



## Planned Project Volume

On many beaches, nourishment volume can be determined using a simple profile-based calculation that is based on the existing condition of the beach, the desired healthy beach condition, and the expected erosion rate. Terms are defined as:

*Profile Volume* – The quantity of sand contained in a beach profile. This is typically reported on a unit-bases, meaning the amount of sand contained in a 1-ft length of beach (cubic yards per foot of beach - cy/ft). The volume is measured between a reference point on the landward end of the profile (typically a line that represents a management line such as the seaward side of oceanfront houses or a dune line) and a seaward point that captures most of the normal sand transport (typically the Closure Depth).

*Depth of Closure* – The depth at which repetitive profiles collected over several surveys tend to overlap and become consistent. This varies by beach based on tide and wave conditions. At Isle of Palms, the Depth of Closure is around -13 ft NAVD, though it is shallower around the inlet areas. The majority of sand transport occurs landward of this point.

*Minimum Healthy Beach Volume* – This is a template profile volume that contains sufficient sand to meet the goals of a community’s management effort and is based on an existing healthy beach condition (if it exists) at a site. The minimum healthy beach volume should contain sufficient quantity to be able to support a protective dune and a dry-sand beach width that is resilient to modest storms and spring tide events. It is the standard by which a beach’s condition can be measured against in long-term planning efforts. It is site specific, determined by the physical parameters shaping the beach profile and the community’s goals.

*Deficit Volume* – The measure of the quantity of sand required to bring an eroded beach condition up to the Minimum Healthy Beach Volume.

*Advance Fill* – The amount of sand needed during nourishment to overcome expected losses over the design life of the project. It is determined by multiplying the expected erosion rate by the planned life cycle of a project.

The amount of fill for a project, or the planned volume, is summarized in the equations below and is based on existing beach conditions.

$$\text{Planned Volume} = (\text{Deficit Volume}) + (\text{Advance Fill}) + (\text{Contingency})$$

If the existing beach profile is healthier than minimum beach profile the equation just Advance Fill:

$$\text{Planned Volume} = (\text{Average erosion rate} * \text{Nourishment Cycle}) + (\text{Contingency})$$

This framework can also be adjusted to rebuild the beach above the minimum profile or to account for atypical erosion events, such as the significant losses experienced near Breach Inlet between 2021 and 2024. It is also



important to note that some stations within a reach may fall below the minimum healthy beach profile before 8 years due to the dynamic nature of beaches (hotspot erosion or storm events). This is especially evident along the northeast end of the island where localized erosion from shoal bypasses causes significant erosion in some areas whereas there may be significant accretion in others. It is important to adopt triggers that both emphasize the reach health as a whole and establish a minimum threshold for areas that may experience heavy periodic erosion.

The methodology for the upcoming project on the determination of planned fill is detailed below and is based on the factors mentioned above. For this project, the beach is divided into three reaches (note that the construction reach numbers differ from annual monitoring reaches identified in monitoring reports and other correspondence with the City):

- Reach 1: Station 280+00 to 328+00
- Reach 2: Station 222+00 to 280+00
- Reach 3: Station 00+00 to 86+00

### **Reaches 1 and 2**

Reaches 1 and 2 are located near the attachment point of an offshore shoal that connects to the shoreline approximately every 6 to 8 years. While the shoal eventually supplies sand to the beach, the attachment process causes localized erosion due to focused wave energy and sediment being drawn offshore. Over the past few decades, the background losses exceed the natural gains from shoals, making periodic large-scale nourishment necessary.

CSE estimates that long-term average erosion rates in Reaches 1 and 2 after the 2008 project were around 100,000 cubic yards (cy) per year (9.4 cy/ft/yr). Recent rates following the 2018 project have been higher, approximately 200,000 cy per year (18.9 cy/ft/yr), although these values do not account for all of the sand currently contained in the attaching shoal. Note that these values are substantially higher than historic erosion rates reported for the east end. SCSGC (2001) reported historic erosion rates of 20,000-30,000 cy per year. The Beach Ad-hoc committee adopted an assumed erosion rate of ~150,000 cy per year, which considers the long-term average losses, current configuration of the shoal attachment, and recent erosion rates. This rate should be continuously evaluated as more data is available and trends in weather and sea level change historic rates.

Using an 8-year nourishment cycle, the advance fill requirements are:

- 2008-2018 rate: 800,000 cy (75 cy/ft)
- 2018-2026 rate: 1,600,000 cy (150 cy/ft)
- Adopted planning rate: 1,200,000 (112 cy/ft)

These values represent a range of likely erosion rates that the beach may experience over the next 8 years. Sand is still approaching the beach via shoal attachment, which will likely improve erosion rates over the next 1-2 years. It is possible that losses to downcoast areas exceed the volume of sand coming to the beach, and a net deficit will remain. There are presently two areas along Wild Dunes that show a volume deficit relative to the minimum healthy beach volume. These include the area from stations 252-262 (east Grand Pavilion to Beachwood East), and stations 308-314 (Seascape and Ocean Club). Collectively, these stations hold a deficit of



~180,000 cy. CSE expects this to be reduced by half or more over the next 6 months as sand continues to spread. The beach between these two areas currently holds ~922,000 cy excess sand above the minimum healthy beach volume.

As of February 2026, the project formulation at the east end would include a deficit volume of 180,000 cy and advance fill of 1.2 million cy. The bid plans are subject to available funds, and include a “Base Bid” quantity that is set at an amount that ensures that the scope of the project is viable and bids will fall below the available budget. This avoids the need to rebid the project and/or delay the process. The bid also includes “Alternate” quantities that allow for award of additional sand should bid prices be returned that allow for additional placement, up to the available budget or permitted quantity. The Base Bid for the project at the east end is 1.2 million cy, with alternate quantities of up to 500,000 cy. The Base + Alt quantity would equal the maximum volume under project permits.

### **Reach 3**

The methodology for Reach 3 is similar, but its erosion history differs. Reach 3, at the southern end of the island, was historically accretional. However, the reach has lost sand since 2009 and from 2021 to 2024 it experienced substantial erosion and shoreline retreat. Over the past year, survey data show renewed accretion due to beneficial use projects and natural recovery.

The long-term average erosion rate for Reach 3 from September 2010 to September 2024 is approximately 33,000 cy per year (3.8 cy/ft/yr). This rate includes the highly erosional period but does not include the benefits of the USACE sand placements. If all survey events are considered (2010 to 2026), the rate decreased to about 14,500 cy per year (1.7 cy/ft/yr); however, this number may be artificially low due to the recent USACE projects. Over an 8-year interval, the measured rate of 33,000 cy per year results in an advance fill requirement of:

- Advance Fill Requirement: 264,000 cy (30.1 cy/ft)
- Adopted Rate Requirement: 400,000 cy (46.5 cy/ft)

As of February 2026, nearly all stations within the Project Reach 3 area maintain at or above the minimum healthy beach volume established by the Beach Ad-Hoc Committee. The Committee also set the assumed loss rate at 50,000 cy/yr as a conservative approach. It is important to note that the beach is currently adjusting to the USACE placement efforts, and a large excess quantity of sand is currently along the low-tide portion of the beach. While some of this sand will move up the profile and increase the dry beach width, there are areas where the beach width remains low despite overall sand quantities exceeding the minimum threshold. Specifically, areas south of 2<sup>nd</sup> Avenue and near 6<sup>th</sup> Ave. If the localized areas below the minimum volume are summed, the total volume deficit is ~16,000 cy.

The proposed project formulation would include a deficit volume of ~16,000 cy, placed in the areas currently below the threshold, and advance fill of 264,000 cy for a total of 280,000 cy. The Base Bid was set at 400,000 cy to allow for contingency and in recognition of some areas having narrower dry-sand levels that the beach volume would normally produce. CSE expects beach widths to improve due to profile adjustment, and via additional sand placement activities by the USACE between the surveys and completion of their project (likely less than 100,000 cy). The Bid allows for additional alternate quantity of up to 400,000 cy more sand. This

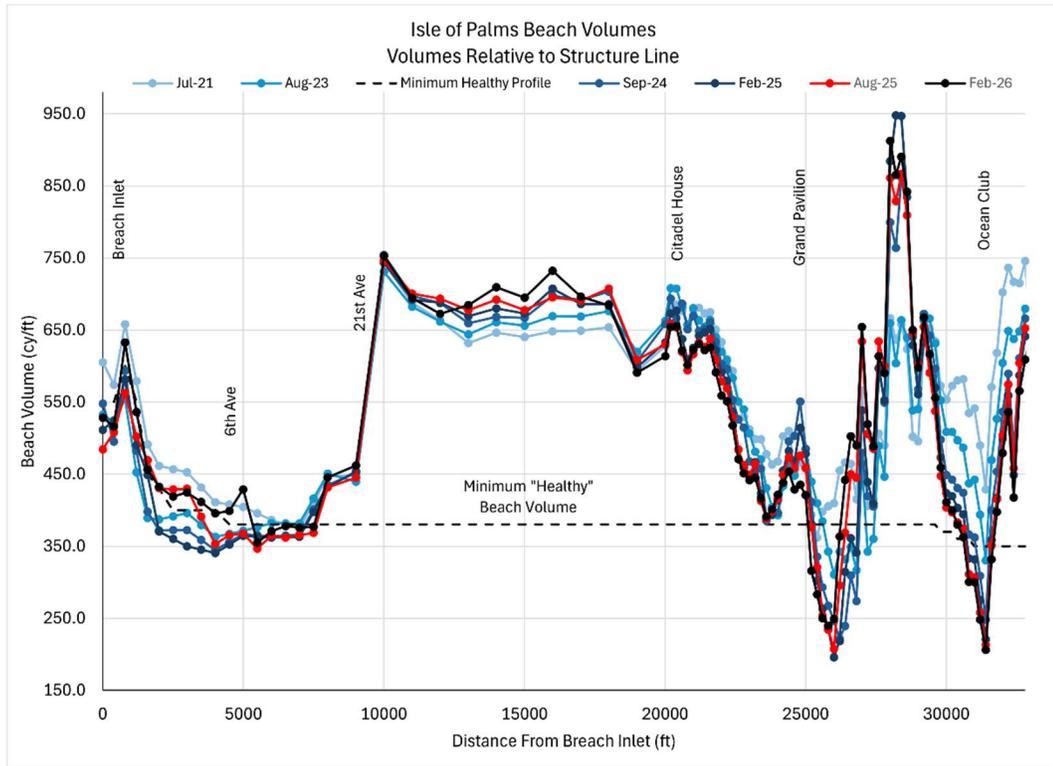


would greatly exceed the design formulation. Addition of the Base Quantity would provide a beach volume exceeding any measured condition since 2009.

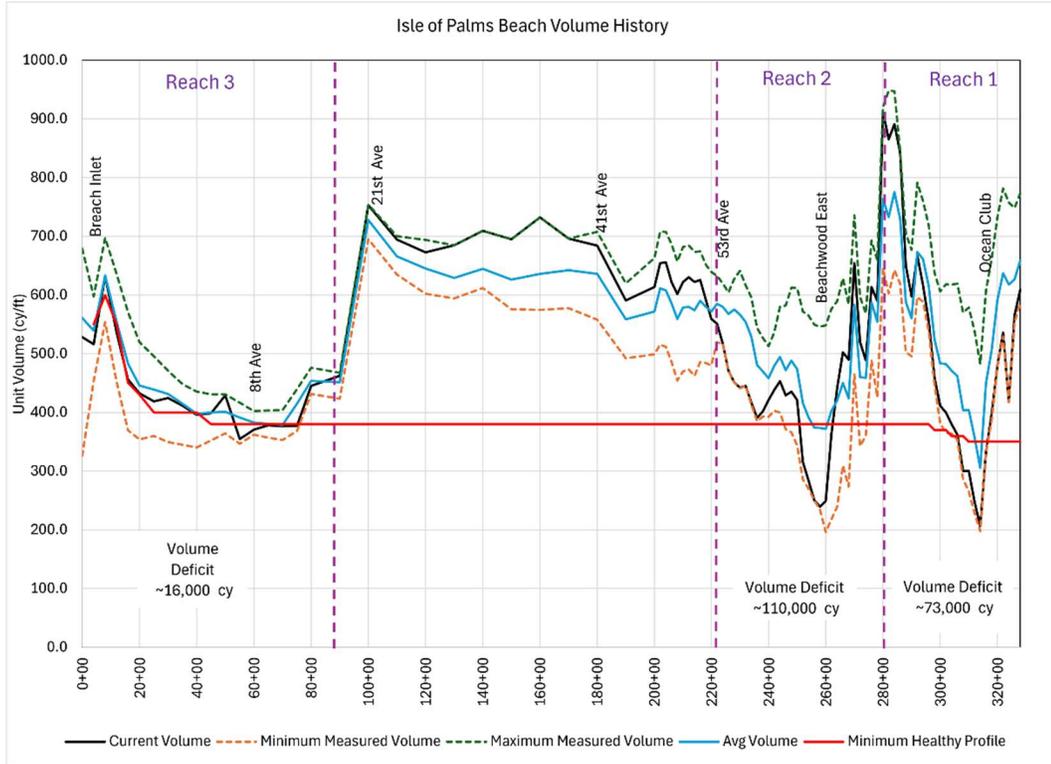
With the erosion rates of Project Reach 3, CSE is confident the base bid of 400,000 cy meets the criteria of an 8-year project. Additional material can be placed, up to 800,000 cy, in Reach 3 if desired and there are additional funds available for nourishment.

### Conclusion

Below are tables to help clarify the current volume above the minimum healthy beach profile as of February 2026 along with the advance fill. There exist some stations that have a volume deficit below the minimum healthy profile. During the project, these areas showing a deficit will receive sufficient sand to restore the beach to the minimum healthy beach condition and advance fill based on localized erosion rates. Also included are figures depicting CSE’s minimum healthy beach profile across the monitoring area and the island’s beach volume history.



**Figure 1: CSE’s Minimum Healthy Beach Profile**



**Figure 2:** Isle of Palms Beach Volume History

**Table 1:** Advance Fills Based on Erosion Rates

	<b>Linear Feet</b>	<b>Advance Fill (Adopted Rate)</b>	<b>Advance Fill (Maximum Measured Rate)</b>
<b>Reach 1</b>	4800	544,000 cy (113 cy/ft)	725,000 cy (151 cy/ft)
<b>Reach 2</b>	5800	656,000 cy (113 cy/ft)	875,000 cy (151 cy/ft)
<b>Reach 3</b>	8600	400,000 cy (46.5 cy/ft)	264,000 cy (30.7 cy/ft)

**Table 2:** Current Volume Deficit relative to the minimum healthy beach profile. Note that this value only includes areas with a reach that show a deficit volume to not allow areas with excess sand to skew the quantity.

	<b>Linear Feet with Deficit</b>	<b>Current Deficit Volume Relative to Minimum Healthy Beach Profile</b>
<b>Reach 1</b>	1,000	73,000 cy (75 cy/ft average)
<b>Reach 2</b>	1,000	110,000 cy (96 cy/ft average)
<b>Reach 3</b>	~1,000	16,000 cy (8.8 cy/ft average)