FloodViewer
City of Cambridge, MA

F.A.Q.

What does this tool show?

The Cambridge FloodViewer 2025 visually displays the *extent* (area covered) of flooding for various storm scenarios, which includes flooding from both precipitation (rainfall), as well as sea level rise and storm surge. Clicking on a parcel will also display the maximum flood elevations modeled within that parcel under each storm scenario, including different planning horizons (2050 and 2070) and storms with different recurrence intervals (10-year and 100-year storms). Ground elevation data provides reference to assess the approximate range in depth of flooding on a specific parcel. In addition, the FloodViewer application provides the 1% and the 10% Long-Term Flood Elevation (LTFE). The LTFE standards refer to the projected floodwater elevation with a specified annual probability of occurrence, considering both sea level rise and storm surge or precipitation, whichever is higher. The 1%-LTFE standard represents the flood elevation with a 1% annual chance of occurrence, while the 10%-LTFE standard corresponds to a 10% annual chance of occurrence. FloodViewer 2025 does not show flood elevations under 2030 planning horizon anymore. Any new built/maintenance should refer to flood elevations for the 2050 planning horizon or the 2070 planning horizon based on the useful life of the asset.

How does the output from the Cambridge FloodViewer 2025 Tool compares with other Statewide data?

The sea level rise/storm surge flood elevations represented in the Cambridge FloodViewer 2025 version correspond to the latest sea level rise/storm surge statewide flood model results from the Massachusetts Coast Flood Risk Model (MC-FRM). The MC-FRM has also been used as part of the Climate Resilient Design Standards Tool developed by the ResilientMass Action Team (RMAT)and led by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA). The MC-FRM results are displayed in the updated version of Climate Resilience Design Standards Tool, which was released by EEA in 2022. Projects entered in the Tool receive maximum, minimum and area-weighted average values for (i) projected future tidal datums, (ii) projected water surface elevations, (iii) projected wave heights, and (iv) projected flood elevations (aka wave action water elevation) that factor both water surface elevations and wave heights for sea level rise/storm surge from MC-FRM for the recommended planning horizon (2030, 2050 2070) and recommended return period (5%, 2%, 1%, 0.5%, 0.2%, 0.1% annual exceedance probability) as output from the Climate Resilient Design Standards Tool.

The Cambridge FloodViewer 2025 provides maximum projected water surface elevation for precipitation and sea level rise/storm surge from MC-FRM for each parcel in the City for the 2050 and 2070 planning horizons for 10% and 1% annual exceedance probability (AEP) and factors both overland coastal flooding and propagated coastal flooding through the City's piped infrastructure. The Cambridge FloodViewer 2025 only reports the water surface elevation output

from MC-FRM and does not factor wave heights in the flood elevations since wave heights have been estimated in MC-FRM based on conservative assumptions and there are limitations with respect to how projected wave height is likely to impact the buildings in the City. While water surface elevation data for 1% AEP is available for the entire State of MA through Climate Resilient Design Standards Tool, 10% AEP data was particularly developed for Cambridge as part of this project.

My property is shown as "impacted", what does this mean?

If flooding is detected anywhere within the boundary of a parcel under a storm scenario, that parcel is flagged as “impacted” and a flood elevation is provided for the respective storm. Note that while a parcel may display as impacted, flooding may not reach any structures or buildings. Flood extents shown are approximate and are based on the best available information at the time of the FloodViewer development. Therefore, the extents are subject to change as more information becomes available in the future about new climate change projections and City’s piped infrastructure.

How do I change the storm scenario displayed?

On the right side of the “The Viewer” tab, a panel titled “Flooding Scenarios & Layers” displays a list of storm scenarios, organized by year and recurrence interval of 100-year or 10-year storm event.[1] You can toggle these layers on and off to display the desired event(s). Note that the more severe storm will take precedence in terms of display hierarchy, so you may want to enable only one layer at a time for an accurate viewing.

Additionally, you can quickly switch to a view displaying the 2070 1% or 10% flooding by navigating to the “2070 1% Flooding” tab or the “2070 10% Flooding” tab from the banner above the map viewer.

What are the 2050 and 2070 planning horizons?

The City of Cambridge has chosen 2050 and 2070 as the two planning horizons for climate change planning and preparedness. The 2050 planning horizon provides a mid-term future, while 2070 provides a longer-range forecast on shifts in climate. However, it is important to note that the precipitation projections for 2050 and 2070 are based on a 30-year averaging period around each planning horizon to capture some of the uncertainty associated with climate change projections. Climate change projections are subject to revision as more information becomes available or by taking actions that mitigate greenhouse gas emissions. However, recent literature and findings suggest that flooding from both extreme precipitation as well as sea level rise/ storm surge are likely to be more frequent and intense in the future.

[1] Hydrologists don’t like to hear a term like “100-year flood” because, scientifically, it is a misinterpretation of terminology that leads to a misconception of what a 100-year flood really is. Instead of the term “100-year flood”, a hydrologist would rather describe this extreme hydrologic event as a flood having a 100-year recurrence interval meaning that a flood of that magnitude has a 1 percent chance of happening in any year. A “10-year flood” has a 10 percent chance of happening in any year.

Why does the Cambridge FloodViewer 2025 use the 2050 planning horizon instead of 2030?

The decision to exclude the 2030 (bounding years of 2010-2039) planning horizon from the Cambridge FloodViewer 2025 was informed by the state-adopted planning horizon ranges recommended by the Climate Resilience Design Standards Tool. According to the Tool, "the recommended planning horizons are determined based on the year through which the asset is expected to last (i.e., before a major reconstruction/renovation), which is calculated by adding the asset's useful life in years to the construction start year".[2] Since most of the new construction/major renovations have a useful life of 30 years or more, 2050 (bounding years of 2040-2069) planning horizon was added to effectively represent projections at the end of the project's useful life.

Why is the ground elevation range on my property different in the Cambridge FloodViewer 2025 than in FloodViewer 2022?

In efforts to use the most up-to-date information available, a more recent ground elevation dataset from 2021 was used in the Cambridge FloodViewer 2025, instead of the 2014 dataset referenced in FloodViewer 2022. As such, reported ground elevations for a parcel may differ from the previous version of the FloodViewer.

What is the Cambridge City Base datum?

The Cambridge City Base (CCB) datum is a standard vertical datum used by the City of Cambridge. This datum is 11.65 ft below the North American Vertical Datum (NAVD) of 1988, which is approximately 0.3 ft above the mean sea level (MSL) in the Boston area. All elevations in the Cambridge FloodViewer 2025 are reported in ft-CCB.

What assumptions were made for the development of the tailwater boundary conditions used in the Sea Level Rise / Storm Surge flood models?

The following model assumptions were included in the development of the tailwater boundary conditions.

- The model assumes that the sluices in the dams remain closed throughout the storm (i.e., no sluices opened during low tides)
- The pumps in the dams are running throughout the storm once the water levels upstream of the dams exceed the threshold level (as decided by the dam management (DCR))
- The upstream areas are divided into zones that group the outfalls. There are 4 zones upstream of the Amelia Earhart Dam and 3 zones upstream of the Charles River Dam. Tailwater surface elevation time series were developed for each zone. The duration of these time series ranges from 48 hours to 144 hours.
- The results include freshwater discharge in both rivers (Mystic and Charles) corresponding to the associated climate horizon (2050 and 2070). They are the same as used in the base MC-FRM results.

[2] Section 4: Climate Resilience Design Standards. Climate Resilience Design Standards & Guidance. Version 1.2, July 2022. Page 10. https://www.mass.gov/doc/climate-resilience-design-standards/download

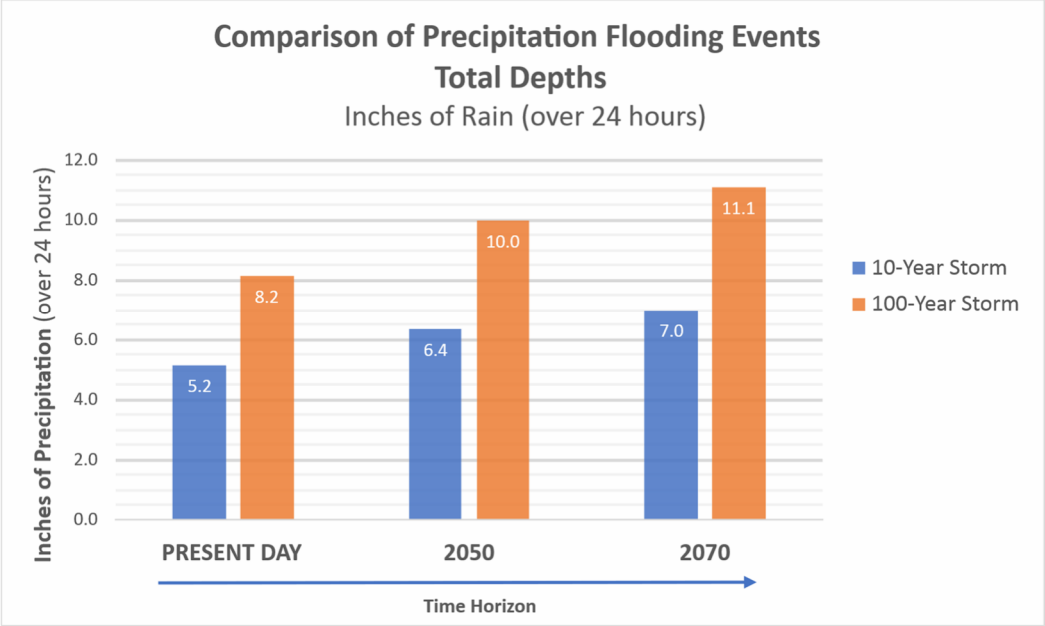
- These boundary conditions provide results for when the ocean water gets upstream of the dams. The time series stops once the water surface elevation in the river returns to pre-overtopped/breached conditions.
- The temporal resolution of model output is 1 hour.

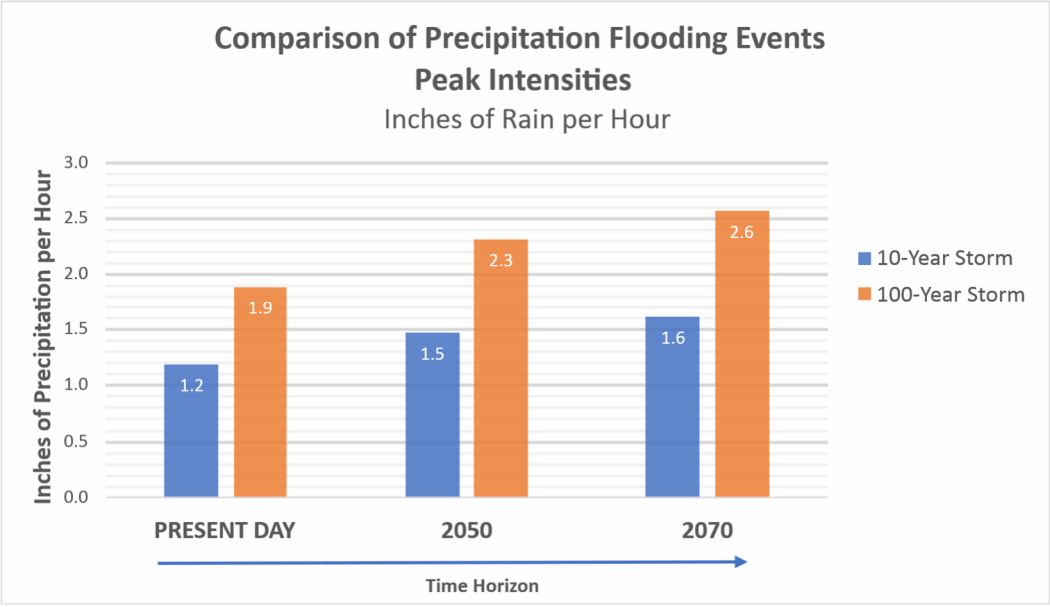
Why has the rainfall distribution methodology been updated in the Cambridge FloodViewer 2025?

The Massachusetts Department of Environment Protection (DEP) proposed revisions to the Wetlands Protection Act and the Water Quality Certification Regulations for Stormwater Management in late 2023. These proposed revisions recommend using the NOAA10 Type C or D rainfall distributions in place of SCS Type III distribution. To align with State recommendations and regulations, the Cambridge FloodViewer 2025 uses the NOAA10 Type D distribution specific to the City of Cambridge.

Why have precipitation depth projections been updated in the Cambridge FloodViewer 2025?

Precipitation projections have been updated based on the IDF projections developed by Cornell University as part of Massachusetts EEA's Climate and Hydrologic Risk Project[3] and adopted by the State in the Climate Resilience Design Standards Tool. Rainfall depths used in the Cambridge FloodViewer 2025 are based on the best available information at the time of FloodViewer development and are subject to change as more information becomes available in the future.





[3] *Massachusetts Climate and Hydrologic Risk Project (Phase 1) – Stochastic Weather Generator Climate Projections XLSX*. (2016). Arcgis.com. https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/documents/23886968313842ba9d268f27699da300/about

Data Dictionary: 7/8/25 DRAFT FOR REVIEW

Data Layer Name:	Definition:
Ground Elevation Min:	The lowest ground elevation (in feet-CCB)[4] found within the parcel, sourced from 2021 LiDAR[5] data.
Ground Elevation Max:	The highest ground elevation (in feet-CCB) found within the parcel, sourced from 2021 LiDAR data.
2070 – 1% – SLR/SS[6]	Maximum flood elevation at the parcel from one percent annual probability of flooding due to sea-level rise and storm surge by 2070, considering both overland coastal flooding and propagated coastal flooding.
2070 – 1% – Precipitation	Maximum flood elevation at the parcel from one percent annual probability of flooding due to precipitation by 2070 (11.1 inches of rain over 24 hours).
2070 – 10% – SLR/SS	Maximum flood elevation at the parcel from ten percent annual probability of flooding due to sea-level rise and storm surge by 2070, considering both overland coastal flooding and propagated coastal flooding.
2070 – 10% – Precipitation	Maximum flood elevation at the parcel from ten percent annual probability of flooding due to precipitation by 2070 (7.0 inches of rain over 24 hours).
2050 – 1% - SLR/SS	Maximum flood elevation at the parcel from one percent annual probability of flooding due to sea-level rise and storm surge by 2050, considering both overland coastal flooding and propagated coastal flooding.
2050 – 1% – Precipitation	Maximum flood elevation at the parcel from one percent annual probability of flooding due to precipitation by 2050 (10.0 inches of rain over 24 hours).
2050 – 10% – SLR/SS	Maximum flood elevation at the parcel from ten percent annual probability of flooding due to sea-level rise and storm surge by 2070, considering both overland coastal flooding and propagated coastal flooding.
2050 – 10% – Precipitation	Maximum flood elevation at the parcel from ten percent annual probability of flooding due to precipitation by 2050 (6.4 inches of rain over 24 hours).
Present Day – 1% – Precipitation	Maximum flood elevation at the parcel from one percent annual probability of flooding due to precipitation in present-day weather conditions (8.2 inches over 24 hours).
Present Day – 10% – Precipitation	Maximum flood elevation at the parcel from ten percent annual probability of flooding due to precipitation in present-day weather conditions (5.2 inches over 24 hours).
FEMA 500-Year Zone	Flood elevation at the parcel corresponding to an area of minimal flood hazard, or 0.2% annual probability of flooding, as defined by the Federal Emergency Management Agency
FEMA 100-Year Zone	Flood elevation at the parcel corresponding to an area with a 1% annual probability of flooding, as defined by the Federal Emergency Management Agency
1% – LTFE[7]	The higher of the flood elevation values between the “2070 – 1% – Precipitation” flood elevation and the “2070 – 1% – SLR/SS” flood elevation for the specific parcel.
10% – LTFE	The higher of the flood elevation values between the “2070 – 10% – Precipitation” flood elevation and the “2070 – 10% – SLR/SS” flood elevation for the specific parcel.

[4] Cambridge City Base (CCB) datum is a standard vertical datum used by the City of Cambridge. This datum is 11.65 ft below the North American Vertical Datum (NAVD) of 1988, which is approximately 0.3 ft above the mean sea level (MSL) in the Boston area.

[5] LIDAR stands for *Light Detection and Ranging* and is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses—combined with other data recorded by the airborne system—generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. (https://oceanservice.noaa.gov/facts/lidar.html)

[6] SLR/SS refers to Sea Level Rise and Storm Surge

[7] LTFE refers to Long-Term Flood Elevation, as defined by Cambridge Zoning Ordinance Section 22.80

Additional Resources:

- CCPR Homepage
- City of Cambridge – Climate Resilience Zoning
- City of Cambridge - Public Works
- City of Cambridge - Community Development Department
- City of Cambridge GIS

Credits:

Designed by Weston & Sampson for the City of Cambridge, MA

Basemap data provided by City of Cambridge GIS

Flood modeling provided by Stantec, Inc. & Woods Hole Group

Technical review by Weston & Sampson

Elevation Data by MassGIS