July 31, 2025

Town of Nahant Conservation Commission
Attn: Kristin Kent, Conservation Agent
Nahant Town Hall
334 Nahant Road
Nahant, MA 01908

Re: Additional Information for Forty Steps Coastal Bank Stabilization and Mixed-Sediment Nourishment, Nahant, MA. File Number NE 047-0610

Dear Commission Members:

On behalf of the Town of Nahant, Sustainable Coastal Solutions, Inc., is pleased to provide you with an update and further information on the Forty Steps Coastal Bank Stabilization project. A design change was required due to a change in the construction access at the project's southern boundary. When the project was originally submitted to the Conservation Commission for review, the construction access was along the southern boundary of the project on an adjoining parcel of privately owned land. The town was granted deeded access through the lot to protect the coastal bank at Forty Steps Beach in 1962. The Town has used the access point several times since deeded access was granted to conduct maintenance on the coastal bank. The current owners of the property have requested that the Town not utilize the deeded access to stabilize the coastal bank. They also requested that the Town not stabilize the eroding coastal bank on their property. The Town evaluated various access points and methodologies again and modified the original project design to change the construction access route and to pull the coastal bank stabilization back 34 feet to meet the property boundary.

Due to the change in design, a Notice of Project Change (NPC) was required to be filed with MEPA, which was published in the Environmental Monitor, and open for public and agency review and comments. MEPA issued a revised Certificate (EEA #16836) on July 25, 2025, which is attached. The revised Certificate did not change any of the conditions assigned to the proposed project.

<u>Previously Reviewed Project</u>

The originally reviewed Forty Steps project and the revised project consist of a mixed sediment nourishment, a bio-engineered nature-based coastal bank stabilization, and the restoration of the native vegetation on the coastal bank. The mixed-sediment beach nourishment was designed to provide a nature-based and efficient form of coastal protection that can adapt and respond to a changing wave and water level environment. The proposed template for the mixed-sediment nourishment profile will be constructed using 1:3 (v:h) front and back slopes. The construction template for the nourishment

begins at the crest of the existing seawall (14.5 feet NAVD88). The back slope of the template slopes upward on a 1:3 (v:h) slope to an elevation of 20 feet NAVD88. The template then extends seaward for 26 feet at a constant elevation of 20 feet NAVD88, before sloping downward on a 1:3 (v:h) slope until the slope intersects with the existing beach profile above the mean low water (MLW) line. The nourishment construction template represents the placement of 17,000 cubic yards of beach compatible sediment. During and after construction, the toe to the crest of the heterogeneous sediment fill (i.e. sand, gravel, and cobble) is expected to begin reshaping. The crest will adjust to match the 2-percent run-up level to minimize wave runup and overtopping during storm events. The numerical modeling used to design the nourishment template showed that implementing this type of shoreline protection would restore coastal and environmental resiliency of the beach while minimizing and avoiding impacts to adjacent/surrounding natural resource areas.

Along the eroding coastal bank, a bio-engineered nature-based stabilization system has been designed to address the ongoing erosion along the base of the coastal bank, which has left the face of the coastal bank oversteepened. Along the southern extent of the coastal bank, where significant erosion has caused substantial retreat of the bank toe, engineered soil lifts will be utilized to restore the face of the coastal bank seaward to the crest of the existing seawall. The soil lifts are 1-foot in height and utilize bank-compatible soils tightly wrapped in coir fabric to restore the face of the coastal bank seaward. Across the face of the coastal bank, 20-inch diameter high-density coir fiber rolls will be placed to stabilize and hold the soil lifts and coastal bank sediments in place. The coir fiber array will extend up to elevation 22 feet NAVD88, corresponding to the maximum elevation where the 2% runup was calculated to impact the coastal bank using the XBEACH model. The fiber rolls are encased in a synthetic knotless mesh. The soil lift envelopes and coir fiber rolls will be anchored into undisturbed soil with earth anchors at 2.5- to 3-foot on-center spacing, secured by 1/4-inch galvanized aircraft cable, and fastened with galvanized copper sleeves. The system incorporates a layer of 900-gram coir matting underneath as a filter fabric and is covered on top with a layer of 900-gram coir matting as a sunscreen to protect the fiber rolls during times of exposure when sand cover has been removed by storm action. Across the surface, an outer layer of sand-based nourishment will be placed. The surface will be re-vegetated with American Beach Grass on 12-inch centers. The revegetation of the surface will enhance the coastal bank's ability to weather wave runup and minimize scour from stormwater runoff occurring along the upper elevations of the bank.

Above the bio-engineered coastal bank stabilization system, the project will manage invasive vegetation up the crest of the coastal bank where it meets Nahant Road. The invasive vegetation management will target all invasive, non-native, and aggressive plant species throughout the lower and upper coastal bank areas. The invasive vegetation will be managed across the face of the coastal bank according to the Maintenance and Monitoring Program which was reviewed with the original project.

The original construction access route for the project was proposed to occur along the deeded accessway on the adjoining parcel to the southeast of Forty Steps Beach. The access way is located seaward of Nahant Road in front of 405 Nahant Road, as

shown in Figure 1. The access way was used by the Massachusetts Department of Public Works (MPDW) when the seawall was constructed in the 1960s. The Town utilized the construction access way in 1978 and 1993 when maintenance was conducted on the coastal bank to address storm erosion.

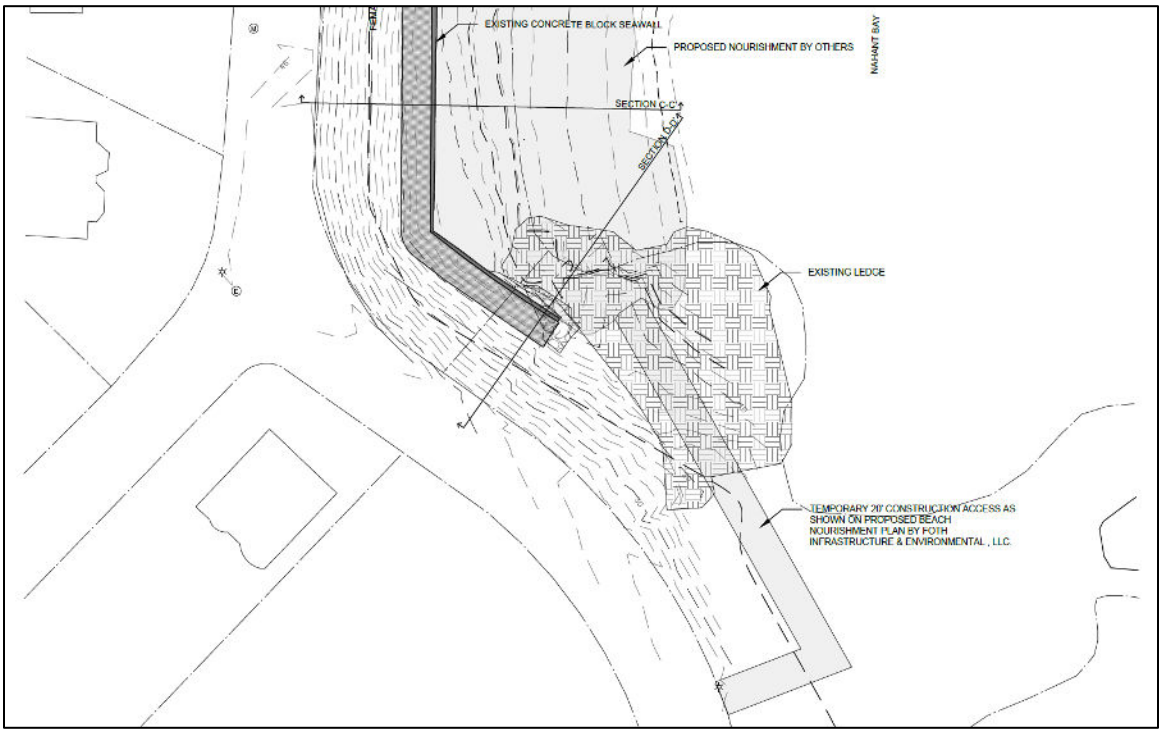

Figure 1. Originally proposed construction access route.

Revised Project Design

The design revisions to the Forty Steps Beach coastal resiliency enhancement project have not resulted in any significant changes to the key design features. The project design maintains the mixed sediment nourishment to naturally enhance the storm damage protection afforded by the cobble beach. The face of the coastal bank will be stabilized using the same nature-based bio-engineered stabilization system. Which minimizes erosion, stabilizes, and restores the eroded face of the coastal bank. Invasive vegetation will be managed across the face of the coastal bank in conjunction with re-vegetating the coastal bank with native grasses and vegetation.

The mixed sediment nourishment has had one minor alteration, which involves reducing the extension of the construction template beyond the Town property line. The overall design of the simplified construction template remains the same. The back slope remains tied into the crest of the seawall and slopes upward on a 3:1 (h:v) slope, with a flat berm crest 26-feet wide at elevation 20 feet NAVD88, and a 3:1 (h:v) foreshore slope to the existing beach as shown in Figure 4.1. The template design still represents approximately 34.7 cubic yards of nourishment sediment per linear foot, or 17,000 cubic

yards of sand, gravel, and cobble. The southern edge of the construction template has been modified so that no nourishment is placed beyond the Town property boundary at the base of the ledge outcropping. However, due to the dynamic nature of mixed–sediment beaches, the material once on the beach, will naturally migrate due to incoming waves and fill the entire beach face as it transitions into the natural equilibrium profile. The minor change to the construction template will not negatively impact the beach's enhanced ability to dissipate and disrupt the incoming wave energy by adjusting its morphology in response to the prevailing tide and wave conditions.

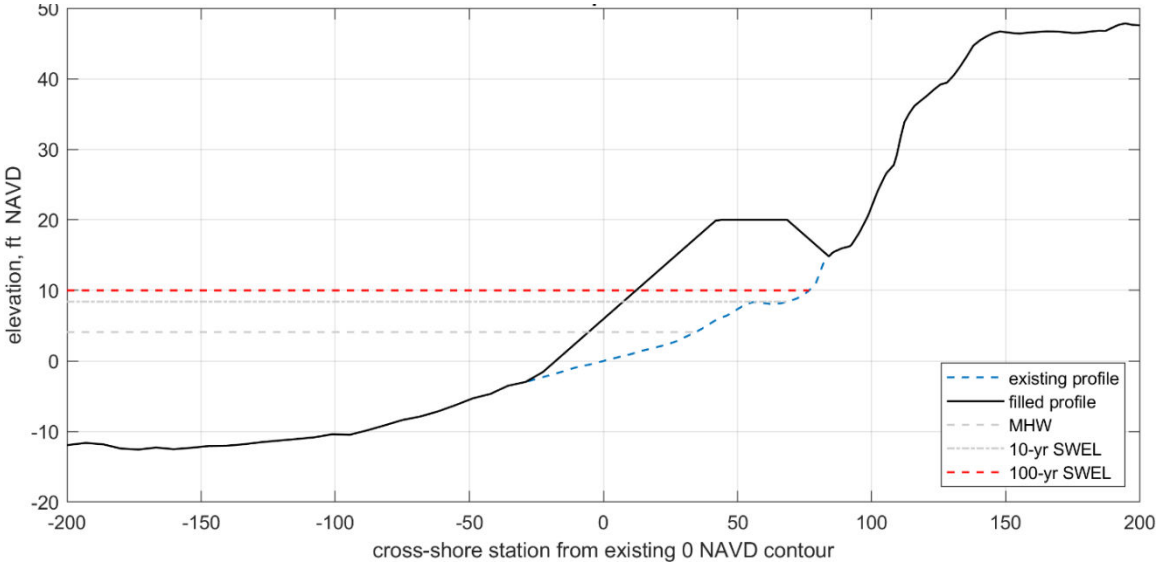

Figure 2. Cross-shore plot of a typical cross-section through the mixed sediment nourishment and the existing beach profile.

The design of the nature-based bio-engineered stabilization system along the base of the coastal bank remains the same as the design previously reviewed and described above. The only modification to the design is at the southern boundary of the system. The coastal bank stabilization will now terminate at the Town property boundary line, which reduces the overall length of the system by 34 feet. Above the bio-engineered stabilization system, invasive vegetation will be managed across the face of the coastal bank according to the Maintenance and Monitoring Program. The invasive vegetation management will target all invasive, non-native, and aggressive plant species throughout the lower and upper coastal bank areas. The means of eradicating invasive vegetation species will consist of mechanical removal and selective herbicide application using the most effective method for the treated invasive vegetation species. The face of the coastal bank will be re-vegetated with native grasses and vegetation, which will enhance the coastal bank's ability to weather wave runup and minimize scour from runoff from the upper elevations of the bank.

Mechanical removal of invasive vegetation will largely coincide with the lower coastal bank areas undergoing regrading/disturbance as part of stabilizing the bank face. Areas along the construction access ramp with significant woody brush and vegetation

will also utilize mechanical removal of vegetation. For vegetation being treated or removed above the coastal bank stabilization system and along the construction access ramp, all root material will remain intact to not destabilize the slope face of the coastal bank.

The most significant change to the overall project's design is the revised location of the construction accessway from Nahant Road down to the beach. The modified access way is required due to the Town's inability to utilize the historic construction accessway. The revised construction access has been positioned to the west of the original route along the coastal bank (see Figure 2). A temporary sediment delivery chute has also been added to facilitate the transfer of the nourishment sediment from delivery trucks to the beach prior to being placed. The sediment chute will be adjacent to the stairway that provides access to the beach, as shown in Figure 2. The chute will be constructed with open-topped corrugated drainage pipes attached in a parallel series to one another. The chute will be 12 to 15 feet in width. The route where the chute will sit on the surface of the coastal bank will have to be cleared of large woody vegetation before the installation. The chute will be anchored at the top and bottom using temporary cabling and earth anchors. The chute will be removed once the nourishment of the beach is completed.

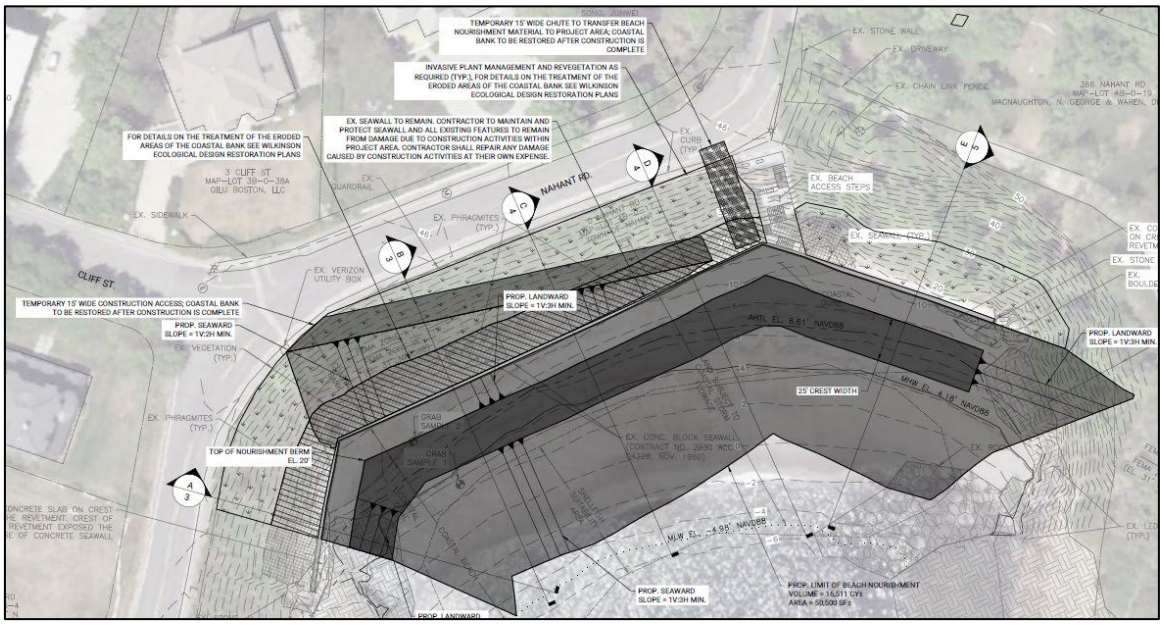

Figure 3. The proposed project plan illustrates the revised construction access ramp and sediment delivery chute.

The construction accessway will extend from Nahant Road down to the base of the coastal bank immediately above the existing seawall. The accessway will be constructed on top of the surface of the coastal bank, utilizing placed sediment. The sediment used for the accessway will be compatible with the coastal bank and the beach sediments. The accessway will be 15 feet in width, and slope downward on approximately

8:1 (h:v) slope. The accessway will be constructed from the roadway downward until the ramp reaches the seawall crest. To provide access from the crest of the seawall down to the surface of the beach, nourishment material will be utilized. The nourishment temple design already calls for raising the elevation of the upper beach to the height of the seawall. The seaward side of the construction accessway will slope seaward and downward on a 2:1 (h:v) slope and cover the lower elevations of the coastal bank. Prior to the construction of the accessway, large woody vegetation that will interfere with the creation and use of the accessway will be cut at ground level to leave the root system in place. Only invasive vegetation will be removed from the coastal bank prior to the construction of the accessway. Once the accessway reaches the base of the coastal bank, the beach nourishment will be placed. When the placement of nourishment is complete, the larger construction equipment will no longer be necessary, and smaller equipment and hand labor will be utilized to construct the coastal bank stabilization system.

The engineered soil lifts at the base of the bio-engineered coastal bank system will utilize the sediment used to create the construction accessway to return the coastal bank face seaward to the seawall crest. Sediment from the construction accessway will also be utilized during the installation of the high-density coir fiber rolls and for the outer layer of protective nourishment across the face of the system. In areas where additional sediment remains from the accessway, it will be pulled down the slope and placed on the nourishment template, as the sediment will be compatible with the native sediments found on the beach.

Once bio-engineered coastal bank stabilization is completed and the access ramp deconstructed, the coastal bank above will be restored utilizing the same techniques and methods used to stabilize the base of the coastal bank, if necessary. What is expected is that the face of the bank along the accessway will be covered with a biodegradable erosion control blanket to act as a temporary means of stabilization until the native grasses are able to take hold. Areas of bare soil will be seeded with a soil stabilizing native grass mix and native herbaceous plugs to supplement the vegetation that remains. The revegetation of the surface will restore the face of the coastal bank, which the Town will monitor as part of the ongoing Maintenance and Monitoring Plan to ensure the vegetation takes hold and any minor erosion on the face of the coastal bank is addressed.

The vegetation on the coastal bank will be managed in conjunction with the invasive plant management on an ongoing basis. Initially, for the first three years after construction, the plant management will typically be carried out two-to-five times per year depending on the response of the target plant species, site conditions, and frequency of storm events.

Updated Project Plans

The project plans have been updated to reflect the additional information that is presented above and the following:

- Revised construction access corridor
- Revised project boundaries
- Updated Resource Area delineations

Resource Areas

The Forty Steps Coastal Bank Stabilization and Mixed-Sediment Nourishment project is located within and/or abutting the following coastal and wetland resource areas:

- Land Under the Ocean (310 CMR 10.25)
- Coastal Beaches (310 CMR 10.27)
- Coastal Dunes (310 CMR 10.28)
- Coastal Banks (310 CMR 10.30 and FWR 10.27)
- Land Containing Shellfish (310 CMR 10.34)
- Land Subject to Coastal Storm Flowage

The potential environmental impacts associated with the revised project include temporarily altering the coastal and wetland resource areas listed in Table 1. The project has been designed and will be constructed using the best available measures to minimize adverse impacts to coastal and wetland resource areas as defined by the Massachusetts Wetlands Protection Act (WPA). Measures to avoid, minimize, and mitigate environmental impacts include the use of erosion and sedimentation controls during project construction; management of invasive species; the planting of native coastal grass species; placement of 17,000 CY of beach compatible sediment, and the restoration of temporarily disturbed areas following construction.

The original and revised project plans identify a coastal dune as being present seaward of the concrete seawall, at the request of the Massachusetts Coastal Zone Management (CZM). The area is a coastal beach; regardless, CZM has developed guidance based on other shoreline types and required it to be utilized at Forty Steps. The CZM guidance suggests that the Annual High Tide Line is the dune delineation boundary on mixed sediment beaches. The area above the Annual High Tide Line on Forty Steps beach transitions from a constant sloping beach face to an approximately flat surface, representing sediment that could have been deposited by storm overwash. This typically classifies the area as a coastal dune under the Wetlands Protect Act. However, the open exposure to the Atlantic Ocean at Forty Steps Beach exposes the shoreline to increased wave energy and creates a broader surf zone and swash zone. Due to the increased wave energy, the surf zone and swash zone regularly extend the wave uprush beyond the Annual High Tide Line to the face of the seawall. This means that these areas above the Annual High Tide Line are part of the coastal beach, according to all contemporary scientific and engineering literature on mixed sediment beaches on open coastal lines.

The areas classified as dunes are an ephemeral feature, dependent on periods of low incoming wave energy to minimize wave setup and allow the littoral processes to deposit sediment in front of the seawall without wave reflection. The dynamics described above are also why when flat surfaces that CZM identifies as dunes are present on Forty

Steps Beach, the feature/dune does not offer any significant storm damage prevention, flood control, or protection of wildlife habitat. As the wave energy and water levels increase, if a dune is present, the beach profile quickly evolves and the coastal beach extends to the face of the seawall. Thus, any dune feature is eroded before the arrival of the storm event.

Table 1 Summary of resource area impacts for the original and revised project.

Resource Area	Original Impacts (square feet)	Revised Impacts (square feet)	Temporary or Permanent Impact
Land Under the Ocean	175	0	No Impact
Coastal Beaches	41,050	37,255	Temporary
Coastal Dunes	2,921	2,921	Temporary
Coastal Banks	30,725	25,760	Temporary
Coastal Bank Stabilization	8,100	7,340	Temporary
Invasive Vegetation Management	22,280	18,420	Temporary
Land Containing Shellfish	18,000	16,440	Temporary
Land Subject to Coastal Storm Flowage	74,540	61,650	Temporary

Nature-Based Approaches to Control Erosion within Massachusetts

Communities around Massachusetts are faced with climate change, sea level rise, erosion, coastal flooding, storm damage, and loss of natural and recreational resources. To address these issues, many coastal communities within the Commonwealth have designed, permitted, and implemented resilient nature-based solutions to enhance coastal resilience and protect community and private infrastructure. Nature-based solutions offer increased coastal resiliency where more traditional coastal protection structures cannot be implemented due to environmental regulations. The nature-based alternatives are intrinsically sustainable, enhance environmental resource areas, and offer regulatory options for communities to address climate change, erosion, and coastal resiliency, while often providing recreational, ecological, and community benefits. Attached is an overview of projects that have been constructed using the same nature-based approaches proposed to enhance and protect Forty Steps Beach.

On behalf of Coastal Solutions, I would like to thank you for your time and attention to this project. For additional information, please feel free to contact me at (508) 846-5652 or truthven@coastalengineer.us.

All the Best,

Trey Ruthven

Cc:

Town Administrator, Town of Nahant
Department of Public Works, Town of Nahant
Massachusetts Department of Environmental Protection

Enclosures:

(1) Updated Project Plans entitled “Forty Steps Beach Proposed Beach Nourishment, Town of Nahant MA”

(2) MEPA NOPC Certificate, EEA Number: 16836, issued on July 25, 2025

(3) Summary of similar nature-based projects in Massachusetts