

SOUTHERN CONNECTICUT REGIONAL FRAMEWORK
for
**COASTAL
RESILIENCE**

**LEGAL, POLICY, and REGULATORY
ASSESSMENT GUIDE**

JUNE 2017



About MAI

The Marine Affairs Institute (MAI) is a partnership of Roger Williams University School of Law, The University of Rhode Island (URI), and Rhode Island Sea Grant. Through this partnership, MAI has access to the resources of two universities and the Sea Grant Legal Network. Through the partnership with URI, MAI has access to faculty, staff, and research facilities at both URI's Graduate School of Oceanography and College of the Environment and Life Sciences. Located at Roger Williams University's School of Law, the only law school in Rhode Island, MAI is home to Rhode Island Sea Grant's Legal Program, one of only four dedicated Sea Grant Legal Programs in the country and the only one in the Northeast. In addition, the Sea Grant Law Fellow Program, housed at MAI, matches qualified law students with constituent groups to answer important and timely questions in ocean and coastal law and policy.

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The Regional Framework for Coastal Resilience in Southern Connecticut is a joint project managed collaboratively by the Southern Connecticut Regional Council of Governments, The Nature Conservancy, and the Connecticut Metropolitan Council of Government.



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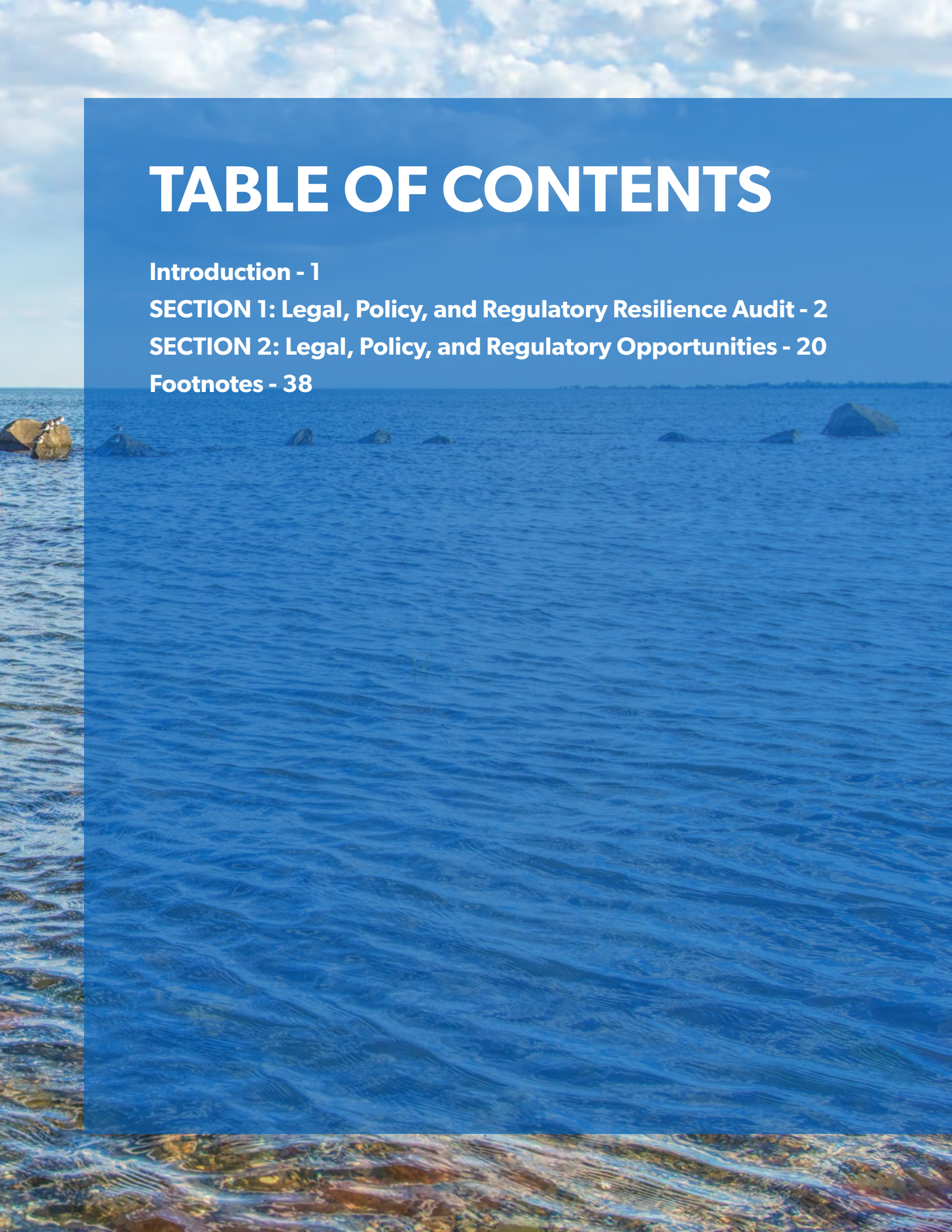


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Introduction

The following “Southern Connecticut Regional Framework for Coastal Resilience: Legal, Policy, Regulatory Assessment Identifying Options for Advancement of Natural/Green Infrastructure Projects and Improve Resilience in Coastal Municipalities” guide is part of a larger project to assess and advance opportunities to reduce risk from large-scale storm events, increase the viability and resiliency of natural ecosystems in the project area, and initiate a Regional Framework for Coastal Resilience across ten coastal municipalities in Southern Connecticut. The project focuses on community resilience building through natural and green infrastructure and land use and is managed via a partnership among the South Central Regional Council of Governments (SCRCOG), Nature Conservancy (TNC) and Connecticut Metropolitan Council of Governments (MetroCOG) (i.e., core project team). The following “Guide” is a truncated version of a much more detailed report prepared by MAI available from the core project team.

Scope and Methodology

The project’s geographic scope consists of ten, contiguous, coastal municipalities in Southern Connecticut including Fairfield, Bridgeport, and Stratford (members of MetroCOG) as well as Milford, West Haven, New Haven, East Haven, Branford, Guilford, and Madison (members of SCRCOG).

This content for this guide was produced by MAI through a combination of independent legal research and interviews. Independent research included direct consideration of federal and state laws and municipal charters, ordinances, and regulations, as well as other relevant sources of legal authority. Interviews were conducted in accordance with a standard protocol and were held with key staff from participating municipalities, relevant regional governance organizations, state agency personnel, and other knowledgeable stakeholders.

Additional Resources

Additional resources about this project can be found at:

- <http://www.ctmetro.org/coastal-resilience>
- <http://scrcog.org/regional-planning/coastal-resilience>

Organization of this Guide

This guide is organized into two sections: 1) audit of legal authorities central to regional resilience policy and planning; and 2) legal and policy options for advancing natural/green infrastructure and improving overall resilience of municipalities.

In each of these sections, jurisdictional and procedural processes are separated into the following categories for ease of navigation and reference:

- Planning and zoning, including building codes, flood and erosion control, coastal management, wetlands regulation, and other issues;
- Water quality protection;
- Parks, wildlife, and open space;
- Transportation infrastructure, including navigation and highways.



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SECTION 1: Legal, Policy, and Regulatory Resilience Audit

This section provides an audit of federal, state, and local legal authorities related to coastal land use and green infrastructure affecting ten municipalities in southern Connecticut. This audit reviews local ordinances, zoning conditions, land use policy, variances, and incentives, as affected by state and federal regulatory and permitting requirements influencing and dictating these authorities and related local practice.

SECTION 1: Legal, Policy, and Regulatory Resilience Audit

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This section is organized around the following regional resiliency strategies:

- Regulating uses of coastal lands;
- Retaining coastal land as open space;
- Mitigating flood hazards in the built environment; and
- Building resilient transportation infrastructure.

The section addresses each of these topics in detail by considering a variety of more specific legal tools that can enable and support activities that improve coastal resiliency within each municipality and across the region.

Coastal Land Use

Coastal areas are subject to coastal flooding and erosion. In these areas, enhanced building requirements (in addition to those related to freeboard) may be needed to reduce vulnerability and to enable coastal natural or green infrastructure. These protections may be offered either through floodplain management provisions—under which CHHAs (FEMA “V” zones) are subject to enhanced building standards—or zoning regulations restricting the type of development in a coastal district or overlay zone. This section reviews several aspects of coastal building regulation, including coastal zoning districts, coastal site plan reviews, setbacks, and vegetated buffers.

Coastal Zoning Districts

Coastal resiliency may require different patterns of land use in coastal areas than inland. Municipalities can ensure that development and land use are consistent with resilience needs by using their planning and zoning authorities to create coastal zoning districts or overlay districts specific to coastal locations. This section reviews whether and how each municipality in the project area has used planning and zoning tools to manage its coastal areas. Not included in this section are provisions related to implementation of state-mandated coastal site plan review or specific provisions regarding setbacks and buffers, all of which are discussed in more detail below.

Summary of Coastal Zoning Districts

Many, but not all municipalities in the project area have established specific zoning districts applicable in the coastal area (Table 1). These may either be zoning districts or overlay districts. Overlay districts are commonly integrated with coastal site plan review requirements (discussed below), and in some cases, include additional use limitations. Waterfront zoning districts, on the other hand, contain their own use limitations focused on types of activities desired and prohibited. These districts generally contain more rigorous and thorough controls on activities than are present in overlay districts, and may therefore more effectively target and require developments that are consistent with coastal resiliency needs.

The contents of coastal districts differ substantially by municipality. Urban jurisdictions seeking to develop their shorefront areas consistent with their coastal resiliency needs have created waterfront business districts to promote mixed use residential and light industrial and commercial use of their less developed—but potentially highly valuable—waterfronts. Suburban jurisdictions, on the other hand, appear to use coastal districts to limit development in coastal areas with a focus on protecting coastal resources, often but not always through an overlay district used exclusively to apply coastal site review requirements, rather than on promoting development. These differences reflect the distinct needs and preferences of each type of municipality.

Urban waterfront zoning districts differ in their approach to coastal resiliency. Some municipalities do not incorporate resiliency concerns. For example, Bridgeport explicitly seeks densification of its waterfront areas without mandating incorporation of resilience considerations. In this context, the long-term resiliency of developments will depend on the coastal site plan review process and the incorporation of resiliency-focused design elements by developers. Other jurisdictions provide more guidance; for example, West Haven seeks low- to mid-rise mixed use development but seeks building elevation with at-grade parking on the ground floor, thus reducing building exposure to coastal flood hazards.

Other municipalities have created multiple zoning or overlay districts to regulate different types of activities in the coastal zone. Milford has created three coastal zoning districts that set areas aside primarily for recreational and park uses; create separate areas where water-dependent marina and boating uses can be allowed by special permit; and identify where (primarily) residential uses may be appropriate by special permit. These three zones in practice occupy only a small part of the coastal area, however: most areas within Milford’s coastal area management boundary are designated under other general or corridor zones that allow residential, commercial, industrial, or open space uses without special reference to coastal issues. Thus,

despite coastal-specific zoning, the coastal site review process remains a critical element of resilience in Milford as elsewhere.

Stratford's approach to coastal zoning applies coastal-specific elements in a more encompassing fashion using an overlay zone. Stratford has created two waterfront zoning districts similar to those in Milford, and like Milford has zoned its coastal area to include not just these two zones but also a wide array of other general zoning districts. Stratford, however, has created an overlay zone that applies to any development in the coastal area and requires not only coastal site review but also specific additional standards (e.g., view lanes). This overlay allows Stratford to avoid large-scale changes to its legacy zoning districts and plan while also requiring affected areas to meet higher standards, which can include resiliency-focused elements.

The municipalities in the project area illustrate the wide variety of approaches available to address coastal zoning. Cities and towns can successfully plan for resilience by using waterfront-specific coastal districts, overlay districts, or both. Municipalities without either type of coastal district may be equally capable of managing their coastal areas through regulations rather than districts (e.g., through coastal site plan review regulations that do not reference a particular district), but this method may be difficult to ally with other coastal resiliency-focused use restrictions. However a municipality designs its selected approach, it must implement that approach in a coherent, consistent, and forward-looking manner for it to operate effectively in practice. The locations of relevant districts and the specific requirements that apply are both important to success.

Table 1. Coastal zoning districts by municipality.

Municipality	Coastal District(s)	Type
Branford	Coastal Management	Overlay
Bridgeport	Mixed Use - Waterfront	Zoning
East Haven	—	—
Fairfield	Beach	Zoning
Guilford	Coastal Area	Overlay
Madison	—	—
Milford	Beach Erosion Zone	Zoning
	Boating Business	Zoning
	Waterfront Design	Zoning
New Haven	Coastal Management District	Overlay
	Light Industry – Marine	Zoning
	Marine	Zoning
Stratford	Coastal Area Management	Overlay
	Coastal Industrial	Zoning
	Waterfront Business	Zoning
West Haven	Waterfront Design	Zoning

Coastal Site Plan Review

The state Coastal Management Act requires all municipalities to implement specific planning and approval processes in the coastal area, including through submission and review of coastal site plans for activities requiring planning and zoning approval seaward of the defined coastal boundary. Municipalities are authorized to exempt certain activities from the requirement to receive approval of a coastal site plan. This section audits whether and how each municipality has established the required coastal site plan review structure, including unique provisions of each municipality's approach.

Summary of Coastal Site Plan Review

As required by state law, each municipality in the project area has established a coastal site plan review process as part of its zoning regulations. These requirements differ only in minor respects, with a few exceptions.

First, while most towns have created an overlay district to serve as the mechanism governing coastal site plan review, several municipalities have simply incorporated regulations for the review without an overlay district. This distinction has little import, except that municipalities have used such overlay districts to incorporate other, related provisions to enhance coastal resiliency, such as vegetated buffers (see elsewhere in this section).

Second, the exemptions from coastal site plan review differ in some respects. Most municipalities have adopted the optional exemptions provided in state law almost or exactly verbatim. Others, however, have modified the language

in marginal or more substantial respects. Differences may result from changes to state law that are not carried over to the municipal level or from more intentional decisions based on the expected development in or the geography of a municipality.

Adoption of setback limitations are an example of intentional municipal decision to limit the scope of exemptions from the law. Several municipalities have limited availability of one or more exemptions to create and modify setback requirements (Table 2). Where a setback limit is set for an exemption, an applicant must undergo coastal site plan review even for activities that would otherwise be exempt. While this may raise expenses for municipalities by increasing the coastal site plan review load, it also may reduce the risk that otherwise-minor development activity causes temporary or irreparable harm to coastal resources that provide important ecosystem services to the community.

In one case—East Haven—the setback limitation is global, insofar as no activity within 50 feet of coastal resources is exempt. All other municipalities with setback limits apply these limits to particular state-allowed exemptions, either alone or with other differences not summarized here but including area limits based on square footage of percent increase in impervious surface; shoreline access losses, or particular activities (e.g., decks). Setback limitations vary from none (as in most but not all exemptions under state law) to 100 feet.

Table 2. Coastal site plan review exemption setback limitations.

Exemption	Municipality	Setback limit
Minor additions to or modifications of existing buildings or detached accessory buildings...	Guilford	100 ft
	Madison	25 ft
	Stratford	100 ft
	West Haven	50 ft
Construction of new or modification of existing structures incidental to the enjoyment and maintenance of residential property	Madison	25 ft; regrading affecting topography
	West Haven	50 ft
Construction of new or modification of existing on-premise structures . . . as will not substantially alter the natural character of coastal resources or restrict access along the public beach	Madison	25 ft; regrading affecting topography
	West Haven	50 ft

Coastal Setbacks

Coastal setback requirements set limits on how close coastal property development can occur to the water. Setbacks are an important tool for both supporting coastal green infrastructure like wetlands and dune systems and for reducing casualty loss. Coastal setbacks are distinct from the limitations on exemptions based on setback, as described above, in that they govern where activity can occur rather than the process required to approve the activity. As such, both types of setback may contribute meaningfully to development patterns in coastal areas and to coastal resiliency. This section reviews the applicable coastal setbacks on a municipal level, as well as dune protection requirements.

Summary of Coastal Setbacks

Towns differ substantially in their approach to coastal setbacks (Table 3). Some require setbacks only through their floodplain management ordinances or regulations. In these provisions, municipalities uniformly select one of two options for a baseline—mean high water or the Coastal Jurisdiction Line (CJL). While either baseline may be workable, the CJL may offer more certainty and ensures consistency with state law regarding, e.g., permitting in tidal wetlands. Municipalities may or may not require setbacks beyond that baseline. Additional setback requirements are likely to decrease vulnerability to coastal flooding and erosion and may therefore enhance resiliency.

The second mechanism that municipalities have used for coastal setbacks arises from zoning restrictions incorpo-

Table 3. Coastal Setbacks

Municipality	Baseline	Setback (feet)
Branford	Coastal Jurisdiction Line	0
	Critical Coastal resources	25
Bridgeport	Mean High Tide	0
East Haven	Coastal Jurisdiction Line	25
Fairfield	Mean High Tide	0
	In Beach District	25 (min.)
Guilford	Coastal Jurisdiction Line	25
	Critical coastal resources	25-100 (min.)
Madison	Coastal Jurisdiction Line	0
	Critical Coastal Resources	50
Milford	Mean High Tide	0
	Seasonal high water, MHT, or legally established boundary	25
New Haven	Coastal Jurisdiction Line	25
Stratford	Mean High Tide	50
	Tidal wetlands, coastal bluffs and escarpments, and beach and dune systems	75
West Haven	Coastal Jurisdiction Line	0

rated into zoning regulations that are generally applicable regardless of district, as in Stratford, or incorporated into the specific requirements applicable in a particular coastal district, as in Fairfield. Most municipalities using generally applicable setbacks (Branford, Guilford, Madison, and Milford) select a baseline that exists only where there are critical coastal resources present, and these setbacks may be tailored to the type of resources present and the particular characteristics of a given lot or neighborhood. Stratford, on the other hand, has created a generally-applicable 50-foot setback that is increased in the presence of coastal resources.

Natural Protective Barrier Protection

Natural coastal features provide an important flood and erosion protection service. These features include topography such as dunes as well as vegetation that may anchor soils, dissipate wave energy, and encourage infiltration. Although dunes and other features provide natural protection against flooding and erosion in coastal areas, property owners nonetheless may seek to remove them in order to obtain enhanced views, water access, or for other reasons.

Protection of dunes and vegetation is largely a municipal function for features located landward of the CJL. This section reviews how municipalities enhance coastal resiliency by specifically protecting dunes and vegetation.

Summary

of Natural Protective Barrier Protection

Limitations on the modification of natural features and vegetation play an important role in flood prevention and mitigation. All flood prevention ordinances, without meaningful variation, prohibit alteration of dunes that will worsen potential flood damage. While beneficial, these provisions are limited and do not protect other important features that provide flood and erosion control features, including vegetation. Only three municipalities in the project area currently have incorporated additional limitations into their zoning regulations. In two cases, these provisions require retention of existing vegetated buffers and may require creation of new buffers, while one requires that dunes, barrier beaches, and “other natural protective barriers” remain intact. Both of these approaches may support coastal green infrastructure, although only the latter approach is directly framed in terms of coastal resiliency.

Flood and Erosion Control Structures

State law authorizes municipalities to create flood and erosion control structures (FECS) or to designate another body with the powers of a flood and erosion control board (FECB), which include the design, layout, construction, and maintenance of FECS. FECS include a wide array of hard infrastructure approaches to erosion management, such as groins, seawalls, and tide gates. The FECB enabling statute does not address green infrastructure, so it is not clear whether FECBs may develop or construct coastal green infrastructure as a FECS—nor has any municipal FECB attempted such a project to our knowledge.

FECB authorities do not exempt municipalities wishing to create FECS from complying with other applicable laws; to the contrary, municipalities are required to obtain a permit from DEEP for activities affecting tidal wetlands or requiring placement of fill material, and such permits for hard infrastructure are granted only where meeting limited criteria. Permitting of green infrastructure and living shorelines approaches to flood and erosion control projects will also be challenging, as DEEP has not to date clarified what types of projects are likely to be considered living shorelines approaches.

As shown in Table 4, most, but not all, municipalities in the project area have established a FECB and vested in them the authority provided under state law. In a few cases, a FECB has additional responsibility to act as an appeals body under the flood management regulations.

Currently, FECBs are typically entities of lower importance in most municipalities in the project area. FECB authorities uniformly lack any details to govern board responsibilities or guide their decision-making. Instead, municipalities simply adopt the provisions set out in state law. Given these limitations, it is not surprising that interviews consistently suggest that FECBs meet only irregularly and in response to particular project proposals. Despite these limitations, FECBs could provide a useful partner for municipal coastal living shorelines projects if they receive the resources and assistance needed to effectively plan and execute such projects in a proactive manner. Without such support, FECBs may primarily serve as an administrative hurdle to the design and execution of such projects.

Open Space

Land development in the coastal area has a substantial impact on municipal and regional resiliency. Densification and development in the coastal zone increases the number of people and amount of property vulnerable to flooding and coastal erosion and may substantially increase the casualty losses associated with storm events and sea level rise. At the same time, coastal development can be highly beneficial for municipalities by increasing property tax income—especially in areas where coastal property values are high.

Legal tools can increase coastal resiliency by requiring or providing incentives for development that mitigates risks associated with sea level rise and storm activity. This section reviews legal approaches that municipalities can use to improve resiliency, including transferable development rights, cluster development, open space set-asides, and coastal setbacks and buffers.

Transferable Development Rights

Transferable Development Rights (TDR) offers developers incentives to reduce density or not develop in one area in exchange for enhanced density or other benefits in another location. “In their simplest forms, these policies divide a jurisdiction into a sending area (where development is discouraged) and a receiving area (where development is encouraged). The receiving area is zoned for relatively high-density development, while the sending area is zoned for agriculture and very low-density housing, e.g., 1 home per 10 acres.”¹¹

Affordable housing, transit-oriented development, and other development patterns have been encouraged using incentive programs in the project area. For example, Branford has created an Incentive Housing Overlay District that “seeks to avoid sprawl and traffic congestion by encouraging a more vibrant residential component to business or mixed-use areas in order to sustain a lifestyle in which residents can walk or use public transportation to reach jobs, services, and recreational or cultural opportunities.” These districts may be eligible for state incentives and have enhanced use and bulk requirements as compared to areas outside the district.¹² However, neither Branford nor any other municipality in the project area has established authority using similar incentives for transfer purposes.

Table 4. Flood Erosion and Control Board adoption by municipality.

Municipality	Authority	Powers beyond those given by state statute
Fairfield	FECB ¹	—
Bridgeport	FECB ²	—
Stratford	—	—
Milford	FECB ³	—
West Haven	FECB ⁴	Hears appeals from decisions by Director of Planning related to flood management ⁵
New Haven	—	—
East Haven	FECB ⁶	—
Branford	FECB ⁷	Hears appeals from decisions and requests for variances under town floodplain management regulations ⁸
Guilford	FECB ⁹	—
Madison	FECB ¹⁰	—

Cluster Development

Cluster development provisions allow for densification of development in certain areas of a parcel, while other areas are left open and undeveloped.¹³ As such, cluster development in subdivision and zoning regulations may be an important element of increasing the resiliency of new coastal subdivision activity. This section reviews municipal cluster development provisions.

Summary of Cluster Development

Many, but not all municipalities in the project area have promulgated authority in their zoning or subdivision regulations that are relevant to cluster development. These requirements are most often through Open Space Subdivisions or Developments (e.g., Guilford, Branford, Fairfield) in which cluster requirements are substantially detailed. These provisions may (but often do not) offer incentives in the form of increased numbers of units in cluster developments.

Cluster development programs are generally only available in low-density residential areas. Insofar as these programs are most relevant in as-yet-undeveloped subdivision lands, they are not models for more urbanized municipalities. Urban areas have established alternative mechanisms, however; Bridgeport and certain other municipalities explicitly authorize cluster development under provisions that grant broad discretion to the PZCs to modify lot area and setbacks within the generally-applicable limitations on density.

Application of cluster developments may also have limited applicability in the coastal zone when, as in Guilford, they exclude SFHAs from the developable area eligible for consideration. While there are sensible reasons for such exclusion (beyond coastal resiliency), where the entire parcel is in the coastal area, access to the densification incentives may require a variance.

Open Space Set-Asides

The ability to conserve coastal areas in an undeveloped state is a critical element to coastal resiliency, both reducing the exposure of the potential built environment and allowing natural/green infrastructure and living shorelines approaches to protect development that occurs in adjoining, vulnerable parcels. Municipalities may increase coastal resiliency by encouraging the placement of coastal lands in municipal ownership or in a land trust, subject to a perpetual easement prohibiting development. Such programs may operate with or without incentives in the form of transferred development rights or other benefits.

Summary of Open Space Set-Asides

Municipal authority—often in subdivision codes—contains provisions requiring transfer of a portion of land into perpetual conservation in exchange for the authority to develop. These authorities generally require a mandatory minimum dedication of subdivision lands to be set aside for open space and recreation. Coastal areas may be well suited for use as set-asides, as the local government can select lands based on their particular vulnerability or utility for coastal resiliency. However, these set-asides are limited because the regulations do not provide incentives for additional set-asides in exchange for density or other benefits that might enhance coastal resiliency. In addition, the limited area open to subdivision in coastal areas will restrict the use of these provisions as resiliency tools—except where in-lieu funds are used to purchase conservation easements or property along the coast.

Several characteristics of municipal regulations may affect their utility for coastal resiliency. Key differences among municipalities include:

AREA: All municipalities require a minimum of ten percent of the subdivision's area to be dedicated as open space, while some also included minimum set-asides in acreage. Fairfield's Open Space Subdivision exception requires 40% set aside.

LAND TYPE: Some municipalities restrict what types of lands may be included, most often focusing on undevelopable lands, including wetlands, watercourses, and steeply sloping lands. While most such set-asides include a fixed percentage of land dedicated, Fairfield uses a floating percentage based on the characteristics of individual parcels. This provision ensures protection of a reasonable portion of the developable area of a site.

PURPOSE: Municipalities commonly direct that set-asides benefit one or more specific purposes. These purposes may commonly be for recreational or parks, but also often include environmental or conservation purposes.

OWNERSHIP: Municipal requirements generally anticipate that the lands set aside will be placed in town ownership or be placed under the control of land trusts or other entities. Regulations generally envisage ownership of the land or an easement by the town, a land trust, or a neighborhood or homeowners' association.

IN-LIEU FEES: All municipalities with relevant programs offer an alternative to dedication through payment of an in-lieu fee equivalent to ten percent of the fair market value of the whole area. The municipal PZC generally has sole discretion to determine whether payment of an in-lieu fee is appropriate.

Financial Mechanisms

Municipalities can affect where and how development occurs in the coastal zone by using financial mechanisms to affect the decisions of developers in favor of, or against, certain activities. Two key mechanisms in this category include tax increment financing and development impact fees.

Tax Increment Financing

Tax increment financing (TIF) uses future increases in property tax receipts expected from development or redevelopment as a means of funding infrastructure or otherwise encouraging the development to occur. As explained by the Connecticut Office of Legal Research:

TIF is a financing technique municipalities use to repay bonds or other debt incurred to finance a development project. The technique taps the increased tax revenue (i.e., the increment) the project generates to repay the debt. Tapping the tax increment for this purpose allows municipalities to finance projects without raising new taxes or diverting funds needed to pay for other expenses. But municipalities may have to do both if the project fails to generate enough incremental revenue to cover the debt.¹⁴

Connecticut authorizes municipalities to use TIF to repay bonds issued for physical project in five scenarios: redevelopment; urban renewal; municipal development for commercial or industrial use; information technology (distressed communities and targeted investment communities only); and redevelopment of contaminated property.¹⁵

Several municipalities in the project area have established redevelopment or urban renewal districts eligible for TIF financing. Numerous municipalities—particularly those with an urban form and legacy manufacturing capacity—have waterfront property with substantial contamination that may soon be underwater. The use of TIF in areas where regular or permanent inundation is likely soon are not good candidates for TIF, as they would be unlikely to yield the increased future tax revenue needed to support payments on a bond. However, certain redevelopment projects and districts, such as downtown Bridgeport, are subject to inundation but also act as economic drivers. These areas may be both eligible for and reasonable candidates for TIF to provide funding for elevation or other infrastructure projects.

Development Impact Fees

Development impact fees offer a second financial tool for discouraging development that may reduce resiliency. As defined under California law, these fees are “a monetary exaction other than a tax or special assessment . . . that is charged by a local agency to the applicant in connection with approval of a development project for the purpose of defraying all or a portion of the cost of public facilities related to the development project.”¹⁶

Development impact fees are commonly authorized at the state level, including in other New England states. Connecticut, however, requires specific authorization for municipalities to levy fees as part of their municipal functions.¹⁷ In other words, municipalities can impose fees only for purposes specifically provided by state law, such as for payments in lieu of open space dedication. As municipalities lack such explicit authorization for development impact fees, they cannot use this tool regardless of its potential utility in a coastal resiliency context.¹⁸

Flood Hazard Mitigation

Municipalities are authorized to create a range of authorities related to flood hazard mitigation, including floodplain management regulations that create requirements for buildings and structures in the floodplain and flood and erosion control authorities empowered to create seawalls and other built flood and erosion control infrastructure for a town. Relevant authorities may be located in zoning and/or subdivision regulations. This section reviews several aspects of municipal flood hazard mitigation regulation, including whether development in high-risk areas can be prevented; what areas are included in Special Flood Hazard Areas (SFHA) subject to regulation; what elevation requirements are provided in those areas; how developments must account for stormwater runoff and infiltration; and requirements to use low-impact development approaches and pervious surfaces.

Suitability for Building

One method for improving coastal resiliency is to limit development in locations that are vulnerable to flooding, erosion, or other threats. Municipalities must issue building permits for new development (and in Connecticut must review and approve a coastal site plan), providing a tool for review of the potential threats posed by coastal development proposals. This section reviews the municipal authorities governing or limiting approval of sites that are unsuitable for development due to these or other issues.

Summary of Suitability for Building

Municipalities differ in terms of whether they have limitations on development based on lot suitability; the terms of suitability; and the consequences of an unsuitability finding.

- Some municipalities have not adopted unsuitability requirements at all; these municipalities are generally in urban areas where subdivision activity is less common. In areas with substantial subdivision regulations, suitability findings are common.
- Hazards that may result in an unsuitability finding commonly include flooding, and less often erosion. Coastal hazards are not included in explicit lists of hazards that may render a proposed lot unsuitable in any municipality in the project area.
- In most locations, lots determined to be unsuitable must be corrected, combined with other suitable lots, or left in an unbuilt condition. In one case—Madison—land unsuitable due to flooding cannot be subdivided.

Defining Flood-Prone Areas

Municipal land use authorities require property owners to comply with special building standards in SFHAs. These areas are generally defined by Federal Emergency Management Agency (FEMA) classifications shown on the Flood Insurance Rate Maps (FIRMs) created as part of the Flood Insurance Study (FIS) for a given locality. FEMA's defined SFHA includes Zone A (areas within the 100-year floodplain) and Zone V (velocity, i.e., coastal areas subject to wave action). The enhanced building standards increase the resiliency of subject developments to periodic flooding and storm surge, mitigating the damage these events may cause.

Municipalities can enhance their coastal resiliency in the near and long term by requiring all development in areas reasonably expected to be subject to flooding to comply with the enhanced standards. They may accomplish this by including higher-elevation properties—"non-special flood hazard areas" (Zones B, C, and X), as defined by FEMA—in the defined SFHA. These higher-elevation areas may not now be required to obtain flood insurance, but they may nonetheless be vulnerable due to sea level rise and underestimation of current flood vulnerability by FEMA. In practice, however, every municipality in the project area has defined its SFHA to correspond to FIRM zones A (100-year floodplain), AE (100-year floodplain with base flood elevation (BFE) defined), and VE (velocity with BFE defined). While all also have particular building standards applicable in coastal high-hazard areas (CHHA) (Zone VE), none has additional standards relevant to buildings or other structures in lower-risk zones.

Enhanced Building Requirements

Building requirements in the coastal zone play a critical role in coastal resiliency, reducing both hazards to human life and casualty losses associated with flood events. While a full comparison of all flood hazard mitigation requirements is beyond the scope of this guide's scope, we include a comparison of building elevation requirements, which serve a key role by establishing minimum standards for vulnerability to 100-year floods. Municipalities can increase resiliency in coastal areas by incorporating "freeboard" into elevation requirements (Table 5) to ensure a margin of safety between anticipated 100-year flood BFE and building floors.

In general, elevation requirements differ in different FIRM zones (A versus V zones), with A zones requiring elevation of the lowest living floor to or above the Base Flood Elevation (BFE) and V zones requiring elevation of the lowest supporting member to at or above the BFE for residential construction. Non-residential construction has lesser elevation requirements, such that floodproofing but not elevation is required up to the BFE. The following table shows deviations from these standards on a municipality-by-municipality level.

Stormwater

and Low-Impact Development

Property development can substantially alter the ability of floodplains to absorb flood waters, resulting in increased surface flows and velocities, particularly where stormwater sewer facilities and infrastructure are not designed to carry water associated with intense storm events. Municipal stormwater management policies, and particularly policies calling for or requiring low-impact development or supporting the use of green infrastructure, can increase permeability, reduce strain on storm sewer systems, and lessen flood hazards.

This section reviews low-impact development provisions incorporated into municipal ordinances and zoning regulations. It does not substantially address soil erosion and sediment control (SESC) requirements, as these are primarily focused on mitigating sediment outfall for pollution control rather than serving a resiliency or flood management function. In addition, specific provisions related to mandatory stormwater sewer functions incorporated into transportation infrastructure are addressed separately below.

Summary of Stormwater Management and Low-Impact Development

Municipalities in the project area consistently require some stormwater management practices. While the relevant provisions are similar in many respects—notably, in the requirement that stormwater management be designed in compliance with the state stormwater manual—they also differ in several important ways, including:

- when stormwater management requirements are triggered;
- whether they explicitly require the use of low impact development (LID) techniques;
- the design storm to which they must avoid increased in peak flow;
- the volume of stormwater that must be retained on site; and
- limitations on impervious cover.

Triggering Events for Stormwater Management

Stormwater management requirements, notably including creation of a stormwater management plan (SMP), apply only in certain cases in most municipalities (Table 6). Development of a SMP or compliance with stormwater management criteria may be triggered under two scenarios:

(i) when other required documentation and analysis is required, including site plans, coastal site plans, special permits, or special exceptions; or

(ii) when the characteristics of a development meet certain criteria, such as square footage, acreage, location within particular zoning districts, or commercial or industrial use.

The municipalities vary widely in both respects. Those triggering stormwater requirements with zoning approvals can do so broadly (as in New Haven) or for particular types of activities, which often do not include all types of approvals. The fewer municipalities with other types of triggers use them sparingly for larger developments and projects in specific districts; however, waterfront districts are commonly included.

Low-Impact Development Techniques and Green Infrastructure

The characteristics and design criteria required when stormwater management requirements are triggered differ from town to town, including with respect to whether LID techniques are required. In some cases, LID techniques are identified explicitly (Branford, East Haven, Guilford), whereas others require or encourage the use of green infrastructure techniques without using LID terminology explicitly (Bridgeport, Madison). The remaining municipalities include no requirement or policy in favor of green infrastructure techniques.

Table 5. Freeboard requirements by municipality.

Municipality	Applicable Zone	Freeboard/floodproofing required above BFE
Branford	A, AE, VE	1 foot (Branford Code §§ 161-18, 161-19).
Bridgeport		—
East Haven		—
Fairfield		—
Guilford		—
Madison		—
Milford		—
New Haven	A, AE, VE	1 foot (New Haven Code Tit. IV § 5.3)
Stratford	VE	1 foot (Stratford Code § 102-19)
West Haven		—

Peak Flow Offset Requirements

Development, particularly when replacing open space, increases the amount of impervious surface and therefore can result in increased stormwater runoff if stormwater management systems are not carefully designed. Whether based on hard (sewer) or green infrastructure, municipalities generally require that stormwater management systems must be designed to prevent increases in the volume and rate of peak flows from storm events. In one case, flows must be reduced. While preventing increases makes sense in cases where open space is converted to development, reductions are likely possible in more urbanized area where impervious cover is ubiquitous; in such cases, reduction may not be difficult to achieve.

The amount of peak flow offset can be limited in a variety of ways. Most commonly, municipalities set different standards for the storm frequency to which stormwater management systems must be designed (Table 7). The specified design storm differs by municipality, from a 2-year to a 100-year storm. Alternatively, some municipalities prohibit increases under any scenario—though often assessments of storm flow are required only up to the 100-year event scenario. Such requirements may not be substantially different in practice from a required 100-year storm offset. Note that assessment requirements differ from offset requirements and only the latter are shown below.

Table 6. Stormwater management plan requirement triggers.

Municipality	Stormwater management required for...					
	Site plan	Coastal site plan	Special exception	Special permit	Inland wetlands permit	Subdivision plan
Branford	Y		Y			
Bridgeport	Any project with potential stormwater impacts					
East Haven	Y	Y	Y		Y	Y
Fairfield						
Guilford	Y	Y		Y		
Madison	Y					Y
Milford						
New Haven	Any project requiring zoning approval					
Stratford	Projects in certain listed zoning districts					
West Haven	Projects with > 10,000 sq. ft. impervious surface					
	Projects in certain listed zoning districts					

Stormwater Retention

In addition to preventing increased peak flows, municipalities often require developers to ensure that a certain amount of stormwater is collected and retained on site. Regulations often call for infiltration to be maximized, while many also or alternatively require the first inch of rainfall to be collected, retained, and treated on site. This first inch is the most likely to be polluted by oils and other pollutants; as a result, this limited retention requirement is unlikely to be intended to provide significant flood management services. However, on-site retention and infiltration can also provide a flood prevention role; in Branford, retention of a 25-year storm is required on site, which will likely to substantially reduce the contribution of a development to downstream flooding during moderate to larger storm events. East Haven, Guilford, Madison, New Haven, and Stratford had a requirement up to a 1" rainfall; Bridgeport extends this to include up to a 50-year storm. Fairfield, Milford, and West Haven do not have requirements for onsite retention currently.

Limits on Impervious Surface

Finally, impervious cover is a key contributor to stormwater runoff. While runoff can be managed through designed systems, the amount of impervious cover can also be explicitly limited for all projects or at different rates in different zoning districts. Municipalities have established different provisions regarding impervious cover. In most cases, no maximum impermeable cover is required by stormwater regulations. However, general commandments to "minimize" impervious cover and "maximize" infiltration are common, if potentially difficult to enforce. In Guilford, maximum impermeable surface is specified for specific zoning districts as a function of the percentage of lot size, and these percentages are reduced for properties in proximity to coastal resources—a particularly salient approach for coastal resiliency, particularly in jurisdictions and/or zoning districts in which the density of the built environment is lower. In urban and downtown areas with high density development, such maximums on impervious surface may not be workable.

Transportation Resiliency

Transportation infrastructure is a critical component of coastal resiliency. This infrastructure includes highways as well as rail, air, and port development. While each of these types of transportation infrastructure is important to resiliency and may incorporate green infrastructure, all but highways are primarily or exclusively governed by federal and/or state authorities rather than by municipalities. As a result, this section focuses on municipal highway authorities and their incorporation of provisions relevant to resiliency.

There are two parallel systems of highways in Connecticut – the state highway system and municipal highway systems. Both are present in coastal areas and therefore important to resiliency efforts. For example, state route 146 connects Branford and Guilford and runs in part along the shoreline. This and other state roads are important primary and secondary connectors, and may include critical means of access to and egress from coastal neighborhoods. Municipal roads make up the greater part of the transportation infrastructure, including smaller neighborhood roads as well as connectors not taken into the state highway system.

Municipal highways are commonly constructed in accordance with design and construction standards. Municipalities may create their own standards or adopt those set out in manuals as a best practice for particular situations. In some cases, municipalities require adherence to particular standards via ordinance, or town and city engineers may simply follow standards as a matter of practice.

Mandatory or practical application of design standards may be effective for implementation of coastal resiliency projects. Mandatory adherence to standards can ensure that municipalities incorporate resilience activities into road construction, but this system requires identification of best practices as standards, and once adopted the standards may be difficult to change. Green infrastructure approaches to highway design are relatively novel, and innovation and experimentation may be expected and desirable in this context. In this case, the absence of a fixed, mandatory standard may be desirable. However, as designs mature, such as for rain gardens, adoption of mandatory standards will have advantages, including by setting requirements for acceptance of new roadways by the municipality and by ensuring that municipal projects and contractors adhere to emerging best practice.

Highway Stormwater Sewer Capacity

Coastal municipalities can increase resiliency by forward-looking design of highway infrastructure for stormwater management. The capacity of stormwater sewer systems is an important aspect of coastal resiliency, storm sewer systems are called upon as a critical link in drainage systems after inundation caused by storm and flood activity. Inadequate stormwater carriage may not be sufficient to drain water, causing backups and flooding with attendant property damage, erosion, and other adverse impacts. This danger may be exacerbated where development results in increased stormwater flows from land parcels—a topic previously discussed above. While not reprised here, municipalities must recognize the relationship and connections between and among land use practices and stormwater carriage needs.

Summary

of Highway Stormwater Sewer Capacity

While several municipalities have established mandatory performance requirements for highway storm drainage, these requirements are not uniform, and some municipalities have not developed any performance standards for storm sewers. Where no performance standard exists, the sufficiency of storm sewer systems will be left to the discretion and expertise of the municipality—generally, the Town Engineer—which will review new proposed highway plans and whose approval will be required to obtain a permit. This system can work, but leaves open the possibilities that

storm sewers may not have consistent carriage ability and/or may not be designed to carry sufficient water.

Incorporation of mandatory performance standards and/or pipe diameter requirements may remove some uncertainty and ensure minimal consistency. These mandatory minimums differ from a 10-year storm in most municipalities to a 25-year storm in one instance, as well as higher standards (50-year storm) for culverts. As flood and storm activity is likely to become more intensive due to climate change, municipalities may increase their resiliency by requiring their storm sewers to carry a larger flow. The incorporation of freeboard and consideration of the safety impacts of larger storms, as required in Milford, may mitigate the impacts of changes in statistical storm flows on sewer design and increase municipal resiliency.

The calculation of the likely flows during storm events will remain critical to the appropriate and adequate design of the sewer system regardless of minimum performance standards. For example, if a developer or municipality underestimates the flow from a ten-year storm, it may not use (or require) a pipe with a diameter large enough to carry the runoff from that storm. Authorities can mitigate the likelihood that flows may be underestimated by specifying how flows are to be calculated. Fairfield, for example, requires calculation of flows over the entire watershed rather than just those flows resulting from a single site. Such provisions

Table 7. Stormwater peak flow offset requirements.

Municipality	Peak flow offset requirement
Branford	No increase from 100-year storm
Bridgeport	No increase under any conditions
	10% reduction for some districts up to 50 year storm
East Haven	No increase in “urban” stormwater
Fairfield	—
Guilford	No increase from 2-year storm
Madison	No increase from 100-year storm
Milford	
New Haven	No increase from “various storm events”
Stratford	No increase from 25-year storm
	Town engineer may require no increase from 50- or 100-year storm
West Haven	—

may be useful models to ensure that flow calculations consider the full potential flow that may affect a given roadway.

Green Infrastructure in Highway Design

Nonstructural and green infrastructure can reduce the stormwater flows arising from storm effects, and thus provide an important service to storm sewer systems by reducing the amount of water that they may be expected to carry in a given storm event. By incorporating rain gardens and other green infrastructure into highway designs, municipalities can reduce the strain on storm sewer systems (and where present, combined sewers). Green infrastructure allows infiltration, reduces impervious surfaces that lead to surface runoff, and provides other means for mitigating the surface flow of stormwater.

Municipalities can encourage or require the use of green infrastructure in highway design by adopting default rules or design and construction standards. However, in most instances municipalities do not explicitly address these emerging practices in their regulation. Without explicit authorization of green infrastructure, uptake of these approaches is likely to be limited, and projects that are proposed or attempted may violate other existing generally applicable highway design standards (e.g., requiring catch basins meeting a particular design). In such municipalities, adoption of green infrastructure would need to either obtain a variance or other required approval or meet all such design parameters even if those parameters fall short of recognized best practice.

Summary of Green Infrastructure in Highway Design

A minority of municipalities in the project area have adopted authority encouraging (but not requiring) the use of green infrastructure specifically in highway design and construction. Those towns that do have such authority—most notably, Branford and Milford—endorse the use of particular types of green infrastructure, including swales and (in Branford) basins, provided that they do not undermine safety. Incorporation of such explicit authority is likely to increase the adoption of these approaches, and they should assist in overcoming challenges associated with the question of whether those approaches are consistent with other existing design and construction criteria.

Barriers to development of new standards for green infrastructure appear lowest in New Haven, which has delegated authority for standards development to its engineer. Where such detailed standards are included in municipal ordinances or regulations, it may be more difficult to establish a new standard or amend an existing standard.

While this section focuses on highway green infrastructure, these design standards do not apply to green infrastructure built outside of the right-of-way. For example, living shorelines buffers for coastal roadways do not appear to be affected by existing design standards. In addition, municipal green infrastructure endorsement as part of larger subdivision plans are outside the scope of this section.

Highway Elevation

Many roadways in the coastal area are subject to periodic flooding during storm events and, increasingly, regular tidal action. Action to address inundation of, and consequent damage to, highways is in many municipalities a matter of substantial interest and high priority. Elevation of roadways above the current or future BFE can protect highways, and has been identified by the state of Connecticut as a key coastal resilience mechanism.

Roadway elevation is a common part of hazard mitigation and coastal resilience programs and strategies, but is explicitly included in legal authorities related to highway construction or design in only one of the municipalities in the project area. Rather, most municipalities have considered and implemented elevation using the discretion accorded to their engineers and public works departments. The following towns are exceptions to this general rule, creating requirements for elevation:

- Fairfield’s subdivision regulations require that “[t]he center line elevation of the pavement shall be seven and one-half (7.5) feet or higher based on current National Geodetic Vertical Datum of 1929.”¹⁹
- Guilford requires that subdivision streets must be at “such elevation or shall be suitably protected” to allow emergency access during flooding periods.²⁰

While a policy requiring elevation of roadways in coastal areas could result in unintended negative consequences (e.g., creating a “bathtub” effect after inundation events if water cannot drain), lesser policy interventions could ensure that elevation and other resilience options are consistently considered. For example, potential authorities could require consideration of elevation for new highway construction or repairs within the coastal area, or a municipality could require its engineer to create a transportation resiliency plan and require construction and repairs to conform to that plan.

Highway Abandonment and Decommissioning

Vulnerable highways that are not candidates for elevation or other protection will suffer continuing damage and degradation because of repeated inundation during high tide and storm events. This damage will result in repeated, costly maintenance—which may be a substantial issue for accepted streets for which the municipality has accepted responsibility for perpetual maintenance.

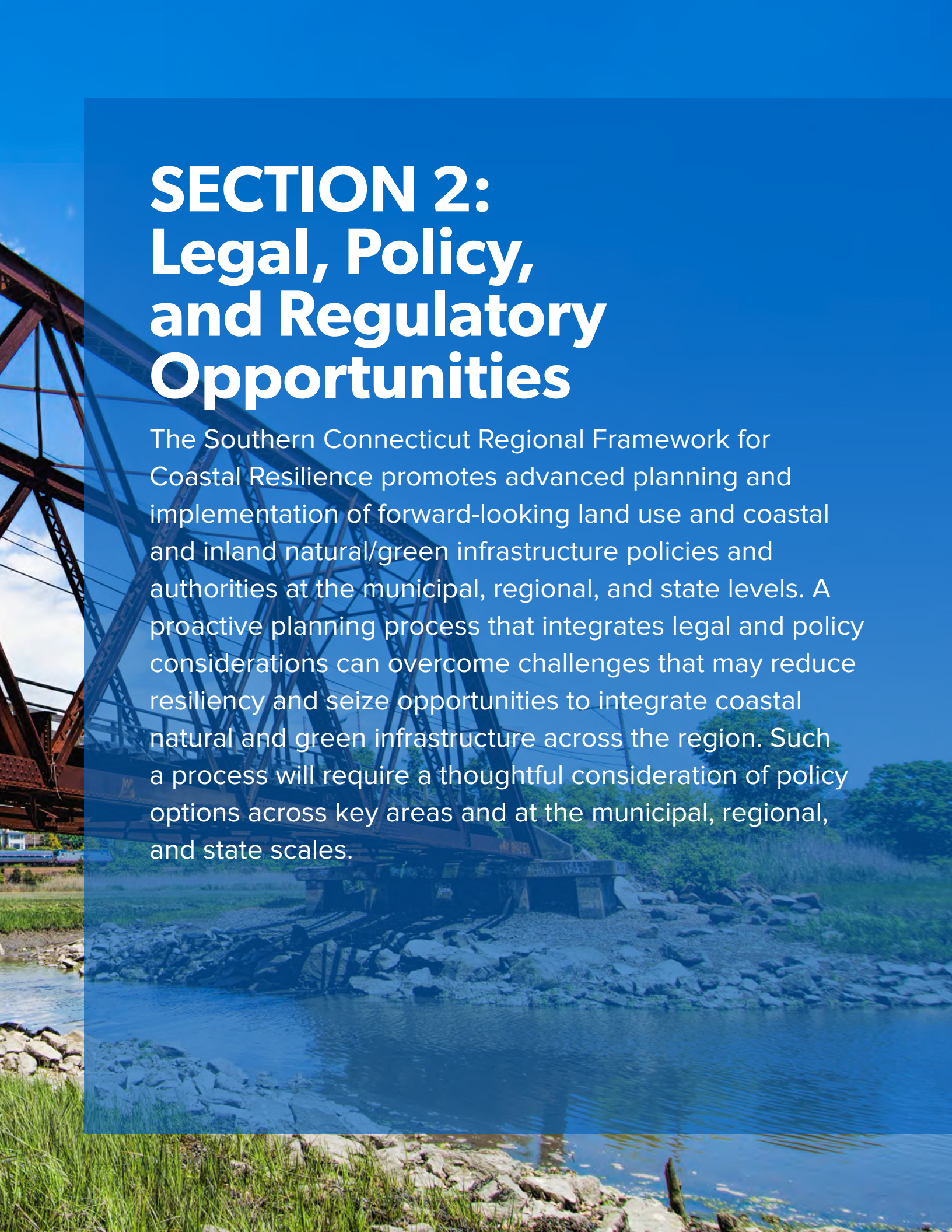
Municipalities may avoid these maintenance costs through two mechanisms. One option is to legally “abandon” a roadway, thereby transferring ownership and responsibility for the roadway to a nongovernmental entity such as a private individual or a civic association. This option may be most appropriate where a road serves as access to only one or a few properties and is not a through thoroughfare.

A section option is to decommission the road by removing it entirely, ceasing maintenance so that it degrades over time, maintaining it only at a lower standard (e.g., gravel rather than tarmac), or restricting the use to non-motorized activities (e.g., greenways or recreational use) so that maintenance is less critical for safety. These approaches may be more appropriate where a highway is not considered critical infrastructure, such as if it is not the sole means of access for properties.

Municipalities can authorize, regulate, or prevent the use of these options through ordinances that identify processes for abandonment or decommissioning of highways.



PHOTO CREDIT: Susan Rubinsky



SECTION 2: Legal, Policy, and Regulatory Opportunities

The Southern Connecticut Regional Framework for Coastal Resilience promotes advanced planning and implementation of forward-looking land use and coastal and inland natural/green infrastructure policies and authorities at the municipal, regional, and state levels. A proactive planning process that integrates legal and policy considerations can overcome challenges that may reduce resiliency and seize opportunities to integrate coastal natural and green infrastructure across the region. Such a process will require a thoughtful consideration of policy options across key areas and at the municipal, regional, and state scales.

SECTION 2: Legal, Policy, and Regulatory Opportunities

This section presents and discusses resiliency options and challenges that merit consideration during the planning process. It is organized around the following regional resiliency strategies, which follow directly from the topics covered in Section 1:

- Regulating uses of coastal lands;
- Retaining coastal land as open space;
- Mitigating flood hazards in the built environment; and
- Building resilient transportation infrastructure.

Development of a regional plan for coastal resiliency in southern Connecticut will build from best practices within the region, but can also benefit from consideration of experiences and practices from other states and municipalities. This section presents case studies focused on particular approaches to coastal resilience and natural/green infrastructure that will be instructive for Southern Connecticut while considering the specific policy options presented.

Coastal Land Use

The Connecticut shoreline is directly impacted by sea level rise and coastal flooding and is a critical component in coastal resiliency. Shorelines are dynamic systems in which erosion and avulsion are natural processes, but these processes are not always welcomed by shoreline property owners or towns—especially as climate change increases the rates of erosion and avulsion. For decades, the response was to armor the shoreline with seawalls, bulkheads, revetments, and other forms of hard infrastructure that rob the coastline of its dynamism and cause or enhance erosion on adjacent or distant properties.

Coastal Zoning Districts

Municipal approaches to the zoning of the coastal area differ substantially; while some jurisdictions have established specific coastal districts, others have not. Some of the districts that do exist are used primarily or exclusively as a tool to implement coastal site plan reviews, while others contain independent provisions enabling or restricting particular uses.

The content and direction of coastal zoning districts depends on each municipality's vision and plan for its coastal areas. All municipalities face a dilemma in that shoreline areas are highly valuable real estate that can substantially contribute to the tax base, but those areas are highly vulnerable to flooding and erosion. This dilemma is most

acute in more urbanized areas, where historic areas and downtown districts are often centered on the waterfront. Retaining and even densifying these areas may be not only a primary driver for city budgets but also a primary focus for redevelopment efforts.

All municipalities must navigate between the desire to invigorate their downtown areas and activate their waterfronts and the responsibility to limit vulnerable development. There are several options for handling this dilemma, which may be selected alone or in combination:

OPTION 1: Erect flood walls or levees to remove highly-valuable areas from the flood zone.

OPTION 2: Prohibit especially vulnerable uses or require applicants to receive a special permit or exemption for those uses.

OPTION 3: Create special enhanced building and construction standards for uses in coastal areas.

OPTION 4: No action.

The first option is to remove particularly high-value areas from the flood zone by erecting levees or other flood protection. This option theoretically would eliminate flooding concerns in most circumstances, and it would eliminate the need for protected properties to obtain flood insurance. On the other hand, this approach is expensive in both capital costs and ongoing maintenance, and it requires substantial participation and support from federal partners for permitting and design of the levee and to update the relevant flood insurance study. This approach may also cause changes to flooding patterns in other locations and will create a high barrier between protected locations and the waterfront, reducing the value of this amenity. Such levees may also fail, with disastrous consequences. This option may therefore be reasonable only in extremely valuable and dense locations.

In other locations, municipalities may wish to consider reducing the exposure of particularly vulnerable land uses to coastal flooding and erosion without prohibiting all uses. For example, hazardous uses or those that may release pollution during flooding (e.g., waste handling facilities) may not be appropriate candidates for location within the coastal zone. To this end, the Coastal Management Act (CMA) disallows certain facilities within the coastal boundary, including tank farms and other fuel and chemical storage facilities that can reasonably be located inland.²¹ In addition, some municipalities have used their coastal districts to prohibit other uses. Others, however, have not created coastal districts and/or used such districts explicitly to regulate land uses beyond the requirements imposed

by state law. Municipalities without existing coastal districts may wish to consider developing one or more new coastal zoning districts or overlays as appropriate for this purpose.

As a related option, municipalities may wish to consider using coastal zoning districts and overlays to require enhanced standards for buildings and structures. While areas in the flood plain are already subject to flood hazard protection requirements (as discussed below), additional or different standards may be desirable (e.g., requiring commercial uses to be elevated with a lower floor used for parking). While this study did not identify any municipalities using coastal zoning in this manner, they could do so in the future.

Finally, municipalities may determine that existing coastal zoning restrictions—in particular, the coastal site review process—offer sufficient regulation of uses in coastal areas. With a strong coastal review process, uses and structures that are not appropriate for a site or that present substantial hazards may not be approved. This option also limits the need for changes to the Plan of Conservation and Development (POCD) and zoning regulations that would be required in most cases to implement changes to coastal zoning.

Coastal Site Plan Review

As required by state law, every municipality in the project area has created a coastal site plan review process. These processes differ very little from town to town in either requirements or process. However, there are some differences related to exemptions from coastal site review for sites located very close to the shoreline. The state CMA allows municipalities to exempt certain activities from coastal site review, and each municipality has adopted these exemptions. In most cases, the exemptions apply regardless of how close they are to the shore, but a few municipalities have added coastal setback limits on these exemptions. As a result, activities must submit a coastal site plan if they are less than a set number of feet from the shore.

The use of setback limits for coastal site plan review exemptions ensures scrutiny of all activities in the most vulnerable areas along the coastline. Such scrutiny may be important, even for seemingly low-impact activities, due to the ecological sensitivity of the coast, the importance of natural features to flood and erosion control, and the vulnerability of structures located on the water. The downside of a requirement to submit coastal site plans for these otherwise-exempt activities is financial. These limitations will increase the number of coastal site plan reviews required and thus may burden reviewers. In addition, landowners will face increased permitting costs. However, the number of affected properties is likely to be low and the site plans for these activities are likely to be relatively simple. Municipalities

that determine that the costs are justified may therefore wish to require submission of coastal site plans for all or a subset of activities within a set distance from the CJL.

Coastal Setbacks

Coastal resiliency efforts can reduce the need for FECS by reducing the extent of coastal development in areas subject to coastal flooding and erosion. Coastal setbacks can reduce the need for coastal protection projects by ensuring space between the shoreline and structures. Setbacks may be consistent with and support the use of coastal natural and green infrastructure, reduce casualty loss, and reduce threats to public safety by ensuring that developments are not placed on the shoreline.

Connecticut has not established mandatory coastal setback requirements through the CMA or other mechanisms. As a result, the use of these buffers is a function of municipal ordinances, which differ substantially from town to town. Setbacks rarely exceed 25 feet from mean high water and often require simply that structures be located landward of the CJL. A few towns have further established setback requirements from critical coastal resources. Where such explicit provisions do not apply, setbacks may be required through the coastal site plan review process; however, these will be required on a case-by-case basis and may not be consistently applied.

Existing setback requirements are roughly consistent with Connecticut's past and legacy development patterns, which will pose a continuing limitation on the ability of the state and municipalities to require greater setbacks. Even where legacy structures are torn down and rebuilt, small lot sizes may not allow the footprint of the rebuilt structure to move substantially landward. Imposition of setback requirements for these properties could eliminate any redevelopment of nonconforming structures, which could raise concerns over takings and limit tax assessment increases if policies do not accommodate such issues through variances or other mechanisms.

The state and/or municipalities could use new or modified authorities to require adequate and appropriate setbacks for new developments and redevelopments. Avenues for strengthening municipal setback requirements may include regional, voluntary efforts to harmonize municipal ordinances, independent amendments to municipal ordinances to introduce or extend setbacks. The state could act to require minimum coastal setbacks either through amendment of the CMA to mandate setbacks or, potentially, through modification of the state Conservation and Development Policies Plan, with which municipal POCDs must conform.

OPTION 1: Develop consistent minimum setback and/or buffer regulations at the municipal level.

OPTION 2: Amend Coastal Management Act to mandate setbacks and/or buffers in coastal site plans.

OPTION 3: Amend state Conservation and Development Policies Plan to require coastal setbacks.

OPTION 4: Establish coastal buffer requirements by state statute and/or municipal ordinance.

OPTION 5: No Action

Natural Protective Barriers

While coastal setbacks are likely to reduce both exposure of coastal properties to flood and erosion hazards and to reduce impacts on sensitive coastal ecosystems and landforms, they do so only indirectly. Legal authorities mandating retention of natural protective barriers are a direct means of strengthening protections for such resources, including dunes and coastal vegetation.

While the current CMA creates a policy “to preserve the dynamic form and integrity of natural beach systems in order to provide . . . a buffer for coastal flooding and erosion,”²² municipal ordinances and regulations do not consistently and fully meet this policy. Specifically, while alteration of dunes is uniformly prohibited if it would increase flood hazards, this protection is incomplete and raises factual questions regarding whether removal of a particular dune would increase flood impacts.

Municipalities may wish to both expand the types of natural coastal landforms that are protected and bar their removal under any circumstances. Milford’s requirement to retain “sand dunes, barrier beaches, and other natural protective barriers” may offer a strong local example for such protections. Alternatively, municipalities can extend protection to “coastal resource areas” mentioned in the state CMA, which include “tidal wetlands, coastal bluffs and escarpments and beaches and dunes.”²³

Protection for coastal vegetation may not be included in protections based on landforms. Municipalities may therefore wish to additionally consider explicit protection for coastal vegetation, which serves important functions, including limiting erosion and capturing pollutants. Several municipalities in the project area actively require retention of existing vegetated buffers in coastal areas and/or creation of new buffers. Other municipalities may wish to consider whether adoption of similar vegetation-oriented protections is desirable.

From a state perspective, the CMA could be modified to ensure or support consistent protection of all relevant forms of natural protective barriers, including both land-

forms and vegetation. Actions to achieve these goals could include language mandating inclusion of such protections in zoning regulations and/or requiring coastal site plans to include information on management of vegetated buffers.

Flood and Erosion Control Structures

Connecticut has created legal authorities supporting the use of living shorelines and other non-structural, natural infrastructure approaches to flood and erosion control. Connecticut’s CMA promotes nonstructural mitigation measures to address the adverse effects of erosion and sedimentation on coastal land uses, and conversely provides that structural solutions are permissible when “necessary and unavoidable,” such as to protect critical infrastructure, including access roadways.

The Department of Energy and Environmental Protection (DEEP) currently implements this state policy through case-by-case analysis. DEEP has not issued general guidance, general permits for dredge and fill for nonstructural approaches, or used other mechanisms to facilitate permitting of development projects focused on non-structural approaches. However, only the subset of FECS seaward of the CJL are subject to DEEP permitting; municipalities review and approve projects proposed landward of the CJL, albeit after referral to and advisory comments from DEEP. Review and approval by municipal PZCs may be substantially less searching and resource-intensive than that carried out by DEEP, giving project proponents incentives to locate FECS of all kinds entirely landward of the CJL.

Bifurcation of review and approval jurisdiction and the burden associated with DEEP review under current practice creates incentives to design projects to avoid DEEP oversight. Stakeholders may wish to consider whether this incentive structure is effectively achieving the goals set out in the CMA. If not, there may be several approaches to improving operation of this system.

One option for improving implementation is through issuance of DEEP guidance for natural infrastructure project design and permitting. Such guidance might assist municipalities and the regulated community in:

- a) understanding when hard structures are likely to be (dis)approved;
- b) identifying design considerations for development of non-structural and hybrid project proposals;
- c) streamlining and reducing the costs and uncertainty associated with DEEP permitting; and/or

d) providing a resource to assist municipal authorities when reviewing FECS projects proposed landward of the CJL.

Interviews suggest that Connecticut stakeholders hold divergent opinions regarding the issuance of guidance. Local government and nongovernmental stakeholders consistently indicate a strong desire for streamlining and increasing the predictability of DEEP review, potentially through the issuance of guidance identifying types of non-structural projects or designs that DEEP would find acceptable.²⁴ These respondents indicate that DEEP review currently is unpredictable, untimely, and inflexible, leading engineers to submit projects with little understanding of whether they will be approved or what elements DEEP staff may find problematic. These respondents support and see a need for guidance, which could be developed through collaboration between coastal engineers and DEEP staff. Other interviewees suggest that such guidance or general permits would be premature and/or inappropriate because FECS permitting necessarily requires a contextual, site-specific and case-by-case process wherein the department or other authority considers geology, wave action, and other factors as well as the design of the FECS. Developers and property owners might incorrectly apply guidance in cases where it is inapplicable. Resolution of the tension regarding issuance of guidance appears to be needed for the CMA to yield outcomes desired by the legislature when enacting the law. A cooperative approach in which DEEP engages with stakeholders may be the most beneficial mechanism for overcoming current disparities.

A second option would be to modify the incentives for placing structures fully landward of the CJL by amending the CMA. Such an amendment could require DEEP approval (or allow DEEP to veto) all FECS proposals, regardless of location. This change could result in an approval process for FECS that is consistent across both elevation and municipal boundaries, thereby encouraging placement of FECS, including living shorelines projects, in the locations where they are likely to be most effective and inexpensive rather than where they may avoid regulatory oversight. On the other hand, however, this approach would not address the existing dissatisfaction with DEEP permitting, and could in fact exacerbate issues experienced by stakeholders by exposing all FECS projects to DEEP oversight. If so, this change could decrease the number of proposed non-structural FECS projects. As a result, resolution of this baseline conflict may be more likely to yield positive outcomes in the short term than a modification of the CMA.

A third option would seek to encourage the development of living shorelines by simplification of the permitting process for dredge and fill. This could entail the issuance of a general permit for certain qualifying projects or through

use of certificates of permission for approval of qualifying projects. Interviews suggest that coastal natural/green infrastructure approaches remain relatively novel in Connecticut, such that general permits—and likely certificates of permission—are not yet considered appropriate. On the contrary, full permit processing may currently provide useful opportunities for regulators and engineers together to modify and improve proposals for maximum efficacy. It is likely that maturation of certain categories of living shorelines approaches and practices over time may become regularized, such that the advantages of full permitting are reduced in comparison to the costs to the department and regulated community, such that streamlined processes are both appropriate and desirable. DEEP may wish to consider issuance of criteria for streamlined permitting at that time.

In the interim, a limited number of municipalities and property owners are proposing living shorelines projects, which may result from multiple factors ranging from lack of knowledge and experience to uncertainty in the regulatory process. In this instance, Connecticut may wish to consider whether and how a grant and/or technical assistance program might be appropriate to support development and implementation of living shorelines projects. Such a grant program would likely require dedication of new or repurposed state grant and/or revolving loan funds, but could be offset in part by new or changed user fee requirements associated with other types of FECS.

OPTION 1: Develop guidance on DEEP permitting of non-structural coastal erosion projects.

OPTION 2: Amend Coastal Management Act to remove incentives for placement of FECS landward of the CJL.

OPTION 3: Develop criteria for certain categories of living shorelines projects that may be appropriate for new general permit and/or approval through a certificate of permission.

OPTION 4: Establish grant and technical assistance program for living shorelines projects.

OPTION 5: No Action.

CASE STUDY: Maryland Living Shorelines

Maryland has a three-pronged approach to regulating and promoting the use of coastal natural and green infrastructure for erosion control rather than hard stabilization. The Maryland Department of Environment (MDE) regulates the use of erosion protection projects under its tidal wetlands permitting authority. The Critical Areas Commission administers coastal management through municipalities, including regulation and review of coastal site plans. Finally, the Department of Natural Resources (DNR) operates a grant and technical assistance program for living shorelines projects.

Erosion Protection Project Regulation

Maryland enacted the Living Shorelines Protection Act of 2008 to require “certain erosion protection projects to include certain nonstructural shoreline stabilization measures” based on a recommendation from the state Commission on Climate Change.²⁵ The Act establishes a state policy in favor of the use of nonstructural “living shoreline” erosion control measures wherever technologically and ecologically appropriate.”²⁶

The act authorizes any shorefront property owner (including government, corporate, and individual owners) to “make improvements” to protect against erosion. Improvements must be “nonstructural shoreline stabilization measures that preserve the natural environment” unless they are located in an area MDE deems suitable for hard stabilization or where the owner can demonstrate that nonstructural solutions are not feasible.²⁸ Property owners, however, must obtain a license from MDE prior to dredge or fill activity, including for any type of shoreline protection, in an area subject to tidal wetlands regulation.²⁹

MDE amended its tidal wetlands regulations in 2013 to implement the Act, after consultation with the DNR.³⁰ The regulations, among other provisions,

- define key terms;³¹
- prohibit authorization of structures in certain instances (e.g., where they may adversely affect an adjacent property);
- require consideration of no action or relocation of existing structures prior to installation of erosion control structures;
- provide for mapping of areas appropriate for structural stabilization; and
- provide procedures for applications and waivers.³²

In addition, the regulations provide design requirements that apply to any non-structural shoreline stabilization measure, which require proponents to:

1. Allow natural littoral movement of sand along the shore;
2. Minimize erosion and undesirable shoaling;
3. Use materials that are:
 - a. Of adequate size, weight, and strength to function as intended;
 - b. Free of protruding objects, debris, and contaminants; and
 - c. Selected to minimize impacts to water quality and plant, fish, and wildlife habitat;³³
4. Use backfill material free of litter, refuse, junk, metal, tree stumps, logs, or other unsuitable materials;
5. Prevent damage due to scour; and
6. Minimize grading and other impacts on riparian habitat.

Encroachment into tidal wetlands is allowed only where structurally necessary and supported by a design report or for bulkheads where other strategies are infeasible.³⁴

Critical Area Program

The Maryland critical area program is based on state coastal zone management legislation like the Connecticut CMA. It requires, among other things, that municipalities develop programs for land use management in the critical area within 1000 feet of the coast, including mandatory provisions including but not limited to buffer management and submission and review of site plans.³⁵ The state Critical Area Commission implements the Act, including through review of site plans. As revised in 2008 in accordance with the Living Shorelines Act,³⁶ the Critical Areas Act requires that site plans adhere to a 200-foot buffer from tidal waters and tidal wetlands³⁷ and establishes a presumption in favor of nonstructural shoreline stabilization measures.³⁸ Buffer management plans are required during wetlands permitting by MDE as well as during site plan review.³⁹

Shore Erosion Control Assistance

DNR provides technical and grant funding for erosion control structures, including by administering the legislatively-mandated Shore Erosion Control Construction Loan Fund.⁴⁰ While not explicitly focused on nonstructural erosion control projects, DNR may provide assistance and up to a 50% direct reimbursement to property owners for such projects carried out under an agreement between DNR and the property owner.⁴¹ The Department is also reimbursed for provision of technical services provided to a property owner, municipality, or other entity.⁴²

In practice, DNR’s shore erosion control program starts with a pre-project meeting where proponents and DNR select from among design options, estimate costs, select funding avenues, coordinate parties, and apply for necessary permits. DNR has implemented project selection criteria to

assist in the selection of shore erosion control approaches that are appropriate to particular sites (Table 8). As indicated on the project selection matrix below, the criteria indicate the use of non-structural and hybrid approaches in many cases.

A recent review of the program by the Federal Highway Administration identified that DNR has completed over 200 projects through this program and, according to this review and DNR reviews, the projects have successfully maintained coastal processes and reversed erosion.⁴³

Open Space

One of the simplest and most effective strategies for coastal resiliency is to avoid development in vulnerable locations through open space preservation. By preserving existing open space in public ownership or under a perpetual easement and providing for the expansion of such protections, municipalities and the region can reduce and mitigate property exposure and casualty losses associated with climate change and storm activity. Conservation has the additional benefit of simplifying the implementation of coastal natural/green infrastructure and other resiliency

projects: the fewer property owners, the simpler the project development process can be.

Many municipalities have protected substantial swathes of their shoreline as public parks (e.g., West Haven, Bridgeport) where development cannot occur. Some undeveloped shoreline areas have been sold by private owners and municipalities to the federal government for inclusion in the Stewart B. McKinney National Wildlife Refuge (McKinney NWR). This option ensures permanent conservation with limited uses still allowed, and it allows landowners, including town governments, to receive one-time payments for their open space assets.

Most municipalities have also established mechanisms to protect lands under private ownership. One option for this is to require minimum set-asides in subdivision and other development proposals and to otherwise encourage open space and cluster developments. These tools are primarily useful in communities with unprotected shoreline open space that provides ongoing opportunities for large-scale subdivision activity along the coast. As few such areas exist, incorporation of these provisions in subdivision regulations is unlikely to have a substantial impact on the conservation of coastal open space in Connecticut.

Table 8. Maryland Shore Erosion Control Program project selection criteria

	Creek or Cove	Minor River	Major Tributary	Chesapeake Bay
Water Depth (ft)	1	1 to 2	2 to 4	4 to 15
Fetch (miles)	0.5	1 to 1.5	2 or more	2 or more
Erosion (ft/yr)	2 or less	2 to 4	4 to 8	8 to 20
Wave Energy	Low	Medium	Medium	High
Type	Non-structural: • Beach replenishment • Fringe marsh creation • Marshy islands • Coir logs edging and groins	Hybrid: • Marsh fringe with stone groins • Marsh fringe with stone sills • Marsh fringe with stone-breakwaters • Marsh edging with stone • Stabilization of stream-banks with vegetation and stone • Stone breakwaters with beach replenishment and appropriate vegetation		Structural: • Bulkheads • Revetments • Stone reinforcing • Pre-cast concrete units
Cost per linear foot	\$100-\$200	\$350-\$400	\$450-\$600	\$500-\$1,500

Financial incentive programs represent a second option for preserving privately-held shoreline open space. None of the municipalities in the project area have established ordinances or zoning regulations to enable the transfer of development rights. These programs do exist in other areas, however, and they offer mechanisms to encourage conservation of highly vulnerable locations while simultaneously promoting transit-oriented or other development in desirable locations. Municipalities may wish to consider the development of such ordinances, both in urban and suburban locations. Such programs are complex and would require substantial work to ensure that the intended markets function as intended. Where adequate demand exists in a receiving area (e.g., transit-oriented development), TDR or similar incentive programs could be used to both preserve existing coastal open space and to convert legacy developed areas into open space, particularly in locations where coastal development is not the primary tax base for the community.

In urban areas and other locations where the shoreline is fully developed under existing zoning, lands are likely to require alternate mechanisms and programs if they are to be brought under public ownership or easements. Urban shoreline properties may be contaminated or have other complications. Development in urban coastal areas is also likely to include central business districts and historic areas where removal of legacy property development presents transactional difficulties and social equity considerations. Municipalities may wish to consider the extent to which they can use redevelopment authorities, brownfields authorities, and similar tools (including TIF authorities) as a mechanism to fund and implement projects that will improve the resiliency of vulnerable urban areas.

Perpetual dedication of open space and developments located in vulnerable areas may both present fiscal challenges to municipalities. Development impact fees provide one option that would allow municipalities to recover the costs associated with developments that are in high-risk areas and may increase municipal costs. For example, development in a high-risk area could result in a need to build and maintain in perpetuity shoreline flood or erosion control systems (including coastal natural/green infrastructure), maintain new highways to ensure access, and otherwise ensure the ongoing safety of the residences or commercial enterprises in that area. Municipalities are currently barred from charging such fees, and state legislation would be required to enable use of this tool. The state may wish to consider the merits of such an approach; while it may enable funding for maintenance and conservation activities, such fees would increase the costs of new development in shoreline areas (as well as, potentially, infill development). Limitations on the types and amounts of fees that could be

levied could be desired to constrain how and why these fees are used.

Sale of municipality-owned lands for perpetual protection may provide an alternative where liquidity is urgently needed and the alternative is substantial development pressure. Such sales may be made to land trusts, the state, or the federal government for inclusion in the McKinney NWR. This option is not available unless there is a willing and interested buyer, however, and in the case of Federal (and likely, state) purchasers, substantial advance work is required. Municipalities considering land sales may increase their chances of success by contacting relevant land managers as early as possible. With respect to federal sales, the development of the CCP for the McKinney NWR may represent a particularly useful moment for such preliminary discussion.

OPTION 1: Amend municipal authorities to ensure strong minimum open space dedication requirements and cluster or open space developments.

OPTION 2: Develop municipal TDR ordinances providing incentives to not develop in areas that are vulnerable and to encourage development in less vulnerable areas.

OPTION 3: Consider the application of redevelopment and brownfields funding and authorities to remediate vulnerable urban lands and transfer them to low-vulnerability uses.

OPTION 4: Enact state legislation authorizing the use of development impact fees for coastal development.

OPTION 5: Explore sale of land to private owners or state or federal governments for perpetual protection.

OPTION 6: Continue existing policies.

CASE STUDY: TDR in Miami, Florida

Miami, FL has established a Transfer of Development Rights (TDR) Ordinance to encourage the preservation of the city's historic resources for the public's benefit "by creating a process whereby the otherwise unusable development rights for historic resources (the sending area) may be converted into an asset that may be sold to a receiving site located within a T-6 transect (high density mixed use district), where a public benefits bonus may be used."⁴⁴ Miami is authorized to create this TDR program through state legislation,⁴⁵ and its program is facilitated by past state judicial decisions clarifying the status of TDR programs with respect to takings, real estate valuation, and tax assessment.⁴⁶

A property is eligible for the TDR program (i.e., in the "sending area") if it is located within "a T4-O Transect [primarily

residential] or higher” and meets criteria for historical significance, including but not limited to listing on the national and/or Miami register of historical places as an individual or contributing property or is a qualified “eligible historic resource.”⁴⁷ Non-contributing property within the Miami Modern/Biscayne Boulevard (MiMo) historical district is also eligible as a sending area for the TDR program.⁴⁸

Owners of eligible property in the sending area may take advantage of the program to sell their unused development rights for development in the receiving area, which includes property in a T-6 transect.⁴⁹ The zoning administrator calculates the unused development potential on these properties, which can be transferred at 100% of the square feet permitted by the underlying transect.⁵⁰ The calculation of development rights within the MiMo area for eligible contributing properties is 2.25% per square foot permitted by the underlying district; for non-contributing properties, the rate is 1.75% per square foot permitted by the underlying district.⁵¹ The zoning administrator issues a certificate of transfer to property owners based on this calculation. T6 property owners can purchase these development rights to access “bonus” square footage that allow the size of their buildings to increase, and record the transaction with the zoning administrator.⁵²

As of 2013, a few certificates of transfer were recorded but no TDR transactions had occurred in Miami.⁵³ According to estimates, up to 10 out of 115 identified historic structures had received certificates of transfer as of 2013.⁵⁴ Although the TDR program has not been widely utilized, reviews suggest that it appears to achieve its goal of historic preservation because certificates require a historic preservation covenant independent of the subsequent sale of the development rights.⁵⁵ Quite a few safeguards are put into the ordinance to ensure that the property, once deemed historic, is preserved and protected.⁵⁶ First, the required covenant ensures that the maintenance standards of the building department are followed for forty years. This covenant runs with the land and the Historic and Environmental Preservation Board must be notified upon transfer of ownership.⁵⁷ Additionally, any additions, modifications, or other renovations on a historical property must be permitted by the Board. Also, the ordinance prevents “demolition by neglect” by an owner of a property in a sending district.⁵⁸

The lack of a market for the transfer of the eligible and recorded rights may inhibit the ongoing success of the program. A review of the program suggests that the lack of market transactions may arise from several factors. As the development rights amount depends upon the square footage of the historical property, the low level of available TDR certificates may limit the value of the program to developers. And the TDR program may involve administrative difficulties, especially where multiple transactions may be

needed to obtain sufficient square footage for a desired development. Second, the TDR program may suffer from a mismatch between the incentive provided by TDR (i.e., increased square footage) and the market demand. There already exists a sizeable market for luxury estates in Miami,⁵⁹ such that developers are seeking increased density and affordable housing as opposed to larger properties.⁶⁰ Miami’s TDR program cannot provide density bonuses or other forms of incentives that might support these market demands.

In order to help facilitate the transaction of TDRs, a review suggests that one possible route is to create a TDR bank.⁶¹ This bank would be a third party operated by a local or regional governmental body or a private non-profit organization.⁶¹ A bank would facilitate contact and transactions between potential sellers of development rights and buyers.⁶³ Owners in sending districts can sell their rights and those rights can sit in a “vault” until a buyer in a receiving district purchases the development right.⁶⁴

Although the TDR program in Chapter 23 of Miami’s zoning regulations has not been used extensively, another form of TDR has occurred in Miami for the past couple of years – the sale of air rights.⁶⁵ This is the sale of unused square footage from one or two story buildings to developers of high rises.⁶⁶ In 2014, 18 of these sales occurred allowing some neglected, one- and two-story hotels in the MiMo district to sell air rights to high-rise residential tower developers, using the funds to renovate their historic buildings.⁶⁷

Flood Hazard Mitigation

Flood damage mitigation requirements are ubiquitous across the ten municipalities in the project area. In most instances, municipal requirements echo the minimum requirements necessary for a community to participate in the National Flood Insurance Program (NFIP). Municipalities can exceed these minima, and in some cases the towns and cities in the project area have done so. For example, some municipalities require that residences be elevated to one foot above the BFE, rather than simply to the BFE as minimally required.

The ability to exceed the minimum requirements for participation in the NFIP opens a range of potential policy options that municipalities can consider to increase their resiliency. These can be divided into the following categories:

- Preventing construction on lands subject to flooding and erosion;
- Expanding geographic areas where construction must meet flood standards; and
- Requiring construction to comply with heightened building requirements.

Suitability for Building

Determination of where buildings can be placed—and restricting building in areas subject to inundation or erosion risks in long-term projections—is a primary method for decreasing flood hazard risks in a community. Many of the municipalities in the project area prohibit building on lots that are deemed unsuitable due to hazards including flooding and, in some cases, erosion. These limitations apply to new subdivisions and thus are primarily applicable in towns with continuing green space development potential—a rarity along the shoreline. As these conditions may rarely apply, these provisions are unlikely to be useful in the most common scenarios for coastal development (e.g., teardown and rebuild).

Municipalities and the region may wish to support expansion and standardization of building lot suitability requirements. Municipalities without suitability requirements may benefit from creating such requirements, which could potentially be written to apply to infill development as well as subdivisions to ensure that they are useful in practice along the shore. In addition, municipalities could consider explicitly incorporating erosion risk and projected future hazards as reasons supporting an unsuitability finding.

In weighing the retention, expansion, and alteration of suitability determinations, municipalities may wish to consider the potential legal issues associated with prohibitions on development. If not carefully delineated and implemented, limitations on where buildings can be placed that result in an inability to build on a property could result in a judicial challenge under a takings theory. As currently deployed, municipalities have not faced such challenges, in part due to provisions allowing construction if the hazard is removed. Similar provisions could enable construction in coastal areas that are protected by living shorelines or other natural/green infrastructure solutions designed to mitigate erosion or flood risks.

OPTION 1: Modify municipal ordinances to require review of building lots for suitability in all municipalities.

OPTION 2: Expand new and proposed suitability analysis to include coastal erosion and projections that consider sea level rise and other climate-related hazards.

OPTION 3: No action.

Defining Flood-Prone Areas

One method for increasing the resiliency of the built environment is to expand the geographic area that is included in the SFHA and/or CHHA. New and substantially renovated structures in these zones must comply with the enhanced building requirements established by the town, including elevation or flood-proofing structures, anchoring foundations, and designing breakaway walls. As a result, expansion of these zones can enhance resiliency in the expanded area.

The minimum geographic area for these zones is set based on FIRMs and includes A, AE, and V zones for SFHAs and V zones for CHHAs. All of the municipalities in the project area use these default zone designations. However, FEMA designates flood zones based on historical studies of flooding during past flood and storm events. The resulting zones are conservative, based on historic data rather than projections, and underestimate current and future flood risk. This retrospective analysis does not fully account for projected sea level rise, and structures may have a higher actual flood risk than indicated on the FIRM. Structures at high risk of flooding in the future despite having little history of inundation are unlikely to be covered by flood insurance. These structures therefore present a risk of casualty loss to homeowners and coastal communities, as well as a risk of harm to inhabitants during storm events—particularly in areas that may be subject to storm velocities (wind and wave impacts) but which are not required to be built to withstand such impacts.

The risks associated with conservative flood zone definitions may warrant intervention at the municipal, state, and/or federal level. FEMA could address the issue through modification of its methodology and subsequent modification of its FIRMs for southern Connecticut. Such a systemic change would provide a global solution, but has proven difficult to implement in recent years.

State legislation could similarly address the issue across the entire region. A state-led approach could potentially avoid market impacts from town to town caused by differential municipal standards. Statewide legislation could also promote a regional, rather than a piecemeal, approach to flood zone reform. On the other hand, state action may be politically difficult and would insert the state in an area (flood zone construction standards) that it currently leaves largely to the federal government and municipalities. While not currently regulating flood zone construction, however, Connecticut has established uniform statewide building standards. Flood zone requirements (e.g., establishment of minimum freeboard requirements) could be incorporated into the existing building code framework.

Alternatively or in addition, the state could redefine the flood zone based on projected baselines for sea level rise

rather than historical storm risk. Connecticut has adopted NOAA-generated sea level risk projections into state law in numerous contexts, including hazard mitigation planning, state and municipal plans of conservation and development, civil preparedness planning, the Long Island Sound Blue Plan, and DEEP water quality projects.⁶⁸ These requirements have been applied to both state and municipal processes and similar or the same language could be used to set a standard definition of the flood zone in the state. Care would be needed to ensure that such a definition does not cause conflict with federal requirements, but could ensure that construction in coastal areas is based in a realistic risk profile.

Finally, municipalities can independently reduce their exposure to flood risk by amending existing flood zone ordinances. These ordinances currently define the SFHA and CHHA for each municipality. These definitions can be modified by changing the zones included in each definition. These amendments could redefine SFHAs to include additional zones (e.g., B or C Zones) and/or redefine CHHAs to include A Zones. These changes could increase construction costs but would not affect flood insurance requirements or other types of costs, and casualty losses in the event of a disaster would be dramatically reduced.

OPTION 1: Modify municipal ordinances to define the SFHA to include B zones, thereby requiring new construction and substantial renovation in B zones to meet specific construction standards currently applicable in A zones.

OPTION 2: Modify municipal ordinances to require new construction and substantial renovation in A zones to comply with specific standards for CHHAs, with or without allowance for exceptions in locations unlikely to be subjected to velocity.

OPTION 3: Modify state law to require compliance with flood zone requirements in B Zones and/or with CHHA standards in A Zones.

OPTION 4: Modify FEMA methodologies and update FIRMs to adopt precautionary projections that include enhanced threats posed by sea level rise and coastal flooding.

OPTION 5: No Action.

CASE STUDY: Old Saybrook Coastal High-Hazard Area

Old Saybrook, Connecticut has increased the resiliency of its built environment by expanding its CHHA to require certain buildings outside the “V” zones to comply with the heightened buildings standards that apply to shoreline properties. The Town is accomplishing this by creating a new “coastal AE zone” bounded by the “Limit of Moderate Wave Action” (LiMWA) delineated on its relevant FIRM.

FEMA has determined that waves higher than 1.5 feet can cause significant damage to structures. However, V zones include only those properties where expected wave action exceeds 3.0 feet. As a result, portions of “A” zones have expected wave heights of between 1.5 and 3.0 feet. FEMA delineates the LiMWA to help property owners and communities better understand the flood risks to their property and to show property owners that, despite living within an AE zone, their property can still be subject to waves capable of causing significant property damage during a 100-year flood event. In addition, communities that adopt VE zones standards in Coastal A zones receive Community Rating System (CRS) credits. Municipal acceptance into the CRS system could lower flood insurance premiums by 5% to 40% for residents and business owners.

Due to a history of high exposure to coastal flood damage, Old Saybrook was the first town in Connecticut to require coastal A zone construction to meet V zone standards. Under an ordinance that took effect in February, 2013, structures must use Zone VE construction standards if they are within identified coastal AE zones that have been designated a LiMWA area. The Town accomplishes this by defining the “coastal high-hazard area” as:

An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high-velocity wave action from storms or seismic sources. Coastal high-hazard areas are designated as Zone VE and Zone AE bounded by a line labeled “Limit of Moderate Wave Action” (LiMWA) on a Flood Insurance Rate Map (FIRM).⁶⁹

It also separately defines the Coastal AE Zone as follows:

The portion of the coastal high-hazard area with wave heights between 1.5 feet and 3.0 feet and bounded by a line labeled the “Limit of Moderate Wave Action” (LiMWA) on a Flood Insurance Rate Map (FIRM). VE Zone floodplain construction standards are applied to development, new construction and substantial improvements in the Coastal AE Zone.⁷⁰

Finally, the specific requirements for development in a CHHA were amended to include the coastal AE zone, as follows: “The following additional standards are applicable to development, including new construction and substantial improvement, in the Zone VE and Zone AE bounded by a line labeled “Limit of Moderate Wave Action” (LiMWA) portion of [SFHAs].”⁷¹

By requiring properties in the Coastal AE Zone to meet V zone standards, Old Saybrook has helped to provide communities and individuals with a better understanding of how their area might be affected by flooding. The Town also provides a more realistic mapping tool of the different kinds of flooding within certain zones by breaking them down even further and creating a zone that carries greater risks than a typical AE zone. By adhering to the standards of Coastal VE Zones, LiMWA areas are better protected against flooding. Additionally, the entire AE zone is not required to meet stricter standards, nor is an unnecessarily large VE zone created.

Enhanced Building Requirements in Flood Areas

In addition to expanding where construction must comply with flood standards, the risk of flood damage can be mitigated by increasing the stringency of flood standards that apply to new and renovated structures in the SFHA, however defined. These standards currently are established at the municipal level and differ in some respects from town to town. In many cases, the requirements are set at the federally-prescribed minimum. For example, elevation requirements in most municipalities in the project area currently are set at the BFE. In a few locations, municipalities go beyond the minimum, as in the case of the municipalities that have established freeboard requirements requiring structures to be elevated one foot above BFE. Such enhanced building standards are important for reducing the property damage and human toll associated with flood events.

As is the case for flood zone definition, federal minimum requirements are conservative and may not adequately reflect the projected flood impacts arising from climate change. For example, BFE is used as the index for elevation requirements but is based on historical flood levels rather than projections; thus, freeboard requirements may be more accurate reflections of future flood elevations and may enhance resiliency.

Additionally, building requirements such as increased structural elements can increase resiliency. For example, the Insurance Institute for Building and Home Safety has created the FORTIFIED program, which provides building standards to reduce property damage resulting from hurricanes.⁷² Application of these standards can result in improved roof

systems, windows, doors, and anchoring. The FORTIFIED program is designed to be an improvement on minimum building codes, and thus is currently applied by property owners independently or through a certification program, which may reduce losses and may yield reductions in insurance costs. However, the state and municipalities could consider adoption of these or similar standards in the state building code or requirements applicable to construction in CHHAs. Such adoption could be mandatory, which would assure consistent adoption in new construction and substantial renovation. Alternatively or in addition, the state or municipalities could develop incentive programs to encourage voluntary uptake of these existing programs. Incentive programs could take the form of a capital outlay by the government, such as a cost share or property tax offset, or could enable modification of zoning requirements (e.g., lot size) for compliant structures. Either approach would require the development or modification of legal authority, which could include state legislation, municipal ordinances, and/or zoning regulations.

OPTION 1: Modify federal minimum requirements to reduce flood risk.

OPTION 2: Modify state building code to require compliance with enhanced construction standards such as those produced by the FORTIFIED program in SFHAs and CHHAs.

OPTION 3: Modify municipal flood ordinances to require new and renovated structures to meet enhanced construction standards such as those produced by the FORTIFIED program in SFHAs and CHHAs.

OPTION 4: Develop state or municipal incentives for property owners to incorporate enhanced building standards.

OPTION 5: No Action

Stormwater and Low-Impact Development

Stormwater management is an important tool for mitigating flood hazards, including in coastal areas. Municipal approaches to stormwater management share some commonalities but also differ in important respects, offering municipalities several models to simultaneously increase regional consistency and strengthen resiliency.

The state is an important player in stormwater management under both water pollution control law governing nonpoint source pollution and by the publication of manuals for stormwater management. While this study does not summarize the manual in detail, DEEP and CTDOT may wish to consider whether modifications specific to coastal areas

are justified and needed in future editions of their stormwater manuals.

Other options to strengthen stormwater management for coastal resiliency across the region are available to municipalities directly, and may be applied alone or in combination. These options include:

OPTION 1: Ensure that stormwater management requirements apply broadly within coastal areas.

OPTION 2: Require and explicitly support the use of low-impact development approaches where safe and appropriate.

OPTION 3: Ensure adequate minimum standards for peak flow, retention, and impervious cover.

Stormwater management requirements generally apply only to a subset of development activities—generally those requiring some form of zoning approval or those larger than minimum thresholds. Municipal triggering standards differ substantially across the project area; while some (e.g., New Haven) apply to any activity requiring zoning approval, other municipalities require stormwater management for smaller subsets of activities, which may or may not cover activities requiring coastal site plan review. Municipalities may wish to consider requiring stormwater management plans more consistently for activities requiring coastal site plan review in order to ensure that these activities do not increase the strain on existing storm sewer systems or contribute to coastal flooding.

Second, municipalities may wish to consider requiring or explicitly supporting the use of low-impact development approaches. Several municipalities do currently incorporate provisions supporting the use of non-structural stormwater techniques to maximize infiltration and minimize runoff. These requirements are descriptive, in part due to the site-specific nature of what LID techniques may be appropriate and how they are best deployed. However, requiring their consideration and use, or simply providing explicit support for these approaches, may provide support to developers and encourage inclusion of natural/green infrastructure in stormwater management plans.

Finally, municipalities may wish to consider whether existing specific standards for stormwater infrastructure are sufficient and appropriate. Municipal design storm requirements differ widely for both peak flows and on-site retention, and municipalities may wish to consider whether to require design to a higher minimum standard would improve resilience during large scale storm events through the full extent of the asset's life cycle. Similarly, impervious surface minimums could work with LID techniques and oth-

er forms of natural or green infrastructure to mitigate runoff, increase on-site retention, and provide other services that may mitigate the effects of coastal flooding.

LID requirements and minimum stormwater management design standards both apply most directly to new construction and often are located in subdivision regulations rather than general zoning regulations. As subdivision activity in the coastal area is limited, these requirements may not substantially impact coastal resiliency as currently implemented. Municipalities therefore may wish to consider whether and how to modify existing standards to cover redevelopment activity as well as new development.

Transportation Resiliency

Transportation systems are critical to coastal resiliency. State and municipal highway systems alike are subject to periodic inundation in coastal areas and may be damaged or destroyed by sea level rise, erosion, or other hazards. This infrastructure is also essential for access to coastal properties and serves as a means of egress during storm and flood events. If designed or redesigned with resilience in mind, transportation infrastructure can continue to provide access with reduced exposure to inundation, while also providing ancillary benefits related to flood defense and ecosystem services. Resilient approaches include designing highway systems to reduce strain on storm sewer systems; and protecting vulnerable coastal highways from hazards including flooding and erosion. Both of these approaches can include natural and green infrastructure.

Successful implementation of resilient roadway systems requires coordination and planning among municipalities, COGs, and the state Department of Transportation (CTDOT).

- Municipal highway system requirements differ but in general are defined most clearly for new streets laid out in subdivisions, and thus are largely inapplicable in coastal areas with existing infrastructure. In some municipalities, both new and existing roadways must meet generally applicable design standards, which may include green infrastructure approaches.
- The parallel state highway system is managed and maintained by CTDOT, which uses different design and construction criteria which may not match local needs or desires.
- COGs also play an important role if designated as Metropolitan Planning Organizations (MPO). MPOs are responsible for developing LRTPs and TIPs used to plan projects that are eligible for federal funding. These activities offer an opportunity to think holistically about the transportation system and proactively address sea level rise, emergency management, and other needs associated with coastal resiliency.

Highways and Stormwater Management

Highway systems are an important element in stormwater management systems. Failure to design highway systems to carry adequate stormwater flows can result in flooding during periodic high tide events or storms. Storm sewers carry stormwater along highway rights-of-way. Green infrastructure approaches, such as swales and rain gardens, can increase permeability along roadways and reduce surface flows that the sewer system must carry.

In many municipalities in the project area, storm sewer capacity requirements are set out in municipal ordinances. These requirements differ from town to town but are generally based on both a minimum diameter specification and a carrying capacity specification, the latter of which is based on statistical storm frequency. The adequacy of these design requirements may be in question under sea level rise scenarios in coastal areas, particularly if storm severity and frequency increase over time. As sewer systems are long-lasting forms of infrastructure, inadequately specified pipe sizes will remain in place for decades. Therefore, municipalities may wish to ensure that their specifications for new and substantially repaired roadways are adequate to carry projected levels of storm water runoff. CTDOT also may wish to consider whether updates to its design standards are needed, as municipal ordinances do not affect state highways, but often do refer to CTDOT design guidance.

Concerns regarding the adequacy of storm sewer systems may be mitigated by designing roadways to absorb runoff before it enters the sewer system. Natural and green infrastructure solutions provide an important means of reducing peak storm runoff. These solutions may reduce flooding along roadways where sewers cannot handle loads; reduce sewer overflow events; and mitigate impacts on water quality during and after storm events.

Several municipalities have incorporated explicit approval of swales and related natural/green infrastructure approaches and/or requirements for Low-Impact Development into their municipal ordinances or regulations. This indicates that such features are desirable and ensures that their inclusion will not cause issues in permitting or roadway acceptance. This study found, however, that other municipalities—and particularly those where subdivisions are less common—lack such provisions. The state also has not adopted policies favoring these approaches within state rights-of-way. The adoption of policies or legal authority that endorses and/or creates design standards for natural/green infrastructure in roadway rights-of-way may be an important step in the increased implementation of rain gardens, swales, and other types of green infrastructure. Such policies will be most effective where they address

both new roadways and renovation of existing roadways in suburban and urban settings where permeability is limited and surface flows may present a continuing challenge. This option would likely require many municipalities to adopt highway standards as generally-applicable ordinances rather than as elements of subdivision regulations, as in the case of New Haven.

In addition to the endorsement of such systems, municipalities and the state may wish to consider whether, and the extent to which, it may be sensible to create design standards for particular natural or green infrastructure projects whose designs are mature and which it is possible to define as a best practice. Once established, subsequent projects could be required to deploy these techniques in compliance with such standards. Other mandatory design provisions are ubiquitous in municipal ordinances, including minimum width requirements and storm sewer capacity requirements. In this light, a requirement to meet natural/green infrastructure requirements to reduce sewer capacity would be in keeping with past practice. Such a requirement could reduce downstream infrastructure costs by allowing the use of smaller pipes and catch basins as well as reduced treatment costs—particularly in locations relying on legacy combined sanitary and storm sewer systems.

On the other hand, mandatory natural/green infrastructure requirements may raise concerns that mandated systems could be unsafe or ineffective in certain situations. Existing municipal ordinances endorsing these approaches address this concern through provisions noting that natural/green infrastructure is supported only where appropriate. Similar language, a design review, or a variance procedure could allay safety fears. A second argument against mandatory standards may arise if mandated systems result in increased capital or maintenance costs. A thorough life-cycle review of costs avoided (e.g., through reduced sewer treatment needs) and incurred may assist authorities in evaluating whether and how cost concerns should influence their design requirements.

OPTION 1: Modify municipal and/or state ordinances, regulations, and design standards to ensure that new and reconstructed highways include adequate stormwater carriage capacity under projected future scenarios.

OPTION 2: Modify municipal and/or state ordinances, regulations, and design standards to endorse the use of natural/green infrastructure approaches such as bioswales and rain gardens.

OPTION 3: Modify municipal and/or state ordinances, regulations, and design standards to require the use of natural/green infrastructure approaches such as bioswales and

rain gardens unless such approaches would be unsafe or otherwise unreasonable.

OPTION 4: No action.

Protection of Vulnerable Highways

Coastal highways are uniquely vulnerable to inundation because of erosion and flooding. As a function of exposure to wave action, erosion can be addressed not only by hard infrastructure such as seawalls, but also through non-structural approaches such as living shorelines and dune or marsh restoration, which may reduce wave impacts. While hard stabilization may occur solely within the highway right-of-way, natural and green infrastructure approaches will typically extend beyond the right-of-way. This approach could potentially increase a project's complexity, as more authorities and permissions are likely to be needed for a project to proceed.

In Connecticut, most activities seaward of the CJL are controlled by the state rather than municipalities. Municipalities may be limited in their ability to influence or carry out projects in these areas without the support and participation of state agencies. Both seawalls and marsh restoration would likely require permits for fill activity from both DEEP and the Army Corps of Engineers (USACE). Projects seeking federal funds through a MPO would also need to be consistent with the applicable TIP and LRTP. As natural and green infrastructure models remain relatively novel, plans may not incorporate these models, and permitting may be difficult in the absence of an applicable general permit from DEEP and/or the USACE. While coastal natural/green infrastructure approaches may be complex, they may nonetheless be highly desirable given the importance of transportation infrastructure and the ancillary benefits and ecosystem services that such projects can provide.

OPTION 1: Review TIPs and LRTPs for integration of coastal natural/green infrastructure approaches and needs and to identify projects that may be good candidates for coastal natural/green infrastructure approaches.

OPTION 2: Include coastal natural/green infrastructure approaches for highway resiliency in ongoing revisions of DEEP and USACE general permits for fill, particularly in tidal wetlands.

OPTION 3: Incorporate natural/green infrastructure and erosion control mechanisms into projects on a case-by-case basis as needed and desired by states and municipalities.

OPTION 4: No action.

Coastal highways are additionally vulnerable to flooding at high tide and during storm events. Elevation of roadways can protect against overwash now and in years to come, but elevation projects must be planned, designed, and implemented to achieve these goals. Not all highways are suitable for elevation—they may be vulnerable to other forces (e.g., erosion), service too few residences or other critical infrastructure, or carry insufficient traffic to warrant investment in elevation. Where a roadway is vulnerable but does not warrant elevation, it may will over time be subjected to degradation and rising maintenance costs to keep it serviceable. This may pose particular issues for smaller roadways that are the sole access for coastal communities. Municipal and state authorities may need to determine whether and how these roadways should be discontinued or otherwise addressed—e.g., by transfer to neighborhood associations as private roads.

While Connecticut has begun consideration and implementation of roadway elevation in some areas—notably, Bridgeport and Guilford—most municipalities have not developed a considered approach to the evolution of their highway systems. Such consideration may be warranted, both for how existing roadways will be managed in years to come and to ensure that new highways are designed to accommodate future conditions. This planning may be carried out at the municipal, regional, and/or state scale, and ideally will incorporate a range of stakeholders to ensure a wide range of viewpoints. A successful plan of this type may be part of a larger effort, such as the regional plan, or may be tightly focused on transportation. Regardless, results related to transportation can be integrated into TIPs and LRTPs that serve as the basis for federal funding or regional transportation projects.

In addition to planning and policy action, legal interventions may be warranted in some cases, particularly at the municipal level for both elevation and abandonment. Only a single municipality in the project area requires that new highways be elevated within the coastal area. While it is possible that not all roadways can or should be elevated to a minimum level to avoid “bathtub” effects, municipalities may benefit from a consideration of such mandatory elevation requirements for new roadways and/or those subject to substantial construction.

Many municipalities lack formal processes for discontinuance of streets, though some have established procedures for abandonment, which could be used to convey public streets to neighborhood associations. Privatization of public ways may be viewed critically, but such concerns may arise primarily due to potential loss of shoreline access. Municipalities may be able to address these concerns through contracting approaches (e.g., retaining an easement for access) or inclusion of mandatory conditions for

abandonment in ordinances. Advantages of abandonment would include shifting maintenance responsibility and costs to the neighborhoods that are most reliant on the roads and allowing those roads to continue without conformity to mandatory roadway standards that apply to public ways.

OPTION 1: Develop interagency and regional transportation resiliency plan(s) (which may be parts of larger hazard mitigation or resiliency plans), with or without new legislative authority, to consider transportation system vulnerability under future scenarios and identify long-range solutions to ensure continuing, safe access to coastal areas. Incorporate findings into state and regional TIPs and LRTPs.

OPTION 2: Review municipal subdivision and zoning regulations to ensure that mandated street designs maintain access to key elevated evacuation routes.

OPTION 3: Review municipal and state highways to identify key evacuation routes and other highways suitable for increased elevation or those that may warrant abandonment or decommissioning in the future. Incorporate these findings into state and regional transportation plans and/or hazard mitigation plans.

OPTION 4: Amend municipal ordinances and/or state design standards to require elevation of roadways within the coastal area as projected under sea level rise scenarios.

OPTION 5: Amend municipal ordinances to create processes for abandonment and/or decommissioning of public ways subject to inundation.

OPTION 5: No action.

CASE STUDY:

Louisiana Coastal Highways

Much of Louisiana's transportation infrastructure is vulnerable to flooding, especially flooding induced by storm surges. Louisiana has taken steps to address highway vulnerability at both the state and parish levels.

Coastal Master Plan

Following Hurricanes Katrina and Rita, the Louisiana legislature created the Coastal Protection and Restoration Authority (CPRA)⁷³ and tasked it with, among other things, "develop[ing] a master plan for integrated coastal protection" as well as annual plans, which must identify projects in order of priority.⁷⁴ Upon acceptance by the legislature, the CPRA must implement the plan projects in order of priority.⁷⁵

The CPRA created the Louisiana Comprehensive Master Plan for a Sustainable Coast (the plan), which is intended to achieve two overall goals:

- "Protection. Use a combination of restoration, non-structural, and targeted structural measures to provide increased flood protection for all communities;" and
- "Restoration. Use an integrated and synergistic approach to ensure a sustainable and resilient coastal landscape."

The plan identifies a variety of coastal restoration projects that the state will implement over the next 50 years, including six projects that will restore wetlands near or adjacent to vulnerable state highways to provide a protective buffer against encroaching waters. To restore these wetlands, the plan requires hydrologic restoration through conveyance of water to an area that was previously cut off by man-made levees or other built structures. Other projects within the plan call for wetlands to be reconnected in order to create a more robust natural barrier against flooding and shoreline erosion.

The CPRA is implementing and continuously upgrading the plan with assistance from several advisory groups:

- The Framework Development Team is the primary collaborative group providing insight and counsel to the planning team. It is made up of representatives from federal, state and local governments; NGOs; business and industry; citizens; academia; and coastal communities.

- The Science and Engineering Board “. . . provides independent technical review of plan elements and makes specific recommendations about how the planning team can improve the scientific basis and/or planning elements”
- The Technical Advisory Committees “are small advisory groups made up of nationally known academics and practitioners that offer insight into specific elements of the plan process.
- The CPRA consults with focus groups, which are intended to expand the engagement of key stakeholders and to receive and incorporate their input into the plan.

The state of Louisiana committed to assist in the expeditious implementation of the plans. In addition to the mandate for CPRA to implement the plans, Governor Bobby Jindal issued an executive order requiring all state agencies to “administer their regulatory practices, programs, contracts, grants, and all other function vested in them in a manner consistent with the Master Plan and public interest to the maximum extent possible.”⁷⁶

In addition, the State is required to monitor and identify needed legislative actions to ensure that the state regulations and policies are consistent with the master plan.

According to CPRA Chairman Johnny Bradberry, “[a]pproximately 40,000 football fields of land have been rebuilt since 2009 and the list goes on.” To date, CPRA has accomplished:

- Built or improved approximately 250 miles of levees
- Benefited over 25,700 acres of coastal habitat
- Secured approximately \$18 billion in state and federal funding for protection and restoration projects
- Moved over 150 projects into design and construction
- Constructed projects in 20 parishes
- Constructed 45 miles of barrier islands and berms

The CPRA is currently in the process of a five-year revision and re-release of its Coastal Master Plan, with a new plan expected in 2017. The continued investment in the master plan suggests that the state views the coastal master plan as a success in directing coastal resiliency projects in a unified manner across the state.

St. Tammany Parish Model Ordinance

While the state coastal master plan is a project-focused framework, Louisiana local government is considering methods for reducing vulnerability through other legal methods, including by establishing elevation standards for highways.

The St. Tammany parish has adopted a model subdivision ordinance requiring elevation of all new highways to meet a design standard based on historical flooding during Hurricane Gustav.⁷⁷ The parish used this evidence to define a mandatory elevation level based on a ten-year storm event. It incorporated the following provision into its subdivision ordinance:

In order to increase resiliency of development in the coastal zone, the minimum elevation for any street as measured at the lowest point of the travel lanes shall be at least 6.0' NAVD'88GEOID 03. No Local Coastal Use Permit in St. Tammany Parish shall be issued for application with roads below this elevation. However, where building roads to at least 6.0' NAVD'88GEOID 03 is infeasible, such as but not limited to transitions to existing roads, the Department of Engineering may waive this requirement.⁷⁸

This mandatory minimum applies to all new roads, but not existing roads, and includes waivers for lower elevations and intersections with lower existing roads. While legacy sections of the parish highway system may be subject to flooding, new development is now required to meet this higher standard.

Table 9. Areas of focus for audit and regulatory opportunities analysis.

Area	Topic
Coastal land use	Coastal zoning districts
	Coastal site plan review
	Coastal setbacks
	Natural protective barriers
	Flood and erosion control structures
Open space	Cluster development
	Transferable development rights
	Open space set-asides
	Financial mechanisms
Flood hazard mitigation	Suitability for building
	Defining flood-prone areas
	Enhanced building requirements
	Stormwater and low-impact development
Transportation	Highway stormwater sewer capacity
	Green infrastructure in highway design
	Highway elevation
	Highway abandonment and decommissioning

Conclusion

Development of a Southern Connecticut Regional Framework for Coastal Resilience is a challenge requiring the cooperation and collaboration of federal, state, and local governments, the public, and private sector and non-governmental organizations. Only by working together in an interdisciplinary manner can the region surmount the complex challenges associated with resilience.

This guide provides legal and regulatory information and analysis to support the advancement of this Regional Resilience Framework. It provides a targeted audit (Section 1) and analysis of coastal resilience opportunities and challenges (Section 2) related to four key areas and 17 topics within these areas (Table 9).

By focusing on specific topics that are critical for a comprehensive coastal resiliency framework, this guide provides a solid foundation for a range of activities that include, but are not limited to:

- identifying areas of focus for jurisdictions seeking to improve coastal resiliency individually or on a regional level;
- comparing legal and regulatory practices on different topics across jurisdictions in the region;
- identifying positive regional models and practices for different coastal resilience elements; and
- developing legal and regulatory strategies to improve resilience within individual jurisdictions or on a state or regional level.

These activities are important steps for integration of legal and regulatory elements into this Regional Resilience Framework. By incorporating the findings and considering the options set out in this guide, policymakers and stakeholders can better engage in long-term planning and build the governance and management systems that are needed for on-the-ground efforts to achieve their local and regional resiliency goals in Southern Connecticut and beyond.

Footnotes

1. Fairfield Charter § 10.12.
2. Bridgeport Code § 15.44.050.
3. Milford Code ch. 18 art. 5, citing Conn. Gen. Stat. §§ 25-84 - 25-94.
4. West Haven Code § 19-1, citing Conn. Gen. Stat. 25-84; West Haven Charter ch. XIV(B) § 5.
5. West Haven Code § 111-8.
6. East Haven Code § 9-16, -17; East Haven Charter ch. VI § 18.
7. Branford Code §§ 50-1, 50-2.
8. Id. §§ 161-21.
9. Guilford Code §§ 42-1, 42-4
10. Madison Code § 2-173
11. James G. Titus, ROLLING EASEMENTS: A PRIMER FOR COASTAL MANAGERS 67 (EPA 2011).
12. Branford Zoning Regs. § 5.7(c).
13. Titus, *supra* note 1103, at 72-74.
14. John G. Rappa, Tax Increment Financing, Conn. Office of Legal Rsch. No. 2011-R-0105 (Mar. 4, 2011).
15. Id.
16. Cal. Gov't Code § 66000.
17. John G. Rappa, Development Impact Fees, Conn. Office of Legal Rsch. No. 2002-R-0582 (Aug. 5, 2002).
18. See John G. Rappa, Case Law Regarding Development Impact Fees, Conn. Office of Legal Rsch. No. 2002-R-0902 (Nov. 26, 2002).
19. Fairfield Subd. Regs. § 3.2.5.
20. Guilford Code § 272-49 et seq.
21. Conn. Gen. Stat. § 22a-92(b).
22. Conn. Gen. Stat. § 22a-92(b)(2)
23. Conn. Gen. Stat. § 22a-109.
24. See A.W. Whelchel et al., (2015) Workshop Summary of Findings: Report on Non-Structural and Natural Infrastructure Alternatives: Current Opportunities and Constraints for Connecticut's Coast, The Nature Conservancy Coastal Resilience Program Publication 15-1, at 13-14 (noting obstacles to deployment of non-structural approaches including the need for guidance and clarity in DEEP permitting process).
25. 2008 Maryland Laws ch. 304 (HB 973).
26. Id.
27. Md. Code, Env't § 16-201 (exempting some activities not including shoreline protection).
28. Id.
29. Id.
30. Id. § 16-202.
31. See Md. Dep't of Env't, Living Shorelines Regulations—Final—Effective 02/04/2013 (showing changes to prior regulations), at <http://mde.maryland.gov/programs/Water/WetlandsandWaterways/Documents/www.mde.state.md.us/assets/document/wetlandswaterways/Living%20Shoreline%20Regulations.Final.Effective%2002-04-13.pdf> (last visited Aug. 31, 2016).
32. Code of Md. Regs. § 26.24.01.02.
33. Id. § 26.24.04.01
34. Id. § 26.24.04.01-4.
35. Id.
36. Md. Code, Nat'l Res. § 8-1801 et seq.
37. 2008 Maryland Laws ch.119 (H.B. 1253).
38. Md. Code, Nat'l Res. § 8-1801.10.
39. Md. Code, Nat'l Res. § 8-1808.11.
40. Code of Md. Regs. § 26.24.04.01-3 (requiring buffer management plan in wetlands permit application); Id. § 27.01.09.01-3 (required content for buffer management plans).
41. Md. Code, Nat'l Res. § 8-1001 – 8-1008.
42. Id. § 8-1004.1.
43. Code of Md. Regs. § 08.10.01.01.
44. See Fed'l Highway Admin., Green Infrastructure Techniques for Highway Resilience (undated), at http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/green_infrastructure/ (last visited Aug. 31, 2016); Bhaskaran Subramanian, Living Shorelines Projects: Have they Worked in Maryland? (May 26, 2011), at http://www.mobilebaynep.com/images/uploads/library/Bhaskar_Subramanian_5-26.pdf (last visited Aug. 31, 2016)
45. MIAMI, FLA. CODE § 23-6.
46. Alexis Levanthal, Preserving Miami: An Evaluation Of Miami's Transferable Development Rights Program, 24 U. FLA. J.L. & PUB. POL'Y 271, 273-74 (2013), citing Fla. Stat. § 163.3177.
47. Id. at 275-76 ("The Florida courts have recognized that, although TDR are not 'real property,' TDR have real value when applied to a development site. Most importantly, TDR have been upheld as a viable mechanism for diffusing the cost of a land use regulation on a land owner and, in turn, limiting the success of takings challenges." (internal citations omitted)).
48. MIAMI, FLA. CODE § 23-6(1). "Eligible historic resources" must meet additional criteria for age, physical integrity, craftsmanship, and historical relationship or importance to its neighborhood. Id. § 23-6(4).

49. *Id.* § 23-6(2).
50. *Id.*
51. *Id.* § 23-6(7).
52. *Id.* § 23-6(2)(b).
53. See Levanthal, *supra* note 1286, at 285-86 (illustrating with example).
54. *Id.* at 291.
55. *Id.* at 286.
56. *Id.* at 288.
57. *Id.*
58. Levanthal, *supra* note 1286, at 288.
59. *Id.*
60. *Id.* at 287.
61. *Id.*
62. *Id.* at 290.
63. Levanthal, *supra* note 1286, at 290-91.
64. *Id.* at 291.
65. *Id.*
66. Lidia Dinkova, Air Rights Sales Soaring, MIAMI TODAY, December 3, 2014, at <http://www.miamitodaynews.com/2014/12/03/air-rights-sales-soaring/> (last visited Aug. 31, 2016).
67. *Id.*
68. *Id.*
69. Conn. Gen. Stat. §§ 8-23 (municipal POCD); 16a-27(h) (state POCD); 22a-92 – 93 (defining “rise in sea level” for coastal planning); 22a-478 (water quality project priority determination); 25-157t (Blue Plan); 25-680 (municipal evacuation or hazard mitigation plans); 28-5 (state civil preparedness plan).
70. OLD SAYBROOK, CONN. CODE § 128-5.
71. *Id.*
72. *Id.* at § 128-19(D).
73. See Insurance Institute for Business & Home Safety, Build Strong. Build FORTIFIED (2016), at <http://disastersafety.org/fortified/> (last visited Aug. 31, 2016).
74. La. Rev. Stat. § 49:214.1.
75. *Id.* § 214.5.3.
76. *Id.*
77. Exec. Order No. BJ 2008-7 (2008).
78. See NOAA Office for Coastal Management, Peer-to-Peer Case Study: St. Tammany Parish, Louisiana, at <https://coast.noaa.gov/digitalcoast/training/tammany-parish.html> (last visited Aug. 31, 2016).
- Id.*



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