Appendix B
Thematic Adaptation Maps and Dynamic Adaptation Pathway Diagrams
Appendix B-0  Keys for Thematic Maps and DAP Diagrams
Strategy is effective in reducing impacts from a 1% chance storm event OR Strategy is effective in reducing impacts from tidal inundation.

Strategy may be effective for some storm protection.

Strategy is no longer effective for reducing impacts from storm or tidal inundation.

Strategy could be effective at an earlier time frame but is not necessary.
Dynamic Adaptation Pathways for Woods Hole

**KEY:**

- **Transfer Station (can change to a different adaptation action)**
- **Adaptation Tipping Point (Terminal – Adaptation no longer meets goals)**

- **Maintain Character pathway**
- **Nature-based Solutions pathway**
- **Protect/Connect pathway**
- **Adaptive Realignment pathway**

**Change in action function**

*Reduced storm performance (>1%)*

Addresses tidal inundation only
Appendix B-1  Gansett Management Area
Use deployable barriers (48") at lower Gansett Road.
Dune Enhancement

Beach nourishment and dune enhancement at lower Gansett Road landing (+3 ft).

Nature-based Solutions
Modular Seawall

Elevate Road/Landing

Raise parking lot and road at lower Gansett Road landing and tie back to high ground

Install modular seawall (up to 42”) at lower Gansett Road landing.
Construct Bridge

Reroute Road (Storm)
Reroute lower Gansett Road west for reducing storm impacts

Reroute Road (Tidal)
Reroute lower Gansett Road west for reducing tidal flooding impacts

Install a bridge at lower Gansett Road

**Adaptive Realignment**

**Management Area**

**Gansett**

**DEP Wetlands**
- Coastal Beach or Dune
- Open Water
- Rocky Intertidal
- Coastal Infrastructure
Appendix B-2  Mill Pond Management Area
Mill Pond Area

Eel Pond Actions:
- Deployable Barriers (mun.) +48”
- Wet Floodproofing (res.)
- Gardiner Rd Dune Construction (@wall)
- Restore Eel/Mill Pond Connection
- Elevate roads and parcels (res.)
- Raise Gardiner seawall w/ drainage
- Floodproof Park Rd
- Sewer Lift Station
- Millfield Rd
- Backyard Berms
- Drainage for Gardiner seawall
- Elevate Structures (res.)
- Buyouts & convert to open space (res.)

Sea Level Rise (ft)
- RCP 8.5
  - 2022
  - 2030
  - 2050
  - 2070
  - 2100
- RCP 4.5
  - 2022
  - 2030
  - 2050
  - 2070
  - 2100
Wet Floodproofing

Wet floodproofing low-lying homes. No longer effective if water floods 1st floor. Consider elevating and wet floodproofing if water level exceeds 18” above grade.

Deployable Barriers

Deployable flood protection strategies (up to 48”) for low-lying Millfield St and Gardiner Rd homes, identify location for communal storage.

Use of deployable barriers may provide long-term resiliency benefits for entire Spencer Baird Management Area.

Management Area
Woods Hole Park
Mill Pond
Construct dune as part of a seawall modification at Gardiner Road. Tie into high ground to the north at 10 ft NAVD88.

Nature-based Solutions

Dune Construction at Wall

- Construct dune as well of a seawall modification at Gardiner Road. Tie into high ground to the north at 10 ft NAVD88.

Restore Connection

- Improve tidal connection between Eel Pond and Mill Pond for future salt marsh migration and drainage. May not be effective for large storms or sea level rise.
Raise seawall at Gardiner road, install drainage outlet for wetland. Tie into high ground to the north at 10 ft NAVD88. Drainage does not add storm protection but may reduce residence time if wall is overtopped.

2022 2030 2050 2070 2100

Raise Seawall with Drainage

Protect/Connect

Elevate Roads and Parcels

Elevate low-lying Millfield and Gardiner corridor, rebuild homes with some elevation. Elevate corridor up to ~10 ft NAVD88.

2022 2030 2050 2070 2100

Backyard Berms

Install landscape berms or elevated bulkhead systems along Mill Pond and Woods Hole Park. Assume build no higher than 3 ft above existing grade to preserve views and fit small backyards. Build berms to 7 ft NAVD88 for backyards at 4 ft NAVD88.

2022 2030 2050 2070 2100

Floodproof Park Rd Sewer Lift Station

Dry floodproof and/or elevate Park Road Sewer Lift Station.
Buyouts & Convert to Open Space

Relocate low-lying homes out of tidal inundation zone, abandon part or all of Gardiner and Millfield roads, and repurpose land (including Woods Hole Park) for flood storage and resilient open space.

Drainage for Gardiner Seawall

Modify seawall at Gardiner Road to enhance post-storm drainage. Does not add storm protection but reduces residence time if seawall is overtopped. Current wall ~6.5 ft NAVD88.

Elevate Structures

Elevate low-lying homes along Millfield and Gardiner Roads. Cenntenially floodproof homes to 10 ft above ground level. Resilience plan and flood storage plan.
Appendix B-3  Spencer Baird Management Area
Spencer Baird Area

Spencer Baird Actions

- Deployable Barriers (res.) +48”
- Wet Floodproofing (res.)
- Stoney Beach dune enhancement
- Elevate Land and Structures
- Elevate Seawalls
- Elevate Structures (res.)
- Buyouts & convert to open space

Sea Level Rise (ft)
- RCP 8.5
- RCP 4.5
Deployable Barriers

Wet Floodproofing

Maintain Character

Coordinated deployable flood protection strategies (up to 48") for low lying homes and identify location for communal storage.

Use of deployable barriers and wet floodproofing may provide longer term resiliency benefits for entire Spencer Baird Management Area.

Wet floodproof low lying homes. No longer effective when water exceeds 1’ flood. Consider elevating and wet floodproofing if water level exceeds 18” above grade.

Use of deployable barriers can provide longer term resiliency benefits for entire Spencer Baird Management Area.
Stoney Beach Dune Enhancement

Nature-based Solutions
Elevate Seawalls

Elevate existing Buzzards Bay seawalls to 10 ft NAVD88 tying into adjacent high areas.

2022 2030 2050 2070 2100

Elevate Land and Structures

Elevate parcels and roads of low-lying corridor, rebuild homes with some elevation. Raise Spencer Baird Rd, Gosnold Rd, and Albatross Rd to 12 ft NAVD88.

2022 2030 2050 2070 2100
Elevate Structures

Buyouts & Convert to Open Space

Elevate low lying homes no more than 10 ft above grade.

Relocate low lying homes out of tidal inundation zone, repurpose land for flood storage and resilient open space.

Elevate structures may provide longer term resiliency benefits for entire Spencer Baird Management Area.

Adaptive Realignment
Appendix B-4  Penzance Point Management Area
Penzance Point Area

Penzance Point Actions

- Deployable Barriers (res.) +48"
- Wet Floodproofing (res.)
- Bar Neck & Point dune enhancement
- Elevate Roads
- Elevate Structures (res.)
- Buyouts and/or Move Structures

Sea Level Rise (ft)
- RCP 8.5
- RCP 4.5

Time Line (Years)
- 2022
- 2030
- 2050
- 2070
- 2100
Deployable Barriers
 Coordinate deployable flood protection strategies (up to 48") for low lying homes.

Wet Floodproofing
 Wet floodproof low lying homes. No longer effective when water level reaches 1st floor. Consider elevating and wet floodproofing if water level exceeds 18" above grade.

Maintain Character
Beach nourishment and dune enhancement (up to 10 ft NAVD88) and tie into adjacent high spots or long shoreline side slope treatments for low-lying segments of Bar Neck Road and Penzance Road.
Elevate Low-Lying Road Segments
Elevate low-lying segments of Bar Neck Road and Penzance Road no more than 3 ft over time.
Elevate Structures
Elevate low lying homes up to 10 ft above grade.

Buyouts and/or Move Structures
Move low lying structures away from tidal inundation zone.

Adaptive Realignment
Eel Pond Actions

- Deployable Barriers (scl., mun.) +48"
- Wet Floodproofing (res.)
- School St increase culvert* and elevate

Dry Floodproofing (scl., com.)
- Elevate Eel Pond bulkheads
- Elevate Millfield Rd and parcels (res.)
- Elevate Water St and parcels (com.)
- Flood Barrier at Eel Pond Channel

Dry Floodproofing (sci., com.)
- Elevate Eel Pond bulkheads
- Elevate Millfield Rd and parcels (res.)
- Elevate Water St and parcels (com.)
- Flood Barrier at Eel Pond Channel

Reprogram 1st fl. floodable (sci.)
- Move ops, develop park
- Elevate Structures (res.)
- Buyouts & convert to open space (res.)

Sea Level Rise (ft)
- RCP 8.5
- 2022 2030 2050 2070 2100
- 2030 2050 2070 2100
- 2070 2100

- RCP 4.5
- 2022 2030 2050 2070 2100
- 2030 2050 2070 2100
- 2070 2100
Wet Floodproofing

- Effective for low-lying homes.
- No longer effective if water floods 1st floor.
- Consider elevating and wet floodproofing if water level exceeds 18” above grade.

Deployable Barriers

- Deployable flood protection strategies (up to 48”) for low-lying Millfield St homes and structures along southwest Eel Pond and Mill Street.
- Identify location for communal storage.
School St Culvert Increase and Elevate

Elevate School Street and increase size of culvert. Connect to School Street high points north and south at ~13.6 ft NAVD88.

2022 2030 2050 2070 2100

Upsize Culvert

Upsize culvert while maintaining existing road elevation. Assume low spot of roadway is ~5.6 ft NAVD88.

2022 2030 2050 2070 2100

OPTION: Marsh Migration

Undevelop driveway and parking lot east of Vincent House to allow for marsh migration. Move parking to Maury Lane.

2022 2030 2050 2070 2100

Nature-based Solutions

Eel Pond School Street
Elevate Millfield Road and Parcels:
Elevate low-lying Millfield corridor and rebuild homes with some elevation. Elevate corridor up to ~10 ft NAVD88.

2022 2030 2050 2070 2100

Elevate Eel Pond Bulkheads:
Elevate Eel Pond seawalls and bulkheads (~42”) backing parcels with commercial, residential and scientific use. Brings new critical elevation to ~8.5 ft NAVD88.

2022 2030 2050 2070 2100

Dry Flood Proofing:
Dry flood proof structures (Scientific and Commercial). No longer viable if tidal inundation impacts the structures.

2022 2030 2050 2070 2100

Elevate Water St and Businesses:
Elevate Water Street and businesses no higher than 9.5 ft NAVD88 (tied into high spot on north side of water street).

2022 2030 2050 2070 2100

Construct flood control barrier at Eel Pond Channel at existing elevation of 7.75 ft NAVD88. Would need to be coordinated with other areas for flanking.

2022 2030 2050 2070 2100

Flood Barrier:
Construct flood control barrier at Eel Pond Channel at existing elevation of 7.75 ft NAVD88. Would need to be coordinated with other areas for flanking.
Relocate low-lying homes out of tidal inundation zone, repurpose land for flood storage and resilient open space.

2022 2030 2050 2070 2100

Buyouts & Convert to Open Space

Buyout low-lying homes out of tidal inundation zone, repurpose and for flood storage and resilient open space.

Elevate Structures

Elevate low-lying homes along Millfield Road. Elevate structures no more than 10 ft above ground level. No longer viable if tidal flooding below.

2022 2030 2050 2070 2100

Reprogram 1st Floor

Elevate mechanical equipment, reprogram 1st floors to accommodate flooding (scientific facilities).

2022 2030 2050 2070 2100

Move Science Operations and Develop Waterfront Park

Move non-water dependent scientific operations, undevelop facilities and develop elevated Eel Pond Park.

2022 2030 2050 2070 2100

Management Area

Eel Pond School Street

Adaptive Realignment
Appendix B-6  Waterfront Management Area
Waterfront Area

Waterfront Actions

- Deployable Barriers (scl., mun.) +48"
- Wet Floodproofing (mun.)
- Bar Neck living shoreline
- Dry Floodproofing (scl., sewer lift)
- Water St/Albatross flood walls
- Elevate NOAA bulkhead (tidal)
- Elevate Waterfront Park/NOAA corner
- Elevate Water St/Albatross
- Reprogram 1st fl. floodable (scl.)
- Move ops, expand waterfront park

Sea Level Rise (ft)

- RCP 8.5
- RCP 4.5
Wet Floodproofing

Wet floodproofing community buildings (WHCA, Fire Station). No longer effective if water floods 1st floor. Consider elevating and wet floodproofing if water level exceeds 3 ft above grade.

2022
2030 2050 2070 2100

Deployable Barriers

Deployable flood protection strategies (up to 48") for science and community buildings (WHCA and Fire Station).

Use of deployable barriers may provide longer term resiliency benefits for entire Spencer Baird Management Area.

Maintain Character

Use of deployable barriers may provide longer term resiliency benefits for entire Spencer Baird Management Area.

Wet Floodproofing

Deployable Barriers
Bar Neck Living Shoreline

Develop a living shoreline 3 ft above low spot along Bar Neck Road (up to 13 ft NAVD88) to preserve view of harbor from road.

Nature-based Solutions
Elevate NOAA Bulkhead to protect against tidal inundation.

- Elevate NOAA Bulkhead (Tidal)
- Elevate Water St/Albatross St
- Elevate Waterfront Park with NOAA Corner
- Elevate Waterfront Park
- Water St/Albatross Flood Walls

Dry Floodproofing

- Dry floodproof structures to scientific facilities and sewer pump station up to the 1% storm event. No longer viable if tidal inundation impacts the structures.
- Elevate Water Street and Albatross Street no higher than 9.5 ft NAVD88, to tie into Lillie Lawn elevations on the north side of Water Street.
- Elevate Waterfront Park with two 24" tiers in park elevation to maintain sightlines, bringing new elevation to ~12 ft NAVD88.
Reprogram 1st Floor

Reprogram 1st floor (higher on 1st floor) to accommodate flooding of scientific buildings. Assume 1st floor is 16.5 ft higher than NAVD88, which can withstand water level impacts until water level exceeds 16.5 ft NAVD88. Usage and daily operations impacts occur.

Move Science Operations and Expand Waterfront Park

Move non-water dependent scientific operations, and develop the area and expand Waterfront Park.
Appendix B-7 Juniper Point Management Area
Juniper Point Area

- **Juniper Point Actions**: Wet Floodproofing (res.), Deployable Barriers (res.) +48”, Hinckley Rd beach dune enhancement, Dry Floodproofing (USCG, com.), Elevate seawalls and bulkheads, Elevate roads, Elevate Structures (USCG, com., res.), Reroute Little Harbor Rd (storm), Luscombe Ave waterfront park.

- **Sea Level Rise (ft)**: RCP 8.5, RCP 4.5.
Deployable Barriers

Deployable flood protection strategies (up to 48") for low-lying homes, bike path at Crane Rd, and Luscombe and Railroad Ave.

Wet Floodproofing

Wet floodproof low-lying homes. No longer effective when water level reaches 1st floor. Consider elevating and wet floodproofing if water level exceeds 18" above grade.

Maintain Character
Enhance existing dune by increasing overall height to 6.5 ft NAVD88.
Elevate Roads
Elevate Little Harbor Road, Luscombe Ave, Railroad Ave and Hinkley Rd and tie into 9 ft NAVD88 high spots near Coffee O, Butler St and Cowdry St.

2022 2030 2050 2070 2100

Elevate Seawalls/Bulkheads
Elevate existing residential and road seawalls (Little Harbor and Hinkley Rd), and bulkheads (USCG, SSA, commercial). Elevate no more than 3 ft.

2022 2030 2050 2070 2100

Dry Flood Proofing
Dry flood proof structures (USCG and Commercial). No longer viable if tidal inundation impacts the structures.

2022 2030 2050 2070 2100
Elevate Structures
Elevate USCG, commercial and residential structures to no more than 10 ft above ground level.

Reroute Little Harbor Rd (Storm)
Reroute Little Harbor and Hinkley Roads using the high spine on Juniper Pt. Linkinclude evacuation 1.1 M to 11 ft NAVD88 near perched wetland.

Luscombe Ave
Waterfront Park
Pull development back from water to Luscombe Ave and create tiered waterfront resilient open space.

Adaptive Realignment
Management Area
Juniper Point
Appendix B-8  Nobska Point Management Area
Nobska Point Area

Deployable Barriers (res.) +48"
Wet Floodproofing (res.)
Coastal bank and dune enhancement
Elevate Church St & Lower Nobska Rd
Reroute Lower Nobska Rd (storm)
Elevate Structures (res.)
Relocate outbuildings (tidal)

Sea Level Rise (ft)
RCP 8.5
RCP 4.5

2022 2030 2050 2070 2100
**Deployable Barriers**

Coordinate deployable flood protection strategies for low-lying homes (up to 48”).

**Wet Floodproofing**

Wet floodproof low-lying homes. No longer effective when water level reaches 1st floor. Consider elevating and wet floodproofing if water level exceeds 16” above grade.

*Management Area*

Nobska Point

*Maintain Character*
Enhance coastal bank or dune at Nobska Beach and lower Nobska Road. Build up to 10 ft NAVD88 and tie into existing high spots.
Elevate Church St & Lower Nobska Road

Elevate Church St and lower Nobska Rd up to 10 ft NAVD88 and tie into existing high spots.

Management Area
Nobska Point

Protect/Connect
Reroute Lower Nobska Road (Storm) - Move Nobska Road west to meet 14 ft NAVD88 grade from Nobska Pt. May require a bridge or increased elevation to connect in the north over the wetland.

Elevate Structures - Elevate low lying homes no more than 10 ft above grade.

Relocate Outbuildings (Tidal) - Move low lying outbuildings landward to reduce tidal inundation impacts.
Appendix B-9 Fay Road Point Management Area
Fay Road Area

Deployable Barriers (res.) +48”  
Wet Floodproofing (res.)  
Coastal bank and dune enhancement  
Landscape berm or terracing  
Elevate Road  
Elevate Structures (res.)

Sea Level Rise (ft)

- 2022
- 2030
- 2050
- 2070
- 2100
Deployable Barriers
Coordinate deployable flood protection strategies for low lying homes (up to 48”).

Wet Floodproofing
Wet floodproof low lying homes. No longer effective when water level reaches 1st floor. Consider elevating and wet floodproofing if water exceeds 18” above grade.

Maintain Character
Enhance coastal bank or dune up to 15 ft NAVD88 and tie into existing neighborhood high spots.

Nature-based Solutions
Landscape Berm or Terracing
Install landscape berm or terrace through existing lawns and tie into existing neighborhood high spots. For lawns currently at 10 ft NAVD88, berms should be built to 15 ft NAVD88 (5 ft berm).

Elevate Low-Lying Road Segments
Elevate roadway to ~15 ft NAVD88 and tie into existing high grade along Fay Rd.

Protect/Connect
Elevate Structures
Elevate low-lying homes no more than 10 ft above grade.

Adaptive Realignment