Seabrook-Hamptons Estuary Alliance

Dedicated to preserving, restoring, and championing the Hampton-Seabrook Estuary and its watershed's health and social functions to support a thriving and diverse habitat, enhance water quality, mitigate flood risks, and offer sustainable recreational and commercial opportunities.

BACKGROUND

The anticipated rates and levels of sea level rise in New Hampshire have been extensively studied and modeled with finding documented in reports such as The Coastal Risks and Hazards Commission reports (2015, updated in 2021), and the Rockingham Planning Commission's "Tides To Storms" report (2015), the Great Bay National Estuarine Research Reserve's "Sea Levels Affecting Marshes Model" (SLAMM) data (2014, updated in 2022), and others. The robust datasets, consistent findings, and timely updates gives scientists and other concerned professionals confidence in the accuracy of such projections. And that confidence gives those scientists, planners, and municipal officials a greater ability to understand and plan for the physical impacts of sea level rise and storm surges on municipal infrastructure (town facilities, drainage systems, roads, etc.) and natural resources (salt marshes, streams, and ponds, etc.).

As valuable as it is to understand the projected physical impacts of sea level rise and storm surges, it is equally important to learn about their fiscal impact. Not only do sea level rise and increasing storm activity have the potential to do physical damage to our towns, but they can also significantly impact our ability to house and support businesses that serve our communities, provide employment for our residents, and provide adequate long and short-term housing for our residents and visitors, especially along our coast. Impacts in any of those areas may also reduce funding for municipal infrastructure and operations.

RATIONALE

The purpose of this report is to provide a "snapshot" of what impacts sea level rise and storm surges may have on Hampton's, Seabrook's, and Hampton Falls' finances in 2050. A team of economists at the National Oceanographic and Atmospheric Administration (NOAA) has helped to collect and analyze data regarding the numbers of businesses that may have to rebuild, close, or relocate because of the physical changes at our coastline in 2050. They have also looked at the impact those losses may have on employment. And they have provided information regarding the numbers and kind of residential structures that may be impacted, and how that may affect our towns' property tax collections.

While no one can guarantee how much our physical and fiscal environment will change between now and 2050, having this kind of projection provides a window into understanding the potential of those changes and what eventualities we may have to prepare for. We see this as another important tool for each municipality to consider in planning for its future. Communities may find themselves grappling with questions such as - Should the towns make sure there are opportunities for coastal businesses to relocate to safer areas if their current locations become untenable? Is there adequate housing in other parts of the town, should coastal residents feel the need to relocate but want to stay local? And if there is a significant reduction in property tax revenues, how can each town best adjust?

Just as there are ways to mitigate some of the physical impacts of sea level rise and increased storm activity, so are there ways to mitigate the financial impacts of those changes. This report does not attempt or intend to suggest ways to adapt to the potential financial impacts. Rather, it is intended to provide critical information to spark conversations and investigations into how our towns can adjust to and continue to thrive in our changing coastal environment.

ECONOMIC REPORT

The Economy and Flood Vulnerability for Hampton, Hampton Falls, and Seabrook, New Hampshire

This report was prepared by the NOAA Office for Coastal Management for the Seabrook-Hamptons Estuary Alliance.

This updated report was shared in March 2024.

OFFICE FOR COASTAL MANAGEMENT

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Executive Summary

The magnitude of the U.S. coastal and marine economies, and the large numbers of people living near the coast, highlight the need for coastal communities to have access to high-quality economic research and data to address coastal hazards. Community leaders require these data to evaluate the various adaptation measures for mitigating hazards such as flooding from storm surge and sea-level rise.

Definitions

- **Coastal Economy:** All of the economic activity that occurs along the coast.
- **Marine Economy:** The economic sectors that depend on the oceans or Great Lakes for their existence, including (but not limited to) living resources, marine construction, marine transportation, offshore minerals, ship and boat building, and tourism and recreation.

This study aims to provide economic information for three coastal towns in New Hampshire (Hampton, Hampton Falls, and Seabrook) by

1. analyzing the coastal economy and marine economy across the towns;
2. evaluating the vulnerability of the towns' business establishments and employees to flooding from sea-level rise (on its own and with storm surge); and
3. evaluating the towns' residential vulnerability to coastal inundation from sea-level rise (on its own and with storm surge).

Results indicate that marine businesses in these three communities account for approximately 12 percent of all business establishments and employ 15 percent of all workers. Furthermore, the tourism and recreation sector constitutes a large portion of the marine economy, including 193 businesses establishments (11 percent of all businesses) and 2,484 employees (14 percent of all employees).

With respect to the towns' vulnerability to flooding from sea-level rise, both marine and non-marine businesses begin to be affected by daily high tides with sea-level rise of 1 foot. With 3 feet of sea-level rise, the number of businesses that may face inundation increases from 7 to 77 businesses (though this may be an underestimate). Eleven of the businesses are marine dependent while 66 are not.

A 1 percent annual chance flood event also affects businesses across all three towns. When coupled with 3 feet of sea-level rise, such an event would impact 255 businesses (15 percent of all businesses) employing 1,780 individuals (10 percent of all employees). Five hundred and fifty-eight of these individuals are employed by the accommodation and food services sector alone, suggesting that lower-income workers might be more likely to lose wages should business establishments close after a flood.

Additional analysis of the publicly available parcel data indicates that 3 feet of sea-level rise may affect 3,090 residential properties (16 percent of all residential parcels analyzed in this study). Meanwhile, a 1 percent annual chance event without any sea-level rise might affect 3,651 residential parcels (19 percent of all parcels analyzed). In combination, 5,316 residential parcels might be affected (27 percent of all parcels analyzed). These scenarios may lead to varying one-time losses (i.e., losses from a single event) as well as varying tax base losses (i.e., losses if properties become uninhabitable or are converted to open space through a buyout program).

This analysis is designed to evolve as data precision improves. The current findings should be considered preliminary or limited, especially with respect to the business establishment data. Future iterations of this study can be improved upon in several ways. Researchers should consider collaborating with local officials to "audit" the business establishment data to ensure that as many business points as possible are captured as accurately as possible. Researchers should also consider using methods that minimize the incorrect omission of Esri business points when overlaid with different inundation footprints. Finally, researchers should consider conducting a more comprehensive study of the parcel data using depth damage curves as well as a complementary assessment of

roads and other infrastructure (while some parcels, residences, or businesses might not experience water damage, they might still become inaccessible during high tide flooding and storms).

1. Introduction

The marine economy is composed of economic sectors that depend on the oceans or Great Lakes, including (but not limited to) living resources, marine construction, marine transportation, offshore minerals, ship and boat building, and tourism and recreation. Most recently, the marine economy accounted for $432.4 billion (US$ 2021), or 1.9 percent, of all U.S. gross domestic product and employed over two million people in 2021 (Bureau of Economic Analysis 2023). Meanwhile, nearly 40 percent of all U.S. residents reside in a coastal shoreline county (National Oceanic and Atmospheric Administration's Office for Coastal Management 2023). The magnitude of the marine economy and the number of people living near the coast necessitate research which seeks to provide vital information to coastal decision-makers as they evaluate various adaptation measures to address hazards such as flooding from storm surge and sea-level rise.

New Hampshire's coastal communities, like many other communities throughout the United States, are experiencing sea-level rise, which contributes to flooding and shoreline erosion. These towns are also threatened by storm events, such as a recent unnamed event which adversely affected the Hampton-Hampton Falls-Seabrook area in January 2024. This event, in particular, led to unexpected flooding due to a "higher than predicted high tide" (Anderson and Sweeney 2024). Per local news outlets, the flooding from this event prompted Hampton police to issue an emergency warning to its residents (Anderson and Sweeney 2024), and emergency responders rescued 20 people in Hampton Beach (Gibson 2024). Further, the unnamed event went on to damage coastal towns in Maine and to register a record high tide in Portland (Gibson 2024).

In response to the event, one Hampton official noted, "It happens every few years. It's definitely not an annual event" (Anderson and Sweeney 2024). While this may have held true historically, climate science has shown that the frequency and severity of weather events is increasing throughout the country and in the Northeast region. The impacts of such events are exacerbated by sea-level rise and storm surge, threatening businesses, residential homes, and properties.

The magnitude of the marine economy and the number of people living near the coast underscores the importance of local research for coastal decision-makers addressing climate risks such as flooding from rising seas.

This study aims to provide this information for three coastal towns in New Hampshire (Hampton, Hampton Falls, and Seabrook) by

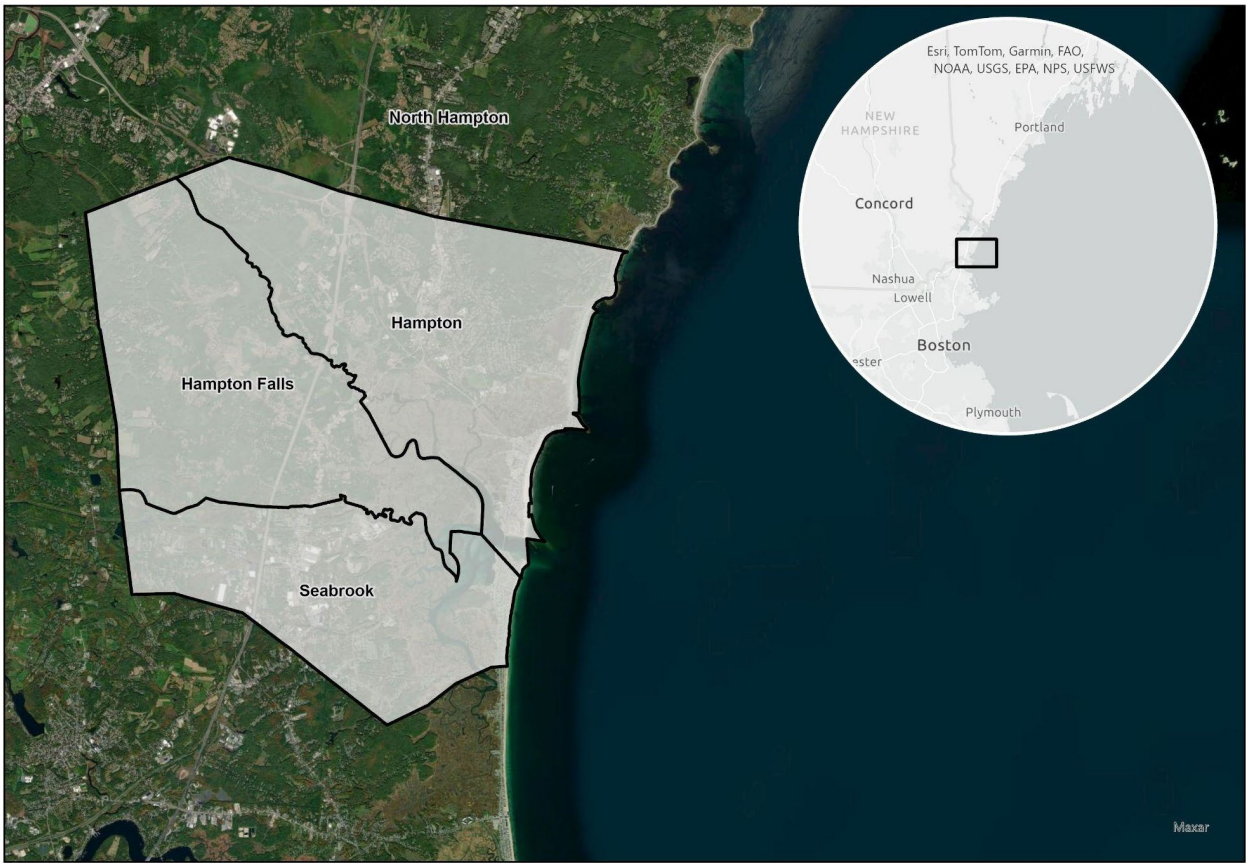
1. analyzing the coastal economy and marine economy across the towns;
2. evaluating the vulnerability of the towns' business establishments and employees to flooding from sea-level rise (on its own and with storm surge); and
3. evaluating the towns' residential vulnerability to coastal inundation from sea-level rise (on its own and with storm surge).

2. Methodology

2.1 Study Area

As displayed in Map 1, this study is focused on the entirety of Hampton, Hampton Falls, and Seabrook, and includes the following zip codes: 03842 (Hampton), 03844 (Hampton Falls), and 03874 (Seabrook). We first present data regarding the coastal economy, followed by insights regarding the marine economy. We follow up by evaluating the impact of sea-level rise on towns, considering both scenarios with and without storm surge. This evaluation encompasses perspectives from both the coastal and marine economies, as well as a residential viewpoint. Data within the main section of the report are presented in aggregate across all three towns. Data for each individual town are presented in Appendices A to C.

Map 1. Study Area

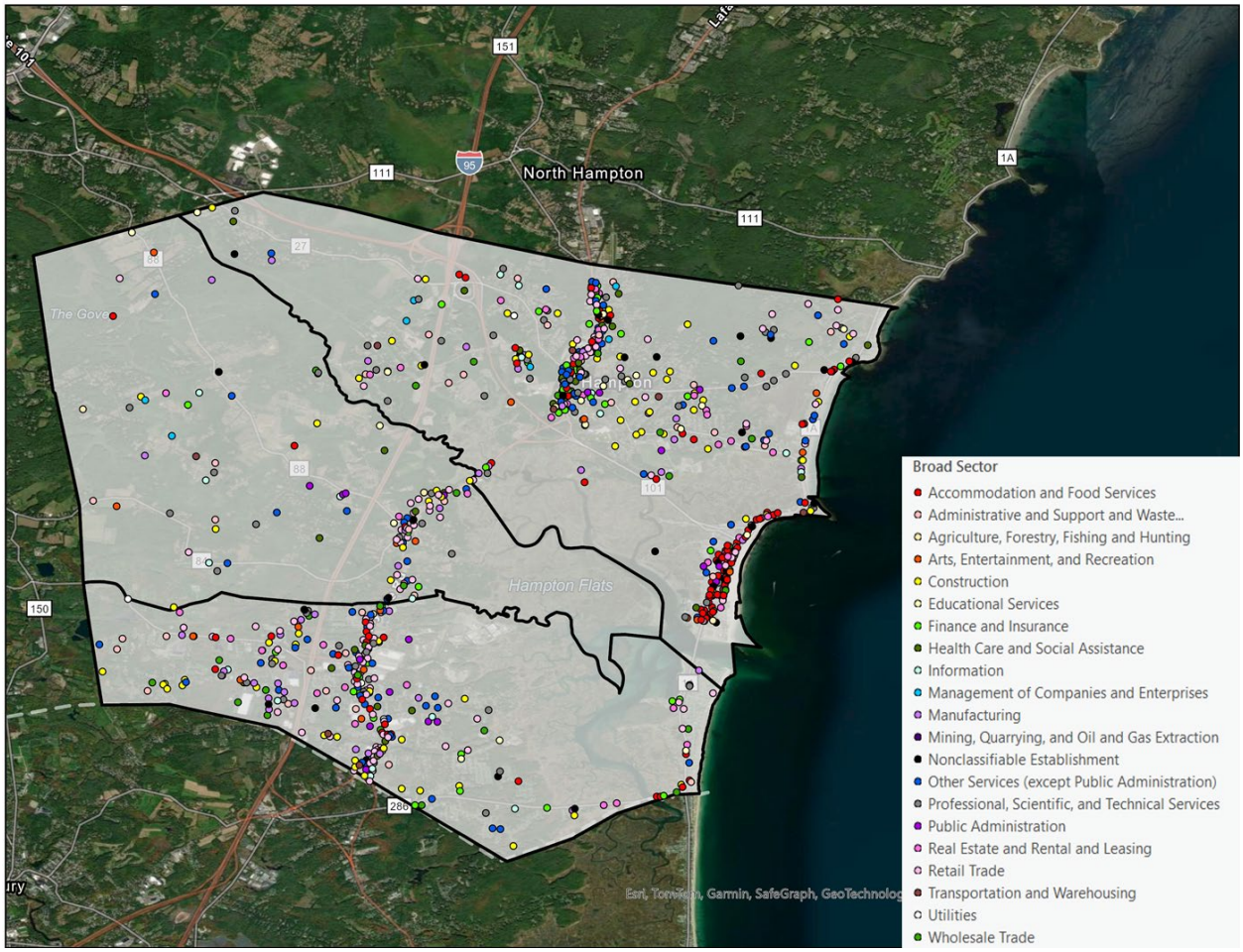


2.2 Economic Overview

Economic insights are generated from two perspectives, as displayed in Maps 2 and 3.

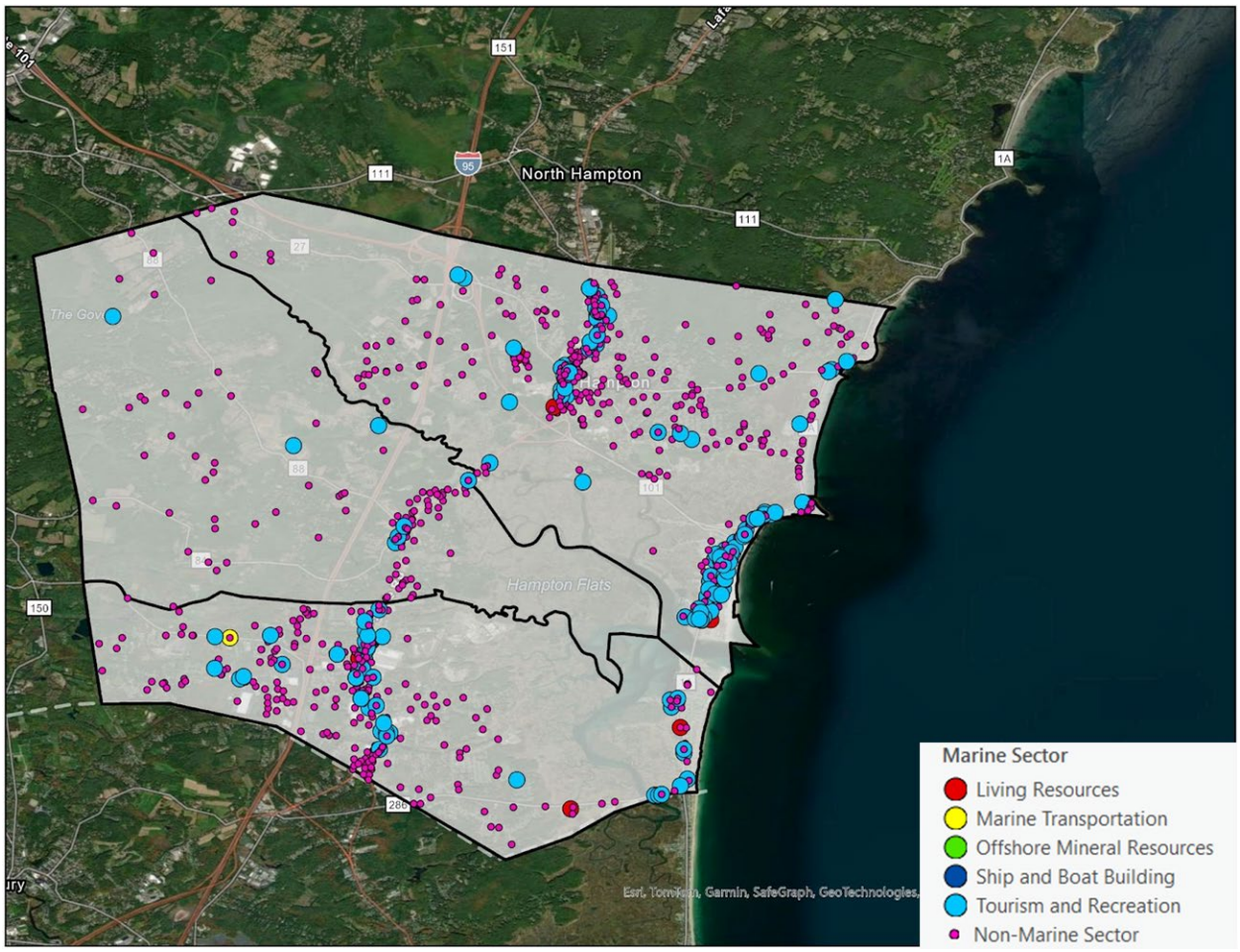
Map 2 uses Esri Business Analyst to identify all of the business establishment points within the study area using two-digit codes from the North American Industry Classification System (NAICS) to categorize them into one of 21 broad sectors ranging from utilities to wholesale trade to educational services and beyond (as defined by the United States Census Bureau). A visual inspection of Map 2 indicates that the towns have a diverse mix of businesses.

Map 2. Coastal New Hampshire's Coastal Economy (Broad Sectors)



Map 3 identifies all of the business establishment points within the study area as well. However, it categorizes them using six-digit NAICS codes to bin them into one of six marine-dependent (i.e., ocean-dependent) sectors, as defined by the National Ocean and Atmospheric Administration (NOAA). Any businesses that do not fall into a marine- or ocean-dependent sector are categorized within the non-marine sector. A majority of the business establishments within the towns are not marine dependent. Most marine-dependent businesses fall within the tourism and recreation sector.

Map 3. Coastal New Hampshire's Marine Economy Sectors



2.3 Sea-Level Rise Vulnerability

New Hampshire's coastal towns, like many other communities throughout the United States, are experiencing sea-level rise, which contributes to flooding and shoreline erosion. These towns are also threatened by storm events, the impacts of which are exacerbated by sea-level rise and threaten businesses, residential homes, and properties. In an effort to account for this threat, this report analyzes the Esri business points' vulnerability to flooding from sea-level rise using multiple sea-level rise inundation footprints.

This report draws from the sea-level rise scenarios that were published by the University of New Hampshire in a report titled, "New Hampshire Coastal Flood Risk Summary Part 1: Science," in order to select appropriate inundation footprints. The University of New Hampshire report develops several relative sea-level rise projections for coastal New Hampshire based on different greenhouse gas emissions scenarios, called Representative Concentration Pathways (RCPs). As detailed in the report, preferred relative sea-level rise projections for this area are based on RCP 4.5 for both the near-term (2000 to 2050) and the intermediate term (2050 to 2100) (Wake et al. 2019).[1] Table 1 reimagines Table 4.2 from the report to concentrate on the most likely estimates associated with RCP 4.5. As seen, there is a 67 percent probability that sea-level rise will be between 0.5 feet and 1.3 feet in 2050 and 1.0 feet to 2.9 feet in 2100. Recent data from the Interagency Sea Level Rise Task Force (Sweet et al., 2022)

[1] Per the report, RCP 4.5 is described as the following: "Carbon emissions begin to stabilize and then slowly decline after 2050. Global temperatures rise by 2.4°C (4.3°F) (likely range 1.7 - 3.2°C) by 2100, compared to 1850-1900" (p. 14).

indicate that sea-level rise would likely exceed 3 feet in 2100 given higher emissions and potential rapid ice sheet melting.

Table 1. Projected Local Sea-Level Rise (SLR) Estimates for New Hampshire*

Year	RCP	Central Estimate 50% probability that SLR meets or exceeds:	Likely Range 67% probability that SLR meets or exceeds:
2030	4.5	0.5 feet	0.3-0.7 feet
2050	4.5	0.9 feet	**0.5-1.3 feet**
2100	4.5	1.9 feet	**1.0-2.9 feet**
2150	4.5	2.7 feet	1.2-4.6 feet

* These estimates are based on a Kopp et al. (2014) study as well as the Seavey Island tide gauge.

The most recently available inundation footprints from NOAA report 1-foot to 10-foot sea-level rise in 1-foot increments. In an effort to capture the "likely range" to 2100, this report utilizes 1-foot to 3-foot sea-level rise footprints to assess the businesses' vulnerability to flooding from sea-level rise.

2.4 Sea-Level Rise and Storm Surge Vulnerability

This report also seeks to assess the vulnerability of the towns' businesses to flooding from sea-level rise *and* storm surge from a 1 percent annual chance event. NOAA has developed a model for storm surge called the NOAA Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model. This model is based on historical data from hurricanes and tropical events. The SLOSH model may not best reflect the conditions of a 1 percent annual chance event in Hampton, Hampton Falls, or Seabrook because there is little historical data on hurricanes that have made landfall in New Hampshire. In fact, per NOAA's Atlantic Oceanographic and Meteorological Laboratory, Hurricane Gloria was the only hurricane to hit New Hampshire's coastline between 1851 and 2022 (2022).[2]

The lack of historical data for New Hampshire as it relates to the SLOSH model necessitates a different methodology to better account for storm surge. Both NOAA and the Federal Emergency Management Agency (FEMA) provide information regarding extreme water levels for coastal locations. NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) provides extreme water level data at tide gauges. The nearest tide gauge to the Seabrook-Hampton estuary with this information is at Seavey Island and reports the 1 percent annual chance water level to be 2.49 meters above mean sea level (equivalent to 3.7 feet above mean higher-high water (MHHW). NOAA's statistics are based upon historically observed water levels and are therefore subject to the influence of tides; unless a storm surge hits at high tide, the magnitude of the surge may be muted.

FEMA uses a probabilistic modeling approach to estimate worst case flood scenarios using historical and synthetic storms, and they provide information specific to the local communities—including the Seabrook-Hampton area—through the National Flood Hazard Layer Viewer. The viewer contains a number of useful data sets including flood hazard areas with associated base flood elevations and model transects with wave and water level statistics. Base flood elevations account for the influence of waves whereas stillwater elevations (SWEL) do not and are more analogous to NOAA's 1 percent annual chance extreme water levels. FEMA's stillwater elevations for the Seabrook-Hampton area are 8.36 feet above the North Atlantic Vertical Datum of 1988 (NAVD88), or approximately 4 feet

[2] Hurricane Gloria made landfall in New Hampshire in September 1985 as a category two hurricane. It also directly impacted North Carolina, New York, Connecticut, and Maine.

above MHHW. Wave setup and wave runup compound on top of stillwater elevations, resulting in base flood elevations ranging from 8 to 18 feet NAVD88 throughout the area depending on exposure, predicted wave action, and backwater effects.

In other words, in the absence of wave action, storm surge that would arise from a 1 percent annual chance event in the Seabrook-Hampton area can be approximated to be 4 feet above MHHW. In this report, 4 feet is added to the NOAA sea-level rise inundation footprints to provide a proxy for sea-level rise *and* surge associated with a storm having a 1 percent chance of occurring in any given year. We recognize that this is a best-case scenario and that certain areas will likely experience higher total water levels.[3]

2.5 Residential Flood Vulnerability

The NOAA team accessed publicly available tax parcel data for 2021. This data are compiled and managed by the New Hampshire Department of Revenue Administration and accessible via the New Hampshire GRANIT Clearinghouse website by the University of New Hampshire.

First, the team retained the parcels that are located in Hampton, Hampton Falls, or Seabrook. Then, the team analyzed the state land-use codes, or SLUCs, to retain parcels described as "Improved Residential Land & Building or Building Only Codes" and which are classified as residential (denoted by an "R") (New Hampshire Department of Revenue Administration 2019). The following property types are included in this study:

- Single family homes (SLUC_1: 11)
- Multi-family 2-4 units (SLUC_1: 12)
- Single residential condominium unit – even if the unit is part of multi-unit block (SLUC_1: 14)
- Residential condominium 2-4 unit building – purchase of multiple units (SLUC_1: 15)
- Manufactured housing with land (SLUC_1: 17)
- Manufactured housing without land (SLUC_1 18)
- Building only – residential (SLUC_1 20)

Apartment buildings and condominiums with at least five units are not included in this study because they are classified as commercial property by the State of New Hampshire. The study also excludes parcels that might be residential but are categorized as unknown or unclassified.

3. Analysis: Economic and Residential Overview

3.1 Coastal Economy

Table 2 provides an overview of how many business establishments and employees are associated with each broad sector, and is arranged in descending order by number of employees. Retail trade has the most businesses and employs the most people among the three towns; it accounts for 319 establishments (18 percent of all businesses) as well as 2,904 employees (17 percent of all employees).

Table 2. Overview of Coastal Economy (Broad Sectors)

Sector	Definition	Establishments	Employees
44-45	Retail Trade	319	2,904

[3] We did not account for higher total water levels as the majority of the three-town region has base floods elevations in the 8- to 9-foot range. Further, total water surface elevations in wave velocity zones will likely change non-linearly under different future sea level conditions.

Sector	Definition	Establishments	Employees
72	Accommodation and Food Services	187	2,586
22	Utilities	11	1,806
31-33	Manufacturing	69	1,618
54	Professional, Scientific, and Technical Services	149	998
62	Health Care and Social Assistance	83	826
92	Public Administration	55	769
71	Arts, Entertainment, and Recreation	46	754
42	Wholesale Trade	59	733
61	Educational Services	38	701
23	Construction	124	699
81	Other Services (excluding Public Administration)	177	680
53	Real Estate and Rental and Leasing	116	588
56	Administrative and Support and Waste Management and Remediation Services	67	514
52	Finance and Insurance	99	328
55	Management and Companies and Enterprises	8	235
48-49	Transportation and Warehousing	29	187
51	Information	37	162
11	Agriculture, Forestry, Fishing and Hunting	7	121
99	Nonclassifiable Establishments	64	30
21	Mining, Quarrying, and Oil and Gas Exploration	1	13
Total		**1,745**	**17,252**

3.2 Marine Economy

Table 3. Overview of Marine and Non-Marine Activity

Type of Business	Business Establishments	Employees
Marine	203	2,536
Non-Marine	1,542	14,716

Type of Business	Business Establishments	Employees
Total	**1,745**	**17,252**
Percent Marine	**12%**	**15%**

Table 3 uses Esri Business Analyst data to quantify the degree to which Hampton, Hampton Falls, and Seabrook can be considered "marine dependent." As seen above, marine businesses account for nearly 12 percent of all businesses within the towns and employ nearly 15 percent of all employees within the towns.

While there are more non-marine businesses across the towns, the marine-dependent businesses may have a difficult time relocating away from the coast as sea-level rise encroaches because many of them depend on a waterfront to operate. As a result, it is important to understand the makeup of the towns' marine economy.

Table 4 does this by indicating the number of businesses and employees within each marine-dependent sector in Hampton, Hampton Falls, and Seabrook, and confirms an observation from Map 3: the tourism and recreation sector dominates the marine economy, accounting for over 95 percent of all marine-dependent businesses and nearly 98 percent of all marine-dependent employees across the towns. Meanwhile, the towns do not contain any marine construction businesses (per their NAICS codes), though some construction businesses may work in coastal and marine areas even though they are not classified as marine construction businesses.

Table 4. Economic Insights by Marine Sector

Sector	Establishments	Employees
Tourism and Recreation	193	2,484
Living Resources	7	35
Offshore Mineral Resources	1	13
Marine Transportation	1	3
Ship and Boat Building	1	1
Total	**203**	**2,536**

Table 5 provides more granular data by disaggregating the marine sectors into marine industries. Eating and drinking places account for 60 percent of all marine-dependent businesses and 74 percent of all marine-dependent employees. Further, 83 percent of all marine-dependent businesses can be accounted for by two tourism and recreation industries alone: eating and drinking places (60 percent) and hotels and lodging places (23 percent). Likewise, these two industries employ 93 percent of all marine-dependent employees across the three towns.

Table 5. Economic Insights by Marine Industry

Marine Sector	Marine Industry	Establishments	Employees
Tourism and Recreation	Eating and Drinking Places	122	1,889
	Hotels and Lodging Places	46	470
	Amusement and Recreation Services	13	59
	Boat Dealers	3	18
	RV Parks and Campgrounds	3	18
	Scenic Water Tours	1	15
	Zoos and Aquaria	2	8
	Marinas	3	7
Living Resources	Seafood Markets	3	22
	Seafood Processing	1	5
	Fishing	2	4
	Fish Hatcheries and Aquaculture	1	4
Offshore Mineral Resources	Oil and Gas Exploration and Production	1	13
Marine Transportation	Warehousing	1	3
Ship and Boat Building	Boat Building and Repair	1	1
Total		**203**	**2,536**

3.3 Residential Parcels

Table 6. Residential Parcels by Property Type

SLUC	Type of Property	Number of Parcels
11	Single Family Home	7,217
12	Multi-Family 2-4 Units	642

SLUC	Type of Property	Number of Parcels
14	Single Residential Condominium Unit	3,328
17	Manufactured Housing with Land	307
18	Manufactured Housing without Land	8,010
20	Building Only – Residential	137
Total		**19,641**

Using the publicly available data from New Hampshire's Department of Revenue Administration, Table 6 indicates the number of properties included in this study per property type. A majority of properties, over 77 percent, are manufactured housing without land or single family homes. Further, manufactured housing without land, single family homes, and single residential condominium units account for nearly 95 percent of all analyzed parcels in this study.

4. Results: Sea-Level Rise Vulnerability

4.1 Coastal Economy

Using Esri Business Analyst, Table 7 shows the number of businesses affected by 1-foot to 3-foot sea-level rise. As seen, seven businesses are expected to flood during daily high tides from 1-foot sea-level rise alone. This increases to 34 businesses at 2-foot sea-level rise and 77 businesses at 3-foot sea-level rise. Since this area may experience upwards of 2.90 feet of sea-level rise by 2100, Table 8 dives deeper into the 3-foot sea-level rise footprint to explore the number of employees who may be impacted. A total of 570 employees may be affected by 3-foot sea-level rise. Further, 148 of these individuals (26 percent) are employed by the accommodation and food services sector alone.

Table 7. Businesses Affected by Sea-Level Rise Alone (Broad Sectors)

Sector	Definition	1ft SLR	2ft SLR	3ft SLR
23	Construction	-	-	8
31-33	Manufacturing	-	2	2
42	Wholesale Trade	-	-	4
44-45	Retail Trade	-	2	5
48-49	Transportation and Warehousing	-	-	3
51	Information	-	-	3
52	Finance and Insurance	-	2	4
53	Real Estate and Rental and Leasing	1	4	7
54	Professional, Scientific, and Technical	-	4	6

Sector	Definition	1ft SLR	2ft SLR	3ft SLR
	Services			
56	Administrative and Support and Waste Management and Remediation Services	-	-	4
62	Health Care and Social Assistance	-	-	3
71	Arts, Entertainment, and Recreation	-	-	2
72	Accommodation and Food Services	1	4	11
81	Other Services (excluding Public Administration)	1	6	3
92	Public Administration	3	6	8
99	Nonclassifiable Establishments	1	4	4
Total		**7**	**34**	**77**

Table 8. Businesses and Employees Affected by 3-Foot Sea-Level Rise (Broad Sectors)

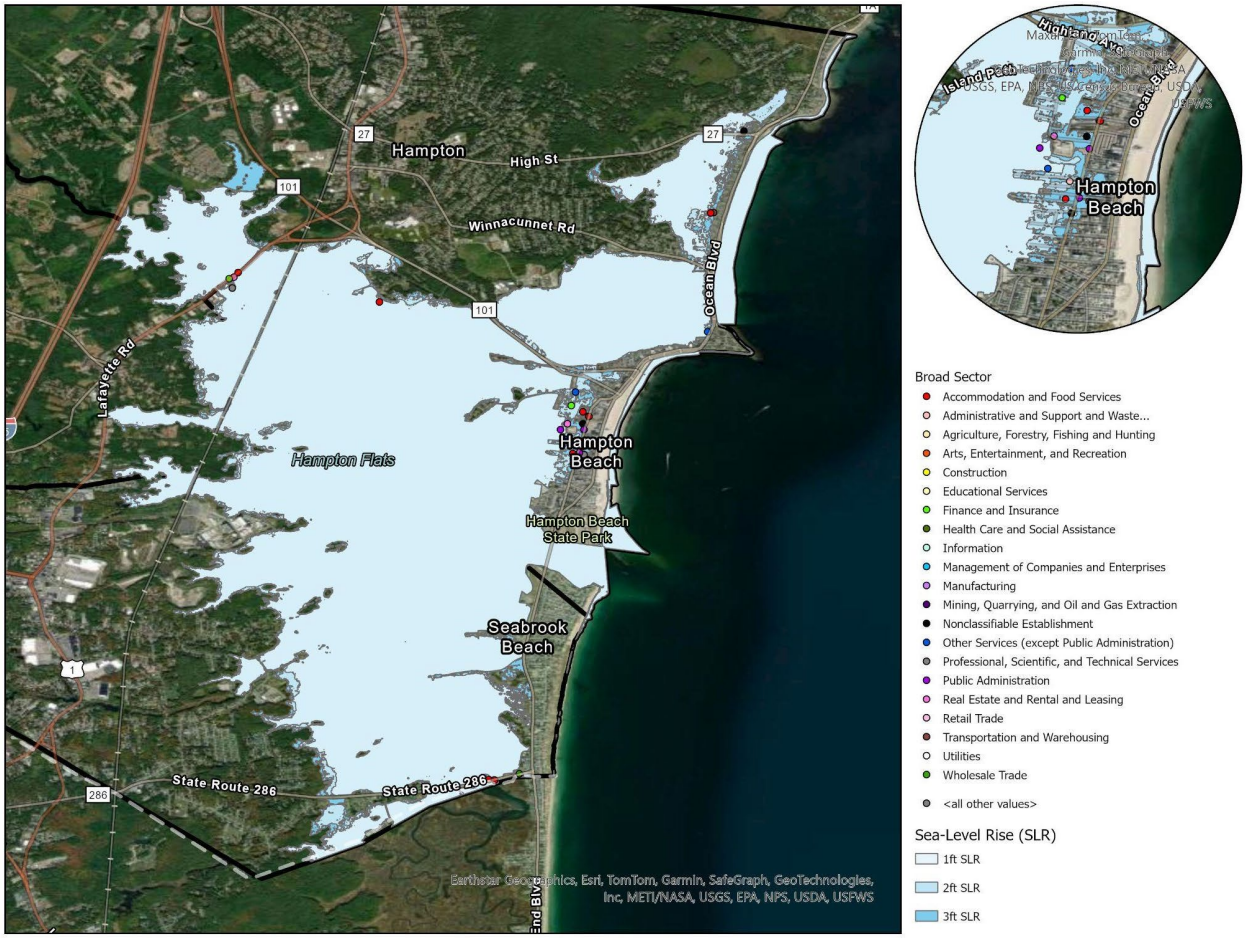
Sector	Definition	Establishments	Employees
72	Accommodation and Food Services	11	148
92	Public Administration	8	146
44-45	Retail Trade	5	64
23	Construction	8	34
53	Real Estate and Rental and Leasing	7	32
54	Professional, Scientific, and Technical Services	6	32
42	Wholesale Trade	4	22
81	Other Services (excluding Public Administration)	3	16
62	Health Care and Social Assistance	3	15
71	Arts, Entertainment, and Recreation	2	12
52	Finance and Insurance	4	11
48-49	Transportation and Warehousing	3	10
51	Information	3	10
56	Administrative and Support and Waste Management and Remediation Services	4	9

Sector	Definition	Establishments	Employees
31-33	Manufacturing	2	9
99	Nonclassifiable Establishments	4	0
Total		**77**	**570**

Table 8 is supplemented by Map 4, which reimagines Map 2 to include the 1-foot to 3-foot sea-level rise inundation footprints as well as the broad sector business points that would be affected by 3 feet of sea-level rise. An inspection of Map 4 indicates that there may be several businesses affected in the waterfront area of Hampton Beach. Per Esri, 53 of the 77 businesses (69 percent) that would be affected by 3 feet of sea-level rise are located within the circle north of Hampton Beach State Park and south of the Exeter-Hampton Expressway. [4]

[4] This may represent a limitation of the Esri Business Analyst data, which is further examined in Section 6: Limitations and Caveats. As noted in the Executive Summary, the business point data should be considered preliminary or limited.

Map 4. Businesses Affected by 3 Feet of Sea-Level Rise (Broad Sectors)



4.2 Marine Economy

Table 9. Marine and Non-Marine Businesses Affected by 1- to 3-Foot Sea-Level Rise

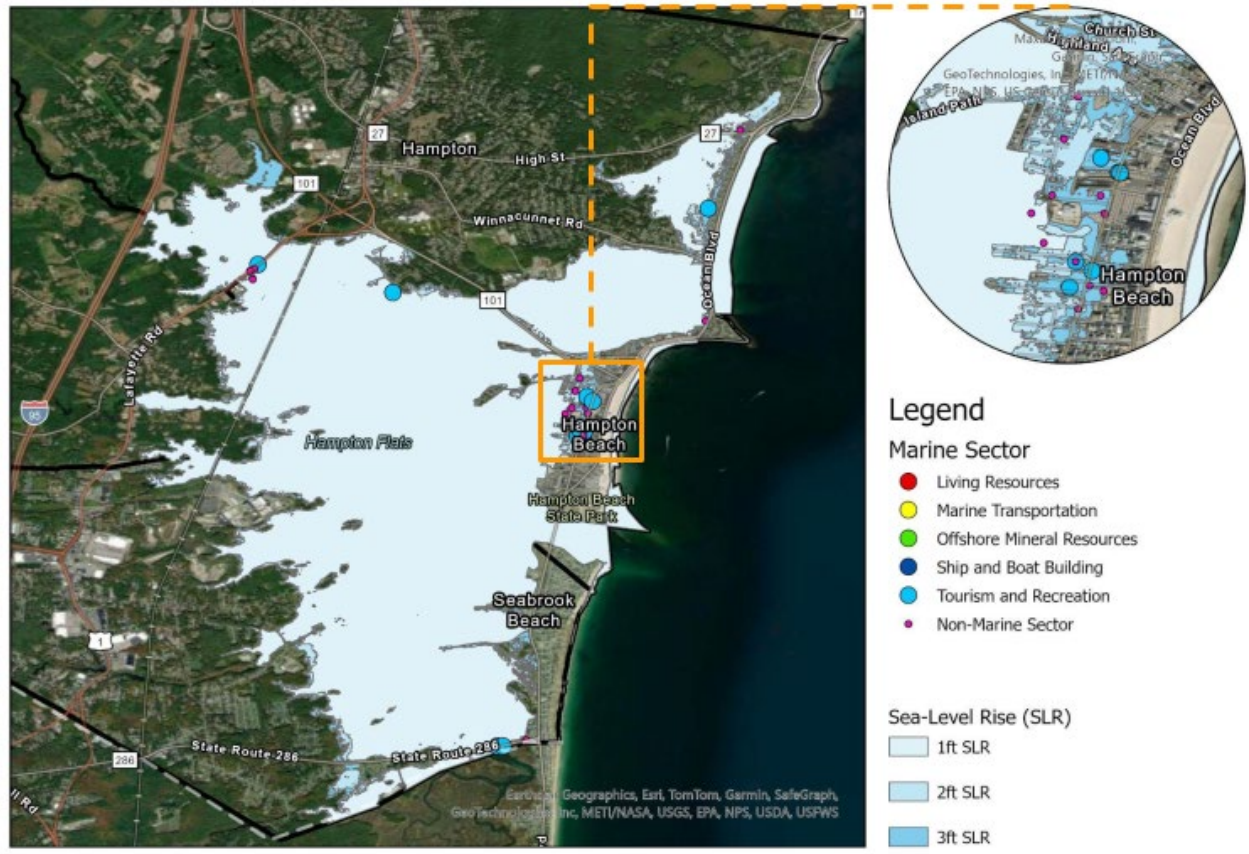
Type of Business	1ft SLR	2ft SLR	3ft SLR
Marine	1	4	11
Non-Marine	6	30	66
Total	**7**	**34**	**77**

Using Esri Business Analyst, Table 9 shows the number of businesses affected by 1-foot to 3-foot sea-level rise inundation footprints. The data indicate that both marine and non-marine business establishments are affected beginning with 1-foot sea-level rise.

While more non-marine businesses would be affected by sea-level rise, the marine sector of tourism and recreation may be disproportionately affected because *all* of the marine establishments affected by 1- to 3-foot sea-level rise are tourism and recreation businesses. The marine businesses affected by 3-foot sea-level rise fall within the following tourism and recreation industries: eating and drinking places (five businesses), hotels and lodging places (four businesses), RV parks and campgrounds (one business), and zoos and aquaria (one business).

Table 8 is supplemented by Map 5, which reimagines Map 3 to include the 1-foot to 3-foot sea-level rise inundation footprints as well as the marine economy business points that would be affected by 3 feet of sea-level rise.

Map 5. Marine Economy Businesses Affected by 3 Feet of Sea-Level Rise



4.3 Residential Parcels

Table 10. Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	364	725	877
12	Multi-Family 2-4 Units	54	98	120
14	Single Residential Condominium Unit	845	1,160	1,557
17	Manufactured Housing with Land	10	16	22
18	Manufactured Housing without Land	472	472	473

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
20	Building Only - Residential	1	29	41
Total		**1,746**	**2,500**	**3,090**

Table 10 indicates the parcels that will be inundated by 1-foot to 3-foot sea-level rise. A majority of the affected parcels are considered single residential condominiums across all three scenarios: At 1 foot of sea-level rise, 48 percent of affected parcels are single residential condominiums. This decreases slightly to 46 percent at 2 feet of sea-level rise only to increase to 50 percent at 3 feet of sea-level rise.

By definition, a condominium is a building or complex of buildings containing a number of individually owned apartments or houses. This poses an analytical challenge regarding the true number of affected properties, as condominiums are often located in multi-story buildings (e.g., some condominiums may resemble townhouses while others are located in high-rise buildings). While a parcel may appear inundated, local knowledge is required to better understand the types of condominiums across Hampton, Hampton Falls, and Seabrook, as well as the number of condominiums located on the first floor of a building, the second floor of a building, and beyond. This also applies to multi-family units.

Appendix D includes Table D.1, which reimagines Table 10 to indicate the properties with the greatest risk factor to sea-level rise.

Table 11. Total Assessed Value of Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	$164,198,059	$282,904,659	$342,218,759
12	Multi-Family 2-4 Units	$ 25,910,600	$ 42,775,300	$ 51,333,300
14	Single Residential Condominium Unit	$232,065,000	$298,452,500	$442,271,300
17	Manufactured Housing with Land	$ 2,024,850	$ 3,368,150	$ 4,683,450
18	Manufactured Housing without Land	$ 25,475,200	$ 25,475,200	$ 25,556,800
20	Building Only - Residential	$ 122,200	$ 2,073,600	$ 3,505,200
Total		**$449,795,909**	**$655,049,409**	**$869,568,809**

Table 11 reimagines Table 10 to indicate the monetary value of the properties that might be lost across the three sea-level rise scenarios. The values above represent the total tax assessment of the land, the buildings, and additional features. It is important to recognize that these values most likely represent underestimates, as tax assessments often lag market values by several years.

We can still draw some conclusions from these values. First, nearly $1 billion of residential infrastructure is at risk of being inundated due to 3 feet of sea-level rise alone. Further, 90 percent of the assessed value that may be inundated under this scenario is associated with single family homes and single residential condominiums units.

Nevertheless, we recommend the use of Tables 12 to 14 over Table 11 to inform decision-making. While most results in the body of this report are reported in aggregate, the tables below disaggregate the values above and utilize each town's unique tax rate (per thousand) as well as its unique revenue commitment to understand the potential property tax loss for each town. This is an especially important component within this report because New Hampshire does not have an income tax and generates a substantial amount of tax revenue from its property taxes:

Table 12. Hampton: Potential Property Tax Loss

Percent Lost	1ft SLR	2ft SLR	3ft SLR
1%	$ (67,513.77)	$ (100,703.70)	$ (134,481.13)
	0.10%	0.15%	0.20%
5%	$ (337,568.86)	$(503,518.48)	$(672,405.64)
	0.51%	0.76%	1.02%
10%	**$ (675,137.73)**	$(1,007,036.97)	$(1,344,811.27)
	1.02%	1.53%	2.04%
15%	$(1,012,706.59)	**$(1,510,555.45)**	$(2,017,216.91)
	1.54%	**2.29%**	3.06%
20%	$(1,350,275.46)	$(2,014,073.94)	**$(2,689,622.54)**
	2.05%	3.06%	**4.08%**
25%	$(1,687,844.32)	$(2,517,592.42)	$(3,362,028.18)
	2.56%	3.82%	5.10%

Table 13. Hampton Falls: Potential Property Tax Loss

Percent Lost	1ft SLR	2ft SLR	3ft SLR
1%	$ (1,088)	$ (1,216)	$ (1,274)
	0.01%	0.01%	0.01%
5%	**$ (5,440)**	**$ (6,079)**	**$ (6,369)**
	0.05%	**0.05%**	**0.06%**
10%	$(10,881)	$(12,158)	$(12,738)
	0.10%	0.11%	0.11%

Percent Lost	1ft SLR	2ft SLR	3ft SLR
15%	$(16,321)	$(18,237)	$(19,108)
	0.15%	0.16%	0.17%
20%	$(21,762)	$(24,316)	$(25,477)
	0.19%	0.22%	0.23%
25%	$(27,202)	$(30,395)	$(31,846)
	0.24%	0.27%	0.28%

Table 14. Seabrook: Potential Property Tax Loss

Percent Lost	1ft SLR	2ft SLR	3ft SLR
1%	$ (5,783)	$ (6,707)	$ (8,580)
	0.01%	0.01%	0.02%
5%	$ (28,917)	$ (33,534)	$ (42,901)
	0.06%	0.07%	0.09%
10%	**$ (57,835)**	**$ (67,068)**	**$ (85,801)**
	0.12%	**0.13%**	**0.17%**
15%	$0(86,752)	$(100,601)	$(128,702)
	0.17%	0.20%	0.26%
20%	$(115,669)	$(134,135)	$(171,603)
	0.23%	0.27%	0.34%
25%	$(144,586)	$(167,669)	$(214,504)
	0.29%	0.33%	0.43%

Tables 12 to 14 are organized as follows: The “Percent Loss” column assumes the percentage of properties that will be lost due to sea-level rise. We have provided a wide range of percentages for consistency both in this section and in the section that covers sea-level rise in conjunction with storm surge. The monetary values in each table represent the total tax loss under each sea-level rise scenario and percent loss scenario. Below that, we have included the percentage of total tax revenue potentially lost.

Each town appears to exhibit different levels of flood risk, as seen below. For this reason, we have also bolded the row which we feel best serves as an appropriate *upper* range in each sea-level rise scenario.[5] Ultimately, we defer to local decision-makers.

- Hampton: 1,455 to 2,737 residential parcels will be affected by 1 foot of sea-level rise and 3 feet of sea-level rise, respectively. This represents 9 percent and 18 percent of all analyzed parcels *in* Hampton.
- Hampton Falls: 19 to 22 residential parcels will be affected by 1 foot of sea-level rise and 3 feet of sea-level rise, respectively. This represents 2 to 3 percent of all analyzed parcels *in* Hampton Falls.
- Seabrook: 272 to 331 residential parcels will be affected by 1 foot of sea-level rise and 3 feet of sea-level rise, respectively. This represents between 8 percent and 10 percent of all analyzed parcels *in* Seabrook.

These tables are supplemented by explanations in Appendices A, B, and C (following Tables A.8, B.8, and C.8), which detail the calculations in greater detail by using the recommended upper bounds at 3 feet of sea-level rise.

5. Results: Sea-Level Rise *and* Storm Surge Vulnerability

5.1 Coastal Economy

Table 15. Businesses Affected by Sea-Level Rise and Storm Surge (Broad Sectors)

		1-Percent Annual Chance Event (4ft) Plus		
Sector	**Definition**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Agriculture, Forestry, Fishing, and Hunting	-	-	1
23	Construction	14	17	19
31-33	Manufacturing	5	6	7
42	Wholesale Trade	6	6	10
44-45	Retail Trade	17	26	30
48-49	Transportation and Warehousing	3	5	5
51	Information	6	6	6
52	Finance and Insurance	8	9	10
53	Real Estate and Rental and Leasing	17	19	25
54	Professional, Scientific, and Technical Services	12	15	15
56	Administrative and Support and Waste Management and Remediation Services	7	7	8
61	Educational Services	-	-	1

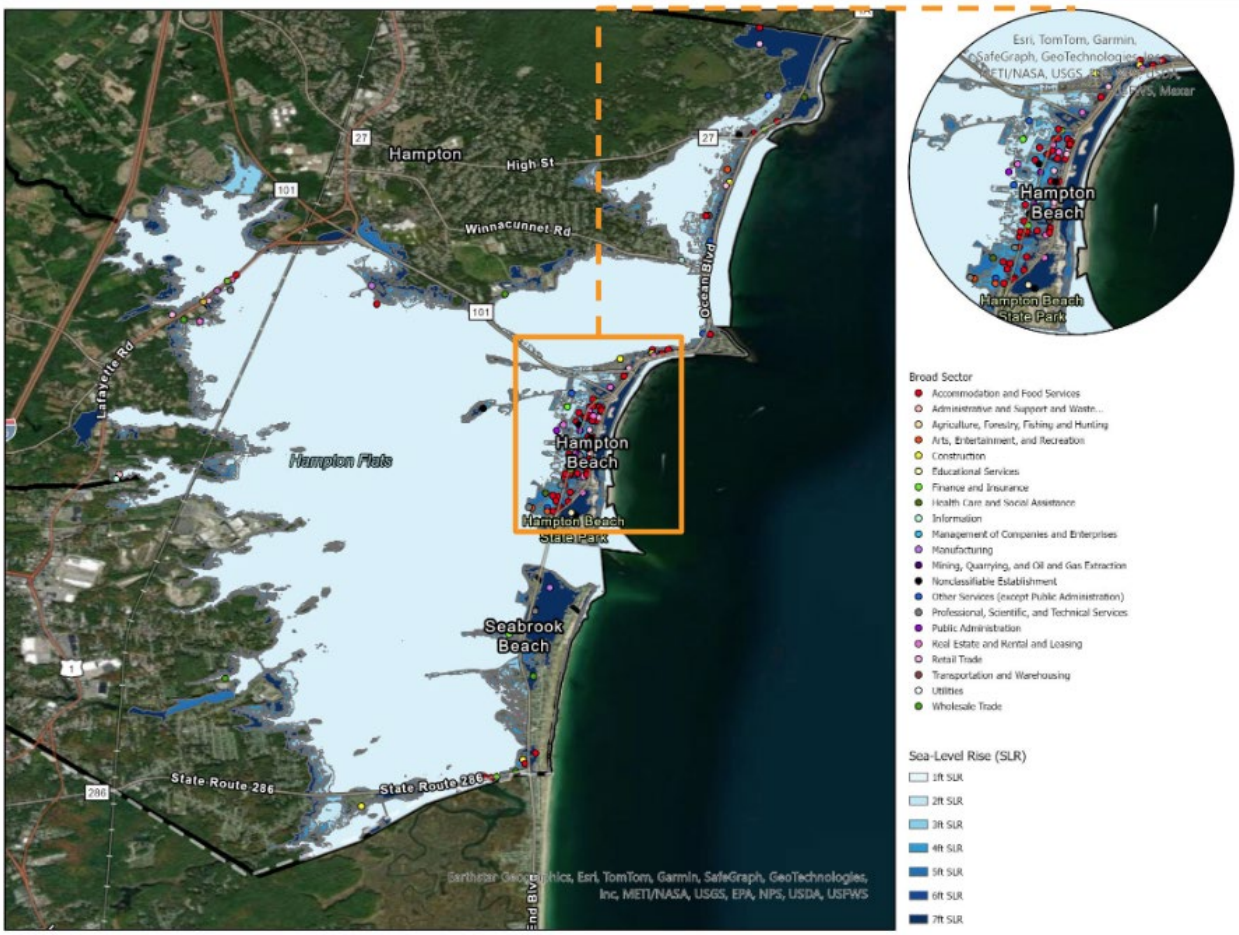
[5] The bolded values in Tables 12 to 14 serve as an upper bound because NOAA sea-level rise footprints are a proxy for periodic inundation. It would be inappropriate to assume that all of the homes that would be inundated under the scenarios in this report would become uninhabitable or that all of the affected homeowners would opt to relocate after a flood event.

Sector	Definition	1-Percent Annual Chance Event (4ft) Plus		
		1ft SLR	2ft SLR	3ft SLR
62	Health Care and Social Assistance	4	5	5
71	Arts, Entertainment, and Recreation	13	14	14
72	Accommodation and Food Services	47	58	70
81	Other Services (excluding Public Administration)	6	8	8
92	Public Administration	8	8	8
99	Nonclassifiable Establishments	11	12	13
Total		**184**	**221**	**255**

Using Esri Business Analyst, Table 15 shows the number of businesses affected by 1-foot to 3-foot sea-level rise in combination with a 1 percent chance annual event. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise with a 1 percent annual chance event are represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

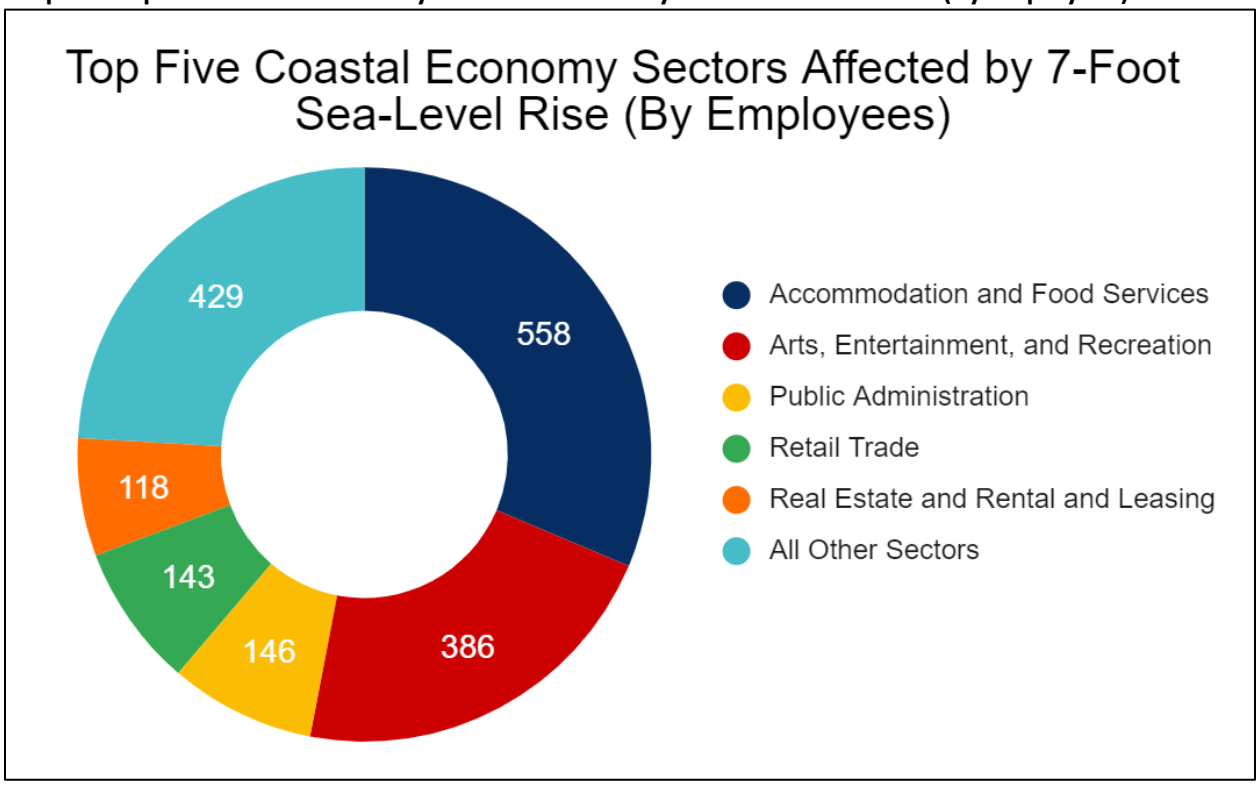
A 1 percent annual chance event *without* sea-level rise may flood 148 businesses across 16 sectors. Meanwhile, a 1 percent annual chance event with 3-foot sea-level rise may flood 255 businesses or nearly 15 percent of all business establishments across the three towns. The effects to business establishments in the latter scenario are captured via Map 6, with special attention paid to the most vulnerable areas.

Map 6. Businesses Affected by 3 Feet of Sea-Level Rise and a 1-Percent Annual Chance Event (Broad Sectors)



This type of event would also impact 1,780 employees across 17 broad sectors. Over 75 percent of these workers are employed by five sectors, as visually depicted in Graph 1. Further, nearly one-third of affected individuals in this scenario are employed by the accommodation and food services sector. Accommodation and food service employees in the state of New Hampshire earned an average weekly wage of $550 in the first quarter of 2023, nearly $1,000 less than the average weekly wage across all industries in the state of New Hampshire for the same period ($1,509) (Bureau of Labor Statistics 2023). This suggests that lower-income individuals might be more likely to lose wages due to business closures from flooding, though additional analyses are needed to confirm this possibility (especially as the accommodation and food services sector includes college students and seasonal workers to some degree).

Graph 1. Top Five Coastal Economy Sectors Affected by 7-Foot Sea-Level Rise (By Employees)[1]



1. All other sectors include the following, of which there were less than 100 employees impacted per sector: Wholesale Trade (92 employees); Construction (81 employees); Professional, Scientific, and Technical Services (79 employees); Other Services (except Public Administration) (32 employees); Manufacturing (28 employees); Transportation and Warehousing (28 employees); Administrative and Support and Waste Management and Remediation Services (26 employees); Information (25 employees); Health Care and Social Assistance (21 employees); Finance and Insurance (11 employees); Agriculture, Forestry, Fishing, and Hunting (4 employees); Educational Services (2 employees)

5.2 Marine Economy

Table 16. Marine and Non-Marine Businesses Affected by Storm Surge and Sea-Level Rise[1]

Type of Business	1 Percent Annual Chance Event (4ft) Plus		
	1ft SLR	2ft SLR	3ft SLR
Marine	47	59	71
Non-Marine	137	162	184
Total	**184**	**221**	**255**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

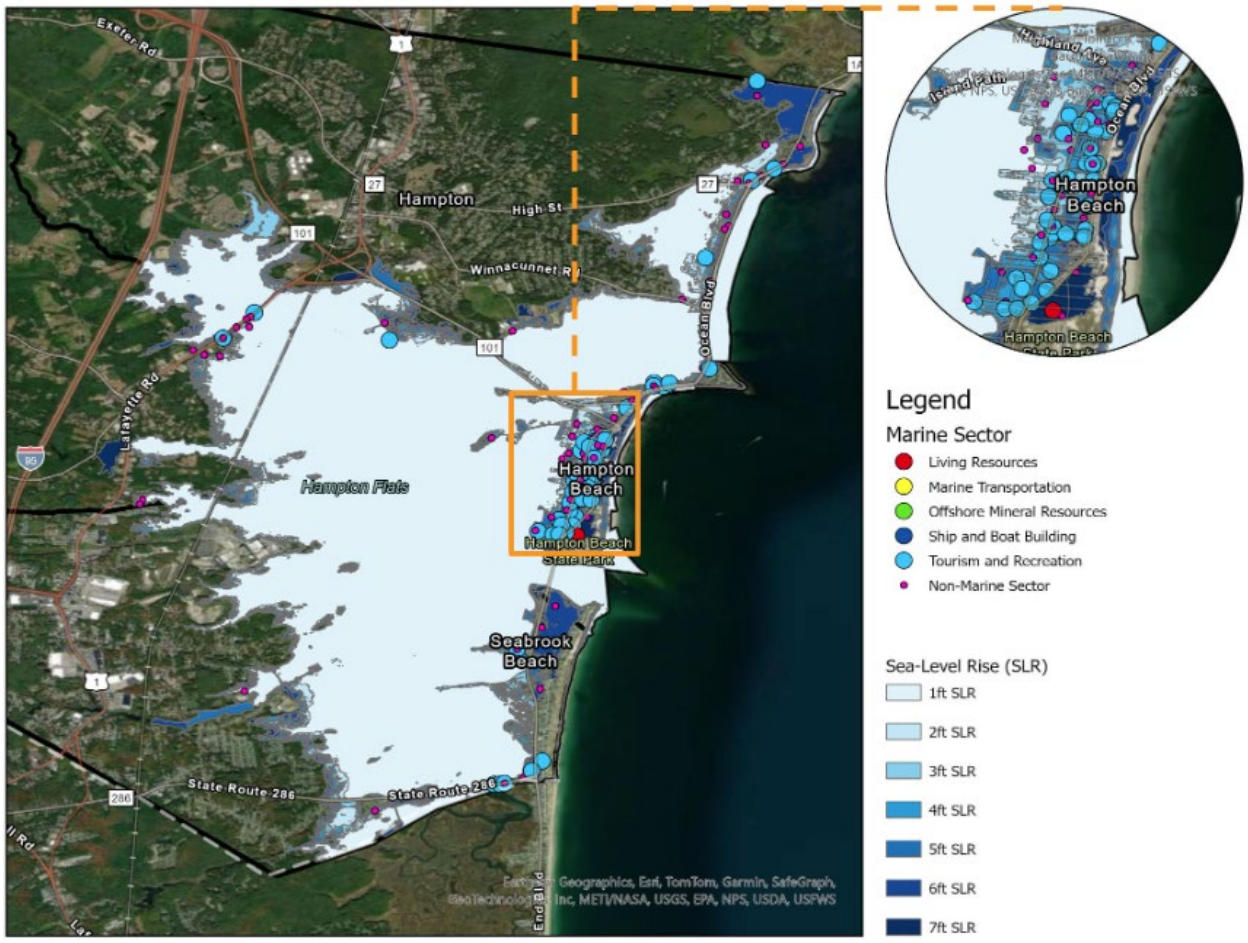
Using Esri Business Analyst, Table 16 shows the number of businesses affected by 1-foot to 3-foot sea-level rise inundation footprints in conjunction with a 1 percent annual chance event (using the same proxy for storm surge as the previous section). Results confirm that the tourism and recreation sector continues to be disproportionately affected. In fact, even at 5-foot and 6-foot sea-level rise, *all* of the marine establishments affected are tourism and recreation businesses.

The first time that a non-tourism and recreation marine sector business is affected is at 3 feet of sea-level rise with a 1 percent annual chance event (or 7-foot sea-level rise). At that time, one living resources business would be affected.

The other 70 marine establishments affected in this scenario fall within the following tourism and recreation industries: amusement and recreation services, eating and drinking places, hotels and lodging places, marinas, RV parks and campgrounds, scenic water tours, and zoos and aquaria. Further, nearly 90 percent of these marine establishments constitute eating and drinking places (36 businesses) as well as hotels and lodging places (26 businesses).

Table 16 is supplemented by Map 7, which once again reimagines Map 3 to include the 1-foot to 7-foot sea-level rise inundation footprints as well as the marine-dependent business points that will be affected by 7 feet of sea-level rise.

Map 7. Marine Economy Businesses Affected by 7 Feet of Sea-Level Rise



5.3 Residential Parcels

Table 17. Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft SLR) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	1,263	1,826	2,050
12	Multi-Family 2-4 Units	192	313	344
14	Single Residential Condominium Unit	2,037	2,108	2,309
17	Manufactured Housing with Land	26	30	31
18	Manufactured Housing without Land	475	477	480
20	Building Only - Residential	82	93	102
Total		**4,075**	**4,847**	**5,316**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table 17 shows the number of residential properties that would be affected by 1-foot to 3-foot sea-level rise in combination with a 1 percent chance annual event using the same proxies that were previously outlined.

A 1 percent annual chance event *without* sea-level rise may flood 3,651 residential parcels. This continues to increase with each additional foot of sea-level rise, until 5,316 residential parcels are affected at the 1 percent annual chance event with 3-foot sea-level rise; this accounts for over 27 percent of all parcels that are analyzed in this study.

Table 17 is supplemented by Graph 2, which visually depicts the number of residential parcels affected across *all* sea-level rise scenarios in this report.

Graph 2. Number of Residential Parcels Affected: 1- to 7-Foot Sea-Level Rise

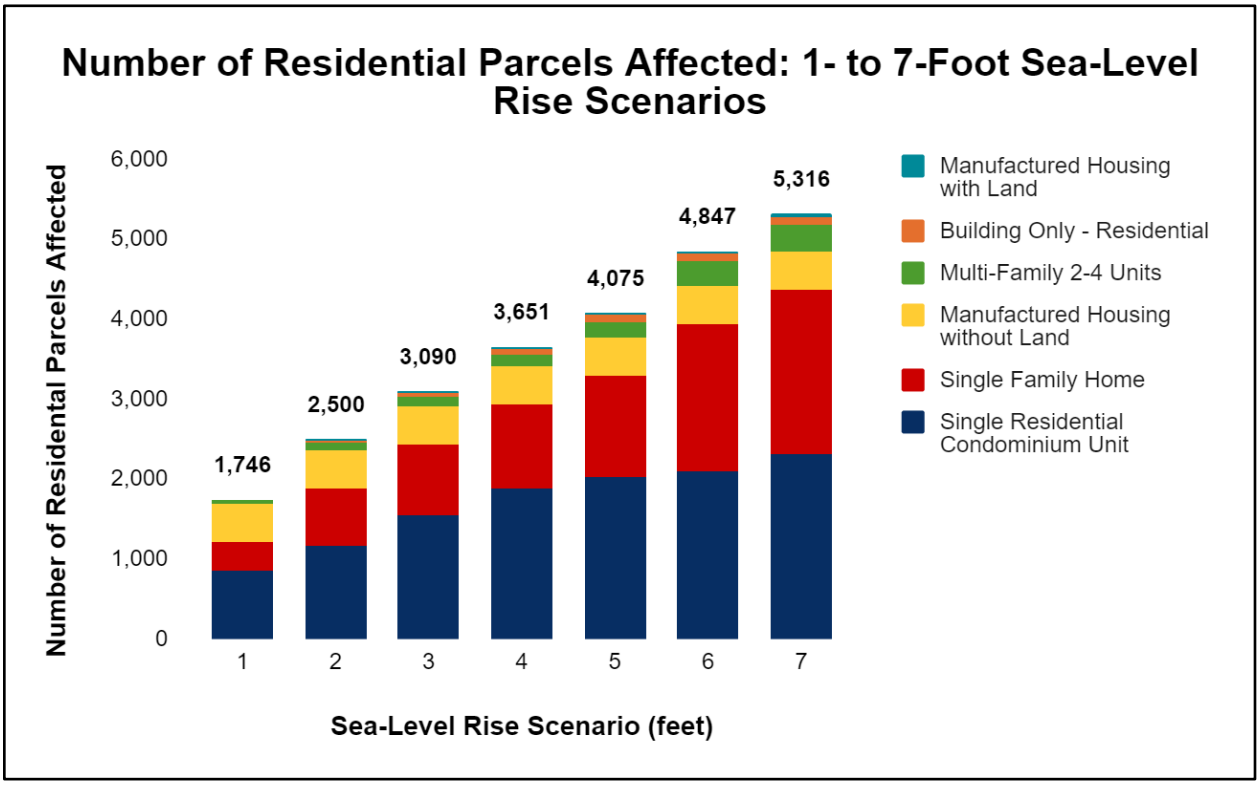


Table 18. Total Assessed Value of Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft SLR) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	$ 533,436,512	$ 942,204,912	$1,092,628,603
12	Multi-Family 2-4 Units	$ 88,695,200	$ 159,937,200	$ 176,588,476
14	Single Residential Condominium Unit	$ 569,871,300	$ 593,005,100	$ 661,858,600
17	Manufactured Housing with Land	$ 5,408,250	$ 6,233,250	$ 6,453,650
18	Manufactured Housing without Land	$ 25,641,000	$ 25,748,800	$ 25,928,500
20	Building Only - Residential	$ 7,096,200	$ 8,153,400	$ 9,384,000
Total		**$ 1,230,148,462**	**$ 1,735,282,662**	**$ 1,972,841,829**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table 18 reimagines Table 17 to indicate the total monetary value of the parcels that would be at risk of flooding under a 1 percent chance annual event with sea-level rise. Like the previous results section, this table relies on the total tax assessment of the land, the buildings, and additional features, which may represent an underestimate.

Nevertheless, the results above suggest that a 1 percent chance annual event can lead to catastrophic losses and that sea-level rise greatly exacerbates the effects of this type of event. In fact, results indicate that a 1 percent chance annual event *without* any sea-level rise may result in losses of $1,050,140,262. This increases by 88 percent to nearly $2 billion when accounting for 3 feet of sea-level rise. Again, this likely yields an underestimate as the assessed value of residential properties tends to lag behind fair market value. Further, these estimates do not include other costly expenditures that may need to be repaired following a 1 percent chance annual event, including critical infrastructure such as roads and bridges as well as utilities.

As in Section 4, we have included three additional tables which highlight the potential tax loss to each town (which are recommended for decision-making):

Table 19. Hampton: Potential Property Tax Loss

	1 Percent Annual Chance Event (4ft SLR) Plus		
Percent Lost	**1ft SLR**	**2ft SLR**	**3ft SLR**
1%	$ (182,471)	$ (228,359)	$ (256,744)
	0.28%	0.35%	0.39%
5%	$ (912,355)	$(1,141,796)	$(1,283,717)
	1.39%	1.73%	1.95%
10%	$(1,824,710)	$(2,283,593)	$(2,567,435)
	2.77%	3.47%	3.90%
15%	$(2,737,065)	$(3,425,389)	$(3,851,152)
	4.16%	5.20%	5.85%
20%	**$(3,649,421)**	**$(4,567,185)**	$(5,134,870)
	5.54%	**6.93%**	7.80%
25%	$(4,561,776)	$(5,708,982)	**$(6,418,587)**
	6.93%	8.67%	**9.74%**

Table 20. Hampton Falls: Potential Property Tax Loss

	1 Percent Annual Chance Event (4ft SLR) Plus		
Percent Lost	**1ft SLR**	**2ft SLR**	**3ft SLR**
1%	$ (2,336)	$ (2,436)	$ (2,931)
	0.02%	0.02%	0.03%
5%	$(11,679)	$(12,180)	$(14,657)

Percent Lost	1 Percent Annual Chance Event (4ft SLR) Plus		
	1ft SLR	2ft SLR	3ft SLR
	0.10%	0.11%	0.13%
10%	**$(23,358)**	**$(24,360)**	**$(29,315)**
	0.21%	**0.22%**	**0.26%**
15%	$(35,036)	$(36,540)	$(43,972)
	0.31%	0.32%	0.39%
20%	$(46,715)	$(48,721)	$(58,630)
	0.42%	0.43%	0.52%
25%	$(58,394)	$(60,901)	$(73,287)
	0.52%	0.54%	0.65%

Table 21. Seabrook: Potential Property Tax Loss

Percent Lost	1 Percent Annual Chance Event (4ft SLR) Plus		
	1ft SLR	2ft SLR	3ft SLR
1%	$ (18,520)	$ (53,288)	$ (62,987)
	0.04%	0.11%	0.13%
5%	$ (92,602)	$ (266,439)	$ (314,934)
	0.18%	0.53%	0.63%
10%	$(185,203)	$ (532,877)	$ (629,869)
	0.37%	1.06%	1.26%
15%	**$(277,805)**	$ (799,316)	$ (944,803)
	0.55%	1.60%	1.89%
20%	$(370,406)	$(1,065,754)	$(1,259,737)
	0.74%	2.13%	2.51%
25%	$(463,008)	**$(1,332,193)**	**$(1,574,671)**
	0.92%	**2.66%**	**3.14%**

Tables 19 to 21 are organized as follows: The "Percent Loss" column assumes the percentage of properties that will be lost due to sea-level rise and storm surge. We have provided a wide range of percentages for consistency both in this section and in the previous section which only covers sea-level rise. The monetary values in the table represent the total tax loss under each sea-level rise and percent loss scenario. Below that, we have included the percentage of total tax revenue potentially lost.

Each town appears to exhibit different levels of flood risk, as seen below. For this reason, we have also bolded the row which we feel best serves as an appropriate *upper* range in each sea-level rise scenario.[6] Ultimately, we defer to local decision-makers.

- **Hampton:** 3,583 to 4,355 residential parcels will be affected by 1 foot of sea-level rise and 3 feet of sea-level rise with a 1 percent annual chance event (respectively). This represents 23 percent and 28 percent of all analyzed parcels *in* Hampton. While the most extreme scenario surpasses our greatest loss assumption of 25 percent, we still feel comfortable utilizing it because NOAA sea-level rise scenarios are a proxy for periodic inundation, as opposed to permanent destruction (see footnote below).
- **Hampton Falls:** 46 to 58 residential parcels will be affected by 1 foot of sea-level rise and 3 feet of sea-level rise with a 1 percent annual chance event (respectively). This represents six to 7 percent of all analyzed parcels *in* Hampton Falls.
- **Seabrook:** 446 to 905 residential parcels will be affected by 1 foot of sea-level rise and 3 feet of sea-level rise with a 1 percent annual chance event (respectively). This represents 13 percent and 27 percent of all analyzed parcels *in* Seabrook. Again, while the most extreme scenario surpasses our greatest loss assumption of 25 percent, we still feel comfortable utilizing it because NOAA sea-level rise scenarios are a proxy for periodic inundation, as opposed to permanent destruction (see footnote below).

These tables are supplemented by explanations in Appendices A, B, and C (following Tables A.12, B.12, and C.12), which detail the calculations in greater detail by using the recommended upper bounds for a 1 percent annual chance event plus 3 feet of sea-level rise.

[6] The bolded values in Tables 19 to 21 serve as an upper bound because NOAA sea-level rise footprints are a proxy for periodic inundation. It would be inappropriate to assume that all of the homes that would be inundated under the scenarios in this report would become uninhabitable or that all of the affected homeowners would opt to relocate after a flood event.

6. Limitations and Caveats

6.1 North American Industry Classification

The businesses are classified and analyzed using codes from the North American Industry Classification System (NAICS). It is possible that not all business establishments were correctly captured using this classification because business establishments self-assign their NAICS code. Further, NAICS codes capture a business' headquarters location (including PO boxes), but fail to capture other locations; this presents an analytical challenge as domestic businesses with multiple locations or international corporations with U.S. locations may not be captured. It also presents a future opportunity to individually analyze the 1,745 businesses within Hampton, Hampton Falls, and Seabrook, with special attention paid to the 64 businesses that begin with a two-digit NAICS code of 99 (businesses that cannot be classified into any other industry).

6.2 Esri Business Analyst

The team did not verify the existence of all 1,745 businesses due to time constraints. It is possible that some establishments have dissolved since the creation of the 2021 Esri Business Analyst data set, though the team would not be able to confirm this without researching or reaching out to each individual establishment. Additionally, it is possible that new businesses have emerged, though the team cannot analyze this within Esri given the proprietary nature of the information.

Further, Esri Business Analyst uses the centroid of each business to establish a single business point that does not encompass an entire building or parcel. It is likely that some parcels and buildings that would be affected by the 1-foot to 7-foot sea-level rise footprints are not captured in this report. This limitation necessitates a more comprehensive analysis in the future (e.g., the addition of parcel data and building footprints).

6.3 National Flood Hazard Zones: 1-Percent Annual Chance Event

FEMA maintains the National Flood Hazard Layer, which includes a number of geospatial data sets including the 1-Percent Annual Chance Flood Hazard layer. This layer represents areas that will likely be inundated during a storm that has a 1 percent annual chance of occurring based on historical observations, extreme value analysis, dynamic modeling, and probabilistic mapping. Projecting the current 1 percent annual chance floodplain into the future under different sea-level rise scenarios is technically challenging and requires advanced modeling techniques to perform accurately. The analysis presented in this report used the 4-foot sea-level rise inundation extent layer from NOAA as a proxy for storm surge that would occur during a 1 percent annual chance event in order to facilitate the seamless transition from current to future inundation under different sea-level rise scenarios. Future iterations of this study can be improved by adopting a set of flood risk data that are based on FEMA's probabilistic modeling approach while also considering graduated flood risk under non-stationary climate and sea-level forces. The State of New Hampshire is currently developing a statewide coastal flood risk model that accounts for future sea-level rise scenarios and different storm climatologies. The products from that model will provide the necessary future flood risk information to improve the local economic projections presented in this paper.

6.4 Residential Parcel Data

The parcel-level data may provide a lower bound in some respects but an upper bound in other respects. As previously noted, Tables 11 and 18 estimate the *full assessed* value of the land, the buildings, and additional features within the affected parcels; this likely underestimates the fair market value of each residential property. However, these tables may still overestimate the total monetary loss associated with a specific inundation footprint or event: Realistically, the full extent of these damages would only be realized if these parcels became uninhabitable under different inundation footprints. However, NOAA sea-level rise footprints are a proxy for periodic inundation. It is more likely that these parcels would still be inhabitable, though they may be subject to

new or additional damages from flooding driven by sea-level rise. The tax assessment also experiences this limitation, as it relies on the full assessed values.

This caveat presents the opportunity for a more comprehensive study using depth damage functions as well as a complementary assessment of roads and other infrastructure (while some parcels, residences, or businesses might not experience water damage, they might still become inaccessible during high tide flooding and storms).

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Appendix A: Hampton Results

The tables below supplement the tables in the report to include insights regarding business points and residential parcels specific to Hampton.

Table A.1. Hampton: Overview of Coastal Economy (Broad Sectors)

Sector	Definition	Establishments	Employees
72	Accommodation and Food Services	130	1,623
31-33	Manufacturing	31	1,017
22	Utilities	8	786
54	Professional, Scientific, and Technical Services	95	704
62	Health Care and Social Assistance	56	627
44-45	Retail Trade	127	606
71	Arts, Entertainment, and Recreation	27	439
56	Administrative and Support and Waste Management and Remediation Services	34	388
81	Other Services (excluding Public Administration)	98	378
61	Educational Services	25	361
53	Real Estate and Rental and Leasing	66	351
92	Public Administration	23	331
23	Construction	63	252
52	Finance and Insurance	61	246
55	Management and Companies and Enterprises	5	220
42	Wholesale Trade	22	147
48-49	Transportation and Warehousing	17	120
51	Information	20	84
99	Nonclassifiable Establishments	44	24
11	Agriculture, Forestry, Fishing and Hunting	3	8
Total		**955**	**8,712**

This table is organized in descending order by number of employees.

Table A.2. Hampton: Economic Insights by Marine Sector

Sector	Establishments	Employees
Tourism and Recreation	131	1,494
Living Resources	4	12
Total	**135**	**1,506**

This table is organized in descending order by number of employees.

Table A.3. Hampton: Economic Insights by Marine Industry

Marine Sector	Marine Industry	Establishments	Employees
Tourism and Recreation	Eating and Drinking Places	75	1,051
	Hotels and Lodging Places	42	394
	Amusement and Recreation Services	8	30
	Zoos and Aquaria	2	8
	Marinas	2	5
	RV Parks and Campgrounds	1	4
	Boat Dealers	1	2
Living Resources	Fish Hatcheries and Aquaculture	1	4
	Fishing	2	4
	Seafood Markets	1	4
Total		**135**	**1,506**

This table is organized in descending order by number of employees.

Table A.4. Hampton: Businesses Affected by Sea-Level Rise Alone (Broad Sectors)

Sector	Definition	1ft SLR	2ft SLR	3ft SLR
23	Construction	-	-	8
31-33	Manufacturing	-	2	2

Sector	Definition	1ft SLR	2ft SLR	3ft SLR
42	Wholesale Trade	-	-	2
44-45	Retail Trade	-	2	5
48-49	Transportation and Warehousing	-	-	3
51	Information	-	-	3
52	Finance and Insurance	-	2	4
53	Real Estate and Rental and Leasing	1	4	6
54	Professional, Scientific, and Technical Services		4	6
56	Administrative and Support and Waste Management and Remediation Services	-	-	4
62	Health Care and Social Assistance	-	-	3
71	Arts, Entertainment, and Recreation	-	-	2
72	Accommodation and Food Services	1	4	9
81	Other Services (excluding Public Administration)	1	6	3
92	Public Administration	3	6	8
99	Nonclassifiable Establishments	1	4	4
Total		**7**	**34**	**72**

This table is organized in ascending order by sector number.

Table A.5. Hampton: Businesses and Employees Affected by 3-Foot Sea-Level Rise (Broad Sectors)

Sector	Definition	Establishments	Employees
23	Construction	8	34
31-33	Manufacturing	2	9
42	Wholesale Trade	2	16
44-45	Retail Trade	5	64
48-49	Transportation and Warehousing	3	10
51	Information	3	10
52	Finance and Insurance	4	11
53	Real Estate and Rental and Leasing	6	27

Sector	Definition	Establishments	Employees
54	Professional, Scientific, and Technical Services	6	32
56	Administrative and Support and Waste Management and Remediation Services	4	9
62	Health Care and Social Assistance	3	15
71	Arts, Entertainment, and Recreation	2	12
72	Accommodation and Food Services	9	63
81	Other Services (excluding Public Administration)	3	16
92	Public Administration	8	146
99	Nonclassifiable Establishments	4	0
Total		72	474

This table is organized in ascending order by sector number.

Table A.6. Hampton: Marine and Non-Marine Businesses Affected by 1- to 3-Foot Sea-Level Rise

Type of Business	1ft SLR	2ft SLR	3ft SLR
Marine	1	4	9
Non-Marine	6	30	63
Total	**7**	**34**	**72**

Table A.7. Hampton: Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	301	647	772
12	Multi-Family 2-4 Units	45	87	106
14	Single Residential Condominium Unit	809	1,124	1,519
17	Manufactured Housing with Land	-	-	-
18	Manufactured Housing without Land	300	300	300
20	Building Only - Residential	-	28	40

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
Total		**1,455**	**2,186**	**2,737**

Table A.8. Hampton: Total Assessed Value of Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	$141,467,900	$255,181,800	$304,432,300
12	Multi-Family 2-4 Units	$ 21,677,300	$ 37,773,300	$ 45,440,000
14	Single Residential Condominium Unit	$227,355,800	$293,743,300	$437,050,800
17	Manufactured Housing with Land	-	-	-
18	Manufactured Housing without Land	$ 12,566,300	$ 12,566,300	$ 12,566,300
20	Building Only - Residential	-	$ 1,951,400	$ 3,383,000
Total		**$ 403,067,300**	**$ 601,216,100**	**$ 802,872,400**

The table above can be utilized to calculate potential property tax loss. Each assessed value is denoted by A_S. The tax rate per thousand (2023), T_R, is $16.75 in Hampton and the total revenue commitment (2023), T_C, is $65,871,801. Further, we have multiple percent loss parameters, T_L, ranging from 1 percent to 25 percent. The total tax loss is calculated as follows:

$$Total\ Tax\ Loss\ = \sum \left(\frac{A_s}{1{,}000}\right) \times T_R \times T_L$$

Let us walk through this for 3 feet of sea-level rise, assuming a 20 percent loss. Begin by examining the single family home under 3 feet of sea-level rise. Divide the $304 million by 1,000. Then, multiple that by $16.75 as well as our percent loss assumption, 20 percent. Repeat this process for each property type above utilizing the same sea-level rise scenario and the same percent loss parameter. The total tax loss under 3 feet of sea-level rise assuming a 20 percent loss is the sum of all of those values, or $2,689,623, expressed as a negative number. From there, we can calculate the percentage of total tax revenue which may be lost as well:

$$Percentage\ of\ Total\ Tax\ Revenue\ = \left|\frac{Total\ Tax\ Loss}{T_C}\right|$$

In this example, the percentage of total tax revenue that may be lost is equal to the $2.7 million tax loss divided by the tax commitment of $65,871,801.

Table A.9. Hampton: Businesses Affected by Sea-Level Rise and Storm Surge (Broad Sectors)[1,2]

		1-Percent Annual Chance Event (4ft) Plus		
Sector	**Definition**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Agriculture, Forestry, Fishing and Hunting	-	-	1
23	Construction	12	15	15
31-33	Manufacturing	5	5	6
42	Wholesale Trade	4	4	5
44-45	Retail Trade	10	18	21
48-49	Transportation and Warehousing	3	4	4
51	Information	5	5	5
52	Finance and Insurance	6	6	7
53	Real Estate and Rental and Leasing	12	13	17
54	Professional, Scientific, and Technical Services	12	14	14
56	Administrative and Support and Waste Management and Remediation Services	6	6	6
62	Health Care and Social Assistance	4	5	5
71	Arts, Entertainment, and Recreation	13	13	13
72	Accommodation and Food Services	41	51	61
81	Other Services (excluding Public Administration)	5	7	7
92	Public Administration	8	8	8
99	Nonclassifiable Establishments	10	11	12
Total		**156**	**185**	**207**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.
2. This table is organized in ascending order by sector number.

Table A.10. Hampton: Marine and Non-Marine Businesses Affected by Storm Surge and Sea-Level Rise[1]

	1 Percent Annual Chance Event (4ft) Plus		
Type of Business	**1ft SLR**	**2ft SLR**	**3ft SLR**
Marine	41	51	61
Non-Marine	115	134	146
Total	**156**	**185**	**207**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table A.11. Hampton: Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

	1 Percent Annual Chance Event (4ft) Plus		
Type of Property	**1ft SLR**	**2ft SLR**	**3ft SLR**
Single Family Home	1,063	1,356	1,512
Multi-Family 2-4 Units	160	181	199
Single Residential Condominium Unit	1,979	2,045	2,244
Manufactured Housing with Land	-	-	-
Manufactured Housing without Land	300	300	300
Building Only - Residential	81	92	100
Total	**3,583**	**3,974**	**4,355**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table A.12. Hampton: Total Assessed Value of Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	$ 438,793,100	$ 677,991,700	$ 770,859,700
12	Multi-Family 2-4 Units	$ 72,373,400	$ 85,080,200	$ 92,738,300
14	Single Residential Condominium Unit	$ 558,672,500	$ 579,669,500	$ 647,751,700

SLUC	Type of Property	1 Percent Annual Chance Event (4ft) Plus 1ft SLR	2ft SLR	3ft SLR
17	Manufactured Housing with Land	-	-	-
18	Manufactured Housing without Land	$ 12,566,300	$ 12,566,300	$ 12,566,300
20	Building Only - Residential	$ 6,974,000	$ 8,031,200	$ 8,881,000
Total		**$1,089,379,300**	**$ 1,363,338,900**	**$ 1,532,797,000**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

The table above can be utilized to calculate potential property tax loss. Each assessed value is denoted by A_S. The tax rate per thousand (2023), T_R, is $16.75 in Hampton and the total revenue commitment (2023), T_C, is $65,871,801. Further, we have multiple percent loss parameters, T_L, ranging from 1 percent to 25 percent. The total tax loss is calculated as follows:

$$Total\ Tax\ Loss\ = \sum \left(\frac{A_s}{1{,}000}\right) \times T_R \times T_L$$

Let us walk through this for a 1 percent annual chance event plus 3 feet of sea-level rise, assuming a 25 percent loss. Begin by examining the single family home in this scenario. Divide the $771 million by 1,000. Then, multiple that by $16.75 as well as our percent loss assumption, 25 percent. Repeat this process for each property type above utilizing the same sea-level rise scenario and the same percent loss parameter. The total tax loss under a 1 percent annual chance event plus 3 feet of sea-level rise assuming a 25 percent loss is the sum of all of those values, or $6,418,587, expressed as a negative number. From there, we can calculate the percentage of total tax revenue which may be lost as well:

$$Percentage\ of\ Total\ Tax\ Revenue\ = \left|\frac{Total\ Tax\ Loss}{T_C}\right|$$

In this example, the percentage of total tax revenue that may be lost is equal to the $6.4 million tax loss divided by the tax commitment of $65,871,801.

Appendix B: Hampton Falls Results

The tables below supplement the tables in the report to include insights regarding business points and residential parcels specific to Hampton Falls.

Table B.1. Hampton Falls: Overview of Coastal Economy (Broad Sectors)

Sector	Definition	Establishments	Employees
61	Educational Services	6	139
44-45	Retail Trade	32	127
11	Agriculture, Forestry, Fishing and Hunting	4	113
54	Professional, Scientific, and Technical Services	17	59
56	Administrative and Support and Waste Management and Remediation Services	10	58
81	Other Services (excluding Public Administration)	17	58
92	Public Administration	9	54
42	Wholesale Trade	6	50
62	Health Care and Social Assistance	7	50
71	Arts, Entertainment, and Recreation	5	49
31-33	Manufacturing	7	45
23	Construction	13	45
72	Accommodation and Food Services	5	37
53	Real Estate and Rental and Leasing	7	31
52	Finance and Insurance	7	27
48-49	Transportation and Warehousing	4	21
51	Information	6	14
55	Management and Companies and Enterprises	2	10
99	Nonclassifiable Establishments	3	0
Total		**167**	**987**

This table is organized in descending order by number of employees.

Table B.2. Hampton Falls: Economic Insights by Marine Sector

Sector	Establishments	Employees
Tourism and Recreation	7	41
Total	**7**	**41**

This table is organized in descending order by number of employees.

Table B.3. Hampton Falls: Economic Insights by Marine Industry

Marine Sector	Marine Industry	Establishments	Employees
Tourism and Recreation	Eating and Drinking Places	3	15
	RV Parks and Campgrounds	1	12
	Boat Dealers	1	8
	Amusement and Recreation Services	1	4
	Marinas	1	2
Total		**7**	**41**

This table is organized in descending order by number of employees.

Table B.4. Hampton Falls: Businesses Affected by Sea-Level Rise Alone (Broad Sectors)

Sector	Definition	1ft SLR	2ft SLR	3ft SLR
N/A	N/A	-	-	-
Total		**0**	**0**	**0**

None of the Hampton Falls business points within the 2021 Esri Business Analyst package are affected by one to 3 feet of sea-level rise.

Table B.5. Hampton Falls: Businesses and Employees Affected by 3 Feet Sea-Level Rise (Broad Sectors)

Sector	Definition	Establishments	Employees
N/A	N/A	-	-
Total		**0**	**0**

None of the Hampton Falls business points within the 2021 Esri Business Analyst package are affected by 3 feet of sea-level rise.

Table B.6. Hampton Falls: Marine and Non-Marine Businesses Affected by 1- to 3-Foot Sea-Level Rise

Type of Business	1ft SLR	2ft SLR	3ft SLR
Marine	-	-	-
Non-Marine	-	-	-
Total	**0**	**0**	**0**

None of the Hampton Falls business points within the 2021 Esri Business Analyst package are affected by 1 to 3 feet of sea-level rise.

Table B.7. Hampton Falls: Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	15	17	18
12	Multi-Family 2-4 Units	2	2	2
14	Single Residential Condominium Unit	1	1	1
17	Manufactured Housing with Land	1	1	1
18	Manufactured Housing without Land	-	-	-
20	Building Only - Residential	-	-	-
Total		**19**	**21**	**22**

Table B.8. Hampton Falls: Total Assessed Value of Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	$6,231,209	$7,217,309	$7,665,609
12	Multi-Family 2-4 Units	$1,618,400	$1,618,400	$1,618,400
14	Single Residential Condominium Unit	$ 295,800	$ 295,800	$ 295,800
17	Manufactured Housing with Land	$ 256,800	$ 256,800	$ 256,800
18	Manufactured Housing without Land	-	-	-
20	Building Only - Residential	-	-	-
Total		**$ 8,402,209**	**$9,388,309**	**$9,836,609**

The table above can be utilized to calculate potential property tax loss. Each assessed value is denoted by A_S. The

tax rate per thousand (2023), T_R, is $12.95 in Hampton Falls and the total revenue commitment (2023), T_C, is $11,251,895. Further, we have multiple percent loss parameters, T_L, ranging from 1 percent to 25 percent. The total tax loss is calculated as follows:

$$Total\ Tax\ Loss\ = \sum \left(\frac{A_s}{1{,}000}\right) \times T_R \times T_L$$

Let us walk through this for 3 feet of sea-level rise, assuming a 5 percent loss. Begin by examining the single family home under 3 feet of sea-level rise. Divide the $7.7 million by 1,000. Then, multiple that by $12.95 as well as our percent loss assumption, 5 percent. Repeat this process for each property type above utilizing the same sea-level rise scenario and the same percent loss parameter. The total tax loss under 3 feet of sea-level rise assuming a 5 percent loss is the sum of all of those values, or $6,369, expressed as a negative number. From there, we can calculate the percentage of total tax revenue which may be lost as well:

$$Percentage\ of\ Total\ Tax\ Revenue\ = \left|\frac{Total\ Tax\ Loss}{T_C}\right|$$

In this example, the percentage of total tax revenue that may be lost is equal to the $6,369 tax loss divided by the tax commitment of $11,251,895.

Table B.9. Hampton Falls: Businesses Affected by Sea-Level Rise and Storm Surge (Broad Sectors)[1,2]

		1-Percent Annual Chance Event (4ft) Plus		
Sector	**Definition**	**1ft SLR**	**2ft SLR**	**3ft SLR**
23	Construction	-	-	2
42	Wholesale Trade	-	-	2
44-45	Retail Trade	2	2	3
51	Information	1	1	1
52	Finance and Insurance	1	1	1
53	Real Estate and Rental and Leasing	-	-	2
56	Administrative and Support and Waste Management and Remediation Services	1	1	2
61	Educational Services	-	-	1
72	Accommodation and Food Services	-	-	1
Total		**5**	**5**	**15**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.
2. This table is organized in ascending order by sector number.

Table B.10. Hampton Falls: Marine and Non-Marine Businesses Affected by Storm Surge and Sea-Level Rise[1]

	1 Percent Annual Chance Event (4ft) Plus		
Type of Business	**1ft SLR**	**2ft SLR**	**3ft SLR**
Marine	0	0	1
Non-Marine	5	5	14
Total	**5**	**5**	**15**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table B.11. Hampton Falls: Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	27	29	35
12	Multi-Family 2-4 Units	2	2	4
14	Single Residential Condominium Unit	16	16	16
17	Manufactured Housing with Land	1	1	1
18	Manufactured Housing without Land	-	-	-
20	Building Only - Residential	-	-	-
Total		**46**	**48**	**56**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table B.12. Hampton Falls: Total Assessed Value of Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	$ 11,333,362	$ 12,107,662	$ 14,636,903
12	Multi-Family 2-4 Units	$ 1,618,400	$ 1,618,400	$ 2,914,976
14	Single Residential Condominium Unit	$ 4,828,200	$ 4,828,200	$ 4,828,200
17	Manufactured Housing with Land	$ 256,800	$ 256,800	$ 256,800

SLUC	Type of Property	1 Percent Annual Chance Event (4ft) Plus		
		1ft SLR	2ft SLR	3ft SLR
18	Manufactured Housing without Land	-	-	-
20	Building Only - Residential	-	-	-
Total		**$18,036,762**	**$18,811,062**	**$22,636,879**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

The table above can be utilized to calculate potential property tax loss. Each assessed value is denoted by A_S. The tax rate per thousand (2023), T_R, is $12.95 in Hampton Falls and the total revenue commitment (2023), T_C, is $11,251,895. Further, we have multiple percent loss parameters, T_L, ranging from 1 percent to 25 percent. The total tax loss is calculated as follows:

$$Total\ Tax\ Loss\ = \sum \left(\frac{A_s}{1{,}000}\right) \times T_R \times T_L$$

Let us walk through this for a 1 percent annual chance event plus 3 feet of sea-level rise, assuming a 10 percent loss. Begin by examining the single family home in this scenario. Divide the $14.6 million by 1,000. Then, multiple that by $12.95 as well as our percent loss assumption, 10 percent. Repeat this process for each property type above utilizing the same sea-level rise scenario and the same percent loss parameter. The total tax loss under a 1 percent annual chance event plus 3 feet of sea-level rise assuming a 10 percent loss is the sum of all of those values, or $29,315, expressed as a negative number. From there, we can calculate the percentage of total tax revenue which may be lost as well:

$$Percentage\ of\ Total\ Tax\ Revenue\ = \left|\frac{Total\ Tax\ Loss}{T_C}\right|$$

In this example, the percentage of total tax revenue that may be lost is equal to the $29,315 tax loss divided by the tax commitment of $11,251,895.

Appendix C: Seabrook Results

The tables below supplement the tables in the report to include insights regarding business points and residential parcels specific to Seabrook.

Table C.1. Seabrook: Overview of Coastal Economy (Broad Sectors)

Sector	Definition	Establishments	Employees
44-45	Retail Trade	160	2,171
22	Utilities	3	1,020
72	Accommodation and Food Services	52	926
31-33	Manufacturing	31	556
42	Wholesale Trade	31	536
23	Construction	48	402
92	Public Administration	23	384
71	Arts, Entertainment, and Recreation	14	266
81	Other Services (excluding Public Administration)	62	244
54	Professional, Scientific, and Technical Services	37	235
53	Real Estate and Rental and Leasing	43	206
61	Educational Services	7	201
62	Health Care and Social Assistance	20	149
56	Administrative and Support and Waste Management and Remediation Services	23	68
51	Information	11	64
52	Finance and Insurance	31	55
48-49	Transportation and Warehousing	8	46
21	Mining, Quarrying, and Oil and Gas Exploration	1	13
99	Nonclassifiable Establishments	17	6
55	Management and Companies and Enterprises	1	5
Total		**623**	**7,553**

This table is organized in descending order by number of employees.

Table C.2. Seabrook: Economic Insights by Marine Sector

Sector	Establishments	Employees
Tourism and Recreation	55	949
Living Resources	3	23
Offshore Mineral Resources	1	13
Marine Transportation	1	3
Ship and Boat Building	1	1
Total	**61**	**989**

This table is organized in descending order by number of employees.

Table C.3. Seabrook: Economic Insights by Marine Industry

Marine Sector	Marine Industry	Establishments	Employees
Tourism and Recreation	Eating and Drinking Places	44	823
	Hotels and Lodging Places	4	76
	Amusement and Recreation Services	4	25
	Scenic Water Tours	1	15
	Boat Dealers	1	8
	RV Parks and Campgrounds	1	2
Living Resources	Seafood Markets	2	18
	Seafood Processing	1	5
Offshore Mineral Resources	Oil and Gas Exploration and Production	1	13
Marine Transportation	Warehousing	1	3
Ship and Boat Building	Boat Building and Repair	1	1
Total		**61**	**989**

This table is organized in descending order by number of employees.

Table C.4. Seabrook: Businesses Affected by Sea-Level Rise Alone (Broad Sectors)

Sector	Definition	1ft SLR	2ft SLR	3ft SLR
42	Wholesale Trade	-	-	2
53	Real Estate and Rental and Leasing	-	-	1
72	Accommodation and Food Services	-	-	2
Total		**0**	**0**	**5**

This table is organized in ascending order by sector number.

Table C.5. Seabrook: Businesses and Employees Affected by 3-Foot Sea-Level Rise (Broad Sectors)

Sector	Definition	Establishments	Employees
42	Wholesale Trade	2	6
53	Real Estate and Rental and Leasing	1	5
72	Accommodation and Food Services	2	85
Total		**5**	**96**

This table is organized in ascending order by sector number.

Table C.6. Seabrook: Marine and Non-Marine Businesses Affected by 1- to 3-Foot Sea-Level Rise

Type of Business	1ft SLR	2ft SLR	3ft SLR
Marine	-	-	2
Non-Marine	-	-	3
Total	**0**	**0**	**5**

Table C.7. Seabrook: Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	48	61	87
12	Multi-Family 2-4 Units	7	9	12
14	Single Residential Condominium Unit	35	35	37
17	Manufactured Housing with Land	9	15	21
18	Manufactured Housing without Land	172	172	173

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
20	Building Only - Residential	1	1	1
Total		**272**	**293**	**331**

Table C.8. Seabrook: Total Assessed Value of Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	$16,498,950	$20,505,550	$30,120,850
12	Multi-Family 2-4 Units	$ 2,614,900	$ 3,383,600	$ 4,274,900
14	Single Residential Condominium Unit	$ 4,413,400	$ 4,413,400	$ 4,924,700
17	Manufactured Housing with Land	$ 1,768,050	$ 3,111,350	$ 4,426,650
18	Manufactured Housing without Land	$12,908,900	$12,908,900	$12,990,500
20	Building Only - Residential	$ 122,200	$ 122,200	$ 122,200
Total		**$ 38,326,400**	**$ 44,445,000**	**$ 56,859,800**

The table above can be utilized to calculate potential property tax loss. Each assessed value is denoted by A_S. The tax rate per thousand (2023), T_R, is $15.09 in Seabrook and the total revenue commitment (2023), T_C, is $50,094,880. Further, we have multiple percent loss parameters, T_L, ranging from 1 percent to 25 percent. The total tax loss is calculated as follows:

$$Total\ Tax\ Loss\ = \sum \left(\frac{A_s}{1{,}000}\right) \times T_R \times T_L$$

Let us walk through this for 3 feet of sea-level rise, assuming a 10 percent loss. Begin by examining the single family home under 3 feet of sea-level rise. Divide the $30.1 million by 1,000. Then, multiple that by $15.09 as well as our percent loss assumption, 10 percent. Repeat this process for each property type above utilizing the same sea-level rise scenario and the same percent loss parameter. The total tax loss under 3 feet of sea-level rise assuming a 10 percent loss is the sum of all of those values, or $85,801, expressed as a negative number. From there, we can calculate the percentage of total tax revenue which may be lost as well:

$$Percentage\ of\ Total\ Tax\ Revenue\ = \left|\frac{Total\ Tax\ Loss}{T_C}\right|$$

In this example, the percentage of total tax revenue that may be lost is equal to the $85,801 tax loss divided by the tax commitment of $50,094,880.

Table C.9. Seabrook: Businesses Affected by Sea-Level Rise and Storm Surge (Broad Sectors)[1,2]

		1-Percent Annual Chance Event (4ft) Plus		
Sector	**Definition**	**1ft SLR**	**2ft SLR**	**3ft SLR**
23	Construction	2	2	2
31-33	Manufacturing	-	1	1
42	Wholesale Trade	2	2	3
44-45	Retail Trade	5	6	6
48-49	Transportation and Warehousing	-	1	1
52	Finance and Insurance	1	2	2
53	Real Estate and Rental and Leasing	5	6	6
54	Professional, Scientific, and Technical Services	-	1	1
71	Arts, Entertainment, and Recreation	-	1	1
72	Accommodation and Food Services	6	7	8
81	Other Services (excluding Public Administration)	1	1	1
99	Nonclassifiable Establishments	1	1	1
Total		**23**	**31**	**33**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.
2. This table is organized in ascending order by sector number.

Table C.10. Seabrook: Marine and Non-Marine Businesses Affected by Storm Surge and Sea-Level Rise[1]

	1 Percent Annual Chance Event (4ft) Plus		
Type of Business	**1ft SLR**	**2ft SLR**	**3ft SLR**
Marine	6	8	9
Non-Marine	17	23	24
Total	**23**	**31**	**33**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table C.11. Seabrook: Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	173	441	503
12	Multi-Family 2-4 Units	30	130	141
14	Single Residential Condominium Unit	42	47	49
17	Manufactured Housing with Land	25	29	30
18	Manufactured Housing without Land	175	177	180
20	Building Only - Residential	1	1	2
Total		**446**	**825**	**905**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

Table C.12. Seabrook: Total Assessed Value of Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	$ 83,310,050	$252,105,550	$307,132,000
12	Multi-Family 2-4 Units	$ 14,703,400	$ 73,238,600	$ 80,935,200
14	Single Residential Condominium Unit	$ 6,370,600	$ 8,507,400	$ 9,278,700
17	Manufactured Housing with Land	$ 5,151,450	$ 5,976,450	$ 6,196,850
18	Manufactured Housing without Land	$ 13,074,700	$ 13,182,500	$ 13,362,200
20	Building Only - Residential	$ 122,200	$ 122,200	$ 503,000
Total		**$ 122,732,400**	**$ 353,132,700**	**$ 417,407,950**

1. A 1 percent annual chance event is represented by 4 feet of additional sea-level rise. Therefore, 1-foot, 2-foot, and 3-foot sea-level rise in combination with a 1 percent annual chance event is represented by 5-foot, 6-foot, and 7-foot sea-level rise inundation footprints, respectively.

The table above can be utilized to calculate potential property tax loss. Each assessed value is denoted by A_S. The tax rate per thousand (2023), T_R, is $15.09 in Seabrook and the total revenue commitment (2023), T_C, is $50,094,880. Further, we have multiple percent loss parameters, T_L, ranging from 1 percent to 25 percent. The total tax loss is calculated as follows:

$$Total\ Tax\ Loss\ = \sum \left(\frac{A_S}{1{,}000}\right) \times T_R \times T_L$$

Let us walk through this for a 1 percent annual chance event plus 3 feet of sea-level rise, assuming 25 percent loss. Begin by examining the single family home in this scenario. Divide the $307 million by 1,000. Then, multiple that by $15.09 as well as our percent loss assumption, 25 percent. Repeat this process for each property type above utilizing the same sea-level rise scenario and the same percent loss parameter. The total tax loss under a 1 percent annual chance event plus 3 feet of sea-level rise assuming a 25 percent loss is the sum of all of those values, or $1,574,671, expressed as a negative number. From there, we can calculate the percentage of total tax revenue which may be lost as well:

$$Percentage\ of\ Total\ Tax\ Revenue\ = \left|\frac{Total\ Tax\ Loss}{T_C}\right|$$

In this example, the percentage of total tax revenue that may be lost is equal to the $1.6 million tax loss divided by the tax commitment of $50,094,880.

Appendix D: Additional Results (Aggregate)

Table D.1. Percent of Residential Parcels Affected by 1- to 3-Foot Sea-Level Rise[1]

SLUC	Type of Property	1ft SLR	2ft SLR	3ft SLR
11	Single Family Home	2%	4%	4%
12	Multi-Family 2-4 Units	0%	0%	1%
14	Single Residential Condominium Unit	4%	6%	8%
17	Manufactured Housing with Land	0%	0%	0%
18	Manufactured Housing without Land	2%	2%	2%
20	Building Only - Residential	0%	0%	0%
Total		9%	13%	16%

1. The total may not equal the sum of each component in the table due to rounding errors.

Table D.2. Percent of Residential Parcels Affected by Storm Surge and Sea-Level Rise[1]

		1 Percent Annual Chance Event (4ft) Plus		
SLUC	**Type of Property**	**1ft SLR**	**2ft SLR**	**3ft SLR**
11	Single Family Home	6%	9%	10%
12	Multi-Family 2-4 Units	1%	2%	2%
14	Single Residential Condominium Unit	10%	11%	12%
17	Manufactured Housing with Land	0%	0%	0%
18	Manufactured Housing without Land	2%	2%	2%
20	Building Only - Residential	0%	0%	1%
Total		**21%**	**25%**	**27%**

1. The total may not equal the sum of each component in the table due to rounding errors.

Tables D.1 and D.2 reimagine Tables 10 and 15 respectively to indicate the properties with the greatest risk factor to sea-level rise using an absolute risk measure. Absolute risk represents the unadjusted probability of an event happening. It is calculated as the number of events (i.e., the number of parcel types flooded in each scenario) divided by the total population (i.e., the total number of parcels in the analysis: 19,641).