

JANT Engineering

EGN-495 HW03

18 September 2022

JANT Engineering will be collecting elevation data along six transects within the Carolina Beach project area using a Reach RS2 RTK-GPS unit. This data will be used to evaluate the current state of the beach and to understand how the beach is changing by comparing our collected data to the existing USACE beach profile survey data. Carolina Beach was renourished in the spring of 2022, and the most recent USACE survey was conducted in January 2021. We need to assess the current beach elevation and slope. The team will also collect three sediment samples along four determined transects at the dune toe, berm, and water line. These samples will be used to examine the grain size characteristics and obtain the median grain size (D50). Median grain size is a necessary statistic for planning potential beach renourishment projects. With renourishment, an offshore borrow site must be established to supply beach fill with similar sand grain characteristics. This data will be used in functional testing to help our team decide the best alternative solution for this site. This testing is crucial for determining a successful alternative plan to withstand the required 50-year life span and 100-year storm conditions.

The site visit will take place on Monday, September 19, 2022. Our team plans to meet at the Coastal Engineering building at 8:00 AM to retrieve all GPS instrumentation and tablet. With travel time, we plan to arrive at Carolina Beach by 9:00 AM. We plan to collect data in the morning due to the tide predictions for Carolina Beach. Low tide is predicted to be at 8:45 AM according to Swell Info. Conducting our beach survey during low tide will allow us to record data further seaward as the lower water level will expose more of the beach. An early Monday morning field visit will also allow us to work in cooler temperatures and avoid traffic along the beach.

The field site boundaries are defined by the corners of a bounding box (Table 1). The corners are labeled corresponding to their relative geographic direction. Elevation data will be collected along the six transects (T01, T02, ..., T06) shown in Figure 1. Six equally distanced transects will allow our team to adequately characterize the entirety of the field site and complete the survey within our limited time frame. Three sediment samples will be collected along four transects T01, T03, T05, and T05. There will be a total of twelve sediment samples. They will be labeled based on transect and cross-shore location (e.g., T01_SedD for a dune sample along transect T01). The distances between sample locations are varied in the alongshore and cross-shore directions for a comprehensive sediment characterization.

Table 1. Coordinates of field site boundaries.

	Latitude (degrees)	Longitude (degrees)
Northwest (NW)	34.0591	-77.8816
Northeast (NE)	34.0556	-77.8654
Southwest (SW)	34.0149	-77.8993
Southeast (SE)	34.0107	-77.8836

All group members will contribute to collecting data during the field workday, but each member will be assigned different roles in the data collection process. Group members are not limited to one job but are encouraged to take on responsibilities as needed. Ashley will lead field day operations, delegate specific tasks for data collection, and record field notes. To collect elevation data, we will be using the Reach RS2 RTK-GPS device. We will be collecting single point elevation data in a cross-shore array over six transects in the NC State Plane coordinate system with units of feet. Jacob will use the tablet to record and manage GPS point data. Noah and Tanner will move and level the Reach receiver at selected

locations along the transects. All members will help ensure data collected from the receiver is efficient and accurate as possible. Sediment samples will be retrieved from four of the six transects and placed into plastic bags. Each member will assist in the collection of sediment samples from the dune, berm, and water line. The samples will be brought to campus the same afternoon and dried in the oven for 24 hours. Once the samples are fully dry (likely Tuesday, September 20), at least two team members will begin the sieve analysis using the W.S. Tyler Ro-Tap sieve machine. The steps for the sieve analysis are as follows:

1. Measure the wet weight of the sediment sample.
2. Dry the sample for 24 hours.
3. Measure the dry weight.
4. Sieve each sample for 10 minutes (2 mm, 1 mm, 0.5 mm, 0.25 mm, 0.125 mm, 0.63 mm sized mesh, and the pan).
5. Weigh the sieved sediment in each pan.
6. Return sand to bag or bucket.

Tanner and Ashley will process the elevation data via MATLAB. First, the data points will be loaded into MATLAB and interpolated to a grid that our team previously established based on the USACE survey data. Visuals will be created to understand the current state of the beach. The team will then compare our survey data to the existing 2014-2021 survey data collected by the USACE. Significant differences will be quantified and noted. The team will also identify any particular areas of concern (i.e., erosional hotspots). ArcGIS Pro will be used for spatial analysis and informative visualization of the survey data.

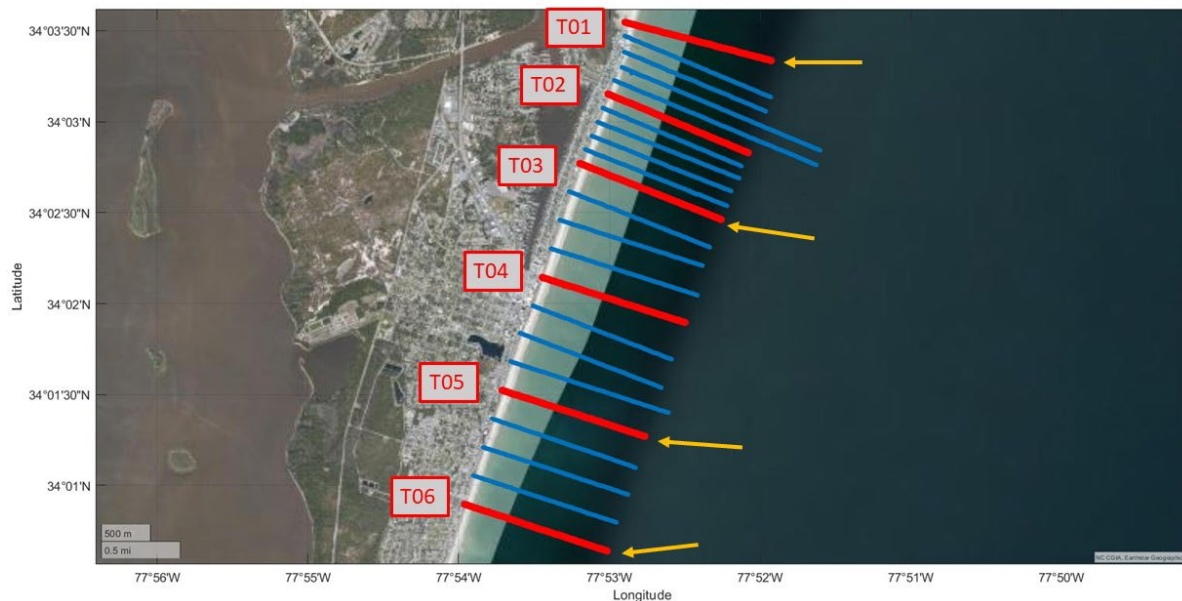


Figure 1. Locations for elevation and sediment data collection. Red lines indicate the transects that will be used for GPS surveying. Orange arrows indicate the transects where sediments samples will be collected.