

Standard Operating Procedure 2.3.11

Please cite this as:

Summary

Revision Log

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Required Equipment/Data List

1. Desktop or laptop computer running ArcGIS 10.x
 - a. Spatial analysis extension
 - b. DSAS toolbar
2. Shoreline survey data collected and post processed according to SOP 1.3.22 *Conducting the GPS Shoreline Survey—Version 1.0* (Baron 2018a) and 2.3.10 *Post Survey GPS Data Processing—Version 1.0* (Baron 2018b).

Procedure

The purpose of this SOP is to ensure that the same data sets and techniques are used to monitor SECN shoreline change along the coastal parks, allowing comparisons to be made within and between parks over time. The high-tide neap-tide swash line will be mapped according to SOP 1.3.22 (Baron 2018a). Once the data are collected, SOP 2.3.10 (Baron 2018b) is used to post-process and prepare the data for analysis. The following steps should be followed to analyze the shoreline data to determine the extent of shoreline change. Annual and seasonal (if collected) shoreline change will be analyzed. Annual change will be monitored from year-to-year, and will address season variability when both spring and fall shorelines are collected. The shoreline change analysis will be performed using the United States Geological Survey (USGS) digital shoreline analysis system (DSAS; Thieler et al. 2009), that runs within ArcGIS. An ArcGIS personal geodatabase is used to store the data and is required to run the DSAS routine.

Initialization Steps

To perform the analysis for shoreline change at each park, multiple components need to be created initially, they include a personal geodatabase, trendline, baseline, and transects. These files will be used in all future analyses. Below is information pertaining to each component.

Personal Geodatabase

A personal geodatabase is used to house the trendline, baseline, shorelines, and transect feature classes in addition to the tables created during the DSAS analysis. Create a personal geodatabase in ArcCatalog named 'PARK_ShorelineChange,' where PARK is the four-letter park code.

Trendline

The information in this section describes how to create a trendline feature class that will be used to adjust the transects in the shoreline change analysis. The trendline represents the general trend of the shoreline and is created by drawing a smoothed line along the length of the beach (Figure 1). Follow these steps to create the trendline feature class:

1. Open ArcCatalog

2. Select the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
3. Right-click the PARK_ShorelineChange personal geodatabase
4. Select New
5. Select Feature Class
6. Name the new feature class 'PARK_Trendline', where PARK is the four-letter park code.
7. Using the ArcGIS editing tools, edit the trendline feature class, creating a line that represents the general trend of the shoreline.
8. Save edits
9. Stop editing
10. Smooth the 'PARK_Trendline' using the ArcGIS Smooth Line tool, if need be.

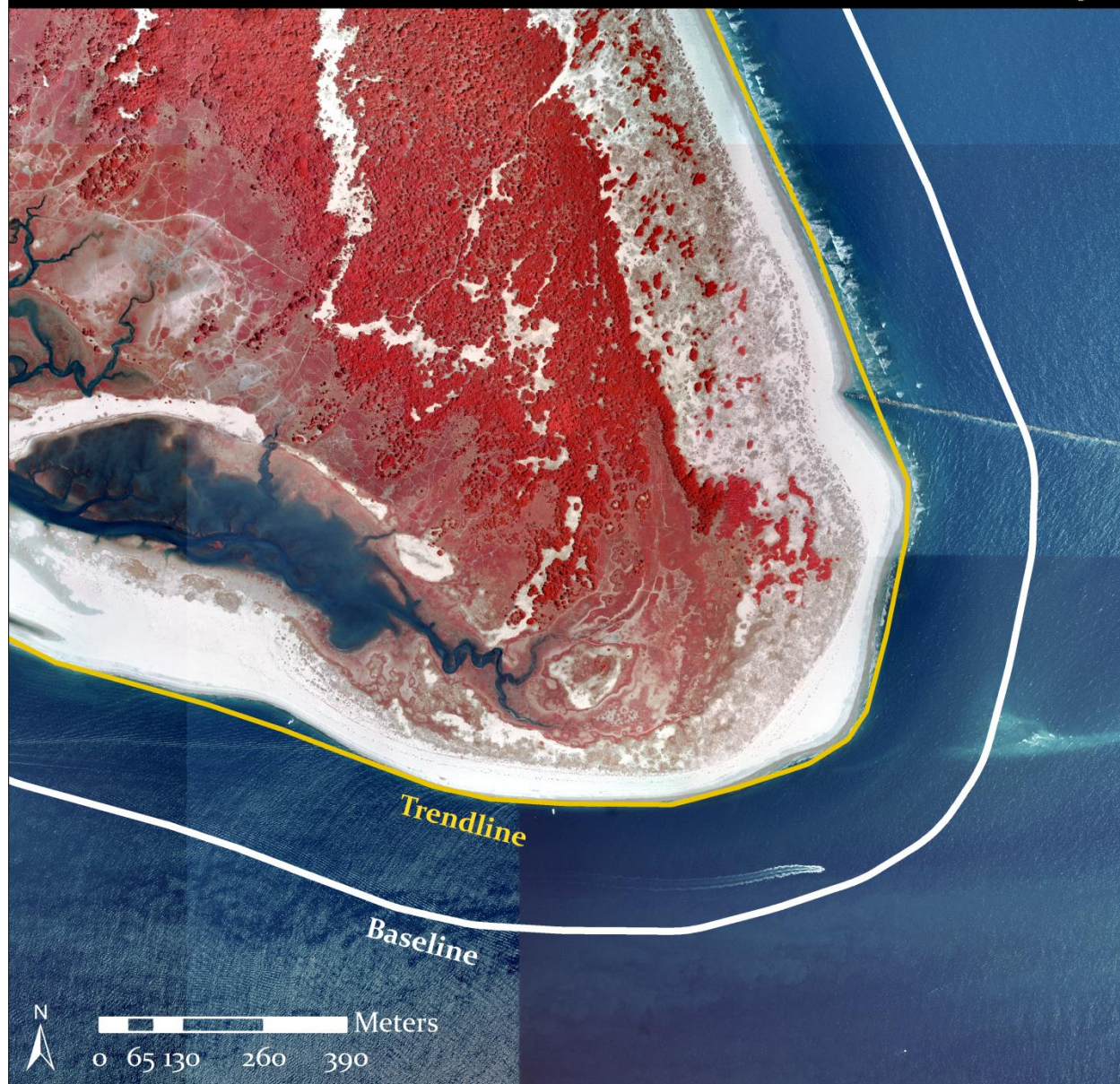


Figure 1. Map displaying the trendline (yellow) and baseline (white) used in the shoreline analysis.

Baseline

The information in this section describes how to create a baseline that will be used in the DSAS shoreline change analysis. The trendline created in the ‘Create Trendline’ section above is used to generate the offshore baseline (Figure 1). The baseline is created by generating a 200-meter (656 feet [ft]) buffer seaward of the trendline using the buffer tool in ArcMap. The baseline is the line from which transects are generated in DSAS. During analysis, the transects intersect the shorelines and are used to calculate change distance. The baseline is created once for each park. If there is a catastrophic

change and the trendline no longer represents the general trend of the shoreline, then the baseline will need to be updated using an updated trendline. The baseline is created and stored in the ‘PARK_ShorelineChange’ personal geodatabase (see Psuty et al. [2010] Appendix A, Database User’s Guide), where PARK is the four-letter park code. The name of the baseline is ‘PARK_Baseline,’ where PARK is the four-letter park code. The general instructions to create a baseline are listed below:

1. Open ArcCatalog.
2. Select the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
3. Right-click the PARK_ShorelineChange personal geodatabase.
4. Select **New**.
5. Select **Feature Class**.
6. Name the new feature class ‘PARK_Baseline’, where PARK is the four-letter park code, with the following fields (Table 1). Refer to the DSAS Manual for additional information regarding Baseline fields (Himmelstoss 2009).

Table 1. List of fields and field information for the baseline feature class. Refer to the DSAS manual for additional information about the field requirements (Himmelstoss 2009).

Field Name	Data Type and Additonal Information
OBJECTID	Object ID, auto-generated
SHAPE	Geometry, auto-generated in geodatabase
SHAPE_Length	Double, auto-generated in geodatabase
ID	Long integer, user-created

7. Create a 200-meter (656 ft) buffer seaward of the PARK_Trendline using the ArcGIS buffer tool.
8. Convert the buffer polygon to line using the ArcGIS polygon to line tool.
9. Edit the new buffer polyline shapefile in ArcGIS by clipping and deleting the lines that are not a seaward representation of the PARK_Trendline.
10. Copy and paste the line seaward of the trendline into the PARK_Baseline feature class.
11. Update PARK_Baseline feature class ‘ID’ field with a number greater than or equal to 1.
12. Save edits.

13. Stop editing.

Transects

Transects are created in DSAS using the PARK_Baseline feature class (where PARK is the four-letter park code), previously generated. The steps below list how to create transects in DSAS and edit the transects using ArcGIS editing tools. The following steps describe how to set the default parameters, create transects, and adjust the transects.

Set Default Parameters

This section describes how to set the default parameters to perform the DSAS shoreline change analysis.

1. Open ArcMAP
2. Add the DSAS toolbar, if not already added
3. Click **set default parameters** on the DSAS toolbar.
4. The 'Set Default Parameters' window will appear (Figure 2). On the **Cast Transect Settings** tab (Figure 2) select the following:

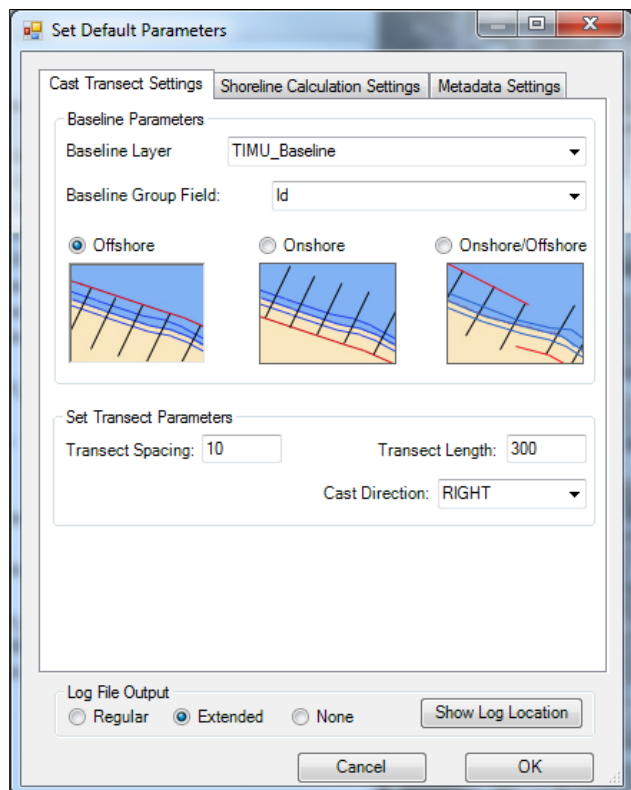


Figure 2. Screen capture of the 'Set Default Parameters' window displaying the **Cast Transect Settings** tab.

- a. Baseline Layer: PARK_Baseline

- b. Baseline Group Field: Id
- c. Toggle **on** Offshore
- d. Set Transect Parameters
 - i. Transect Spacing: Transects will be spaced at a distance of 10 meters (32.8 ft).
 - ii. Transect Length: This value will depend on the distance (in meters) of the baseline to the farthest shoreline. This value needs to exceed the distance from the baseline to the farthest shoreline for future shoreline movement and analyses. Use the measure tool to determine the needed distance.
 - iii. Cast Direction: The direction the transects will be cast (this is based on the direction that the baseline was drawn). If the baseline is offshore and was drawn from the north to south, as directed in SOP 2.3.10 (Baron 2018b), then select **Right**.

5. Click the **Shoreline Calculation Settings** tab (Figure 3) and select the following:

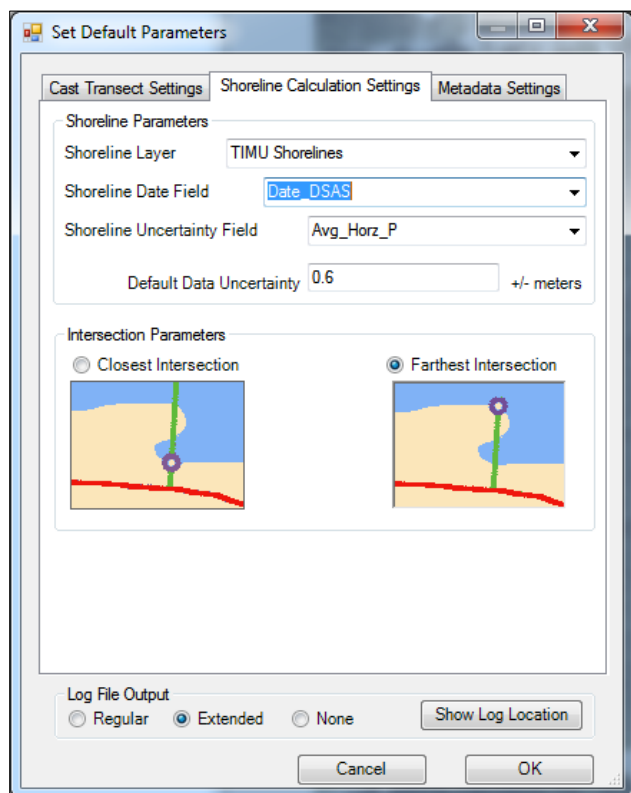


Figure 3. Screen capture of the 'Set Default Parameters' window displaying the **Shoreline Calculation Settings** tab.

- a. Shoreline Layer: PARK_Shoreline

- b. Shoreline Date Field: DATE_
 - c. Shoreline Uncertainty Field : UNCERTAINTY
 - d. Default Data Uncertainty: 5
 - e. Intersection Parameters: Toggle **on** Farthest Intersection
6. Click the **metadata settings** tab (Figure 4) and select the following:

The screenshot shows a window titled 'Set Default Parameters' with three tabs: 'Cast Transect Settings', 'Shoreline Calculation Settings', and 'Metadata Settings'. The 'Metadata Settings' tab is active. It contains three main sections: 'General Information', 'Data Update and Access Information', and 'Contact Information'. The 'General Information' section has fields for 'Originator' (Lisa Cowart Baron), 'Abstract' (This shoreline change analysis was conducted using shoreline), and 'Purpose' (The purposed of this anlysis it to inform the park of the shoreline). The 'Data Update and Access Information' section has 'Update Frequency' set to 'Annually' and 'Progress' set to 'Complete'. The 'Contact Information' section has fields for 'Organization' (National Park Service Southeast Coast Inventory and Monitor), 'Person' (Coastal Ecologist), 'Address' (135 Phoenix Road), 'City' (Athens), 'State' (Ga), 'Zip' (30605), 'Phone' (706.425.2093), and 'Email' (ser_secn@nps.gov). At the bottom, there is a 'Log File Output' section with radio buttons for 'Regular', 'Extended' (selected), and 'None', and a 'Show Log Location' button. 'Cancel' and 'OK' buttons are at the bottom right.

Figure 4. Screen capture of the 'Set Data Parameters' window displaying the **Metadata Settings** tab.

- a. General Information
 - i. Originator: Protocol Lead
 - ii. Abstract: Shoreline change annual analysis for YYYY to YYYY (for annual change) or MMYYYY to MMYYYY (for seasonal change) at PARK. The annual (or seasonal) shoreline change analysis contains the net shoreline displacement statistic. Where YYYY is the four-digit year, MMYYYY is the two-digit month and four-digit year, PARK is the four-letter park code
 - iii. Purpose: Analyze the annual (or seasonal) shoreline change from YYYY to YYYY (or MMYYYY to MMYYYY for seasonal change) at PARK for an

annual report. Where YYYY is the four-digit year, MMYYYY is the two-digit month and four digit year, PARK is the four-letter park code

- b. Data Update and Access Information
 - i. Update Frequency: Annually
 - ii. Progress: In work
 - iii. Constraints on Access: Data will be made publicly available through the National Park Service Integrated Resource Management Applications (IRMA) when reports are published
 - c. Contact Information
 - i. Organization: Southeast Coast Inventory and Monitoring Network
 - ii. Person: protocol lead
 - iii. Address: 135 Phoenix Road
 - iv. City: Athens
 - v. State: Ga
 - vi. Phone: protocol lead's phone number
 - vii. Email: protocol lead's email
7. Log File Output: Toggle **on** Extended.
8. Click **OK**

Create Transects

Transects are created using DSAS. The default setting in the previous section are required prior to generating transects. Follow the steps below to create transects.

1. Open ArcMAP
2. Add the DSAS toolbar if not already added
3. Set the default parameters as outlined in previous section
4. Click the **Cast Transects** button on the DSAS toolbar and select the following criteria in the **cast transects** window (Figure 5):

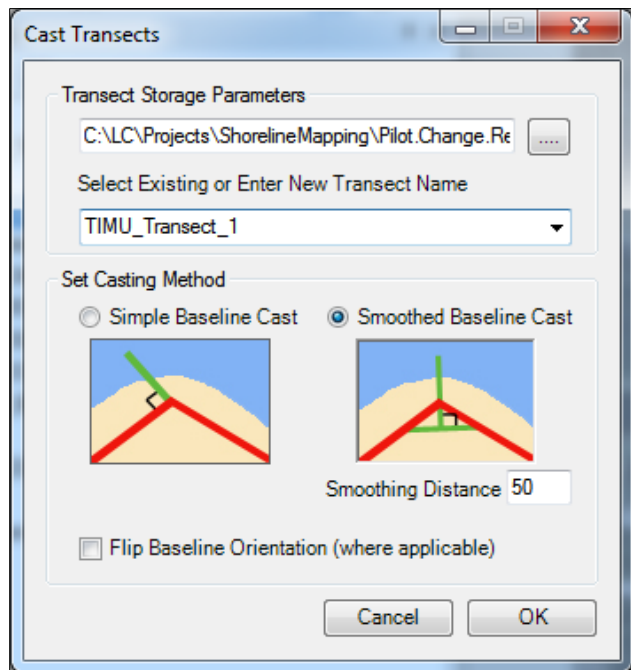


Figure 5. Screen capture of the DSAS 'Cast Transects' window.

- a. Transect Storage Parameters: Browse to the personal geodatabase location named 'PARK_ShorelineChange', where PARK is the four letter park code. This is where the transects will be saved.
- b. Select Existing or Enter New Transect Name: Type in the transect name using the format: 'PARK_Transect_X', where PARK is the four letter park code. Once the transect layer has been created, it will be used in future analyses, X is a single digit denoting the transect run. This number will start at '1' and will change only if or when the transect layer needs to be adjusted.
- c. Set Casting Method: Toggle **ON** Smoothed Baseline Cast
 - i. Smoothing distance: 50 (default)
- d. Flip Baseline Orientation: toggle **OFF**
5. Click **OK** to generate transects.
6. The transects will appear in the map view as shown in Figure 6.

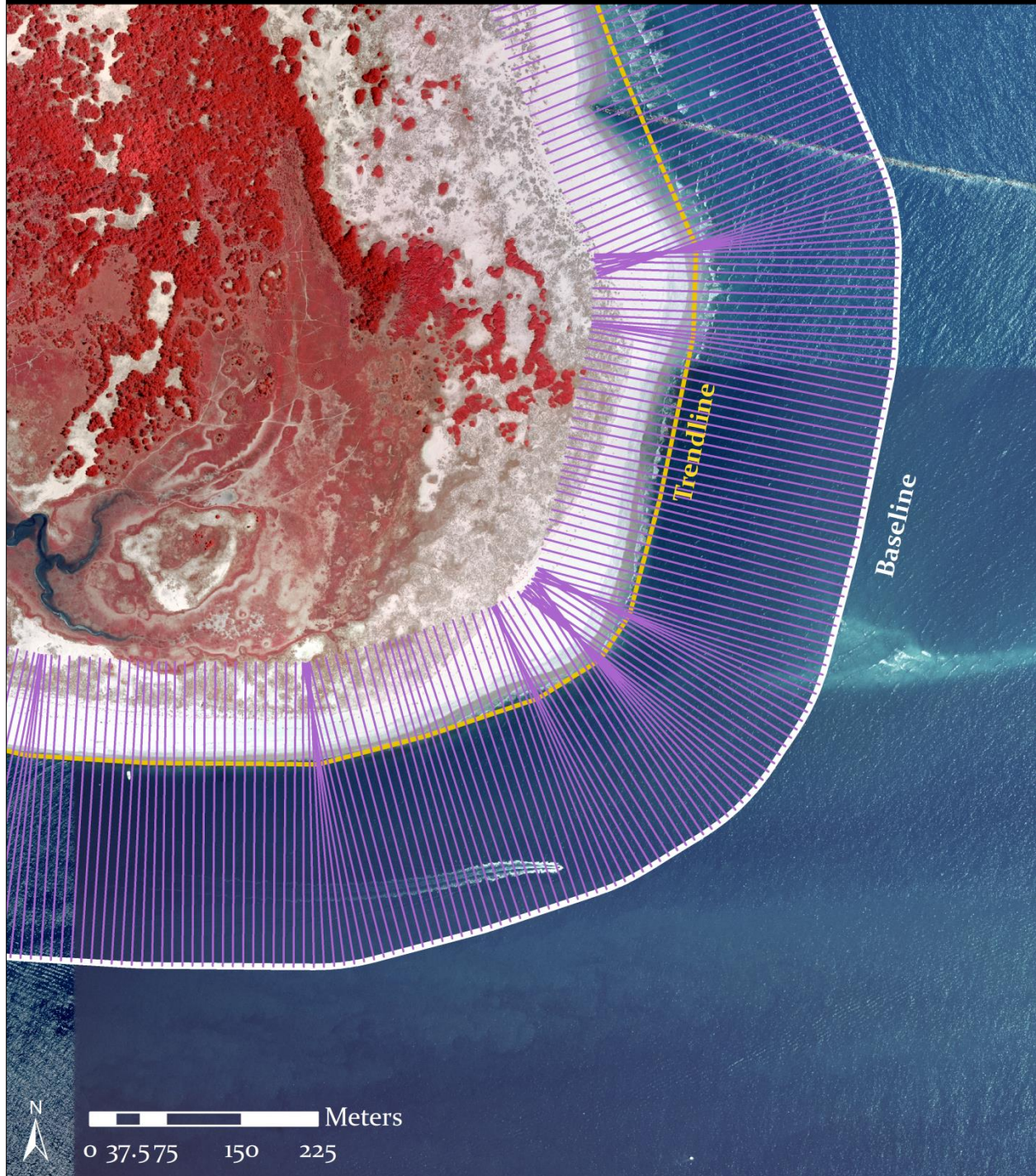


Figure 6. Map of the trendline (yellow), baseline (white), and transects (purple) created at 10-meter (32.8 feet) spacing at the baseline along a curved shoreline. Note: the transects in the map have not been adjusted.

Adjust Transects

The transects should intersect the trendline perpendicularly at approximately 10-meter (32.8 ft) spacing. On straight shorelines transects will not need adjustment; however, on curved shoreline areas, transect adjustment may need to be performed (Figure 7). Using the ArcGIS editing tools, adjust the transects so that they intersect the trendline perpendicularly at approximately a 10 meter (32.8 ft) spacing by adding, deleting, and/or moving transects.

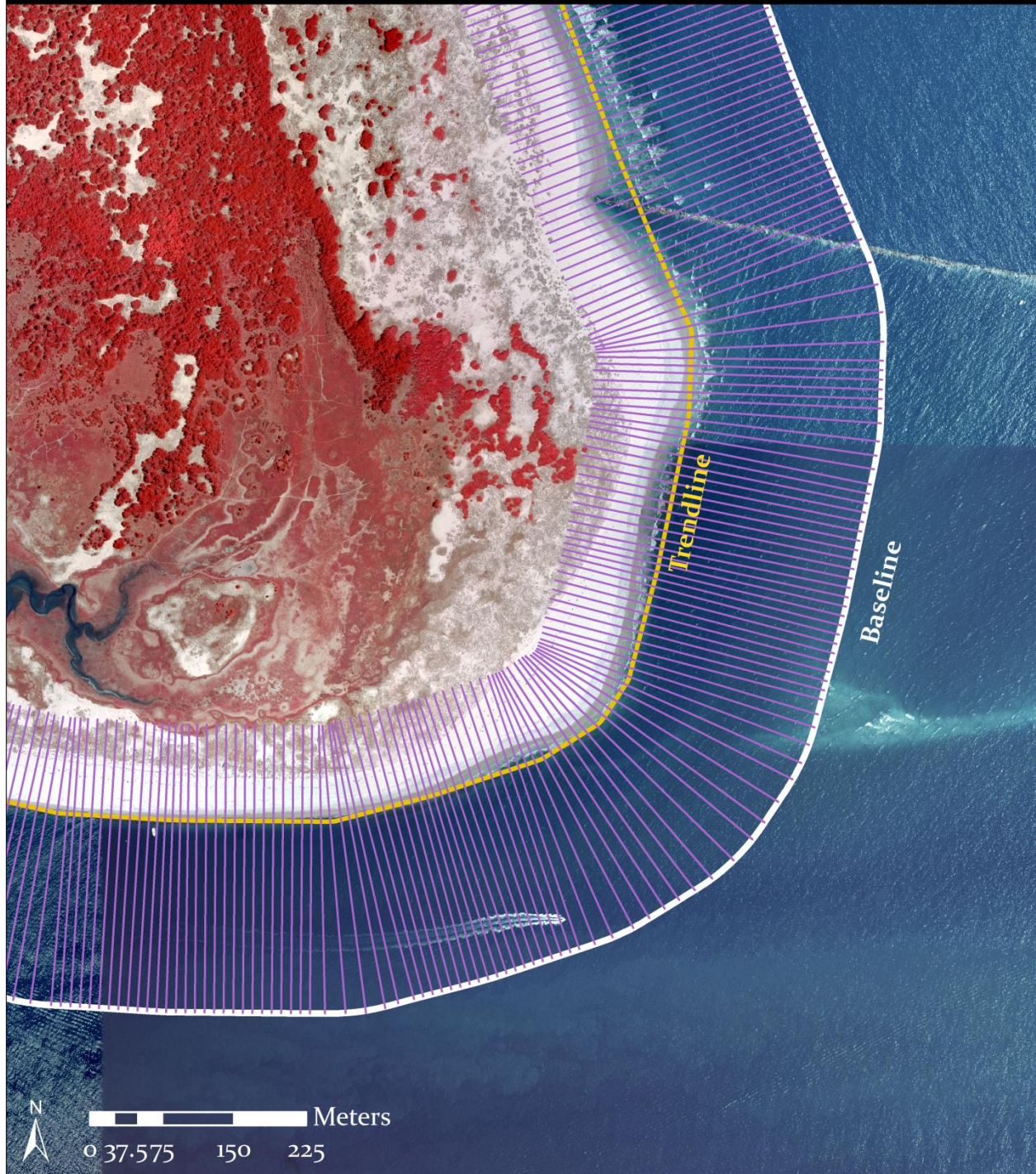


Figure 7. Map of the trendline (yellow), baseline (white), and adjusted transects (purple) created at a 10 meter (32.8 ft) spacing at the trendline along a curved shoreline.

Shoreline

The information in this section describes how to create the shoreline feature class within the personal geodatabase created previously. The shoreline feature class will be used in the DSAS shoreline change analysis and will contain the shoreline surveys that were post processed in the SOP 2.3.10 (Baron 2018b). Follow the steps below to create the shoreline feature class.

1. Open ArcCatalog
2. Select the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code
3. Right-click PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code
4. Select **New**
5. Select **Feature Class**
6. Name the new feature class 'PARK_Shoreline', where PARK is the four-letter park code, with the fields in Table 2. See the DSAS manual (Himmelstoss 2009) for more information about the shoreline field requirements.

Table 2. List of fields and field information for shoreline feature class. Refer to the DSAS manual for additional information about the field requirements (Himmelstoss 2009).

Field Name	Data Type and Additional Information
OBJECTID	Object ID, auto-generated
SHAPE	Geometry, auto-generated in geodatabase
SHAPE_Length	Double, auto-generated in geodatabase
DATE_	Text, Length = 10, user created
UNCERTAINTY	Float, Precision = 2, Scale = 2, user-created

Load Shoreline

The edited shoreline shapefile that was created in SOP 2.3.10 (Baron 2018b) will be loaded into the PARK_ShorelineChange personal geodatabase PARK_Shoreline feature class, where PARK is the four letter park code. The PARK_Shoreline feature class schema was created when the feature class was created, therefore fields not included in the schema will not be imported. Follow the steps below to load the previously prepared shoreline shapefile using SOP 2.3.10 (Baron 2018b) into the PARK_Shoreline feature class.

1. Open ArcCatalog

2. Navigate to PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
3. Expand the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
4. Select PARK_Shoreline feature class, where PARK is the four-letter park code.
5. Right-click PARK_Shoreline feature class
6. Select **Load**
7. Select **Load Data...**
8. The Simple Data Loader window will appear (Figure 8).
 - a. Input Data
 - i. Click the browse button and navigate to the shoreline shapefile prepared using SOP 2.3.10 (Baron 2018b)
 - ii. Select the shapefile
 - iii. Click **Open**

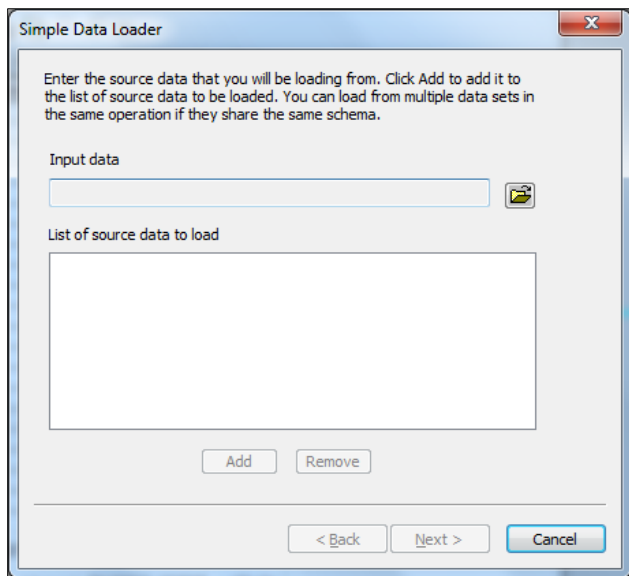


Figure 8. Screen capture of the 'Simple Data Loader' window.

9. The shapefile selected will appear in the Input Data section of the Simple Data Loader window (Figure 9).

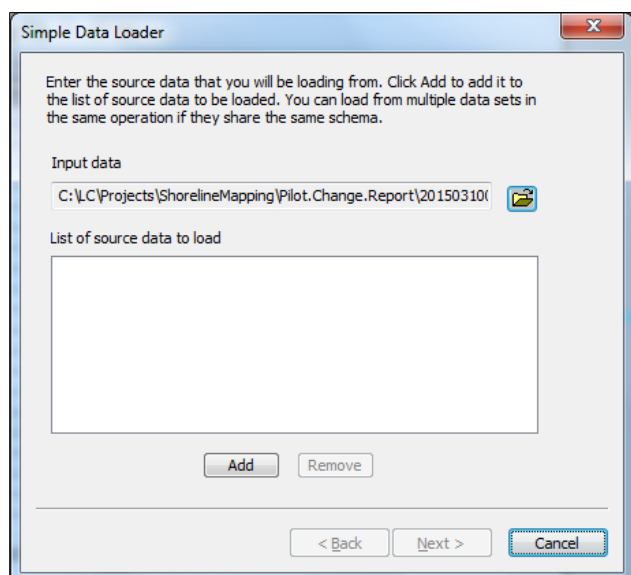


Figure 9. Screen capture of the 'Simple Data Loader' after selecting the Input Data.

10. Click **Add** and the shapefile will be listed in the List of source data to load (Figure 10).

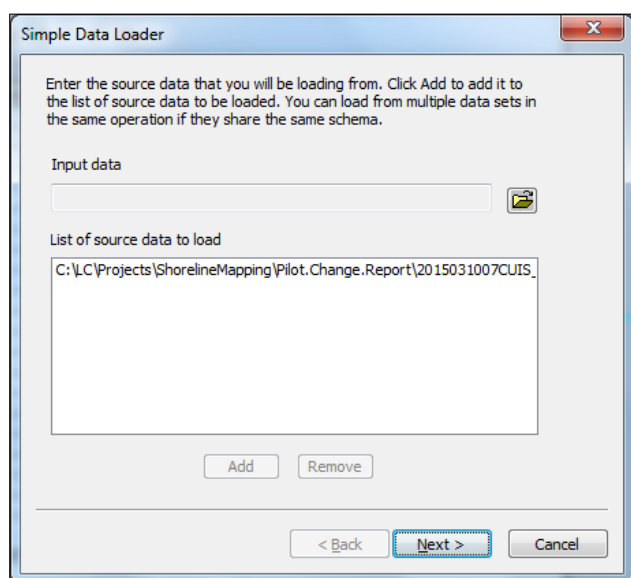


Figure 10. Screen capture of the 'Simple Data Loader' window after adding the file in the Input Data.

11. Click **Next**.

12. The 'Simple Data Loader' window will change. Toggle **on** 'I do not want to load all features into a subtype' (Figure 11).

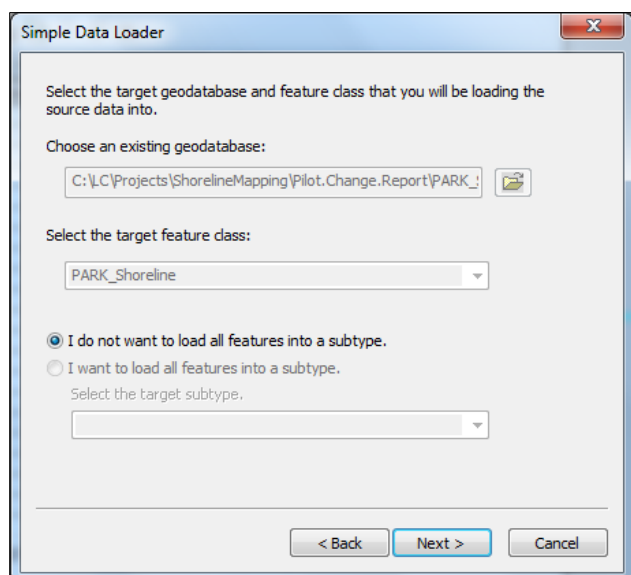


Figure 11. Screen capture of the ‘Simple Data Loader’ window with the ‘I do not want to load all features into a subtype’ toggled on.

13. Click **Next**.

14. The ‘Simple Data Loader’ window will change to display the fields of the feature class and the fields of the input shapefile (Figure 12).

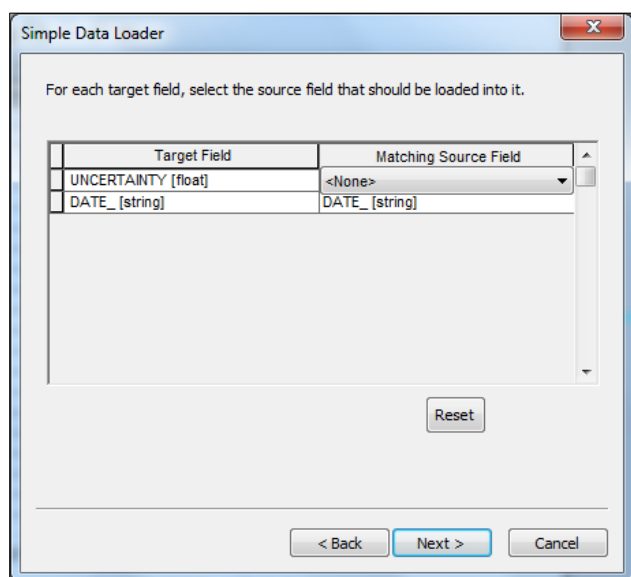


Figure 12. Screen capture of the ‘Simple Data Loader’ window displaying the fields of the target schema and the corresponding shoreline field that can be transferred.

15. Change the ‘Matching Source Field’ so that it appears as the screen capture below (Figure 13).

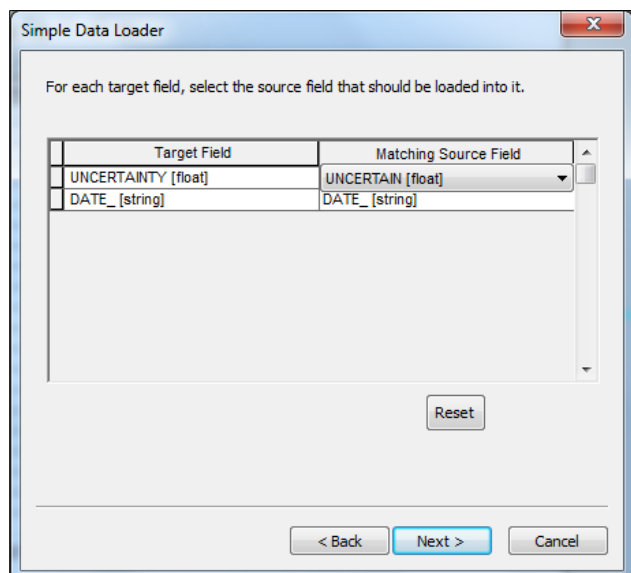


Figure 13. Screen capture of the 'Simple Data Loader' window displaying the fields of the target schema and the corresponding shoreline field that have been selected to be transferred.

16. Click **Next**.

17. The 'Simple Data Loader' will change, asking what data you want to load (Figure 14).

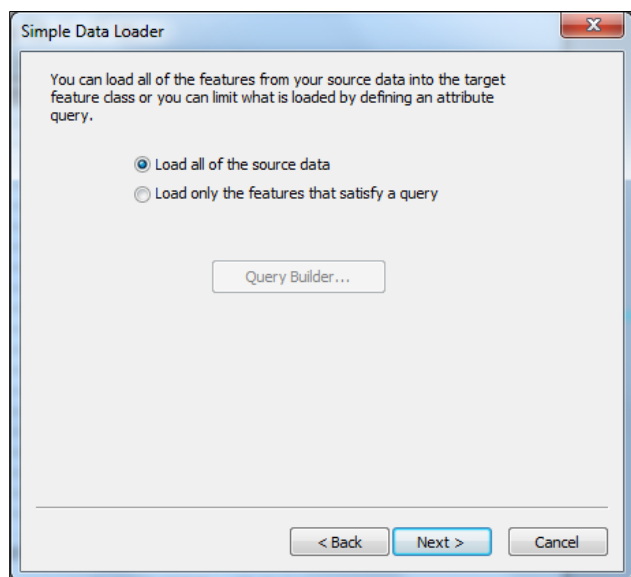


Figure 14. Screen capture of the 'Simple Data Loader' window what features should be loaded into the data source.

18. Toggle **on** 'Load all of the source data.'

19. Click **Next**.

20. A summary will be displayed in the 'Simple Data Load' window (Figure 15).

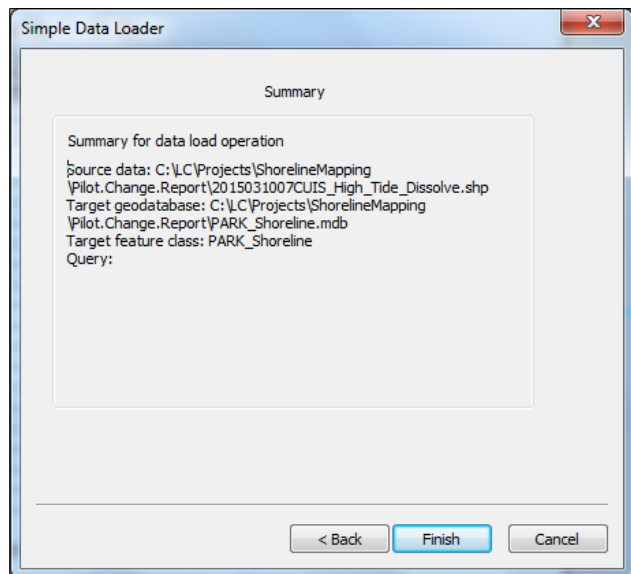


Figure 15. Screen capture of the 'Simple Data Loader' window displaying the summary information of the load operation.

21. Click **Finish**.

22. Open the attribute table of the PARK_Shoreline feature class, where PARK is the four-letter park code, to confirm that the shapefile loaded correctly.

Set Default Parameters

Before performing an analysis in DSAS, the DSAS default parameters have to be set. Step through the instruction in the previous procedure located in the Initialization Steps > Transects > Set Default Parameters. The previously selected default settings should appear; therefore, it is important to check the default settings each time before running each analysis.

Calculate Shoreline Distance

This section describes how to determine annual and seasonal (if applicable) shoreline change distance. These analyses are performed using two shorelines. Seasonal change is calculated by analyzing the spring and fall shorelines collected during the same calendar year. Annual changes are calculated using shorelines, from the same season, that were collected during consecutive years, (e.g., spring 2015 and spring 2016). Use the following steps to calculate the shoreline change distance:

1. Open ArcGIS
2. Open the PARK_Shoreline_Change.mxd, where PARK refers to the four-letter park code
3. If not already loaded, add the PARK_ShorelineChange geodatabase feature classes (PARK_Shoreline, PARK_Transect_#, and PARK_Baseline), where PARK refers to the four-letter park code
4. Add the DSAS toolbar, if not already loaded
5. Optional: Add the most recent imagery as a background
6. Open the PARK_Shoreline feature class attribute table
 - a. Select the shorelines to be analyzed (Figure 16)

OBJECTID *	Shape *	Date_	Time_	Max_PDO	GNSS_Lengt	Avg_Horz_P	Shape_Length	Date_Collected
1	Polyline	10/15/1000	03:28:38p	6.9	695.75	0.6	695.487532	10/15/1000
2	Polyline	10/7/1001	10:04:57a	6.3	788.511	0.1	697.211684	10/07/1001
3	Polyline	5/24/1001	<Null>	<Null>	<Null>	0.4	658.896428	05/24/1001

Figure 16. Screen capture of the PARK_Shorelines feature class attribute table, where PARK is the four-letter park code, with two shorelines selected.

7. In the DSAS toolbar, select the PARK_Transect_# feature class (where PARK is the four letter park code and # is the run number) previously created and adjusted in the DSAS Transect Layer pull-down menu (Figure 17).

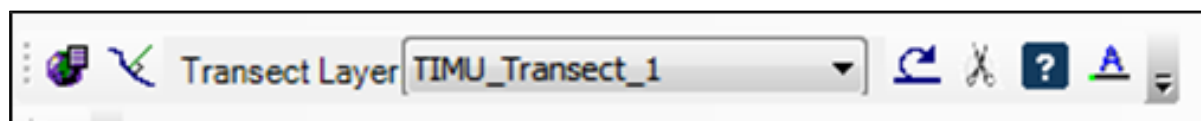


Figure 17. Screen capture of the DSAS tool bar displaying the PARK_Transect_# feature class (where PARK is the four letter park code and # is the run number) previously created.

8. Click the **Calculate Statistics** button on the DSAS toolbar (Figure 18).

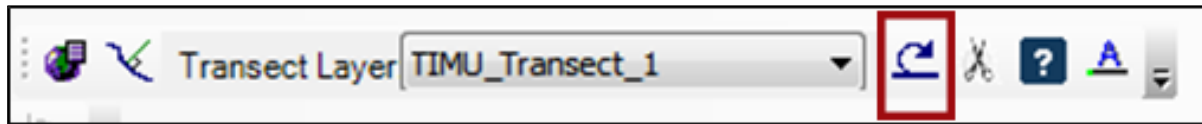


Figure 18. Screen capture of the DSAS tool bar with a red rectangle on the **Calculate Statistics** button.

- a. The 'Calculate Change Statistics' window will appear (Figure 19). For an in-depth description of the various change analysis options, refer to the DSAS manual (Himmelstoss 2009).

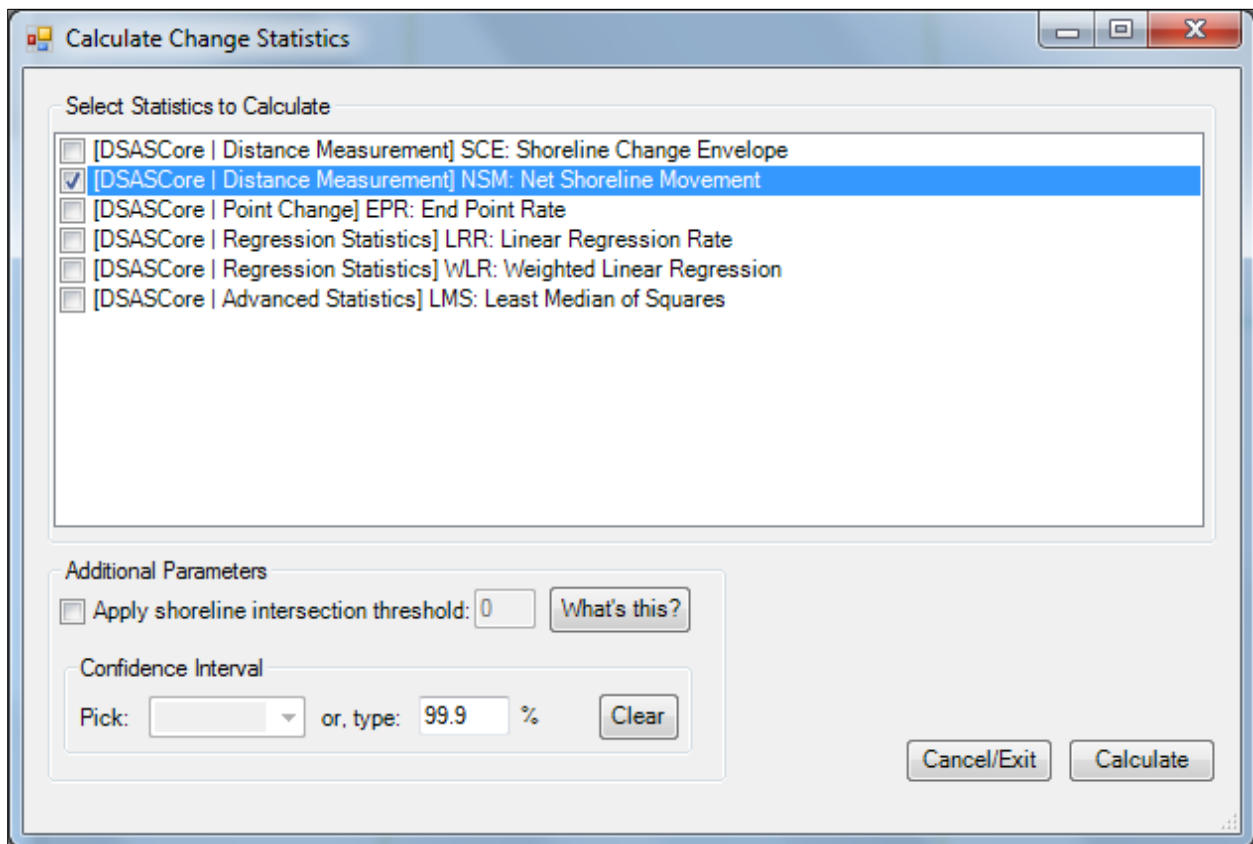


Figure 19. Screen capture of the DSAS 'Calculate Change Statistics' window.

- i. Select NSM: Net Shoreline Movement.
- ii. Toggle **off** Apply shoreline intersection threshold:
- iii. Confidence Interval: use default '99.9%.'
- iv. Click **Calculate**.

- b. Once the calculations have been run, the 'Calculate Change Statistics' window will be updated with ... Net Shoreline Movement (Run Complete, results received.)' (Figure 20).

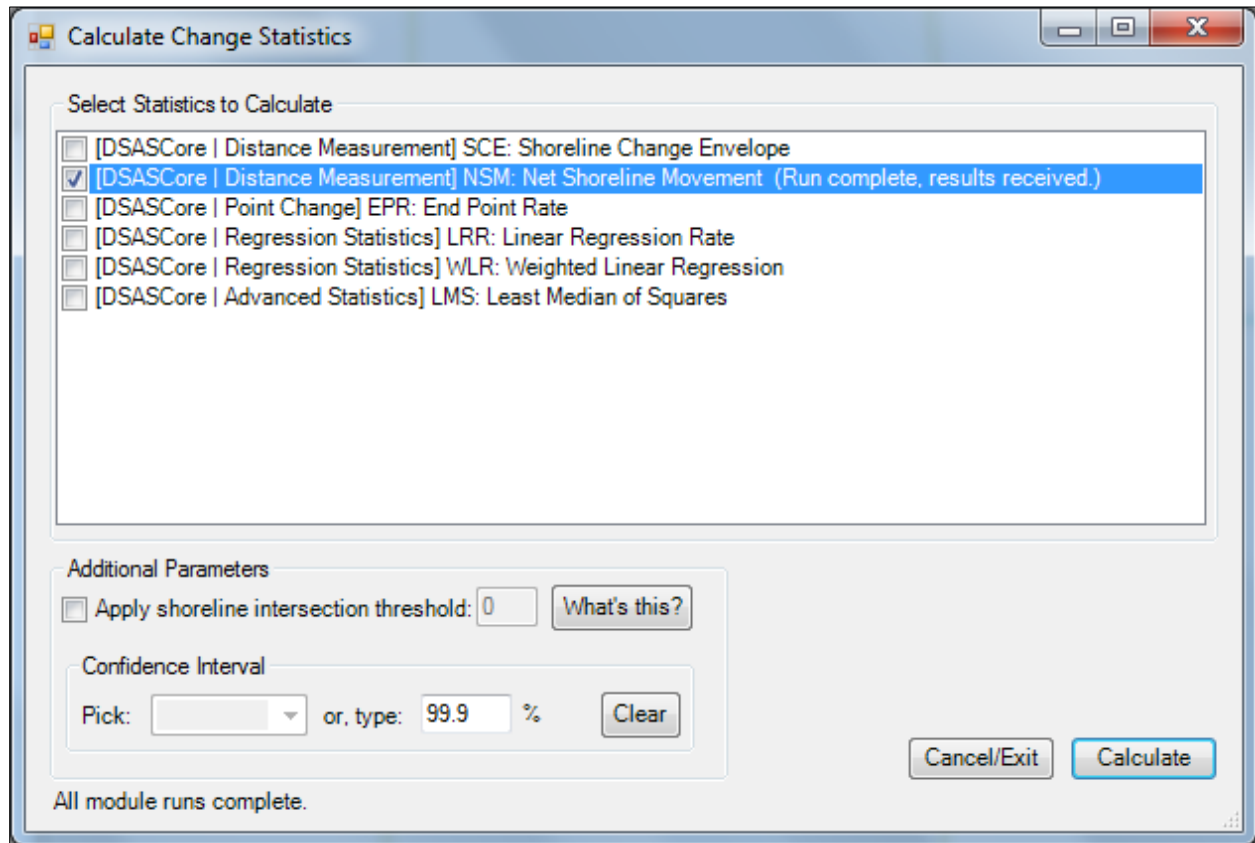


Figure 20. Screen capture of the DSAS 'Calculate Change Statistics' window showing that the run is complete.

- c. Click Cancel/Exit.
9. The analyses performed by DSAS are stored in tables. Click on the Source tab in the Table of Contents to see the intersect and rates tables generated (Figure 21). See the 'Data Output' section below to use these tables.

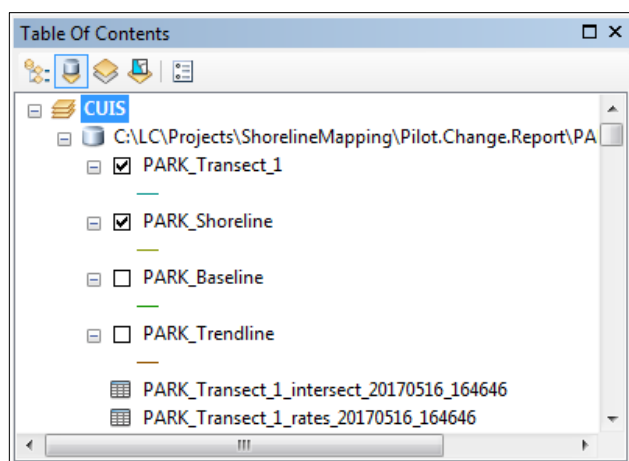


Figure 21. Screen capture of the ArcMap table of contents displaying the two tables generated by DSAS.

Shoreline Uncertainty

The uncertainty of the individual shoreline survey is ± 5 meters (16.4 ft). This value is derived from the: (1) GPS accuracy, (2) differential tide position, (3) meteorological effects – wave dimension and run-up, and (4) interpretation of the line (Psuty et al. 2010). The annual comparisons deduced in SOP 2.3.09 *Coastal Shoreline Monitoring Annual Reporting—Version 1.0* (Baron, 2018c) using two individual shoreline surveys will have an uncertainty of 10 meters (32.8 ft; Psuty et al. 2010). Refer to Psuty et al. 2010 for additional information regarding shoreline survey uncertainty.

Data Output

The shoreline distances calculated in the previous sections by DSAS are stored in tables in the PARK_ShorelineChange personal geodatabase and are used for the analysis. There are two tables created with each DSAS run, a rates and an intersect table. To view these data in ArcGIS and create maps, the tables need to be joined to the transect layer. The following section describes how to clip the transects to the shoreline envelope (the area of shoreline change) and create a shapefile of the clipped transects with the shoreline distance change.

Clip Transects

The steps below describe how to clip the transect layer to the shoreline envelope so that they can be used to create report maps.

1. In the Transect Layer drop box on the DSAS toolbar, select the PARK_Transect_# feature class (where PARK is the four letter park code and # is the run number) used in the previous ‘Calculate Shoreline Distance’ section (Figure 22).
2. Click the **Clip to shoreline change envelope** button, shown as a pair of scissors (Figure 22).

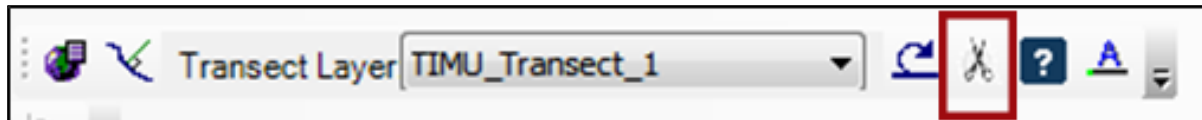


Figure 22. Screen capture of the DSAS toolbar with the PARK_Transect_# feature class (where PARK is the four letter park code and # is the run number) is listed as the Transect Layer. The **Clip to shoreline change envelope** button is the button with the scissors icon.

3. The 'Clip to Shoreline Change Envelope' window appears (Figure 23).

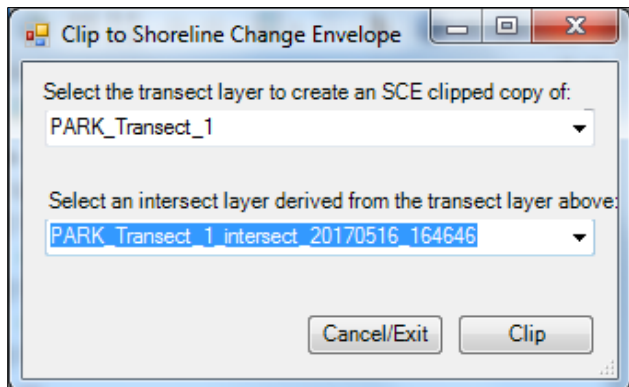


Figure 23. Screen capture of the 'Clip to Shoreline Change Envelope' window.

- a. Select the transect layer to create an SCE clipped copy of: Select the PARK_Transect_# feature class, where PARK is the four letter park code.
- b. Select an intersect layer derived from the transect layer above: select the intersect table relative to the shoreline change analysis.
- c. Click **Clip**.
- d. A information window will appear telling you that the transect layer has been created and added to the map (Figure 24).

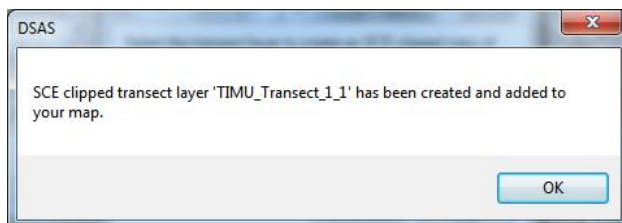


Figure 24. Screen capture of the DSAS information window informing that the transect layer was created and asking if it should be added to the map.

- i. Click **OK**.
- e. Click **Cancel/Exit** in the 'Clip to shoreline change envelope' window.

4. The new clipped layer will be created, named 'PARK_Transect_X_Y', where X is the transect run number of the transect feature class selected to be clipped and Y is a single digit denoting the clipped transect layer created (Figure 25). The number will start at '1' and will increase if multiple clipped transects are created for shoreline analysis.

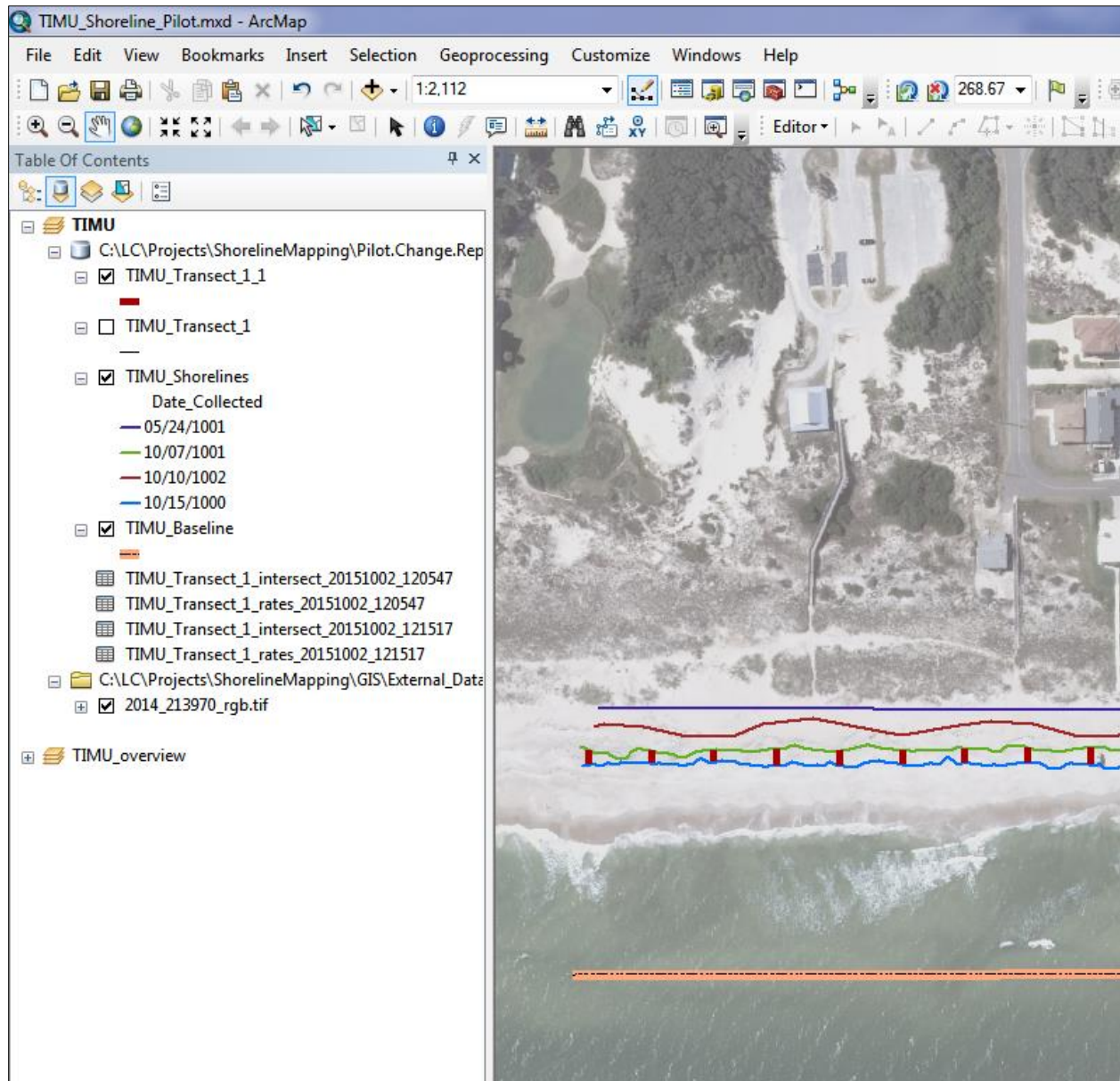


Figure 25. Screen capture of ArcMap displaying the clipped transect layer (TIMU_Transect_X_Y, shown in red).

Create Shapefile

The steps below list how to create a shapefile that will contain the clipped transects previously created and the shoreline change distance previously calculated.

1. In ArcMap, select the clipped transect feature class previously created (PARK_Transect_X_Y, where PARK is the four letter park code, where X is the transect run number of the transect feature class selected to be clipped, and Y is a single digit denoting the clipped transect layer created).
2. Right-click the PARK_Transect_X_Y feature class.
3. Select 'Joins and Relates' -> 'Join...'
4. The 'Join Data' window will appear (Figure 26). Make the selections listed below.

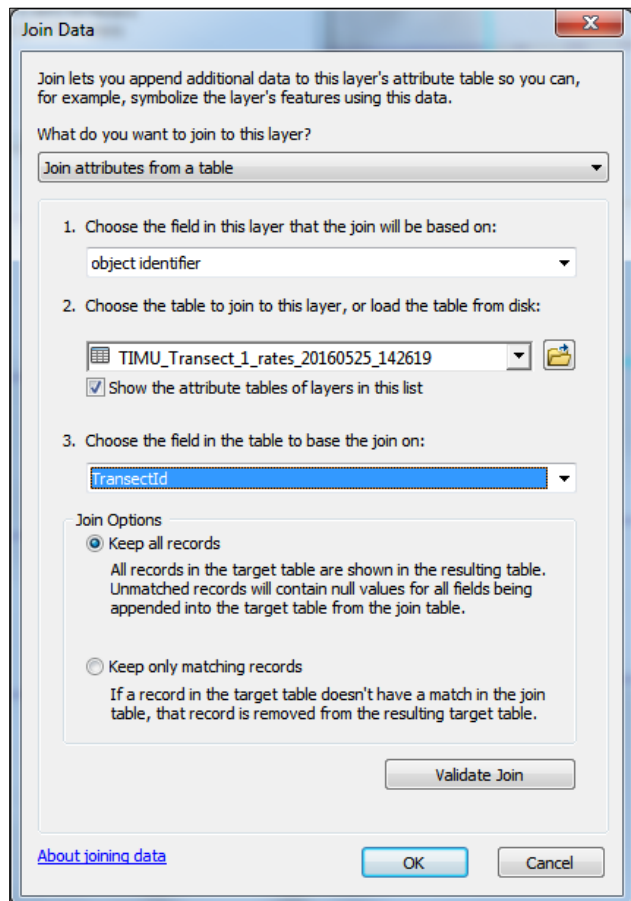


Figure 26. Screen capture of the 'Join Data' window.

- a. What do you want to join to this layer? select Join attributes from a table.
- b. Choose the field in this layer that will be based on: Object Identifier.
- c. Choose the table to join in this layer, or load the layer from disk:
PARK_Transect_X_YYYYY_ZZZZZ_rates_YYYYMMDD_hhmmss, where
PARK: Four-letter park code, X: Transect Run number, YYYYY: First letter of the season ('S' for spring and 'F' for fall) followed by the four-digit year for the oldest shoreline analyzed, ZZZZZ: First letter of the season ('S' for spring and 'F' for fall)

followed by the four-digit year for the most recent shoreline analyzed, YYYY: Year the run was conducted, MM: Month the run was conducted, DD: Day the run was conducted, hh: Hour the run was conducted, mm: Minute the run was conducted, ss: Second the run was conducted (For example: TIMU_Transect_1__S1000_S1001_rates_20160607_103907).

- d. Choose the field in the table to base the join on: TransectId.
 - e. Join Options: Toggle **on** Keep all records.
 - f. Click **OK**.
- Open the attribute table of the clipped transect feature class to see if the join was performed correctly. The shoreline change distance data is now temporarily linked to the clipped transect attribute table and is listed in the field 'NSM' (Figure 27).

BaselineID	Group	TransOrder	ProcTime	Autogen	StartX	StartY	EndX	EndY	Azimuth	SHAPE_Length	object identifier *	Transectid *	TCD	NSM
483	1	1	2017/05/17 14:35:26	1	461421.6	3421628.34	461415.01	3421628.31	269.75	6.589119	373	483	4820	-6.59
484	1	1	2017/05/17 14:35:26	1	461421.4	3421618.34	461415.47	3421618.31	269.75	5.932749	374	484	4830	-5.93
485	1	1	2017/05/17 14:35:26	1	461422.15	3421608.34	461414.11	3421608.31	269.75	8.038842	375	485	4840	-8.04
486	1	1	2017/05/17 14:35:26	1	461423.03	3421598.35	461415.29	3421598.31	269.75	7.743623	376	486	4850	-7.74
487	1	1	2017/05/17 14:35:26	1	461423.55	3421588.35	461415.27	3421588.31	269.75	8.279757	377	487	4860	-8.28
488	1	1	2017/05/17 14:35:26	1	461422.82	3421578.35	461415.4	3421578.31	269.75	7.423997	378	488	4870	-7.43
489	1	1	2017/05/17 14:35:26	1	461423.48	3421568.35	461415.97	3421568.32	269.75	7.506329	379	489	4880	-7.51
490	1	1	2017/05/17 14:35:26	1	461424.19	3421558.35	461416.16	3421558.32	269.75	8.03591	380	490	4890	-8.04
491	1	1	2017/05/17 14:35:26	1	461424.25	3421548.35	461416.01	3421548.32	269.75	8.244561	381	491	4900	-8.24
492	1	1	2017/05/17 14:35:26	1	461424.13	3421538.35	461415.49	3421538.31	269.75	8.641917	382	492	4910	-8.64
493	1	1	2017/05/17 14:35:26	1	461423.8	3421528.35	461414.83	3421528.31	269.75	8.966286	383	493	4920	-8.97
494	1	1	2017/05/17 14:35:26	1	461422.47	3421518.34	461414.96	3421518.31	269.75	7.511555	384	494	4930	-7.51
495	1	1	2017/05/17 14:35:26	1	461422.33	3421508.34	461415.16	3421508.31	269.75	7.157057	385	495	4940	-7.15
496	1	1	2017/05/17 14:35:26	1	461422.39	3421498.34	461415.11	3421498.31	269.75	7.275551	386	496	4950	-7.28
497	1	1	2017/05/17 14:35:26	1	461422.82	3421488.35	461415.32	3421488.31	269.75	7.501313	387	497	4960	-7.5
498	1	1	2017/05/17 14:35:26	1	461422.54	3421478.34	461414.85	3421478.31	269.75	7.689227	388	498	4970	-7.69
499	1	1	2017/05/17 14:35:26	1	461422.37	3421468.34	461415.64	3421468.31	269.75	6.729321	389	499	4980	-6.73
500	1	1	2017/05/17 14:35:26	1	461421.91	3421458.34	461415.25	3421458.31	269.75	6.660847	390	500	4990	-6.66
501	1	1	2017/05/17 14:35:26	1	461422.01	3421448.34	461415.68	3421448.31	269.75	6.348703	391	501	5000	-6.35

Figure 27. Screen capture of the PARK_Transect_X_Y feature class attribute table displaying the NSM field with the shoreline distance change.

- a. **Note:** the transects will have a '<Null>' value when they do not intersect two shorelines.
- Export the clipped transect feature class (with joined rate table) as a shapefile.
 - a. Save the shapefile as PARK_Transect_X_FFFFF_ZZZZZ_rates_YYYYMMDD_hhmmss, where PARK: the four letter park code, X: the transect number, FFFFF: First letter of the season ('S' for spring and 'F' for fall) followed by the four digit year for the oldest shoreline analyzed, ZZZZZ: First letter of the season ('S' for spring and 'F' for fall) followed by the four digit year for the most recent shoreline analyzed, YYYY: Year the run was conducted, taken from the corresponding table name, MM: Month the run was conducted, taken from the corresponding table name, DD: Day the run was conducted, taken from the

corresponding table name, hh: Hour the run was conducted, mm: Minute the run was conducted, ss: Second the run was conducted.

- b. For example, 'TIMU_Transect_1_F2000_F2001_rates_20150911_1210' would be the shapefile created for a seasonal shoreline change transect analyzing the shoreline change of two fall shorelines collected at TIMU and run on September 11, 2015 at 12:10 p.m.

Create Metadata

Metadata should be created for each shapefile, geodatabase, feature class, and table according to SOP 2.1.08 Dataset and Metadata Publication (SECN 2016), which complies with the Federal Geographic Data Committee standards.

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