Structural Changes

- Relocation
  - Structure/site
  - Stairs/deck etc. when applicable
- Elevation
- Fill basement
- Dry floodproofing (barriers)
- Wet floodproofing (e.g. flood vents)
- Use original/new flood-resistant materials below Base Flood Elevation
Non-Structural Changes

- Start with Elevation Certificate
  - Letter of Map Amendment
- Relocate important contents
- Regrading/positive drainage
- Elevate/protect mechanicals & utilities
- Use window wells to protect against small floods
- Emergency measures (e.g. sandbagging)

Source: NFIP Floodplain Management Bulletin on Historic Structures
Historic Structure Considerations

- What makes the property historic?
- Which of the mitigation options will best preserve the historic nature?
- Are there other alternative mitigation options?

Resources:
- National Park Service’s Preservation Briefs
- Secretary of the Interior’s Standards for the Treatment of Historic Properties
- National Flood Insurance Program’s Floodplain Management Bulletin on Historic Structures
Alternative Mitigation Study:
Breezy Point, NY

March 29, 2018
Shannon Jarbeau, CFM
Barnstable County, MA/Woods Hole Sea Grant
Flood Hazards & Historic Structures
Breezy Point Home Elevation Study
Overview

• Incorporates geographic and developmental understanding of community

• Perspectives
  • Architectural (individual homes)
  • Urban design (how individual homes function as a community)

• Impacts
  • Mitigation options/elevation on community character
  • Existing conditions on mitigation options
Public Input – Capturing Character

What do you like or wish to preserve about the appearance, architecture or character of Breezy Point?

- neighborhood character
- beaches
- beach community
- decks
- cottage/bungalow
- outdoor spaces
- open/natural
- elevation is good
- elevation uniformity
- pedestrian-friendly
- all is good
- low elevation
- daylight
- docks
- dunes
- ground-level porch/deck
- landscaped/maintenance
- light house
- make own decisions
- one car
- open foundation
- parking under home would be good
- peaceful/relaxing
- trees
- rock jetties

What about homes in Breezy Point that have been elevated do you dislike regarding the appearance, architecture, character or foundation?

- rebuilt/new homes too high
- closed/concrete foundation
- cost of elevating
- non-uniformity
- nothing
- small/high decks
- stairs/lift in front of home
- concrete pilings/open foundation
- new homes too large
- open foundation
- building requirements
- car ports
- egress windows
- elevated homes that aren’t high enough to use space underneath
- elevation removes sense of community
- losing casual beach feel
- no longer beach community
- no privacy/fences too low
- trees along main road
Structural Options

- Whole Building Strategy
  - Rebuild
    - Comply with all codes & regulations
  - Elevate
    - Likely not feasible
  - Relocate
    - Likely not feasible
  - Dry Floodproof
    - Not allowed in habitable space
  - Wet Floodproof
    - Not allowed in habitable space
  - Do Nothing
    - Not recommended

- Elevation Strategy
  - Raise Entire Structure
  - Abandon Lowest Floor
  - Extend Walls

- Further Considerations
  - Foundation Options
  - Service Equipment
  - Height Mitigation
  - Community Interaction
  - Accessibility
### Costs

#### Table 1. Elevation Costs

**ELEVATION COSTS**

<table>
<thead>
<tr>
<th>Item</th>
<th>High ($)</th>
<th>Low ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hard Costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost to Elevate</td>
<td>40,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Demo</td>
<td>30,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Excavation and Fill</td>
<td>25,000</td>
<td>16,000</td>
</tr>
<tr>
<td>Foundation, Files, Caps and Piers</td>
<td>75,000</td>
<td>55,000</td>
</tr>
<tr>
<td>New Access Construction</td>
<td>12,000</td>
<td>8,500</td>
</tr>
<tr>
<td>Electrical</td>
<td>12,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Plumbing</td>
<td>6,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Miscellaneous Construction</td>
<td>15,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>15,000</td>
<td>0</td>
</tr>
<tr>
<td>Environmental</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>Site Protection</td>
<td>15,000</td>
<td>8,000</td>
</tr>
<tr>
<td><strong>Hard Cost Total</strong></td>
<td>$355,000</td>
<td>$142,000</td>
</tr>
</tbody>
</table>

**Soft Costs**

<table>
<thead>
<tr>
<th>Item</th>
<th>High ($)</th>
<th>Low ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>1,500</td>
<td>1,000</td>
</tr>
<tr>
<td>Homeowner relocation/temp housing</td>
<td>25,000</td>
<td>15,000</td>
</tr>
<tr>
<td>A/E Plans and Specs</td>
<td>20,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Inspections</td>
<td>12,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Permitting/Filing</td>
<td>10,000</td>
<td>5,500</td>
</tr>
<tr>
<td>Expediting</td>
<td>8,000</td>
<td>5,500</td>
</tr>
<tr>
<td>Energy Star Consulting</td>
<td>6,000</td>
<td>4,500</td>
</tr>
<tr>
<td><strong>Soft Cost Total</strong></td>
<td>$82,500</td>
<td>$47,500</td>
</tr>
</tbody>
</table>

**RECONSTRUCTION TOTAL RANGE**

<table>
<thead>
<tr>
<th>Item</th>
<th>High ($)</th>
<th>Low ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 SF Living Space</td>
<td>$372,500</td>
<td>$322,500</td>
</tr>
<tr>
<td>2000 SF Living Space</td>
<td>$782,500</td>
<td>$647,500</td>
</tr>
</tbody>
</table>

### Table 2. Reconstruction Costs

**RECONSTRUCTION COSTS**

Based on 1000 SF and 2000 SF Living Space

<table>
<thead>
<tr>
<th>Hard Costs</th>
<th>High ($)</th>
<th>Low ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Square Foot Living Area</td>
<td>400</td>
<td>275</td>
</tr>
<tr>
<td>1000 SF Living Space</td>
<td>$450,000</td>
<td>$273,000</td>
</tr>
<tr>
<td>2000 SF Living Space</td>
<td>$750,000</td>
<td>$586,000</td>
</tr>
</tbody>
</table>

**Soft Costs**

<table>
<thead>
<tr>
<th>Item</th>
<th>High ($)</th>
<th>Low ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey</td>
<td>1,500</td>
<td>1,000</td>
</tr>
<tr>
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</tr>
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</tr>
<tr>
<td>Inspections</td>
<td>12,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Permitting/Filing</td>
<td>10,000</td>
<td>5,500</td>
</tr>
<tr>
<td>Expediting</td>
<td>8,000</td>
<td>5,500</td>
</tr>
<tr>
<td>Energy Star Consulting</td>
<td>6,000</td>
<td>4,500</td>
</tr>
<tr>
<td><strong>Soft Cost Total</strong></td>
<td>$82,500</td>
<td>$47,500</td>
</tr>
</tbody>
</table>
Street/Neighborhood Approach (rather than structure only)
### HEIGHT MITIGATION OPTIONS

**Height Mitigation Options Chart**

NYC Zoning and Breezy Point Co-Op Regulations require that elevated homes have additional architectural elements at the street level to promote a pedestrian-friendly and engaging streetscape.

<table>
<thead>
<tr>
<th>Level of First Floor After Elevation:</th>
<th>Number of Height Mitigation Elements Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ft.- 5 ft. Above Grade</td>
<td>0</td>
</tr>
<tr>
<td>5 ft.- 9 ft. Above Grade</td>
<td>1</td>
</tr>
<tr>
<td>9+ Above Grade</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type Of Height Mitigation</th>
<th>Porch/Deck</th>
<th>Stairs With 90 Degree Turn</th>
<th>Plantings</th>
<th>Raised Yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts towards Height Mitigation for Zoning</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Applicable in Breezy Point</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>X</td>
</tr>
<tr>
<td>Details and Additional Information</td>
<td>See pages 62-63 for design requirements</td>
<td>See Page 64 for design requirements and possible stair layouts.</td>
<td>See Page 65 for design requirements. See NYC Zoning, 64-A50 for regulations for homes on corner lots, or with excessively narrow front yards.</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**NOTE:** No Height Mitigation is required where more than 50 percent of the street wall of the building is within three feet of the street line. However, it is still suggested that all homes employ height mitigation elements.
Stairs

- A: Front U-Shaped
- B: Wrap Around
- C: Side U-Shaped
- D: Side Straight
- E: Side Straight Reversed
- F: Front/Parallel to Street
- G: Front/Perpendicular to Street
- H: Front L-Shaped
Community Character & Social Interactions

Figure 6-12: Community Interaction Elements
Neighborhood 1

Figure 7-13. Architectural standards, concepts and terminology as visible in the conceptual illustration.
Neighborhood 2

Figure 7-28. Architectural standards, concepts and terminology as visible in the conceptual illustration.
Neighborhood 3
Regulatory Framework

Federal
- FEMA (Federal Emergency Management Agency)
  - Floodplain Management
  - FIRM Maps
- NFIP (National Flood Insurance Program)
  - Flood Insurance

State
- DEC (Department of Environmental Conservation)
  - Floodplain Administrator

Local
- NYC Building Code
  - Allowable Use & Occupancy
  - Construction Type
  - Fire Districts
  - Egress
- Appendix G of the NYC Building Code
  - Certification & Inspections
  - Flood Zone Construction Standards
- NYC Zoning
  - Setbacks & Height Restrictions
  - Non-Conformance / Non-Compliance
  - Flood Resilience Text Amendment
- Breezy Point Co-Op Regulations
  - Setbacks & Height Restrictions
  - Porches, Decks, Fences
- NYC ECC (Energy Conservation Code)
  - Insulating Walls & Elevated Slabs
  - Energy Usage
  - Waterproofing / Vapor Barriers
Questions?
Shannon.Jarbeau@barnstablecounty.org
(508) 375-6952
MITIGATION OPTIONS AND ALTERNATIVES
MITIGATION OPTIONS AND ALTERNATIVES

KEEPING 74 BRIDGE STREET ABOVE WATER

Lessons from the City of Newport and the Point Neighborhood on protecting historic structures and neighborhoods from the impacts of climate change
MITIGATION OPTIONS AND ALTERNATIVES
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