



Mapping the coastal margins of the Falklands & South Georgia

Project Stakeholder Group - UPDATE

Friday 15th February 2019



#SouthAtlanticCoastalMapping



- *DPLUS065 Coastal Mapping Project – Grant aided by the Darwin Initiative through UK Government funding*
- *Satellite images courtesy of Digital Globe Foundation*

Overview

- Coastal Mapping Project – current progress
 - 1956 Aerial imagery geo-referencing (Falklands)
 - Broad-scale habitat maps (Falklands & South Georgia)
 - Stakeholder prioritisation for fine-scale mapping/modelling (Falklands & South Georgia)
 - Satellite-derived bathymetry (Falklands)
 - Data gathering for fine-scale mapping/modelling
- Looking ahead
 - Fieldwork (drone mapping and ground validation) (Falklands & South Georgia)
 - Stakeholder training workshop – July 2019
 - Final workshop- November 2019


1956 Aerial Imagery: geo-referencing

- Raw data (Tiff images) with Dept. of Mineral Resources
- Huge data resource: 3,675 b&w photos – 458 Gb
- Innovative scripting by SAERI IMS data centre
- Creation of a digital map on the Coastal Habitat Mapping webGIS

<https://ims.saeri.org/lm/index.php/view/>

1956 Aerial Imagery: geo-referencing

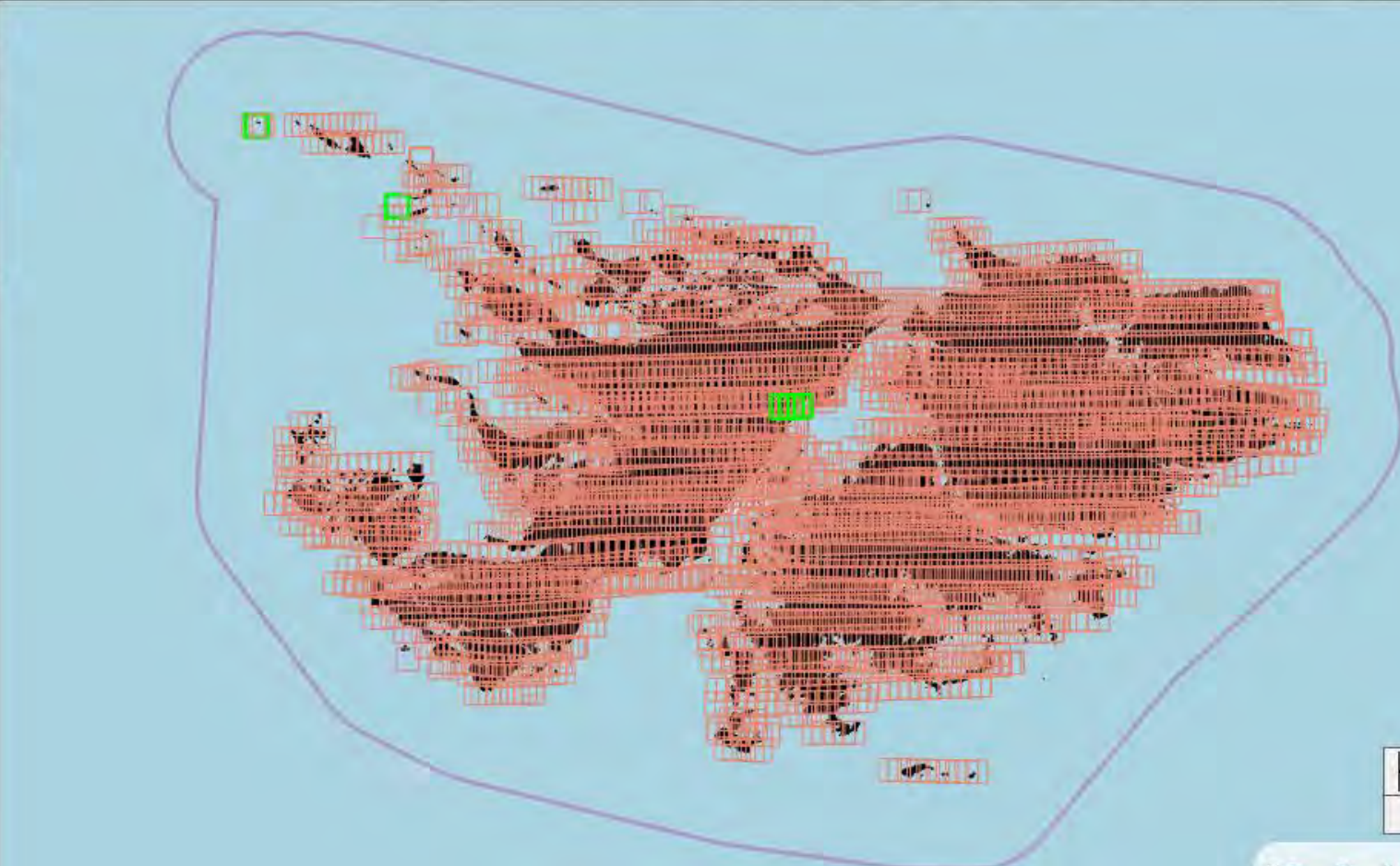
← → ↻ https://data.saeri.org/saeri_webgis/lizmap/www/index.php/view/map/?repository=04f&project=fi_coastal_hab_map ☆ ⓘ ⋮

 **Coastal Habitat Mapping of the Falkland Islands** SAERI Darwin Initiative projects ⏻ Connect

Layers Close

Legend

- ▶ All 1956 aerial images
- ▶ falklands landmass
- ▶ bing aerial map



Map Controls: Hand, Home, Full Screen, Refresh, Zoom In (+), Zoom Out (-), Previous View, Next View

Scale: 50 km / 20 mi | **Scale:** 1 : 2,311,162

Mouse position: Meters

1956 Aerial Imagery: geo-referencing


Coastal Habitat Mapping of the Falkland Islands SAERI Darwin Initiative projects

Coastal Habitat Mapping of the Falkland Islands

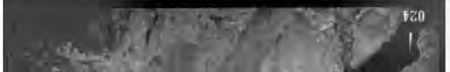
Close

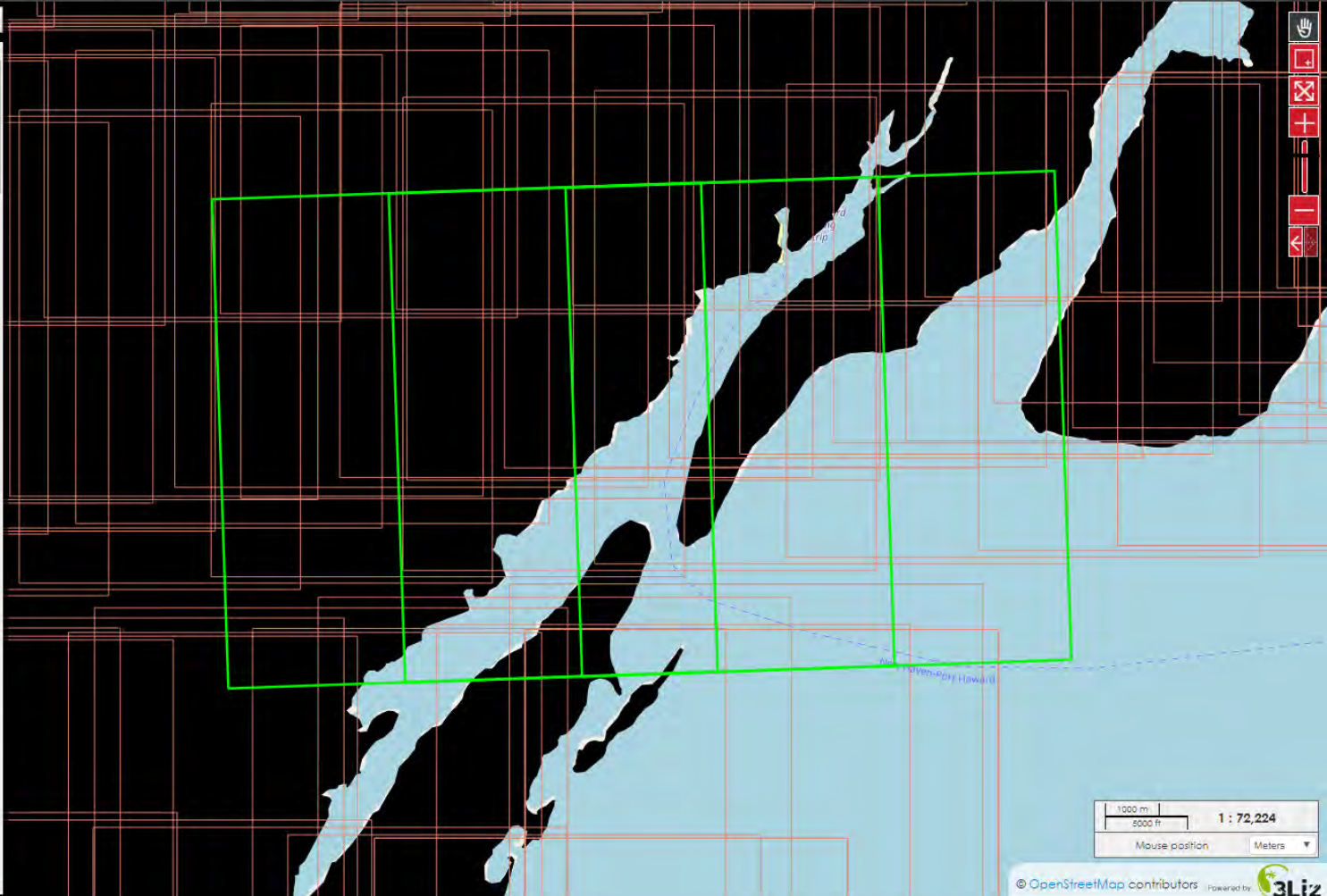
PopUp

All 1956 aerial images

Field	Value
name	F_I_15_0023
present	1
photos	
georef_photos	https://data.saeri.org/geo_photos/F_I_15_0023.tif
status	georeferenced

All 1956 aerial images

Field	Value
name	F_I_15_0024
present	1
photos	

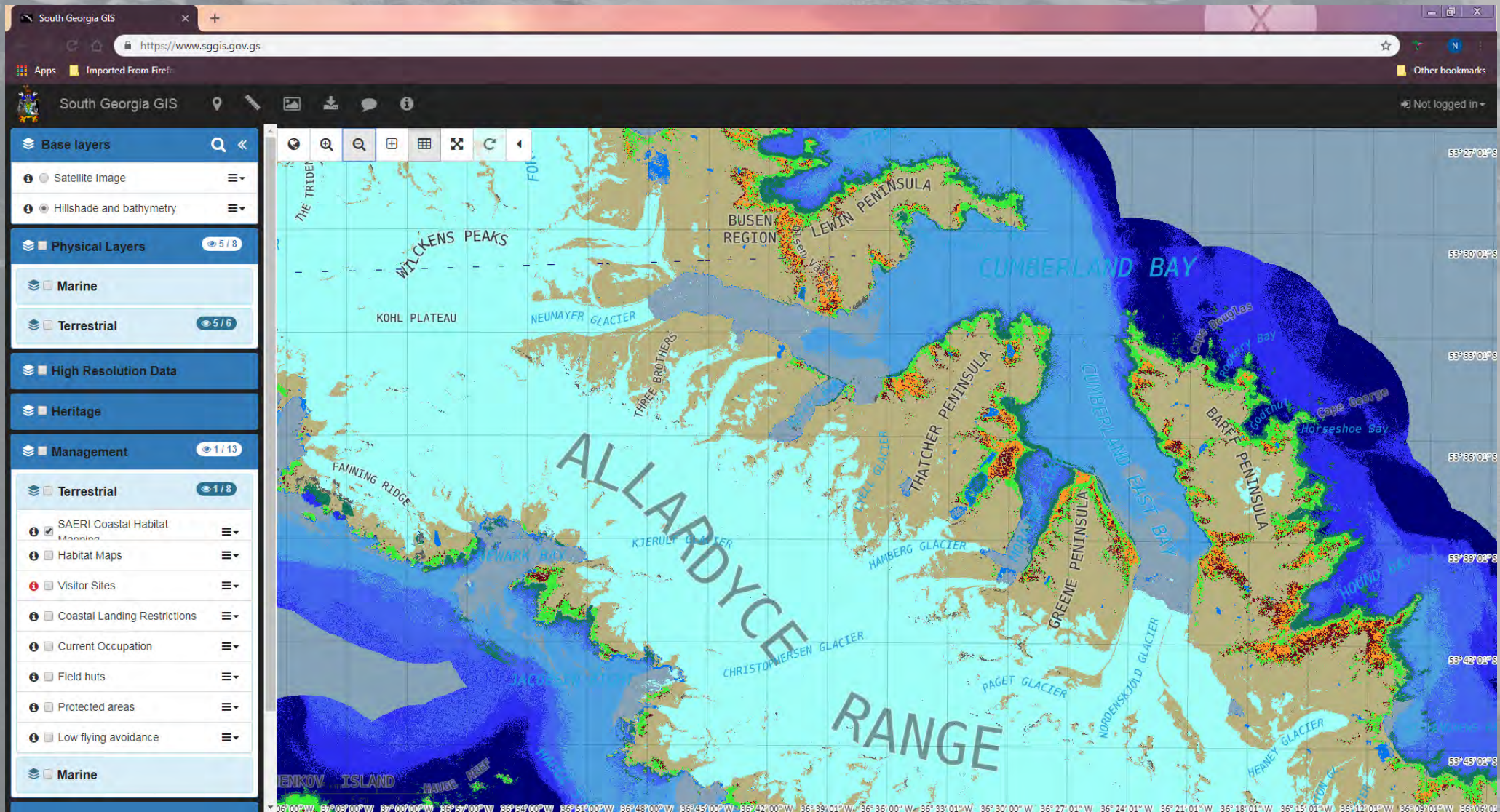


1000 m
5000 ft
1 : 72,224
Mouse position Meters
© OpenStreetMap contributors Powered by 3Liz

Broad-scale habitat mapping

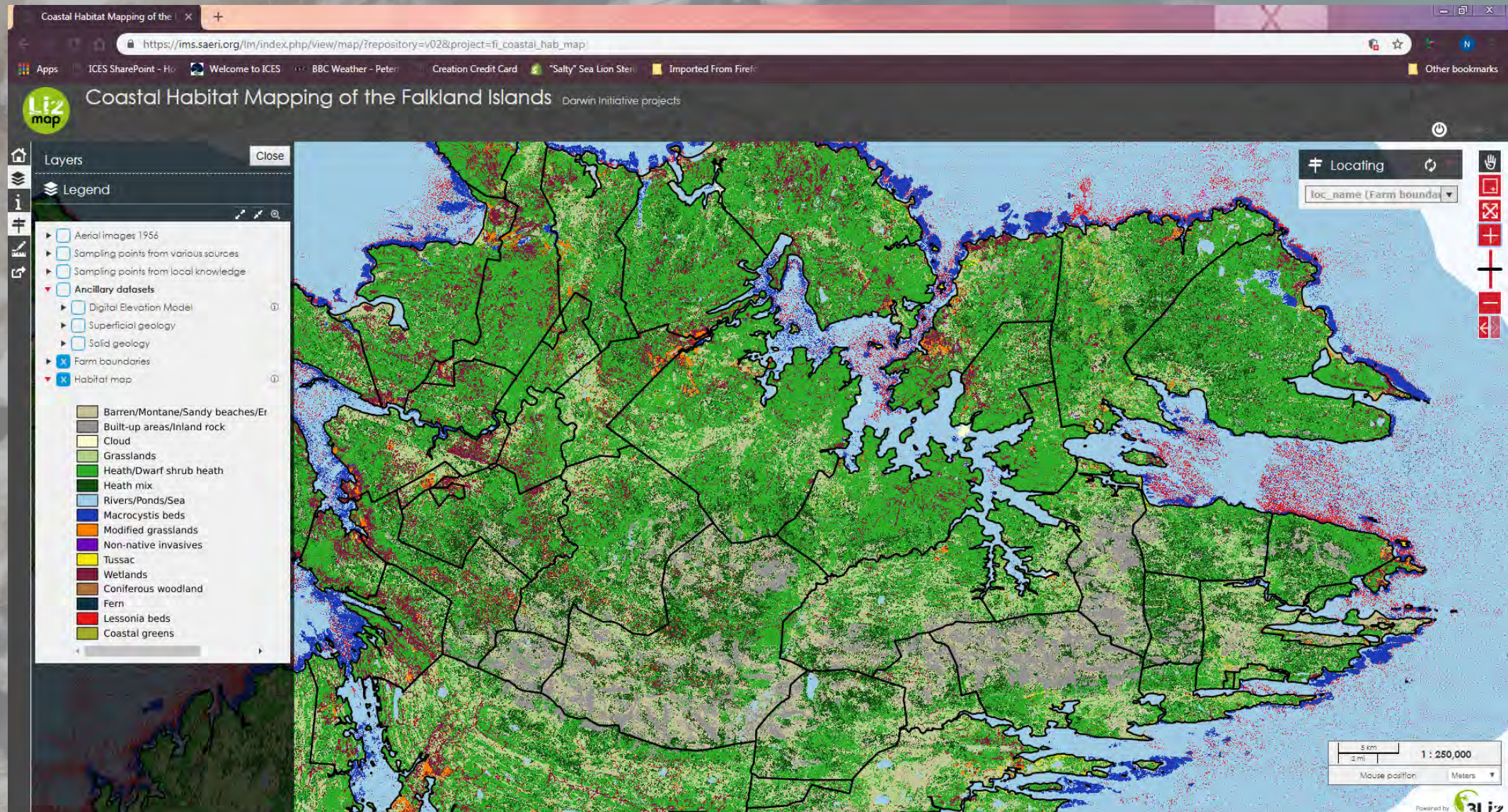
- Utilises Google Earth Engine random forest model
 - Extensive satellite imagery library “in the cloud”
 - Models can be re-run with new imagery in 5/10 years time – monitoring potential
- Software trained to classify “free to access” satellite data (10m resolution) using ground validation data.
- South Georgia broad-scale maps delivered July ‘18
- Falklands broad-scale maps delivered October 2018
- Plan to refine these maps in 2019 following data collection phase
- Confusion matrix indicates the confidence in modelling different habitat types.

South Georgia broad-scale habitat map



<https://www.sggis.gov.gs/>

Falkland Islands broad-scale map



<https://ims.saeri.org/lm/index.php/view/>

Stakeholder fine-scale prioritisation workshops



- Two successful workshops held
- Reports published on project website
- Clear steer provided on fine-scale mapping priorities

Stakeholder fine-scale prioritisation workshops



South Georgia fine-scale mapping priorities

Priority locations for fine scale coastal habitat mapping, based on WorldView (~2m resolution) imagery (in no particular order):

- 1. Baseline habitat mapping for hikes, such as the Shackleton Walk, Gold Harbour (Head), Godthul to Sandebugten Walk, Maiviken Walk, Ocean Harbour Walk, Rookery Point Walk & Stromness to Leith Walk.*
- 2. Baseline habitat mapping of Grytviken, Jason Harbour, Stromness & Fortuna Bay, for integration into Site Visitor Management Plans.*
- 3. Potential continuation of Barff/Busen/Thatcher vegetation change studies - post eradication*
- 4. Prion Island / Annenkov / Albatross (using WorldView imagery) – Albatross counts - timing is essential here when looking at breeding bird numbers.*

Priority locations for fine scale coastal habitat mapping, based on drone (~2cm resolution) imagery (in no particular order):

- 1. Collection of drone imagery inside/outside reindeer exclusion enclosures, potentially using RedEdge multispectral camera (2 x Husvik, 1 x Sörling Valley)*
- 2. Acquisition of high resolution aerial imagery from Elsehul*
- ~~*3. Baseline survey of King Edward Point and wharf development area using RTK GPS and ground control points*~~
- 4. Baseline aerial mapping around Grytviken, focussing on invasive species such as sheep's sorrel*
- 5. Baseline aerial mapping around Cape Rosa, Godthul & Prion Island boardwalk system (and adjacent)*

Falkland Islands fine-scale mapping priorities

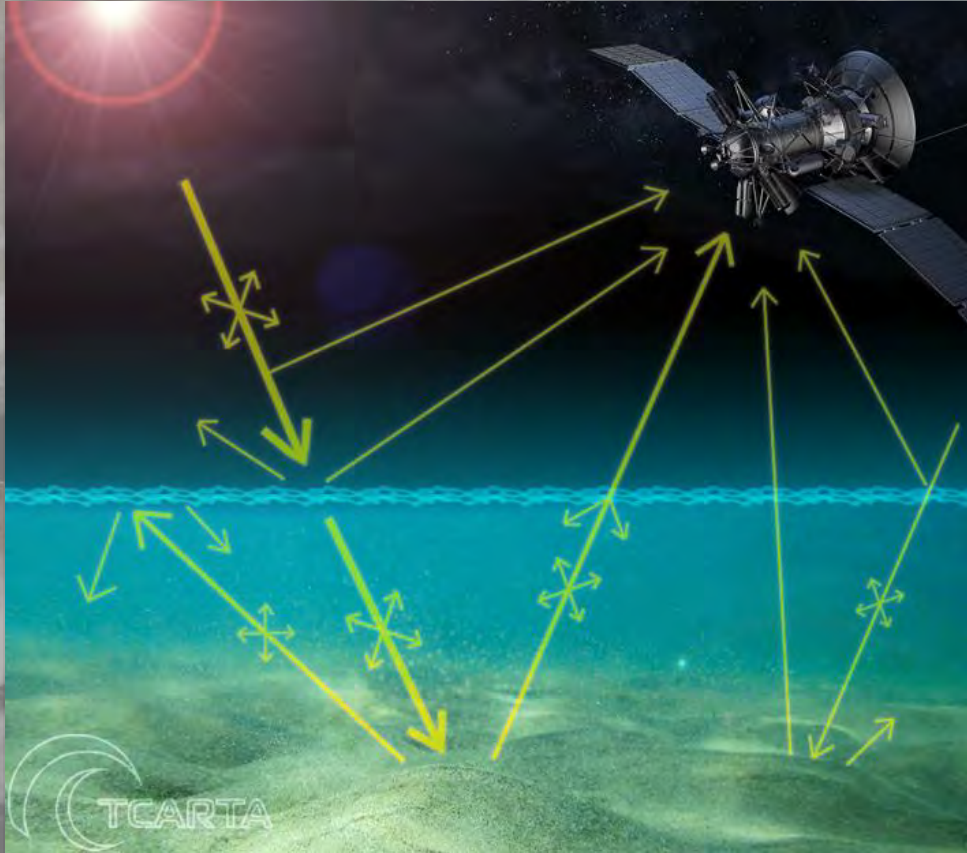
Priority locations for fine-scale coastal habitat mapping, based on WorldView (2m resolution) imagery:

- 1. Stanley Common & Cape Pembroke*
- 2. Mare Harbour (pending confirmation by Project Management Group)*
- 3. Jason Islands*
- 4. Ruggles Bay & /or Johnsons Farm (joint fourth)*

Priority locations for fine-scale coastal habitat mapping, based on drone (2cm resolution) imagery:

- 1. Stanley Common & Cape Pembroke*
- 2. Kidney Island/Tussac Islands*
- 3. Port Sussex (Calafate - invasive species)*

Satellite-derived bathymetry - Falklands



- For each given pixel, there is a statistical relationship between the amount and type of energy detected, and depth of water at that pixel location
- Proof of concept for Falklands
- Delivery due at end Feb '19

Data gathering: Ground validation & drone imagery

- Baseline datasets ahead of demining activity
- Port Sussex – invasive species mapping (calafate)
- Port Howard Nature Area – Falklands Conservation
- Other areas:
 - Newhaven
 - Walker Creek
 - Gypsy Cove
 - Hadassa Bay

Data gathering: Ground validation & drone imagery

- York Bay minefields
- Collaboration with SafeLane Global



Penguin News, February 15, 2019
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Using drones to create fine scale models of minefields

View across York Bay minefield from drone (SAERI)

Top: an ortho-mosaic (many hundred images merged together) of York Bay minefield (you can spot the blue SAERI vehicle at the bottom). Below: A digital terrain model created with the help of SafeLane Global for the same area as the image above. (SAERI)

One of the drones being used to map Stanley's minefields: (SAERI)

Project Manager at the South Atlantic Environmental Research Institute (SAERI), has been out to York Bay and the surrounding area with SafeLane Global partners, capturing imagery with drones to create state of the art maps of these minefields.

Neil realised there was an opportunity to create a better product with wider utility through collaborating with the UK Government Falkland Islands Demining Programme, led by Guy Marquet of Felix Insight, and SafeLane Global who undertake the clearance work.

As part of this collaboration, SafeLane Global deployed markers (known as Ground Control Points) actually within the minefields and then took their positions and heights using specialist survey equipment.

Neil then used this information during the processing of the drone imagery to create highly accurate digital terrain models of the minefields. The models are a useful addition to the work already undertaken by SafeLane as part of the demining process.

The Coastal Habitat Mapping project is currently working to feed this high resolution drone imagery into a habitat modelling process in order to develop fine-scale habitat maps for the coastal margins of the Falkland Islands. These fine-scale habitat models/maps are scheduled for completion by the end of June 2019.

Neil said: "Being able to work with the Falklands Demining Programme, and the project is great for the support Dave Clark and the SafeLane Global survey team has been able to provide, not the Public Works Department.

The resulting aerial maps not only provide an excellent baseline project and land has been handed back, but have also hopefully provided SafeLane with valuable additional information for their work." John Hare, Technical Director at SafeLane Global of work provides really good corroborative, and in some cases additional, data and a bench mark field site."

Historically, and to this day, the coastal and inshore marine ecosystems and resources have played an important role in the Falkland Islands, both from a social and economic perspective. Knowledge of these coastal environments is essential for their management, yet comprehensive scale coastal habitat maps are an important baseline from which to measure future change. The DPLUS06 Coastal Habitat Mapping project aims to fill this critical gap in coastal knowledge.

This three-year project, granted by the Darwin Initiative and with a financial contribution made by FIC through the Environmental Studies Budget brings together many organisations.

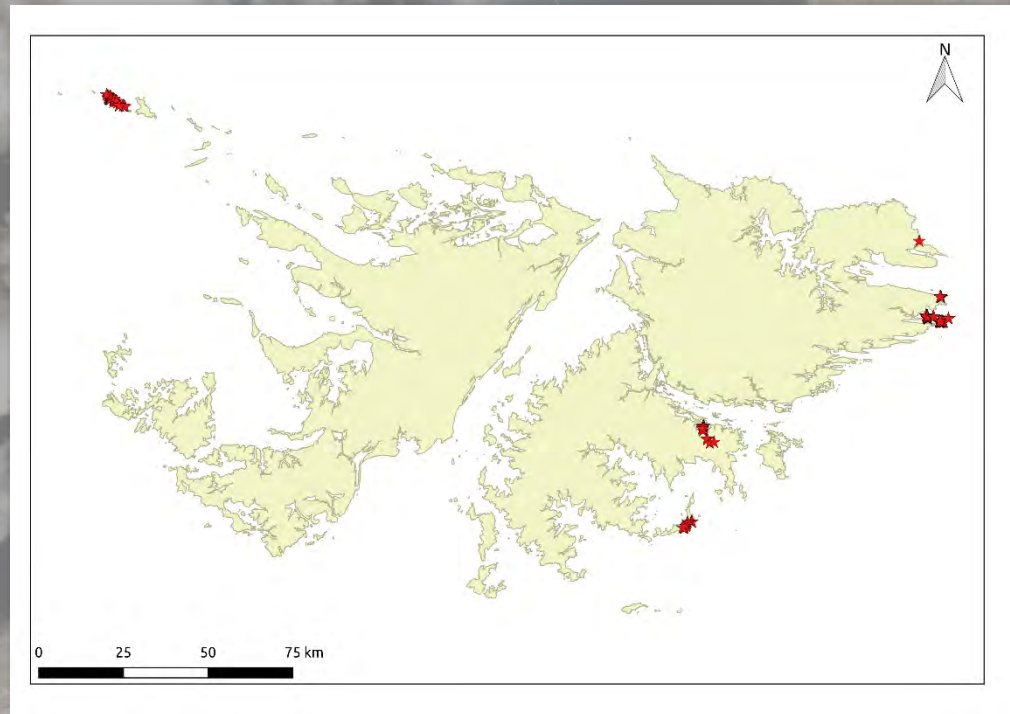
These comprise SAERI, Oregon State University, the Joint Nature Conservation Committee, Shallow Marine Survey Group, Falkland Islands Government and Government of South Georgia & the South Sandwich Islands, representing the leading edge in remote sensing, ecological knowledge and field expertise.

The Coastal Habitat Mapping project is due to conclude in March 2020.

SAERI

Data gathering: Ground validation & drone imagery

- SAERI ground validation smartphone app



A screenshot of a smartphone app interface titled "fi_hab_survey_m...". The app displays a list of habitat types under the heading "habitat information" and "Select one habitat". The list includes:

- Tussac (tus)
- Grassland (gra)
- Dwarf shrub heath (dsh)
- Fern beds (fer)
- Cushion heath (cus)
- Montane-Feldmark
- Bog-wetlands (wet)
- Non-native invasive species (nni)
- Inland water (iwa)
- Rock-eroded-bare - mineral (min)
- Eroded-bare ground - organic (org)
- Scrub (scr)
- Woodland coniferous (woo)
- Built-up areas (bua)
- Littoral sediment (lsd)
- Littoral rock (lro)
- Sand dunes (san)
- No habitat

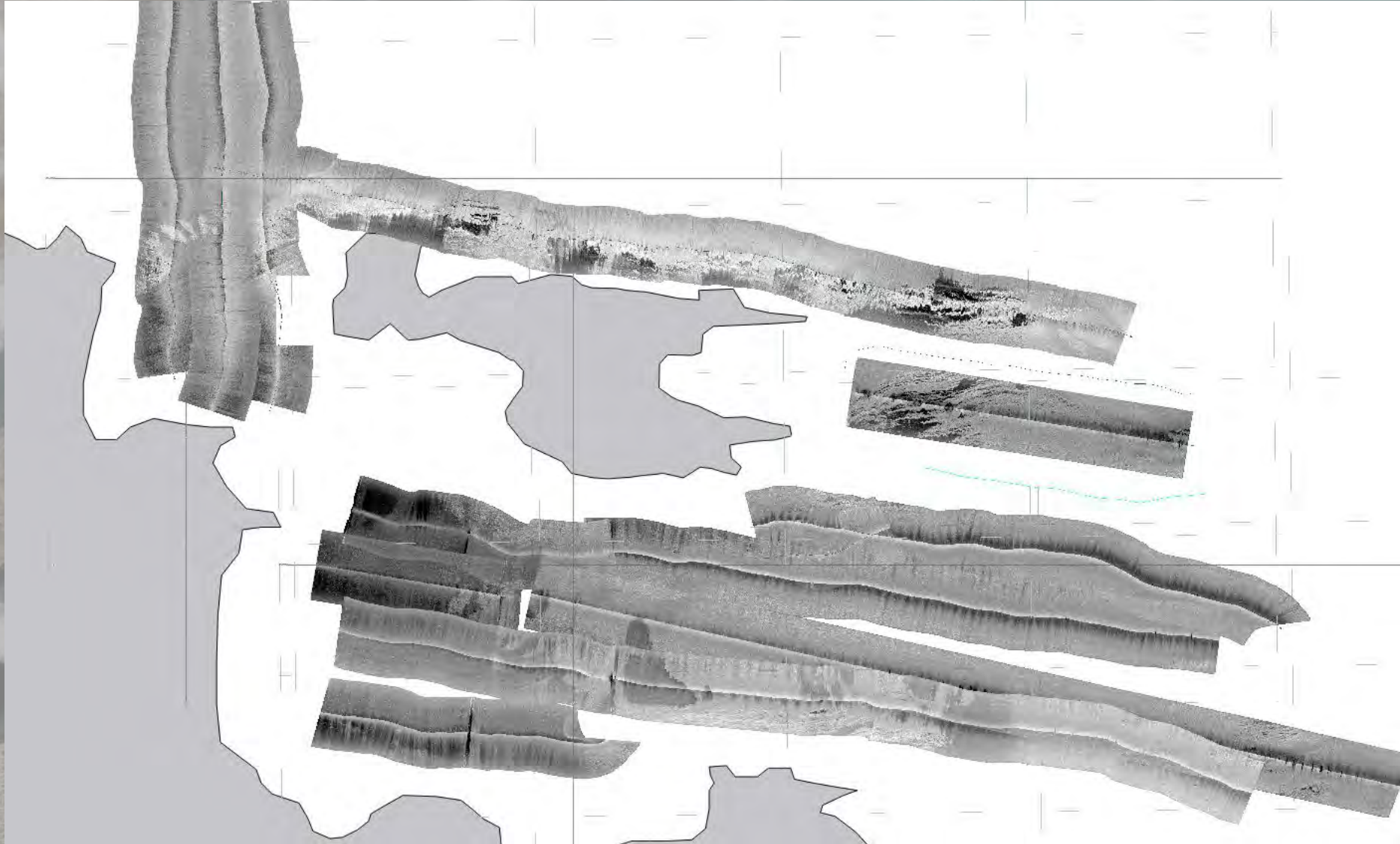
The screenshot also shows the time 08:39, a battery level of 93%, and standard Android navigation icons at the bottom.

Data gathering: Ground validation & drone imagery

- Port Sussex - calafate



Data gathering: Ground validation & drone imagery



Looking ahead: Fieldwork in 2019

- Tackling South Georgia priorities – Feb/March 2019
- Ground validation & collection of drone imagery



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- Working alongside SGHT 19th C archaeological sealing expedition
- Based on Hans Hansson visiting various locations around SG



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Satellite images courtesy of Digital Globe Foundation

Looking ahead: Fieldwork in 2019

- Further sublittoral data collection – Falklands
 - Drop camera work
 - Additional sidescan sonar data collection
- Further mapping work at Port Sussex – calafate
- Collection of ground validation data at other priority locations

Looking ahead

- Fine-scale models/maps delivery – end June ‘19
- Training workshop scheduled for July 2019
 - Aimed at Government, institutions and other interested stakeholders
 - Transfer knowledge & skills to update the broad-scale models into the future
- End of project “workshop” – Nov ‘19
- Project ends Dec ‘19

An aerial photograph of a turquoise bay. The water is a vibrant, clear greenish-blue. A white motorboat is positioned in the lower-left quadrant of the bay. A small, dark figure, likely a person, is visible swimming in the water towards the upper-right. The bay is bordered by dark, rocky shorelines with patches of brown seaweed or algae. The overall scene is bright and clear, suggesting a sunny day.

Questions...

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