Western Cape Government

Agriculture

BETTER TOGETHER.

CAPE FARM MAPPER - an integrated spatial portal

Skukuza **Dr Mike Wallace** June 2017

Overview of GIS applications in WCDoA

- Spatial information and technology has become indispensable across a wide range of spheres and applications in agriculture & rural development
- General GIS Applications in Agriculture
  - GIS infrastructure and internal user base support
  - Mapping of agricultural footprint and land use
  - Farm and regional planning support
  - Crop and vegetation monitoring
  - Drought monitoring and analysis
  - Crop Suitability/Agronomic/Resource modelling
  - Land Reform & development planning

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Background & Requirements leading to CapeFarmMapper

There was a need for an integrated GIS portal that was:

- Easily usable by non-experts
- Able to consume 3rd party Web Services
- Preferably fully "open" – no login!!
- Useful to our own officials & management
- Useful to our planning partners in biodiversity & other multi-agency projects
- Able to produce simple maps to reduce the *ad-hoc* load on our technicians
- Integrated with internal project management systems (AIMS)
- Responsive and dynamic in terms of development, i.e. in-house!
- "Lightweight" in terms of architecture

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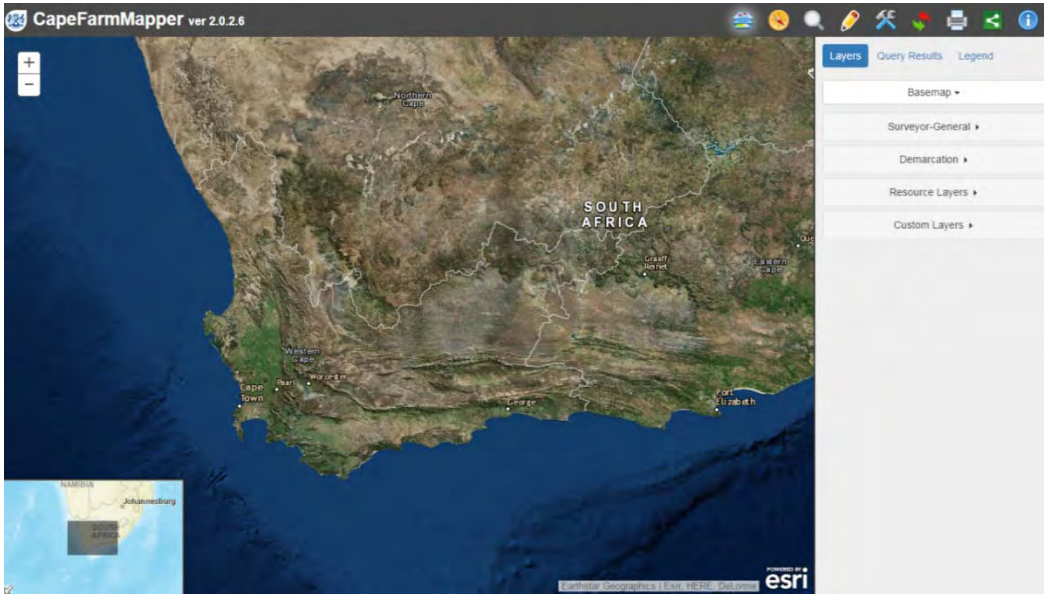
MAGIC – Integrated UK rural planning portal (DEFRA, et al)



(One of the early inspirations for developing CFM)

CapeFarmMapper – born in Dec 2011 and still evolving…

- CapeFarmMapper is a Web Mapping Application
  - Developed and maintained in-house by the Western Cape Department of Agriculture
  - Initially built in Open Layers, until we deployed ArcGIS Server on site in 2012/3.
- Access to data in our
  - Spatial database or via
  - Web services
- View, query, search and create spatial data
- Access many spatial data layers



- URL: **https://gis.elsenburg.com/apps/cfm**

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Technology used

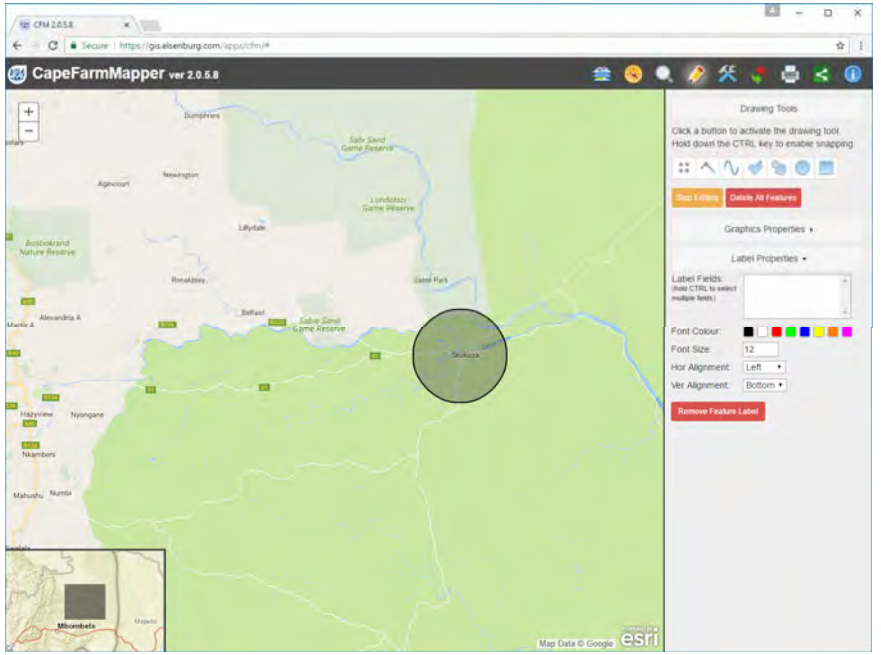
- ESRI – ArcGIS Server implemented through provincial enterprise licence
- HTML5
- ESRI JavaScript API (Ver3)
- Interface created with JQuery & Bootstrap
- Elements of ESRI's Web App Builder



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CapeFarmMapper: Features

- Map navigation
- Bing, Google, NGI, SPOT and other base maps
- Surveyor-General Cadastre search
- Surveyor-General scanned diagrams search and download
- Layer view, overlay and query
- Feature drawing tools
- Limited geoprocessing tools
- Data import and export (KML/GPX)
- Map export & print
- Map scene share



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CapeFarmMapper: Datasets

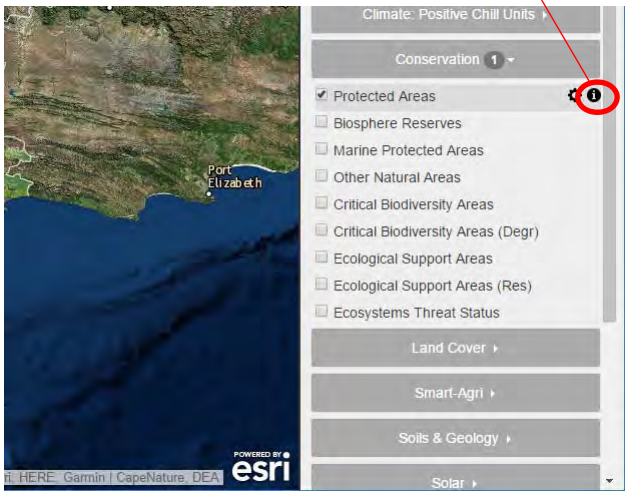
- Surveyor-General cadastre boundaries
- Administrative demarcation boundaries
- Agricultural commodities (crops, infrastructure)*
- Agricultural potential
  - Dryland potential, cultivated land use, grazing capacity, etc.
- Broad soil descriptions
- Long-term climate parameters (SA Atlas of Climatology and Agrohydrology, RE Schulze)
- Conservation (Cape Nature/SANBI)
- Solar Energy
- Vegetation
- Water Resources
- Other

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Data Sources

- Spatial data layers are integrated from various sources and accredited accordingly:
  - Department of Agriculture Forestry and Fisheries
  - Department of Rural Development and Land Reform
    - Chief Surveyor-General
    - Chief Directorate: National Geo-spatial Information
  - Department of Environmental Affairs
  - Department of Water Affairs
  - Municipal Demarcation Board
  - Agricultural Research Council
  - Cape Nature
  - Council for Scientific and Industrial Research (CSIR)
  - South Africa National Botanical Institute (SANBI)
  - South Africa National Energy Development Institute (SANEDI)
  - University of KwaZulu-Natal
  - University of Stellenbosch
  - Water Research Commission
  - Western Cape Department of Agriculture

Data source & brief metadata



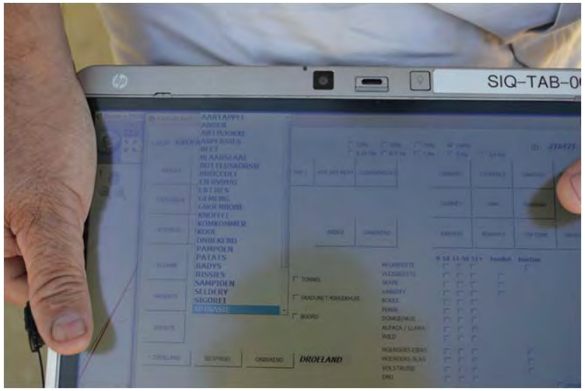
*“Flyover” Data 1

- One of the key data sets for Agriculture is Land Use. Previously this had to be derived from Landsat-based Land Cover data classes but much greater detail was required.
- In 2013 we undertook a detailed mapping (SPOT 5) and aerial survey mission (summer & winter) to accurately map all agricultural commodities and infrastructure.









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“Flyover” Data 2

- The data is currently being updated and refined – available 2018
- SPOT 5/6 Mosaic (SA Govt) time series seems to have been discontinued…





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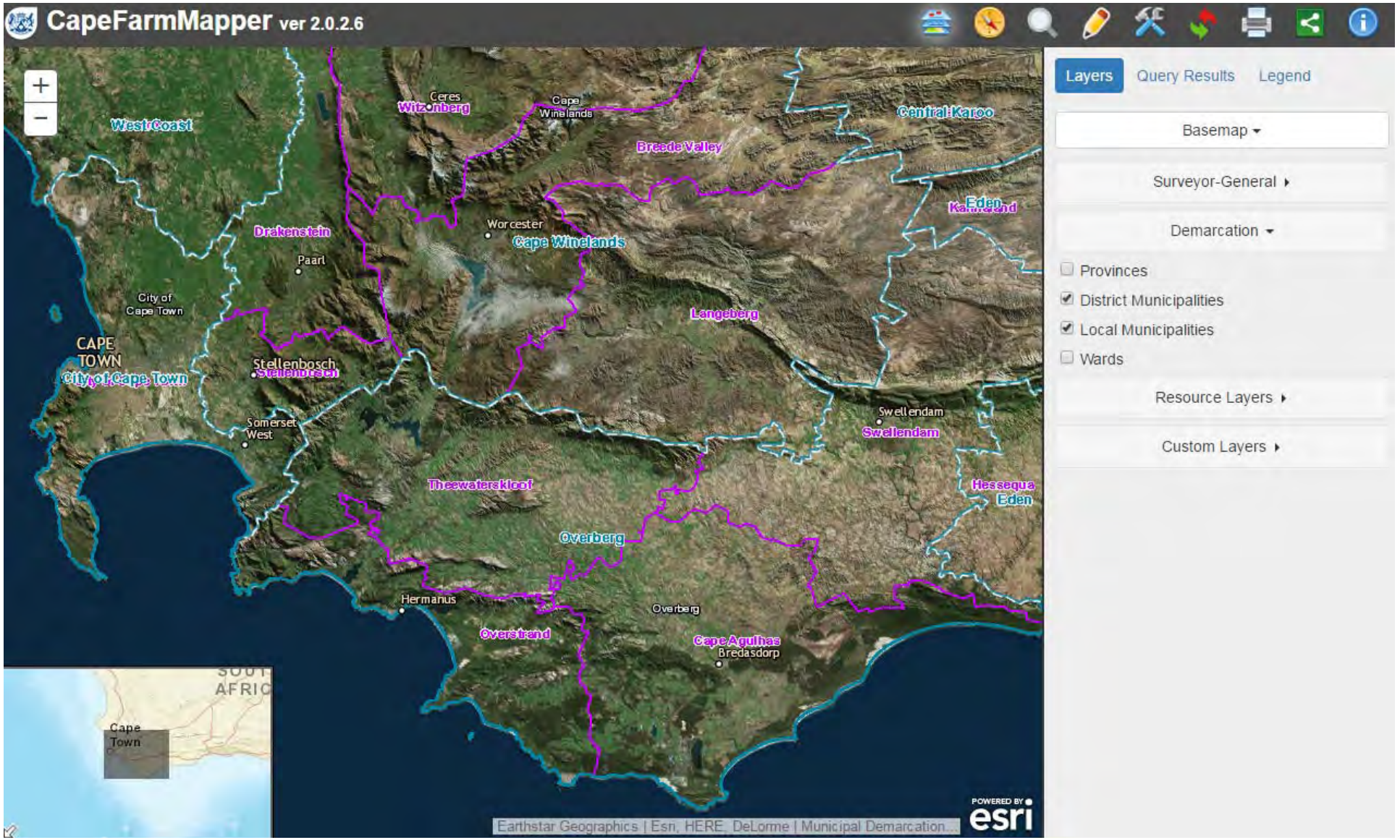
Online Access

- Direct link:
  - **https://gis.elsenburg.com/apps/cfm**
- Department of Agriculture Web site
  - **https://www.elsenburg.com/**
  - Agri-Tools menu => CapeFarmMapper

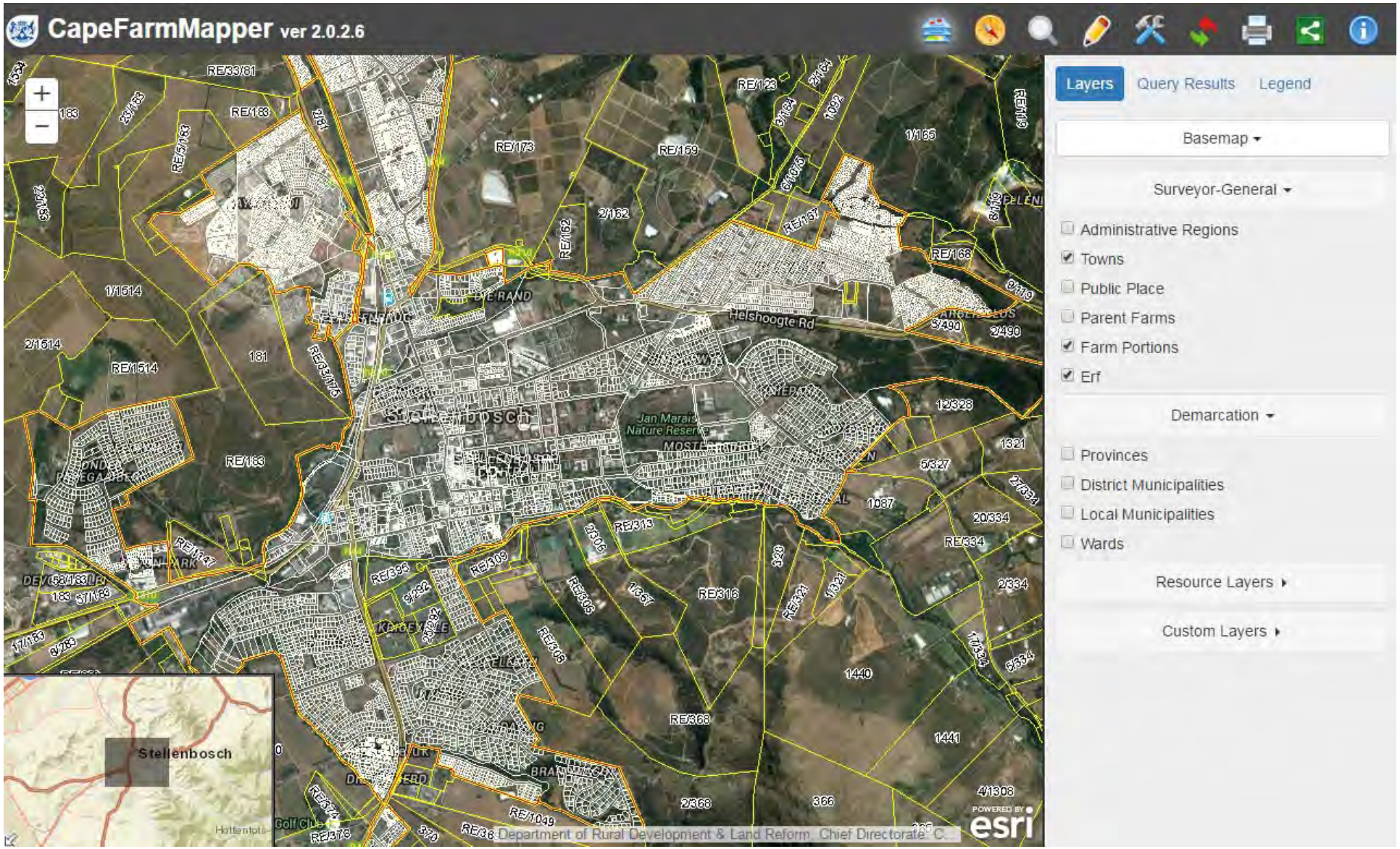
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Screenshots

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Demarcation

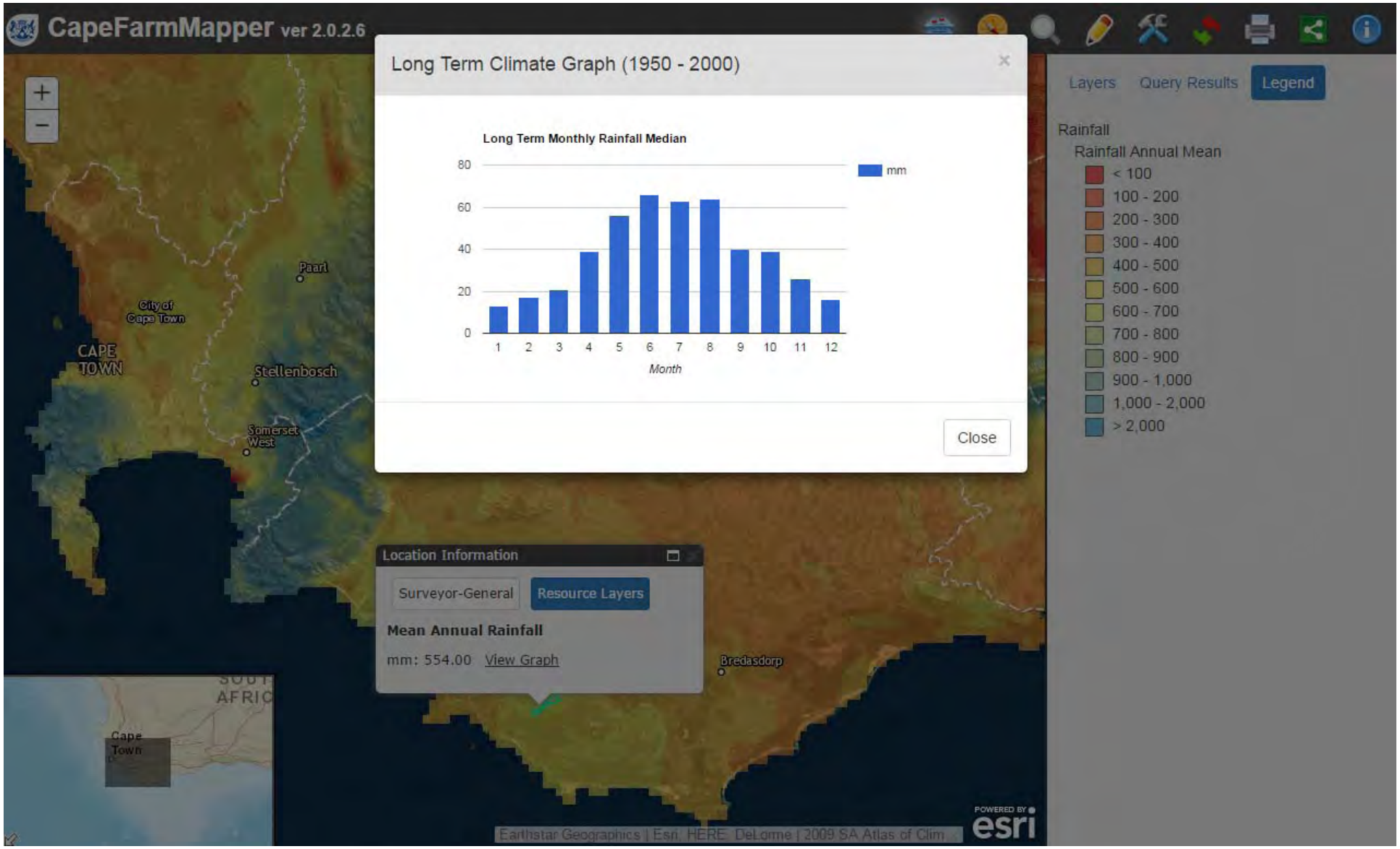


Farm & Erven Boundaries

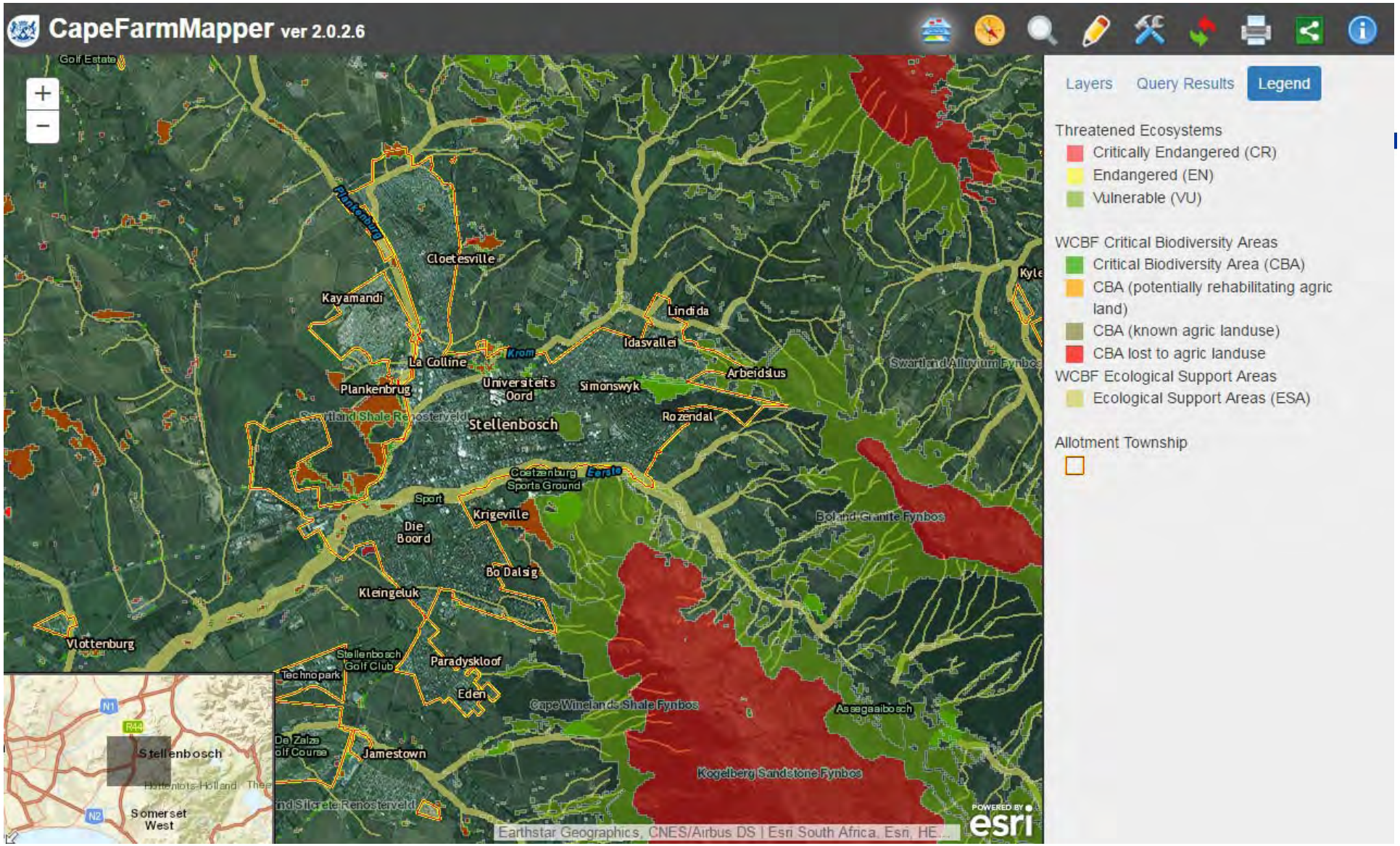
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Land Capability

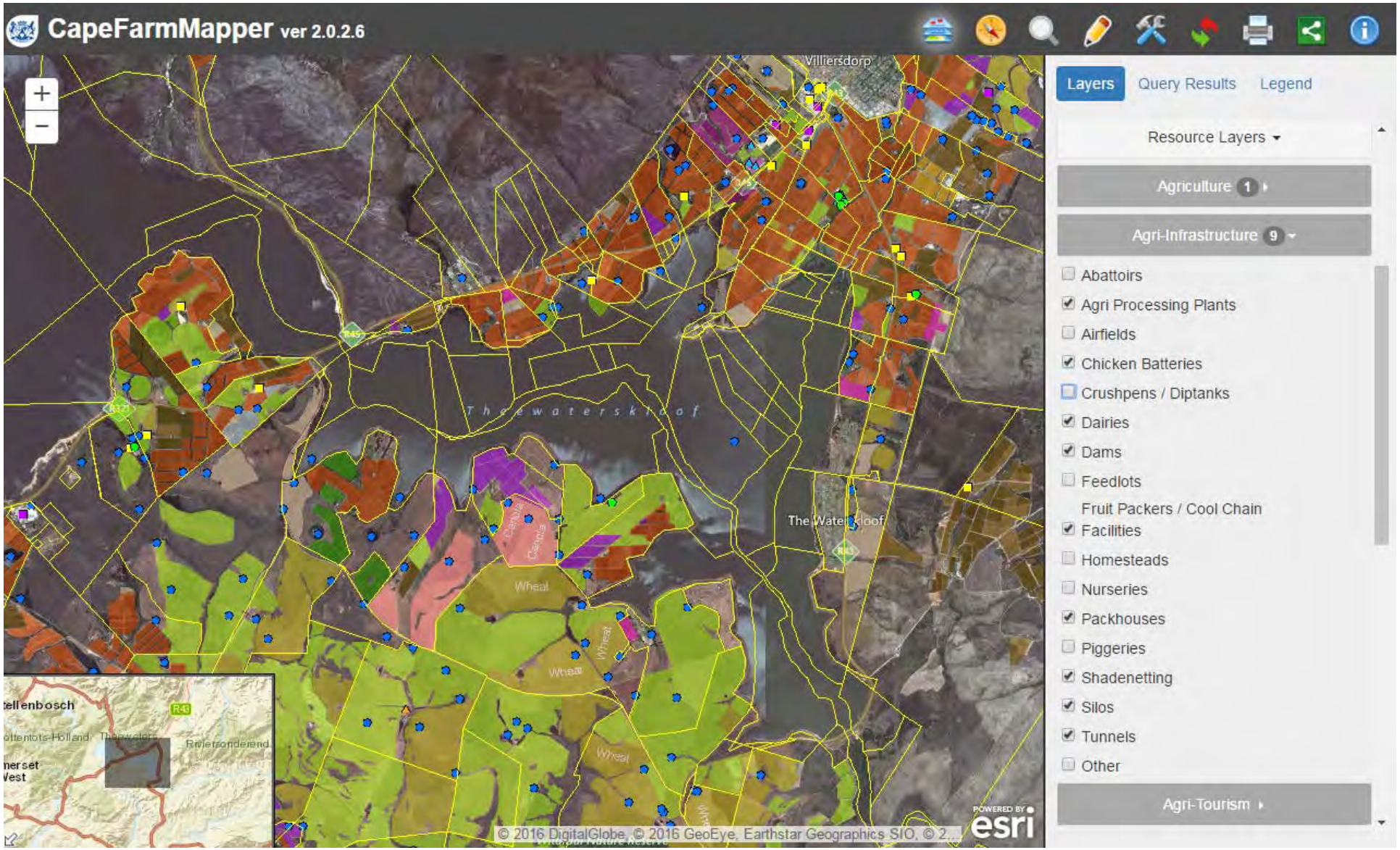


Long Term Climate: Rainfall



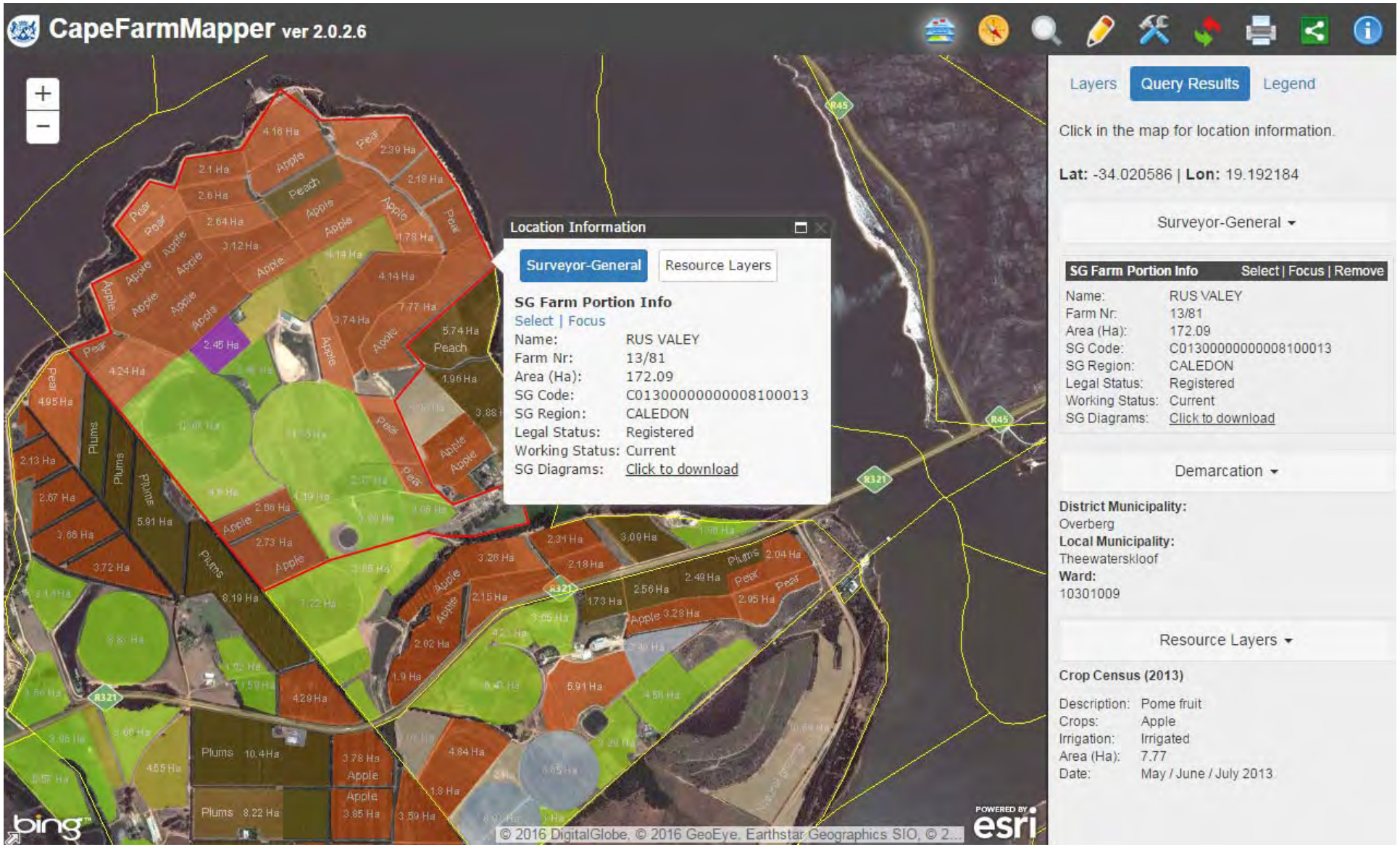
Conservation (Cape Nature)

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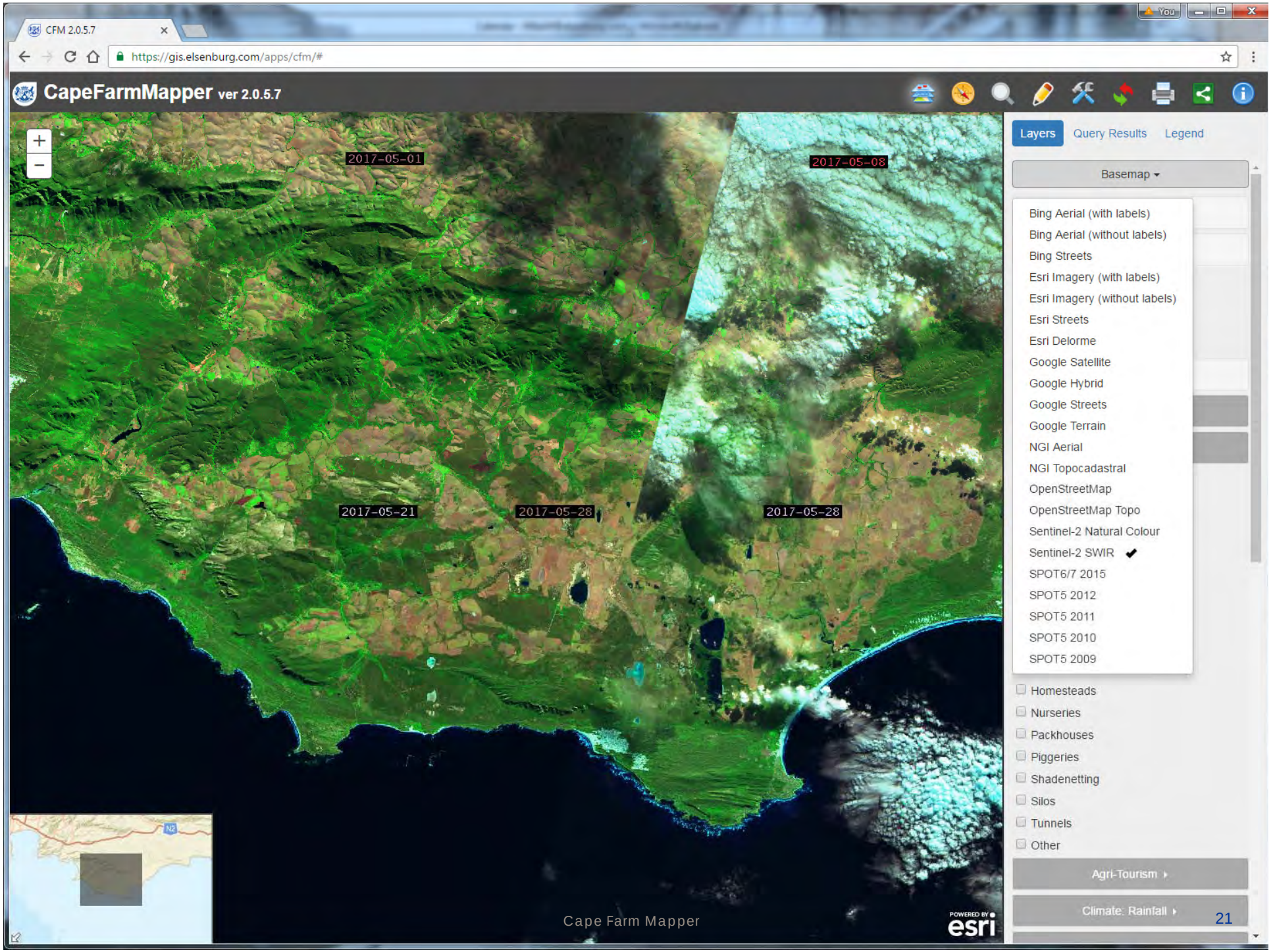
Crops & Infrastructure

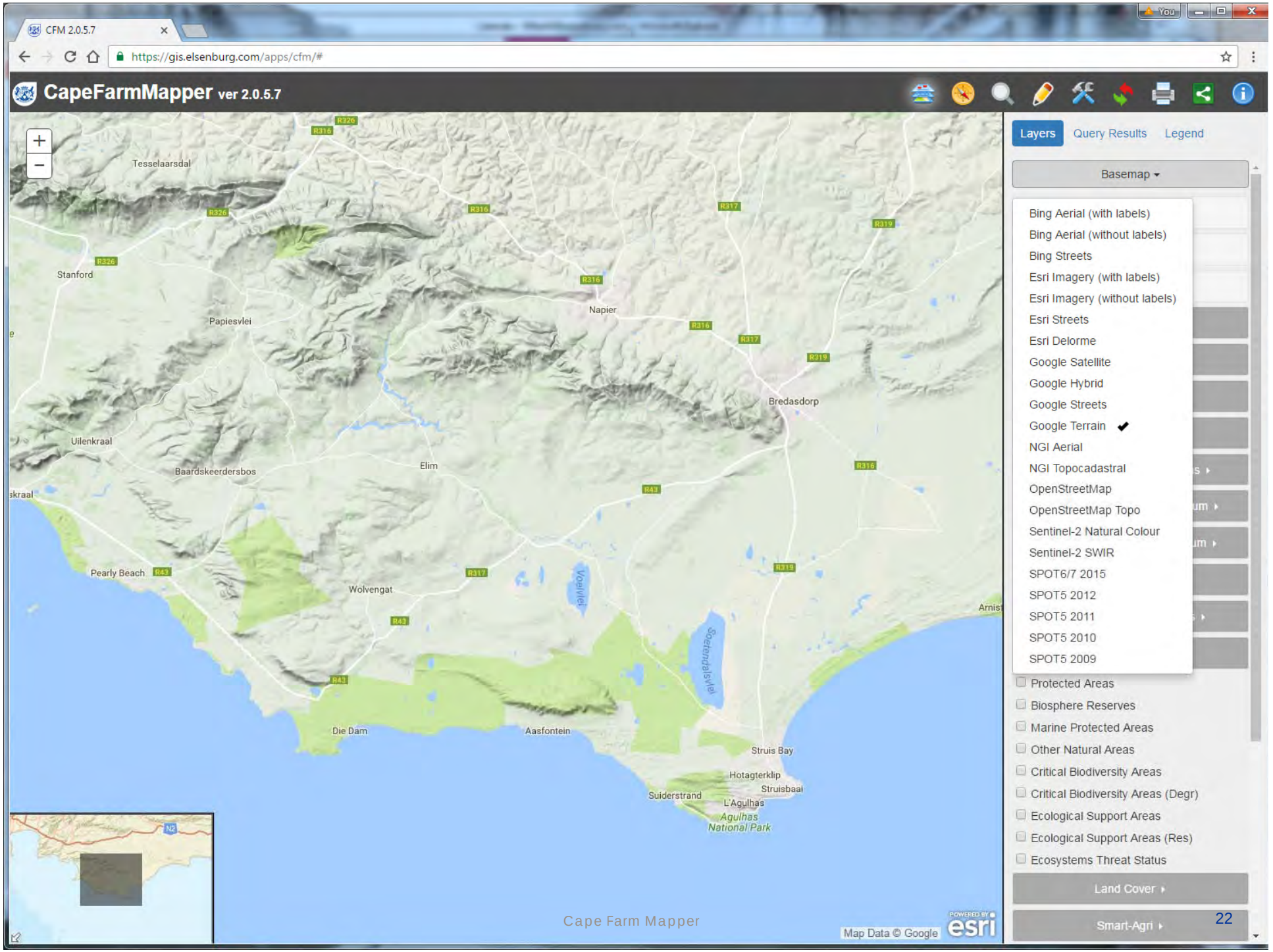
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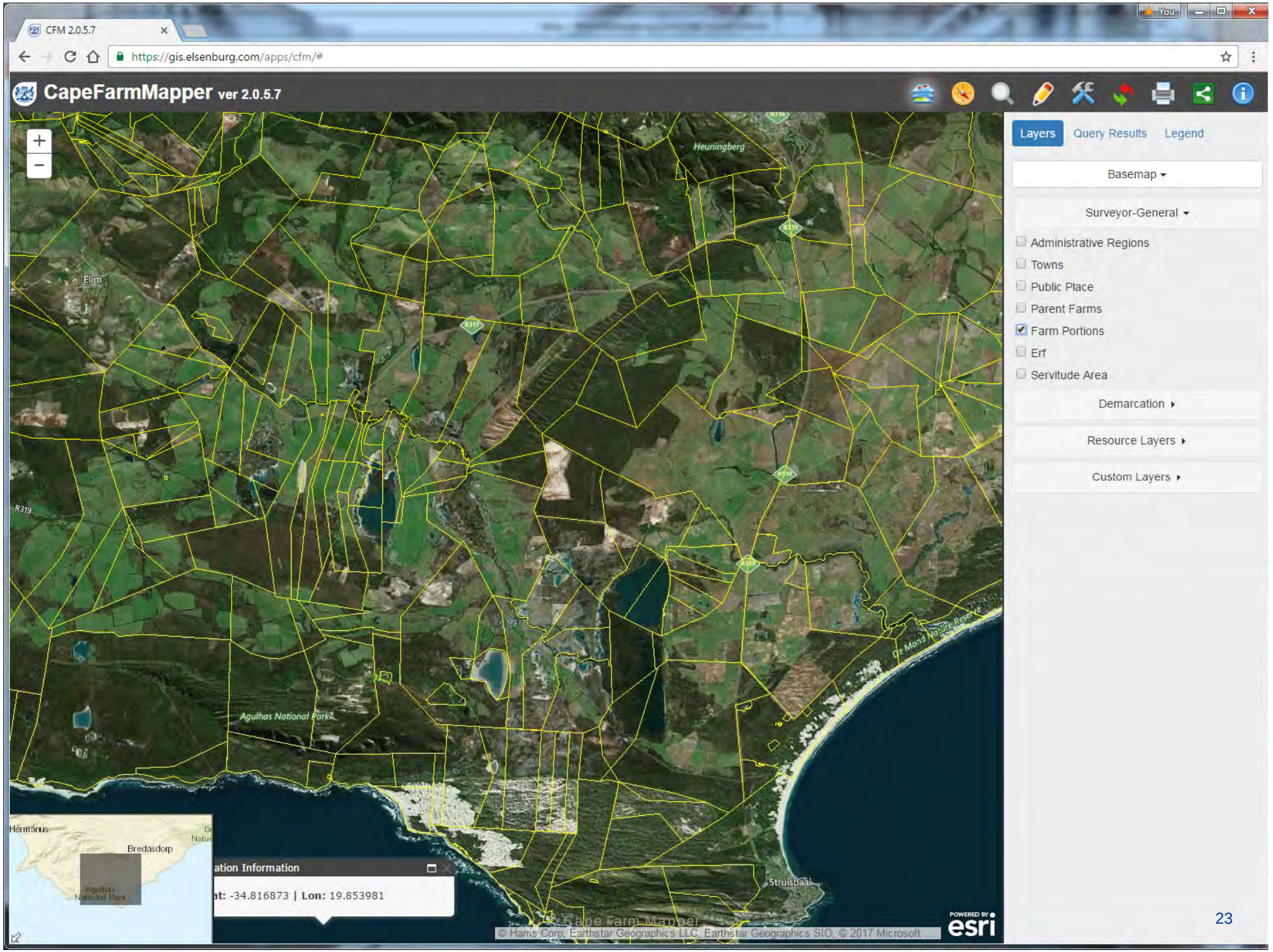


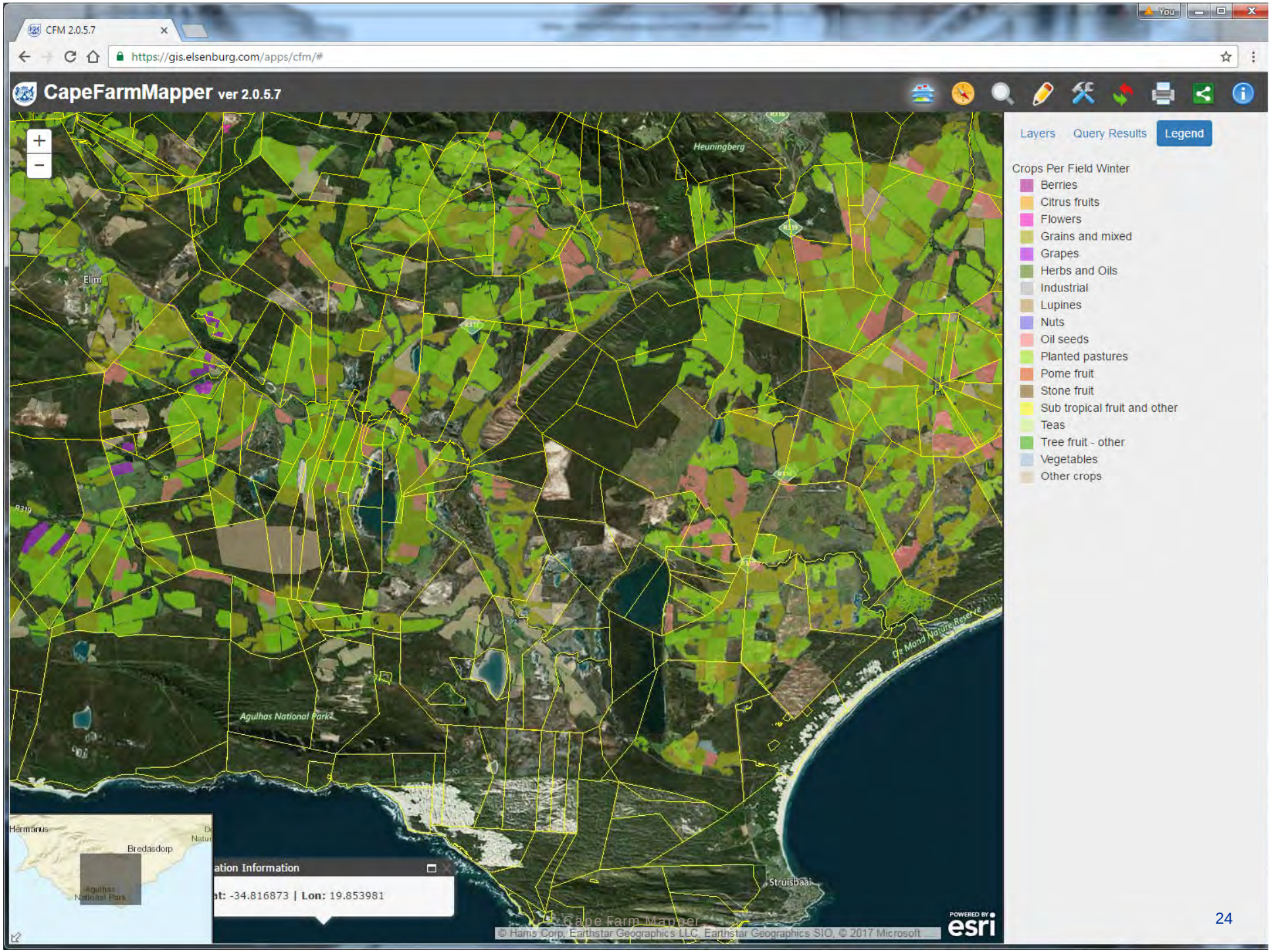
Farm Information

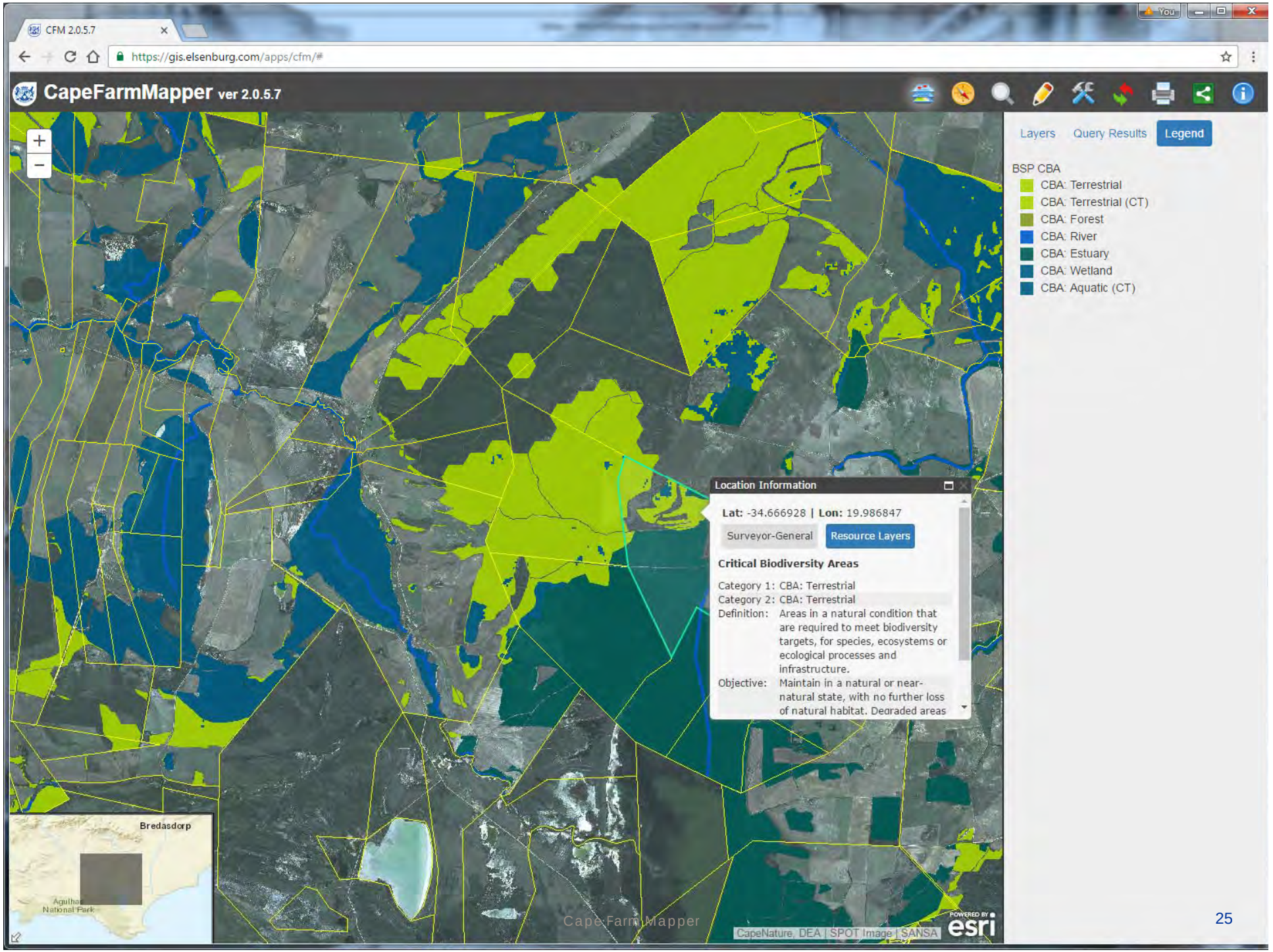
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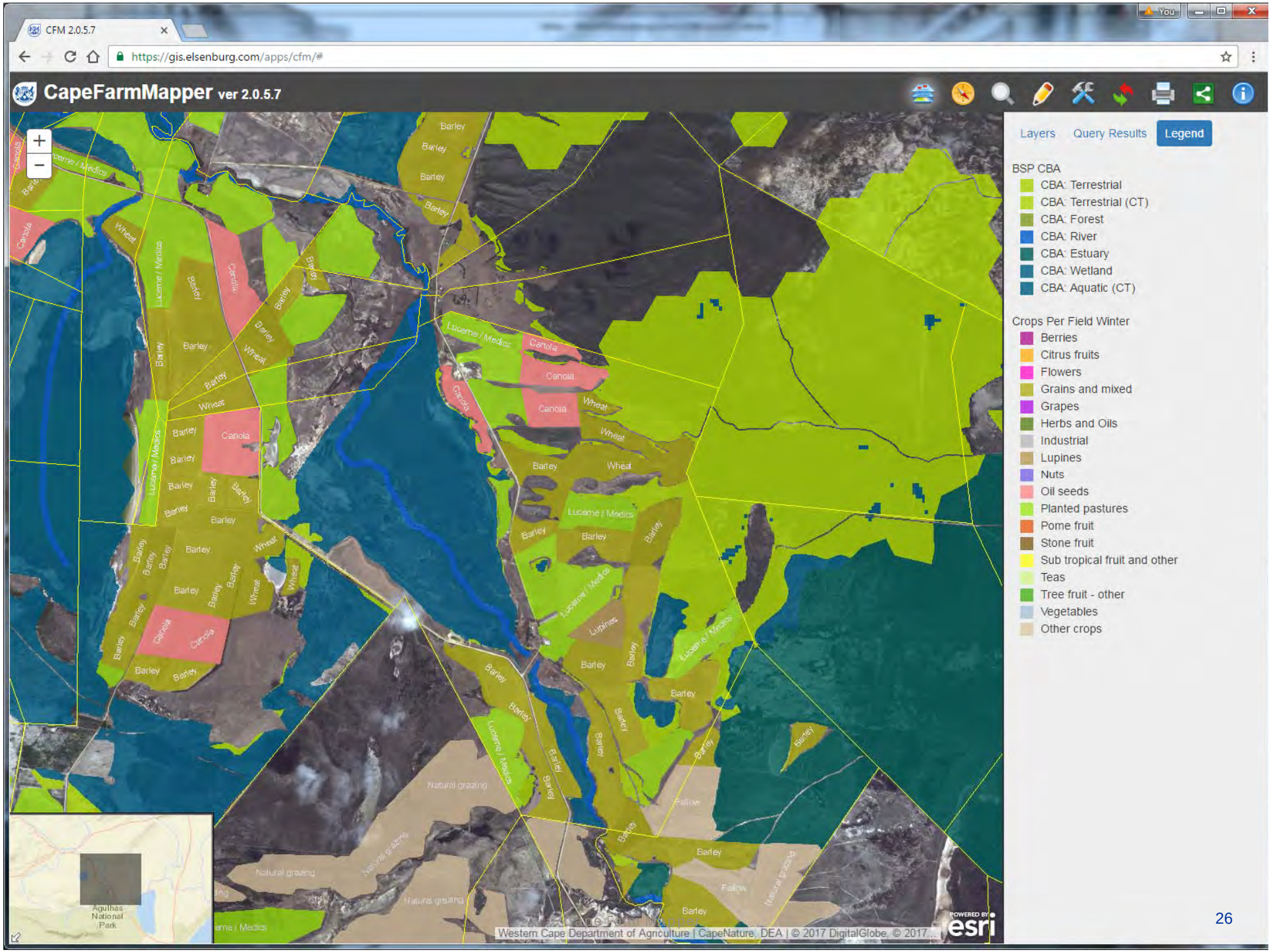

CFM 2.0.5.7
https://gis.elsenburg.com/apps/cfm/#
CapeFarmMapper ver 2.0.5.7
2017-05-01
2017-05-08
2017-05-21
2017-05-28
2017-05-28
Layers
Query Results
Legend
Basemap
Bing Aerial (with labels)
Bing Aerial (without labels)
Bing Streets
Esri Imagery (with labels)
Esri Imagery (without labels)
Esri Streets
Esri Delorme
Google Satellite
Google Hybrid
Google Streets
Google Terrain
NGI Aerial
NGI Topocadastral
OpenStreetMap
OpenStreetMap Topo
Sentinel-2 Natural Colour
Sentinel-2 SWIR
SPOT6/7 2015
SPOT5 2012
SPOT5 2011
SPOT5 2010
SPOT5 2009
Homesteads
Nurseries
Packhouses
Piggeries
Shadenetting
Silos
Tunnels
Other
Agri-Tourism
Climate: Rainfall
Cape Farm Mapper
esri

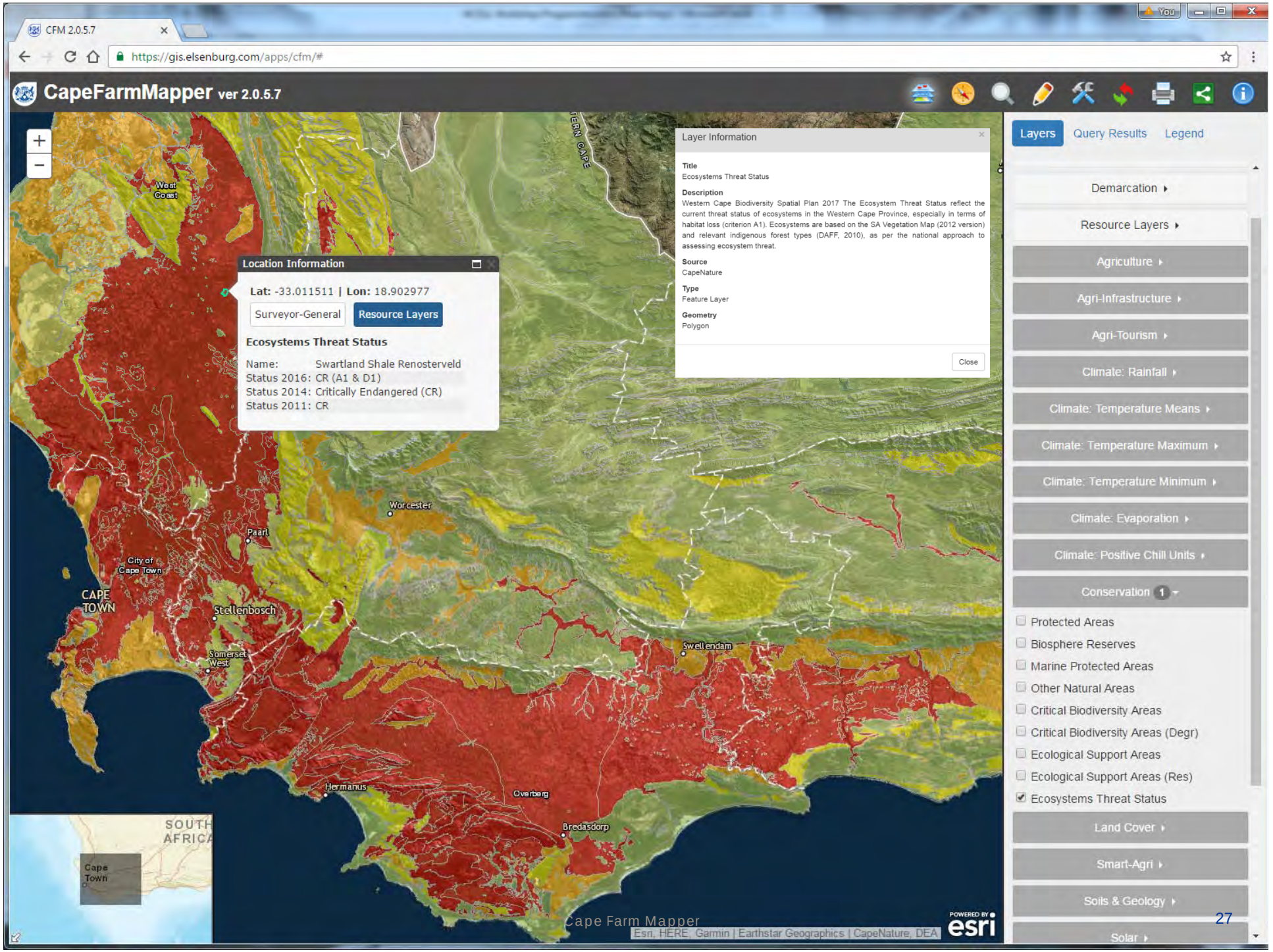

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Google Satellite
Google Hybrid
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Sentinel-2 Natural Colour
Sentinel-2 SWIR
SPOT6/7 2015
SPOT5 2012
SPOT5 2011
SPOT5 2010
SPOT5 2009
Protected Areas
Biosphere Reserves
Marine Protected Areas
Other Natural Areas
Critical Biodiversity Areas
Critical Biodiversity Areas (Degr)
Ecological Support Areas
Ecological Support Areas (Res)
Ecosystems Threat Status
Land Cover
Smart-Agri
Tesselaarsdal
Stanford
Papiesvlei
Napier
Bredasdorp
Uilenkraal
Baardskeerdersbos
Elim
Pearly Beach
Wolvengat
Die Dam
Aasfontein
Struis Bay
Hotagterklip
Struisbaai
Suiderstrand
L'Agulhas
Agulhas National Park
Map Data © Google
esri
Cape Farm Mapper

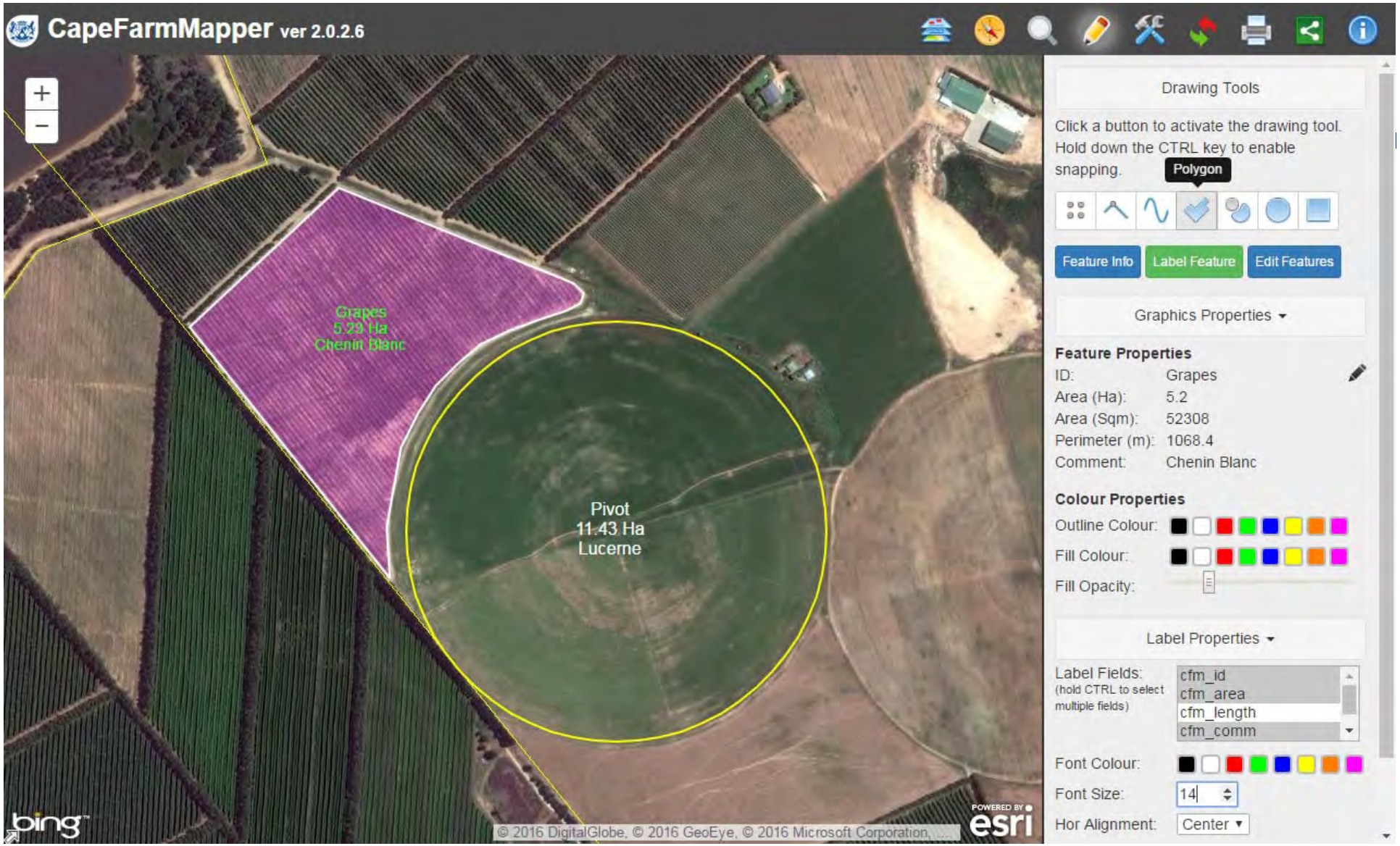

CFM 2.0.5.7
https://gis.elsenburg.com/apps/cfm/#
CapeFarmMapper ver 2.0.5.7
Layers
Query Results
Legend
Basemap
Surveyor-General
Administrative Regions
Towns
Public Place
Parent Farms
Farm Portions
Erf
Servitude Area
Demarcation
Resource Layers
Custom Layers
Heuningberg
Elim
R319
Agulhas National Park
De Mond Nature Reserve
Struisbaai
Hermanus
Bredasdorp
Agulhas National Park
ation Information
at: -34.816873 | Lon: 19.853981
Cape Farm Mapper
© Harris Corp, Earthstar Geographics LLC, Earthstar Geographics SIO, © 2017 Microsoft
POWERED BY esri


CFM 2.0.5.7
https://gis.elsenburg.com/apps/cfm/#
CapeFarmMapper ver 2.0.5.7
Layers
Query Results
Legend
Crops Per Field Winter
Berries
Citrus fruits
Flowers
Grains and mixed
Grapes
Herbs and Oils
Industrial
Lupines
Nuts
Oil seeds
Planted pastures
Pome fruit
Stone fruit
Sub tropical fruit and other
Teas
Tree fruit - other
Vegetables
Other crops
Heuningberg
Elim
Agulhas National Park
De Mond Nature Reserve
Struisbaai
Hermanus
Bredasdorp
ation Information
at: -34.816873 | Lon: 19.853981
Cape Farm Mapper
© Harris Corp, Earthstar Geographics LLC, Earthstar Geographics SIO, © 2017 Microsoft
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CFM 2.0.5.7
https://gis.elsenburg.com/apps/cfm/#
CapeFarmMapper ver 2.0.5.7
Layers
Query Results
Legend
BSP CBA
CBA: Terrestrial
CBA: Terrestrial (CT)
CBA: Forest
CBA: River
CBA: Estuary
CBA: Wetland
CBA: Aquatic (CT)
Location Information
Lat: -34.666928 | Lon: 19.986847
Surveyor-General
Resource Layers
Critical Biodiversity Areas
Category 1: CBA: Terrestrial
Category 2: CBA: Terrestrial
Definition: Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.
Objective: Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas
Bredasdorp
Agulhas National Park
CapeFarmMapper
CapeNature, DEA | SPOT Image | SANSA
esri

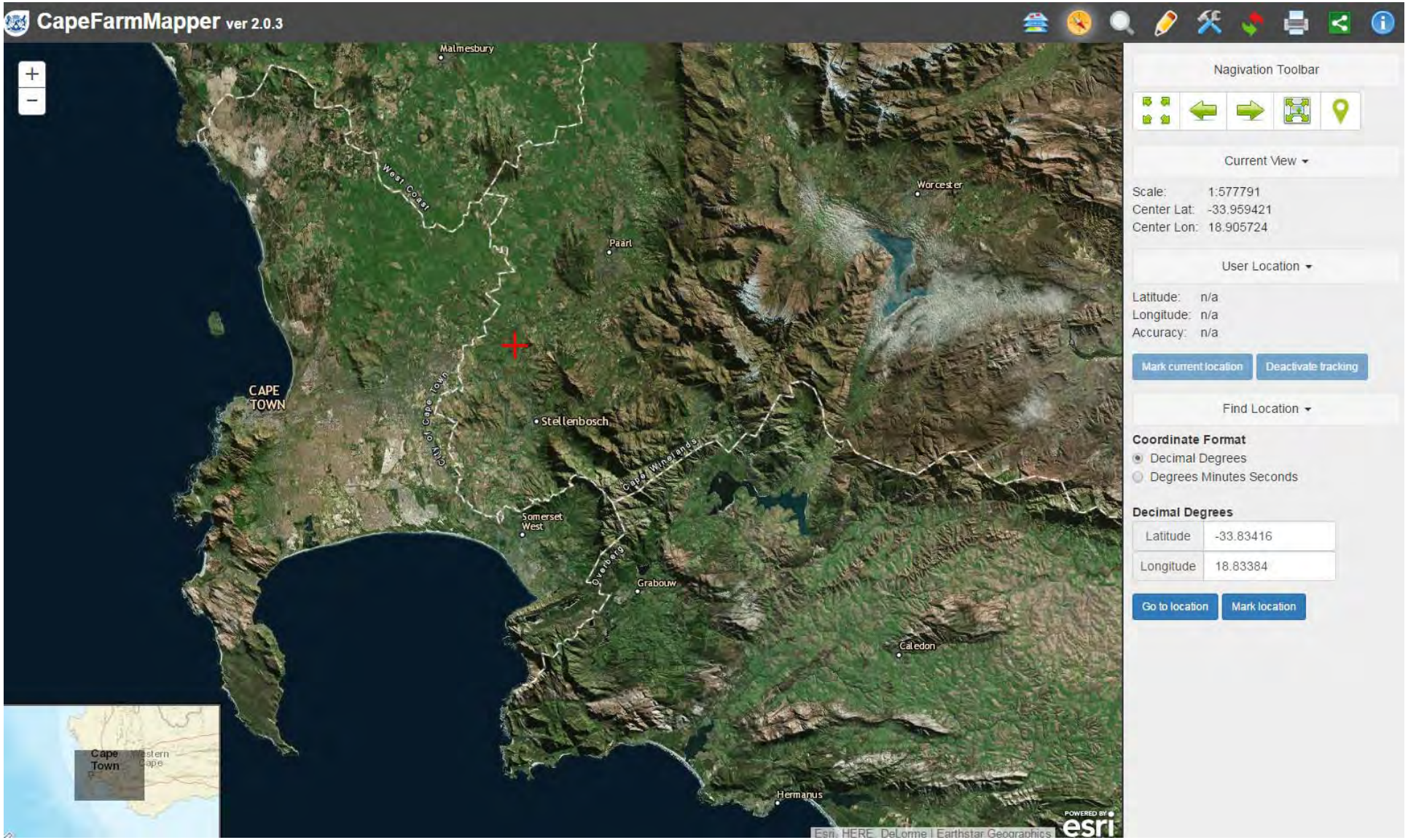

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https://gis.elsenburg.com/apps/cfm/#
CapeFarmMapper ver 2.0.5.7
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Nuts
Oil seeds
Planted pastures
Pome fruit
Stone fruit
Sub tropical fruit and other
Teas
Tree fruit - other
Vegetables
Other crops
Agulhas National Park
Western Cape Department of Agriculture | CapeNature, DEA | © 2017 DigitalGlobe, © 2017...
POWERED BY esri


CFM 2.0.5.7
https://gis.elsenburg.com/apps/cfm/#
CapeFarmMapper ver 2.0.5.7
Location Information
Lat: -33.011511 | Lon: 18.902977
Surveyor-General
Resource Layers
Ecosystems Threat Status
Name: Swartland Shale Renosterveld
Status 2016: CR (A1 & D1)
Status 2014: Critically Endangered (CR)
Status 2011: CR
Layer Information
Title
Ecosystems Threat Status
Description
Western Cape Biodiversity Spatial Plan 2017 The Ecosystem Threat Status reflect the current threat status of ecosystems in the Western Cape Province, especially in terms of habitat loss (criterion A1). Ecosystems are based on the SA Vegetation Map (2012 version) and relevant indigenous forest types (DAFF, 2010), as per the national approach to assessing ecosystem threat.
Source
CapeNature
Type
Feature Layer
Geometry
Polygon
Close
Layers
Query Results
Legend
Demarcation
Resource Layers
Agriculture
Agri-Infrastructure
Agri-Tourism
Climate: Rainfall
Climate: Temperature Means
Climate: Temperature Maximum
Climate: Temperature Minimum
Climate: Evaporation
Climate: Positive Chill Units
Conservation 1
Protected Areas
Biosphere Reserves
Marine Protected Areas
Other Natural Areas
Critical Biodiversity Areas
Critical Biodiversity Areas (Degr)
Ecological Support Areas
Ecological Support Areas (Res)
Ecosystems Threat Status
Land Cover
Smart-Agri
Soils & Geology
Solar
West Coast
Worcester
Paarl
City of Cape Town
CAPE TOWN
Stellenbosch
Somerset West
Swellendam
Hermanus
Overberg
Bredasdorp
Cape Town
Esri, HERE, Garmin | Earthstar Geographics | CapeNature, DEA
POWERED BY esri



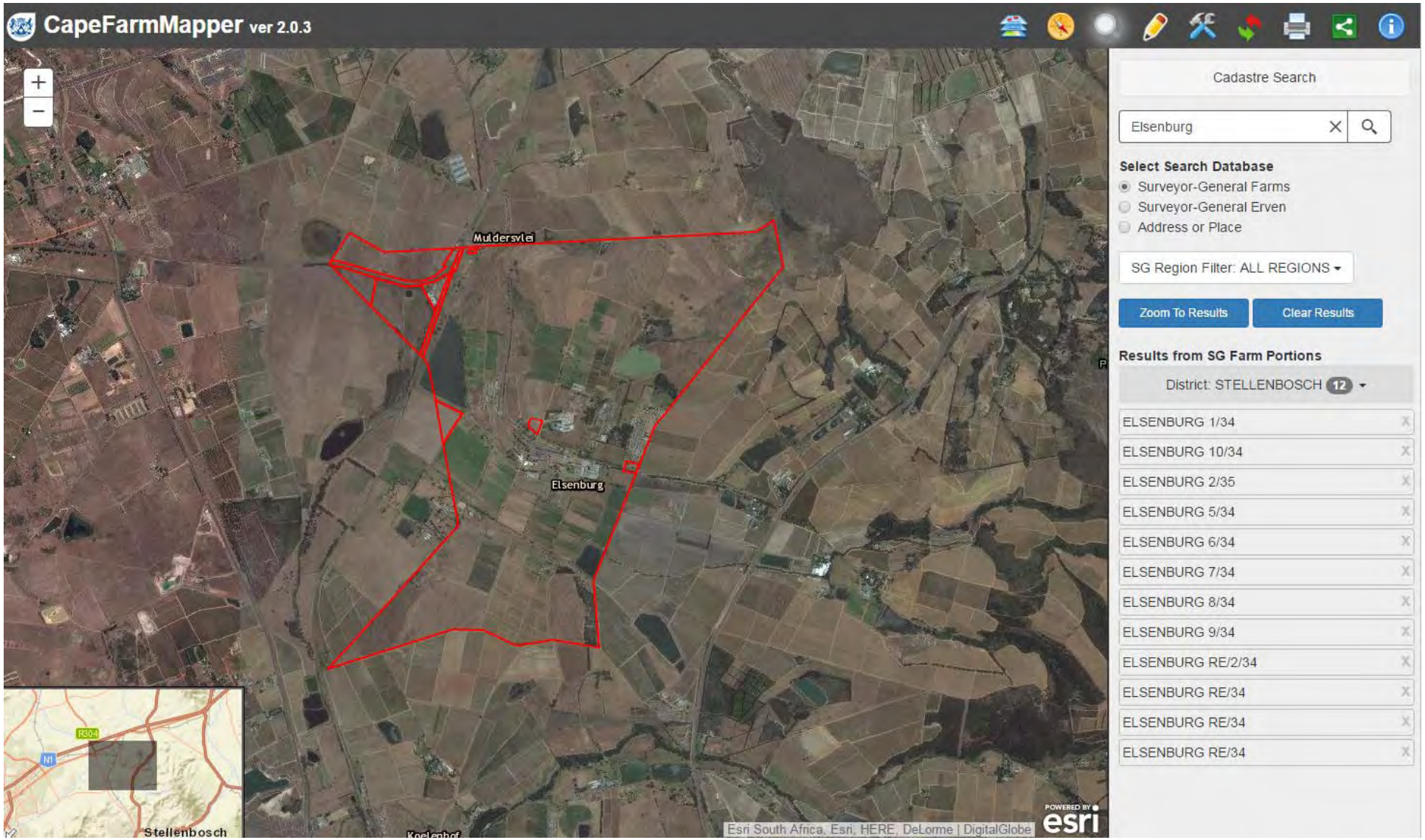
Drawing Tools

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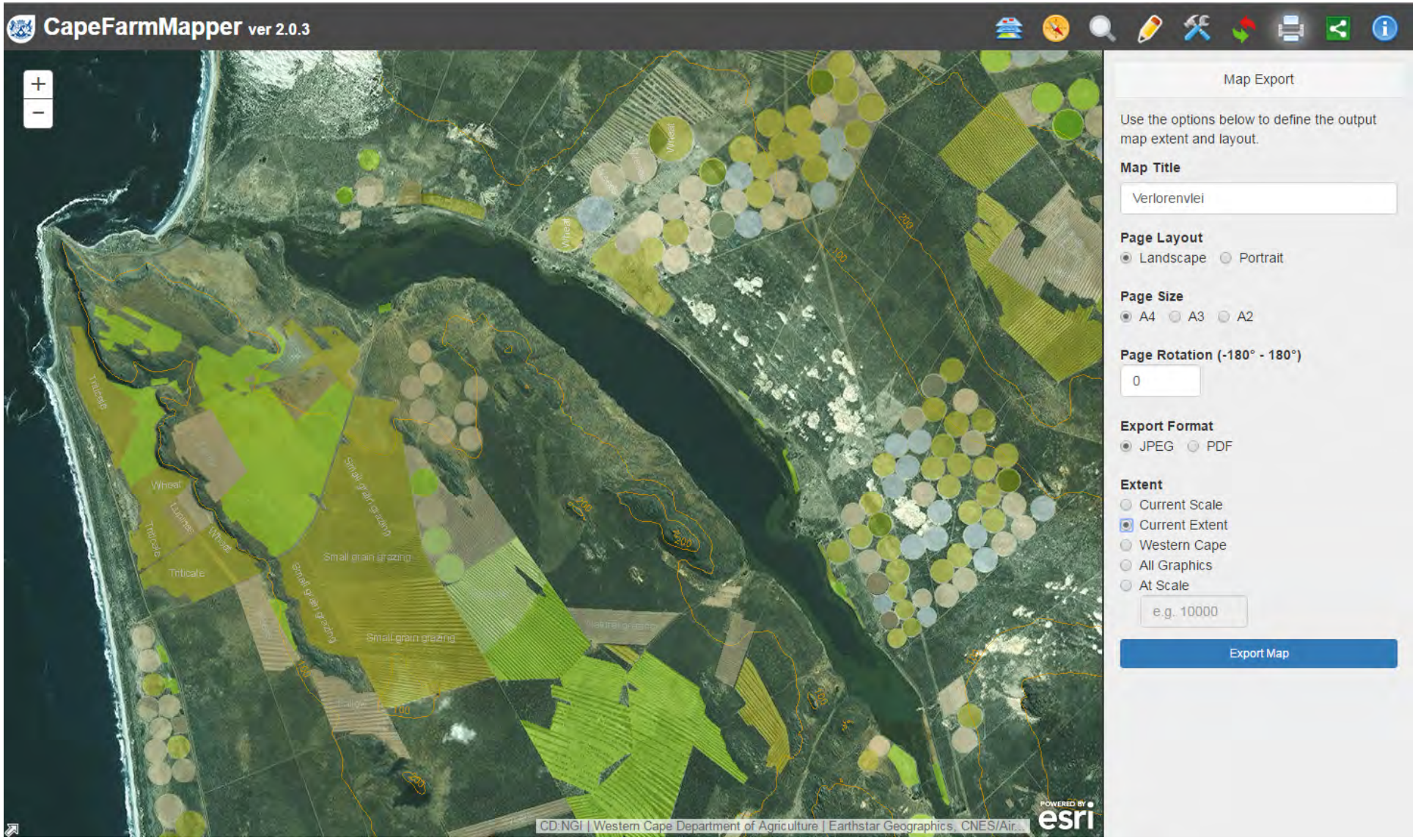
Navigation/Location

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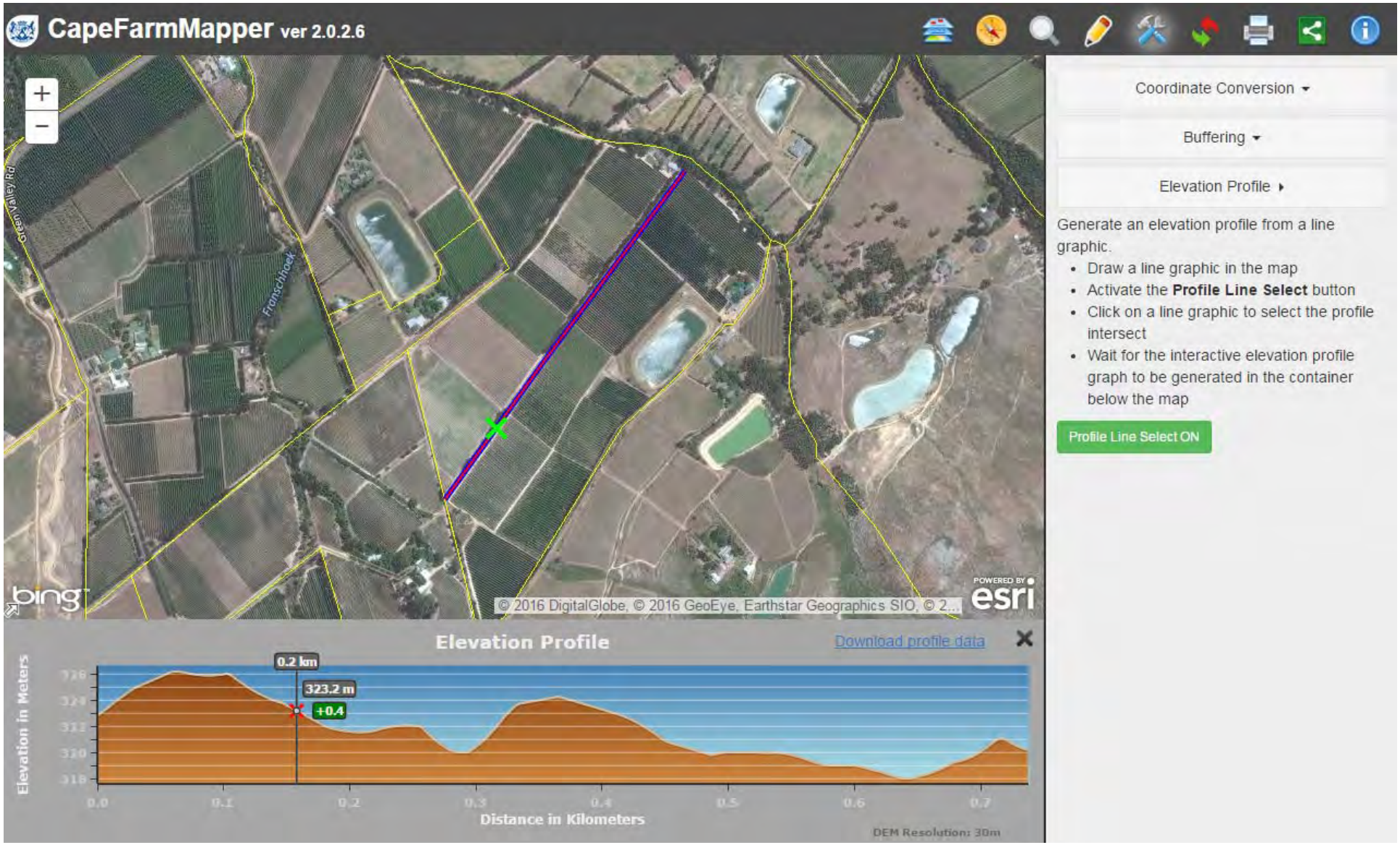
Farm & Erf Cadastre Search

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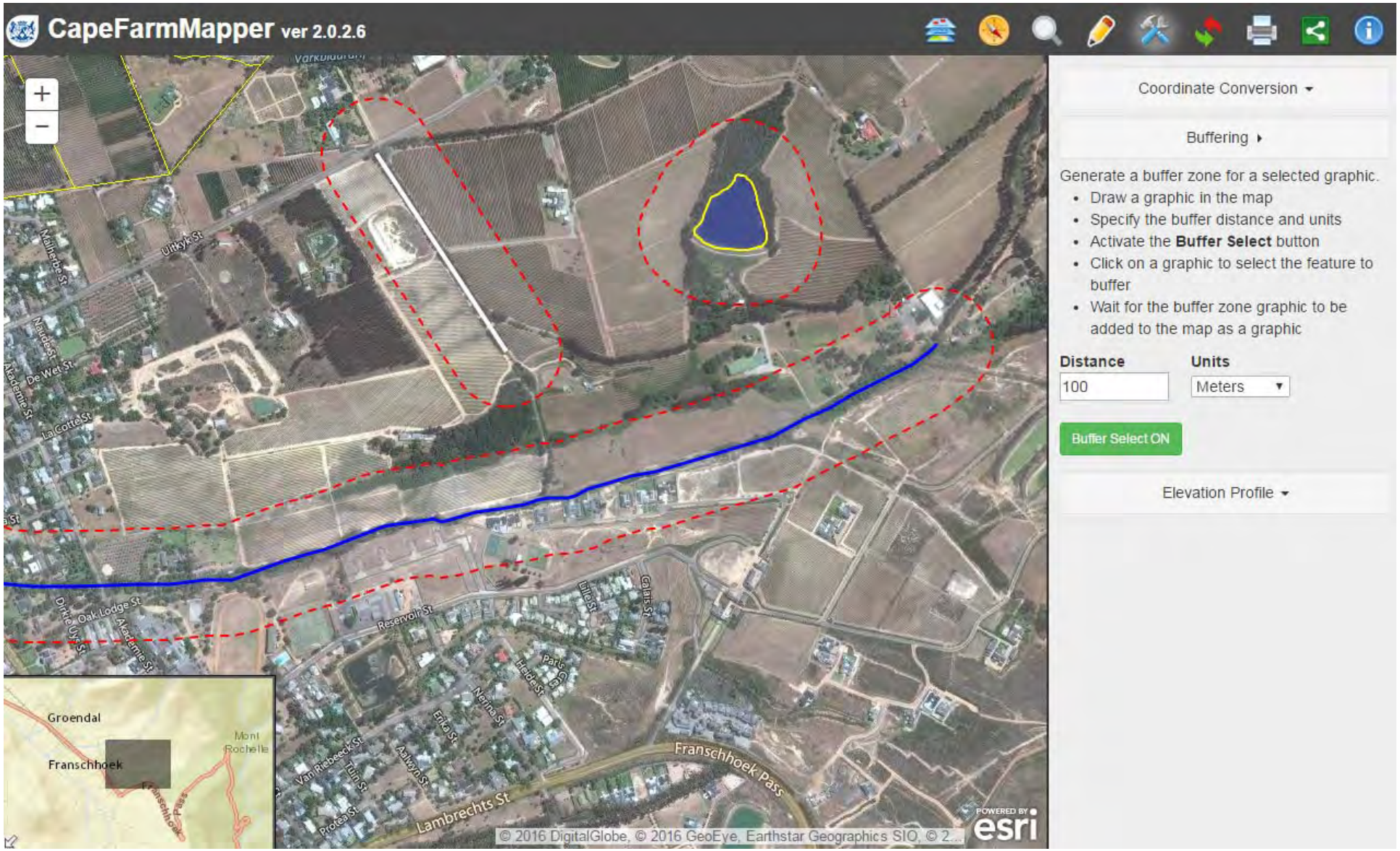


Map Export/Print

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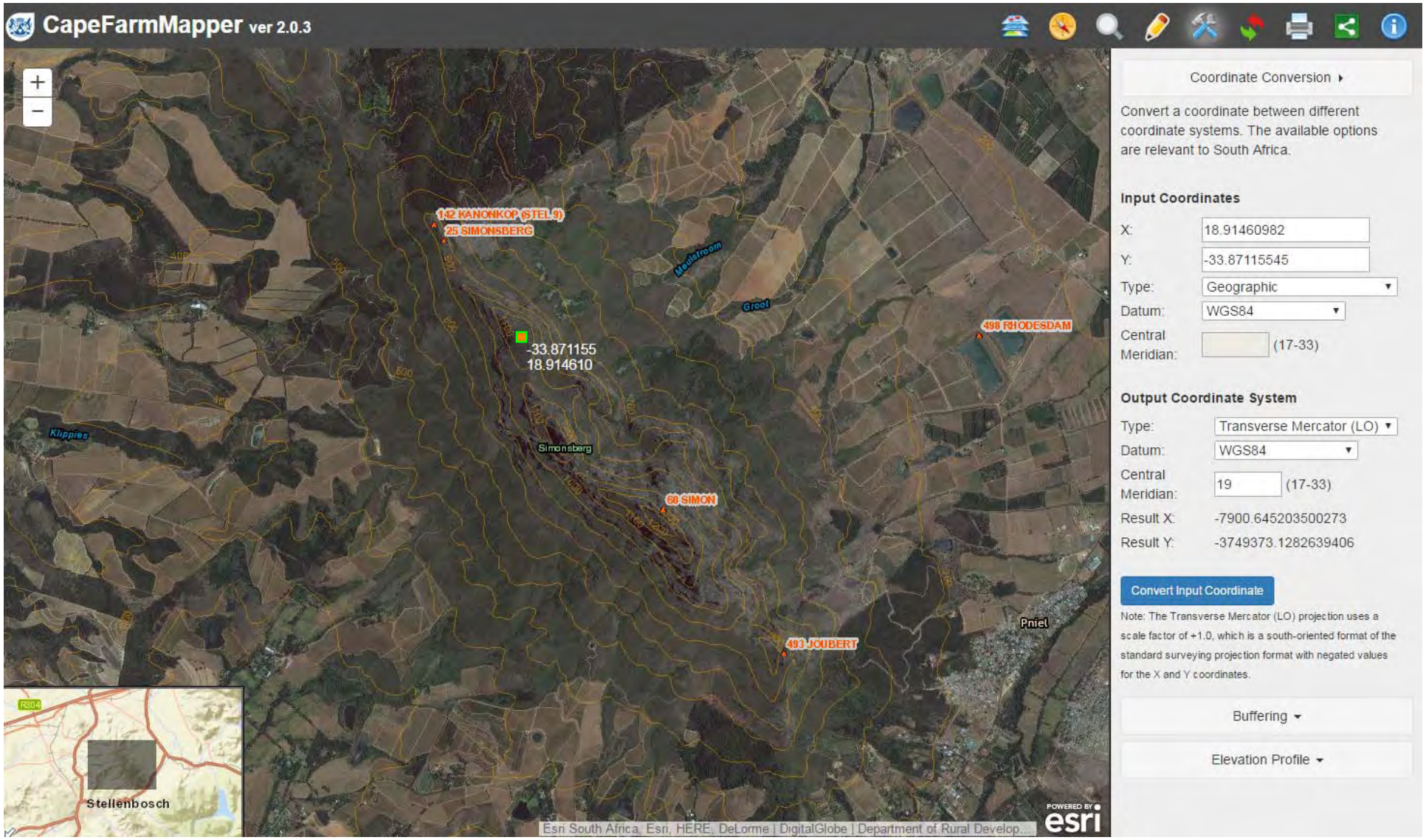


Tools: Elevation Profile



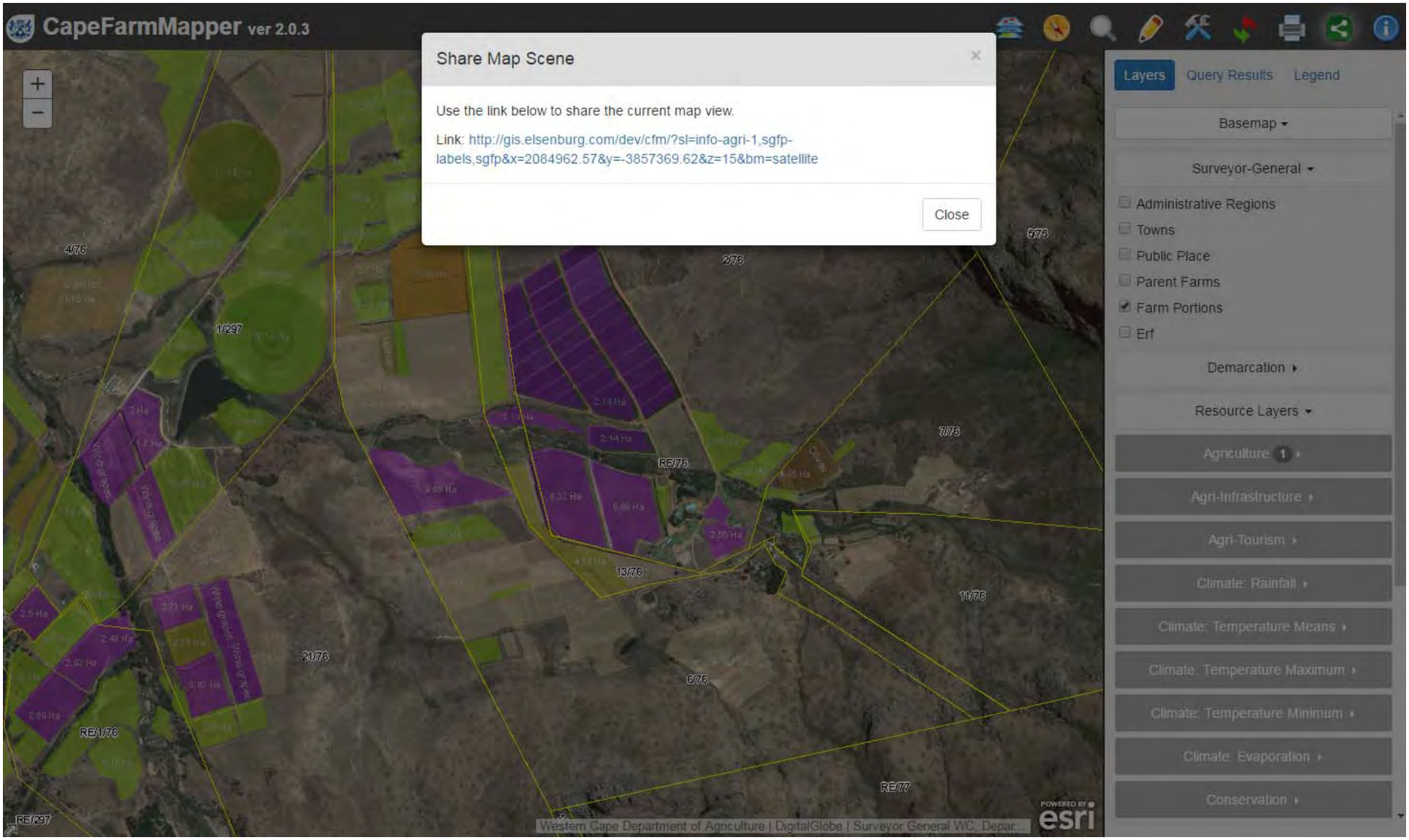
Tools: Buffering

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Tools: Coordinate Conversion

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CapeFarmMapper ver 2.0.3
Share Map Scene
Use the link below to share the current map view.
Link: http://gis.elsenburg.com/dev/cfm/?sl=info-agri-1,sgfp-labels,sgfp&x=2084962.57&y=-3857369.62&z=15&bm=satellite
Close
Layers
Query Results
Legend
Basemap
Surveyor-General
Administrative Regions
Towns
Public Place
Parent Farms
Farm Portions
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Agriculture 1
Agri-Infrastructure
Agri-Tourism
Climate: Rainfall
Climate: Temperature Means
Climate: Temperature Maximum
Climate: Temperature Minimum
Climate: Evaporation
Conservation
4/76
1/297
2/76
5/76
7/76
RE/76
13/76
11/76
21/76
6/76
RE/1/76
RE/77
RE/297
Western Cape Department of Agriculture | DigitalGlobe | Surveyor General WC, Depar...
esri

Map Share

User Statistics

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Usage per Month (1 Jan 2012 to 31 May 2017)

CFM



	Country	Sessions	% Sessions
1.	South Africa	196,244	97.30%
2.	(not set)	1,431	0.71%
3.	United States	1,036	0.51%
4.	United Kingdom	627	0.31%
5.	Germany	271	0.13%
6.	Indonesia	148	0.07%
7.	Namibia	131	0.06%
8.	France	129	0.06%
9.	Netherlands	126	0.06%
10.	Kenya	100	0.05%

1.	Western Cape	163,465 (83.30%)
2.	Gauteng	19,988 (10.19%)
3.	Eastern Cape	9,114 (4.64%)
4.	KwaZulu-Natal	1,546 (0.79%)
5.	Northern Cape	684 (0.35%)
6.	Free State	383 (0.20%)
7.	Limpopo	348 (0.18%)
8.	Mpumalanga	305 (0.16%)
9.	North West	257 (0.13%)
10.	(not set)	137 (0.07%)

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User Events per Month (1 May 2016 to 31 May 2017)

- 71,377 Farm Portion searches (5,490 per month)
- 14,825 Erf searches (1,140 per month)
- 37,761 Map exports (2,904 per month)
- 52,583 SG Diagram requests (4,044 per month)



		799,060 % of Total: 100.00% (799,060)
1.	Search 0	71,377 (8.93%)
2.	SG Diagram	52,583 (6.58%)
3.	Layer view: Farm Portions	44,696 (5.59%)
4.	Map Export	37,761 (4.73%)
5.	Layer view: Erf	36,086 (4.52%)
6.	Draw POLYGON	19,062 (2.39%)
7.	Draw POLYLINE	18,797 (2.35%)
8.	Layer view: Erf Labels	17,779 (2.22%)
9.	Layer view: Farm Portions Labels	17,572 (2.20%)
10.	Layer view: Parent Farms	17,050 (2.13%)
11.	Basemap: Google Satellite	15,069 (1.89%)
12.	Search 1	14,825 (1.86%)
13.	Search 2	11,244 (1.41%)
14.	Basemap: Bing Aerial (with labels)	10,536 (1.32%)
15.	Basemap: Google Hybrid	10,336 (1.29%)
16.	Layer view: Towns	9,881 (1.24%)
17.	Geolocation	9,713 (1.22%)
18.	Layer view: 5m Contours	9,246 (1.16%)
19.	Layer view: Critical Biodiversity Areas	8,713 (1.09%)
20.	Basemap: Esri Imagery (with labels)	8,634 (1.08%)

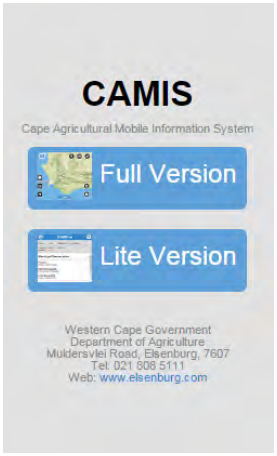
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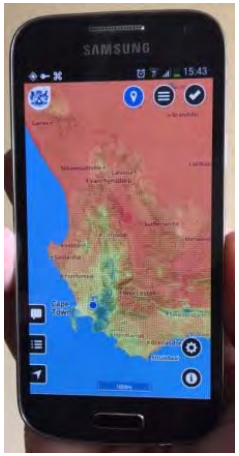
Mobile Solutions

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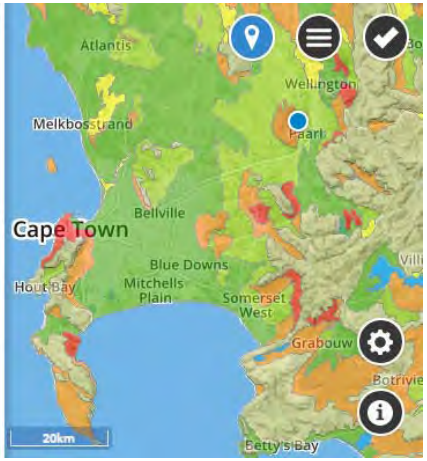
Mobile Solutions: CAMIS

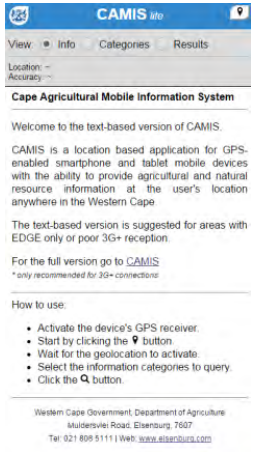
- Cape Agricultural Mobile Information System
  - location-based mobile web application
  - Responsive Web design with HTML5, jQuery Mobile, OpenLayers 3 API
  - Not platform dependant – can access from any device
- Two versions for accessibility:
  - Full: Web map user interface design with user interaction - used where mobile connectivity is good (3G+)
  - Lite: Text based user interface with low data usage for areas with poor mobile connectivity











- URL: **https://gis.elsenburg.com/mobile/camis**

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Conclusion

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Lessons learned

- Spatial technology changes rapidly!!
- Needs to be dynamic – easy to add/modify. Ideally have a dedicated developer in-house.
- But….new software tools and services making this easier to deploy (WAB)*.
- Web Mapping Services are a powerful tool! Curatorship at source. Can easily produce very focused mashups for a target group from widely disparate sources.
- Multi-agency spatial planning interactive tools are a very achievable reality.
- Multi-agency data capture initiatives?
- Obviously not intended for analysis – but certain routine geoprocessing activities can be included.
- Planning partners, administrators, researchers are the primary clients (not necessarily farmers).
- Many “unforeseen” users!

- Location-based services still don’t really work away from main roads and centres (cell data coverage).

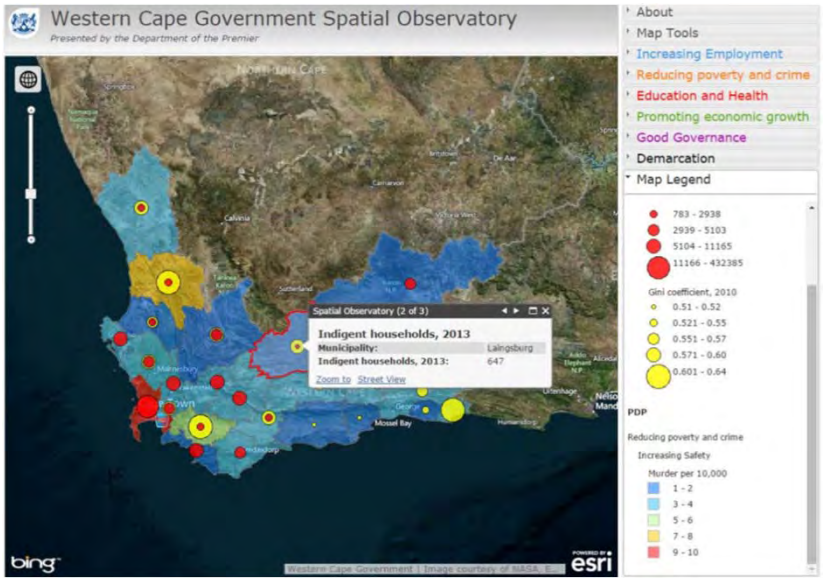
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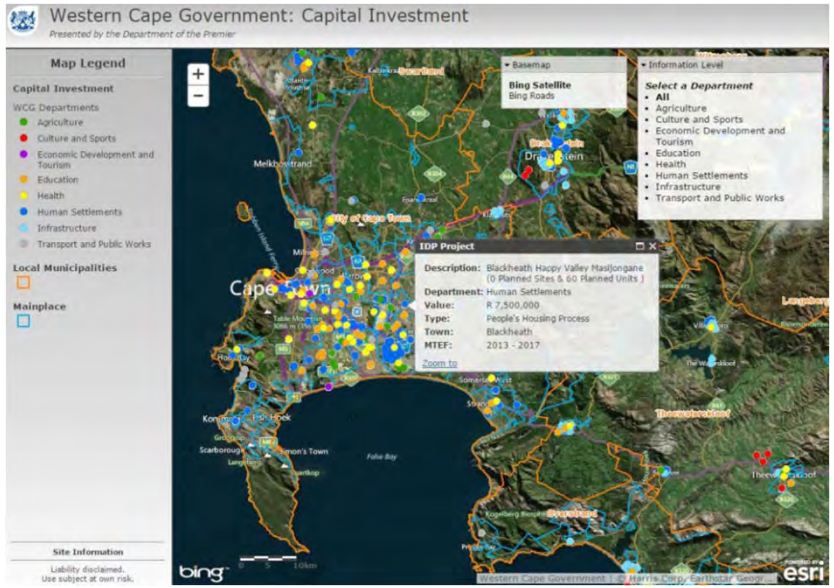
*Web AppBuilder for ArcGIS: doc.arcgis.com/en/web-appbuilder

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Cape Farm Mapper – Future Plans

- Will continue to evolve & be responsive to our stakeholders' needs
- Leverage "live" or near real-time imagery & data
- Develop location based interactivity
- Assess and implement new APIs as appropriate
- Applying the technology in related developments:





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Thank you



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