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Introduction

This SOP details the procedure for identifying and mapping the position of the shoreline. To reduce the effects of short-term variations in shoreline position, the optimal shoreline data collection is conducted during a period of low tidal range (neap tide) and during non-stormy conditions (SOP 1.3.21 *Survey Timing and GPS Mission Planning—Version 1.0* [Baron 2018]). Therefore, the target shoreline, for the purposes of this protocol, is the neap high-tide swash line (Figure 1). It is a representative qualitative feature that identifies a water or land surface intercept (a shoreline). It is easily collected using GPS equipment, feasible to implement on the network level, and its collection as a data set allows it to be compared to archives of historical shoreline positions.

An initial procedure of the shoreline monitoring protocol is the selection of a shoreline survey window using the process outlined in SOP 1.3.21. Unless constrained by a storm event or very high spring tides, the survey is scheduled for the first convenient high-tide neap tide in March through April (spring survey) and mid-September to mid-November (fall survey). The shoreline data collection will begin at least 60 minutes after high tide, allowing time for the water level to recede. This will expose sufficient beach face for collection and leave a clearly identifiable high-tide swash mark.

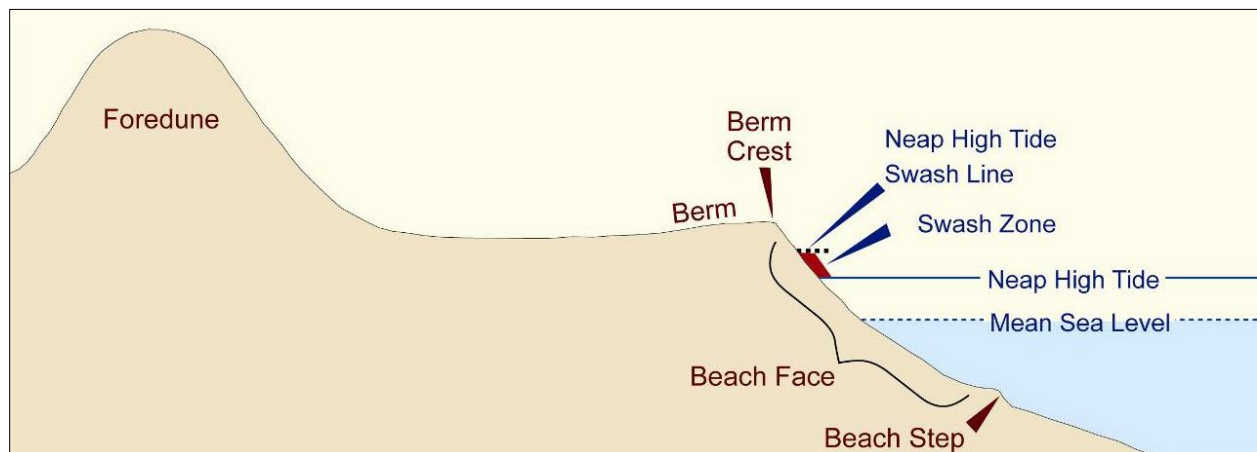


Figure 1. Conceptual dune-beach profile showing the juxtaposition of water level, topographic features, and the identification of the neap high-tide swash line (Figure from Psuty et al. 2010).

Equipment List

- Flatbed trailer
- Utility task vehicle (UTV)
- Tie downs (at least two per UTV)
- Gasoline container(s) (full)
- Tire pressure gauge
- Boards/rope or tow cable/shovel (recommended)
- Water container(s) (one)
- Trimble GPS, case, and pen, fully charged, and charger (one per person)
- GPS mount cradle and pole bracket (if using)
- PVC to attach pole bracket to UTV (if using)
- Hose clamps (two) to attach PVC to UTV (if using)
- Screwdriver (for hose clamps, if using GPS cradle)
- GPS antenna pole(s) (if using)
- Clipboard(s)
- First-aid kit
- Duct tape
- Measuring tape
- Pens and pencils
- Bungee cords and/or zip ties
- Towels/rags
- Radios (from parks)
- Sun block
- Field data forms on Rite-in-the-Rain paper
- Copy of shoreline mapping SOPs

- Trimble GPS manual
- Tide sheet for proposed data collection locations
- List of emergency phone numbers
- List of park contact numbers
- Camera (one per GPS unit)
- Camera charger(s)
- Field phone and charger
- Hat
- Bug spray
- Binoculars
- Water bottle
- Rain gear

Overview

This SOP consists of four components. The first component is the initial preparation procedures that include the visual identification of the shoreline, initialization of the data form, and start of the shoreline survey. The second component is the survey of the shoreline with GPS and records the position of any benchmarks. The third component deals with natural or artificial perturbations to the shoreline, including natural features (e.g., cusps, scarps), hard structures (e.g., groins, jetties), and human interference (e.g., anglers). The fourth component ends the survey.

Component 1: Preparatory Procedures

Before beginning data collection, the previous actual and predicted high tides are checked. If the previous actual high tide is greater than 1 foot (0.3 meters [m]) above the predicted high tide during the previous week, the mapping must be rescheduled. As identified in SOP 1.3.21 *Surveying Timing and GPS Mission Planning* (Baron 2018), the shoreline should not be mapped during or soon after storm tides, defined as a tide greater than 1 foot (0.3 m) above the predicted tide. If the previous actual tide is not greater than 1 foot (0.3 m) above the predicted tide, in the neap window already identified, visually inspecting the shoreline is the next step.

Go to the beach and visually confirm that the swash line is identifiable and on the beach face. The line may be a damp sand and shell hash line, a debris line, or some combination of these characteristics (Figure 2). The swash line's presence on the beach face assures that no unusual wave or water levels were present. If the swash line is landward of the berm crest, it is likely that the surge

and tides that created this line exceeded the threshold for a low tide or non-stormy conditions. Therefore, the survey must be rescheduled using the procedures described in SOP 1.3.21 (Baron 2018).

There may be more than one shell hash and debris line on the beach face. The more recently-deposited high-tide swash lines are more distinctive than older, more muted lines (Figure 3). Less distinct lines may also be deposited as the tide recedes (Figure 3). It is essential to survey the most **recent and highest** of the shell hash lines on the beach face.



Figure 2. This high-tide swash line (dashed red line) on the beach face is composed of the upper limit of damp sand, shell hash, and small amounts of debris (Figure from Psuty et al. 2010).



Figure 3. This recent high-tide swash line (dashed red line) is a damp sand and shell hash line with debris. There are older more muted lines landward and there are lower lines seaward (Figure from Psuty et al. 2010).

Initiate the Field Data Form

The field data form (FDF) in Appendix A is used for all field notations. A completed field data form is necessary for post-processing of the data and recording accurate metadata. Once the shoreline has been visually identified on the beach face, fill in all fields (except for end time) in the “Event Information” and “GPS Device” sections of the FDF.

Many of these initial values may be entered prior to going into the field. Log any notes regarding equipment problems or obstacles encountered in the survey notes section, as well as the time from the GPS unit. Either the FDF or the comment/note function of the data logger will be used to record observations and notes during the survey. If stored on the GPS unit, a copy of all comments should be attached to the FDF (either digitally or with a hard copy) prior to submitting all data products to the SECN project leader.

Component 2: Shoreline Survey Procedure

Setting up the GPS

Below are instructions for creating a GPS file for shoreline mapping. The GPS can be set up and the GPS file created before going into the field. The data dictionary must be loaded into the GPS data logger before creating the file and choosing the settings as described below.

Creating a GPS file

1. Start TerraSync: Turn on the GPS data logger. The opening page looks very similar to most Windows pages.

- Click on **Start > TerraSync** (or **Start > Programs > TerraSync** if TerraSync is not on the start menu).
- TerraSync will open to the status screen (Figure 4). If the skyplot is not showing, click the top drop down menu (upper left corner) and click on **Status**, and then right below, on the second drop down menu, click **Skyplot**.
- Move to a location with a clear view of the sky. In a few minutes the GPS unit will start tracking satellites, and the Skyplot screen will show satellite and PDOP status (Figure 4).

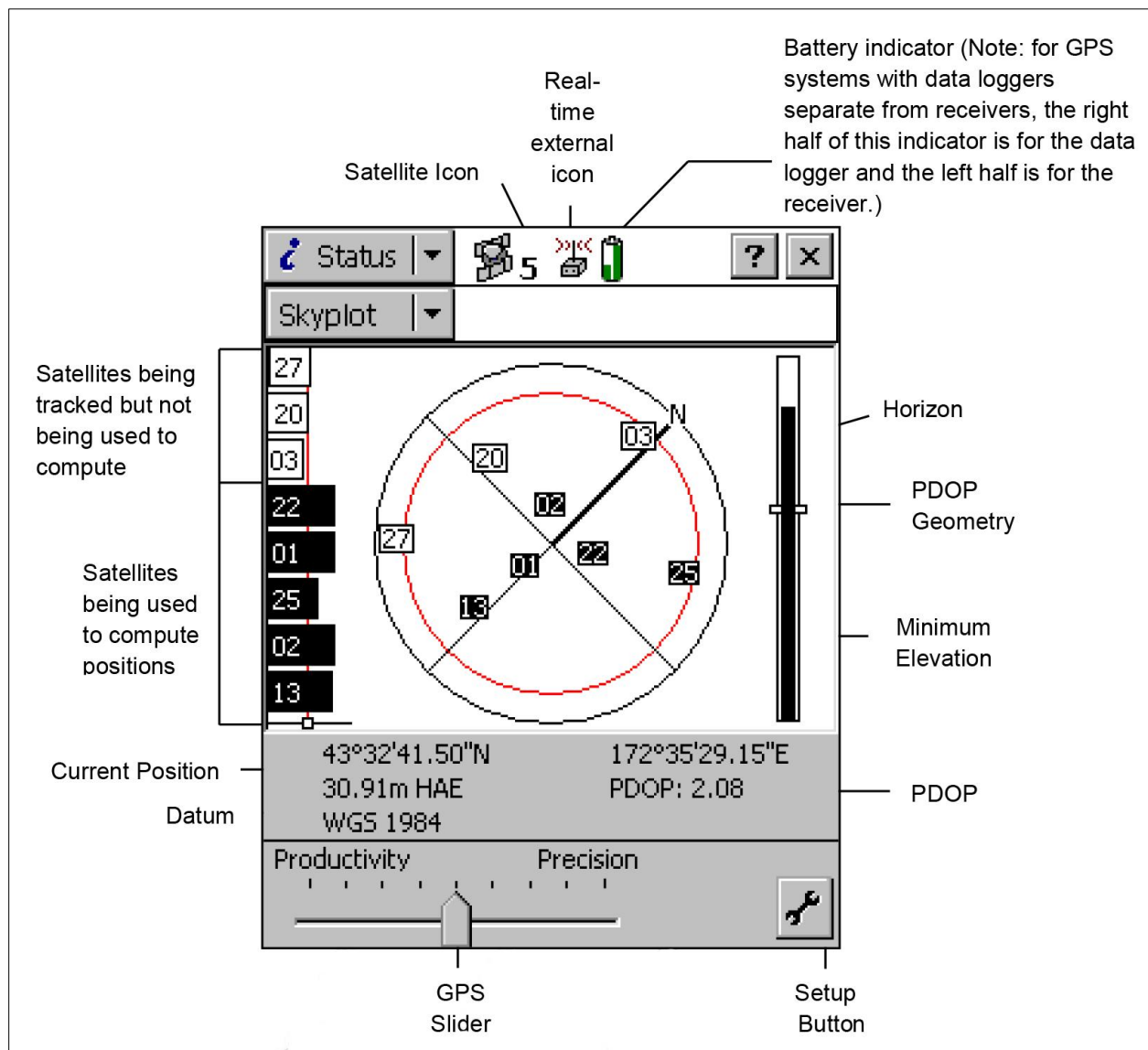


Figure 4. Skyplot showing satellites and the PDOP status. Note, this is a screen capture from an older version and may differ slightly from the newer GPS models.

2. Using the stylus, click the arrow next to the **Status** icon (upper left corner of the screen) and choose **Data** from the drop down list.
3. Under **Data**, **New** should be displayed and **Create New Data File** should appear on the screen.
4. Enter the settings listed in Table 1.

Table 1. Settings used when creating a new GPS file for shoreline mapping.

Parameter	Choice
File Type	Rover
Location	Default
File Name	YYYYMMDDHHPARK*
Dictionary Name	Shoreline_v_#**

*Use the following format for the filename

YYYY = current year; MM = current month; DD = current day; HH = current hour; PARK = four letter park code.
Example: 2014070506CAHA is a file collected on July 5, 2014 at 6 a.m. at Cape Hatteras National Seashore.

**When the shoreline data dictionary is updated, the version number will increase. For example, Shoreline_v_2 is the current data dictionary being used.

5. Click **Create**
6. A window will appear to confirm antenna height.
 - a. Input anticipated antenna height (this value can be changed later if needed)
 - b. Select the type of antenna to be used during the survey
 - i. If using only the GPS data logger, select **Internal**
 - ii. If using antenna, select **External**
 - c. Click **OK**
7. The GPS file has been created and data can be collected, but first the critical GPS settings need to be selected.

Set the critical settings for the GPS mission

1. Click **Data > Setup**

2. Click **GNSS Settings**

- a. For Trimble Geo XH units:
 - i. **Enable** the accuracy slider bar by checking the box next to the bar under Productivity Precision and move the slider bar all the way to Productivity.
 - ii. When finished, click **Done** to return to the main Setup Menu.
- b. For Trimble Geo 7X units:
 - i. GNSS Receiver Port : **com 3:GNSS serial port**
 - ii. Use Smart Settings: toggle **ON**
 - iii. NMEA Output: **OFF**
 - iv. Click **Done** to return to the main Setup Menu

3. Click the **Logging Settings** button.

- a. Click the wrench below the Accuracy Settings to change the accuracy settings.
 - i. Accuracy Value for Display/Logging: Horizontal, Post Processed
 - ii. Post-processing Base Distance: **<80 km**
 - iii. Base Data : **GPS+GLONASS** or **Multiconstellation**
 - iv. Use accuracy-based logging: **No**
 - v. Click **DONE** to return to the Logging Settings window

(Note: Below is where the additional features in the data dictionary are listed. They should already be set appropriately, as the default settings are included in the data dictionary. If a different data dictionary is used or no data dictionary is used, only the default features [point, line, and area_generic] will be listed.)

- b. Point/Vertex Auto-pause Count: **NONE**
- c. Antenna Height: If you need to change the antenna height, click the wrench next to Antenna Height and change the height (in **meters**) to the top of the antenna or if only using the GPS data logger, the height the data logger is held or mounted.
- d. Allow Position Update: **Confirm**
- e. Confirm End Feature: **Yes**
- f. Filename Prefix: **Default is 'R'** for Rover. Change this if there are multiple GPS units – type a unique prefix for each one.
- g. Between Feature Logging
 - i. Style: **Time**
 - ii. Interval: **Off**

- h. High-tide swash
 - i. Style: **Distance**
 - ii. Interval: **5 m**
 - i. Discontinuity
 - i. Style: **Distance**
 - ii. Interval: **5 m**
 - j. Benchmark
 - i. Style: **Time**
 - ii. Interval: **1 s**
 - k. Point_Generic
 - i. Style: **Time**
 - ii. Interval: **1 s**
 - l. Line_Generic
 - i. Style: **Distance**
 - ii. Interval: **5 m**
 - m. Area_Generic
 - i. Style: **Time**
 - ii. Interval: **1 s**
 - n. When finished, click **Done** to return to the main Setup Menu.
4. Now click the **Real-time Settings** button. Application of real-time data correction precludes post-processing with some systems. In order to guarantee the ability to post-process the collected values, real-time data correction should always be set to **Use Uncorrected GNSS**. Make the following changes, if necessary:
- a. Choice 1: **Integrated SBAS**
 - b. Choice 2: **Use Uncorrected GNSS**
 - c. Real Time Age Limit: **25 seconds**
 - d. Click **Done** to return to the main Setup Menu.
5. Click the **Coordinate System** button. Set the coordinate system to match the background file exported from ArcMap. Below is an example of parameters:
- a. System: **UTM**
 - b. Zone: **17 or 18 North**
 - i. CANA, FOMA, TIMU, CUIS are UTM 17 North
 - ii. CAHA and CALO are UTM 18 North

- c. Datum: **NAD 1983 (Conus) CORS96**
- d. Altitude Reference: **Height Above Ellipsoid (HAE)**
- e. Altitude Units: **Meters**
- f. Display USNG: **OFF**
- g. Coordinate Units: **Meters**
- h. Coordinate Order: **North/East**
- i. When finished, click **Done** to return to the main Setup Menu.

Incorporating Benchmarks into the Survey

All GPS positions are independent data points, and collecting reference locations (benchmarks) at a variety of locations and times can help to verify the continued precision of the GPS measurements of the shoreline position. Benchmarks can serve as high quality reference points and can be collected when available as a check for accuracy both during and following the survey. Benchmarks can be collected before or after the survey is completed or during surveying. When collecting benchmarks, follow the steps below.

Collecting Benchmarks Before or After Survey:

1. Position the GPS data logger over the benchmark.
2. In the Collect Features screen, click **Benchmark**.
3. Note the following information on the field data form:
 - a. The GPS benchmark ID number.
 - b. The unique benchmark identifier stamped on the benchmark, if applicable.
 - c. The condition of the benchmark, especially if the condition is degraded or questionable.
 - d. Notes regarding orientation of temporary benchmarks (e.g. point collected on SE corner of access ramp).
4. Click **Log**. Allow the GPS unit to log at least 10 points.
5. Click **Done**.
6. Confirm closing and storing feature by clicking **OK**.

Collecting Benchmarks During Shoreline Surveying:

When recording a line or area feature, it is possible to come across another feature that needs to be recorded. The feature may be adjacent to the line/area feature, or it may be some distance away. Simply end the high-tide swash or discontinuity feature, collect the benchmark feature, and then use the **Continue** option to resume collecting the path feature.

1. If a high-tide swash or discontinuity feature is being collected, click **Done**.
2. Confirm ending the discontinuity or high-tide swash by clicking **OK**.
3. Note time, point count, ID, and additional information in the field data form.
4. Mark in the sand the position the feature ended.
5. Walk or drive to the benchmark.
6. Position the GPS data logger or antenna over the benchmark.
7. In the collect features screen, click **Benchmark**.
8. Note the following information on the field data form:
 - a. The GPS benchmark ID number.
 - b. The unique benchmark identifier stamped on the benchmark, if applicable.
 - c. The condition of the benchmark, especially if the condition is degraded or questionable.
 - d. Notes regarding orientation of temporary benchmarks, e.g. point collected on the southeast corner of access ramp.
9. Click **Log**. Allow the GPS unit to log at least 10 points.
10. Click **Done**.
11. Confirm closing and storing feature by clicking **OK**.
12. Walk or drive back to where the previous high-tide swash or discontinuity survey ended.
13. Position the GPS or antenna slightly in front of where the high-tide swash or discontinuity feature ended.
14. In the collect features screen, click **Collect > Update Features**.
15. Select the high-tide swash or discontinuity feature previously ended (Note: The features are listed sequentially in the order they are collected). Click **Begin**.
16. Note time, point count, and any additional information in the field data form. Click **Log**.
17. Toggle on **Continue feature (Append)**. Click **OK**.
18. Continue surveying.
19. When finished surveying, click **Done**.

Beginning the Survey

The survey can be conducted using an antenna attached to a GPS data logger or solely using a GPS data logger. If using an antenna, mount the GPS antenna on the UTV. Place the antenna on the higher side of the beach face between the observer's position and a front tire to make it easier for the operator to accurately drive the shoreline. Regardless of the placement of the antenna on the vehicle, the GPS always records the position of the antenna. Once the antenna is directly over the shoreline, collection can begin.

If not using an antenna, mount the GPS data logger in a cradle and attach the cradle to the pole bracket. The pole bracket should be mounted to the UTV in a position that is clear of overhead interference, but visible to the data collector. Position the vehicle at the starting point for the shoreline collection where the GPS will track the shoreline position. Start collecting data.

Notes should be as detailed as possible and must include point numbers (if applicable) and detailed descriptions. These notes are crucial in the QA/QC procedure and are the only documentation for decisions made in the field. Do not use abbreviations when taking notes.

To begin data collection, follow the steps below.

1. Position the antenna or GPS over the beginning of the shoreline.
2. Turn on the GPS data logger.
3. Click **Start > TerraSync**.
4. Click **Status > Data**.
5. Click **New > Existing File**.
6. Select file previously created from list. Click **Open**.
7. Confirm antenna height window appears.
 - a. Change (if necessary) antenna height.
 - b. Change (if necessary) antenna type.
 - c. Click **OK**.
8. If the satellite icon and number is not at the top of the display (Figure 4), click **Data > Setup**.
 - a. Click the **GNSS** button on the top right part of the display.
9. Click **Setup > Data**.
10. Click **Update > Collect Features**.
11. If the GPS data logger is already on and you have just made your GPS file, Click **Data**.
12. Click **Options > Log Later**.

Collecting High-Tide Swash Line Data:

1. Click **high-tide swash**.
2. Fill in or select any additional information in the data logger supplied by the data dictionary.

3. Note point count, time on GPS unit, feature ID, and any additional information in the FDF.
4. Click **Log** to start collecting the line feature.
5. Ensure that the positions are being collected by observing the point count increasing and/or hearing the audible clicks (depending on one's unit/settings, Figure 5).

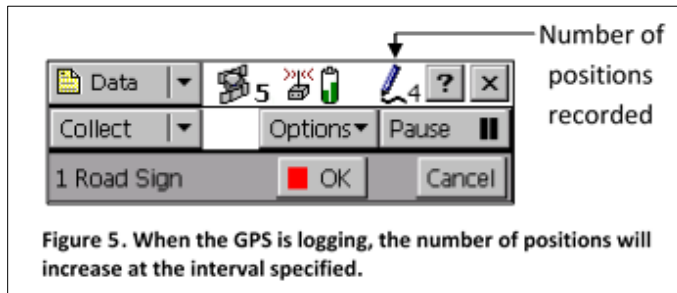


Figure 5. When the GPS is logging, the number of positions will increase at the interval specified.

6. Once logging is verified, proceed to drive the shoreline, maintaining the position of the antenna or GPS over the high-tide swash line.
7. When the survey is complete, click **Done**.
8. Confirm the feature by clicking **OK**.

Tracking the Shoreline

The natural shape of the shoreline may be linear, or it may be cusped (scalloped; Figure 6), or there may be broad sweeping curvilinear forms in the beach. These configurations may be indicative of a change in processes and are important to the shoreline data collection. Make every effort possible to maintain antenna position over the high-tide swash line while following these features.



Figure 6. Example of a cusped shoreline where the high-tide swash line tracks the shape of the cusps. Cusp dimensions are approximately 10–15 meters (33–49 feet) along the shore and the swash line should be followed as part of the shoreline survey.

If the features are very small (on the order of a few meters), driving the line will naturally average these features because it would be impractical to position the GPS unit to follow every nuance of the line (Figure 7). The dashed line in Figure 7 shows the path that should be taken in surveying the very irregular swash line on a nearly linear beach face. These small-dimensioned irregularities are related to the micro-topography of the beach and are therefore representative of short-term conditions, rather than long-term (seasonal and longer) trends. Large dimension cusps, on the order of 50 meters (164 feet [ft]) or greater, may be indicative of sediment budget processes that are representative of trends of seasonal and annual time scales, and therefore their location should be recorded. Cusps greater than 10 meters (33 ft) along shore should be followed wherever possible.



Figure 7. The high-tide swash line (red dashed line) has small irregularities that will be smoothened, recording the average position of the line (Figure from Psuty et al. 2010).

Verification of the Survey

Every 15–20 minutes, visually verify that points are still being collected, and visually note the location. Verification of the data logger’s functionality reduces the potential loss of data. If points are no longer being collected, rectify the problem and return to the previous verification point to resume shoreline collection. These brief stops provide an opportunity to survey supplemental benchmarks if they are available and nearby. Anytime logging is stopped and restarted, a note should be made on the field data form.

During any stop:

1. Confirm points are still being collected.
 - a. If points are being collected, continue survey.
 - b. If points are not being collected, rectify the problem, return to the last known verified point location, and resume shoreline survey.
 2. (Optional) If a benchmark is nearby and convenient, record the position of the benchmark as a point feature.
 3. (Optional) End and store the line feature, and start a new line feature in the same GPS file.
- Any time the survey is stopped there is an opportunity to store the feature to help prevent loss of data.

Photographs

Photographs are taken at the beginning and end of the survey. Additionally, photographs are taken at sites along the survey that have an identifiable geographical reference, such as a prominent natural or cultural feature. Similar views will allow for visual comparison between surveys. Take a photograph in areas of special concern or anytime some irregularity occurs on the beach, such as the presence of scarps. Also, the photo should include the neap-tide, high-tide swash line that is being followed. Record the time, picture number, and description of the theme of the picture on the FDF.

Component 3: Interruption Procedure

Interruptions to the Shoreline Survey

During the survey, a variety of landforms and obstacles may be encountered. Natural landforms such as scarps or cliffs may either temporarily impede the collection of the line, cause a break in the line (where the line has to be paused and restarted after the obstacle is passed), or cause a different collection method to be used (such as walking the shoreline). The shoreline may also be physically interrupted by artificial structures (e.g., groins, jetties, seawalls). Additionally, human obstacles (e.g., anglers, bathers) may interrupt shoreline collection. In these situations, and in the presence of unusual interruptions, the field surveyor should make a note on the field data form.

It may be difficult to survey with a vehicle in some locations because the beach may become excessively steep, it may be very narrow, or there may be restricted access. For example, the swash line may be at the base of a steep scarp, or beach visitors may make it impossible to drive the beach face. If an interruption in the shoreline occurs, follow the steps below:

1. During surveying, click **Pause**.
2. Remove the GPS unit from the vehicle.
3. Position yourself on the swash line location shortly in front of where you paused the data logger. Click **Log**.
4. Walk the shoreline (Figure 8), recording the swash line location until the shoreline can be reoccupied using a vehicle. Click **Pause**.
5. Reposition the GPS on UTV shortly in front of position where data logger was paused. Click **Log**.
6. Continue surveying.



Figure 8. Conducting the survey and holding the GPS receiver. The operator walks along the wet/dry line on the beach face to capture the position of the neap high-tide swash line.

Discontinuities

Other interruptions in the shoreline may occur, such as hard structures, visitors, wildlife, hazard, or something else encountered while surveying. Physical obstacles may impede the collection of a continuous shoreline. Below is a brief description of each discontinuity and how to map them.

Hard Structures: Hardened structures consist of features such as jetties, groins, and other manufactured structures located on the beachfront (Figure 9).



Figure 9. This aerial view of GATE-SHU demonstrates how an interruption source offsets the shoreline. Source: NPS-GATE (Figure from Psuty et al. 2010).

Visitors: Visitors can consist of sunbathers, anglers, and other people in the park. Anglers tend to congregate near the high-tide swash line. Their fishing lines and equipment can create a hazard to a surveyor in a UTV or other vehicle. Also, GPS equipment can cut or break fishing lines.

Wildlife: The high-tide swash line can cross or overlap areas occupied by wildlife that are not to be disturbed, such as sea turtle nests, or other sensitive species. Therefore, the surveyor cannot map these areas and must walk or drive around them.

Hazard: A hazard can be anything that does not allow the high tide line to be surveyed, such as a deep drainage ditch that is impassable on foot or UTV.

Mapping discontinuities:

When the surveyor encounters a discontinuity, follow steps below:

1. Assuming you are collecting a high-tide swash line, click **Pause**.
2. Click **Done** to end and save the high-tide swash line.
3. Note time, point count, and additional information in the FDF.
4. From the Collect Features screen, click **Discontinuity**.
5. Note time, discontinuity type, ID number, and additional information in the FDF.
6. Select the type of discontinuity type from the drop down list or type in a description of the discontinuity in the comments section of the data logger.

7. To start mapping the discontinuity, click **Log**.
8. When finished mapping discontinuity, click **Done**.
9. Confirm ending the discontinuity by clicking **OK**.
10. Note time, point count, and additional information in the FDF.
11. Position the GPS or antenna on the high-tide swash line.
12. Create a new high-tide swash feature and continue surveying.

Component 4: Completion of the Survey

After the spatial extent of the shoreline survey is completed, follow the steps below.

1. Before completing the survey, take any additional benchmark points remaining.
2. With the 'Data' page active on the Trimble Geo unit, click **Close** to end surveying.
3. Note time, point count, and additional information in the FDF.
4. Write 'End Survey' on the FDF to denote the survey collection has been completed.
5. Click **Data > Exit**.
6. Confirm you want to close the program by clicking **OK**.
7. Turn off data logger.

Upon return to the office, download the data and make a backup copy. If the data are not downloaded immediately, there is a chance they could be lost due to an equipment malfunction.

Literature Cited

- Baron, L. C. 2018. Survey timing and GPS mission planning for coastal shoreline monitoring—Version 1.0. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—1.3.21. Southeast Coast Network, Athens, Georgia. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2253885> (last accessed July 2018).
- Psuty, N. P., M. Duffy, J. F. Pace, D. E. Skidds, and T. M. Silveira. 2010. Northeast Coastal and Barrier Network geomorphological monitoring protocol: part I—ocean shoreline position. Natural Resource Report NPS/NCBN/NRR—2010/185. National Park Service. Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/664308> (last accessed July 2018).
- Trimble. 2012. User Guide GeoExplorer 3000 Series Version 1.00 Revision B. Available at: http://trl.trimble.com/docushare/dsweb/Get/Document-528617/GeoExpl3000_UserGde_RevB_ENG.pdf (last accessed July 2018).

Appendix A: Field Data Form

EVENT INFORMATION					
Filename: _____		Protocol/SOP 1.3.22 Version: _____			
Survey Date: _____		Data Dictionary: _____			
Start Time: _____		Time of Last High Tide: _____			
End Time: _____		GPS DEVICE			
Observer 1: _____		Make (e.g. Garmin, Trimble): _____			
Observer 2: _____		Model (e.g. GeoXH, ProXr): _____			
Within Sampling Window?	Yes	No	DATA DOWNLOAD		
Storm Tide?	Yes	No	Pathfinder Office version: _____		
(Storm tide = actual tide > 1 ft above predicted)			Date: _____	Person: _____	
SITE NOTES (General information about accessing the site, obstacles, etc.)					

Page ____ of ____

Figure A-1. Example field data form, page 1 of 2.

SURVEY NOTES (List Benchmarks collected, any equipment problems, obstacles encountered, etc.)			
POINT COUNT	TIME (from GPS unit)	ID	NOTES

Page __ of __

Figure A-2. Example field data form, page 2 of 2.

Field Data Form Descriptions

1. Filename—YYMMDDHHPARK.
 - a. YYYY—year the survey was conducted.
 - b. MM—month the survey was conducted.
 - c. DD—day the survey was conducted.
 - d. HH—the hour the survey started. Necessary to distinguish between mapping events performed on the same day at a park.
 - e. PARK—four letter park unit code where survey was conducted.
 - f. Example—2014070511CAHA.
2. Survey Date (YYYYMMDD)—Write the date in the format shown. Examples are 20050505 and 20051231.
3. Start Time—military time.
4. End Time—military time.
5. Observer 1—Write the surveyor's full name (First Middle Last).
6. Observer 2—Write the surveyor's full name (First Middle Last).
7. Within Sampling Window—Choose one (Yes or No). Yes, if the high-tide swash line is within the sampling window. No, if the high-tide swash line surveyed is not within the sampling window.
8. Storm tide—Choose one (Yes or No). Yes, if a storm tide has occurred within 1 week of the high-tide swash line being mapped. No, if there has not been a storm tide within one week of the high-tide swash line being mapped. A storm tide is defined as when the actual tide is greater than one foot above the predicted tide.
9. Protocol/SOP 1.3.22 Version—Version of the protocol or SOP used to guide field data collection. Example: SOP 1.1.3—version 1.0.
10. Data Dictionary—the name and version of the data dictionary used.
11. Time of Last High Tide—military time.
12. Make—make of the GPS equipment used to collect data, e.g., Garmin, Trimble.
13. Model—model of GPS equipment used to collect data, e.g., GeoXH, ProXr.
14. Datum and Coordinate System—use the NAD 1983 (Conus) CORS96 UTM 17 or 18 North (depending on where you are located, see page 10).

15. Pathfinder Office version – the version number of the Pathfinder Office software used to download the GPS file.

16. Site notes—general information about accessing the site, obstacles encountered while accessing the site, issues that need to be considered during future data collection.

17. Survey notes

- a. Point count—the point count number indicated on the GPS unit when the note is taken.
- b. Time (from GPS) —the time indicated on the GPS unit when the note is taken.
- c. ID—the identification number generated by the GPS unit to signify that it is unique to the feature. This is automatically generated when using the data dictionary.
- d. Notes—information regarding feature start and end collection, benchmark point numbers, etc.