SAND SCRAPING AND TRANSFERS ALONG SEABROOK ISLAND

(P/N TBD)

SUPPLEMENTARY REPORT

REVIEW & ANALYSIS OF ALTERNATIVES

Prepared for:

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1.0 INTRODUCTION AND PURPOSE

This supplementary report #1 is prepared in connection with the planning and permitting of the Sand Scraping and Transfer Project at Seabrook Island, South Carolina (P/N TBD) (Figure 1.1). It addresses alternatives to the proposed project. On behalf of the applicant, CSE has identified seven (7) alternatives to the proposed project.

- Do nothing
- Scrape sand from the low-tide beach along North Beach and place it along the critically eroded beach around the Beach Club
- Truck in beach-quality sand from inland borrow areas and place along the critically eroding project area
- Dredge the North Shoal of North Edisto River Inlet, realign the northern channel, and place sand along the critically eroding project area
- Reinforce the existing quarry stone revetment in the critically eroding area
- Construct groins to trap and retain sand in the profile adjacent to the critically eroding area
- Abandon or relocate downcoast developed property as erosion progresses

Each of the above-listed alternatives is addressed based on previous erosion analyses along Seabrook Island and related reports cited in the 2014 Comprehensive Beach Management Plan for the Town of Seabrook Island (SI 2014). Advantages and disadvantages are given for each alternative, along with order-of-magnitude costs. Potential environmental impacts are also discussed.

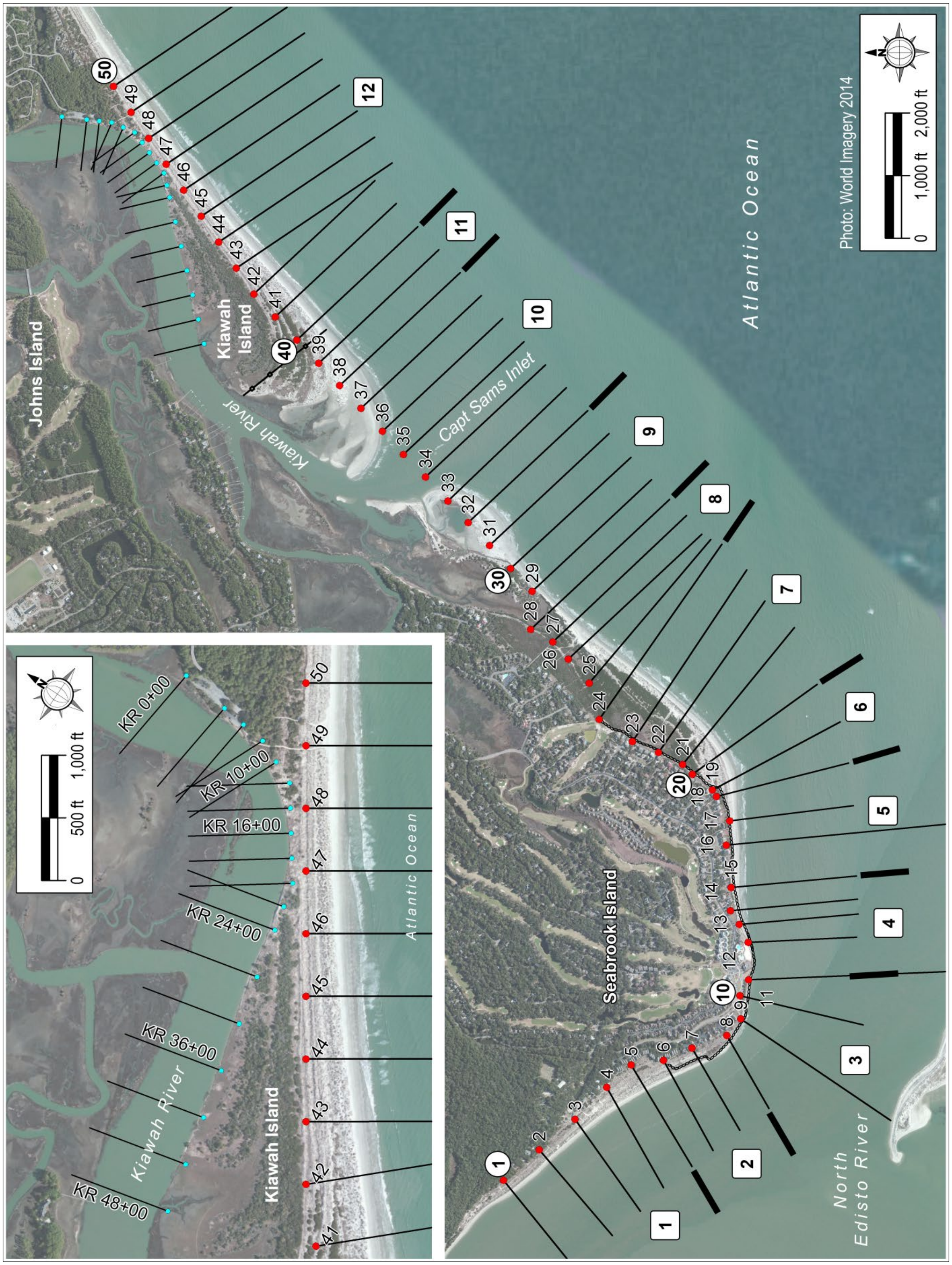


FIGURE 1.1. Seabrook Island showing principal reaches and monitoring profiles. Reaches 3 and 4 lack a dry-sand beach and Reach 3 has experienced underwater slumping and collapse of the beach around stations 9–11.

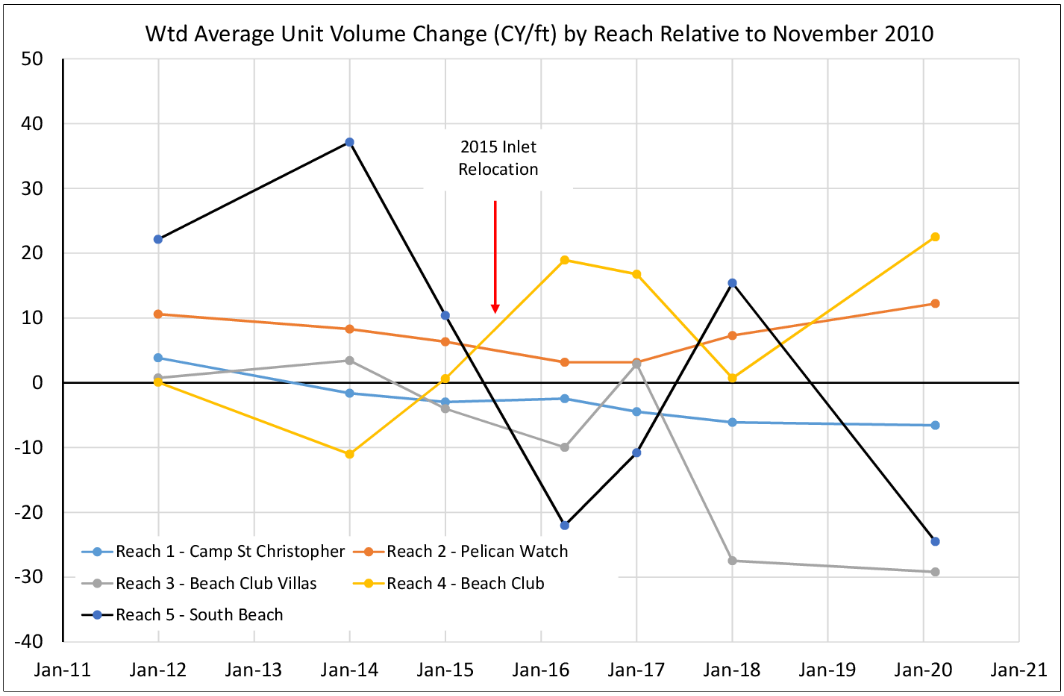
2.0 GOALS OF THE PROJECT

The purpose of the project is for sand management along the Seabrook Island ocean and inlet shoreline, whereby some excess sand in accreting sections of the island (ie – North Beach) is shifted mechanically to eroding areas (ie – South Beach) (Figure 2.1). The project seeks to augment the natural flow of sand from upcoast (Capt Sams Inlet) to downcoast (North Edisto River Inlet) and restore a viable profile along a segment of the island that presently is backed by an exposed seawall.

FIGURE 2.1. Project map showing proposed borrow area along North Beach ('A') and fill area between the Seabrook Beach Club and Beach Club Villas ('B').

The applicant closely monitors erosion and accretion along Seabrook Island because of the natural variability in rates (Figure 2.2). Virtually the entire shoreline is influenced by tidal inlets and their associated shoals, which modify wave heights and directions alongshore. This leads to irregular rates of cross-shore and longshore sediment transport.

Processes of erosion at the confluence of the North Edisto River Inlet and its northern marginal channel are further complicated by an exposed section of seawall that exacerbates wave reflection. Commonly, the junction of large tidal creeks creates zones of extra scour near the mouth of the tributary channel. At Seabrook, a deep scour hole persists at the downcoast end of the northern marginal flood channel within the general boundaries of the North Edisto River Inlet channel. This leads to instability of the channel slope and contributes to periodic underwater slumping and collapse of the beach along the inlet margins.



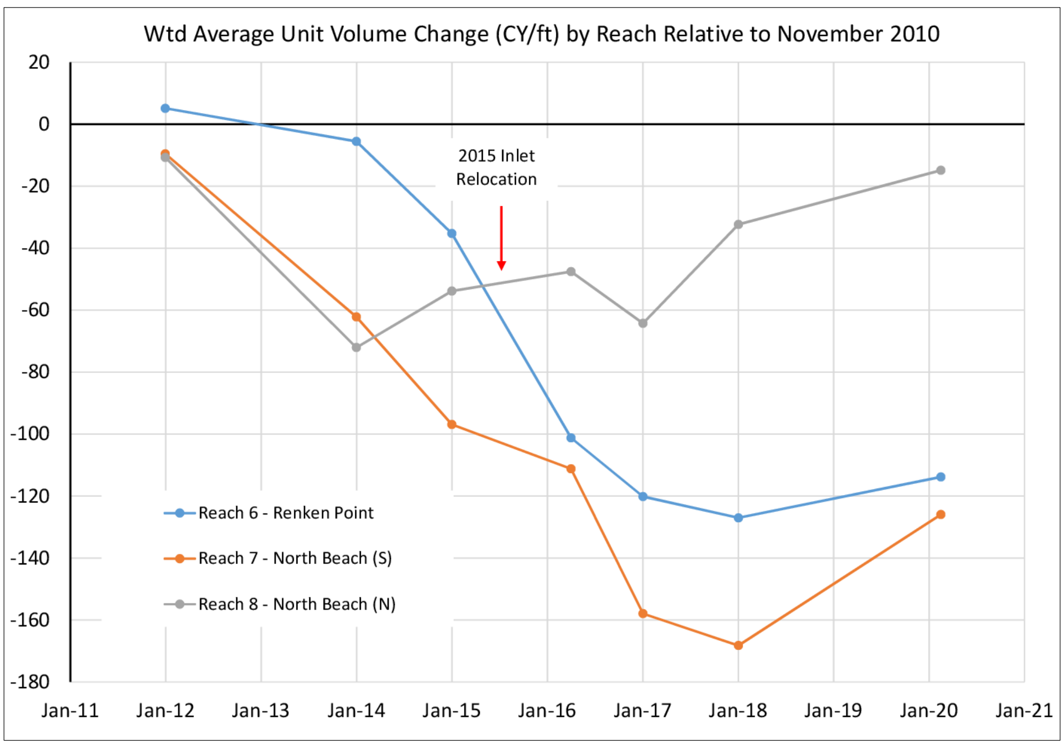


FIGURE 2.2. Variable volumetric change by reach relative to the November 2010 condition. In recent years, upcoast reaches (eg ± 7 and 8) along the North Beach have accumulated sand, whereas the critically eroded Reach 3 has been losing sand.

The applicant has documented at least eight underwater slope failures since 2015 in the project area, whereby a 100–300 foot (ft) segment of the intertidal beach has slumped into the main channel of North Edisto River Inlet (Figure 2.3). While the erosion arcs in the beach caused by slumping tend to heal naturally by longshore transport from the upcoast, each event produces a significant loss of sand volume on the visible beach, narrowing the profile and lowering the elevation of the wet-sand beach.

FIGURE 2.3. Aerial images of Reaches 1 and 2 from Camp St Christopher to Deveaux Villas. **[UPPER]** Conditions on 28 July 2016—note horseshoe-shaped scour in beach at Deveaux Villas (right side of image) [SB Traynum]. **[MIDDLE]** A recurring scour hole after Hurricane *Matthew* at Deveaux Villas on 12 October 2016 [SB Traynum]. **[LOWER]** Conditions on 15 May 2020 showing no scour hole but a more eroded section of beach along the seawall. [J Hair]

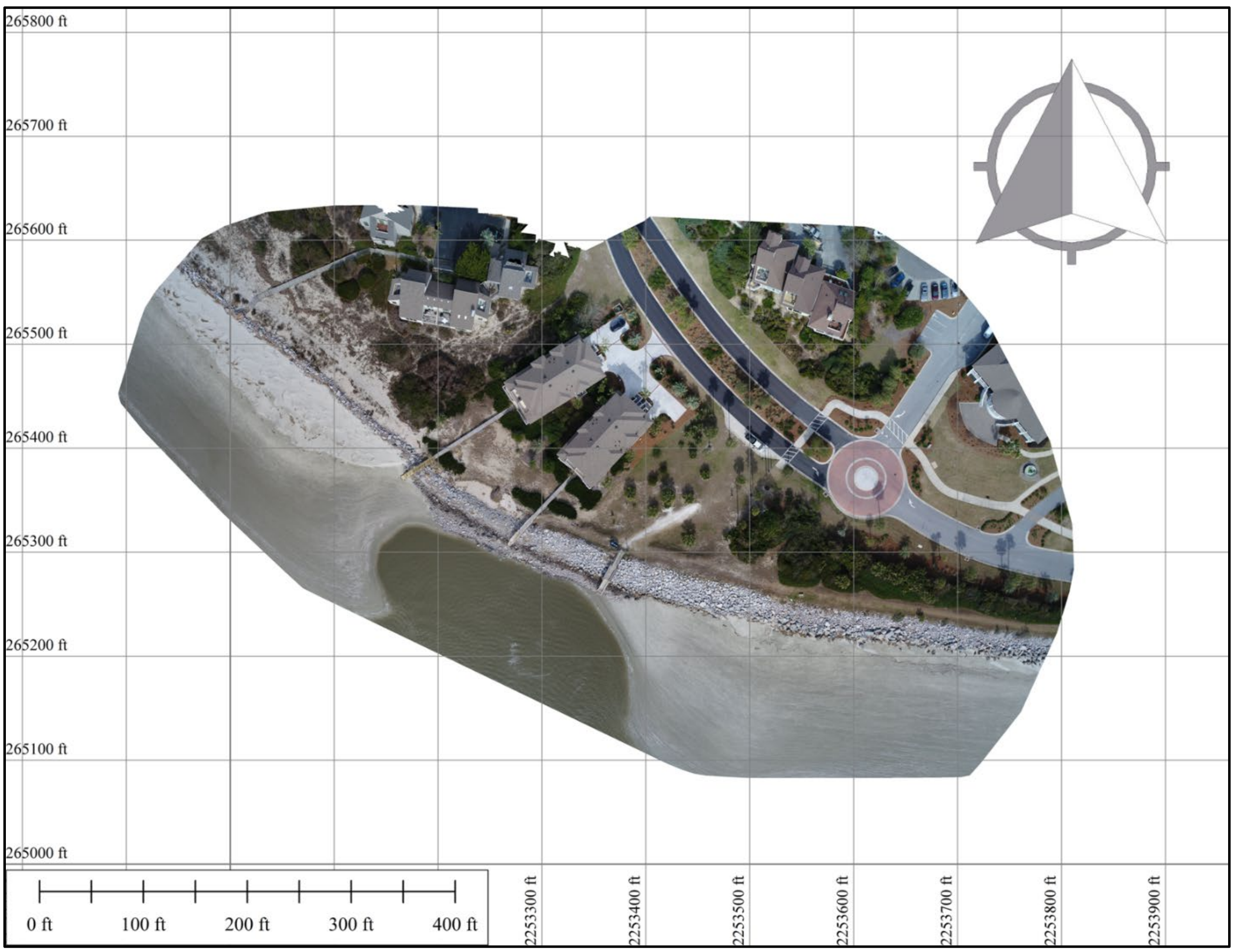
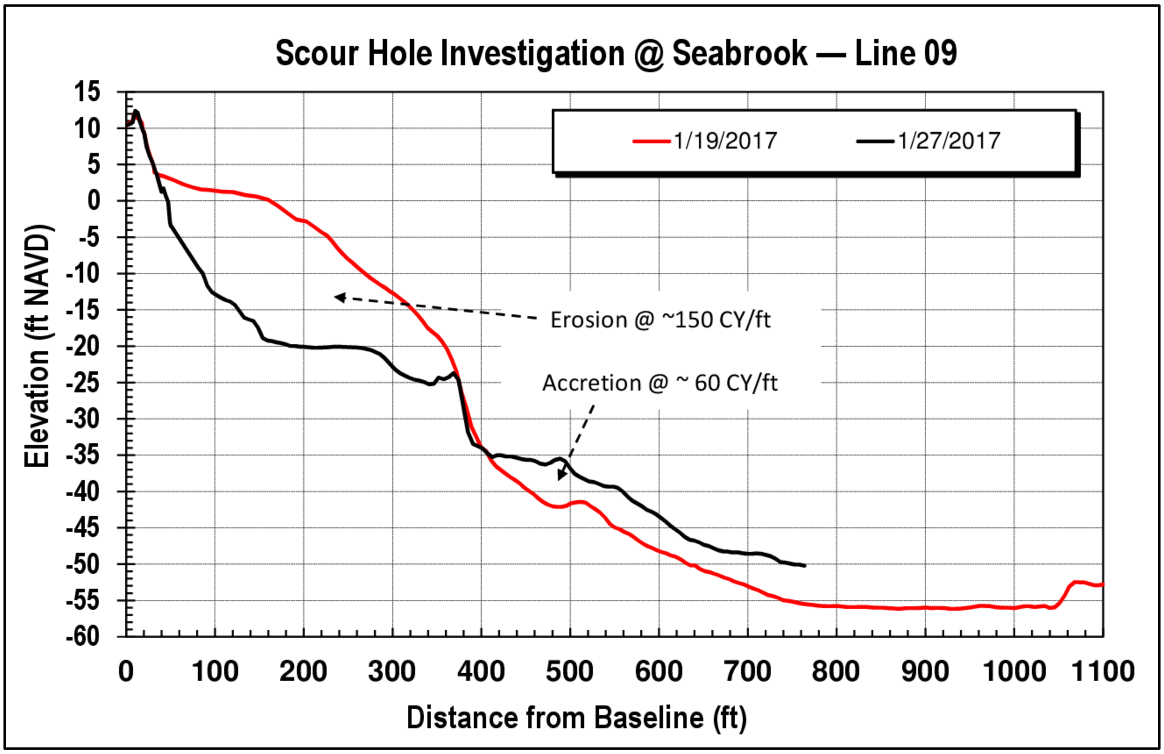


FIGURE 2.4. **[UPPER]** Ground image of the scour-hole event on 25 January 2017 viewed from the community boardwalk next to Deveaux Villas (D Giles). **[LOWER]** Orthorectified mosaic of drone images of the third scour hole obtained at low tide on 27 January 2017 (D Giles).



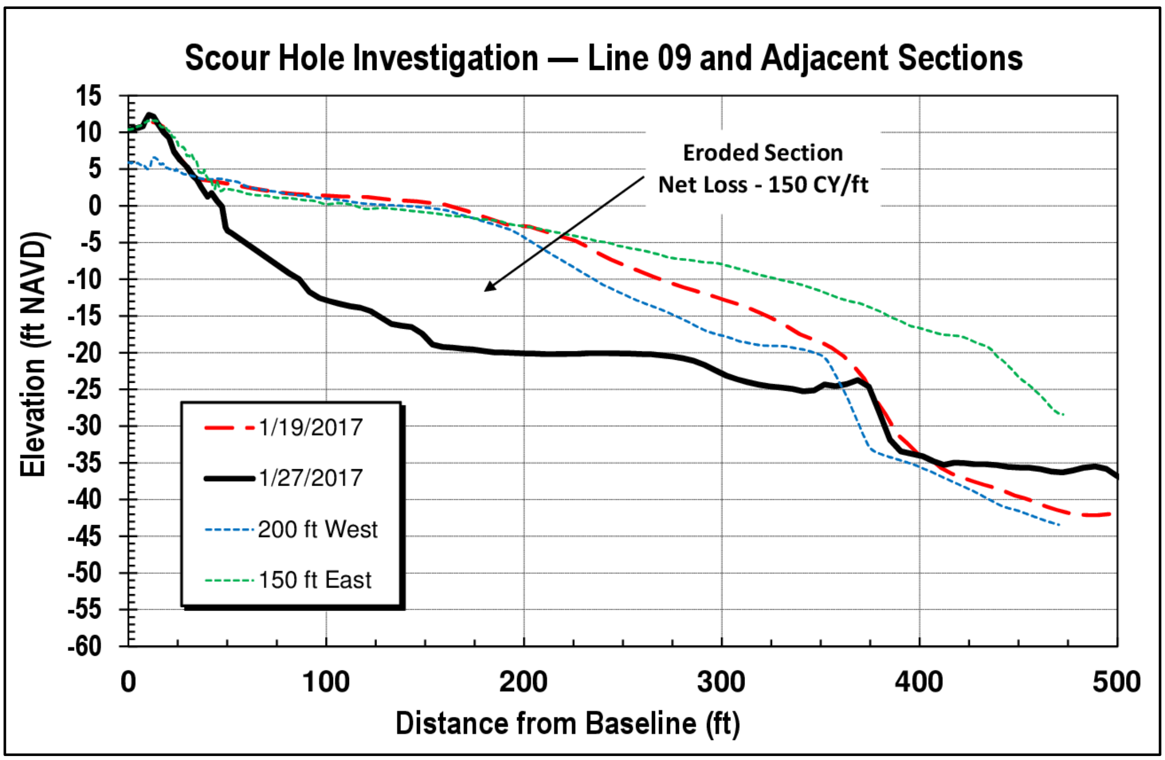


FIGURE 2.5. Representative profiles obtained on 19 and 27 January 2017 before and after formation of the third scour hole. Profile 9 shows extensive sand loss above the 25-ft depth contour and buildup along the margin of the inlet channel between 35 ft and 55 ft depths. The zone between 25 ft and 35 ft did not change, presumably because this area consists of denser consolidated sediments that hold the inlet in place (Moslow 1980, Imperato et al 1988).

Seabrook Island has a positive sediment budget because of the ample sand supply from Kiawah Island (Town of Seabrook Island 2014 p. 112) (Figure 2.6). In fact, Seabrook Island in 2022 contains more sand seaward of the seawall than it had in 1980, around the time seawalls were first constructed (Kana et al 2013). The distribution of sand alongshore is highly uneven. Some areas (eg – North Beach) contain over four times the minimum volume required for a healthy beach, while other areas lack any dry-sand beach.

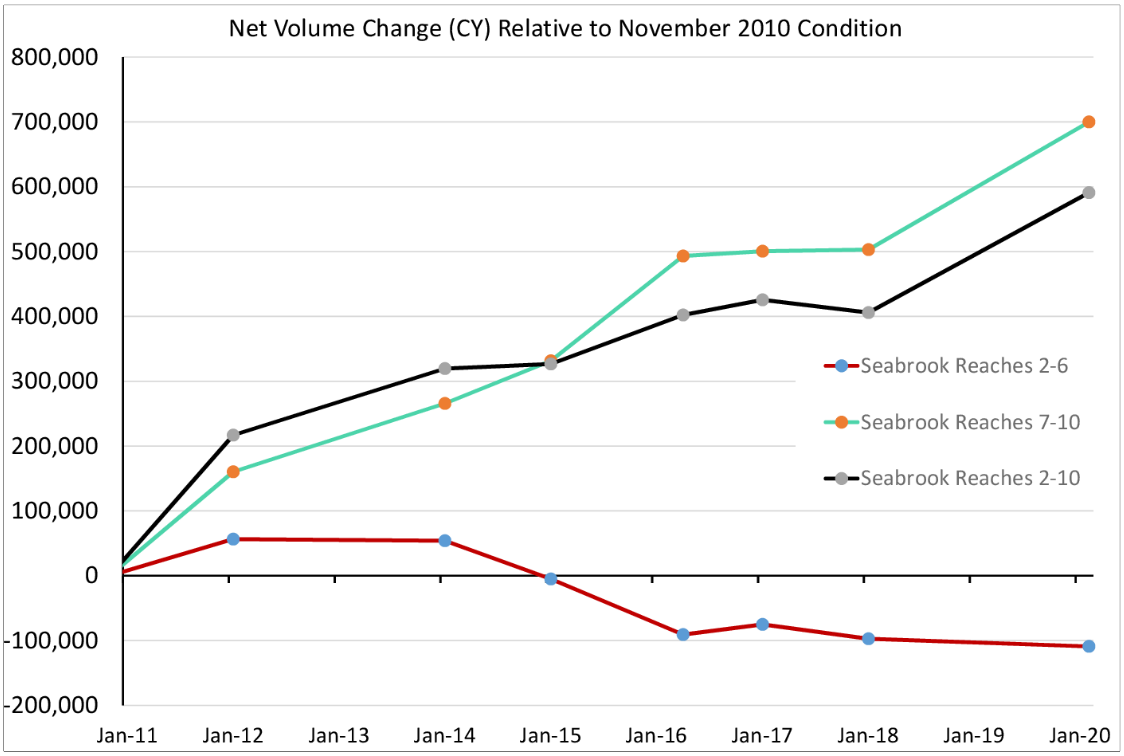


FIGURE 2.6. Seabrook Island has a net positive sand budget but the accumulation is concentrated along North Beach (reaches 7–10). The proposed project seeks to redistribute some of the surplus sand in North Beach to severely eroded sections of South Beach, particularly reaches 3 and 4.

Sand naturally moves from Capt Sams Inlet to North Edisto River Inlet under predominant northeast waves. However, some artificial redistribution of sand has been necessary since the 1970s to maintain a minimum supply along sections of the seawall.

Early studies demonstrated that the presence of a continuous beach along the seawall is necessary for sand to reach Camp St Christopher, which is the downcoast terminus of the beach system along Seabrook Island (Kana 1989). Between 1979 (Hurricane *David*) and 1989 (Hurricane *Hugo*), there was major encroachment by the northern marginal flood channel between Renken Point and the Beach Club upcoast of the camp (Figure 2.7). This led to a channel realignment project in 1990 whereby the northern channel was shifted about 1000 ft seaward by dredging the north shoal of the inlet and rebuilding the profile along the seawall (Figure 2.8). Prior to the 1990 project, there was no beach platform to carry sand around South Beach to Camp St Christopher. Once the platform was restored, the beach along the margin of North Edisto River Inlet began to recover naturally. It has generally continued to gain sand or remain stable without manipulation since the early 1990s.

The applicant has maintained the intertidal beach platform between Renken Point and the Beach Club by occasional sand transfers from North Beach. The most recent event was in 2007, which was accomplished as the final sand transfer under Permit PN 2001–1W–352P. Between February 2002 and February 2007, working in December, January, and/or February, contractors transferred a total of ~294,000 cubic yards (cy) from North Beach to South Beach in four small-scale events (CSE 2008). The applicant seeks to repeat the success of that effort and further enhance the viability of South Beach as a platform for sand transport to downcoast areas of Seabrook Island.

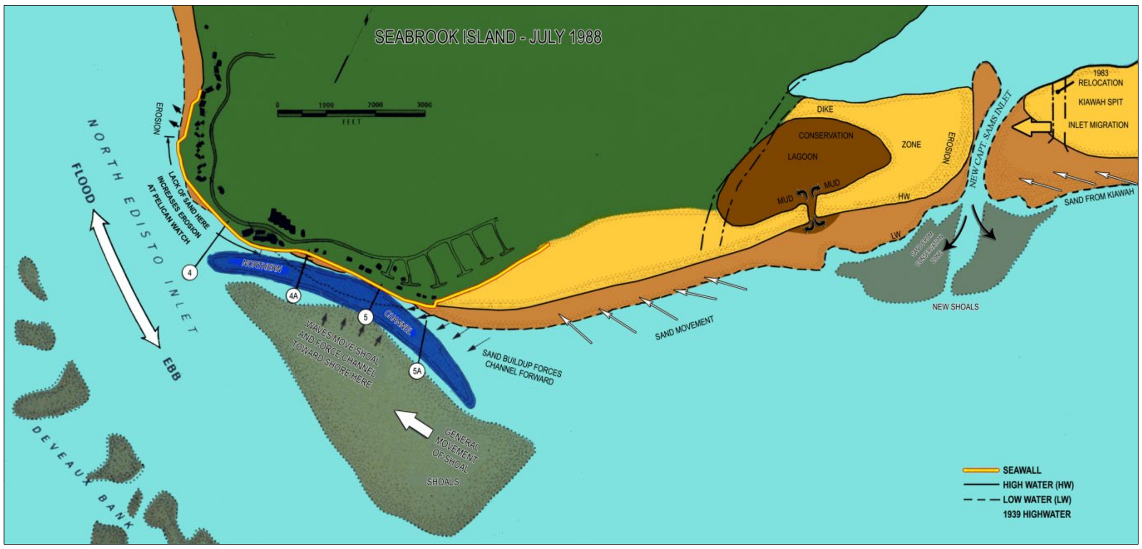


FIGURE 2.7. Conditions along Seabrook Island around 1989 (upper) when the north shoal of North Edisto River Inlet forced the Northern Channel into the seawall and eliminated the wet-sand beach, inhibiting longshore transport to downcoast areas. The lower diagram shows a collapse of the seawall in 1983 in Reach 5.

FIGURE 2.8. [UPPER] 1989 plan for realignment of the northern channel and nourishment south of Renken Point. **[LOWER]** Start of dredging operations in February 1990 at Renken Point.

2.2 Consistency with the Town of Seabrook Island Beach Management Plan (BMP)

The proposed project is consistent with the Town of Seabrook Island Beach Management Plan (BMP approved 16 December 2014) and the initial BMP dated 19 November 1992. As stated on page 112 of the BMP, "Seabrook Island's beach management approach has shifted from hard solutions (the 1970s to early 1980s) to soft solutions (1980s to present)." Seabrook Island has a "three-part strategy for improving the conditions of the beach-dune system and increasing the setback of existing structures from the ocean." The first is maintaining a one-mile-long inlet conservation zone ('ICZ'; Reaches 9, 10, and 11 in Figure 1.1) where no development is allowed on the oceanfront and Capt Sams Inlet (north end of North Beach) is left free to migrate within the zone. Second, Capt Sams Inlet is relocated on a 15–20 year cycle to stay within the ICZ and periodically release trapped sand to downcoast beaches (Figure 2.9). Third, and most relevant for the proposed project, is the periodic transfer of sand from areas of rapid accretion to erosional hotspots "so as to maintain an adequate supply to downcoast areas" (Figure 2.10) (SI 2014, p. 115). Further, as stated in the BMP, the strategy "requires all three elements. Otherwise, interruptions to the sand supply will re-expose segments of the seawall, diminish building setbacks, and degrade beach habitat" (SI BMP 2014, p. 115). The applicant is requesting a permit to move up to 300,000 cubic yards (cy) (cumulative) in up to three (3) discrete winter events. This would be similar in scale but at a lower frequency than the permitted work performed by the applicant under P/N 2001-1W-352P

In summary, the primary goals of the project are:

- Mitigate erosion hot spots along South Beach associated with sudden slope failures along margins of North Edisto River Inlet and the northern marginal channel.
- Artificially increase the transfer of sand from accreting sections of North Beach to eroding sections of South Beach.
- Maintain a viable wet-sand beach along all exposed sections of the seawall to facilitate downcoast sand transport.
- Accomplish multiple small-scale sand transfer events via land-based equipment during winter months when biological productivity is low, and there will be minimal disruption to beach use.
- Lessen the need for seawall reinforcement or maintenance of failed sections.

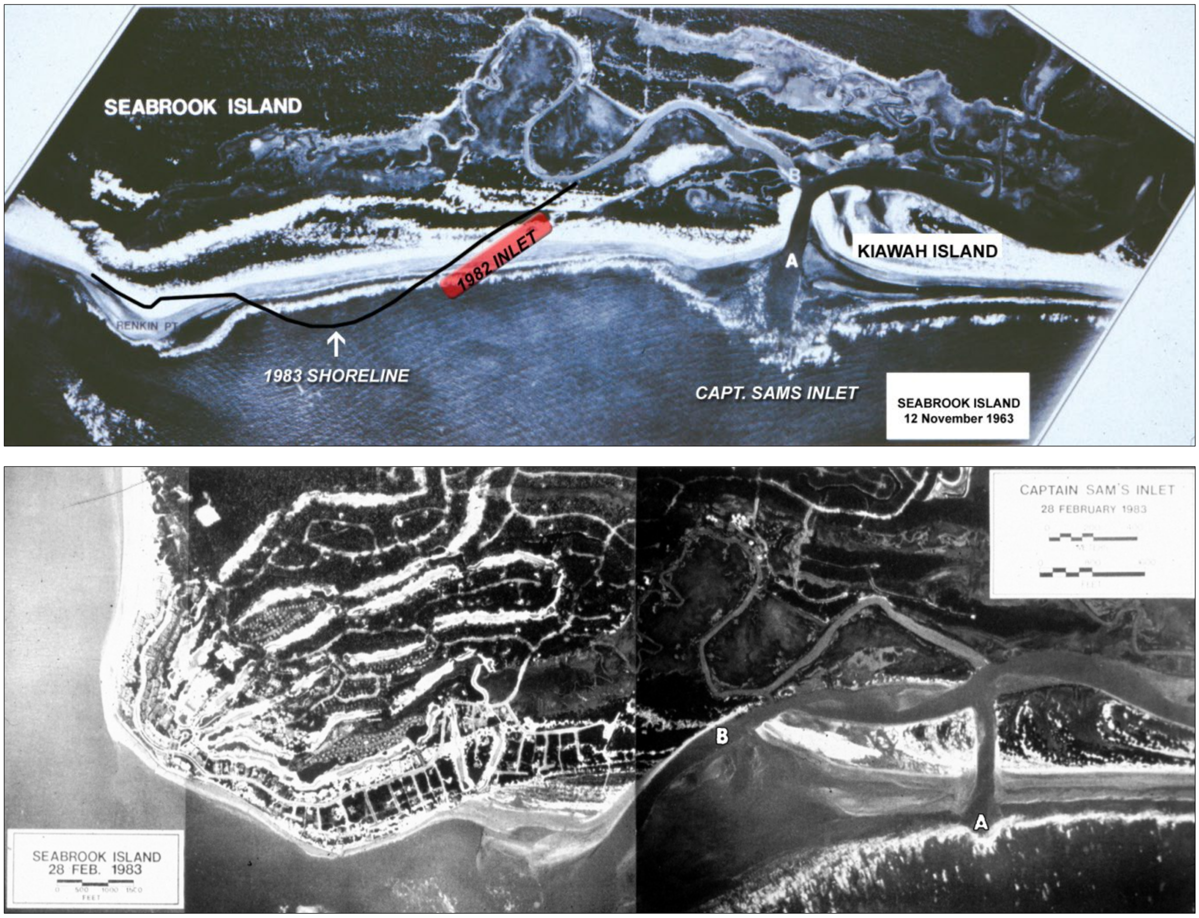


FIGURE 2.9. Seabrook Island and Capt Sams Inlet in 1963 (upper) and 1983 (lower). The 1963 condition served as a model for the plan to relocate Capt Sams Inlet. Lower photo shows the new channel (A) open before the old channel (B) was closed on 4 March 1983. The relocation project was repeated successfully in 1996 and 2015.

FIGURE 2.10. Photos of the 2004-2005 sand scraping and transfer project. **[UPPER LEFT]** Pan earthmovers loading sand from North Beach at low tide. **[UPPER RIGHT]** A bulldozer and farm tractor with scraper blade grading and dressing the beach. **[LOWER LEFT]** Regrading and dressing slopes around Oystercatcher beach access. **[LOWER RIGHT]** Scraped sand in place against the seawall around Beach

3.0 ALTERNATIVES

3.1 Do Nothing

The Do-Nothing alternative means that erosion hot spots along South Beach, particularly local beach slumping and profile collapse at the confluence of the Northern Marginal channel and North Edisto River Inlet (ie – Reach 3, Figure 1.1), will continue. The applicant believes it is just a matter of time before one of these erosion events causes a major failure of the seawall at the point of the scour hole. When the intertidal beach platform is lost, there will be no natural pathway for sand to move along the inlet shoreline to Camp St Christopher, the downcoast end of the beach. Instead, sand moving north to south (east to west) along the area of the Beach Club (Reach 4) will be drawn into North Edisto River Inlet – further exacerbating the problem.

Catastrophic failure of the seawall would jeopardize adjacent residential properties which currently have average values ranging from $1.3 to $2.9 million per unit (Source: Zillow.com). The loss of any of these properties would impact county tax revenues and have a ripple effect of reduced property values and tax base in the immediate area. A breach in the seawall south of the Beach Club would allow wave runup to reach Seabrook Island Road and cause damage to infrastructure. It would also lead to the unraveling of the seawall as damage propagates along the wall in either direction (Figure 3.1). This is because the seawall is a quarry stone structure built on a sand core. As wave action draws off sand from the core, the armor stone collapses, and functionality is lost.

There are also environmental impacts if the seawall remains intact, but more wet-sand beach is lost. Additional lengths of shoreline would lose dry sand beach and associated turtle nesting habitat.

The Do-Nothing alternative has low costs initially, but high costs over the next decade. Relative to the estimated 5-year cost of sand transfers from North Beach to South Beach (~$1 million), seawall failure and upland property damage would be many times higher. Loss of the most vulnerable duplex homes near the point of recent beach collapses in Reach 3 would represent a loss of ~$10 million in just four units of real property. Conservatively, another $15 million worth of property would soon become directly exposed to damaging wave action.

The applicant rejects the Do-Nothing alternative because it would not accomplish the goals and objectives of the proposed project.

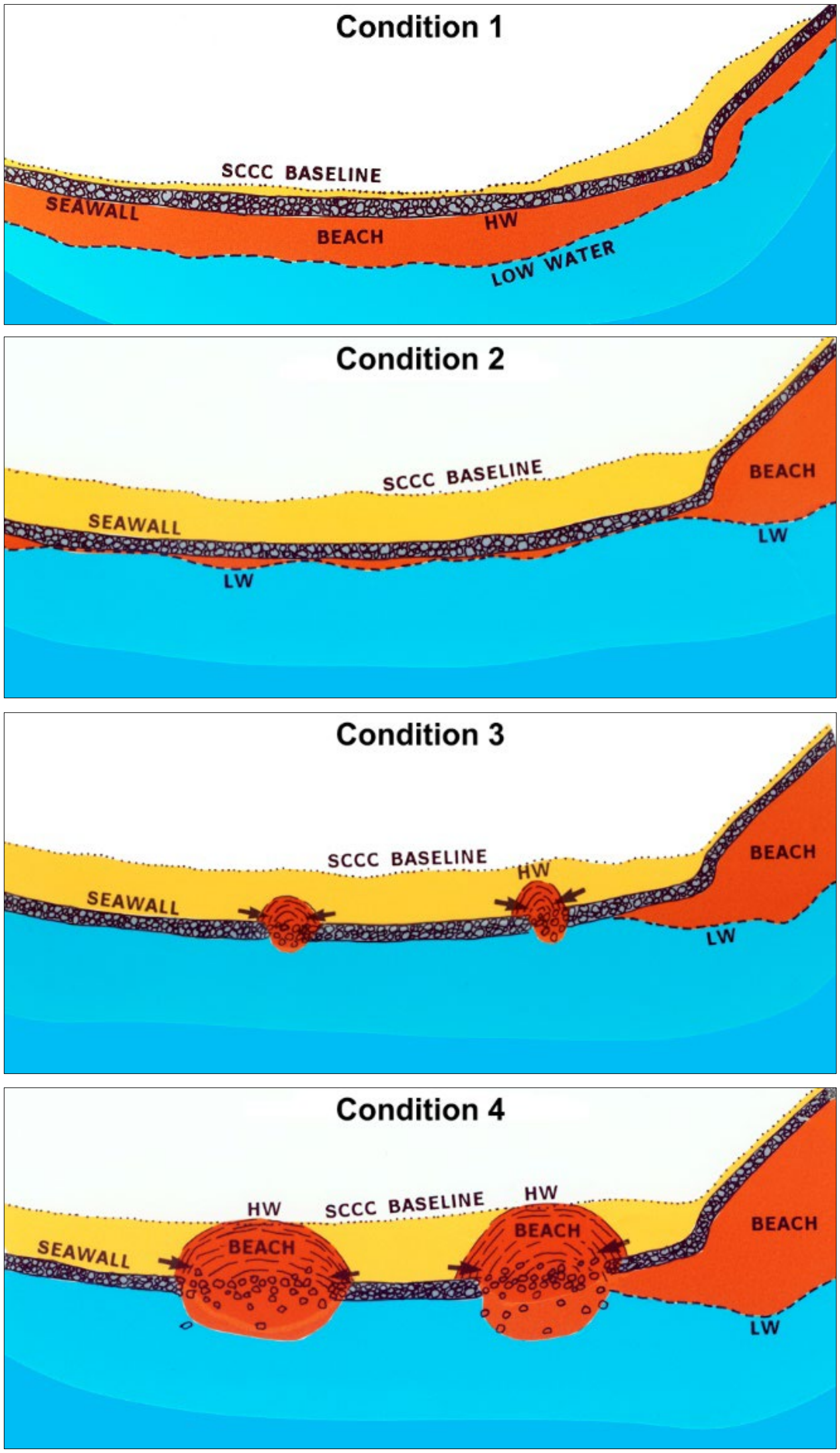


FIGURE 3.1. Illustration of progressive seawall failure. Condition 1 shows protective beach fronting armored shoreline. When the wet-sand beach erodes (Condition 2), weak points along the wall will slump and breach (Condition 3). The breaches then propagate along the wall as supporting sand is drawn off (Condition 4). Normal waves propagating through the breaches carve a n arcuate beach landward of the wall alignment. [Source: CSE]

3.2 Scrape Sand from North Beach and Transfer to Erosion Hot Spots

This alternative (Preferred Alternative) would transfer excess sand accumulating on the Seabrook side of Capt Sams Inlet along North Beach to downcoast eroding areas. The anticipated buildup of sand around Oystercatcher beach access (see Figure 2.4) would provide a renewable source for transfer downcoast to areas lacking a dry-sand beach. By transferring a portion of the accreting bars to downcoast areas (via trucks), this alternative would potentially offset the reduction in longshore transport which occurs as Capt Sams Inlet shifts south(west) (Kana 1989).

Sand scraping and transfer along North Beach was implemented in 1981 and 1982 prior to the relocation of Capt Sams Inlet in 1983 (Kana et al 1984). Additional sand transfers were performed after the 1983 inlet relocation because of the severely degraded conditions in reaches 6 and 7. At that point in time, seawalls were exposed and failing along upward of 8,000 ft of oceanfront (Figure 3.2). Since 1981, approximately 855,000 cy have been transferred in ten events by trucks from accreting areas around Capt Sams Inlet to eroding areas of Seabrook Island (SI 2014).

FIGURE 3.2. Beach erosion in reaches 6 and 7 (see Fig 1.1) led to exposed seawalls, no recreational beach, and severe damage to structures in 1983. View north along Reach 7 in 1985 at low tide. [After CSE 1989]

The unit cost of sand scraping is similar to the cost of inlet relocation because both projects involve mechanical excavation and transfer to downcoast areas. Costs are proportional to the volumes and distances sand has to be moved. Inlet relocation projects typically involve movement of ~150,000 to 200,000± cubic yards (cy). Sand scraping of Reach 8 after the 1983 inlet relocation involved ~225,000 cy. Sand scraping was performed in conjunction with the 1996 inlet relocation project after sand bars in the abandoned ebb-tidal delta migrated into the low-tide zone off North Beach. Between 2001 and 2007, four small-scale events moved 290,000 cy (average ~70,000 cy per event) at a net cost of

<$500,000. The project helped restore a viable profile along exposed sections of the seawall and maintain a downcoast sand supply. There were no observed underwater slope failures during the period covered by the permit.

Sand scraping and transfers along Seabrook Island are considered a useful management tool for addressing localized erosion during the years between inlet relocations (CSE 2002). They are an integral part of Seabrook's long-term beach management strategy, and are consistent with the soft engineering approach to erosion that the community has followed since the early 1980s (SI 2014). Figure 3.3 illustrates typical sections for the Preferred Alternative – Sand Scraping from accreting areas of North Beach and transfer by land-based equipment to eroding areas along South Beach (see Figure 2.1 for project plan).

The applicant estimates a similar project as the 2001-2007 sand scraping and downcoast transfers would now cost ~$3-$5/cy, factoring in current inflation and rising fuel costs. This would total ~$1–$1.5 million over a 5-year period to accomplish up to 300,000 cy of work using off-road equipment (eg – pan earth movers or off-road dump trucks, loaders, and a bulldozer).

All work under this alternative could be performed above water levels working along the wet sand beach to minimize impacts to dry beach habitat. As the project progresses, the area of dry beach would expand and exposure of the seawall would decline. Thep roposed borrow area would likely be restored naturally as shallow water bars from the migrating delta of Captain Sams Inlet shift downcoast into the project area. This, in turn, would help maintain the ephemeral washover habitat upcoast of the borrow area.

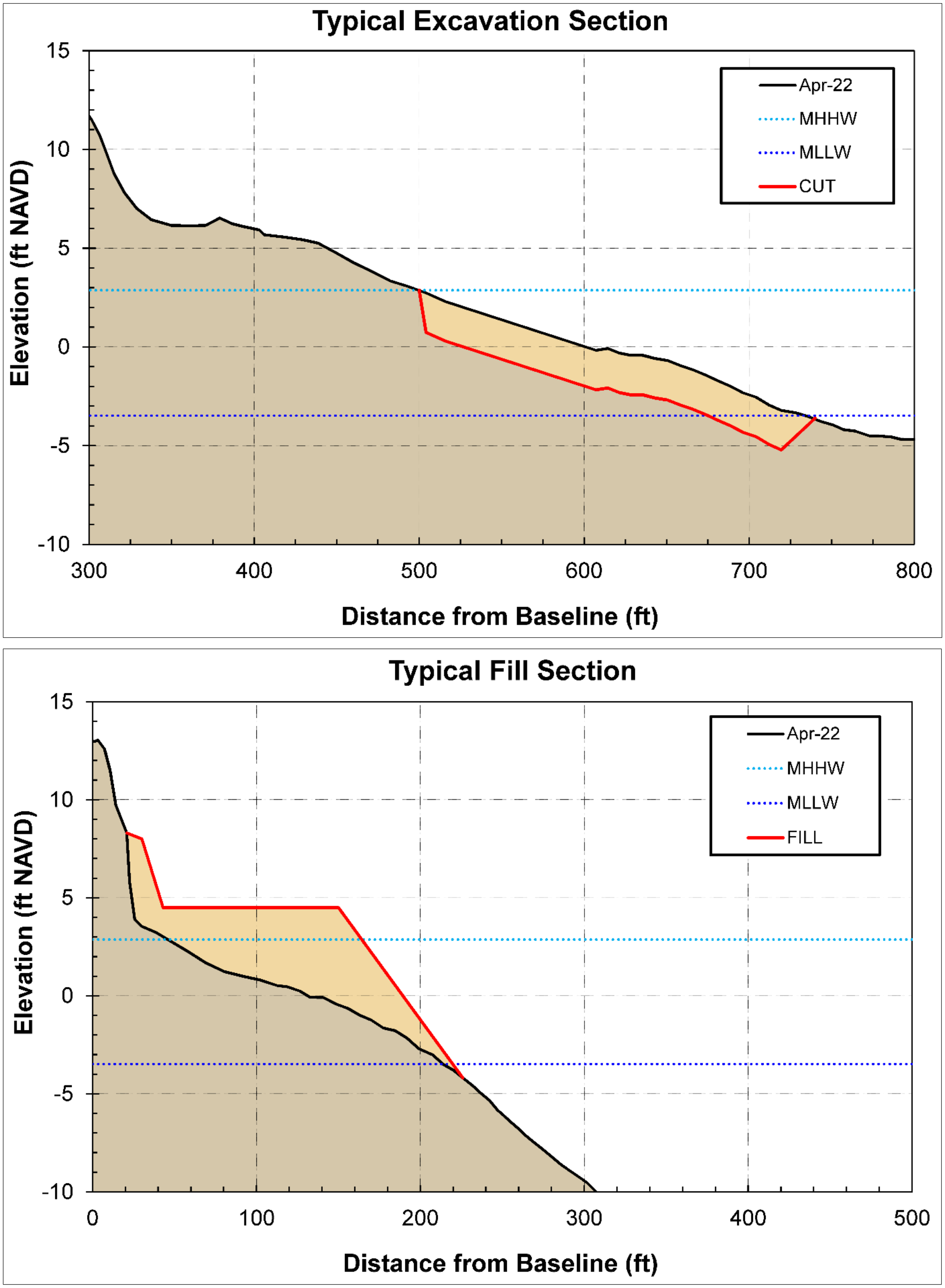


FIGURE 3.3. Typical excavation and fill sections for the proposed project to be performed in the dry via land-based equipment working around low tide. Excavations of the wet-sand beach would be shallow and expected to heal quickly under daily tidal action.

3.3 Truck in Sand from Inland Deposits

The applicant evaluated the alternative of trucking in sand from inland sand mines to augment the sand supply along Seabrook Island and address the sand deficit along exposed portions of the seawall. Sand trucking must be from approved borrow pits that contain beach-quality sand. Most sand suppliers (sources) in the Charleston area cater to small-scale projects.

The estimated volume requirement for the proposed project is ~300,000 cy over a 5-year period. There are no known sand pits containing such quantities of beach-quality sand on Seabrook Island, Kiawah Island, or Johns Island.

In 2021, the Town of Edisto Beach imported ~30,000 cy of sand for emergency dune restoration along its oceanfront. The source was a sand pit in Ravenel off New Road (which is roughly the same distance from Seabrook Island). The unit cost was $25 per cy for uncompacted material. In trucks, such "loose loads" generally yield ~0.8-0.85 cy of in-place volume (CSE 2015). Thus the effective net cost was ~$30/cy. Unit costs by Fall 2022 are likely to be higher because of significant increases in fuel costs in recent months.

The applicant estimates that trucking in ~300,000 cy of sand would cost upwards of $10 million and require ~20,000 round trips by tri-axle dump trucks. Such a project would add considerable wear and tear to state and local roads and add significant traffic along Bohicket Road on Johns Island. This mostly 2-lane artery serves as the only access road between Ravenel and the project site.

Because of the much higher cost of inland trucking and the impact on traffic, the applicant has rejected this alternative for the proposed project.

3.4 Realign the Northern Marginal Flood Channel

In 1990, the Seabrook community completed a 650,000 cy beach nourishment project combined with a realignment of the Northern Marginal flood channel (see Figure 2.8). At the time of the project, long sections of the seawall along the Northern Channel were in danger of catastrophic failure because of channel encroachment. Since project completion, the Northern Channel has remained more or less in the same position, and the adjacent beach has accreted sand along most of the wall, leaving a dry-sand beach between Renken Point and the Beach Club (Reach 5).

The applicant considered a similar plan for the proposed project but rejected it based on cost. Such a project would require the mobilization of an ocean-certified dredge (~$1.5 million) and pumping costs for the volume required (estimated at $6-8/cy). A smaller volume would be needed relative to the 1990 project, but the volume would have to be sufficient to provide an extended design life associated with a one-time project. Because of the vulnerability of the erosion hot spot along two major channels, a project focused on the south end of Seabrook Island, where erosion is worst, would leave an unstable bulge in the shoreline. Much of the sand placed by a channel realignment dredging of the North Shoal would slough into the channel and be quickly lost to the inlet.

We assume a "5-year" project would require ~400,000 cy bringing the total cost of this alternative to a range of ~$4-4.5 million. To be successful, most of the sand would have to be concentrated around the Beach Club (Reach 4) along the Northern Channel so that it could gradually feed downcoast areas rather than direct placement at the erosion hot spot along the margin of North Edisto River Inlet in Reach 3.

Realignment of the Northern Channel would potentially accomplish the goals and objectives of the project, but at upwards of five times the cost of the Preferred Alternative. Presently, only a small section of the channel south of the Beach Club is threatening the seawall. The applicant believes the Preferred Alternative, combined with the natural downcoast flow of sand, can keep pace with channel encroachment on an "as-needed" basis through multiple, small-scale sand transfers. Realignment of the channel by hydraulic dredge would necessarily require more design work (for a one-time event) and produce incrementally greater environmental impacts relative to sand placement via off-road trucks.

For reasons of cost and greater volumes required under a one-time event, the applicant has rejected realignment of the Northern Marginal Channel for the proposed project.

3.5 Alternative – Beach Nourishment

Much of Seabrook Island is protected by an ~8,500 ft seawall, which includes sections of concrete sheet pile (Figure 3.4) underlaying large quarry stone, as well as timber bulkhead structures along the North Edisto River Inlet shoreline. Approximately 70% of the seawall is presently buried and protected by a dry-sand beach and incipient foredune (Figure 3.5). Sections lacking dry beach protection are vulnerable to direct wave action, runup, and overtopping. As some sections become increasingly exposed, concomitant with a lower wet-sand beach, wave forces exceed the design of the structure. The crest of the seawall and the size of individual armor stones are inadequate for such conditions along the critically eroded sections between the Beach Club and Beach Club Villas (Figure 3.6). The applicant considered reinforcing the seawall at the most vulnerable sections, but rejected this alternative for several reasons.

Seawalls constructed before 1988 in South Carolina are grandfathered-in under the Beach Management Act (BMA) but cannot be upgraded or functionally modified. It is not possible under the BMA to raise the crest elevation of the wall or substantially increase the quantity and unit size of the armor stone. Damage has occurred in some sections of Seabrook's seawall, and repairs have consisted of replacing slumped rock of similar size at the pre-damage slopes and crest elevations.

FIGURE 3.4. Concrete sheet pile seawalls were installed along portions of reaches 5 and 6 in the 1970s. As they became more exposed, rip rap and larger armor stone was added for reinforcement and scour protection. Image shows a section of the concrete seawall after a collapse during Hurricane *David* (September 1979). [Source photo by Research Planning Institute Inc.]

FIGURE 3.5. Reaches 4, 5, and 6 along Seabrook Island are armored by a quarry stone seawall that is now buried by sand transported south from Capt Sams Inlet by natural, as well as, artificial means. Arrow marks the location of Fig 3.4 where the 1970s seawall has been completely buried under a vegetated dune. [Image by SB Traynum – CSE on 11 April 2018]

Presently, the most vulnerable section of seawall in the vicinity of repeated scour and slumped beach areas has a lower crest elevation and smaller-sized armor stone than the immediate upcoast area (see Figure 3.6). This section is considered the most vulnerable to catastrophic failure at present. Some repairs consistent with BMA rules have been made to this section of the wall, but these remain insufficient to prevent a future collapse. Much more armor stone using larger units would be required to provide long-term protection if the beach continues to erode. The crest would have to be raised by 3–4 ft, consistent with upcoast sections around the Beach Club, and armor stone would have to extend underwater down the channel slope. Such repairs and upgrades would be comparable in cost to the Preferred Alternative but would not maintain a viable beach. Such a structure would likely impede sand transport to downcoast areas because it would eliminate a critical section of wet-sand beach over which sand is transported from upcoast to downcoast areas by breaking waves.

Because reinforcement of the existing seawall is not allowed under the BMA, and because this alternative does not meet the goals and objectives of the project, the applicant rejects it. Further, this alternative would not be consistent with the Seabrook Island BMP, which favors soft engineering solutions such as beach nourishment, inlet relocation, and sand transfers.

FIGURE 3.6. Section of exposed seawall in the critically eroded Reach 3 on 15 May 2020. The crest elevation of the wall is lower and the armor stone is smaller in front of the homes in the image. This is considered the most vulnerable section of the beach at present. [Photo by J. Hair – CSE]

3.6 Install Groins Along the Critically Eroding Area

The applicant considered installing a terminal groin or a short field of groins around the southern tip of Seabrook Island to hold a beach in place. The Dutch have utilized a series of groins or jetties for similar purposes along some of their large inlet channels around the curve of the shoreline (eg – Burgh Haemstede, Netherlands). To be successful, such structures generally must extend underwater to the base of the channel slope, so they can deflect channel currents away from erosion hot spots on the beach. The structure would have to be combined with nourishment in accordance with the BMA and configured to allow some sand to bypass downcoast.

A single terminal groin would likely only address upcoast erosion and, in this case, exacerbate erosion along the North Edisto River Inlet shoreline because of the sharp curve in the shoreline and depth of the main channel.

This alternative would require the most time and effort at the design stage because the erosion hot spot is situated at the junction of two large tidal channels. Functionality would need to consider not only sand retention along the seawall but impacts to inlet flows. The cost of this alternative would, be orders of magnitude higher than the Preferred Alternative. Figure 3.7 illustrates the concept. The primary factor controlling costs is the scale of the structures needed along an inlet margin that terminates in water depths greater than 60 ft. Assuming the south point of Seabrook Island could be stabilized by four groins extending to the base of the channel, each structure would have to be of the order of 400 ft long and built of large quarry stone or precast armor units sufficient to withstand strong currents in North Edisto River Inlet. Based on recent experience, such structures would cost upwards of $10,000 per foot. Therefore, four structures plus concomitant nourishment would cost at least $20 million, which would be ~20 times costlier than the Preferred Alternative. Planning, design, and permitting would also be many times more expensive and lengthy.

For the reasons outlined above, the applicant rejects the installation of groins as a feasible alternative for the proposed project.

3.7 Abandon or Relocate Vulnerable Developed Property

Prior to 1985, approximately 80% of Seabrook's developed shoreline lacked a dry-sand beach. That percentage was reduced to about 15% in 2020 by way of inlet relocation (1983, 1996, and 2015), channel realignment and nourishment (1990), and ten small-scale transfer projects (Kana et al 2013). A positive sand budget has increased the separation between most developed properties and the ocean lessening vulnerability to erosion and damage. The success of this soft engineering approach to erosion management has helped maintain property values and the community's tax base.

The applicant considered selective abandonment and relocation of vulnerable properties, particularly the buildings behind exposed sections of the seawall illustrated in Figure 3.7. This solution would also incorporate realignment of the seawall in a more landward position to enhance beach recovery. The present Zillow value of oceanfront properties shown in Figure 3.7 is ~$21 million. The Beach Club buildings and pools are assumed to be valued similarly. Abandonment or relocation of the most vulnerable properties would therefore cost 30-40 times the Preferred Alternative before considering the potential costs of seawall realignment and the likely high cost of litigation associated with any property condemnation.

For the reasons of cost and potential for litigation with private property owners, the applicant rejects property abandonment or relocation as an alternative. This alternative would not restore the beach or achieve the primary goals of the applicant.

FIGURE 3.7. Section of exposed seawall on 11 April 2018. Oceanfront properties (11) visible at lower left corner of the image have a present Zillow value of ~$21 million. The Beach Club complex (center of image) is estimated to have a comparable value. Buyouts and relocation of these properties was considered but rejected by the applicant based on cost and potential for litigation.

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