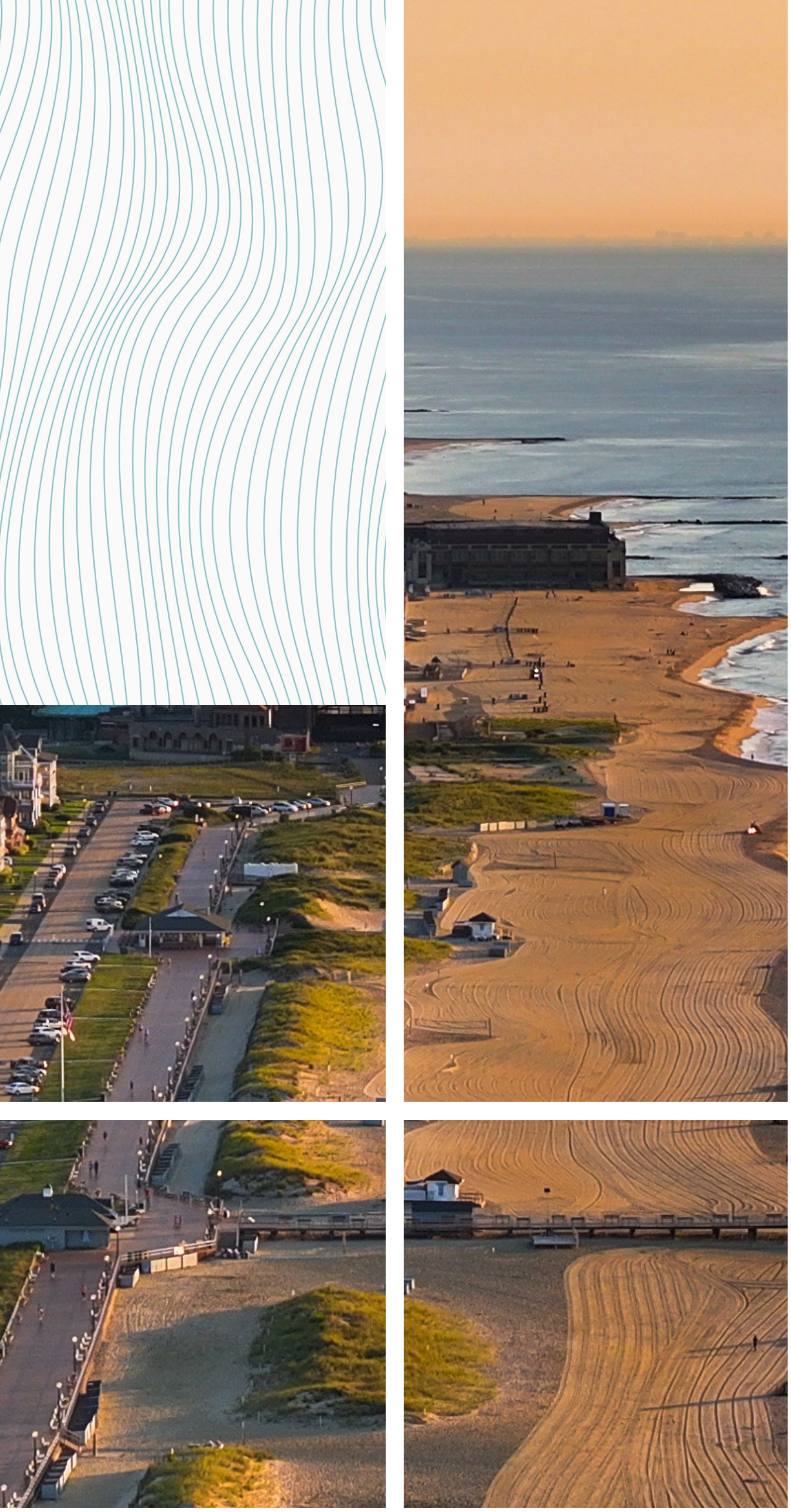
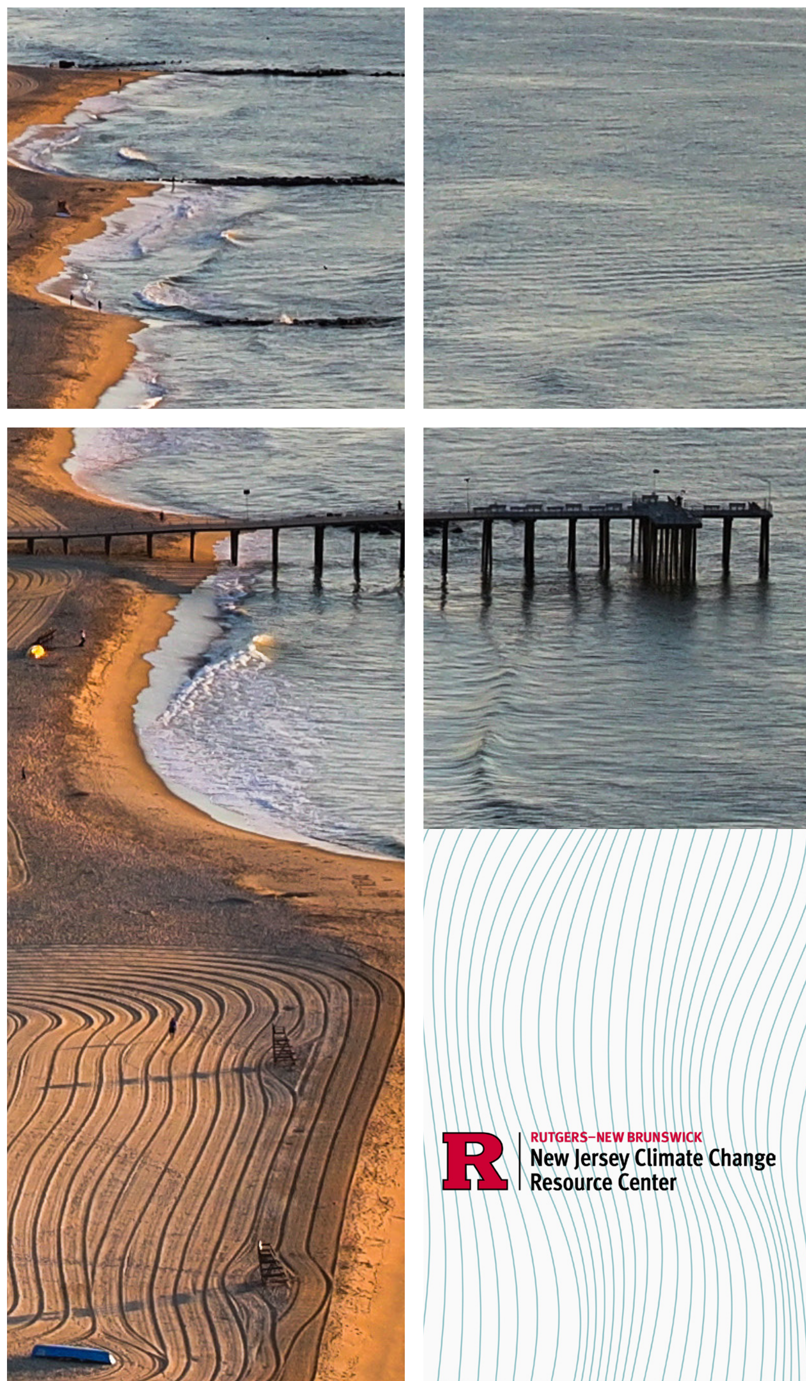
# New Jersey's Rising Seas and Changing Coastal Storms





## Report of the 2025 Science and Technical Advisory Panel

RUTGERS–NEW BRUNSWICK
New Jersey Climate Change Resource Center

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## Table of Contents

## Digital Appendix

The Digital Appendix is available at https://njclimateresourcecenter.rutgers.edu/resources/nj-sea-level-rise-reports/

## Glossary of Select Terms and Acronyms

Below are explanations of key terms and concepts used throughout this report. This Glossary of Select Terms and Acronyms is included per the recommendation of the Practitioner Panel. Please also see Box 2.1 for an overview of the terms used to quantify uncertainty in scientific data (the treatment of uncertainty in this report is explored in greater detail in Section 4b).

- **AR6 –** The Intergovernmental Panel on Climate Change's 2021 Sixth Assessment Report (AR6).
- **Baselines –**
  - A sea-level rise baseline is the reference point, or starting elevation, used to measure and project future changes in sea level. This reference point is also called a datum. For example, a baseline called the National Tidal Datum Epoch (NTDE) provides a benchmark used by federal, state, and local governments as a reference for elevation to compare water levels for mapping, floodplain management, coastal planning, research, and more.
  - The current NTDE is based on average sea levels measured over 19 years (between 1983 and 2001), as utilized by the National Oceanic and Atmospheric Administration (NOAA), though NOAA expects to update this to use a new 19-year period (2002-2020) over the coming years. Measuring average sea levels over 19 years minimizes the effect of significant tidal range variations arising from the 18.6-year cycle in lunar gravitational pull on the ocean, as well as other variations (e.g., other tidal cycles, and variations caused by weather or seasons).
  - For sea-level rise projections, the AR6 and the 2025 New Jersey Science and Technical Advisory Panel on Sea-Level Rise and Coastal Storms (STAP) Report use a 2005 baseline (averaging over 1995-2014) while the 2019 STAP Report uses a 2000 baseline (averaging over 1991-2009). Readers need to subtract 0.1 ft (0.03 m) from any 2019 STAP estimate to have the same baseline used in the 2025 STAP Report. Table 4 provides conversions for other commonly used datums.
- **Coast –** The 2025 STAP Report focuses on the impacts of sea-level rise along New Jersey's coast. In this document, the "coast" means part of New Jersey that is affected by the tides. This includes parts of the following counties, listed from north to south: Bergen, Hudson, Union, Middlesex, Monmouth, Ocean, Atlantic, Cape May, Cumberland, Salem, Gloucester, Camden, Burlington and Mercer counties. Sea-level rise projections are reported in the 2025 STAP Report for the following locations, listed from north to south: The Battery, NY; Sandy Hook, NJ; Atlantic City, NJ; Cape May, NJ; and Philadelphia, PA. While this report does focus on the coast, the STAP recognizes that the coast is not an isolated system and can be impacted by upriver or upland areas (e.g., storms that impact inland areas may also have impacts on the coast).
- **Emission Scenario -**
  - A plausible representation of the future release of emissions of substances that absorb, emit, or reflect radiation (e.g., greenhouse gases [GHGs], aerosols). Each scenario is based on a coherent, internally consistent set of assumptions about driving forces affecting future

emissions (such as demographic and socio-economic development, technological change, energy and land use) and their key relationships.

  - Like the AR6, the 2025 STAP Report employs the Shared Socioeconomic Pathway (SSP) emission scenarios. The AR6's low (SSP1-2.6), intermediate (SSP2-4.5), and high (SSP3-7.0) greenhouse-gas trajectories correspond with median projected global warming of 1.8°C, 2.7°C, and 3.6 °C by 2100, respectively. Current analyses indicate that policy and technology trends as of 2024 are most consistent with the intermediate emissions scenario. For these reasons, this report uses 'low', 'intermediate', and 'high' labels in the same manner as AR6, distinct from the usage of the 2019 STAP report.

- **Global Mean Sea Level** - The average height of the ocean above the sea floor (i.e., the ocean-wide average of relative sea level).
- **High Coastal Water Levels** – There are several terms used in Section 5 of this report to describe high coastal water levels:
  - Coastal Flood Day – A day with at least one coastal flood event.
  - Coastal Flood Event – A flood that exceeds at least the minor flooding threshold.
  - High Tide Flood – A flood event that occurs without a storm.
  - Minor, Moderate and Major Flooding Thresholds – NOAA uses the terms 'minor,' 'moderate,' and 'major' flooding to describe how serious a flood is, no matter what causes it, like sea level rise, storms, or heavy rain. These terms help keep flood warnings consistent across the country (Sweet et al. 2018). Minor flooding is "more disruptive than damaging," moderate flooding causes damage, and major flooding is destructive (Sweet et al., 2018). Flood thresholds as defined by NOAA are unique to a given location. They are measured above Mean Higher High Water (MHHW) (the average of the highest daily tides over many years) relative to the NTDE for 1983-2001. Thus, these thresholds remain the same regardless of future rising sea levels. For example, the Atlantic City, NJ, flood thresholds are the derived flood thresholds of 1.8ft (minor flooding), 2.8ft (moderate flooding), and 4.0ft (major flooding) above MHHW (relative to the NTDE for 1983–2001)[1]. For additional information, see Section 5.
- **Intergovernmental Panel on Climate Change (IPCC)** – The IPCC is a United Nations body that assesses the scientific, technical, and socio-economic information related to climate change. The objective of the IPCC is to provide governments at all levels with scientific information that is policy relevant but not policy prescriptive. The IPCC does not conduct its own primary research. Instead, through assessments conducted by scientists who volunteer their time, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed. The IPCC's 2021–2023 Sixth Assessment Report (AR6) is, the latest

[1] In meters, these thresholds are: 0.55 m (minor flooding), 0.85 m (moderate flooding), 1.21 m (major flooding).

comprehensive climate report from the IPCC. It provides an authoritative text regarding the physical science of climate change (including sea-level rise) and its impacts. (IPCC 2021)

- **Italicized Text –** Consistent with the conventions developed by the IPCC, terms related to confidence, likelihood, and deep uncertainty that reflect assessments by the assessment panel (in this case, the STAP) and the IPCC are italicized. Terms are italicized to alert readers that these terms are not being used casually or in everyday language. They represent specific, defined terms for communicating quantifiable uncertainty and are based on a panel assessment.

- ***Low Confidence* and *Medium Confidence* –** See Boxes ES.1, ES.2, and 2.1 for a full definition. Below is an overview of the different ways *low* and *medium confidence* are used in the 2025 STAP Report:

  - Confidence terms (e.g., *very low, low, medium, high,* and *very high confidence*) are used by the IPCC to define the level of evidence and degree of agreement among scientists around scientific findings. In the context of sea-level rise projections, these terms are used to classify the strength of evidence regarding the timing and magnitude of the processes contributing to sea-level change. Confidence increases when there are multiple, independent lines of high-quality evidence and the agreement among lines of evidence is high.

  - In the case of sea-level rise projections, *low-confidence* processes can also be described as processes with potentially high impact but a poorly known likelihood of occurrence ("unknown likelihood, high-impact processes"). As noted by Fox-Kemper et al. (2021), in Antarctica, these processes include those that could drive "earlier-than-projected disintegration of marine ice shelves" and "the abrupt, widespread onset of marine ice sheet instability [or] marine ice cliff instability around Antarctica," as well as "faster-than-projected changes in the surface mass balance and discharge from Greenland."[2] These processes are on the frontier of scientific understanding. Because they have the potential to have a large impact on sea-level rise estimates, they can be important to consider in sea-level rise projections intended for protective risk management. For short-hand, we refer to these low-confidence processes as **"potential rapid ice-sheet loss processes."**

  - The STAP report, consistent with AR6, provides *low-confidence* projections that include these unknown-likelihood, high-impact processes, and *medium-confidence* projections that do not include them. The *low-confidence* and *medium-confidence* labels do not characterize the overall quality of the projections themselves but rather indicate whether the projections incorporate potential rapid ice-sheet loss processes in whose rate and magnitude there is currently *low confidence*.

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[2] As noted in Fox Kemper et al. (2021), "Higher amounts of GMSL rise before 2100 could be caused by earlier-than-projected disintegration of marine ice shelves, the abrupt, widespread onset of marine ice sheet instability and marine ice cliff instability around Antarctica, and faster- than-projected changes in the surface mass balance and discharge from Greenland. These processes are characterized by deep uncertainty arising from limited process understanding, limited availability of evaluation data, uncertainties in their external forcing and high sensitivity to uncertain boundary conditions and parameters. In a low-likelihood, high-impact storyline, under high emissions such processes could in combination contribute more than one additional [meter] of sea level rise by 2100. {9.6.3, Box 9.4}"

- **Processes Driving Sea-Level Change –** See Section 3.b.
- **Relative Sea Level –** The height of the sea surface relative to the height of the underlying land.

# SECTION 1. EXECUTIVE SUMMARY

The 2025 STAP report represents the findings of the third New Jersey Science and Technical Advisory Panel on Sea-Level Rise and Coastal Storms (STAP). The STAP was charged with identifying, evaluating, and summarizing the most current science on sea-level change (i.e., historic sea-level rise and projections of future sea-level rise) and changing coastal storms. The 17 expert members of the STAP convened between November 2024 and September 2025 to draft this report and revise it in response to independent review by four peer experts and feedback on its usability from a panel of practitioners.

As with previous STAP reports, this report aims to be policy-relevant, not policy-prescriptive. The report does not make recommendations about how decision makers should use projections. Such selections depend upon value judgments, such as the level of risk decision makers and impacted communities are willing to accept when planning their long-term resilience goals, as well as how decision makers and impacted communities choose to trade off the near-term costs of risk reduction and long-term sea-level risk. Readers may benefit from referring to Box ES.1. ES.2, and 2.1 to understand the process and terms used to aid decision makers and communities in these decisions.

Additionally, while the STAP Report does not assess what (e.g., infrastructure, properties) or who (e.g., communities) are impacted by sea-level rise, readers may find the information in this STAP Report useful to inform such impacts assessments.

The STAP recommends that scientists and practitioners review the estimates and information herein on a regular basis, not to exceed five years, including after the publication of any major global (e.g., Intergovernmental Panel on Climate Change) or national (e.g., National Climate Assessment) assessments related to sea-level rise and coastal storms relevant to New Jersey.

## a) Historical Changes in Sea Level, Storms, and Flooding

**Sea-level change:** Over the two millennia prior to the late nineteenth century, New Jersey sea-level rose at an average rate of about 0.5 ± 0.1 inches/decade (1.4 ± 0.2 mm/yr). Over this time period, global mean sea-level (GMSL) change was minimal; the New Jersey rise resulted from subsidence due to glacial isostatic adjustment (GIA, the ongoing response of the solid Earth to the end of the last ice age). Rates of sea-level rise in New Jersey and globally exceeded pre-industrial variability beginning in the late nineteenth century. From 1912 to 2021, sea-level rose 1.7 ± 0.1 inches/decade (4.2 ± 0.2 mm/yr) at the Atlantic City tide gauge, compared to a GMSL rise of 0.6 ± 0.1 inches/decade (1.5 ± 0.2 mm/yr). [Section 3.f]

From 1993 to 2021, sea-level rose 2.0 ± 0.4 inches/decade (5.0 ± 1.0 mm/yr) at the Atlantic City tide gauge, compared to a GMSL rise of 1.3 ± 0.1 inches/decade (3.2 ± 0.3 mm/yr). Of the observed rise in sea-level at Atlantic City, the largest driving factors are GIA (about 28%), global-mean thermal expansion (the expansion of the warming ocean; about 26%), the reduction of the amount of ice stored in glaciers and the polar ice sheets (about 24%), and ocean dynamic sea level change (changes in winds and currents, as well as the distribution of heat and salinity within the ocean; about 20%). [Section 3.f]

**Tropical Cyclones**: Tropical cyclones (TCs), including hurricanes, are rapidly rotating warm-core low pressure systems that begin over tropical oceans and vary in wind speed, size, and intensity.[3] TC frequency, including the frequency of major hurricanes, has increased in the North Atlantic since the 1980s (*high confidence*). The overall intensity that Atlantic TCs reach, and the rate at which they do so, has also increased in recent decades *(high confidence)*, though the relative role of various drivers (e.g., internal climate variability, increasing greenhouse gas concentrations, and decreasing aerosol emissions) for such intensity changes is unclear. The rainfall rate of tropical storms is increasing with global warming *(very high confidence)*. [Section 3.g]

**Extratropical Cyclones:** Extratropical cyclones (ETCs), called nor'easters along the US Atlantic coast, are large storms that form outside of the tropics and are typically larger than TCs and affect coastal New Jersey more frequently than TCs. As with TCs, the precipitation rate of ETCs is increasing (*very high confidence)*. However, there is *limited evidence* for long-term trends in ETC frequency, intensity, and trajectory. [Section 3.g]

**Coastal Flooding:** High coastal water levels, such as those associated with storms or extreme high tides, push water levels above the normal high tide mark (i.e., mean higher high water or MHHW). Coastal flooding in New Jersey has increased in frequency and magnitude over time due to sea-level rise (*very high confidence*). In the 1950s, Atlantic City experienced an average of less than one coastal flood day per year exceeding the NOAA minor flooding threshold (1.8 ft above the 1983–2001 MHHW for Atlantic City). Over 2007–2024, there were an average of twelve coastal flood days per year, with annual totals ranging between four coastal flood days in 2007 and an all-time high of 23 coastal flood days in 2024. [Section 5.a]

**Compound Flooding:** Flood mechanisms such as storm surge, river discharges, and extreme rainfall can often occur simultaneously or sequentially during a storm event and interact in ways that exacerbate overall flood hazard, resulting in a compound flood event. Compound flood events are becoming more common, and compound flood risks during hurricanes are especially high *(high confidence*). [Section 3.h]

[3] Intensity, when used in the context of TCs and ETCs, refers to the wind speed or minimum pressure of a TC or ETC.

**Box ES.1. Confidence Term Basics**

The STAP report includes confidence statements that are used to communicate the STAP's level of scientific certainty that key outcomes may occur (e.g., *low, medium, high, very high confidence*). These levels of confidence have been assigned by expert members of the STAP consistent with IPCC conventions and are based on the most current science and are a measure of (1) the type, amount, and quantity of scientific evidence and (2) the degree of agreement among lines of evidence.

Consistent with the conventions developed by the IPCC, these confidence terms are italicized. Terms are italicized to alert readers that these terms are not being used colloquially but because they represent specific, defined terms for communicating quantifiable uncertainty and are based on a panel assessment.

## b) Future Sea-Level Rise Findings

Consistent with the prior STAP reports, the STAP selected Atlantic City (with the longest established tide gauge in the state) as the tide gauge station to represent the New Jersey coast (Table ES-1). Relative to a 1995–2014 baseline, New Jersey coastal areas are *likely* (at least a 66% chance) to experience SLR of 0.7 to 1.3 ft (0.20 to 0.40 m) by 2040, and 0.9 to 1.7 ft (0.28 to 0.52 m) by 2050. Even considering potential contributions from unknown-likelihood, high-impact ice-sheet processes (i.e., potential rapid ice-sheet loss processes, see Box ES.2 and 2.1 for definition),[4] it is *extremely unlikely* (less than a 5% chance) that SLR will exceed 1.7 ft (0.52 m) by 2040 and 2.3 ft (0.71 m) by 2050. [Section 4.d]

While near-term SLR projections through 2050 exhibit only minor sensitivity to different emissions scenarios, SLR projections after 2050 increasingly depend on the pathway of future global greenhouse gas emissions. Relative to a 1995–2014 baseline:

1. Under a low-emissions scenario, consistent with the global goal of limiting warming to below 2°C above late nineteenth-century levels, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to see SLR of 1.3 ft to 2.3 ft (0.41 to 0.71 m) by 2070, and 1.8 ft to 3.3 ft (0.54 to 1.01 m) by 2100. Including potential rapid ice-sheet loss processes could extend these ranges to 2.5 ft (0.77 m) in 2070 and 3.7 ft (1.12 m) in 2100. Even considering such potential rapid ice-sheet loss processes, it is *extremely unlikely* (less than a 5% chance) that SLR in this scenario will exceed 3.2 ft (0.96 m) by 2070 and 5.1 ft (1.54 m) by 2100.

2. Under an intermediate-emissions scenario, approximately consistent with current global climate policies, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential

[4] We use the term 'potential rapid ice-sheet loss processes' to refer to processes whose study is at the forefront of scientific research and whose likelihood of occurrence is poorly known, but which have the potential to significantly increase the rate of ice-sheet mass loss. These processes include a "faster-than-projected disintegration of marine ice shelves and the abrupt, widespread onset of marine ice cliff instability and marine ice-sheet instability in Antarctica", as well as "faster-than-projected changes in both the surface mass balance and dynamical ice loss in Greenland" (Fox-Kemper et al., 2021). See Box ES.2 and 2.1 for further discussion.

rapid ice-sheet loss processes) to see SLR of 1.5 ft to 2.5 ft (0.46 to 0.76 m) by 2070, and 2.2 ft to 3.8 ft (0.67 to 1.17 m) by 2100. Including *potential* rapid ice-sheet loss processes could extend these ranges to 2.8 ft (0.86 m) in 2070 and 4.5 ft (1.36 m) in 2100. Even considering such ice-sheet processes, it is *extremely unlikely* (less than a 5% chance) that SLR will exceed 3.5 ft (1.07 m) by 2070 and 6.2 ft (1.88 m) by 2100.

3. Under a high-emissions scenario consistent with global emissions trends before the adoption of the Paris Agreement, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to see SLR of 1.6 ft to 2.6 ft (0.49 to 0.78 m) by 2070, and 2.6 ft to 4.3 ft (0.79 to 1.30 m) by 2100. Including potential rapid ice-sheet loss processes could extend these ranges to 3.0 ft (0.91 m) in 2070 and 5.2 ft (1.58 m) in 2100. Even considering such ice-sheet processes, it is *extremely unlikely* (less than a 5% chance) that SLR will exceed 3.9 ft (1.17 m) by 2070 and 7.5 ft (2.28 m) by 2100. [Section 4.d]

The 2025 STAP Report's projected *likely* ranges of SLR agree well with observed SLR between 2005 and 2020. For example, STAP projections of 0.25–0.51 ft (0.08–0.16 m) of sea-level rise between 1995–2014 and the 19-year period centered at 2020 (2011–2029) along the Jersey Shore compare to estimates of 0.31 ± 0.11 ft (0.09 ± 0.03 m) at Atlantic City, 0.33 ± 0.09 ft (0.10 ± 0.03 m) at Sandy Hook, and 0.37 ± 0.11 ft (0.11 ± 0.03 m) at Cape May. [Section 4.j]

This report's projections are also quite similar to those of the 2019 STAP Report when accounting for differences in emissions scenarios and the presentation of information regarding potential rapid ice-sheet loss processes (Box ES.1). For example, the *likely range* of projected sea-level rise for 2100 (relative to the 1995–2014), incorporating a representation of potential rapid ice-sheet loss processes, was 1.9–5.0 ft (0.58 – 1.52 m) according to the 2019 STAP report for its moderate warming (3.5°C) scenario and is 2.6–5.2 ft (0.79 – 1.58 m) for this report for the high emissions scenario (median warming of 3.8°C). [Section 4.h]

**Box ES.2. Differences in sea-level rise projections from the 2019 STAP report**

In addition to technical updates to modeling methodologies, the sea-level projections in this report differ from those in the 2019 STAP report in two main ways:

1. **Climate Scenarios:** The climate scenarios used in the report are updated from those in the 2019 STAP Report. The 2019 STAP Report provided sea-level rise projections for low, moderate, and high global warming scenarios (corresponding respectively with 2°C, 3.5°C, and 5.0°C of warming above pre-industrial levels by 2100). At the time of the 2019 STAP Report, independent assessments indicated that the then-current global policy and technology trends would lead to a median projected warming of around 3.3°C by 2100, consistent with the 2019 STAP Report's moderate warming scenario. This report employs the same Shared Socioeconomic Pathway (SSP) emission scenarios used by the Intergovernmental Panel on Climate Change's 2021 Sixth Assessment Report (AR6). The AR6's low (SSP1-2.6), intermediate (SSP2-4.5), and high (SSP3-7.0) greenhouse-gas trajectories correspond with median projected global warming of 1.6°C, 2.6°C, and 3.8°C by 2100, respectively. Current analyses indicate that policy and technology trends as of 2024 are most consistent with the intermediate emissions scenario. For these reasons, this report uses 'low', 'intermediate,' and 'high' labels in the same manner as AR6, distinct from the usage of the 2019 STAP. This report's 'high' emissions scenario aligns most closely with the 'moderate' warming scenario in the 2019 STAP report. [Sections 4.a, 4.h]

2. **Communication of Scientific Uncertainty:** The methodology used in this report to create sea-level rise projections is similar to that employed by AR6 and updated from that of the 2019 STAP. In addition to modeling updates, the two STAP reports differ in how they incorporate and communicate the effects of potential rapid ice-sheet loss processes (i.e., unknown-likelihood, high-impact processes that could rapidly accelerate ice-sheet mass loss in Antarctica or Greenland). The 2019 STAP Report included representations of these rapid ice-sheet loss processes in all sea-level rise projections. Consistent with AR6, this report provides sea-level rise projections that include these rapid ice-sheet loss processes and projections that do not. This allows users to choose between more protective projections that attempt to include unknown-likelihood, high-impact processes and less protective projections that exclude them. [Sections 4.b, 4.h]

To clarify, both the 2019 and 2025 STAP Reports incorporate ice-sheet loss in sea-level rise estimates (i.e., ice loss from melting ice sheets and calving), but each STAP Report differs in how potential rapid ice-sheet loss processes are included in sea-level rise estimates (i.e., a faster, accelerated rate of ice-sheet loss in Antarctica and Greenland that will cause additional sea-level rise).[5] These potential rapid ice-sheet loss processes are at the frontier of scientific discovery, and scientists are uncertain how much and how fast potential rapid ice-sheet loss may occur (magnitude and rate) [Sections 4.b, 4.h]

[5] As noted in Fox Kemper et al. (2021), these rapid-ice sheet loss processes include, "earlier-than-projected disintegration of marine ice shelves, the abrupt, widespread onset of marine ice sheet instability and marine ice cliff instability around Antarctica, and faster-than-projected changes in the surface mass balance and discharge from Greenland." For more information see the "Low Confidence" definition in this document's Glossary of Select Terms and Acronyms.

## c) Future Coastal Storms Findings

The proportion of very intense hurricanes (Category 4 and 5) will increase with warming, as will the rate at which TCs intensify (*high confidence*). However, there is mixed evidence regarding changes in the total number of North Atlantic TCs, and potential changes in TC trajectories, which complicates the link between TC intensification and coastal impacts. There is *very high confidence* that the rainfall rate of TCs will continue to increase with warming. Overall, there is *low confidence* regarding future changes in ETCs due to the limited body of evidence. [Section 6.a]

## d) Future Coastal and Compound Flood Hazards Findings

There is *very high confidence* that, even excluding changes to storm characteristics, future coastal flooding will be worse due to rising sea levels. [Section 6.b] Considering only the effects of future SLR (and its uncertainty) on flood events:

- It is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) that Atlantic City will experience between 29 and 148 coastal flood days (i.e., a high-water level greater than 4 feet above 1995–2014 mean sea level baseline at least one time during the 24-hour day) in a typical year around 2050. Note that this is the average number of coastal flood days per year and does not include the year-to-year variability, which will cause some years to have a number of flood events well above average.

- It is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) that Atlantic City will experience between 227 and 359 coastal flood days in a typical year by 2100. Including potential rapid ice-sheet loss processes could extend the upper end of the number of coastal flood days to daily coastal flood days.

- It is *extremely likely* (more than a 95% chance) that the average number of coastal flood days at Atlantic City in a typical year will exceed 130 by the year 2100. It is *likely* (at least a 66% chance in the absence potential rapid ice-sheet loss processes) that flooding will occur between 227 and 359 days a year in a typical year around 2100. [Section 5.b]

Changes in compound flooding depend on the changes in all the contributing flood drivers, with some being more uncertain than others. Overall, there is *very high confidence* that the frequency of compound flooding will increase due to the combination of SLR, increased rainfall rate, and changes in storm intensity with associated changes in the storm surge climate. [Section 6.b]

## e) Impacts of SLR and Coastal Storms Findings

SLR and storms have significant effects on the erosion, ecology, and hydrology of coastal environments. The future resilience of New Jersey's coastal environments will be shaped by how effectively planning and management approaches integrate process-based understanding, account for nature-based strategies, and consider the differing capacities of communities to adapt *(high confidence)*. [Section 7.e]

New Jersey’s shorelines will continue to experience significant erosion driven by SLR and storms, with patterns strongly influenced by local geomorphology and the extent of coastal engineering *(high confidence)*. Current levels of intervention may become economically unsustainable, particularly for lower-income communities. [Section 7.a]

Between 1993 and 2021, sea-level rose an estimated 5.0 ± 1.0 mm/yr (2.0 ± 0.4 inches/decade) in Atlantic City, NJ, which is near the maximum rate of SLR with which coastal wetlands may be able to keep pace.

SLR will cause saltwater intrusion in both groundwater and surface water *(high confidence)*. Barrier islands are expected to be particularly vulnerable, especially those that pump large volumes of groundwater. However, few studies have examined site-specific vulnerability to saltwater intrusion in the New Jersey Coastal plain, thus implying a *low confidence* in whether particular sites will experience saltwater intrusion over the near term (next 50 years). [Section 7.c]

SLR will raise coastal water tables, leading to more groundwater flooding (*high confidence)*, but there is *low confidence* as to which communities will be most impacted. [Section 7.d]

**Table ES-1. New Jersey SLR estimates for Atlantic City, NJ, above the 1995–2014 baseline (ft).** SLR estimates are grouped by emissions scenario and year with rows corresponding to different SLR projection probabilities. Banners across the full width of the table indicate which SLR projections include or exclude unknown-likelihood, high-impact processes that are on the frontier of scientific understanding (i.e., potential rapid ice-sheet loss processes). Table footnotes provide additional information regarding how to interpret this table.

| | Across Emissions Scenarios | | Low Emissions (SSP1-2.6) | | | Intermediate Emissions (SSP2-4.5) | | | High Emissions (SSP3-7.0) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Degrees of Warming (°C)†* | ***1.7*** *(1.3-2.5) °C Warming* | ***1.9*** *(1.3-3.1) °C Warming* | ***1.7*** *(1.3-2.4) °C Warming* | ***1.6*** *(1.2-2.3) °C Warming* | ***1.5*** *(1.1-2.3) °C Warming* | ***2.3*** *(1.8– 3.0) °C Warming* | ***2.6*** *(2.0-3.6) °C Warming* | ***2.8*** *(2.1-4.0) °C Warming* | ***2.8*** *(2.2- 3.5) °C Warming* | ***3.8*** *(3.0-5.0) °C Warming* | ***5.1*** *(3.9-7.0) °C Warming* |
| **Year** | **2040** | **2050** | **2070** | **2100** | **2150** | **2070** | **2100** | **2150** | **2070** | **2100** | **2150** |
| ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.5 | 0.7 | 1.1 | 1.3 | 1.7 | 1.2 | 1.8 | 2.5 | 1.3 | 2.1 | 3.2 |
| ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| > 83% Chance SLR Exceeds* | 0.7 | 0.9 | 1.3 | 1.8 | 2.3 | 1.5 | 2.2 | 3.1 | 1.6 | 2.6 | 3.9 |
| ~50% Chance SLR Exceeds | 1.0 | 1.3 | 1.8 | 2.4 | 3.5 | 1.9 | 2.9 | 4.5 | 2.0 | 3.3 | 5.5 |
| <17% Chance SLR Exceeds‡ | 1.3 | 1.7 | 2.3 | 3.3 | 4.9 | 2.5 | 3.8 | 6.3 | 2.6 | 4.3 | 7.7 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 1.4 | 1.9 | 2.5 | 3.7 | 5.8 | 2.8 | 4.5 | 12.0 | 3.0 | 5.2 | 16.2 |
| ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 1.7 | 2.3 | 3.2 | 5.1 | 9.4 | 3.5 | 6.2 | 17.9 | 3.9 | 7.5 | 20.2 |

* Projections that include unknown-likelihood, high-impact rapid ice-sheet loss processes in whose rate and magnitude there is *low confidence* are denoted with an asterisk (*). SLR projections with a >95% chance or >83% chance of being exceeded (i.e., the top two row of SLR estimates) are the same regardless of whether these potential rapid ice-sheet loss processes are included or excluded. The ~50% and <17% chance *likely* range rows do not incorporate these rapid ice-sheet loss processes.

‡ The likelihood of potential rapid ice-sheet loss processes falls somewhere between zero and one, but different experts have different opinions on where it falls within that range. Thus, other experts will disagree on where they draw the 'true' '<17% chance SLR exceeds' bound, but would agree that it falls between the 83rd percentile of projections excluding potential rapid ice-sheet loss processes (i.e., the "<17% chance‡" values) and the 83rd percentile of projections that incorporate potential rapid ice-sheet loss processes (i.e., the "<17% chance*" values). As such the "<17% chance*" projections can be considered within the extended *likely* range projections.

† Estimated degrees of atmospheric warming relative to late nineteenth century (1850–1900) levels provided for each year and emissions scenario using the format "median ($5^{th}$ – $95^{th}$ percentile range)." Values derived from the FaIR climate module within the FACTS 1.1. Estimated degrees of warming for 2040 and 2050 are reported using the format "median of the intermediate emissions scenario ($5^{th}$ percentile from SSP1-2.6 – $95^{th}$ percentile from SSP3-7.0).

**Additional Notes for Table ES1:**

- All SLR estimates are 19-year means of sea-level measured with respect to a 1995–2014 baseline centered on the year indicated in the third row of the table. Low (blue), intermediate (orange), and high (red) emissions scenarios above correspond to SSP1-2.6, SSP2-4.5, and SSP3-7.0, respectively.
- Near-term projections (through 2050) exhibit only minor sensitivity to different emissions scenarios (<0.1 feet for projections using *medium-confidence* processes [i.e., excluding rapid ice-sheet loss], <0.2 feet for projections using *low-confidence* processes [i.e., including rapid ice-sheet loss]). As such, these columns span the emissions scenarios used in the main body of this report (the low, intermediate, and high emissions scenarios).
- The STAP 2019 low scenario corresponds most closely to the 2025 STAP low scenario, the STAP 2019 moderate scenario corresponds most closely to the 2025 STAP high scenario, and the STAP 2019 high scenario corresponds most closely to the 2025 STAP very high scenario (found in Appendix B).
- Table 5 highlights: the *extremely likely* to be exceeded SLR to show the amount of SLR that is most likely to occur; the *likely* range to show what amount of SLR has at least a 66% chance of occurring consistent with AR6; the extended *likely* range to show the potential effects of rapid ice-sheet loss processes on SLR; and the *extremely unlikely* to be exceeded SLR to highlight the greatest SLR extent resulting from rapid ice-sheet loss processes.
- All SLR projections include the impact of ice-sheet loss (i.e., ice loss from melting ice sheets and calving). However, the projections designated to include rapid ice-sheet loss processes incorporate the potential impact of processes in Antarctica and Greenland that could further accelerate ice-sheet loss.

# SECTION 2. INTRODUCTION

## a) The Charge/Statement of Purpose

This document (hereafter the "2025 STAP report") represents the findings of the third New Jersey Science and Technical Advisory Panel on Sea-Level Rise and Coastal Storms (STAP). This STAP was convened by Rutgers University on behalf of the New Jersey Department of Environmental Protection (NJDEP). It follows two prior STAPs. The first STAP was convened in 2015 by Rutgers University on behalf of the New Jersey Climate Change Alliance and culminated in a 2016 report that identified planning options for practitioners to enhance the resilience of New Jersey's people, places, and assets to SLR, coastal storms, and the resulting flood risk (Kopp et al., 2016). The second STAP was convened in 2019 by Rutgers on behalf of the NJDEP and culminated in a 2019 report, which updated the 2016 report based on the most current scientific information (Kopp et al., 2019). Similar to the previous two STAPs, the third STAP was charged with identifying and evaluating the most current science on sea-level change and changing coastal storms. Specifically, the STAP was charged with reaching consensus on the following questions:

1. **Historical Changes in Sea Level and Storms:** How much has sea level risen in New Jersey, and what has driven these changes? How have high tide flooding, tropical cyclones, and extratropical cyclones changed historically?

2. **Future Sea-Level Rise:** What is the range of future estimates of sea-level rise (SLR) for New Jersey? How probable are different estimates of SLR for New Jersey?

3. **Future Storms:** How are coastal storm characteristics and impacts projected to change in New Jersey and the Atlantic Basin?

4. **Flood Hazards:** What are the estimated changes in flood hazards for New Jersey from coastal storms and SLR, and how probable are those estimates? Including:

    - How will different estimates of SLR and changes in storms impact the frequency with which communities experience coastal flooding and compound coastal/rain-driven flooding from storm events in New Jersey?

    - How will different estimates of SLR impact the frequency with which communities experience coastal flooding events in New Jersey?

    - How will coastal storms and SLR impact coastal erosion, coastal wetlands, and saltwater intrusion in New Jersey?

5. **Scientific Uncertainty:** How can efforts to apply current science recognize scientific uncertainties and the ongoing nature of scientific learning, and how often should stakeholders reassess advances in scientific information for the purposes of applying the latest science into practice?

## b) Producing this Report

This document was produced through a rigorous collaboration among scientists, practitioners, and reviewers. First, the STAP compiled and assessed information and data published or pending publication in peer-reviewed journals as of September 2025. Next, the STAP summarized its findings in a draft STAP report which was subsequently reviewed by four independent expert reviewers. The expert reviewers (1) assessed the evidence and arguments presented in the draft STAP report and (2) determined whether the science presented was sound and fully responsive to the STAP's charge. Expert reviewers were asked to follow guidelines based on the National Academy of Sciences policies and procedures regarding the review of reports (NAS 2025) to ensure the STAP report:

1. Responds to all aspects of the project scope but does not go beyond it;
2. Has evidence, analysis, and arguments to support its conclusions;
3. Acknowledges when there are uncertainties or incompleteness in the evidence;
4. Acknowledges if any conclusions are based primarily on value judgments or the collective opinion of the STAP authors, and if so, gives adequate reasons for reaching those judgements;
5. Maintains a tone of impartiality, considers alternative viewpoints, avoids advocacy, and treats sensitive issues with care; and,
6. Is clear and easy to understand, and communicates its key messages effectively, especially in the Executive Summary.

The draft STAP report was then reviewed by a panel of practitioners (hereafter "Practitioner Panel") to offer insights on applying the STAP science to State and local planning and decision-making. The Practitioner Panel's input was considered by the STAP and was incorporated into the final 2025 STAP report. This includes: the addition of the Glossary of Select Terms and Acronyms; a restructured sea-level rise table (Table ES.1) grouped by emissions scenario and with clear banners indicating whether potential rapid ice-sheet loss processes (see Box 2.1) were included in the sea-level rise projections; clearer communication of uncertainty; and more. Review Editors oversaw the scientific review and Practitioner Panel process to ensure the STAP's full consideration of the scientific reviewer and Practitioner Panel input for the final 2025 STAP report.

## c) How to Use this Document

Planners, engineers, elected officials, land managers, and other practitioners can use the 2025 STAP report to consider community asset exposure to various levels of flooding, such as permanent inundation, high-tide flooding, and compound flooding, both in the near- and long-term. Consistent with the recommendations of the Practitioner Panel, readers may benefit from plain language definitions of key terms to interpret the results in this STAP Report. These key terms can be found in the "Glossary of Select Terms and Acronyms" just after the Table of Contents for this report. A detailed explanation about Uncertainty Terms is included in Box 2.1 for additional context: Box 2.1 is an abridged version of the discussion of uncertainty terms in Section 4b of this report.

**Box 2.1. Uncertainty Terms Used in the 2025 STAP Report**

There is much that is very well known about climate change; for instance, it is an unequivocal fact that Earth's surface is being heated by greenhouse gases emitted by human activities, and that global-mean sea level is also rising as a consequence. But as with all science, different processes are understood with different degrees of certainty and uncertainty. Correctly characterizing uncertainty is essential to accurate scientific communication and to inform risk management.

Following conventions established by the IPCC, this report distinguishes two types of uncertainty: confidence and likelihood (Mastrandrea et al., 2010). Confidence is a qualitative measure of the amount and degree of agreement among different lines of evidence (e.g., observations, experiments, theories, models, statistics) for a conclusion (Figure BX1). *High confidence* conclusions have a robust, diverse body of evidence with a high degree of agreement, while *low confidence* conclusions are characterized by a limited amount of evidence and/or a low degree of agreement among lines of evidence. Well-established science is associated with *high confidence*, while the frontier of scientific discovery is generally associated with *low confidence*.

Likelihood is a quantitative measure of how probable a conclusion is. In IPCC terminology, a conclusion is *likely* if there is at least a 2-in-3 chance of it being true, and *very likely* if there is at least a 9-in-10 chance of it being true (Table BX1)

In the context of SLR, the IPCC identified many contributing processes with rates and magnitudes that can be projected with *medium* or *high confidence*, and these processes are reflected in the IPCC's projections of future *likely* SLR. The IPCC also identified a suite of scientifically contested ice-sheet processes, with potential rates and magnitudes characterized by *low confidence*. Because of the limited agreement among lines of evidence regarding the rates and magnitudes of these processes within published literature, their likelihood is poorly known.

High-end sea-level outcomes associated with these processes were called "low-likelihood, high-impact outcomes" by IPCC AR6, but subsequent authors have suggested that they would be more clearly referred to as "unknown-likelihood, high-impact outcomes," since their likelihood is not known to be low, but rather is poorly known altogether (Lempert et al., 2024; Kopp et al., 2025). We adopt this convention herein.

The type of uncertainty associated with *low confidence* processes and unknown-likelihood, high-impact outcomes is sometimes called deep uncertainty, which the IPCC (following Lempert et al., 2003) defines as a situation in which "experts or stakeholders do not know or cannot agree on: (1) appropriate conceptual models that describe relationships among key driving forces in a system, (2) the probability distributions used to represent uncertainty about key variables and parameters and/or (3) how to weigh and value desirable alternative outcomes."

**Box 2.1. Uncertainty Terms Used in the 2025 STAP Report (continued)**

In an unknown-likelihood, high-impact future, the IPCC notes the potential for "faster-than-projected disintegration of marine ice shelves and the abrupt, widespread onset of marine ice cliff instability (MICI) and marine ice-sheet instability (MISI) in Antarctica", as well as "faster-than-projected changes in both the surface mass balance and dynamical ice loss in Greenland" (Fox-Kemper et al., 2021; Fricker et al., 2025). We also refer to these phenomena herein as "potential rapid ice-sheet loss processes."

Note that the IPCC does not ascribe low likelihood to *low-confidence* processes; rather, the likelihood of these processes are described as deeply uncertain and poorly known. Accordingly, the IPCC does not provide *likely* ranges considering all processes contributing to sea-level change – the IPCC's likely projections include only processes characterized by at least *medium confidence*. Some experts might judge the likelihood of *low-confidence* processes to be very low and thus take the IPCC *medium confidence* likely ranges as assessments of likely sea-level change in total; other experts, judging the likelihood of *low-confidence* processes to be higher, might take the IPCC *medium confidence* likely range as lower bounds of likely sea-level change. This discussion of uncertainty is continued in Section 4b.

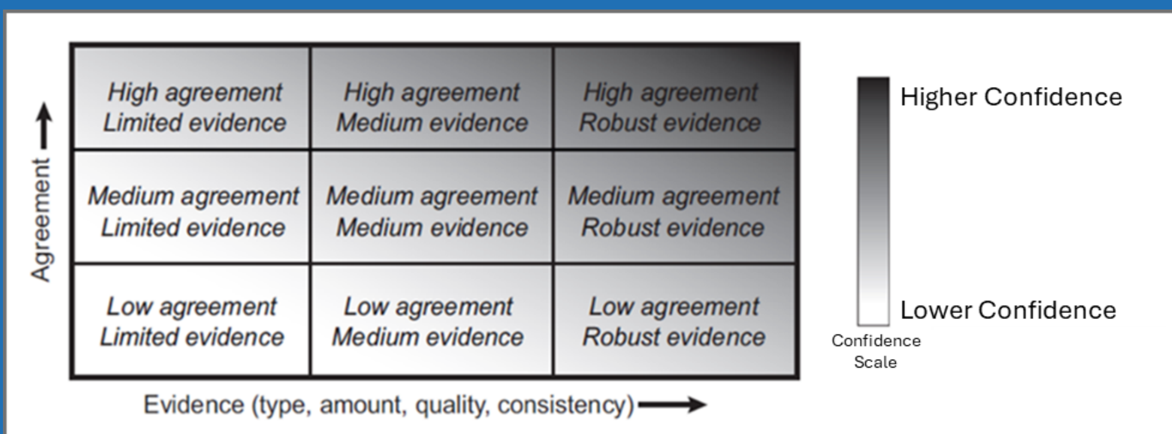


**Figure BX1.** The IPCC schematic describing the different levels of confidence associated with differing degrees of evidence and agreement among lines of evidence. Confidence increases toward the top-right corner, as reflected by the darker shading. (Modified from Mastrandrea et al., 2010).

**Table BX1.** The likelihood scale used by the IPCC and by this report to help readers interpret the probability of an event or broader outcome occurring. (Modified from Mastrandrea et al., 2010).

| Term | Likelihood of the Outcome |
|---|---|
| *Virtually certain* | 99–100% probability |
| *Extremely likely* | 95–100% probability |
| *Very likely* | 90–100% probability |
| *Likely* | 66–100% probability |
| *More likely than not* | 50–100% probability |
| *About as likely as not* | 33–66% probability |

# SECTION 3. FACTORS CONTRIBUTING TO CHANGES IN SEA LEVEL AND COASTAL STORMS

## a) Introduction

The report analyzes two critical drivers of future coastal hazards facing New Jersey residents: changing local relative sea levels and changing coastal storms. Scientists use knowledge about past changes in sea level and coastal storms to contextualize and help project future changes in sea level and coastal storms. Section 3 provides (1) an overview of concepts and terminology used to describe factors that contribute to changes in sea level and coastal storms (Section 3.b), (2) an overview of the latest published science regarding historical changes in sea level and coastal storms in New Jersey (Sections 3.c, 3.d, 3.g), and (3) a sea-level rise (SLR) budget generated by the STAP that incorporates the latest science and the STAP's expert assessment of the drivers of SLR over time in New Jersey (Section 3.f).[6]

Section 3 describes two types of SLR: **global mean sea-level (GMSL) change** and **relative sea-level (RSL) change**. GMSL change is the change in the global-average height of the ocean relative to the sea floor. It is free of spatial redistribution processes that appear in regional sea levels, such as wind and ocean circulation changes. It is determined by the volume of water in the ocean and is measured as the area-weighted mean of RSL change over the connected surface area of the ocean, including areas covered by sea ice and ice shelves (Gregory et al., 2019). GMSL change provides a useful metric for summarizing the effects of those processes that change sea level all around the world. RSL change is a measure of the change in local sea level. RSL change is the change in local mean sea level relative to the local land surface over a period of time (Gregory et al., 2019). RSL change is the metric that is most directly relevant to the coastal impacts of SLR and adaptation thereto.

## b) Overview of Processes Driving Sea-Level Change

GMSL change and RSL change are determined by several factors (Gregory et al., 2019; Fox-Kemper et al., 2021). Global factors, discussed in greater detail in Section 3.c, include:

1. Thermal expansion of ocean water.
2. Land ice mass loss from glaciers and ice sheets.
3. Changes in terrestrial water storage.

[6] Section 3 of the 2025 STAP report keeps language from the previous edition (2019) of the report where the current science is consistent with the 2019 edition. Where the science is not consistent, the language has been modified as necessary. The authors would like to acknowledge the authors of the 2019 edition for their contribution to this work as listed in Kopp et al. (2019).

Beyond these global factors, additional factors also impact RSL change in New Jersey. These regionally important factors, discussed in greater detail in Section 3.d, include:

1. Glacial isostatic adjustment (GIA), which is the ongoing adjustment of the solid Earth to the loss of the North American ice sheet at the end of the last ice age.

2. Vertical land motion (VLM) due to natural sediment compaction and human-caused groundwater withdrawal.

3. Ocean dynamic sea-level (DSL) changes due to changes in ocean and atmosphere circulation, temperature, and salinity.

4. Gravitational, rotational, and deformational effects (GRD), which are changes in the height of Earth's gravitational field and crust associated with the large shifts of mass from land ice or land-water reservoirs to the ocean. For New Jersey, GRD diminishes the effect of the Greenland ice sheet and Arctic glacier melt and increases the effect of Antarctic ice-sheet melt.

5. Inverse barometer effects (IB), which are changes in the ocean's surface due to variations in atmospheric pressure above sea level. IB typically expresses as a 0.03 ft (~1cm) SLR to a 1hPa drop in sea-level pressure.

## c) Overview of Published Science on Global Mean Sea-Level (GMSL) Change

The IPCC AR6 assessed that, over 1900–2018, GMSL rose at a rate of 0.7 ± 0.2 inches/decade (1.7 ± 0.5 mm/yr) (Fox-Kemper et al., 2021), with human-caused climate change from atmospheric warming being the dominant driver since at least 1970 (Oppenheimer et al., 2019). The rate of GMSL rise, as measured using both tide gauges and satellite observations, has been accelerating since the 1960s (Dangendorf et al., 2019). The average rate of GMSL rise over 1993–2024 was about 1.3 ± 0.2 inches/decade (3.3 ± 0.4 mm/yr), and it has accelerated from 0.8 ± 0.4 inches/decade (2.1 ± 1.0 mm/yr) in 1993 to 1.7 ± 0.4 inches/decade (4.5 ± 1.0 mm/yr) in 2024 (Hamlington et al., 2024). The three major processes contributing to GMSL change on human timescales are thermal expansion, land ice mass loss, and changes in terrestrial water storage.

1. **Thermal expansion**, also known as global-mean thermosteric SLR, is the increase in the volume of seawater that occurs because of ocean warming. AR6 assessed that, over 1993–2018, it was responsible for about 46% of observed GMSL rise (about 0.5 ± 0.1 inches/decade [1.3 ± 0.4 mm/yr]; Fox-Kemper et al., 2021).

2. **Land ice mass loss** *(from ice sheets and glaciers)* increases GMSL when ice sheets and glaciers lose more mass via melting than they accumulate and when ice breaks off and flows into the ocean as icebergs. Note that this volume addition does not include the parts of ice shelves or glacier tongues whose weight is supported by the ocean rather than the land (Gregory et al., 2019).

   AR6 assessed that mountain glaciers are currently responsible for about 19% of observed GMSL rise (0.2 ± 0.1 inches/decade [0.6 ± 0.2 mm/yr]; Fox-Kemper et al., 2021). (Note: these values will differ depending on whether experts include Greenland peripheral glaciers as part of the ice sheet.)

The rates of Greenland ice-sheet and Antarctic ice-sheet loss have increased over the past decades (e.g., Harig & Simons, 2012, 2015; Shepherd et al., 2012; Mouginot et al., 2019; Rignot et al., 2019). The Greenland ice sheet was approximately stable in the 1970s (Mouginot et al., 2019) and has been shrinking at an accelerating rate since then due to warming Arctic temperatures (with it and its peripheral glaciers contributing about 15% of observed GMSL rise (0.1 ± 0.03 inches/decade [0.4 ± 0.1 mm/yr] over 1993–2018; Fox-Kemper et al., 2021) (Mouginot et al., 2019). The Antarctic ice sheet and its peripheral glaciers, whose loss is also accelerating (Rignot et al., 2019), contributed to GMSL at a rate of 0.1 ±0.04 inches/decade (0.3 ± 0.1 mm/yr) (about 9% of observed GMSL rise) from 1993–2018 (Fox-Kemper et al., 2021). [7]

Since about 2020, total Antarctic ice-sheet mass loss has slowed, with notable mass gain occurring in the year 2022 as a result of high snowfall (Wang et al., 2025). However, this short-term slowdown does not necessarily reflect a long-term trend. Total Antarctic mass trends reflect a balance between areas that are losing mass at an accelerating rate due to ocean-ice interactions and areas that are gaining mass due to increasing snowfall. The potential for rapid acceleration in ice loss due to ocean-ice interactions can greatly outpace the accumulation effect of increasing snowfall.

Antarctic mass loss is currently localized near the ice sheet margins of West Antarctica, particularly the Amundsen Sea Sector. Marine-based sectors like the Amundsen Sea Sector are subject to dynamic instability (e.g., Schoof, 2007), and some evidence suggests that parts of the West Antarctic ice sheet may already be committed to long-term retreat (Joughin et al., 2014; Rignot et al., 2014). Gravitational instability of marine ice cliffs (i.e., calving of icebergs at marine-terminating ice fronts) may also accelerate future mass loss of the West Antarctic Ice Sheet and some parts of the East Antarctic Ice Sheet (DeConto et al., 2021), though the importance of this process remains scientifically contested (e.g., Bassis et al., 2021; Crawford et al., 2021; Schlemm et al., 2022; Morlighem et al., 2024). On centennial timescales, the behavior of the marine-based sectors of the Antarctic ice sheet are the dominant source of uncertainty in GMSL rise projections (Kopp et al., 2014; WCRP Global Sea Level Budget Group, 2018).

3. **Terrestrial water storage** is water on land in the form of surface water (e.g., in lakes, rivers, and reservoirs), groundwater, soil moisture, snow, and permafrost (Gregory et al., 2019). Changes in terrestrial water storage are caused by natural variability in the amount of water stored in lakes, as well as from the filling of dams (driving GMSL fall) and groundwater extraction (driving rise). AR6 assessed that changes in land-water storage contributed about 0.12 ± 0.07 inches/decade (0.3 ± 0.2 mm/yr) to GMSL rise over 1993–2018, about 11% of the observed rise (Fox-Kemper et al., 2021).

[7] Percentages are IPCC AR6 estimates based on central estimate contributions compared to the central estimate of the sum of contributions, not compared to observed GMSL change.

## d) Overview of Published Science on Relative Sea-Level (RSL) Change in New Jersey

Sea level is not changing at the same rate at all points around the globe. The factors affecting RSL change can be divided into three categories: (1) those affecting GMSL, discussed above; (2) those affecting the height of the sea surface relative to a globally uniform change; and (3) those affecting the height of the solid Earth (i.e., causing vertical land motion) (e.g., Kopp et al., 2015; Gregory et al., 2019). The latter two categories of factors affecting RSL change are discussed in greater detail below:

1. **Glacial isostatic adjustment (GIA)** arises from the ongoing, multi-millennial response of Earth's mantle to past glaciations. Twenty thousand years ago, the Laurentide ice sheet covered much of North America, extending as far south as northern New Jersey. The Laurentide ice sheet reached its maximum extent from 27,000 to 20,000 years ago, covering the northern tier of North America, extending as far south as northern New Jersey. Between about 20,000 and 7,000 years ago, this giant ice sheet melted during the termination of the ice age. GIA is caused by the ongoing, viscous redistribution of mantle mass due to past changes to the load of ice mass on the Earth's surface (Gregory et al., 2019). Like GRD effects arising in response to contemporary changes in land ice, GIA affects both the height of the solid Earth and Earth's gravitational field and rotation (and thus the height of the sea surface). The land under the former cores of shrunken ice masses rebounds upward as displaced mantle material returns underneath, lowering RSL. Land at the periphery of former ice sheets (that was raised high as a bulge while the ice sheet depressed neighboring land downwards) subsides, again due to the migration of mantle mass to the previously depressed region (raising RSL). New Jersey, which sits on the former peripheral bulge of the Laurentide Ice Sheet, is currently experiencing GIA-associated subsidence, associated with SLR at a rate of about 0.5 ± 0.1 inches/decade (1.4 ± 0.2 mm/yr) (e.g., Walker et al., 2021).

2. **Vertical Land Movement**. Other factors aside from GIA can also contribute to vertical land motion (VLM), including tectonics and sediment compaction (Shirzaei et al., 2020). In the New Jersey region, tectonic subsidence and uplift are minimal, but sediment compaction can be a significant factor. Sediment compaction affects the height of the solid Earth in areas located on unconsolidated sediments, such as the mid-Atlantic Coastal Plain (as opposed to bedrock, such as that on which Manhattan sits). Compaction occurs naturally due to mass loading due to the mass of sediments and water. Since the early 20th century, it has been substantially enhanced along the Jersey Shore by groundwater withdrawal; pumping water from aquifers can cause rapid subsidence due to decreased pore pressures allowing compaction to shrink the void space between sediment grains (Hamlington et al., 2020). Over the 20th century, natural and anthropogenic subsidence typically contributed around 0.4 inches/decade (1 mm/yr) of SLR along the New Jersey coastal plain, but the anthropogenic component varies over space and time (Miller et al. 2013; Johnson et al., 2018).

3. **Ocean dynamic sea-level (DSL)** change affects only the height of the sea surface. It arises from ocean-atmosphere interactions and from ocean circulation changes that alter ocean density and the distribution of mass in the ocean (Gregory et al., 2019). DSL exhibits rich spatiotemporal variability associated with both anthropogenic climate change and natural climate modes.

Studies of observed DSL change in the early 2010s focused on an observed regional "hotspot" of sea-level acceleration in the U.S. Northeast, beginning in about 1975 (e.g., Ezer & Corlett, 2012; Sallenger et al., 2012; Andres et al., 2013; Kopp 2013Various drivers were suggested to be related to Gulf Stream variability and/or changes in alongshore wind stress (Andres et al., 2013; Ezer et al., 2013; Yin and Goddard, 2013). However, more recently, the regional hot spot of acceleration has diminished, while the southeast US coast has experienced SLR rates of up to five times the global mean, far larger than New Jersey (e.g., Valle-Levinson et al., 2017; Domingues et al., 2018; Dangendorf et al., 2023). The long timescales of internal variability hinder the identification of the causal drivers of observed decadal to multidecadal "hotspots" (Kopp et al., 2015). Most recent analyses have related DSL variability and the differences between locations north and south of Cape Hatteras to a combination of spatially varying wind and buoyancy forcing (Wang et al., 2024), both of which may be linked to climate modes, including the North Atlantic Oscillation, Atlantic Multidecadal Variability, and El Niño Southern Oscillation (e.g., McCarthy et al., 2015; Valle-Levinson et al., 2017; Gehrels et al., 2020).

Future changes in in the position and strength of the Gulf Stream associated with 21st century climate changes and weakening of the Atlantic Meridional Overturning Circulation (AMOC) may significantly influence DSL along the coast of New Jersey (Yin et al., 2009; Yin & Goddard, 2013; Fox-Kemper et al., 2021), with some models projecting >1 ft (30 cm) of DSL rise over the course of the century. Indeed, tide gauge observations have found that AMOC influences the frequency of flood events in the northeast (Zhang et al., 2025). However, the spatial pattern and amplitude of DSL change associated with AMOC weakening varies widely across climate models. The connection between future changes and observed decadal to multidecadal variability, and their underlying drivers, is currently unclear (Little et al., 2019). DSL thus remains a major contributor to uncertainty in 21st-century sea-level changes in the U.S. Northeast (Kopp et al., 2014), which also hampers the early detection of long-term accelerations (Sallenger et al., 2012; Haigh et al., 2014; Dangendorf et al., 2023).

4. **Gravitational, rotational, and deformational (GRD) effects,** arising in response to the shifting of mass between land ice, terrestrial water storage, and the ocean, affect both the height of the sea surface and the height of the solid Earth (Gregory et al., 2019). The movement of mass from land ice into the ocean deforms the Earth's gravitational field, reducing gravitational pull, and thus sea level near a shrinking ice sheet and increasing sea level farther away from the ice sheet. It also deforms the Earth's crust and alters the planet's rotation (Gregory et al., 2019). These processes cause the regional expression of SLR associated with land ice mass loss to differ, sometimes substantially, from the global mean. Near a melting ice sheet, SLR is suppressed relative to GMSL change, with an RSL fall occurring in those areas within ~2000 km of the ice sheet. Distant from a melting ice sheet, SLR is enhanced relative to GMSL. For example, along the Jersey Shore, the SLR associated with Greenland Ice Sheet melt is ~50% of the global mean, while that associated with West Antarctic Ice Sheet melt is ~120% of the global mean, and that associated with East Antarctic Ice Sheet melt is ~105% of the global mean (Mitrovica et al., 2011; Kopp et al., 2014). Loss of mass from southern Greenland causes less SLR in New Jersey than mass loss in northern Greenland (Mitrovica et al., 2018). Another GRD effect is from terrestrial water storage, where

water stored in lakes and by the filling of dams can locally depress the Earth's surface and gravitationally attract seawater to collectively increase SLR in New Jersey (Fiedler & Conrad, 2010).

5. **Inverse Barometer effects (IB)** affect the sea surface height in response to the load of atmospheric pressure on top of it. IB affects sea level particularly at high latitudes (Ponte 2006) where it can account for up to 40% of the inter-annual variance (Ponte 2006; Piecuch et al., 2016). IB affects linear trends particularly when based on short assessment periods up to a few decades (as opposed to long centennial or more extended periods) and in terms of spatial variability, where it accounts for 10-30% at centennial timescales (Piecuch et al., 2016). Along the U.S. northeast coast, IB has been demonstrated to account for ~25% of the interannual variance, 50% of the 2009–2010 extreme SLR event (Goddard et al., 2015), and ~10–30% of recent multidecadal accelerations (Piecuch et al., 2015).

Changes in RSL in New Jersey have been estimated on millennial timescales using geological data. Over the last five thousand years, the dominant long-term driver of SLR in New Jersey has been the sinking of the land as part of the ongoing GIA response to the disappearance of the North American ice sheet about 7000 years ago (Walker et al., 2022). Specifically, RSL in New Jersey rose by a total of about 28 ft (8.6 m) over the last 5000 years (Walker et al., 2022). Over 0–1700 CE, sea level rose at an average rate of about 6 inches/century (1.4 ± 0.2 mm/yr) (Walker et al., 2022). Rates of SLR in New Jersey began to increase in the late 1800s, reflecting a growing contribution from processes related to current, greenhouse gas-driven climate changes and anthropogenic subsidence (Miller et al., 2013; Walker et al., 2022). In particular, modern rates of SLR in New Jersey *very likely* emerged above pre-industrial rates of SLR during the 1880s (Walker et al., 2022). Geological and tide-gauge data demonstrate an increase over the 20th century of about 12 inches (about 3.1 mm/yr) (Walker et al., 2021).

## e) STAP Statistical Analysis Methods for Estimating Global and Local Sea-Level Budgets Using Published Science

Sea-level budget analyses aim to quantify the contribution of the SLR components (e.g., thermal expansion, GIA, VLM, etc.) to historical SLR. In other words, sea-level budgets seek to reconcile observed sea-level changes with the sum of their independently observed or modelled components found in published literature. The sea-level budget for GMSL changes has been closed (i.e., the sum of individual components agrees with the measured total) both over the altimetry era (i.e., since 1993) and since the beginning of the 20th century (Cazenave et al., 2018; Frederikse et al., 2020; Fox-Kemper et al., 2021). Recently, sea-level budget analyses have also been localized using a combination of observations and reanalysis models to describe the sum of independent contributions (Frederikse et al., 2016; Dangendorf et al., 2021; Harvey et al., 2021; Wang et al., 2021; Dangendorf et al., 2024).

The STAP has produced global and regional sea-level budgets based on the estimates from Dangendorf et al. (2024, SLR budgets available for 1900-2021) and in consideration of the published literature discussed in Sections 3.c and 3.d (Table 1). Dangendorf et al. (2024) created a global and regional sea-level reconstruction in which ensembles of component fields are used as prior information to construct globally consistent sea-level budgets constrained at a set of tide gauge records. The prior information in Dangendorf et al. (2024) came from state-of-the-art observational estimates of GRD (Frederikse et al., 2020; Fox-Kemper et al., 2021), IB, globally modelled GIA (Caron et al., 2018), and a reconstruction of global mean thermal expansion and DSL (jointly referred to as 'sterodynamic' sea-level change, Gregory et al., 2019) using residual signals at tide gauges and covariance information from satellite altimetry.

The STAP SLR budget analysis (1993–2021) used the components of GRD, IB, and sterodynamic sea level from Dangendorf et al. (2024). GIA was taken from local geological estimates from Walker et al. (2022), as indicated in Section 3.d. The analysis was extended temporally for thoroughness (1912–2021, Appendix G) and generally shows good agreement with other published estimates, both globally and locally. Results of this analysis are found in Section 3.f below.

## f) Sea-Level Budget for the Globe and New Jersey

Observed changes in sea level for New Jersey since the start of the Atlantic City tide-gauge record in 1912 show sea level in New Jersey is rising faster than GMSL (Figure 1). This is consistent with the geological record, which shows sustained relative sea-level rise in New Jersey over the last several millennia (Figure 2). Taken together, the tide-gauge record (Figure 1) and geological record (Figure 2) show the rates of New Jersey SLR have been generally increasing since about 1700 CE. Based on the available data, the STAP concludes:

1. Based on geological data, over the Common Era prior to the late nineteenth century, in New Jersey sea-level rose at an average rate of about 0.5 ± 0.1 inches/decade (1.4 ± 0.2 mm/yr). This rate is due to regional GIA (Walker et al., 2021). Over this time period, the GMSL change was minimal. Rates of sea-level rise in New Jersey, and globally, exceed pre-industrial variability beginning in the late nineteenth century.
2. From 1912 to 2021, sea-level rose 1.7 ± 0.1 inches/decade (4.2 ± 0.2 mm/yr) at the Atlantic City tide-gauge, compared to a GMSL rise of 0.6 ± 0.1 inches/decade (1.5 ± 0.2 mm/yr).
3. From 1970–2021, sea-level rose 1.9 ± 0.2 inches/decade (4.9 ± 0.6 mm/yr) along the New Jersey coast, compared to a GMSL rise of 0.9 ± 0.2 inches/decade (2.2 ± 0.5 mm/yr).

Assessing the different driving factors (i.e., the sea-level budget), provides crucial information about the current understanding of sea-level changes along the coast. It also helps distinguish between mitigable (e.g., those linked to human-induced climate change) and non-mitigable (e.g., glacial isostatic adjustment) contributions. The STAP assessed the driving factors of the observed changes in New Jersey sea level by estimating a sea-level budget for 1993–2021 (Table 1). From 1993 to 2021, sea-level rose 2.0 ± 0.4 inches/decade (5.0 ± 1.0 mm/yr) at the Atlantic City tide gauge, compared to a GMSL rise of 1.3 ± 0.1 inches/decade (3.2 ± 0.3 mm/yr). Of the observed rise in sea-level at Atlantic City, the largest driving factors are glacial isostatic adjustment (about 28%), global-mean thermal expansion (about 26%), the reduction of the amount of ice stored in glaciers and the polar ice sheets (about 24%), and ocean dynamic sea level change (changes in winds and currents, as well as the distribution of heat and salinity within the ocean; about 20%). These rates may vary somewhat spatially along the New Jersey coast.

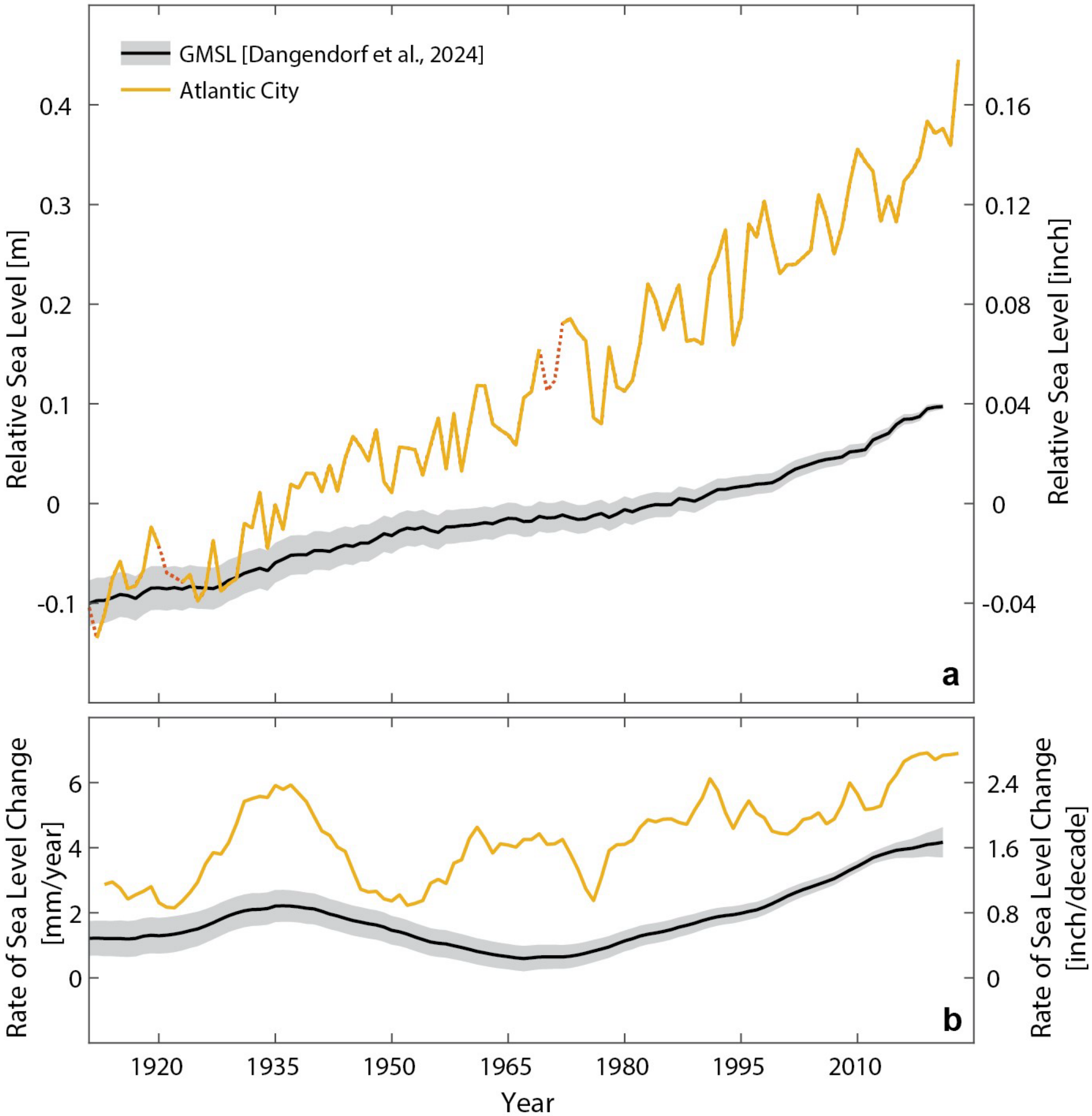


**Figure 1.** Comparison of (a) historical sea levels and (b) rates of sea-level change in Atlantic City, NJ and for global-mean sea-level change using recorded tide gauge data from Dangendorf et al. (2024). Atlantic City values in (a) were downloaded from NOAA Center for Operational Oceanographic Products and Services (CO-OPS) Water Levels Tool. 30-year rates for (b) were calculated using a Singular Spectrum Analysis with an embedding dimension of 15 (Moore et al. 2005) with gaps in tide gauge data filled using existing tide gauge reconstruction methods (Dangendorf et al., 2024). The shadings indicate the 1σ standard error of the nonlinear trend and the GMSL reconstruction, respectively. Values for additional tide gauges available in Figure C1. Data gaps (red dotted lines) have been filled for the period 1921–1922 and 1970–1971 for (a) using values from the sea-level reconstruction from Dangendorf et al. (2024). This was done solely to fit a nonlinear trend using the Singular Spectrum Analysis, which requires complete records.

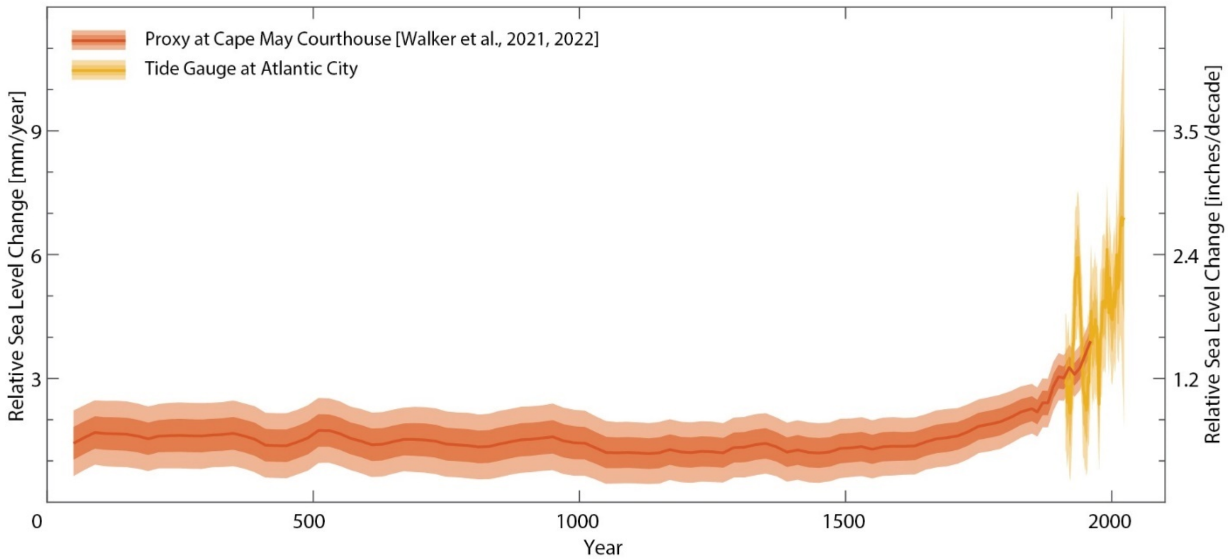


**Figure 2.** In orange, rates of SLR as obtained by a spatiotemporal model from Walker et al. (2022) using data from a Common Era proxy reconstruction from Cape May Courthouse (Kemp et al., 2013) with centennial-scale trends at 10-year intervals from 0 to 1960. In yellow, 30-year rates of SLR inferred from the annual tide gauge record at Atlantic City using a Singular Spectrum Analysis with an embedding dimension of 15. Uncertainties are shown as 68% and 95% confidence intervals, as represented by the shadings.

**Table 1.** Assessed sea-level budget for 1993–2021 (mm/yr and inches/decade).

| | Global Mean Sea Level (mm/yr) | Relative Sea Level at Atlantic City (mm/yr) | Global Mean Sea Level (inches/decade) | Relative Sea Level at Atlantic City (inches/decade) |
|---|---|---|---|---|
| **Total Observed** | 3.2 ± 0.3 | 5.0 ± 1.0 | 1.3 ± 0.1 | 2.0 ± 0.4 |
| | | | | |
| **Global-mean thermal expansion** | 1.3 ± 0.3 | 1.3 ± 0.3 | 0.5 ± 0.1 | 0.5 ± 0.1 |
| **Ocean dynamic sea level** | - | 1.0 ± 0.4 | - | 0.4 ± 0.2 |
| **Inverse barometer effects** | - | -0.3 ± 0.3 | - | -0.1 ± 0.1 |
| **Glaciers** | 0.7 ± 0.1 | 0.6 ± 0.1 | 0.3 ± 0.04 | 0.2 ± 0.04 |
| **Greenland Ice Sheet** | 0.7 ± 0.1 | 0.2 ± 0.1 | 0.3 ± 0.04 | 0.1 ± 0.04 |
| **Antarctic Ice Sheet** | 0.3 ± 0.1 | 0.4 ± 0.1 | 0.1 ± 0.04 | 0.2 ± 0.04 |
| **Terrestrial Water Storage** | 0.3 ± 0.2 | 0.2 ± 0.1 | 0.1 ± 0.1 | 0.1 ± 0.04 |
| **Glacial isostatic adjustment** | - | 1.4 ± 0.2 | - | 0.6 ± 0.1 |
| **Residual (likely local VLM)** | - | 0.4 ± 0.8 | - | 0.2 ± 0.3 |

## g) Changing Coastal Storm Characteristics

Communities throughout New Jersey are susceptible to various coastal storm hazards, including those from both tropical cyclones (e.g., tropical storms and hurricanes; TCs) and extratropical cyclones (e.g., nor'easters; ETCs). As our planet has warmed, the characteristics of these storms and the hazards they present have evolved. The STAP deliberations focused on four aspects of the changing characteristics of TCs and ETCs: frequency, intensity, precipitation, and trajectories. Below is an assessment of the most updated science regarding these changing characteristics for both TCs and ETCs.

Regarding TCs:

1. **Frequency:** TC frequency in the Atlantic has unambiguously increased since the 1980s (e.g., Landsea et al., 2008; Klotzbach et al., 2008, 2011; Vecchi & Knutson, 2008; 2011; Villarini et al., 2010). However, once known observing system changes are accounted for, there are no significant trends in TC frequency since the late 19th or early 20th century, with the record dominated by multidecadal fluctuations and a pronounced decrease in frequency between the 1950s and 1980s (Landsea et al., 2008; Vecchi and Knutson 2008, 2011; Villarini et al., 2010; Vecchi et al., 2021). There is considerable debate in the scientific community as to the underlying causes and predictability of historical multidecadal fluctuations in North Atlantic TC frequency (e.g., Vecchi et al., 2017), with changes in TC frequency driven by some combination of variations in anthropogenic and natural aerosols, natural variability, and the anthropogenic warming of our atmosphere and ocean (e.g., Mann and Emanuel 2006; Booth et al., 2013; Villarini and Vecchi 2013). Compilations of geological indicators of TC activity in the North Atlantic suggest that recent changes in basin-wide frequency remain within the range of variability over the past 1000 years (e.g., Yang et al., 2024). Moreover, a recent study found, consistent with earlier work, that most of the variability of North Atlantic TC activity over the last century was directly related to regional rather than global climate change (Emanuel 2021). There is no century-scale trend in US landfalling TC frequency nor in the fraction of North Atlantic TCs that make landfall in the US (e.g., Vecchi et al., 2011).

2. **Intensity:** Both the overall rates at which TCs strengthen and the peak intensity (maximum sustained wind near the surface) that Atlantic TCs achieve have increased. The rates at which TCs in the Atlantic basin strengthen have increased since the 1970s and 1980s. The rate of abrupt increases in intensity over 24 hours (referred to as rapid intensification) has increased both globally and in the Atlantic (Bhatia et al., 2019, 2022), and 21st century Atlantic TCs are more than three times as likely to strengthen from a Category 1 or weaker storm into a Major Hurricane (Category 3 or greater) within 12 hours (Garner 2023).

   There has also been a clear increase in the frequency of the strongest hurricanes in the Atlantic (Major Hurricanes, Categories 3–5) since the 1980s (Hall and Kossin 2019; Vecchi et al., 2021), though once Major Hurricane frequency is homogenized to account for known changes in observing practices, much of this recent increase in the number of basin-wide Atlantic Major Hurricanes is a recovery from a large decrease in Major Hurricane frequency between the 1950s and 1980s and not part of a century-scale trend (Vecchi et al., 2021). Other research suggests that human-caused increases in SSTs have helped to increase intensities in at least 84% of Atlantic TCs from 2019–2023 (Gilford et al., 2024).

There is no robust trend in US landfalling Major Hurricane frequency since the late 19th century, early 20th century or even since the 1980s (Vecchi et al., 2021). After accounting for the impact of changing observing practices, there is no significant trend in the ratio of US landfalling Major Hurricane frequency to US landfalling TC frequency, but there is an indication that the ratio of North Atlantic basin-wide Major Hurricane to TC frequency (a measure of basinwide TC intensity) has increased since the mid-19th century (Vecchi et al., 2021). It has been suggested that increases in Atlantic hurricane intensity since the 1980s are the result of a combination of internal climate variability, natural and anthropogenic aerosol forcing, and increases in greenhouse gases, with no strong consensus yet on the relative contributions of each in the scientific literature (e.g., Booth et al., 2013; Villarini and Vecchi 2013; Vecchi et al., 2017; Knutson et al., 2019; Gilford et al., 2024).

While more research is required to fully understand the drivers of TC intensity changes in the Atlantic, (Villarini and Vecchi 2013; Booth et al., 2013; Vecchi et al., 2017; Knutson et al., 2019), recent research indicates that modern Atlantic TCs often reach greater strengths than their historical counterparts (Hall and Kossin 2019; Vecchi et al., 2021; Gilford et al., 2024) more quickly than they would have in the past (Bhatia et al., 2019, 2022; Garner et al., 2023), suggesting an increased hazard for U.S. East and Gulf Coast communities, including those in New Jersey.

3. **Trajectories:** The locations in which TCs form, travel, and make landfall have evolved in recent years. Using results from downscaled climate models, Garner et al. (2021) show that from the pre-industrial era (850–1800 CE) to the modern era (1970–2005), TCs that impact the northeastern U.S. have become more likely to form closer to the U.S. Southeast coast, and to travel most slowly along the U.S. Atlantic coastline. Using a similar technique, Weaver and Garner (2023) show that increased TC genesis near the U.S. Southeast coast is robust in all parts of the Atlantic TC season for storms that impact the northeast, and that there is an increase in the density of TC landfall events along all parts of the New Jersey coast in the modern era compared to the pre-industrial era. There is also limited evidence from geological data (specifically, overwash deposits in sediment cores) that the frequency of land-falling TCs in New Jersey was higher in the 20th century than in the 17th-19th centuries (Joyse et al., 2024). Homogenized estimates of TC tracks indicate an eastward shift in TC and tropical storm tracks since the late-19th century (Vecchi and Knutson 2008, 2011) and over recent decades (Kossin et al., 2010). The drivers of decadal and multi-decadal historical changes in TC tracks remain to be fully understood, with changes in greenhouse gas concentrations (Garner et al., 2021; Murakami & Wang, 2022; Wang et al., 2023), aerosols (Murakami 2022, 2024; Wang et al., 2023), natural climate variability (Kossin et al., 2010; Sainsbury et al., 2022) and weather scale noise (Kortum et al., 2024)all suggested as plausible drivers.

Although work is still being done to fully understand what causes such changes (Kossin et al., 2010; Murakami & Wang, 2022; Murakami 2022, 2024; Sainsbury et al., 2022; Wang et al., 2023;

Kortum et al., 2024), the scientific literature suggests that modern TCs have become more likely to make landfall in New Jersey than their historical counterparts (Weaver & Garner, 2023; Joyse et al., 2024), and may do so with less warning time and longer-lasting impacts for New Jersey coastal communities (Garner et al., 2021).

4. **Precipitation:** TC rainfall is related to TC intensity, and the rain rate varies with radius with the highest rain rates typically occurring in the eyewall region of the TC. Several mechanisms have been found to be important for TC rainfall including frictional effects, topographic forcing, vertical wind shear, and vortex stretching (the effect of storm intensification and weakening associated with vortex spinup and spindown) (Lu et al., 2018). Furthermore, storms transitioning from tropical to extratropical have been found capable of producing heavy rainfall, especially in higher-latitude regions, including New Jersey (Atallah & Bosart, 2003; Liu et al., 2020). As the atmosphere warms, the air can hold about 7% more moisture per 1°C (1.8°F) increase of the air temperature (i.e., Clausius-Clapeyron scaling). However, the increase of TC-related rain rate exceeds Clausius-Clapeyron scaling, since the increase of TC intensity (maximum sustained wind near surface) in a warming climate further amplifies increases in the rain rate (Knutson et al., 2013; Liu et al., 2019). Furthermore, Xi et al. (2022) found that the sensitivity of the TC rain rate to SST is +9% per 1°C (1.8°F) increase of SST, roughly the product of the sensitivity of TC intensity to SST and the Clausius-Clapeyron scaling.

**STAP Assessment Statement on TCs:** In summary, there is *high confidence* (see Section 4.b for summary of confidence terms) that tropical cyclone frequency, including the frequency of major hurricanes, has increased in the North Atlantic since the 1980s. There is *medium confidence* that these changes are reflective of the increase in North Atlantic sea-surface temperature, but *low confidence* in the relative importance of internal climate variability, increasing greenhouse gas concentrations, and decreasing aerosol (e.g., particulate matter) emissions in driving these changes. There is *high confidence* that the overall intensity that Atlantic TCs reach, and the rate at which they do so, has increased in recent decades, though the relative role of various drivers for such intensity changes is still unclear. There is also *limited evidence* from modeling and geological data that suggests that landfalling hurricanes in New Jersey are more common in the 20th and 21st centuries than in prior centuries, with the drivers uncertain. There is *very high confidence* that the amount and rate of rainfall associated with tropical storms is increasing with global warming.

Regarding ETCs:

1. **Frequency** - Conclusive evidence of multidecadal trends in the number of ETCs is lacking, because individual studies have produced mixed results and any long-term trends are small relative to variability on decadal time scales. Findings surveyed by AR6 led to the conclusion that there is only *low confidence* that the total number of ETCs in the Northern Hemisphere has likely increased since the 1980s, but with fewer deep cyclones (Gulev et al., 2021). The finding of increased northern hemisphere ETC activity by Chang et al. (2015) supports this conclusion. While Chen et al. (2025) has found evidence of long-term increases in ETC frequency. Fritzen et al. (2021) found a decrease in ETCs over North America during the period 1979–2019. Substantial decadal variability in the frequency of ETCs has been noted, with a decrease from

1950–1970, an increase from 1970–1980, and a relatively active period during the 1990s (Davis et al., 1993; Colle et al., 2015). Reanalysis products have shown that the number of ETCs with very low central pressure has decreased between 1979 and 2010 (Chang et al., 2016). ETC frequency increases during El Niño conditions along the US southeast coast (DeGaetano et al., 2002; Eichler & Gottschalck, 2013), including for storms that tend to follow tracks that eventually impact the mid-Atlantic and New Jersey. Coupled Model Intercomparison Project Phase 5 (CMIP5) models underpredict the number of strong ETCs and show no trend in US East Coast frequency (Colle et al., 2013; Sheffield et al., 2013).

2. **Intensity** – Studies of variations in ETC intensity have yielded mixed results because there is significant decadal variability in ETC intensity. For example, a study assessing ETC intensities over the Arctic and North Atlantic found that the number of cyclones with very low central pressure increased from 1979 to 1990 and then declined until 2010 in all five reanalysis datasets considered (Tilinina et al., 2013). Using central pressure to define intensity may not be the best method because pressure values rely heavily on the greater atmospheric conditions, and using this metric may cause some of the ambiguity in the results (Seneviratne et al., 2021). More recently, Chen et al. (2025) found an increasing trend in the maximum wind speeds of the most intense ETCs over the period 1940–2024, using ERA5 reanalysis, in a domain centered on the mid-Atlantic coast.
3. **Trajectory** – The AR6 concluded that there is *medium confidence* that regions of concentrated ETC activity (i.e., "storm tracks") have shifted northward in the Northern Hemisphere since the 1980s (Seneviratne et al., 2021).
4. **Precipitation** - Historically, 80% or more of precipitation globally and along the east coast is associated with ETCs' major storm track regions (Colle et al., 2015; Utsumi et al., 2017). Annual precipitation increased approximately 4% over the 1901–2015 period in the US (Walsh et al., 2014). With atmospheric warming there is high agreement that precipitation has increased (Seneviratne et al., 2021). In a region centered on the mid-Atlantic coast, Chen et al. (2025) found an increasing trend in hourly precipitation rate over the period 1940–2024.

**STAP Assessment Statement on ETCs:** In summary, there is *very high confidence* that the precipitation rate of nor'easters is increasing, but limited evidence for long-term trends in ETC frequency, intensity, and trajectory.

## h) Changing Coastal Flooding and Compound Flooding

New Jersey's coasts are vulnerable to flooding. There are several environmental variables that affect the magnitude and frequency of these coastal flooding events including, but not limited to, SLR, storm surge, and rainfall.

Storm surge is the rise of water above typical tidal levels and is caused primarily by strong onshore winds during a TC or ETC event. The exceptionally low surface pressures that occur in such storms also contribute to the total storm surge height, though to a lesser extent than onshore winds. The height of storm tide (composed of storm surge and astronomical tide) can vary with local topography/bathymetry and the timing of the peak surge relative to the tidal cycle.

The impact of storm surge is also affected by SLR because higher sea levels increase the baseline for flooding from coastal storms. Multiple studies have shown that storm surge flood heights have already increased along and near New Jersey's coasts relative to historical baselines, primarily because sea levels have increased (Reed et al., 2015; Lin et al., 2016; Garner et al., 2017). Such increases can be extremely damaging; Strauss et al. (2021) illustrate that economic damages in New Jersey associated with storm surge flooding during Hurricane Sandy were approximately $3.7 billion (13%) higher than they would have been in the absence of human-caused SLR. Analyzing extreme storm surges based on U.S. tide gauge records (after removing mean sea level and tidal influences), Morim et al. (2025) find positive trends in the storm surge magnitudes, with hotspots in areas affected by TCs such the eastern Gulf, east coast of Florida, and U.S. northeast coast. In the mid-Atlantic region, the annual maximum storm surge increased on the order of about 0.5 mm/yr over 1950–2020. While comparatively small, those changes in the magnitude of extreme storm surges took place in addition to the underlying mean sea-level rise.

Flood mechanisms such as storm surge, high volume river discharges, and extreme rainfall can often occur simultaneously or sequentially during a storm event and interact in ways that exacerbate overall flood hazard, resulting in a compound flood event (Zscheischler et al., 2018) (Figure 3). In several U.S. cities, the frequency of coincident rainfall-surge events has been increasing (Wahl et al., 2015), indicating that the risk of compound flood events is on the rise. In New Jersey, more than 77% of the recorded flood events between 1980 and 2018 were compound events (Ali et al., 2025). The threat of compound flooding during TC events is especially high since landfalling TC systems are typically accompanied by wind-driven storm surge and intense precipitation at the coast. While intense eyewall rainfall along the coast can result in localized compound impacts to coastal streams and tributaries if peak rainfall occurs near the time of peak storm tide, intense outer rain bands falling over inland portions of coastal areas can also be a driver of river-surge compounding (Gori et al., 2020a). Thus, in addition to TC characteristics such as intensity, approach angle, and forward speed, relative timing and spatial patterns of rainfall and storm surge are critical factors determining compound flooding during TC events.

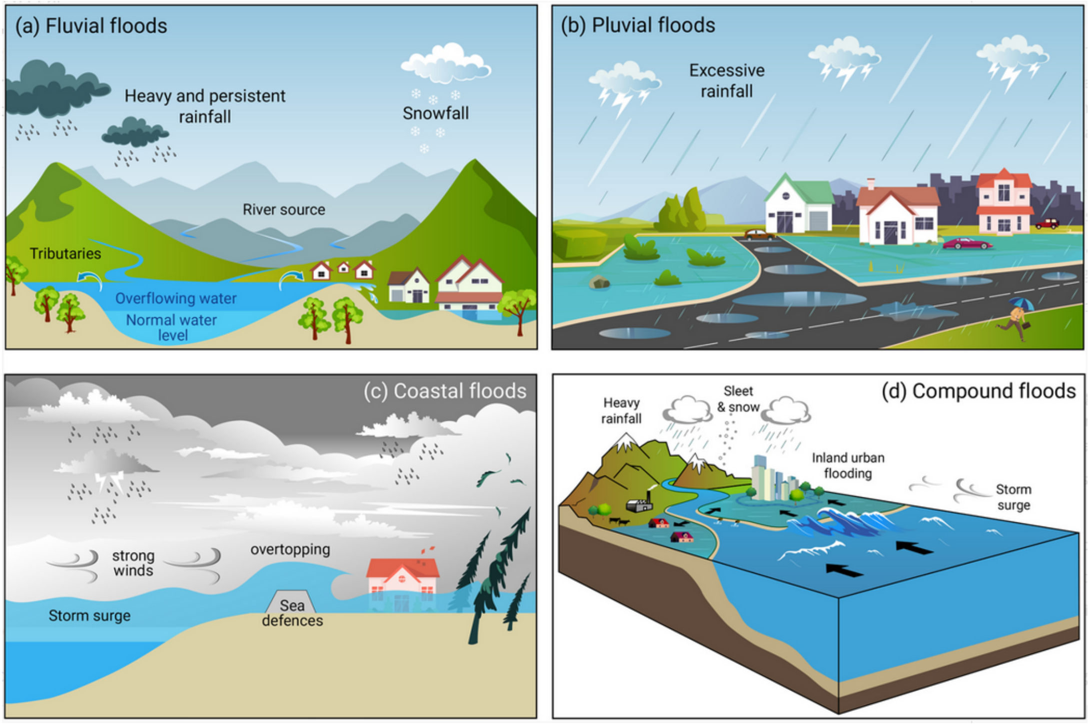


**Figure 3.** Schematic diagram of flood drivers showing (a) fluvial (river discharge), (b) pluvial (rainfall-runoff), (c) coastal (surge, tide, waves, and total sea level) components, as well as their (d) compound flood interactions (from Green et al., 2025).

Examining the various flood mechanisms during TC events, Gori et al. (2020b) identified various flood zones. Flood events in areas close to the coastline are surge-dominated for lower return periods (i.e., relatively common flood events), but compound flooding may become more important in these zones for high return periods (i.e., less common, but larger and potentially more damaging flood events, such as a 100-year flood, which is a flood with a 1% chance of occurring annually). Also, while the main stream of coastal rivers are often surge-dominated, with upstream portions of small streams and pluvial areas being rainfall dominated, midstream portions of the main stream may be compounding zones. Gori et al.'s (2020b) analysis also showed that neglecting rainfall in flood estimates could lead to the underestimation of flood depths across a significant portion of the coastal floodplain. Indeed Gori et al. (2022) found the frequency of events with both hazards exceeding their historical 100-year levels would increase 30–195 fold in the Northeast by the year 2100 under a very high emissions scenario (SSP5-8.5).

**STAP Assessment Statement on Coastal Flooding and Compound Flooding:** In summary, coastal flooding in New Jersey has increased in frequency and magnitude over time due to sea-level rise *(very high confidence)*. There is *very high confidence* that rising sea levels are increasing storm surge-driven coastal flood heights in New Jersey. There is also *high confidence* that compound flood events are becoming more common, and that compound flood risks during hurricanes are especially high.

# SECTION 4. SEA-LEVEL RISE PROJECTIONS FOR NEW JERSEY

## a) Anticipated Future Emissions and Warming

As greenhouse gases trap the Sun's heat, they warm Earth's surface and ocean. This, in turn, causes thermal expansion of the ocean and loss of ice on land, which are the dominant factors driving global mean SLR. A major driver of the range of future SLR projections is therefore future greenhouse gas emissions, which are driven by future social, economic, technological, and policy changes, each of which brings their own sources of uncertainty.

Climate Action Tracker (CAT), the Rhodium Group, and Resources for the Future (RFF) are three groups that project future emissions while accounting for different sources of uncertainty. CAT estimates emissions associated with current global climate policies (Ellis et al., 2024); Rhodium Group includes current trends in policy and technology development alongside probabilistic modeling of the energy, policy and socioeconomics of the system (Rhodium Climate Outlook; Larsen et al., 2024) and the RFF projections employ expert elicitation to account for the broad range of potential demographic, technological, and policy futures (Rennert et al., 2021). Despite the range of approaches executed by those models, the resulting median projections for end-of-century warming are consistently around 2.7°C (Table 2, Figure 4).

Notably, projections of global warming under contemporary global policies have declined over time as policy and technology trends have changed (Table 2). For example, the CAT has produced current-policy projections for over a decade. The 2014 CAT assessment found global policies put the planet on course for warming of about 3.9°C above late nineteenth-century levels by the end of the century. By the time of the second STAP report, published in 2019, the 2018 CAT assessment found global policies put the planet on course for about 3.3°C of warming. By 2024, CAT's median projected warming had declined to 2.7°C (Table 2). In contrast with that declining trend, it is expected that the next update to the Rhodium Climate Outlook will indicate a modest increase in end-of-century warming due, in part, to recent changes in policy.

These anticipated warming levels provide context for the climate scenarios considered in this report. The STAP employed the Shared Socioeconomic Pathway (SSP) scenarios, developed by the climate and integrated assessment modeling communities. These scenarios were widely used in the most recent Coupled Model Intercomparison Project (CMIP) climate modeling exercise and the IPCC Sixth Assessment Report (AR6). The STAP analyzed three of the five SSPs (Raihi et al., 2017):

1. SSP1-2.6: Low greenhouse gas emissions, with global net-zero CO2 emissions by about 2075, with a good chance of meeting the international goal of limiting global warming to below 2°C above late-nineteenth century levels.
2. SSP2-4.5: Intermediate greenhouse gas emissions, approximately consistent with interpretations of current global policy (as of November 2024), with global emissions slowly rising to about mid-century and then declining.
3. SSP3-7.0: High greenhouse gas emissions, with continued emissions growth throughout the century.

The STAP focuses on the low (SSP1-2.6), intermediate (SSP2-4.5) and high (SSP3-7.0) scenarios. SSP2-4.5 is most closely aligned with the probabilistic emission projections for current policies (as of November 2024) discussed above, while SSP3-7.0 is more closely aligned with emissions projections available at the time of the STAP 2019 report. Accordingly, the 'high' scenario in this report most closely aligns with the 'moderate' scenario in the 2019 report, which was associated with about 3.5°C of warming.

This report does not analyze SSP1-1.9 (the 'very low' emission scenario) and SSP5-8.5 (the 'very high' emissions scenario). SSP1-1.9 is consistent with meeting the 2015 United Nations Paris Climate Agreement goal of pursuing efforts to limit the temperature increase to 1.5°C (UN 2015). SSP5-8.5 reflects sustained growth in fossil fuel use at rates comparable to those of the 1990s and 2000s. SSP1-1.9 and SSP5-8.5 are not considered probable by the STAP and broader scientific community and are therefore not included in this report (Hausfather 2025).[8]

[8] The 'high' scenario in the 2019 STAP Report most closely corresponds to SSP5-8.5, or the 'very high' scenario. The STAP and Practitioner Panel find consistency among STAP reports is important to allow readers to see how estimates of SLR have changed over time. As such, results for the very high emissions scenario are provided in the appendices of this report to allow for comparisons with previous assessments.

**Table 2.** Projected global temperature increase (°C) by 2100, relative to a late-nineteenth century baseline, for CAT's current policy scenario (Ellis et al., 2024), Rhodium Climate Outlook's baseline scenario (Larsen et al., 2024), Resources for the Future's projection (Rennert et al., 2021), and SSPs (IPCC 2021) including the median, and lower and upper bounds of their respective *very likely* ranges (90% likelihood).

| **Source** | **Global warming*** | **Notes** |
|---|---|---|
| | ***Recent probabilistic emissions projections*** | |
| Climate Action Tracker (2024) | 2.7°C (2.2–3.4°C) | Current global policies |
| Rhodium Climate Outlook (2024) | 2.7°C (2.0–3.7°C) | Current global policy trends |
| Resources for the Future (2021) | 2.6°C (1.6–4.0°C) | Structured expert elicitation, considering a broad range of policy, economic and technology futures |
| | ***Past probabilistic emissions projections*** | |
| Climate Action Tracker (2014) | 3.9°C (3.3–4.5°C) | Global policies as of 2014 |
| Climate Action Tracker (2016) | 3.6°C (2.6–4.9°C) | Global policies as of 2016 |
| Climate Action Tracker (2018) | 3.3°C (2.5–4.4°C) | Global policies as of 2018 |
| Climate Action Tracker (2020) | 2.9°C (2.1–3.9°C) | Global policies as of 2020 |
| Climate Action Tracker (2022) | 2.7°C (2.2–3.4°C) | Global policies as of 2022 |
| | ***Shared Socioeconomic Pathway (SSP) scenarios**** | |
| SSP1-2.6 (Low emissions) | 1.6°C (1.2–2.3°C) | Comparable to STAP 2019 Low (2°C) scenario |
| SSP2-4.5 (Intermediate emissions) | 2.6°C (2.0–3.6°C) | Comparable to current global policies |
| SSP3-7.0 (High emissions) | 3.8°C (3.0–5.0°C) | Comparable to STAP 2019 Moderate (3.5°C) scenario and to global policies as of 2016 |
| | | |

*CAT does not explicitly state their temperature ranges;, however, published data (CAT 2025) and methodologies (Rogelj et al., 2012) suggest reported CAT values are the *very likely* range.

**Warming levels for SSP scenarios are based upon projections of the FaIR climate module used in the Framework for Assessing Changes to Sea-level (FACTS).

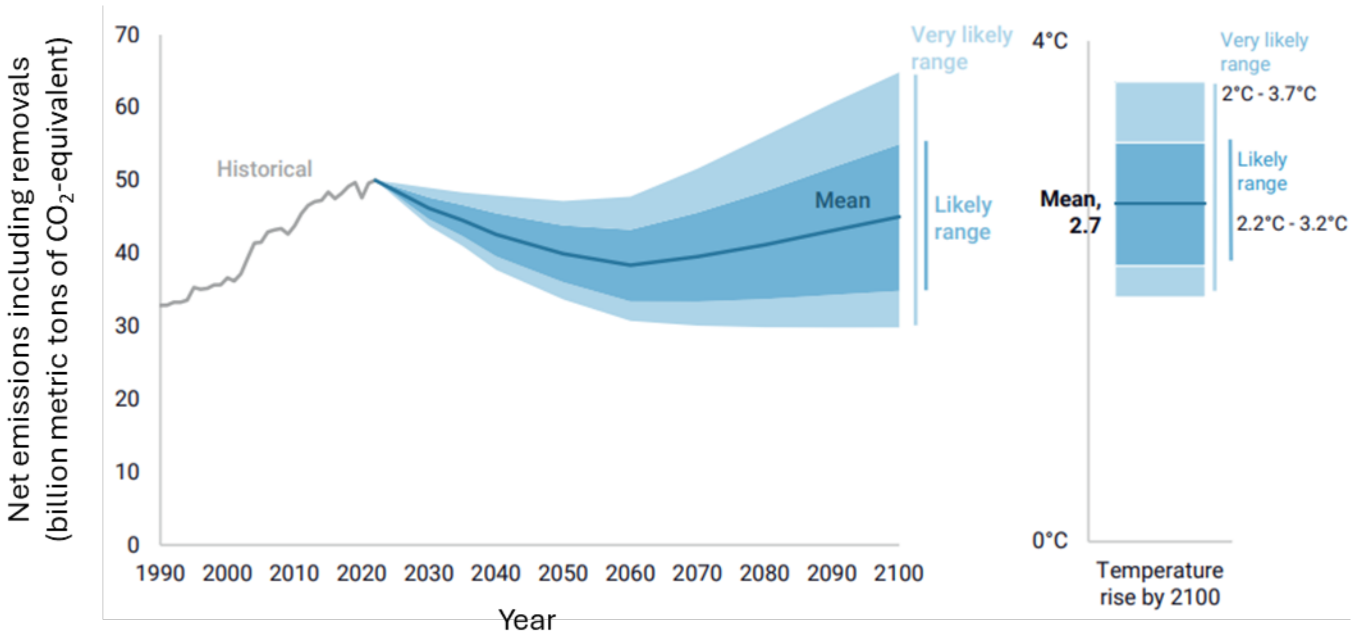


**Figure 4.** Rhodium Climate Outlook Baseline Scenario. Global greenhouse gas emissions (net emissions including removals in billion metric tons of $CO_2$-equivalent) and temperature rise from late nineteenth century levels (1850–1900) under current policy trends. (Figure modified from Larsen et al., 2024.) Following IPCC conventions, *very likely* ranges indicate a 90% probability of occurring and *likely* ranges to indicate a 66% probability of occurring.

## b) Treatment of Uncertainty

As described in Box 2.1, confidence is a qualitative measure of the amount and degree of agreement among different lines of evidence (e.g., datasets, models, and expert judgment) for a conclusion (Figure 5). *Low-confidence* conclusions are characterized by a limited amount of evidence and/or a low degree of agreement among lines of evidence[9], while *high-confidence* conclusions have a robust body of evidence with a high degree of agreement. Well-established science is associated with *high confidence*, while the frontier of scientific discovery is generally associated with *low confidence*.

In the context of SLR, the IPCC identified many contributing processes with rates and magnitudes that can be projected with *medium* or *high confidence*, and these processes are reflected in the IPCC's projections of future *likely* SLR. The IPCC also identified a suite of scientifically contested ice-sheet processes, with potential rates and magnitudes characterized by *low confidence*. Their likelihood is unknown because of the limited agreement among lines of evidence regarding the rates and magnitudes

[9] The following are three different examples of when *low confidence* may be assigned to a process or result, but this list is not exhaustive: a topic is studied extensively using different methods, but by a small number of experts who are finding different results; a topic is studied extensively by many experts, but the experts are using similar methods and are finding different results; and a topic is not studied extensively so there are minimal to no results to discuss.

of these processes within published literature. High-end sea-level outcomes associated with these processes are also called unknown-likelihood, high-impact outcomes.[10]

In an unknown-likelihood, high-impact future, the IPCC notes the potential for "faster-than-projected disintegration of marine ice shelves and the abrupt, widespread onset of marine ice cliff instability (MICI) and marine ice-sheet instability (MISI) in Antarctica", as well as "faster-than-projected changes in both the surface mass balance and dynamical ice loss in Greenland" (Fox-Kemper et al., 2021; Fricker et al., 2025). The STAP refer to these phenomena herein as "potential rapid ice-sheet loss processes."

To indicate the potential contribution of *low-confidence* processes to SLR, AR6 generated quantitative *low-confidence* projections using two published papers representing the limited available evidence. The first published paper employed structured expert judgment, a formal, calibrated risk assessment methodology that translates experts' understanding of the relevant systems into probability distributions (Bamber et al., 2019). The second published paper was based on a single Antarctic ice-sheet model (DeConto et al., 2021) that incorporates the gravitational instability of ice cliffs, a mechanism not represented in the ice-sheet models supporting the *medium confidence* projections and assessed as being in the *likely* range.

Several studies on ice-cliff calving have been published since 2019 (e.g., Bassis et al., 2021; Crawford et al., 2021; DeConto et al., 2021; Schlemm et al., 2022; Morlighem et al., 2024), some of which have supported marine ice cliff instability as a plausible rapid ice-sheet loss process and others of which have argued against it. This highlights ongoing deep uncertainty in rapid ice-sheet loss processes but also justifies the notion that rapid ice-sheet loss processes cannot currently be ruled out.

The ranges of SLR in AR6 and in the STAP report are constructed from multiple alternative probability distributions that represent the ice-sheet contribution to sea level in different ways (Figure 5). Two different probability distributions inform the *medium-confidence* projections that help define the *likely* range, while four probability distributions inform the *low-confidence* projections. The 17th-83rd percentile values of the two *medium confidence* distributions together bound the *likely* range; that is, both the *medium-confidence* distributions agree there is at least a 67% chance that the actual value falls into the *likely* range, and no more than a 33% chance that it will fall outside it.

In the projections presented in this report, the STAP includes two versions of *likely* ranges. Specifically, the STAP has included *likely* SLR estimates that do not include *low-confidence* processes (i.e., potential rapid ice-sheet loss processes) and an extended *likely* range that does incorporate the potential effects of *low-confidence projections*. Different experts will give different weights to the alternative projections, but most including the STAP, will agree that while the likelihood of these potential rapid ice-sheet loss processes is unknown, it is also nonzero. It then follows that the actual 83rd percentile (i.e., the upper end

[10] Technical experts may benefit from this additional clarification: AR6 refers to its high-impact storyline as "low-likelihood, high-impact", but defines a "low-likelihood, high-impact outcome" as one "whose probability of occurrence is low or not well known (as in the context of deep uncertainty) but whose potential impacts on society and ecosystems could be high". The high-end sea-level storyline involves deep uncertainty and thus a probability of occurrence that is not well known, rather than known to be low. (Lempert et al., 2024; Kopp et al., 2023) High-end sea-level outcomes associated with these processes were called "low-likelihood, high-impact outcomes" by IPCC AR6, but subsequent authors have suggested that they would be more clearly referred to as "unknown-likelihood, high-impact outcomes," since their likelihood is not known to be low, but rather is poorly known altogether (Lempert et al., 2024; Kopp et al., 2025). We adopt this convention herein.

of the *likely* range) falls between the 83rd percentile projections that exclude *low-confidence* processes and the 83rd percentile projections that incorporate them. Almost all experts would then also agree that there is a less than 17% chance that the correct value would fall above the 83rd percentile of projections incorporating *low-confidence* processes (this concept is shown visually in Figure 5). Consistent with this conclusion, the 2019 STAP report presented "<17% chance" projections that incorporated *low-confidence* processes via the structured expert judgment study of Bamber et al. (2019).

While the extended *likely* range outcomes associated with *low-confidence* processes are of unknown likelihood, this does not mean that they are irrelevant for decision-making. Consideration of unknown-likelihood, high-impact outcomes is well-established in risk analysis (e.g., Kaplan & Garrick, 1980; Lempert et al., 2003) and is common practice in many domains, such as national security. In the context of local adaptation planning, Feng et al. (2024) show that dynamic adaptive approaches that consider *low-confidence* processes and incorporate learning over time generally modestly outperform approaches that neglect them and substantially outperform approaches that do not allow learning over time. In contexts where dynamic adaptation is not possible, considering *low-confidence* processes can protect against extremely costly outcomes.

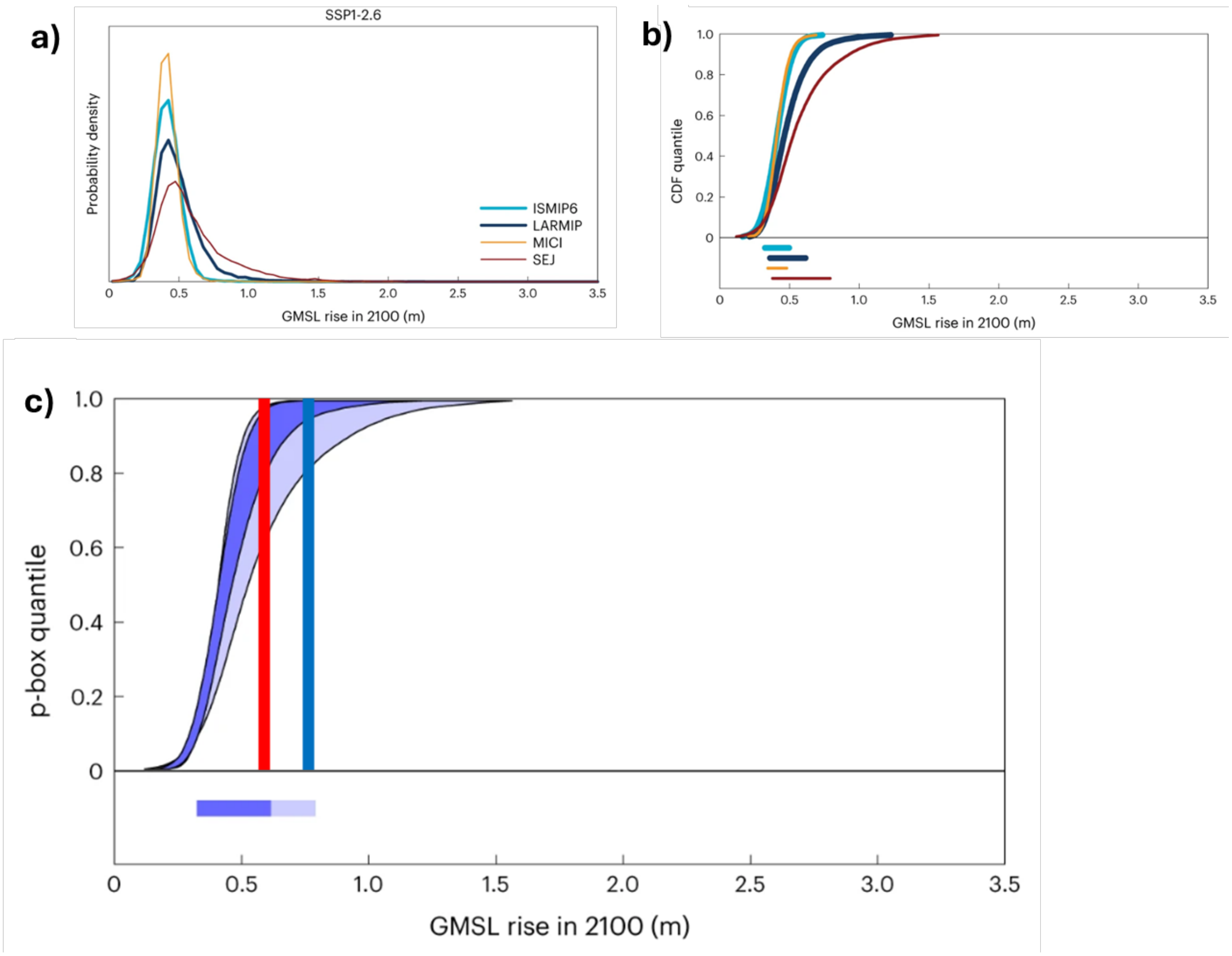


**Figure 5.** Modified from Kopp et al. 2023. (a) Four alternative probability distributions for the low-emissions SSP1-2.6 scenario, including two distributions that contribute to both *low-confidence* and *medium-confidence* projections [ISMIP6 (light blue) and the Linear Antarctic Response Model Intercomparison Project (LARMIP; dark blue)] and two additional distributions that contribute only to *low-confidence* projections [the Antarctic marine ice cliff instability-permitting projection (MICI; orange) and the structured expert judgment ice-sheet projection (SEJ; red)]. (b) Cumulative distribution functions (CDFs) corresponding to the probability distributions in a. The bars at the bottom show the 17th-83rd percentile range for each probability distribution. (c) *Medium confidence* (dark purple) and *low confidence* (light purple) p-boxes for SSP1-2.6. The width of the p-box provides a metric of disagreement among the contributing probability distributions. The bars at the bottom) show the lower 17th to upper 83rd percentile range for each p-box. If the upper end of the *likely* range falls between the 83rd percentile projections excluding *low-confidence* processes (denoted by the red vertical bar) and the 83rd percentile of projections that fully incorporate them (denoted by the blue vertical bar), then the width of the area between each vertical bar represents the possible SLR values that are part of the extended *likely* range. As such, for the purpose of the 2025 STAP Report, the extended *likely* range extends up to the “<17% chance SLR exceeds” range, but starts at the “>83% chance SLR exceeds*” range as described in Tables ES-1 and Table 5.

## c) Projection Methodology

The 2019 STAP report (Kopp et al., 2019) provided SLR projections for global low, moderate, and high warming scenarios for coastal New Jersey. These projections leveraged model simulations from the

Coupled Model Intercomparison Project Phase 5 (CMIP5), a set of projections extensively used in the IPCC Fifth Assessment Report (AR5). Rather than structuring projections based on emissions scenarios, the 2019 STAP report organized projections into 'low', 'moderate', and 'high' warming trajectories, corresponding to end-of-century warming of about 2°C, 3.5°C, and 5°C (Rasmussen et al., 2018; Bamber et al., 2019). The 2019 STAP's moderate warming scenarios aligned with the CAT's median end-of-century warming of about 3.3°C (range of 2.5–4.4°C) based on the then-current policy. The 2019 STAP scenarios correspond approximately to SSP1-2.6 ('low' in this report), SSP3-7.0 ('high' in this report), and SSP5-8.5 ('very high' in Appendix B of this report).

This report employs an updated version of the sea-level projection framework used by AR6 (Fox-Kemper et al., 2021). This framework, the Framework for Assessing Changes to Sea-level (FACTS), integrates multiple lines of evidence to produce distributions of future global-mean and regional relative sea-level change (Kopp et al. 2023). The modeling choices employed by the STAP are identical to those of AR6 with one exception. The exception is that, due to limited published data, AR6 was could not provide *low-confidence* projections for scenarios other than SSP1-2.6 and SSP5-8.5. The absence of *low-confidence* projections for the emission scenario closest to current policy trends, SSP2-4.5, thus confounded the interpretation of ice-sheet instability processes with low-probability, very-high emissions. However, FACTS 1.1 introduced a probabilistic interpolation scheme that allows *low-confidence* projections to be generated for all emissions scenarios (Reedy and Kopp, 2023). Rather than using the AR6 projections, as hosted by the NASA/IPCC Sea Level Projection Tool (NASA 2021)), we produce new projections so that we can provide *low-confidence* projections for all emissions scenarios. Aside from the inclusion of l*ow-confidence* projections for SSP2-4.5 and SSP3-7.0, other differences (of order 0.1 ft) from the AR6 projections are minor, due to numerical sampling choices and computational refinements, and should not be viewed as decision relevant.

For greater consistency with the presentation used in AR6, rather than simply presenting a "<17% chance" projection incorporating *low-confidence* processes as in STAP 2019, here the STAP presents both a *likely* range "<17% chance" projection that excludes *low-confidence* processes and a "<17% chance" projection that incorporates *low-confidence* processes. Some experts will consider the latter part of the *likely* range; experts generally agree that it also constitutes part of a high-end projection (see discussion in Section 4.b for additional information).

The current STAP methodology thus updates the 2019 STAP methodology in a manner that brings the current projections in line with the assessment of the AR6. For details regarding the projection methodology and a comparison of STAP 2019 and STAP 2025 projection methods, see Appendix D. For a comparison of AR6 SLR to STAP 2025 SLR, see Table C1.

The following relevant STAP decisions were made regarding the findings in subsequent sections:

- **Maximum Planning Horizon –** Consistent with STAP 2019 and AR6, the STAP selected 2150 as the maximum planning horizon to accommodate both near-term and long-term asset lifecycles for infrastructure consistent with feedback from the practitioner panel. The STAP selected 2040, 2050, 2070, 2100, and 2150 as periods representative of long-term projections for SLR, affirmed as relevant by discussions with practitioners. Additional decadal projections are provided in Appendix B.

- **2005 (1995–2014) Baseline** - Scientists measure sea level with respect to a geodetic datum. For the U.S. National Spatial Reference System, this datum is the North American Vertical Datum of 1988 (NAVD88). NOAA measures tidal datum levels such as Mean Sea-level (MSL), Mean Higher High Water (MHHW), and Mean Lower Low Water (MLLW) in relation to the NAVD88 geodetic datum over a 19-year tidal cycle referred to as a tidal datum epoch. The current National Tidal Datum Epoch is 1983 – 2001. Practitioners use several different tidal datum levels within their professions to communicate flood forecasts (MLLW), coastal boundaries (for NJ, MHHW), and other information as points of reference for coastal communities and ecosystems.

For consistency with the sea-level projection literature, including most recent IPCC and federal assessments, the baseline tidal epoch for the projections in this report is different from the National Tidal Datum Epoch (NTDE). Instead, it is centered on the year 2005; more specifically, it is the average sea level over 1995–2014 (Table 4).11  Due to atmosphere and ocean dynamics, the annual average sea-level can vary by up to 0.2 ft around the 19-year average sea-level centered in the same year.

Table 4 can be used to convert a SLR estimate between the 2025 STAP baseline and other baselines. Below are two examples of converting values from the 2025 STAP Report to other generally used baselines:

- The 2025 STAP projects a *likely* rise at Atlantic City by 2050 of 0.9–1.7 feet relative to a 1995-2014 baseline. To shift this projection into the current NTDE baseline, add 0.19 feet; this would thus translate to 1.1–1.9 feet above NTDE.

- To shift this projection into NAVD88, subtract 0.21 feet; this would thus translate to 0.7–1.5 feet above NAVD88.

**Table 4.** A comparison of the 2005 (1995–2014) baseline, used in both the 2025 STAP and the IPCC AR6, to other common sea level change baselines is provided for Atlantic City, NJ (in meters and feet). Mean sea level values are referenced.

| Time period | Difference from 2025 STAP and IPCC AR6 Baseline (1995–2014) | |
|---|---|---|
| | Meters | Feet |
| Current NTDE (1983–2001) | -0.059 | -0.19 |
| STAP 2019 baseline (1991–2009) | -0.023 | -0.08 |
| Forthcoming NTDE (2002–2020)* | 0.030 | 0.10 |
| NAVD88 | 0.064 | 0.21 |

*The 2002-2020 NTDE has not yet been published at the time of the STAP 2025 Report's publication. As such, the values here are preliminary.

[11] Replicates of Table 4 Sandy Hook, NJ; Cape May, NJ; The Battery, NY; and Philadelphia, PA can be found in Appendix C (Tables C12-C15).

## d) How much will sea-level rise in NJ?

Consistent with the prior STAP reports, the STAP selected Atlantic City, NJ as the tide gauge station to represent the New Jersey coast (Figure 6, Table 5). SLR values for Sandy Hook, NJ and Cape May, NJ are relatively similar to Atlantic City, NJ (SLR values for Sandy Hook, NJ; Cape May, NJ; The Battery, NY; and Philadelphia, PA can be found in Appendix B).[12] The STAP has reached the following conclusions on SLR along the coast of New Jersey:[13]

1) Relative to a 1995–2014 baseline, New Jersey coastal areas are *likely* (at least a 66% chance) to experience SLR of 0.7 to 1.3 ft (0.20 to 0.40 m) by 2040, and 0.9 to 1.7 ft (0.28 to 0.52 m) by 2050. Even considering potential contributions from unknown-likelihood, high-impact ice-sheet processes (i.e., potential rapid ice-sheet loss processes, see Box ES.2 for definition), it is *extremely unlikely* (less than a 5% chance) that SLR will exceed 1.7 ft (0.52 m) by 2040 and 2.3 ft (0.71 m) by 2050. [Section 4.d]

2) While near-term SLR projections through 2050 exhibit only minor sensitivity to different emissions scenarios (<0.1 ft and <0.2 ft [<0.02 and <0.02 m]) for projections that exclude and include potential rapid ice-sheet loss processes, respectively), SLR projections after 2050 increasingly depend on the pathway of future global greenhouse gas emissions. Relative to a 1995–2014 baseline:

    a. Under a low-emissions scenario, consistent with the global goal of limiting warming to below 2°C above late nineteenth-century levels, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to see SLR of 1.3 ft to 2.3 ft (0.41 to 0.71 m) by 2070, and 1.8 ft to 3.3 ft (0.54 to 1.01 m) by 2100. Including potential rapid ice-sheet loss processes could extend these ranges to 2.5 ft (0.77 m) in 2070 and 3.7 ft (1.12 m) in 2100. Even considering such potential rapid ice-sheet loss processes, it is *extremely unlikely* (less than a 5% chance) that SLR in this scenario will exceed 3.2 ft (0.96 m) by 2070 and 5.1 ft (1.54 m) by 2100.

    b. Under an intermediate-emissions scenario, approximately consistent with current global climate policies, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to see SLR of 1.5 ft to 2.5 ft (0.46 to 0.76 m) by 2070, and 2.2 ft to 3.8 ft (0.67 to 1.17 m) by 2100. Including potential rapid ice-sheet loss processes could extend these ranges to 2.8 ft (0.86 m) in

[12] Appendix A provides decadal projections for all emissions scenarios in both metric and American customary units.

[13] The STAP has focused the narrative on the period through 2100 because (1) it is a reasonable option for a planning horizon for many local decision makers and communities (as confirmed by the Practitioner Panel) and (2) it is consistent with end of century reporting provided in other states' SLR reports (e.g., Boesch et al., 2023) and the AR6. Like AR6, we include projections through 2150, because for some long-term infrastructure investments, century-scale risks can be important. The STAP has focused the narrative on: the *likely range* to highlight what range of SLR has at least a 66% chance of occurring consistent with AR6; the *extended likely* range to show the potential effects of rapid ice-sheet loss processes on SLR; and *extremely unlikely* values to highlight the greatest SLR extent resulting from rapid ice-sheet loss processes.

2070 and 4.5 ft (1.36 m) in 2100. Even considering such ice-sheet processes, it is extremely *unlikely* (less than a 5% chance) that SLR will exceed 3.5 ft (1.07 m) by 2070 and 6.2 ft (1.88 m) by 2100.

c. Under a high-emission scenario consistent with global emissions trends before the adoption of the Paris Agreement, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to see SLR of 1.6 ft to 2.6 ft (0.49 to 0.78 m) by 2070, and 2.6 ft to 4.3 ft (0.79 to 1.30 m) by 2100. Including potential rapid ice-sheet loss processes could extend these ranges to 3.0 ft (0.91 m) in 2070 and 5.2 ft (1.58 m) in 2100. Even considering such ice-sheet processes, it is extremely *unlikely* (less than a 5% chance) that SLR will exceed 3.9 ft (1.17 m) by 2070 and 7.5 ft (2.28 m) by 2100.

Present day SLR and its acceleration are primarily attributed to anthropogenic factors (i.e., human induced climate change), but there are natural phenomena that occur on interannual and multidecadal time scales that contribute to SLR (Cazenave and Moreira 2022). The SLR projections presented in this report focus on long-term changes and should be interpreted as changes in 19-year averages. Superimposed on these changes is variability that occurs on interannual and decadal timescales. For example, SLR changes in the North Atlantic are influenced by natural climate modes, like the North Atlantic Oscillation (NAO), which affects coastal sea level through the IB effect (Piecuch & Ponte, 2015) and changes in longshore winds (Andres et al., 2013; Piecuch et al., 2016). There are also links between changes in the Atlantic Meridional Overturning Circulation (AMOC) or its local expression through the Gulf Stream and coastal sea level in New Jersey (Goddard et al., 2015), but the timescale at which this relationship becomes effective remains unclear (Piecuch et al., 2019; Little et al., 2019). Studies show the Gulf Stream and AMOC have weakened (Thornalley et al., 2018; Ditlevsen & Ditlevsen, 2023), which could alter the interannual and multidecadal variability in SLR. Additional research is needed to fully understand the causes of these observed changes in regional sea level (Cazenave & Moreira, 2022).

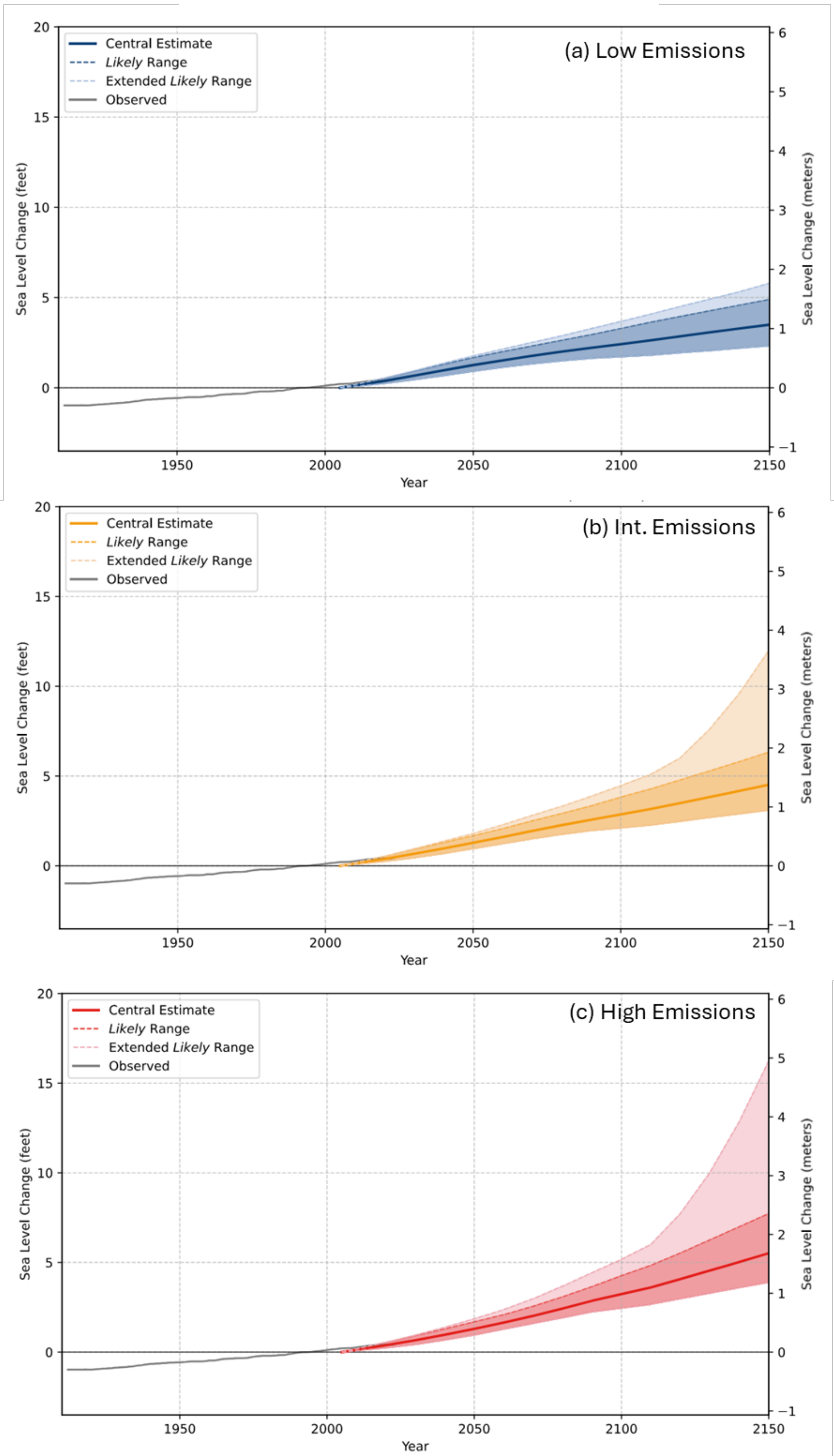


**Figure 6.** Time series of tide-gauge measurements (grey) and projections for (a) low emissions, (b) intermediate emissions, and (c) high emissions scenarios. All observations and SLR values are expressed as 19-year means of tide-gauge measurements and are measured with respect to a 1995-2014 (2005) baseline. Projections are 19-year averages using a rolling mean. In each panel: the dark solid line (central estimate) represents the amount of SLR that has about a 1-in-2 chance of being exceeded when excluding potential rapid ice-sheet loss processes; dark shaded areas (*likely* range) indicate the amount of SLR that has at least a 2-in-3 chance of occurring, when excluding potential rapid ice-sheet loss processes; and the full (light and dark) shaded areas (extended *likely* range) indicate the amount of SLR that has at least a 2-in-3 chance of occurring, when potential including rapid ice-sheet loss processes.

**Table 5. New Jersey SLR estimates for Atlantic City, NJ above the 1995–2014 baseline (ft).** SLR estimates are grouped by emissions scenario and year with rows corresponding to different SLR projection probabilities. Banners across the full width of the table indicate which SLR projections include or exclude unknown-likelihood, high-impact processes that are on the frontier of scientific understanding (i.e., potential rapid ice-sheet loss processes). Table footnotes provide additional information regarding how to interpret this table.

| | Across Emissions Scenarios | | Low Emissions (SSP1-2.6) | | | Intermediate Emissions (SSP2-4.5) | | | High Emissions (SSP3-7.0) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Degrees of Warming (°C)†* | ***1.7** (1.3-2.5) °C Warming* | ***1.9** (1.3-3.1) °C Warming* | ***1.7** (1.3-2.4) °C Warming* | ***1.6** (1.2-2.3) °C Warming* | ***1.5** (1.1-2.3) °C Warming* | ***2.3** (1.8– 3.0) °C Warming* | ***2.6** (2.0-3.6) °C Warming* | ***2.8** (2.1-4.0) °C Warming* | ***2.8** (2.2- 3.5) °C Warming* | ***3.8** (3.0-5.0) °C Warming* | ***5.1** (3.9-7.0) °C Warming* |
| **Year** | **2040** | **2050** | **2070** | **2100** | **2150** | **2070** | **2100** | **2150** | **2070** | **2100** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.5 | 0.7 | 1.1 | 1.3 | 1.7 | 1.2 | 1.8 | 2.5 | 1.3 | 2.1 | 3.2 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| > 83% Chance SLR Exceeds* | 0.7 | 0.9 | 1.3 | 1.8 | 2.3 | 1.5 | 2.2 | 3.1 | 1.6 | 2.6 | 3.9 |
| ~50% Chance SLR Exceeds | 1.0 | 1.3 | 1.8 | 2.4 | 3.5 | 1.9 | 2.9 | 4.5 | 2.0 | 3.3 | 5.5 |
| <17% Chance SLR Exceeds‡ | 1.3 | 1.7 | 2.3 | 3.3 | 4.9 | 2.5 | 3.8 | 6.3 | 2.6 | 4.3 | 7.7 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 1.4 | 1.9 | 2.5 | 3.7 | 5.8 | 2.8 | 4.5 | 12.0 | 3.0 | 5.2 | 16.2 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 1.7 | 2.3 | 3.2 | 5.1 | 9.4 | 3.5 | 6.2 | 17.9 | 3.9 | 7.5 | 20.2 |

* Projections that include unknown-likelihood, high-impact rapid ice-sheet loss processes in whose rate and magnitude there is *low confidence* are denoted with an asterisk (*). SLR projections with a >95% chance or >83% chance of being exceeded (i.e., the top two row of SLR estimates) are the same regardless of whether these potential rapid ice-sheet loss processes are included or excluded. The ~50% and <17% chance *likely* range rows do not incorporate these rapid ice-sheet loss processes.

‡ The likelihood of potential rapid ice-sheet loss processes falls somewhere between zero and one, but different experts have different opinions on where it falls within that range. Thus, different experts will disagree on where they draw the 'true' '<17% chance SLR exceeds' bound, but would agree that it falls between the 83rd percentile of projections excluding potential rapid ice-sheet loss processes (i.e., the "<17% chance‡" values) and the 83rd percentile of projections that incorporate potential rapid ice-sheet loss processes (i.e., the "<17% chance*" values). As such the "<17% chance*" projections can be considered within the extended *likely* range projections.

† Estimated degrees of atmospheric warming relative to late nineteenth century (1850–1900) levels provided for each year and emissions scenario using the format "median (5th – 95th percentile range)." Values derived from the FaIR climate module within the FACTS 1.1. Estimated degrees of warming for 2040 and 2050 are reported using the format "median of the intermediate emissions scenario (5th percentile from SSP1-2.6 – 95th percentile from SSP3-7.0).

**Additional Notes for Table ES1:**

- All SLR estimates are 19-year means of sea-level measured with respect to a 1995–2014 baseline centered on the year indicated in the third row of the table. Low (blue), intermediate (orange), and high (red) emissions scenarios above correspond to SSP1-2.6, SSP2-4.5, and SSP3-7.0, respectively.
- Near-term projections (through 2050) exhibit only minor sensitivity to different emissions scenarios (<0.1 feet for projections using *medium-confidence* processes [i.e., excluding rapid ice-sheet loss], <0.2 feet for projections using *low-confidence* processes [i.e., including rapid ice-sheet loss]). As such, these columns span the emissions scenarios used in the main body of this report (the low, intermediate, and high emissions scenarios).
- The STAP 2019 low scenario corresponds most closely to the 2025 STAP low scenario, the STAP 2019 moderate scenario corresponds most closely to the 2025 STAP high scenario, and the STAP 2019 high scenario corresponds most closely to the 2025 STAP very high scenario (found in Appendix B).
- Table 5 highlights: the *extremely likely* to be exceeded SLR to show the amount of SLR that is most likely to occur; the *likely* range to show what amount of SLR has at least a 66% chance of occurring consistent with AR6; the extended *likely* range to show the potential effects of rapid ice-sheet loss processes on SLR; and the *extremely unlikely* to be exceeded SLR to highlight the greatest SLR extent resulting from rapid ice-sheet loss processes.
- All SLR projections include the impact of ice-sheet loss (i.e., ice loss from melting ice sheets and calving). However, the projections designated to include rapid ice-sheet loss processes incorporate the potential impact of processes in Antarctica and Greenland that could further accelerate ice-sheet loss.

## e) How fast will sea-level rise in New Jersey?

It is particularly important to understand the rate of SLR to assess the adaptability of anthropogenic and ecological systems, such as the capacity of coastal marshes to keep pace with SLR. The STAP has produced rates of historic SLR (Figure 1, Table 1) and future SLR (Table 6) based on the projections described above.[14] Based on these changes, the STAP has reached the following conclusions about rates of SLR in New Jersey:

1. New Jersey coastal areas are expected to experience higher future average SLR rates in the middle (2040–2060) and late (2080–2100) 21st century (Table 6) than historic SLR rates (Table 1).

2. Rates of SLR in the middle and late 21st century increasingly depend upon global greenhouse gas emissions (Table 6):

    a. Under a low-emissions scenario consistent with the global goal of limiting warming to below 2°C above late nineteenth-century levels, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to experience mid-century rates of SLR between 6.3 and 11.0 mm/yr (2.5 and 4.3 inches/decade) and late-century rates of SLR between 3.4 and 10.3 mm/yr (1.3 and 4.1 inches/decade). Including potential rapid ice-sheet loss processes could extend mid-century ranges upward to 12.5 mm/yr (4.9 inches/decade) and late-century ranges upward to 13.4 mm/yr (5.3 inches/decade).

    b. Under an intermediate-emissions scenario, approximately consistent with current global climate policies, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to experience mid-century rates of SLR between 7.5 and 11.9 mm/yr (3.0 and 4.7 inches/decade) and late-century rates of SLR between 5.6 and 14.3 mm/yr (2.2 and 5.6 inches/decade). Including potential rapid ice-sheet loss processes could extend mid-century ranges upward to 14.9 mm/yr (5.9 inches/decade) and late-century ranges upward to 21.5 mm/yr (8.5 inches/decade).

    c. Under a high-emissions scenario consistent with global trends before the adoption of the Paris Agreement, coastal areas of New Jersey are *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to experience mid-century rates of SLR between 8.1 and 12.5 mm/yr (3.2 and 4.9 inches/decade) and late-century rates of SLR between 8.2 and 18.3 mm/yr (3.2 and 7.2 inches/decade). Including potential rapid ice-sheet loss processes could extend mid-century ranges upward to 16.4 mm/yr (6.5 inches/decade) and late-century ranges upward to 30.1 mm/yr (11.9 inches/decade).

    d. Rates of global-mean sea-level change are related to the magnitude of global-mean warming. In the low emissions scenario, *likely* SLR rates decrease toward the end of century, consistent with declining global-mean warming driven by net-negative greenhouse gas emissions.

[14] Rates of future SLR for all emissions scenarios are provided in Appendix C (Tables C6 – C10).

**Table 6.** Estimated average rates of future SLR in mm/year over 2040–2060 and 2080–2100 for Atlantic City, New Jersey. Future SLR rates for additional tide gauges are available in Table C6-C10.

| | 2040–2060 | | | 2080–2100 | | |
|---|---|---|---|---|---|---|
| | *Emissions* | | | | | |
| Chance rate (mm/yr) exceeds | Low | Int. | High | Low | Int. | High |
| ***Likely* Range, Excludes Potential Rapid Ice-Sheet Loss Processes** | | | | | | |
| > 83% chance | 6.3 | 7.5 | 8.1 | 3.4 | 5.6 | 8.2 |
| ~50 % chance | 8.2 | 9.3 | 9.8 | 6.5 | 9.4 | 12.5 |
| <17% chance‡ | 11.0 | 11.9 | 12.5 | 10.3 | 14.3 | 18.3 |
| **Extended *Likely* Range, Includes Potential Rapid Ice-Sheet Loss Processes** | | | | | | |
| <17% chance* | 12.5 | 14.9 | 16.4 | 13.4 | 21.5 | 30.1 |

‡,*Extended *likely* range projections include potential rapid ice-sheet loss processes in whose rate and magnitude there is *low confidence* (indicated by *). However, most experts (including the STAP), agree the actual 83rd percentile falls between the 83rd percentile of projections in the absence of potential rapid ice-sheet loss processes (i.e., the "<17% chance‡" values) and the 83rd percentile of projections that fully incorporate the potential rapid ice-sheet loss processes (i.e., the "<17% chance*" values). As such the "<17% chance*" projections can be considered within the extended *likely* range projections.

## f) How does relative sea-level rise vary across New Jersey?

The impacts on coastal areas will be highly dependent on local environmental dynamics including subsidence. Subsidence is a variable rate that is site-specific (Oelsmann et al., 2024; Ohenhen et al., 2024a) with some experts suggesting studies without high-resolution, site-specific vertical land motion (VLM) data may underestimate New Jersey subsidence rates. For example, by focusing only on changes at the tide gauge, AR6 may underestimate the amount of recent subsidence (i.e., between 2007–2020) in Atlantic City as a whole by 25.5% (Ohenhen et al., 2023). Therefore, site-specific data on subsidence are imperative to accurately estimate the implications of subsidence to New Jersey communities and infrastructure (Ohenhen et al., 2024b).

Subsidence “hot spots” can occur on former landfill sites or sites with artificial fill due to compaction (Buzzanga et al., 2023) and in areas of increased groundwater withdrawal (Hamlington et al., 2020). The STAP has produced maps of normalized changes in groundwater pumping volumes by county from 1985–2015 for New Jersey compiled from the U.S. Geological Survey Water Use dataset (Figure 7) to provide an overview of where subsidence could be accelerating. However, while differences in relative sea-level rise rates could be driven by spatially variable rates of groundwater extraction, differences in measured sea-level rise rates at the tide gages are not clearly attributable to groundwater extraction at this time.

Projected groundwater demand is expected to produce groundwater declines of up to 15 feet between 2014 and 2040, but there is substantial spatial variability in projected drawdown (Kauffman 2024). Subsidence is not expected to increase linearly with groundwater pumping as it will depend on the compressibility of the sediments, the hydrogeologic properties, and the spatial distribution of pumping. More data is needed to estimate the contribution of groundwater pumping to subsidence and relative sea-level rise in New Jersey.

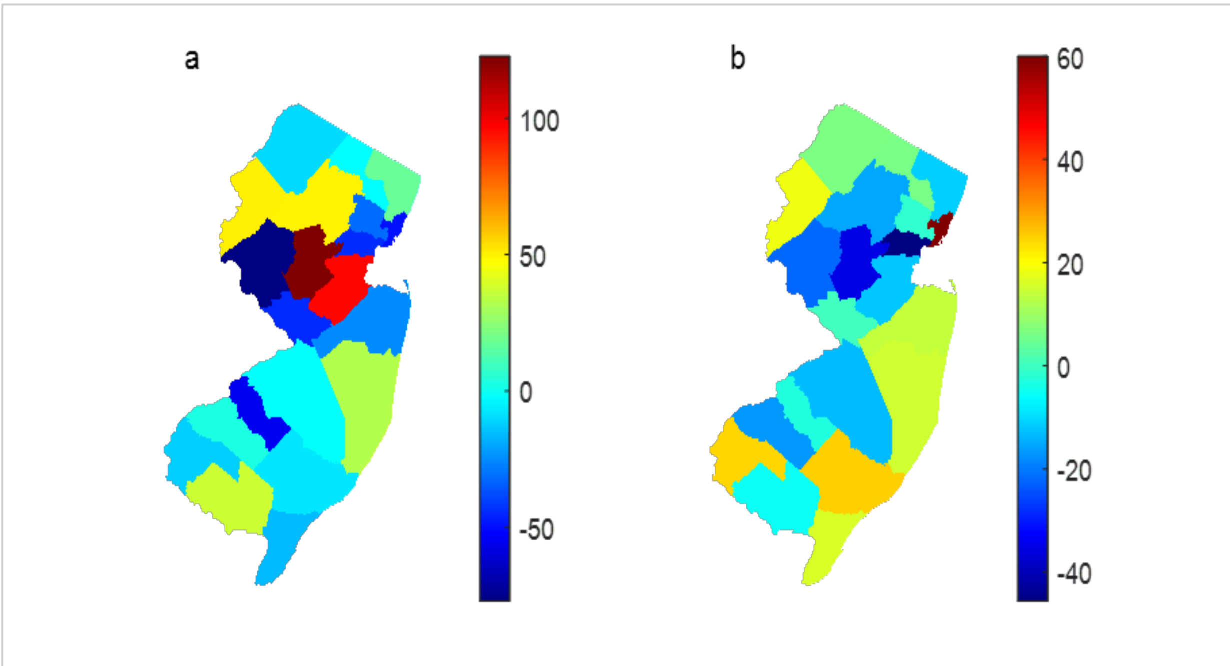


**Figure 7.** Map of normalized change (percent change) in groundwater withdrawals in New Jersey counties from a)1985–2000 and b)2000-2015. Data obtained from USGS Water Use Data for New Jersey (USGS 2025).

## g) When is sea-level rise going to exceed a particular threshold?

Consistent with the 2019 STAP report and IPCC AR6, practitioners stated that it would be helpful to be able to communicate when a particular level of SLR is projected to occur. More specifically, practitioners must be able to respond to the question, "When is sea-level going to exceed X ft over the 2005 baseline in New Jersey?" Figure 8 compares the projected timing of when Atlantic City, NJ will exceed stated thresholds from 1, 2, 3, 4, and 5 ft. of SLR above the 2005 baseline. Values for other tide gauges (i.e., Sandy Hook and Cape May, NJ; Philadelphia, PA; The Battery, NYC) are available in Appendix C (Figures C3-C7). This information can help practitioners communicate the strength of evidence to support incorporating a given amount of SLR over time into their decision.

The data in Figure 8 present information about SLR similar to that illustrated in Table 5, but in a fundamentally different way. Instead of providing a range of projected SLR for a given future year (Table 5), Figure 8 presents a range of timings for a given level of SLR. For example:

- Relative to mean sea level over 1995–2014: regardless of emissions, coastal New Jersey SLR is *likely* (at least a 66% chance) to exceed 1 ft (0.30 m) by 2030–2055.

- Under a low-emissions scenario, consistent with the global goal of limiting warming to below 2°C above late nineteenth-century levels, coastal New Jersey SLR is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to exceed 2 ft (0.6 m) between 2060 and 2125 and exceed 4 ft (1.2 m) between 2120 and sometime after 2300

- Under an intermediate-emissions scenario, consistent with approximate current global climate policies, coastal New Jersey SLR is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to exceed 2 ft (0.6 m) between 2055 and 2095 and exceed 4ft (1.2 m) between 2100 and 2195.

- Under a high-emission scenario, consistent with global trends before the adoption of the Paris Agreement, coastal New Jersey SLR is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) to exceed 2 ft (0.6 m) between 2055 and 2085 and exceed 4 ft (1.2 m) between 2095 and 2155.

- Even accounting for the potential impact of potential rapid ice-sheet loss processes, across emissions scenarios, coastal New Jersey SLR is *extremely unlikely* (less than a 5% chance) to exceed 2 ft (0.6 m) before 2045. It is *extremely unlikely* to exceed 4 ft (1.2 m) before 2080 in a low-emissions scenario, 2075 in an intermediate-emissions scenario, and 2070 in a high-emissions scenario.

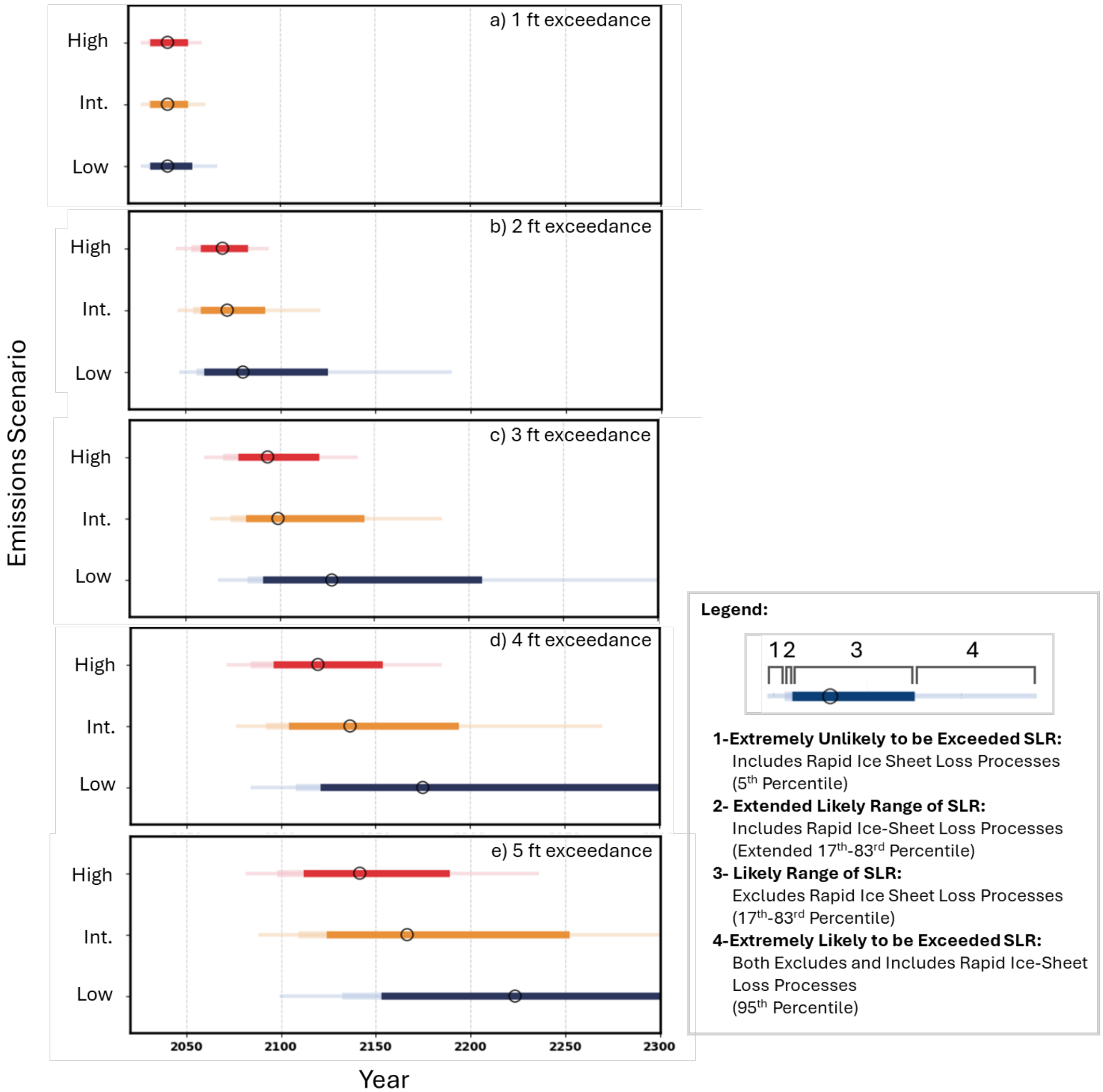


**Figure 8.** Range of probabilities that SLR in Atlantic City, NJ will exceed (a) 1 ft, (b) 2 ft, (c) 3 ft, (d) 4 ft, and (e) 5 ft of SLR above a 1995–2014 (2005) baseline under low, intermediate, and high emissions scenarios (in blue, orange, and red respectively). Refer to the legend to interpret how the projections are plotted: in general, projections that include potential contributions from rapid ice-sheet loss processes are indicated by light shading, while projections that exclude potential rapid ice-sheet loss processes are indicated by dark shading (the exception being #4 in the legend, which both excludes and includes potential rapid ice-sheet loss processes). The *likely* and extended *likely* range are represented by thicker lines. Open circles represent the median projections (~50% *likely* SLR will exceed the given height at the corresponding time).

## h) How do the STAP 2025 sea-level rise projections compare with the STAP 2019 projections?

Despite substantially updated methodologies, for comparable warming scenarios and comparable choices about the inclusion of unknown-likelihood, high-impact ice-sheet processes (i.e., potential rapid ice-sheet loss processes), the SLR projections in this report and STAP 2019 are quite similar (Table C4, Table C5).

There are two crucial distinctions between the 2019 and 2025 reports. First, based on the AR6 assessment and policy changes leading to reductions in projected global emissions, the warming scenarios used by the STAP in 2019 differ from the emissions scenarios used by the STAP in 2025 (Table C1). In this report, we adopt the same vernacular labels for SSP scenarios used by AR6. Meaning:

- The 'moderate' warming scenario in STAP 2019, associated with 3.5°C of 21st-century global warming, most closely aligns with SSP3-7.0, which is the 'high' emissions scenario in this report. The STAP 2019 'moderate' warming scenario was consistent with assessments of current-policy emissions a decade ago, but current policies in 2025 are more consistent with SSP2-4.5, the 'intermediate' emissions scenario in this report. Like-to-like comparisons of projections between the two reports should therefore compare the STAP 2019 'moderate' scenario to the STAP 2025 'high' scenario.
- The 'low' warming scenario in STAP 2019, associated with 2.0°C of 21st-century global warming, most closely aligns with SSP1-2.6 which is the 'low' emissions scenario in this report.

Second, rather than simply presenting a "<17% chance" projection incorporating *low-confidence* processes as in STAP 2019, we present two "<17% chance of exceeding" projections (Table 5). The first such projection (denoted by "<17% chance‡") excludes *low-confidence* processes, and thus assumes no significant contribution from unknown-likelihood, high-impact ice-sheet processes. This is analogous to how AR6 presented the upper bound of its *likely* range. The second "<17% chance" projection (i.e., upper bound of the extended *likely* range) is a high-end projection that incorporates *low-confidence* processes. This projection (denoted by "<17% chance*") allows for unknown-likelihood, high-impact ice-sheet processes whose projections are characterized by *low confidence*. This second row is analogous to how STAP 2019 presented the upper bound of its *likely* range, and how AR6 presents the upper bound of its *low-confidence* projections. Both the STAP 2019 and STAP 2025 approaches are scientifically defensible. Like-to-like comparisons should compare the "<17% chance" values in STAP 2019 to the "<17% chance*" values in this report. Like-to-like comparisons should also compare the upper bound of the *likely* range in AR6 to the "<17% chance‡" values.

When these two differences are taken into account, the STAP 2019 and STAP 2025 projections are notably similar. For example, *likely range* of projected sea-level rise for 2100 (relative to the 1995–2014), incorporating a representation of potential rapid ice-sheet loss processes, was 1.9–5.0 ft (0.58 – 1.52 m) according to the 2019 STAP report for its moderate warming (3.5°C) scenario and is 2.6–5.2 ft (0.79 – 1.58 m) for this report for the high emissions scenario (median warming of 3.8°C). Additionally, when considering the STAP 2019 projections are 0.08 ft (0.02 m) lower than the 2025 STAP projections due to the different baselines used between reports (Table 4), the STAP 2019's 5.1ft projection is still nearly the STAP 2025's 5.2ft (1.58 m) (i.e., 5.1ft - 0.08ft = 5.02 ft [1.55 m – 0.02 m = 1.53 m]) (Table 7).

**Table 7.** Comparison of the STAP 2019 SLR estimates (converted here from the 2019 STAP Report's 1991–2009 baseline to the 2025 STAP Report's 1995–2014 baseline) to the STAP 2025 SLR estimates for a comparable warming and emission scenario. All SLR estimates are in feet.

| | **2100, feet above 1995–2014** | |
|---|---|---|
| Chance SLR Exceeds | STAP 2019, Moderate warming | STAP 2025, High emissions |
| > 83% chance | 1.9 | 2.6 |
| ~50% chance | 3.2 | 3.3 |
| <17% chance* | 5.0 | 5.2 |
| Median projected warming | 3.5°C | 3.8°C |

* Includes potential contributions from potential rapid ice-sheet loss processes.

## i) How do the STAP 2025 sea-level rise projections for New Jersey compare with the federal Interagency sea-level rise scenarios?

The federal Sea Level Rise and Coastal Flood Hazard Scenarios and Tools Interagency Task Force released a 2022 report (hereafter the Interagency report) (Sweet et al., 2022) that builds on AR6. The STAP report and AR6 offer scientific projections of future sea level change that result from potential emissions and warming. These reports answer the question: What is the likelihood of different amounts of SLR under different future climate scenarios? In contrast, the Interagency report offers scenarios of future sea level change to answer the question: What is the range of plausible future sea level that a decision maker might wish to consider (incorporating both the range of possible emissions and the range of possible physical responses, regardless of whether those ranges are likely)? The Interagency report relies upon AR6 to evaluate the likelihood of the Interagency scenario trajectories under different warming levels and does not make an independent evaluation of likelihoods.

The Interagency report presents five sea-level scenarios (i.e., Low, Intermediate-Low, Intermediate, Intermediate-High, and High), defined primarily by 2100 global-mean sea level change (ranging from 0.3 to 2.0 m [1.0 to 6.6 ft]). Each scenario includes a central estimate, which is most commonly used, and low and high variants that reflect the uncertainty in how global-mean sea-level change relates to local relative sea-level change. In comparing the STAP projections to the Interagency scenarios for Atlantic City, we focus on the five central estimates as well as the high variant of the Interagency High scenario and the low variants of the Interagency Low scenario.

Figure 9 compares the Atlantic City, NJ STAP projections to the Atlantic City, NJ Interagency scenarios. The STAP concludes:

- For 2040 and 2050, the median Interagency Low, Intermediate-Low, Intermediate, Intermediate-High, and High sea-level scenarios are all in the *likely* range of the STAP's SLR projections. The high variant of the Interagency High scenario (83rd percentile of the Interagency High scenario) exceeds the extended *likely* range, falling slightly below the 95th percentile of the STAP projections.

- In 2070, under the Low emissions scenario, the Interagency Low, Intermediate-Low, and Intermediate sea-level scenarios fall within the STAP *likely* range, while the Intermediate-High, High, and High variant scenarios exceed the extended *likely* range. The Interagency Low variant ($17^{th}$ percentile of the Interagency Low scenario) falls below the STAP *likely* range.
- In 2100, under the Low emissions scenario, the Interagency Low and Intermediate-Low SLR scenarios fall within the *likely* range, while higher Interagency scenarios exceed the extended *likely* range. The Interagency Low variant falls below the *likely* range.
- In 2070, under the Intermediate emissions scenario, the Interagency Low, Intermediate-Low, and Intermediate SLR scenarios fall within the STAP *likely* range. The Interagency Intermediate-High scenario falls at the upper edge of the extended *likely* range. The Interagency High and High variant scenarios exceed the extended *likely* range. The Interagency Low variant is lower than the *likely* range of the STAP Intermediate SLR estimates by 2070.
- In 2100, under the Intermediate emissions scenario, the Interagency Low scenario is below the *likely* range but above the 5th percentile (*extremely likely* to exceed projection). The Interagency Intermediate-Low scenario falls within the *likely* range, and the Interagency Intermediate scenario falls within the extended *likely* range. The higher Interagency scenarios exceed the extended *likely* range. The Interagency Low variant falls below the STAP 5th percentile.
- In 2070, under the High emissions scenario, the Interagency Intermediate-Low and Intermediate scenarios fall within the *likely* range, with the Interagency Intermediate-High scenario falling within the extended *likely* range. The Interagency High scenario falls below the STAP 95th percentile, while the High variant scenario exceeds the 95th percentile. The Interagency Low scenario is below the *likely* range and above the 5th percentile, while the Low variant is below the 5th percentile.
- In 2100, under the High emissions scenario, the Interagency Low and Low variant scenarios are below the 5th percentile STAP projection.  The Interagency Intermediate-Low and Intermediate scenarios are within the *likely* range. The Interagency Intermediate-High and High scenarios exceed the extended *likely* range but fall below the 95th percentile STAP projection. The Interagency High variant scenario exceeds the 95th percentile. The Interagency Low and Low variant scenarios are below the 5th percentile.

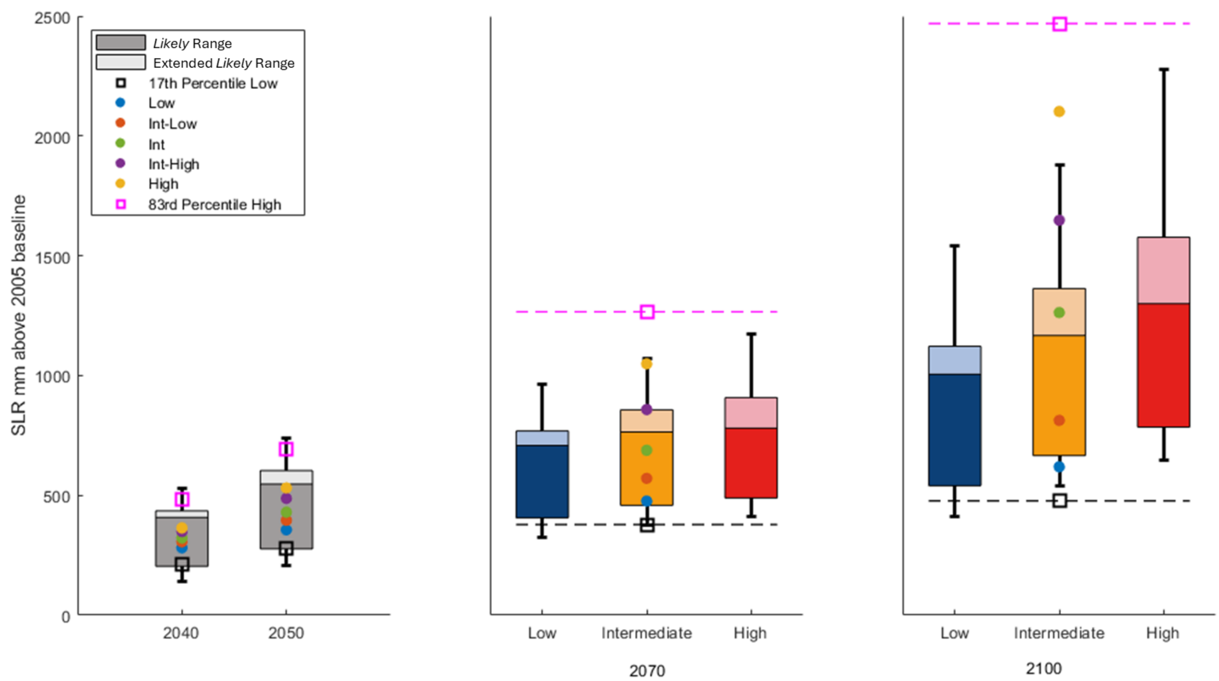


**Figure 9.** STAP sea-level projections compared with Interagency sea-level rise scenarios for Atlantic City, NJ. Interagency scenarios are represented by dots and dashed lines. STAP sea-level projections are represented by box plots and provide the same data points presented in Table 5. The *likely* range of SLR estimates that do not consider potential rapid ice-sheet loss processes are represented by the darker colors of the box plots (grey, blue, orange, and red); the extended *likely* range of SLR estimates that do consider potential rapid ice-sheet loss processes are represented by the lighter shades of the box plots (grey, blue, orange, and red. The box plot's arms span from the 5th percentile (extremely likely to be exceeded) to 95th percentile (extremely unlikely to be exceeded).

## j) How do the STAP projections for New Jersey compare with observations?

In comparing the STAP projections to tide-gauge observations, it is essential to be cognizant that the STAP is projecting changes in 19-year average sea level (e.g., the reported 2040 projections are the projected average sea level over the period 2031–2049). The projections do not include interannual variability, which at Atlantic City (for example) adds ± 0.2 ft (0.06 m) variability (2σ) around the 19-year average.

The closest SLR projection the STAP can compare to observations is the 2020 projection (or the measured average of sea level during the period 2011–2029). Since the 2011–2029 average sea-level has not yet been fully observed at the time of publication, the STAP must extrapolate the observed tide-gauge record to estimate the 2011–2029 average sea-level. The Federal Interagency SLR report (Sweet et al., 2022) constructed quadratic extrapolations of the 1970–2020 tide-gauge record. The Federal Interagency SLR report partially removed natural variability through regression on climate indices representing the El Niño–Southern Oscillation, Pacific Decadal Oscillation, and North Atlantic Oscillation. The Federal Interagency SLR report also accounted for serially correlated variability in estimating the associated uncertainty.

The Federal Interagency SLR report's extrapolations for 2020 (adjusted to match the 2005 or 1995–2014 baseline period used in this report) are shown in Table 8. In New Jersey, the extrapolated value in 2020 relative to 1995–2014 ranges from 0.31 ± 0.11 ft (0.09 ± 0.03 m) at Atlantic City to 0.37 ± 0.13 ft (0.11 ± 0.04 m) at Cape May. The notable difference between the two relatively proximal sites likely reflects differences in subsidence, potentially associated with groundwater withdrawal.

The 2025 STAP projections indicate, using the 19-year average centered on the year 2005 as the baseline, that the *likely* 19-year average relative SLR for New Jersey in the 19-year interval centered on 2020 is 0.26–0.51 ft (0.08 – 0.15 m) of SLR (Appendix B) (i.e., from 2005 to 2020 it is *likely* there was between 0.26 and 0.51 ft [0.08 – 0.15 m] of SLR). Overall, this suggests good agreement between the 2025 STAP's projected *likely ranges* of sea-level rise and trends extrapolated from tide-gauge observations.

By comparison, the 2019 STAP projected a *likely* rise of 0.2–0.7 ft (0.06 – 0.21 m) for New Jersey over the same period (2005–2020) (Kopp et al., 2019). Therefore, the 2019 STAP projection also agrees with observations, but with a broader range.

**Table 8.** 2020 projections compared to observation extrapolations from Sweet et al. (2022).

| | Observation Extrapolation for 2020* | AR6/STAP 2025 Projection for 2020 |
|---|---|---|
| **The Battery** | 0.27 (0.20–0.34) ft | 0.33 (0.21–0.47) ft |
| **Sandy Hook** | 0.33 (0.25–0.42) ft | 0.38 (0.26–0.51) ft |
| **Atlantic City** | 0.31 (0.20–0.41) ft | 0.38 (0.26–0.51) ft |
| **Cape May** | 0.37 (0.26–0.48) ft | 0.37 (0.25–0.51) ft |

**Extrapolations, taken from the online datasets associated with Sweet et al., 2022 (NASA 2021), are adjusted from a 1991–2009 to 1995–2014 baseline based on local tide gauge observations. Ranges shown are 17th–83rd percentile values for the extrapolation and likely ranges for the projections. The methodology used for the AR6 projections is identical to that used by the STAP.*

# SECTION 5. HIGH COASTAL WATER LEVELS AND ASSOCIATED FLOODING

High coastal water levels, such as those associated with storms or extreme high tides, push water levels above the normal high tide mark (i.e., mean higher high water or MHHW). High coastal water level events are occurring now along New Jersey's coastline and will increase in frequency as sea levels continue to rise. The STAP deliberations focused on analyzing the frequency and magnitude of past and future flood events.

Per NOAA's recommended vernacular for objective and nationally consistent flood thresholds, 'minor flooding', 'moderate flooding', and 'major flooding' are severity terms used to describe flooding regardless of the driver (e.g., SLR, storms, precipitation) (Sweet et al. 2018). Minor flooding is "more disruptive than damaging," moderate flooding causes damage, and major flooding is destructive (Sweet et al., 2018). Flood thresholds as defined by NOAA are unique to a given location. NOAA reports them relative to the NTDE for 1983–2021, but they do not change in height with increasing sea level. For example, the Atlantic City, NJ, flood thresholds are the derived flood thresholds of 1.8 ft (minor flooding), 2.8 ft (moderate flooding), and 4.0 ft (major flooding) above MHHW (defined in the NTDE for 1983–2001).[15]

In this report, the term "coastal flood event" refers to a flood that exceeds at least the minor flooding threshold, and the term "coastal flood day" refers to a day with a flood event. A "high tide flood" is a flood event that occurs without a storm.

## a) Past Coastal Flooding

The total number of coastal flood days in New Jersey has increased in frequency and magnitude over time. In the 1950s, Atlantic City experienced an average of less than one coastal flood day per year. Over 2007–2024, there were an average of twelve coastal flood days per year, with annual totals ranging between four coastal flood days in 2007 and an all-time high of 23 coastal flood days in 2024 (Figure 10).

[15] The flood threshold values were derived using a consistent standard for coastal flooding nationwide by NOAA (Sweet et al., 2018) but are not the same as the local National Weather Service thresholds. Derived flood thresholds can be found in Appendix 1 of Sweet et al. 2018. In meters, these thresholds are: 0.55 m (minor flooding), 0.85 m (moderate flooding), 1.21 m (major flooding).

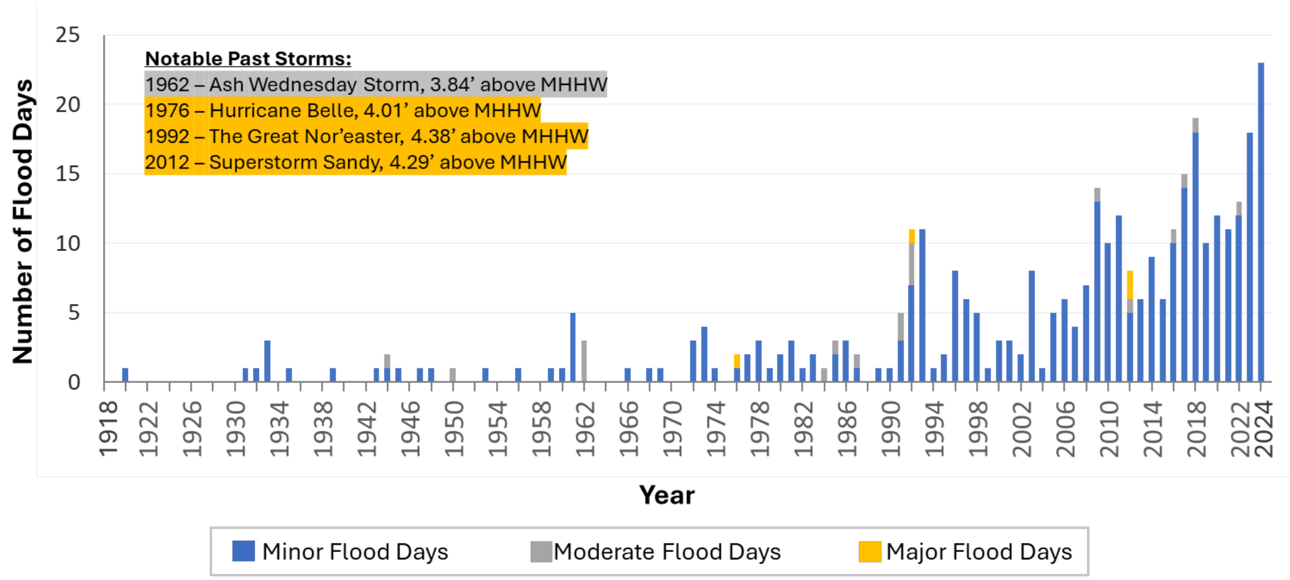


**Figure 10.** Historical flood frequency (number of coastal flood days) for Atlantic City, NJ. Data was downloaded from the NOAA Historic Flood Days portal (NOAA Tides and Currents 2025). Minor, moderate, and major flood event days are blue, grey, and orange, respectively. Flood events are recorded based on calendar year, not meteorological year. Major flood event names and a notable moderate flood event name are superimposed and color-coded on the upper left corner.

## b) Future Coastal Flooding

Understanding the likelihood of future flood events can help practitioners plan for the detrimental impacts of flooding on infrastructure and community function (Sweet et al., 2018). In this section, following the methodology of Sweet et al. (2018), the STAP examines the effects of projected future SLR (and its uncertainty) on flood events.[16] As in Section 5a, the thresholds for minor, moderate, and major floods are 1.8 ft (minor flooding), 2.8 ft (moderate flooding), and 4.0 ft (major flooding) above MHHW (defined in the NTDE for 1983–2001)This analysis excludes the potential effects of changes in coastal storms, which are discussed in Section 6. Projected future flood frequencies for Atlantic City, New Jersey, under the intermediate emissions scenarios for minor, moderate, and major flood events are shown in Table 9.

The STAP generated future coastal flood day frequencies for Atlantic City, NJ under an intermediate-emissions scenario (Table 9). Future coastal flood frequencies for additional tide gauge locations (i.e., Sandy Hook and Cape May, NJ; Philadelphia, PA; The Battery, NYC) are included in Appendix E. The STAP concludes:

- It is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) that Atlantic City will experience between 29 and 148 coastal flood days (i.e., a high-water level greater than 4 feet above 1995–2014 mean sea level baseline at least one time during the 24-hour day) in a typical year around 2050. Note that this is the average number of coastal flood days per year and

[16] A “coastal flood event” refers to a flood that exceeds at least the minor flooding threshold, as discussed in Section 4a.

does not include the year-to-year variability, which will cause some years to have a number of flood events well above average.

- It is *likely* (at least a 66% chance in the absence of potential rapid ice-sheet loss processes) that Atlantic City will experience between 227 and 359 coastal flood days in a typical year by 2100. Including potential rapid ice-sheet loss processes could extend the upper end of the number of coastal flood days to daily coastal flood days.
- It is *extremely likely* (more than a 95% chance) that the average number of coastal flood days at Atlantic City in a typical year will exceed 130 by the year 2100. It is *likely* (at least a 66% chance in the absence potential rapid ice-sheet loss processes) that flooding will occur between 227 and 359 days a year in a typical year around 2100.
- The number of minor, moderate, and major flood events is expected to increase over time. For example, it is *extremely likely* (more than a 95% chance) that there will be an average of one major flood days (i.e., floods greater than 6.2 ft [1.89 m] above this report's 1995–2014 baseline) in a typical year by the year 2100.

**Table 9.** Expected coastal flooding days in Atlantic City, NJ through 2150 under the intermediate emissions scenario both excluding and including potential rapid ice-sheet loss processes

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) under the Intermediate-Emissions Scenario for Atlantic City | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Year | **2020** | **2030** | **2040** | **2050** | **2070** | **2100** | **2150** |
| **Minor Flooding** | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | > 95% Chance SLR Exceeds* | 5 | 6 | 9 | 15 | 54 | 131 | 257 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | > 83% Chance SLR Exceeds | 6 | 9 | 15 | 29 | 97 | 227 | 331 |
| | ~50% Chance SLR Exceeds | 8 | 16 | 35 | 72 | 194 | 326 | 363 |
| | <17% Chance SLR Exceeds‡ | 13 | 34 | 80 | 148 | 297 | 359 | 365 |
| | **Extended** ***Likely*** **Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | <17% Chance SLR Exceeds* | 13 | 36 | 93 | 178 | 326 | 364 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | < 5% Chance SLR Exceeds* | 17 | 61 | 151 | 262 | 356 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 1 | 5 | 14 | 69 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 1 | 3 | 9 | 47 | 194 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 31 | 179 | 353 |
| | <17% Chance SLR Exceeds‡ | 1 | 3 | 7 | 17 | 113 | 327 | 365 |
| | **Extended** ***Likely*** **Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 3 | 9 | 25 | 179 | 355 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 5 | 18 | 73 | 306 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 2 | 11 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 10 | 220 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 5 | 103 | 361 |
| | **Extended** ***Likely*** **Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 10 | 238 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 63 | 360 | 365 |

Table 10 summarizes coastal water levels associated with permanent inundation occurring at the mean higher high water level, coastal flood events, and various coastal storms through 2150. Values here are presented with respect to mean higher high water calculated over the National Tidal Datum Epoch (NTDE) 1983-2001 baseline. With respect to this baseline, the NOAA flooding thresholds are 1.8 ft (minor flooding), 2.8 ft (moderate flooding), and 4.0 ft (major flooding).[17] The SLR projections are presented with respect to the 1995–2014 baseline used for the STAP's projections (as in Table 5). Table 10 shows two illustrative SLR projections under the intermediate emissions scenario: (1) the median projection in the absence of potential rapid ice-sheet loss processes and (2) the upper bound of the extended *likely* range including potential rapid ice-sheet loss processes. Table 10 does not reflect future changes in storms; instead, Table 10 communicates the total water level if the same exact past storm occurs in the future.[18] For example, for the intermediate emissions scenario with a ~50% of occurring excluding potential rapid ice-sheet loss processes, to estimate the change in coastal water level extremes of a Hurricane Sandy event in 2100, the STAP used the observed water level from 2012 during Hurricane Sandy converted to the 2005 baseline (i.e., 3.8 ft [1.16 m] relative to the NTDE MHHW in Atlantic City, NJ) and added the 2012 water level to the estimated SLR in the year 2100 (e.g., 3.8 ft + 2.9 ft = 6.7 ft [1.16 + 0.88 = 2.04 m]). Table 10 can be modified to reflect additional emissions scenarios (instructions available in Appendix F). Based on Table 10, the practitioner can begin to understand potential future coastal water level extremes that include projected SLR. For example, the practitioner might wish to communicate the following:

1. Under the intermediate emissions scenario excluding potential rapid ice-sheet loss processes (Table 10a), between 2050 and 2070 the Atlantic City, New Jersey will have about a 50% chance of experiencing permanent inundation that will surpass the current minor flood threshold (1.8 ft [0.55 m] relative to the NTDE baseline).
2. Under an intermediate-emissions scenario excluding potential rapid ice-sheet loss processes (Table 10b) by 2050, Atlantic City, NJ has a 50% chance of experiencing annual flood events that exceed the water levels of 2012's Hurricane Sandy (3.6 ft [1.09 m] relative to the NTDE).
3. Under an intermediate-emissions scenario excluding potential rapid ice-sheet loss processes by 2040, Atlantic City, NJ has a 50% chance of exceeding a 3.5 ft [1.07 m] annual flood event, surpassing the threshold for the NTDE 10-year flood event (3.3 ft).

Based on this analysis of Atlantic City, the STAP has concluded minor flood events observed in the mid-20th century are now commonplace (Figure 7) and are *extremely likely* (more than a 95% chance of occurring) to occur over more than half the days of the year in a typical year by 2100 (i.e., 200 days of the year). Minor flood events are *likely* (at least a 66% chance of occurring) to occur between 270–360 days a year in the absence of potential rapid ice-sheet loss processes.

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[17] Conversions were needed to ensure the baseline SLR is measured against is in the temporal baseline (the 19-year average sea level between 1995-2014) and vertical datum (i.e., mean sea level) used for the STAP projections. Conversion values were derived from the Atlantic City, NJ datums webpage (available at NOAA 2025) and based on Table 4 of this report. Second, 0.19 was subtracted to convert the flood threshold from the NTDE baseline (1983–2001 baseline) to a 1995–2014 baseline consistent with Table 4. In meters, these thresholds are: 1.21 m (minor flooding), 1.52 m (moderate flooding), 1.89 m (major flooding).
[18] Additional Context for Technical Experts: The calculation of water levels in historic events under future sea levels does not reflect future changes in storm intensity. It also does not include nonlinear effects of sea level on storm surge (i.e., it relies on linear superposition) although in many locations future surges can be expected to experience nonlinear amplification by sea level (though in some areas, dampening could occur).

**Table 10**. Values in the table (in feet) refer to changes in coastal water level extremes under two SLR projections centered on the year 2005 (i.e., average sea level over 1995–2014) relative to the NTDE tidal datum for Mean Higher High Water centered on the year 1992 (average over 1983-2001). The 100-year flood (1% AEP), 10-year flood (10% AEP), and Annual Flood (63% AEP) are derived from NOAA Tides & Currents extreme water levels (available here). The storms of 1992, 1962, and 2012 are derived from NOAA Tides and Currents top 10 highest water levels (available here). The coastal flooding threshold for Atlantic City, NJ is from Sweet et al. (2018). All values in this table are based on measurements recorded at the Atlantic City tide gauge; all values, therefore, include storm surge.

| | NTDE* | 2005 | 2020 | 2040 | 2050 | 2070 | 2100 | 2150 |
|---|---|---|---|---|---|---|---|---|
| **a) Int. Emissions, Middle of *Likely* Range (50% Change), Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| **SLR relative to 1995-2014** | **-0.2** | **0.0** | **0.4** | **1** | **1.3** | **1.9** | **2.9** | **4.5** |
| 100-year flood (1% AEP) | 4.7 | 4.9 | 5.3 | 5.9 | 6.2 | 6.8 | 7.8 | 9.4 |
| Ash Wednesday Storm (1962 - 4.3ft)** | 4.7 | 4.9 | 5.3 | 5.9 | 6.2 | 6.8 | 7.8 | 9.4 |
| *Great Nor'Easter (1992 - 4.4ft)*** | 4.4 | 4.6 | 5.0 | 5.6 | 5.9 | 6.5 | 7.5 | 9.1 |
| *Major Flood Threshold* | *4.0* | — | — | — | — | — | — | — |
| Sandy (2012 - 3.9ft)** | 3.6 | 3.8 | 4.2 | 4.8 | 5.1 | 5.7 | 6.7 | 8.3 |
| 10-year flood (10% AEP) | 3.3 | 3.5 | 3.9 | 4.5 | 4.8 | 5.4 | 6.4 | 8.0 |
| *Moderate Flood Threshold* | *2.8* | — | — | — | — | — | — | — |
| Annual Flood (63% AEP) ‡ | 2.3 | 2.5 | 2.9 | 3.5 | 3.8 | 4.4 | 5.4 | 7.0 |
| *Minor Flood Threshold* | *1.8* | — | — | — | — | — | — | — |
| Bimonthly Flood (99% AEP) ‡ | 1.6 | 1.8 | 2.2 | 2.8 | 3.1 | 3.7 | 4.7 | 6.3 |
| **Mean Higher High Water** | **0.0** | **0.2** | **0.6** | **1.2** | **1.5** | **2.1** | **3.1** | **4.7** |
| *NAVD88* | *-2.0* | — | — | — | — | — | — | — |
| Mean Sea Level | -2.4 | -2.2 | -1.8 | -1.2 | -0.9 | -0.3 | 0.7 | 2.3 |
| **b) Int. Emissions, Upper Bound of Extended *Likely* Range (<17% Chance), Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| **SLR relative to 1995-2014** | **-0.2** | **0.0** | **0.5** | **1.4** | **1.9** | **2.8** | **4.5** | **12.0** |
| 100-year flood (1% AEP) | 4.7 | 4.9 | 5.4 | 6.3 | 6.8 | 7.7 | 9.4 | 16.9 |
| Ash Wednesday Storm (1962 - 4.3ft)** | 4.7 | 4.9 | 5.4 | 6.3 | 6.8 | 7.7 | 9.4 | 16.9 |
| *Great Nor'Easter (1992 - 4.4ft)*** | 4.4 | 4.6 | 5.1 | 6.0 | 6.5 | 7.4 | 9.1 | 16.6 |
| *Major Flood Threshold* | *4.0* | — | — | — | — | — | — | — |
| Sandy (2012 - 3.9ft)** | 3.6 | 3.8 | 4.3 | 5.2 | 5.7 | 6.6 | 8.3 | 15.8 |
| 10-year flood (10% AEP) | 3.3 | 3.5 | 4.0 | 4.9 | 5.4 | 6.3 | 8.0 | 15.5 |
| *Moderate Flood Threshold* | *2.8* | — | — | — | — | — | — | — |
| Annual Flood (63% AEP)* | 2.3 | 2.5 | 3.0 | 3.9 | 4.4 | 5.3 | 7.0 | 14.5 |
| *Minor Flood Threshold* | *1.8* | — | — | — | — | — | — | — |
| Bimonthly Flood (99% AEP)* | 1.6 | 1.8 | 2.3 | 3.2 | 3.7 | 4.6 | 6.3 | 13.8 |
| **Mean Higher High Water** | **0.0** | **0.2** | **0.7** | **1.6** | **2.1** | **3.0** | **4.7** | **12.2** |
| *NAVD88* | *-2.0* | — | — | — | — | — | — | — |
| Mean Sea Level | -2.4 | -2.2 | -1.7 | -0.8 | -0.3 | 0.6 | 2.3 | 9.8 |

*NTDE refers to the National Tidal Datum Epoch, defined by NOAA as the average over 1983-2001. Values in the NTDE column are taken from NOAA Tides & Currents at https://tidesandcurrents.noaa.gov/datums.html?id=8534720 and https://tidesandcurrents.noaa.gov/est/est_station.shtml?stnid=8534720 and then shifted based upon the sea-level rise projection. Fixed thresholds (NAVD88, minor/moderate/major flood thresholds) do not shift with sea-level rise.

**Water levels for historic storms are adjusted from the sea level at the time of the storm's occurrence to the contemporary NTDE baseline. Water levels for historic storms in their historic year are provided based on their historic mean higher high water baseline in parentheses.

‡For this report, an Annual Flood is a flood event expected to occur once per year. According to AEP experts, this definition of an annual flood has a 63.2% AEP. Moreover, AEP experts have clarified flood events with a 99% AEP are expected to occur approximately six times per year (or every other month). For this report, a 99% AEP flood event will be referred to as a “Bimonthly Flood.” Conversions between AEP and the average number of exceedances per year can be found at Langbein 1949 and Ladson 2017.

# SECTION 6. FUTURE COASTAL STORMS AND STORM-DRIVEN FLOODING

## a) Future Storms

In a warmer climate, coastal storms, including both TCs and ETCs, may evolve in ways that impact the hazards they present to New Jersey communities, both at the coast and farther inland. The STAP deliberations focused on four aspects of the changing characteristics of TCs and ETCs: frequency, intensity, precipitation, and trajectories.

Below is a summary of the changing characteristics of TCs:

1. **Frequency** - Most recent studies suggest that global TC frequency will decrease in a warmer future (Knutson et al., 2020). However, several studies also suggest potential increases in global TC frequency (Murakami et al., 2014; Camargo 2013; Emanuel 2013; Wehner et al., 2015; Bhatia et al., 2018; Knutson et al., 2020). The IPCC AR6 concluded with *medium confidence* that the total global frequency of TC formation will decrease or remain unchanged with increasing global warming (Seneviratne et al., 2021)

   In the Atlantic Basin specifically, results pertaining to overall TC frequency are similarly mixed, with most models projecting a decrease in TC frequency in the North Atlantic (e.g., Xi et al., 2024), but some suggesting possible increases in future Atlantic TC frequency (Sena et al., 2022).

2. **Intensity** - Although absolute changes in future TC frequency remain uncertain, there is greater confidence that the proportion of very intense TCs (Category 4 and 5) will increase in a warmer world. A 2020 assessment from the World Meteorological Organization (WMO) indicated that all authors involved in the assessment had either *medium-to-high confidence* or *high confidence* that the proportion of TCs that reach very intense levels will increase in the future. Similarly, IPCC AR6 stated that there was *high confidence* that the proportion of intense TCs, average peak TC wind speeds, and peak wind speeds of the most intense TCs will increase on the global scale with increased warming (Seneviratne et al., 2021). In the Atlantic Basin specifically, Xi et al., (2024) showed a shift of the distribution of TC lifetime maximum intensity towards higher values due to climate change under the high emissions SSP5-8.5 scenario, based on statistical downscaling of multiple global climate models.

   In addition, the rate at which TCs intensify is expected to increase as the planet warms. Various modeling studies have shown that peak intensification rates of TCs increase notably with additional warming (e.g., Bhatia et al., 2018; Ramsay et al., 2020). An analysis of downscaled TCs indicates that in a warmer world, it may be especially common for TCs to intensify quickly in the 24 hours before landfall (Emanuel 2017), amplifying forecasting challenges associated with such dangerous storms (DeMaria et al., 2021). Rapid intensification (RI) events induce notably higher rainfall hazard levels than non-RI events with the same intensity. Thus, increasing RI in the future climate contributes to future increases of TC rainfall hazards (Lockwood et al., 2024).

3. **Trajectories** - The locations where Atlantic TCs form, travel, and dissipate are projected to change in a warming climate, impacting the TC hazards that New Jersey communities will face. Using downscaled global climate models, Garner et al., (2021) show that in a very high-emissions future (RCP8.5; 2080-2100 CE) compared to the pre-industrial era (850-1800 CE), TCs that impact the northeastern U.S. are more likely to form closer to the U.S. southeast coast (>15% increase), and move more slowly in regions along the U.S. Atlantic coast (>15% increase). While this emission scenario produces a warmer future than the 2025 STAP "high" scenario, studies of TC tracks in other ocean basins using the same methods produce similar changes in TC tracks across both moderate (SSP2-4.5) and very high (SSP5-8.5) scenarios (Garner et al., 2024). Another study using TCs downscaled from global climate models shows that, over the same time period, TCs impacting the U.S. Northeast tend to form closer to the U.S. Southeast coast, potentially impacting landfall patterns and warning time (Weaver and Garner 2023). These findings suggest an evolving TC hazard for New Jersey, including potential changes in TC landfalls in some regions that are accompanied by both decreased time to prepare for TCs when they occur and increased impacts from TCs that may remain in the region for a greater duration of time.

4. **Precipitation** - Xi and Lin (2022) found that, under very high emissions (SSP5 8.5 scenario), the 100-year TC rainfall level can increase by up to 320% along the U.S. coastline by the end of this century, considering projected changes in storm characteristics including increases in intensity and frequency (Emanuel et al., 2013). The influence of increased TC rainfall-producing ability (due to increases in TC intensity, TC duration and atmospheric temperature) is more significant than the influence of TC frequency increase on the increase of the 100-year TC rainfall level (up to 180% vs. 60% increase). Thus, the projected increase of TC rainfall hazard is robust against the relatively large uncertainties that exist in the current TC frequency projection (Knutson et al., 2020).

Regarding ETCs, future projections of ETCs show increases in precipitation (Seneviratne et al., 2021). In addition, some studies suggest northward and eastward shifts in tracks of ETCs (Seneviratne et al., 2021; Zappa et al., 2013). Frequency and intensity changes under future climate scenarios are ambiguous due to low model resolution and the wide breadth of study areas (Priestley & Catto, 2022). However, a recent study of the impacts of climate change on the intensity of explosive cyclones (a rapid deepening and intensification of ETCs) in the North Atlantic has found warming scenarios will create more intense atmospheric rivers that are also associated with explosive cyclones deepening earlier and for longer periods of time: this is expected to result in potentially more hazardous future storms (Lopez-Marti et al., 2025). In addition, so-called "pseudo-global warming" experiments, in which the effects of climate change are simulated by imposing large-scale changes in environmental conditions (e.g., sea surface temperatures, vertical temperature profiles), indicate enhanced ETC activity over the North Atlantic and offshore of the US east coast (Michaelis et al., 2017). In another pseudo-global warming study, Willison et al. (2015) found that horizontal resolution greater than what is used in most current climate models results in an amplified storm track response.

**STAP Assessment Statement on Future TCs and ETCs:** In summary, while there is mixed evidence regarding changes in the total number of North Atlantic TCs, there is *high confidence* that the proportion of very intense hurricanes (Category 4 and 5) will increase with warming. Additionally, there is *high* *confidence* that the rate at which TCs intensify will increase with additional warming. Potential changes in TC trajectories complicate the link between TC intensification and coastal impacts. In addition, there is *very high confidence* that the rainfall rate of tropical storms will continue to increase with warming. Overall, there is *low confidence* regarding future changes in ETCs due to the limited body of evidence.

## b) Future Flooding

**Coastal Flooding**

A 2020 assessment from an expert team with the World Meteorological Organization (WMO) noted that the most confident projection related to how TCs will change in a warming world is that flooding driven by coastal storms will become worse due to increasing sea levels (Knutson et al., 2020). Consistent with the analysis in section 5, several studies have shown the impact of future SLR upon coastal extreme water levels along and near New Jersey coastlines, where future storm surge flood heights from both TCs and ETCs will be amplified due to rising sea levels in the coming decades (Lin et al., 2016; Garner et al., 2017; Roberts et al., 2017; Marsooli et al., 2019). Marsooli et al. (2019) found the effect of TC climatology change is relatively small for the US northeast. However, it would become comparable to the effect of SLR for the US southeast and Gulf regions. Lin et al. (2019) found that the effect of ETC climatology change is small, although uncertainties exist among the climate models and projections.

**Compound Flooding**

Many flood events are compound events where multiple flood drivers (e.g., storm surge, riverine flow, and rainfall) contribute to the observed impacts. In NJ, more than 77% of the recorded flood events between 1980 and 2018 were compound events (Ali et al., 2025). Changes in the different flood drivers combine to create changes in compound flooding.

Gori et al. (2022) found a drastic increase in the joint rainfall-storm surge-SLR hazard from historical to projected future conditions, up to 30–195-fold increase in the Northeast by 2100 under the SSP5–8.5 emissions scenario. They found that the contribution of TC climatology change to the joint hazard is relatively large due to TC rainfall increases, and increasing storm intensity and decreasing translation speed are the main TC change factors that cause higher rainfall and storm tides and an increase in their dependence. This projected increase in the joint rainfall-storm surge-SLR hazard results in increases of the 100-year compound flood extent by 27% and inundation volume by 62% in the Cape Fear Estuary, NC, by the end of the century under SSP5–8.5 (Gori and Lin 2023).

At the national scale, Bates et al. (2021) provided the projection of compound flood hazards for the conterminous US (i.e., the lower 48 states), considering all major sources (pluvial, fluvial, coastal) of flood hazards from main storm systems (TCs and ETCs). They provided projections for both current conditions and for future time periods (2035 and 2050 under the RCP4.5

emissions scenario) and showed that even for an intermediate emissions trajectory, there will be locally significant changes in the land area at risk from compound floods by 2050.

**STAP Assessment Statement on Coastal and Compound Flooding:** There is *very high confidence* that, even without changes to storm characteristics, future storm surge flooding will be worse due to rising sea levels. Changes in compound flooding depend on the changes in all the contributing flood drivers, with some being more uncertain than others. Overall, there is *very high confidence* that the frequency of compound flooding will increase due to the combination of SLR and increased rainfall and storm surge associated with TC intensification.

# SECTION 7. ADDITIONAL IMPACTS OF SEA-LEVEL RISE AND COASTAL STORMS

To assess the impacts of SLR and coastal storms on New Jersey's coastline, it is essential to move beyond passive models and develop dynamic frameworks that account for the coupled evolution of coastal landscapes and human activities over multi-decadal timescales (Kopp et al., 2019). SLR and storms have significant effects on the morphology, morphodynamics, ecology, and hydrology of coastal environments (Lorenzo-Trueba & Mariotti, 2017; Passeri et al., 2018; Le Cozannet et al., 2019; Lemke & Miller, 2020; Fanning et al., 2024). This section reviews key impacts on coastal erosion, coastal wetlands, saltwater intrusion, and linkages between these processes.[19]

## a) Coastal Erosion

New Jersey's coastline encompasses a diverse array of coastal environments, including barrier islands, sandy and headland beaches, coastal bluffs, and extensive estuarine shorelines along the Raritan Bay, the Delaware Bay and River, and the Hudson-Raritan Estuary (Psuty & Ofiara, 2002; Hapke et al., 2013). Barrier-marsh-lagoon systems, most prominently along the Atlantic coast but also occurring in modified forms in parts of Delaware and Raritan Bays, represent some of the state's most dynamic coastal features. These systems experience high rates of shoreline change due to their inherent geomorphic sensitivity and exposure to wave action, storm surge, and SLR (McBride et al., 2013).

Barrier islands are among the most dynamic coastal environments and experience the highest erosion rates due to wave action, storm surges, and SLR (McBride et al., 2013). Unlike passive flooding models, where coastlines submerge gradually, barrier islands undergo active sediment redistribution. This occurs through onshore sediment transport from overwash events (Leatherman and Zaremba 1983; Donnelly et al., 2006; Lorenzo-Trueba and Ashton 2014; Lorenzo-Trueba and Mariotti 2017, Nienhuis et al., 2021), lateral transport interacting with coastal structures (Krauss et al., 1994, Hanson et al., 2010, Zimmerman and Miller 2021), and offshore sediment transport from the upper shoreface to deeper waters (Bruun, 1962; Lorenzo-Trueba & Ashton, 2014; Lorenzo-Trueba & Mariotti, 2017). These processes cause shoreline retreat rates to exceed those estimated by passive flooding models alone (Kopp et al., 2019). In many cases, barrier shorelines erode horizontally at rates 100–1000 times greater than the rate of relative sea-level rise, such that meters of shoreline retreat can occur for each centimeter of sea-level rise (Leatherman et al., 2000).

Sea-level rise can also push barrier systems toward geomorphic thresholds where they fragment into smaller segments or convert to shoals and tidal inlets. Recent modeling frameworks (Palermo et al., 2024) identify a critical alongshore length scale — determined by the balance between overwash flux and alongshore sediment transport — beyond which barriers become increasingly susceptible to breaching. As SLR accelerates, overwash frequency and magnitude can increase (Nienhuis and Lorenzo-Trueba 2019a; Nienhuis & Lorenzo-Trueba, 2019b), shifting more barriers above this threshold and raising fragmentation risk.

[19] The STAP recognizes the impacts of SLR on coastal ecosystems affects more than these three sectors to include impacts such as wetland migration, ghosts forests, agricultural salinization, and more (NJDEP 2020; Griggs and Ruguero 2021; McDermott 2023). An analysis of all SLR impacts is outside the scope of this report.

Coastal engineering plays a significant role in shaping New Jersey's coastline. Projects like beach nourishment, dune construction, and hard stabilization (e.g., seawalls, groins, and jetties) alter natural erosion processes (Valverde et al., 1999; Psuty & Ofiara, 2003; Miselis & Lorenzo-Trueba, 2017; Almarshed et al., 2020). In a 2011 study (Hapke et al., 2011), the USGS found the shoreline change rate in New Jersey to be highly variable (from -8.6 m/yr to +15.4 m/yr) and strongly influenced by human interventions. Long Beach Island (LBI) illustrates how human intervention can locally alter coastal dynamics. From the 1830s to the 1930s, natural processes—including a lack of new sediment supply from offshore or fluvial sources (Ashley et al., 1991) combined with sea-level rise—caused a 171-meter retreat of LBI's shoreline. Since the 1930s, repeated beach nourishment, dredging, and jetty construction have led to localized shoreline advance, with some areas experiencing net seaward movement (e.g., a 22-meter expansion reported by Tenebruso et al., 2022). However, this reversal is not uniform along the entire island — the unprotected and unnourished Holgate section has continued to migrate westward — and does not occur in all engineered settings in New Jersey (e.g., Sea Bright). Along most of the state's coast, the prevailing erosional tendency reflects the absence of natural sediment inputs and the reliance on alongshore sediment redistribution, with observed shoreline advance generally tied to direct nourishment efforts.

Projecting future rates of coastal erosion in New Jersey faces several challenges. Key uncertainties stem from:

1. Limited historical data on how coastlines respond in the absence of human intervention (Miselis & Lorenzo-Trueba, 2017; Tenebruso et al., 2022),
2. Uncertainties in climate projections and storm pathways (Jamous et al., 2023);
3. The extent of future coastal engineering (McNamara et al., 2023; Lorenzo-Trueba et al., 2025) and
4. The lack of models that can efficiently incorporate SLR, storm intensity, and human intervention (Nienhuis & Lorenzo-Trueba, 2019) over the vast parameter space.

Advanced, computationally intensive models for projecting future rates of erosion (e.g., van Verseveld et al., 2015, Jamous et al., 2023) remain difficult to apply at the scales required, while simplified categorical models (e.g., Sallenger, 2000; Leaman 2021) do not capture the necessary dynamics. Recent advances in several areas have begun to overcome some of the challenges in projecting future storm erosion. These include:

1. Advances in projecting the impact of climate change on factors controlling storm erosion (Marsooli et al., 2021; Fanning et al., 2024), and
2. Advances in remote sensing and data-driven, probabilistic models (Lemke and Miller 2021; Janssen and Miller 2022; Ranasinghe 2023; Vitousek et al., 2023; Schmelz et al., 2024).

Storm events affecting the New Jersey coastline vary widely in magnitude and spatial impacts. At the lower end, a storm may cause minor beach erosion, with sediment transported offshore to form temporary sandbars that can naturally migrate back toward the beach. At the upper end, extreme events like Hurricane Sandy can cause profound geomorphic change, widespread economic losses, and life-threatening hazards. The effects of storms of a given magnitude are often highly localized, and their recurrence intervals remain poorly constrained for specific sites along the coast. This variability underscores the need for high-frequency monitoring and probabilistic approaches that can resolve a range of event scales and project localized responses.

Equity considerations also shape New Jersey's coastal future. While wealthy communities may continue to invest in engineered shorelines, economically disadvantaged areas may be unable to keep pace (Kolodin et al., 2021; Lorenzo-Trueba et al., 2025). Nourishment costs have more than doubled since the early 2000s and can exceed $10 million per mile per project, particularly where offshore sand is scarce (Elko et al., 2021; Staudt et al., 2021). More frequent renourishment—every 2–5 years in some areas—adds further financial pressure (Miselis et al., 2021).

**STAP Assessment Statement on Coastal Erosion:** There is *high confidence* that New Jersey's shorelines will continue to experience significant erosional pressure driven by SLR and storms, with the resulting shoreline change strongly influenced by local geomorphology and the extent of coastal engineering. While current levels of intervention have been successful at reducing erosion rates (Hapke et al., 2011) these efforts may become economically unsustainable in the future, particularly for lower-income communities.

## b) Coastal Wetlands

Coastal wetlands provide critical services, such as wave attenuation, biodiversity support, and carbon sequestration, making them critical components of New Jersey's landscape. Coastal wetlands develop dynamically with SLR through elevation-building processes which depend on sediment availability, vegetation productivity, and the capacity for landward migration (Morris et al., 2002; Kirwan et al., 2016; Elsey-Quirk et al., 2022). Yet, when SLR exceeds critical thresholds (globally, about 4 mm/yr [1.5 inches/decade] with 66% probability and about 7 mm/yr [2.8 inches/decade] with 90% probability; Saintilan et al., 2023), chronic flooding caused by SLR can overwhelm these processes and lead to drowning (Morris et al., 2002; Kirwan et al,. 2010). As shown in Table 6, rates of SLR in this range are *likely* in New Jersey by the middle of the century.

New Jersey currently has over 300,000 acres of coastal wetlands, but historical analyses have shown declines. For instance, Barnegat Bay lost approximately 650 acres of coastal wetlands from 1995 to 2015 (Krause et al., 2022) and Delaware Bay lost 334 acres from 1975 to 2011 (Carr et al., 2018). Declining sediment loads (Weston 2014) and human alteration (Weis et al., 2021) can exacerbate losses as sea levels continue to rise. Sediment-starved systems (systems with suspended sediment concentrations <30 mg/L; D'Alpaos et al., 2011) with limited migration pathways are at the greatest risk of drowning, particularly where historical human disturbance has negatively affected plant production. Erosion also plays a factor: for example, a significant portion of the loss of salt marshes is due to shoreline erosion, which is not necessarily tied to the conversion of the marsh platform to tidal flat or open water, but can further exacerbate losses as sea levels rise (Fagherazzi et al., 2013; Lathrop & Hasse, 2020).

As tracking elevation change is critical to understand patterns of loss, in 2019, the New Jersey Tidal Wetland Monitoring Network was formed to track the condition of the state's coastal wetlands. Over 15 partners contributed data from >230 surface elevation tables (SETs), which measure elevation changes in coastal wetlands on a millimeter scale (see Callaway et al., 2013). Preliminary results from 196 SETs show 46% had elevation changes less than local SLR ((Artigas et al., 2020; Haaf et al., 2022; NJTWMN 2025).

Previous studies also indicated that several locations in Barnegat Bay and the Delaware Estuary had elevation changes averaging less than 6 mm/yr (2.4 inches/decade), while current estimates of SLR are ~5 mm/yr (~2.0 inches/decade) or greater (Haaf et al., 2022).[20] Together, these results suggest that the elevation building processes that yield resilient coastal wetlands have recently lagged behind local SLR in many areas.

Current, ongoing research on coastal wetland processes emphasizes the need for management strategies that promote sediment delivery, reduce fetch, and support coastal wetland migration corridors (Mariotti, 2020; Haaf et al., 2022). To sustain coastal wetland acreage under accelerating sea-level rise, the most promising tactics include shoreline protection to reduce edge erosion, facilitating upslope migration through land use planning, and augmenting existing wetland surface elevations with clean dredged sediments (Weiss et al. 2021, Suedel et al. 2021, Brown et al. 2024). The upslope migration of coastal wetlands, in particular, stands out in that it represents an expansion of tidally affected lands as coastal flooding increases at higher elevations with rising sea levels. While conversion of these upslope areas, such as forests and agricultural fields, into coastal wetlands involves multiple stages and exhibits considerable variability, a growing body of literature is enhancing our understanding of these complex processes in the Mid Atlantic (Kirwan et al 2016a, Schieder et al 2018, Tully et al. 2019, Guimond & Michael 2021, Hall et al. 2022, Molino et al. 2022, Kirwan et al. 2024, Chen & Kirwan 2024, Haaf & Dymond 2024), which in turn will help inform more effective land management planning. As SLR accelerates, predictive models and monitoring are essential to track coastal wetland vulnerability and guide effective conservation strategies (Kirwan et al., 2016; Haaf et al., 2022).

**STAP Assessment Statement on Coastal Wetlands**: Between 1993-2021 the sea level rose an estimated 5.0 ± 1.0 mm/yr (2.0 ± 0.4 inches/decade) in Atlantic City, NJ (Table 1), which is near the maximum rate of SLR that coastal wetlands may be able to keep pace with.

## c) Saltwater Intrusion

Saltwater intrusion occurs when seawater encroaches into freshwater aquifers and surface water systems. SLR, tidal action, and changes in groundwater withdrawal rates drive saltwater intrusion. Due to density differences between saltwater and freshwater, a wedge-shaped saltwater body typically underlies fresh groundwater in coastal aquifers. SLR raises the freshwater-saltwater interface, which causes saline water to intrude into previously freshwater zones. This saltwater intrusion threatens coastal water supplies, agriculture, and ecosystems. However, there is no guarantee that SLR will cause saltwater intrusion because the location of the saltwater wedge is driven by both local sea level and terrestrial freshwater input (e.g., groundwater recharge).

If groundwater recharge remains the same, SLR will cause inland water tables to rise, and push the saltwater interface seaward countering the salinization risk from SLR (Chang et al., 2011). The location of the freshwater-saltwater interface is driven by the difference in hydraulic head from inland to offshore.

[20] Relative sea-level rise near Haaf et al. 2022 study sites in the Mid-Atlantic U.S. averaged 4.34 mm/yr over the last 50 years, yet over the last 19 years, relative sea-level rise averaged 6.25 mm/yr and the rise in high tide water levels averaged 8.13 mm/yr.

Thus, rising water tables allow the hydraulic gradient to keep pace with sea-level rise which prevents the saltwater wedge from intruding further inland. Locations where the water table has space to rise are classified as recharge-limited (i.e., declines in recharge are the predominant cause of saltwater intrusion). While the water table can rise in some regions, in others, the water table is close to the land surface and any water table rise will result in greater runoff. These places are called topography-limited (i.e., the topography constrains their ability to counteract saltwater intrusion from SLR). In topography-limited regions, saltwater intrusion can occur rapidly (Michael et al., 2016).

While large-scale studies indicate that New Jersey is topography-limited and thus likely vulnerable to saltwater intrusion due to SLR, there is substantial site-specific variability that prevents generalization. For example, Frederiks et al. (2024) found that while Assateague Island, MD, was expected to be topography limited due to extremely low elevation, high hydraulic conductivity is expected to generate recharge-limited conditions until at least 2080.

Groundwater extraction exacerbates saltwater intrusion, especially where communities rely heavily on aquifer withdrawals. For example, Cape May has abandoned some wells due to pumping-induced saltwater intrusion (Schuster & Hill, 1995; Lacombe and Carleton 2002; Spitz & Barringer, 2002), and future withdrawal scenarios will likely induce more intrusion (Carleton et al., 2021). Similarly, wells in the Raritan Bay area have been closed due to saltwater intrusion which was found to occur along paleochannels (Gaswirth et al., 2002). As erosion and SLR shift coastal landforms, natural barriers to saltwater intrusion weaken, increasing aquifer salinity. Saltwater intrusion is being monitored in New Jersey, but future estimates remain uncertain due to variable pumping rates and climate-driven hydrological changes.

In addition to horizontal saltwater intrusion driven by SLR and groundwater extraction, coastal aquifers are vulnerable to vertical salinization due to coastal storms. Drivers of coastal aquifer vulnerability to storm surge salinization vary along the mid-Atlantic depending on the connectivity to the ocean, aquifer properties, and geomorphology (Frederiks et al., 2024), with Sandy Hook, NJ experiencing moderate salinization risk on the bay side. Groundwater recovery from large events such as Hurricane Sandy was found to take many months (Personna et al., 2015). As SLR will make overwash more frequent, there is a greater risk of groundwater salinization from ocean-driven flooding, but more research is needed to assess vulnerability in New Jersey.

Not only does SLR cause the salinization of coastal groundwater, but it also causes the salt front to migrate landward in estuaries. While the magnitude of the change can be small, the amount of intrusion depends on the shape of the estuary and the freshwater discharge (Peters et al., 2022). Studies of Delaware Bay show that estuarine saltwater intrusion is controlled by river discharge, tides, short-term sea-level changes, wind and waves (Cook et al, 2023). When sea-level rise is incorporated into surface water models, Delaware Bay is expected to experience a greater maximum salinity extent, up to 15 miles inland under extreme SLR scenarios (Liu et al, 2024). Sea-level rise is also expected to increase the tidal range when sea walls are erected, and exacerbating seawater intrusion (Lee et al., 2017). Additionally, data from Mid-Atlantic coastal aquifers suggests that groundwater salinization can be caused by salinizing coastal streams (Hingst et al., 2023). Future projections for the Delaware Bay region indicate that the greatest groundwater salinization threat from SLR is caused by pumping wells pulling water from previously fresh streams (Hingst, 2024). Coastal groundwater salinization can lead to the formation of ghost forests and the loss of productive agricultural land (Tully et al., 2019; Mondal et al., 2023). More research is needed to better understand which parts of New Jersey are most vulnerable to saltwater intrusion driven by SLR and what the primary salinization mechanism will be.

**STAP Assessment Statement on Saltwater Intrusion:** In summary, there is a *high confidence* that SLR will cause saltwater intrusion in both groundwater and surface water. Barrier islands are expected to be particularly vulnerable, especially those that pump large volumes of groundwater. However, few studies have examined site specific vulnerability to saltwater intrusion in the NJ Coastal plain, thus implying a *low confidence* in whether particular sites will experience saltwater intrusion over the near term (next 50 years). Therefore, management of coastal water resources will require increased monitoring and modeling of saltwater intrusion.

## d) Groundwater Flooding

In addition to saltwater intrusion, SLR will drive water tables to rise in state's coastal regions. This water table rise can lead to new freshwater bodies forming or can cause temporary flooding during storm events (e.g., Cantelon & Kurylyk, 2024). Rising water tables will lead to more saturation-excess flooding as the water table is more likely to rise above land surface and can lead to more infiltration-excess overland flow due to higher soil moisture. Rising water tables can also move into the rooting zone, causing tree die-off due to lack of oxygen (Sacatelli et al., 2023). This is an active area of research, and few studies have examined the vulnerability to groundwater flooding across New Jersey. Additional characterization of the hydrogeologic parameters and future rainfall projections are needed to better identify locations vulnerable to this process.

**STAP Assessment Statement on Groundwater Flooding:** In summary, there is a *high confidence* that SLR will raise coastal water tables, which will lead to more groundwater flooding, but there is *low confidence* as to which communities will be most impacted.

## e) Connections Among Coastal Erosion, Marshes, and Salt Intrusion

Coastal erosion, marsh loss, and saltwater intrusion are interconnected processes. Back-barrier environments, such as salt marshes, are integral to the dynamics of barrier islands and lagoon systems (Tenebruso et al., 2022). Changes in marsh platforms can trigger feedback loops that affect barrier island migration and lagoon dynamics (Fitzgerald 1988; Walters et al., 2014; Lorenzo-Trueba and Mariotti 2017; Lauzon & Murray, 2018). For instance, marsh loss in back-barrier areas affects tidal exchange and lagoon fetch which in turn enhances wave energy and accelerates barrier island retreat.

Coastal erosion can also exacerbate saltwater intrusion. As back-barrier marshes erode, marsh platforms lose their capacity to act as natural filters for storm surge and tidal flow. This increases the permeability of coastal landscapes, allowing saltwater to more easily intrude into inland aquifers. As SLR accelerates, these effects will compound, with greater exposure of aquifers to saltwater. Protecting marshes and reducing erosion could help buffer coastal communities from saltwater intrusion impacts.

## f) Summary of Impacts

Addressing the impacts of SLR and coastal storms requires an integrated and adaptive approach that considers the dynamic feedbacks among coastal erosion, wetland loss, saltwater intrusion, and groundwater flooding. The New Jersey coast comprises interconnected systems—barrier islands, back-barrier marshes, lagoons, estuaries, and aquifers—whose responses to climate-driven changes are deeply coupled. Human activities, including beach nourishment, hard shoreline stabilization, dredging, and coastal development, further modify these processes, sometimes amplifying vulnerabilities by constraining natural adaptation pathways.

Predictive models of coastal flooding and subsequent impacts must evolve beyond passive flood scenarios to simulate cross-shore sediment transport, back-barrier interactions, and the co-evolution of natural systems with human infrastructure. Additionally, models need to reflect uncertainties in SLR, storm intensity, and future coastal engineering practices. These tools are critical to guide decisions about when and where interventions such as beach nourishment or marsh restoration are likely to be effective—and when alternative strategies (e.g., managed retreat or sediment diversion) may be more appropriate.

Monitoring programs that track shoreline change, marsh elevation, groundwater salinity, and tidal wetland condition are essential for improving model calibration, informing adaptive management, and targeting investments where they yield the greatest long-term benefits.

In summary, there is *high confidence* that the future resilience of New Jersey's coastal environments will be shaped by how effectively planning and management approaches integrate process-based understanding, account for nature-based strategies, and consider the differing capacities of communities to adapt.

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# Appendix A: Members of the STAP, Review Editors, and Rutgers Authors Team

## Members of the STAP:

1. **Dr. Robert Kopp (Chair)** – Rutgers University, Department of Earth and Planetary Sciences
2. **Dr. Anthony Broccoli** – Rutgers University, Department of Environmental Sciences
3. **Glen Carleton** – U.S. Geological Survey (retired)
4. **Dr. Sönke Dangendorf** – Tulane University, Department of River-Coastal Science and Engineering
5. **Dr. Rob DeConto** – University of Massachusetts Amherst, School of Earth and Sustainability
6. **Dr. Ryan Frederiks** - New York State Department of Environmental Conservation
7. **Dr. Andra J. Garner** – Rowan University, Department of Environmental Science
8. **Emily Grover-Kopec** – Rhodium Group
9. **Dr. LeeAnn Haaf** – Partnership for the Delaware Estuary
10. **Dr. Benjamin Hamlington** – National Aeronautics and Space Administration, Sea Level and Ice Group
11. **Dr. Ning Lin** – Princeton University, Department of Civil and Environmental Engineering
12. **Dr. Jorge Lorenzo-Trueba** – University of Florida, Department of Geological Sciences
13. **Dr. Jon Miller** – Stevens Institute of Technology, Department of Civil, Environmental and Ocean Engineering
14. **Dr. David Robinson** – Rutgers University, Department of Geography, NJ State Climatologist
15. **Dr. Gabriel Vecchi** – Princeton University, Geosciences Department and High Meadows Environmental Institute
16. **Dr. Thomas Wahl** – University of Central Florida, Department of Civil, Environmental, and Construction Engineering & National Center for Integrated Coastal Research
17. **Dr. Jennifer Walker** – Rowan University, Department of Environmental Science

## Review Editors:

1. **Dr. Donald F. Boesch** (Science Review Editor)–University of Maryland Center for Environmental Science
2. **Dr. William Hallman** (Practitioner Panel Review Editor) – Rutgers University, Department of Human Ecology

## Reviewers:

1. **Dr. Richard Lathrop** – Rutgers University, Department of Ecology, Evolution and Natural Resources; Center for Remote Sensing and Spatial Analysis
2. **Dr. Kenneth G. Miller** – Rutgers University, Department of Earth and Planetary Sciences[21]
3. **Dr. William Veatch** – United States Army Corps of Engineers, Infrastructure and Installation Resilience Community of Practice

## Science and Managing Support Team:

1. **Janine M. Barr** – Rutgers University, Bloustein School of Planning and Public Policy
2. **Dr. James Shope** – Rutgers University, Department of Environmental Sciences & New Jersey Agricultural Experiment Station
3. **Diana K. Apoznanski** – Rutgers University, Department of Environmental Sciences
4. **Dr. Praveen Kumar** – Rutgers University, Department of Earth and Planetary Sciences
5. **Lucas Marxen** – Rutgers University, Associate Director of the Center for Urban Policy Research; Co-Director New Jersey Climate Change Resource Center
6. **Ashlyn Spector** – Rutgers University, Bloustein School of Planning and Public Policy
7. **Dr. Karen O'Neill** – (Chair of Practitioner Panel) Rutgers University, Department of Human Ecology
8. **Lisa Auermuller** – Rutgers University, Department of Marine and Coastal Sciences
9. **Dr. Marjorie Kaplan** – Rutgers University, Senior Associate Director, Rutgers Climate and Energy Institute; Co-Director, New Jersey Climate Change Resource Center

[21] Dr. John W. Schmelz of Rutgers University (Department of Earth and Planetary Sciences) provided supplemental comments as part of Dr. Miller's review.

# Appendix B – Sea-Level Rise at Different Locations

**Table B1.** Atlantic City, NJ SLR above the year 2005 (1995-2014 average) baseline (ft). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.1 | 0.3 | 0.5 | 0.7 | 0.9 | 1.1 | 1.2 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.6 | 1.7 | 1.0 | 1.2 | 1.5 | 1.6 | 1.8 | 1.8 | 2.0 | 2.2 | 2.3 | 2.5 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.2 | 0.4 | 0.7 | 0.9 | 1.1 | 1.3 | 1.5 | 1.6 | 1.8 | 1.8 | 2.0 | 2.1 | 2.2 | 2.3 | 1.2 | 1.5 | 1.8 | 2.0 | 2.2 | 2.3 | 2.5 | 2.7 | 2.9 | 3.1 |
| ~50 % Chance SLR Exceeds | 0.4 | 0.7 | 1.0 | 1.3 | 1.5 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.9 | 3.1 | 3.3 | 3.5 | 1.6 | 1.9 | 2.3 | 2.6 | 2.9 | 3.2 | 3.5 | 3.8 | 4.2 | 4.5 |
| <17% Chance SLR Exceeds‡ | 0.5 | 0.9 | 1.3 | 1.7 | 2.0 | 2.3 | 2.6 | 3.0 | 3.3 | 3.6 | 4.0 | 4.3 | 4.6 | 4.9 | 2.1 | 2.5 | 2.9 | 3.3 | 3.8 | 4.3 | 4.8 | 5.3 | 5.8 | 6.3 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.5 | 1.0 | 1.4 | 1.9 | 2.1 | 2.5 | 2.9 | 3.3 | 3.7 | 4.1 | 4.5 | 5.0 | 5.3 | 5.8 | 2.3 | 2.8 | 3.3 | 3.9 | 4.5 | 5.1 | 6.0 | 7.6 | 9.6 | 12.0 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.6 | 1.1 | 1.7 | 2.3 | 2.6 | 3.2 | 3.7 | 4.4 | 5.1 | 5.7 | 6.4 | 7.0 | 7.8 | 9.4 | 2.8 | 3.5 | 4.3 | 5.2 | 6.2 | 5.3 | 8.6 | 10.5 | 14.1 | 17.9 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 1.0 | 1.3 | 1.6 | 1.9 | 2.1 | 2.2 | 2.4 | 2.7 | 3.0 | 3.2 | 1.1 | 1.4 | 1.7 | 2.1 | 2.4 | 2.5 | 2.8 | 3.0 | 3.3 | 3.6 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 1.3 | 1.6 | 1.9 | 2.2 | 2.6 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 1.4 | 1.7 | 2.1 | 2.5 | 2.9 | 2.9 | 3.3 | 3.7 | 4.0 | 4.3 |
| ~50 % Chance SLR Exceeds | 1.6 | 2.0 | 2.4 | 2.9 | 3.3 | 3.6 | 4.1 | 4.6 | 5.0 | 5.5 | 1.8 | 2.2 | 2.7 | 3.1 | 3.6 | 4.0 | 4.5 | 5.1 | 5.6 | 6.1 |
| <17% Chance SLR Exceeds‡ | 2.1 | 2.6 | 3.1 | 3.7 | 4.3 | 4.8 | 5.5 | 6.3 | 7.0 | 7.7 | 2.3 | 2.8 | 3.4 | 4.0 | 4.7 | 5.5 | 6.3 | 7.1 | 7.9 | 8.8 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 2.4 | 3.0 | 3.7 | 4.4 | 5.2 | 6.0 | 7.7 | 10.0 | 12.9 | 16.2 | 2.6 | 3.3 | 4.1 | 4.9 | 5.8 | 6.8 | 8.6 | 11.2 | 14.6 | 18.5 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 3.0 | 3.9 | 4.9 | 6.1 | 7.5 | 9.0 | 10.8 | 12.6 | 16.1 | 20.2 | 3.3 | 4.3 | 5.6 | 6.9 | 8.5 | 10.1 | 12.1 | 14.2 | 16.9 | 21.1 |

**Table B2.** Atlantic City, NJ SLR above the year 2005 (1995-2014 average) baseline (m). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.05 | 0.09 | 0.15 | 0.23 | 0.27 | 0.32 | 0.36 | 0.40 | 0.41 | 0.42 | 0.45 | 0.48 | 0.50 | 0.53 | 0.30 | 0.38 | 0.45 | 0.50 | 0.54 | 0.55 | 0.60 | 0.65 | 0.70 | 0.76 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.08 | 0.14 | 0.21 | 0.29 | 0.35 | 0.41 | 0.46 | 0.50 | 0.54 | 0.55 | 0.59 | 0.63 | 0.67 | 0.71 | 0.38 | 0.46 | 0.53 | 0.60 | 0.67 | 0.81 | 0.91 | 1.00 | 1.10 | 1.19 |
| ~50 % Chance SLR Exceeds | 0.12 | 0.21 | 0.30 | 0.40 | 0.46 | 0.54 | 0.61 | 0.68 | 0.74 | 0.80 | 0.87 | 0.94 | 1.00 | 1.07 | 0.49 | 0.59 | 0.69 | 0.78 | 0.88 | 1.10 | 1.24 | 1.39 | 1.53 | 1.68 |
| <17% Chance SLR Exceeds‡ | 0.17 | 0.28 | 0.40 | 0.52 | 0.61 | 0.71 | 0.80 | 0.90 | 1.00 | 1.11 | 1.21 | 1.30 | 1.40 | 1.49 | 0.63 | 0.76 | 0.89 | 1.02 | 1.17 | 1.48 | 1.69 | 1.91 | 2.13 | 2.36 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.17 | 0.29 | 0.42 | 0.57 | 0.66 | 0.77 | 0.88 | 1.00 | 1.12 | 1.25 | 1.38 | 1.50 | 1.62 | 1.77 | 0.70 | 0.86 | 1.01 | 1.18 | 1.36 | 1.55 | 1.83 | 2.32 | 2.92 | 3.65 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.20 | 0.34 | 0.47 | 0.61 | 0.80 | 0.96 | 1.13 | 1.33 | 1.54 | 1.74 | 1.94 | 2.13 | 2.38 | 2.87 | 0.86 | 1.07 | 1.30 | 1.59 | 1.88 | 2.27 | 2.62 | 3.21 | 4.29 | 5.45 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.32 | 0.41 | 0.50 | 0.58 | 0.65 | 0.67 | 0.74 | 0.82 | 0.90 | 0.98 | 0.34 | 0.43 | 0.53 | 0.64 | 0.74 | 0.75 | 0.84 | 0.93 | 1.01 | 1.09 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.39 | 0.49 | 0.58 | 0.68 | 0.79 | 0.81 | 0.91 | 1.00 | 1.10 | 1.19 | 0.42 | 0.53 | 0.63 | 0.75 | 0.87 | 0.90 | 1.00 | 1.11 | 1.22 | 1.31 |
| ~50 % Chance SLR Exceeds | 0.50 | 0.62 | 0.74 | 0.87 | 1.00 | 1.10 | 1.24 | 1.39 | 1.53 | 1.68 | 0.54 | 0.67 | 0.81 | 0.96 | 1.10 | 1.22 | 1.38 | 1.54 | 1.70 | 1.86 |
| <17% Chance SLR Exceeds‡ | 0.64 | 0.78 | 0.94 | 1.11 | 1.30 | 1.48 | 1.69 | 1.91 | 2.13 | 2.36 | 0.69 | 0.86 | 1.04 | 1.23 | 1.44 | 1.67 | 1.91 | 2.16 | 2.41 | 2.67 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.72 | 0.91 | 1.12 | 1.35 | 1.58 | 1.83 | 2.36 | 3.05 | 3.92 | 4.95 | 0.79 | 1.00 | 1.24 | 1.50 | 1.78 | 2.06 | 2.62 | 3.42 | 4.45 | 5.63 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.91 | 1.17 | 1.48 | 1.86 | 2.28 | 2.76 | 3.29 | 3.85 | 4.89 | 6.16 | 1.00 | 1.30 | 1.70 | 2.10 | 2.58 | 3.09 | 3.70 | 4.33 | 5.15 | 6.44 |

**Table B3.** The Battery, NY SLR above the year 2005 (1995-2014 average) baseline (ft). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.1 | 0.2 | 0.4 | 0.6 | 0.7 | 0.8 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.3 | 0.8 | 1.0 | 1.2 | 1.4 | 1.5 | 1.5 | 1.7 | 1.8 | 2.0 | 2.1 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.2 | 0.3 | 0.6 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 1.5 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.0 | 2.2 | 2.3 | 2.5 | 2.7 |
| ~50 % Chance SLR Exceeds | 0.3 | 0.6 | 0.9 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.1 | 2.3 | 2.5 | 2.7 | 2.9 | 3.1 | 1.4 | 1.7 | 2.0 | 2.3 | 2.6 | 2.8 | 3.2 | 3.5 | 3.8 | 4.1 |
| <17% Chance SLR Exceeds‡ | 0.5 | 0.9 | 1.2 | 1.5 | 1.9 | 2.1 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 4.2 | 4.5 | 1.9 | 2.3 | 2.7 | 3.1 | 3.5 | 4.0 | 4.4 | 4.9 | 5.4 | 5.8 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.5 | 0.9 | 1.3 | 1.7 | 2.0 | 2.3 | 2.6 | 3.0 | 3.4 | 3.7 | 4.1 | 4.5 | 4.9 | 5.3 | 2.1 | 2.6 | 3.3 | 3.6 | 4.1 | 4.7 | 5.6 | 7.2 | 9.1 | 11.5 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.7 | 1.1 | 1.6 | 2.2 | 2.5 | 3.0 | 3.5 | 4.1 | 4.7 | 5.3 | 5.9 | 6.5 | 7.4 | 9.0 | 2.6 | 3.3 | 4.0 | 4.9 | 5.8 | 7.0 | 8.1 | 10.1 | 13.6 | 17.4 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.9 | 1.1 | 1.4 | 1.7 | 1.9 | 1.9 | 2.1 | 2.3 | 2.6 | 2.8 | 0.9 | 1.2 | 1.5 | 1.9 | 2.2 | 2.2 | 2.5 | 2.7 | 3.0 | 3.2 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 1.1 | 1.4 | 1.7 | 2.0 | 2.3 | 2.3 | 2.6 | 2.9 | 3.2 | 3.5 | 1.2 | 1.5 | 1.9 | 2.2 | 2.6 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 |
| ~50 % Chance SLR Exceeds | 1.5 | 1.8 | 2.2 | 2.6 | 3.0 | 3.3 | 3.7 | 4.2 | 4.6 | 5.1 | 1.6 | 2.0 | 2.4 | 2.9 | 3.4 | 3.7 | 4.2 | 4.7 | 5.2 | 5.7 |
| <17% Chance SLR Exceeds‡ | 1.9 | 2.4 | 2.8 | 3.4 | 4.0 | 4.5 | 5.2 | 5.9 | 6.5 | 7.3 | 2.1 | 2.6 | 3.2 | 3.8 | 4.4 | 5.2 | 5.9 | 6.7 | 7.5 | 8.4 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 2.2 | 2.8 | 3.4 | 4.1 | 4.9 | 5.7 | 7.3 | 9.6 | 12.4 | 15.7 | 2.4 | 3.0 | 3.8 | 4.6 | 5.5 | 6.4 | 8.2 | 10.8 | 14.2 | 17.9 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 2.8 | 3.6 | 4.6 | 5.8 | 7.1 | 8.6 | 10.3 | 12.0 | 15.5 | 19.6 | 3.1 | 4.0 | 5.3 | 6.6 | 7.1 | 9.8 | 11.7 | 13.8 | 16.5 | 20.6 |

**Table B4.** The Battery, NY SLR above the year 2005 (1995-2014 average) baseline (m). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.02 | 0.05 | 0.10 | 0.16 | 0.21 | 0.26 | 0.29 | 0.32 | 0.32 | 0.32 | 0.33 | 0.35 | 0.37 | 0.38 | 0.25 | 0.32 | 0.38 | 0.43 | 0.46 | 0.47 | 0.51 | 0.56 | 0.60 | 0.64 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.05 | 0.10 | 0.17 | 0.23 | 0.29 | 0.34 | 0.38 | 0.42 | 0.45 | 0.45 | 0.48 | 0.51 | 0.54 | 0.57 | 0.33 | 0.40 | 0.46 | 0.53 | 0.59 | 0.60 | 0.66 | 0.71 | 0.77 | 0.83 |
| ~50 % Chance SLR Exceeds | 0.10 | 0.18 | 0.26 | 0.34 | 0.41 | 0.48 | 0.54 | 0.60 | 0.65 | 0.70 | 0.76 | 0.86 | 0.87 | 0.93 | 0.44 | 0.53 | 0.62 | 0.71 | 0.79 | 0.87 | 0.96 | 1.05 | 1.15 | 1.24 |
| <17% Chance SLR Exceeds‡ | 0.15 | 0.26 | 0.37 | 0.47 | 0.57 | 0.65 | 0.74 | 0.83 | 0.92 | 1.01 | 1.10 | 1.19 | 1.27 | 1.36 | 0.58 | 0.70 | 0.82 | 0.94 | 1.08 | 1.20 | 1.35 | 1.49 | 1.64 | 1.78 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.15 | 0.27 | 0.39 | 0.50 | 0.60 | 0.71 | 0.80 | 0.92 | 1.03 | 1.14 | 1.25 | 1.36 | 1.48 | 1.61 | 0.64 | 0.79 | 0.94 | 1.09 | 1.26 | 1.43 | 1.72 | 2.20 | 2.79 | 3.50 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.19 | 0.33 | 0.47 | 0.61 | 0.76 | 0.90 | 1.06 | 1.25 | 1.44 | 1.62 | 1.80 | 1.98 | 2.25 | 2.73 | 0.80 | 1.01 | 1.22 | 1.50 | 1.76 | 2.12 | 2.48 | 3.08 | 4.14 | 5.29 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.26 | 0.35 | 0.43 | 0.51 | 0.56 | 0.57 | 0.64 | 0.71 | 0.78 | 0.85 | 0.28 | 0.38 | 0.46 | 0.56 | 0.66 | 0.67 | 0.75 | 0.83 | 0.91 | 0.99 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.34 | 0.43 | 0.52 | 0.61 | 0.70 | 0.71 | 0.80 | 0.88 | 0.96 | 1.06 | 0.36 | 0.46 | 0.57 | 0.68 | 0.79 | 0.81 | 0.91 | 1.01 | 1.11 | 1.20 |
| ~50 % Chance SLR Exceeds | 0.45 | 0.56 | 0.67 | 0.79 | 0.91 | 1.00 | 1.13 | 1.27 | 1.41 | 1.54 | 0.49 | 0.61 | 0.74 | 0.88 | 1.02 | 1.13 | 1.28 | 1.43 | 1.59 | 1.74 |
| <17% Chance SLR Exceeds‡ | 0.59 | 0.72 | 0.87 | 1.03 | 1.21 | 1.38 | 1.57 | 1.79 | 2.00 | 2.21 | 0.64 | 0.79 | 0.97 | 1.16 | 1.35 | 1.58 | 1.80 | 2.04 | 2.30 | 2.55 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.67 | 0.84 | 1.04 | 1.25 | 1.48 | 1.73 | 2.24 | 2.92 | 3.77 | 4.78 | 0.73 | 0.93 | 1.16 | 1.41 | 1.67 | 1.94 | 2.51 | 3.30 | 4.32 | 5.46 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.85 | 1.10 | 1.40 | 1.78 | 2.17 | 2.63 | 3.15 | 3.66 | 4.74 | 5.98 | 0.94 | 1.23 | 1.60 | 2.02 | 2.47 | 2.98 | 3.57 | 4.19 | 5.02 | 6.28 |

**Table B5.** Sandy Hook, NJ SLR above the year 2005 (1995-2014 average) baseline (ft). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.1 | 0.2 | 0.4 | 0.7 | 0.9 | 1.0 | 1.2 | 1.3 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 1.8 | 2.0 | 2.2 | 2.3 | 2.5 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.2 | 0.4 | 0.7 | 0.9 | 1.1 | 1.3 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.3 | 1.2 | 1.5 | 1.7 | 2.0 | 2.2 | 2.3 | 2.5 | 2.7 | 2.9 | 3.1 |
| ~50 % Chance SLR Exceeds | 0.4 | 0.7 | 1.0 | 1.3 | 1.5 | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.1 | 3.3 | 3.5 | 1.6 | 1.9 | 2.3 | 2.6 | 2.9 | 3.1 | 3.5 | 3.8 | 4.2 | 4.5 |
| <17% Chance SLR Exceeds‡ | 0.6 | 0.9 | 1.3 | 1.7 | 2.0 | 2.3 | 2.6 | 3.0 | 3.3 | 3.6 | 4.0 | 4.3 | 4.6 | 4.9 | 2.1 | 2.5 | 2.9 | 3.3 | 3.8 | 4.3 | 4.8 | 5.3 | 5.8 | 6.3 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.6 | 1.0 | 1.4 | 1.8 | 2.1 | 2.5 | 2.9 | 3.3 | 3.6 | 4.1 | 4.5 | 4.8 | 5.3 | 5.7 | 2.3 | 2.8 | 3.3 | 3.8 | 4.4 | 5.0 | 6.0 | 7.6 | 9.5 | 11.9 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.7 | 1.2 | 1.6 | 2.3 | 2.6 | 3.2 | 3.7 | 4.3 | 5.0 | 5.6 | 6.3 | 6.9 | 7.8 | 9.4 | 2.8 | 3.5 | 4.2 | 5.2 | 6.1 | 7.3 | 8.5 | 10.5 | 14.0 | 17.8 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 1.0 | 1.3 | 1.4 | 1.6 | 1.8 | 2.2 | 2.4 | 2.7 | 2.9 | 3.2 | 1.1 | 1.4 | 1.7 | 2.1 | 2.4 | 2.5 | 2.8 | 3.1 | 3.4 | 3.6 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 1.2 | 1.6 | 1.7 | 2.0 | 2.2 | 2.6 | 2.9 | 3.3 | 3.6 | 3.9 | 1.3 | 1.7 | 2.1 | 2.5 | 2.9 | 3.0 | 3.3 | 3.7 | 4.0 | **4.3** |
| ~50 % Chance SLR Exceeds | 1.6 | 2.0 | 2.3 | 2.6 | 2.9 | 3.6 | 4.1 | 4.5 | 5.0 | 5.5 | 1.8 | 2.2 | 2.6 | 3.1 | 3.6 | 4.0 | 4.5 | 5.1 | 5.6 | **6.1** |
| <17% Chance SLR Exceeds‡ | 2.1 | 2.6 | 2.9 | 3.3 | 3.8 | 4.8 | 5.5 | 6.2 | 7.0 | 7.7 | 2.3 | 2.8 | 3.4 | 4.0 | 4.7 | 5.5 | 6.3 | 7.1 | 7.9 | **8.8** |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 2.3 | 3.0 | 3.3 | 3.6 | 4.4 | 6.0 | 7.7 | 10.0 | 12.8 | 16.2 | 2.6 | 3.2 | 4.0 | 4.9 | 5.8 | 6.7 | 8.6 | 11.2 | 14.6 | 18.4 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 2.8 | 3.8 | 4.2 | 5.2 | 6.1 | 8.9 | 10.7 | 12.4 | 16.0 | 20.1 | 3.2 | 4.2 | 5.5 | 6.9 | 8.4 | 10.1 | 12.1 | 14.2 | 16.9 | 21.1 |

**Table B6.** Sandy Hook, NJ SLR above the year 2005 (1995-2014 average) baseline (m). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.02 | 0.07 | 0.13 | 0.20 | 0.26 | 0.31 | 0.35 | 0.39 | 0.40 | 0.41 | 0.43 | 0.46 | 0.48 | 0.51 | 0.30 | 0.37 | 0.44 | 0.50 | 0.54 | 0.55 | 0.61 | 0.66 | 0.72 | 0.76 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.06 | 0.12 | 0.20 | 0.27 | 0.34 | 0.40 | 0.45 | 0.49 | 0.53 | 0.54 | 0.58 | 0.62 | 0.65 | 0.69 | 0.37 | 0.45 | 0.53 | 0.60 | 0.67 | 0.69 | 0.76 | 0.82 | 0.88 | 0.95 |
| ~50 % Chance SLR Exceeds | 0.11 | 0.20 | 0.29 | 0.38 | 0.46 | 0.54 | 0.61 | 0.68 | 0.74 | 0.80 | 0.86 | 0.93 | 1.00 | 1.06 | 0.49 | 0.59 | 0.69 | 0.78 | 0.88 | 0.96 | 1.06 | 1.16 | 1.27 | 1.37 |
| <17% Chance SLR Exceeds‡ | 0.17 | 0.28 | 0.40 | 0.51 | 0.61 | 0.71 | 0.81 | 0.90 | 1.00 | 1.11 | 1.21 | 1.30 | 1.40 | 1.49 | 0.63 | 0.76 | 0.88 | 1.01 | 1.16 | 1.30 | 1.45 | 1.60 | 1.76 | 1.91 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.17 | 0.29 | 0.42 | 0.54 | 0.65 | 0.77 | 0.87 | 1.00 | 1.11 | 1.24 | 1.36 | 1.48 | 1.61 | 1.74 | 0.69 | 0.85 | 1.00 | 1.17 | 1.34 | 1.53 | 1.83 | 2.31 | 2.91 | 3.64 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.21 | 0.35 | 0.50 | 0.65 | 0.80 | 0.96 | 0.96 | 1.32 | 1.53 | 1.72 | 1.91 | 2.11 | 2.37 | 2.86 | 0.85 | 1.06 | 1.29 | 1.57 | 1.85 | 2.23 | 2.53 | 3.20 | 4.27 | 5.43 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.31 | 0.40 | 0.49 | 0.58 | 0.64 | 0.66 | 0.73 | 0.81 | 0.89 | 0.97 | 0.33 | 0.43 | 0.53 | 0.64 | 0.74 | 0.75 | 0.85 | 0.94 | 1.03 | 1.11 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.38 | 0.48 | 0.58 | 0.69 | 0.77 | 0.80 | 0.90 | 0.99 | 1.08 | 1.18 | 0.41 | 0.52 | 0.63 | 0.75 | 0.87 | 0.90 | 1.01 | 1.12 | 1.23 | 1.32 |
| ~50 % Chance SLR Exceeds | 0.50 | 0.61 | 0.73 | 0.87 | 1.00 | 1.10 | 1.24 | 1.38 | 1.53 | 1.67 | 0.54 | 0.66 | 0.81 | 0.96 | 1.10 | 1.22 | 1.38 | 1.54 | 1.71 | 1.86 |
| <17% Chance SLR Exceeds‡ | 0.64 | 0.78 | 0.93 | 1.10 | 1.29 | 1.47 | 1.68 | 1.90 | 2.12 | 2.35 | 0.69 | 0.85 | 1.03 | 1.23 | 1.44 | 1.67 | 1.91 | 2.16 | 2.42 | 2.86 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.72 | 0.90 | 1.11 | 1.33 | 1.57 | 1.82 | 2.34 | 3.04 | 3.90 | 4.92 | 0.78 | 0.99 | 1.23 | 1.49 | 1.76 | 2.04 | 2.62 | 3.41 | 4.45 | 5.60 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.90 | 1.17 | 1.48 | 1.85 | 2.26 | 2.73 | 3.26 | 3.79 | 4.87 | 6.13 | 0.99 | 1.29 | 1.67 | 2.10 | 2.55 | 3.08 | 3.69 | 4.32 | 5.15 | 6.43 |

**Table B7.** Cape May, NJ SLR above the year 2005 (1995-2014 average) baseline (ft). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.1 | 0.3 | 0.4 | 0.7 | 0.8 | 1.0 | 1.1 | 1.2 | 1.2 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 0.9 | 1.2 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 2.0 | 2.2 | 2.3 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.2 | 0.4 | 0.7 | 0.9 | 1.1 | 1.3 | 1.4 | 1.6 | 1.7 | 1.7 | 1.8 | 2.0 | 2.1 | 2.2 | 1.2 | 1.4 | 1.7 | 1.9 | 2.1 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 |
| ~50 % Chance SLR Exceeds | 0.4 | 0.7 | 1.0 | 1.3 | 1.5 | 1.7 | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 | 3.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.1 | 3.4 | 3.7 | 4.1 | 4.4 |
| <17% Chance SLR Exceeds‡ | 0.5 | 0.9 | 1.3 | 1.7 | 2.0 | 2.3 | 2.6 | 2.9 | 3.3 | 3.6 | 3.9 | 4.3 | 4.6 | 4.9 | 2.0 | 2.5 | 2.9 | 3.3 | 3.8 | 4.2 | 4.7 | 5.2 | 5.7 | 6.2 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.5 | 0.9 | 1.4 | 1.8 | 2.1 | 2.5 | 2.9 | 3.2 | 3.7 | 4.1 | 4.5 | 4.9 | 5.3 | 5.8 | 2.3 | 2.8 | 3.3 | 3.8 | 4.4 | 5.0 | 5.9 | 7.5 | 9.5 | 11.8 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.7 | 1.2 | 1.6 | 2.3 | 2.6 | 3.1 | 3.7 | 4.3 | 5.0 | 5.7 | 6.3 | 7.0 | 7.7 | 9.3 | 2.8 | 3.5 | 4.2 | 5.2 | 6.2 | 7.4 | 8.5 | 10.4 | 14.0 | 17.8 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 1.0 | 1.3 | 1.5 | 1.8 | 2.0 | 2.0 | 2.3 | 2.5 | 2.7 | 3.0 | 1.0 | 1.3 | 1.6 | 2.0 | 2.3 | 2.3 | 2.6 | 2.9 | 3.1 | 3.4 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 1.2 | 1.5 | 1.8 | 2.1 | 2.5 | 2.5 | 2.8 | 3.2 | 3.5 | 3.7 | 1.3 | 1.6 | 2.0 | 2.4 | 2.8 | 2.8 | 3.2 | 3.5 | 3.8 | 4.1 |
| ~50 % Chance SLR Exceeds | 1.6 | 2.0 | 2.4 | 2.8 | 3.2 | 3.5 | 4.0 | 4.5 | 4.9 | 5.4 | 1.7 | 2.2 | 2.6 | 3.1 | 3.5 | 3.9 | 4.4 | 4.9 | 5.5 | 6.0 |
| <17% Chance SLR Exceeds‡ | 2.1 | 2.5 | 3.1 | 3.6 | 4.2 | 4.8 | 5.5 | 6.2 | 6.9 | 7.7 | 2.3 | 2.8 | 3.4 | 4.0 | 4.7 | 5.4 | 6.2 | 7.0 | 7.8 | 8.7 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 2.3 | 2.9 | 3.7 | 4.4 | 5.1 | 6.0 | 7.7 | 9.9 | 12.8 | 16.2 | 2.6 | 3.3 | 4.0 | 4.9 | 5.8 | 6.7 | 8.5 | 11.1 | 14.4 | 18.3 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 3.0 | 3.8 | 4.8 | 6.1 | 7.4 | 8.9 | 10.7 | 12.6 | 16.0 | 20.1 | 3.3 | 4.2 | 5.5 | 6.8 | 8.4 | 10.0 | 12.0 | 14.2 | 16.8 | 20.9 |

**Table B8.** Cape May, NJ SLR above the year 2005 (1995-2014 average) baseline (m). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.03 | 0.08 | 0.13 | 0.19 | 0.25 | 0.31 | 0.34 | 0.37 | 0.38 | 0.39 | 0.41 | 0.43 | 0.46 | 0.48 | 0.28 | 0.35 | 0.42 | 0.46 | 0.50 | 0.52 | 0.56 | 0.61 | 0.66 | 0.69 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.07 | 0.13 | 0.20 | 0.27 | 0.33 | 0.39 | 0.44 | 0.48 | 0.52 | 0.52 | 0.56 | 0.60 | 0.63 | 0.67 | 0.36 | 0.44 | 0.51 | 0.57 | 0.64 | 0.66 | 0.72 | 0.78 | 0.84 | 0.90 |
| ~50 % Chance SLR Exceeds | 0.11 | 0.20 | 0.29 | 0.37 | 0.45 | 0.53 | 0.60 | 0.66 | 0.72 | 0.78 | 0.85 | 0.92 | 0.98 | 1.05 | 0.48 | 0.58 | 0.68 | 0.77 | 0.86 | 0.94 | 1.04 | 1.14 | 1.24 | 1.34 |
| <17% Chance SLR Exceeds‡ | 0.16 | 0.28 | 0.39 | 0.50 | 0.60 | 0.70 | 0.79 | 0.89 | 0.99 | 1.10 | 1.20 | 1.30 | 1.39 | 1.49 | 0.62 | 0.75 | 0.88 | 1.01 | 1.15 | 1.29 | 1.44 | 1.59 | 1.75 | 1.90 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.16 | 0.28 | 0.41 | 0.53 | 0.64 | 0.76 | 0.87 | 0.99 | 1.11 | 1.24 | 1.36 | 1.49 | 1.62 | 1.76 | 0.69 | 0.85 | 1.00 | 1.17 | 1.35 | 1.53 | 1.80 | 2.29 | 2.89 | 3.59 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.20 | 0.34 | 0.49 | 0.65 | 0.79 | 0.95 | 1.12 | 1.32 | 1.53 | 1.74 | 1.93 | 2.12 | 2.36 | 2.85 | 0.86 | 1.06 | 1.29 | 1.57 | 1.88 | 2.26 | 2.60 | 3.17 | 4.25 | 5.41 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.30 | 0.39 | 0.46 | 0.53 | 0.61 | 0.62 | 0.69 | 0.76 | 0.84 | 0.91 | 0.31 | 0.40 | 0.49 | 0.60 | 0.69 | 0.70 | 0.79 | 0.87 | 0.95 | 1.03 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.38 | 0.47 | 0.56 | 0.65 | 0.75 | 0.78 | 0.87 | 0.96 | 1.05 | 1.14 | 0.40 | 0.50 | 0.60 | 0.72 | 0.84 | 0.86 | 0.96 | 1.06 | 1.16 | 1.26 |
| ~50 % Chance SLR Exceeds | 0.49 | 0.60 | 0.73 | 0.86 | 0.98 | 1.08 | 1.22 | 1.36 | 1.51 | 1.65 | 0.53 | 0.66 | 0.79 | 0.94 | 1.08 | 1.19 | 1.35 | 1.51 | 1.66 | 1.82 |
| <17% Chance SLR Exceeds‡ | 0.63 | 0.77 | 0.94 | 1.11 | 1.29 | 1.47 | 1.67 | 1.89 | 2.11 | 2.35 | 0.69 | 0.85 | 1.03 | 1.22 | 1.42 | 1.65 | 1.89 | 2.13 | 2.39 | 2.64 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.71 | 0.90 | 1.12 | 1.34 | 1.57 | 1.82 | 2.34 | 3.03 | 3.90 | 4.92 | 0.78 | 1.00 | 1.23 | 1.48 | 1.77 | 2.05 | 2.59 | 3.38 | 4.40 | 5.57 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.90 | 1.17 | 1.48 | 1.85 | 2.27 | 2.73 | 3.27 | 3.83 | 4.88 | 6.13 | 1.00 | 1.29 | 1.68 | 2.07 | 2.56 | 3.06 | 3.66 | 4.31 | 5.11 | 6.39 |

**Table B9.** Philadelphia, PA SLR above the year 2005 (1995-2014 average) baseline (ft). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.1 | 0.2 | 0.3 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.2 | 1.2 | 0.8 | 1.0 | 1.2 | 1.4 | 1.5 | 1.5 | 1.6 | 1.8 | 1.9 | 2.0 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.2 | 0.3 | 0.6 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 1.5 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 1.0 | 1.3 | 1.5 | 1.7 | 1.9 | 1.9 | 2.1 | 2.3 | 2.5 | 2.6 |
| ~50 % Chance SLR Exceeds | 0.3 | 0.6 | 0.3 | 1.2 | 1.3 | 1.6 | 1.8 | 1.9 | 2.1 | 2.3 | 2.5 | 2.7 | 2.9 | 3.0 | 1.4 | 1.7 | 2.0 | 2.3 | 2.6 | 2.8 | 3.1 | 3.4 | 3.7 | 4.0 |
| <17% Chance SLR Exceeds‡ | 0.5 | 0.8 | 1.2 | 1.5 | 1.8 | 2.1 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 4.2 | 4.4 | 1.9 | 2.3 | 2.7 | 3.1 | 3.5 | 3.9 | 4.4 | 4.9 | 5.3 | 5.8 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.5 | 0.9 | 1.3 | 1.7 | 2.0 | 2.3 | 2.6 | 3.0 | 3.4 | 3.7 | 4.1 | 4.5 | 4.9 | 5.3 | 2.1 | 2.6 | 3.1 | 3.6 | 4.1 | 4.7 | 5.6 | 7.1 | 9.1 | 11.4 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.6 | 1.1 | 1.5 | 2.2 | 2.5 | 2.9 | 3.5 | 4.1 | 4.7 | 5.3 | 5.9 | 6.6 | 7.3 | 8.9 | 2.6 | 3.3 | 4.0 | 4.9 | 5.8 | 7.0 | 8.2 | 10.0 | 13.5 | 17.3 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.8 | 1.1 | 1.4 | 1.6 | 1.8 | 1.8 | 2.1 | 2.3 | 2.5 | 2.7 | 0.9 | 1.2 | 1.5 | 1.8 | 2.1 | 2.1 | 2.4 | 2.6 | 2.9 | 3.1 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 1.1 | 1.4 | 1.7 | 2.0 | 2.3 | 2.3 | 2.6 | 2.9 | 3.1 | 3.4 | 1.2 | 1.5 | 1.8 | 2.2 | 2.5 | 2.6 | 2.9 | 3.2 | 3.5 | 3.8 |
| ~50 % Chance SLR Exceeds | 1.5 | 1.8 | 2.2 | 2.6 | 3.0 | 3.3 | 3.7 | 4.1 | 4.6 | 5.0 | 1.6 | 2.0 | 2.4 | 2.9 | 3.3 | 3.7 | 4.1 | 4.6 | 5.1 | 5.6 |
| <17% Chance SLR Exceeds‡ | 1.9 | 2.4 | 2.8 | 3.4 | 4.0 | 4.5 | 5.1 | 5.8 | 6.5 | 7.3 | 2.1 | 2.6 | 3.2 | 3.8 | 4.4 | 5.1 | 5.9 | 6.7 | 7.5 | 8.3 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 2.2 | 2.8 | 3.4 | 4.1 | 4.8 | 5.6 | 7.3 | 9.6 | 12.3 | 15.7 | 2.4 | 3.1 | 3.8 | 4.6 | 5.5 | 6.4 | 8.2 | 10.7 | 14.1 | 17.8 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 2.8 | 3.6 | 4.6 | 5.8 | 7.1 | 8.6 | 10.3 | 12.1 | 15.5 | 19.6 | 3.1 | 4.0 | 5.3 | 6.6 | 8.1 | 9.7 | 11.7 | 13.7 | 16.3 | 20.5 |

**Table B10.** Philadelphia, PA SLR above the year 2005 (1995-2014 average) baseline (m). Results for the very high emissions scenario (SSP5-8.5) are included to provide continuity with the 2019 STAP. For information regarding the interpretation of this table and the significance of the *, **, and ‡ symbols, refer to Table 5.

| | Across Emissions Scenarios | | | | Low Emissions (SSP1-2.6) | | | | | | | | | | Intermediate Emissions (SSP2-4.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.02 | 0.05 | 0.10 | 0.16 | 0.21 | 0.26 | 0.29 | 0.31 | 0.31 | 0.32 | 0.33 | 0.35 | 0.37 | 0.38 | 0.24 | 0.31 | 0.37 | 0.41 | 0.44 | 0.45 | 0.50 | 0.54 | 0.58 | 0.62 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.05 | 0.10 | 0.17 | 0.23 | 0.29 | 0.34 | 0.38 | 0.41 | 0.45 | 0.45 | 0.48 | 0.51 | 0.53 | 0.56 | 0.32 | 0.39 | 0.46 | 0.51 | 0.57 | 0.59 | 0.64 | 0.70 | 0.75 | 0.81 |
| ~50 % Chance SLR Exceeds | 0.10 | 0.18 | 0.26 | 0.34 | 0.41 | 0.48 | 0.54 | 0.59 | 0.65 | 0.70 | 0.76 | 0.81 | 0.87 | 0.92 | 0.44 | 0.53 | 0.62 | 0.70 | 0.79 | 0.86 | 0.95 | 1.05 | 1.14 | 1.23 |
| <17% Chance SLR Exceeds‡ | 0.15 | 0.26 | 0.37 | 0.47 | 0.56 | 0.65 | 0.73 | 0.82 | 0.91 | 1.01 | 1.09 | 1.18 | 1.27 | 1.36 | 0.58 | 0.70 | 0.81 | 0.93 | 1.07 | 1.20 | 1.34 | 1.49 | 1.63 | 1.78 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.15 | 0.27 | 0.38 | 0.50 | 0.60 | 0.70 | 0.80 | 0.92 | 1.02 | 1.14 | 1.25 | 1.37 | 1.48 | 1.61 | 0.64 | 0.79 | 0.93 | 1.09 | 1.26 | 1.44 | 1.71 | 2.18 | 2.77 | 3.48 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.19 | 0.33 | 0.46 | 0.61 | 0.75 | 0.90 | 1.06 | 1.24 | 1.44 | 1.62 | 1.81 | 2.00 | 2.23 | 2.72 | 0.80 | 1.00 | 1.22 | 1.49 | 1.77 | 2.14 | 2.49 | 3.06 | 4.12 | 5.26 |

| | High Emissions (SSP 3-7.0) | | | | | | | | | | Very High Emissions (SSP5-8.5) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 95% Chance SLR Exceeds* | 0.26 | 0.34 | 0.41 | 0.49 | 0.55 | 0.56 | 0.63 | 0.70 | 0.77 | 0.83 | 0.28 | 0.36 | 0.45 | 0.55 | 0.64 | 0.64 | 0.72 | 0.80 | 0.88 | 0.95 |
| ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| > 83% Chance SLR Exceeds | 0.33 | 0.42 | 0.51 | 0.60 | 0.69 | 0.70 | 0.79 | 0.88 | 0.96 | 1.04 | 0.36 | 0.46 | 0.55 | 0.66 | 0.78 | 0.79 | 0.89 | 0.99 | 1.08 | 1.17 |
| ~50 % Chance SLR Exceeds | 0.45 | 0.55 | 0.66 | 0.79 | 0.91 | 1.00 | 1.13 | 1.26 | 1.40 | 1.54 | 0.49 | 0.60 | 0.73 | 0.87 | 1.01 | 1.12 | 1.26 | 1.41 | 1.56 | 1.71 |
| <17% Chance SLR Exceeds‡ | 0.58 | 0.72 | 0.87 | 1.03 | 1.21 | 1.37 | 1.57 | 1.78 | 1.99 | 2.21 | 0.64 | 0.79 | 0.96 | 1.15 | 1.35 | 1.56 | 1.79 | 2.03 | 2.27 | 2.53 |
| **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| <17% Chance SLR Exceeds* | 0.67 | 0.84 | 1.04 | 1.26 | 1.48 | 1.72 | 2.23 | 2.91 | 3.76 | 4.78 | 0.73 | 0.93 | 1.16 | 1.41 | 1.67 | 1.94 | 2.49 | 3.27 | 4.29 | 5.44 |
| ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | | | | | | | |
| < 5% Chance SLR Exceeds* | 0.85 | 1.10 | 1.40 | 1.77 | 2.17 | 2.62 | 3.15 | 3.69 | 4.73 | 5.96 | 0.94 | 1.23 | 1.61 | 2.00 | 2.47 | 2.96 | 3.56 | 4.19 | 4.97 | 6.24 |

# Appendix C: Supplemental Tables and Figures

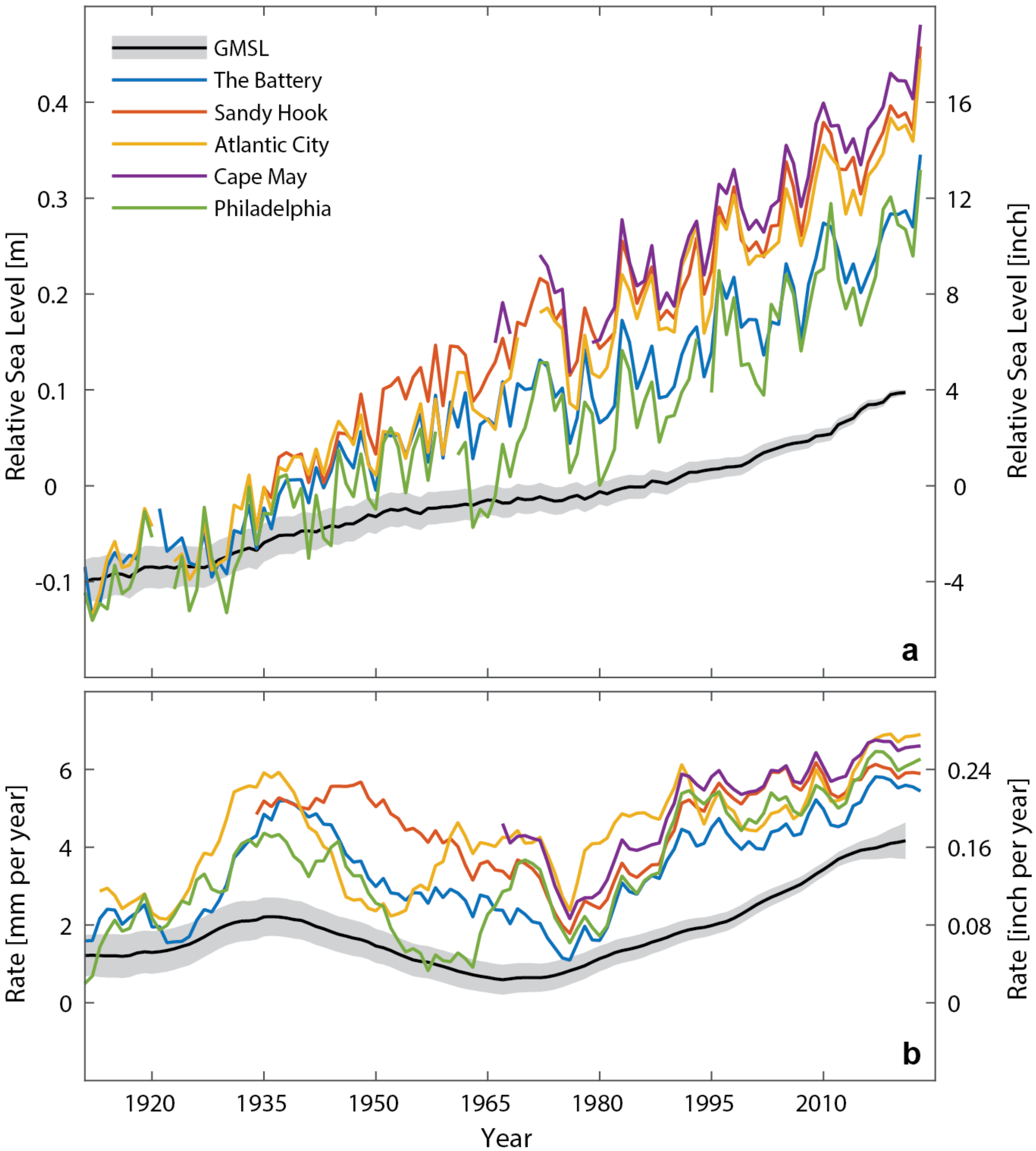



**Figure C1.** Comparison of (a) historical sea levels and (b) rates of sea-level change for tide gauge stations New Jersey (Sandy Hook in red, Atlantic City in yellow, Cape May in purple), New York (The Battery in blue), and Philadelphia (green) and for global-mean sea-level change using recorded tide gauge data from Dangendorf et al. (2024). Atlantic City values in (a) were downloaded from NOAA Center for Operational Oceanographic Products and Services (CO-OPS) Water Levels Tool. 30-year rates for (b) were calculated using a Singular Spectrum Analysis with an embedding dimension of 15 (Moore et al. 2005) with gaps in tide gauge data filled using existing tide gauge reconstruction methods (Dangendorf et al., 2024). The shadings indicate the 1σ standard error of the nonlinear trend and the GMSL reconstruction, respectively. Data gaps (red dotted lines) have been filled for the period 1921-1922 and 1970-1971 for (a) using values from the sea-level reconstruction from Dangendorf et al. (2024). This was done solely for the purpose of fitting a nonlinear trend using the Singular Spectrum Analysis, which requires complete records.

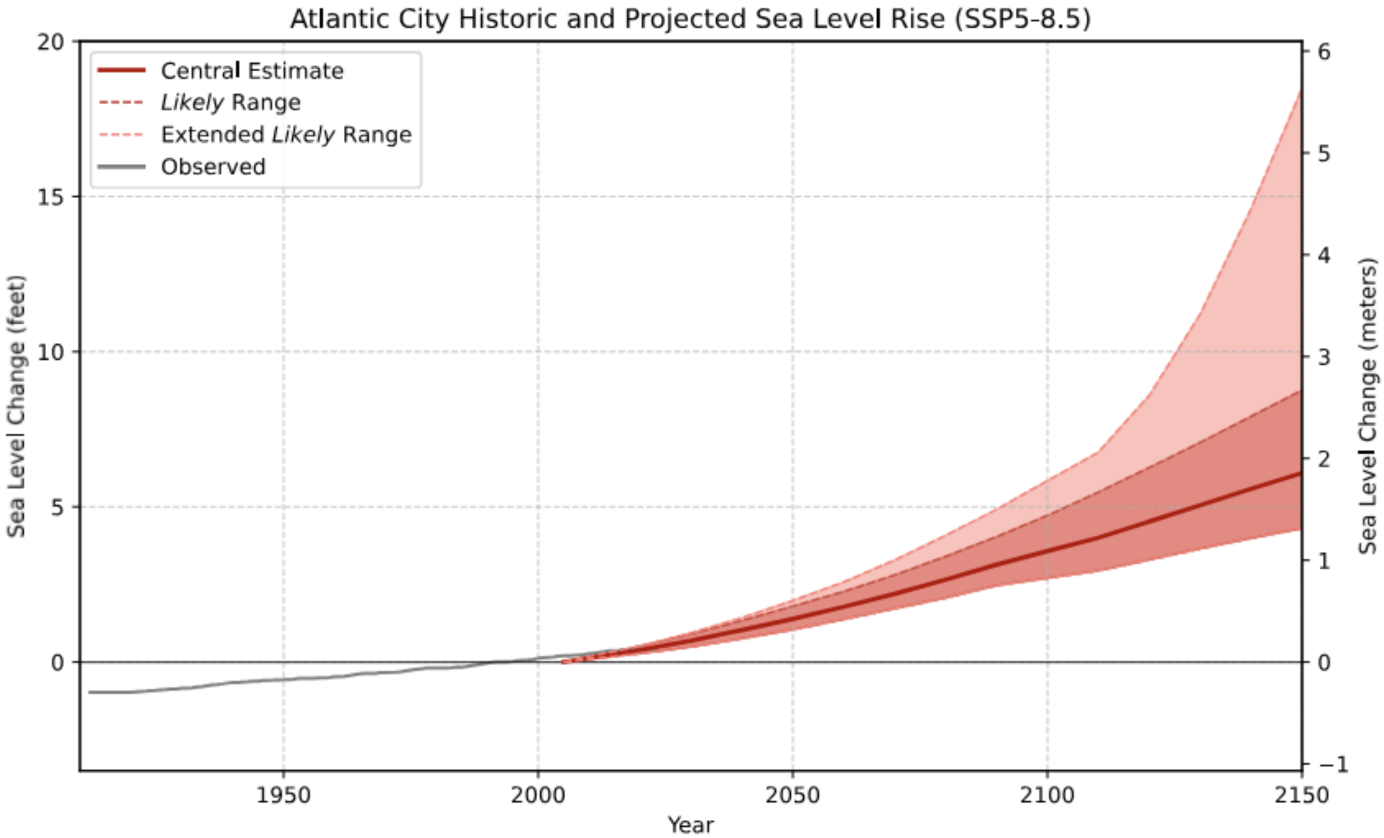



**Figure C2.** Time series of tide-gauge measurements (grey) and projections for the very high emissions scenarios. All observations and SLR values are expressed as 19-year means of tide-gauge measurements and are measured with respect to a 1995-2014 (2005) baseline. Projections are 19-year averages using a rolling mean. The dark solid red line (central estimate) represents the amount of SLR that has about a 1-in-2 chance of being exceeded when excluding potential rapid ice-sheet loss processes; dark red shaded areas (*likely* range) indicate the amount of SLR that has at least a 2-in-3 chance of occurring, when excluding potential rapid ice-sheet loss processes; and the full (light and dark) red shaded areas (extended *likely* range) indicate the amount of SLR that has at least a 2-in-3 chance of occurring, when potential including rapid ice-sheet loss processes.

**Table C1.** Comparison of STAP vernacular for the STAP 2019 warming scenarios and the STAP 2025 emissions scenarios. Colored boxes indicate color coding and values used throughout main body of 2019 and 2025 STAP reports. The STAP 2025 vernacular is consistent with AR6 emissions scenario naming conventions such that the IPCC Low (SS1-2.6) is the STAP 2025 low emission scenario, the IPCC Intermediate (SSP2-4.5) is the STAP 2025 intermediate emission scenario, and the IPCC High (SSP3-7.0) is the STAP 2025 high emissions scenario.

| | New Jersey Sea-Level Rise Estimates (ft.) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Report | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | |
| IPCC Scenario | AR6, IPCC Low (SSP1-2.6) | | | AR6, IPCC Int. (SSP2-4.5) | | | AR6, IPCC High (SSP3-7.0) | | | AR6, IPCC Very High (SSP5-8.5) | | |
| Deg. of Warming (°C)* | 2.0 | 1.6 | | -- | 2.6 | | 3.5 | 3.8 | | 5.0 | 4.7 | |
| STAP Nomenclature | Low | Low | Low | n/a | Int. | Int. | Mod | High | High | High | Very High (Reported in Appendix) | Very High (Reported in Appendix) |
| Processes Included** | Low | Low | Medium | Low | Low*** | Medium | Low | Low*** | Medium | Low | Low | Medium |

** Reported global warming levels are for the end of the 21st century, relative to a late nineteenth century baseline.*
*** 'Low confidence' does not indicate lower quality than a 'high confidence' estimate of sea level rise: rather, confidence is used to qualify the degree of agreement and level of evidence around the processes that are used as inputs into the sea level rise estimates For the IPCC scenarios, reported warming levels are median projections, while the IPCC sea level projections incorporate the range of possible warming levels consistent with the specified emissions scenario.*
**** IPCC low confidence projections for the intermediate (SSP2-4.5) and high (SSP3-7.0) emissions scenarios are interpolated and are not direct outputs of the IPCC.*

**Table C2.** Comparison of SLR projections for Atlantic City derived from the AR6 and the 2025 STAP (in feet). The SLR projections in this report and the AR6 are reasonable reasonably similar (Table 3).

| | New Jersey Sea-Level Rise Estimates (ft.) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Climate Scenario | STAP Low / IPCC Low (SSP1-2.6) | | | | IPCC Intermediate (SSP2-4.5) | | | | STAP Moderate / IPCC High (SSP3-7.0) | | | | STAP High / IPCC Very High (SSP5-8.5) | | | |
| Report | AR6 | | STAP 2025 | | AR6 | | STAP 2025 | | AR6 | | STAP 2025 | | AR6 | | STAP 2025 | |
| Processes Included | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium |
| Baseline | 2005 | 2005 | 2005 | 2005 | -- | 2005 | 2005 | 2005 | -- | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| Chance SLR Exceeds | **2030** | | | | | | | | | | | | | | | |
| >95% chance | 0.4 | 0.4 | 0.3 | 0.3 | -- | 0.3 | 0.3 | 0.3 | -- | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 |
| > 83% chance | 0.5 | 0.5 | 0.4 | 0.4 | -- | 0.5 | 0.4 | 0.4 | -- | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 |
| ~ 50% chance | 0.7 | 0.7 | 0.7 | 0.7 | -- | 0.7 | 0.7 | 0.7 | -- | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| < 17% chance | 0.9 | 0.9 | 0.9 | 0.9 | -- | 0.9 | 0.9 | 0.9 | -- | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| <5% chance | 1.1 | 1.0 | 1.1 | 1.1 | -- | 1.0 | 1.1 | 1.1 | -- | 1.1 | 1.2 | 1.1 | 1.1 | 1.0 | 1.1 | 1.1 |
| Chance SLR Exceeds | **2050** | | | | | | | | | | | | | | | |
| >95% chance | 0.8 | 0.8 | 0.7 | 0.7 | -- | 0.8 | 0.7 | 0.7 | -- | 0.8 | 0.7 | 0.7 | 0.9 | 0.9 | 0.8 | 0.8 |
| > 83% chance | 1.0 | 1.0 | 0.9 | 0.9 | -- | 1.0 | 1.0 | 1.0 | -- | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.0 | 1.0 |
| ~ 50% chance | 1.3 | 1.3 | 1.3 | 1.3 | -- | 1.3 | 1.3 | 1.3 | -- | 1.3 | 1.3 | 1.3 | 1.4 | 1.4 | 1.4 | 1.4 |
| < 17% chance | 1.7 | 1.6 | 1.8 | 1.7 | -- | 1.6 | 1.8 | 1.7 | -- | 1.7 | 1.9 | 1.7 | 1.9 | 1.8 | 2.0 | 1.8 |
| <5% chance | 2.1 | 1.9 | 2.1 | 2.0 | -- | 1.9 | 2.2 | 2.0 | -- | 1.9 | 2.3 | 2.0 | 2.4 | 2.0 | 2.4 | 2.1 |
| Chance SLR Exceeds | **2070** | | | | | | | | | | | | | | | |
| >95% chance | 1.2 | 1.2 | 1.1 | 1.1 | -- | 1.4 | 1.2 | 1.2 | -- | 1.5 | 1.3 | 1.3 | 1.6 | 1.6 | 1.4 | 1.4 |
| > 83% chance | 1.4 | 1.4 | 1.3 | 1.3 | -- | 1.6 | 1.5 | 1.5 | -- | 1.7 | 1.6 | 1.6 | 1.8 | 1.8 | 1.7 | 1.7 |
| ~ 50% chance | 1.8 | 1.8 | 1.8 | 1.8 | -- | 2.0 | 2.0 | 1.9 | -- | 2.0 | 2.1 | 2.0 | 2.3 | 2.2 | 2.3 | 2.2 |
| < 17% chance | 2.4 | 2.3 | 2.5 | 2.3 | -- | 2.4 | 2.8 | 2.5 | -- | 2.5 | 3.0 | 2.6 | 3.3 | 2.7 | 3.3 | 2.8 |
| <5% chance | 2.9 | 2.7 | 3.2 | 2.8 | -- | 2.8 | 3.5 | 3.0 | -- | 2.9 | 3.9 | 3.0 | 4.2 | 3.2 | 4.3 | 3.4 |
| Chance SLR Exceeds | **2100** | | | | | | | | | | | | | | | |
| >95% chance | 1.6 | 1.6 | 1.3 | 1.3 | -- | 1.9 | 1.8 | 1.8 | -- | 2.4 | 2.1 | 2.1 | 2.6 | 2.6 | 2.4 | 2.4 |
| > 83% chance | 1.9 | 1.9 | 1.8 | 1.8 | -- | 2.3 | 2.2 | 2.2 | -- | 2.7 | 2.6 | 2.6 | 3.0 | 3.0 | 2.9 | 2.9 |
| ~ 50% chance | 2.5 | 2.5 | 2.5 | 2.4 | -- | 2.9 | 3.0 | 2.9 | -- | 3.3 | 3.5 | 3.3 | 4.0 | 3.7 | 3.9 | 3.6 |
| < 17% chance | 3.4 | 3.2 | 3.7 | 3.3 | -- | 3.8 | 4.5 | 3.8 | -- | 4.2 | 5.2 | 4.3 | 5.9 | 4.7 | 5.8 | 4.7 |
| <5% chance | 4.4 | 3.8 | 5.1 | 4.0 | -- | 4.5 | 6.2 | 4.6 | -- | 5.0 | 7.5 | 5.2 | 8.6 | 5.6 | 8.5 | 5.7 |
| Chance SLR Exceeds | **2150** | | | | | | | | | | | | | | | |
| >95% chance | 2.1 | 2.1 | 1.7 | 1.7 | -- | 2.8 | 2.5 | 2.5 | -- | 3.6 | 3.2 | 3.2 | 3.9 | 3.9 | 3.6 | 3.6 |
| > 83% chance | 2.6 | 2.6 | 2.3 | 2.3 | -- | 3.4 | 3.1 | 3.1 | -- | 4.1 | 3.9 | 3.9 | 4.5 | 4.5 | 4.3 | 4.3 |
| ~ 50% chance | 3.7 | 3.5 | 3.7 | 3.5 | -- | 4.6 | 4.9 | 4.5 | -- | 5.4 | 6.9 | 5.5 | 8.3 | 5.9 | 8.1 | 6.1 |
| < 17% chance | 5.3 | 4.8 | 5.8 | 4.9 | -- | 6.2 | 12.0 | 6.3 | -- | 7.2 | 16.2 | 7.7 | 19.0 | 8.1 | 18.5 | 8.8 |
| <5% chance | 7.0 | 5.8 | 9.4 | 6.1 | -- | 7.5 | 17.9 | 7.8 | -- | 8.6 | 20.2 | 9.6 | 21.4 | 9.8 | 21.1 | 11.0 |

**Table C3.** Comparison of SLR projections for Atlantic City derived from the AR6 and the 2025 STAP (in cm). The SLR projections in this report and the AR6 are reasonable reasonably similar, with differences in *medium confidence* projections due only to numerical sampling algorithms and to computational modifications from FACTS 0.9 to FACTS 1.1.

| | New Jersey Sea-Level Rise Estimates (m) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Climate Scenario | STAP Low / IPCC Low (SSP1-2.6) | | | | IPCC Intermediate (SSP2-4.5) | | | | STAP Moderate / IPCC High (SSP3-7.0) | | | | STAP High / IPCC Very High (SSP5-8.5) | | | |
| Report | AR6 | | STAP 2025 | | AR6 | | STAP 2025 | | AR6 | | STAP 2025 | | AR6 | | STAP 2025 | |
| Processes Included | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium | Low | Medium |
| Baseline | 2005 | 2005 | 2005 | 2005 | -- | 2005 | 2005 | 2005 | -- | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| Chance SLR Exceeds | **2030** | | | | | | | | | | | | | | | |
| >95% chance | 0.11 | 0.11 | 0.09 | 0.09 | -- | 0.10 | 0.09 | 0.09 | -- | 0.09 | 0.08 | 0.08 | 0.12 | 0.12 | 0.11 | 0.11 |
| > 83% chance | 0.15 | 0.15 | 0.14 | 0.14 | -- | 0.14 | 0.14 | 0.14 | -- | 0.14 | 0.13 | 0.13 | 0.16 | 0.16 | 0.15 | 0.15 |
| ~ 50% chance | 0.21 | 0.21 | 0.21 | 0.21 | -- | 0.20 | 0.21 | 0.21 | -- | 0.20 | 0.20 | 0.20 | 0.21 | 0.21 | 0.21 | 0.21 |
| < 17% chance | 0.28 | 0.27 | 0.29 | 0.28 | -- | 0.27 | 0.29 | 0.28 | -- | 0.27 | 0.29 | 0.28 | 0.28 | 0.27 | 0.29 | 0.28 |
| <5% chance | 0.32 | 0.32 | 0.34 | 0.34 | -- | 0.32 | 0.35 | 0.34 | -- | 0.32 | 0.35 | 0.34 | 0.33 | 0.31 | 0.34 | 0.33 |
| Chance SLR Exceeds | **2050** | | | | | | | | | | | | | | | |
| >95% chance | 0.23 | 0.23 | 0.21 | 0.21 | -- | 0.25 | 0.23 | 0.23 | -- | 0.25 | 0.22 | 0.22 | 0.27 | 0.27 | 0.25 | 0.25 |
| > 83% chance | 0.29 | 0.29 | 0.28 | 0.28 | -- | 0.31 | 0.29 | 0.29 | -- | 0.31 | 0.29 | 0.29 | 0.33 | 0.33 | 0.32 | 0.32 |
| ~ 50% chance | 0.39 | 0.39 | 0.39 | 0.38 | -- | 0.40 | 0.40 | 0.39 | -- | 0.40 | 0.40 | 0.40 | 0.43 | 0.43 | 0.43 | 0.42 |
| < 17% chance | 0.52 | 0.50 | 0.54 | 0.51 | -- | 0.50 | 0.55 | 0.51 | -- | 0.50 | 0.57 | 0.52 | 0.59 | 0.53 | 0.60 | 0.55 |
| <5% chance | 0.63 | 0.58 | 0.65 | 0.61 | -- | 0.58 | 0.67 | 0.61 | -- | 0.59 | 0.71 | 0.62 | 0.74 | 0.62 | 0.74 | 0.65 |
| Chance SLR Exceeds | **2070** | | | | | | | | | | | | | | | |
| >95% chance | 0.36 | 0.36 | 0.32 | 0.32 | -- | 0.42 | 0.38 | 0.38 | -- | 0.44 | 0.41 | 0.41 | 0.48 | 0.48 | 0.43 | 0.43 |
| > 83% chance | 0.43 | 0.43 | 0.41 | 0.41 | -- | 0.48 | 0.46 | 0.46 | -- | 0.51 | 0.49 | 0.49 | 0.55 | 0.55 | 0.53 | 0.53 |
| ~ 50% chance | 0.55 | 0.55 | 0.55 | 0.54 | -- | 0.60 | 0.61 | 0.59 | -- | 0.62 | 0.63 | 0.62 | 0.69 | 0.67 | 0.69 | 0.67 |
| < 17% chance | 0.74 | 0.70 | 0.77 | 0.71 | -- | 0.75 | 0.86 | 0.76 | -- | 0.77 | 0.91 | 0.78 | 1.00 | 0.84 | 1.00 | 0.86 |
| <5% chance | 0.90 | 0.82 | 0.96 | 0.85 | -- | 0.87 | 1.07 | 0.91 | -- | 0.89 | 1.17 | 0.93 | 1.29 | 0.98 | 1.30 | 1.02 |
| Chance SLR Exceeds | **2100** | | | | | | | | | | | | | | | |
| >95% chance | 0.49 | 0.50 | 0.41 | 0.41 | -- | 0.59 | 0.54 | 0.54 | -- | 0.73 | 0.65 | 0.65 | 0.80 | 0.80 | 0.74 | 0.74 |
| > 83% chance | 0.59 | 0.59 | 0.54 | 0.54 | -- | 0.70 | 0.67 | 0.67 | -- | 0.83 | 0.79 | 0.79 | 0.92 | 0.92 | 0.87 | 0.87 |
| ~ 50% chance | 0.76 | 0.75 | 0.76 | 0.74 | -- | 0.90 | 0.92 | 0.88 | -- | 1.02 | 1.07 | 1.00 | 1.23 | 1.12 | 1.20 | 1.11 |
| < 17% chance | 1.03 | 0.97 | 1.12 | 1.01 | -- | 1.16 | 1.36 | 1.17 | -- | 1.29 | 1.58 | 1.30 | 1.80 | 1.42 | 1.78 | 1.44 |
| <5% chance | 1.33 | 1.16 | 1.54 | 1.22 | -- | 1.37 | 1.88 | 1.40 | -- | 1.53 | 2.28 | 1.57 | 2.63 | 1.70 | 2.58 | 1.75 |
| Chance SLR Exceeds | **2150** | | | | | | | | | | | | | | | |
| >95% chance | 0.65 | 0.65 | 0.53 | 0.53 | -- | 0.85 | 0.76 | 0.76 | -- | 1.09 | 0.98 | 0.98 | 1.18 | 1.18 | 1.09 | 1.09 |
| > 83% chance | 0.78 | 0.78 | 0.71 | 0.71 | -- | 1.03 | 0.94 | 0.94 | -- | 1.26 | 1.19 | 1.19 | 1.37 | 1.37 | 1.31 | 1.31 |
| ~ 50% chance | 1.12 | 1.08 | 1.13 | 1.07 | -- | 1.40 | 1.48 | 1.38 | -- | 1.65 | 2.12 | 1.68 | 2.53 | 1.81 | 2.46 | 1.86 |
| < 17% chance | 1.63 | 1.47 | 1.77 | 1.49 | -- | 1.90 | 3.65 | 1.93 | -- | 2.18 | 4.95 | 2.36 | 5.80 | 2.46 | 5.63 | 2.67 |
| <5% chance | 2.13 | 1.78 | 2.87 | 1.85 | -- | 2.28 | 5.45 | 2.39 | -- | 2.64 | 6.16 | 2.92 | 6.52 | 2.98 | 6.44 | 3.36 |

**Table C4**. Comparison of the 2019 and 2025 STAP report SLR projections with 2000 and 2005 baselines respectively (in feet).

| | New Jersey Sea-Level Rise Estimates (ft.) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Climate Scenario | 2019 STAP "Low" / 2025 STAP "Low" / IPCC Low (SSP1-2.6) | | | 2025 STAP "Intermediate" / IPCC Intermediate (SSP2-4.5) | | | 2019 STAP "Moderate" / 2025 STAP "High"/ IPCC High (SSP3-7.0) | | | 2019 STAP "High" / 2025 STAP "Very High" / IPCC Very High (SSP5-8.5) | | |
| Report | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | |
| Deg. of Warming (°C) | 2.0 | 1.6 | | -- | 2.6 | | 3.5 | 3.8 | | 5.0 | 4.7 | |
| Processes Included | Low | Low | Medium | Low | Low | Medium | Low | Low | Medium | Low | Low | Medium |
| Baseline | 2000 | 2005 | 2005 | -- | 2005 | 2005 | 2000 | 2005 | 2005 | 2000 | 2005 | 2005 |
| Chance SLR Exceeds | **2030** | | | | | | | | | | | |
| >95% chance | 0.3 | 0.3 | 0.3 | -- | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 |
| > 83% chance | 0.5 | 0.4 | 0.4 | -- | 0.4 | 0.4 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 |
| ~ 50% chance | 0.8 | 0.7 | 0.7 | -- | 0.7 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 0.7 | 0.7 |
| < 17% chance | 1.1 | 0.9 | 0.9 | -- | 0.9 | 0.9 | 1.1 | 0.9 | 0.9 | 1.1 | 0.9 | 0.9 |
| <5% chance | 1.3 | 1.1 | 1.1 | -- | 1.1 | 1.1 | 1.3 | 1.2 | 1.1 | 1.3 | 1.1 | 1.1 |
| Chance SLR Exceeds | **2050** | | | | | | | | | | | |
| >95% chance | 0.7 | 0.7 | 0.7 | -- | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 |
| > 83% chance | 0.9 | 0.9 | 0.9 | -- | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 |
| ~ 50% chance | 1.4 | 1.3 | 1.3 | -- | 1.3 | 1.3 | 1.4 | 1.3 | 1.3 | 1.4 | 1.4 | 1.4 |
| < 17% chance | 2.1 | 1.8 | 1.7 | -- | 1.8 | 1.7 | 2.1 | 1.9 | 1.7 | 2.1 | 2.0 | 1.8 |
| <5% chance | 2.6 | 2.1 | 2.0 | -- | 2.2 | 2.0 | 2.6 | 2.3 | 2.0 | 2.6 | 2.4 | 2.1 |
| Chance SLR Exceeds | **2070** | | | | | | | | | | | |
| >95% chance | 0.9 | 1.1 | 1.1 | -- | 1.2 | 1.2 | 1.0 | 1.3 | 1.3 | 1.1 | 1.4 | 1.4 |
| > 83% chance | 1.3 | 1.3 | 1.3 | -- | 1.5 | 1.5 | 1.4 | 1.6 | 1.6 | 1.5 | 1.7 | 1.7 |
| ~ 50% chance | 1.9 | 1.8 | 1.8 | -- | 2.0 | 1.9 | 2.2 | 2.1 | 2.0 | 2.4 | 2.3 | 2.2 |
| < 17% chance | 2.7 | 2.5 | 2.3 | -- | 2.8 | 2.5 | 3.1 | 3.0 | 2.6 | 3.5 | 3.3 | 2.8 |
| <5% chance | 3.2 | 3.2 | 2.8 | -- | 3.5 | 3.0 | 3.8 | 3.9 | 3.0 | 4.4 | 4.3 | 3.4 |
| Chance SLR Exceeds | **2100** | | | | | | | | | | | |
| >95% chance | 1.0 | 1.3 | 1.3 | -- | 1.8 | 1.8 | 1.3 | 2.1 | 2.1 | 1.5 | 2.4 | 2.4 |
| > 83% chance | 1.7 | 1.8 | 1.8 | -- | 2.2 | 2.2 | 2.0 | 2.6 | 2.6 | 2.3 | 2.9 | 2.9 |
| ~ 50% chance | 2.8 | 2.5 | 2.4 | -- | 3.0 | 2.9 | 3.3 | 3.5 | 3.3 | 3.9 | 3.9 | 3.6 |
| < 17% chance | 3.9 | 3.7 | 3.3 | -- | 4.5 | 3.8 | 5.1 | 5.2 | 4.3 | 6.3 | 5.8 | 4.7 |
| <5% chance | 5.0 | 5.1 | 4.0 | -- | 6.2 | 4.6 | 6.9 | 7.5 | 5.2 | 8.0 | 8.5 | 5.7 |
| Chance SLR Exceeds | **2150** | | | | | | | | | | | |
| >95% chance | 1.3 | 1.7 | 1.7 | -- | 2.5 | 2.5 | 2.1 | 3.2 | 3.2 | 2.9 | 3.6 | 3.6 |
| > 83% chance | 2.4 | 2.3 | 2.3 | -- | 3.1 | 3.1 | 3.1 | 3.9 | 3.9 | 3.8 | 4.3 | 4.3 |
| ~ 50% chance | 4.2 | 3.7 | 3.5 | -- | 4.9 | 4.5 | 5.2 | 6.9 | 5.5 | 6.2 | 8.1 | 6.1 |
| < 17% chance | 6.3 | 5.8 | 4.9 | -- | 12.0 | 6.3 | 8.3 | 16.2 | 7.7 | 10.3 | 18.5 | 8.8 |
| <5% chance | 8.0 | 9.4 | 6.1 | -- | 17.9 | 7.8 | 13.8 | 20.2 | 9.6 | 19.6 | 21.1 | 11.0 |

**Table C5.** Comparison of the 2019 and 2025 STAP report SLR projections with 2005 baseline (in feet).

| | New Jersey Sea-Level Rise Estimates (ft.) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Climate Scenario | 2019 STAP "Low" / 2025 STAP "Low" / IPCC Low (SSP1-2.6) | | | 2025 STAP "Intermediate" / IPCC Intermediate (SSP2-4.5) | | | 2019 STAP "Moderate" / 2025 STAP "High"/ IPCC High (SSP3-7.0) | | | 2019 STAP "High" / 2025 STAP "Very High" / IPCC Very High (SSP5-8.5) | | |
| Report | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | | STAP 2019 | STAP 2025 | |
| Deg. of Warming (°C) | 2.0 | 1.6 | | -- | 2.6 | | 3.5 | 3.8 | | 5.0 | 4.7 | |
| Processes Included | Low | Low | Medium | Low | Low | Medium | Low | Low | Medium | Low | Low | Medium |
| Baseline | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| Chance SLR Exceeds | **2030** | | | | | | | | | | | |
| >95% chance | 0.4 | 0.3 | 0.3 | -- | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 |
| > 83% chance | 0.6 | 0.4 | 0.4 | -- | 0.4 | 0.4 | 0.6 | 0.4 | 0.4 | 0.6 | 0.5 | 0.5 |
| ~ 50% chance | 0.9 | 0.7 | 0.7 | -- | 0.7 | 0.7 | 0.9 | 0.7 | 0.7 | 0.9 | 0.7 | 0.7 |
| < 17% chance | 1.2 | 0.9 | 0.9 | -- | 0.9 | 0.9 | 1.2 | 0.9 | 0.9 | 1.2 | 0.9 | 0.9 |
| <5% chance | 1.4 | 1.1 | 1.1 | -- | 1.1 | 1.1 | 1.4 | 1.2 | 1.1 | 1.4 | 1.1 | 1.1 |
| Chance SLR Exceeds | **2050** | | | | | | | | | | | |
| >95% chance | 0.8 | 0.7 | 0.7 | -- | 0.7 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 |
| > 83% chance | 1.0 | 0.9 | 0.9 | -- | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| ~ 50% chance | 1.5 | 1.3 | 1.3 | -- | 1.3 | 1.3 | 1.5 | 1.3 | 1.3 | 1.5 | 1.4 | 1.4 |
| < 17% chance | 2.2 | 1.8 | 1.7 | -- | 1.8 | 1.7 | 2.2 | 1.9 | 1.7 | 2.2 | 2.0 | 1.8 |
| <5% chance | 2.7 | 2.1 | 2.0 | -- | 2.2 | 2.0 | 2.7 | 2.3 | 2.0 | 2.7 | 2.4 | 2.1 |
| Chance SLR Exceeds | **2070** | | | | | | | | | | | |
| >95% chance | 1.0 | 1.1 | 1.1 | -- | 1.2 | 1.2 | 1.1 | 1.3 | 1.3 | 1.2 | 1.4 | 1.4 |
| > 83% chance | 1.4 | 1.3 | 1.3 | -- | 1.5 | 1.5 | 1.5 | 1.6 | 1.6 | 1.6 | 1.7 | 1.7 |
| ~ 50% chance | 2.0 | 1.8 | 1.8 | -- | 2.0 | 1.9 | 2.3 | 2.1 | 2.0 | 2.5 | 2.3 | 2.2 |
| < 17% chance | 2.8 | 2.5 | 2.3 | -- | 2.8 | 2.5 | 3.2 | 3.0 | 2.6 | 3.6 | 3.3 | 2.8 |
| <5% chance | 3.3 | 3.2 | 2.8 | -- | 3.5 | 3.0 | 3.9 | 3.9 | 3.0 | 4.5 | 4.3 | 3.4 |
| Chance SLR Exceeds | **2100** | | | | | | | | | | | |
| >95% chance | 1.1 | 1.3 | 1.3 | -- | 1.8 | 1.8 | 1.4 | 2.1 | 2.1 | 1.6 | 2.4 | 2.4 |
| > 83% chance | 1.8 | 1.8 | 1.8 | -- | 2.2 | 2.2 | 2.1 | 2.6 | 2.6 | 2.4 | 2.9 | 2.9 |
| ~ 50% chance | 2.9 | 2.5 | 2.4 | -- | 3.0 | 2.9 | 3.4 | 3.5 | 3.3 | 4.0 | 3.9 | 3.6 |
| < 17% chance | 4.0 | 3.7 | 3.3 | -- | 4.5 | 3.8 | 5.2 | 5.2 | 4.3 | 6.4 | 5.8 | 4.7 |
| <5% chance | 5.1 | 5.1 | 4.0 | -- | 6.2 | 4.6 | 7.0 | 7.5 | 5.2 | 8.1 | 8.5 | 5.7 |
| Chance SLR Exceeds | **2150** | | | | | | | | | | | |
| >95% chance | 1.4 | 1.7 | 1.7 | -- | 2.5 | 2.5 | 2.2 | 3.2 | 3.2 | 3.0 | 3.6 | 3.6 |
| > 83% chance | 2.5 | 2.3 | 2.3 | -- | 3.1 | 3.1 | 3.2 | 3.9 | 3.9 | 3.9 | 4.3 | 4.3 |
| ~ 50% chance | 4.3 | 3.7 | 3.5 | -- | 4.9 | 4.5 | 5.3 | 6.9 | 5.5 | 6.3 | 8.1 | 6.1 |
| < 17% chance | 6.4 | 5.8 | 4.9 | -- | 12.0 | 6.3 | 8.4 | 16.2 | 7.7 | 10.4 | 18.5 | 8.8 |
| <5% chance | 8.1 | 9.4 | 6.1 | -- | 17.9 | 7.8 | 13.9 | 20.2 | 9.6 | 19.7 | 21.1 | 11.0 |

**Table C6.** Estimated rates of future SLR in mm/year for 2050 and 2090 based on the average estimated SLR rates for two time periods (2040-2060 and 2080-2100, respectively) for **Atlantic City, NJ**. SLR rates are presented for three emissions scenarios using both *medium-* and *low-confidence* processes. SLR rates are shown in a(b c) format where "a" represents the median value and "b c" represents the 17th-83rd percentile range of a given SLR rate.

| | **2040-2060** | | | | **2080-2100** | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Emissions*** | | | | | | | |
| **Chance rate (mm/yr) exceeds** | **Low** | **Int.** | **High** | **V. High** | **Low** | **Int.** | **High** | **V. High** |
| ***Likely* Range, Excludes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| > 83% chance | 6.3 | 7.5 | 8.1 | 8.4 | 3.4 | 5.6 | 8.2 | 9.9 |
| ~50 % chance | 8.2 | 9.3 | 9.8 | 10.9 | 6.5 | 9.4 | 12.5 | 14.3 |
| <17% chance | 11 | 11.9 | 12.5 | 14.3 | 10.3 | 14.3 | 18.3 | 21.1 |
| **Extended *Likely* Range, Includes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| <17% chance** | 12.5 | 14.9 | 16.4 | 18.7 | 13.4 | 21.5 | 30.1 | 33.9 |

**Table C7.** Estimated rates of future SLR in mm/year for 2050 and 2090 based on the average estimated SLR rates for two time periods (2040-2060 and 2080-2100, respectively) for The Battery, NY. SLR rates are presented for three emissions scenarios using both *medium-* and *low-confidence* processes. SLR rates are shown in a(b c) format where "a" represents the median value and "b c" represents the 17th-83rd percentile range of a given SLR rate.

| | **2040-2060** | | | | **2080-2100** | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Emissions*** | | | | | | | |
| **Chance rate (mm/yr) exceeds** | **Low** | **Int.** | **High** | **V. High** | **Low** | **Int.** | **High** | **V. High** |
| ***Likely* Range, Excludes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| > 83% chance | 5.5 | 6.8 | 7.5 | 7.4 | 2.4 | 5 | 7.2 | 9.1 |
| ~50 % chance | 7.4 | 8.4 | 9 | 10 | 5.5 | 8.6 | 11.6 | 13.4 |
| <17% chance | 10.2 | 11 | 11.6 | 13.4 | 9.4 | 13.3 | 17.5 | 20.4 |
| **Extended *Likely* Range, Includes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| <17% chance** | 11.6 | 13.9 | 15.5 | 17.6 | 12.2 | 20.6 | 29 | 33 |

**Table C8.** Estimated rates of future SLR in mm/year for 2050 and 2090 based on the average estimated SLR rates for two time periods (2040-2060 and 2080-2100, respectively) for **Sandy Hook, NJ**. SLR rates are presented for three emissions scenarios using both *medium-* and *low-confidence* processes. SLR rates are shown in a(b c) format where "a" represents the median value and "b c" represents the 17th-83rd percentile range of a given SLR rate.

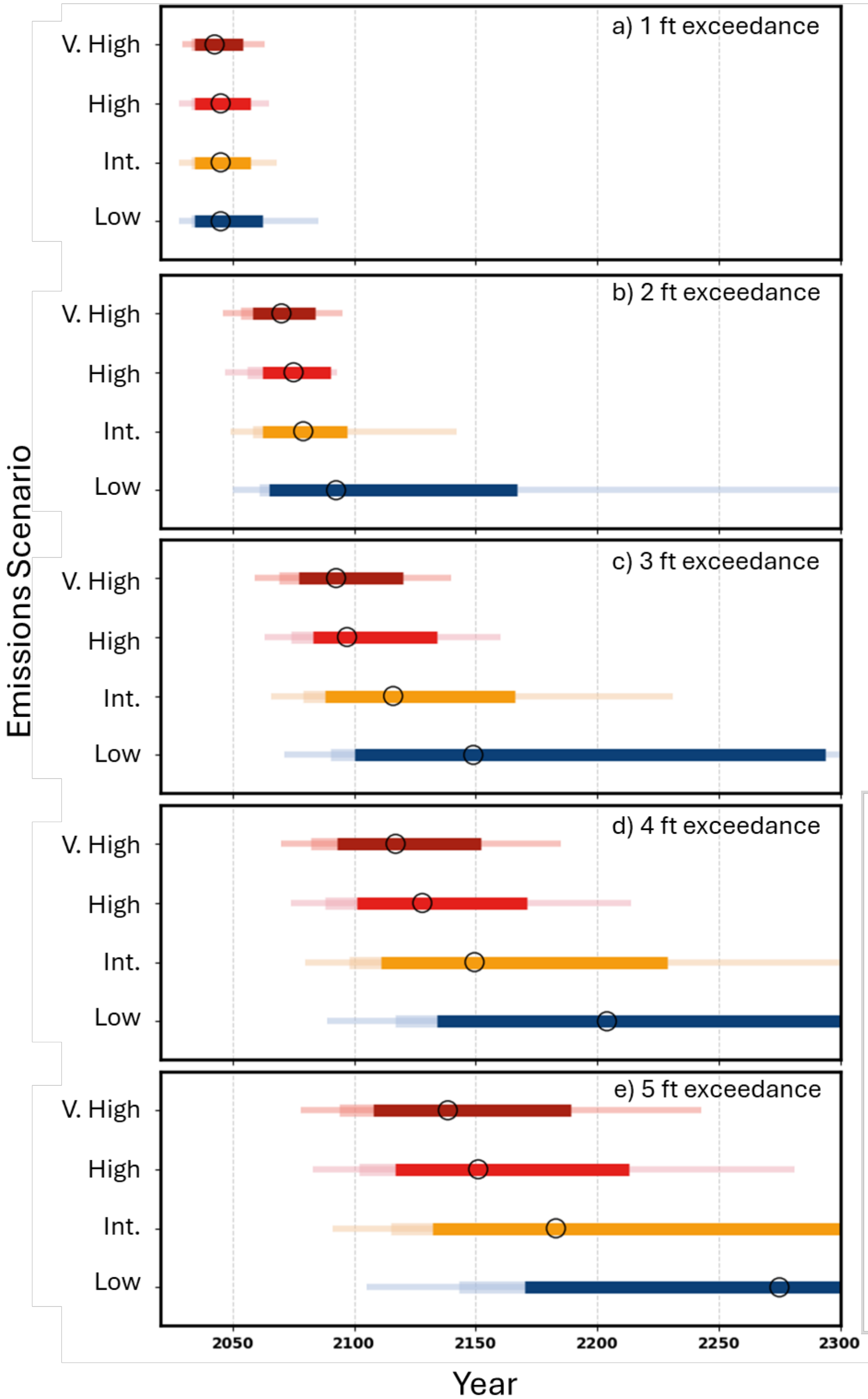
| | **2040-2060** | | | | **2080-2100** | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Emissions*** | | | | | | | |
| **Chance rate (mm/yr) exceeds** | **Low** | **Int.** | **High** | **V. High** | **Low** | **Int.** | **High** | **V. High** |
| ***Likely* Range, Excludes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| > 83% chance | 6.4 | 7.6 | 8.4 | 8.3 | 3.2 | 5.9 | 8 | 9.9 |
| ~50 % chance | 8.3 | 9.3 | 9.9 | 10.8 | 6.4 | 9.5 | 12.5 | 14.3 |
| <17% chance | 11.1 | 11.9 | 12.5 | 14.3 | 10.3 | 14.2 | 18.5 | 21.3 |
| **Extended *Likely* Range, Includes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| <17% chance** | 12.5 | 14.8 | 16.4 | 18.5 | 13.2 | 21.5 | 30.0 | 33.9 |

**Table C9.** Estimated rates of future SLR in mm/year for 2050 and 2090 based on the average estimated SLR rates for two time periods (2040-2060 and 2080-2100, respectively) for **Cape May, NJ**. SLR rates are presented for three emissions scenarios using both *medium-* and *low-confidence* processes. SLR rates are shown in a(b c) format where "a" represents the median value and "b c" represents the 17th-83rd percentile range of a given SLR rate.

| | **2040-2060** | | | | **2080-2100** | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Emissions*** | | | | | | | |
| **Chance rate (mm/yr) exceeds** | **Low** | **Int.** | **High** | **V. High** | **Low** | **Int.** | **High** | **V. High** |
| ***Likely* Range, Excludes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| > 83% chance | 6.1 | 7.1 | 7.9 | 8.1 | 3 | 5.3 | 8 | 9.5 |
| ~50 % chance | 7.9 | 9 | 9.5 | 10.7 | 6.4 | 9.2 | 12.3 | 14 |
| <17% chance | 10.7 | 11.7 | 12.2 | 14.2 | 10.5 | 14.2 | 18.1 | 21 |
| **Extended *Likely* Range, Includes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| <17% chance** | 12.3 | 14.7 | 16.2 | 18.5 | 13.5 | 21.3 | 29.9 | 33.6 |

**Table C10**. Estimated rates of future SLR in mm/year for 2050 and 2090 based on the average estimated SLR rates for two time periods (2040-2060 and 2080-2100, respectively) for Philadelphia, PA. SLR rates are presented for three emissions scenarios using both *medium-* and *low-confidence* processes. SLR rates are shown in a(b c) format where "a" represents the median value and "b c" represents the 17th-83rd percentile range of a given SLR rate.

| | **2040-2060** | | | | **2080-2100** | | | |
|---|---|---|---|---|---|---|---|---|
| | ***Emissions*** | | | | | | | |
| **Chance rate (mm/yr) exceeds** | **Low** | **Int.** | **High** | **V. High** | **Low** | **Int.** | **High** | **V. High** |
| ***Likely* Range, Excludes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| > 83% chance | 5.4 | 6.6 | 7.3 | 7.4 | 2.4 | 4.8 | 7.2 | 8.9 |
| ~50 % chance | 7.3 | 8.3 | 8.8 | 9.9 | 5.6 | 8.5 | 11.5 | 13.3 |
| <17% chance | 10 | 10.9 | 11.4 | 13.3 | 9.3 | 13.3 | 17.4 | 20.2 |
| **Extended *Likely* Range, Includes Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | |
| <17% chance** | 11.5 | 13.8 | 15.4 | 17.6 | 12.3 | 20.4 | 28.9 | 32.7 |



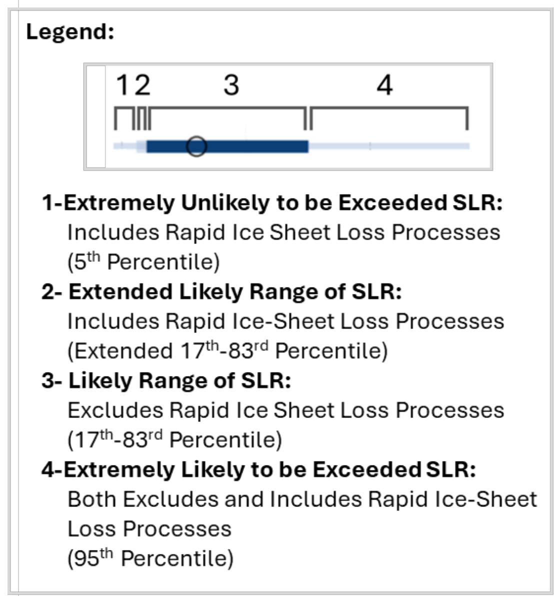




**Figure C3.** Range of probabilities that SLR in **The Battery, NY** will exceed (a) 1 ft, (b) 2 ft, (c) 3 ft, (d) 4 ft, and (e) 5 ft of SLR above a 1995–2014 (2005) baseline under low, intermediate, high, and very high emissions scenarios (in blue, orange, and red respectively). Refer to the legend to interpret how the projections are plotted: in general projections that include potential contributions from rapid ice-sheet loss processes are indicated by light shading, while projections that exclude potential rapid ice-sheet loss processes are indicated by dark shading (the exception being #4 in the legend which excludes or includes potential rapid ice-sheet loss processes). The *likely* and extended *likely* range are represented by thicker lines. Open circles represent the median projections (~50% *likely* SLR will exceed the given height at the corresponding time).

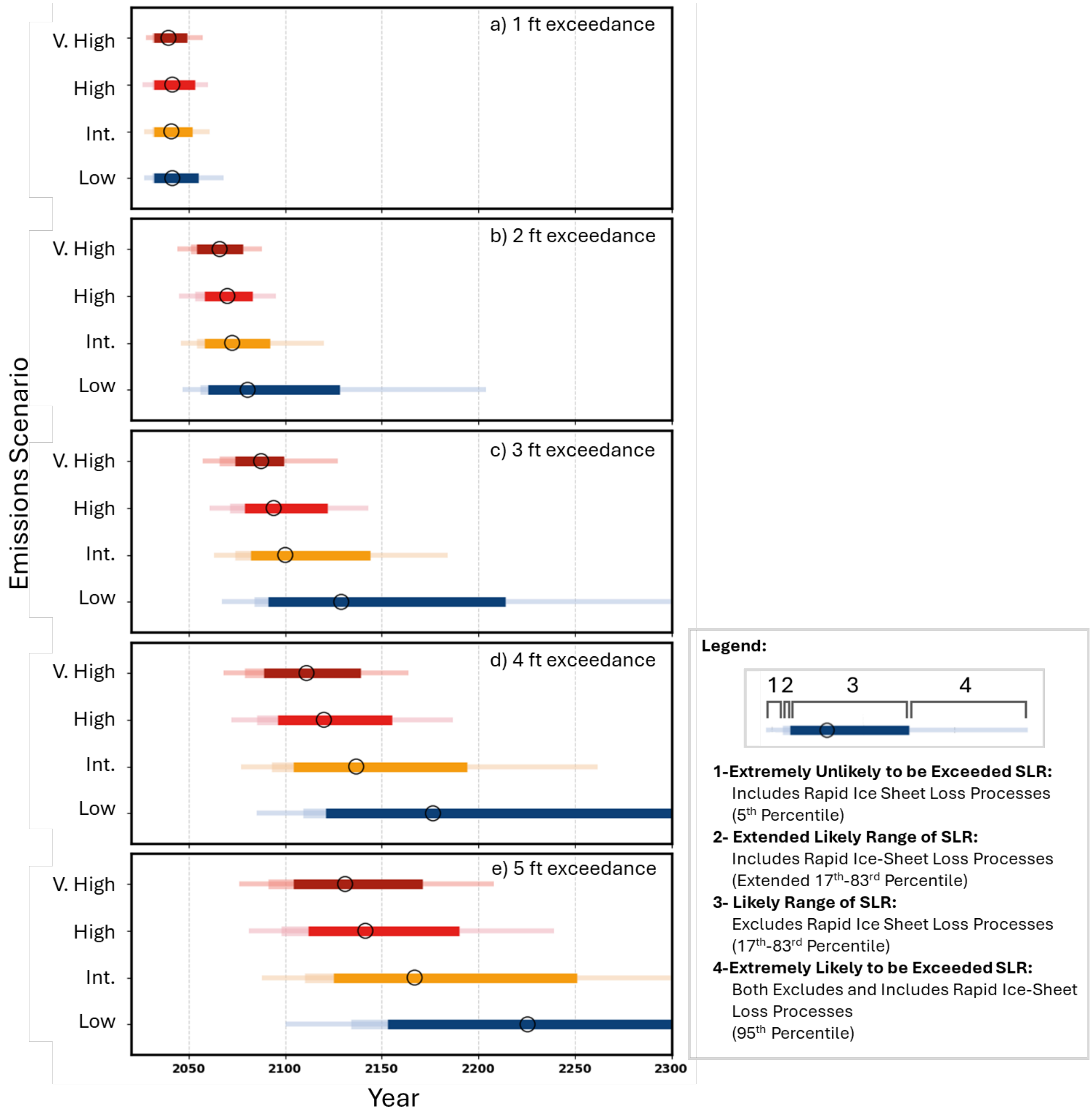



**Figure C4.** Range of probabilities that SLR in **Sandy Hook, NJ** will exceed (a) 1 ft, (b) 2 ft, (c) 3 ft, (d) 4 ft, and (e) 5 ft of SLR above a 1995–2014 (2005) baseline under low, intermediate, high, and very high emissions scenarios (in blue, orange, and red respectively). Refer to the legend to interpret how the projections are plotted: in general projections that include potential contributions from rapid ice-sheet loss processes are indicated by light shading, while projections that exclude potential rapid ice-sheet loss processes are indicated by dark shading (the exception being #4 in the legend which excludes or includes potential rapid ice-sheet loss processes). The *likely* and extended *likely* range are represented by thicker lines. Open circles represent the median projections (~50% *likely* SLR will exceed the given height at the corresponding time).

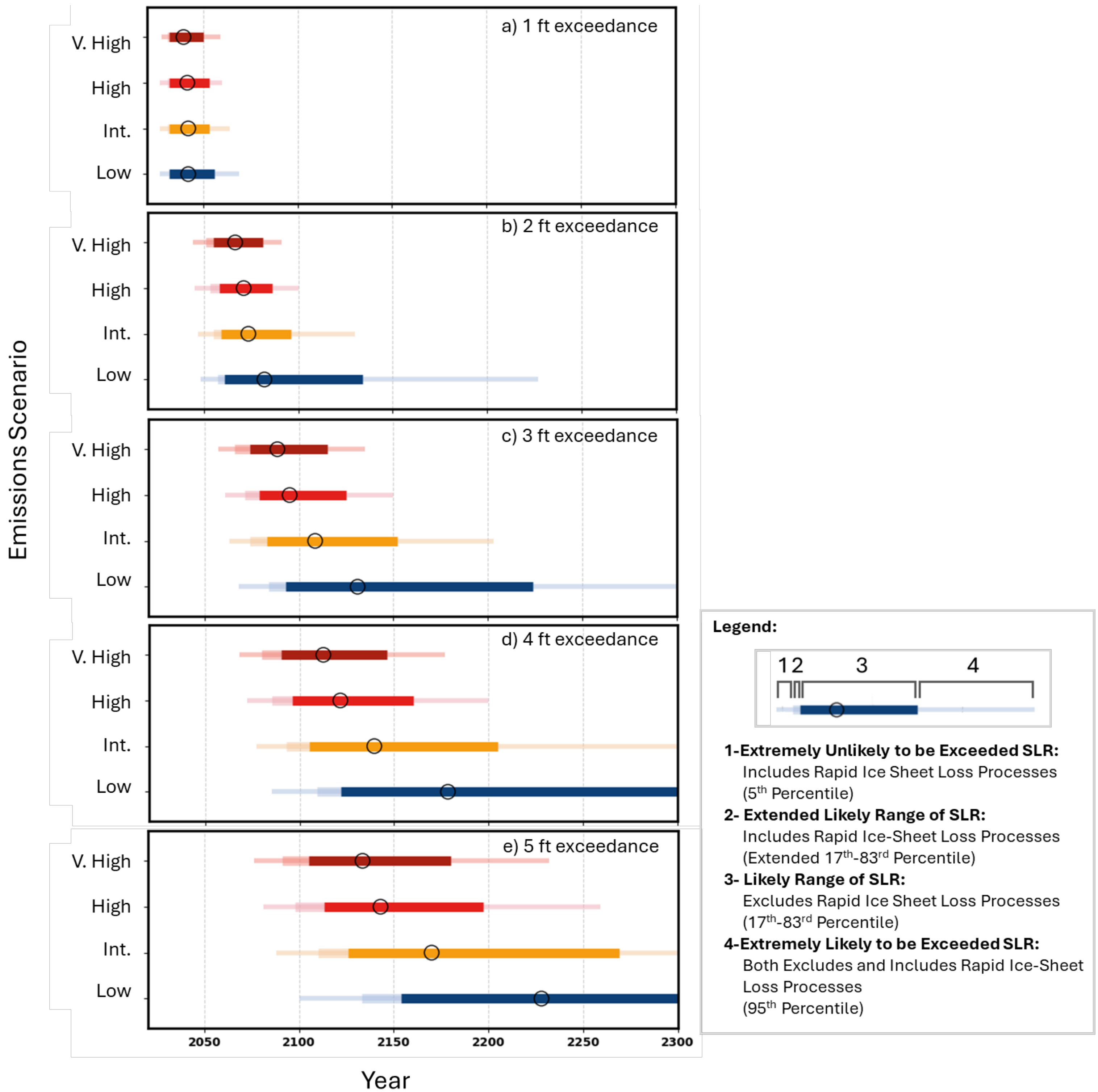



**Figure C5.** Range of probabilities that SLR in **Cape May, NJ** will exceed (a) 1 ft, (b) 2 ft, (c) 3 ft, (d) 4 ft, and (e) 5 ft of SLR above a 1995–2014 (2005) baseline under low, intermediate, high, and very high emissions scenarios (in blue, orange, and red respectively). Refer to the legend to interpret how the projections are plotted: in general projections that include potential contributions from rapid ice-sheet loss processes are indicated by light shading, while projections that exclude potential rapid ice-sheet loss processes are indicated by dark shading (the exception being #4 in the legend which excludes or includes potential rapid ice-sheet loss processes). The *likely* and extended *likely* range are represented by thicker lines. Open circles represent the median projections (~50% *likely* SLR will exceed the given height at the corresponding time).

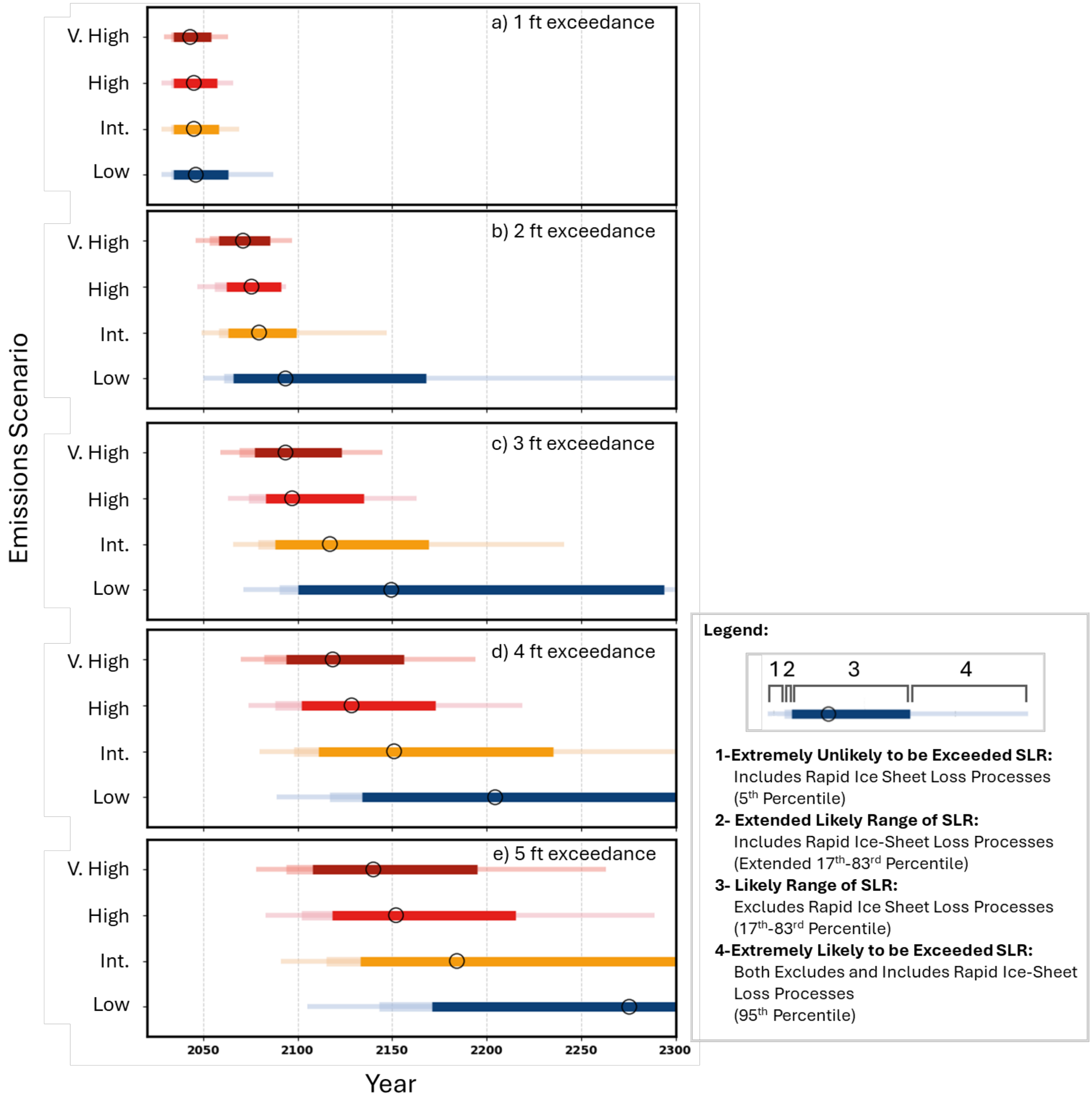



**Figure C6.** Range of probabilities that SLR in **Philadelphia, PA** will exceed (a) 1 ft, (b) 2 ft, (c) 3 ft, (d) 4 ft, and (e) 5 ft of SLR above a 1995–2014 (2005) baseline under low, intermediate, high, and very high emissions scenarios (in blue, orange, and red respectively). Refer to the legend to interpret how the projections are plotted: in general projections that include potential contributions from rapid ice-sheet loss processes are indicated by light shading, while projections that exclude potential rapid ice-sheet loss processes are indicated by dark shading (the exception being #4 in the legend which excludes or includes potential rapid ice-sheet loss processes). The *likely* and extended *likely* range are represented by thicker lines. Open circles represent the median projections (~50% *likely* SLR will exceed the given height at the corresponding time).

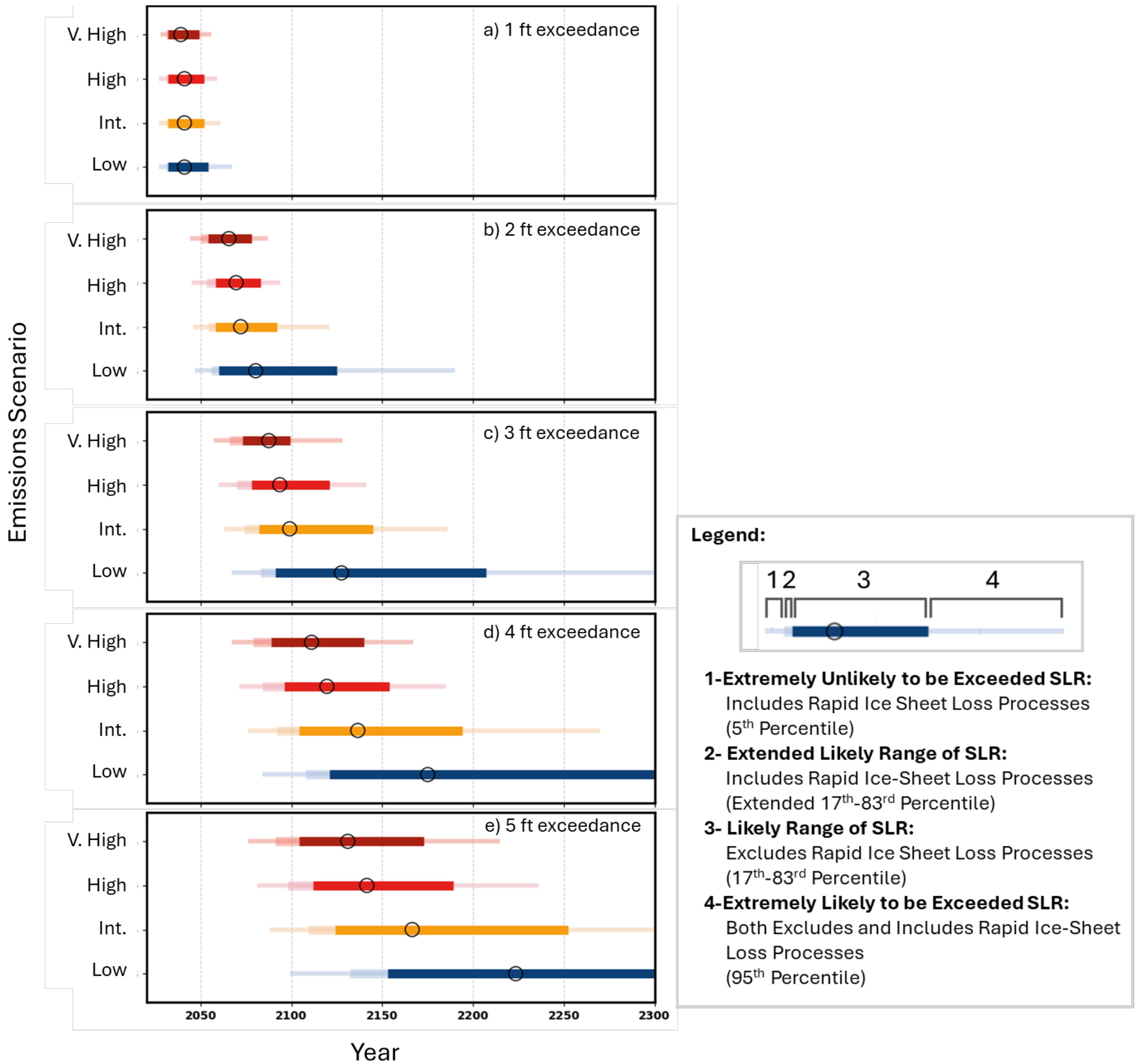



**Figure C7.** Range of probabilities that SLR in **Atlantic City, NJ** will exceed (a) 1 ft, (b) 2 ft, (c) 3 ft, (d) 4 ft, and (e) 5 ft of SLR above a 1995–2014 (2005) baseline under low, intermediate, high, and very high emissions scenarios (in blue, orange, and red respectively). Refer to the legend to interpret how the projections are plotted: in general projections that include potential contributions from rapid ice-sheet loss processes are indicated by light shading, while projections that exclude potential rapid ice-sheet loss processes are indicated by dark shading (the exception being #4 in the legend which excludes or includes potential rapid ice-sheet loss processes). The *likely* and extended *likely* range are represented by thicker lines. Open circles represent the median projections (~50% *likely* SLR will exceed the given height at the corresponding time).

**Table C11.** 2020 projections compared to observation extrapolations from Sweet et al. (2022).

| | Observation Extrapolation for 2020* | AR6/STAP 2025 Projection for 2020 |
|---|---|---|
| **The Battery** | 0.08 (0.06–0.10) m | 0.10 (0.06–0.14) m |
| **Sandy Hook** | 0.10 (0.08–0.13) m | 0.12 (0.08–0.16) m |
| **Atlantic City** | 0.09 (0.06–0.12) m | 0.12 (0.08–0.16) m |
| **Cape May** | 0.11 (0.08–0.15) m | 0.11 (0.08–0.16) m |

**Extrapolations, taken from the online datasets associated with Sweet et al., 2022 (https://sealevel.nasa.gov/task-force-scenario-tool) , are adjusted from a 1991–2009 to 1995–2014 baseline based on local tide gauge observations. Ranges shown are 17th–83rd percentile values for the extrapolation and likely ranges for the projections. Methodology for the AR6 projections is identical to that used by the STAP.*

**Table C12.** A comparison of the 2005 (1995–2014) baseline, which was used in both the 2025 STAP and the IPCC AR6, to other common sea level change baselines is provided for **Sandy Hook, NJ** (in meters and feet). Mean sea level values are referenced.

| Time period | Difference from 2025 STAP and IPCC AR6 Baseline (1995–2014) | |
|---|---|---|
| | Meters | Feet |
| Current NTDE (1983–2001) | -0.066 | -0.22 |
| STAP 2019 baseline (1991–2009) | -0.029 | -0.09 |
| Forthcoming NTDE (2002–2020)* | 0.033 | 0.11 |
| NAVD88 | 0.008 | 0.02 |

*The 2002-2020 NTDE has not yet been published at the time of the STAP 2025 Report's publication. As such, the values here are preliminary.

**Table C13.** A comparison of the 2005 (1995–2014) baseline, which was used in both the 2025 STAP and the IPCC AR6, to other common sea level change baselines is provided for **Cape May, NJ** (in meters and feet). Mean sea level values are referenced.

| Time period | Difference from 2025 STAP and IPCC AR6 Baseline (1995–2014) | |
|---|---|---|
| | Meters | Feet |
| Current NTDE (1983–2001) | -0.070 | -0.23 |
| STAP 2019 baseline (1991–2009) | -0.029 | -0.09 |
| Forthcoming NTDE (2002–2020)* | 0.033 | 0.11 |
| NAVD88 | 0.066 | 0.22 |

*The 2002-2020 NTDE has not yet been published at the time of the STAP 2025 Report's publication. As such, the values here are preliminary.

**Table C14**. A comparison of the 2005 (1995–2014) baseline, which was used in both the 2025 STAP and the IPCC AR6, to other common sea level change baselines is provided for **The Battery, NY** (in meters and feet). Mean sea level values are referenced.

| Time period | Difference from 2025 STAP and IPCC AR6 Baseline (1995–2014) | |
|---|---|---|
| | Meters | Feet |
| Current NTDE (1983–2001) | -0.052 | -0.17 |
| STAP 2019 baseline (1991–2009) | -0.024 | -0.08 |
| Forthcoming NTDE (2002–2020)* | 0.022 | 0.07 |
| NAVD88 | 0.011 | 0.04 |

*The 2002-2020 NTDE has not yet been published at the time of the STAP 2025 Report's publication. As such, the values here are preliminary.

**Table C15.** A comparison of the 2005 (1995–2014) baseline, which was used in both the 2025 STAP and the IPCC AR6, to other common sea level change baselines is provided for **Philadelphia, PA** (in meters and feet). Mean sea level values are referenced.

| Time period | Difference from 2025 STAP and IPCC AR6 Baseline (1995–2014) | |
|---|---|---|
| | Meters | Feet |
| Current NTDE (1983–2001) | -0.063 | -0.21 |
| STAP 2019 baseline (1991–2009) | -0.023 | -0.08 |
| Forthcoming NTDE (2002–2020)* | 0.035 | 0.12 |
| NAVD88 | -0.164 | -0.54 |

*The 2002-2020 NTDE has not yet been published at the time of the STAP 2025 Report's publication. As such, the values here are preliminary.

# Appendix D: Comparison of STAP 2019 and STAP 2025 Projection Methods

**Table F1.** Comparison of STAP 2019 and STAP 2025 Projection Methods by Framework and Physical Processes.

| | **STAP 2019 Projection Method** | **STAP 2025 Projection Method (based on IPCC AR6)** |
|---|---|---|
| **Climate models** | CMIP5 ensemble (Taylor et al., 2012) | CMIP6 ensemble (Eyring et al., 2016) |
| **Scenarios** | Representative Concentration Pathways (RCP) (Van Vuuren et al., 2011), with filters based on 2°C and 5°C warming levels (Rasmussen et al., 2018); 3.5°C intermediate scenario interpolated between 2°C and 5°C scenarios | Shared Socio-Economic Pathway scenarios (SSP) (O'Neill et al., 2016) |
| **Uncertainty Framing** | Probability bounds on projections; all approaches agree there is *at least* a 2-in-3 chance the correct value falls within the stated *likely* range<br><br>*Medium confidence* and *low confidence* processes combined in a single *likely* range | Probability bounds on projections; *likely* range includes only *medium* and *high confidence* processes, and does not include potential contributions from unknown-likelihood, high-impact ice-sheet instability processes characterized by *low confidence*<br><br>High-end projections include *low confidence* processes |
| **Thermal expansion** | As Kopp et al. (2014): Distribution fitted to an ensemble of CMIP5 climate models | Climate model emulator calibrated to the IPCC assessment of climate sensitivity |
| **Ocean dynamics** | As Kopp et al. (2014): Distribution fitted to an ensemble of CMIP5 climate models, accounting for the underlying correlation between global mean thermosteric sea level rise and ocean dynamic sea level change | Updated from Kopp et al. (2014): Distribution fitted to an ensemble of CMIP6 climate models, accounting for the underlying correlation between global mean thermosteric sea level rise and ocean dynamic sea level change |
| **Glaciers** | As Kopp et al. (2014): Distribution based on a single glacier model (Marzeion et al., 2012) | Emulated GlacierMIP2 glacier model ensemble output (Edwards et al., 2021; Marzeion et al., 2020) |

| | | |
|---|---|---|
| **Antarctic ice sheet** | *Medium confidence* processes: As Kopp et al. (2014): Based upon IPCC AR5 assessment, which include temperature-driven surface mass balance derived from an emulator of a high-resolution model and ice-sheet dynamics based on a multi-model assessment, and upon information about distributional tails from structured expert judgment (Bamber and Aspinall 2013) | *Medium confidence* processes: Temperature-driven emulators fit to two different ensembles of ice-sheet models – ISMIP6 ( Nowicki et al., 2016; Edwards et al., 2021) and LARMIP (Levermann et al., 2020) |
| | *Low confidence* processes: Structured expert judgment (Bamber et al., 2019) | *Low confidence* processes: Structured expert judgment (Bamber et al., 2019) and ice-sheet model simulations incorporating Marine Ice Cliff Instability (DeConto et al., 2021); modified from AR6 with FACTS 1.1 probabilistic interpolation, based on integrated 21st century (Reedy and Kopp 2023) |
| **Greenland ice sheet** | *Medium confidence* processes: As Kopp et al. (2014): Based upon IPCC AR5 assessment, which include temperature-driven surface mass balance derived from an emulator of a high-resolution model and ice-sheet dynamics based on a multi-model assessment, and upon information about distributional tails from structured expert judgment (Bamber and Aspinall 2013) | *Medium confidence* processes: Temperature-driven emulators fit to an ensemble of ice-sheet models – ISMIP6 ( Nowicki et al., 2016; Edwards et al., 2021) |
| | *Low confidence* processes: Structured expert judgment (Bamber et al., 2019) | *Low confidence* processes: Structured expert judgment (Bamber et al., 2019); modified from AR6 with FACTS 1.1 probabilistic interpolation, based on 21st century integrated temperature (Reedy and Kopp, 2023) |

| | | |
|---|---|---|
| **Land water storage** | As Kopp et al. (2014): Derived statistical relationships for population and groundwater depletion (Konikow, 2011; Wada et al., 2012), and population and dam impoundment (Chao et al., 2008), driven by UN probabilistic population projections | Updated from Kopp et al. (2014): Derived statistical relationships for population and groundwater depletion (Konikow 2011; Wada et al., 2012, 2016), and population and dam impoundment (Chao et al., 2008; Hawley et al., 2020), driven by scenario-dependent SSP population changes |
| **Gravitational, rotational, and deformational effect** | Sea level fingerprints (Mitrovica et al., 2011) for glacier changes (fingerprints for 19 regions, based on Randolph Glacier Inventory) and ice sheet changes (fingerprints for Greenland, East Antarctica, West Antarctica). | Sea level fingerprints (Slangen et al., 2012, 2014) for glacier changes (fingerprints for 19 regions, based on Randolph Glacier Inventory), ice sheet changes (fingerprints for Greenland, East Antarctica, West Antarctica) and land-water storage changes (fingerprint based on 2100 regional distribution from (Wada et al., 2012)). |
| **Land subsidence** | As Kopp et al. (2014): Spatiotemporal statistical model of tide-gauge data | Kopp et al. (2014) spatiotemporal statistical model with updated tide-gauge data |

## Appendix E: Future High Coastal Water Levels - Projections and Frequencies

**Table E1.** Expected high tide flooding days in Atlantic City, NJ through 2150 under the low emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Low Emissions Scenario for Atlantic City | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 4 | 6 | 8 | 14 | 22 | 33 | 43 | 54 | 55 | 56 | 62 | 74 | 81 | 90 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 6 | 9 | 15 | 26 | 45 | 69 | 91 | 110 | 132 | 134 | 157 | 178 | 199 | 220 |
| | ~50% Chance SLR Exceeds | 8 | 16 | 34 | 67 | 107 | 155 | 202 | 240 | 273 | 298 | 319 | 333 | 343 | 350 |
| | <17% Chance SLR Exceeds‡ | 13 | 34 | 81 | 148 | 216 | 271 | 310 | 334 | 349 | 356 | 360 | 362 | 364 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 13 | 36 | 92 | 170 | 243 | 299 | 330 | 349 | 357 | 361 | 363 | 364 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 18 | 60 | 146 | 249 | 316 | 347 | 359 | 363 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 6 | 7 | 7 | 8 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 1 | 2 | 4 | 6 | 8 | 11 | 14 | 15 | 19 | 25 | 32 | 43 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 10 | 19 | 34 | 55 | 83 | 115 | 157 | 199 | 237 | 270 |
| | <17% Chance SLR Exceeds‡ | 1 | 3 | 7 | 17 | 40 | 81 | 136 | 202 | 263 | 308 | 333 | 347 | 355 | 359 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 3 | 9 | 23 | 58 | 116 | 191 | 266 | 314 | 341 | 354 | 360 | 363 | 364 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 5 | 17 | 62 | 150 | 255 | 324 | 353 | 362 | 364 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 5 | 8 | 12 | 20 | 32 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 1 | 3 | 6 | 12 | 29 | 65 | 118 | 182 | 242 | 292 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 2 | 5 | 11 | 30 | 75 | 149 | 233 | 297 | 332 | 352 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 2 | 7 | 25 | 94 | 222 | 322 | 353 | 361 | 364 | 365 | 365 |

**Table E2.** Expected coastal flooding days in Atlantic City, NJ through 2150 under the intermediate emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Intermediate- Emissions Scenario for Atlantic City** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 5 | 6 | 9 | 15 | 28 | 54 | 84 | 111 | 131 | 136 | 170 | 200 | 227 | 257 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 6 | 9 | 15 | 29 | 57 | 97 | 142 | 184 | 227 | 236 | 270 | 299 | 317 | 331 |
| | ~50% Chance SLR Exceeds | 8 | 16 | 35 | 72 | 125 | 194 | 254 | 298 | 326 | 341 | 353 | 358 | 361 | 363 |
| | <17% Chance SLR Exceeds‡ | 13 | 34 | 80 | 148 | 230 | 297 | 333 | 351 | 359 | 363 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 13 | 36 | 93 | 178 | 269 | 326 | 351 | 360 | 364 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 17 | 61 | 151 | 262 | 330 | 356 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 1 | 3 | 5 | 8 | 11 | 14 | 15 | 23 | 33 | 47 | 69 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 1 | 3 | 5 | 9 | 16 | 27 | 47 | 53 | 81 | 115 | 153 | 194 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 13 | 31 | 66 | 114 | 179 | 231 | 285 | 321 | 341 | 353 |
| | <17% Chance SLR Exceeds‡ | 1 | 3 | 7 | 17 | 49 | 113 | 199 | 275 | 327 | 349 | 359 | 363 | 364 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 3 | 9 | 25 | 80 | 179 | 274 | 333 | 355 | 362 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 5 | 18 | 73 | 191 | 306 | 351 | 363 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 3 | 5 | 7 | 11 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 5 | 10 | 18 | 42 | 87 | 149 | 220 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 2 | 5 | 12 | 35 | 103 | 194 | 284 | 333 | 353 | 361 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 3 | 10 | 35 | 118 | 238 | 321 | 358 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 11 | 63 | 209 | 335 | 360 | 365 | 365 | 365 | 365 | 365 |

**Table E3.** Expected coastal flooding days in Atlantic City, NJ through 2150 under the high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the High-Emissions Scenario for Atlantic City** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 4 | 5 | 8 | 15 | 33 | 68 | 111 | 166 | 210 | 214 | 259 | 297 | 321 | 336 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 6 | 8 | 14 | 28 | 64 | 115 | 179 | 242 | 292 | 300 | 327 | 344 | 353 | 358 |
| | ~50% Chance SLR Exceeds | 8 | 16 | 34 | 72 | 132 | 212 | 281 | 326 | 348 | 356 | 361 | 364 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 13 | 34 | 81 | 151 | 233 | 305 | 343 | 357 | 363 | 364 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 13 | 37 | 96 | 188 | 283 | 338 | 358 | 363 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 19 | 66 | 163 | 278 | 340 | 360 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded,Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 1 | 1 | 3 | 6 | 11 | 22 | 38 | 39 | 71 | 113 | 162 | 211 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 1 | 3 | 6 | 12 | 25 | 57 | 106 | 118 | 181 | 242 | 288 | 319 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 14 | 38 | 92 | 178 | 261 | 305 | 339 | 355 | 361 | 363 |
| | <17% Chance SLR Exceeds‡ | 1 | 3 | 7 | 18 | 50 | 126 | 235 | 316 | 350 | 360 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 3 | 9 | 28 | 94 | 216 | 319 | 355 | 363 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 6 | 21 | 89 | 225 | 335 | 361 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | 5 | 8 | 14 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 5 | 10 | 21 | 44 | 84 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 1 | 4 | 9 | 28 | 61 | 142 | 238 | 309 | 342 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 2 | 6 | 19 | 78 | 199 | 299 | 347 | 361 | 364 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 4 | 15 | 85 | 236 | 331 | 358 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 17 | 124 | 309 | 360 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E4.** Expected coastal flooding days in Atlantic City, NJ through 2150 under the very high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Very High=Emissions Scenario for Atlantic City | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 5 | 7 | 11 | 19 | 39 | 80 | 134 | 207 | 269 | 269 | 307 | 330 | 344 | 353 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 6 | 10 | 18 | 37 | 78 | 139 | 212 | 281 | 323 | 327 | 346 | 355 | 360 | 362 |
| | ~50% Chance SLR Exceeds | 8 | 17 | 40 | 89 | 163 | 245 | 311 | 343 | 357 | 361 | 364 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 12 | 32 | 87 | 176 | 267 | 328 | 353 | 362 | 364 | 365 | 365 | 365 | 365 | 365 |
| | **Extended** ***Likely*** **Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 12 | 36 | 103 | 216 | 309 | 351 | 362 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 16 | 57 | 170 | 293 | 352 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely*** **to be Exceeded,Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 2 | 4 | 7 | 15 | 36 | 80 | 80 | 131 | 188 | 243 | 285 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 2 | 3 | 7 | 16 | 38 | 92 | 170 | 182 | 249 | 301 | 330 | 346 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 4 | 8 | 21 | 59 | 138 | 238 | 310 | 337 | 355 | 361 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 1 | 3 | 8 | 25 | 78 | 182 | 290 | 343 | 359 | 364 | 365 | 365 | 365 | 365 |
| | **Extended** ***Likely*** **Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 3 | 10 | 40 | 134 | 275 | 345 | 361 | 364 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 5 | 23 | 108 | 280 | 352 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 3 | 6 | 11 | 21 | 41 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 4 | 9 | 10 | 23 | 57 | 110 | 173 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 6 | 20 | 68 | 132 | 240 | 314 | 347 | 358 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 3 | 10 | 46 | 156 | 287 | 346 | 361 | 364 | 365 | 365 |
| | **Extended** ***Likely*** **Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 6 | 35 | 168 | 313 | 356 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 4 | 38 | 214 | 352 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E5.** Expected coastal flooding days in The Battery, NY through 2150 under the low emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Low Emissions Scenario for The Battery | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 8 | 12 | 20 | 35 | 55 | 78 | 97 | 117 | 120 | 127 | 141 | 158 | 174 | 190 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 11 | 19 | 34 | 60 | 90 | 123 | 154 | 181 | 206 | 212 | 237 | 259 | 279 | 298 |
| | ~50% Chance SLR Exceeds | 17 | 36 | 68 | 113 | 162 | 213 | 255 | 291 | 316 | 333 | 346 | 353 | 358 | 361 |
| | <17% Chance SLR Exceeds‡ | 27 | 64 | 122 | 193 | 258 | 306 | 335 | 350 | 358 | 362 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 27 | 67 | 133 | 212 | 279 | 325 | 347 | 358 | 362 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 38 | 96 | 185 | 280 | 335 | 356 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 3 | 5 | 8 | 11 | 15 | 16 | 18 | 21 | 27 | 33 | 40 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 10 | 17 | 25 | 36 | 48 | 51 | 67 | 84 | 101 | 124 |
| | ~50% Chance SLR Exceeds | 1 | 3 | 7 | 14 | 28 | 51 | 80 | 115 | 152 | 192 | 234 | 273 | 303 | 326 |
| | <17% Chance SLR Exceeds‡ | 2 | 6 | 16 | 41 | 82 | 136 | 197 | 258 | 307 | 337 | 352 | 359 | 362 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 6 | 19 | 51 | 101 | 171 | 239 | 304 | 338 | 354 | 361 | 364 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 11 | 38 | 102 | 196 | 289 | 341 | 360 | 364 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 4 | 6 | 8 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 7 | 11 | 19 | 34 | 55 | 83 | 117 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 4 | 9 | 21 | 45 | 87 | 146 | 210 | 268 | 312 | 339 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 2 | 6 | 15 | 36 | 84 | 149 | 229 | 296 | 335 | 354 | 361 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 6 | 20 | 68 | 159 | 279 | 344 | 360 | 364 | 365 | 365 | 365 |

**Table E6.** Expected coastal flooding days in The Battery, NY through 2150 under the intermediate emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Intermediate- Emissions Scenario for The Battery** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 8 | 12 | 21 | 41 | 70 | 108 | 148 | 187 | 211 | 222 | 255 | 284 | 308 | 324 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 11 | 19 | 36 | 66 | 108 | 157 | 206 | 250 | 286 | 297 | 322 | 338 | 348 | 355 |
| | ~50% Chance SLR Exceeds | 17 | 35 | 69 | 117 | 179 | 244 | 296 | 329 | 347 | 355 | 361 | 363 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 26 | 63 | 121 | 193 | 268 | 324 | 348 | 359 | 363 | 364 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 27 | 66 | 133 | 217 | 297 | 343 | 358 | 363 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 36 | 95 | 188 | 289 | 344 | 361 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 4 | 7 | 13 | 23 | 38 | 50 | 57 | 80 | 107 | 138 | 170 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 13 | 26 | 47 | 76 | 109 | 123 | 165 | 208 | 247 | 284 |
| | ~50% Chance SLR Exceeds | 2 | 3 | 7 | 15 | 35 | 72 | 121 | 181 | 242 | 288 | 327 | 347 | 357 | 361 |
| | <17% Chance SLR Exceeds‡ | 2 | 6 | 16 | 41 | 91 | 168 | 247 | 311 | 347 | 358 | 363 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 6 | 19 | 54 | 123 | 224 | 307 | 347 | 360 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 11 | 39 | 113 | 227 | 327 | 358 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 3 | 4 | 6 | 9 | 15 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 6 | 8 | 14 | 24 | 39 | 63 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 1 | 1 | 3 | 7 | 17 | 37 | 67 | 119 | 183 | 248 | 303 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 5 | 14 | 39 | 92 | 181 | 267 | 329 | 353 | 361 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 2 | 8 | 29 | 86 | 185 | 290 | 345 | 363 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 7 | 31 | 119 | 263 | 350 | 364 | 365 | 365 | 365 | 365 | 365 |

**Table E7.** Expected coastal flooding days in The Battery, NY through 2150 under the high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the High-Emissions Scenario for The Battery** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 8 | 10 | 18 | 37 | 75 | 124 | 182 | 240 | 273 | 281 | 315 | 337 | 349 | 356 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 11 | 17 | 33 | 62 | 113 | 174 | 239 | 295 | 328 | 334 | 350 | 358 | 361 | 364 |
| | ~50% Chance SLR Exceeds | 17 | 34 | 66 | 116 | 185 | 257 | 315 | 346 | 358 | 362 | 364 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 28 | 65 | 121 | 195 | 271 | 329 | 353 | 362 | 364 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 28 | 68 | 137 | 226 | 309 | 350 | 362 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 39 | 102 | 198 | 301 | 350 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 3 | 7 | 17 | 36 | 69 | 96 | 104 | 150 | 202 | 252 | 291 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 14 | 33 | 68 | 120 | 178 | 195 | 253 | 303 | 332 | 349 |
| | ~50% Chance SLR Exceeds | 1 | 3 | 6 | 15 | 37 | 82 | 150 | 236 | 305 | 335 | 354 | 362 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 2 | 6 | 16 | 42 | 93 | 180 | 274 | 337 | 358 | 364 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 6 | 20 | 59 | 140 | 256 | 338 | 360 | 364 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 4 | 12 | 43 | 128 | 257 | 347 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 11 | 22 | 42 | 70 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 7 | 16 | 20 | 43 | 82 | 132 | 191 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 1 | 2 | 4 | 11 | 34 | 84 | 138 | 229 | 306 | 344 | 358 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 5 | 17 | 56 | 144 | 264 | 334 | 359 | 364 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 10 | 44 | 149 | 284 | 350 | 363 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 8 | 45 | 184 | 335 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E8.** Expected coastal flooding days in The Battery, NY through 2150 under the very high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Very High Emissions Scenario for The Battery** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 9 | 14 | 27 | 47 | 84 | 142 | 204 | 271 | 318 | 321 | 343 | 354 | 359 | 362 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 12 | 21 | 42 | 76 | 129 | 199 | 267 | 320 | 347 | 350 | 359 | 362 | 364 | 365 |
| | ~50% Chance SLR Exceeds | 17 | 36 | 76 | 135 | 212 | 285 | 335 | 355 | 362 | 364 | 365 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 26 | 61 | 126 | 216 | 298 | 344 | 360 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 26 | 65 | 143 | 249 | 328 | 357 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 34 | 90 | 203 | 314 | 357 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 4 | 9 | 22 | 47 | 93 | 156 | 163 | 224 | 278 | 316 | 338 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 4 | 8 | 18 | 44 | 90 | 161 | 239 | 257 | 310 | 340 | 354 | 360 |
| | ~50% Chance SLR Exceeds | 2 | 3 | 8 | 20 | 51 | 108 | 198 | 286 | 337 | 353 | 362 | 364 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 2 | 6 | 17 | 53 | 124 | 226 | 318 | 354 | 363 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 6 | 22 | 75 | 179 | 301 | 354 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 10 | 46 | 148 | 302 | 358 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 12 | 13 | 29 | 59 | 99 | 149 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 13 | 36 | 45 | 90 | 155 | 224 | 280 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 1 | 2 | 6 | 21 | 66 | 145 | 220 | 306 | 347 | 360 | 364 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 8 | 30 | 102 | 227 | 326 | 358 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 4 | 16 | 80 | 227 | 337 | 361 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 11 | 81 | 259 | 358 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E9.** Expected coastal flooding days in Sandy Hook, NJ through 2150 under the low emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Low Emissions Scenario for Sandy Hook | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 9 | 14 | 24 | 41 | 61 | 83 | 101 | 120 | 124 | 130 | 143 | 159 | 174 | 190 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 13 | 23 | 40 | 65 | 95 | 127 | 155 | 181 | 205 | 211 | 236 | 258 | 277 | 296 |
| | ~50% Chance SLR Exceeds | 20 | 41 | 73 | 117 | 163 | 212 | 254 | 289 | 315 | 332 | 345 | 353 | 358 | 361 |
| | <17% Chance SLR Exceeds‡ | 31 | 69 | 125 | 192 | 256 | 305 | 334 | 350 | 358 | 362 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 32 | 72 | 136 | 210 | 277 | 324 | 346 | 358 | 362 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 43 | 101 | 185 | 278 | 334 | 356 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 3 | 5 | 8 | 12 | 17 | 18 | 19 | 23 | 29 | 35 | 42 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 10 | 18 | 28 | 38 | 50 | 53 | 68 | 84 | 100 | 122 |
| | ~50% Chance SLR Exceeds | 2 | 3 | 7 | 16 | 31 | 53 | 80 | 113 | 148 | 185 | 227 | 266 | 298 | 322 |
| | <17% Chance SLR Exceeds‡ | 3 | 6 | 18 | 43 | 82 | 133 | 190 | 250 | 301 | 334 | 350 | 358 | 362 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 3 | 6 | 21 | 53 | 100 | 165 | 231 | 298 | 336 | 353 | 361 | 364 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 12 | 40 | 101 | 189 | 282 | 339 | 359 | 364 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 9 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 3 | 4 | 7 | 14 | 23 | 39 | 61 | 87 | 120 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 4 | 10 | 25 | 51 | 92 | 148 | 209 | 267 | 311 | 338 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 6 | 18 | 41 | 88 | 151 | 227 | 295 | 335 | 354 | 361 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 6 | 24 | 73 | 160 | 278 | 344 | 360 | 364 | 365 | 365 | 365 |

**Table E10.** Expected coastal flooding days in Sandy Hook, NJ through 2150 under the intermediate emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Intermediate- Emissions Scenario for Sandy Hook | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 10 | 14 | 25 | 46 | 75 | 112 | 150 | 186 | 210 | 221 | 254 | 283 | 306 | 323 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 14 | 23 | 41 | 71 | 112 | 158 | 205 | 248 | 285 | 295 | 321 | 338 | 348 | 355 |
| | ~50% Chance SLR Exceeds | 21 | 41 | 74 | 121 | 179 | 243 | 294 | 328 | 347 | 356 | 361 | 364 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 31 | 69 | 124 | 192 | 266 | 322 | 348 | 359 | 364 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 31 | 71 | 136 | 216 | 296 | 342 | 358 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 41 | 100 | 188 | 288 | 343 | 361 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 4 | 7 | 14 | 26 | 41 | 52 | 58 | 80 | 106 | 135 | 164 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 14 | 29 | 50 | 76 | 108 | 120 | 159 | 200 | 239 | 277 |
| | ~50% Chance SLR Exceeds | 2 | 3 | 7 | 17 | 37 | 72 | 119 | 174 | 234 | 282 | 323 | 345 | 356 | 361 |
| | <17% Chance SLR Exceeds‡ | 3 | 6 | 18 | 43 | 91 | 162 | 239 | 306 | 345 | 358 | 363 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 3 | 6 | 21 | 56 | 121 | 216 | 301 | 346 | 360 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 11 | 41 | 111 | 220 | 323 | 358 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 4 | 7 | 11 | 17 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 7 | 8 | 16 | 28 | 45 | 69 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 1 | 2 | 4 | 8 | 20 | 42 | 72 | 122 | 183 | 246 | 301 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 5 | 17 | 45 | 96 | 181 | 265 | 328 | 353 | 362 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 8 | 34 | 91 | 184 | 289 | 344 | 364 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 7 | 36 | 123 | 261 | 350 | 364 | 365 | 365 | 365 | 365 | 365 |

**Table E11.** Expected coastal flooding days in Sandy Hook, NJ through 2150 under the high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the High-Emissions Scenario for Sandy Hook | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 8 | 12 | 22 | 42 | 80 | 127 | 182 | 239 | 272 | 280 | 314 | 336 | 349 | 356 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 12 | 21 | 38 | 67 | 117 | 174 | 238 | 294 | 327 | 334 | 349 | 358 | 362 | 364 |
| | ~50% Chance SLR Exceeds | 20 | 39 | 71 | 120 | 184 | 256 | 314 | 345 | 358 | 362 | 364 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 32 | 70 | 124 | 194 | 269 | 328 | 353 | 362 | 365 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 32 | 73 | 139 | 224 | 307 | 350 | 362 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 44 | 106 | 197 | 299 | 350 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 2 | 3 | 8 | 18 | 39 | 69 | 95 | 103 | 146 | 195 | 245 | 285 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 16 | 35 | 69 | 118 | 172 | 188 | 246 | 297 | 329 | 347 |
| | ~50% Chance SLR Exceeds | 2 | 3 | 6 | 16 | 40 | 82 | 146 | 228 | 299 | 332 | 354 | 362 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 3 | 6 | 18 | 44 | 93 | 174 | 268 | 334 | 358 | 364 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 3 | 6 | 22 | 61 | 136 | 249 | 336 | 360 | 364 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 4 | 13 | 46 | 125 | 249 | 345 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 5 | 6 | 13 | 26 | 48 | 75 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 8 | 19 | 24 | 48 | 87 | 134 | 190 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 2 | 4 | 13 | 39 | 89 | 141 | 228 | 304 | 344 | 358 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 5 | 20 | 62 | 146 | 263 | 334 | 359 | 364 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 11 | 50 | 151 | 282 | 349 | 363 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 9 | 50 | 184 | 334 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E12.** Expected coastal flooding days in Sandy Hook, NJ through 2150 under the very high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Very High Emissions Scenario for Sandy Hook** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 10 | 17 | 32 | 53 | 89 | 144 | 204 | 269 | 317 | 320 | 342 | 354 | 359 | 362 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 14 | 25 | 48 | 80 | 132 | 198 | 266 | 319 | 346 | 350 | 359 | 363 | 364 | 365 |
| | ~50% Chance SLR Exceeds | 21 | 42 | 81 | 138 | 210 | 284 | 334 | 355 | 362 | 364 | 365 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 30 | 67 | 129 | 215 | 296 | 343 | 360 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 31 | 70 | 145 | 247 | 327 | 358 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 39 | 95 | 202 | 312 | 358 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 3 | 4 | 9 | 24 | 49 | 93 | 151 | 158 | 216 | 271 | 311 | 336 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 4 | 8 | 20 | 46 | 90 | 156 | 232 | 249 | 304 | 338 | 353 | 359 |
| | ~50% Chance SLR Exceeds | 2 | 3 | 8 | 22 | 53 | 107 | 191 | 280 | 334 | 352 | 362 | 364 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 2 | 6 | 19 | 55 | 122 | 219 | 313 | 353 | 363 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 6 | 24 | 76 | 173 | 295 | 353 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 10 | 48 | 144 | 296 | 357 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 14 | 16 | 34 | 64 | 103 | 151 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 15 | 41 | 50 | 95 | 157 | 222 | 279 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 1 | 3 | 7 | 25 | 71 | 147 | 219 | 304 | 347 | 360 | 364 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 3 | 9 | 35 | 106 | 226 | 325 | 358 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 4 | 20 | 85 | 226 | 336 | 362 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 13 | 85 | 258 | 358 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E13.** Expected coastal flooding days in Cape May, NJ through 2150 under the low emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Low Emissions Scenario for Cape May | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 6 | 9 | 16 | 28 | 46 | 68 | 85 | 102 | 105 | 111 | 124 | 139 | 156 | 169 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 8 | 15 | 28 | 50 | 80 | 113 | 143 | 169 | 195 | 201 | 226 | 249 | 269 | 287 |
| | ~50% Chance SLR Exceeds | 13 | 30 | 59 | 103 | 151 | 204 | 250 | 283 | 313 | 332 | 345 | 353 | 358 | 361 |
| | <17% Chance SLR Exceeds‡ | 21 | 55 | 113 | 186 | 251 | 302 | 334 | 350 | 359 | 362 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 21 | 57 | 125 | 206 | 275 | 324 | 348 | 359 | 363 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 29 | 85 | 179 | 277 | 334 | 356 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 2 | 3 | 5 | 8 | 11 | 11 | 12 | 15 | 19 | 24 | 28 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 2 | 4 | 7 | 13 | 20 | 28 | 39 | 42 | 56 | 72 | 90 | 109 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 4 | 11 | 22 | 44 | 73 | 105 | 147 | 186 | 233 | 272 | 304 | 327 |
| | <17% Chance SLR Exceeds‡ | 1 | 4 | 13 | 35 | 74 | 129 | 193 | 255 | 309 | 340 | 354 | 360 | 363 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 4 | 15 | 45 | 96 | 169 | 244 | 307 | 342 | 357 | 362 | 364 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 8 | 32 | 98 | 193 | 289 | 344 | 361 | 364 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 4 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 8 | 14 | 27 | 47 | 74 | 110 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 2 | 6 | 16 | 37 | 80 | 144 | 213 | 272 | 316 | 342 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 3 | 11 | 32 | 78 | 153 | 236 | 303 | 342 | 357 | 362 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 4 | 16 | 60 | 161 | 284 | 348 | 362 | 364 | 365 | 365 | 365 |

**Table E14.** Expected coastal flooding days in Cape May, NJ through 2150 under the intermediate emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Intermediate- Emissions Scenario for Cape May | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 6 | 9 | 16 | 32 | 54 | 90 | 131 | 161 | 184 | 195 | 225 | 255 | 282 | 301 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 8 | 15 | 29 | 55 | 94 | 145 | 194 | 235 | 272 | 284 | 312 | 331 | 344 | 352 |
| | ~50% Chance SLR Exceeds | 13 | 30 | 59 | 108 | 170 | 238 | 292 | 327 | 347 | 355 | 361 | 363 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 21 | 55 | 112 | 188 | 265 | 323 | 349 | 359 | 363 | 364 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 21 | 58 | 126 | 214 | 298 | 345 | 359 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 29 | 87 | 182 | 288 | 346 | 361 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 2 | 4 | 9 | 17 | 25 | 35 | 39 | 55 | 77 | 104 | 128 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 2 | 4 | 9 | 20 | 39 | 62 | 93 | 106 | 145 | 185 | 227 | 263 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 5 | 12 | 29 | 64 | 116 | 176 | 239 | 285 | 325 | 347 | 357 | 362 |
| | <17% Chance SLR Exceeds‡ | 1 | 4 | 13 | 36 | 85 | 165 | 251 | 313 | 349 | 360 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 4 | 16 | 49 | 124 | 230 | 311 | 351 | 362 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 8 | 34 | 111 | 235 | 331 | 360 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 3 | 4 | 6 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 4 | 8 | 14 | 25 | 41 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 12 | 29 | 56 | 106 | 171 | 239 | 296 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 3 | 10 | 35 | 86 | 180 | 270 | 331 | 355 | 362 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 1 | 6 | 26 | 83 | 192 | 301 | 349 | 363 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 4 | 28 | 118 | 270 | 353 | 364 | 365 | 365 | 365 | 365 | 365 |

**Table E15.** Expected coastal flooding days in Cape May, NJ through 2150 under the high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the High-Emissions Scenario for Cape May | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 6 | 8 | 15 | 31 | 65 | 111 | 155 | 208 | 258 | 262 | 299 | 326 | 343 | 353 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 8 | 14 | 28 | 55 | 104 | 165 | 223 | 280 | 323 | 330 | 348 | 357 | 361 | 363 |
| | ~50% Chance SLR Exceeds | 13 | 29 | 59 | 110 | 178 | 252 | 314 | 346 | 358 | 362 | 364 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 21 | 55 | 114 | 192 | 267 | 328 | 355 | 363 | 365 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 22 | 58 | 131 | 226 | 309 | 351 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 30 | 91 | 197 | 303 | 352 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 2 | 5 | 12 | 24 | 46 | 80 | 83 | 125 | 174 | 222 | 270 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 2 | 4 | 11 | 27 | 54 | 101 | 166 | 183 | 243 | 295 | 329 | 346 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 5 | 12 | 32 | 75 | 149 | 236 | 304 | 336 | 355 | 362 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 1 | 4 | 13 | 38 | 88 | 178 | 282 | 342 | 360 | 364 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 4 | 17 | 56 | 141 | 262 | 343 | 361 | 364 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 9 | 40 | 132 | 263 | 350 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 3 | 6 | 12 | 23 | 45 |
| | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 11 | 14 | 31 | 65 | 114 | 169 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 8 | 28 | 75 | 130 | 224 | 304 | 345 | 359 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 3 | 13 | 54 | 151 | 270 | 339 | 360 | 364 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 0 | 2 | 7 | 40 | 155 | 295 | 352 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 6 | 41 | 189 | 340 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E16.** Expected coastal flooding days in Cape May, NJ through 2150 under the very high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Very High Emissions Scenario for Cape May** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 7 | 11 | 20 | 38 | 69 | 117 | 178 | 248 | 301 | 304 | 333 | 349 | 356 | 360 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 9 | 17 | 35 | 66 | 118 | 185 | 252 | 310 | 344 | 346 | 357 | 362 | 364 | 364 |
| | ~50% Chance SLR Exceeds | 13 | 31 | 68 | 128 | 207 | 282 | 334 | 355 | 362 | 364 | 365 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 20 | 54 | 123 | 214 | 298 | 345 | 360 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 20 | 59 | 141 | 250 | 332 | 359 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 26 | 84 | 204 | 316 | 359 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 1 | 1 | 3 | 6 | 14 | 32 | 71 | 128 | 133 | 191 | 247 | 291 | 322 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 1 | 2 | 5 | 14 | 35 | 74 | 143 | 226 | 237 | 295 | 332 | 350 | 358 |
| | ~50% Chance SLR Exceeds | 1 | 2 | 5 | 16 | 45 | 104 | 193 | 283 | 336 | 353 | 362 | 364 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 1 | 4 | 15 | 49 | 124 | 232 | 322 | 355 | 363 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 1 | 4 | 19 | 73 | 186 | 311 | 356 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 2 | 8 | 44 | 153 | 312 | 360 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 6 | 6 | 15 | 33 | 61 | 99 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 7 | 25 | 29 | 65 | 121 | 186 | 249 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 4 | 16 | 54 | 133 | 208 | 299 | 345 | 359 | 364 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 1 | 6 | 27 | 99 | 223 | 327 | 359 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 2 | 14 | 83 | 232 | 341 | 363 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 9 | 84 | 267 | 360 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E17.** Expected coastal flooding days in Philadelphia, PA through 2150 under the low emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | **Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Low Emissions Scenario for Philadelphia** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 9 | 14 | 23 | 38 | 59 | 83 | 104 | 122 | 130 | 136 | 152 | 171 | 187 | 206 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 12 | 22 | 37 | 63 | 94 | 127 | 157 | 185 | 213 | 220 | 246 | 265 | 287 | 304 |
| | ~50% Chance SLR Exceeds | 18 | 38 | 71 | 115 | 163 | 214 | 257 | 290 | 317 | 334 | 346 | 354 | 358 | 361 |
| | <17% Chance SLR Exceeds‡ | 27 | 64 | 123 | 193 | 257 | 304 | 334 | 350 | 358 | 362 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 27 | 67 | 133 | 213 | 280 | 325 | 347 | 358 | 363 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 36 | 93 | 185 | 279 | 334 | 356 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 4 | 6 | 10 | 14 | 18 | 21 | 22 | 28 | 35 | 42 | 52 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 3 | 6 | 12 | 20 | 30 | 41 | 56 | 60 | 78 | 95 | 118 | 140 |
| | ~50% Chance SLR Exceeds | 1 | 4 | 7 | 16 | 32 | 56 | 87 | 121 | 161 | 201 | 244 | 281 | 310 | 330 |
| | <17% Chance SLR Exceeds‡ | 2 | 7 | 18 | 45 | 87 | 140 | 202 | 261 | 311 | 339 | 353 | 359 | 363 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 7 | 22 | 56 | 110 | 180 | 250 | 310 | 342 | 356 | 362 | 364 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 11 | 41 | 108 | 202 | 293 | 343 | 360 | 364 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 5 | 7 | 9 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 7 | 12 | 21 | 36 | 59 | 87 | 121 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 2 | 4 | 9 | 21 | 45 | 89 | 147 | 211 | 268 | 312 | 338 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 2 | 6 | 16 | 39 | 87 | 156 | 236 | 303 | 340 | 355 | 362 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 6 | 21 | 69 | 163 | 280 | 346 | 361 | 364 | 365 | 365 | 365 |

**Table E18.** Expected coastal flooding days in Philadelphia, PA through 2150 under the intermediate emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of High Tide Flooding (Minor, Moderate, and Major) under Intermediate-Emissions Scenario for Philadelphia | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | **2020** | **2030** | **2040** | **2050** | **2060** | **2070** | **2080** | **2090** | **2100** | **2110** | **2120** | **2130** | **2140** | **2150** |
| **Minor Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 10 | 14 | 24 | 44 | 71 | 111 | 152 | 186 | 211 | 221 | 252 | 279 | 302 | 322 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 13 | 21 | 39 | 68 | 110 | 159 | 209 | 249 | 285 | 297 | 321 | 338 | 348 | 354 |
| | ~50% Chance SLR Exceeds | 19 | 38 | 71 | 119 | 180 | 246 | 297 | 329 | 347 | 356 | 361 | 363 | 364 | 365 |
| | <17% Chance SLR Exceeds‡ | 27 | 64 | 121 | 194 | 268 | 324 | 349 | 359 | 363 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 27 | 68 | 134 | 219 | 300 | 344 | 359 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 35 | 95 | 188 | 289 | 345 | 361 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Moderate Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 4 | 7 | 15 | 28 | 42 | 55 | 61 | 84 | 109 | 138 | 172 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 4 | 7 | 15 | 31 | 54 | 81 | 116 | 130 | 170 | 213 | 250 | 284 |
| | ~50% Chance SLR Exceeds | 2 | 4 | 7 | 18 | 39 | 78 | 130 | 189 | 250 | 293 | 329 | 348 | 358 | 362 |
| | <17% Chance SLR Exceeds‡ | 2 | 7 | 18 | 46 | 98 | 176 | 255 | 316 | 348 | 359 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 7 | 22 | 59 | 134 | 236 | 313 | 350 | 362 | 364 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 12 | 43 | 120 | 239 | 331 | 359 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| **Major Flooding** | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 4 | 6 | 9 | 14 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 6 | 8 | 14 | 24 | 39 | 61 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 3 | 8 | 18 | 39 | 69 | 120 | 186 | 250 | 304 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 2 | 5 | 15 | 42 | 96 | 185 | 269 | 330 | 354 | 362 | 364 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 2 | 8 | 33 | 92 | 194 | 298 | 347 | 363 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 1 | 7 | 34 | 124 | 267 | 352 | 364 | 365 | 365 | 365 | 365 | 365 |

**Table E19.** Expected coastal flooding days in Philadelphia, PA through 2150 under the high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the High-Emissions Scenario for Philadelphia | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Minor Flooding | > 95% Chance SLR Exceeds* | 9 | 13 | 23 | 42 | 80 | 130 | 183 | 237 | 278 | 286 | 318 | 338 | 350 | 357 |
| Minor Flooding | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Minor Flooding | > 83% Chance SLR Exceeds | 12 | 20 | 38 | 68 | 118 | 180 | 240 | 294 | 330 | 336 | 351 | 358 | 362 | 364 |
| Minor Flooding | ~50% Chance SLR Exceeds | 18 | 37 | 71 | 121 | 187 | 259 | 317 | 346 | 358 | 362 | 364 | 365 | 365 | 365 |
| Minor Flooding | <17% Chance SLR Exceeds‡ | 28 | 64 | 121 | 197 | 270 | 328 | 354 | 362 | 365 | 365 | 365 | 365 | 365 | 365 |
| Minor Flooding | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Minor Flooding | <17% Chance SLR Exceeds* | 28 | 68 | 137 | 229 | 310 | 351 | 363 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Minor Flooding | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Minor Flooding | < 5% Chance SLR Exceeds* | 37 | 97 | 198 | 303 | 351 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Moderate Flooding | > 95% Chance SLR Exceeds* | 1 | 1 | 2 | 4 | 9 | 21 | 41 | 72 | 108 | 116 | 163 | 215 | 263 | 301 |
| Moderate Flooding | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Moderate Flooding | > 83% Chance SLR Exceeds | 1 | 2 | 4 | 7 | 17 | 39 | 74 | 126 | 190 | 208 | 265 | 310 | 337 | 351 |
| Moderate Flooding | ~50% Chance SLR Exceeds | 2 | 3 | 7 | 18 | 42 | 89 | 161 | 245 | 310 | 338 | 356 | 362 | 364 | 365 |
| Moderate Flooding | <17% Chance SLR Exceeds‡ | 2 | 7 | 18 | 47 | 100 | 187 | 283 | 340 | 359 | 364 | 365 | 365 | 365 | 365 |
| Moderate Flooding | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Moderate Flooding | <17% Chance SLR Exceeds* | 2 | 7 | 23 | 66 | 150 | 265 | 342 | 361 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Moderate Flooding | < 5% Chance SLR Exceeds* | 3 | 12 | 48 | 139 | 266 | 349 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely*** **to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Major Flooding | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 6 | 6 | 12 | 25 | 47 | 77 |
| Major Flooding | ***Likely*** **Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Major Flooding | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 7 | 18 | 23 | 48 | 88 | 139 | 198 |
| Major Flooding | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 4 | 12 | 37 | 88 | 142 | 233 | 307 | 345 | 359 |
| Major Flooding | <17% Chance SLR Exceeds‡ | 0 | 0 | 0 | 2 | 5 | 17 | 60 | 151 | 266 | 335 | 359 | 364 | 365 | 365 |
| Major Flooding | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Major Flooding | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 3 | 10 | 48 | 156 | 292 | 351 | 363 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Unlikely*** **to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| Major Flooding | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 9 | 49 | 189 | 336 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |

**Table E20.** Expected coastal flooding days in Philadelphia, PA through 2150 under the very high emissions scenario both excluding and including potential rapid ice-sheet loss processes. Refer to Table ES.1 or Table 5 to learn the significance of the * and ‡ symbols.

| | Average Days Per Year of Coastal Flooding (Minor, Moderate, and Major) Under the Very High Emissions Scenario for Philadelphia | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chance Flood Frequency Exceeds Thresholds Based on SLR Projections | 2020 | 2030 | 2040 | 2050 | 2060 | 2070 | 2080 | 2090 | 2100 | 2110 | 2120 | 2130 | 2140 | 2150 |
| Minor Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 11 | 17 | 30 | 51 | 91 | 144 | 204 | 271 | 317 | 320 | 341 | 353 | 359 | 362 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 14 | 24 | 46 | 80 | 134 | 203 | 266 | 320 | 346 | 349 | 358 | 362 | 364 | 365 |
| | ~50% Chance SLR Exceeds | 18 | 39 | 79 | 138 | 214 | 287 | 335 | 355 | 362 | 364 | 365 | 365 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 26 | 63 | 128 | 217 | 298 | 344 | 360 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 26 | 66 | 145 | 251 | 330 | 358 | 364 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 32 | 91 | 205 | 316 | 358 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Moderate Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 1 | 1 | 3 | 5 | 11 | 25 | 51 | 100 | 162 | 168 | 226 | 277 | 313 | 336 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 1 | 2 | 4 | 9 | 22 | 50 | 96 | 168 | 246 | 259 | 311 | 340 | 353 | 360 |
| | ~50% Chance SLR Exceeds | 2 | 4 | 9 | 23 | 57 | 118 | 206 | 290 | 339 | 354 | 362 | 364 | 365 | 365 |
| | <17% Chance SLR Exceeds‡ | 2 | 6 | 20 | 59 | 131 | 235 | 322 | 355 | 363 | 365 | 365 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 2 | 7 | 25 | 83 | 190 | 309 | 356 | 364 | 365 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 3 | 11 | 51 | 159 | 309 | 359 | 365 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |
| Major Flooding | ***Extremely Likely* to be Exceeded, Including or Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 95% Chance SLR Exceeds* | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 12 | 13 | 29 | 55 | 91 | 137 |
| | ***Likely* Range, Excluding Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | > 83% Chance SLR Exceeds | 0 | 0 | 0 | 0 | 1 | 2 | 5 | 13 | 37 | 44 | 88 | 150 | 217 | 274 |
| | ~50% Chance SLR Exceeds | 0 | 0 | 0 | 1 | 2 | 7 | 22 | 66 | 145 | 221 | 305 | 346 | 360 | 364 |
| | <17% Chance SLR Exceeds‡ | 0 | 0 | 1 | 2 | 8 | 32 | 105 | 226 | 325 | 358 | 364 | 365 | 365 | 365 |
| | **Extended *Likely* Range, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | <17% Chance SLR Exceeds* | 0 | 0 | 1 | 4 | 18 | 87 | 233 | 339 | 362 | 365 | 365 | 365 | 365 | 365 |
| | ***Extremely Unlikely* to be Exceeded, Including Potential Rapid Ice-Sheet Loss Processes** | | | | | | | | | | | | | | |
| | < 5% Chance SLR Exceeds* | 0 | 0 | 2 | 12 | 87 | 266 | 359 | 365 | 365 | 365 | 365 | 365 | 365 | 365 |

# Appendix F: Modifying Table 10 to Reflect Users' Needs

Practitioners may generate their own version of Table 10 to reflect other emission scenarios for Atlantic City, NJ by following these steps below:

1. Identify Emissions Scenario – Using Table B1 in Appendix B, practitioners should select their emission scenario of interest.
2. Update Table 10a – Practitioners need to put new numbers into the row of Table 10a which reads "SLR relative to 1995-2014" for the years 2020 – 2150. These new numbers come from Table B1 and are based on the practitioner's desired emission scenario of interest. For example, if a practitioner would like to use a likely high emissions scenario in the absence of potential rapid ice-sheet loss processes, the practitioner would replace the SLR row in Table 10a to reflect the values in Table B1's ~50% chance row under the red high-emissions column for the respective years (i.e., 2020, 0.4ft; 2040, 1.0 ft; 2050, 1.3 ft; 2070, 2.0 ft; 2100, 3.3 ft; 2150, 5.5 ft).The 2005 baseline value will always be zero for the "SLR relative to 1995-2014" row.
3. Calculate the Yellow Cells in Table 10a– Once the "SLR Relative to 1995-2014" row has been updated, the practitioner will populate the yellow cells of Table 10a using simple addition: the practitioner will take the sum of the "2005" baseline column and the "SLR relative to 1995-2014" row to fill in each yellow cell. Using the current Table 10a as an example, calculating the total water level of a Hurricane Sandy storm occurring in the year 2100 is the sum of 3.8 ft (found in the "2005" baseline column, representing the observed water level during Hurricane Sandy in 2012) and 2.9 ft (found in the "SLR relative to 1995-2014" row, representing the estimated amount of SLR at Atlantic City, NJ for the year 2100 under the intermediate emissions scenario in the absence of potential rapid ice-sheet loss processes). As such, if the total water level observed during Hurricane Sandy occurred with the projected SLR for 2100 under an intermediate emissions scenario that is 50% chance of occurring, the storm would generate a water level of 6.7 ft (i.e., 3.8 ft + 2.9 ft = 6.7 ft) relative to MHHW NTDE.

To apply this approach with data from a different tide gauge, the baseline needs to be recalculated. Data to generate baseline columns for these other locations can be found at the following locations:

- Datums: Identify datum levels by navigating to NOAA's Datum -Station Selection website (NOAA 2025). Once the station is selected, ensure the "Tides/Water Levels" tab at the top of the screen is selected (NOAA 2025b).
- Extreme Water Level Values: Navigate to the "Extreme Water Levels" section by selecting the "Sea Level/Coastal Flooding" tab at the top of the "Tides/Water Levels" page (NOAA 2025b). The "Extreme Water Levels" subtab will be a landing page for many helpful resources (NOAA 2025c).
    - Select the "Annual Exceedance Probability" subtab to identify the AEP values for this tide gauge location (NOAA 2025d).
    - Download the NOAA provided AEP data for this station (NOAA 2025d), and plot the "Annual_Exceedance_probability_Percent" with "Exceed_level_meters" (x- and y-axis, respectively). Fit a power trendline to the plot, and use the formula for the power trendline to identify the AEP 63% value. (For example, the equation for Atlantic City's power trendline was y=1.5207x-0.195. Inserting 63% into the equation as x yields a water level (relative to MHHW NTDE)).
    - Navigate to the "Top-10 Water Levels" subtab to find station specific water levels for specific storm events (e.g., Sandy) or other extreme weather events (NOAA 2025e).

Practitioners may also choose the emissions scenario and likelihood most suited to their level of risk tolerance. Use the example calculations provided throughout this report to ensure your baseline column is relative to the 2005 (1995-2014 baseline) used by the 2025 STAP Report. Practitioners are encouraged to analyze at least two sea-level rise estimates for a specific location. Choosing one estimate in the *likely* range, along with the extended *likely* range will allow you to see how a range of SLR scenarios change community level exposures to flooding.

# Appendix G: Expanded Global Mean and New Jersey SLR Budget

The extended sea-level budget includes estimates of GMSL rise and New Jersey RSL rise and reflects three time periods to capture: the full observed New Jersey tide-gauge record (the Atlantic City tide gauge began collecting data in 1911), to highlight a period of SLR acceleration that began in 1970, and to be consistent with published literature which frequently uses 1993 as a key date in sea-level budgets to align with the beginning of satellite altimetry data collection.

**Table G1.** Global-Mean and New Jersey Sea-Level Budgets, 1912-2021 (in mm/year); specifically, for (a) 1912-1969, (b) 1970-1992, and (c) 1993-2021 (panel c on next page).

| (a) 1912-1969 | Global Mean Sea Level (mm/yr) | Relative Sea Level at Atlantic City (mm/yr) |
|---|---|---|
| Total Observed | 1.6 ± 0.1 | 3.8 ± 0.3 |
| | | |
| Global-mean thermal expansion | 0.11 ± 0.15 | 0.11 ± 0.15 |
| Ocean dynamic sea level | -- | 0.00 ± 0.13 |
| Inverse barometer effects | -- | 0.03 ± 0.06 |
| Glaciers | 0.95 ± 0.17 | 0.85 ± 0.18 |
| Greenland Ice Sheet | 0.66 ± 0.10 | 0.23 ± 0.03 |
| Antarctic Ice Sheet | 0.09 ± 0.04 | 0.12 ± 0.05 |
| Terrestrial Water Storage | -- | 0.00 ± 0.03 |
| Glacial isostatic adjustment | -- | 1.4 ± 0.2 |
| Residual (likely local VLM) | -- | 1.1 ± 0.3 |

| (b) 1970-1992 | Global Mean Sea Level (mm/yr) | Relative Sea Level at Atlantic City (mm/yr) |
|---|---|---|
| Total Observed | 1.2 ± 0.2 | 3.6 ± 2.5 |
| | | |
| Global-mean thermal expansion | 0.69 ± 0.23 | 0.69 ± 0.23 |
| Ocean dynamic sea level | -- | -0.69 ± 0.86 |
| Inverse barometer effects | -- | -0.12 ± 0.25 |
| Glaciers | 0.57 ± 0.18 | 0.49 ± 0.14 |
| Greenland Ice Sheet | 0.13 ± 0.07 | 0.05 ± 0.03 |
| Antarctic Ice Sheet | 0.09 ± 0.04 | 0.12 ± 0.05 |
| Terrestrial Water Storage | -0.26 ± 0.15 | -0.05 ± 0.12 |
| Glacial isostatic adjustment | -- | 1.4 ± 0.2 |
| Residual (likely local VLM) | -- | 1.7 ± 2.4 |

| (c) 1993-2021 | Global Mean Sea Level (mm/yr) | Relative Sea Level at Atlantic City (mm/yr) |
|---|---|---|
| **Total Observed** | 3.2 ± 0.3 | 5.0 ± 1.0 |
| | | |
| **Global-mean thermal expansion** | 1.26 ± 0.30 | 1.26 ± 0.30 |
| **Ocean dynamic sea level** | -- | 0.95 ± 0.38 |
| **Inverse barometer effects** | -- | -0.28 ± 0.27 |
| **Glaciers** | 0.70 ± 0.07 | 0.55 ± 0.06 |
| **Greenland Ice Sheet** | 0.65 ± 0.15 | 0.23 ± 0.05 |
| **Antarctic Ice Sheet** | 0.29 ± 0.10 | 0.38 ± 0.12 |
| **Terrestrial Water Storage** | 0.28 ± 0.16 | 0.16 ± 0.14 |
| **Glacial isostatic adjustment** | -- | 1.4 ± 0.2 |
| **Residual (likely local VLM)** | -- | 0.4 ± 0.8 |

*Note the statistical method employed (Dangendorf et al., 2024) estimates GMSL change in a manner that assumes the total change is equal to the sum of the component changes*

## Digital Appendix

The Digital Appendix is available at https://njclimateresourcecenter.rutgers.edu/resources/nj-sea-level-rise-reports/