

Coastal Modeling

This document summarizes the coastal modeling efforts for the North/West Battery Park City Resiliency Project (NWBPCR), as well as independent validation of those efforts and their compliance with applicable local law.

Design Storm Criteria

In line with other components of the Lower Manhattan Coastal Resiliency (LMCR) initiative, N/WBPCR is designed to provide immediate risk reduction for the present day 100-year storm, and will be adaptable to provide flood risk reduction for a projected 100-year storm in the 2050s, inclusive of sea level rise. A 100-year storm is a severe storm with a 1% likelihood of happening in any given year. A 100-year storm in one year does not decrease the chance of a second 100-year storm occurring in that same year or any subsequent year; there is a 1 in 100 or 1% chance that a storm will reach this intensity in any given year. One hundred-year storm projections change over time due to factors that include changes in storm frequency and severity and rising sea levels. As a result, the expectations for a 100-year storm in the 2050s will be different than those for a current-year 100-year storm.

Stillwater Baseline

To project the design flood elevations necessary for N/WBPCR, the project team is developing a system to assess the project area's vulnerability to future flooding, assuming existing conditions with no flood risk mitigation implemented, as well as a means of comparing that condition with the proposed flood risk reduction barrier system contemplated by the project. As a baseline, the team uses data from the Federal Emergency Management Agency (FEMA) to scientifically establish the 100-year flood across the study area today. In its analysis, FEMA considers the astronomical tide¹ plus the storm surge, as well as offshore and overland wave heights and wave runup, or the elevation of the sea level produced by waves at the shoreline during this hypothetical storm. FEMA's analysis establishes the stillwater elevation in terms of feet above NAVD88 elevation (NAVD88 elevation is commonly described as sea level). This is then validated by the National Oceanic and Atmospheric Administration's (NOAA) recording of the highest water levels during various storm events, as well as a separate FEMA model — conducted by their Risk Assessment Mapping Planning Partners group — that leveraged data from previous storms.

Sea Level Rise

With the aforementioned baseline established, the project team then uses data from the New York City Panel on Climate Change (NPCC), a 20-member independent advisory body consisting of leading climate change and impact scientists, academics, and private sector practitioners, that synthesizes scientific information on climate change and advises policymakers on local resiliency and adaptation strategies, to inform what impact sea level rise will have on future storm events. In its most recent report issued in 2019 (NPCC3), NPCC used data from NOAA, the United States Army Corps of Engineers (USACE), and other leading climate scientists — as well as observed trends and its own scholarly work — to formulate sea level rise projections for New York City. Among its findings, NPCC confirms both that the pace of sea level rise is quickening -- due in part to the acceleration of Arctic glacial melt -- and that, due to an array of factors, New York City sea level rise is outpacing the global average. In line with every other LMCR project, the N/WBPCR project team is adding the NPCC's 90th percentile future sea level rise projections to FEMA's

¹ Tidal activity related solely to the earth's rotation and gravitational effects of the earth, sun, and moon.

current stillwater elevation definition when estimating the expected increase in stillwater elevation by 2050 — an increase of 30 inches.

Wave Impacts

The project team also uses numerical wave models, including the industry-accepted computer simulated hydrodynamic and wave model known as MIKE 21, to better understand future wave behavior, heights and frequency. Under varying storm conditions, the computer model simulates the local wave action and identifies the expected wave heights in the project area. The project team uses best-available data, including FEMA’s statistical information on wave heights and water elevations, in combination with these additional computer models to better understand the potential wave crest elevation on- and off-shore for a 100-year storm in the year 2050. Wave impacts in this area occur due to the study area’s relative location in New York Harbor, where there is substantial “fetch,” or space for waves to gain energy across open water before reaching land. After the waves break, the wave run-up on the shoreline structures materially increases the projected total flood elevation.

Design Flood Elevations

To calculate the design flood elevations necessary for the project, the project team totals stillwater elevation with sea level rise, wave impacts, and an additional measure of freeboard — height FEMA recommends as a factor of safety to account for statistical uncertainty. Doing so will result in an array of DFEs across the N/WBPCR project site in order to protect against a 100-year storm in 2050. Note that DFE is a different indicator than height of intervention (HOI), which indicates the height of the flood infrastructure compared to the finished grade. Put another way, if you stand at an NAVD88 elevation of +9’10” and the DFE is +19’10”, the height of intervention would be ten feet.

Compliance with LL96

Local Law 96 of 2013 requires that the New York City Building Code, and therefore the coastal flood protection projects built in compliance with it, use the more restrictive of either FEMA’s Effective Flood maps that date to 2007 or any Preliminary Flood maps released since then — in the case of N/WBPCR, those that date to 2013 and, more recently, 2015. In compliance with that requirement, N/WBPCR, like every other resiliency project in New York City, will be designed to that standard. In 2016, the City challenged FEMA’s Preliminary Flood Insurance Rate Maps in an effort to alleviate additional flood insurance costs for New York City homeowners, not to lower the design criteria for flood mitigation projects. This, too, is consistent with Local Law 96, which within the same bill protected homeowners from insurance cost escalations while also ensuring that any new construction is built to the more restrictive standard.

Coordination with the City of New York

A letter submitted to BPCA from Kizzy Charles-Guzman of the Mayor’s Office of Climate and Environmental Justice reads, in part, “BPCA has adopted the same design criteria, including flood elevations, as the East Side Coastal Resiliency project and the Brooklyn Bridge-Manhattan Coastal Resilience project, as required by Local Law 96 of 2013. Together, these three projects will form a critical link in the City’s overall coastal storm surge protection system, sufficient to respond to a 2050s 100-year storm, inclusive of sea level rise.”