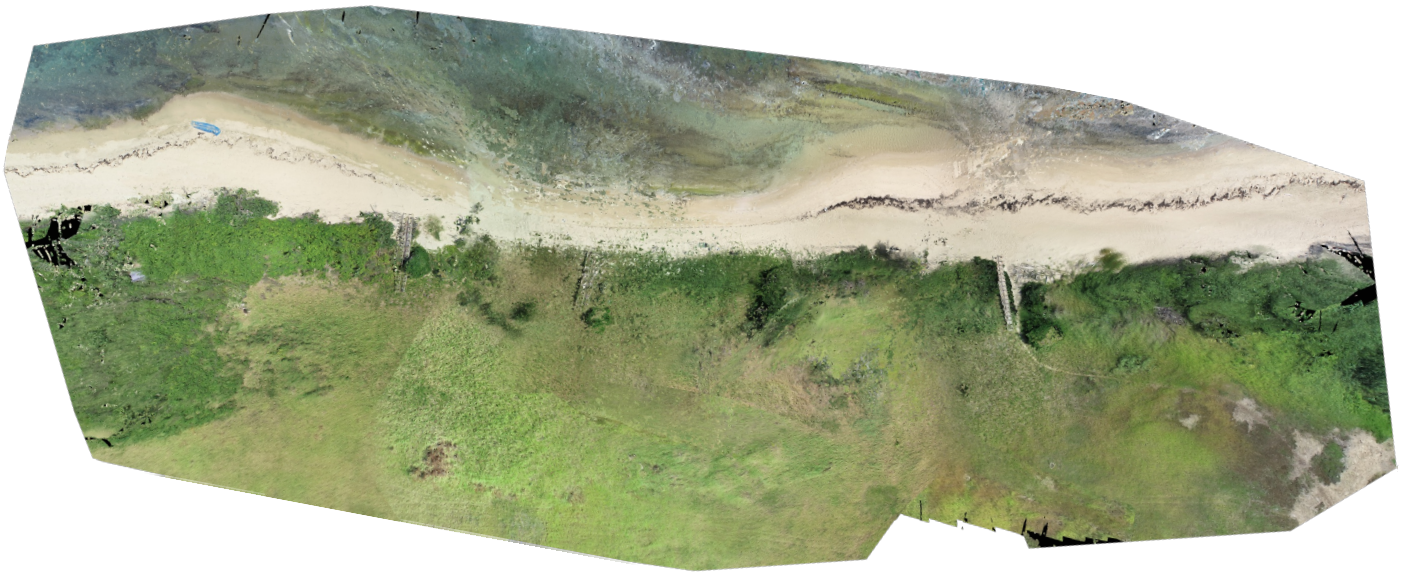
Finca Bravo, Isabela
August 01, 2023.

Centroid coordinates : 18.51524° N 67.09665° W

Ecological restoration actions
August 01, 2023



Length of biomimicry matrix = 1,860 ft

Area of biomimicry matrix = 1,325 m²

Area planted with dune vegetation = 1,325 m²

Note:

In this area we have installed a large biomimicry matrix with vegetation including beach beans (*Canavalia rosea*), sea purslane (*Sesuvium portulacastrum*) and beach bean (*Coccoloba uvifera*).

3D map
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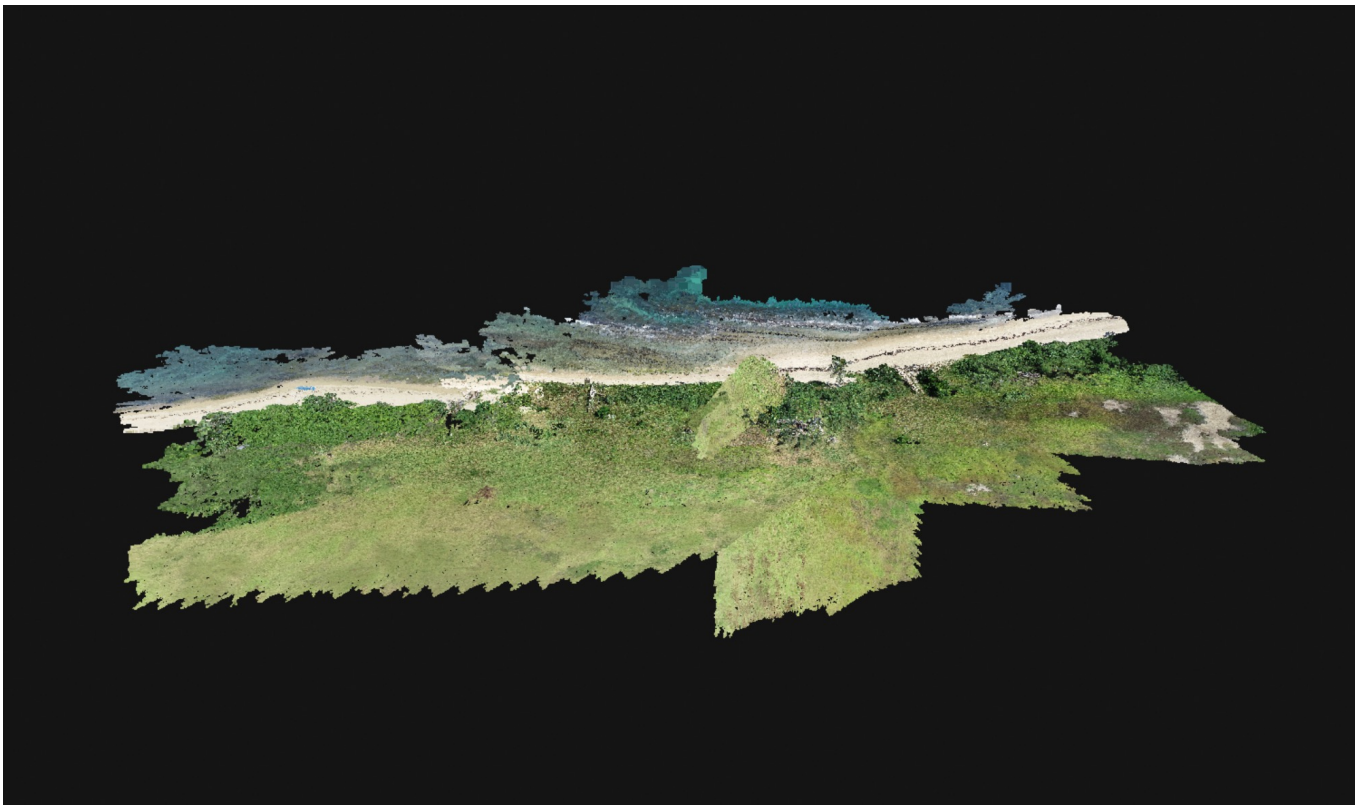
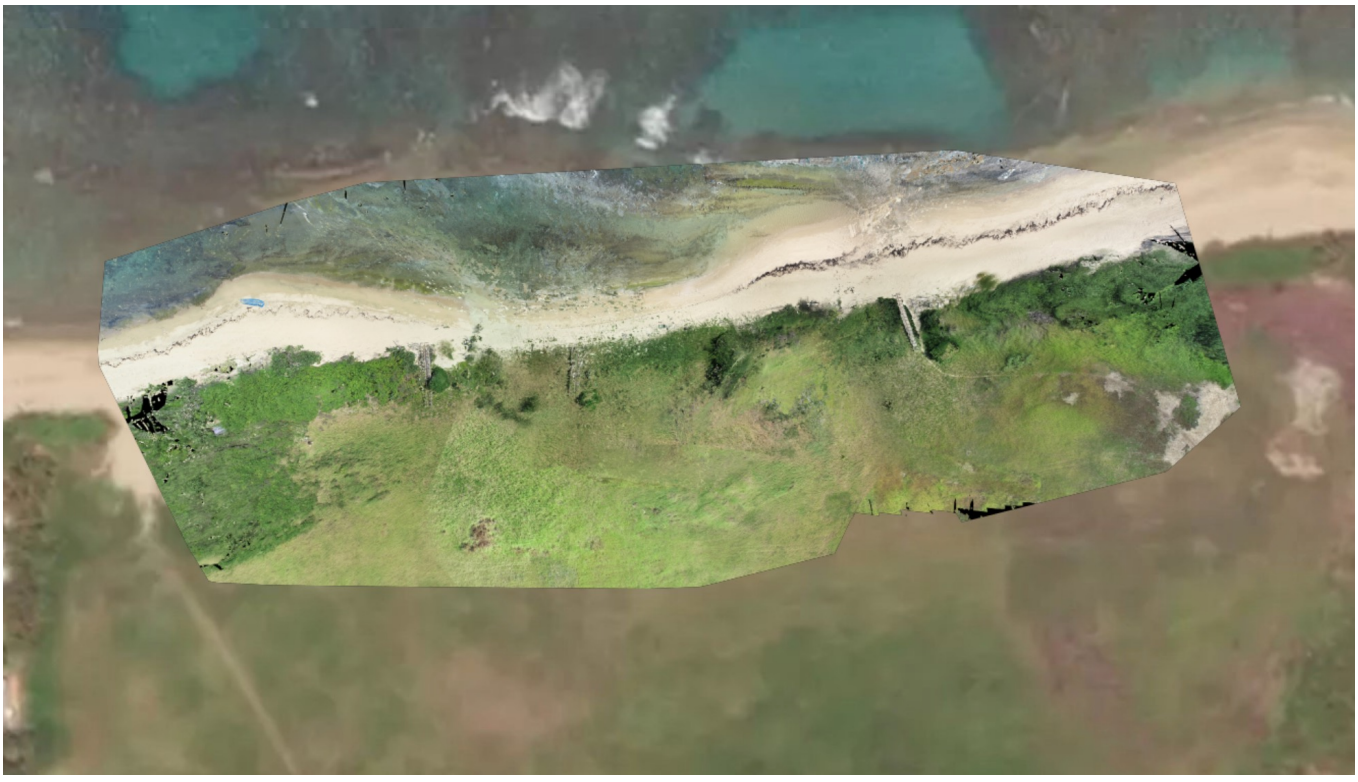


2D map



Total area of site = 3.11747 ha

Beach length (m)
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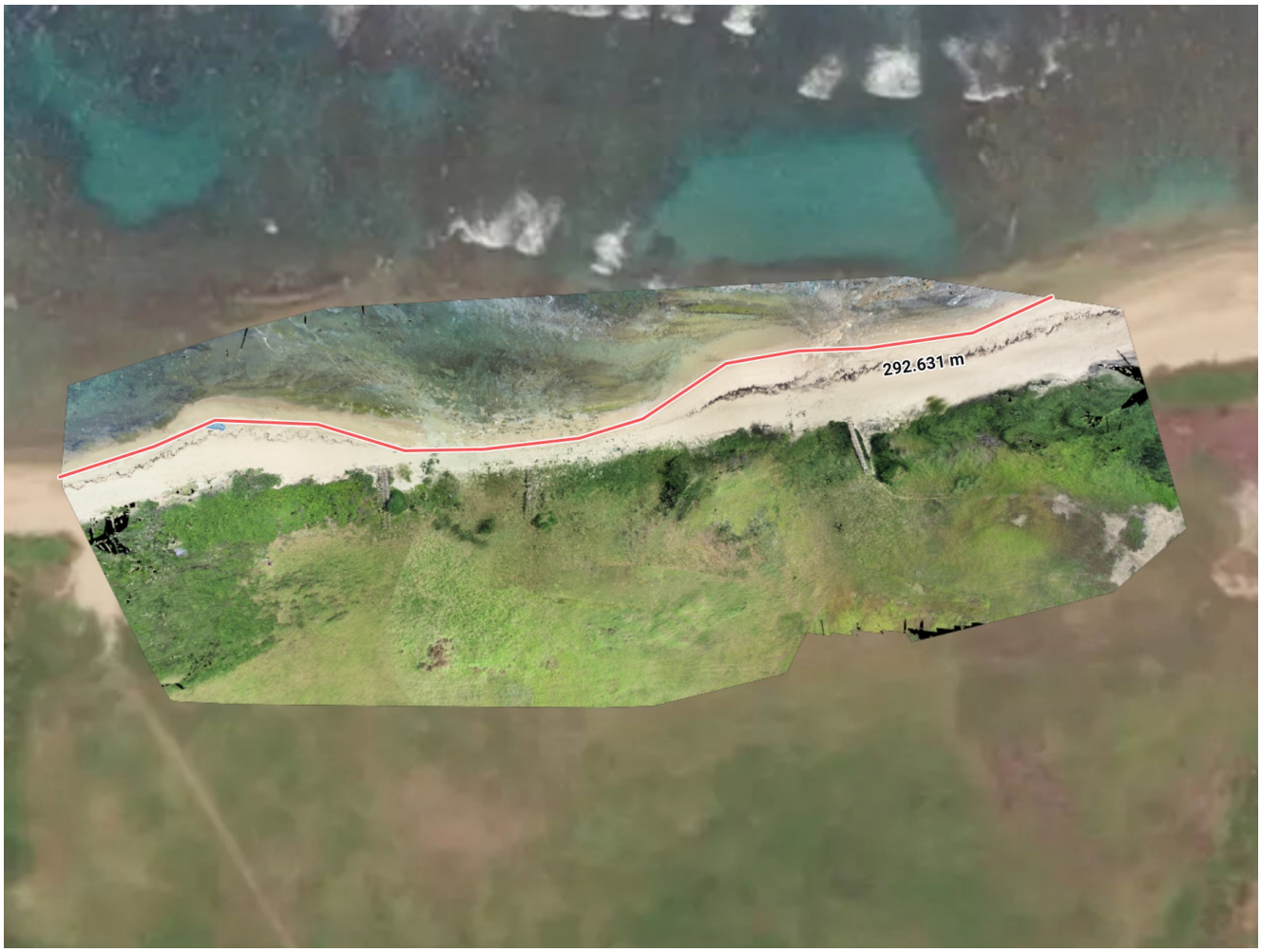
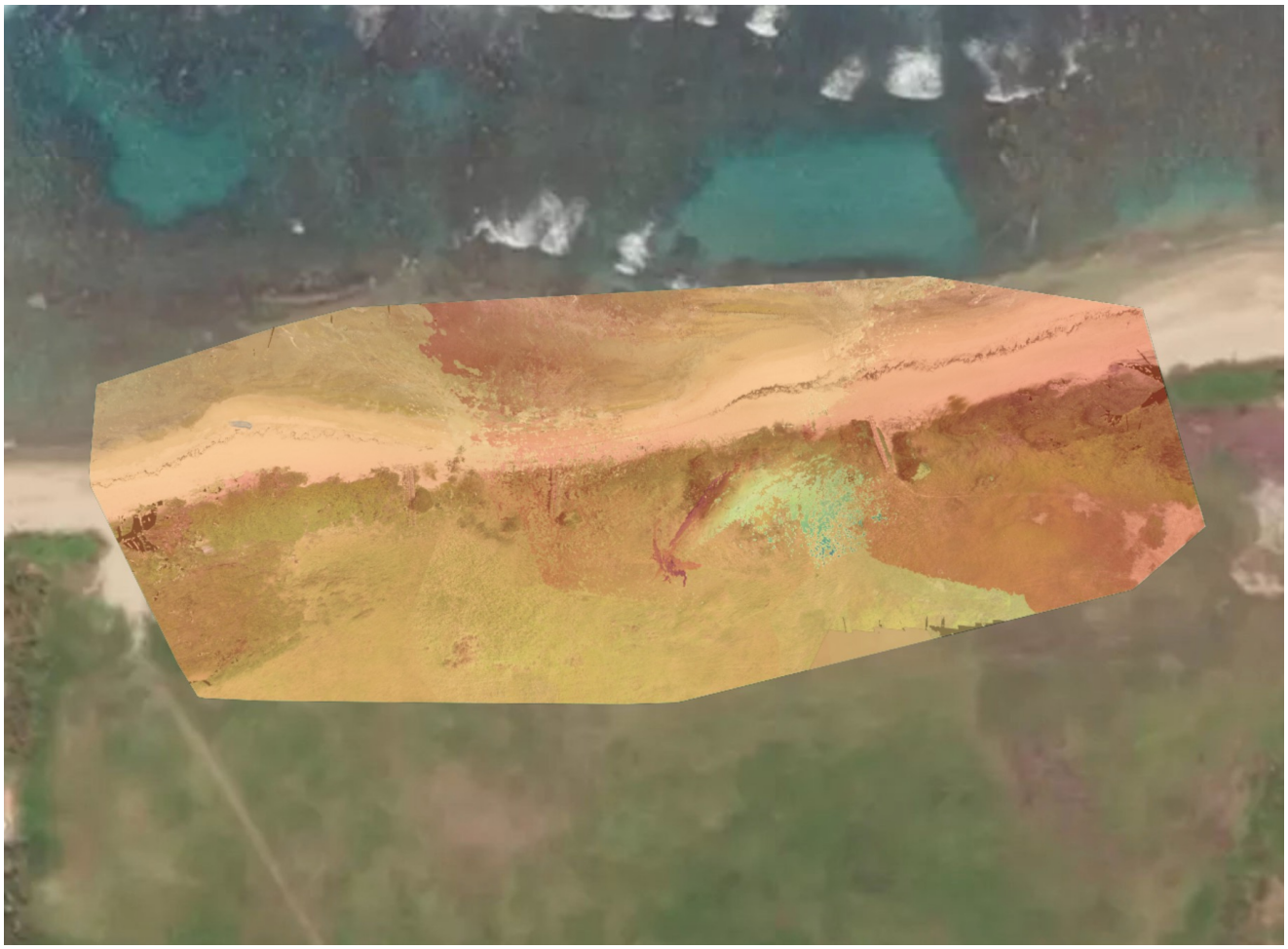


Beach length = 292.631 m

Density surface model
Finca Bravo, Isabela



Area of the beach
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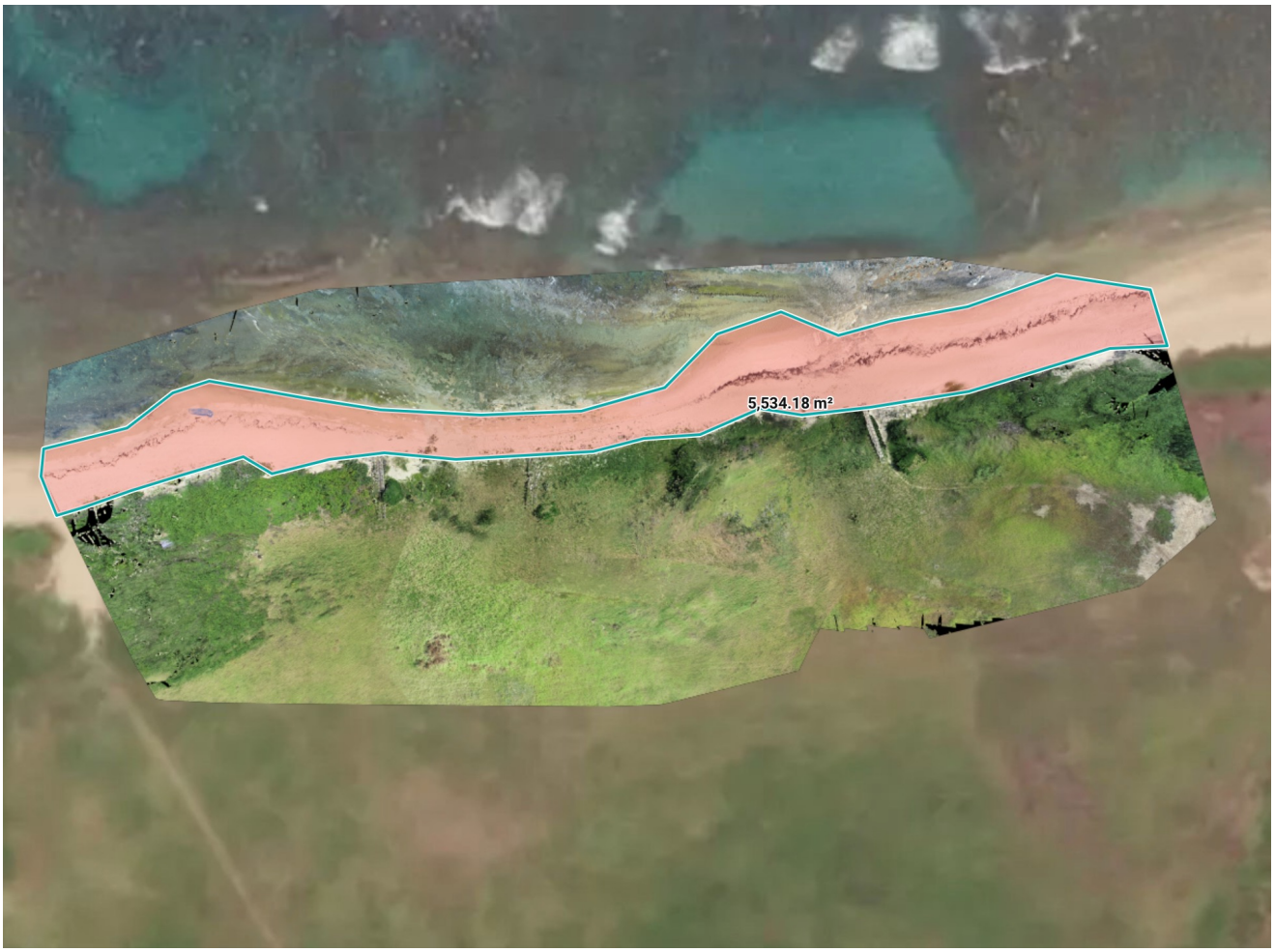
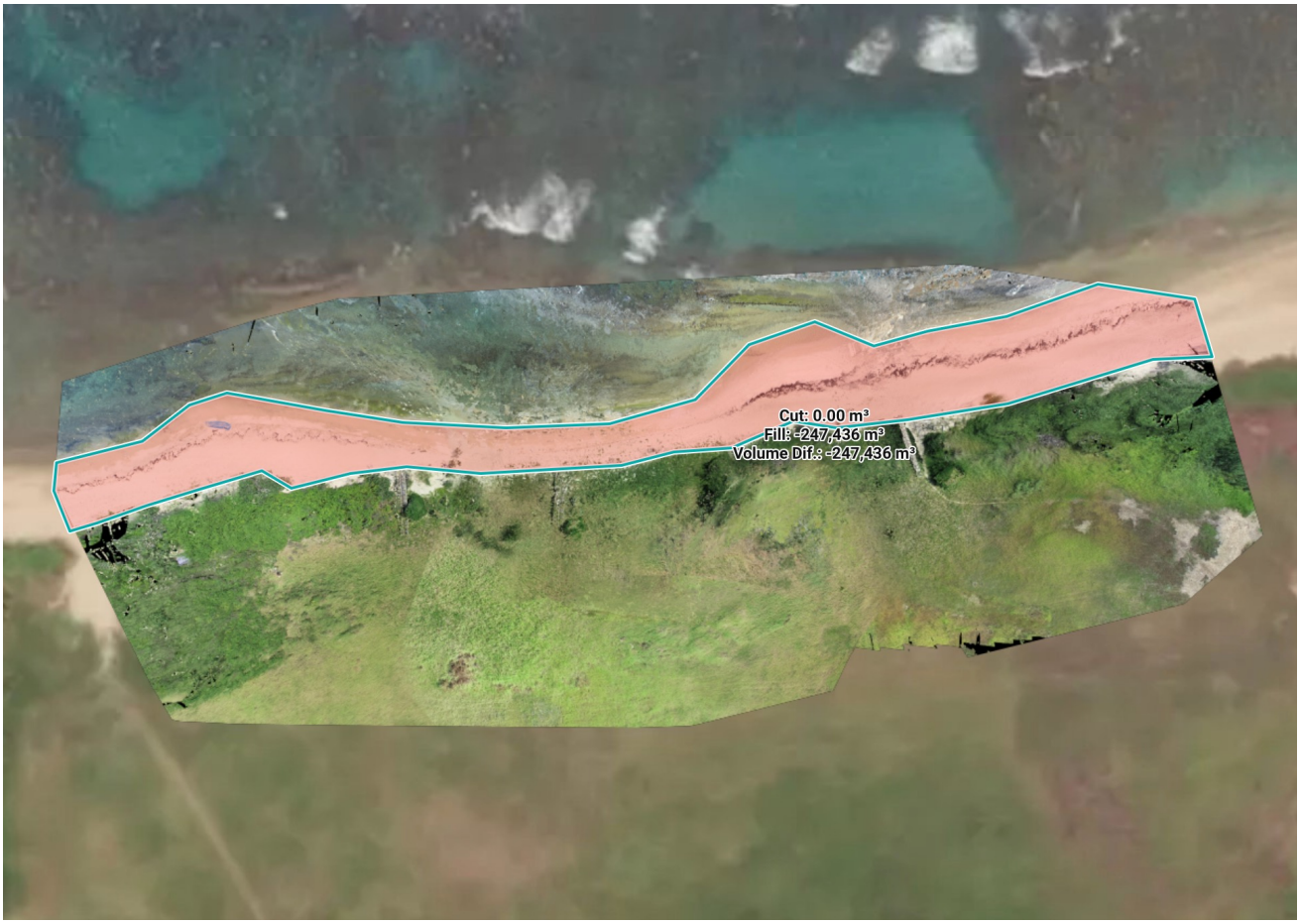


Area of the beach = 5,534.18 m²

Beach volume
Finca Bravo, Isabela



Cut = 0.00 m³
Fill = -247,436 m³
Volume Dif. = -247,436 m³

Beach elevation

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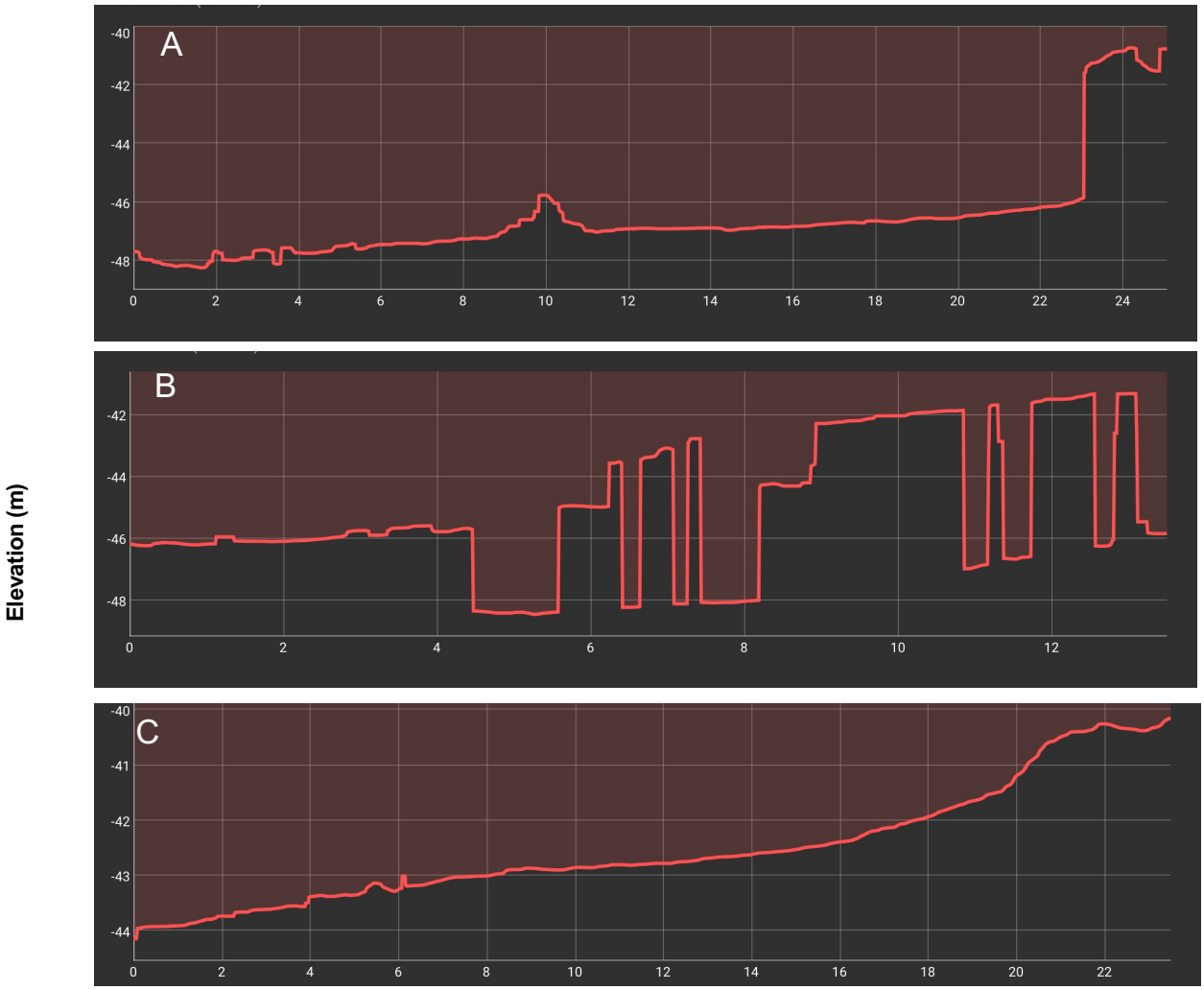

Site elevation (m)
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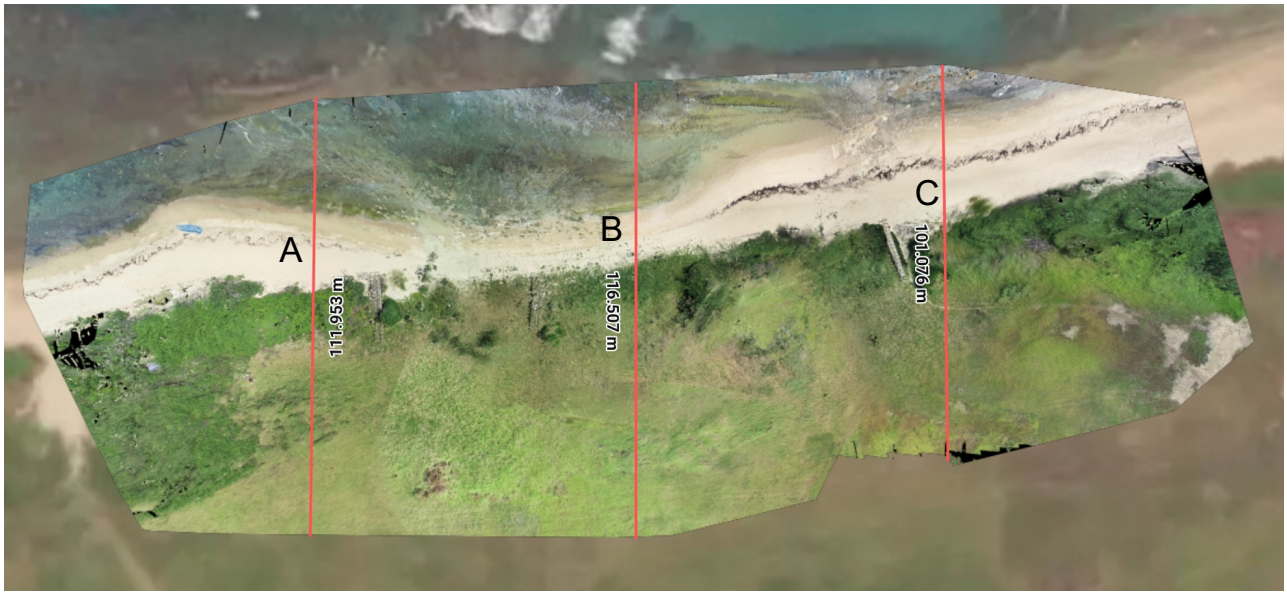

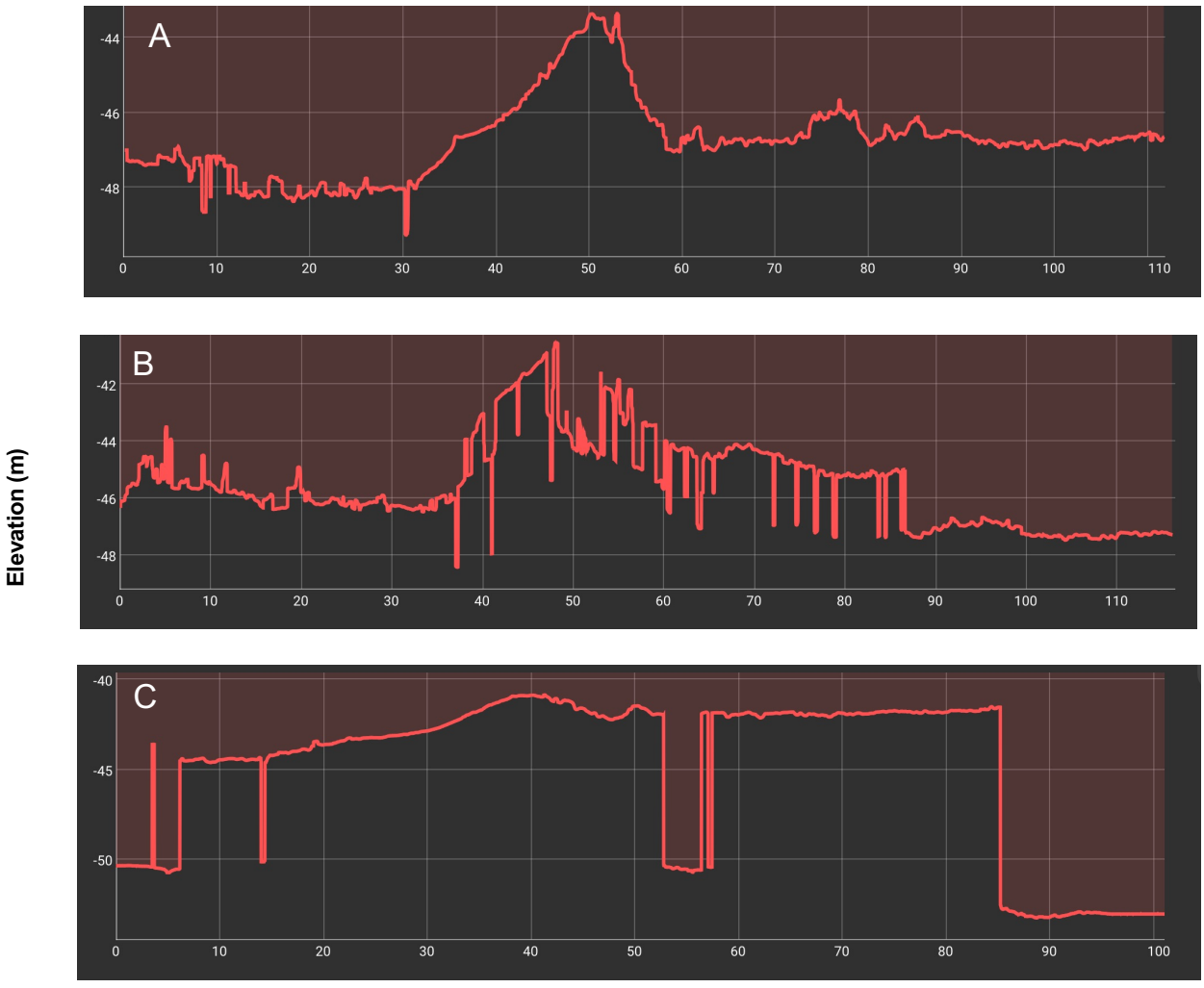

Dune height (m)
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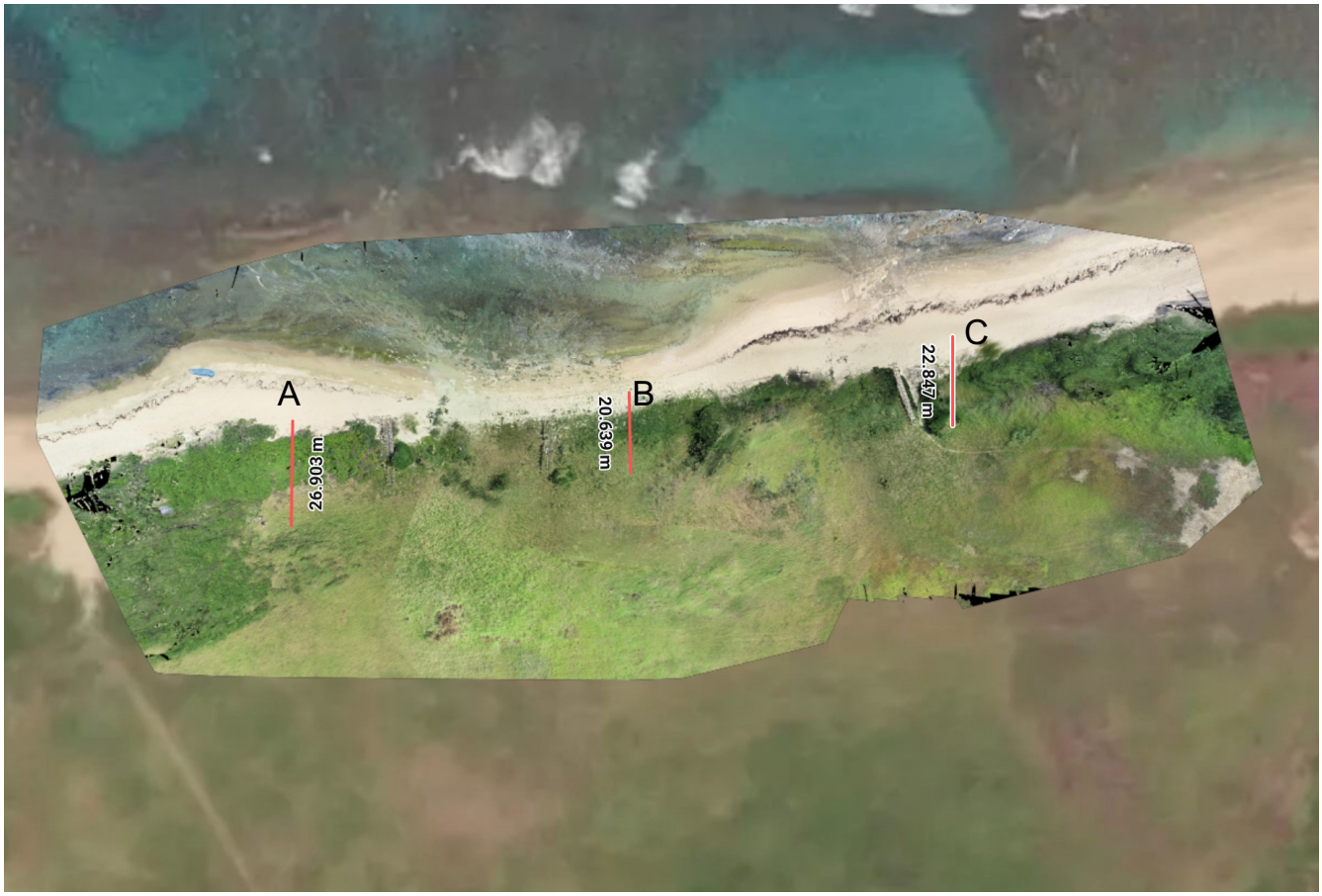

Dune height
A =1.733 m **B** = 2.61 m **C** = 8.112 m

Dune width (m)
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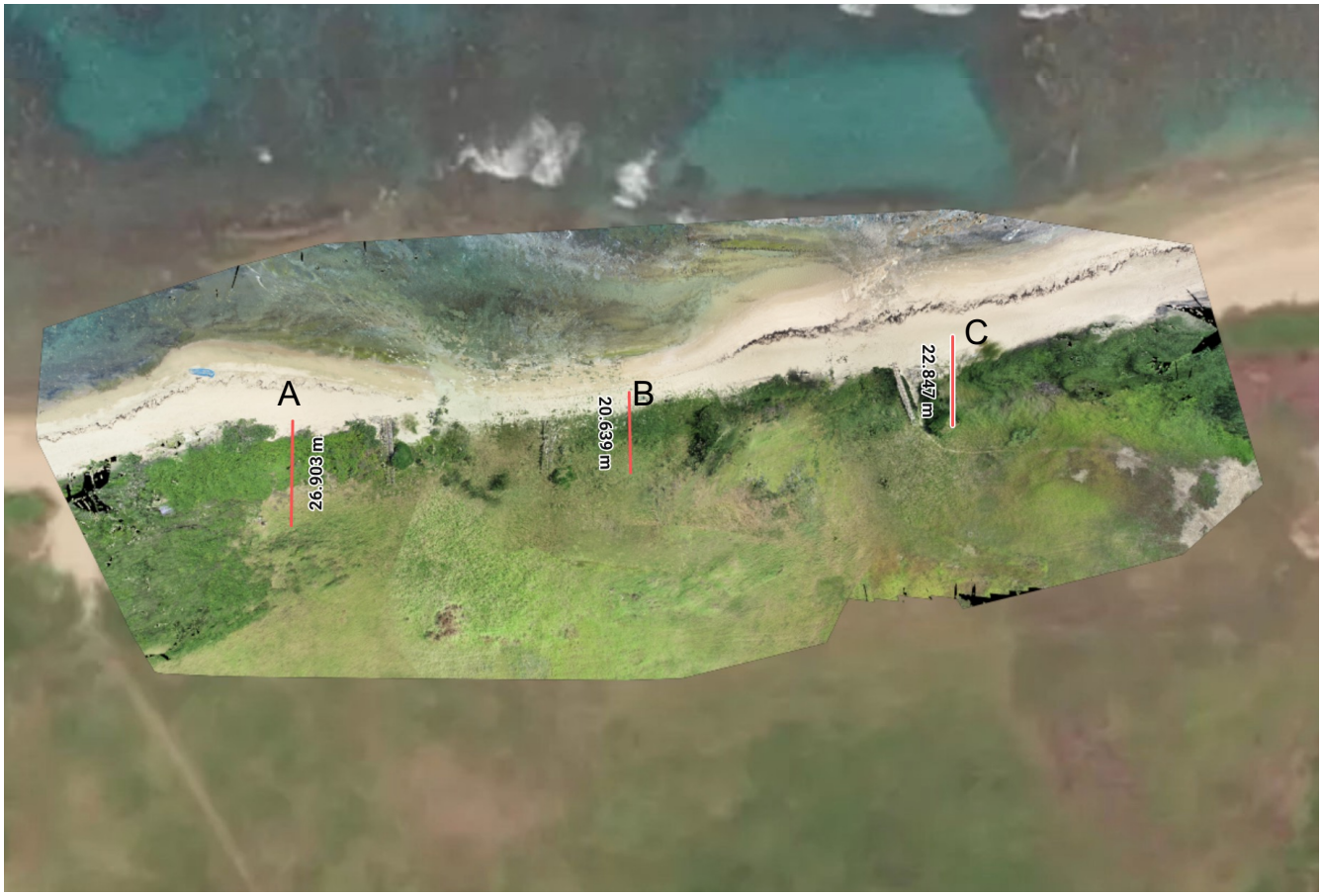

Dune width
A = 26.903 m **B** = 20.639 m **C** = 22.847 m

Area and perimeter of dune
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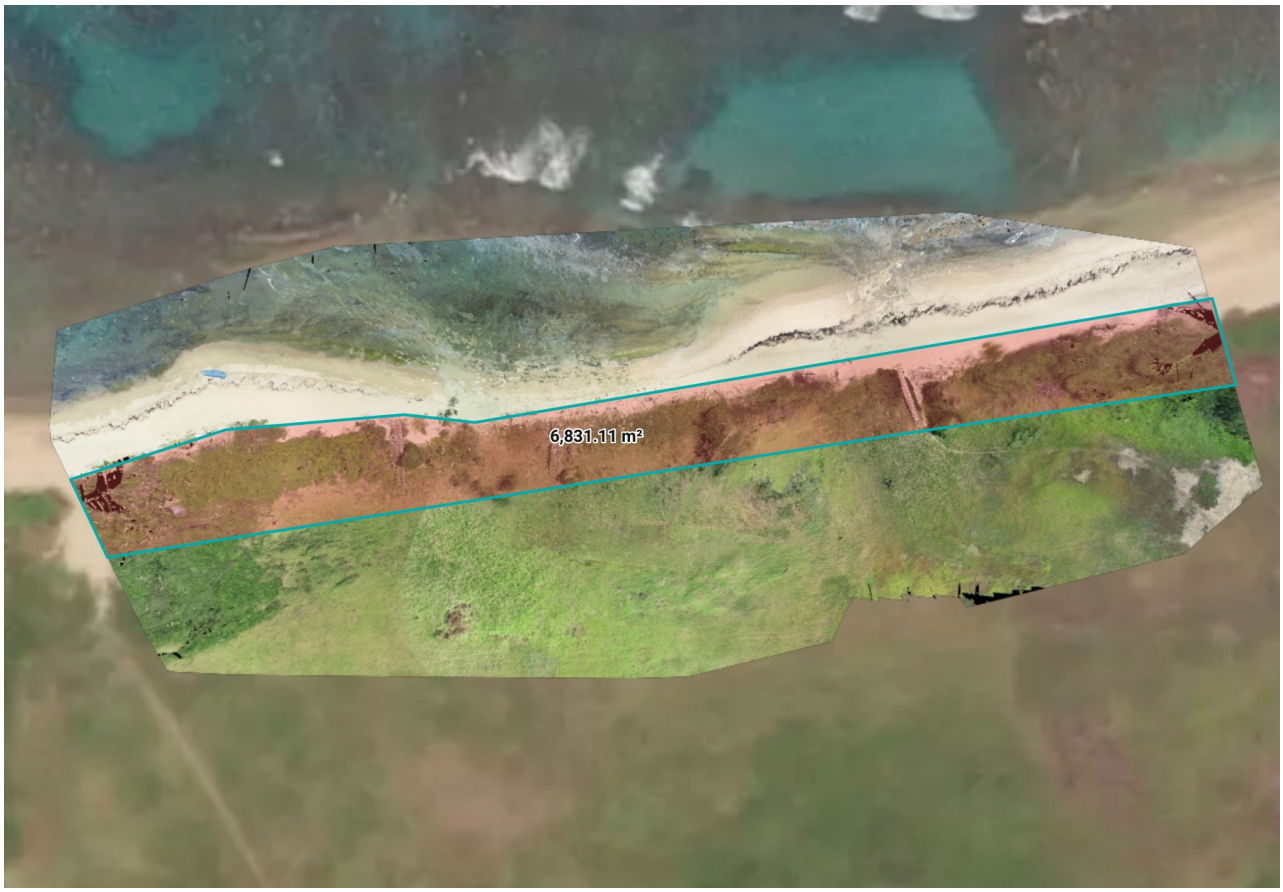

Area and perimeter of dune

2D area = 6,831.11 m²
3D area = 6,831.11 m²
2D perimeter = 648.528 m
3D perimeter = 648.528 m
Elevation difference = 0.00 m

Volume of dune
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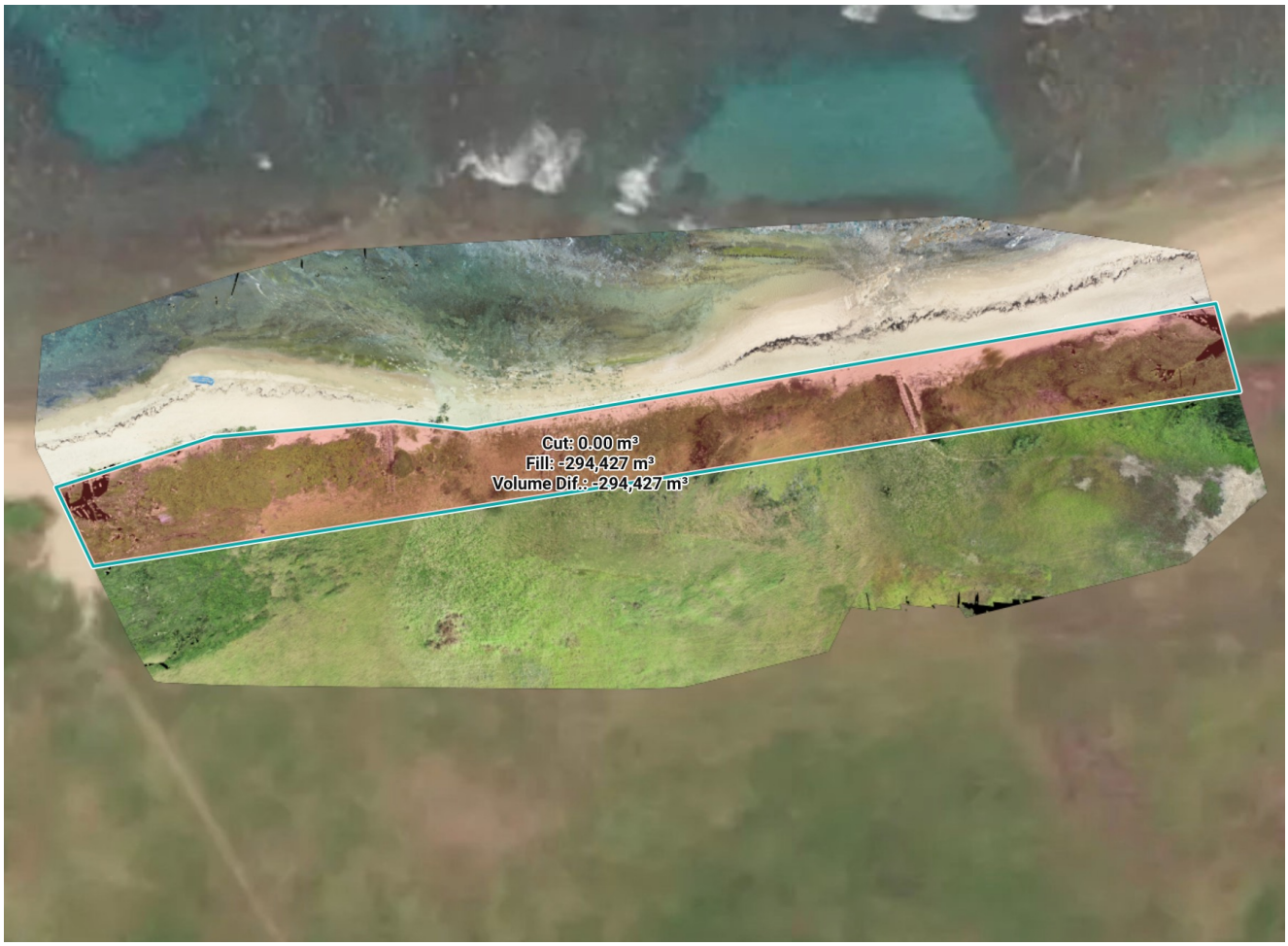
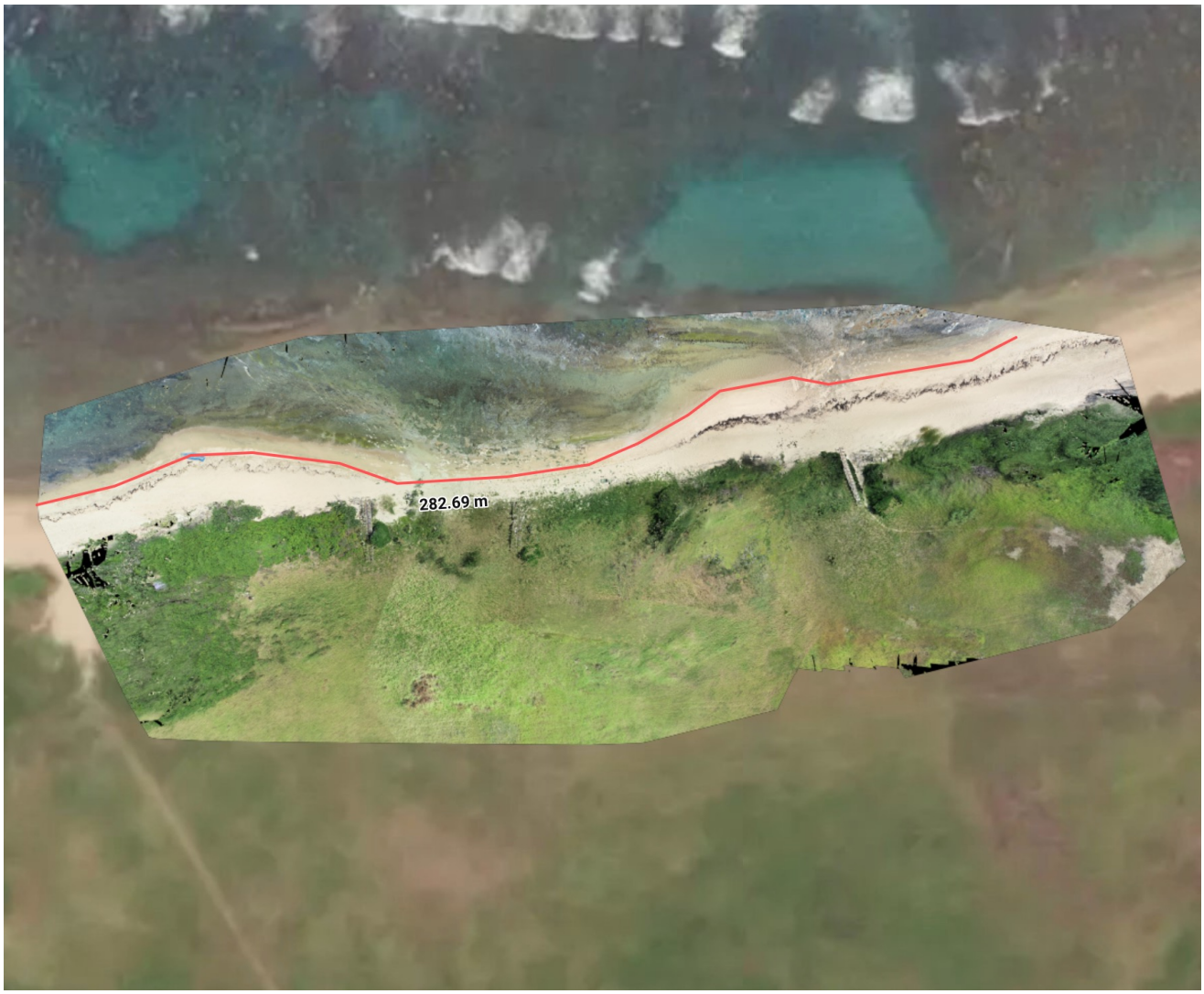


Base surface	**Triangulated**
Cut volume	0.00 m³
Cut error	0.00 m³
Fill volume	-294,427 m³
Fill error	536.898 m³
Volume difference	-294,427 m³

Shoreline
Finca Bravo, Isabela



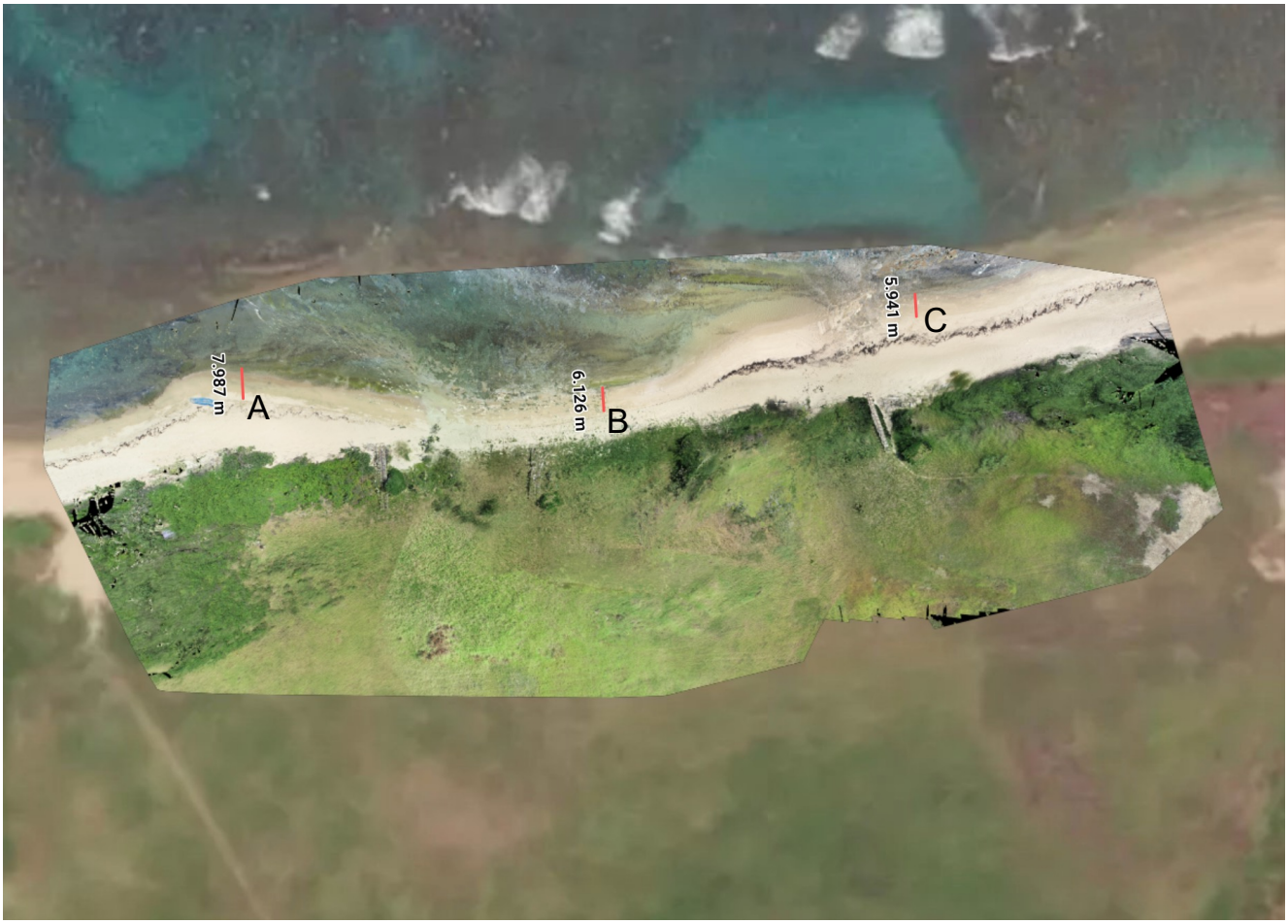
Shoreline length = 282.69 m

Shoreline geolocation
Finca Bravo, Isabela

Shoreline markers

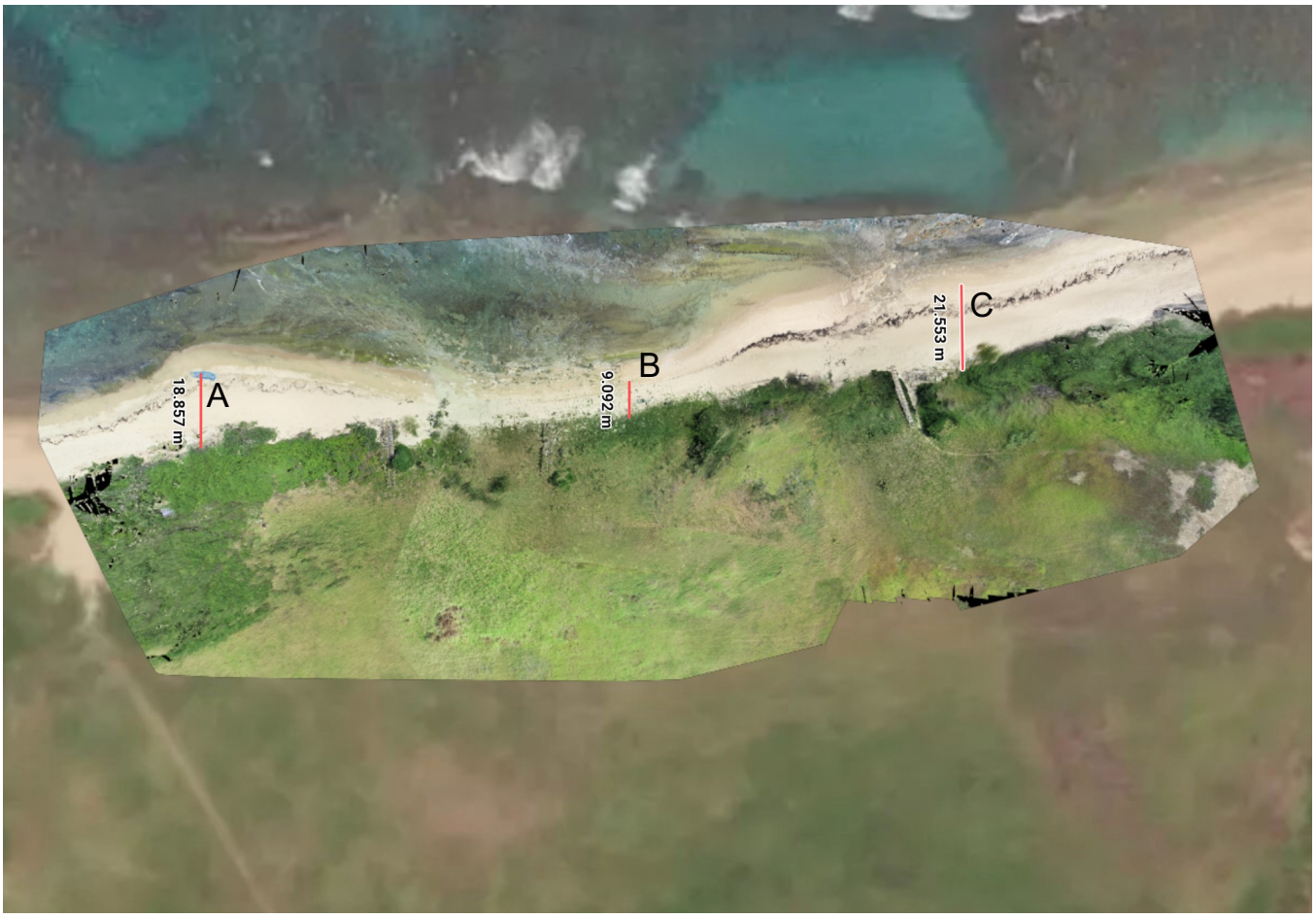
A = 18.51539° N 67.09771° W
B = 18.51534° N 67.09716° W
C = 18.51550° N 67.09641° W
D = 18.51560° N 67.09581° W

Shoreline extension
Finca Bravo, Isabela



Shoreline extension
A = 7.987 m **B** = 6.126 m **C** = 5.941 m

Shoreline position
Finca Bravo, Isabela



Shoreline position
A = 18.857 m **B** = 9.092 m **C** = 21.553 m

Area of dune breaches
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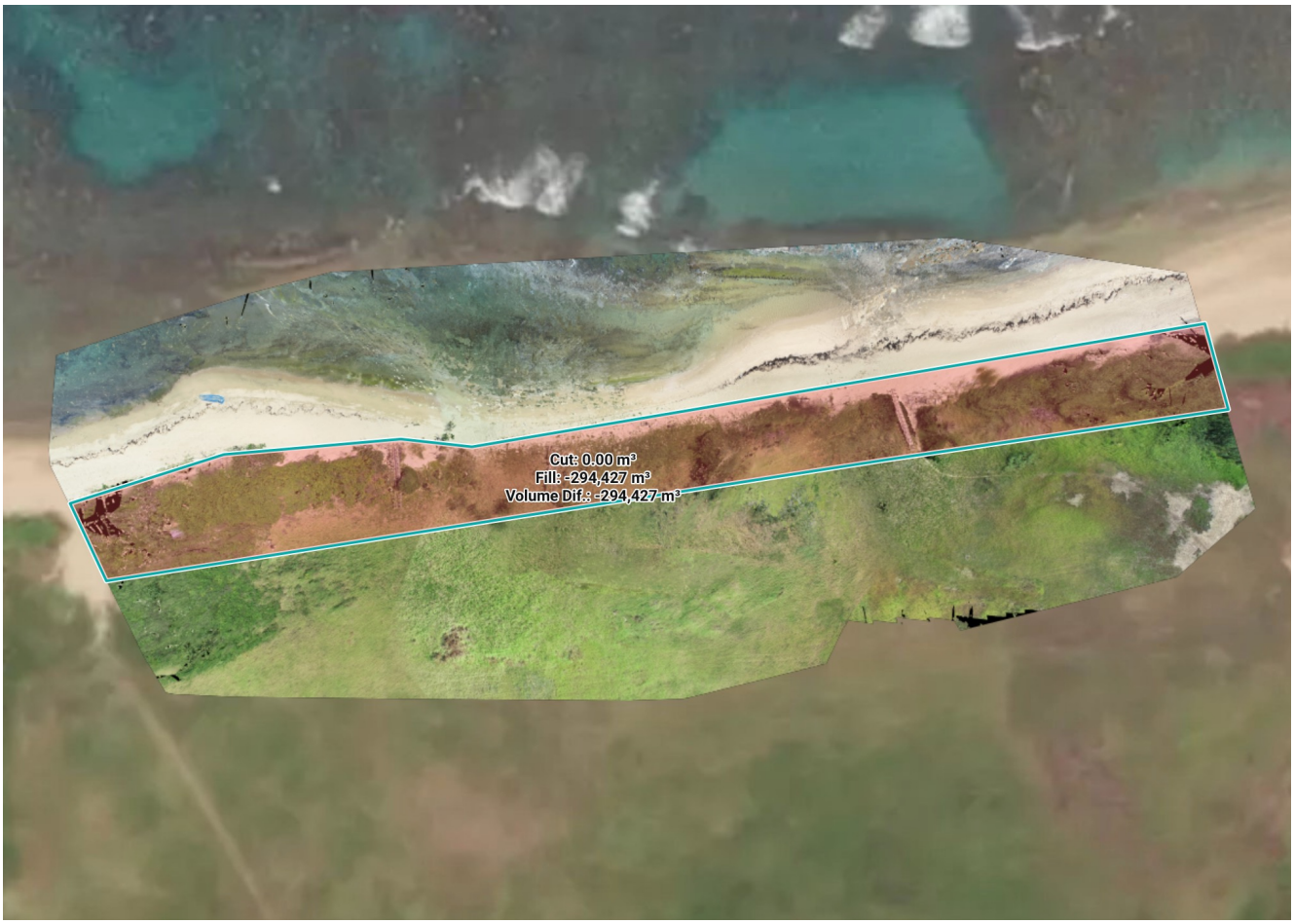


Area of dune breaches
Breach = 6,831.11 m²

Quality Report

Generated with Pix4Denterprise version 4.8.3 Preview

Important: Click on the different icons for:

Help to analyze the results in the Quality Report

Additional information about the sections

Click here for additional tips to analyze the Quality Report

Summary

Project	233017-Project-2023-08-01T19:27:03.536Z
Processed	2023-08-01 20:20:21
Camera Model Name(s)	FC6310R_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	1.31 cm / 0.52 in
Area Covered	0.031 km^2 / 3.0952 ha / 0.01 sq. mi. / 7.6523 acres
Time for Initial Processing (without report)	39m:05s

Quality Check

Images	median of 65809 keypoints per image	✓
Dataset	224 out of 266 images calibrated (84%), all images enabled, 5 blocks	⚠
Camera Optimization	11.8% relative difference between initial and optimized internal camera parameters	⚠
Matching	median of 5973.57 matches per calibrated image	✓
Georeferencing	yes, no 3D GCP	⚠

Preview

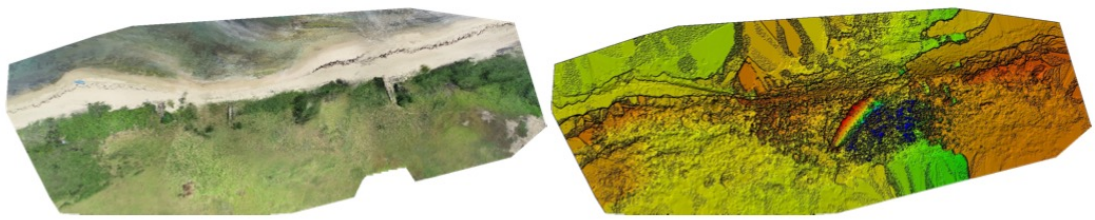


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	224 out of 266
Number of Geolocated Images	266 out of 266

Initial Image Positions

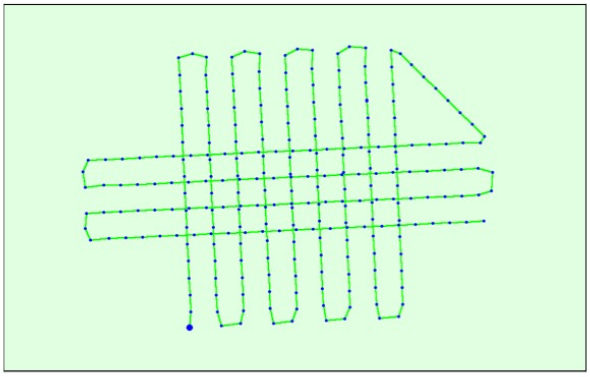
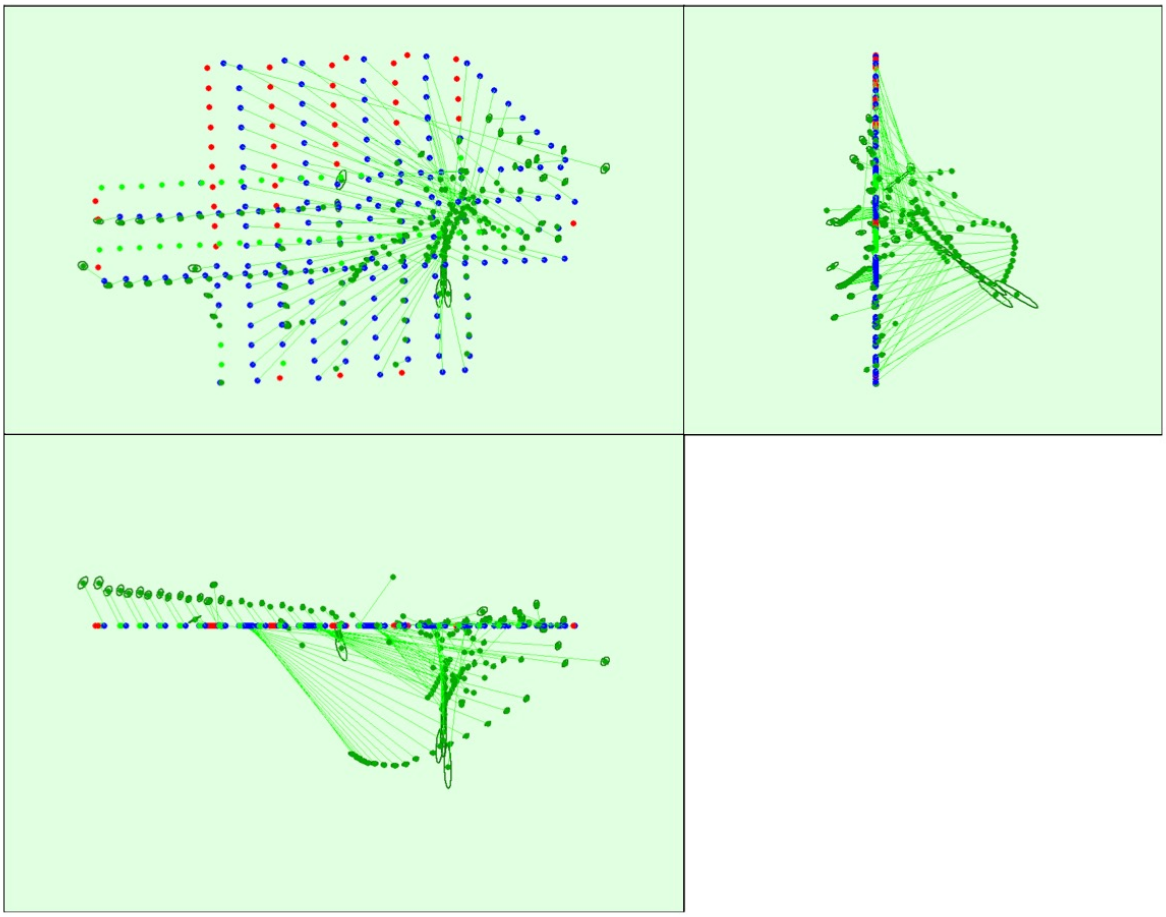


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 10x magnified

Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Red dots indicate disabled or uncalibrated images. Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

Absolute camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.054	0.062	0.077	0.194	0.105	0.186
Sigma	0.033	0.056	0.079	0.178	0.098	0.172

Overlap

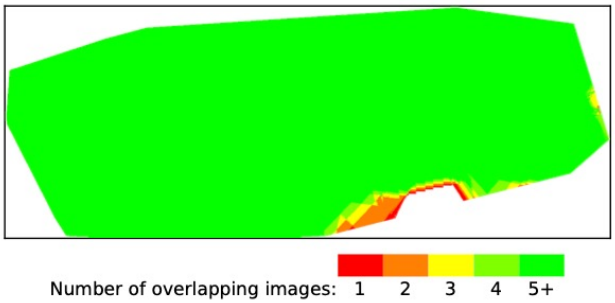


**Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).**

Bundle Block Adjustment Details

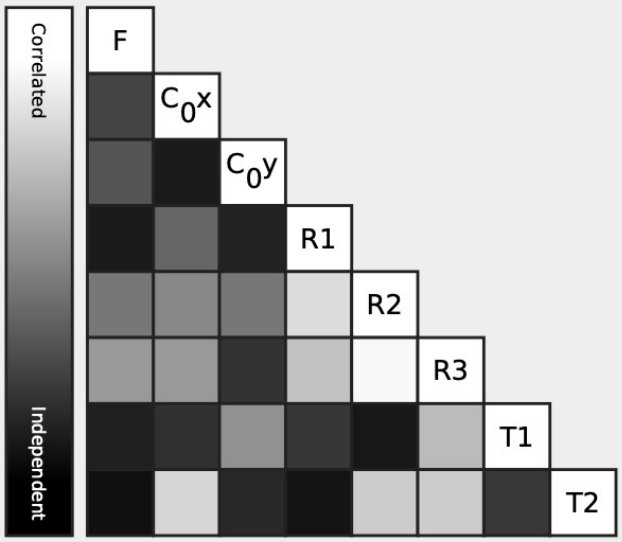
Number of 2D Keypoint Observations for Bundle Block Adjustment	1533143
Number of 3D Points for Bundle Block Adjustment	669537
Mean Reprojection Error [pixels]	0.195

Internal Camera Parameters

FC6310R_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310R_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3658.300 [pixel] 8.580 [mm]	2722.500 [pixel] 6.385 [mm]	1835.100 [pixel] 4.304 [mm]	-0.269	0.112	-0.033	0.000	-0.001
Optimized Values	4090.317 [pixel] 9.593 [mm]	2714.707 [pixel] 6.367 [mm]	1394.951 [pixel] 3.272 [mm]	-0.023	0.005	0.006	-0.001	-0.001
Uncertainties (Sigma)	2.171 [pixel] 0.005 [mm]	2.387 [pixel] 0.006 [mm]	3.157 [pixel] 0.007 [mm]	0.001	0.003	0.003	0.000	0.000



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.

The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	65809	5974
Min	39879	29
Max	79944	18583
Mean	65575	6844

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	552668
In 3 Images	77580
In 4 Images	22196
In 5 Images	8579
In 6 Images	3955
In 7 Images	1836
In 8 Images	1074
In 9 Images	571
In 10 Images	391
In 11 Images	234
In 12 Images	135
In 13 Images	82
In 14 Images	72
In 15 Images	48
In 16 Images	32
In 17 Images	15
In 18 Images	19
In 19 Images	11
In 20 Images	11
In 21 Images	11
In 22 Images	7
In 23 Images	1
In 24 Images	2
In 25 Images	2
In 26 Images	3
In 27 Images	1
In 28 Images	1

2D Keypoint Matches

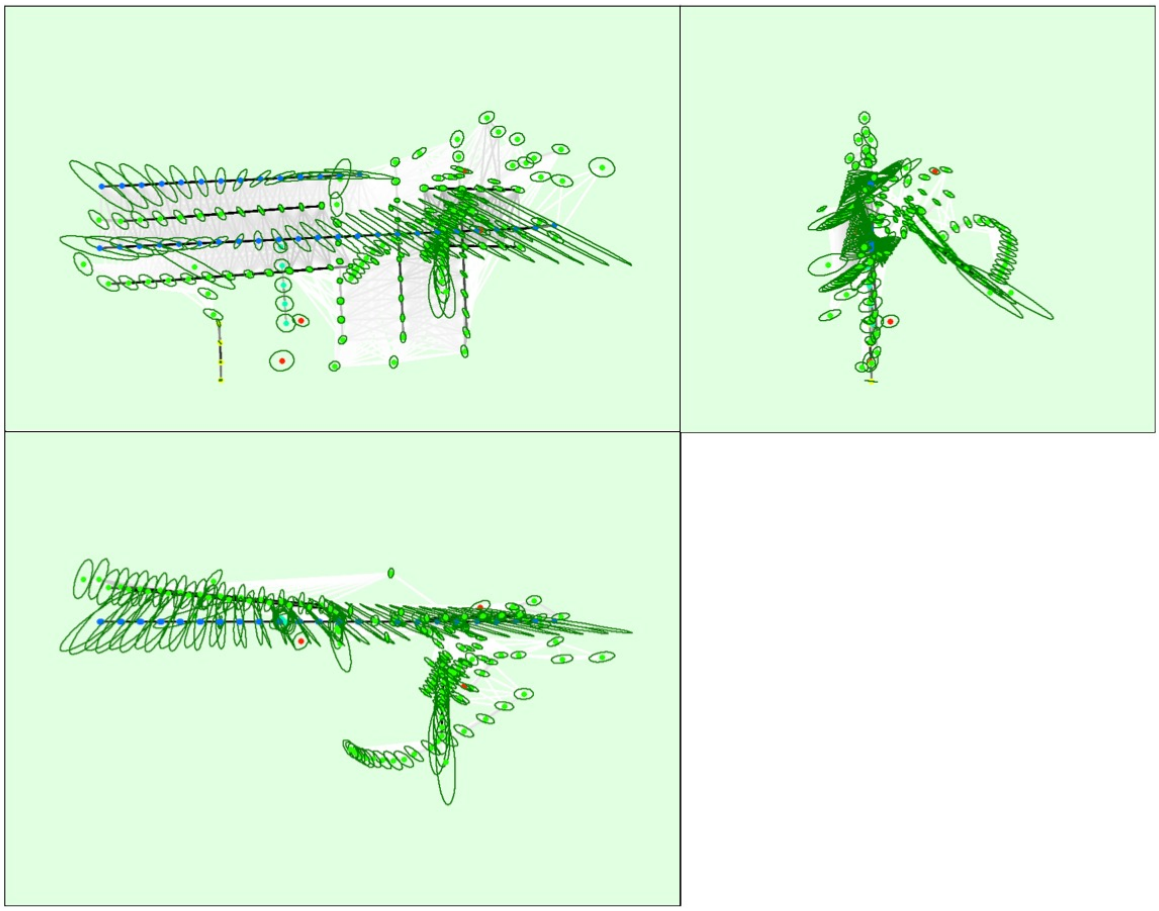


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

Relative camera position and orientation uncertainties

	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.059	0.041	0.060	0.103	0.050	0.123
Sigma	0.070	0.041	0.049	0.095	0.048	0.101

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.04	0.00	0.00	9.76
-0.04	-0.03	0.00	0.00	4.88
-0.03	-0.02	7.32	0.00	0.00
-0.02	-0.01	12.20	7.32	4.88
-0.01	-0.01	17.07	19.51	9.76
-0.01	0.00	9.76	26.83	9.76
0.00	0.01	14.63	21.95	19.51

0.01	0.01	24.39	14.63	19.51
0.01	0.02	9.76	9.76	12.20
0.02	0.03	2.44	0.00	7.32
0.03	0.04	0.00	0.00	0.00
0.04	-	2.44	0.00	2.44
Mean [m]		-0.000167	0.000338	-0.000508
Sigma [m]		0.014875	0.009665	0.025247
RMS Error [m]		0.014876	0.009671	0.025252

Min Error and Max Error represent geolocation error intervals between -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the initial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	39.02	65.85	75.61
[-2.00, 2.00]	80.49	97.56	92.68
[-3.00, 3.00]	97.56	100.00	95.12
Mean of Geolocation Accuracy [m]	0.009614	0.009614	0.022938
Sigma of Geolocation Accuracy [m]	0.000239	0.000239	0.000409

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]
Omega	6.908
Phi	5.920
Kappa	6.418

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Xeon(R) Platinum 8124M CPU @ 3.00GHz RAM: 69GB GPU: no info (Driver: unknown)
Operating System	Linux 5.15.0-1040-aws x86_64

Coordinate Systems

Image Coordinate System	WGS 84
Output Coordinate System	WGS 84 / UTM zone 19N

Processing Options

Detected Template	cloud-3d-maps-1*
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic

Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details

Processing Options

Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	07m:58s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	05m:59s

Results

Number of Generated Tiles	1
Number of 3D Densified Points	11524461
Average Density (per m^3)	622.98

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (1.31 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Time for DSM Generation	03m:28s
Time for Orthomosaic Generation	24m:24s
Time for DTM Generation	00s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s

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