



# **ORR & ASSOCIATES**

**SPECIALISTS IN THE PROVISION OF DIGITAL GEOTECHNICAL DATA**

## **Introduction**

### **Tom & Lisa Orr**

**Before setting up Orr & Associates in 1998 we had worked for nearly 20 years in exploration and mining, mainly in gold but also in oil and base metals.**

**Worked in QLD, VIC, NT, WA, Zimbabwe, New Zealand, Indonesia, Solomon Islands, Philippines, South Korea, Thailand and Burma.**

**We spent our first recession doing our MSc studies in the Tararua Ranges of New Zealand.**

**Since 1998 we have been based in Wongaling Beach.**













































## **Examples of Current work:**

- Digitising of geological maps for Zimbabwe (approx. 100 - 100k sheets) & Serbia (approx. 200 - 100k sheets).
- Remote database management.
- Alluvial gold exploration in Western Australia (sampling, drone surveys and mapping).
- Drone work for Real-estate company as well as environment and community groups.
- Due diligence work on FNQ copper mine.

## **Examples of historical work:**

- Scan and catalogue 2 container loads of historical maps (approx. 12,000 maps).
- Catalogue and structure a corporate digital report library (approx. 16,000 reports).
- Scan and catalogue around 200,000 pages of reports and maps from private historical collection.
- Data migration - numerous.
- Processing of geochemical data (levelling and imaging).
- Various prospectivity studies involving large geochemical, geological and geophysical databases.
- Supplied digital geological data to numerous organisations such as the USGS, AGSO, BRGM, US National Hurricane Centre, National Geographic, Red Cross as well as providing free data to many students & Universities.
- Drone work for ABC TV Landline show.











# Software

## Primarily use:

MapInfo/Discover/Discover3D  
QGIS

## Also use:

ArcGIS  
TNTMips

## Database management:

Acquire  
Datashed  
Geobank  
SQL server



ORR & ASSOCIATES resources maps services about contact Mailing List

**Mineral Occurrence** FREE  
OFR02\_110: Mines and Mineral Occurrences of Afghanistan

**Mineral Occurrence** FREE  
OFR02\_131: USGS Sediment hosted Gold deposits of China

**Mineral Occurrence** \$150.00  
Sudan Mineral Occurrence Data


**Mineral Occurrence** FREE  
USGS Eastern Mexico Geology 2.5M

**Geology Map** FREE  
USGS Geology of Africa

**Geology Map** FREE  
USGS Geology of Alaska

**Geology Map** FREE  
USGS Geology of Arabia

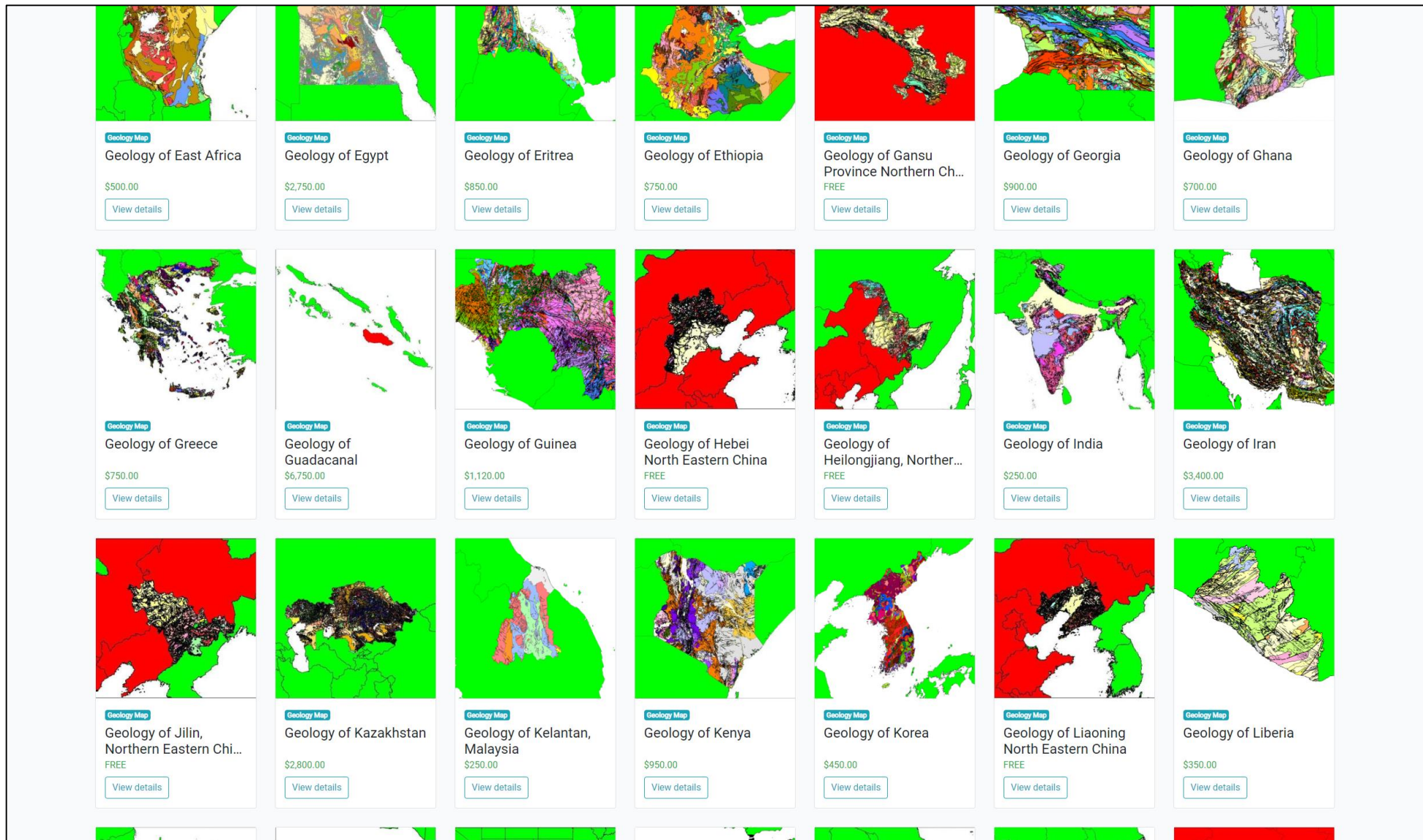
**Geology Map** FREE  
USGS Geology of Bangladesh

A world map showing the distribution of resources. Blue location pins are placed across various continents, with a high concentration in Europe and Asia. The map includes zoom in (+) and zoom out (-) controls in the top right corner. The text 'Leaflet | Wikimedia' is visible in the bottom right corner of the map area.

Currently we have 141 resources listed

(64 are free, 59 for sale, 18 in progress)





Currently the dataset with the most geology units – Saudi Arabia 250k coverage with 70,716





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**Drone surveys – quality data  
on a budget.....  
It's time to start doing it  
yourself**



**We are currently experiencing an Explosion in drone technology and the associated software required to deal with the diverse imagery collected.**

### **Interesting uses for drones**

- **Monitoring coastal erosion**
- **Mine detection**
- **Finding missing climbers**
- **Shark patrol**
- **Mapping refugee camps**



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- **Mapping refugee camps**
- **Walking dogs**





00:26.393





## Mapping Refuge Camps

- Accurate maps of refugee camps showing great detail (latrines, roads, water points etc) quickly produced and shared.
- Key learning point - your own people on the ground need to be able to do this work as getting specialists in to do this kind of work is not sustainable.





# Regulations

## Non commercial use

- Not above 120m
- Not within 30m of people
- Not at night
- At least 5.5km away from controlled aerodromes
- Keep within visual line of sight
- Do not fly over or above people

## Commercial use

To fly Drones over 2kg commercially you must have a remote pilot license.

Drones between 100g and 2kg – you can fly a drone in the CASA excluded category

- Apply for an aviation reference number
- Tell CASA before you fly (first commercial flight)
- Fly within the standard operating conditions (see left)
- Download CASA app showing restricted airspace



## **New regulations in place in the next 12 months...**

- Registration and accreditation is proposed for:
  - drones more than 250 grams operated recreationally.
  - all drones operated commercially.
- Accreditation would be free and involve watching a video and answering a quiz.
- Registration cost:
  - \$20 or less (per person per annum) for recreational drones.
  - Around \$140 per drone for each commercial drone.



# A low cost workhorse (i.e. not such an issue if you crash or lose it)

## DJI Phantom 3 Professional

### Specs

Weight: 1.28kg

Maximum speed: 60kph

Maximum transmission range: 5km

4K video and 12.4 megapixel stills camera

Maximum flight time: 23 minutes

Released: April 2015

Cost – around \$2,000 to set up with 6 batteries



# Apps for drone surveys



Pix4D**capture**



**MAPS**  
MADE EASY

Map pilot



**DroneDeploy**



# Apps for drone surveys

Generally free or low cost



## Processing options

1. Purchase software
2. Cloud based
3. Pay an expert

- Pix4D approx. \$550per month or perpetual license \$13,699
- MapsMadeEasy. Approx. \$50 per square kilometre (@60m – 1,600 images)



Pix4D**mapper**



**MAPS**  
MADE EASY



**DroneDeploy**



**PhotoScan**



# **Ground Sampling Distance (GSD)**

**(GSD - the distance between adjacent pixel centres)**

**Phantom 3 examples:**

**120m = 5.18cm**

**60m = 2.59cm**

**30m = 1.3cm**

# **Absolute vs Relative (or local) accuracy**

## **Relative accuracy**

**(within your survey)**

**Generally your horizontal accuracy is 2x GSD and your vertical accuracy is 3x GSD**

## **Absolute accuracy**

**(locational accuracy of your survey on the surface of the planet)**

**Using onboard GPS on drone like the P3 you are looking at around 2m horizontal and 6m vertical accuracy**

**If you need accurate survey control, cost effective RTK is now available  
(see Alistair Hart).**

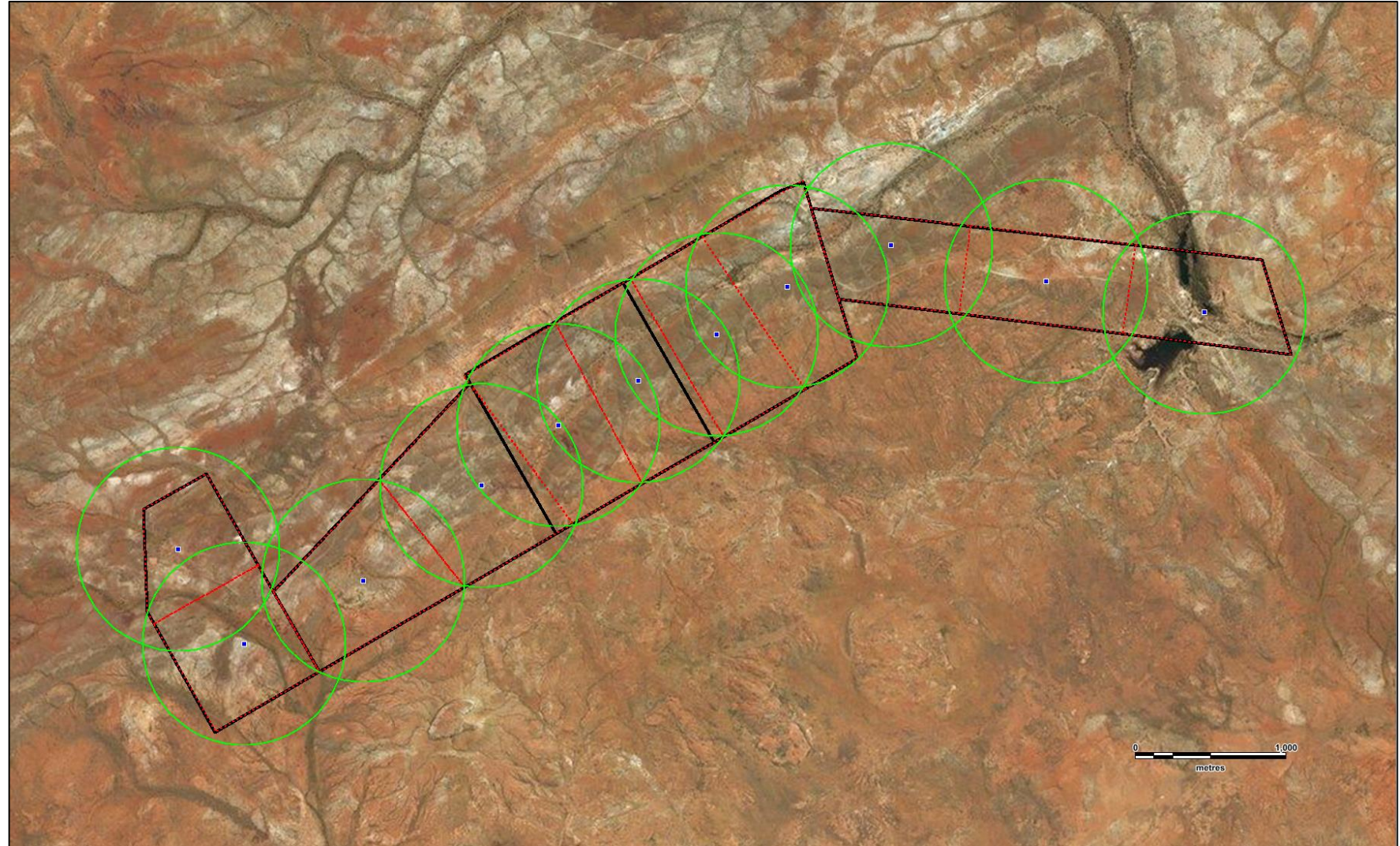


## Planning your survey – key points

- You need a phone or tablet no older than iPhone 5 or equivalent
- Survey can cover around 1 hectare/minute (60m).
- Best to land with about 20% battery life remaining.
- If shadow is an issue consider flying 9.00am to 3:00pm. Flying around midday can also cause reflectance issues.

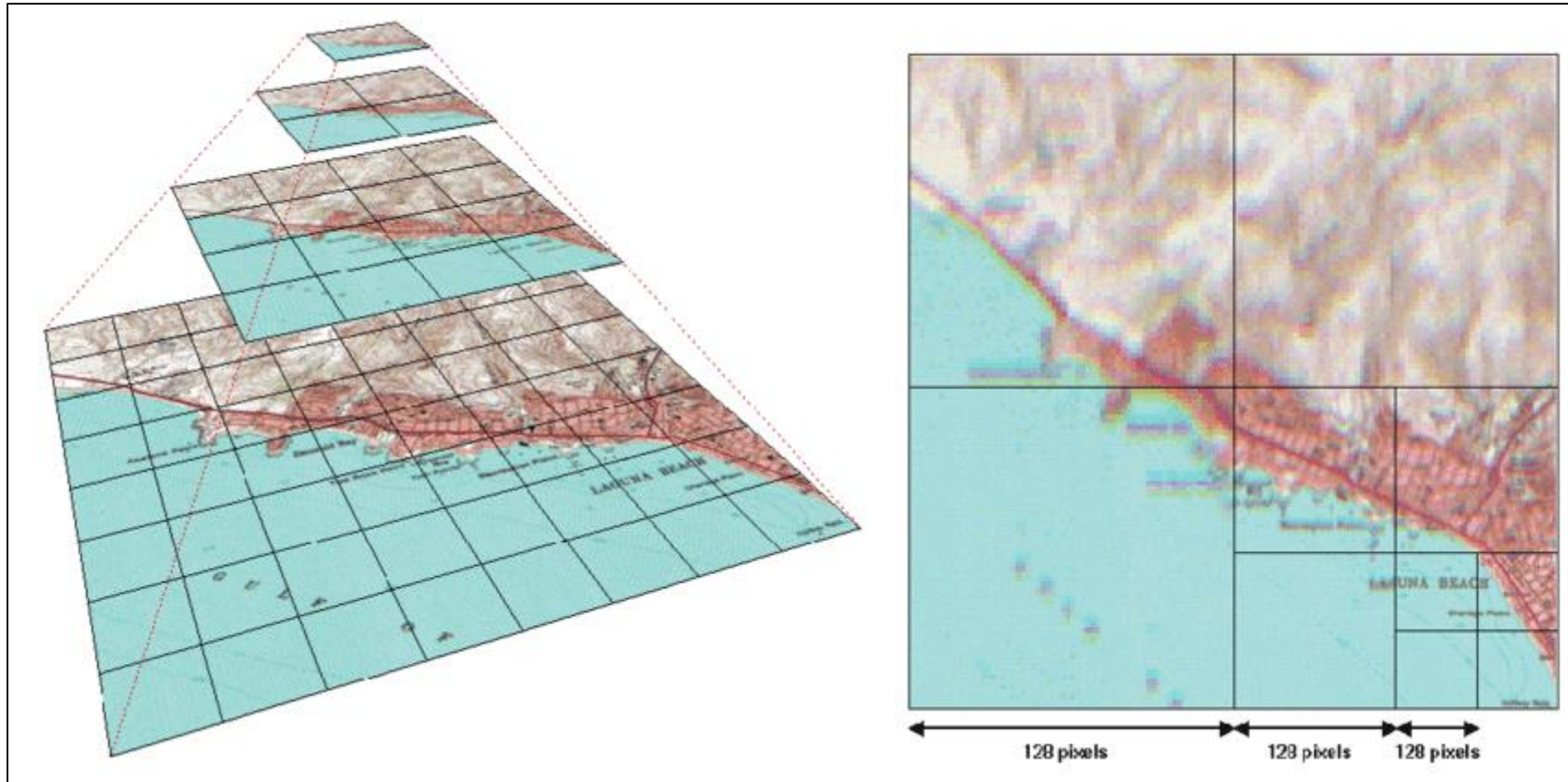
# Example survey – 740 hectares of mine leases

- For planning used a 670m maximum distance from take off point
- 60m altitude
- Google image used to plan access and take off points
- Used 70% overlap (lowest overlap recommended - for areas with few trees).
- Flying time 11 hours, over 3.5 days gives 3.15 hours per day requires 11 batteries per day.
- Add 50 minutes for 10 battery changes and 60 minutes for 2 moves per day.
- Survey time per day 5 hours





## A quick word about Multiresolution tiled image pyramids (can be produced in QGIS)



# **Two examples of what we do with Drones**

or more correctly a UAV  
(Unmanned aerial vehicle)

- **Stockpile volumetric survey**
- **Regolith and alluvial resource mapping survey**





**TABLELANDS  
MINING GROUP**



Volumetric survey Mourilyan Harbour – precision volume measurements in a web browser





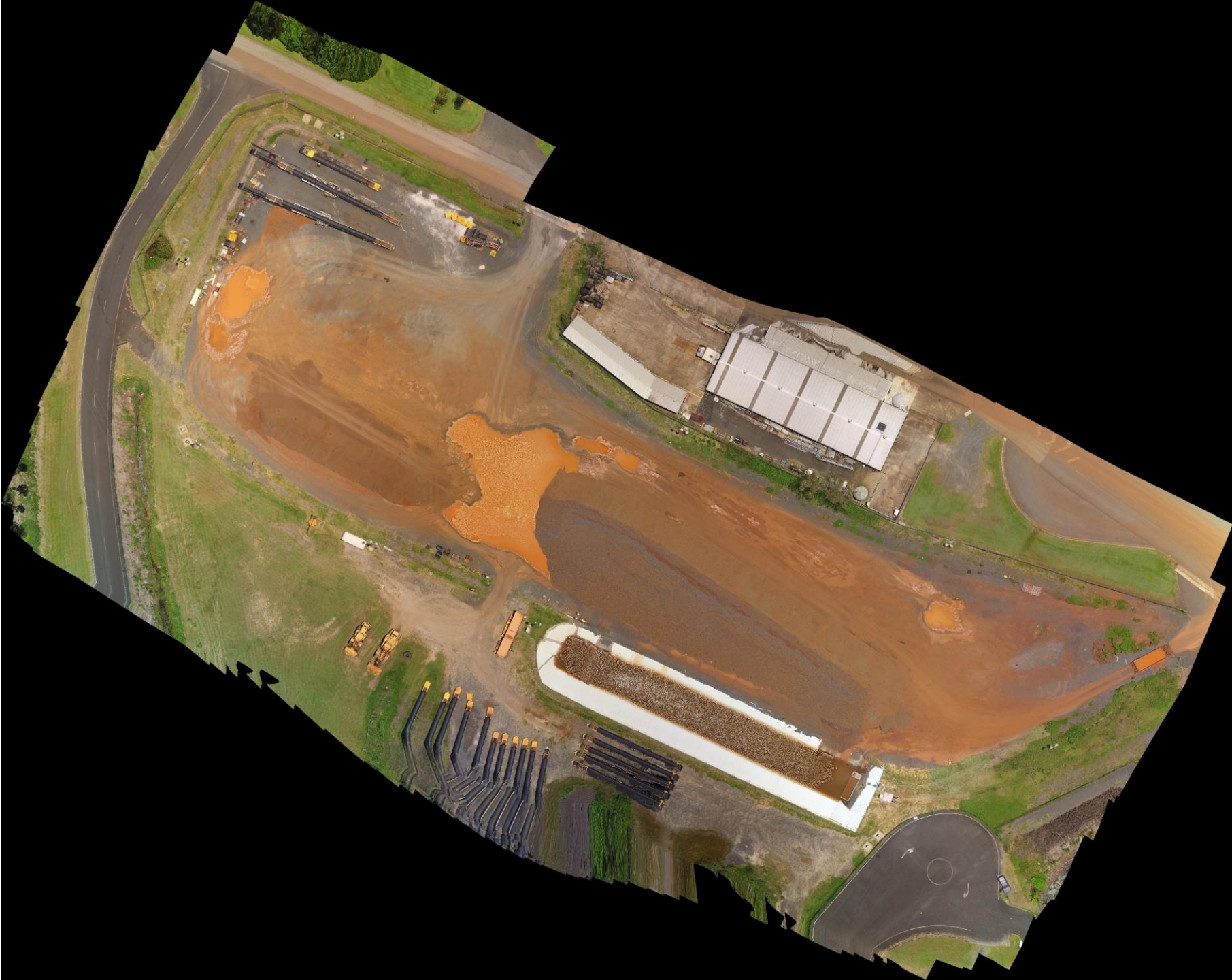




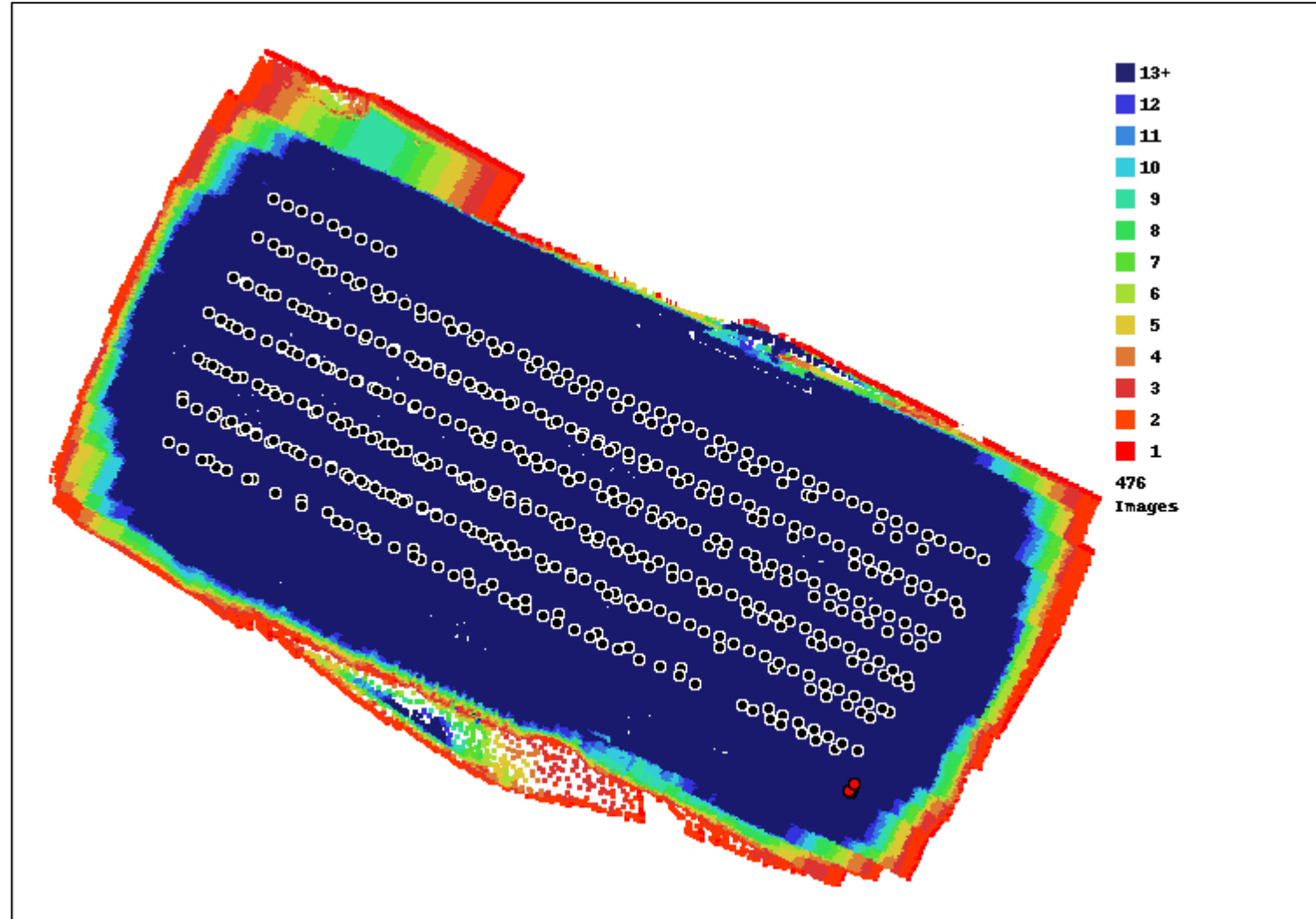




2.5 hectares  
14 minutes  
34m altitude  
264 images  
1.5cm/pixel





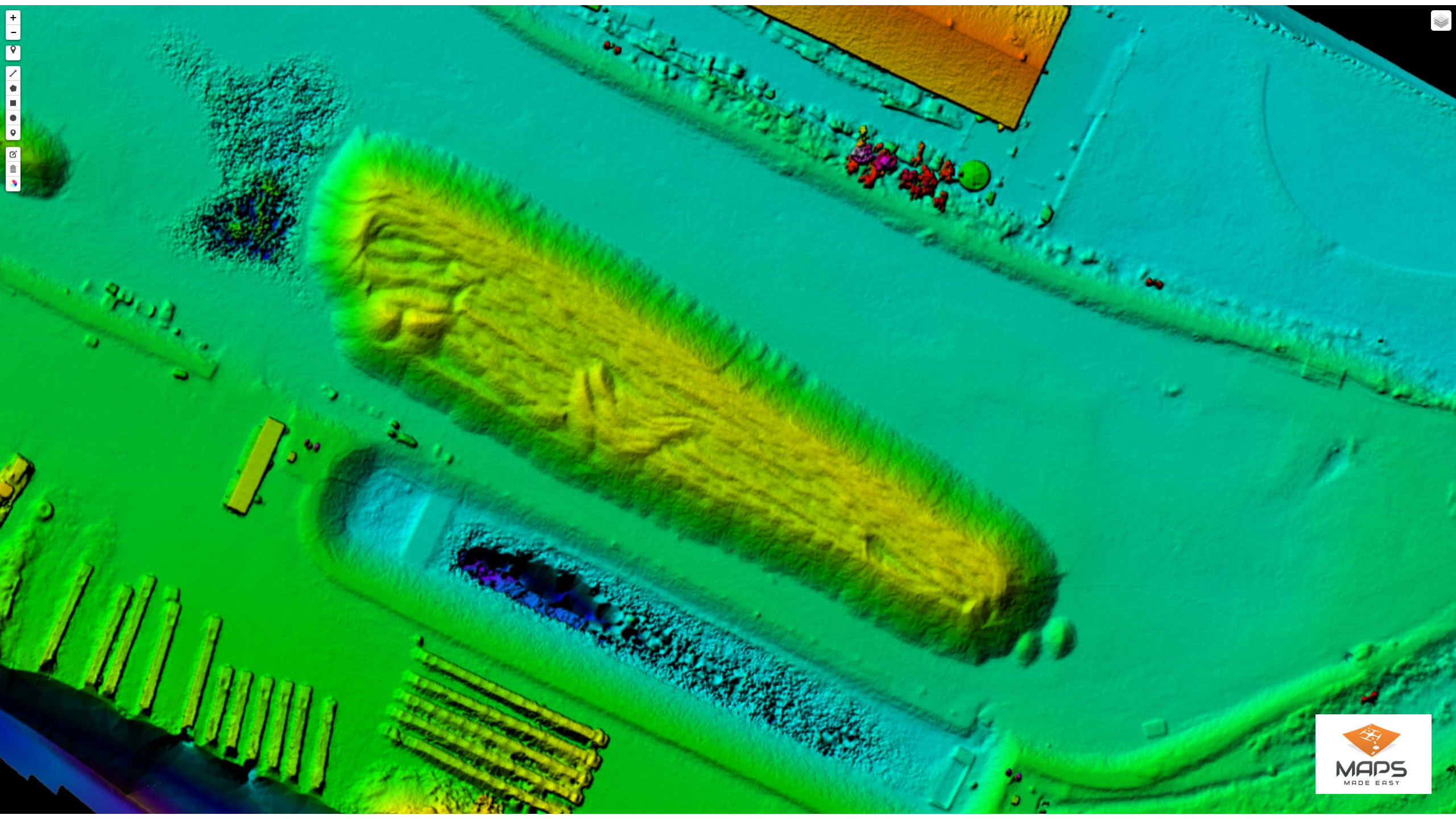


Overlap report

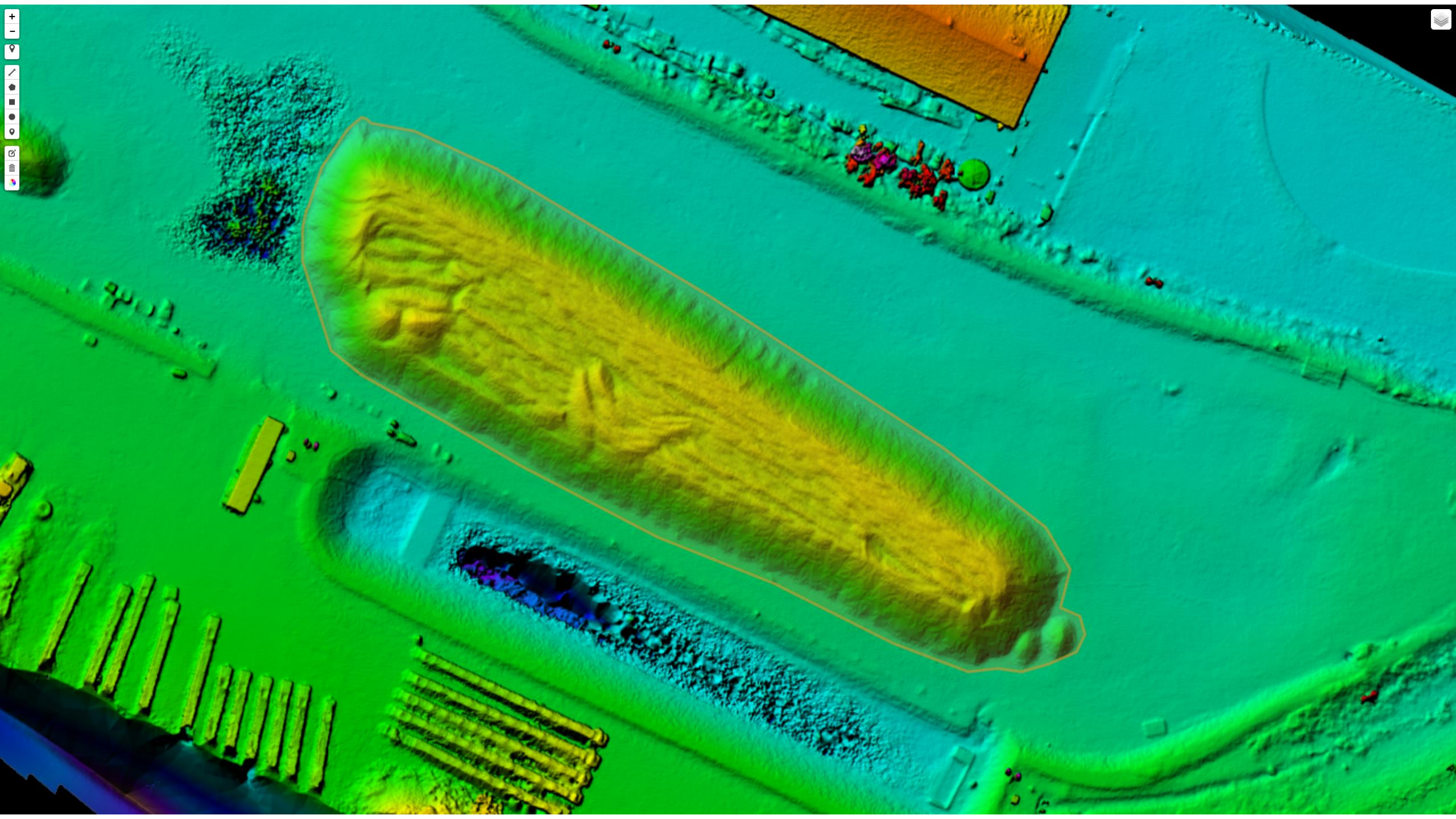




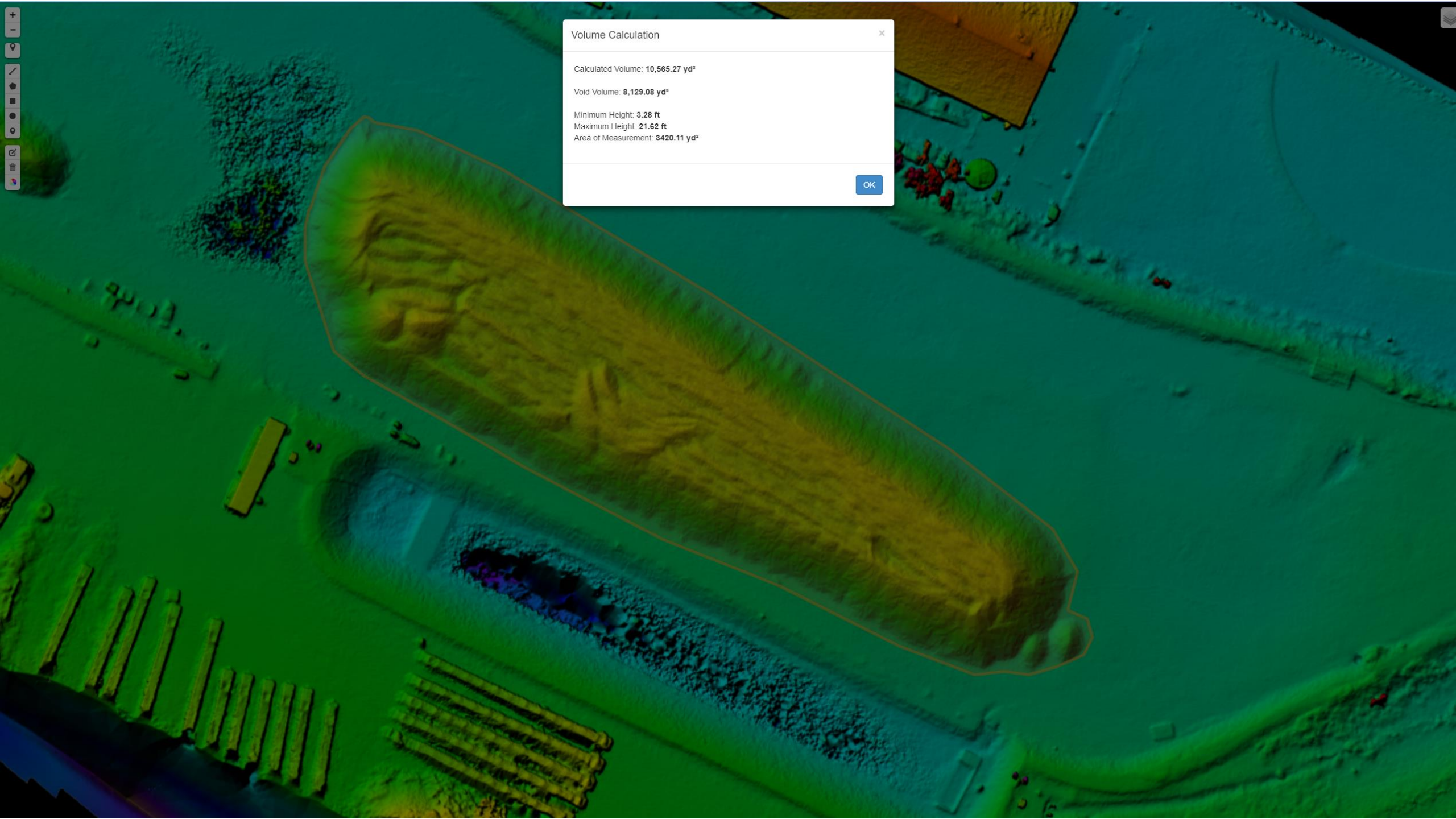












### Volume Calculation

Calculated Volume: **10,565.27 yd³**

Void Volume: **8,129.08 yd³**

Minimum Height: **3.28 ft**

Maximum Height: **21.62 ft**

Area of Measurement: **3420.11 yd²**

OK



# Regolith mapping - Mosquito Creek, Nullagine WA































200691  
7578004

010853

Company: ..... NIMBLE .....

Sample No: .....

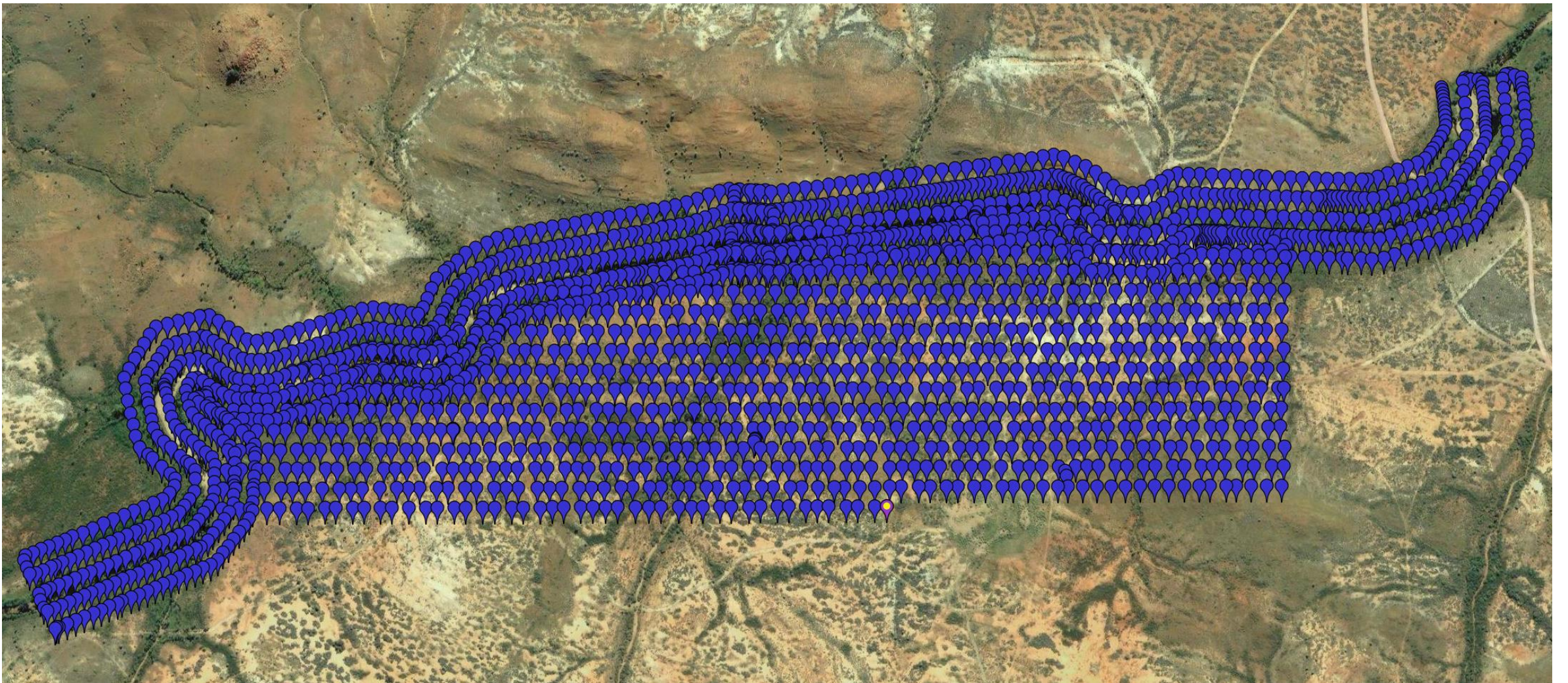
Lease Name: .....

Drill Hole No: ..... BCL 26 .....

Depth: ..... 10.24m .....

From: ..... 25 ..... To: ..... 27 .....





- View shows location of 2072 images, flown as 3 individual surveys.
- 60 metre altitude, 2.59cm per pixel, maximum speed during survey 9.0 m/s.
- Southern grid area took 61 minutes of flight time (4 batteries), area of 71.8 hectares, distance flown 31km.



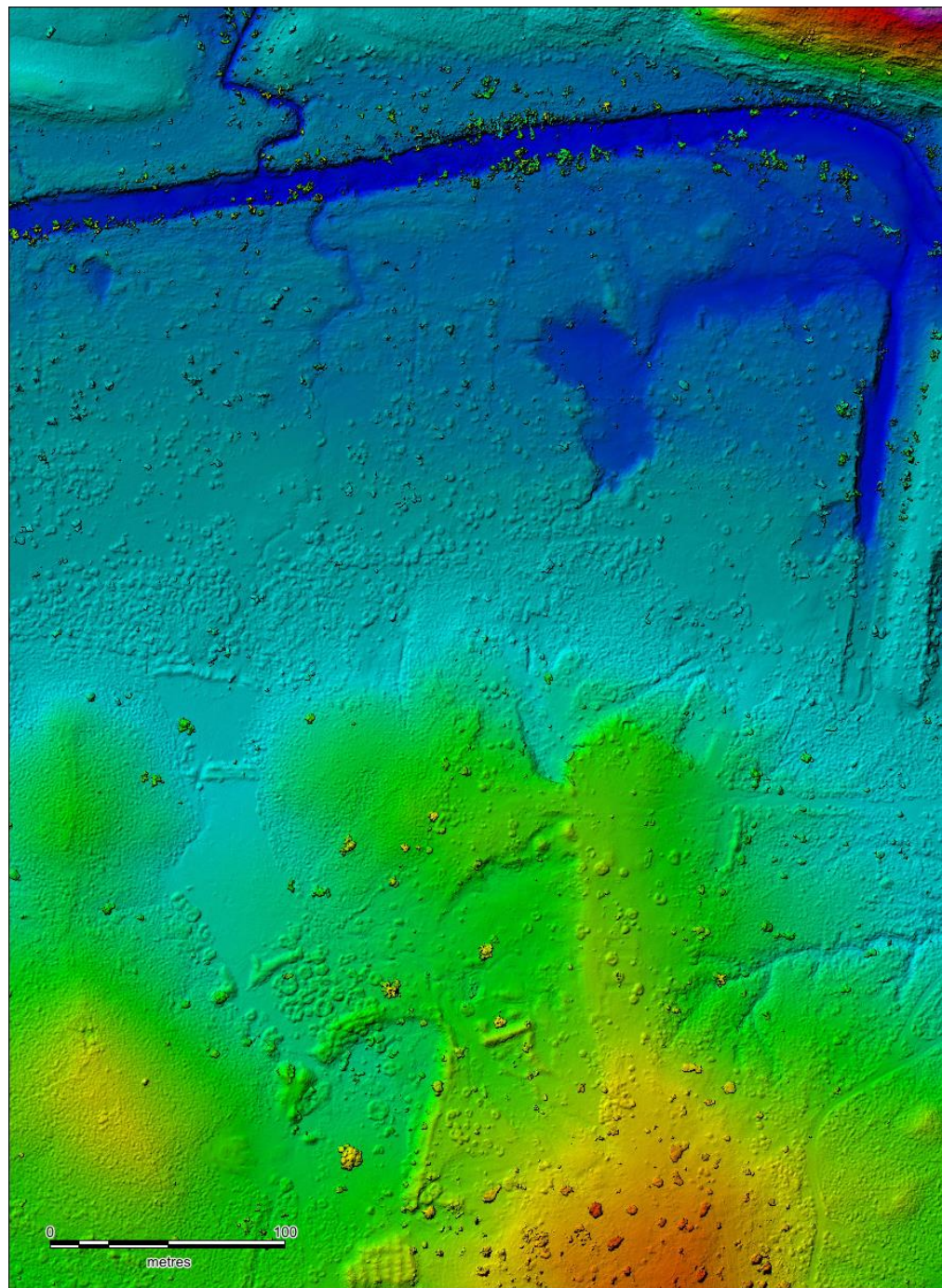


**Comparison of Google Earth and 60m drone image (GSD 2.59cm)**





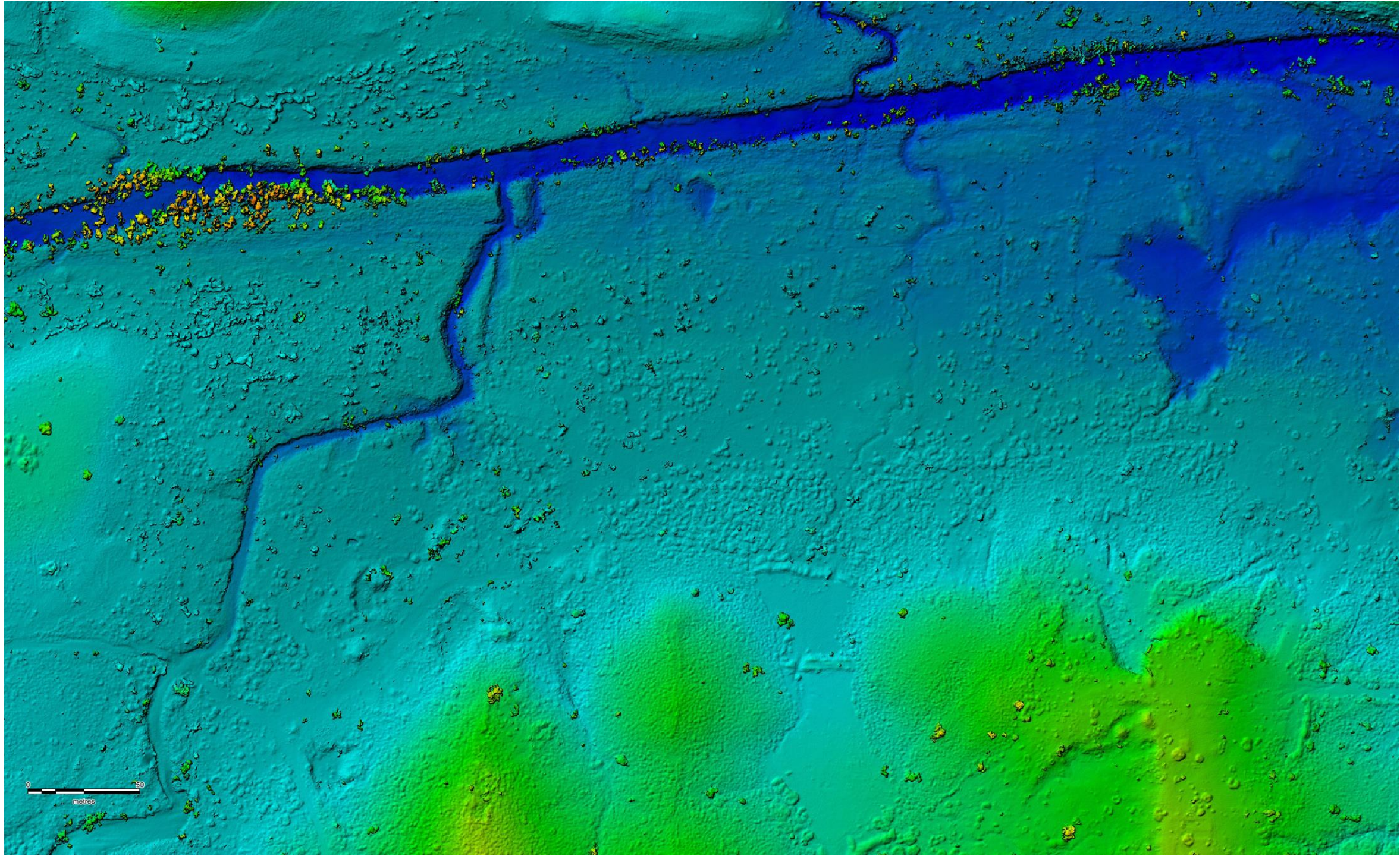




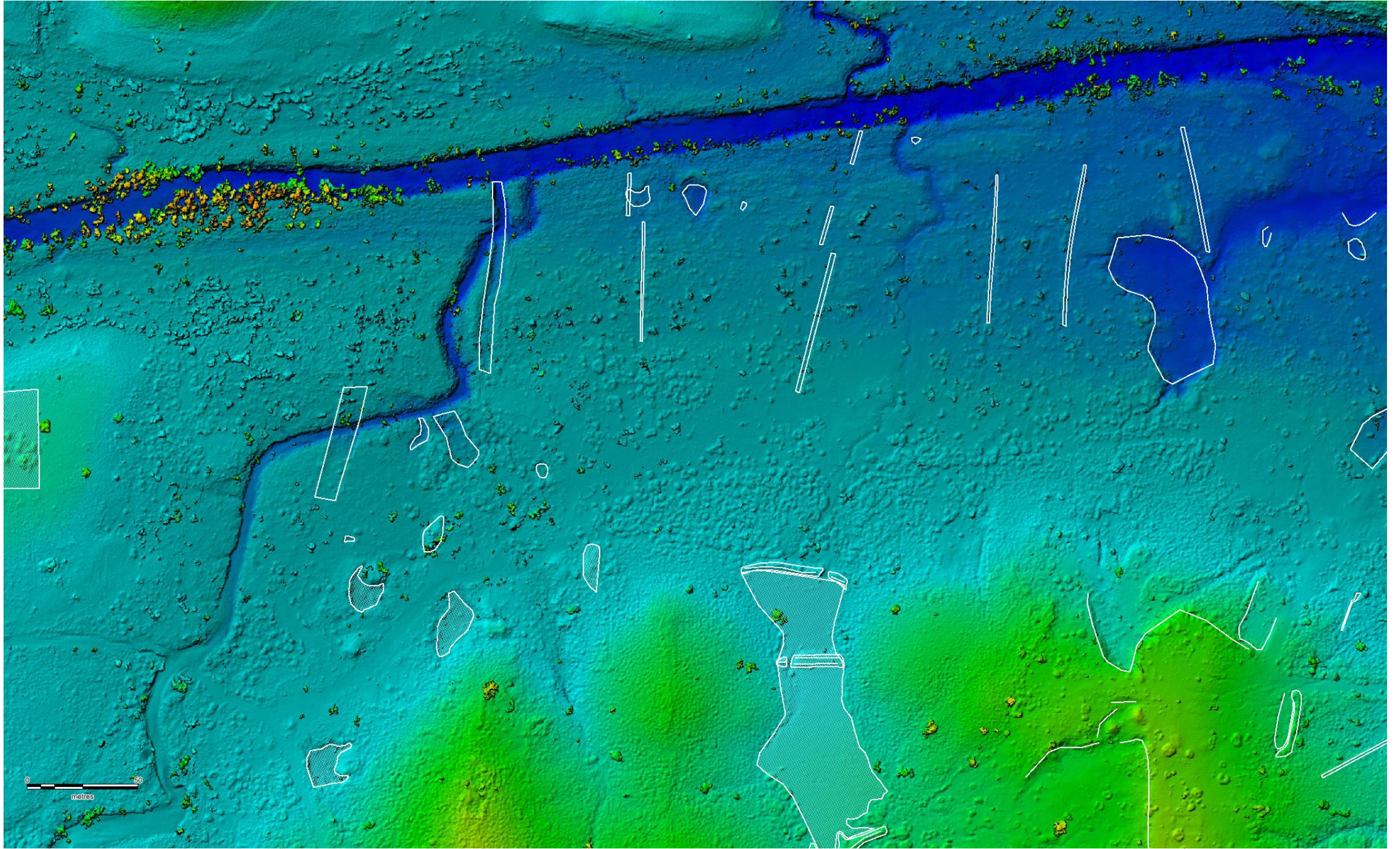




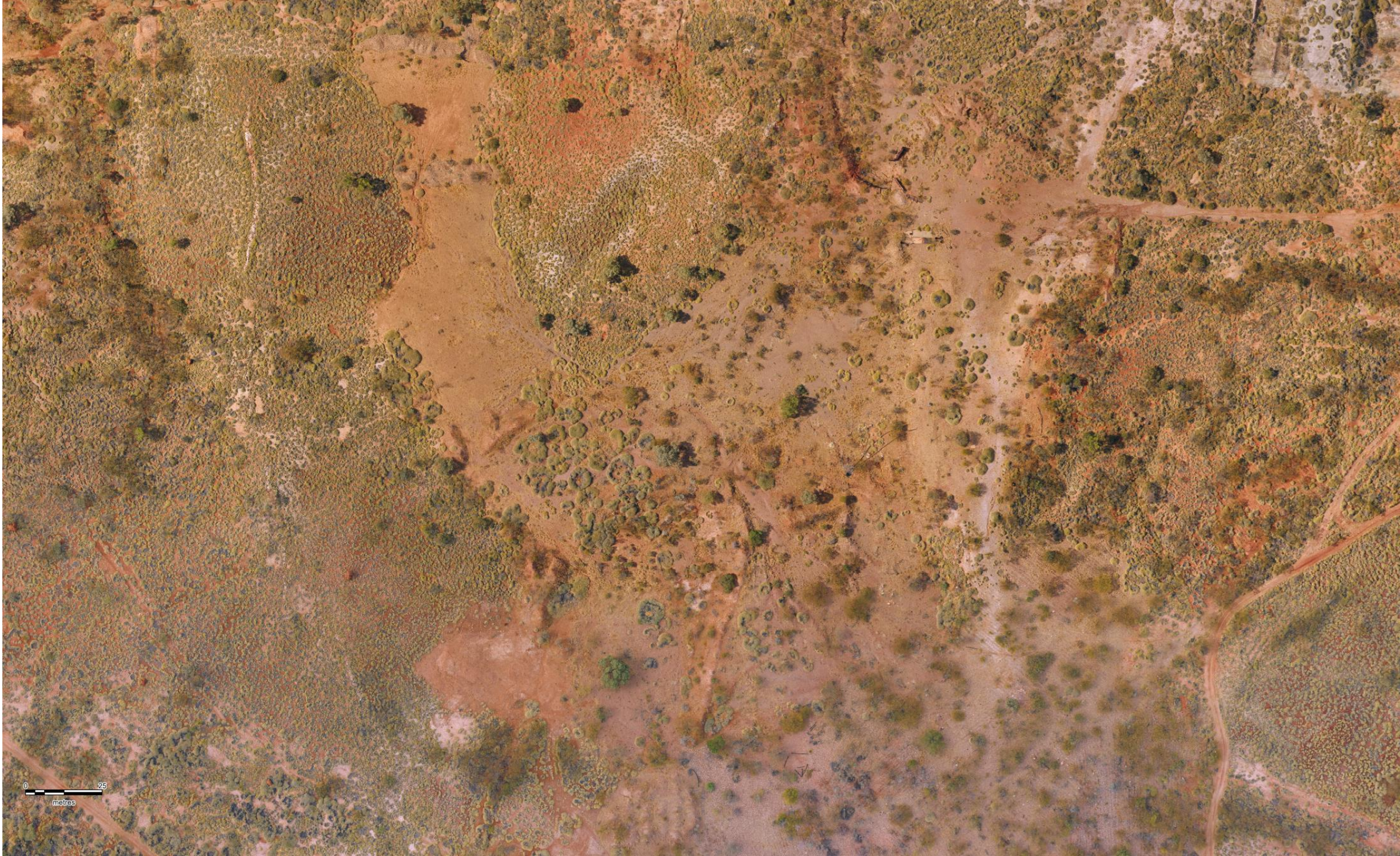




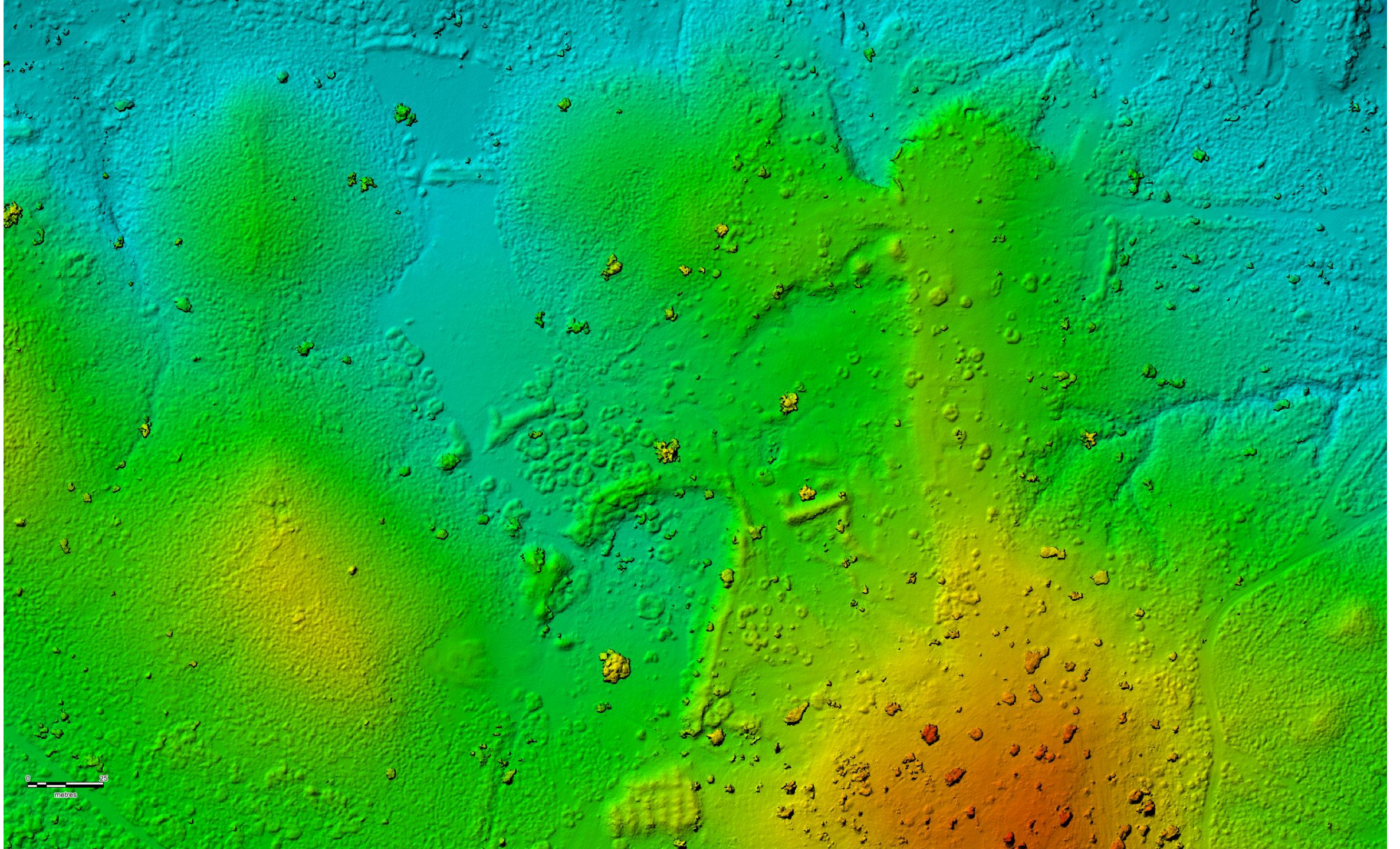




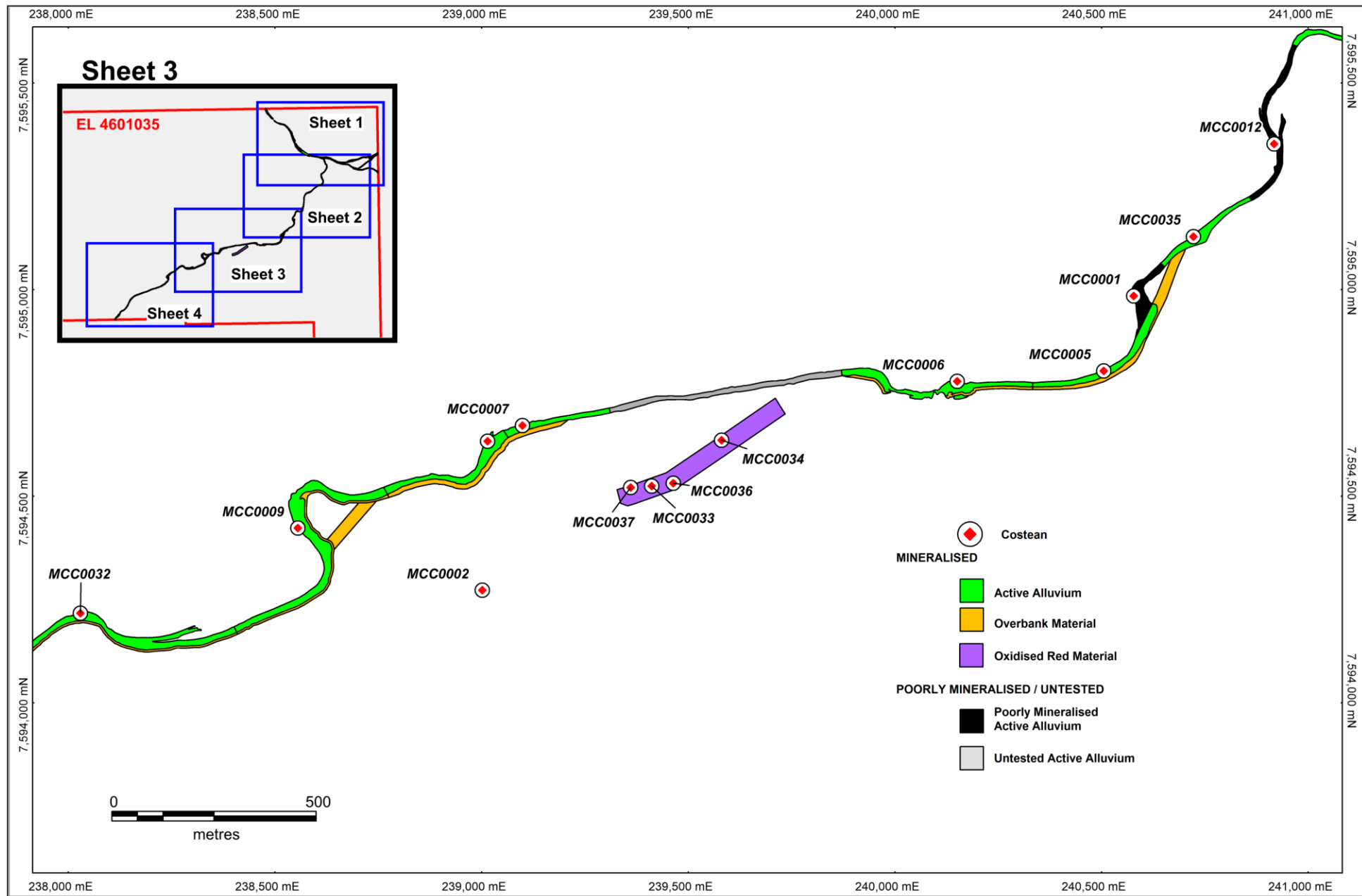




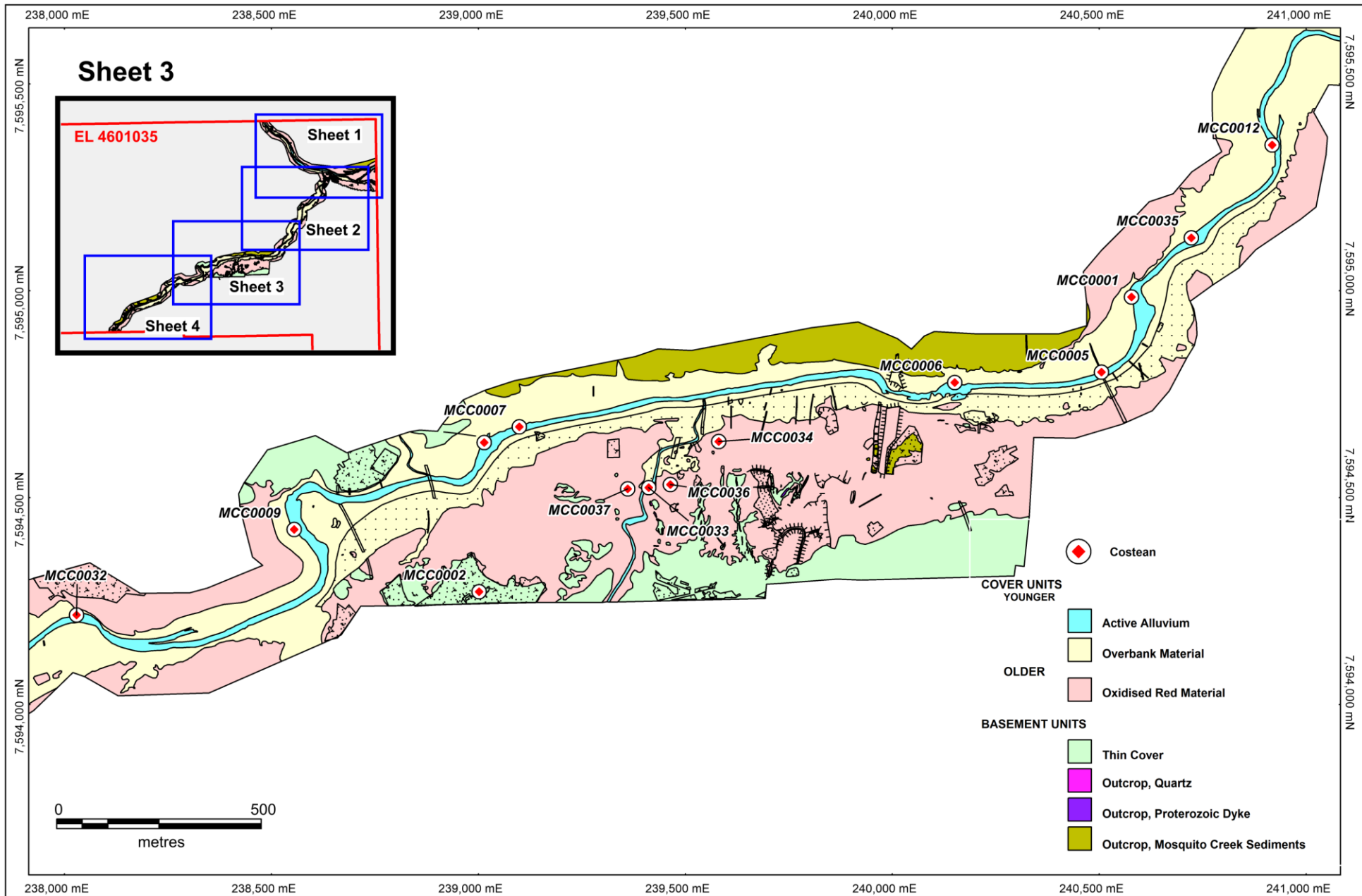




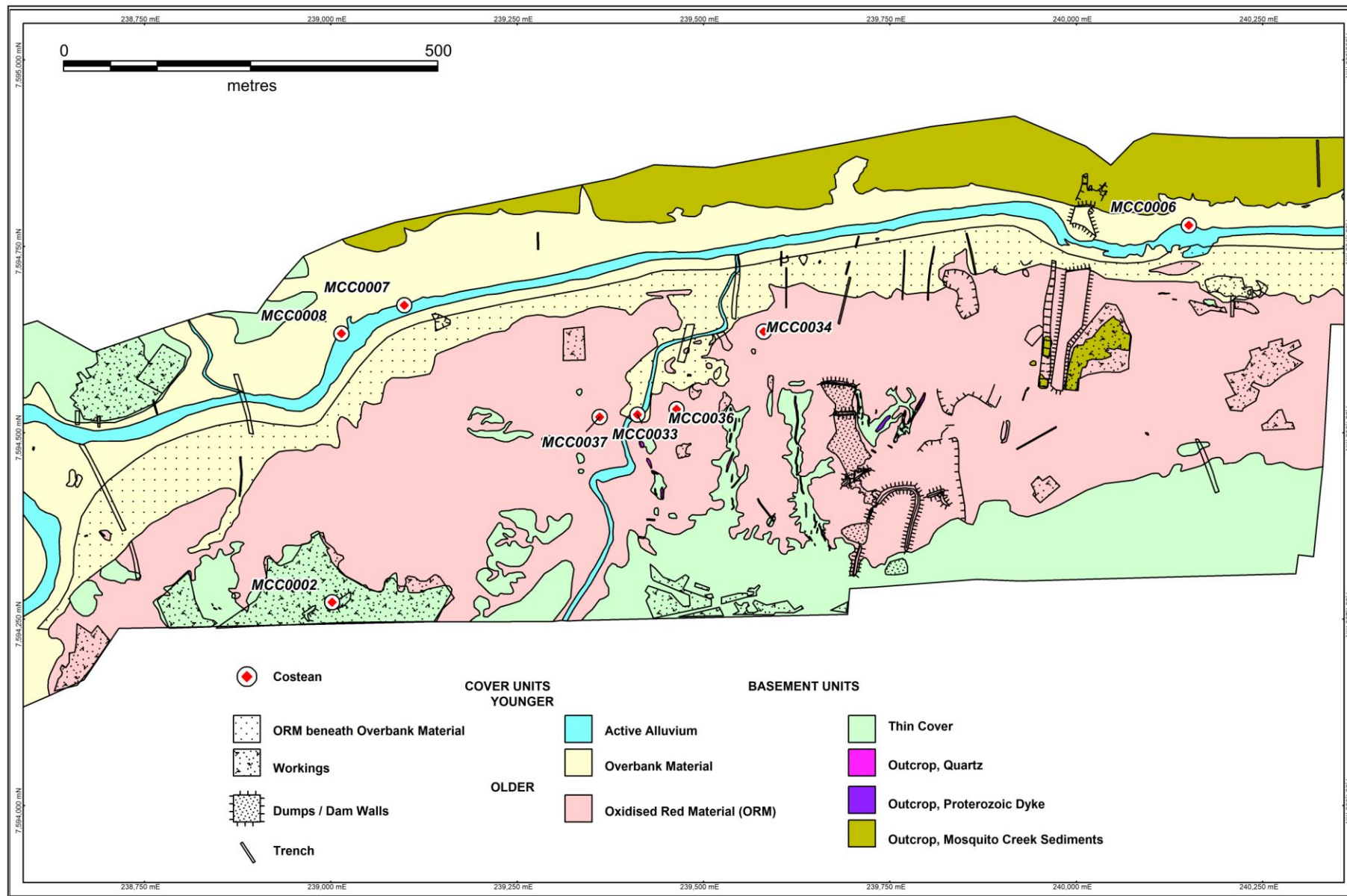















A wide-angle photograph of a sunset. The sun is a large, bright yellow circle in the center of the frame, partially obscured by a thin layer of clouds. The sky is a gradient of orange and yellow. In the foreground, there is a dark silhouette of a landscape with trees and a house on the left. The text "Thank you" is centered at the bottom of the image.

Thank you