

Westport, MA



Municipal Vulnerability Preparedness (MVP) and Community Resilience Building Workshop Summary of Findings

June 2018

Submitted by:



Resilient Taunton Watershed Network (RTWN)



Overview

Westport is a low-lying coastal town in Buzzard's Bay, with both highland and lowland forested riparian areas around the branches of its tidal river. Coastal nature are central to Westport's community character and economy.

Westport is built around the east and west branches of the tidal Westport River. Flooding from sea level rise and storms has been felt in culvert/road collapses, and access/evacuation issues. Beaches and salt marshes in the southern part of town serve as tourist destinations as well as natural buffers against storms, which are expected to continue increasing in frequency and magnitude. Coastal storms, sea level rise, and increasing temperature have severely impacted Westport. The town sees collaborative planning as the most effective way to ensure future safety of town residents and infrastructure.

To help them consider and prioritize actions in town to be more climate resilient, the Town of Westport applied for and received a grant from the Massachusetts Department of Energy and Environmental Affairs to become a Certified Municipal Vulnerability Preparedness (MVP) Community. Core members of the Resilient Taunton Watershed Network (RTWN) were critical for coordinating the workshop, specifically the Southeast Regional Planning and Economic Development Division (SRPEDD), who acted as Westport's MVP Provider. Staff from The Nature Conservancy, Manomet, and Mass Audubon supported the Community Resilience Building (CRB) workshop process as part of RTWN and certified MVP providers. These planning workshops took place on two consecutive Fridays, May 11 and 18, 2018 at the Westport Public Library.

Stakeholders from Westport were present as workshop participants, including members of the Westport River Watershed Alliance, Coastal Zone Management employees, Health Department, Police Department, Planning Board, Landing Commission, and Westport's local Mass Audubon sanctuary at Allen's Pond. Attendees were divided into three distinct groups that remained consistent in both workshops. Each group identified features in Westport visually with a map (Appendix A), and verbally on a matrix (Appendix B). Each feature is related to hazards that the town is concerned about and whether it was considered vulnerable to those hazards or a strength that helps Westport mitigate them. Each item listed on a group's matrix is



numbered, and corresponds to a numbered dot on the group's map. Three colors used on the map visually represent the different feature categories of infrastructural (red), environmental (green), and social (blue).

Through facilitated discussion, workshop attendees:

- Defined top local natural and climate-related hazards of concern;
- Identified existing and future strengths and vulnerabilities;
- Developed prioritized actions for the Community;
- Identified immediate opportunities to collaboratively advance actions to increase resilience.

Two striking themes that emerged from the working groups was their openness to a changing landscape and a call to make local government more efficient and inclusive. All three groups recorded the vulnerability of East Beach Road to flooding, storms, and sea level rise as a medium to high priority. The conclusion from this topic was unique in that residents expressed willingness to abandon this access road to Horseneck Beach and Gooseberry Island if a future cost-benefit analysis indicates that to be the town's least costly scenario. This discussion was distinctly pragmatic despite the cultural significance of maintaining a town's historical land use. Participants expressed a fatigue from troubleshooting this and similar highly vulnerable infrastructure (i.e. Atlantic Ave) year after year.

The working groups also unanimously recorded a social vulnerability describing concerns about how town government functions. One group referred to the vulnerability as, "Town government model (efficiency, responsiveness)", another called it, "Divided community North-South / Government capacity and education/ Government difficulties (environmental, economic, political)", and the third said, "Lack of consensus on environmental issues". This theme was multifaceted, and touched on feelings of exclusion by residents in the northern part of town from decision-making processes. For example, attendees viewed residents who violate boating restrictions as most of the same people who do not share the town's concern for conservation. This example also gave way to discussion about the capacity of Westport to enforce its existing policies. This discussion was unique in its openness to changing traditional government structure and/or employing new outreach strategies to include residents with conflicting ideologies.

Top Hazards and Vulnerable Areas

Participants discussed past hazards they've experienced, and named these four natural hazards to their community by coming to consensus:

- Coastal Storms (wind, water, utility effects)
- Flooding (storm/ground water)
- Increasing Temperature
- Sea Level Rise



Coastal Storms was a category created to describe concerns about wind damage, above-ground electricity and cell tower damage, and high volume precipitation events. All three symptoms of coastal storms have significant effects on infrastructure. More frequent strong storms and higher volumes of precipitation in each storm require adaptations. Repeated road closures and overwhelmed culverts were the prevailing examples of what coastal storms cause.

Flooding was another general category created to include both coastal flooding from storms and groundwater flooding from the area's naturally high water table. Both types of flooding are top safety, environmental, and infrastructural concerns. Elderly and low income residents have been more isolated from evacuation during flooding/storm events. Groundwater flooding has caused septic systems to leach, threatening public health and environmental integrity. Flooding of either type overwhelms culverts and has caused roads to collapse.

Increasing temperatures refers to higher temperatures on the hottest days of the year, and higher average temperatures overall. This new heat has impacts on the health and safety of vulnerable populations (elderly, low income), and changes the life cycles of insect populations. Invasive insects like Gypsy Moths become more difficult to manage, because extreme weather can vary their time of hatching and reproducing. Tick populations have also been increasing, and hotter average temperatures with longer summer season means more opportunity for ticks to interact with people. Increasing temperature also creates a positive feedback for organisms that thrive in nitrified waterways, which contributes to water quality degradation.

Sea level rise primarily impacts municipal buildings in the downtown area, and other historic sites in Westport. Bridge flooding and road closures attributed to sea level rise overlap somewhat with coastal storms and flooding. Elevation of roads and power lines are becoming more and more vulnerable to damage as sea level rises also.

Areas of Concern

Several locations in town were identified as vulnerable, many of which were unsurprisingly along the coast. The four natural hazards identified by Westport workshop attendees included coastal storms, flooding, increasing temperature, and sea level rise. Infrastructure and resource disruptions are the outcomes attendees are most concerned about. Trees fall during strong wind events and obscure roads when emergency access is needed and alternative routes may not exist. Utilities are impacted by falling trees and strong wind, and residents have gone many consecutive days without power in December 2017-March 2018. Prioritization (high, medium, low) and time anticipated to take each action is indicated in the digitized matrices (Appendix C)

Infrastructure concerns relate to storm water and flood management in some capacity. In the past 5 years or so, attendees have cited:

- Power outages
- Failing septic systems
- Bridge/road closures
- Culvert back up
- Emergency service access to all parts of town

Roadway elevation and culvert replacement around town was rated a high priority by consensus. Many roads of interest were combined under one category of vulnerable bridges and dams. Specifically, attendees are concerned about:

- East Beach Road
- Main Road
- Kirby Brook,
- Main Road by Adamsville Pond
- Adamsville Pond dam and culvert
- Main Road at Brookwood
- Route 6 at Bread and Cheese Brook
- the Head
- Hixbridge Bridge
- River Road
- Route 88 Bridge
- Old County Road.

Decentralization of energy sources was cited as both a strength and a vulnerability by workshop attendees. National Grid, Eversource, and Commonwealth Electric Co. are the three utility providers in Westport. This diversity is cited as a strength when one service is compromised and others remain intact. In emergencies, this diversity has made communication and repairs more challenging than if the town had a strong relationship with a single provider. Westport residents have long been experiencing major challenges relative to stormwater and water quality management. Runoff from agricultural sites upstream cause nitrification downstream, and change the environment for fish important to the town's economy. Nitrification also promotes growth of algae and bacteria that can monopolize an ecosystem's resources. Nitrogen loading from both branches of the Westport River also causes ocean acidification where the river meets Buzzard's Bay.



Flooding from stormwater also poses a challenge to the majority of Westport's homeowners, who live with private septic systems. The water table is naturally high in this area, and has become saturated more frequently with additional precipitation, runoff, and tidal flooding. Septic leaching is a serious public health and environmental concern, as well as expensive to remediate and replace failed systems.

Environmental concerns frequently related back to themes of either water quality or preservation of ecosystems/their services. For instance, beaches and marshes are important to mitigate impacts from coastal storms, but are also particularly vulnerable to damage from storms. Top environmental concerns included:

- Nitrification of groundwater
- Gradual disappearance of barrier beaches
- No salt marsh migration (especially on islands), difficulty maintaining natural flood barriers
- Nitrogen accumulation, groundwater quality decline

Most residents in town have private septic systems and leaching issues are common. Groundwater contamination and runoff impacts all organisms downstream, while attendees are particularly concerned with shellfish. Shellfish, herring, and salter fisheries

that residents depend on for income. Increasing temperature and longer summer season exacerbates the impacts of water quality change by creating hospitable environments for algae and bacteria to dominate.

Societal concerns highlighted in the workshops included:

- Community division over environmental management
- Difficulty enforcing existing environmental policies
- Need for regional planning and collaboration
- Unequal access to resources, exposure to throughout town (north or south)



All group discussions touched on a theme of ideological differences as a challenge. Many social and economic factors contribute to this disconnect such as income and access to resources in emergencies. The two major resource discrepancies for northern and southern residents of Westport were vulnerability to groundwater contamination and proximity to emergency services.

The recurring mention of political and ideological challenges happened in the first and second workshop. Attendees made the distinction of north and south areas of town typically corresponding to different perspectives in local decision making. Attendees acknowledged that the full spectrum of demographic and political diversity was not represented at the workshops. By the close of the workshop, attendees agreed that communication and representation is critical in order to begin pursuing sustainable solutions.

Current Strengths and Assets

The larger group generally agreed that environmental interest by all residents was a strength. Despite the lack of consensus in town of which environmental assets to protect and how to protect them, a general interest in the landscape seems to exist for everyone.

Some residents acknowledge the ecosystem services that Westport's landscape provides, and hope to reach others through education and community dialogue. Those who emphasize the recreational value of open space in Westport demonstrate an affinity for their surroundings by interacting with it. The common experience of interacting with nature is seen as a strength, as attendees feel that the town can engage more equitably with all residents.

Many environmental features in Westport were named strengths, and overlap with social assets:

- Marshes and Islands act as buffers during storms and provide important habitat
- Cherry & Web, East Beach, the Knubble, Town Beach, Horseneck Beach provide recreation for residents, are an economic asset that attract tourists, and offer environmental benefits
- Vistas, plus East and west branches of Westport River have inherent value in the landscape, some residents use for recreation
- Agricultural and commercial fishing contribute to Westport's economic resiliency
- Farms contribute to the local economy and utilize local resources

Capacity to plan for growth was another cited strength. Many groups, governmental and non-profit, seem to be having similar conversations relating land use, planning, and resiliency. Within Westport, residents mentioned:

- Development controls and zoning changes demonstrate that decision makers in Westport will make changes when existing policies do not enhance resiliency
- Land Trust holdings are a tool to maintain the natural landscape, adds to a landscape's resiliency

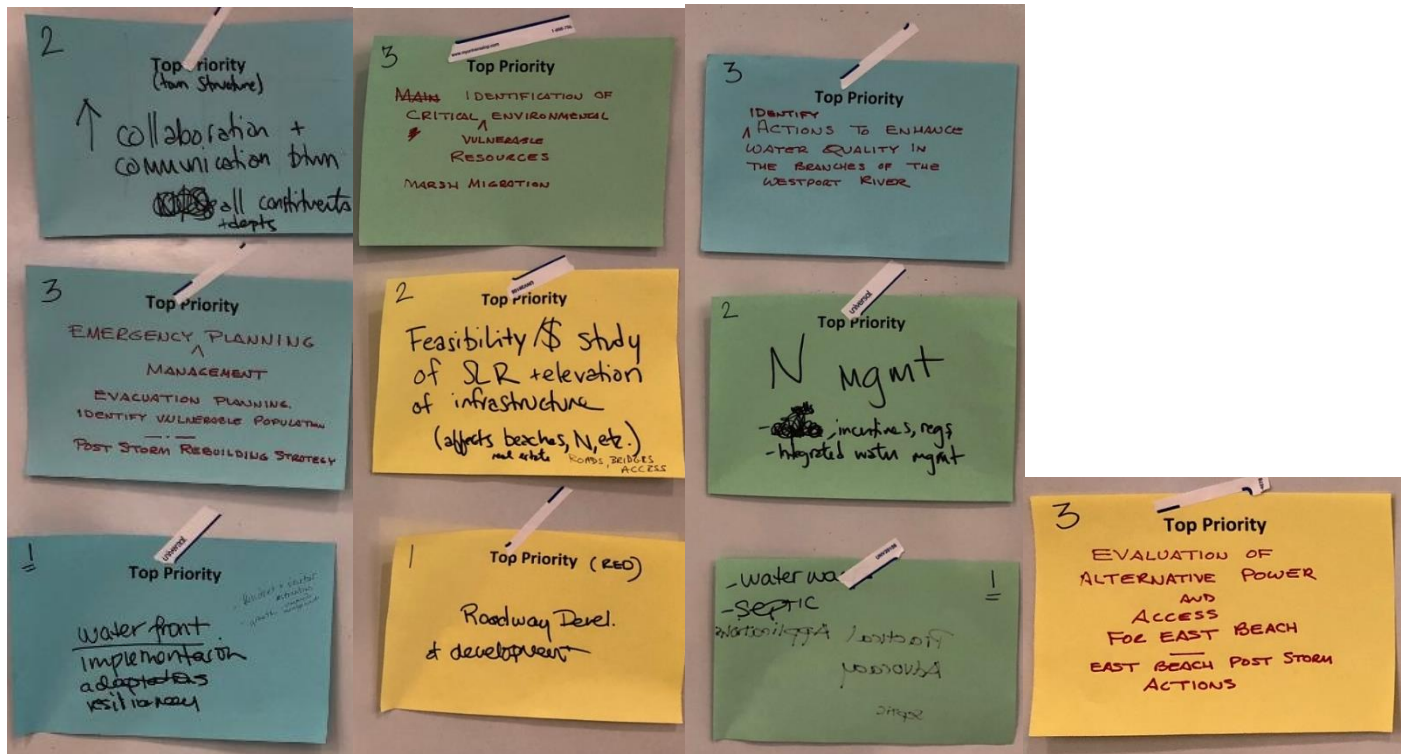
Community buildings, service buildings, police, fire, Westport High School have proven secure in the past year's major storm and flood events. Many attendees cited Westport's High School as a future shelter once it's fully updated. Some additional strengths related to infrastructure include:

- Hix Bridge connects east and west sides of town, so that first responders have access to the west side of town during emergencies
- Route 88 also provides access during emergencies/evacuations
- Diverse energy providers in a single town make it less likely that the whole town will lose power simultaneously

A complete list of strengths and assets can be found in Appendix C in the digitized feature matrices.

Top Recommendations to Improve Resilience

Each of the three groups identified their top 3-4 actions with their facilitator, then reported out as a whole group. Facilitators then lead a discussion with all attendees to best incorporate each group's suggestions into common themes.



The three themes that emerged included infrastructure changes for storm water management, improving communication, and nitrogen removal. Ultimately the group named recommendations:

Bridge Elevation, Dam Removal, and Culvert Replacement

- Research and identify best management practices for waterfront adaptation/resiliency
- Assess cost/benefits of actions for East Beach Road, Head Bridge, Hix Bridge and Landing
- Assess and build necessary partnerships to restore areas around Noquockoke Dam and Forge Pond
- Feasibility study of cost for elevation of infrastructure vulnerable to sea level rise

Refined Communication

- Emergency planning management; update evacuation plan
- Research and identify vulnerable populations to emergencies

- Increase communications between all constituents in Westport through education and outreach

Nitrogen Removal from Ground and Surface Water

- Identify state/federal incentives, any regulation changes, techniques for integrated water management
- Identify technologies and resources needed to enhance water quality in the Westport River
- Identify critical environmental features to protect, the ecosystem services they offer

In making these recommendations, this cohort generated an array of potential actions that related back to the themes identified by facilitators. A complete list of actions generated by the groups, along with their prioritization can be found in Appendix C.

CRB Workshop Participants

Jim Hartnett, Westport Town Planner

Johnathan Paull, Westport Harbor Master

Ron Knapp, Westport River Watershed Alliance (WRWA)

Jim Whitin, Westport Planning Board

Tony Millham, Westport Landing Commission

Patricia Bowie, MA Coastal Zone Management

Dale Weber, WRWA

John Bell, Westport Police

Gina Purtell, Mass Audubon, Allen's Pond Sanctuary

Evan Almeida, Westport Highway Department

Brian A. Beaulieu, Westport Fire Department/EMA

Bob Daylor, Westport Planning Board

Carol Hansen, UMass Dartmouth

Phil Weinberg, Westport Board of Health

Tim King, Town Administrator

Jeff Bull, Westport Landing Commission

John Bullard, Westport Resident

Deborah Weaner, WRWA

Mary Griffin, Mass Audubon

Citation

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CRB Workshop Project Team

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Town of Westport, Chris Gonsalves, Highway Surveyor/Core Team Member

SRPEDD, Bill Napolitano, Facilitator

Mass Audubon, Stefanie Covino, Facilitator

Manomet, Eric Walberg, Facilitator

The Nature Conservancy, Sarah Burns, Note taker

EPA, Trish Garrigan, Note taker

Mass Audubon, Dan Brown, Note taker

Mass Audubon, Ariel Maiorano, Note taker

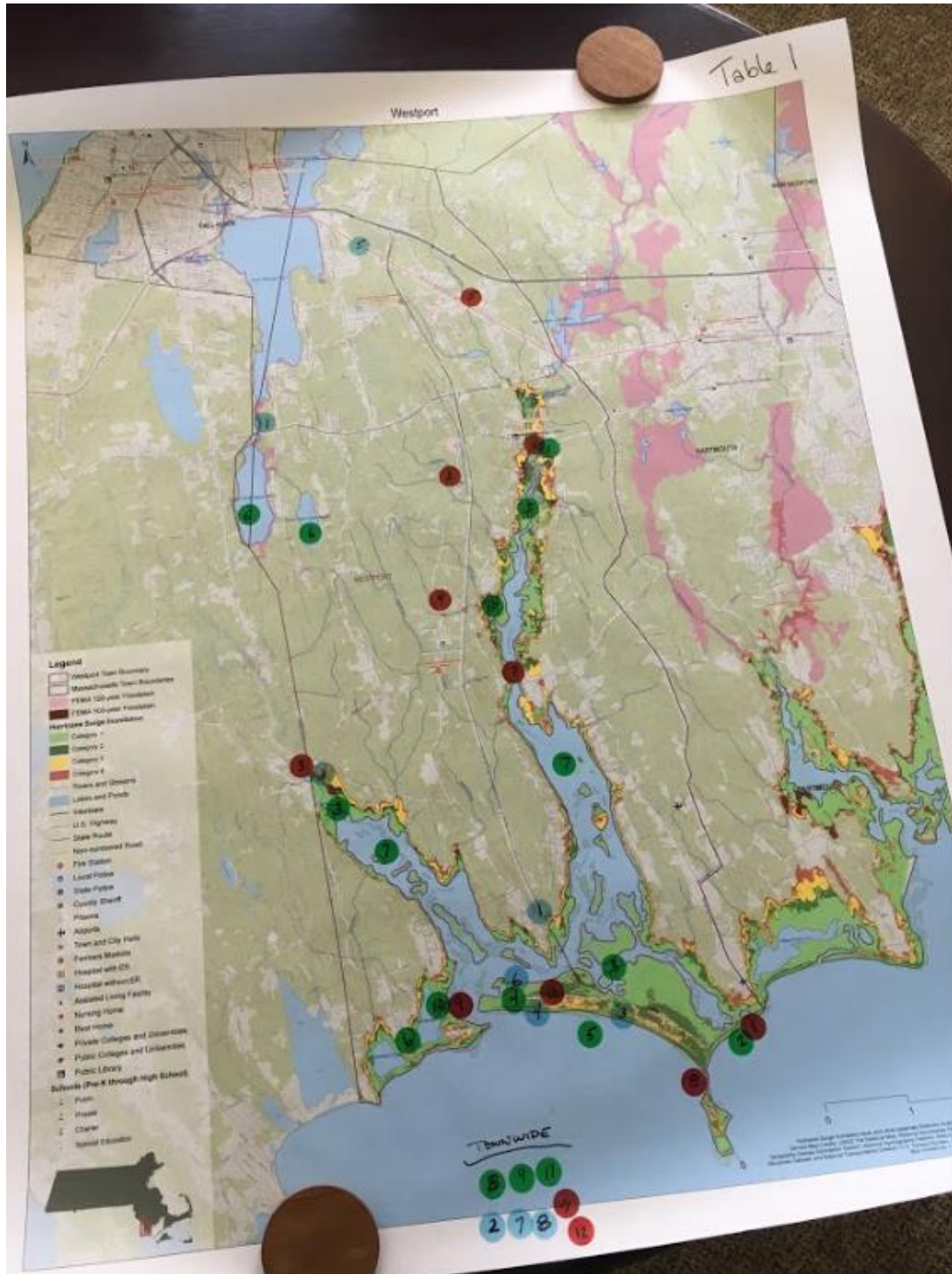
Acknowledgements

The Westport Core Team and Facilitation Team would like to thank the following for their contributions to the MVP Workshop process: staff of the Westport Public Library for providing a wonderful meeting space, assistance with room set-up, and tech support; the

Commonwealth of Massachusetts, EEA, Municipal Vulnerability Preparedness Program for their funding support for these workshops, and; all of those who participated in the workshops and contributed to the plan resulting from these workshops.

Appendix A Maps Marked with Environmental (green), Infrastructural (red), Societal (blue) Features

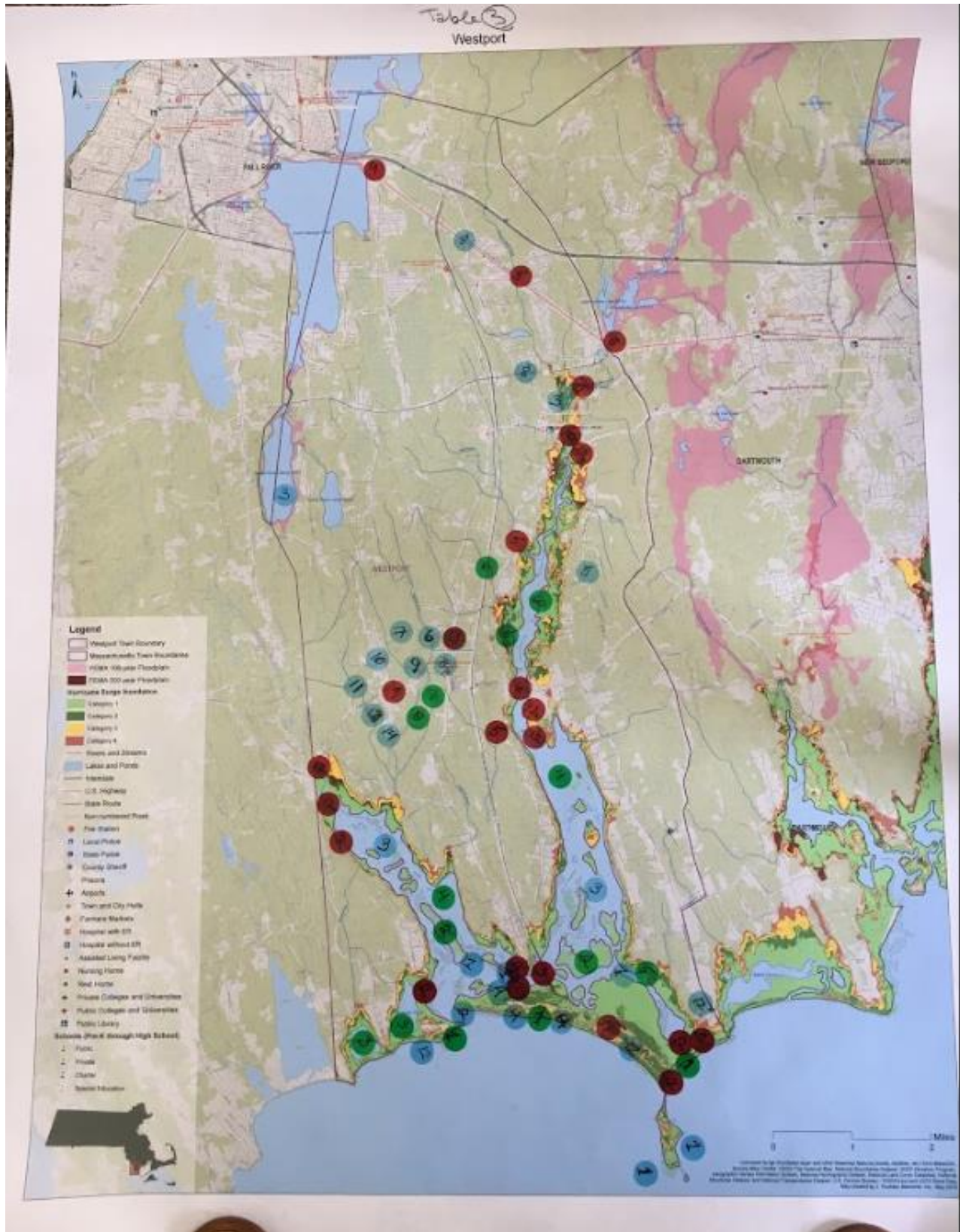
Group 1 Annotated Map



Group 2 Annotated Map



Group 3 Annotated Map



Appendix B Feature Matrices

Group 1 Environmental Feature Matrix

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.com					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)					
Features	Location	Ownership	V or S	Coastal Storm	Floodings	↑Temp	SLR	Priority	Time
								H M L	Short Long Ongoing
Environmental									
1. Head Landing storm water retention		town	V	Resilient for built property	minimize sea level rise			M	L/O
2. Barrier beach to Let		multi	V	Public awareness - engage state to identify solutions				H	L/O
3. Salt marsh	town-wide	multi	V	Adaptation + transition planning				M	O
4. Back dune rare habitat		town	V	Education awareness, advocacy, cooperation				M	O
5. Beach erosion		State, town private	V	improve signage + visual materials				M	O
6. Algae growth	pond + sandy ponds + vegetation	multi	V	replace native grass, grass, revegetation	monitor extent of sand and tide		engage colleges + universities	H	O
7. Nitrogen, acidification, bacteria	town-wide	multi	V	identify contribute variables	storm water management			H	S
8. Winter moth + other foliage eaters	townwide	multi	V	Blow-down tree replacement Reduce other stresses (flood control, etc)	public awareness support natural controls of larvae financial + technical assistance		public awareness reduce other stresses to related animals transitional recovery planning program	H	S
9. Biting insects - disease vectors	townwide	multi	V	public awareness support natural controls of larvae financial + technical assistance			adaptation of naturally functioning ecosystems	H	O
Clean air w/ low industry + SW woods			S						
Environmental investment in community		ngo's private	S						
# acres protected, # protected acres Subject to law			V/S	Support + advocate for CPC B + NGO?			Open space planning	H	O
10. Fisheries - herring saltfish - shellfish	multi location	multi	V		retain buffers - stream prepare to receive location		of future landings + access to ACO	H	O
11. Rare species + focal species Florida Sea Turtle osprey, pollinators	townwide	multi	V	Public awareness				H	O

Thematic links:
 1. Education / outreach / advocacy
 2. Planning + coordination
 3. Practical applications

Group 1 Infrastructural Feature Matrix

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.com							
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)							
Features				Coastal Storms (wind, water, utility, etc.)	FLOODING storm/grand etc	↑ TEMP	S.L.R.	Priority H M L	Time Short Long Ongoing		
Location	Ownership	V or S									
Infrastructural											
1	East Beach Rd - disapproy	SE owner on bay	Multi	V	So ridge purchase and designate a park	Bridge purchase and designate a park	alter/replace utility input	Bridge, purchase and designate a park	#11	O	
2	Main Rd Kirby Brooks		Town	V	enlarge culvert				#11	S	
3	Adamsville Rd	small hill Road Flood	Town	V	Town cooperation - L.C. protect historic structures community awareness	Partnering + zoning efforts partner w/ USDA, etc. Consider dam removal			#9, 11, 13	L/O	
4	UNT. Main Rd @ Brookwood road		Town	V	decharge culvert				#11	S	
5	RT 6 @ Broad + Cheese Brk	side down Flood	Multi-town	V	protect commercial area - well/lighting	consider dam removal			#9, 11, 13	S/L	
6	The Head		Multi	V	Develop strategic plan to identify + prioritize up + down the river/river project	zoning, financial assistance buy out properties or who protect.	protect historic + commercial + municipal buildings		#9, 11, 13	S/L/O	
7	Hix bridge Bridge		State + Town	V	Review + implement ACUE restoration project	consider level setting + material			11, 0	S	
8	Gooseberry causeway		State	V	Defar to state to consider all options				L	L	
	Majority of town buildings are safe			S							
12	Majority of septic + wells in town are low-bay	townwide	private	V	explore bylaws + regulations for more sustainable systems identify financial assistance for homeowners				#13	S/O	
10 → 9	River Rd @ herring run	specific Townwide	Town	V	Develop alternatives + investigate to identify + prioritize up + down the river/river project	can there other structure like this + not selective	calculate about how much + up + down the river + not about the state estimate to estimate etc		H	L/O	
10	Cherry + We 66		Multi - State + Town	V	study nature-based solutions				#11	M L	
	Fire + Police are now + sited well			S							
	School will be upgraded + sited well			S							
10 → 11	Roadway development	townwide		V	Roadway prioritization planning - all aspects				H	L/O	
10 → 13	Utilities = electricity + water	townwide	Multi	V	Plan + funding source to future BNFs + grade - into bylaws				H	L/O	
	Working waterfront = docks + roads	Point	Town + priv	V					write w/ industry reps to make resilient	++	O

Group 1 Societal Feature Matrix

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.com					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)					
Features	Location	Ownership	V or S	Coastal Storms	Flooding Storms <small>↑ sea level rise</small>	↑ TEMP	SLR	Priority	Time
								H M L	Short Long Ongoing
Societal									
1. Evacuation Routes - <small>coordinates of other town</small>		Multi	V	public awareness mapping resources	→		→	H	L/O
2. Farming - <small>local production @</small>	townwide		S+V	coordinate w USDA/AM	coordinate w transit resources to implement BAP's Transition Planning →			H	L/O
Development - <small>infrastructure help town?</small>	townwide		S+V					H	O
4. Beaches - <small>town</small>	coast		S				plan for increased use + more contact as beach	H	O
3. State Beach	coast		S+V				Plan for increased use	H	O
5. Public transportation <small>only on RTG</small>	RT 6 only		V				plan/more to reduce row congestion	L	L
6. Tripps Boatyard + <small>workshop waterfront utility usage</small>	RT	priv + town	S+V	Help plan for resilience adaptation plan				H	S
7. Growing Senior pop. <small>- 3 locations</small>	3 locations		V+S				Coordinate resources existing + new utility planning w sustainable accommodations	H	S/L/O
8. Tourism growth - <small>infrastructure</small>	townwide		V+S	Education			Better crowd management public awareness address stressors on social services	H	S/O
Planning for growth <small>existing capacity</small>	townwide	Planning Board	S						
Town govt model - <small>efficiency responsiveness</small>	townwide		V	Takes a big picture look at current set up				M	L
Seasonal residents - <small>spread low burden</small>	townwide		S						

Group 2 Environmental Feature Matrix

T2

N

Integrated Water Mgmt
 - Septic reg. - new
 - townwide require
 - incentives
 N
 Life economic fishing/farming
 in basin
 it's also
 public health
 issue

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.com					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)					
Features	Location	Ownership	V or S	coastal storms	flooding	temp	SLR	Priority	Time
				H	M	L	Short	Long	Ongoing
Environmental									
1	Beach Ave Barrier Beach	SW	town + private	S/V	stabilize dunes w/ planting, move handicap access from here to other areas			H/L	S/O
2	Salt Marshes	throughout	private, many small	S/V	beach mgmt, inland migration where possible, then buyout designation for islands, continue studies			H	0
3	wetland forests/wetlands	throughout	P	V	setbacks for dept in wetland mgmt			M	0
4	upland forests	throughout	P	S/V	mgmt plans w/ climate stresses (invasive, water, temp dept) + assessment				
5	rare + endangered spp	shore/thr		S/V	+ conservation, in dept of workshop				
6	Septic leaching + N (+BOD)	thr	P/K	V	offer \$ incentives to manage septic, N removal, income based + enforce regulation of pumping records			H	S
7	WCT - Westport Land Conservation Trust	thr	private	S	river access, Boat Farm Trust, ↑ \$ + conservation			M	0
8	beach erosion	thr	+SP	V	erosion mgmt plan			H	O/L
9	ponds (freshw)				investigate, clean removal			M	0
10	salt ponds - Cockeart + Richmond	SW	?	S/N	buffer w/ standards for N-reg			H	2
11	oyster beds + shellfish generally	→ coast	R/S	S/V	review reg on buffers + N-often dead for best + support local sale of oysters			H	S
12	Farms	thr	P	S/V	more WQAP, NUCS, EPA to ↓ N fert. used, get agents to enhance, support SWAT, best works etc			H	S
13	VIXOS	thr		S/V	N/A				
14	bread + cheese brook (N)	N of river	T/P	V	consider seeding, water int. program N mgmt/reduction / OSPD by night			H	S/O
15	lg solar arrays on forests	thr	P	V	continue to revise (setbacks?) -> can't clear?			H	S
16	NITROGEN LOADINGS	thr	all	V				H	0

Franklin
 =
 N

if it's a public health issue in WA

Group 2 Infrastructural Feature Matrix

Table 2

feasibility SLR + elevated
w/for
w/bridges
w/N

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.com					
H=M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)					
Features	Location	Ownership	V or S	Coastal Storms	Flooding sw/gw	↑ temp	SLR	Priority	Time
				H M L	H M L	H M L	H M L	Short Long Ongoing	
Infrastructural									
1	Head Bridge	N Wetuppa Pond	town	V/S	cost benefit analysis of surge barrier gate vs. raising bridges			H	O
2	Hix Bridge + Landing	S	town	V/S	raise road + bridge - explore options w/ engineer			H	O
3	Culvert @ Adamsville Pond	P/VMA	private	V	" + gain access to public park			H	O
4	River Rd	near rd marker	town	V	expand culvert, elevate road			H	M
5	Gooseberry Access - cause way	S tip	state	V/S	plan to keep open + manage sw (homes, tax base)			L	O
6	Herring Run		+		state area of rd not protected → decide to make into island or maintain			L	O
7	E Beach Rd		+	S/V	raise rd + replace w/ open bottom culvert			L	O
8	Head Landing		+	S	at 88 bridge - put emergency power lines across riverbed + talk to state re: E Beach Rd replacement plan for not rep b				
9	Fire Station (2)		+	S/M	see #1 (continue mutual aid w/ Dartmouth for E. part of town)				
9	Police Station (lower fire)		+	S					
10	Schools		+	S	incorporate NBS/sw mgmt into new school planning			H	S
11	energy system - Not Grid + Excess	throughout	NB/ES	S/V	see #7 + collaboration btwn town + energy co for emergency mgmt planning + encourage solar				
12	Pte 88			S	see #7				
13	cell towers	throughout, incl. Boat yard		S/V	NA				
14	Nagvockoke Dam		city	V	work w/ Fall River + DER to explore removal			M	O
15	Dam @ Forge Pond		Manufacturing Private Co.	V	work w/ Titcomb Mfg + DER - explore removal + w/ Fall River			M	O
16	Athletic Ave			V	see #4 → feasibility study - keep open or not?			M	O
17	private drinking wells		private	V	Monitor salt water intrusion + private water testing			L	O
18	septic systems		private	V	regulation - N removal for new subdiv + construction -			H	S
19	Marinas + town docks		P/A	V/S	- create w/ owners + compare - plan SLR			M/H	O
20	E beach sheds		P	V	enforce regulation & work w/ neighborhood assn to more sheds in winter			H	S
21	Flooding home S Watuppa Pond				work w/ Fall River			M	O

same location →

* emergency access input

26t. em

Group 2 Societal Feature Matrix

T2

S16/17/11/12/16 - combine

- new charter to get structure
- access

Community Resilience Building Risk Matrix					www.CommunityResilienceBuilding.com					
H=M=L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength					Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)					
Features					Storms	Flooding	Temp	SLR	Priority	Time
Societal									H M L	Short Long Ongoing
1	failed businesses	Coast	P	✓	engage cos. to deal w/ SLR - see +19 infra				M	0
2	Senior + aging popl	thr.	P	✓	→ continue Council on aging programs to support seniors - support/awareness of wellness check program assistance program - part health network to help seniors age in place				M	0
3	N. West part popl - economic ability to react	N	P	✓	adapt water infra. to replace escarpments + water mgmt + health (GW)				H	0
4	neighborhood on E bank on river	E bank	P	✓	failing septic, see #5, work w/ neighborhoods to mgmt + flooding				"	
5	Divided community	N/S	P/+	✓	relationship, reciprocity, work w/ kids/schools/community grps				H	L/O
6	Govt difficulties	thr.	+	✓	involve + work sharing, create 7 districts - 5 district, 2 Atk?				H	L/O
7	govt capacity + education	thr.	+	✓	tenure ed in N, make economic issue - cheaper now than later				H	L/O
8	tick-borne disease	thr.	-	✓	education				M	0
9	atxkis + motor boats	Coast	P	SV	(pollution, protect marsh)				M	S/O
10	no reverse 911/code red + emergency communication or coordination/responsibility	thr.	+	✓	N/A					
11	public engagement			✓					H	L/O
12	conflicting interest groups	thr.	PA	✓					H	L/O
13	flood insurance/ FEMA maps	thr.	-	✓	(education)				H	S
14	Wn. industries E bank			✓	see infra.					
15	Adamsville neighborhood	W	.	✓	coordinate w/ Little Compton				L	0
16	tax base - paying vs delivery			✓	water work					
17	Westport engaging in regional decision making (need ↑)			✓	work w/ SRPEDD + Enhance SHC => funding!				H/M	S
18	tourism economy - need to ↑ resources; we pay, not benefit			✓	?					

13 - ask Jim for FEMA contact

18 - stickers for doing funding - buy in

Group 3 Infrastructural Feature Matrix

Table 3

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.com					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Top Priority Hazards (tornado, floods, wildfires, earthquake, drought, sea level rise, heat wave, etc.)					
Features	Location	Ownership	V or S	Coastal storms	Flooding sw/gw	Temperature	SLR	Priority	Time
								H M L	Short Long Ongoing
Infrastructural									
1 EAST BEACH ROAD	WATER FRONT	TOWN	✓	1) FOUNDATION 2) SHORT TERM RISK FOR FLOODS			1) LONG TERM REALIGNMENT 2) OF ROAD & POWER LINES	H	S, O, L
2 RIVER ROAD	"	"	✓	1) IMPROVED EMG. RESPONSE			2) PLANNING FOR POST MAJOR STORM REBUILDINGS	H, M	S
3 RT. 88 BRIDGE	"	STATE	✓	1) IMPROVED COORD. W/ STATE			ON EMG. OPERATIONS	H	COORD. S
4 TOWN DOCKS	"	TOWN	✓	1) TRANSITION FROM FIXED TO			FLOATING DOCK 2) POWER PROVISION	M	S
5 MULTIPLE UNDERSIZED CULVERTS	STREAM CROSSINGS	TOWN	✓	1) PLANNING & ANALYSIS UNDERWAY			2) NEED FUNDING FOR FIXES	M	O
6 MIX BRIDGE		STATE	V and S	1) STUDY OF FLOOD VULNERABILITY			2) RUBBLE REMOVAL	M	S
7 FORGE POND DAM		PRI.	✓	EVAL. INTEGRITY & ENV. IMPACT (BUT: FLOOD THREAT)				L	L
8 HOQUOCHOKE DAM		CITY FALL RIVER	✓	"				L	L
9 FALL RIVER LIFT STATION		PRI.	✓	EVAL. FLOOD VULN.				M	L
10 OLD COUNTY RD.		TOWN	✓	"		(LINK TO NEW U.S. & EMG. PLAN)		H	S
11 H. NECK STATE RES.		STATE	✓	NEED POST-STORM RECOVERY PLAN				M	L
12 TOWN LANDINGS	MULTIPLE	TOWN	✓	EVAL. POST STORM RECOVERY				L	O
13 SEPTIC + WELLS	MULTIPLE	PRIVATE	✓	TOWN WAS STUDY UNDERWAY - COULD ADDRESS OTHER AREAS NEED ALTERNATIVE STUDY & FIX			SOME VULN AREA	H	O
14 POWER LINES	"	PRI. PRE/ RESEARCH	✓	EVAL & EMG. PLANNING				H	O
15 DOCKS & MARINAS	✓	MIX	✓	EVAL				L	L

Appendix C Digitized Feature Matrices

Group 1 Digitized Feature Matrix

Features	Location	Owner-ship	V or S	Coastal Storms (wind, water, utility effects)	Flooding (storm/ground water)	Increasing Temperature	Sea Level Rise	Prior-ity	Time
								H M L	Short Long On-going
Infrastructural									
East Beach Rd – disappearing	S.E. corner on bay	Multi	V	Seawall, bridge, purchase land designate a park	Bridge, purchase land designate a park	β Alternative utility layout →	Bridge, purchase land designate a park	#11	O
Main Rd Kirby Brook (flood)		Town	V		Enlarge culvert			#11	S
Adamsville Rd, Gray's Mill Pond (flood)		Multi-town	V	<ul style="list-style-type: none"> Town cooperation--L.C. Protect historic structures Community awareness 	<ul style="list-style-type: none"> Planning and zoning efforts Partner with USDA, etc. Consider dam removal 			#9, 11, 13	L/O
U.N.T. Main Rd at Brookwood (flood)		Town	V		Enlarge culvert			#11	S
Rt 6 at Bread & Cheese Brook (tide & storm flood)		Multi-town	V	Protect commercial area and dwelling/population	Consider dam removal			#9, 11, 13	S/L
The Head		Multi	V	Develop strategic plan to identify and purchase open space for	<ul style="list-style-type: none"> Zoning, financial assistance Buy out properties 		Protect historic, commercial, and municipal buildings	#9, 11, 13	S/L/O

				infrastructure protection	s for water protection				
Hixbridge Bridge		State; Town; U.S.	V		<ul style="list-style-type: none"> • Revise and implement Army Corps of Engineers restoration project • Consider novel solutions through research (materials & design) 		<-- see Flooding	#11	S
Gooseberry causeway		State	V	Defer to state to consider all options --> provide options				L	L
Majority of town buildings are safe			S					-	-
Majority of septic and wells in town are low-lying	Townwide	Private	V	<ul style="list-style-type: none"> • Explore bylaws & regulations for more sustainable systems • Identify financial assistance for homeowners 				#13	S/O

River Rd at herring run	Specific (+) Townwide	Town	V	<ul style="list-style-type: none"> Public awareness campaign (identify and strategize to use mechanisms/venues, public events, official docs, stakeholder presentations) Can state create something like Title V for SLR/flood issues? 		<ul style="list-style-type: none"> Eduate about managed retreat (expiration dates, town road, etc.) Ask for state assistance to prepare info 	H	L/O
Cherry and Webb		Multi (state, town, private, commercial)	V	Study nature-based solutions			#11 M	L
Fire/Police are new and sited well			S				-	-
School will be upgraded and sited well			S				-	-
Roadway development	Townwide		V	<ul style="list-style-type: none"> Roadway prioritization planning - all aspects Pursue funding sources to future BMPs & transfer into bylaws 			H	L/O
Utilities (electricity, water, septic)	Townwide	Multi	V				H	L/O
Working waterfront (docks, roads)	Point	Town; Private	V			Work with industry representatives to make resilient	H	O
Environmental								

Head Landing storm water retention		Town	V	Resize for built capacity	Maintenance schedule & resources			M	L/O
Barrier Beach to Let		Multi	V	Public awareness - engage state to identify solutions				H	L/O
Salt marsh	Townwide	Multi	V	<ul style="list-style-type: none"> Adaptation and transition planning Education, awareness, advocacy, cooperation 				M	O
Back dune rare habitat		Town	V	Improve signage and visual materials				M	O
Beach erosion		State; Town; Private	V	Explore nature-based solutions (grass, re-nourishment)	Monitor movement of sand over time		Engage with colleges and universities	H	O
Algae growth	Devol & Sawdy Ponds and upper river	Multi	V	Identify controllable variables				H	S
Nitrogen, acidification, bacteria	Townwide	Multi	V		Storm water management	<ul style="list-style-type: none"> BMP Awareness Reduce other stressors 		H	S
Winter moth & other foliage eaters	Townwide	Multi	V	<ul style="list-style-type: none"> Blow-down tree replacement Reduce other stressors (flood control, etc.) 		Transitional forestry/vegetation planning		M	O
Biting insects - disease vectors	Townwide	Multi	V	<ul style="list-style-type: none"> Public awareness Support natural controls of larvae Financial & technical assistance 		Retention of naturally functioning ecosystems		H	O

Clean air with low industry and SW breeze			S						-
Environmental interest in community		NGOs; Private	S						-
# acres protected, # protected acres subject to loss			V/S	Support and advocate for CPC and NGOs			Open space planning	H	O
Fisheries (herring, salters, shellfish)	Multi locations	Multi	V				<ul style="list-style-type: none"> • Retain buffers - stream • Prepare to receive donations of future landings and access to water 	H	O
Rare species (e.g. plover, tern, turtle) and Focal species (e.g. osprey, pollinators)	Townwide	Multi	V	Retain buffers - stream			Prepare to receive donations of future landings and access to water	H	O
Societal									
Evacuation Routes (coordinate with other towns)		Multi	V				<ul style="list-style-type: none"> • Public awareness • Mapping risk areas • Coordinate with towns/RI 	H	L/O
Farming (local production (+); flooding, temps., insects, disease)	Townwide		S & V	Coordinate with USDA/Mass. Dept. of Agricultural Resources	Resources to implement BMPs	Transition planning		H	L/O
Development (infrastructure? help town?)	Townwide		S & V					H	O
Beaches (town)	Coast		S			Plan for increased use and more		H	O

						conflict as loses space			
State Beach	Coast		S & V			Plan for increased use		H	O
Public transportation (only on Rt 6)	Rt 6 only		V			Plan for more to reduce road congestion		L	L
Tripps Boatyard (and working waterfront)	Point	Private ; Town	S & V	• Help plan for resilience • Adaptation plan				H	S
Growing senior population (utility usage, transportation, temperature/storm response, public health)	3 locations		V & S			• Coordinate resources (existing & new) • Utility planning with sustainable alternatives		H	S/L/O
Tourism growth (infrastructure)	Townwide		V & S	Education			Public awareness	H	S/O
Planning for growth (existing capacity)	Townwide	Planning board	S						
Town government model (efficiency, responsiveness)	Townwide		V	Take a big picture look at current setup				M	L
Seasonal residents (spend money, low burden)	Townwide		S						

Group 2 Digitized Feature Matrix

Features	Location	Ownership	V o r s	Coastal Storms (wind, water, utility effects)	Floodin g (storm/ ground water)	Increasin g Temp- erature	Sea Level Rise	Prior- ity	Tim e
								<u>H</u> <u>M</u> <u>L</u>	<u>S</u> <u>h</u> <u>o</u> <u>r</u> <u>t</u> <u>L</u> <u>o</u> <u>n</u> <u>g</u> <u>o</u> <u>n</u> <u>g</u>
Infrastructural									
Head Bridge	N Westport River	Town	V & S	Raise road and bridge - explore options with engineer				H	O
Hix Bridge & Landing	S	Town	V & S	Raise and gain access to public park					
Culvert & Dam at Adamsville Pond	RI/MA	Private	V	Expand culvert, elevate road				H	
River Rd	Near RI border	Town	V	Plan to keep open and manage SW (homes, tax base)				M	
Gooseberry Access (causeway)	S tip	State	V & S	State area of road not protected -- > decide to make into island or maintain				L	O
Herring Run		Multi		Raise road and replace with open bottom culvert				L	L
E Beach Rd (emergency access from beach)		Multi	S & V	Rt 88 bridge - put energy power lines across riverbed and talk to state re: E Beach Rd replacement plan (or not replaced)				M	O
Head Landing		Multi		See #1					
Fire Station (2) (vulnerable, esp. lower station if Hix Bridge out)		Multi	S & V	See #2 (continue mutual aid with Dartmouth for E. part of town)					
Police Station (lower fire); same location as above		Multi	S & V						
Schools		Multi	S	Incorporate NBS/SW management into new school planning				H	S
Energy system (National Grid & Eversource)	Throughout	NG/ES	S & V	See #7 and increase collaboration between town and energy companies for emergency management planning and encourage solar & alternative energy					

Rt 88			S	See #7					
Cell towers	Throughout, including boat yard		S & V	NA					
Noquockoke Dam	N at river	City (Fall River)	V	Work with Fall River and DER to explore removal				M	O
Dam at Forge Pond		Private Company (manufacturing)	V	Work with Titcomb Manufacturing and DER - explore removal and with Fall River				M	O
Atlantic Ave.			V	See #4 --> feasibility study; keep open \$ or not?				M	O
Private drinking wells and Fall River water		Private	V	Monitor salt water intrusion and private water testing				L	O
Septic systems		Private	V	Regulation - N removal for new subdivision and construction				H	S
Marinas and town docks		Private; Multi	V & S	Engage with owners and companies - plan for sea level rise				M/H	O
E Beach sheds (washing away inf. And cost now/later and tight tanks)	E Beach Rd	Private	V	Enforce regulation and work with neighborhood association to move sheds in winter				H	S
Flooding home S Watuppa Pond	Boat house Rd; Fall River			Work with Fall River				M	O
Environmental									
Beach Ave Barrier Beach	SW	Town; Private	S & V	Stabilize dunes with planting (explore restoration), move handicap access from here to other areas				H/L	S/O
Salt Marshes	Throughout	Private; Town; State	S & V	Beach management, allow for inland migration where possible, thin layer deposition for islands, continue studies				H	O
Wetland forests/wetlands	Throughout	Private	V	• Increase setbacks for development in wetland regulations					
Upland forests	Throughout	Private	S & V	• Management plan to reduce climate stressors (invasive, water, temp., development) and assessment				M	O
Rare and endangered species, esp. birds	Shore; Throughout		S & V	• Increase conservation, in and out of Westport					

Septic leaching (and nitrogen, farms)	Throughout	Private; Town	V	<ul style="list-style-type: none"> • Offer financial incentives to manage septic • N removal • Income-based • Enforce regulation of pumping records 	H	S
Westport Land Conservation Trust	Throughout	Private	S	<ul style="list-style-type: none"> • Increase river access Poor Farm Trust • Increase funding and conservation 	M	O
Beach erosion	Throughout	Town; State; Private	V	Erosion management plan	H	O/L
Ponds (freshwater)				Investigate dam removal	M	O
Salt ponds (Cockeest & Richmond)	SW	?	S & V	Buffer with increase standards for N-regulations	H	S
Oyster beds and shellfish generally	3 areas	Private; State	S & V	<ul style="list-style-type: none"> • Review regulations on bacteria and N - often closed for bacteria • Support local sale of local oysters 		
Farms	Throughout	Private	S & V	<ul style="list-style-type: none"> • Work with MACD and farms, NRCS, EPA to decrease N fertilizer used • Get grants to enhance, support SEMAP/Meatworks Rt 6 	H	S
Vistas	Throughout		S & V	NA		
Bread & Cheese Brook (nitrogen)	N of river	Town; Private	V	<ul style="list-style-type: none"> • Consider sewerage, water infrastructure program, N management/reduction • OSRD by right 	H	S/O
Solar arrays on forests	Throughout	Private	V	Continue to revise (increase setbacks?) --> can't clear?	H	S
Nitrogen loading	Throughout	Multi	V		H	O
Societal						
Failed businesses	Coast	Private	V	Engage companies to deal with sea level rise - see #19 infrastructure	M	O

Seniors & aging population	Throughout	Private	V	<ul style="list-style-type: none"> • Continue council on aging programs to support seniors • Increase support/awareness of wellness check program, assistance program, Dartmouth network to help seniors age in place 				M	O
N. Westport population (economic ability to react)	N	Private	V	Adopt water infrastructure bill to replace cesspools and increase water management and health				H	O
Neighborhoods on E branch on river	E branch	Private		Failing septs, see #3; work with neighborhoods to manage N & flooding				H	
Divided community N/S	Throughout	Private; Town	V	<ul style="list-style-type: none"> • Increase relationship; reciprocity; work with kids/schools/community groups • Inclusion and cost sharing; create 7 districts - 5 district, 2 AL? • Increase environmental education in N, make economic issue - cheaper now than later 				H	L/O
Government difficulties (environmental, economic, political)		Town							
Government capacity and education		Town							
Tick-borne disease	Throughout		V	Education				M	O
Jet skis and motor boats	Coastal	Private	S & V	(pollution, protect marsh)				M	S/O
No reverse 911/code red (and emergency communication or coordination/responsibility)	Throughout	Multi	V	NA					
Public engagement			V					H	L/O
Conflicting interest groups	Throughout	Private; Town	V					H	L/O
Flood insurance, FEMA maps, \$	Throughout		V	(education)				H	S
[?] E Beach			V	See infrastructure					
Adamsville neighborhood	W		V	Coordinate with Little Compton				L	O
Tax base - paying vs. delivery			V	Barrier beach					
Westport engaging in regional decision-making			V	<ul style="list-style-type: none"> • Need to increase regional decision-making • Work more with SRPEDD and 				H/M	S

				enhance S4C • Funding!					
Tourism economy (need to increase resources; we pay, not benefit)			V ?						

Group 3 Digitized Feature Matrix

Features	Location	Ownership	V or S	Coastal Storms (wind, water, utility effects)	Flooding (storm/ground water)	Increasing Temperature	Sea Level Rise	Priority	Time	
								H M L	Short Long Ongoing	
Infrastructural										
East Beach Road	Waterfront	Town	V	<ul style="list-style-type: none"> • Realignment of road and power lines • Abandonment 				H	S/O/L	
River Road	Waterfront	Town	V	<ul style="list-style-type: none"> • Improved emergency response • Planning for post major storm rebuilding 				H/M	S	
Rt 88 Bridge	Waterfront	State	V	<ul style="list-style-type: none"> • Improved coordination with state on emergency opening • Need town emergency coordinator 				H	S	
Town Docks	Waterfront	Town	V	<ul style="list-style-type: none"> • Transition from fixed to floating dock • Power provision 				M	S	
Multiple undersized culverts	Stream crossings	Town	V	<ul style="list-style-type: none"> • Planning and analysis underway • Need funding for fixes 				M	O	
Hix Bridge		State	V & S	<ul style="list-style-type: none"> • Study of flood vulnerability • Rubble removal 				M	S	
Forge Pond Dam		Private	V	Evaluate integrity and environmental impact (potential flood threat)						
Hoquochoke Dam		City of Fall River	V						L	L
Fall River Lift Station		Private	V						M	L
Old County Rd.		Town	V	Evaluate flood vulnerability			(link to new H.S. and [?] plan)	H	S	
H. Neck State Res.		State	V	Need post-storm recovery plan				M	L	
Town Landings	Multiple	Town	V	Evaluate post-storm recovery				L	O	

Septic and wells	Multiple	Private	V	<ul style="list-style-type: none"> • Town W & S study underway - could address some vulnerable areas • Other areas need alternative study and fix 				H	O
Power lines	Multiple	Private (Eversource)	V	<ul style="list-style-type: none"> • Evaluate • Emergency planning 				H	O
Docks and marinas	Multiple	Multi	V	Evaluate				L	L
Environmental									
Cherry & Web, East Beach, the Knubble, Town Beach, H.N.	Coastal	Town	V & S	Evaluation & planning (different for each)				H	S
Marsh & Islands	Interior/freshwater	Multi	V & S	Study underway				H	O
Coastal Ponds		Multi	V & S	Evaluation & planning				H	S
E & W Branches of W.P. River		State	V & S	Study needed to understand climate change impacts				H	L
Land Trust Holdings	Multiple	Multi	S	Planning for future acquisitions (resiliency)				M	L
Fresh water streams	Multiple	Private	V	Land use planning for adjacent lands				H	L
Groundwater level and quality	All	?	V	Analysis of pollution				H	S
Forested Land	Multiple	Multi	V & S	Conservation and land use planning				H	O
Lack area for marsh management	Multiple	Multi	V						
Societal									
Aquacultural and commercial fishing	Multiple	Multi	V & S	High value, potential adverse social and economic impacts					
Harbor entrance		State	V & S	Evaluate both M.S. change and use impacts				H	O
Recreational fishing: salt and fresh water	Multiple	State	V & S	Quality of life					
Beaches	Multiple	Multi	V & S	Evaluate viability of future public use				H	S

Agriculture; dairy, nur., winter	Multiple	Private	V & S	Land use change; questions of economic viability				
Tourism and seasonal use	Multiple (but much waterfront)	Multi	V & S	Education			M	L
Reduction in waterfront property value	Waterfront	Private	V & S	Evaluate potential loss, response			M	L
Commercial zones	3	Private	V & S					
Voluntary emergency response group	Fall River	Private		Maintain linkage as W.P. develop own approach			H	S
Municipal buildings	Multiple, but high ground	Town	S	Designate emergency shelter			H	S
Development and re-development	Multiple	Private	V	Strengthen development controls: vulnerable areas			H	O
Vulnerable populations and evacuation plans	East Branch Rd area	Private	V	Plan needed: identify vulnerable populations			H	S
Development controls and zoning		Town	S	Update for above issues			H	S
Lack of consensus on environmental issues			V	Public education			H	O