DRAFT—not approved by participants. Names next to comments do not indicate direct quotes.

Newington Fox Point Shoreline Stabilization Options
WORKSHOP NOTES (Field trip notes and indoor lecture notes)

Monday, March 26, 2018

Stop #1 | Hiatt Property on shoreline at project site | Little Bay Rd.

Kirsten Howard

- Introduced the workshop, objectives (learn, improve designs for sites, make new connections), and ground rules
- Participants introduced themselves

Jeff Hiatt

- bought the property in 2009
- prior owner had installed telephone poles at the base of bank to stop erosion
- started working with Ken Barry 10 years ago
- estimated cost of the original plan thought to be $30-50K; but actually estimated at $150K-$300K due to barge needs and other factors
- cost of staging/access is an issue
- floodwaters recently (within a fortnight) carried away remnants of an old pier that had helped hold back sand.
- wants:
    - to keep house from falling into Little Bay (effective stabilization for the bank)
    - it to look nice / an alternative to stainless steel gabion baskets
    - a reasonable price point

Ken Berry

- reference line = 4.95 feet
- Jeff has lost about 10 feet in some areas
- original guidance was 5-foot boulders with shot rock in between them but when estimate came in high; another contractor said he could do gabion baskets for $150K
- The design sheets show the 5-ft boulder and gabion baskets.

Jim Nelson (Jeff's neighbor)

Jim is excited about the idea of an all-soft approach, but Dave Burdick is skeptical and says the toe needs to be fortified. Likely needs a hybrid soft & hard solution.

Discussion

- Q- what effect would the Hiatt plans have on other properties and down into Little Bay and Great Bay?
    - Ans- Neighboring impacts seem minimal once you reach the clay pits. Would be ideal to find a good stopping point for the project which may include Jim's property. Wetlands Bureau looked at larger impact, but we didn't do a study. It's not something we analyzed. First application was for 150 feet, minus initial 20 feet. (Jeff's permit stopped within 20 feet of the property line but they got permission to go to the property line.)

- Q-Wave height and direction?
    - Ans-Jeff: Not more than five (5) feet. They come from the bay. We experience constant wave pressure on a windy day.
- Seth- helpful site analysis tool is to look for seaweed presence after a storm to understand how high the water went. Good idea to get that surveyed while it's still visible.
- Jeff- Jim's valley area is a potential access point for the rocks. Rocks can be barged in but this costs 4250-$350K.

Group walked to Jim's Site

- Dave Burdick- challenging site, so steep, slump from above started a decade ago. Erosion starts 2/3 or 3/4 of the way down from the hill.
- Seth- you want to focus on the toe first. Then, need to look further up the slope, think about vegetation. Clay is a blessing and curse because clay slopes hold the angle but clay slopes can easily get undercut during storms and small portions of bank can crumble while thawing out. Clay does have some benefits.

Seth Wilkinson's On the Spot Site Analysis

- The more vertical the geometry less the the dissipation of energy. The bank is tall, very steep.
- Trees/vegetation: Seeing large deciduous trees on site, could be handled by cutting, allowing them to re-grow but maintaining their lower heights. Seeing coniferous vegetation on site whose days are numbered. Might need significant removal of vegetation for regrading access points and long term stabilization.
- End-scour: True end-scour occurs at least 25 ft away from a structure. End-scour is often confused with erosion. If end scour is 150 ft away, it's erosion. End-scour is energy that swirls around/runs along the structure/contained in a small area.
- Energy is transferred by waves along the edge. More nooks & crannies, more dissipation. Gabions have lots of nooks & crannies, but they're not as aesthetically pleasing to some. Natural bank with clay is best for absorbing energy but not great for the property.
- Living shoreline approaches for this site: 18-inch coconut fiber coir logs (covered with sand to protect them from sunlight) anchored using my proprietary anchoring method. They won't be less expensive than "hard" solutions; not more cost-effective than a gabion. Fiber rolls result in systems with 20-30 years of design life, if you opt for high quality options, maybe $400-500 per linear foot. It would vegetate the bank more quickly and get roots into ground quicker. Less expensive ones break down in 5-10 years. Sunlight and salt break down coconut fibers, and tidal inundation and ice can pull fiber out. Won't have design life of a rock wall. Fiber rolls result in less run up on the bank and can get up to 8 feet of root in the ground.

Discussion

- Q-Dave Burdick- what happens to sand in 20-30 years?

  - Ans-Seth: You will lose the beach. It's better to encapsulate the sand in tubes that slowly leach it out about every three years. Sand comes out of the bank, ends up on the beach. If the bank gets locked up, the beach goes away, eventually.
  - Some have tried piling sand on the toe protection, but the sand goes too quickly after 1 storm. Could cut off sediments downstream.
- Comment-Jeff- there's lots of ice buildup. It even broke our staircase. I'm concerned about having to re-do coconut fibers because of ice abrasion.
  - Seth- yes ice can pull out some of the fibers and can cause problems
  - Dave- three months ago, observed several 3-ft ice floes.
  - Jane Hislop- storm + high tide can rip at the coconut fibers.
  - Seth- even rock can get pushed by ice. Pointed to examples at the Great Lakes which deals with ice daily. Ice is localized. Usually the fiber rolls are repairable. Doesn't undermine the structure too much so you don't want to over-engineer against ice.
- Seth- it takes 2-3 years for sand before you have to refill the sand envelopes, typically.
- Dave Burdick- we should recognize that the slope was forested 1000 years ago, 100 years ago not forested as much.
- Jeff- down the bay, Jon Wendell used modular rock. More aesthetically pleasing. Quickly deployable, more financially viable, transportable, proven and available in salt-marine environments.
  - Seth-I have not worked with them, but that doesn't mean they don't work.
  - Jeff-If we could get it permitted for 10-12ft, that might work.
- Cost estimates from Jeff:
  Gabion baskets= $125-175K
  5ft rock= $250-350K
  3ft rock= don't know
- Kevin Lucey- what types of vegetation communities are you targeting on the steep slope?
  - Seth- currently, it's heavily forested, can even see hemlock above high tide elevation. A transitional shrubling community would be ideal. We could select for understory species such as Viburnum, bayberry, chokeberry, and other woody species that do well on a north facing bank. Red cedar maybe a lever but doesn't have a good root system; horizontal junipers have a good root system but needs sunlight. Grasses have the quickest establishing root system with deepest roots. Switch grass = 8 ft deep root. No other woody plants can compete. They are very important for interstitial areas.
- Seth- another important site analysis component is base elevation. The elevation post storm is as low as it gets in elevation for that site. We should design for 1 foot lower than that lowest beach elevation.
- Seth- another important cost effective strategy is getting the runoff channelized down the coastal bank. Surficial runoff needs to be channelized down and off the bank in a smart way.

- Jeff and Ken passed around a handout with some additional options they would like to consider. Poured concrete wall options.

  - Cheryl Coviello- Be cautious of the bank slope adding load on the back of the wall. Makes it complex. Prefer rocks because they are easy to repair and they disperse energy better than a wall structure. Also consider weight of trucks that bring materials in, look at roadway weight limits.
- Jeff- followed up by showing the team access point area for the rocks on Jim's property. The proposal is to remove stairs and send the rocks down the hill.

Stop #2 | Town Fox Point Property project intro & observations at "The Boat Pier"

- Jerry- Town applied for Moose plate grant, got denied because the plan had riprap and minimal natural components. So they're now considering a living shorelines approach.
- Tristan- Toe of this site is eroding. Originally, we thought of riprap. Other characteristics for this site include low energy, sheltered, long fetch but no huge wind waves.
  2 ideas:
  - Idea 1- Use coir matting instead of riprap, eventually it will disintegrate but at least it will bring in vegetation.
  - Idea 2 – get salt marsh to spread out since there are already a few pockets here and there. Take advantage of wave dampening function of vegetated upland.
- Jane- historically, this area was a farm. Town bought it at the same time that Durham purchased Wagon Hill Farm (1989). This site has only residential access, weddings held here, oyster farms around here. We have 60 acres of protected town owned property. We don't want to give up residential-only access.
- Dave Burdick- I see two themes (looking to left and right of the pier):
  - Theme 1 – algae growing on rocks (on one side)
  - Theme 2- salt marsh on the other side.
- Seth- how would you facilitate idea 2?
  - Tristan- first restore beach elevation, riprap at the toe area, add plantings (time consuming), can get community involved, lots of sunlight here.
- Stefanie- how do you keep the plantings in, given the ice conditions?
  - Tristan- this is a cove-like area, collects ice, need to replant and maintain salt marsh.
- Seth- last page of handout- shows high energy salt marsh sites that simulate peat. Higher energy site, higher the risk for plugs to get disturbed. Coconut fibers play the role of dead roots that comprise peat. The steel in the design is 100% biodegradable. It's important to inspect plants for salinity tolerance (don't plant anything that;s habituated to fresh water environments!!). Regarding anchoring the pillow, it is easier to anchor a 2-inch root. Sand is added to the pillow once it's on-site.
- Dave Burdick- How successful is high marsh planting for this site?
  - Tristan- Yes, that's hard.
  - Seth- tried pillows; it's like watering a salt marsh!! Just make sure energy and exposure match simulated peak technique.
- Cheryl- there are roadways really close to this site. How do town snow removal operations impact the roadway?
  - Tristan- don't think they use salt on this road, so that's not a concern.

- Kirsten- if we're stabilizing the toe with salt marsh, what about the steep slope?
    - Tristan- Slope will be fine, there are no erosion channels down the slope.
- Kirsten- what is the primary goal of the town regarding this site?
    - Jane- avoiding erosion and stabilizing the toe.
- Jane- how does boat traffic affect this location? Because there's lots of boat activity.
    - Tristan- Boat wakes are probably too small to impact riprap.
- Dave Burdick- Do you have cost estimates?
    - Tristan- Not for this project, but a similar one.
      Plants are about a dollar each, 10,000 plants.
      1 plant per sq. ft + labor.
      20 dollars a foot per envelope, 2 envelopes.
    - Tristan- extent of project is 200-250 ft (salt marsh side)
- Kirsten- what kind of tide measurements do you do/have you done?
    - Tristan- done tide measurements, but not sure of details.
- Tristan- may have to increase beach elevation to get the system to function correctly.
- Jerry- town will work on it incrementally to see how things go.
- Seth- Marsh elevation is important. With sea-level rise, most marshes need a good elevation.
    - Cheryl- but how does this go through regulatory approval?
    - Seth- usually works up to the existing salt marsh. In Massachusetts, harvesting sand approaches have been okay with regulators.
    - Jane- not sure if that'll work given current NH wetland regulations.
    - Dave- we are working on drafting new rules, but happy to chat in the meantime.

Stop #3 | Town Fox Point Property project site observation at "The Beach"

- Tristan – 2:1 slopes, toe erosion. Looking at coir envelopes to stabilize slopes and salt marsh. Similar to idea #2 in stop #2.
- Tristan- At the point of Fox Point: there are waves, high current area, sand washed away, eating at the toe. Still trying to figure it out. Coir envelopes unsuitable. Devoid of vegetation. Options we considered and rejected include:
    - Wall- not permittable by DES
    - Revetment- won't work because the site is too steep.
    - Stabilized earth embankments that will be planted – too much excavation
- Kirsten- do we know the elevation at the point?
    - Tristan- it's a 30-ft drop. We want to keep the point around because of its aesthetic and recreational value. There is a path there.
    - Jane- we're looking for suggestions about what to do with the point!!
- Seth- looking at geometry of this site (referring to the beach), if you can make this a 3:1 slope, it'd be great. Maybe just planting to naturally get that slope. Shallower slope can allow salt marshes to migrate once SLR kicks in.
- Kirsten- why is the marsh struggling?

    - Dave Burdick- lots of Canada geese activity. This marsh was also oiled due to an oil spill a while ago. This site is also part of a sediment cycle, sand waves that come from eroding point to this site.
- Jerry- we're looking for ideas to move forward with this site and the point
- Kirsten- for funding, are you seeking a conservation approach in order to be eligible for moose plate grants?
- Jerry- We're open to lots of sources of funding, a wide variety of options and approaches. The town might have funds to match.
- Jerry- There are some property owners who say they've lost 50 ft of land over 40 years.
- Dave Knight- I'm actually seeing accretion on my property.
- Jeff- Is the erosion natural?
    - Seth- yes, but it is likely exacerbated due to anthropomorphic factors
- Stef-when planning, do you use a linear approach?
    - Tristan-yes, but targeting where problem is worst first
- Seth-this site could be graded up to the nice shelf behind the bank
    - Dave-agree!
- Steve- Regarding cutting down trees, not viewed positively by the public. Is there a way to get more light without cutting down trees?
    - Jane-there's been a lot of tree cutting here in the last year. It's inevitable.
    - Seth- it's about educating the public. 1 foot of erosion is not going to support the trees anyway. But yes, you can get light without cutting the trees by reducing "sail" effects of larger canopies.
- Dave – looks like this site erodes at a lower rate than others?
- Seth- it still needs a 3:1 slope. Achieving this slope gives stability for decades.
- Cheryl- How would you reconcile salt marsh presence with public access?
    - Tristan- the marsh would grow on low beach, and the high beach will be used for recreation. We may not want to fence the marsh off, but we would use education as a way of letting people know that they shouldn't get on the marsh.
- Cheryl- what about dogs?
    - Dave-would you install a high energy beach with a marsh behind it?
    - Jane- Yes. Also we technically have a "Carry Out" policy for pets in Newington.
    - Seth- if you decide to use fencing, I've found that diagonal fencing, or fences at an angle is good for project design. In previous projects, fencing is required for 1 season but not longer than that.
    - (Comment about dogs benefitting the salt marsh in this instance because they'll chase the geese!)

WORKSHOP NOTES (INDOOR SECTION)

Monday, March 26, 2018

Kirsten Howard: Context of shoreline stabilization in the Great Bay Estuary

- Kirsten introduced Regional Resilience grants, emphasizing living shoreline component.
- Newington shoreline is much appreciated by the community.
- 5% of Great Bay itself is stabilized, 12% of state tidal shoreline is stabilized, 70% of Atlantic coastline; with that stabilization often comes detrimental impacts to natural systems as well as unintended shoreline destabilization on neighboring properties.
- I think everyone here is interested in protecting our assets in the most natural way to maintain land water connections and benefits provided by our ecosystems.

Seth Wilkinson of Wilkinson Ecological Design Inc.: Lessons about bank stabilization ("Progressive Bioengineering")

- Nice to see the interesting designs that are being thought about today. When the project is decided, it takes weeks, even months to pull designs together.
- Site specific criteria:
    1) Understanding if a beach has a base elevation
    2) Understanding the function a fringe marsh plays
    3) Understanding near shore characteristics such as fetch, water depths, sand bars, and location within a littoral cell.
- If there's no historic indication of salt marsh presence on a site, it's unlikely introducing salt marsh on that site will work.
- In some cases (such as narrow beaches, where high water interacts with toe of a slope) fiber roll array has a lower design life.
- Coconut fibers are very resistant to salty water. They break down slower than other fibers.
- Seeding the salt marsh: if you can stabilize even a narrow strip of a marsh, it'll extend landward.
- Showed example of wooden stakes in Pleasant Bay New Orleans. Wood stakes are porous, attract a lot of sand that are naturally in the water column.
- Plants will grow in coconut fiber, but don't love to grow in coconut fiber. This is a good thing because we don't want the roots to stay in the coconut fiber. We want the roots to go into the deeper soils.

- Your plants will have growing pains—they may look chlorotic at first.
- Case study of a salt marsh that did not succeed in the seaward direction because base elevation was lower than ideal.
- Coir fiber rolls are well suited for the duration you need for plants to get established in dynamic coastal areas. Especially in high energy areas.
- The whole point of bioengineering is to hold things long enough to get the roots in the ground.

- How to anchor fiber rolls? Most unsuccessful projects are because of improper anchors. Wooden anchors don't work great. Seth has a proprietary anchoring system that works well.
- Erosion control blanketing: the area above toe protection is important and can't be ignored because sometimes the storm scours the area behind /above the toe. Break down after about 2 years.
- TRM- turf reinforcement mat- didn't work great in a project and the bank collapsed (has some plastic components).
- Native scrubs, native grasses: Eastern red cedars suffers from desiccation in winter time. Scrub oak is a good example (but won't grow to a great height)
- Pre vegetated fiber rolls has worked well in Seth's projects.

- Native grasses
    - Root depths of native plants:
        - scrub oak (7 ft.)
        - switchgrass (8 ft.) (use in moderation)
        - Indian grass (8 ft.)
        - little blue stem (9 ft.)
        - big bluestem (9 ft.)
        - bayberry (2.5 ft.)
- Beach grass is great in dune areas. Not great in coastal bank areas. Dies in 10-15 yrs. Doesn't do well in banks because if there is not a lot of sand accreting over the beach grass, you get pests in the plants.
- Anchoring system for fiber rolls: horse shoe shaped (in the design pages). Seth & co. submitted a patent for it. They intend to provide technical assistance/license/certification to others who want to use the technique.
- Seth's first pre vegetated fiber roll project:
    - For the toe, they used beach grass with 4 anchors for three fiber rolls, covered it with sand, grew successfully.
    - For the upper bank, they used jute blankets which are woven differently than coir. Jute can get pulled apart easily. Coir is preferable. Upper bank stabilized quickly after 2 growing seasons.
    - Hurricane Sandy, Nemo- wave reached above fiber rolls with no damage.

- Sand envelopes: encapsulated sand inside coir to form the envelope, covered with loose sand. In some projects, you can plant inside the envelope. Design life is 5 years. So make sure the plants grow out and stabilize by then.
    - Best attributes of envelope (weight) + fiber rolls (ability to be repaired) = high integrity series of terraces that can tolerate different wave energies.

- Nantucket harbor project- high area of erosion-used pre vegetated fiber rolls with temporary irrigation heads. Trying to get as much root system in the ground. Not a municipal scale project. Very expensive. The value of the land was high, so clients were willing to pay.

DRAFT—not approved by participants. Names next to comments do not indicate direct quotes.

Questions

- Do you ever worry about hydrostatic pressure behind the wall?
    - Seth- we haven't had to. So far, it's been okay. Only impacts we've seen is surficial sediment which form a delta in front of the array. Our anchors work well in hydrated soils.

- Question about presence of boulders in the site. Present naturally or did you add them?
    - Seth- we didn't add them. There are many examples of salt marsh with naturally lying rocks among them. But adding rocks are out of the question given MA regs.