CHAPPY FERRY

CLIMATE CHANGE RESILIENCE ALTERNATIVES ASSESSMENT

EDGARTOWN, MA

PRELIMINARY – JULY 15, 2024

FUSS & O'NEILL

EDGARTOWN
RESILIENT CHAPPY

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WOODS HOLE GROUP
A CLS COMPANY

FUSS & O'NEILL

PROJECT TEAM & PARTNERS

EDGARTOWN
RESILIENT CHAPPY

STAKEHOLDERS

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Rick Schifter, Chair

CHAPPY FERRY OWNER/OPERATOR

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PRELIMINARY

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1. PROJECT OVERVIEW

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PRELIMINARY

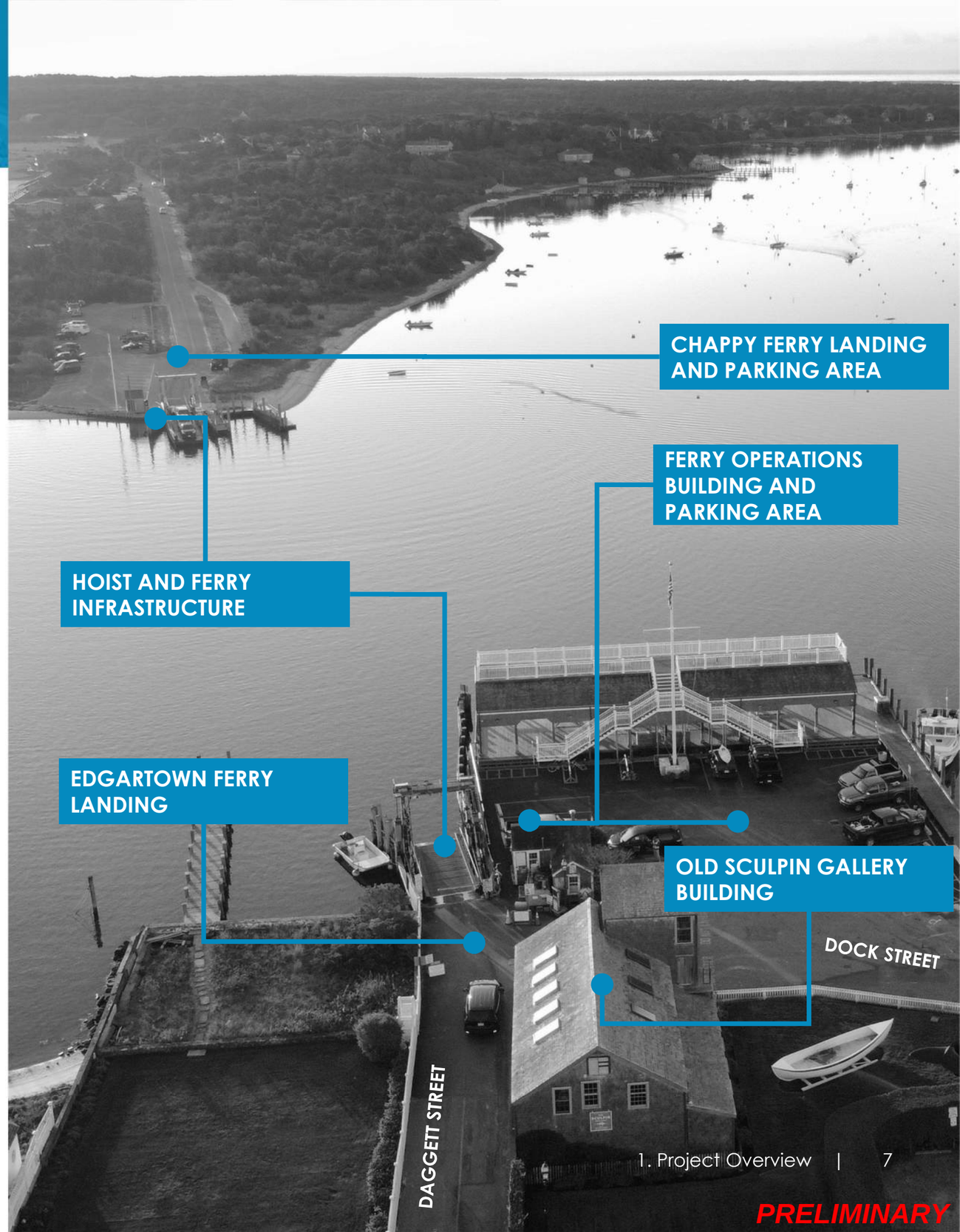
ABOUT THE PROJECT

The Edgartown harbor area experiences frequent coastal flooding, putting much of the Town's harbor area at risk. In 2021, the Edgartown Climate Change Vulnerability Assessment and Adaptation Plan (CCVAAP) identified the Chappaquiddick Ferry and its associated facilities as being particularly vulnerable to high tide flooding and coastal storms (Woods Hole Group, 2021). Storms, like the December 23, 2022 storm that occurred during this project process, have resulted in widespread flooding in the area causing disruption to ferry service (see Figure 1). The Chappy Ferry Climate Change Resilience Report builds off the CCVAAP by collecting additional information and conducting assessments to identify preferred resilience alternatives and design concepts.

This Chappy Ferry Climate Change Resilience Report was developed to provide a rigorous alternatives analysis for improving the long-term connectivity between downtown Edgartown and Chappaquiddick Island. The report was formed beginning with a site assessment and review of existing conditions (Section 2) and was followed by a thorough alternatives evaluation (Section 3). A potential permitting and regulatory pathway for the proposed project was provided in Section 3.

Stakeholder and community engagement were central to guiding the development of the report, as stakeholder feedback and priorities were incorporated into each stage of the process.

Figure 1: Edgartown ferry landing during the March 2, 2018 storm (left photo, courtesy of Barry Stringfellow, the MV Times). Memorial Wharf during the December 23, 2022 storm (right photo, courtesy of Richard Knight, the Vineyard Gazette).



PROJECT APPROACH

The project process (see Figure 2) began in September 2022 with a project kick-off meeting, where project team members and stakeholders met to learn about the project, discuss the project schedule and approach, and to solicit initial feedback from stakeholders on anticipated alternatives and adaptations.

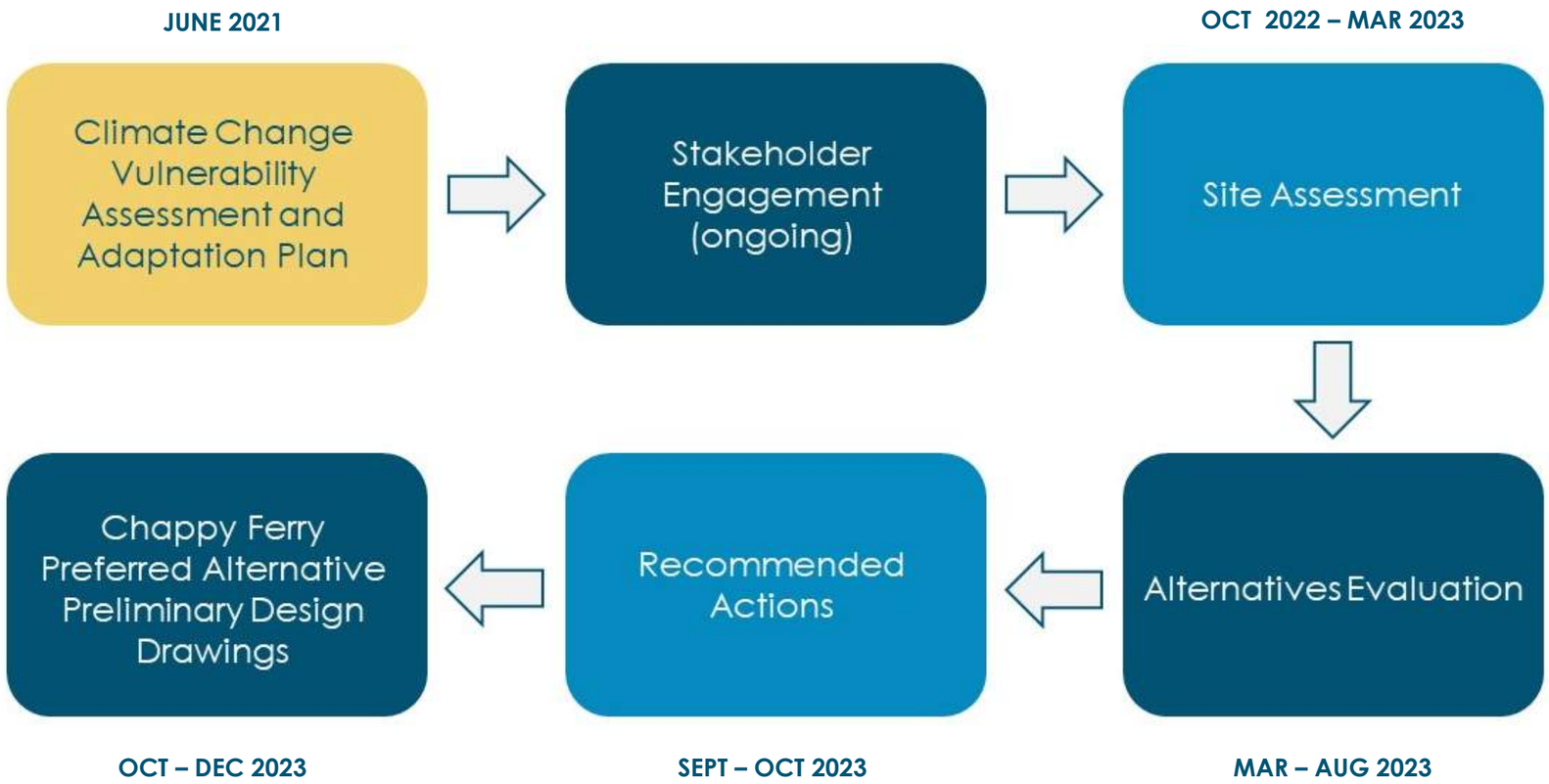
PHASE 1: SITE ASSESSMENT
Site specific data was collected to better understand regulatory and engineering limitations to potential improvements to coastal flood resilience. Data collection included:

- Critical elevations and existing conditions of Dock and Daggett Streets, abutting buildings (including their foundations, utilities, first-floors and property boundaries), other low points at the two ferry landings and parking areas, and associated drainage infrastructure
- Maps, plans, and information from past studies on the existing conditions of the ferry landings and private and public utilities
- Information about cultural and historic resources

PHASE 2: ALTERNATIVES EVALUATION
Conceptual alternatives identified in the CCVAAP were evaluated and further refined by conducting an exhaustive engineering study and incorporating findings from the site assessment detailed in Section 2. In addition to developing alternatives to maximize coastal flood resilience of the project area, the assessment included a look at potential permitting and regulatory pathways. A thorough analysis of grant funding opportunities was not provided in this report. However, it is worth noting that grant funding is available to support the proposed alternatives. Grant funding is competitive, and eligibility differs with each grant.

PHASE 3: RECOMMENDED ACTIONS & PRELIMINARY DRAWINGS
Following the alternatives evaluation, the project team will determine a preferred alternative to maximize resilience of the project area and develop preliminary design drawings based on the results of the site assessment, alternatives evaluation, and feedback received from stakeholders. A Continuity of Operations Plan for the ferry will be determined by the Town based on the provided construction sequence and traffic control plan.

Figure 2: Approach and timeline for report development



PROJECT BACKGROUND

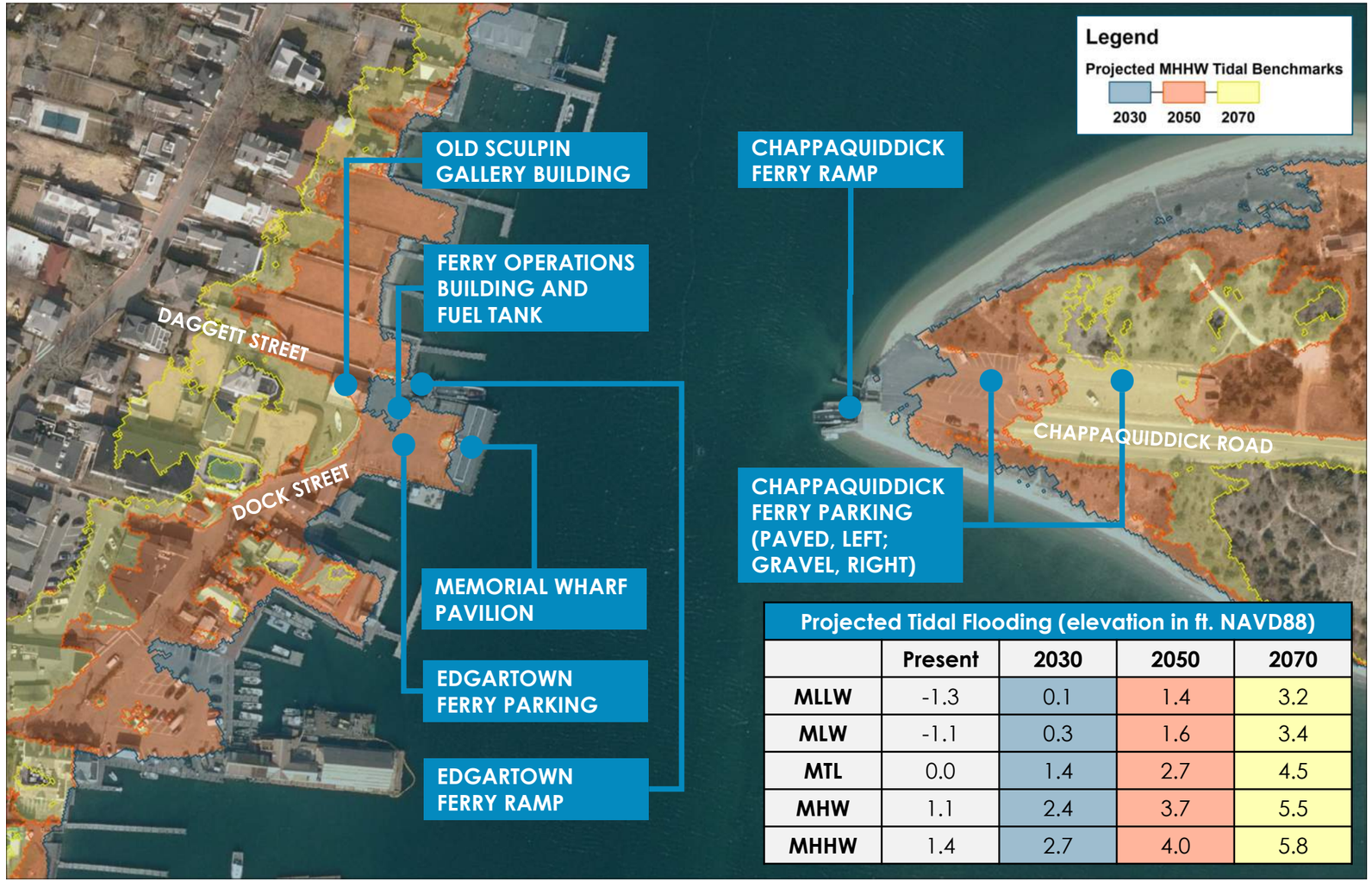
Woods Hole Group published the Edgartown Climate Change Vulnerability Assessment and Adaptation Plan (CCVAAP) in June 2021. Focusing on Edgartown's municipal, commercial, and residential assets along the harbor's waterfront, the CCVAAP identified areas that are vulnerable to anticipated sea level rise (SLR), including the Chappaquiddick Ferry and its associated facilities and adjacent streets. Associated structures, facilities and transportation infrastructure include:

- Edgartown and Chappaquiddick ferry ramps
- Edgartown and Chappaquiddick ferry ramp mechanical control equipment
- The ferry operations building
- The ferry fuel tank
- The ferry electrical panel
- The Memorial Wharf pavilion
- The ferry parking lots (paved and unpaved)
- Dock Street
- Daggett Street
- Chappaquiddick Road

Utilizing the Massachusetts Coast Flood Risk Model (MC-FRM) and ResilientMA probabilistic SLR projections, the CCVAAP indicated the project study area is likely to experience tidal flooding on a more regular basis as early as 2030. The CCVAAP identified the projected elevations for mean lower low water (MLLW), mean low water (MLW), mean tide level (MTL), mean high water (MHW), and mean higher high water (MHHW) for present day, 2030, 2050, and 2070 (see Figure 3).

The range of projected tidal flooding elevations must be accommodated through any modifications or adaptations to the ferry landings and associated facilities. Consideration of the change of ranges of tidal and storm surge elevations was recognized as being crucial in evaluating respective alternatives described in Section 3.

See Appendix A for the full CCVAAP.



Projected Tidal Flooding (elevation in ft. NAVD88)

	Present	2030	2050	2070
MLLW	-1.3	0.1	1.4	3.2
MLW	-1.1	0.3	1.6	3.4
MTL	0.0	1.4	2.7	4.5
MHW	1.1	2.4	3.7	5.5
MHHW	1.4	2.7	4.0	5.8

Figure 3: Projected tidal flooding for Edgartown Harbor (Woods Hole Group, 2021).

PROJECT BACKGROUND

The mean higher high water (MHHW) is a useful vertical elevation reference that corresponds to the average of all daily higher high tides that occur throughout a 19-year tidal epoch – a period long enough to account for lunar and solar variability.

Figure 4 shows the critical elevations of existing Chappy Ferry facilities compared to present day and projected MHHW tidal flood elevations.

- As early as 2030, both the Edgartown and Chappaquiddick ferry ramps are likely to be inundated regularly by tidal flooding.
- As early as 2050, critical ferry infrastructure (e.g., the fuel tank and ferry mechanical control equipment) may be partially inundated regularly.
- By 2070, regular tidal flooding may fully inundate critical ferry facilities.

Figure 3: Projected tidal flooding for Edgartown Harbor (Woods Hole Group, 2021).

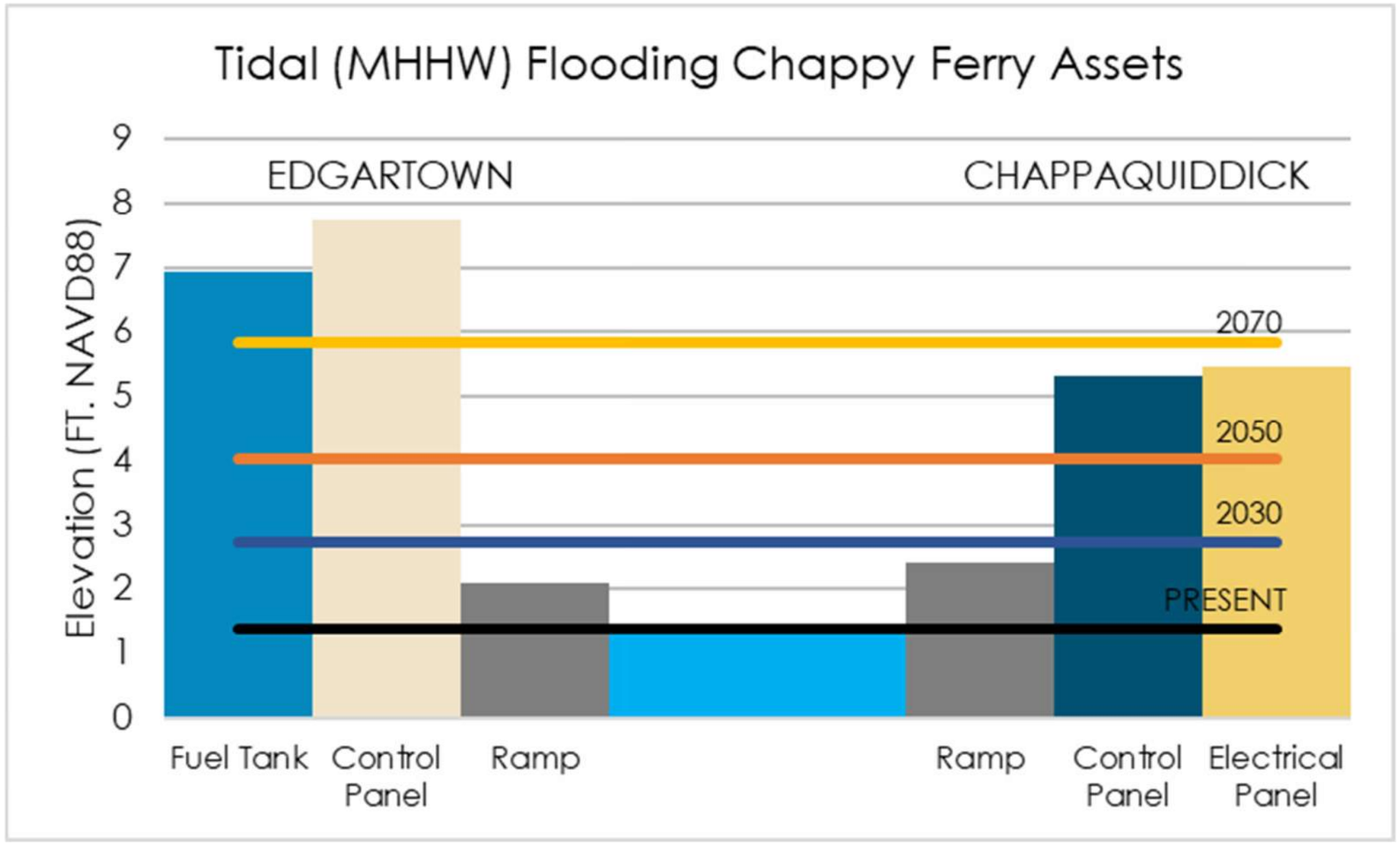


Figure 4: Projected tidal flooding compared to the existing critical elevations of Chappy Ferry assets (Woods Hole Group, 2021).

ABOUT CRITICAL ELEVATIONS
Critical elevations are defined as the elevation at which flood water will cause the asset to cease to function as intended or sustain significant damage (Woods Hole Group, 2021).

STAKEHOLDER ENGAGEMENT

As was noted earlier, stakeholder and community engagement were central to guiding the development of the report.

A project kickoff meeting was held in September 2022 with Town staff and stakeholders. Attendees offered preliminary feedback on the anticipated alternatives and adaptations.

During an October 2022 site visit, project team members interviewed stakeholders to understand their concerns about the Chappy Ferry and its associated facilities. Project team members gained insight on the history of the area and learned about potential plans for the Chappy Ferry and nearby structures. Those interviewed included:

- Louise O'Brien, Vineyard Preservation Trust (VPT) Director
- Other Members of the VPT
- Sharon McCann Daly, Old Sculpin Gallery Director
- Peter Wells, owner/operator of the Chappy Ferry

Project team members attended two public Chappaquiddick Ferry Steering Committee (CSC) meetings during key milestones throughout the project process. In December 2022, project team members presented an overview of the project, anticipated goals and timeline, and solicited initial feedback. In April 2023, project team members presented the site assessment findings, reviewed preliminary alternatives, and solicited additional feedback.

Another public meeting was held in April 2023 where the project team received additional feedback on the findings of the site assessment and preliminary alternatives. Over 80 community members and stakeholders attended the public meeting (see Figure 5). Public comment received during the meeting directly contributed to the alternatives developed and evaluated in Section 3.

EDGARTOWN
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Engagement Activities	
Project Kickoff Meeting	September 2022
Site Visit and Interviews	October 2022
Chappaquiddick Ferry Steering Committee Meeting	December 2022
Chappaquiddick Ferry Steering Committee Meeting	April 2023
Public Meeting	April 2023

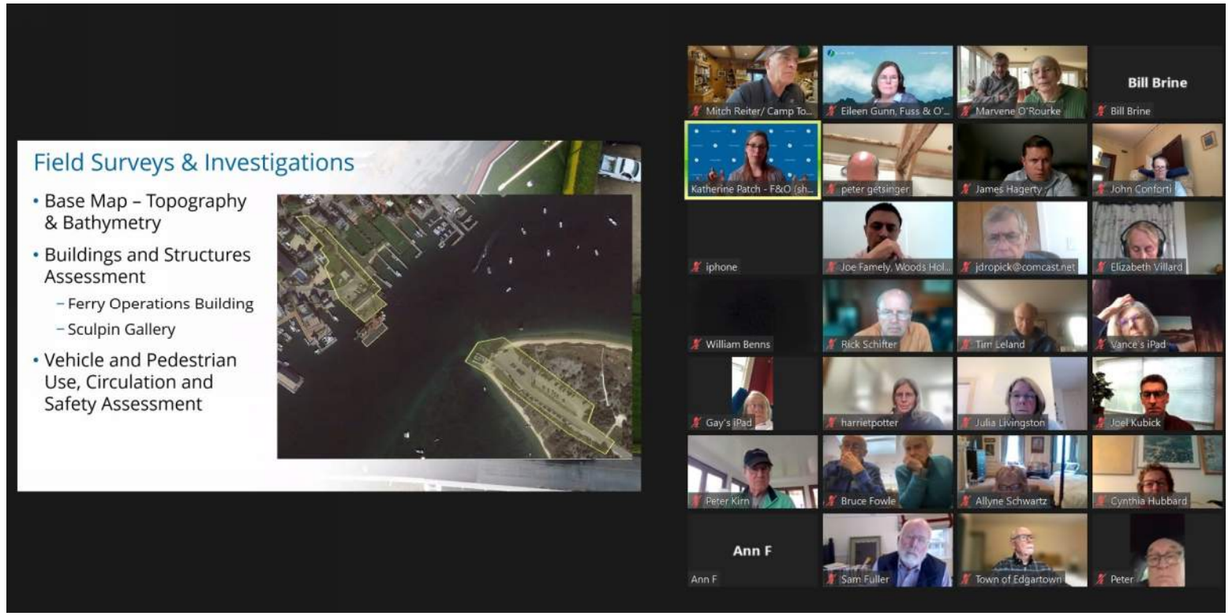


Figure 5: Table of engagement activities held throughout the project process (above). Screen capture of the virtual public meeting held in April 2023 (below).

2. FERRY INFRASTRUCTURE AND SITE ASSESSMENTS

Site and Infrastructure Assessments
Vehicle and Pedestrian Movements
Old Sculpin Gallery Building
Cultural Resource Assessment

PRELIMINARY

SITE SURVEY

Project area elevations identified in the CCVAAP were determined by reviewing existing documentation (e.g., as-built plans and FEMA Elevation Certificates), and conducting site visits to document elevations by survey and field measurement.

On October 12th and 25th, 2022, the project team conducted a topographic and bathymetric survey of the project area, providing precise elevations of critical points. The survey located and mapped site elevations and locations of existing site features such as buildings, edges of pavement, curb lines, docks, boardwalks, utility structures, ferry landing equipment, and fences. Bathymetric survey results found the underground terrain elevations before each of the ferry transfer ramps ranged from -5.9 to -11.5 ft (NAVD88).

Determining the elevations of critical ferry landing infrastructure and other nearby assets and facilities was key to developing and evaluating alternatives for respective project elements.

PROJECT AREAS SURVEYED BY WOODS HOLE GROUP

SITE INFRASTRUCTURE ASSESSMENTS

The project team examined the conditions of existing structures, utilities, and mechanical support operations at the Edgartown ferry landing and found that while the components are currently operational, many are nearing the end of their expected service life and would likely need to be repaired or replaced in the near future.

The project team conducted surveys of underground utilities using a radio detection line locator and ground penetrating radar (GPR) (see Figure 6). Electric, communication, water, storm sewer, sanitary sewer, and numerous pipe-style anomalies indicating potential unknown utilities were detected. Some underground utilities services were improved during the recent Memorial Wharf Waterfront Rehabilitation project; however, other utilities may require future modifications or replacement. See Appendix B for the full utility survey.

The ferry landing structure includes the ferry loading ramp, an overhead steel frame that supports the ramp, timber piers, and concrete abutments (see Figure 7). The components of the landing structure vary in age and condition but show signs of deterioration, including rust and settled foundation. The ferry landing uses a hydraulic system utilizing counter-weight assemblies to raise and lower the loading ramp to meet the varying elevation of the ferry's deck (depending on tidal conditions). The loading ramp and hydraulic system were recently replaced; however, the new construction will be inadequate to service a reconfigured ramp that can function over the range of existing low tides and projected high tide conditions.

The ferry operations building is a timber framed structure supported directly on the surrounding paved surface. While in fair condition, the building is susceptible to frequent flooding, as was evidenced inside the structure. The building's mechanical, electrical, plumbing, and fire protection systems were also assessed (see Figure 7). Except for the fuel storage tank, all the building's systems do not appear to meet current code requirements and would need to be replaced, modified, or relocated in the event of a major renovation.

See Appendix B for more details on the Edgartown ferry landing structures and utilities.

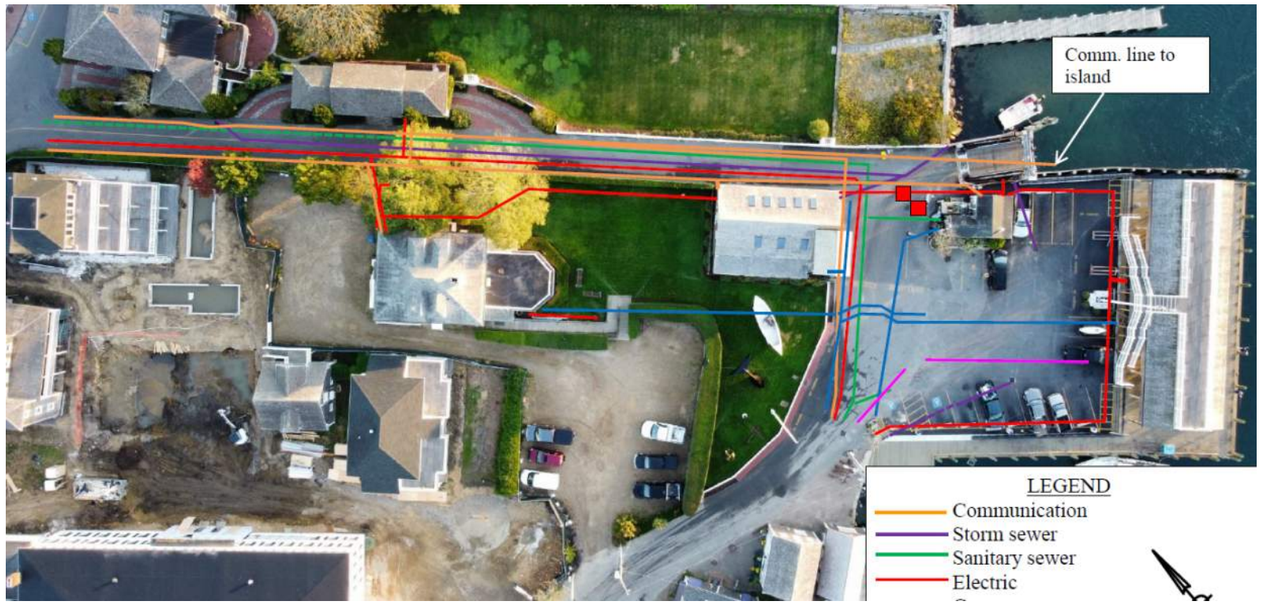


Figure 6: Screen capture of utility survey mapping at the Edgartown ferry landing.

Figure 7: Edgartown ferry landing operations building electrical meter (left), ferry landing structure (center), and the operations building lavatory and water closet (right).

FERRY LANDING ASSESSMENTS

Operation systems at the Chappaquiddick ferry landing were found to be in fair to good condition.

The Edgartown and Chappaquiddick ferry landing sites differ in their system operations. To raise and lower the ferry ramp, the Chappaquiddick ferry landing uses a new, more efficient hydraulic pulley system requiring less power than the counter-weight system used on the Edgartown landing. The ramp also has a new, overhead structure supporting an older ramp deck and frame. The only building on the Chappaquiddick ferry landing site is a small shelter serving as an area of refuge for commuters and a gas-fired back-up generator. The ferry landing's electrical service has been modified; however, should there be a significant increase in elevation to the dock landing and/or ramp assembly, the system may need to be updated to meet future requirements.

Unlike the Edgartown ferry landing site, the Chappaquiddick side is unimpeded by adjacent properties or structures, which allows easier access for modifications and repairs.

AERIAL IMAGE OF THE CHAPPAQUIDDICK FERRY LANDING. IMAGE BY TPI ENVIRONMENTAL, INC. OCTOBER 2022.

VEHICLE AND PEDESTRIAN MOVEMENTS

The Chappy Ferry carries vehicles, pedestrians, and bicyclists between Chappaquiddick and Edgartown (see Figure 8).

EDGARTOWN FERRY LANDING

The general public and smaller commercial vehicles queue on Daggett Street to drive straight onto the ferry, while priority vehicles line up along Dock Street in front of the Old Sculpin Gallery building. Priority vehicles include emergency vehicles, mail trucks, and construction vehicles (e.g., cement trucks). Vehicles disembarking the ferry on the Edgartown landing side turn immediately left onto Dock Street. This left-turn maneuver requires larger vehicles to encroach upon pedestrian areas in front of the Old Sculpin Gallery building. This space is largely shared between vehicles and pedestrians, with very little dedicated space for travelers outside of vehicles.

CHAPPAQUIDDICK LANDING

A long, approximately 400-ft paved, one-way lane on the south side of Chappaquiddick Road is where the general public queues for the ferry. A grassy median separates the queue lane from Chappaquiddick Road. Like the Edgartown landing, priority vehicles have a designated location to queue separate from the general public. Priority vehicles line up between the parking area and the ferry landing. Vehicles disembarking the ferry on the Chappaquiddick landing side drive straight onto Chappaquiddick Road.

A small amount of dedicated space for pedestrians and close interactions between vehicles and pedestrians contributes to safety hazards in the immediate area. Pedestrian traffic in the area significantly increases during the warmer summer months; therefore, improvements to safety hazards associated with vehicle and pedestrian interactions was critical in developing the alternatives.

Figure 8: Bicyclist queuing on the Edgartown landing (top). A priority vehicle queuing on the Chappaquiddick landing while a public vehicle disembarks (center). Public vehicles queuing on Daggett Street (bottom).

OLD SCULPIN GALLERY BUILDING

The Old Sculpin Gallery building was built in 1890 and previously housed a boat building shop owned by Manuel Swartz Roberts (MACRIS, 2023). The building was designated a historic structure within a National Register District in 1983 and within a Local Historic District in 1987. The building was originally located closer to the water and was relocated to its current location (Vineyard Preservation Trust, 2022).

The building is a timber-framed structure supported on stacked granite blocks. While generally in fair condition, the building shows evidence of prior water damage along its base and portions of the building appear to have settled at some point in the past (see Figures 9 and 10).

Figure 9: Old Sculpin Gallery building foundation and recent repair after a collision with a vehicle turning from Daggett Street to Dock Street. October 2022.

Figure 10: Old Sculpin Gallery building. May 2022.

CULTURAL RESOURCE ASSESSMENT

A cultural resource assessment was conducted by Public Archaeology Laboratory, Inc. (PAL) to provide the project team with information about known aboveground historic resources and archaeological sites that may be affected by the proposed alternatives.

PAL used the GIS-based Massachusetts Cultural Resources Information System (MACRIS) to identify previously recorded aboveground historic resources and archaeological sites and reviewed previous cultural resource management (CRM) investigations within or near the project area.

A total of 320 cultural resources were identified, including 310 aboveground resources and 10 archaeological sites (see Figure 11). Aboveground resources included historic, mostly wood-frame houses built during the 19th and early 20th centuries, including the Old Sculpin Gallery building. Archaeological resources included seven pre-contact Native American sites and three post-contact. Three of the pre-contact sites directly abut the project area.

Based on the results of the assessment, the project team should consult with the Massachusetts Historical Commission (MHC) to better understand the impacts of the project.

See Appendix B for the full Cultural Resource Assessment.

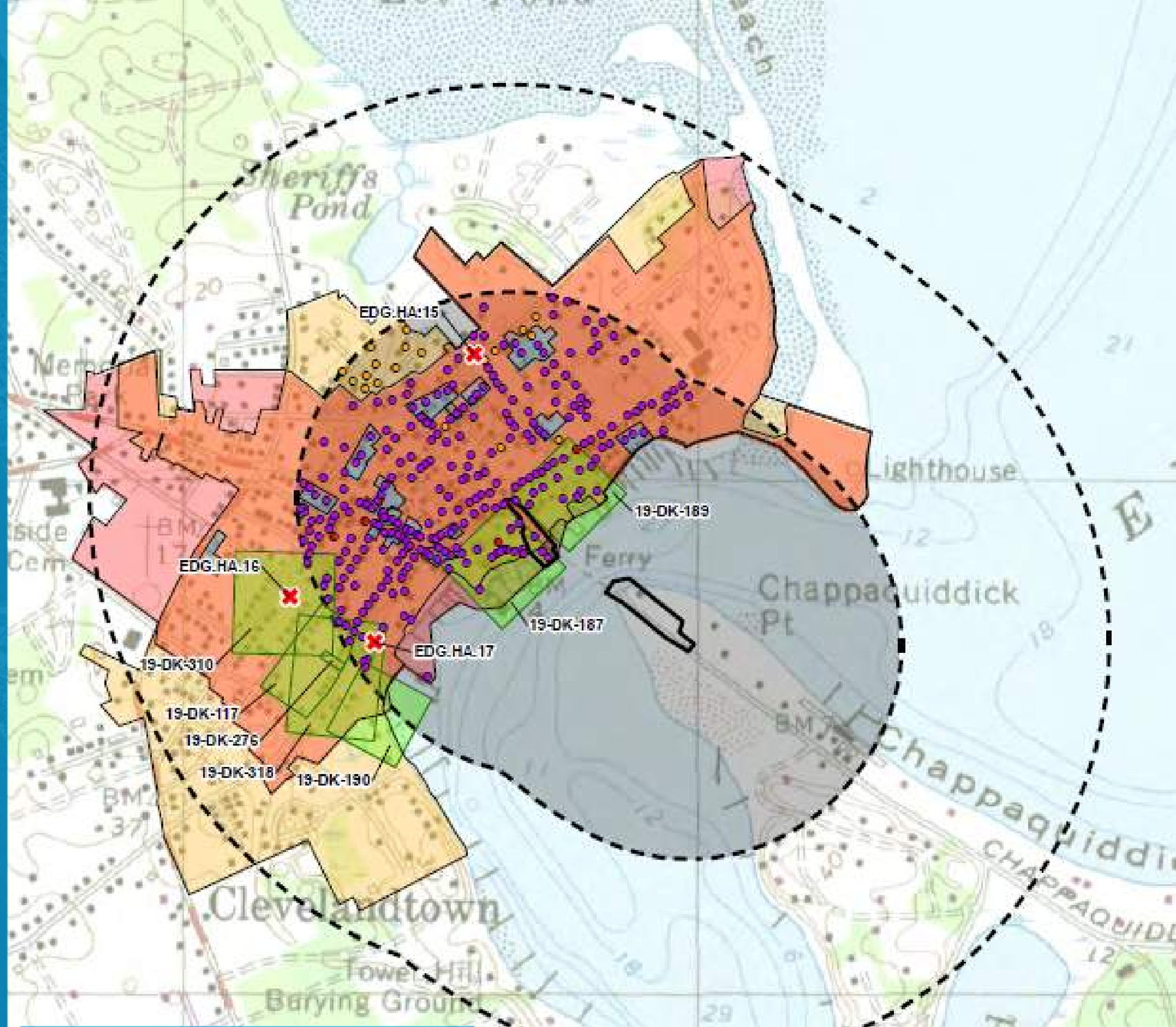


Figure 11: Map of recorded archaeological sites within a half-mile and aboveground historic resources within a quarter-mile of the project area.

3. RESILIENCE ALTERNATIVES

Development of Alternatives
Evaluation Criteria
Edgartown Ferry Landing Alternatives
Chappaquiddick Ferry Landing Alternatives
Ferry Landing Hoists and Vessels Alternatives
Ferry Vessel Power Source Alternatives
Ferry Operations Building Alternatives
Old Sculpin Gallery Building Alternatives
Recommendations
Regulatory Requirements

PRELIMINARY

DEVELOPMENT OF ALTERNATIVES

Alternatives were identified and developed based on preliminary data collected during the site assessment, Town and community feedback, and knowledge from previous project experience. These alternatives, detailed in the following section, have been determined for the five major assets of the project area that are, or will be, subject to increasing sea level conditions.

1. Edgartown Ferry Landing
2. Chappaquiddick Ferry Landing
3. Ferry Landing Hoists and Vessels
4. Ferry Vessel Power Source
5. Ferry Operations Building
6. Old Sculpin Gallery Building

These assets were selected based on their importance to resident and emergency vehicle access, ferry operations performance, and the overall flow of vehicles and pedestrians in the immediate vicinity of the ferry landings. Changes to one asset will likely impact another, therefore each alternative was evaluated in relation to the others.

FLOODING AT THE EDGARTOWN FERRY RAMP. MARCH 2018.
PHOTO COURTSEY OF THE CHAPPY FERRY FACEBOOK PAGE.

EDGARTOWN AND CHAPPAQUIDDICK FERRY LANDINGS.
NOVEMBER 2022.

EVALUATION CRITERIA

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

In evaluating these alternatives, the following criteria was used to determine the most advantageous elements to incorporate for subsequent design, permitting and implementation:

- **Site Compatibility and Natural Resource Criteria**
  - Avoid or minimize impacts to abutting properties and costs to address impacts
  - Minimize environmental impacts and permitting, regulatory, or 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 and adaptability to climate change (*the ability to recover from a storm or flood event, and the ability to readily modify project elements to meet changes to anticipated future conditions*)
  - Minimize protected infrastructure's vulnerability to damage from climate change conditions (*the ability to prevent or minimize impacts to protected infrastructure*)
  - Minimize operation and maintenance, repair, and future replacement costs

Criteria weighting was used to quantitatively compare the alternatives. Each alternative was rated between 1 and 5 based on that alternative's ability to meet the criteria listed above (1=least, 5=most). Weightings are used since some criteria are more important to consider than others. The evaluation scores and weightings are subject to change based on ongoing review with the Town and stakeholders.

See Appendix C for the full Evaluation Criteria and Scoring Matrix.

EDGARTOWN FERRY LANDING: ALTERNATIVES 1A AND 1B

Alternative 1A raises the Edgartown ferry landing infrastructure approximately 1.55 feet (maximum) above the existing elevation to an elevation of 3.85 feet (NAVD88). Alternative 1B raises the landing infrastructure approximately 3.5 feet (maximum) above the existing elevation to an elevation of 5.8 feet (NAVD88). These elevations were developed from recommendations in the CCVAAP as intermediate (1A) and long-term (1B) solutions to protect the ferry landing infrastructure from projected tidal elevations and SLR. This would include raising the ferry landing hoists, parking areas, drainage structures, and utility access gates.

FERRY LANDING

Dependent upon changes to the ferry landing hoist infrastructure or vessel, two options are being presented: Option one would raise the gantry system and elongate the ferry ramp through modification or replacement. Option two would replace the existing ramp with an adaptable fixed ramp compatible with landing requirements of a double-ended ferry equipped with deployable ramps. The elevation of timber fenders flanking the approach to the landing would need to be evaluated to determine the extent to which they are raised.

DOCK STREET AND MEMORIAL WHARF

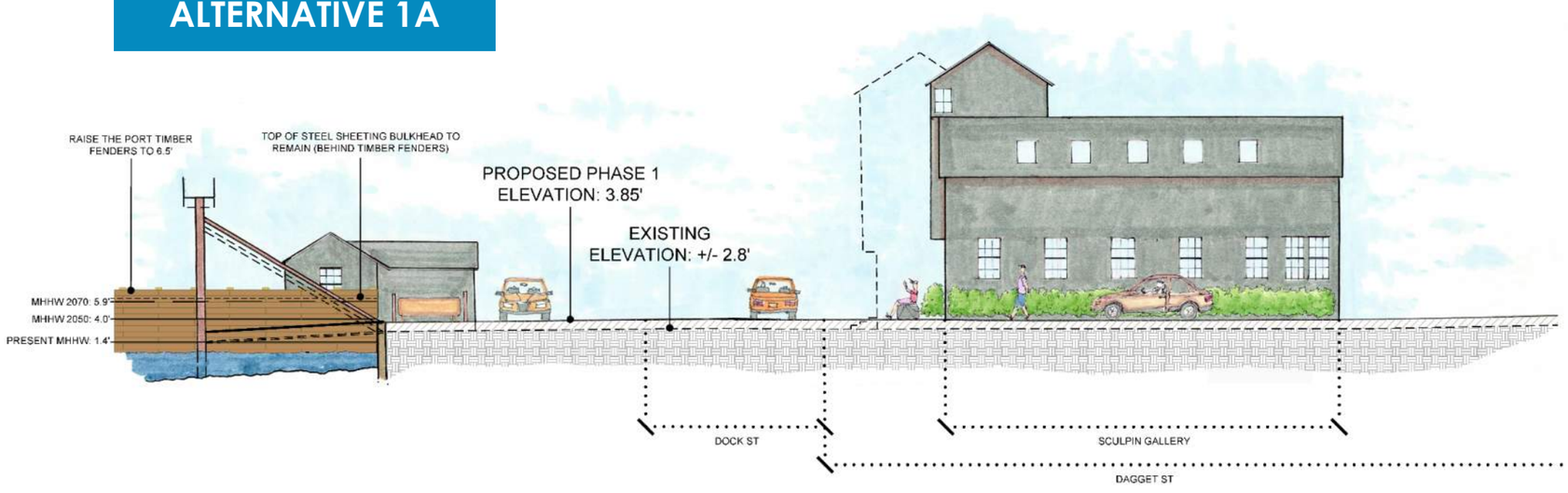
Currently, the perimeter of the parking area is lined with steel sheeting that prevents vehicles from driving into the harbor. For any increase in the parking lot's elevation, additional vehicle guards would be needed. The Old Sculpin Gallery has an entrance directly into the parking lot on Dock Street. Raised pavement at this entrance would benefit the Gallery in terms of accessibility by eliminating the steps required to enter.

DAGGETT STREET

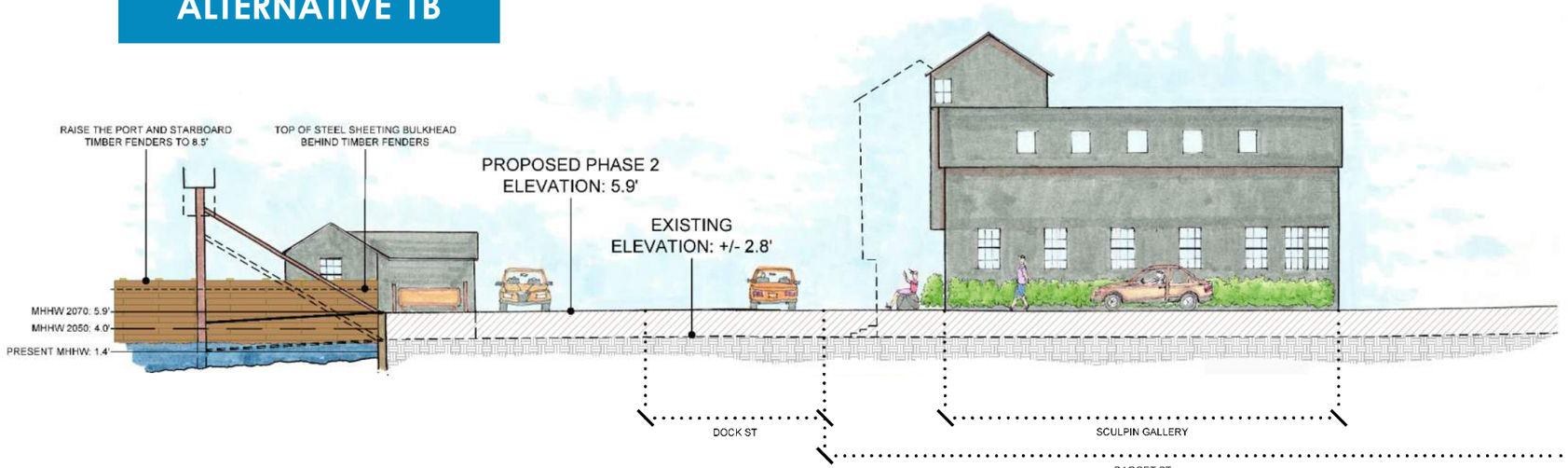
Raising Daggett Street to accommodate the increased elevation of the landing site will require increasing the height of the existing retaining wall and providing an additional retaining structure along the south side of Daggett Street. Alternative 1B will require coordination with the abutting property owner at 59 N Water Street to address modifications to the carriage house, driveway, fence, access gate, and retaining wall.

EDGARTOWN FERRY LANDING CROSS SECTION

ALTERNATIVE 1A



ALTERNATIVE 1B



These views of the Edgartown Ferry Landing show the elevations associated with Alternatives 1A (~3.85 ft) and 1B (~5.8 ft) from the perspective of a person looking to the southwest toward Dock Street.

In these views, potential adaptations associated with the ferry landing hoist structure, ferry operations building and Old Sculpin Gallery building, described further below as Alternatives 3A/3B, 5A/5B and 6A/6B, respectively, are also depicted showing these structures being raised (and relocated in the case of the Old Sculpin Gallery building) in conjunction with the increased ground elevation.

A significant consideration between Alternatives 1A and 1B is the proximity of adjacent properties and structures that would remain unchanged and how the higher ground elevations within the project area would "tie-into" those adjacent areas. For example, the residential property east of Daggett Street has a short retaining wall, privacy fence and pedestrian gate near the landing that would need to be modified. In addition, there is a driveway and carriage house on this property near the mid-point of Daggett Street (off and to the right of the adjacent views). While the elevation associated with Alternative 1A would not require modifications to maintain access to that private driveway and carriage house, modifications would be required for Alternative 1B.

0 4' 8' 16'
GRAPHIC SCALE
1/8" = 1'

PRELIMINARY

EDGARTOWN FERRY LANDING ALTERNATIVES EVALUATION

Resiliency Alternative		Site Compatibility/Natural Resources Criteria			Construction Phase Criteria			Long-Term Operation and Maintenance Criteria			OVERALL SCORE
		Avoid/Minimize Impacts to Abutting Properties/ Structures and Costs to Address Impacts	Minimize Environmental Impacts and Permitting/ Regulatory/ Code Compliance Barriers	Maximize Public Safety and Accessibility	Minimize Construction Cost	Maximize Ability to Secure Public Grant Funding	Minimize Construction Duration and Associated Temporary Impacts	Maximize Resilience and Adaptability to Climate Change	Minimize Protected Infrastructure's Vulnerability to Damage from Climate Change Conditions	Minimize Operation/ Maintenance, Repair and Future Replacement Costs	
Criteria Weighting		5	3	5	4	5	3	4	5	3	
Edgartown Ferry Landing Alternatives	**Alternative 1A** - Raise Ferry Landing to Intermediate "Phase 1" Elevation	4	4	3	4	4	3	3	3	3	**3.46**
	Alternative 1B - Raise Ferry Landing to Higher "Phase 2" Elevation	2	3	4	2	4	2	4	5	4	**3.41**

**Evaluation criteria scores and weightings are subject to adjustment based on ongoing review with the Town and project stakeholders.*

While Alternative 1B provides a higher level of protection for a longer time horizon, higher costs and greater impacts to adjacent properties (with the associated mitigations needed) offset these benefits.

It is noted in particular that Alternative 1A avoids the need for modifications to the abutting private residence's driveway and carriage house, and also can be accommodated with the existing elevation of steel bulkhead structures recently installed around the perimeter of Memorial Wharf. Alternative 1B would require modifications to the abutting property and the elevation of the steel bulkhead structures to be increased.

As a result, Alternative 1A is recommended for implementation.

CHAPPAQUIDDICK FERRY LANDING: ALTERNATIVES 2A AND 2B

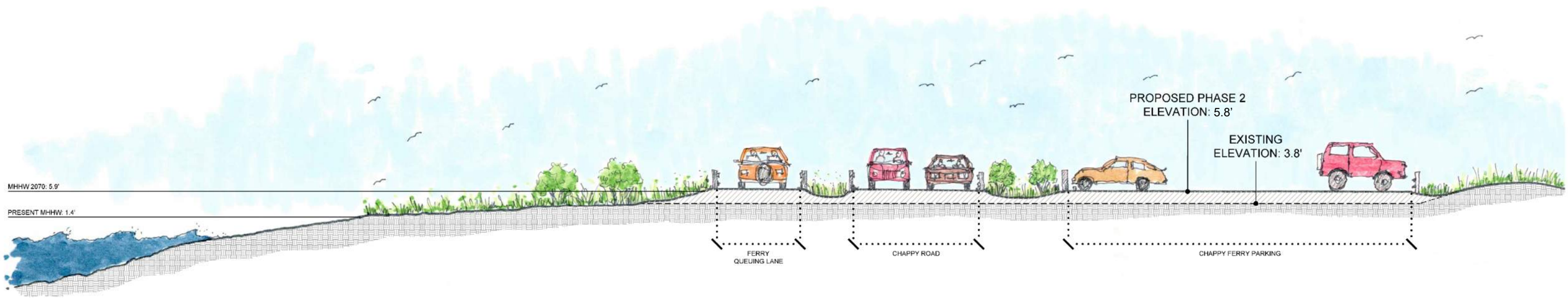
Alternative 2A raises the Chappaquiddick ferry landing infrastructure and a portion of the paved parking and queuing area to an elevation of approximately 3.85 feet (NAVD88). Alternative 2B raises the Chappaquiddick ferry landing infrastructure and a portion of the paved parking and queuing area to an elevation of approximately 5.8 feet (NAVD88). This would include raising the ferry landing hoist equipment and the shelter. The Alternative 2A elevation would be the basis for grading throughout the project extents and allow an incremental approach to reducing flood risks if funding limitation or permitting concerns are identified.

FERRY LANDING
Dependent upon changes to the ferry landing hoist infrastructure, two options are being presented. Option one would raise or modify the existing infrastructure to accommodate the new vertical operating range at the raised elevation. Option two would replace the existing ramp with an adaptable fixed ramp compatible with landing requirements of a double-ended ferry equipped with deployable ramps. The elevation of timber fenders flanking the approach to the landing would need to be evaluated to determine the extent to which they are raised.

ADJACENT RESOURCES
The parking and queuing area, and the ferry shelter would be raised to the proposed elevation of 3.85 feet NAVD88 (2A) or 5.8 feet NAVD88 (2B) and sloped back to match the existing elevation away from the ferry landing. Alternative 2B includes a larger portion of Chappaquiddick Road to accommodate the proposed elevation change. Either alternative would involve adjusting utilities in the vicinity and addressing any environmental factors including the sandy slope from the ocean to the parking lot.

Under either alternative, living shoreline or vegetative stabilization practices would be incorporated into the perimeter of the raised road and parking area to protect the transition to the bordering wetlands and beach.

CHAPPAQUIDDICK FERRY LANDING CROSS SECTION



This view of the Chappaquiddick Ferry Landing cross section shows the elevation associated with Alternative 1B (~5.8 ft) from the perspective of a person looking to the northwest towards the landing and Edgartown.

In this view, the raised elevation of vehicle traffic lanes and the adjacent parking area are shown with transitions to adjacent unchanged ground areas provided by gentle slopes that would be stabilized with biodegradable erosion control blankets and replanted with native coastal grass and shrub vegetation.

Stormwater management improvements would also be evaluated and incorporated where possible (e.g., vegetated infiltration basins between Chappy Road and the ferry queuing lane and parking area, respectively.

0 4' 8' 16'
GRAPHIC SCALE
1/8" = 1'

CHAPPAQUIDDICK FERRY LANDING ALTERNATIVES EVALUATION

Resiliency Alternative		Site Compatibility/Natural Resources Criteria			Construction Phase Criteria			Long-Term Operation and Maintenance Criteria			OVERALL SCORE
		Avoid/Minimize Impacts to Abutting Properties/ Structures and Costs to Address Impacts	Minimize Environmental Impacts and Permitting/ Regulatory/ Code Compliance Barriers	Maximize Public Safety and Accessibility	Minimize Construction Cost	Maximize Ability to Secure Public Grant Funding	Minimize Construction Duration and Associated Temporary Impacts	Maximize Resilience and Adaptability to Climate Change	Minimize Protected Infrastructure's Vulnerability to Damage from Climate Change Conditions	Minimize Operation/ Maintenance, Repair and Future Replacement Costs	
Criteria Weighting		5	3	5	4	5	3	4	5	3	
Chappaquiddick Ferry Landing Alternatives	**Alternative 2A -** Raise Ferry Landing to Intermediate "Phase 1" Elevation	3	3	3	4	4	4	3	3	3	**3.32**
	Alternative 2B - Raise Ferry Landing to Higher "Phase 2" Elevation	3	2	4	3	4	3	4	5	4	**3.65**

**Evaluation criteria scores and weightings are subject to adjustment based on ongoing review with the Town and project stakeholders.*

In contrast to the evaluation of Alternatives 1A/1B, raising the Chappaquiddick Landing to the higher elevation associated with Alternative 2B does not have as significant of an impact (and associated mitigations) to adjacent areas or structures.

While Alternative 2B has a marginally larger impact to adjacent vegetated areas, due to its higher elevation which requires a longer distance to match the adjacent existing grades, the increase is not prohibitive from a permitting/regulatory standpoint since the transition areas will be vegetated to restore, and ideally enhance, habitat values in these areas. If non-native or invasive species are identified in future field assessments in support of permitting, they could be addressed in concert with implementation of the preferred alternative.

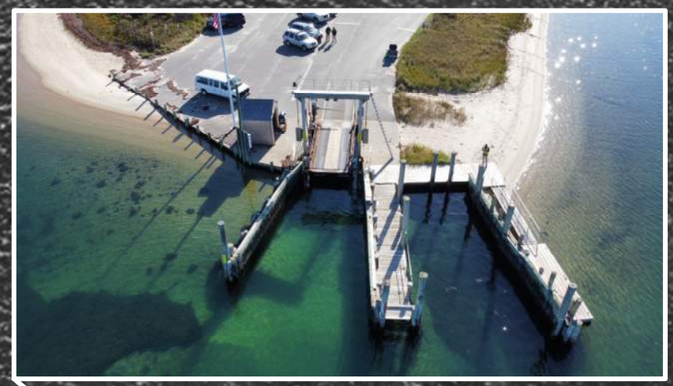
As a result, Alternative 2B is recommended for implementation.

FERRY LANDING HOIST AND VESSELS: ALTERNATIVE 3A

Alternative 3A would modify the existing hoist infrastructure, foundation, and mechanical/electrical systems at both the Edgartown and Chappaquiddick landing sites to accommodate the raised elevation decided in Alternatives 1A and 2B for existing vessels.

The elevation of the timber fenders flanking the approach to both landings would be evaluated and modified as needed to safely guide ferries into the landing during the projected tidal elevations.

EXISTING HOIST INFRASTRUCTURE AT THE EDGARTOWN (LEFT) AND CHAPPAQUIDDICK (RIGHT) FERRY LANDING SITES



MODIFY FERRY RAMP HOIST INFRASTRUCTURE

Edgartown and Chappaquiddick ferry landing sites

FERRY LANDING HOISTS AND VESSELS: ALTERNATIVE 3B

Alternative 3B would remove and replace the existing ferry landing hoist infrastructure at both the Edgartown and Chappaquiddick landings and replace the existing ferry vessels with one or two new, larger ferry vessel(s), which may incorporate deployable ramps (see Figure 12) and/or a wider beam/width to allow two lanes of vehicles to be carried on the vessel.

The landing configurations would be designed based on the dimensions and operating characteristics of both the existing vessels and the replacement double ended ferry(ies). It would also be designed to be adaptable to varying and projected increased tidal elevations. As an example, this could be accomplished by incorporating a buoyant landing fixed to adjacent piles with an articulating ramp set to a fixed landing. The landing configurations would be raised to the elevations determined in Alternatives 1A and 2B.

The specific design and operating characteristics of the replacement ferry(ies) would be determined through a refined evaluation of operational, vessel and landing requirements/ constraints.

EXISTING CHAPPY FERRY VESSEL

Figure 12: Example of proposed small double-ended ferry vessel equipped with deployable ramps. Photo and ferry design by Damen.

REPLACE FERRY RAMP HOIST INFRASTRUCTURE AND RECONFIGURE TO NEW ELEVATION; REPLACE EXISTING FERRY VESSELS WITH DOUBLE-ENDED FERRY(IES)

Edgartown and Chappaquiddick ferry landing sites

FERRY LANDING HOISTS AND VESSELS ALTERNATIVES EVALUATION

Resiliency Alternative		Site Compatibility/Natural Resources Criteria			Construction Phase Criteria			Long-Term Operation and Maintenance Criteria			OVERALL SCORE
		Avoid/Minimize Impacts to Abutting Properties/ Structures and Costs to Address Impacts	Minimize Environmental Impacts and Permitting/ Regulatory/ Code Compliance Barriers	Maximize Public Safety and Accessibility	Minimize Construction Cost	Maximize Ability to Secure Public Grant Funding	Minimize Construction Duration and Associated Temporary Impacts	Maximize Resilience and Adaptability to Climate Change	Minimize Protected Infrastructure's Vulnerability to Damage from Climate Change Conditions	Minimize Operation/ Maintenance, Repair and Future Replacement Costs	
Criteria Weighting		5	3	5	4	5	3	4	5	3	
Ferry Landing Hoists and Vessels Alternatives	**Alternative 3A -** Modify Hoist/Landing Infrastructure to New Landing Elevations for Existing Vessels	4	4	3	3	4	4	3	2	2	**3.22**
	Alternative 3B - Replace Hoist/Landing Infrastructure to New Landing Elevations for Replacement Vessels	4	3	4	1	3	3	5	4	4	**3.49**

**Evaluation criteria scores and weightings are subject to adjustment based on ongoing review with the Town and project stakeholders.*

While Alternative 3A accommodates a reduced environmental impact and cost by modifying the existing hoist infrastructure versus replacement entailed in Alternative 3B, it provides a significantly lower protective benefit and a higher future operation, maintenance, and replacement cost in comparison to Alternative 3B.

It is also noted that the existing ferry vessels are several decades old, and while still serviceable for the foreseeable future, they will need to be replaced within the lifetime of the modified hoist infrastructure entailed within Alternative 3A. Therefore, if Alternative 3A were selected, the landing infrastructure would likely still need to be modified or replaced to accommodate new ferry vessels in the future.

As a result, Alternative 3B is recommended for implementation.

FERRY VESSEL POWER SOURCE: ALTERNATIVES 4A, 4B, AND 4C

Each of the Alternative 4 scenarios involve the use of double-ended vessel, with or without deployable ramps (see Figure 13).

4A – FULLY ELECTRIC VESSEL
There is currently a limited market of fully electric ferry vessel suppliers in the U.S. With that, the regulatory environment around electric ferry vessels in the U.S is evolving, compared to the established regulatory environment seen throughout Europe. Consideration must be given to the weight of the batteries, an estimated 15,000 lbs., when determining the vessel's payload capacity. Battery life is typically 7-10 years. Fully electric ferry vessels require significant fire suppression and ventilation and cooling systems. Charging systems would be land-side, with an Overnight Trickle Charging System on the Chappaquiddick side and a Fast-Charging System on the Edgartown side. The Fast-Charging system would require space to accommodate the pad-mounted unit. See Figure 13 for an example land-side charging system.

4B – HYBRID ELECTRIC/DIESEL VESSEL
The hybrid electric/diesel ferry vessel would use the same power system as a fully electric vessel, with onboard clean diesel generators. The clean diesel generators would power the vessel for planned or unplanned travel to and from the shipyard and would also serve as backup power in the case of electric battery system failure.

4C – CLEAN DIESEL VESSEL
Clean diesel vessels have a more well-known and proven technology and are therefore more dependable. This also results in reduced service time and cost, as compared to the fully electric or hybrid electric/diesel vessel alternatives. Current emissions treatment systems provide catalytic reduction of sulfur oxides (Sox) and nitrogen oxides (NOx), and carbon reduction systems (scrubbers) are also available.


Burger Boat Company: Neebish Islander III


ipt-technology.com


ipt-technology.com

Figure 13: Double ended, roll-on-roll-off vessel (above). IPT Technology wireless, on-shore inductive charging system (bottom).

NW0

FERRY VESSEL POWER SOURCE ALTERNATIVES EVALUATION

Resiliency Alternative		Site Compatibility/Natural Resources Criteria			Construction Phase Criteria			Long-Term Operation and Maintenance Criteria			OVERALL SCORE
		Avoid/Minimize Impacts to Abutting Properties/ Structures and Costs to Address Impacts	Minimize Environmental Impacts and Permitting/ Regulatory/ Code Compliance Barriers	Maximize Public Safety and Accessibility	Minimize Construction Cost	Maximize Ability to Secure Public Grant Funding	Minimize Construction Duration and Associated Temporary Impacts	Maximize Resilience and Adaptability to Climate Change	Minimize Protected Infrastructure's Vulnerability to Damage from Climate Change Conditions	Minimize Operation/ Maintenance, Repair and Future Replacement Costs	
Criteria Weighting		5	3	5	4	5	3	4	5	3	
Ferry Vessel Power Source Alternatives	**Alternative 4A -** Fully Electric Vessel with Supporting Landside Utility Infrastructure	3	4	3	3	5	3	2	3	2	**3.16**
	Alternative 4B - Hybrid Electric/Clean Diesel Vessel with Supporting Landside Utility Infrastructure	3	4	3	2	4	3	3	3	2	**3.03**
	Alternative 4C - Clean Diesel Vessel	3	3	4	4	3	4	4	3	4	**3.51**

**Evaluation criteria scores and weightings are subject to adjustment based on ongoing review with the Town and project stakeholders.*

While Alternative 4A and 4B have reduced environmental impacts (e.g., lower emissions) and would be more competitive against other applications for limited grant funding sources, they are significantly more expensive to fabricate and operate/maintain.

These higher initial and ongoing costs, coupled with these alternatives' dependency on Martha's Vineyard's electrical grid during and after storm conditions (i.e., a fully electrified ferry would be inoperable if the electrical power system is damaged) and longer timelines for emergency repairs of complex systems with limited number of electric ferry shipbuilders/service providers in comparison to diesel powered vessels/systems, outweigh potential benefits.

As a result, Alternative 4C is recommended for implementation.

FERRY OPERATIONS BUILDING: ALTERNATIVES 5A AND 5B

Each of the Alternative 4 scenarios involves raising the building and providing an improved foundation.

5A – RAISE EXISTING BUILDING
Alternative 5A raises the existing building to or above elevation 3.85 feet (NAVD88). This will include raising the existing foundation, fuel tank, and utility connections.

5B – REPLACE WITH RAISED BUILDING
Alternative 5B replaces the existing building with a new two-story building that will include public restrooms and an employee bunkroom. The new building would be built at or above the elevation selected for the ferry landing and Memorial Wharf parking area under Alternative 1. The owner and operator of the Chappy Ferry, Peter Wells, has previously investigated building replacement (see Figure 14).

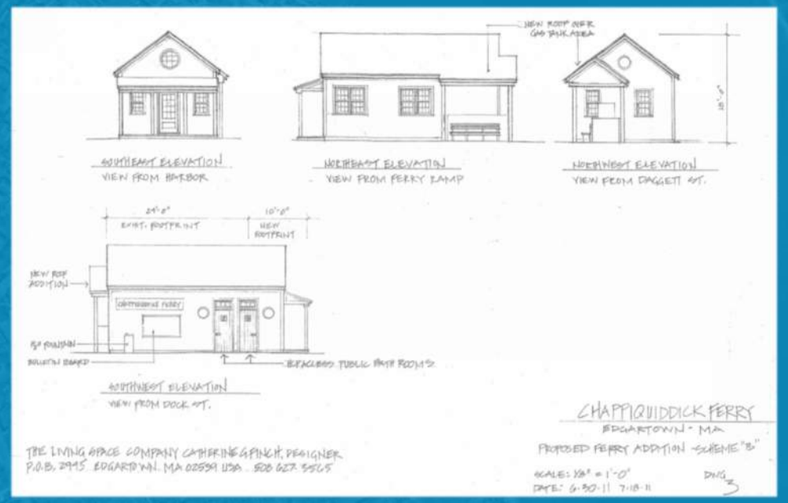


Figure 14: Preliminary drawings of replacement building design. Prepared for Peter Wells by The Living Space Company. July 2011.

RAISE FOUNDATION, FUEL TANK, AND UTILITY CONNECTIONS

RAISE EXISTING BUILDING (5A) OR REPLACE WITH NEW RAISED BUILDING (5B)

Ferry operations building

FERRY OPERATIONS BUILDING ALTERNATIVES EVALUATION

Resiliency Alternative		Site Compatibility/Natural Resources Criteria			Construction Phase Criteria			Long-Term Operation and Maintenance Criteria			OVERALL SCORE
		Avoid/Minimize Impacts to Abutting Properties/ Structures and Costs to Address Impacts	Minimize Environmental Impacts and Permitting/ Regulatory/ Code Compliance Barriers	Maximize Public Safety and Accessibility	Minimize Construction Cost	Maximize Ability to Secure Public Grant Funding	Minimize Construction Duration and Associated Temporary Impacts	Maximize Resilience and Adaptability to Climate Change	Minimize Protected Infrastructure's Vulnerability to Damage from Climate Change Conditions	Minimize Operation/ Maintenance, Repair and Future Replacement Costs	
Criteria Weighting		5	3	5	4	5	3	4	5	3	
Ferry Operations Building Alternatives	**Alternative 5A -** Raise Existing Building	4	1	2	3	3	4	3	3	2	**2.84**
	Alternative 5B - Raise and Replace Building	3	2	5	1	4	2	4	4	5	**3.43**

**Evaluation criteria scores and weightings are subject to adjustment based on ongoing review with the Town and project stakeholders.*

Because the existing operations building does not meet many current building code requirements, the cost of raising the existing structure in comparison to the current value of the building may constitute a "substantial improvement" under Federal Emergency Management Agency's (FEMA) National Flood Insurance Program requirements, and thus require associated improvements to be made to bring it into compliance with all code requirements. Due to the additional costs of these potential requirements to raise the existing building, replacing it with a new building is more cost-effective – even before considering the improved functionality and protection, longer lifetime and reduced ongoing operation and maintenance of a new building structure.

By providing public sanitary facilities in this area of the town's waterfront and providing an improved shelter and bunk room for ferry operations staff to respond more quickly to potential future urgent ferry operations (the existing building has neither), new building structure would significantly improve public safety.

As a result, Alternative 5B is recommended for implementation.

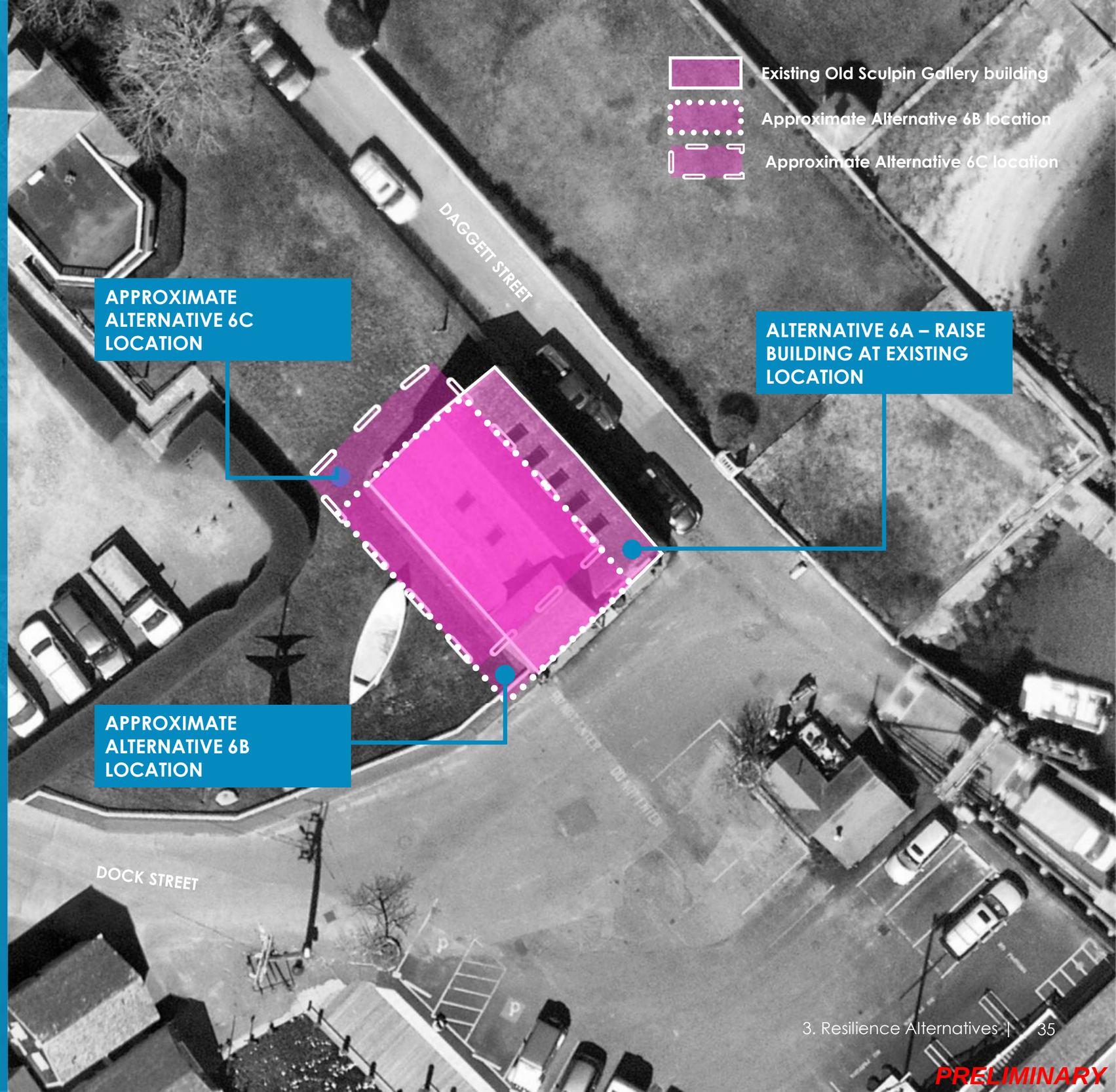
OLD SCULPIN GALLERY BUILDING: ALTERNATIVES 6A, 6B, AND 6C

Each of the Alternative 6 scenarios involves raising the building and providing a new concrete foundation and framing joints.

6A – RAISE BUILDING AT EXISTING LOCATION
The elevation to which the building is raised will be influenced by the elevation selected under Alterative 1. The current first floor is at approximately 4.6 feet NADV88. Plumbing and electricity would need to be taken into consideration and adjusted to the new elevation.

6B – RAISE AND MOVE BUILDING AWAY FROM DAGGETT STREET
Raising the building and moving it approximately 6-8 feet southwest of its current location would allow for widening Daggett Street, and potentially a dedicated ferry queuing lane. This would reduce the likelihood of larger vehicles turning onto Dock Street continuing to damage the Gallery building. Because the property boundary is immediately adjacent to the footprint of the building, relocation would require a property transaction between the Vineyard Preservation Trust and the Town. Water, plumbing and electrical/communication service connections would need to be adjusted to the new elevation and location.

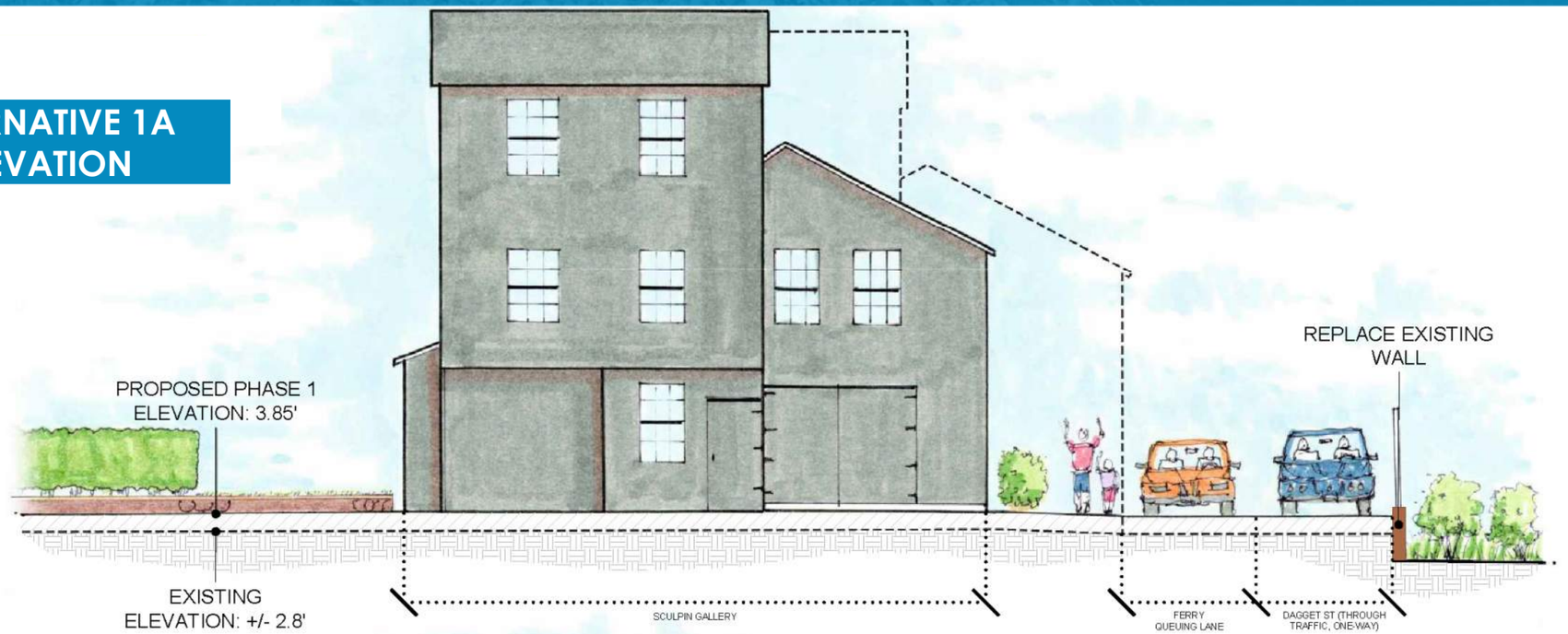
6C – RAISE AND MOVE BUILDING AWAY FROM DAGGETT AND DOCK STREETS
Raising the building and moving it approximately 6-8 feet away from both Daggett and Dock Streets to improve safety by providing space for an exclusive pedestrian area in front of the Gallery building. It is noted that larger vehicles and 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. Like Alternative 6B, this alternative could potentially provide space for widening Daggett Street, would require water, plumbing and electrical/communication service connections to be adjusted to the new elevation and location, and would also require a property transaction between the Vineyard Preservation Trust and the Town.



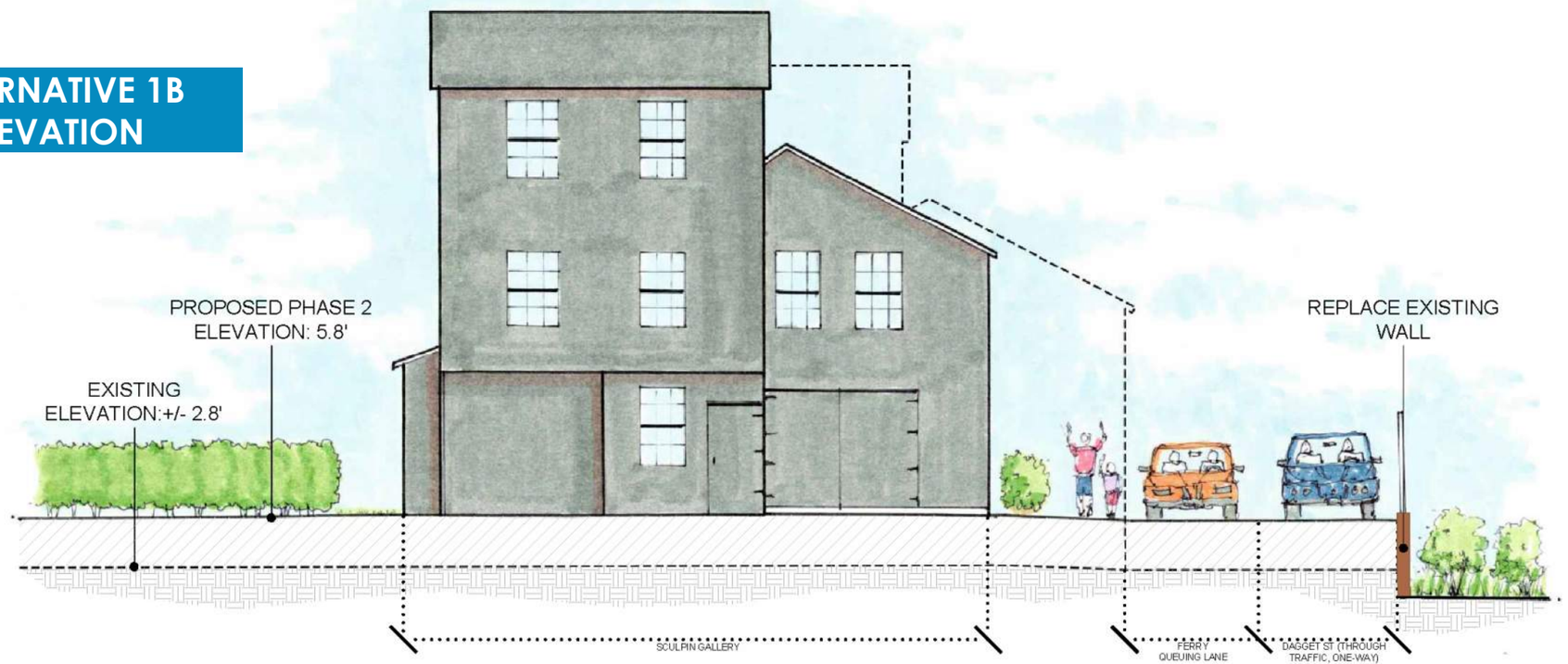
PRELIMINARY

OLD SCULPIN GALLERY CROSS SECTION

ALTERNATIVE 1A ELEVATION



ALTERNATIVE 1B ELEVATION



These views of the Old Sculpin Gallery building show the proposed Phase 1 elevations described in Alternative 1A (~3.85 ft) and 1B (~5.8 ft) from the perspective of a person looking to the north from Memorial Wharf.

In both of these scenarios, the first-floor elevation of the building is conceptually shown level with the outside ground elevation, improving the safety and accessibility of this building's entrance from Dock Street.

Both views also depict the repositioning of the building to the southwest, away from Daggett Street, which would be entailed under both Alternatives 6B and 6C. This adjustment provides more room for vehicles (especially larger vehicles that need more room to turn corners) turning right from Daggett Street onto Dock Street. This repositioning would also provide more room for persons walking along Daggett Street or queueing to walk onto the ferry during the summer season.

Both views also show the change in ground elevation relative to the adjacent residential property abutting Daggett Street to the east. Although not shown in this drawing, steps or a ramp could be provided at the existing gated entrance adjacent to the ferry landing to accommodate future access to this property's owner.

PRELIMINARY

OLD SCULPIN GALLERY BUILDING ALTERNATIVES EVALUATION

Resiliency Alternative		Site Compatibility/Natural Resources Criteria			Construction Phase Criteria			Long-Term Operation and Maintenance Criteria			OVERALL SCORE
		Avoid/Minimize Impacts to Abutting Properties/ Structures and Costs to Address Impacts	Minimize Environmental Impacts and Permitting/ Regulatory/ Code Compliance Barriers	Maximize Public Safety and Accessibility	Minimize Construction Cost	Maximize Ability to Secure Public Grant Funding	Minimize Construction Duration and Associated Temporary Impacts	Maximize Resilience and Adaptability to Climate Change	Minimize Protected Infrastructure's Vulnerability to Damage from Climate Change Conditions	Minimize Operation/ Maintenance, Repair and Future Replacement Costs	
Criteria Weighting		5	3	5	4	5	3	4	5	3	
Sculpin Gallery Building Alternatives	**Alternative 6A -** Raise Building at Existing Location	5	3	2	4	3	4	3	3	3	**3.32**
	Alternative 6B - Raise and Move Building Southwest	2	3	4	2	4	2	4	3	3	**3.05**
	Alternative 6C - Raise and Move Building West	2	3	5	2	4	2	4	4	4	**3.41**

**Evaluation criteria scores and weightings are subject to adjustment based on ongoing review with the Town and project stakeholders.*

While raising the Old Sculpin Gallery building at its current location avoids the need for a property transaction between the Town and the Vineyard Preservation Trust (which owns the building and land under the building) and provides a lower cost and duration of construction, these considerations are outweighed by the public safety, resilience and protection benefits provided by repositioning the building to the west (away from both Daggett Street and Dock Street).

As a result, Alternative 6C is recommended for implementation.

RECOMMENDATIONS

EDGARTOWN
RESILIENT CHAPPY

Based on the evaluation of the alternatives, the recommended actions are labeled in the photo below, and approximate order of magnitude costs for the recommended alternatives are provided in the table.

CHAPPY FERRY LANDING - Raise landing and parking area to "Phase 2" elevation of 5.8 ft (2B)

HOIST AND FERRY INFRASTRUCTURE - Replace Hoist/Landing Infrastructure to accommodate replacement vessels (3B)

FERRY VESSEL POWER SOURCE - Clean Diesel Vessel (4C)

FERRY OPERATIONS BUILDING - Raise and replace building (5B) to 1A elevation

EDGARTOWN FERRY LANDING - Raise landing and parking area to "Phase 1" elevation of 3.85 ft (1A)

OLD SCULPIN GALLERY BUILDING – Raise building to 1A elevation and move building west (6C)

DOCK STREET

DAGGETT STREET

ALTERNATIVE	APPROXIMATE ORDER OF MAGNITUDE COST ($)*
RAISE EDGARTOWN FERRY LANDING (1A)	1 – 2 MILLION
RAISE CHAPPAQUIDDICK FERRY LANDING (2B)	500K – 1 MILLION
REPLACE FERRY LANDING HOISTS (3B)	1 – 2 MILLION
REPLACE FERRY VESSELS (4C)	6 – 8 MILLION**
REPLACE/RAISE FERRY OPERATIONS BUILDING (5B)	1 – 1.5 MILLION
RAISE/RELOCATE OLD SCULPIN GALLERY BUILDING (6C)	500K – 1 MILLION
TOTAL	10 – 15.5 MILLION

**Cost ranges are estimates and will be refined with additional permitting, engineering, and design analysis.*
***Cost range for ferry vessel is approximate for one individual vessel. Approximate costs for fully electric, and hybrid electric vessels are 15 – 18 million and 17 – 20 million, respectively.*

REGULATORY REQUIREMENTS

Understanding the necessary approvals and permits required for each of the alternatives will play a large role in deciding which alternative is the best fit for the Town.

The following are reasons for the anticipated regulatory requirements:

- Ferry infrastructure and adjacent roadways are within filled Commonwealth tidelands
- Project is intended to receive public funding through a grant source to be determined at a later date
- Some alternatives involve fill within a FEMA velocity zone
- Historic and cultural resources within and adjacent to the project area

A Chapter 91 license, issued by the Massachusetts Department of Environmental Protection (DEP), is required for work within state-owned waters or filled tidelands. Research indicates that the Edgartown ferry infrastructure has a license issued by the Massachusetts Department of Public Works in 1941, while the Chappaquiddick side has a DEP Chapter 91 license issued in 2002. Depending on the proposed alternative, a minor modification, amendment, or a new Chapter 91 License may be required.

Following the issuance of the Chapter 91 license, the Massachusetts Coastal Zone Management (CZM) issues a Consistency Statement to ensure consistency with their marine environmental policies. A General Permit is issued by the United States Army Corps of Engineers (USACE) following the issuance of the Consistency Statement.

An Environmental Notification Form (ENF) would need to be submitted to the Massachusetts Executive Office of Energy and Environmental Affairs (MEPA office), due to the required Chapter 91 license and receipt of public funding. MEPA solicits additional input from state environmental regulatory agencies to determine whether the project will have a significant environmental impact, and whether the project warrants a more extensive Environmental Impact Report (EIR).

A Notice of Intent (NOI) must be filed with the Town of Edgartown Conservation Commission. Followed by a site visit and public hearings, the Commission will issue an Order of Conditions if the project is approved.

If the proposed work falls within the mapped habitat for endangered species, coordination with MassWildlife's Natural Heritage and Endangered Species Program (NHESP) will be required.

The Massachusetts Department of Environmental Protection (MADEP) Wetlands Division issues a water quality certification to ensure there are not adverse water quality impacts associated with the proposed project.

Consultation with the Massachusetts Historical Commission (MHC) will be required to ensure the proposed project does not result in an adverse impact on historic and cultural resources within or adjacent to the project area.

See Figure 15 for a list of anticipated permits, reviews, or approvals.

AGENCY	AUTHORIZATION OR REVIEW
FEDERAL	
UNITED STATES ARMY CORPS OF ENGINEERS (USACE)	GENERAL PERMIT
UNITED STATES COAST GUARD (USCG)	FERRY OPERATIONS LICENSE
STATE	
MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS (MEPA OFFICE)	CERTIFICATE FROM THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE ENF
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MA DEP) WETLANDS DIVISION	WATER QUALITY CERTIFICATION
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MA DEP) WATERWAYS DIVISION	CHAPTER 91 LICENSE
MASSACHUSETTS COASTAL ZONE MANAGEMENT (CZM)	CONSISTENCY STATEMENT
MASSACHUSETTS STATE HISTORIC PRESERVATION OFFICER (SHPO)/ MASSACHUSETTS HISTORICAL COMMISSION (MHC)	DETERMINATION OF NO EFFECT
LOCAL	
TOWN OF EDGARTOWN CONSERVATION COMMISSION	ORDER OF CONDITIONS

Figure 15: Anticipated Federal, State, and Local Permits, Reviews, or Approvals

4. APPENDICES

Appendix A: Edgartown Climate Change Vulnerability Assessment and Adaptation Plan
Appendix B: Existing Conditions Technical Memorandum
Appendix C: Evaluation Criteria and Scoring Matrix

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PRELIMINARY