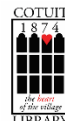


# THREE BAYS STORMWATER MANAGEMENT PROJECT FINAL REPORT



Association to Preserve Cape Cod, Horsley Witten Group  
and Town of Barnstable

June 2022





**SNEP Watershed Grants  
Final Report June 2022**

**1. Cover Information**

Date: 6/30/2022

Project Name: Three Bays Stormwater  
Contract Number: SNEPWG18-7-APCC  
Grant Period: September 2018 – April 2022

Contract Number: SNEPWG19-8-APCC  
Grant Period: September 2019 – April 2022

Grantee Organization: Association to Preserve Cape Cod  
Report Contact Person/Project Lead: April Wobst, 508-619-3185 ext. 6, [awobst@apcc.org](mailto:awobst@apcc.org)

Report Type: Final

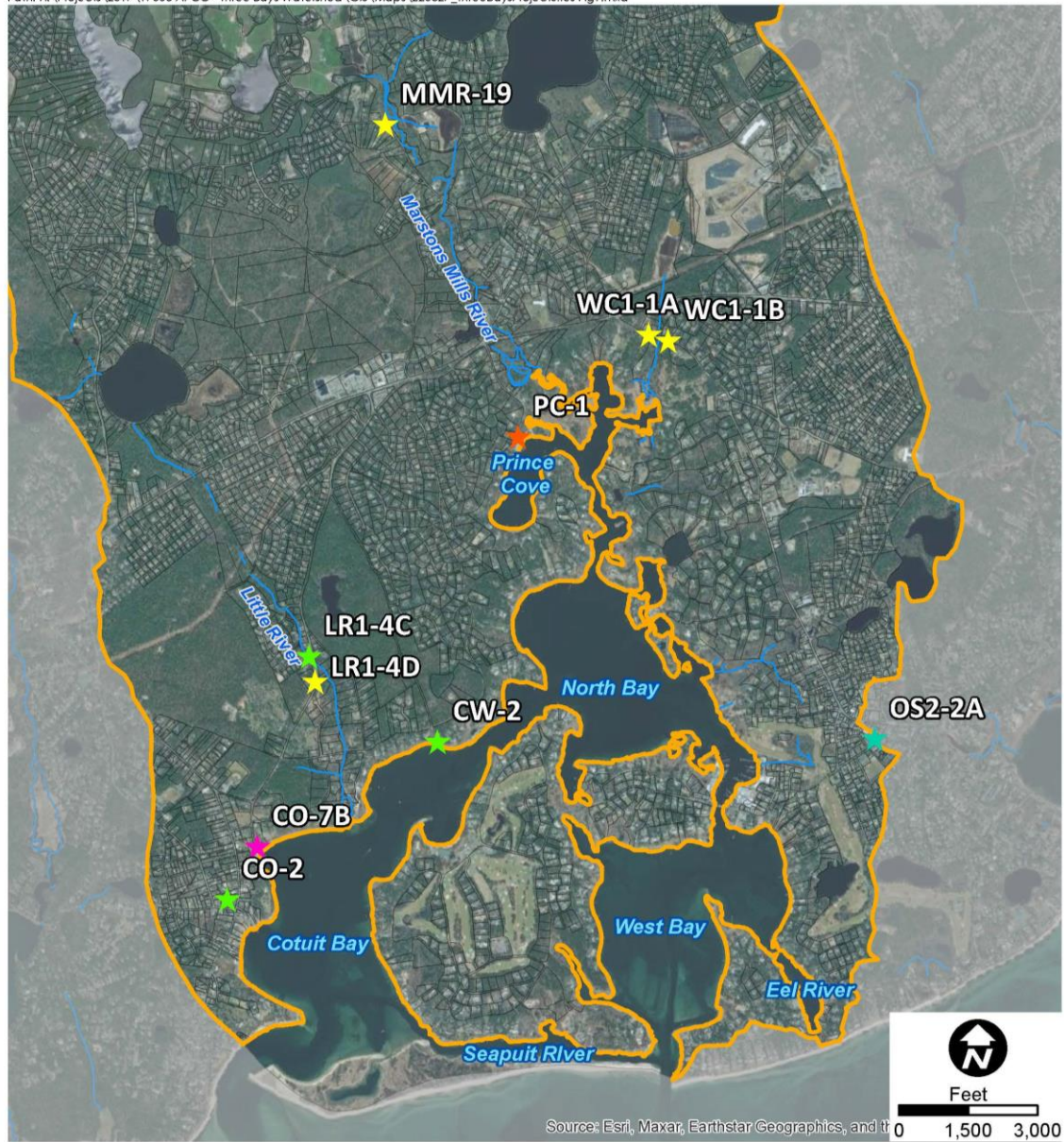
**2. Project Report Narrative Summary**

The Three Bays stormwater management project was a six year, \$2 million project that supported planning, assessment, design, permitting, construction, and maintenance of green infrastructure best management practices (BMPs) within the watershed along with education and outreach to local communities in the town of Barnstable and across Cape Cod. The project completed a watershed scale assessment to identify and prioritize potential stormwater retrofits and provide a comprehensive stormwater management plan including 10% concept designs for 71 sites. This plan, along with community input, was used to inform selection of 10 sites for further survey work, development of existing conditions plans and initial design. Of these ten sites, seven were funded through to completion with a total of nine BMPs constructed including three bioretentions, a sand filter, a gravel wetland, and a series of four dry swales (Table 1 and Figure 1).

Table 1. Summary of Three Bays stormwater constructed BMPs sites and practices (2018-2022).

<b>Retrofit ID</b>	<b>Site Name</b>	<b>Practice Type</b>	<b>Location (Address)</b>
CW-1	Cordwood Landing	Bioretention	590 Cordwood Road, Cotuit, MA 02635
PC-1	Prince Cove	Sand Filter	0 Prince Avenue, Marstons Mills, MA 02648
CO-7	Ropes Beach	Gravel Wetland	85 Old Shore Road, Cotuit, MA 02635
LR1-4C	Putnam Avenue	Bioretention	16-52 Captain Isaiah Road, Cotuit, MA 02635
LR1-4D	Putnam Avenue	Dry Swale	325-451 Putnam Avenue, Cotuit, MA 02635
CO-2	Cotuit Library	Bioretention	871 Main Street, Cotuit, MA 02635
WC1-1C	South County Road	Water Quality Unit	1774-1812 South County Road, Osterville, MA 02655
WC1-1A&B	South County Road	Dry Swales	1774-1812 South County Road, Osterville, MA 02655
MMR-19	River Road	Dry Swales	465 River Road at Rosa Lane, Marstons Mills, MA 02648

Path: H:\Projects\2017\17006 APCC - Three Bays Watershed\GIS\Maps\220627\_ThreeBaysProject\Sites-Fig1.mxd



Date: 6/28/2022  
Data Sources: Bureau of Geographic Information (MassGIS), ESRI

This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

- |                  |                |                      |
|------------------|----------------|----------------------|
| ★ Bioretention   | ★ Rain Garden  | Three Bays Watershed |
| ★ Dry Swale      | ★ Sand Filter  |                      |
| ★ Gravel Wetland | — Stream/River |                      |
|                  | □ Parcels      |                      |

**Three Bays Stormwater Management Project**  
APCC and Town of Barnstable, MA.

**Figure 1**  
Constructed Retrofit Sites.

The Three Bays watershed is located in Barnstable, MA on the south side of Cape Cod draining to the Nantucket Sound. The watershed is roughly 12,500 acres and includes land draining to the following coastal waterbodies: Cotuit Bay, North Bay, Prince Cove, Warrens Cove, Seapuit River, and West Bay. The watershed is severely degraded by high pathogen loads and nutrient

enrichment resulting in poor water quality, degraded habitat, and closures of beaches and shellfish areas. Land uses, including stormwater runoff and fertilizer use, contribute 19.6% of the 2019 total nitrogen unattenuated load in the Three Bays watershed. The project area contains four Category 4a nutrient or estuarine bioassessment impaired waterbody segments: Cotuit Bay, North Bay, Prince Cove, and West Bay. Cotuit Bay, North Bay, Prince Cove, and Seapuit River are also listed as Category 4a for pathogens. Bacterial contamination regularly causes closures of shellfish harvest areas within Prince Cove, Warrens Cove, and North Bay all of which receive discharge from the Marstons Mills River. Monitoring indicates 100% eelgrass loss across all sub-embayments. Dissolved oxygen depletion ranges from moderately impaired to severely degraded resulting in periodic fish kills in the system and near loss of the benthic community in Prince Cove, Warrens Cove, and upper North Bay. These enclosed sub-embayments and the Marstons Mills River lie in a densely-populated area popular for boating, recreation, and shellfishing.<sup>1,2,3,4,5,6</sup>

The goals of this project were to improve water quality, reduce shellfish and beach closures, and restore habitat for fish, shellfish and other wildlife in the Three Bays watershed. This was accomplished by taking an integrated approach, which included improvements to stormwater management through green infrastructure BMP installation as well as education and outreach aimed at changing behaviors to reduce use of fertilizers and other chemicals on lawns. This project focused on remediating runoff contributing to high-priority stormwater outfalls in the Town of Barnstable. The high-priority outfalls were those that discharge directly to surface waters connected to the Three Bays embayments where we could achieve the greatest reduction in pollutant loadings, especially nitrogen, bacteria, and sediment.

The project was managed by the Association to Preserve Cape Cod (APCC) working in close coordination with the Town of Barnstable (Town). APCC managed project scope, schedule, and administration including grant expense and match reporting. APCC provided review of all technical documents and managed ongoing education and outreach throughout the project. The Horsley Witten Group (HW) was hired and managed by APCC as the stormwater engineer and completed all design, permitting, maintenance trainings, and joint construction oversight with the Town. HW put all sites out to bid and held the construction subcontracts. Both HW and the Town supported grant administration and reporting along with public meetings and outreach. Town staff provided technical review of all plans, permits, and bid specifications and assisted with coordination of local permitting as well as construction oversight.

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<sup>1</sup> Howes B., S. W. Kelley, J. S. Ramsey, R. Samimy, D. Schlezinger, E. Eichner (2006). Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Three Bays, Barnstable, Massachusetts. Massachusetts Estuaries Project, Massachusetts Department of Environmental Protection. Boston, MA.

<sup>2</sup> Massachusetts DEP, USEPA New England Regions 1. (2009). Final pathogen TMDL for Three Bays Watershed, Barnstable, MA. Report Number MA96-TMDL-19, Control Number: CN 309.0. Boston, MA.

<sup>3</sup> Commonwealth of Massachusetts. (2007). Final Three Bays System Total Maximum Daily Loads for Total Nitrogen.

<sup>4</sup> Massachusetts Year 2016 Integrated List of Waters: Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts Department of Environmental Protection.

<sup>5</sup> Cape Cod Commission. (2015). Cape Cod Area Wide Quality Management Plan Update (208 Plan). Barnstable, MA.

<sup>6</sup> Town of Barnstable. (2020). Comprehensive Wastewater Management Plan. Appendix SS: 2020 Wastewater Plan MEP Scenarios: Additional 3 Bays Sewering and Barnstable Great Marshes Impact.



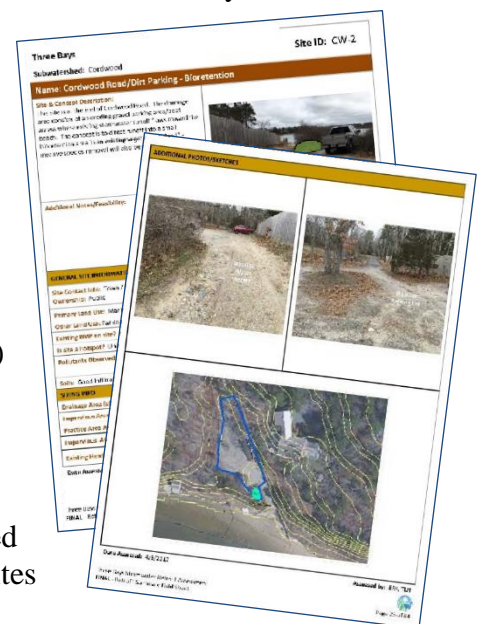
The project was funded jointly by EPA Southeast New England Program (SNEP) Grants, Office of Coastal Zone Management Coastal Pollutant Remediation (CPR) Grants and in-kind contributions from the project team and partners. The total project cost was \$2,205,470 including \$1,905,470 in grant expense and \$300,000 in tracked in-kind match. Total in-kind contributions far exceeded this amount, but to limit the administrative burden on town staff, the bulk of their time and contributions were not tracked beyond the first two years of the project. After the first two years, complimentary SNEP and CPR grants were used for match. A total of three SNEP grants (FY16, FY18, FY19) were awarded to APCC and five CPR grants (FY18-FY22) were awarded to the Town in support of this work.

## 2.A. Project Results

The goal of this project was to improve coastal water quality in the pollutant-impacted Three Bays system in Barnstable, MA by reducing or eliminating pollutant loadings from stormwater runoff and fertilizer use (nitrogen in particular). This goal was achieved through design, permitting and installation of green infrastructure stormwater BMPs as well as through education and outreach to public to reduce the impacts of stormwater runoff and fertilizer by homeowners.

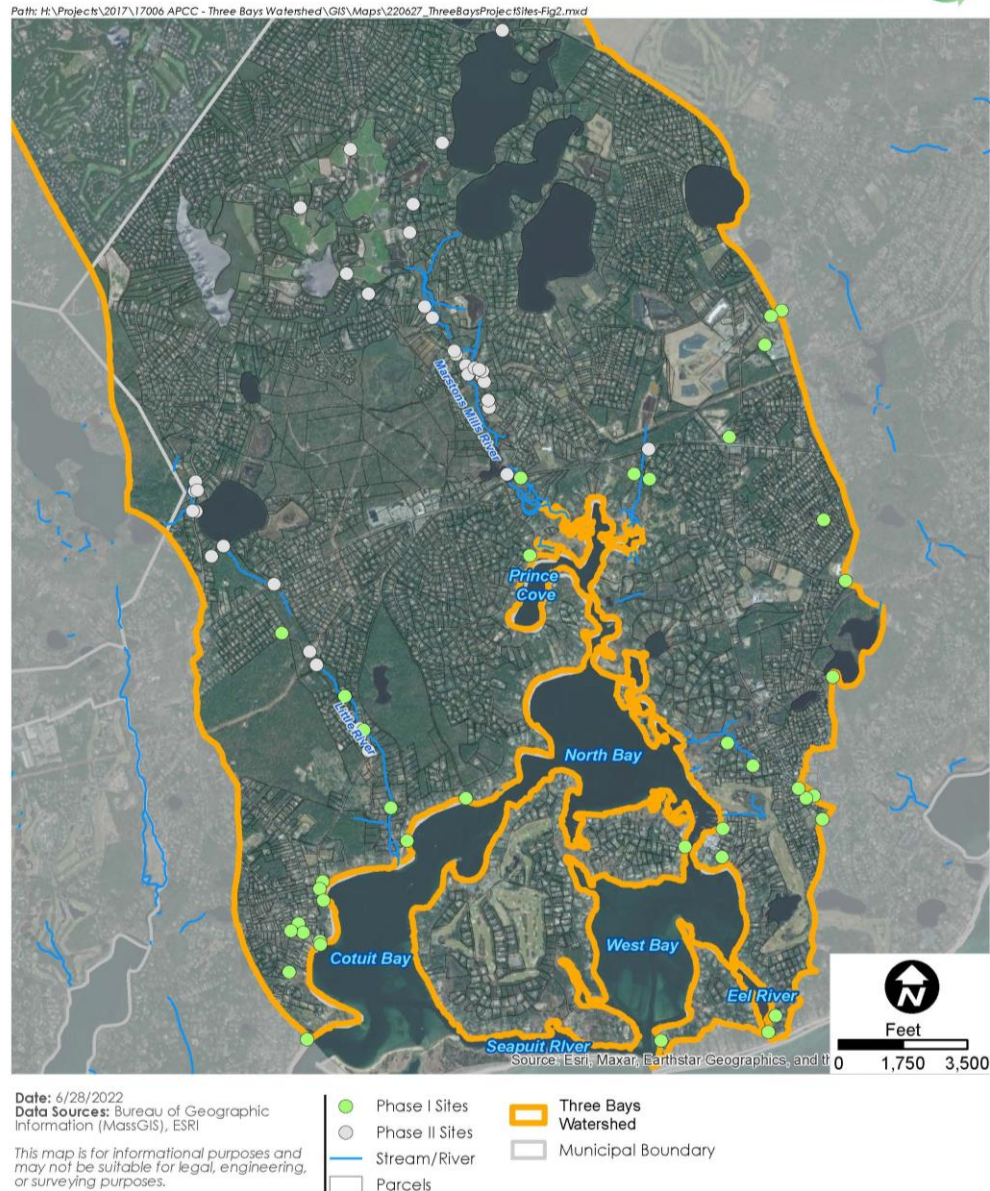
### *Activities carried out to complete the project*

The SNEP 2018 grant supported an expansion of the SNEP 2016 funded sub-watershed assessment to include areas upstream and connected to the bays through surface waters (ponds, lakes, and streams). This assessment identified and prioritized 29 new potential retrofits sites and was combined with the existing assessment of 42 sites to provide a comprehensive stormwater management plan for the Three Bays watershed (Figure 2). This scope of work included field assessments, completed in 2018, and a GIS desktop assessment, completed in January of 2019, that incorporated mapping, calculation of drainage areas, development of 10% concept designs and cost estimates, estimation of pollutant removal for the proposed BMP, and any other information relevant to prioritization of sites. From this information potential retrofit sites were scored and ranked according to the following criteria: pollutant removal potential (water quality volume treated and pollutant reduction), estimated construction cost, ease of implementation (permitting complexity, access issues, ownership issues, and maintenance burden) and other benefits (education/demonstration opportunity, and benefits to shellfish or beaches). As part of this site assessment, two previously identified sites (Little River Landing and Seaview Avenue Two) were reassessed for potential development of new concept designs based on public feedback. After review, the team was not able to determine an alternative design that was agreeable to the town and public that would achieve the desired stormwater management goals so alternate upstream locations were reviewed including two sites along Sea View Avenue (ER-2/3) and two sites along Little River at Old Post Road and Putnam Avenue.



Example retrofit fact sheets  
generated from field assessments in Three  
Bays Watershed, MA

This ranking of proposed retrofits from the expanded watershed assessment report was reviewed with the project team and a set of 10 priority sites selected for public review at meetings held in February of 2019. From this three sites were selected for site survey, development of existing condition plans, and 25% design from April through August of 2019 with the goal to complete 75% design and permitting for two of these sites and complete construction of a minimum of one site in the spring of 2020. The sites included for SNEP18 funding were: the Cotuit Library (CO-2), River Road at High River (MMR-10) and River Road at Rosa Lane (MMR-19).



**Three Bays Stormwater Management**  
APCC and Town of Barnstable, MA.

**Figure 2**  
Identified Retrofit Sites by Phase.

After completion of the 25% design plans and review by the project team, the top two sites (Cotuit Library and River Road at Rosa Lane) were selected for further development. The 75%



design plans were completed by November of 2019 and the permit hearing for the River Road site was held in December of 2019. The Cotuit Library site did not require any permitting and thus was fast-tracked toward construction. At the same time that this design work was underway, 75% design plans and permitting were completed for South County Road and Putnam Avenue BMPs with CZM FY19 grant funding. Draft 100% design plans and bid specs were completed for the Cotuit Library, South County Road and Putnam Avenue sites by December of 2019 and the projects put out to bid for 2020 construction. Permitting for the River Road site was completed and approved in early 2020. The SNEP18 grant funded 25/75% design the Cotuit Library and River Road sites, permitting for River Road and the 100% bid specs for the Cotuit Library. The SNEP19 grant supported completion of 100% design plans and bid specs for the South County Road site.

Construction bids were received, and a contract awarded in January of 2020 to Sum Co Eco-Contracting as the lowest qualified bidder. In the spring of 2020, construction was completed at the Cotuit Library, Putnam Avenue and South County Road. However, due to high bids received the 2020 construction at South County Road was limited to installation of a water quality unit. The SNEP grants funded construction at the bioretention at the Cotuit Library and installation of the water quality unit at South County Road, and along with a CZM FY20 grant jointly funded construction of a dry swale and bioretention at Putnam Avenue.



Photos of 2020 constructed BMPs (left to right): the Cotuit Library bioretention, South County Road water quality unit and Putnam Avenue bioretention

In the fall of 2020, with additional funding from a CZM FY21 grant, the two dry swales designed for South County Road were put out to bid again. Bids for construction of the dry swales at South County Road were received in January of 2021 and a construction contract awarded to Coastal Excavation. Construction began in March and was completed in June with the support of SNEP19 supplemental and contingency funding.

With additional funding from a CZM FY22 grant, the team was able to put out to bid the dry swales designed for River Road at Rosa Lane. Construction bid documents were drafted in the fall of 2021 and the project put out to bid in November. Bids were received in January of 2022 with a contract awarded to Coastal Excavation and construction completed March through June of 2022. The CZM grant funded the bulk of construction expense at River Road with bidding, contracting, project management, and a portion of construction funded by the SNEP19 grant.



Photos of 2021 and 2022 BMP Construction (left to right): the South County Road dry swale 1, South County Road dry swale 2 and River Road dry swale

Maintenance trainings were held annually for town of Barnstable staff and volunteers. As construction of Phase 1 SNEP16/CZM funded sites (Cordwood Landing, Prince Cove Marina, and Ropes Beach) wrapped up in the fall of 2019, the team organized and hosted an in-office and on-site maintenance training for town staff and volunteers (21 total in attendance including 12 from Barnstable DPW, two from Brewster DPW, a CZM representative and 6 volunteers). In the fall of 2020, a much smaller maintenance training was organized with town staff and two volunteers, which included inspections of the newly constructed BMPs at the library and Putnam Avenue. An additional maintenance training was provided in the fall of 2021 for town partners and two volunteers interested in helping with maintenance of the Cotuit Library bioretention. In April of 2022, a site review covering necessary maintenance for the South County Road and River Road swales was completed as close out to construction of those sites.

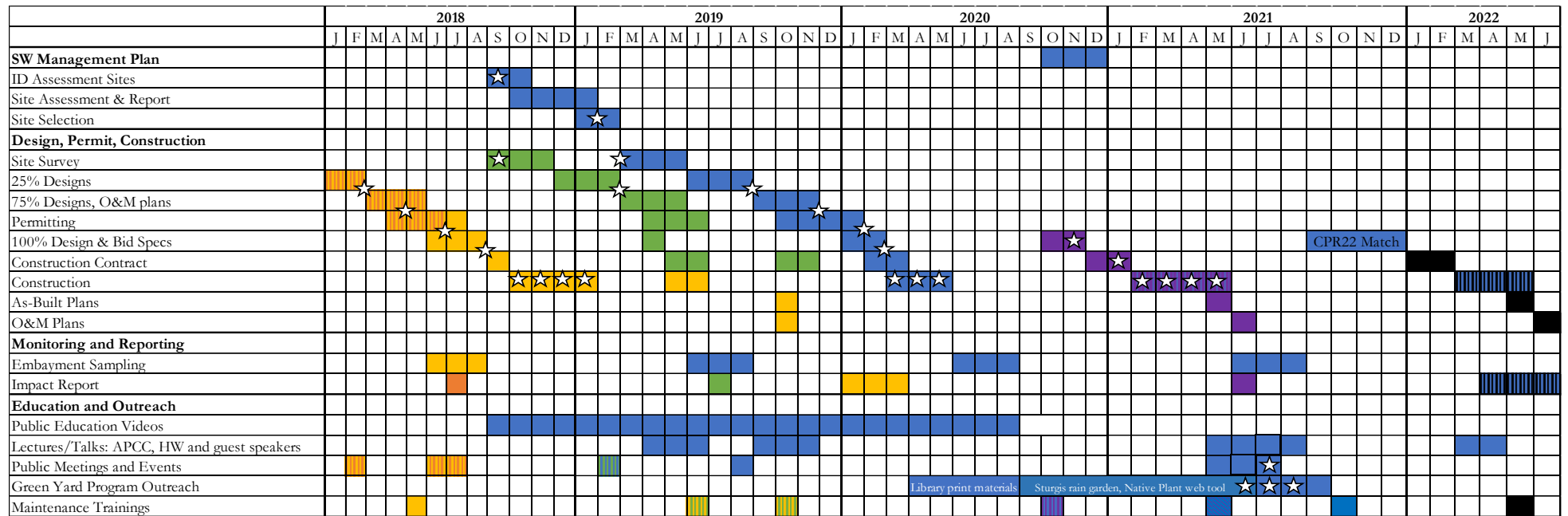









Photos from the 2019 in-office and on-site maintenance training for municipal staff and volunteers.

The project scope as described above was completed with SNEP and CPR funding according to the schedule summarized in Table 2.



Table 2. Three Bays scope and schedule for SNEP16/18/19 and CZM CPR grants from 2018 through 2022.



SNEP 2016 Grant Scope	
CZM 2018 CPR Grant Scope	
CZM 19/20 CPR Grant Scope	
SNEP 2018/19 Grant Scope	
CZM 21 CPR Grant Scope	
CZM 22 CPR Grant Scope	
Meetings/Workshops/Events	

### Report on short and long-term outcomes:

The following are a list of proposed short and long-term outcomes for the project and a summary report on the measurement of success to date at achieving these outcomes.

#### *Water Quality Improvement Outcomes:*

- 1) Eliminate 60-90% of bacteria (minimum of 70%) and 30-65% of nitrogen (minimum 55%) from stormwater runoff at sites.
- 2) Fifty percent reduction in frequency and/or length of beach and shellfish closures in the embayment (Cotuit Bay, North Bay, West Bay, Prince Cove, or Warren's Cove) immediately adjacent to the BMP.
- 3) Reduction in algal blooms, including toxic cyanobacteria blooms, in the embayment (Cotuit Bay, North Bay, West Bay, Prince Cove, or Warren's Cove) immediately adjacent to the BMP.

Each of the installed BMPs was selected and designed to meet the minimum pollutant removal goals of the projects. Final pollutant removal estimates based on performance curves and final calculated BMP sizing and drainage area from as-builts can be found in Table 3.

The Barnstable Clean Water Coalition collects water samples and in-situ measurements of water quality every two weeks, from the end of May through the beginning of October, at five stations within the Three Bays Estuary. The water samples are analyzed for various nutrient components (including dissolved and particulate forms of nitrogen, total nitrogen, particulate carbon, silicate, dissolved inorganic phosphorus, and total phosphorus) and algal pigments at the Center for Coastal Studies. The data are available for download on the Center for Coastal Studies website: <http://www.capecodbay-monitor.org/>.

The nine stormwater BMPs implemented as part of the Three Bays Stormwater Project are located throughout the Three Bays watershed and were installed between 2019 and 2022. The four water quality monitoring stations in close proximity to these stormwater improvements are at Warrens Cove, North Bay, the Narrows, and Cotuit Bay (Figure 3). Simple trend analyses of total nitrogen, turbidity (measure of water clarity), and total phosphorus indicate that water quality has either stayed the same or worsened over this time period when the stormwater BMPs were installed (Figures 4-6). The analyses also indicate a general water quality gradient from the northernmost station in Warrens

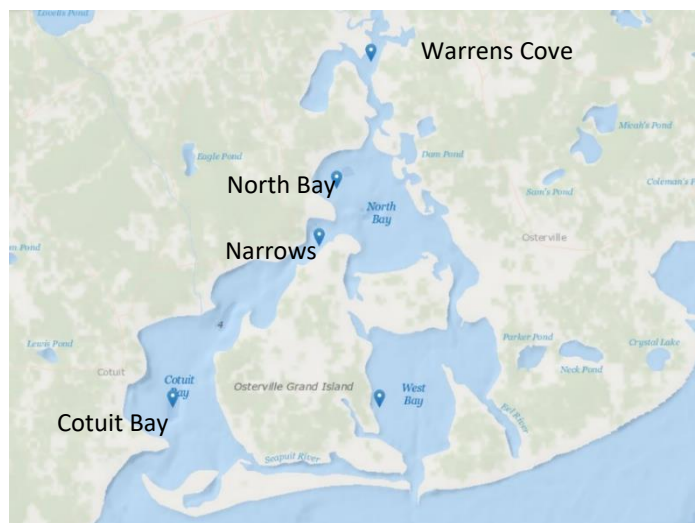


Figure 3. Map of water quality stations in the Three Bays Estuary. These stations were sampled by the Barnstable Clean Water Coalition in 2013 through 2021. The labeled sites are located within close proximity to the stormwater BMPs.



Cove to the southernmost station in Cotuit Bay. In other words, water quality is worst (highest total nitrogen, turbidity, and total phosphorus) at Warrens Cove and gradually improves as it mixes with the tidal waters of Nantucket Sound. These results suggest that the impact of the stormwater BMPs on water quality is overshadowed by other environmental and human land-use factors, such as nitrogen load from septic systems and increasing temperatures related to climate change.

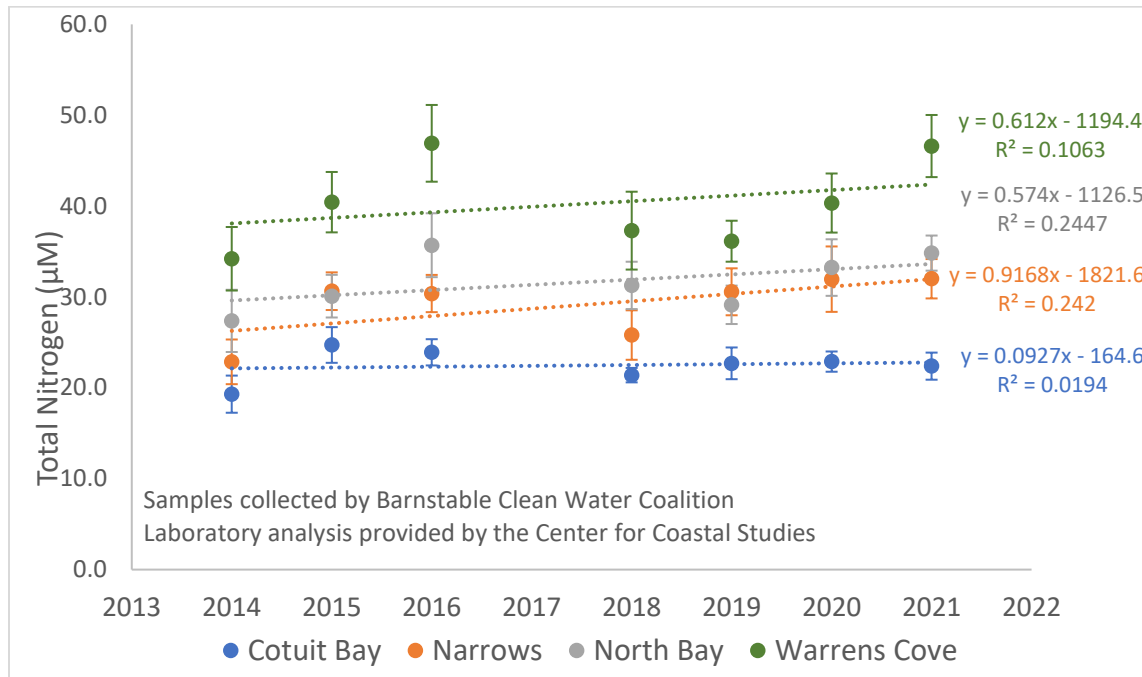


Figure 4. Trends in summer averages of total nitrogen at four stations within the Three Bays Estuary. These stations are located within close proximity to the stormwater BMPs. No data collected in 2017. Error bars show standard error.

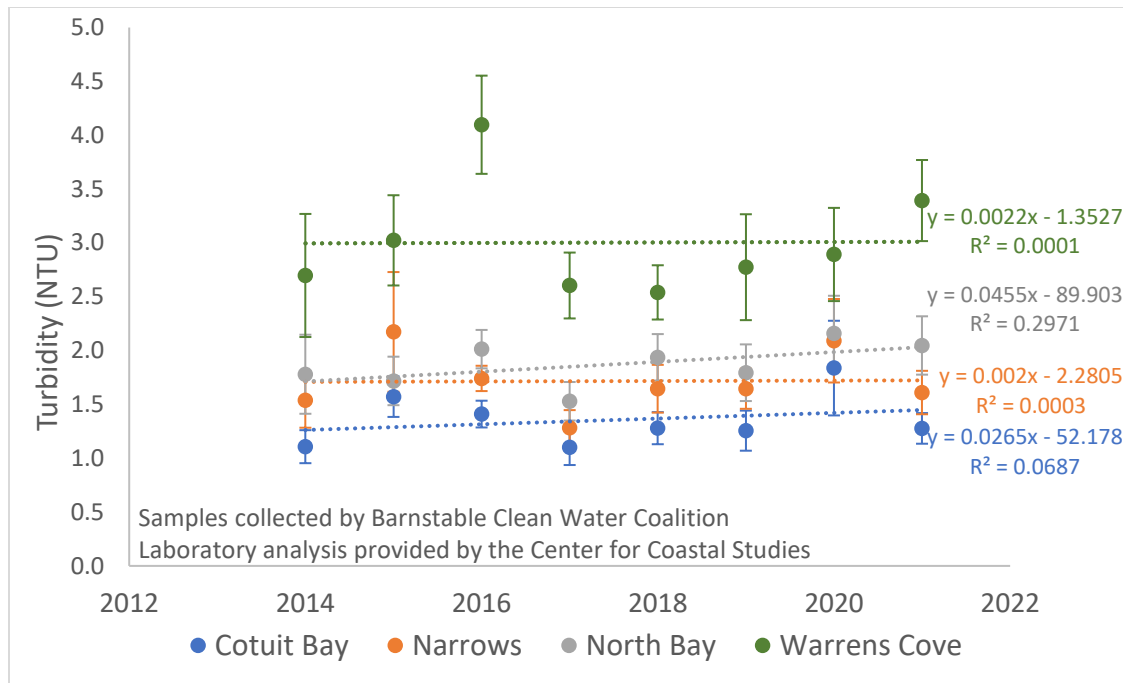


Figure 5. Trends in summer averages of turbidity at four stations within the Three Bays Estuary. These stations are located within close proximity to the stormwater BMPs. Error bars show standard error.

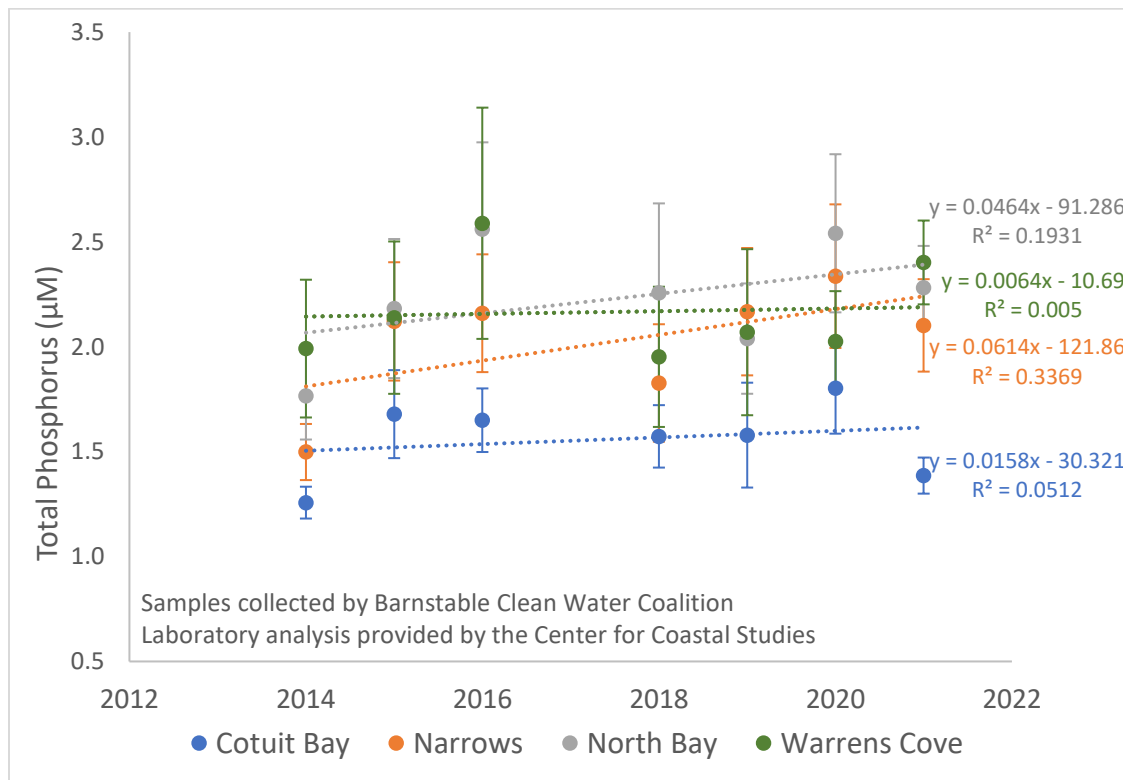


Figure 6. Trends in summer averages of total phosphorus at four stations within the Three Bays Estuary. These stations are located within close proximity to the stormwater BMPs. No data collected in 2017. Error bars show standard error.



Table 3. Summary of the pollutant removal and construction expense for the Three Bays stormwater constructed BMPs (2018-2022).

Retrofit ID	Site Name	Practice Type	Construction Year	Drainage Area	Impervious Surface	Nitrogen Removal		Bacteria Removal		TSS Removal		Construction Cost	Construction Grant Funder(s)
				(ac)	%	%	lbs	%	billion colonies	%	lbs		
CW-1	Cordwood Landing	Bioretention	2019	1.4*	32	100%	13.1	100%	126.5	100%	398	\$106,835	SNEP16
PC-1	Prince Cove	Sand Filter	2019	1.8	38	70%	14	86%	164	90%	539	\$105,415	SNEP16
CO-7	Ropes Beach	Gravel Wetland	2020	0.25*	50	68%	2.2	76%	23.8	90%	88	\$132,000**	SNEP16/18, CPR19/20
LR1-4C	Putnam Avenue	Bioretention	2020	0.3	56	32%	1.5	55%	25	90%	128	\$65,250	CPR20/SNEP19
LR1-4D	Putnam Avenue	Dry Swale	2020	3.8	18	100%	23	100%	219	100%	685	\$122,750	CPR20/SNEP19
CO-2	Cotuit Library	Bioretention	2020	0.17	96	100%	4.4	100%	42.3	100%	133	\$179,000	SNEP18/19
WC1-1C	South County Road	Water Quality Unit	2020	4.7***	27	0%	0	0%	0	80%	687	\$22,000	SNEP19
WC1-1A&B	South County Road	Dry Swales	2021	2.6	24	100%	12	100%	182	100%	513	\$157,808	CPR21/SNEP19
MMR-19	River Road	Dry Swales	2022	1.1	32	100%	6.3	100%	96.4	100%	302	\$148,659	CPR22/SNEP19
				<b>Totals:</b>	<b>76.5</b>		<b>879</b>		<b>3473</b>		<b>\$1,039,717</b>		

\*Drainage area quantity does not include the drainage area to an existing stormwater BMP that was retrofit during this project.

\*\*The amount listed is the cost of the BMP. The total project amount including additional demobilization/remobilization and wall repair costs was \$214,263.15.

\*\*\*Total drainage area includes the 2.6 acres from WC1-1A&B. However, the TSS removal for the Water Quality Unit was calculated separate from WC1-1A&B.

There are five public beaches in the project area. Ropes Beach is the only beach directly adjacent to an installed stormwater BMP. The other four beaches located in Cotuit Bay and the intersection of Cotuit Bay and North Bay are downstream of constructed BMPs but likely less directly impacted by the project scope of work. Table 4 provides a summary of beach closure days due to high bacteria loads measured and reported by the Massachusetts Department of Public Health<sup>7</sup> from 2013 to 2021. The table summarizes closures for these five public beaches, their location in the project area and the most immediate upstream stormwater BMPs along with the date of installation of those BMPs. The data shows no specific trend or reduction in beach closures to date following installation of these stormwater BMPs, however more years of data might be needed to track trends and changes at Ropes Beach in particular to determine the effectiveness of that BMP in reducing beach closures.

Table 4. Public marine beach closures in the Three Bays watershed from 2013 through 2021.

Public Beaches in Three Bays	Embayment	Stormwater BMP (construction year)	Days of Closure								
			2013	2014	2015	2016	2017	2018	2019	2020	2021
Ropes Beach	Cotuit Bay	Ropes Gravel Wetland (2019)	1		1	1	3			2	2
Cross Street (Rileys Beach)	Cotuit Bay to Nantucket Sound	Downstream of Ropes, Cordwood, Prince Cove (2019)				1	2		3		
Loop Beach	Cotuit Bay to Nantucket Sound	Downstream of Ropes, Cordwood, Prince Cove (2019)									6
Oyster Harbors Club	Cotuit Bay	Across Bay from Cordwood (2019)		1							
Cotuit Bays Shores (Isabella Point)	Cotuit Bay/North Bay	Downstream of PC ('19), SC ('21), RR ('22)	1						1	1	2

(gray = years prior to construction)

There has been no reduction in shellfish closure area or duration to date in the Three Bays coastal embayments (see Appendix A for full description and maps). Also, there were no additional coastal algal blooms formally reported during the project period, and none of the final BMP sites were located near freshwater sites where cyanobacteria is currently monitored. Thus, at this time there is no evidence to support whether the completed stormwater management work has resulted in any reduction of algal blooms.

However, the proximity of monitoring stations relative to the locations of installed BMPs, as well as the overall size of the coastal embayments, make conclusions based on water quality data, beach closures, shellfish closures and algal blooms challenging. These large-scale metrics are influenced by a wide variety of human land use and environmental variables, such as high nutrient loads from septic systems, tidal exchange with Nantucket Sound, and climate change. Thus, they are not an effective means of measuring the impact of the smaller-scale, site-specific stormwater BMPs. In conclusion, the performance curves remain the best estimate of pollutant reduction for the installed systems at this time.

<sup>7</sup> <https://www.mass.gov/lists/water-quality-at-massachusetts-swimming-beaches>.



### Education and Outreach Outcomes:

- 1) Reduction in application of fertilizers and increased use of eco-landscape practices in the Three Bays watershed by 2021.
- 2) Increase public support for and involvement with GI stormwater projects in the Three Bays and Town of Barnstable by 2021.

The success of education and outreach outcomes to date can be measured in output of materials produced and estimated number of community members and individuals reached with public engagement. The following tables summarize the outreach materials produced, events hosted as well as estimated attendance and reach of in-person, print and online outreach to the public (Tables 5 and 6). In total, the SNEP funded outreach activities including lectures, presentations, public meetings, events and videos reached an estimated 2,331 individuals (outcome 2). Of those activities, those specifically geared toward messaging to homeowners to encourage reduction in fertilizer use and use of alternative eco-landscape practices (highlighted in green) reached an estimated 966 individuals (outcome 1). A total of five press releases were issued from 2018 to 2022 resulting in 15 news articles about the project highlighting the goals, and achievements of the project (outcome 2). Supporting outreach included sharing of news, events, and project updates online. Photos and videos were shared with the project team members and the community through webpages, print and online newsletters, Facebook and Instagram. The combined outreach online by APCC and partners is estimated to have reached a total of 27,927 people (outcome 2, Table 6).



Photos from the July 2021 Five-Year Celebration Event including tours of the Cotuit Library Bioretention (center) and Ropes Beach gravel wetland (right)

Table 5. Summary of outreach activities, events and videos along with estimated or actual number of individuals reached from 2018-2022. Activities highlighted in green involved direct outreach to homeowners to encourage eco-landscaping practices in support of Outcome 1.

Activity, Event or Material	Date	Estimated or Actual Attendance for Events	
Presentation of the Project at the Cape Coastal Conference	December of 2018	50	estimated total in attendance
Presentation of the project at the Restore America's Estuaries Summit	December of 2018	50	estimated total in attendance
Presentation to the Barnstable Association of Recreational Shellfishermen	February of 2019	25	estimated total members in attendance
Public meetings to review watershed assessment and "top 10" list of priority sites	February of 2019	30	estimated total members in attendance
Presentation at the Cape Cod Natural History Conference	March of 2019	300	total estimated in attendance
Eco-Landscape Lecture Series (3 lectures)	May, June, July 2019	160	total in attendance at in-person lectures

Presentation of the project and proposed 25% designs at the Cotuit Civic Association	August of 2019	30	total estimated in attendance
Cordwood Landing Construction, Stormwater 101 and Residential Stormwater Videos produced by Town of Barnstable CH18 TV	Released 2018, 2019, 2021	663	total views of videos to date as shared by APCC and Town on Vimeo and YouTube
Creatively Managing Stormwater Video produced by APCC volunteer	2020	171	views from APCC vimeo page
Presentation of project update at the Cotuit Civic Association	September of 2020	30	estimated in attendance for this virtual zoom meeting
Presentation at the Restore America's Estuaries Virtual Summit	October of 2020	50	estimated in attendance
Horsley Witten Group Video, Nature Based Solutions: An Introduction to Green Stormwater Infrastructure highlighting this project	November of 202	425	total views of video to date
Cotuit Library Garden Tour	June of 2021	100	or more in attendance that toured the Cotuit Library bioretention garden
Cape Cod Native Garden Lectures for the Cotuit and Sturgis Libraries	July of 2021	35	estimated in attendance for two virtual lectures by Kristen Andres of APCC
Five Year Project Celebration Event Hosted at the Cotuit Library with Tours of Installed BMPs	July of 2021	30	estimated in attendance at this small in-person invite only outdoor event
Rain Garden Workshop for homeowners at the Cotuit Library	August of 2021	8	total in attendance for this small format in-person outdoor workshop
Presentation of the Project and Lessons Learned for EPA Soak Up the Rain Webinar	April of 2022	174	total in attendance for this virtual webinar
<b>TOTAL ESTIMATED REACH</b>		<b>2,331</b>	
<b>SUBTOTAL HOMEOWNER OUTREACH ON ECO-LANDSCAPING PRACTICES</b>		<b>966</b>	

Table 6. Total outreach to members and followers from print and online outreach.

News and Online Outreach	Date	Total Numbers as of June 2022	
APCC membership	2018-2022	5,000	total reached with print and e-newsletters
APCC Facebook	2018-2022	4,341	total followers
APCC Instagram	2018-2022	1,303	total followers
Horsley Witten Facebook	2018-2022	402	total followers
Horsley Witten Instagram	2018-2022	392	total followers
Horsley Witten Newsletters	2018-2022	2,500	total reached with e-newsletters
Town of Barnstable Facebook	2018-2022	11,000	total followers
Town of Barnstable Instagram	2018-2022	1,466	total followers
Cotuit Library Facebook	2020-2022	1,523	total followers
<b>TOTAL</b>		<b>27,927</b>	

*Municipal Capacity Outcomes:* Improve Town of Barnstable municipal capacity to better address stormwater management in the Three Bays over the next 3-5 years.

The initial SNEP16 funding awarded in 2016 was intended to complete design, permitting and installation of up to two green infrastructure stormwater BMPs and provide a subwatershed scale

management plan to guide future implementation. With the success of this work and increased support within the Town this was expanded to a six-year \$2 million project including two additional SNEP grants awarded to APCC and five CZM grants awarded to the Town. The scope expanded to the area of assessment and completed construction of seven additional (nine total) BMPs over this period.

One of the keys to the project's success was its foundation in watershed-scale planning. From the very first SNEP grant, this project was based on watershed assessments and opportunities. This allowed us to not only identify and prioritize sites for the near-term but also to provide an effective roadmap for the Town to follow to address water quality and find funding well into the future.

Prior to the implementation of these systems, stormwater treatment in these project areas was largely untreated or minimally treated with catch basins. The addition of these stormwater systems to the existing stormwater infrastructure has greatly increased the amount of TSS, bacteria, and nutrient removal before discharge to a river or estuary. It has also heightened the Town's awareness of measures necessary to maintain stormwater infrastructure in these areas, particularly, since these systems are not catch basins, which is largely what the highway division staff were accustomed to maintaining. After these systems were constructed, it was apparent that the Town needed education, training, and communication to ensure adequate maintenance of these systems.

APCC and HWG provided the Town with Operation and Maintenance Plans and hands on trainings to help educate the Town staff on maintenance of these systems. However, staffing turnovers often resulted in the loss of maintenance reminders and maintenance of these systems would default to local notification that the system needed to be maintained. Ultimately, the Town decided to create a reoccurring work order in the highway division's work order system that would occur at the various maintenance intervals, grouping similar maintenance needs at multiple systems. This has helped the Town become more proactive and less reactive in maintaining these stormwater systems.

Within the Town of Barnstable, this project has also supported progress toward improved stormwater management. Through the creation of recurring work orders in the highway division's work order system, the Town was able to expand the impact of this improved maintenance workflow to address multiple stormwater BMPs located throughout the Town. Overall, this has helped the Town organize and proactively maintain stormwater treatment systems in Barnstable.

In addition, the Town also initiated an annual capital funding project for developing and implementing stormwater improvements at impaired ponds. This program seeks to implement low impact development and nature based solutions where possible and provides a funding source that is able to help leverage grant requests. As a result of this funding and the Three Bays stormwater assessment and management plan completed with this project, the Town will be advancing three additional sites through permitting, design, and construction.



## Findings to Date and Lessons Learned

### *Project Funding*

One lesson learned for how to fund a project such as to seek a large source of multi-year funding upfront to cover work from planning through implementation. Multi-year funding and project progress and success can then be leveraged to secure additional funding to expand the scope and impact of the project. The initial SNEP16 grant for the Three Bays stormwater management project (as well as subsequent SNEP grants to a lesser degree) provided funding to cover assessment, design, permitting and implementation. Securing this grant to cover the project from start to finish allowed the team to feel secure in building plans for a multi-year project and know that investment of time, money and public input would take the project through to construction. Another benefit of these SNEP grants as large multi-year funding sources was that they were able to complement the annual CPR grants and support ongoing work to continue to address and develop plans or designs for the next set of priority sites. The progress the team made in the first years garnered interest and support from the town to apply for the CPR funds as well as subsequent SNEP funding to expand the geographic area and scope of the project. The success of ongoing design and construction built support and allowed us to leverage additional funding to complete design and then construction of each of the subsequent rounds of priority sites. With ongoing funding from the combined SNEP and CPR grants, we were able to switch from a model in which Town staff and the project team were providing the bulk of the project match to a model in which the complementary SNEP and CPR grant scope of work was used as match. This too provided a mechanism to make applying for additional funds easier and reduced the administrative burden of tracking a lot of in-kind contributions of time and other expense.

Construction costs are a major unknown when planning for a project of this scope and scale and funding work with grants. Construction bids for the Three Bays project came in high (greater than available grant funds allocated for construction) in three out of four years. While each grant had its own distinct scope and set of deliverables, much of this project was jointly funded by SNEP and CPR grants. The complementary nature of funding provided the team the opportunity to expand the scope and impact of the project as well as have flexibility to address gaps in construction funding year to year. However, there were still challenges with efficiently implementing projects given the often unpredictable nature of the construction bid process. With limited grant funding, there was little wiggle room if contractor bids were higher than expected. Rather than lose valuable time in a limited grant cycle revising a project and issuing a re-bid, the project team worked together to identify “deduct alternates” in each construction set when feasible. “Deduct alternates” are pre-identified, discrete portions of the project that could be removed from the project by the owner. On their bids, contractors provide a total project bid and then an amount to subtract if the deduct alternate were removed from the scope. In this way, we were able to proceed with the bulk of our construction projects within the grant timeframes and budgets, even when bids came in higher than expected by removing portions of the project in a given year and securing additional funding for construction in subsequent years. For example, the 2018 construction bids including Ropes Beach were higher than the available SNEP16 funding could cover but with additional CPR19 and CPR20 funds this BMP was able to be constructed. Likewise, the 2019 construction bids for three sites (Cotuit Library, Putnam Avenue and South County Road) to be installed in 2020 was also high so the dry swales at South County Road were deducted from that scope and contract. These dry swales at South County Road were then rebid in late 2020 and constructed in 2021 with additional funding from the CPR20 grant.

The only year that construction bids came in under estimates was in 2020 for the 2021 construction at South County Road. Since then construction costs have been on the rise both as a result of labor and materials expense.

### *Planning and Assessment*

One of the keys to the project's success was its foundation in watershed-scale planning. From the very first SNEP grant, this project was based on watershed assessments and opportunities. This allowed us to not only identify and prioritize sites for the near-term but also to provide an effective roadmap for the Town to follow to address water quality and find funding well into the future.

While GIS assessments are always critical to watershed assessments, to really give this project a great head start, we made sure to also get “boots on the ground” at the initial assessment phase. We have found that desktop assessments and models are a good first step, but are not enough to develop sound, realistic concepts that can be quickly advanced to the next design stages. Some GIS-based models focus on finding the “best” locations for certain types of GSI practices. However, there are so many GSI options available regardless of site conditions that it is often more important to understand a site's physical and land usage constraints that are not always discernible using spatial data.

For our field assessments, Horsley Witten would upload GIS to tablets or phones, and head out to the watershed. While visiting pre-identified areas based on GIS and team discussions, the team would also make sure to at least see as much of the watershed as we could so as to not miss obvious retrofit opportunities just because we didn't travel down a certain road. The team invited various town staff and other engaged stakeholders to join us during our fieldwork, and also talked to residents along the way. Not only did the assessment benefit from the institutional knowledge and local land use information this provided, but we were also able to build capacity and awareness along the way. In many cases, the key to successful designs are learned from these conversations in the field.

A couple of examples of a few top priority sites that may not have been identified from desktop analysis alone included Cordwood Landing and Prince Cove Marina. Cordwood Landing had an existing vegetated swale for road and driveway runoff. However, we determined in the field that the runoff from the driveway itself was not flowing into the system because debris had built up along the pavement edge, trapping flows on the dirt driveway, causing erosion gullies right down to Cotuit Bay and a popular shellfishing area.

Another benefit of on-the ground early assessments is that you can “follow the signs.” The Prince Cove site is in a neighborhood with no stormwater infrastructure and would have been easy to miss with just mapping. However, the flow paths were readily apparent in the field, with eroding road edges, sediment build-up, and a large gully at the downstream end. It was clear that runoff flows overland along the main road and collects in the parking lot before overflowing with no treatment down



Prince Cove Site Assessment Photo

into Prince Cove, one of the most impaired parts of the Three Bays. Seeing this in the field was really helpful to understand specific flow paths and drainage areas, as well as the sheer amount of sediment and debris buildup to account for in design and O&M plan.

After the fieldwork, Horsley Witten would then delineate drainage areas based on field findings and perform initial sizing calculations. This is when we can really do a reality check on the site. Using both field and desktop analyses, Horsley Witten could then develop realistic concept designs that fit into the context of the site, both natural and social. The information was compiled on 2-page forms that were used to compare and rank the sites. These forms also integral to the final watershed management plan to be used for planning for future projects, even for those sites not initially at the top of the list. The Team worked together to develop ranking criteria based on watershed goals and local constraints, including pollutant removal, cost, implementation factors, and additional benefits for public educations and key resources.

In summary, we have found that desktop-only initial assessments can be too high level to quickly advance to design because too many constraints are hidden from a GIS standpoint. We recommend getting dirty right from the start to ensure identified priority projects meet community expectations and are impactful and ultimately constructible.

#### *Public Engagement and Site Selection*

Regular semi-annual public meetings and presentations were held throughout the project. However, to be successful in effectively engaging the public we found speaking to community early, and often was the best approach. In each phase of the project, the team sought to identify a “top 10” list of potential retrofits from the field assessment and ranking to review with the public. From this list and input received from the community we then selected 3-4 sites for 25% design. These design plans would be reviewed with the public and the top 2-3 sites selected for final design and construction. This input was important not only for site selection but also informing design to maintain and improve upon existing uses at each site. In this manner by starting broad and narrowing down the set of sites throughout the project we were able to respond to input from the public while minimizing major changes in design or removal of sites at later phase in the project. However, with this approach there were sites that we explored which did not move beyond concept, 25% or sometimes 75% permit-ready designs. In some cases these



sites were removed due to concerns by the public and the town that could not be adequately addressed with the proposed design and thus may not be of interest for future implementation. However, some sites might warrant further review and development. The following is a summary of priority sites that were reviewed but did not progress through to construction (Table 7) organized by the various stages when they were withdrawn from further development with the current project funding. Further details on each of these sites can be found in Appendix B.

Public Meeting to Review Potential Sites



Table 7. Summary of priority sites withdrawn from further development under the current project, organized by design stage.

Site ID	Withdrawn High Priority Sites	Further Investigated	Site Assessments	25% Design	75% Design	Permitted	100% Design
CO-8	Ropes Wet Swale	X	X	X	X	X	X
ER-1	End of Sea View Avenue Bioretention	X	X	X			
ER-2/3	Sea View Avenue Swales East/West	X					
LR1-1	Old Post Road at Little River	X					
LR1-2	Little River Landing	X	X	X	X	X	
OS2-1	Bridge Street Wet Swale	X	X				
OS2-6	West Bay Road Sand Filters	X	X				
MMR10A&B	River Road Dry Swales	X	X	X			
MMR-17	River Road Historic Site Bioretention	X					

### *Operations and Maintenance*

Another lesson learned is that maintenance trainings are hard to fit in within the timeframe of CZM fiscal year funding when paired with design and construction projects. Even without the restriction on in-person gatherings due to COVID-19, the ability to host a training by the end of the grant period would have been very challenging both due to available time left post-construction and the increasing workload of municipal staff in late spring and early summer. Likewise, there are many benefits to hosting these trainings six months post-construction as we have seen with past project work. This allows the plants and seed to better establish in the BMPs and provides more opportunity to show municipal staff the types of maintenance and operational checks that will be needed bi-annually and more often. While challenging to manage within the framework of state-funded grants, for our project, scheduling trainings in this manner seems to be the best approach. With the joint funding provided by SNEP grants the team was able to provide initial site reviews in the spring post-construction and SNEP funded maintenance trainings the following fall.

### Changes Made to the Project Plan over the Course of the Project

The initial proposal for the SNEP18 grant encompassed completion of design, permitting and construction of two new BMPs as well as construction of a third existing BMP at Little River Landing which had completed permitting but required additional funding for construction and revision to the design to meet town and public needs. After review of alternative options for Little River Landing, no agreeable alternative was found, so the team instead looked upstream in the watershed and identified the Putnam Avenue site as the best alternative to address stormwater runoff entering the bays from Little River.

The proposed SNEP18 scope included development of a short (~15 minute) educational stormwater management video to be used for ongoing meetings and public engagement. After further discussion within the team, it was decided that a series of short videos would be more effective in providing focused messaging to raise awareness about the impact of stormwater runoff on water quality and providing actions that could be taken by individual homeowners to help contribute to the solution. APCC had initially outlined plans for development of up to six educational videos with the Town of Barnstable, however, actual video development took longer than anticipated, and due to limitations on staff and capacity especially during the COVID-19 pandemic, this scope was reduced to completion of two videos. Video production began in 2019 with one completed in 2019 (Stormwater 101) and one in 2021 (Managing Residential Stormwater). APCC supplemented this with an additional video developed by one of our volunteers (Creatively Managing Stormwater) to highlight recently constructed BMPs as examples of what can be done on a smaller scale by homeowners.

The SNEP18 scope also proposed development of a maintenance training video. However, due to limited capacity of town partners and further discussion on the use and value of a video with the town, it was determined that this would not be as useful for DPW staff as trainings and written plans.

While the project was able to proceed with 2020 construction as planned, the closures and limited staff capacity (particularly in early 2020), due to the COVID-19 pandemic, meant much of the education and outreach programming planned had to be postponed with the hopes of completing this virtually or ideally in-person in 2021. The Cotuit Library, intended to be our main partner in outreach, had its staffing reduced (to their Director only) for period of several months with new hires and a change in Director in the fall of 2021. Thus, the “Green Your Lawn” campaign, as originally proposed for the SNEP18 grant, was significantly changed. The team had initially planned to develop a “Green your Lawn” yard sign and support a golden lawn competition to be launched in 2020 to encourage homeowners to reduce and eliminate fertilizers, pesticides and watering of lawns while shifting to use of more native plants and stormwater management practices including rain gardens and porous pavement. This program was abandoned for alternative outreach in 2020 and 2021. Thus, outreach work in 2020 was much more limited and consisted of development of print materials for use by the Cotuit Library, including a factsheet about the new garden, the video described above, and scavenger hunt cards. The garden was used regularly by library staff to host outdoor story time for children during the late summer and fall of 2020, and a revised program of outreach was developed for 2021 with a portion of funds redirected to development of Cape Cod Native Plant Finder Tool. APCC requested, and RAE approved, an extension on the SNEP18 grant through the end of 2021 to allow for this shift in timing and scope for outreach and education.

The SNEP18 grant was intended to fund construction of a minimum of two BMPs and the SNEP19 grant was intended to fund construction of South County Road and provide contingency construction funds to support work at other sites (Ropes Beach, Putnam Avenue, and/or River Road). However, due to high construction costs with bids typically coming in over estimates (the only exception being the 2021 bids which included final contract just under cost estimate), actual construction expenditures were much more complex and SNEP18, SNEP19 and CZM funds were used jointly to cover costs and contingency. The high bids received in 2020, in particular,

meant that the two dry swales at South County Road had to be removed from the scope of work as part of a deduct alternate. Thus, the bulk of construction funds spent from the SNEP18 and SNEP19 grants were applied to construction of the Cotuit Library, installation of a water quality unit at South County Road, and construction of the swale and bioretention at Putnam Avenue jointly funded with CZM grants. With additional funding awarded to the town by a CZM FY21 grant, the dry swales at South County Road were constructed with supplemental funding provided by the SNEP19 grant. Likewise, an additional CZM FY22 grant was able to support construction of the River Road dry swales, which was made possible with match from the SNEP19 grant for bidding, contracting and a portion of construction. Thus, in total the SNEP18 and SNEP19 grants supported construction of 9 BMPs including: full funding for the Cotuit Library bioretention, and South County Road water quality unit, about 50% of the Putnam Avenue swale and bioretention, and smaller supplemental and contingency funding for the South County Road (2) and River Road (3) swales. RAE approved an extension of the SNEP19 grant through April 30, 2022, to allow for the remaining funds to be spent for support of 2022 construction at River Road. This extension request was extended to the SNEP18 grant completed in 2021 to allow for joint final reporting.

#### Next Steps for Future Progress

One of the goals of this project was to create a project model for green infrastructure stormwater management that could be transferred across the region and to build knowledge and capacity to increase the number of projects completed. APCC sought to achieve this through inclusion of stormwater managers across the Cape in workshops and trainings, regular updates to the stormwater managers group at their meetings, and development of a new project to address stormwater runoff at public boat ramps across the region.

One mechanism for sharing of knowledge was maintenance trainings. The first trainings held in 2017 with support from the SNEP16 grant were targeted at stormwater managers from all Cape towns, and community and non-profit volunteer groups. As an outgrowth from these trainings the town of Eastham reached out to APCC with interest in support for stormwater management in their town. In 2018, a workshop and maintenance training was held at the Eastham Library to review existing green infrastructure installed there and the necessary maintenance needs for those systems. Subsequent to that APCC reviewed other potential stormwater retrofit sites around the town. In 2020, the Town of Eastham contracted with APCC and Horsley Witten Group to assist with planning and design for stormwater BMPs to address runoff to Schoolhouse Ministers Pond. That collaboration is ongoing with 25% design plans completed for two proposed BMPs along Route 6 and construction of a smaller BMP at the town owned Fisherman's Landing planned for 2022.

Growing interest and need to address water quality in freshwater ponds along with identification of an expansive inventory of stormwater project needs across the Cape, led APCC to pursue a new project to address stormwater runoff at priority public boat ramps across the region. Building on the successful model from the Three Bays stormwater project, APCC proposed to manage the project hiring the engineering consultant and partnering with Towns as well as the state. This project, currently funded with a SNEP22 grant, has identified an initial set of 20 priority sites for field assessment in July of 2022. As was done with the Three Bays project, concept (10%) designs will be developed and all sites ranked, prioritized and reviewed with the



public and project team to inform final selection of up to 5 BMPs for development of permit-ready designs. APCC has also applied to CZM for FY23 funds to supplement this scope of work and include additional priority BMPs for design with the goal of replicating the successful funding approach from the Three Bays project. The goal is to continue to partner with the towns to secure funding to advance sites through to construction.

Likewise, as mentioned above the Town has initiated an annual capital funding project for developing and implementing stormwater improvements at impaired ponds. This program seeks to implement low impact development and nature based solutions where possible and provides a funding source that is able to help leverage grant requests. The Town is currently working on advancing three additional sites through permitting, design, and construction. These sites are located along Santuit Newtown Road next to Lovells Pond which drains to Little River which discharges into Cotuit Bay (LR1-13A, 13B, and 14).

#### Challenges for Future Progress

After several years and iterations of construction of green infrastructure BMPs in the Three Bays area, the town and project partners have a very smooth process for project management, coordination, bidding, contracting and completion of scope of work. However, the project partners did encounter a few unanticipated challenges along the way. First, the construction bids were higher than the estimated costs in three out of four years, with the most recent construction bids nearly \$50,000 higher than the estimated costs. This increase in cost following low bids received for 2021 construction are a reflection the reduced availability of construction materials from supply chain shortage issues as well as increased energy prices resulting from the pandemic and inflation. Fortunately, for 2022 construction CZM was able to cover the extra costs but reliance on award of extra funds is not likely to be feasible in most cases.

Availability of construction materials including plants and staffing of police detail has been a challenge for this project in the past three years and we anticipate this being an ongoing challenge in future years. The team was able to work together to identify options for alternative plants and materials as issues arose, however, if alternatives are not readily available this could result in significant delays in project completion. In the most recent construction completed at River Road in 2022, the team was about to replace a proposed catch basin with a locally sourced precast drain manhole top section and a manhole frame and cover. This was the last available set from the seller; if it had not been available, this could have caused major delays while trying to find and order another. The contractor also experienced some initial delays in sourcing of drainage infrastructure materials, such as frame and grate for the new double catch basin. Alternatives were approved by Horsley Witten as appropriate, and the contractor worked with the Team to revise the order of work to keep the project moving and on track. The site proximity to the roadway for construction at South County Road and River Road these past two years meant police detail was needed for in-road work and while moving equipment and materials on and off site. The contractor had difficulty in both 2020 and 2021 in particular finding available police detail due to high demand in the Town and region with many construction projects underway. Police detail from nearby Towns as well as flaggers were used to fill this gap and limit delays or changes in schedule. It is anticipated that provision of police detail will be an

ongoing challenge to construction projects for the near-term and regular use of flaggers will be necessary to advance construction projects. APCC would recommend for future projects planning ahead for potential shortages in materials and ordering plants and other items as early as possible to avoid delays.

## **2.C. Compliance**

The final guidance provided by EPA was that a QAPP was not needed for this project. Permitting was completed for all sites as required (Putnam Avenue, South County Road and River Road) including preparation and filing of a Notice of Intent (NOI – WPA Form 3) with the local Conservation Commission including a descriptive project narrative, MA DEP data forms, alternatives analysis (as applicable), Stormwater Management Form and supporting calculations. Notifications were sent to abutting property owners and the project team attended public hearings before the Conservation Commission to review the permit request and respond to requested revisions. The Cotuit Library site did not require permitting. The following permits listed in the proposed potential scope were not needed for this project: Natural Heritage and Endangered Species Program, U.S. Army Corps of Engineers Preconstruction Notification General Permit; Massachusetts Environmental Policy Act (MEPA), Environmental Notification Form or Environmental Impact Report; Chapter 91 Waterways Permit; 401 Water Quality Certification; National Pollutant Discharge Elimination System Construction Permit; Beneficial Use of Solid Waste; Jurisdictional Determination, Chapter 253 Massachusetts Office of Dam Safety Permit; and Massachusetts Historic Commission, Section 106.

## **2.D. Project Partners**

The Association to Preserve Cape Cod managed the project schedule and scope of work. APCC held and managed contracts with Horsley Witten Group and the Town of Barnstable (the latter for CZM funded scope of work). APCC managed all outreach and public engagement including drafting of press releases, response to media inquiries, coordination and hosting of lectures, public meetings, tours, events and workshops. APCC staff reviewed all deliverables and technical documents (assessment, prioritization, design plans, permits, bid documents, O&M plans, as-builts, etc.) and coordinated project team meetings and calls to review and comment on these deliverables. APCC coordinated bi-weekly calls during construction and



Project Team after completion of the Osterville Library Rain Garden installation in 2017



2019 SNEP Award Event

participated in key site visits including pre-bid review, pre-construction meetings, and final site inspection for development of punch list.

The Town of Barnstable Department of Public Works (Town) participated in project team meetings, public meetings, events, maintenance trainings, construction site visits, and biweekly construction coordination calls. The Town provided input on and participated in site assessment field work and with APCC selected the final sites for design and implementation. The Town provided review of all technical documents including design plans, permits, construction bid documents, as-builts and O&M plans. The Town also provided construction oversight and completed regular checks and

maintenance of existing and newly installed BMPs. The Town provided comment on draft and final educational signs installed. Town of Barnstable Channel 18TV supported completion of educational videos.

Horsley Witten Group (HW) completed the site assessment and prioritization, design, permitting, construction bid documents, construction oversight, as-builts and O&M plans. HW managed the bidding of construction and held all construction contracts with subcontractors. HW also developed and printed educational signage for the Cotuit Library and Ropes Beach along with “no mow” signs for several BMP sites. HW participated in all public meetings throughout project presenting proposed designs and project updates. HW also participated in much of the 2020-2021 outreach programming with the Cotuit Library including development of materials for and leadership of the August 2021 rain garden workshop and assisting the Cotuit Library with monitoring equipment set up for their patron programs. HW provided materials for and presented at all maintenance trainings.



Project Managers April Wobst, APCC and Michelle West, HW

Cotuit and Sturgis Libraries were partners in the project providing comments on proposed design plans for the final installed stormwater systems as well as draft educational signs and other materials. The libraries hosted events and lectures with the team in 2021 in support of the revised outreach programming. See Outreach and Communications section below for more details on the events and lectures.

Barnstable Clean Water Coalition (BCWC) managed the annual embayment sampling completed by their trained volunteers. BCWC also provided input from their in-stream nutrient sampling program to inform the 2018 field assessment and site selection and participated in the 2019 public meetings providing input on sites to inform final site selection for design and implementation.

## **2.E. Volunteer and Community Involvement**

The project was presented to the public for input in multiple ways as reported above. Additionally, embayment water quality sampling by the Barnstable Clean Water Coalition and their volunteers is ongoing and continues to inform management of wastewater and stormwater in Barnstable.

On-site maintenance training regarding newly constructed BMPs was held in October of 2019 for members of the Barnstable Association of Recreational Shellfishermen (BARS) in tandem with a training for town staff. In 2020, volunteer involvement was very limited due to the COVID-19 pandemic. BARS continues to complete biannual cleanup of the Cordwood Landing and Ropes Beach systems based on their 2019 training and regular feedback and communication with the project team.

In the fall of 2020, training was provided to town staff as well as two new volunteers (Bryan Horsley, formerly of APCC and Kelly Barber of Barnstable Land Trust) and library staff for newly constructed BMPs at the Cotuit Library and Putnam Avenue. In the fall of 2021, APCC



and HW met with two volunteers (Bryan Horsley and Lisa Nagely, retired Cotuit Library staff) to review the maintenance needs for the Cotuit Library bioretention. Volunteers are expected to help with management of unwanted weeds and fall leaf cleanup and to notify APCC or the Town when issues arise related to erosion or failed infrastructure. The Town provides regular sediment removal from forebays, mowing and weeding, structural review and cleanout, and other general maintenance.

## **2.F. Outreach & Communications**

APCC maintained an updated project summary factsheet to promote the project along with public meetings. APCC and HW attended the 2018 and 2019 SNEP award events and promoted the RAE press release to local media and to APCC members. As noted above, a total of 5 press releases were issued with 15 news articles produced supporting outreach and education about the project and need for improved stormwater management in Barnstable and across the region.

The project was highlighted in [APCC quarterly and annual reports](#), and APCC maintained an project webpage ([www.apcc.org/threebays](http://www.apcc.org/threebays)) recently updated in the spring of 2023 with final project materials and videos. The town of Barnstable has also created stormwater management webpage with links to the APCC Three Bays stormwater management project page and the Stormwater 101 video (<https://barnstablewaterresources.com/stormwater/>).

APCC, with support from Horsley Witten Group and/or the Town, presented the project at the following venues: the Cape Coastal Conference (Dec. 2018), Restore America's Estuaries Summit (Dec. 2018), the Barnstable Association of Recreational Shellfishermen monthly meeting (Feb. 2019), two public meetings (Feb 2019), updates to the public at Cotuit Civic Association meetings in (August of 2019 and September of 2020), presentation of the Restore America's Estuaries virtual summit (October 2020), and an EPA Soak up the Rain Webinar (April 2022).

APCC coordinated and provided a series of eco-landscape lectures to educate the public about stormwater management and alternatives landscaping options for homeowners. APCC hosted three lectures in 2019 on how to "Kill your Lawn," on "Pollinators," and "The Perfect Yard" by Edwina von Gal which focused on how to reduce lawn and switch to more native plantings with no pesticides or fertilizer use. APCC, in collaboration with the Cotuit and Sturgis Libraries, provided additional virtual lectures in July of 2021 on The Cape Cod Native Garden. APCC participated in the Cotuit Garden Tour, hosted by the Cotuit Library in June of 2021, talking to visitors and showing them the bioretention garden constructed there in 2020 as well as promoting eco-landscaping for their own properties including use of rain barrels, rain gardens, native plants, and porous pave materials. In August of 2021, APCC also hosted tours of the newly constructed demonstration rain garden at the Sturgis Library.

APCC managed education and outreach for the project, working closely with the Town and Horsley Witten Group. APCC worked with the Town of Barnstable Channel 18TV to outline and produce two educational videos geared toward the public: [stormwater 101](#) and [residential stormwater management](#). These two videos were in addition to an existing video created in 2018 documenting the [Cordwood Landing BMP construction](#). In 2020, a fourth video, "[Creatively Managing Stormwater](#)," was completed with an APCC volunteer to promote the project and

work at the Cotuit Library in particular, and Horsley Witten produced the following video highlighting their work and several BMPs constructed with the Three Bays project: [“Nature Based Solutions: An Introduction to Green Infrastructure.”](#)

APCC, with support from volunteer photographer, Gerald Beetham, documented the project including outreach events and construction. A set of “best of photos” from construction and events was compiled in 2021 for final outreach and reporting. Photos provided by Gerald should be listed as “Photo credit: Gerald Beetham for the Association to Preserve Cape Cod.”

New and updated outreach materials were produced in coordination with outreach events hosted with the Cotuit Library. This included an update to an existing self-guided walking tour of stormwater installation in Cotuit to include the newly constructed BMPs at Ropes Beach and the Cotuit Library. New materials included: a factsheet for the Cotuit Library bioretention, and scavenger hunt cards with photos and fun facts. Posters summarizing each of the constructed BMPs, with photos, maps and a summary of their impact, were created for the six sites completed by 2021. These posters and other materials were shared with partners, funders and the public at the July 2021 five-year project celebration event and tour of nearby stormwater installations hosted by APCC and the Cotuit Library. APCC developed and launched the Cape Cod Native Plant Finder web-based tool to help homeowners with selection of native plants to promote eco-landscaping including reduction of fertilizers and pesticides.

Education signs were developed, printed and installed at the Cotuit Library (June 2021) and Ropes Beach (spring 2022). These locations were selected due to high visibility and traffic of the public. A third educational sign was designed and installed (summer of 2021) for the demonstration rain garden at the Sturgis Library. The Sturgis Library rain garden was completed with a subcontract to Blue Flax Design, a local landscape designer focused on use of native plants. While the sign was not funded by this project, the SNEP grants supported design and installation of this garden. In addition to these educational signs, Horsley Witten designed and printed a set of small “no mow” signs to install at several constructed BMPs where accidental mowing of low more or no mow sections of the design had occurred in the months just after construction. The signs are intended to define the area where mowing should not occur to aid in ongoing maintenance of the systems and to ensure the plants are allowed to grow and thrive.



Photos (left to right): Cotuit Library bioretention educational sign, Sturgis Library demonstration rain garden, and Ropes Beach gravel wetland educational sign.

**3. Project Budget Report – 3.A. Summary Budget Tables**  
**SNEP 2018 Grant** (Contract Number: SNEPWG18-7-APCC)

Budget Category	Total Budgeted Funds*	Total Budgeted Match	Total Budgeted Grant + Match	Actual Grant Funds Cumulative	Actual Match Funds Cumulative	Actual Expended Grant + Match	Match Source
Personnel	\$47,365.00	\$67,547.00	\$114,912.00	\$46,424.80	\$16,419.08	\$62,843.88	APCC
Fringe	\$13,005.00	\$3,864.00	\$16,869.00	\$11,305.20	\$656.50	\$11,961.70	APCC
Travel	\$2,981.00	\$763.00	\$3,744.00	\$2,782.14	\$26.20	\$2,808.34	APCC
Equipment	\$0.00	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$0.00	
Supplies	\$4,000.00	\$8,000.00	\$12,000.00	\$3,319.57	\$286.29	\$3,605.86	APCC
Contractual	\$271,590.90	\$25,700.00	\$297,290.90	\$275,990.72	\$194,088.19	\$470,078.91	HWG/CZM
<b>Total Direct</b>	<b>\$338,941.90</b>	<b>\$107,874.00</b>	<b>\$446,815.90</b>	<b>\$339,822.43</b>	<b>\$211,476.26</b>	<b>\$551,298.69</b>	
Indirect	\$11,058.10	\$7,774.56	\$18,832.66	\$10,177.57	\$1,909.31	\$12,086.88	APCC
<b>Total</b>	<b>\$350,000.00</b>	<b>\$115,648.56</b>	<b>\$465,648.56</b>	<b>\$350,000.00</b>	<b>\$213,385.57</b>	<b>\$563,385.57</b>	

\*Based on approved reallocation of funds 2.27.2020.

**SNEP 2019 Grant** (Contract Number: SNEPWG19-8-APCC)

Budget Category	Total Budgeted Funds	Total Budgeted Match	Total Budgeted Grant + Match	Actual Grant Funds Cumulative	Actual Match Funds Cumulative	Actual Expended Grant + Match	Match Source
Personnel	\$4,760	\$4,096	\$8,856.00	\$7,574.00	\$131.20	\$7,705.20	APCC
Fringe	\$1,190	\$1,024	\$2,214.00	\$1,893.50	\$32.80	\$1,926.30	APCC
Travel	\$1,290	\$0	\$1,290.00	\$1,120.61	\$0.00	\$1,120.61	
Equipment	\$0	\$0	\$0.00	\$0.00	\$0.00	\$0.00	
Supplies	\$5,000	\$300	\$5,300.00	\$154.28	\$0.00	\$154.28	
Contractual	\$229,036.00	\$96,600	\$325,636.00	\$230,686.00	\$167,009.41	\$397,695.41	CZM
<b>Total Direct</b>	<b>\$241,276.00</b>	<b>\$102,020.00</b>	<b>\$343,296.00</b>	<b>\$241,428.39</b>	<b>\$167,173.41</b>	<b>\$408,601.80</b>	
Indirect	\$3,724.00	\$541.44	\$4,265.44	\$3,571.62	\$16.40	\$3,588.02	APCC
<b>Total</b>	<b>\$245,000</b>	<b>\$102,561.44</b>	<b>\$347,561.44</b>	<b>\$245,000.01</b>	<b>\$167,189.81</b>	<b>\$412,189.82</b>	

### 3.B. Detailed Project Budget Table (This Period and Total to Date)

**SNEP 2018 Grant** (Contract Number: SNEPWG18-7-APCC)

Cost Item or Category	Cost Basis	RAE SNEP Request	RAE SNEP Final Revised*/**	Grant Total	Total Non-Federal Match Proposed	Actual Match Total	Match Source	Proposed Total Project Cost Revised	Actual Total Project Cost
<b>Personnel</b>									
April Wobst, APCC	775 hrs @ \$37.60, and 100 hrs match	\$29,140.00	\$29,140.00	\$25,462.40	\$3,760.00	\$10,599.07	APCC	\$32,900.00	\$36,061.47
B. Horsley and Jordan Mora, APCC**	400 hrs @ \$32, and 40 hrs match	\$12,800.00	\$8,145.00	\$4,708.80	\$1,280.00	\$1,070.63	APCC	\$9,425.00	\$5,779.43
Kristin Andres, APCC	210 hours @ \$48	\$10,080.00	\$10,080.00	\$14,463.20				\$10,080.00	\$14,463.20
Lauren Powers, APCC	120 hours @ \$32			\$586.40	\$3,840.00	\$723.40	APCC	\$3,840.00	\$1,309.80
Laura Curry, APCC	80 hours @ \$31.20				\$2,496.00	\$30.40	APCC	\$2,496.00	\$30.40
Patrick Frye, APCC	150 hours @ \$27.20				\$4,080.00	\$1,204.00	APCC	\$4,080.00	\$1,204.00
Dale Saad and Nathan Collins, DPW	540 hours @ \$57.01				\$30,785.40	\$1,311.23	DPW	\$30,785.40	\$1,311.23
Other Staff, DPW	~275 hours Mixed rates				\$15,380.00	\$1,480.35	DPW	\$15,380.00	\$1,480.35
Zenas Crocker, BCWC*	100 hours @ \$40	\$4,000.00	\$0.00	\$0.00				\$0.00	\$0.00
Other Staff, BCWC*	150 hours @ \$25	\$3,750.00	\$0.00	\$0.00				\$0.00	\$0.00



Volunteers and Interns	240 hours @ \$24.69			\$1,204.00	\$5,925.60	\$0.00	BCWC Volunteer	\$5,925.60	\$1,204.00
<b>Total Personnel</b>		<b>\$59,770.00</b>	<b>\$47,365.00</b>	<b>\$46,424.80</b>	<b>\$67,547.00</b>	<b>\$16,419.08</b>		<b>\$114,912.00</b>	<b>\$62,843.88</b>
<b>Fringe (%)</b>									
April Wobst, APCC	25% fringe	\$7,285.00	\$7,285.00	\$6,365.60	\$940.00	\$206.80	APCC	\$8,225.00	\$6,572.40
Bryan Horsley, APCC	25% fringe	\$3,200.00	\$3,200.00	\$1,177.20	\$320.00	\$0.00	APCC	\$3,520.00	\$1,177.20
Kristin Andres, APCC	25% fringe	\$2,520.00	\$2,520.00	\$3,615.80				\$2,520.00	\$3,615.80
Lauren Powers, APCC	25% fringe			\$146.60	\$960.00	\$141.10	APCC	\$960.00	\$287.70
Laura Curry, APCC	25% fringe				\$624.00	\$7.60	APCC	\$624.00	\$7.60
Patrick Frye, APCC	25% fringe				\$1,020.00	\$301.00	APCC	\$1,020.00	\$301.00
Nathan Collins, DPW	Fringe included in rates above								
Other Staff, DPW	Fringe included in rates above								
Zenas Crocker, BCWC*	30% fringe	\$1,200.00	\$0.00	\$0.00				\$0.00	\$0.00
Other Staff, BCWC*	30% fringe	\$1,125.00	\$0.00	\$0.00				\$0.00	\$0.00
<b>Total Fringe</b>		<b>\$15,330.00</b>	<b>\$13,005.00</b>	<b>\$11,305.20</b>	<b>\$3,864.00</b>	<b>\$656.50</b>		<b>\$16,869.00</b>	<b>\$11,961.70</b>
<b>Travel</b>									
APCC Travel	1800 mi @ \$0.545	\$981.00	\$981.00	\$602.64		\$0.58		\$981.00	\$603.22
DPW Travel	1400 mi @0.545				\$763.00	\$25.62	DPW	\$763.00	\$25.62

2019 Watershed Conference	Flight, hotel, etc.	\$2,000.00	\$2,000.00	\$2,179.50				\$2,000.00	\$2,179.50
<b>Total Travel</b>		<b>\$2,981.00</b>	<b>\$2,981.00</b>	<b>\$2,782.14</b>	<b>\$763.00</b>	<b>\$26.20</b>		<b>\$3,744.00</b>	<b>\$2,808.34</b>
<b>Equipment</b>									
DPW Equipment					\$2,000.00	\$0.00	DPW	\$2,000.00	\$0.00
<b>Total Equipment</b>		<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$2,000.00</b>	<b>\$0.00</b>		<b>\$2,000.00</b>	<b>\$0.00</b>
<b>Supplies</b>									
Embayment WQ Monitoring					\$7,000.00	\$0.00	DPW	\$7,000.00	\$0.00
Meeting Expenses*		\$2,000.00	\$2,327.67	\$3,066.85	\$500.00	\$115.29	APCC	\$2,827.67	\$3,182.14
Educational Signage*		\$2,000.00	\$1,672.33	\$0.00				\$1,672.33	\$0.00
Office Supplies				\$252.72	\$500.00	\$171.00	APCC	\$500.00	\$423.72
<b>Total Supplies</b>		<b>\$4,000.00</b>	<b>\$4,000.00</b>	<b>\$3,319.57</b>	<b>\$8,000.00</b>	<b>\$286.29</b>		<b>\$12,000.00</b>	<b>\$3,605.86</b>
<b>Contractual</b>									
Horsley Witten Group (HWG)*		\$230,360.90	\$260,515.90	\$260,509.22	\$24,500.00	\$194,088.19	HWG/CZM	\$285,015.90	\$454,597.41
Videos*		\$3,500.00	\$1,000.00	\$0.00	\$1,200.00	\$0.00	DPW	\$2,200.00	\$0.00
Other Contractual*	Contingency	\$23,000.00	\$0.00					\$0.00	\$0.00
Other Contractual*	Blue Flax Design, ColeWeb and Police Detail	\$0.00	\$10,075.00	\$15,481.50				\$10,075.00	\$15,481.50
<b>Total Contractual</b>		<b>\$256,860.90</b>	<b>\$271,590.90</b>	<b>\$275,990.72</b>	<b>\$25,700.00</b>	<b>\$194,088.19</b>		<b>\$297,290.90</b>	<b>\$470,078.91</b>

Other									
Total Other		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		\$0.00	\$0.00
<b>TOTAL DIRECT</b>		<b>\$338,941.90</b>	<b>\$338,941.90</b>	<b>\$339,822.43</b>	<b>\$107,874.00</b>	<b>\$211,476.26</b>		<b>\$446,815.90</b>	<b>\$551,298.69</b>
Modified Total Direct Cost		\$110,581.00	\$110,581.00	\$153,277.13	\$77,745.60	\$18,898.07		<b>\$188,326.60</b>	<b>\$172,175.20</b>
INDIRECT (10%)		\$11,058.10	\$11,058.10	\$10,177.57	\$7,774.56	\$1,909.31		<b>\$18,832.66</b>	<b>\$12,086.88</b>
<b>TOTAL (DIRECT+INDIRECT)</b>		<b>\$350,000.00</b>	<b>\$350,000.00</b>	<b>\$350,000.00</b>	<b>\$115,648.56</b>	<b>\$213,385.57</b>		<b>\$465,648.56</b>	<b>\$563,385.57</b>
<b>Non-Federal Match as Percentage of Request:</b>					<b>33.04%</b>	<b>60.97%</b>			
*Based on approved reallocation of funds 2.27.2020. ** Funds moved to HW contractual for final design and production of sign for Ropes Beach, not part of requested reallocation as was within 10% of proposed expense by cost category.									

**SNEP 2019 Grant** (Contract Number: SNEPWG19-8-APCC)

Cost Item or Category	Cost Basis	RAE SNEP Request	SNEP Grant this Period	Actual Grant Total	Total Non-Federal Match	Match this Period	Actual Match Total	Match Source	Proposed Total Project Cost	Actual Total Project Cost
<b>Personnel</b>										
April Wobst, APCC	100 hrs @ \$37.60	\$1,880.00	\$1,684.80	\$4,800.80	\$1,880.00		\$0.00		\$3,760.00	\$4,800.80
Kevin Johnson and Jordan Mora, APCC	60 hrs @ \$28.8	\$1,152.00	\$728.00	\$1,677.20	\$576.00		\$0.00		\$1,728.00	\$1,677.20
Kristin Andres, APCC	45 hrs @ \$38.40	\$1,728.00		\$873.60					\$1,728.00	\$873.60
Lauren Powers, APCC	50 hours @ \$32.80		\$52.80	\$222.40	\$1,640.00		\$131.20	APCC	\$1,640.00	\$353.60
<b>Total Personnel</b>		<b>\$4,760.00</b>	<b>\$2,465.60</b>	<b>\$7,574.00</b>	<b>\$4,096.00</b>	<b>\$0.00</b>	<b>\$131.20</b>		<b>\$8,856.00</b>	<b>\$7,705.20</b>
<b>Fringe</b>										
April Wobst, APCC	25% fringe	\$470.00	\$421.20	\$1,200.20	\$470.00	\$0.00	\$0.00		\$940.00	\$1,200.20
Kevin Johnson, APCC	25% fringe	\$288.00	\$182.00	\$419.30	\$144.00	\$0.00	\$0.00		\$432.00	\$419.30
Kristin Andres, APCC	25% fringe	\$432.00	\$0.00	\$218.40					\$432.00	\$218.40

Lauren Powers, APCC	25% fringe		\$13.20	\$55.60	\$410.00	\$0.00	\$32.80	APCC	\$410.00	\$88.40
Total Fringe		\$1,190.00	\$616.40	\$1,893.50	\$1,024.00	\$0.00	\$32.80		\$2,214.00	\$1,926.30
Travel										
RAE 2020 Conference	Travel and Registration	\$1,290.00		\$1,120.61	n/a	n/a	n/a		\$1,290.00	\$1,120.61
Total Travel		\$1,290.00	\$0.00	\$1,120.61					\$1,290.00	\$1,120.61
Equipment										
n/a									\$0.00	\$0.00
Total Equipment		\$0.00			\$0.00				\$0.00	\$0.00
Supplies										
Education/Outreach		\$5,000		\$154					\$5,000.00	\$154.28
Office Supplies					\$300.00		\$0.00		\$300.00	\$0.00
Total Supplies		\$5,000.00	\$0.00	\$154.28	\$300.00	\$0.00	\$0.00		\$5,300.00	\$154.28
Contractual										
Horsley Witten Group (HWG)	Design, Permit, and Construction Oversight	\$19,213.65		\$45,076.60					\$19,213.65	\$45,076.60
Construction Subcontract	Subcontract to HWG	\$209,822.35	\$16,592.25	\$183,959.40	\$96,600.00		\$167,009.41	CZM	\$306,422.35	\$350,968.81
Contractual Other	Police detail and Webpage	\$0.00	\$150.00	\$1,650.00					\$0.00	\$1,650.00
Total Contractual		\$229,036.00	\$16,742.25	\$230,686.00	\$96,600.00	\$0.00	\$167,009.41		\$325,636.00	\$397,695.41
Other										
n/a										
Total Other		0			0				0	0
TOTAL DIRECT		\$241,276.00	\$19,824.25	\$241,428.39	\$102,020.00	\$0.00	\$167,173.41		\$343,296.00	\$408,601.80
Modified Total Direct Cost		\$37,240.00	\$3,232.00	\$35,892.39	\$5,420.00		\$164.00		\$42,660.00	\$36,056.39
INDIRECT (10%)		\$3,724.00	\$305.57	\$3,571.61	\$541.44	\$0.00	\$16.40	APCC	\$4,265.44	\$3,588.01
TOTAL (DIRECT+INDIRECT)		\$245,000.00	\$20,129.82	\$245,000.00	\$102,561.44	\$0.00	\$167,189.81		\$347,561.44	\$412,189.81
Non-Federal Match as Percentage of Request:					41.86%		68.24%			



### **3.C. Budget Narrative**

#### **SNEP 2018 Grant** (Contract Number: SNEPWG18-7-APCC)

A total of \$350,000 were awarded for the SNEP18 grant with a proposed match of \$115,648.56 (33.04% of the requested funds). A total of \$350,000 was spent and \$213,385.57 provided in match (60.97% of the requested funds).

The SNEP18 grant funded the following: assessment, prioritization, and concept designs for 29 new potential retrofit sites and development of a comprehensive watershed stormwater management plan for the Three Bays including 71 total potential retrofits from this and the prior SNEP16 funded assessment; survey work, existing condition plans and 25% designs for three sites (Cotuit Library, River Road and High River, and River Road at Rosa Lane), 75% designs for two sites (Cotuit Library and River Road at Rosa Lane); permitting for River Road; 100% designs and bid specs for the Cotuit Library; construction of bioretention at Cotuit library; development of two education videos with the town of Barnstable, a 2019 eco-landscape lecture series (3 in-person talks), a series of public meetings (Feb 2019, ), maintenance trainings of town staff and volunteers (August 2019, ), a demonstration rain garden at the Sturgis Library; design and printing of educational signs for the Cotuit library and Rope Beach BMPs, development, launch and updates for the Cape Cod Native Plant Finder tool, 2021 outreach programming and events hosted with the Cotuit and Sturgis libraries,

RAE approved a reallocation of requested funds on February 27, 2020, moving funds proposed for personnel, fringe to contractual and shifting other proposed funds within cost categories to align with revision of scope and expense. This request included shifting of \$10,075 in unused funds proposed for Barnstable Clean Water Coalition (BCWC) personnel and fringe to contractual expense. While BCWC played an important role in early assessment and selection of sites they were not involved in further design, permitting and construction work and did not require funding to support their time. This funding was spent in 2020 and 2021 to support design and installation of a demonstration rain garden at the Sturgis Library and development and launch of the Cape Cod Native Plant Finder web-based tool to support education and outreach to encourage better management of stormwater on private properties. A total of \$2,500 was moved from contractual for video production to Horsley Witten contract for site survey work and \$23,000 proposed for contractual contingency was shifted to the Horsley Witten contract to support the 2020 construction of a bioretention at the Cotuit Library. APCC completed two educational videos with the Town of Barnstable and two videos with volunteers resulting in no direct expense to the project. A total of \$327.67 was also shifted from educational sign supplies to meeting supplies to cover the cost of 2019 eco-landscape lecture series expenses. In late, 2021 APCC shifted an additional \$4,655 in proposed personnel expense to Horsley Witten contractual expense to support design and production of educational signage at Ropes beach. This reallocation in funds was not part of a formal proposed reallocation to RAE as the shift resulted in less than 10% change in cost category expense. These shifts in expense are shown in the detailed budget table column titled “RAE SNEP Final Revised” with the original proposed “RAE SNEP Request” provided for comparison.

Final grant expense included: \$46,424.80 personnel, \$11,305.20 fringe, \$2,782.14 travel, \$3,319.57 supplies, \$260,509.22 Horsley Witten contractual (including \$107,952 for the Cotuit library bioretention construction), \$15,481.50 other contractual and \$10,177.57 indirect cost.

Personnel, fringe, travel and supplies covered APCC direct costs for planning, management, administration and technical review of deliverables for the project as well as travel (to meetings, events and site visits), participation and travel to the 2019 RAE conference, and meeting expenses (print materials, posters, and refreshments as approved by RAE and EPA). Horsley Witten contractual expense included assessment, design, permitting, construction oversight and construction contractual expense. Other contractual included Blue Flax Design expense for design and installation of the Sturgis Library rain garden, ColeWeb website design for the Cape Cod Native Plant Finder web-based tool, and police detail for construction.

The project met and exceeded its match requirements due to contributions by APCC, the Town, Horsley Witten Group and, most significantly, success in receiving FY19 and FY20 funding from the Massachusetts Office of Coastal Zone Management Coastal Pollution Remediation grant program. The CPR FY19 grant funded 25/75% design and permitting for Putnam Avenue and South County Road as well as initial construction at Ropes Beach. Additional CPR FY20 funds for completion of Ropes Beach construction were also provided as match. These grants allowed the team to shift match from previously proposed match from APCC, the Town and volunteers to contractual expenses for the complimentary grant funded scope of work. The Town provided significant amounts of additional in-kind contribution of their time, but due to the provision of CZM funding used this time and expenditure was not tracked or reported as match for the SNEP grants. This effectively reduced the administrative burden on the Town for tracking time and expense for match and allowed us to not only meet but exceed our proposed match. Horsley Witten also provided a total of \$24,500 in in-kind support (see scope for details).

A small correction was previously made to the match accounting summary moving \$120.60 reported as match travel to the match supplies line item. There was no change in cumulative match overall just a shift in reporting by cost categories to align with the actual invoice reporting and total amounts shown in our detailed reporting table.

#### **SNEP 2019 Grant (Contract Number: SNEPWG19-8-APCC)**

A total of \$245,000 were awarded for the SNEP19 grant with a proposed match of \$102,561.44 (44.86% of the requested funds). A total of \$245,000 was spent and \$167,189.81 provided in match (68.24% of the requested funds).

The SNEP19 grant funded 100% design and bid specs for the South County Road site along with significant portions of 2020-2022 construction expense. RAE approved a reallocation of requested funds on February 27, 2020, moving the construction contingency budget requested (\$52,222) to Horsley Witten Group contract for construction subcontracting, management and oversight. Final construction expense supported by the SNEP19 grant included installation of the Water Quality unit at South County in 2020 (\$22,000); joint funding for construction of the dry swale and bioretention at Putnam Avenue and bioretention at the Cotuit library in 2020 (\$127,559.40); a portion of 2021 South County Road dry swale construction (\$17,808); and a portion of the River Road swale construction in 2022 (\$16,592) as well as close out of 2020/2021 construction for a total construction cost (not including engineering construction oversight) equal to \$183,959.40. The SNEP19 grant also supplemented SNEP18 funding for final outreach in 2021 and 2022. While the bulk of construction for the 2021 and 2022 construction of South County Road and River Road dry swale was funded by the CZM FY21 and

FY22 grants SNEP19 funds were integral for match and supplemental funding including construction oversight in 2021 as well as initial planning, development of bid specs and bidding for the 2022 River Road construction in late 2021. Thus, completion of construction at these final sites would not have been possible without SNEP19 funding.

Final grant expense included: \$7,574 personnel, \$1,893.50 fringe, \$1,120.61 travel, \$154.28 supplies, \$230,686 contractual (including \$45,076.60 Horsley Witten direct expense and \$1,650 other contractual), and \$3,571.61 indirect. Final personnel and fringe exceeded the proposed cost due to final expenditures in late 2021 and early 2022 for APCC staff time for planning and management of the 2022 construction work. This overspend was greater than the 10% threshold. APCC had indicated to RAE that this might be the case, however, a formal request was not officially filed in late 2021 due to transition of APCC project management during this period and unintended oversight of this step. An additional \$1,650 was also spent in 2021 and 2022 for other contractual expense including police detail for the 2021 construction and final webpage updates for APCC outreach. This additional contractual expense did not exceed the 10% cost category threshold. These overspend incidences were compensated for by an underspend in supplies. The funding for supplies was intended for additional educational signage which was completed with SNEP18 funds.

Match for the SNEP19 grant was provided by the CPR FY20 grant for final design and construction at Putnam Avenue. The CPR FY21 and FY22 grants are not included in reported match totals as the project had previously met and exceeded match requirements. However, these grants were important in supporting final construction of several sites supported by SNEP funding. The majority of the 2021 and 2022 construction expense of dry swales at South County Road and River Road were funded by CPR grants but could not have been completed without the supplemental SNEP19 funding. The CPR FY21 grant for South County Road swales was equal to \$173,255 for planning, bidding, construction, construction oversight and inspections, as-builts and final O&M plans. The CPR FY22 grant for River Road was equal to \$173,588 for construction, construction oversight, inspections, as-builts and final O&M plans.

#### **4. Supporting Materials**

- Appendix A. Shellfish Closure Summary (PDF)
- Appendix B. Summary of Incomplete Sites (PDF)
- Constructed BMP Summary (PDF)
- News and PR including five: press releases and copies of associated new articles
- Outreach materials including: Three Bays Project summary 2022 factsheet, Cotuit walking tour 2020 brochure, final Cotuit Library, Sturgis Library and Ropes Beach sign design files and photos of installed signs.
- Updated materials on: [www.apcc.org/threebays](http://www.apcc.org/threebays)
- Best of photos from the project: [Photos Best Of Project](#)
- Final Design Plans: [Final Design Plans](#)
- As-Builts for all Constructed BMPs: [As BUILTS](#)
- Final Operation and Maintenance Plans: [O&M Plans](#)

## 5. Certification

***Include this language:*** *The undersigned verifies that the descriptions of activities and expenditures in this progress report are accurate to the best of my knowledge; and that the activities were conducted in agreement with the grant contract. I also understand that matching fund levels established in the grant contract must be met.*

Grantee Signature:

A handwritten signature in blue ink, appearing to be 'Andrew Gottlieb', with a long horizontal flourish extending to the right.

Name: Andrew Gottlieb, Job Title: Executive Director

Date: 6/30/2022

Organization: Association to Preserve Cape Cod