

## RESILIENCE ALTERNATIVES EVALUATION MEMORANDUM

### Chappaquiddick Ferry Resilience Improvements Alternatives Assessment and Preliminary Design April 25, 2023

**PREPARED BY:** Nils Wiberg, PE, CFM  
Katherine Patch, PE

**PROJECT NUMBER:** 20211042.A10

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This memorandum is provided to outline Fuss & O'Neill's recommended alternatives for respective project elements to evaluate under the current project scope of work. This memorandum also outlines proposed evaluation criteria and provides an evaluation matrix template incorporating these alternatives and criteria in the graphical format that will be used and developed in following stages of this project's assessment. Project elements recommended for evaluation of resilience alternatives are listed below:

1. Raise Edgartown Ferry Landing, Memorial Wharf and Portions of Dock/Daggett Streets
  - A. Raise Infrastructure to Interim Phase 1 Elevation
  - B. Raise Infrastructure to Higher Phase 2 Elevation
2. Raise Chappaquiddick Ferry Landing, Parking Area and Portion of Chappaquiddick Road
  - A. Raise Infrastructure to Interim Phase 1 Elevation
  - B. Raise Infrastructure to Higher Phase 2 Elevation
3. Modify/Replace Ferry Landing Hoists or Replace Hoists with Double-Ended Ferry
  - A. Modify/Replace Ferry Landing Hoist Infrastructure
  - B. Replace Hoist Infrastructure with Double-Ended Ferry Equipped with Deployable Ramps
4. Raise Existing Chappy Ferry Operations Building or Construct New Raised Building
  - A. Raise Existing Ferry Operations Building
  - B. Raise and Replace Ferry Operations Building
5. Raise and Potentially Move Sculpin Gallery
  - A. Raise Building in Existing Location
  - B. Raise and Move Building Southwest
  - C. Raise and Move Building Northwest

The 2021 Climate Change Vulnerability Assessment and Adaptation Plan prepared by Woods Hole Group (WHG) identified the Phase 1 elevation as EL 3.4 (NAVD88), which is the elevation of Daggett Street at the downgradient end of the abutting property's (59 N. Water Street) lower driveway to the

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carriage building. Additionally, WHG identified the Phase 2 elevation as EL 5.8 (NAVD88), which is the elevation of Daggett Street near the middle of the abutting property's upper driveway to the carriage building. This elevation would increase ground elevations at the landing and adjacent paved areas of up to approximately 3.55 feet.

Woods Hole Group has reported the following projected tidal elevations at the site, for reference relative to respective proposed elevations noted below:

**MC-FRM Projected Tidal Benchmarks (ft. NAVD88)**

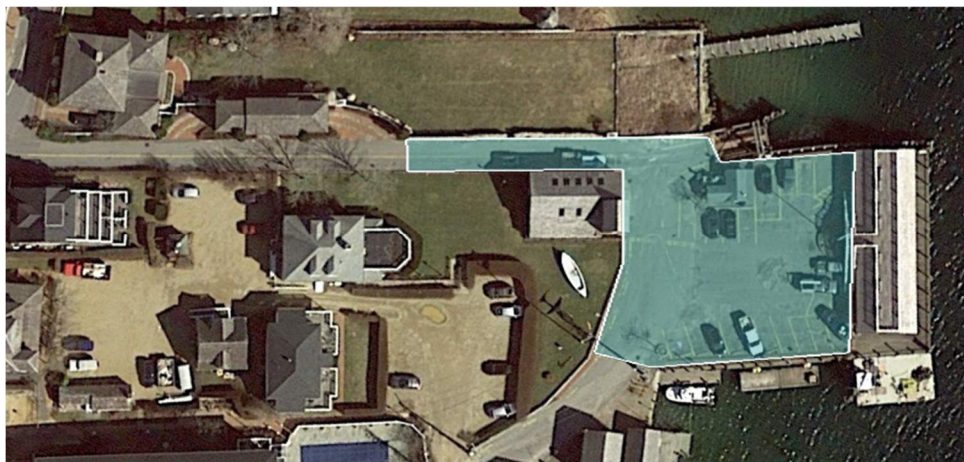
	<u>2030</u>	<u>2050</u>	<u>2070</u>
MLLW	0.0	1.3	3.0
MLW	0.2	1.5	3.2
MTL	1.3	2.6	4.4
MHW	2.4	3.7	5.6
MHHW	2.7	4.0	5.9

These recommended alternatives and evaluation criteria will be further reviewed and discussed in future a stakeholder conference and public workshop to answer questions and obtain feedback to inform future assessments, development of the matrix and identification of the respective preferred alternatives.

**Recommended Resilience Alternatives**

**1. Raise Edgartown Ferry Landing, Memorial Wharf and Portions of Dock/Daggett Streets**

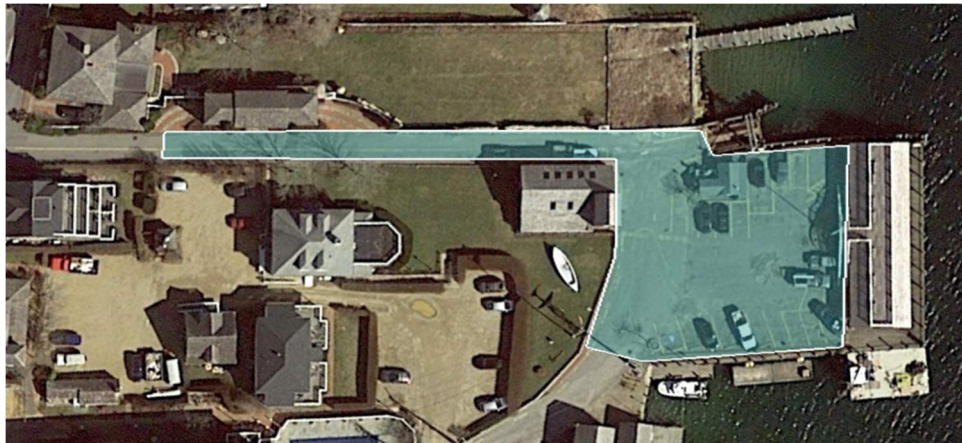
- Alternative 1A – Raise Infrastructure to Interim Phase 1 Elevation



- This target elevation would be the basis for grading throughout the landing, parking area and Dock Street up to the existing catch basin near the end of the Memorial Wharf boardwalk and adjacent Martha's Vineyard Preservation Trust properties at 45 and 47 Dock Street.

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- The current elevation of the landing and parking area varies between approximately EL 2.25 to 2.6 (NAVD88), representing an increase of up to approximately 1.15 feet from existing conditions.
  - The top elevation of the steel sheeting bulkhead recently constructed around the Memorial Wharf parking area is approximately El. 5.3. It is understood that the bulkhead was designed to accommodate increased loading that would result from an increase of the parking area's elevation to the top of sheeting.
  - For any increase of the parking lot elevation, it is expected that additional vehicle guards would be required, as the exposed portion of the steel sheeting bulkhead (extending approximately 24" above pavement along the bulkhead's length) now provides that protective function.
  - Depending on the preferred alternative for the ferry ramp hoist infrastructure (Alternative 3 below), the existing structures would need to be either 1) modified or replaced to accommodate ferry vessels landing within the range of water levels accommodated under Phase 1, or 2) replaced with an adaptable fixed ramp compatible with landing requirements of a double-ended ferry equipped with deployable ramps.
  - It is anticipated that if Alternative 1 is selected, retaining walls on both sides of Daggett Street could be designed to be subsequently extended/raised to accommodate a future increase to the Phase 2 elevation.
- Alternative 1B - Raise Infrastructure to Higher Phase 2 Elevation



- Coordination will be needed with the abutting property owner at 59 N. Water Street to address modifications to its vinyl fence, access gate and retaining wall near the ferry landing, and to accommodate potential future changes (under Phase 2) to Daggett Street's elevation adjacent to the carriage house and downgradient driveway.
- Similar to Alternative 1A, the existing structural elements, hoists, foundations, hinged ramps and other mechanical/electrical systems would be either modified/replaced to

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accommodate the new vertical operating range at the Phase 2 elevation or be removed and replaced with an adaptable landing compatible with a double-ended ferry.

- Also consistent with Alternative 1A, the elevation of timber fenders flanking the approach to the landing will be evaluated to determine the extent to which they would need to be raised to safely guide ferries into the landing under project high tide/flood elevations.

**2. Raise Chappaquiddick Ferry Landing, Parking Area and Portion of Chappaquiddick Road**

- Alternative 2A - Raise Infrastructure to Interim Phase 1 Elevation



- This alternative would entail raising the ferry landing and portion of the paved parking area to the Phase 1 elevation (EL 3.4, NAVD88) would allow an incremental approach to reducing flood risks if funding limitation or permitting concerns are identified.
- Depending on the selected approach under Alternative 3, the existing structural elements, hoists, foundations and other mechanical/electrical systems, which were noted to be in relatively good condition, would either be 1) raised/modified to accommodate the new vertical operating range (from storm/flood to normal low tide) at the Phase 1 elevation or 2) removed and replaced with an adaptable landing compatible with the landing requirements of a double-ended ferry equipped with deployable ramps.
- Similar to Alternative 1A, the elevation of timber fenders flanking the approach to the landing will be evaluated to determine if current elevations are sufficient to safely guide ferries into the landing under project high tide/flood elevations.



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▪ Alternative 2B - Raise Infrastructure to Higher Phase 2 Elevation



- The alternative would entail raising the ferry landing, paved parking area, queuing lane and a portion of Chappaquiddick Road to the Phase 2 elevation (EL 5.8, NAVD88).
- Similar to Alternative 2A, the existing structural ferry ramp infrastructure would be raised to accommodate the new vertical operating range at the Phase 2 elevation or removed and replaced with an adaptable landing compatible with the landing requirements of a double-ended ferry equipped with deployable ramps.
- Also mimicking Alternative 2A, the elevation of timber fenders flanking the approach to the landing will be evaluated to determine if current elevations are sufficient to safely guide ferries into the landing under project high tide/flood elevations.

**3. Modify/Replace Ferry Landing Hoists or Replace Hoists with Double-Ended Ferry**

▪ Alternative 3A - Modify/Replace Ferry Landing Hoist Infrastructure

- Given their age and condition, the existing hoist structure, foundation and mechanical/electrical systems at the Edgartown landing would be replaced to accommodate the vertical operating range of either the Phase 1 or Phase 2 elevation, depending on the selected approach under Alternative 1.



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- The existing hoist structure, foundation and mechanical/electrical systems at the Chappaquiddick landing would be raised to accommodate the vertical operating range of either the Phase 1 or Phase 2 elevation, depending on the selected approach under Alternative 2.
- As noted, the elevation of timber fenders flanking the approach to the landing would be evaluated and modified as appropriate to safely guide ferries into the landing under projected high tide/flood elevations.

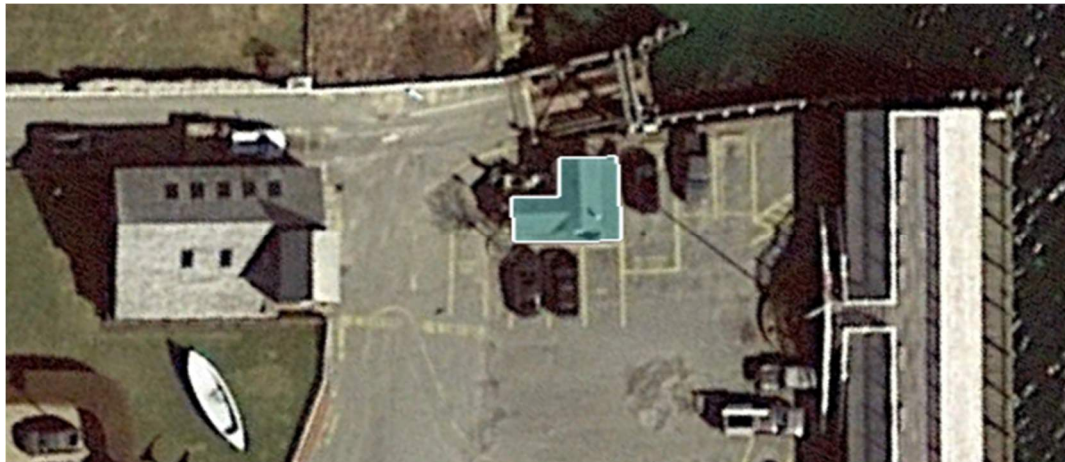


▪ Alternative 3B - Replace Hoist Infrastructure with Ferry Equipped with Deployable Ramps

- The alternative would entail removing existing ferry landing hoist infrastructure at both the Edgartown and Chappaquiddick landings and replacing the existing ferry vessels with double-ended ferries equipped with deployable ramps.
- The configuration of the landings would be designed based on the dimensions and operating characteristics of the replacement ferries (deck height above water, ramp length and range) under the range of tidal conditions under Phase 1.
- The landings would be designed to be adaptable to varying and projected increased tidal elevations within the Phase 1 period. For example, this could be accomplished by incorporating a buoyant landing fixed to adjacent piles with an articulating ramp set to a fixed landing. The landings and piles would be designed to be adapted to future increased tidal/storm conditions associated with the Phase 2 elevation.



**4. Raise Existing Chappy Ferry Operations Building or Construct New Raised Building**



- Alternative 4A – Raise Existing Ferry Operations Building
  - The existing building would be raised to or above the elevation selected for the ferry landing and Memorial Wharf parking area under Alternative 1 (e.g., Phase 1 or 2).
  - Independent of the elevation selected in Alternative 1, the existing foundation, floor decking and supports would likely need to be improved along with utility connections.
- Alternative 4B – Raise and Replace Ferry Operations Building
  - The existing building would be replaced with a new two-story building with public bathrooms and an employee bunkroom at or above the elevation selected for the ferry landing and Memorial Wharf parking area.

**5. Raise and Potentially Move Sculpin Gallery**

For each of the Alternative 5 scenarios, the building will need to be raised and held in place while new concrete foundations, either in existing or new locations, are poured and cured. Additionally, framing joints will likely need to be shored and/or fortified to ensure proper support during movement of the overall structure.





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- Alternative 5A – Raise Building at Existing Location
  - The elevation to which the building is raised will be influenced by the elevation selected for the ferry landing and Memorial Wharf parking area under Alternative 1 (e.g., Phase 1 or 2 elevation). It is noted that the current first floor is at approximately El. 4.6.
- Alternative 5B – Raise and Move Building Southwest
  - Repositioning the building approximately 6-8 feet southwest would allow for widening and potentially a dedicated ferry queuing lane on Daggett Street, which would reduce the likelihood for larger vehicles turning onto Dock Street to continue damaging the Sculpin Gallery building.
  - As the property boundary is immediately adjacent to the footprint of the building, this building relocation would entail a property transaction between the Vineyard Preservation Trust and the Town.
- Alternative 5C – Raise and Move Building Northwest
  - Repositioning the building approximately 6-8 feet northwest would improve safety by providing space for an exclusive pedestrian area in front of the Sculpin Gallery building. It is noted that larger vehicles and vehicles pulling trailers exiting the ferry require a larger turning radius onto Dock Street, coming within feet of the steps to the building's entrance.
  - This alternative could also potentially include repositioning the building away from Daggett Street as described in Alternative 5B.
  - Similar to Alternative 5B, this alternative would entail a property transaction between the Vineyard Preservation Trust and the Town.

### **Proposed Alternatives Evaluation Criteria**

The assessment of alternatives requires thorough evaluation applying multiple criteria reflecting project climate resilience performance goals/requirements, site constraints, public use and safety, stakeholder interests, ecological and natural resource restoration, project costs, project sustainability, and adaptability.

Criteria proposed for evaluation of respective alternatives is listed and briefly described below. The graphical matrix format and alternative scoring/criteria weighting framework that will be used to facilitate collaborative evaluation of alternatives against respective criteria is provided as an attachment to this memorandum. Within this matrix, relative numeric scores will be provided for each alternative/criterion, based on a scale of 1 to 5, with 5 being most advantageous and 1 being most disadvantageous in comparison to other alternatives.

This matrix is intended as a decision-making tool to facilitate aggregation of multiple layers of information within a single concise document, thus providing a clearly transparent means to communicate the results of a collaborative evaluation process. Its value is to provide a concise platform



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reflecting informed consideration of multiple, and sometimes conflicting, considerations presenting challenges to implementing the project with the consensus and support of interested and affected parties.

Initial scorings and criteria weightings (developed with a companion matrix reflecting equal weightings for comparison) resulting from F&O's preliminary evaluations will be provided and reviewed with the Town and stakeholders in a project review workshop. Through this workshop (and potentially refined evaluations and a follow-up workshop), sensitivity analyses can be performed to evaluate potential alterations of scorings/weightings to evaluate durability of relative rankings resulting from various changes.

- Site Compatibility and Natural Resource Criteria
  - Avoid/Minimize Impacts to Abutting Properties and Costs to Address Impacts
  - Minimize Environmental Impacts and Permitting/Regulatory/Code Compliance Barriers
  - Maximize Public Safety and Accessibility
- Construction Phase Criteria
  - Minimize Construction Cost
  - Maximize Ability to Secure Construction Phase Funding from Public Grant Sources
  - Minimize Construction Duration and Associated Temporary Impacts
- Long-Term Operation and Maintenance Criteria
  - Maximize Resilience (ability to recover from a storm/flood event) and Adaptability (ability to readily modify project element to meet changes to anticipated future conditions) to Climate Change
  - Minimize Protected Infrastructure's Vulnerability to Damage (ability to prevent/minimize impacts to protected infrastructure) from Climate Change Conditions
  - Minimize Operation/Maintenance, Repair and Future Replacement Costs