

3 Background

The Rebuild by Design (RBD) competition was launched in 2013 by the United States Department of Housing and Urban Development (HUD) as a response to Hurricane Sandy. The goals of the competition were to develop innovative ideas and flexible solutions to improve resilience in the affected areas. Hurricane Sandy flooded nearly 80% of Hoboken. Residents and businesses suffered hardships and displacement long after the storm had passed. Flood waters in some areas of Hoboken did not recede until days later. The Rebuild by Design – Hudson River project (RBDH) was one of six winning concepts, developed with the goal of reducing flooding risk due to storm surge and heavy rainfall in Hoboken, Weehawken, and Jersey City (RBD OMA Team, 2014). In order to reach this goal, HUD awarded \$230 million to the State of New Jersey for the project. The majority of the project occurs within the Hoboken municipality but does extend north into Weehawken and south into Jersey City. The approximate boundaries of the project are the Hudson River to the east, Baldwin Avenue in Weehawken to the north, the Palisades to the west, and 18th Street, Washington Boulevard and 14th Street in Jersey City to the south (see Figures 2-1 and 2-2).

The approach to the RBDH project consists of four components: Resist, Delay, Store, and Discharge (see Figure 3-1). The “Resist” portion incorporates a combination of hard infrastructure and soft landscaping to abate exceptionally high tides and/or storm surge. The “Delay, Store, and Discharge” portions all aim to reduce the risk of flooding due to rainfall runoff.

The “Delay” component includes green/grey infrastructure to slow the stormwater runoff which allows the treatment plant to treat more combined sewage during the peak of the storm.

The “Store” component includes green and grey infrastructure features such as bioswales, detention and retention tanks that capture stormwater and prevent it from entering the sewer system.



Figure 3-1. Rebuild by Design Competition Vision Components

The “Discharge” component incorporates enhancements to the stormwater management system such as use of pumping systems and upgrading the sewer system to allow for greater discharge of stormwater during heavy rainfall.

3.1 Purpose

The Study Area, comprising the entire City of Hoboken, and adjacent areas of Weehawken and Jersey City (see Figure 2.1), is vulnerable to flooding from both coastal storm surge and inland rainfall events. The purpose of the project is to reduce the flood risk to flooding areas within the Study Area. The project intends to minimize the impacts from surge and rainfall flood events on the community, including adverse impacts to public health, while providing benefits that will enhance the urban condition, recognizing the unique challenges that exist within a highly developed urban area.

3.2 Need

The historic flooding, and the high likelihood of future flood events from both rainfall and coastal surge flooding, has a tremendous impact on the lives of Study Area residents from a health and safety and economic perspective. When critical infrastructure, including fire stations, hospitals, and a waste water treatment plant is impacted, it affects the welfare of the entire community. The economic livelihood of the community is diminished by the business disruptions caused by flooding and continual costs to repair and restore homes and businesses, with costs often exceeding the average National Flood Insurance claim award. The future potential for flooding is significant based on Hoboken’s topography and the need for a project that minimizes flooding is critical to the health and safety and economic vitality of Hoboken and its affected neighbors in Weehawken Cove and Jersey City.

The Study Area is a very dense urban area of Hudson County that is situated along the Hudson River directly west of Manhattan, New York. The Study Area is vulnerable to two interconnected types of flooding: coastal flooding from storm surge and high tide, as well as systemic inland (rainfall) flooding from medium (generally a 5-year, 24-hour) to high (generally over 10-year, 24 hour) rainfall events.

Coastal flooding happens with much less frequency than rainfall flooding events, but can devastate widespread areas of the Study Area and cause significant economic damage and safety concerns. Rainfall-induced flooding occurs with significantly greater frequency than coastal flooding, but causes less severe economic damage and safety concerns.

The flooding problems for both coastal flooding and rainfall-induced flooding can be attributed to several factors, including naturally low topography and proximity to waterways; significant areas impervious ground coverage which causes surface runoff; existing combined storm sewer infrastructure which cannot handle the volume of water during significant rainfall events and insufficient storm sewer discharge capability, particularly during high tide.

The topography of the study area is highest along the east-central portion abutting the coastline of the Hudson River at Castle Point. From here, the land slopes gently downward to the north (towards Weehawken Cove), south (towards the Hoboken Terminal and Jersey City) and to the west (towards the foot of the Palisades). This topography reflects the Study Area's history; when originally settled, Castle Point was an island surrounded to the north, south and west by wetlands. These wetlands were gradually filled in as the area was developed. Today, these areas – in particular those to the west – are still extremely low-lying, in some places no more than three feet above sea level.

The City of Hoboken's exposure to flood hazard risks is evident by the number of properties included in the FEMA Special Flood Hazard Area. The National Flood Insurance Program (NFIP) is intended to reduce the financial and recurring impact of flooding on private and public structures by providing affordable insurance to property owners and encouraging adoption of floodplain management regulations. Mortgage lenders for properties within the Special Flood Hazard Area (SFHA) (areas with a 1-percent-annual-chance of flooding, also referred to as the base floodplain or the 100-year floodplain) require owners to obtain flood insurance from the NFIP. In addition, property owners receiving awards following presidentially-declared disasters (such as Hurricane Sandy) are also often required to obtain NFIP insurance. According to NFIP statistics (<https://www.fema.gov/policy-claim-statistics-flood-insurance>), as of August 31, 2016, the City of Hoboken had 9,446 NFIP policies in place (the highest in Hudson County), with premiums totaling \$7,213,754 (the highest in Hudson County and fifth highest in New Jersey). In addition, the overall liability to the NFIP from property owners in Hoboken was over \$2 billion (third highest in New Jersey) with an average claim amount of \$26,733.

The need for the project that minimizes the impacts from coastal and rainfall flooding is necessary and essential to protect public health and safety, and the economic vitality of the community of Hoboken and its beneficiary neighbors in Weehawken Cove and Jersey City.

3.3 Goals and Objectives

The Project is intended to create a resilient community that is able to “Resist” and rapidly recover from disasters or other shocks with minimal outside assistance. The Project is a comprehensive urban water strategy whose overall purpose is to reduce flood hazard risks, and which seeks to leverage resiliency investment to enhance the urban condition. The ability to meet this purpose will be measured in terms of Goals and Objectives. Goals (in italics below) are overarching principles that guide decision-making. Goals are measured in terms of Objectives, which are measurable steps to meet the Goal. The Goals and Objectives for the Project are:

- *Goal: Contribute to Community Resiliency:*
- Objective: The Project will seek to integrate flood hazard risk reduction strategies with emergency, civic, and cultural assets. The Project will reduce flood risks within the Study Area, leading to improved resiliency and the protection of accessibility and on-going operations of services (including protecting physical

infrastructure such as hospitals, fire stations and police department buildings as well as roadways and transit resources). This would allow these key assets to support emergency preparedness and community resiliency during and after flood events.

- *Goal: Reduce Risks to Public Health:*

- Objective: In addition to providing protection to critical healthcare infrastructure (such as local hospitals and emergency preparedness services), the Project will aim to reduce the adverse health impacts that result from combined sewage backups onto streets, and within businesses and residences, through a reduction in stormwater infiltration into the existing combined sewer collection system.

- *Goal: Contribute to On-going Community Efforts to Reduce FEMA Flood Insurance Rates:*

- Objective: The City of Hoboken's exposure to flood risks has resulted in some of the highest insurance premiums in the state. The City has long had a goal of reducing those rates through a number of comprehensive flood risk reduction programs, such as those identified in the City's Green Infrastructure Plan. The NFIP's Community Rating System (CRS) allows municipalities to reduce their flood insurance rates through implementation of comprehensive floodplain management. The Project will propose concepts and alternatives that are consistent with Hoboken's overall effort of reducing FEMA Flood Insurance Rates.

- *Goal: Delivery of Co-Benefits:*

- Objective: Where possible, the Project will seek to integrate the flood hazard risk reduction strategy with civic, cultural and recreational values. The Project will look to incorporate active and passive recreational uses, multi-use facilities, and other design elements that integrate the Project into the fabric of the community. In this way, the Project will complement local strategies for future growth.

- *Goal: Connectivity to the Waterfront:*

- Objective: The Study Area's waterfront is currently the location of a vast length of interconnected parks and public walkways which contribute to the vibrancy of the community. The Project will aim to incorporate features that do not restrict access to the waterfront. Where feasible, the Project will build upon, and enhance, existing waterfront access points while providing flood risk reduction.

- *Goal: Activation of Public Space:*

- Objective: The Project will develop concepts that reduce risks to private and public property from flood impacts while also incorporating design elements that activate public and recreational spaces, thereby enhancing quality of life for the community.

- *Goal: Consider Impacts from Climate Change:*

- Objective: The Project will take into account the projected impacts from climate change, particularly as it relates to sea-level rise and its impacts on the frequency and degree of flooding.

3.4 Purpose of the Feasibility Study

The primary goal of the feasibility study is to develop and evaluate the effectiveness of the alternatives that would aim to meet the Purpose and Need of the project as well as the project's goals and objectives. In order to achieve this, this feasibility study seeks to do the following:

- a. Develop concepts/alternatives for “Resist” alignments that could provide varying levels of flood risk reduction benefits from coastal storm surge to the study area with particular emphasis on maximizing the use of publicly owned property for “Resist” alignments
- b. Develop set of interventions (coastal structure barriers) that could fit within the site constraints along the “Resist” alignments
- c. Develop conceptual design of the “Resist” alignments using FEMA levee certification criteria per 44 Code of Federal Regulations (CFR) 65.10 requirements and by incorporating sea-level rise, meeting the requirements of the FFRMS.
- d. Develop various components of “Delay, Store, Discharge (DSD)” elements that would collectively provide flood risk reduction benefits from rainfall events
- e. Evaluate the effectiveness and any potential impacts of “Resist ” alignments with a coastal storm surge model
- f. Evaluate the effectiveness of “DSD” components with a stormwater management model
- g. Perform a multi-disciplinary assessment of the “Resist” and “DSD” alternatives and use multi-disciplinary screening criteria’s that would allow to evaluate the feasibility of each alternative
- h. Use the engineering screening criteria to compare the alternatives that would inform the recommendation for a preferred alternative that is feasible within the available project budget