Amendments to the Town of York Comprehensive Plan:

1. To Amend the “Sea Level Rise” and “Beach Erosion” subsections of the existing Coastal Resources Inventory & Analysis section of the Natural Resources Chapter;

2. To Add a new Inventory & Analysis Chapter entitled: “Adaptation to Sea Level Rise;” and

3. To Add new Town Goals and Town Actions Under State Goal 6, to Implement a Variety of Strategies to Adapt to Sea Level Rise.

Draft 3 – Printed 4 December 2012
Changes from Draft 2 indicated with yellow highlighting.

Prepared by the Southern Maine Regional Planning Commission for the Town of York, with a grant from the Maine Coastal Program, Maine Department of Agriculture, Conservation and Forestry

Natural Resources Chapter

Comprehensive Plan
Inventory & Analysis

* * * * *

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7. Sea Level Rise – See Adaptation to Sea Level Rise Chapter

~~According to Stephen Dickson, State Marine Geologist with the Maine Geological Survey (MGS), the State projects a 2' rise in sea level in the coming 100 years. The MGS is uncertain about future changes in the range of tides (the difference between high and low tides), but there is a potential this could change as well. An increase in sea level will have significant impacts on the coastal landscape. As the coastline moves inland, floodplains will rise, salt marshes will change, and erosion will worsen. Each of these issues is problematic. Although beyond the Town's current capability to analyze with existing data, a map of the existing high water line and the contour 2' above this elevation would be very helpful. This would show the existing upland areas that will become tidal. Knowing the extent of intrusions and the distribution of these areas around the community would be very helpful in planning for this contingency.~~

~~Floodplains will change significantly. To put the change in perspective, a 6" increase in floodwater elevations would place areas in the 500-year floodplain into the 100-year floodplain. A 2 foot rise in sea level is 4 times greater. It is not clear the exact extent that any particular area of floodplain would change in response to the rise in sea level. Projection of revised floodplains requires complex hydrological analysis that is far beyond the Town's capability. What is immediately clear, however, is that properties within the 100-year floodplain today will remain in the flood-prone area, and that the flood waters in the foreseeable future will become increasingly deeper. To this end, the policy section of the Comprehensive Plan should address this issue and pursue preventative policies such as requiring greater freeboard in new construction and renovations.~~

~~Changes in salt marshes will vary. Some very low lying areas will be inundated throughout the tidal cycle, while other areas that are outside the tidal influence will become salt marsh. New salt marshes may begin as mud flats because they will initially lack the organics required to be vegetated salt marsh. This will improve over time as the biomass builds through the years.~~

~~Erosion will worsen, both along the coast and up the inland waterways. The potential for scour and bank erosion will increase as new areas are subjected to inundation, wave action, and related forces.~~

~~The policy section of the Comprehensive Plan should develop policies regarding the implications of sea level rise and hazard mitigation planning. When large coastal storms hit, should the Town automatically pursue re-building roads, utilities, and similar public infrastructure everywhere it exists today? What role should the Town have in permitting homes to be replaced on-site? These land use issues should be evaluated in advance, and should be integrated with the Town's emergency management programs.~~

~~To facilitate policy development with respect to sea level rise, the Town should consider preparation of an engineering study to document the areas of land that would become inundated, and to estimate a revised 100-year floodplain. This should not be undertaken until more accurate contour data is available Town-wide, but it should not be deferred too far into the future as opportunities for prevention will be lost year after year.~~

~~8. Beach Erosion~~

~~This issue is related to the rise in sea level. As the sea level increases, there will be increased erosion, and the size of York's beaches will be reduced as they are pinched between the ocean and adjacent roads and development. This is a threat to the long-term viability of the beaches for recreational use. The value of the beaches to the community and region is significant, and the Town may be faced with costly choices to maintain these resources. Consider the cost of replacing sand lost to erosion. Currently it costs in the range of $1 million to $5 million per mile to replace sand on beaches, and this must be done every few years.~~

Adaptation to Sea Level Rise Chapter

Comprehensive Plan
Inventory & Analysis

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C. **ANALYSIS**

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D. **APPENDICES.....(not yet included with this draft)**

I. Introduction:

A. Historical and Recent Trends in Sea Level Rise

Sea Level is rising according to one hundred years of records from the Portland, ME tide gauge. Along with this change, storms are becoming more frequent and intense, and damages are increasing. The important question for the Town of York is: "How should the Town respond and adapt?" This chapter will inventory and analyze the best available data on historical and recent trends in sea level change, and lay out the best available current predictions for the future. In the goals section of the Plan, the Town will list actions it will take in response. What this chapter will not do is delve into the underlying causes of the observed problem.. The underlying causes of sea level rise are being debated in national news media, and are the subject of international scholarly investigation. This chapter will simply acknowledge the tide gauge data, and leave the climate change debate to others at higher levels of government and academia.

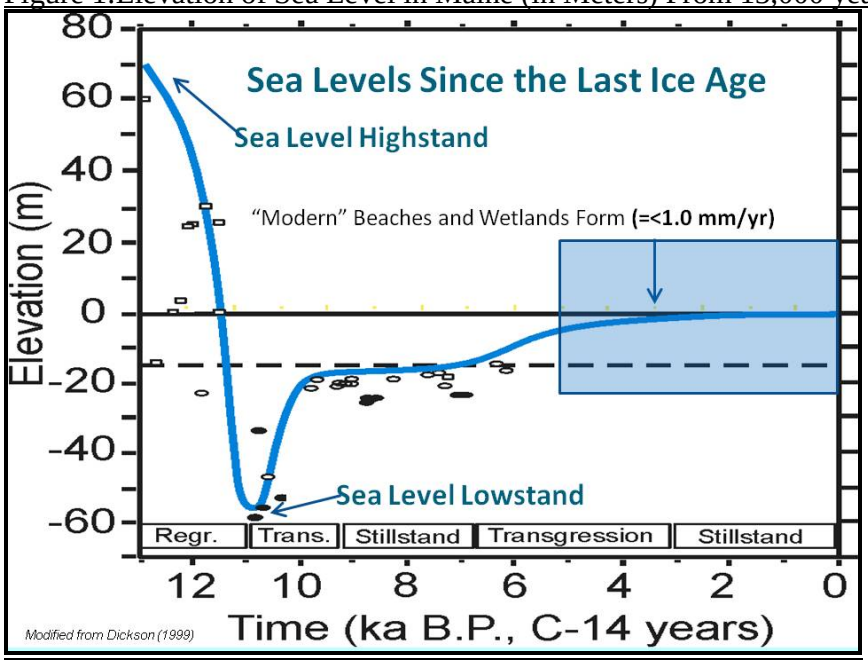
Some citizens may still wish to debate the point of whether climate changes and global warming are behind sea level rise, and whether the observed changes are part of a large natural cycle or are induced by modern human activities. However, it is not necessary for the town to participate in the large debate, while taking action to adapt to rising seas. If one's home is broken into repeatedly, a person would typically take steps to strengthen door locks and secure windows. However, it would not be necessary to determine why robberies are increasing in the neighborhood before taking these actions to secure one's home.

Scientists believe that there are ~~three~~ two dominant components to what is happening when global sea level is observed to increase. The first is thermal expansion, as the ocean temperature warms. The second is volumetric increase when the volume of water in the ocean increases, as melting glaciers and ice sheets located on land melt, ant the water runs down into the sea. ~~The third are, changes in global ocean currents (the most well known being the El Nino/La Nina phenomenon) that may affect water temperatures and levels.~~

When scientists look at data on a specific piece of coast, like at the shoreline of York, Maine, there are more local reasons for changes in sea level, other than those at the global level. Some movement of the land up or down is left over from the end of the last ice age. As the crust of the earth in this area was covered with thousands of feet of ice, it sank in response, just like when you lie down on a mattress. When the ice age ended, the land experienced "isostatic rebound,' as the crust bounced back up. Some isostatic rebound is still happening today after thousands of years, but the effect now is very slight. However, in the past, this phenomenon had a tremendous effect on Maine. In other parts of the United States, there was no ice age, and sinking of the land or "subsidence" is a problem. This is pronounced in the Chesapeake Bay area and the Louisiana coast, where higher rates of sea level rise are happening right now, compared to York, Maine. It should also be noted that seasonal wind patterns can change tide levels during different periods within each year. In our area, tides will run ~~higher~~ lower during periods of sustained northeast winds during the winter which blow water offshore.

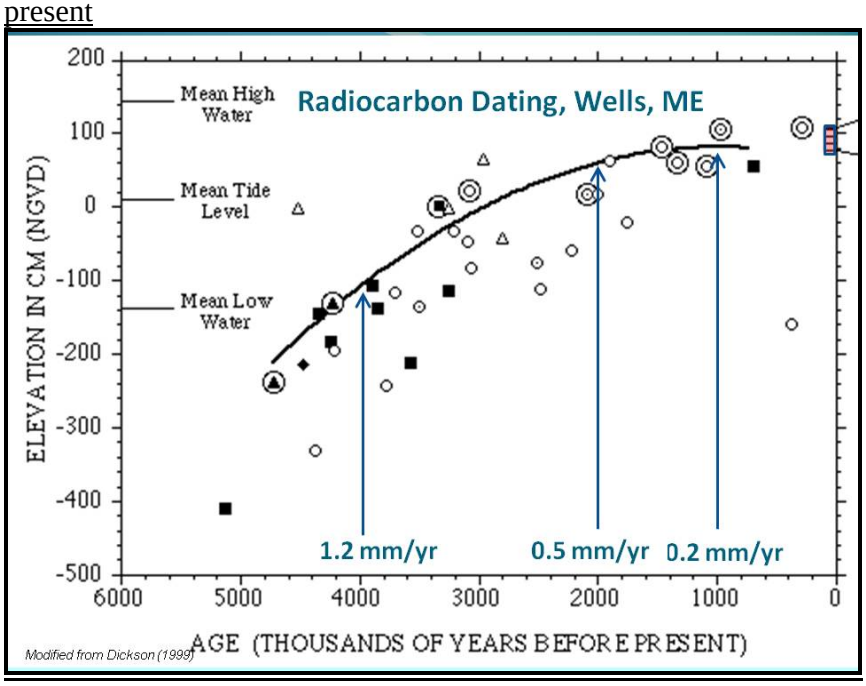
Figure 1 shows that in Maine, thirteen thousand years ago at the end of the last ice age, the land was so crushed by ice, that sea level was 70 meters higher than it is today. At eleven thousand years ago, the land bounced up so that sea level was 60 meters below today's levels. Then melting waters filled the oceans, and in the last five thousand years, levels in Maine have been very stable. It is important to note that this is the period when our modern beaches and wetlands that we know today were formed.

Figure 1:Elevation of Sea Level in Maine (in Meters) From 13,000 years ago until present day.



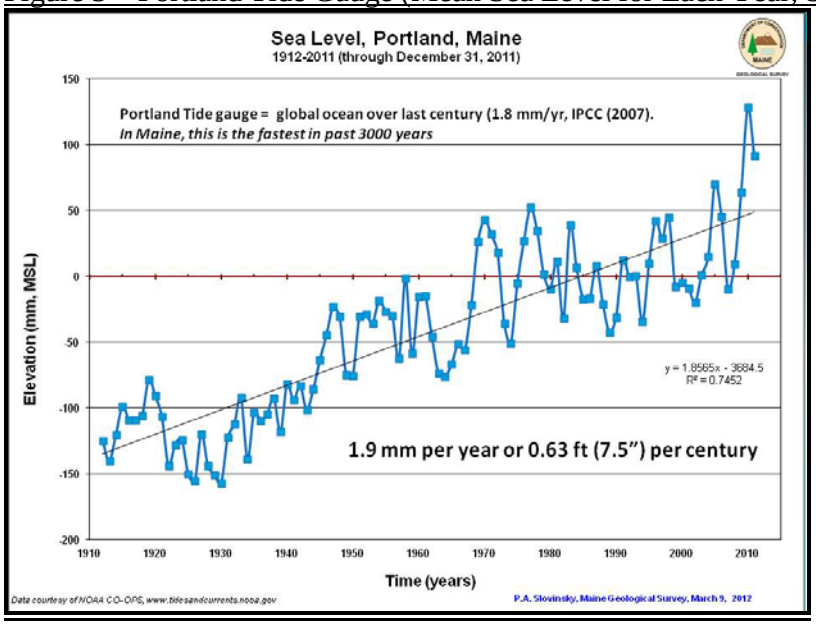
Studies of the marshes in Wells show that in the last five thousand years (the area shaded in blue in figure 1) the rate of change in sea level has leveled off from over 1mm per year to only 0.2 mm per year about a thousand years ago. See figure 2.

Figure 2: Sea Level Change in Wells, ME, as measured by Radiocarbon Dating of Marsh Borings, 5,000 years ago to present



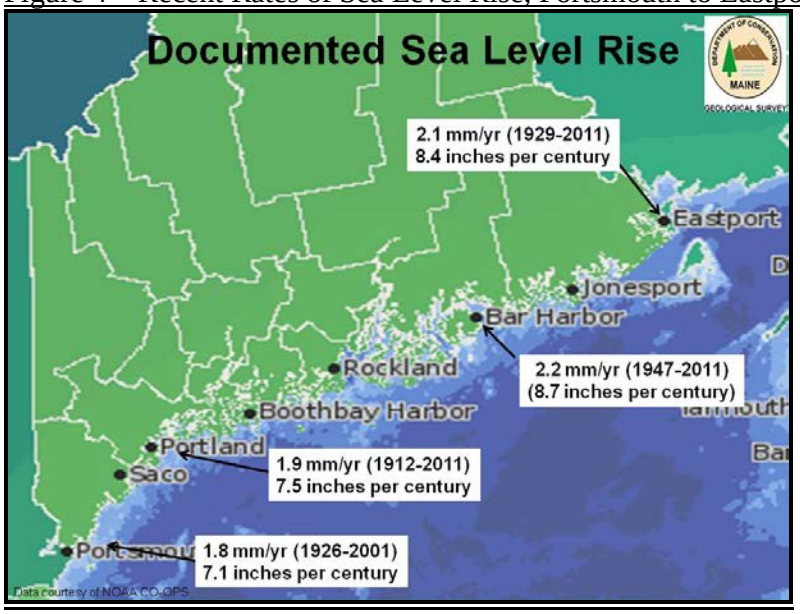
However, the peaceful period of gradual sea level rise that we had in Maine for the last several thousand years appears to be over. The Portland tide gauge shows that over the last hundred years, since 1912, sea level has been rising at a rate of ~~1.8~~ 1.9 mm per year. That would be ~~180~~ 190 mm, or about ~~7+~~ 7.5 inches during this period. This mirrors global ocean changes, as measure from orbiting satellites, of about 1.8 mm/yr. See Figure 3.

Figure 3 – Portland Tide Gauge (Mean Sea Level for Each Year, between 1912 and 2011)



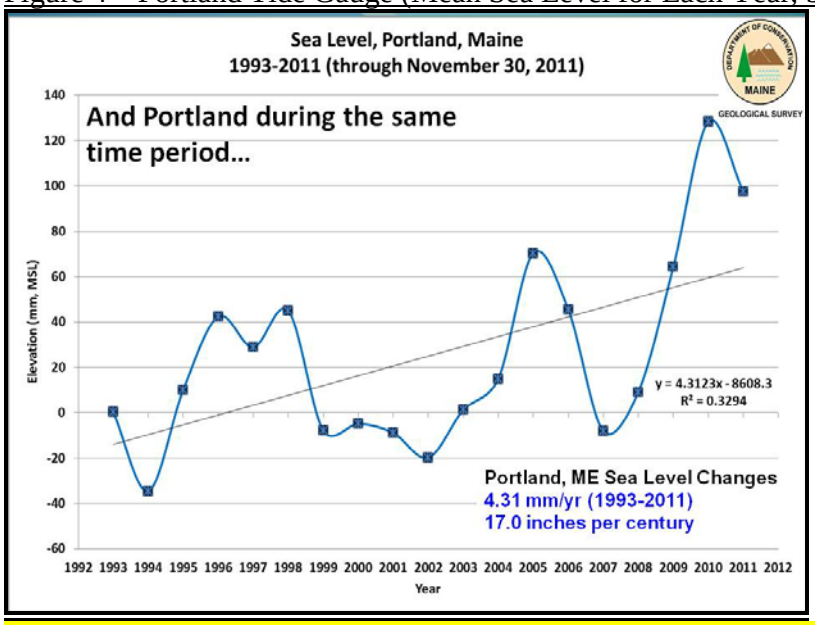
The results are roughly the same as you look up and down our nearby coastal tide gauges. See Figure 4.

Figure 4 – Recent Rates of Sea Level Rise, Portsmouth to Eastport



However, not only has the pace of sea level rise picked up over the last hundred years, the rate is increasing, and is up quite a bit since 1993. For the last 20 years or so, the rate of sea level rise has increased to 4.3 mm per year or 17 inches per century. See figure 4.

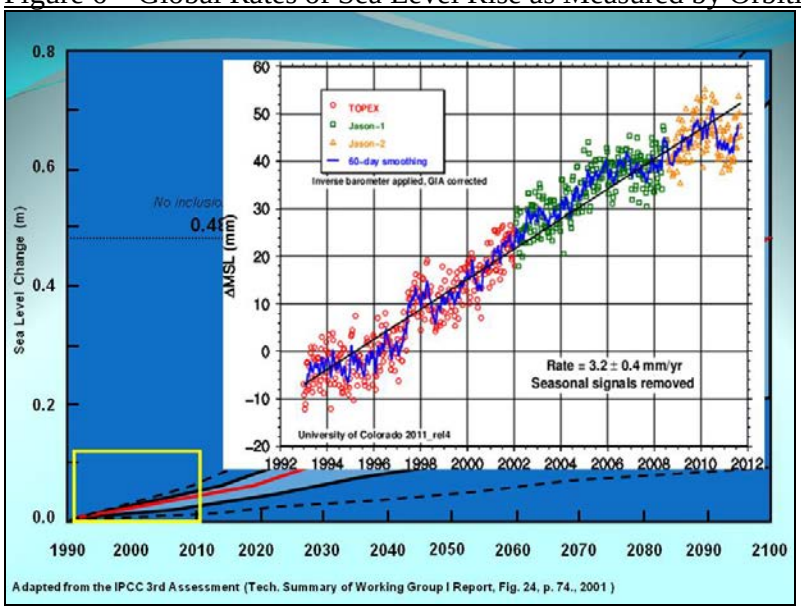
Figure 4 – Portland Tide Gauge (Mean Sea Level for Each Year, between 1993 amd 2011)



Not: Pete Slovinsky has a replacement image for Figure 4 with error bars.

Not only has the pace of sea level rise picked up locally here in Maine, but the rate of rise has picked up on global sea level, as measured by orbiting satellites. Since 1993, global sea level has risen at a rate of 3.2 mm per year, or 12.5 inches per century See Figure 6.

Figure 6 – Global Rates of Sea Level Rise as Measured by Orbiting Satellites

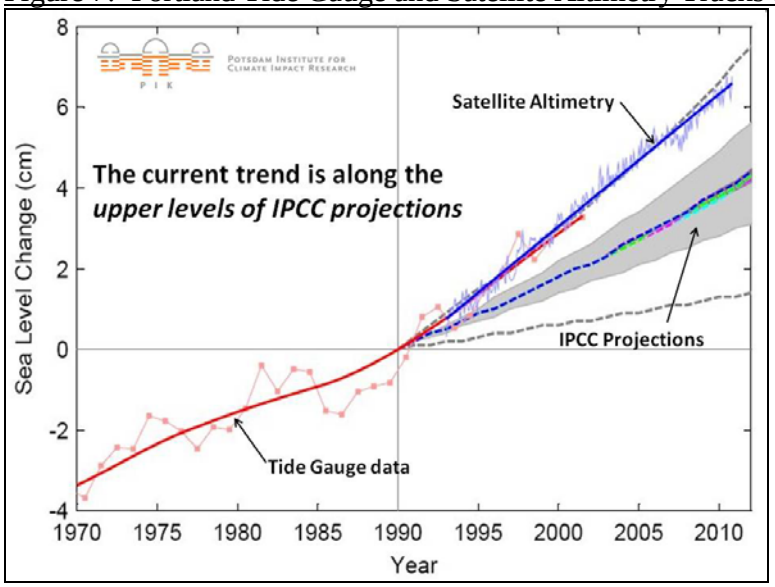


B. Best Predictions of Future Sea Level Rise

For planning purposes, and under the rules of the Sand Dune Act administered by the Maine Department of Environmental Protection, ~~one foot of sea level rise is expect by mid century and~~ two feet of sea level rise is expected by 2100. The current trends since 1993 shown on our local tide gauge, as well as the satellite measurements of the global ocean levels, are showing faster increases than we have seen before. The amount of sea level rise in the last 100 years since 1912 has been ~~a little over 7~~ about 7.5 inches. The next hundred years will probably be triple that, according to the projections of the Intergovernmental Panel on Climate Change (IPCC) and reach at least two feet. The IPCC projections do not include contributions from the melting of glacial, land-based ice sheets.

Figure 7 shows that if you superimpose the Portland tide gauge date from 1993 to the present, as well as the satellite measurements of the global ocean level, that sea level rise during the last 20 years is tracking the HIGHEST PROJECTION curve of the IPCC.

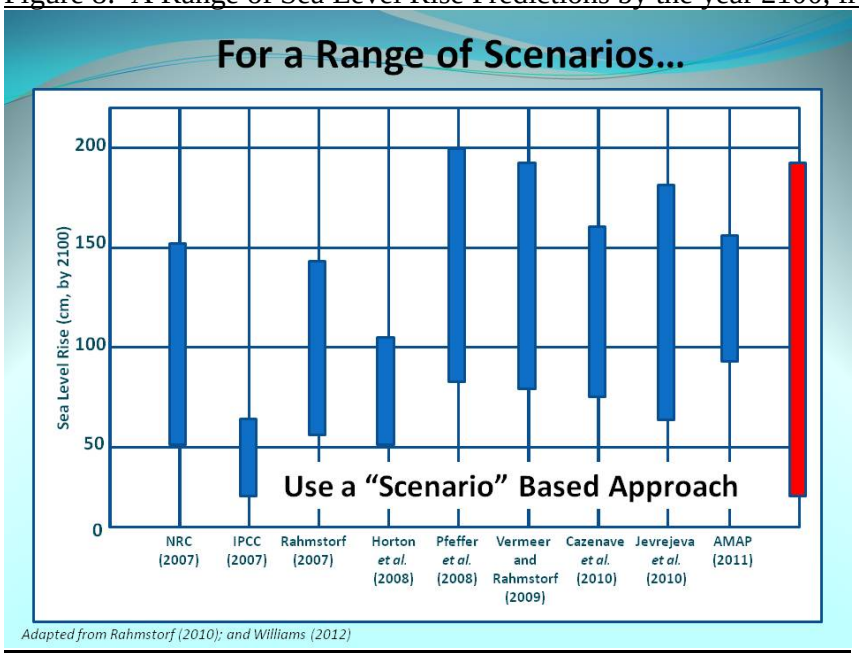
Figure 7: Portland Tide Gauge and Satellite Altimetry Tracks the Highest IPCC Sea Level Rise Predictions



There is another factor at work, which should be considered by the Town of York, which makes the prediction of ~~on~~ one foot of sea level rise by 2050, and two feet of sea level rise by 2100, conservative numbers. Geologists are measuring that ice sheets on land in Greenland and the Antarctic are melting, which could add substantial amounts of water to the world's oceans. This has not been a factor over the past hundred years. The recent SWIPA report (Snow, Water, Ice, and Permafrost in the Arctic) by Rignot and Others, from March 2011, predicts that "if the current Antarctic and Greenland ice sheet melting rates continue for the next four decades, their cumulative loss could raise sea level by 5.9 inches by 2050. When this is added to the predicted sea level contribution of 3.1 inches from glacial ice caps and 3.5 inches from ocean thermal expansion, total sea level rise could reach 12.6 inches by the year 2050." See: http://www.agu.org .

Figure 8 shows a review of 9 different peer reviewed studies from the last five years, that indicate between one and six feet of sea level rise, by the year 2100, when the influence of ice sheets is included in sea level rise scenarios. The center of the red bar on the right side of the figure is the middle of all predictions, at around 4 feet. Most newer authors are factoring in a contribution from ice sheet melting processes, which drives their predictions higher.

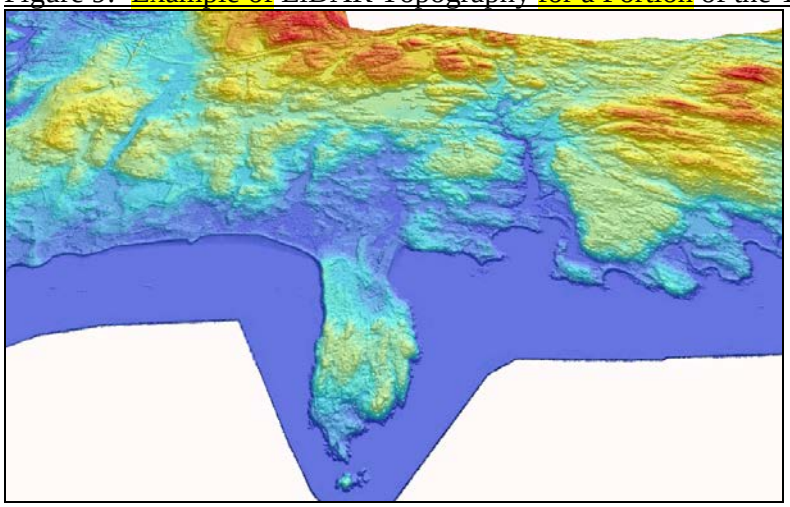
Figure 8: A Range of Sea Level Rise Predictions by the year 2100, from 9 recent scientific papers.



II. Inventory: Vulnerability Assessment for the Town of York

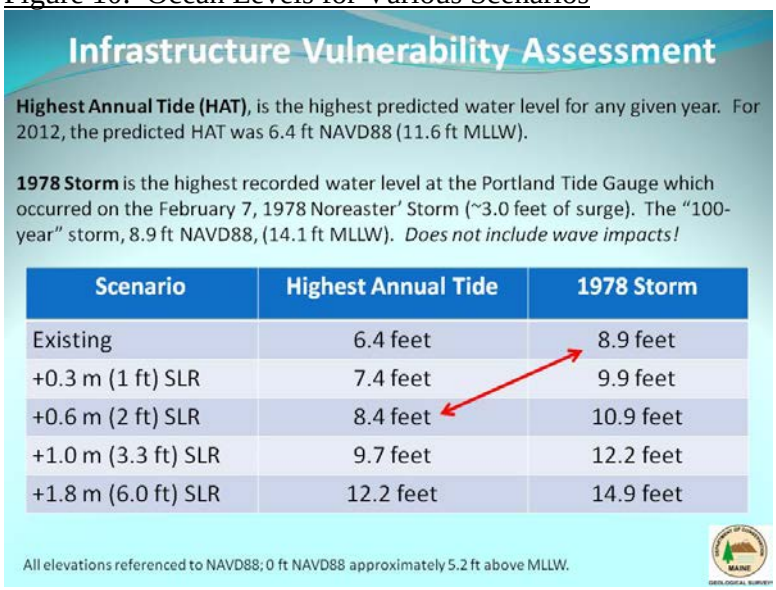
During the spring of 2012, Peter A. Slovinsky, Marine Geologist, of the Maine Geological Survey conducted a vulnerability assessment for the Town of York. The complete results are found in the appendices to this chapter. Light Detection and Ranging (LiDAR) data, derived from laser distance measurements from an airplane to the ground surface, was utilized to make a highly accurate map of the topography, or height of all lands, for the Town of York. See figure 9.

Figure 9: Example of LiDAR Topography for a Portion of the Town of York



Scenarios were created based on a variety of predicted ocean levels, starting with today's highest annual tide, which occurs when the full moon arrives at a time when it is also closest to the earth in its orbit (perigee). See Figure 10, where the water levels for each scenario are summarized. The figure shows that by the year 2100, after two feet of sea level rise, the highest annual tide each year will reach near the water height seen during the 1978 storm, which is the "storm of record , or the 100 year storm", or the storm that has a 1% chance of occurring in any given year for the York area. During that storm, the keeper's house at the Boon Island Light was swept away.

Figure 10: Ocean Levels for Various Scenarios



Infrastructure Vulnerability Assessment

Highest Annual Tide (HAT), is the highest predicted water level for any given year. For 2012, the predicted HAT was 6.4 ft NAVD88 (11.6 ft MLLW).

1978 Storm is the highest recorded water level at the Portland Tide Gauge which occurred on the February 7, 1978 Noreaster' Storm (~3.0 feet of surge). The "100-year" storm, 8.9 ft NAVD88, (14.1 ft MLLW). *Does not include wave impacts!*

Scenario	Highest Annual Tide	1978 Storm
Existing	6.4 feet	8.9 feet
+0.3 m (1 ft) SLR	7.4 feet	9.9 feet
+0.6 m (2 ft) SLR	8.4 feet	10.9 feet
+1.0 m (3.3 ft) SLR	9.7 feet	12.2 feet
+1.8 m (6.0 ft) SLR	12.2 feet	14.9 feet

All elevations referenced to NAVD88; 0 ft NAVD88 approximately 5.2 ft above MLLW.

The implications of this are enormous. This means that by the year 2100, during clear weather, the normal astronomical high tide level (normal spring tide) will nearly reach the heights seeing during one of York's worst storms.

A. Impacts to Buildings

Figure 11. Summary of Number of Buildings Damaged at varying scenarios of sea level rise

Summary of Potentially Vulnerable* Building Infrastructure

Scenario	Highest Annual Tide (6.4 ft)	1978 Storm (8.9 ft)
Existing	4	101
+0.3 m (1 ft) SLR	6	204
+0.6 m (2 ft) SLR	38	342
+1.0 m (3.3 ft) SLR	192	528
+1.8 m (6.0 ft) SLR	564	868

includes only primary buildings, excludes decks, dock structures, outbuildings, pools, mobile homes

elevations referenced to NAVD88

** Assumes "bathtub" flooding, no wave setup, static topography, and that a building is "inundated" if the flooding scenario **covers** the centroid of the building footprint, regardless of the flooding depth. Does not assign any kind of damage function.*

Figure 11 shows the results of the vulnerability assessment of York's buildings to sea level rise. With two feet of sea level rise, 38 buildings will routinely be flooded by astronomical high tides several times each year, without any storm or wave activity. Should a storm with water heights seen during the 1978 event happen with two feet of sea level rise, 348 buildings would be damaged. The vulnerability assessment did not estimate the dollar value of damage to buildings. In order to find out the economic impact of such damage, further GIS analysis would be necessary, estimating the predicted depths of floods in various locations. Such "depth-damage" function can be applied and summed over the areas shown as flooded on a computerized mapping system.

B. Impacts to Transportation Infrastructure

Figure 12. Summary of Miles of Road Flooded ~~at varying~~ under different scenarios of sea level rise

Summary of Potentially Vulnerable* Road Infrastructure

Scenario	Highest Annual Tide (6.4 ft)	1978 Storm (8.9 ft)
Existing	0.1 miles	1.9 miles
+0.3 m (1 ft) SLR	0.2 miles	4.1 miles
+0.6 m (2 ft) SLR	1.1 miles	6.6 miles
+1.0 m (3.3 ft) SLR	3.8 miles	9.5 miles
+1.8 m (6.0 ft) SLR	9.9 miles	15.9 miles

elevations referenced to NAVD88

excludes bridges removed from LiDAR

** Assumes "bathtub" flooding, no wave setup, static topography, and that a road is "inundated" if the flooding scenario **covers** the entire road, regardless of the flooding depth. Does not assign any kind of damage function.*

Figure 12 shows the results of the vulnerability assessment of York's roads to sea level rise. With two feet of sea level rise, 1.1 miles of York's roads will routinely be flooded by astronomical high tides several times each year, without any storm or wave activity. Should a storm with water heights seen during the 1978 event happen with two feet of sea level rise, 6.6 miles of roads would be flooded. The vulnerability assessment did not estimate whether these flooded roads in the scenario would be able to be reopened after flood waters receded, or whether they would be damaged and closed until repairs could be made. A depth-damage analysis would need to be conducted to predict damage levels, as discussed in the previous section.

C. Impacts to Sewage Treatment Plant

Sewage treatment plants historically have been located near or on the shore, as this is typically the lowest point in a community. The more sewage can run downhill to the plant without the need for extensive pumping, the more energy and money can be saved, in getting raw sewage to the plant for treatment. York is no different than most places in this regard, with its sewage treatment plant located adjacent to Cape Neddick harbor. This leaves the facility vulnerable to sea level rise.

Figure 13. Potential Impact to Sewer District Treatment Plan with 2 feet of Sea Level Rise, on top of the highest annual tide.

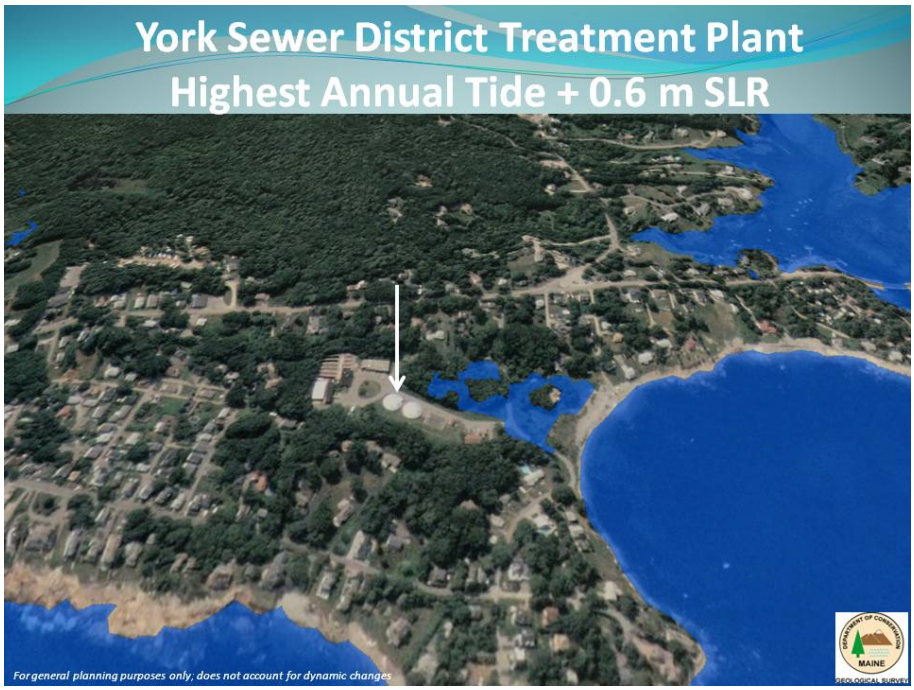


Figure 14. Potential Impact to Sewer District Treatment Plan with 2 feet of Sea Level Rise, and 2.6 feet of wave setup action, during a storm equivalent to the 1978 Storm.

Figure 13 shows that with two feet of sea level rise, the area immediately adjacent to the plant site would be routinely inundated during astronomical high tides several times each year, without any storm of wave activitity. Figure 14 shows that should a storm with water heights seen during the 1978 event happen with 2 feet of sea level rise, with 2.6 feet of wave

action (which might easily be expected in this coastal area by flood studies), the plant could be flooded enough to compromise its ability to operate.

It should be noted that in neighboring Ogunquit, the sewage treatment plant has also been identified as vulnerable to sea level rise. A study recently completed for the Ogunquit Sewer District by Woodard and Curran Engineers has recommended that Ogunquit consider relocating away from its current site in 30 years, with the main recommendation that Ogunquit should connect alternately to the Wells sewage treatment system. Needless to say, should a sewage treatment plant be flooded, bypassing of untreated sewage could have negative effects on the local marine environment and lead to beach closures during swimming seasons.

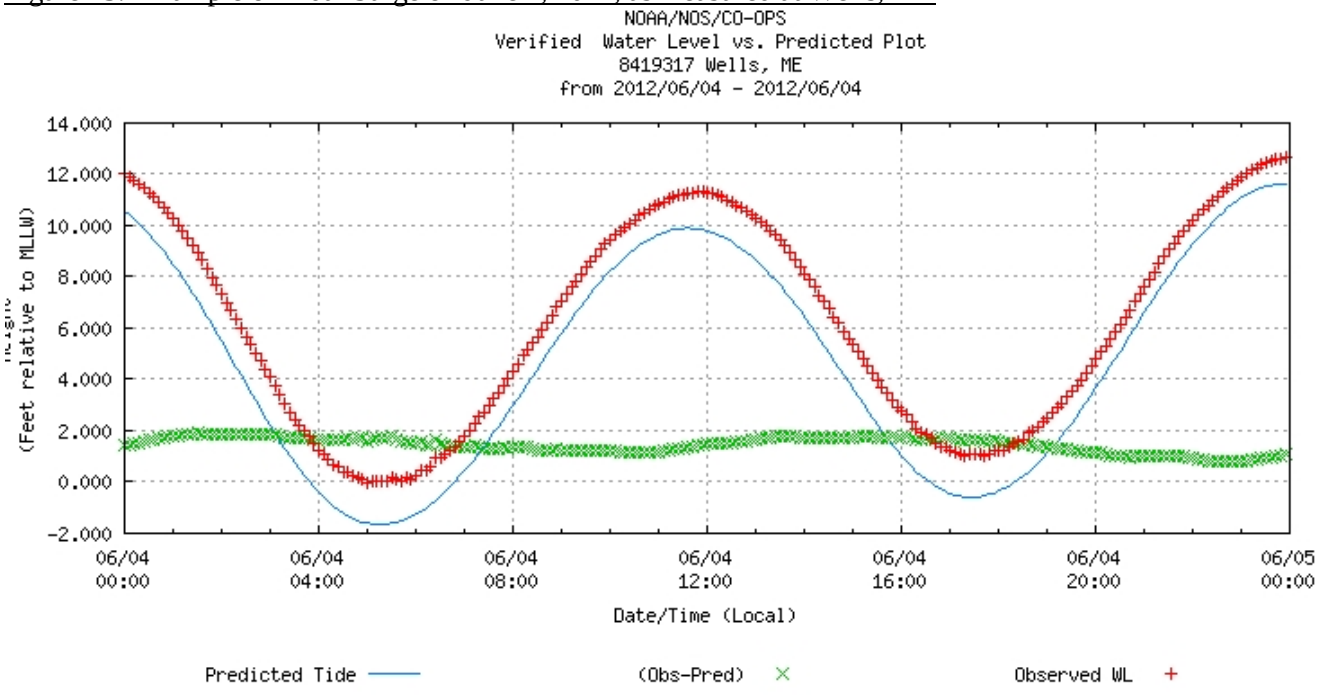
III. ANALYSIS

A. Preparing for Today's Surge or Tomorrow's Sea Level

The Maine Coastal Program and Maine Geological Survey point out that when Towns prepare for long term sea level rise ~~which will slowly happen over time~~, any actions taken will also protect again tidal surges which can happen at any time in the short term ~~present~~. Therefore, these State agencies counsel Towns that many actions to adapt to sea level rise can be made now with no regrets,

Tidal surge is the term for any time the observed water level in a tidal water body is ~~different~~ higher than the predicted level in the tide tables. Figure 15 illustrates that during June 4, 2012, there was a surge of almost 2 feet ~~in our areas~~ recorded at the Wells tide gauge, associated with a not particularly notable rain storm. This means that tides were running almost two feet higher than on the chart. On this particular night early this past summer, seaweed was washed up onto the road at Long Sands and needed to be removed by the Town public works department.

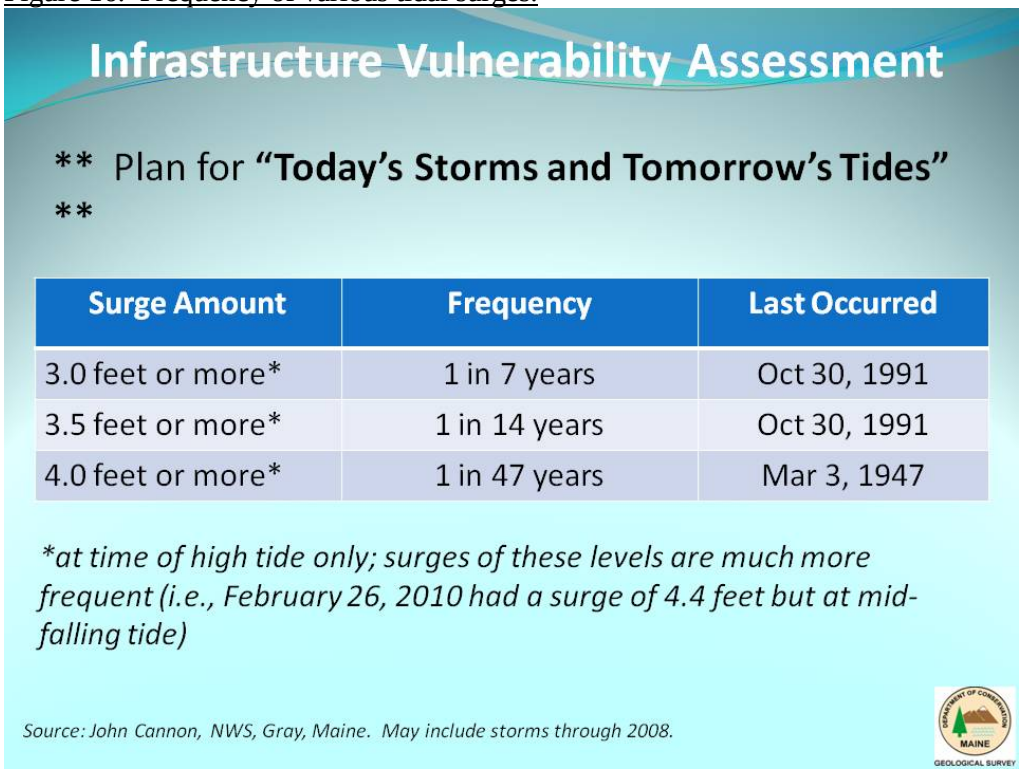
Figure 15. Example of Tidal Surge on June 4, 2012, as measured at Wells, ME



Therefore, any actions taken to adapt the road at Long Sands Beach to protect against 2 feet of sea level rise, would also have helped with a current public works maintenance problem.

If surge happens at low tide, any associated problems are minimal or non-existent. When surge happens at a high tide, flooding and damage can occur. Figure 16 shows the frequency of surges in our area, between 3 and 4 feet, that occur at high tide.

Figure 16. Frequency of various tidal surges.



Surge Amount	Frequency	Last Occurred
3.0 feet or more*	1 in 7 years	Oct 30, 1991
3.5 feet or more*	1 in 14 years	Oct 30, 1991
4.0 feet or more*	1 in 47 years	Mar 3, 1947

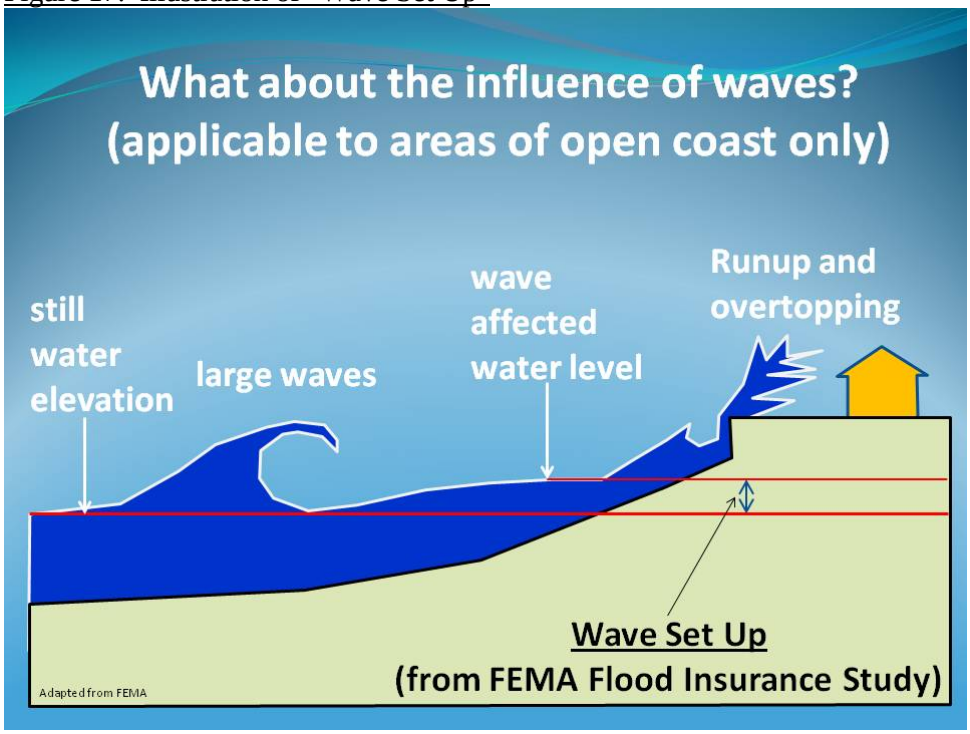
Note: Pete Slovinsky has newer data, and would like to replace this figure.
Surge levels and tide levels found on NOAA charts are "Still Water" elevations, like the waterline in a calm bath tub. Of course, it is unusual for the salt water in our area to be that still. Most of the scenarios of sea level rise found in the vulnerability assessment for York did not take into account wave action or changes to shoreline from erosion. The reasons for this are:

It is relatively easy to predict static water levels over time…tide tables have done it for years.
Wave action and erosion are harder to predict.
Erosion events can be very dramatic, and cause drastic changes, or can happen gradually over time, or both.

Also, predicted tide and surge levels do not take into account sudden intense rain events, which add freshwater runoff to the saltwater. During the Mother's Day and Patriot's Day storms in 2006 and 2007, as experienced in York Beach, the impacts from freshwater flooding greatly compounded the saltwater tidal surge levels.

Therefore the scenarios of possible damages from sea level rise to buildings, roads, and the sewage treatment plant, are very conservative. Any of the predictions can be considered to be on the low side, with any extreme rainfall, erosion or wave action that happens during storms, surely making things even worse. Figure 17 shows how wave setup can add to the predicted height of sea level rise.

Figure 17. Illustration of "Wave Set Up"



State Goals, Town Goals and Town Actions

* * * * *

The Comprehensive Plan Steering Committee has used a sequential numbering system to identify each Town Goal and Town Action that is recommended to achieve the State Goals. For example, Town Action 2.3.4 identifies the following:

• The first number is the number of the State Goal; State Goal 2.
• The second number is the number of the Town Goal in response to the State Goal; Town Goal 3.
• The third number is the specific Town Action recommended to achieve the Town's Goal for the State Goals; Town Action 4.

The Action Statement also identifies the Town policy-making body - such as the Selectmen - who is expected to take the lead role in implementing the Action. When the Board of Selectmen or Budget Committee is identified, the Town Manager will directly assist in this effort. When the Planning Board is identified, the Code and Planning Department will assist. It is fully expected that other Town boards and the citizenry will be involved in the implementation process.

The final information identified in the Action Statement is a recommended priority for its implementation, as follows:

• Immediate - The highest priority for implementation, generally recommended before lower priorities are pursued.
• Mid-Term - The mid-level priority for implementation, generally recommended after immediate priorities have been addressed but before long-term priorities are pursued.
• Long-Term - The lowest priority for implementation, generally recommended after higher priorities are pursued.
• Ongoing - Priorities that require regular action, or periodic monitoring and/ or action as needed.

* * * * *

STATE GOAL 6: To protect the State's other critical natural resources including without limitation wetlands, wildlife and fisheries habitat, sand dunes, shorelands, scenic vistas and unique natural areas.

RELATED STATE COASTAL MANAGEMENT POLICIES from Title 38 M.R.S.A. sec. 1801:

Marine resource management. Manage the marine environment and its related resources to preserve and improve the ecological integrity and diversity of marine communities and habitats, to expand our understanding of the productivity of the Gulf of Maine and coastal waters and to enhance the economic value of the State's renewable marine resources;

Shoreline management and access. Support shoreline management that gives preference to water-dependent uses over other uses, that promotes public access to the shoreline and that considers the cumulative effects of development on coastal resources;

Hazard area development. Discourage growth and new development in coastal areas where, because of coastal storms, flooding, landslides or sea-level rise, it is hazardous to human health and safety;

State and local cooperative management. Encourage and support cooperative state and municipal management of coastal resources;

Scenic and natural areas protection. Protect and manage critical habitat and natural areas of state and national significance and maintain the scenic beauty and character of the coast even in areas where development occurs;

Recreation and tourism. Expand the opportunities for outdoor recreation and encourage appropriate coastal tourist activities and development;

Water quality. Restore and maintain the quality of our fresh, marine and estuarine waters to allow for the broadest possible diversity of public and private uses;

Much of York is comprised of natural resource features which warrant protection. Water, rock and forests are the dominant land features. York has an extensive shoreline along the Atlantic Ocean that consists of both sandy beaches and rocky high energy coasts. In addition, nearly 11% of York's 56 sq miles of land is either waterbodies or wetlands that are greater than 1 acre in size. York is also a land of steep slopes. Mt. Agamenticus is located less than 5 miles from the coastline of the Atlantic Ocean but steeply rises to a height of nearly 700 feet. The characteristics of York's soils is evidenced by the large number of stone walls that dot the landscape and the many craggy ledge outcrops along York's roads. The land also provides good quality habitat for many species of animals, birds, amphibians and plants. In fact, the State inventory of significant fish, wildlife and plants identifies that rare or endangered plant species or important habitat areas are located throughout the community. York is a unique area in New England where the southern and northern forests meet to support a diversity of tree and plant species found in few other areas located this far north. With regard to this Plan, general use of the word " habitat" shall be considered in its most broad context, applying generally to any living creatures. General use of the terms " wildlife" and " wildlife habitat" shall be considered to include all forms of animal life, including but not limited to fish, amphibians, reptiles, mammals and birds.

The challenge confronting York is how to wisely allow the development of privately owned lands while protecting the quality of the area' s natural resources. Clearly, much has been done well as York remains a land of abundant resources. For example, if you stand at the top of Mt. Agamenticus and look over the wide expanse of forest below it is hard to imagine there are over 8,000 homes and 13,000 year-round residents crouched in among the trees. In addition, many describe a trip up the York River as a step back into time, as long stretches of the River miraculously remain undeveloped. All is not well with York' s natural resource base, but there are areas and resources that warrant saving.

Another challenge facing York is the realization that sea level is rising, and intense rainfall events and storm surges are happening more frequently. According to the Maine Geological Survey (MGS), the State projects a 2' rise in sea level in the coming 100 years. An increase in sea level will have significant impacts on the coastal landscape. As the coastline moves inland, floodplains will rise, salt marshes will change, and erosion will worsen.

The recommendations in this Plan build on current Ordinances and processes now being used to manage potential adverse impacts on York's natural resources. Many of these recommendations warrant immediate Town action to best position the community to responsibly manage future development.

TOWN GOAL 6.4: Recognize that Sea Level Rise is occurring, and that storms are happening more frequently, with higher intensities and water levels. The Town should implement strategies to adapt this situation.

6.4.1 The Town of York shall review its floodplain management ordinance and land use ordinance to strengthen standards for new or replacement construction located in vulnerable tidal areas, or areas subject to freshwater flooding. The Town of York shall also review ~~its floodplain management ordinance and land use~~ these ordinances provisions ~~for properties in tidal areas indentified as vulnerable~~, and enact amendments to protect ~~such~~ existing properties and direct owners over time, to modify their structures so that they are more resilient to sea level rise, storm surges, and rainfall events. This may include requiring additional elevation of the base floor of reconstructed buildings after flood damage, or in all cases of new or replacement construction.

IMMEDIATE PRIORITY - PLANNING BOARD TAKES LEAD ROLE

6.4.2. The Town shall incorporate sea level rise into its decision-making and design of transportation improvements, such as increasing road surface elevations and improving road subsurfaces, increasing the capacity of all stormwater management and drainage systems, and adjustment of bridge heights.

IMMEDIATE & ON-GOING PRIORITY – SELECTMEN TAKE LEAD ROLE

6.4.3. The Town shall identify its public investments and infrastructure at risk from sea level rise impacts, and update this assessment every 10 years. Specifically, the Town shall analyze vulnerability to facilities and services, including but not limited to: town buildings; water and wastewater treatment plants and pumping stations; stormwater systems; town roads and bridges. The Town shall coordinate with other municipalities, and water and wastewater utility districts in this effort.

ONGOING PRIORITY – ~~PLANNING BOARD TAKES~~ SELECTMEN AND UTILITY DISTRICTS TAKE LEAD ROLE

6.4.4. The Town shall evaluate the costs and benefits of sea level adaptation alternatives in the location and design of new infrastructure as well as the fortification or retrofitting of existing infrastructure. Such evaluations should be incorporated into the planning, siting, construction, replacement and maintenance of public infrastructure in a manner that is cost-effective and that maximizes the use of the infrastructure throughout its expected life span. In each case, the Town should consider the three alternatives of adapting; whether to fortify, accommodate or retreat in the face of sea level rise.

IMMEDIATE & ON-GOING PRIORITY – SELECTMEN TAKE LEAD ROLE

6.4.5. The Town shall continue to improve analysis and mapping capabilities for identifying areas vulnerable to sea level rise and tidal flooding. The Town should acquire increasingly accurate Light Detection And Ranging (LiDAR) data, or other state-of-the-art elevation data as it becomes available from State or Federal sources, to update its

vulnerability assessment and make informed decisions regarding sea level adaptation. Every five years, LiDAR data shall be used to locate the position of the contour line at the highest annual tide level on the Town's zoning map, so that the Shoreland Zones are accurately depicted, as the shoreline position changes.

ONGOING PRIORITY – PLANNING BOARD TAKES LEAD ROLE

6.4.6 The Town shall work with the Federal Emergency Management Agency when required to amend its Floodplain Management Ordinance and Flood Insurance Rate Maps, and should participate in the Community Rating System program to achieve lower rates for flood insurance policy holders.

IMMEDIATE & ON-GOING PRIORITY – SELECTMEN TAKE LEAD ROLE

6.4.7. The Town should consider the use of beach nourishment and the installation and maintenance of native beach dune vegetation, along appropriate areas of beach.

IMMEDIATE & ON-GOING PRIORITY – SELECTMEN TAKE LEAD ROLE

6.4.8. The town should review its Shoreland zoning and consider provisions with the objective of providing additional coastal buffer area between developed areas and the shoreline, as properties are redeveloped, and should consider hard structures, such as seawalls, only when alternative options are unavailable.

IMMEDIATE & ON-GOING PRIORITY – PLANNING BOARD TAKES LEAD ROLE

6.4.9. The Town should seek to allow tidal marsh areas to migrate when adjacent uplands are available for conversion to marsh, facilitating public or private land acquisition when appropriate, as sea level rise causes these vital ecosystems to move landward.

ON-GOING PRIORITY - CONSERVATION COMMISSION TAKES LEAD ROLE

6.4.10. Where tidal flows have been restricted because of existing road crossings or other development, the Town should consider restoring more natural flows, by removing such restrictions or by expanding culverts or bridges, should engineering studies indicate that potential flooding could be mitigated and flood storage capacity and ecological health of coastal marshes could be increased. Conversely, the Town should consider tide gates, one-way valve devices on drains, or other engineered measures when appropriate, if engineering studies indicated that potential flooding could be mitigated, and other, more passive approaches are not feasible.

ON-GOING PRIORITY – CONSERVATION COMMISSION AND PLANNING BOARD TAKE LEAD ROLES.

6.4.11. The Town shall support and participate in the recurring and continued development of local integrated models and continuous data collection, as funding permits or as grant opportunities arise, to help predict and track the impacts of sea level rise on properties, natural systems, and road and drainage infrastructure, through enhanced development and application of local hydrologic models and the use of downscaled climate models.

ON-GOING PRIORITY – PLANNING BOARD TAKES LEAD ROLE

6.4.12. The Town shall develop ordinance amendments that require new construction, redevelopment, additions, retrofits or modifications of property to incorporate porous materials, reduce total impervious area, and employ other techniques to reduce or slow run-off, capture and reuse rain water.

MID-TERM PRIORITY – PLANNING BOARD TAKES LEAD ROLE

6.4.13. The Town shall create and maintain effective and ongoing paths for communicating its sea level rise preparedness needs with the public and other local, regional, state, and national agencies. The Town should participate in regional and state efforts, and partner with other entities or organizations, to plan collaboratively for sea level rise adaptation, as such opportunities arise.

ON-GOING PRIORITY – SELECTMEN AND PLANNING BOARD TAKE LEAD ROLES

6.4.14. The Town shall encourage the school department to provide educational and outreach programs on how sea level rise and adaptation is affecting the Town of York, to involve the youth of the community in this issue.

ON-GOING PRIORITY – SELECTMEN TAKE LEAD ROLE