

Establishing accurate elevations on Assateague Island

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Abstract: Assateague Island National Seashore is a barrier island on the coast of Maryland and Virginia with a geomorphological monitoring program operated by the National Park Service. This program relies on survey control for establishing accurate elevations of important natural and man-made assets on the island. Park staff and partners have implemented a robust survey control network relying on four major operational phases:

1. Identify existing marks and establish new survey control marks (if necessary).
2. Reference survey control marks to each other using geodetic GPS methods.
3. Relate survey control marks to local water level measurements using differential leveling.
4. Establish GNSS Continuously Observing Reference Station (CORS) for vertical land motion monitoring and providing IP-based RTK GNSS corrections.

The completion of these steps has provided precise island-wide elevation reference network with quality local relationships. The ability to quickly collect accurate elevations throughout the island has prepared land managers for measurement against environmental changes and future geodetic reference system updates.

2 – In 2015 park staff and partners completed a GPS survey control network using simultaneous static GPS occupations spread over a timespan of two months. Marks were reoccupied at least once for redundancy and processed using the OPUS-Projects software from the National Geodetic Survey. The survey network adjustment resulted in approximately 5mm of accuracy for all marks in the network.

3 – Survey control marks are given reference to local water level using water level gauges. Water level gauges are tied to the survey control network using differential digital leveling. In small distances differential leveling is accurate to the mm level. Assateague Island has three water level gauges: Ocean City Inlet (NOAA), Bunting's Gut (USGS), and Chincoteague Inlet (USGS).

1 – Existing marks were located and new marks installed in areas lacking survey control (black circles on map). Due to the lack of bedrock on Assateague island, new marks were driven into the ground approximately 80 feet for vertical stability.

4 – In 2017 a GNSS Continuously Observing Reference Station was installed near the Bunting's Gut. This station will perform long-term monitoring of vertical land motion as a part of local water level change and to estimate subsidence impacts on the survey control network. It will also aid in preparing data related to the geomorphological monitoring program for a major geodetic reference frame change in 2022 (NATRF2022) which will replace the current version of NAD83. The geomorphological monitoring program also operationally benefits from the IP-based Real-time Kinematic GNSS corrections providing better than 2cm accuracy all over Assateague Island. The relationship of RTK data, survey control, and water level provide a consistent format for relating any elevation measurement on Assateague Island to any control mark or water level station.

