



Coastal Resilience Advisory Committee (CRAC) recommendation to Select Board

2022 update to supersede the July 28th, 2020 recommendation accepted by Select Board.

Recommendation

In July 2020, while the Coastal Resilience Plan was in development, the Coastal Resilience Advisory Committee made a recommendation, shown below. ~~This wording does not change, and this is primarily an update to the support materials, and what materials Town Departments, Boards, Committees & Commissions should use when planning projects.~~

~~Pending the Select Board's acceptance of a detailed Coastal Resilience Plan and its specific project recommendations (for which an RFP is currently in the procurement process), the CRAC proposes the following recommendation to the SB:~~

~~The wording of the recommendation remains:~~

"The CRAC recommends all Town Departments, Boards, Commissions and Committees and any service providers, contracted engineers and consultants need to be aware of and need to use the NOAA "High" scenario to accommodate current storm surge as well as Sea Level Rise in their decisions, deliberations and planning. These data are periodically updated by NOAA and will be posted on the CRAC page on the Town's website."

Commented [VM1]: Delete this if the committee does want changes to the wording of the recommendation.

Intent

The purpose of the recommendation is to supplement FEMA flood elevations as FEMA flood elevations does not include sea level rise.

Commented [VM2]: Two questions.

1. Do committee members wish to have any wording changes to the recommendation wording?
2. If no changes, but the committee moves to MC-FRM, this NOAA wording needs to change.
 - a. If the committee goes with NOAA & MC-FRM, this should reflect both.

Supporting information

In November 2021 the Coastal Resilience Advisory Committee finalized and approved the Nantucket Coastal Resilience Plan (CRP). The CRP was then endorsed by the Select Board in January 2022. <https://www.nantucket-ma.gov/DocumentCenter/View/40278/Nantucket-Coastal-Resilience-Plan-PDF> Sea Level Rise (SLR) data and Coastal Resilience strategies are listed in the Town of Nantucket Coastal Resilience Risk Assessment and Strategies report that was received by the Town in January 2020: <https://www.nantucket-ma.gov/DocumentCenter/View/35045/Coastal-Risk-Assessment-and-Resiliency-Strategies-Report-January-2020-PDF>. This is now a guiding document for CRAC and is a reference for all Town staff and vendors to make public infrastructure and private construction & development projects more resilient to Sea Level Rise and coastal flooding. The CRP uses the Massachusetts Coastal Flood Risk Model as the primary source of sea level rise preparedness projections. In February 2022 NOAA released updated sea level rise projections. Projects should look at the Sea Level Rise scenarios and risk tolerance that is appropriate for the expected service life of the project.

Nantucket Sea Level Rise Scenarios – MC-FRM & NOAA

MC-FRM

Massachusetts Coastal Flood Risk Model is a probabilistic model that shows mapped areas percentage changes of flooding in three timeframes – Present (2020), 2050 and 2070. This was developed by Massachusetts Department of Transportation through University of Massachusetts Boston and Woods Whole Group. This is a more precise model with significantly higher resolution (to 10 foot intervals,



where most models are 100-1000 foot intervals) and includes wave runup and wash areas. The drawback is that it requires specific software (ARC Gis, or similar) and is not yet publicly available. It is available to Town Departments. Overview of MC-FRM in Downtown & surrounding areas is shown in Appendix 1.

NOAA

NOAA has developed specific Sea Level Rise scenarios specific to Nantucket. Due to the orientation of the harbor, and the position of the island off the Northeast coast, the island is projected to experience higher levels of Sea Level Rise than the global average.

NOAA (2017/2022) SLR scenarios are presented in **Table 1**. The relative sea level rise (RSL) scenarios shown in this table are derived from the 2022/17 NOAA SLR maps. The Technical Report NOS-CC-OPS-083 "Global and regional sea level rise scenarios for the United States" and uses the same methods as the USACE Sea Level Rise Calculator. 2022/17 NOAA report available here <https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf> https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

The 2017 NOAA report used 2000 as the base year, as previous NOAA reports also did. The updated 2022 NOAA report still uses 2000 as the base year, and shows that Nantucket has experienced 0.43 feet (5.16 inches) of sea level rise to 2020. The is an update to the 2017 report and offers improved SLR scenarios and timelines out to 2150. The main advantage is that the NOAA information is publicly available.

Commented [VM3]: So far, only for select locations. Closest is The Battery, NY. Not available for anywhere in New England.

The CRAC recommends following the "High" NOAA scenario to accommodate current storm surge as well as Sea Level Rise. (See **Storm frequency and impact on SLR** section on the next page). The upward trend in sea level rise also worsens the impact of storm surge, high tides and wave action. Use the table as a guide for selecting the elevations that are appropriate for the lifespan of the project, project risk tolerance and the project's adaptive capability.

Table 1. NOAA SLR scenarios. All elevations are in feet local mean sea level (LMSL) and relative to year 2000.

Year	Low	Int-Low	Intermediate	Int-High	High	Extreme
2000	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.16	0.20	0.26	0.36	0.43	0.46
2020	0.36	0.43	0.59	0.79	0.92	0.95
2030	0.52	0.62	0.92	1.21	1.48	1.64
2040	0.72	0.85	1.28	1.77	2.26	2.49
2050	0.89	1.05	1.71	2.36	3.12	3.54
2060	1.08	1.31	2.17	3.05	4.13	4.82
2070	1.21	1.51	2.66	3.81	5.15	6.17
2080	1.38	1.71	3.22	4.66	6.36	7.71
2090	1.48	1.87	3.77	5.58	7.74	9.51
2100	1.57	2.03	4.33	6.56	9.25	11.42



	<u>2020</u>	<u>2040</u>	<u>2060</u>	<u>2080</u>	<u>2100</u>
<u>Inter low</u>	<u>0.43</u>	<u>0.95</u>	<u>1.54</u>	<u>2.03</u>	<u>2.49</u>
<u>Intermediate</u>	<u>0.43</u>	<u>1.02</u>	<u>1.74</u>	<u>2.69</u>	<u>4.04</u>
<u>Inter high</u>	<u>0.43</u>	<u>1.12</u>	<u>2.07</u>	<u>3.48</u>	<u>5.25</u>
<u>High</u>	<u>0.43</u>	<u>1.15</u>	<u>2.36</u>	<u>4.36</u>	<u>6.66</u>

Commented [VM4]: 2022 SLR for NOAA. Pulled out from a mapping system, so may have errors. And did not find the original source. That is why I also added the graph. Graph had 5 scenarios, Table has 4. Low is not shown.

Commented [VM5R4]: Update. Delete this table. Use the one below.

<u>Year</u>	<u>Inter Low</u>	<u>Intermediate</u>	<u>Inter High</u>	<u>High</u>
<u>2000</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>2010</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>2020</u>	<u>0.43</u>	<u>0.43</u>	<u>0.43</u>	<u>0.43</u>
<u>2030</u>	<u>0.69</u>	<u>0.72</u>	<u>0.75</u>	<u>0.75</u>
<u>2040</u>	<u>0.95</u>	<u>1.02</u>	<u>1.12</u>	<u>1.15</u>
<u>2050</u>	<u>1.25</u>	<u>1.38</u>	<u>1.54</u>	<u>1.67</u>
<u>2060</u>	<u>1.54</u>	<u>1.74</u>	<u>2.07</u>	<u>2.36</u>
<u>2070</u>	<u>1.77</u>	<u>2.20</u>	<u>2.72</u>	<u>3.28</u>
<u>2080</u>	<u>2.03</u>	<u>2.69</u>	<u>3.48</u>	<u>4.36</u>
<u>2090</u>	<u>2.26</u>	<u>3.35</u>	<u>4.33</u>	<u>5.54</u>
<u>2100</u>	<u>2.49</u>	<u>4.04</u>	<u>5.25</u>	<u>6.66</u>

Commented [VM6]: Rechecked and improved 2022 table. Use this one.

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8449130 Nantucket Island

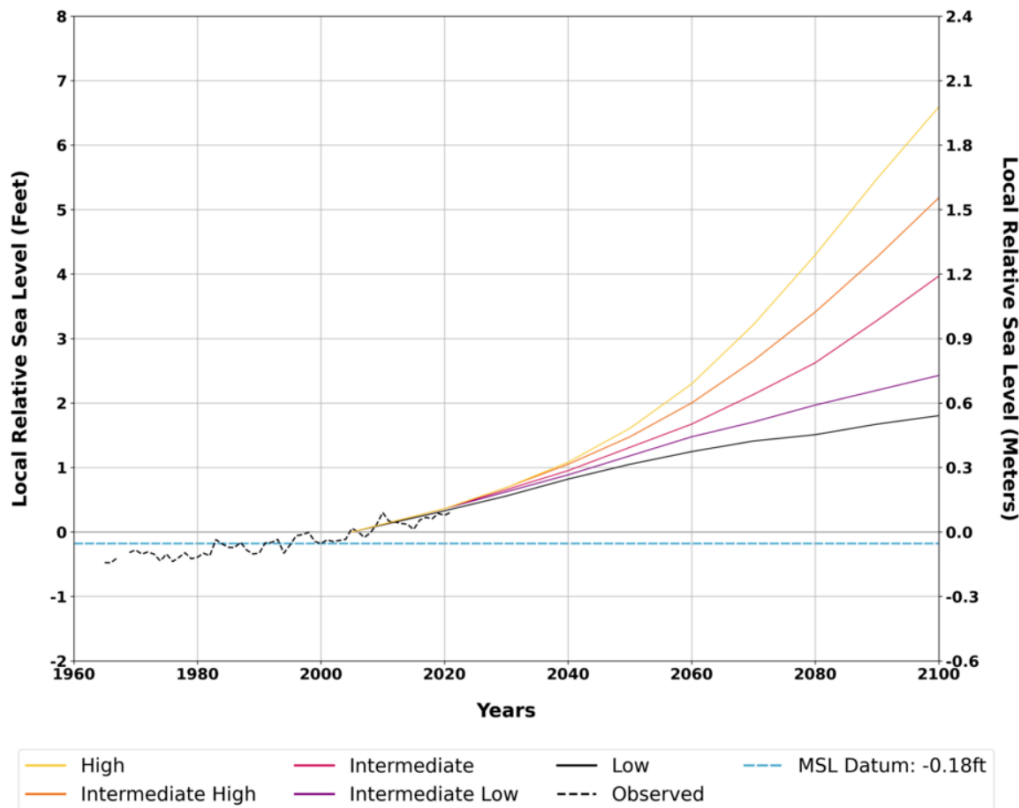


Figure 1. NOAA Sea Level Rise scenarios for Nantucket, based on tide gauge. Also includes observed sea levels from 1965 to 2021.

MC-FRM can be used by Town departments as appropriate and NOAA information can be used more widely and by the public to understand their risks.

Commented [VM7]: This graph is added for increased understanding and because it has the low scenario that the table does not have. Likely not needed for final version. Could it be an appendix?

Commented [VM8]: Likely delete. Just thought some kind of summation statement was needed. Filler for now.

Storm frequency and impact on SLR

Critical infrastructure, high value infrastructure, infrastructure with long life expectancy, infrastructure that would not tolerate flooding, or other infrastructure that is currently not in a flood zone but is near a flood zone may need to be designed to resist the combination of SLR and storm impacts.



The U.S. Army Corp of Engineers (USACE) commissioned a report published in 2014 called “North Atlantic Coast Comprehensive Study”. Phase 1 of the report, “Statistical Analysis of Historical Extreme Water levels with Sea Level Change”, looks at historical water levels and combines that data with storm surge modeling. This differs from many other SLR projections that are limited to increases in mean sea level and do not estimate high water elevations during future storms. The report projects to the year 2114, looking out 100 years from the report’s baseline year. This data is for the North Atlantic area, and not Nantucket specific.

The USACE report is available on the Town website <https://nantucket-ma.gov/DocumentCenter/View/36719/North-Atlantic-Coast-Comprehensive-Study-Phase-1-Report-Statistical-Analysis-of-Historical-Extreme-Water-levels-with-Sea-Level-Change-PDF>

Commented [VM9]: This report does much the same as what MC-FRM does. Looks at water levels with both SLR and in storms. There are differences. Starting to think this is now redundant.

Commented [VM10R9]: Link still works.

Storm Surge

Storm events, particularly from the Northeast, have the potential to temporarily increase the water level in Nantucket Harbor and cause flooding. Stormtide stacking may also occur when the wind does not allow the low tide to release high tide waters from the harbor. Subsequent high tides can “stack” more water in the harbor and compound flooding. Stormtide pathways were studied and added to the Town of Nantucket GIS online mapping system, which can be accessed here to evaluate potential risk to developments and projects: <https://www.nantucket-ma.gov/151/GIS-Maps>

Commented [VM11]: This paragraph is still accurate. Seems like MC-FRM does not take account of storm tide stacking. Recommend to leave this in.

Commented [VM12R11]: Link still works.

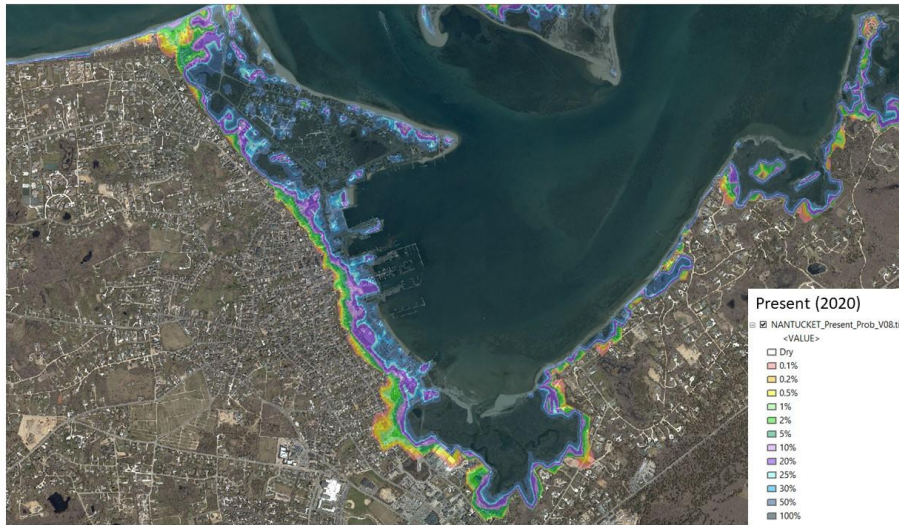
Appendix 1

Downtown overview of MC-FRM probabilistic model

Commented [VM13]: Mainly included for demonstration purposes for the committee.

Commented [VM14R13]: Note. Darker colors matter more. The brighter more eye-catching colors are lower risk areas. See the percentages.

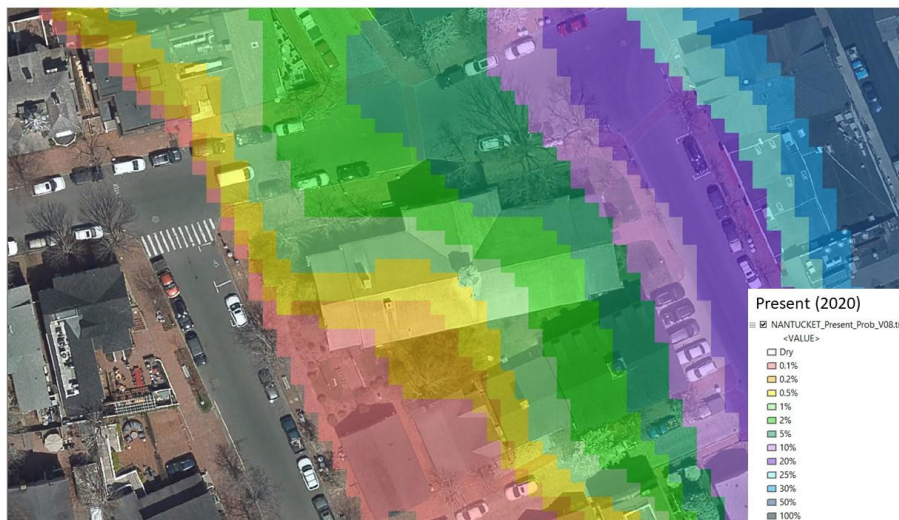
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Zoomed in to show Town Building at 16 Broad Street and change in percentage risk over time, and demonstrate high level granularity.



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