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Colliers Engineering & Design

September 1, 2021

Mayor Carolyn Broullon *cbroullon@highlandsborough.org*

Borough of Highlands
42 Shore Drive
Highlands, NJ 07732

2021 Flood Mitigation Resiliency Plan – Priorities 1 thru 4 w/ Funding Opportunities
Bulkheads, Storm Drains, Pump Stations & Living Shorelines
Borough of Highlands, Monmouth County, NJ
Colliers Engineering & Design Project No. 21001682G

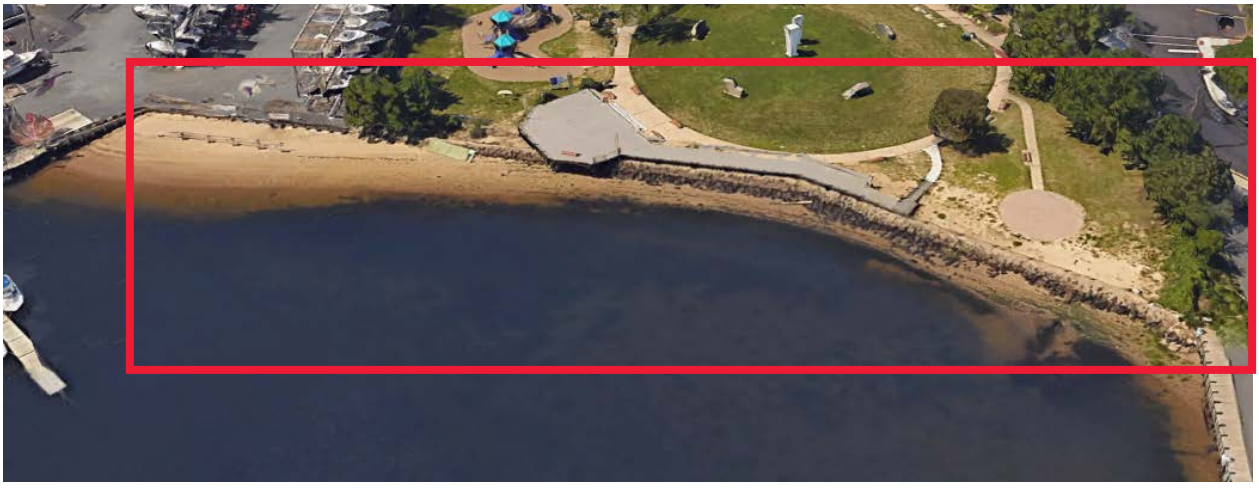
Dear Mayor,

Colliers Engineering & Design (CED) has evaluated four (4) locations throughout the Borough that may reduce the risk of flooding in the community as well as improve the aquatic life and environmental qualities of the shoreline. The sites are prioritized as noted below and said priorities match up with the Engineer's Estimate of Costs, attached as well, with a Funding Sources report at the close:

1. Veteran's Park – Living Shoreline & Bulkhead Combination
2. Snug Harbor Avenue Pump Station – New Pump Station
3. North Street Pump Station Upgrades and Storm Drainage
4. Steel Bulkhead adjacent to Captain's Cove – Painting of Water Side Only

Each of these locations have been reviewed and estimates have been formulated for each improvement. The improvements to be made range from new bulkheads, pumping stations, and hardened shoreline / living shorelines to mitigate consistent erosion along a shoreline and to reduce flooding internally. We have outlined the necessary improvements below for each site area:

1. **<u>Veteran's Park Bulkhead Improvements Project</u>**
   At Veteran's Park there currently exists roughly 400' of exposed shoreline with only a concrete/rock sea wall for protection against soil loss. From previous aerials, we have noted that the park area has



lost nearly 70' of beach area in the past 40 years. In most cases, rip rap edging is not enough to prevent soil loss from continuous wave action from either boats or wind.

If left without any type of live shoreline or hardened protection such as bulkhead, the beach area will continue to erode and eat away into the park area. The introduction of jetty's and groins have already shown the lateral movement of soil within the general area.

From the photo above, the area on the right has lost sand while the area on the left continues to receive sand from the lateral movement during storm events and from natural currents.

The introduction of stabilization measures such as bulkheads and living shorelines can help to reduce the movement of soil and actually create additional beach area.

For this park area, we suggest a combination composite bulkhead and living shoreline to reduce flooding and sustain the shoreline. The living shoreline would extend into the water abutting the bulkhead. In moderate storm events, the living shoreline would provide the protection necessary for wave action attenuation and shifting of sands.

The advantage to a bulkhead combined with a living shoreline is that the bulkhead need not be tied-back or battered, since nearly 75-percent of the sheeting is buried. This will be an economical means to assure shoreline protection during major flooding events.

The use of native aquatic plantings and oyster castles will create an ecosystem along the shoreline which will be flooded at times of high tide and remain exposed at times of low tide.

We intend to re-use the rock that is currently stabilizing the shoreline within the living shoreline in an effort to save cost. The improvements that are to be made will significantly reduce soil loss. This sea-wall material may be crushed up and re-cycled as part of the living shoreline make-up.

This priority may bode well for REPI Grant Funding thru the NJDEP since the remediation will result in a 'living shoreline.'

Recommended Funding Program: USDOD Readiness and Environmental Protection Integration Program (REPI), FEMA Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA), and NJDEP Shore Protection Program.

2. **<u>Snug Harbor Avenue Pump Station & Stormwater Water Infrastructure Improvements</u>**

After reviewing the watershed maps and grades, we suggest a regional storm water pump station be installed at Snug Harbor, adjacent to Bay Avenue, inside the top end of the man-made canal. This would result in zero land loss, no need for land acquisition, and minimize construction costs.

When reviewing the overall grading of the Borough, we see that a large volume of rainwater is taken on from the Monmouth Hills Community in Middletown, on the top-side of Route 36; said water gains high velocities and water depths as it traverses downslope to Bay Avenue, and eventually floods Snug Harbor.

This regional pump station would intercept these upland surface waters from Route 36 and higher, before reaching the Snug Harbor development, thus reducing flooding implications.

A total of 12-16-new Type 'B' NJDOT Grade Inlets will accommodate for roughly 100-cubic feet per second of vertical inflow into the pipe network, thus providing ample flow to a new duplex pumping station.

Snug Harbor Avenue is a major flooding concern due to the old and antiquated tide check valves that discharge to the channel. During storms the check valves get stuck open and the tide water fills the storm system which floods the area.

The goal of the improvements that include a new pump station and gravity stormwater infrastructure upgrades, is to eliminate the need for gravity outfall pipes that have been known to be a factor in the flooding of this area. The outfalls would be cut and capped and would be piped to the new pump station which will be designed to handle small and larger storms. The idea would be to add more inlets at the low point along Bay Avenue which will increase the capacity into the gravity system to feed the pump station and adequately pump out all of the collected stormwater.

The Station will include duplex pumps to accommodate for 30,000 gallons per minute flow. This will require 12 to 16 new inlets and associated pipe work to carry the flood waters to the station. The precast pump station will be set on timber pilings and have a 24-inch ductile iron discharge pipe, running straight out to the river, with an 'over-land' discharge.

The plan would also include disconnecting five (5) outfall pipes that discharge into the canal and pump the storm flow into the pump station which will prevent the back up of these outfalls during high tide events.

All electrical components would be housed in a structure that is above BFE to ensure all electrical components stay intact during a flooding event. Also, a generator would be installed in the event of a total power outage. The generator would be natural gas so that liquid fuel is not required during a storm/ power outage.

We anticipate that the generator would be designed to allow for one possibly two pumps to be operational during a power outage event. The physical size and space of the generator, the cost of the supporting structures structural components, the cost of the large generator, and the cost of maintenance during non-use periods would out way the benefit of installing a smaller generator.

In the future, the Borough should prioritize the Redevelopment of Captain's Cove to include a much higher continuous bulkhead, roughly 1400 linear feet in all. We understand that this Cove and existing bulkhead is privately owned, however, this bulkhead elevation is 'Critical' in controlling flooding from Shrewsbury River.

Recommended Funding Program: FEMA Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) and NJDEP Shore Protection Program.

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3. North Street Stormwater Pump Station, Bulkhead & Drainage Upgrades

The existing North Street Pump Station should be upgraded to a duplex station with new composite bulkheading to reduce flooding along North Street (this watershed takes flood waters from as far away as Veterans Park). During flood events this entire area contributes to the North Street Pump Station drainage area. This area is a 'natural sink' thus warranting a pump station upgrade to handle these high intensity storm events and rising sea-level.

As you see, the station has no safe lid, nor any permanent fencing. These two items should be addressed during the electrical upgrade.

The neighbors to the left and right have higher composite bulkheads, thus creating a concentrated flooding issue at North Street. Roughly 60-ft of Borough-owned bulkhead, as well as 60-ft of a private owner's bulkhead needs to be replaced/raised, to a minimum elevation of 8.50.

Without raising this 120-140 feet of old bulkheading, the storm drainage remediation is negatively impacted. The bulkhead work should be done in concert with the pump station upgrade.

This picture shows the neighbor's bulkhead that is at elevation 4.50, which is roughly 4-ft too low. The bulkhead at the Station matches this as well.

When extreme high tides and flooding occurs the pump station bulk head gets overtaken and when that occurs the pump station shuts down since the ocean water would just be cycling since the bulkhead was overtopped. When the pump station shuts down due to this occurrence the drainage area as stated above is completely affected since the pump station is no longer running.

This pump station is a single pump on two floats; the electrical system fails on occasion; floats stick and pumps do not respond. So, in turn, the area floods during moon-tides and heavy rainfall events.

The plan is to add more inlets at the low point along Bay Avenue which will increase the capacity into the gravity system to feed the pump station and adequately pump out all of the collected stormwater.

Surface waters coming down Miller Street Monmouth Hills and Route 36 must be collected via roughly 12-new B Inlets up along Bay and Miller and be piped to the upgraded station. The station will be designed to accommodate for roughly 25,000 to 30,000 Gallons per Minute.

Conceptually, we estimate that the pump station would use a duplex vertical column pump with two (2) 18-inch discharge lines, overland, to the river. The capacity, overall structure size, pump size, and discharge pipe size would be determined during the design phase by the calculated runoff area and flow that is collected by the storm system.

The existing 30-inch storm drain running along North Street is actually back-pitched, roughly 4-ft in the wrong direction. This pipe will need to be removed and reset, if in good condition, at a positive slope, down to the newer, deeper pump station, so any storm water collected will have positive fall down to the station, at all times. This pipe, we believe is not too old, is concrete, and may be salvageable.

Since the pump station would rely on electrical components all electrical would be housed in a structure that is above BFE to ensure all electrical components stay intact during a flooding event. Also, a generator would be installed in the event of a total power outage.

The generator would be natural gas so that liquid fuel is not required during a storm/ power outage. We anticipate that the generator would be designed to allow for one of the two pumps to be operational during a power outage event. This will allow for the system to still physically work however, the pumping capacity would be decreased.

The physical size and space of the generator, the cost of the supporting structures structural components, the cost of the large generator, and the cost of maintenance during non-use periods would out way the benefit of installing a smaller generator to power one pump for the system during the rare full power outage periods.

Along with the pump station upgrades it would be critical for the bulkhead in this area to be replaced to a higher elevation. The current bulkhead is very low compared to the surrounding properties. For this reason and to aid in the actual operation of the system, we recommend installing new bulkhead along this property and the adjacent to meet the top elevation of all other bulkheading along this waterway.

As an immediate upgrade, the Borough has already authorized design and expenditures to upgrade the electrical for the station, raise the equipment to BFE, and replace the old floats and upgrade the backflow prevention sluice gate system to reduce interior flooding during moon-tides.

These plans and bid documents are 70-percent complete and should be implemented this Fall.

Recommended Funding Program: FEMA Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA).

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4. **Steel Bulkhead Remediation – Adjacent to Captain's Cove – Water Side Only**

   Along the Shrewsbury River and adjacent to Captain's Cove, there is a stretch of bulkhead in need of remediation due to wet corrosion from salt water.

   The BH should be cleaned, sand blasted if necessary, and coated with a 3-coat system rust-proofing paint to slow the aging process of the steel. This coating should be applied on the waterward side since the landward side may be remediated with a coal tar epoxy, in the coming months.

   Recommended Funding Program: FEMA Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) and NJDEP Shore Protection Program.

FUNDING SOURCES:

The following are potential sources of grant funding for the projects listed above.

1. USDOD Readiness and Environmental Protection Integration Program (REPI) – This program can fund up to 100% of construction and soft costs related to environmental/ecological improvements near a Department of Defense installation. Our team spoke to the NJDEP Shore Protection program contact about the eligibility of these projects in the Borough. The recommendation is that we apply for project No. 1 Veteran's Park Bulkhead Improvements Project. This would include a bulkhead and living shoreline at Veteran's Park. In order to apply, we need to submit a narrative, cost estimate and conceptual plan in the next 2 weeks.

2. FEMA Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA) – This is FEMA's annual funding round. Any flood mitigation-related scope items would be eligible. Generally, the cost share for this program is 75% federal/25% non-federal. The deadline to apply through NJOEM is November 15. Our team will reach out to our contact to discuss the projects.

3. NJDEP Shore Protection Program – This is NJDEP's program to protect property and infrastructure from coastal storm damage, erosion and shoreline migration, and sea-level rise. Projects include beach replenishment and construction and maintenance of bulkheads, jetties, and seawalls. There is typically a long wait time for funding, as much as 5 years, as the funding is primarily used to match ACOE projects in the state. To get in line, we will simply need a letter of intent with project details. Grantees typically have to match at least 25% of the cost.

Conclusion:

From an engineering standpoint, we believe that the four (4) noted priorities above warrant action in a timely fashion. Grant funding at this level would be most beneficial to the local government; minimizing overall soft costs, bonding costs, bond counsel, interest rates, etc. REPI grants may work well with Veterans Park since it includes a living shoreline. The other four (4) projects may fit in well with Shoreline Protection, FEMA, or FEMA Flood Mitigation.

Attached is a preliminary estimate for all four projects, with approximate soft-costs as well. We are ready to meet with the Borough upon request, to initiate the Grant Funding Applications Process.

Should you have any questions regarding our recommendations, or should you need further information regarding the proposed improvements, feel free to contact this office.

Sincerely,

Colliers Engineering & Design, Inc.
(DBA Maser Consulting)

Theodore Wilkinson, P.E.,
Senior Client Manager

Enclosure (estimate & exhibit of projects)
cc: Mike Muscillo, Administrator
Joe Raftery, CED
James Priolo, CED
Kelsey Howard, CED

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