Peconic Land Trust Widow's Hole Preserve Shoreline Restoration Project

Final Report (ver. 1)

Site Description and Background

The former Greenport Terminal is 2.31 acres, an estimated 1.67 acres of which comprised the former terminal area with the remaining 0.64 acres consisting of undeveloped beach front along Greenport Harbor. The facility became operational in the 1920s and was taken out of service in the early 1980s. The former site included six above ground storage tanks (ASTs) that varied in capacity from an estimated 46,000 gallons to 329,000 gallons and an approximate 900 square foot warehouse was situated at the northwest corner of the subject site. In addition, ancillary terminal equipment such as above ground piping, a distribution rack, and fuel pumps were also present on Site. Historical releases have occurred at the subject site that resulted in several NYSDEC spill numbers to be opened, including the most recent NYSDEC spill No, 92-00081. All spill numbers associated with the Site have since been closed with approval from the NYSDEC. The most recent remediation project and final spill closure was completed in December 2003 upon completion of hot spot excavation which removed 194.5 tons of impacted soil. There are no environmental easements, engineering controls, or site management plans associated with past cleanup activities at the Site.

On December 7, 2012 Exxon-Mobil Oil Corporation ("Exxon-Mobil"), donated the approximately 2.3 acre property, situated in the Village of Greenport, Town of Southold, New York, to the Peconic Land Trust subject to a conservation easement granted to the Town of Southold.

Figure 1. The property location (outlined with dashed line) of the Widow's Hole Preserve within the Village of Greenport, with cross streets (4th and Clark Streets) and nearest waterbodies (Widow's Hole and Greenport Harbor) indicated.

Project Overview

The proposed focus of the shoreline restoration activities at the Widow's Hole Preserve, Greenport, NY, includes approximately 0.4 acres of shoreline and adjacent upland. The location of the property at which the proposed restoration would take place is presented in Figure 1. As detailed below, the shoreline restoration will include two components that are intended to significantly increase the resiliency of the shoreline to erosion, while also increasing the overall habitat value and aesthetics of the property.

Project Work Plan

Upland Edge/Coastal Grass Restoration

Due to recurrent storm damage, beginning with Superstorm Sandy, there continues to be erosion along the upland edge of the beach. Figure 2 identifies the overall project area proposed for restoration activities. The area indicated as the "Upland Restoration Area" in Figure 3, would require clean sand fill to provide a 50% grade on the beach face (Figure 4) and a sand dune area that would transition into the upland section of the property. Prior to the placement of sand over this section of the project area, it has been suggested that a rock toe be placed along the eroded upland edge, then covered with sand. The rock toe would be installed to protect the upland edge in the event of catastrophic damage leading to the erosional loss of the sand that will be added to the site. The proposed rock toe would consist of rock, approximately 3 feet in diameter, lined along the upland edge within the project area (Figures 4 and 5). The rock toe will cover approximately 130 linear feet. The rocks would be buried under the sand that will be added to form the dune. This area of the restoration would require

Figure 2. The proposed project area (indicated by the hashed area) within the Widow's Hole Preserve property, the Village of Greenport, New York. The proposed project area encompasses approximately 0.4 acres of shoreline and adjacent upland.

approximately 900 cubic yards of clean sand to create (based on elevations Cornell University Cooperative Extension's (CCE) Habitat Restoration Team collected using a transit, then inputted into ArcGIS to calculate fill volume), 430 cubic yards for the upland restoration area and 470 cubic yards for the beach face (Figures 4 and 5). The amount of material that will be added below spring high water (SHW) for this aspect of the project will be 66 cubic yards of fill covering 335 square feet. Dump trucks bringing sand to the site will be able to access the project area through the Preserve. The filled area would be planted by CCE with American beachgrass (*Ammophila breviligulata*) to stabilize the beach face and crest of the dune and a mix of little blue-stem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*) and possibly other coastal grasses and salt-tolerant shrubs (e.g. eastern baccharis (*Baccharis halimifolia*) and northern bayberry (*Morella pensylvanica*)).

The plants to be used for this restoration will be locally sourced when possible. Beachgrass was collected from the northern shoreline of Widows Hole Preserve on May 6th, 2016 and transplanted into sand-filled planting frames located at Peconic Land Trust's (PLT) Charnews Farm in Southold on May 7th by PLT volunteers. An additional beachgrass nursery was also established at CCE's Habitat Restoration Greenhouse in Southold. The plants were propagated until they are harvested for restoration on April 23, 2019. Approximately 250 beachgrass culms were initially planted into five of the eight frames at the Ag Center, with a like number of culms planted at CCE's facility. The remaining three frames were filled in January 2017 with beachgrass culms split from plants that had been planted in 2016. It is estimated that there will be between 4,000-6,000 beachgrass culms available for transplanting by Fall 2017, which should exceed the needs of the upland edge restoration.

Figure 3. An outline of the proposed project components. The project proposes planting smooth cordgrass (Spartina alterniflora) from the mid-intertidal to high tide line. A section of open beach will be maintained between the cordgrass and American beachgrass (upland restoration area). An existing smooth cordgrass stand adjacent (northeast) to the project area that is being used as a biological benchmark and a small patch of smooth cordgrass growing in the proposed restoration area are highlighted.

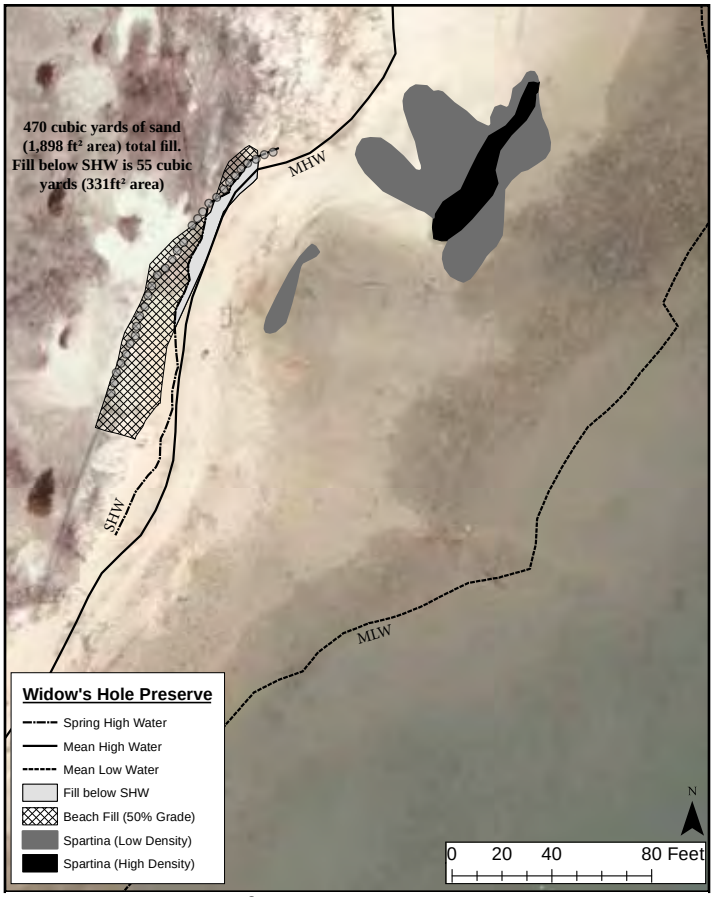

Figure 4. A map of Widow's Hole Preserve indicating the area of the beach that received approximately 470 cubic yards of clean, sand fill to create a new, 50% grade dune face. The ○ symbol represents the placement of a rock toe

Volunteer assistance will be used to sort beachgrass into individual culms from the nursery plantings, as well as for the installation of the plants into the restoration area. The other plants listed above for the upland restoration would be sourced from Widow's Hole Preserve and transplanted into the restoration area. Once the restoration planting is finished, the perimeter of the restoration area should be fenced to prevent foot traffic through the plantings that could trample, and kill the plants. Snow fencing attached to wooden or metal stakes would be adequate and would also serve to reduce the loss of sand to winter winds at the site while the plants are dormant.

Shoreline Restoration

The historic use of the Widow's Hole Preserve has led to a degradation of the shoreline. Bulkheads, pilings for supporting piers, and other structures installed, and eventually removed, over the years have left this section of the shoreline disturbed and virtually unvegetated. To add resiliency to the shoreline, a restoration plan was developed that would rebuild the shore with clean sand fill to allow for the planting of smooth cordgrass (*Spartina alterniflora*). The project area presented in Figure 3 (hashed line area) shows the proposed *Spartina* restoration area. The area covers approximately 8,000 square feet and would connect to, and extend, the *Spartina* stand (encircled area) that currently inhabits the site and will be used as a biological benchmark for the restoration. *Spartina* is an intertidal plant that spends approximately half of each day immersed in salt water and ranges from mean sea level (MSL) to mean high water (MHW). Using the elevation data collected in February 2016 by CCE, and using the lower edge of the extant *Spartina* stand as a biological benchmark, current MSL for the site was determined. The elevation data was also used to create a GIS model to determine how much clean, sand fill would be required within the project area to create a 5% grade shore, with MSL as its bottom boundary, in which to plant *Spartina*. The GIS model calculated an estimated 1,100 cubic yards of sand would be needed

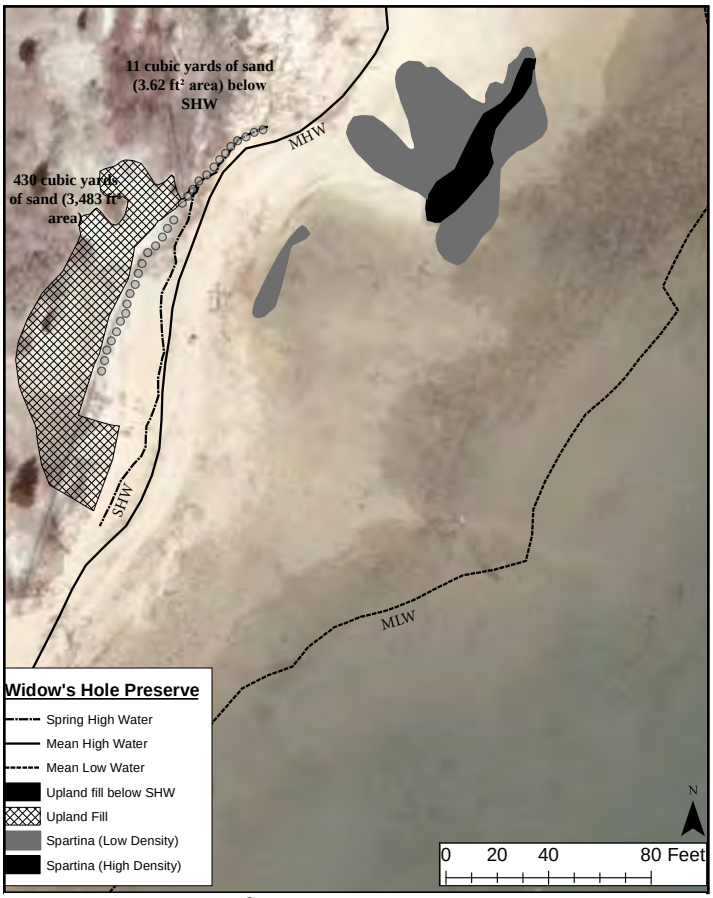

Figure 5. A map of Widow's Hole Preserve indicating the area of the beach that will receive clean, sand fill (430 cubic yards) for a new coastal dune area. The ○ symbol represents the placement of a rock toe.

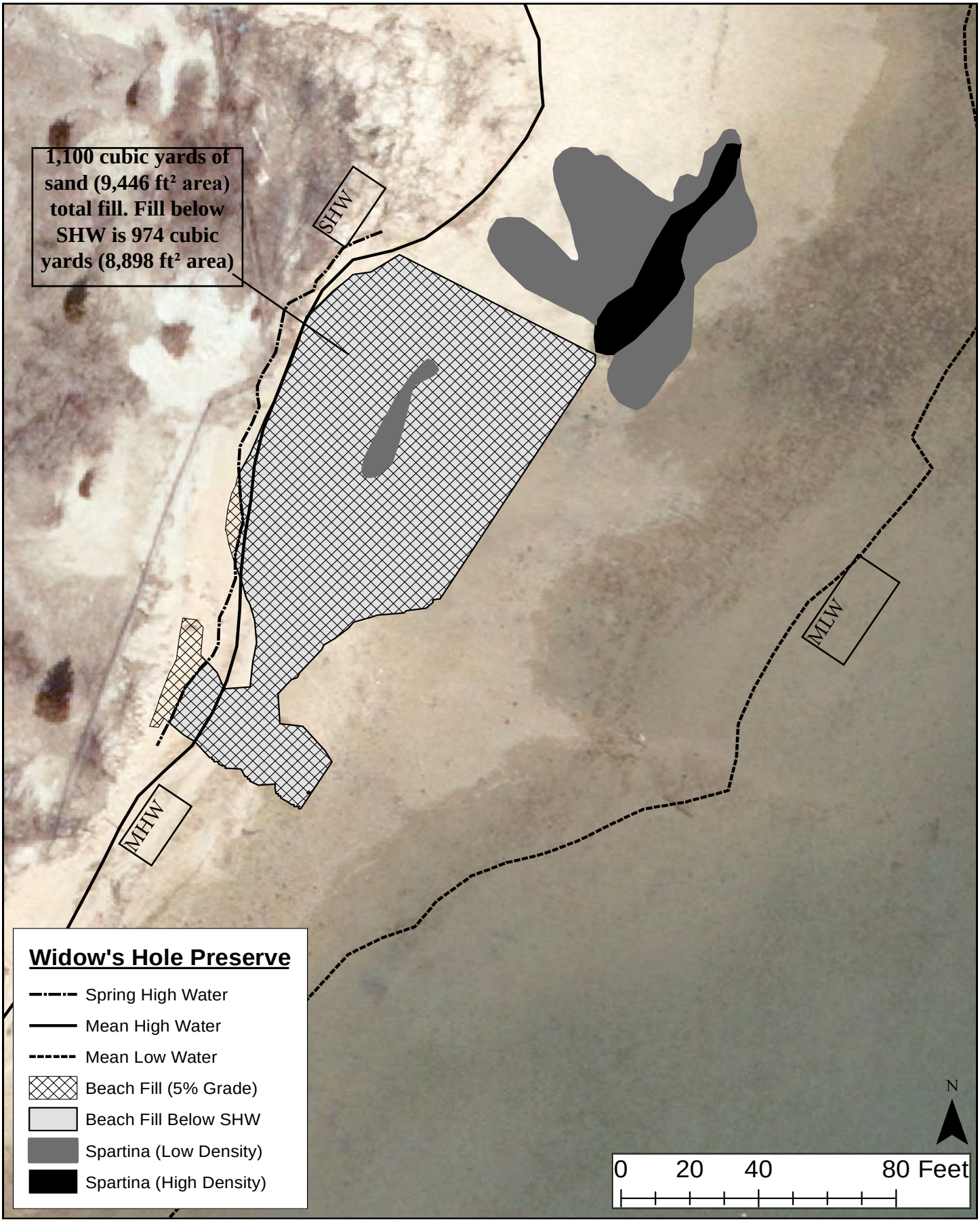

Figure 6. A map of Widow's Hole Preserve indicating the area of the beach that received 1,100 cubic yards of clean, sand fill to create a new, 5% grade beach profile. The lower portion of the shoreline was eventually planted with *Spartina alterniflora*.

Figure 7. Photographs of two reference salt marshes, one (a) adjacent to the proposed project area and (b) a second in Orient Harbor, East Marion with naturally-occurring "armoring" bands of gravel and cobble extending seaward from the base of the smooth cordgrass. It is proposed for this project to include a 4-6 foot band of 2-4 inch cobble, seaward, from the base of the smooth cordgrass plantings at the Widow's Hole Preserve.

to fill the shore, providing an elevation near, or above MSL, at which *Spartina* could survive (Figure 6). The total fill required for this component of the project that will be deposited below SHW is 974 cubic yards and will cover an 8,898 ft² area. Dump trucks bringing sand to the site accessed the project area through the Preserve. The addition of fill to the site restored this section of shoreline to a grade comparable to pre-commercial use of the site. The addition of sand and change in the overall grade of the shoreline within the project area will also result in a wider intertidal area which will allow for the natural expansion of cordgrass and an expanded forage area for shore birds.

Prior to the addition of fill and grading of the shoreline, a small patch of smooth cordgrass that currently exists in the proposed restoration area (indicated in Figure 3 would need to be removed, transplanted into one gallon pots, and held at CCE's Habitat Restoration Greenhouse until the planting phase of the project would begin. The smooth cordgrass plants would be removed by hand, wrapped in wet burlap, then transported to CCE's facility in Southold where they would be planted into pots using a potting medium of 3:1 peat moss to sand. The smooth cordgrass would be planted back into the upper intertidal zone of the project area, with the plants that CCE grew from local seeds to complete the shoreline restoration.

Using the adjacent stand of *Spartina* and a marsh in Orient Harbor as references (Figure 7a and 7b), it is proposed for this project that an "armoring" band of cobble be installed along the seaward edge of the proposed *Spartina* restoration area (Figure 8). If permitted, 2-4 inch cobble would be placed in a 6 foot-wide band starting 2-3 feet upshore of MSL (within the *Spartina* restoration area), and extending seaward. Approximately 20 cubic yards of cobble will be spread approximately 6 inches deep over the proposed 1,061ft² buffer area (Figure 8). Once the shoreline has been properly graded, *Spartina* would be planted into the project area. *Spartina* transplants will be propagated from seed collected from a local salt marshes (Cedar Beach Creek, Southold and Pipes Cove, Greenport) by CCE and PLT in October 2016. *Spartina* seeds will be sown into plug trays starting in April 2017 and held in CCE's restoration nursery until planting. Additionally, the *Spartina* that was

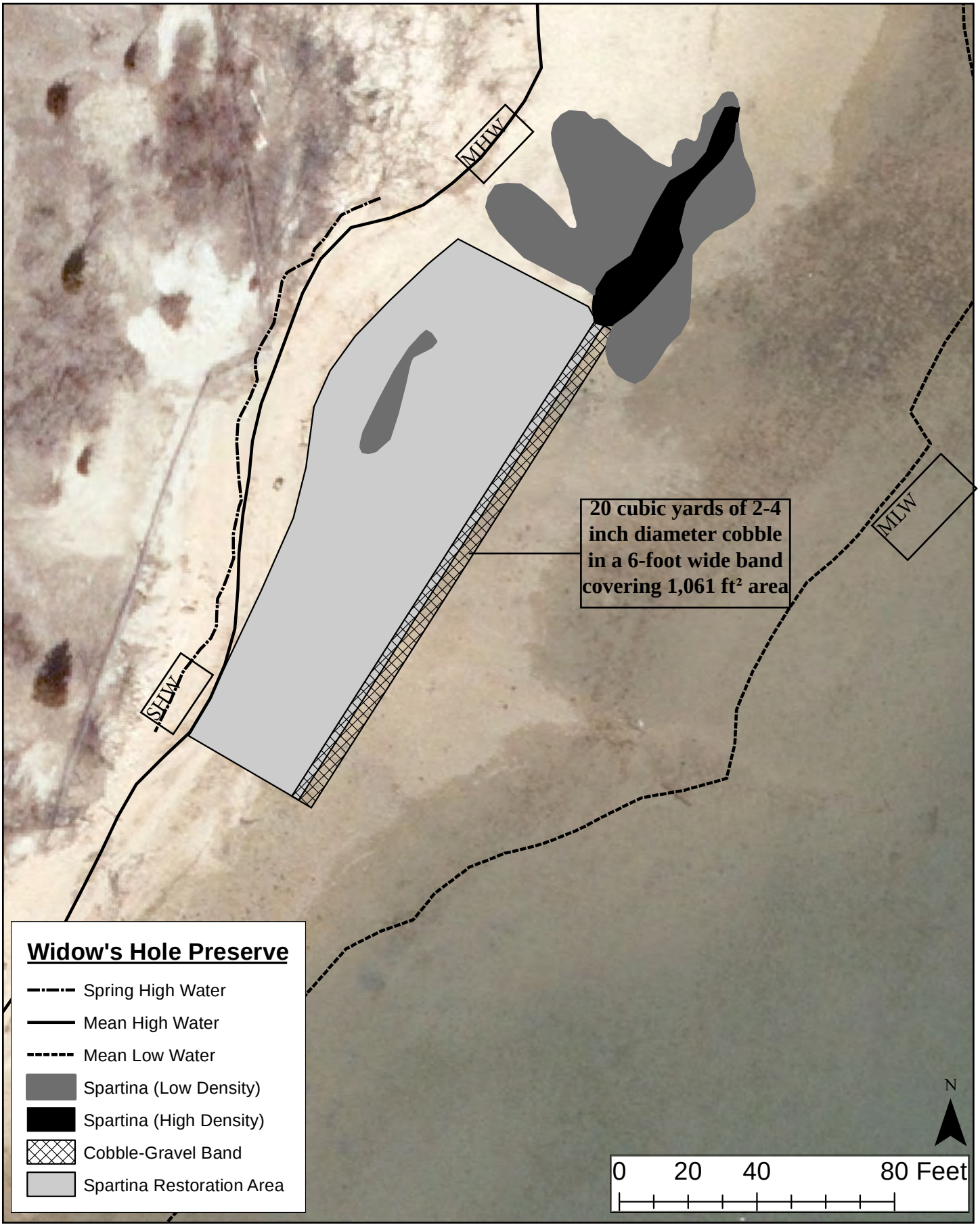

Figure 8. The hashed area delineates the proposed cobble-gravel band that would be used to "armor" the shore just below the smooth cordgrass planting (gray area). The area will require approximately 20 cubic yards of 2-4 inch diameter cobble. The 1,061 ft² area will be covered by approximately 6-inches of cobble.

removed from the project site prior to fill and grading would be replanted back into the shoreline. *Spartina* are planted at 1 foot spacing, requiring approximately 8,000 planting units (e.g. plugs or bare root) to cover the proposed project area. Planting is conducted by hand and can utilize volunteer labor to complete. The planting window for *Spartina* extends through the end of September, providing sufficient time to propagate the material needed for the restoration. Throughout the planting process, the restoration area will need to be fenced off to prevent herbivory from waterfowl, specifically mute swans and Canada geese. There is evidence in the existing *Spartina* stands that these birds visit this shoreline and graze on the rhizomes and young shoots. Simple string fences typically prove sufficient in discouraging geese and swans. Until the transplants become established, or go dormant for the winter, the fencing will have to be maintained, including regular removal of macroalgae and other materials that might get caught in the fencing during the tidal cycle and storm events.

Adaptive Management

This living shoreline project will be the first conducted in the Peconic Estuary and one of the few undertaken on Long Island. Given the limited local experience with living shoreline construction, this project includes an adaptive management plan to address concerns with a component of the project, specifically the cobble band. The six-foot wide cobble (2-4 inch stone) was proposed to offer protection from wave action and to prevent/reduce erosion within the lower areas of the *Spartina* plantings. A concern was offered that the small diameter cobble would not provide adequate protection from waves along this shoreline. The cobble band was designed based on the shoreline composition of the adjacent *Spartina* stand, as presented in Figure 7. However, if the cobble band does not prove to be adequate for wave protection after the first winter, it is proposed that large rock be installed along the MSL edge of the project area to provide increase protection the following spring. Based on recommendations published for several other states (e.g. Virginia, Maryland, Delaware, and New Jersey), rocks ranging from 1.5-3 feet in diameter (approximately 300-600 pounds) would be appropriate for the level of wave exposure of the project site. The larger rock could be placed with a skid-steer accessing the beach through the Preserve or from the end of 4th Street. Any *Spartina* lost due to wave erosion and/or the placement of the larger rock would be replanted.

Monitoring

Monitoring is an important component of any habitat restoration project. The monitoring plan for this project will be carried out annually for five years following the completion of the construction phase of the project. The goals of the monitoring program will be to evaluate changes in the elevation of the shoreline in the project area over time to identify loss/gain of sand and to monitor the growth of the *Spartina* plants.

Changes in elevation will be monitored at several points throughout the restoration area. Stakes will be driven into the shoreline at points within the project area, randomly chosen by ArcMap GIS software, and located using a Trimble Yuma 2 DGPS unit. A survey transit level will be used to determine the elevations at each of the monitoring stations starting with elevations taken immediately after the completion of construction, followed by annual measurements for the 5-year period.

Monitoring within the *Spartina* restoration area will be conducted at least ten (10) stations, randomly assigned by the GIS software. Three 0.25 meter^2 PVC quadrats will be randomly placed within a two-meter radius of the center point of the station (marked by a short PVC stake) and *Spartina* shoot densities recorded. Initial shoot counts will be conducted following the completions of Spartina planting. Subsequent counts will be conducted in August-September, annually, starting the year after initial installation of the plants.

Beachgrass (*Ammophila*) will be monitored in a manner similar to *Spartina*, as stated above. At least ten, randomly selected monitoring stations will be selected using GIS. Labeled stakes will be driven in at each monitoring station. A one-meter^2 PVC quadrat will be placed with the stake at is center, and all beachgrass culms within the quadrat will be recorded. Monitoring will begin one year after the initial installation of the plants. Annual density data will be compared with the initial "as built" beachgrass density of one culm per square foot and data from previous monitoring visits to determine trend in growth.

Project Implementation

Permitting

Wetland permit applications were filed with all federal, state and local agencies on July 1, 2017. The final permit authorization for the project was received on September 26, 2018.

Plant Propagation

All of the vegetative material used for the Widows Hole Preserve project was propagated from local source material. American beachgrass culms were harvested from a natural population growing in an area adjacent to the project area at Widows Hole Preserve. Approximately 250 beachgrass culms were harvested on May 6, 2016 and transplanted into planting beds located at the Peconic Land Trust's Charnew's Farm, Southold, NY (Figure 9). Beachgrass propagation at Charnews Farm and CCE's Habitat Restoration Nursery produced all the beachgrass culms used for the dune planting required for the Widow's Hole Preserve restoration project.

Figure 9. A photograph of the American beachgrass nursery (taken July 2018) established at the PLT's Charnews Farm (Southold) to supply plants for the shoreline restoration project at Widow's Hole Preserve.

Spartina alterniflora seeds were first collected in October 2016 from Cedar Beach Creek (Southold) and Pipes Cove (Greenport). The seeds were separated from their seed heads and an placed into 5-gallon buckets. Filtered seawater was added to the buckets, until seeds were covered, then cold-stratified at 40°F until they were sown into plug trays in March 2017 and grown-out in CCE's Restoration Greenhouse until plugs were root-bound (mid-late April 2017). Plants were "up-potted" into 1-gallon pots and moved outside into the restoration nursery by early May. Starting in June 2017, the 1-gallon Spartina were split and repotted, increasing the nursery stock for the project. Nursery stock was maintained until planting started in June 2019. Additionally, *Spartina* plants growing within the project area were removed as 12 inch diameter sods in November 2018 and transferred to CCE's facility at Cedar Beach, Southold. The sods were "heeled in" along an unvegetated section of shoreline between MSL and MHW and left over the winter. The sods were harvested in June 2019 and included in the *Spartina* plantings at Widow's Hole Preserve. More than 5,000 *Spartina* plants were produced for the project.

Construction Phase

The construction phase of the project began with the first deliveries of sand started on April 2, 2019. The regrading of the shore was completed by April 4 and the cobble band was installed on April 5, 2019. By April 15, the contractor was installing the rock/boulder toe along the upland edge that would provide added erosion protection in the event of a major storm, protecting upland section's of the Preserve. Additional sand was delivered to the site to create the dune crest and final grading/smoothing of the project area was completed by April 22, 2019. Figure 10 includes pictures taken during the different stages of the shoreline construction.

Dune and Upland Plantings

On April 23, 2019, CCE staff harvested the American beachgrass (*Ammophila breviligulata*) from the nurseries at PLT's Charnews Farm and CCE's Restoration Nursery for the volunteer planting day to be held on April 23. Beachgrass plants were pulled out of the planting beds and processed by CCE staff. Beachgrass was separated into single culms (Figure 11) and the plants were stored overnight in a cool location with

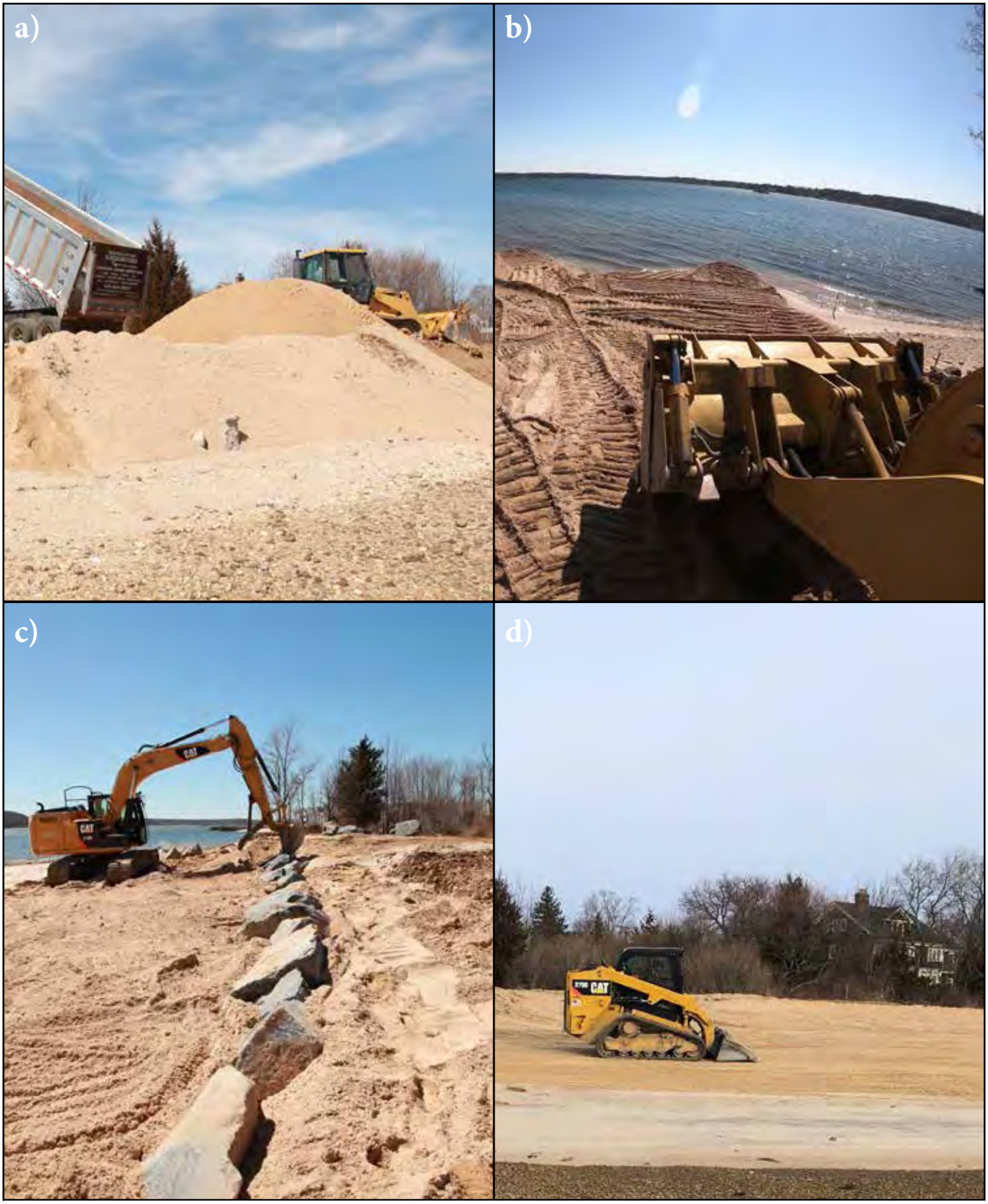

Figure 10. Photographs documenting the different stages of construction of the new beach at Widows Hole Preserve. a) Sand delivery began on April 2, 2019 and b) was immediately spread over the project area with a bulldozer. c) A rock toe was installed along the Preserve's upland edge was buried under the dune. d) The final grading of the shore was completed on April 22, 2019.

Figure 11. CCE staff splitting clusters of American beachgrass culms into single culms for planting the dune area of the Widows Hole Preserve.

wet burlap placed over the totes of plants to prevent them from drying out.

On April 23, 2019, volunteers from the PLT, CCE and the Peconic Estuary Program (PEP) planted beachgrass culms on the dune face and crest at Widows Hole Preserve (Figure 12a). Volunteers used hand trowels and trenching shovels to plant more than 3,500 American beachgrass culms at one-foot-on-center spacing along the dune face and crest. Volunteers ran out of plants leaving a small section unplanted. Plans were made to complete the planting on April 25 with CCE and PLT staff and volunteers.

Additional beachgrass plants were harvested from the nurseries on April 24, 2019 and stored overnight for the completion of the beachgrass planting the following day. Beachgrass culms were split by volunteers at Widows Hole Preserve on April 25 and installed into that areas that were not planted on the original volunteer day. Between 1,000 and 1,500 additional beachgrass culms were added to the dune, filling all unvegetated areas within the planting area. Volunteers also assisted with installing snow fencing along the upland and shoreline edges of the beachgrass planting areas (Figure 12b). The snow fencing serves to exclude foot-traffic through the newly planted area, but the fencing will also serve to help catch windblown sand and build the dune. The fencing will be removed once the beachgrass has had the opportunity to establish and spread.

Shoreline Salt Marsh Planting

On June 10, 2019, half of the Fourth Grade class from Greenport Elementary School, lead by teacher Stephanie Pawlik walked to Widows Hole Preserve to volunteer their assistance with planting *Spartina* along the shoreline (Figure 13). The students, along with staff from PLT, PEP, CCE, and local public servants assisted with planting approximately 2,000 plants along the shoreline in the project area. A second day with the second half of the 4th Graders was planned for June 13, 2019, but inclement weather resulted in the cancellation of the visit from the students. The second half of the 4th Grade was unable to assist with planting at Widows Hole Preserve due to the end of the school year. However, CCE, with help from PLT and PEP staff were able to finish the planting over two more days, June 18 and 27. The newly planted *Spartina* area covered approximately 4,000 square feet and included more than 5,000 *Spartina* plants. A string fence was erected over the *Spartina* planting site to discourage waterfowl (e.g. swans and geese) from grazing on the newly planted marsh grass. The fence will stay in place until the plants go dormant later in the fall.

Conclusions

The Widows Hole Preserve Shoreline Restoration Project as the first living shorelines projects in the Peconic Estuary, proved to be a success in several ways. The project garnered significant public support, as was evident by the number of volunteers and the support from a majority of the neighbors to the preserve. The inclusion of elementary school students resulted in a group of young people who are invested in the success of the project through their own hands-on work. Hopefully, they have an appreciation for the value of natural shorelines to their community. The project provided invaluable experience to all that were

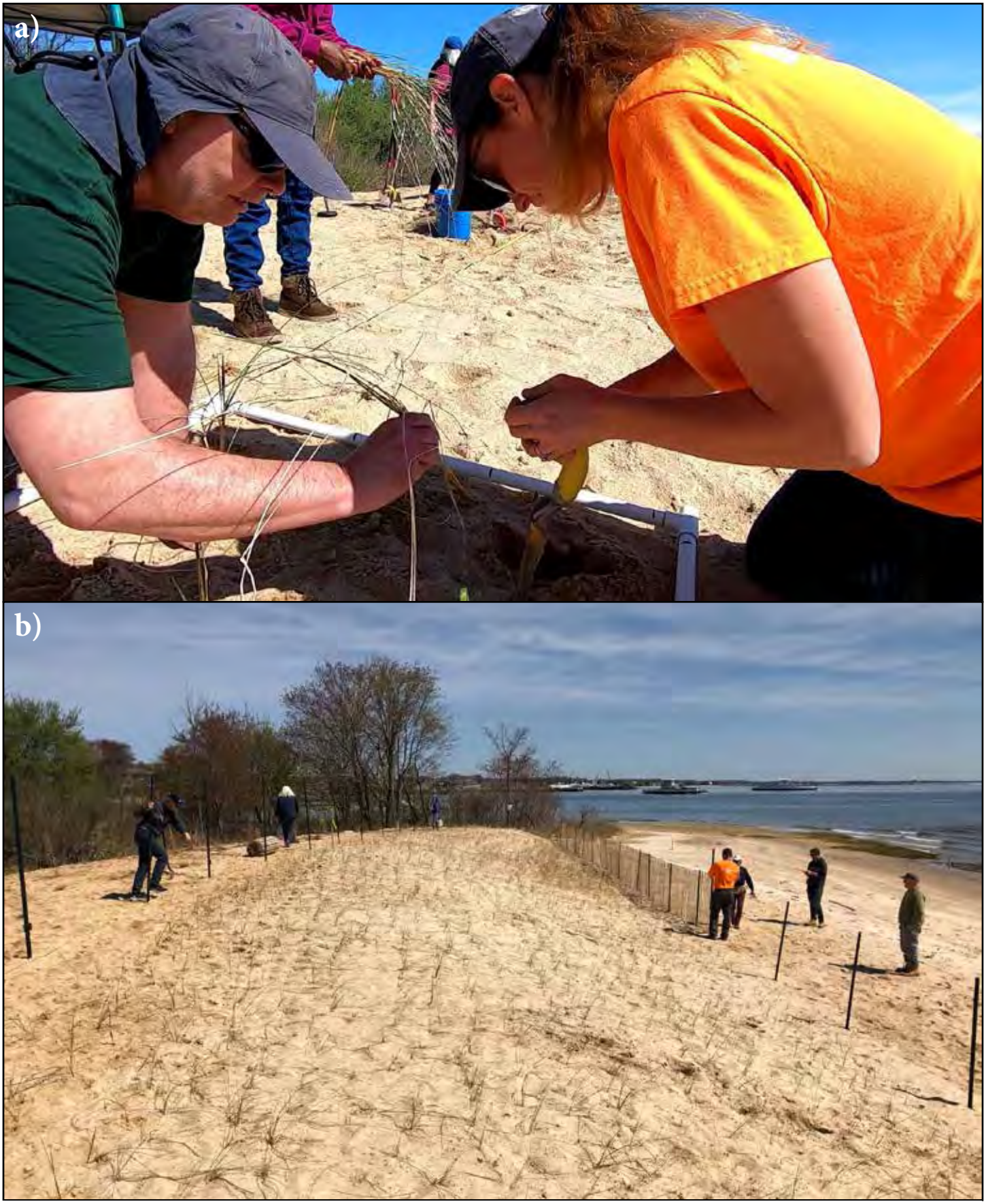

Figure 12. American beachgrass planting on the newly constructed dune. a) CCE staff member working with volunteer to plan beachgrass culms on April 23, 2019. b) Volunteers and staff installing snow fencing to protect newly planted dune at Widows Hole Preserve on April 25, 2019.

Figure 13. *Spartina* planting at Widows Hole Preserve with the Greenport Elementary School's 4th Grade class lead by teacher Stephanie Pawlik. The students have been visiting the preserve all year to study different aspects of its ecology.

involved in its planning and implementation, and future living shoreline projects will benefit from the lessons learned from this project.

The completed living shoreline project at the Widows Hole Preserve created 4,500 square feet of dune and coastal upland and more than 4,000 square feet of intertidal salt marsh. Nearly 10,000 plants were installed at the site, with more beachgrass and *Spartina* plantings planned for the winter and early summer of 2020. The site will be monitored by CCE for the next 5-years to document the changes and provide maintenance to the plantings, as needed.

The view from the top of the dune at Widows Hole Preserve overlooking the completed living shoreline project.