Eksplorasi Jejak Pelabuhan Kuno Daerah Aliran Sungai Brantas "Situs Kadipaten Terung"

Firman Syaifuddin

05-06-2021

Institut Teknologi Sepuluh Nopember (ITS), Kampus ITS, Sukolilo, Jl. Raya ITS, Keputih, Surabaya, Jawa Timur, 60117, Indonesia.

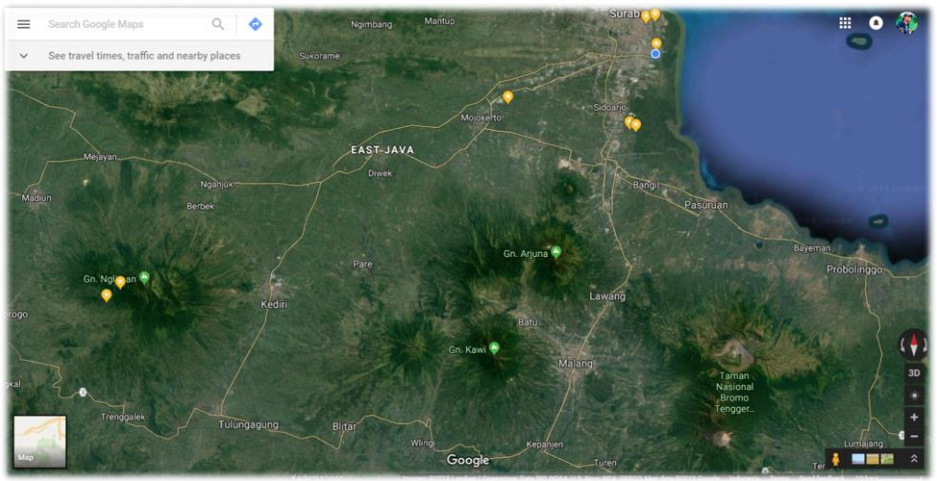
Outline

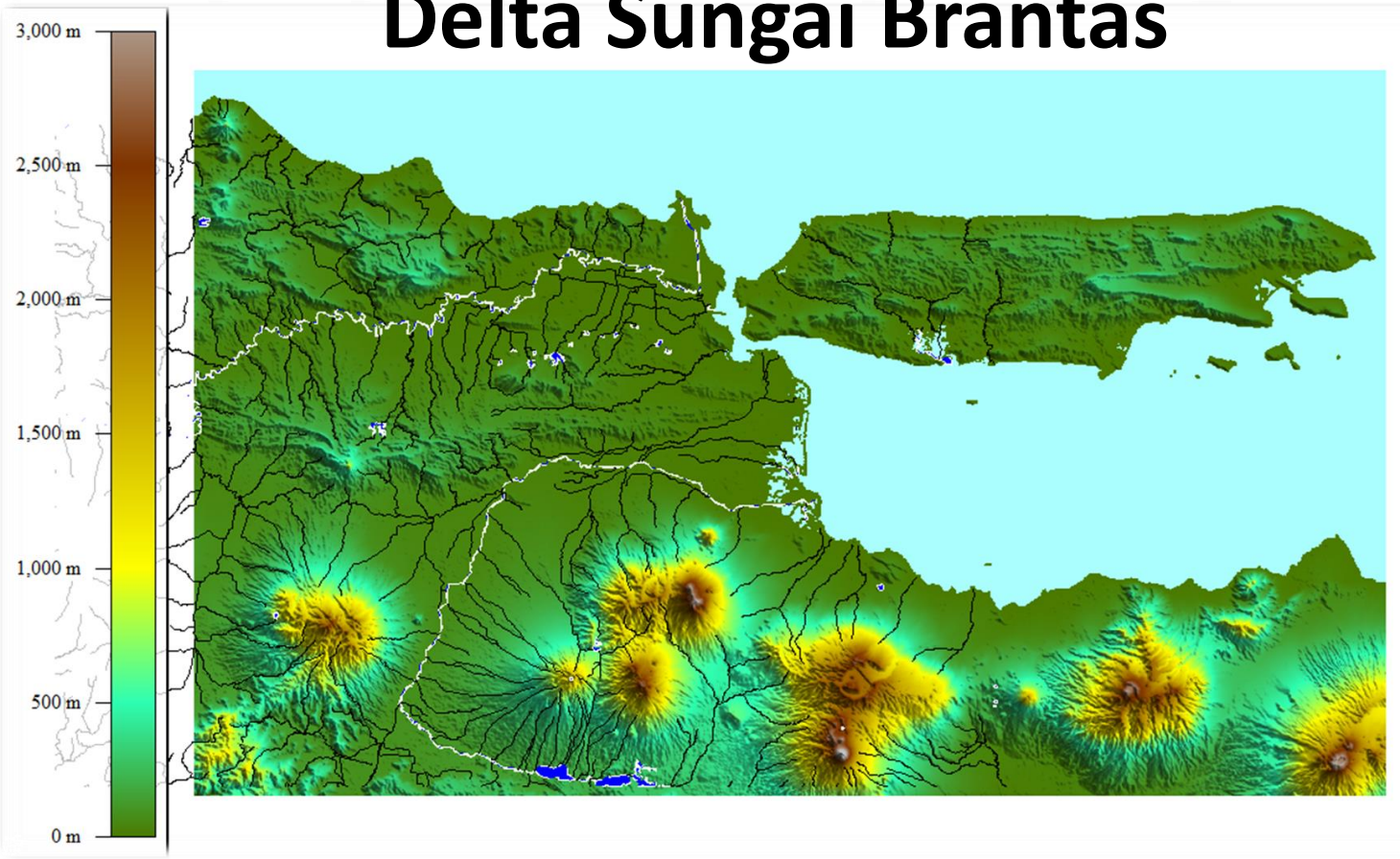
1. Peradaban Delta Sungai Brantas
2. Metoda Eksplorasi
3. Jejak Situs Pelabuhan Kadipaten Terung
4. Kesimpulan

1 • Peradaban Delta Sungai Brantas

TEKNIK GEOFISIKA ITS

Bentang Alam
Delta Sungai Brantas






© 2018 AfriGIS (Pty) Ltd.
Graph: Min, Avg, Max Elevation: 14, 23, 58 m
Range Totals: Distance: 17.2 km
Elev Gain/Loss: 111 m, -95.2 m
Max Slope: 3.8%, -5.9%
Avg Slope: 1.1%, -1.1%
58 m
50 m
40 m
30 m
20 m
14 m
16 m
0.0%
2.5 km
5 km
7.5 km
8.63 km
10 km
12.5 km
15 km
17.2 km

2 • Metoda Eksplorasi

Research Methods

Literature study Area of

- Historical research
- Archival research
- Oral History research

Surface & Geophysical Surveys

- Remote sensing
- Field survey & Drones
- Geophysical Surveys
- Structural Interpretation

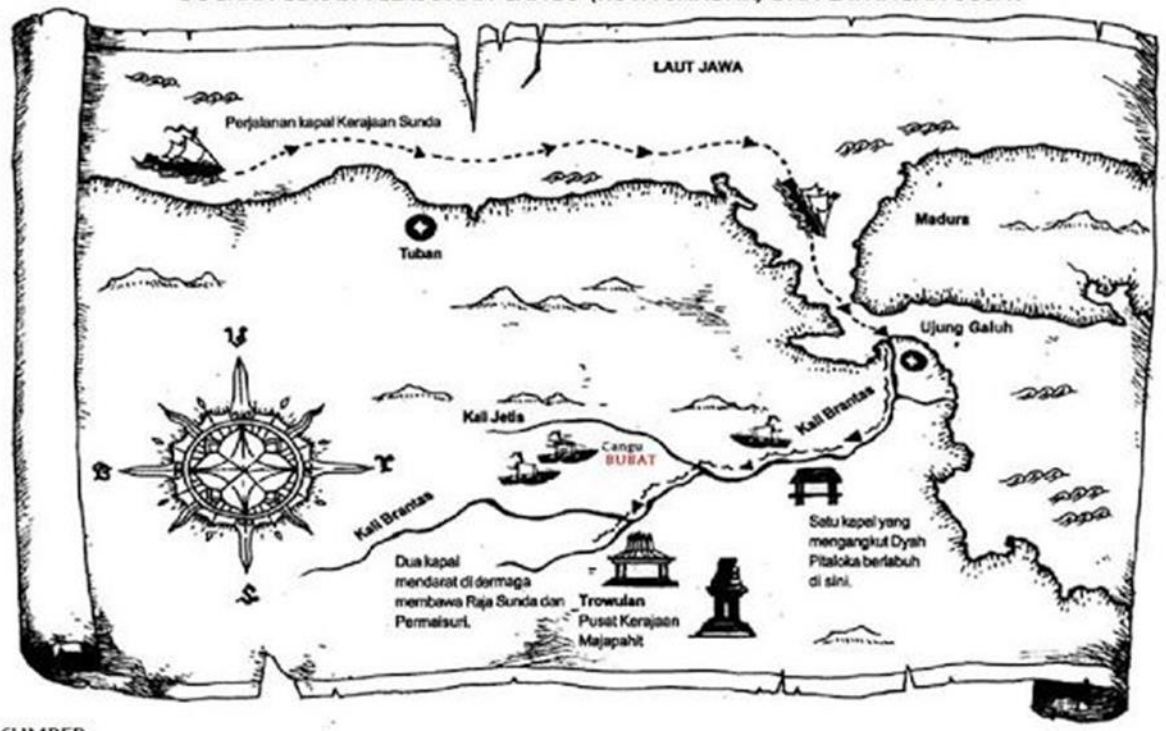
Analysis & Extracting Information

- Excavation
- Data Analysis
- Computational and virtual archaeology

3

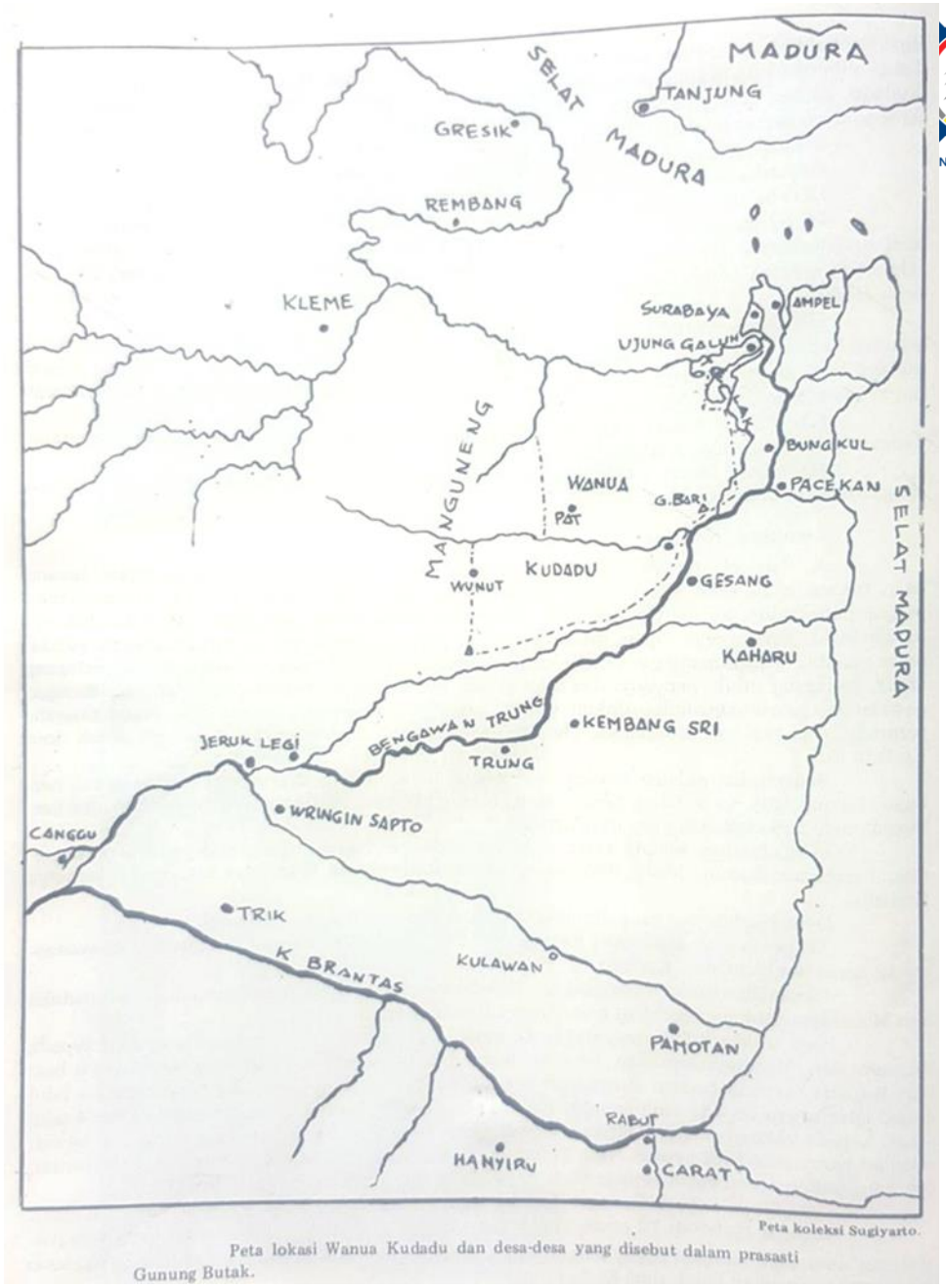
- Jejak Situs Pelabuhan Kadipaten Terung

PETA KERAJAAN MAJAPAHIT 1350M
DUGAAN LOKASI PELABUHAN CANGU (KOTA BANDAR) DAN LAPANGAN BUBAT



SUMBER:

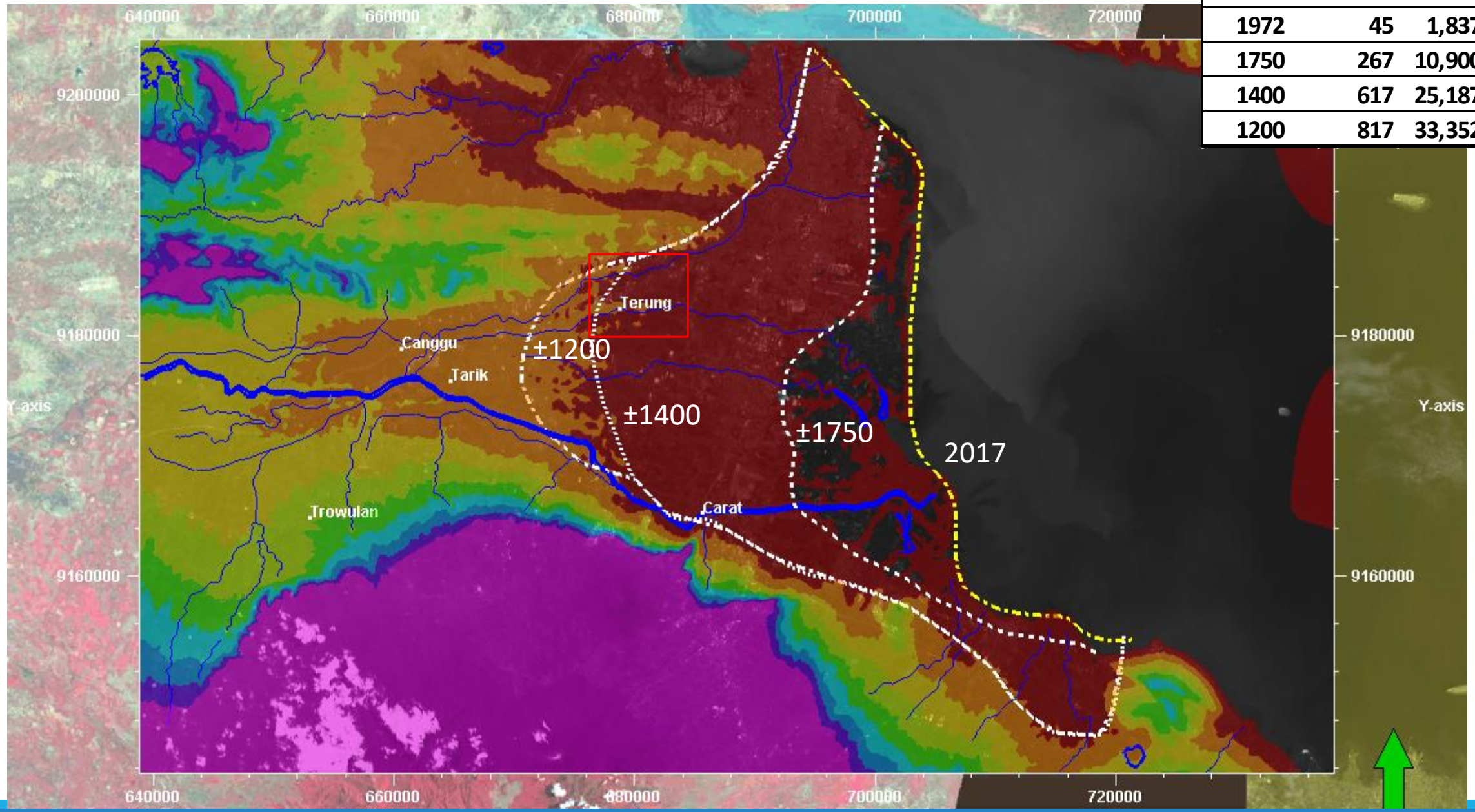
01. Kidung Sundayana (versi CC. Berg)
02. Perang Bubat, Tragedi di Balik Cinta Gajah Mada dan Dyah Pitaloka; Aan Merdeka Permana. Penerbit Qanita. PT Mizan Pustaka, Bandung Maret 2009



Peta koleksi Sugiyarto.

Peta lokasi Wanua Kudadu dan desa-desa yang disebut dalam prasasti Gunung Butak.

	2017		
1972	45	1,837	m
1750	267	10,900	m
1400	617	25,187	m
1200	817	33,352	m



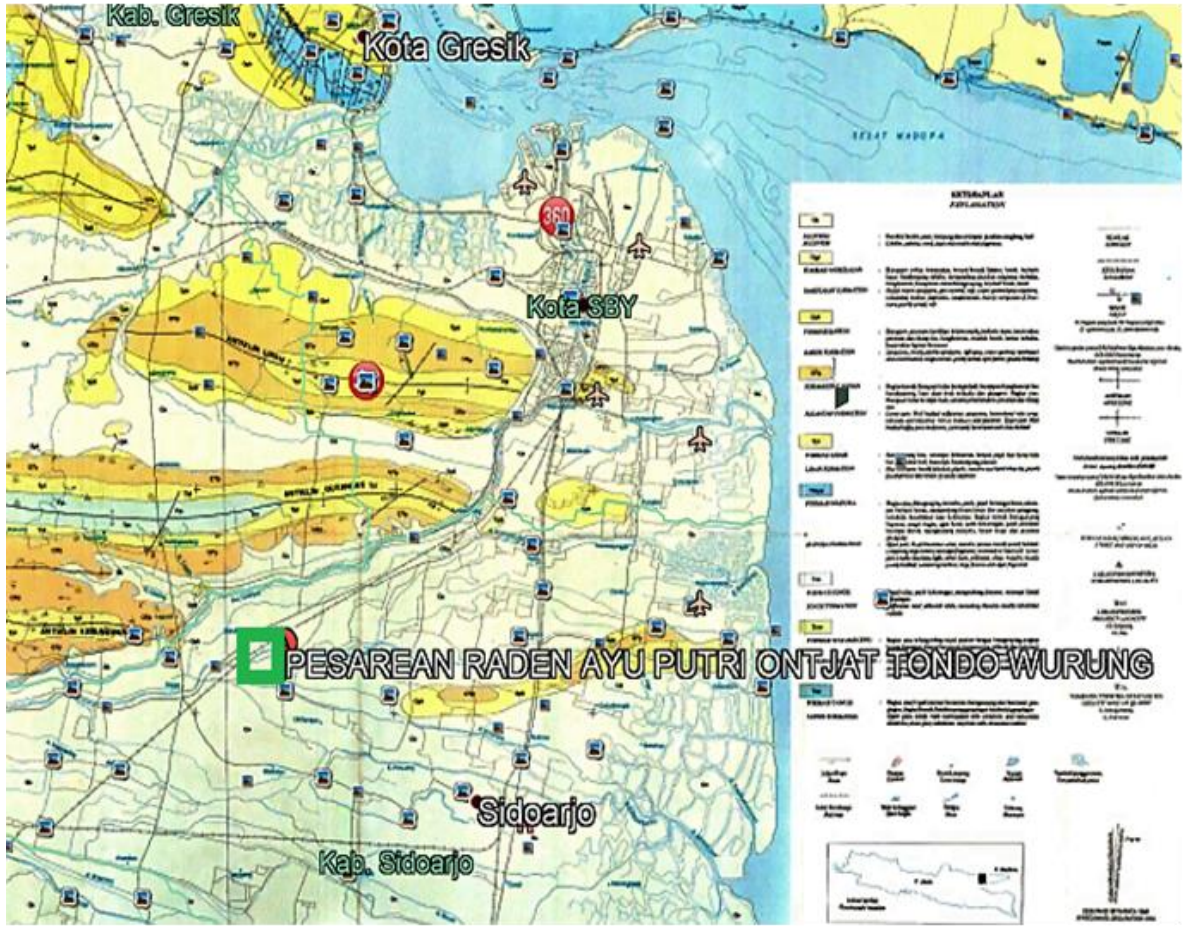
Penelusuran Jejak Peradaban "Komunitas Laskar Nusantara"


Terung
Canggu
Tarik
Trowulan
Carat

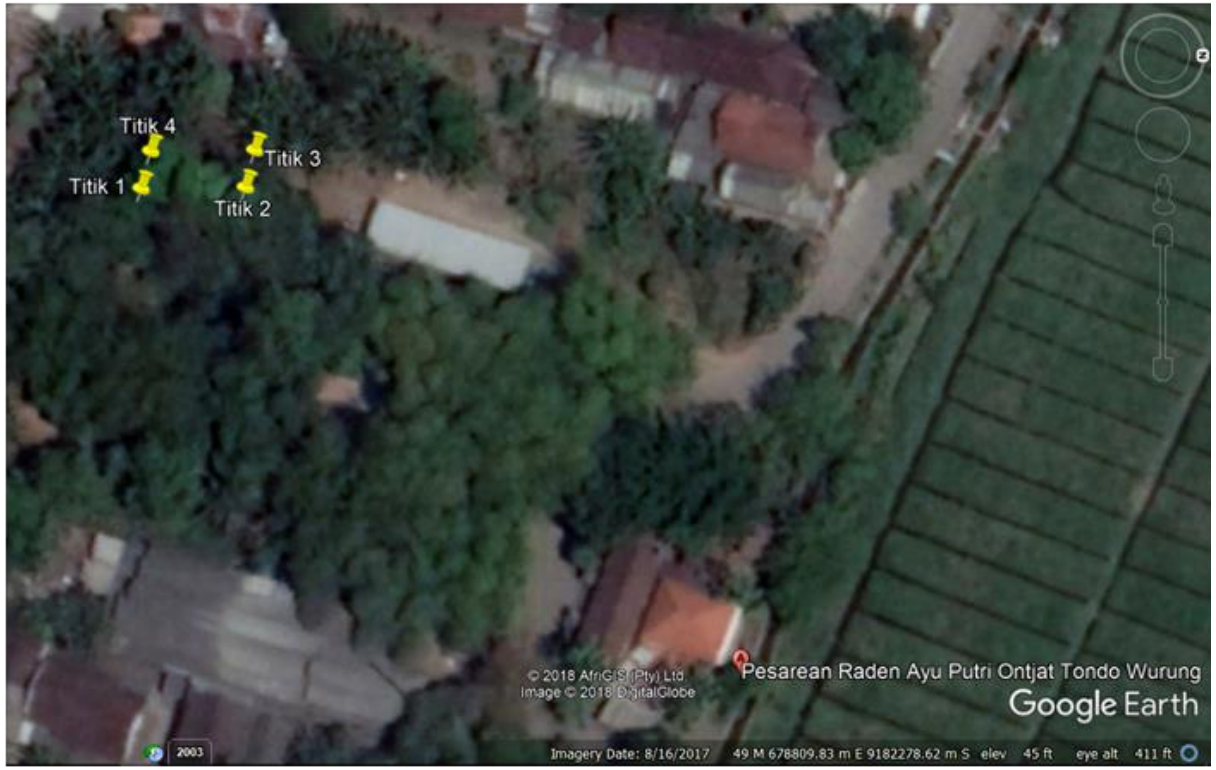
Studi Detail Situs Pelabuhan Kadipaten Terung

1. Identifikasi lapisan tanah keras bawah permukaan Situs Kadipaten Terung menggunakan metode geolistrik resistivitas 2 dimensi.
2. Identifikasi struktur bangunan bawah permukaan Situs Kadipaten Terung menggunakan metode geolistrik resistivitas 3 dimensi.
3. Analisis sedimen sungai dari hasil geolistrik resistivitas 2 dimensi.
4. Analisis *paleo-channel*, pola dan bentuk *channel* berdasarkan sampel tanah.

Situs Pelabuhan Kadipaten Terung



Peta geologi lembar Surabaya-Sapulu (Supandjono dkk., 1992)



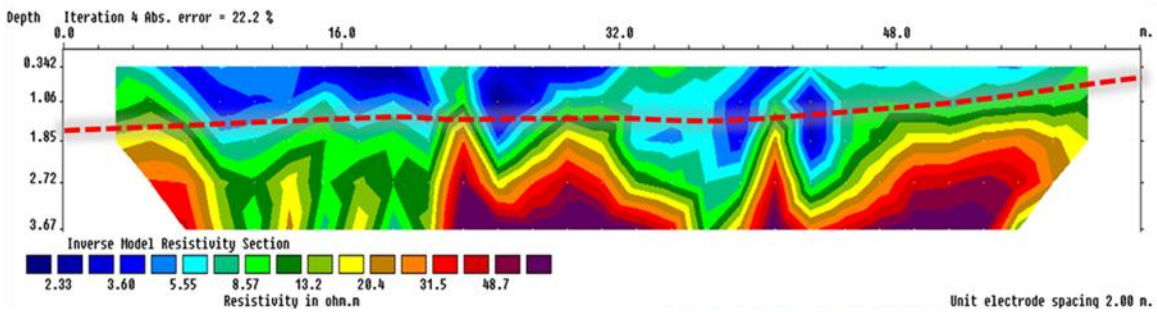
Terdapat pada formasi endapan alluvium (Qa) yang ditandai warna hijau pada peta geologi.

- **Identifikasi lapisan tanah keras bawah permukaan Situs Kadipaten Terung menggunakan metode geolistrik resistivitas 2 dimensi.**

Pengukuran Geolistrik 2D

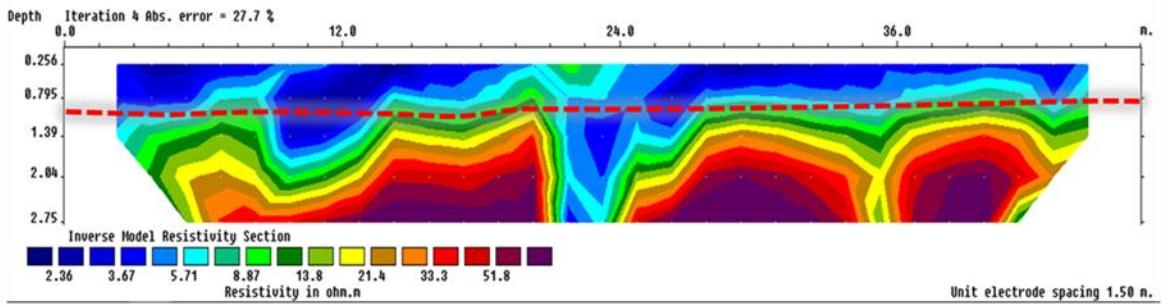
1A	1B
7.39501 LS 112.61998 BT	7.39555 LS 112.61979 BT

1B



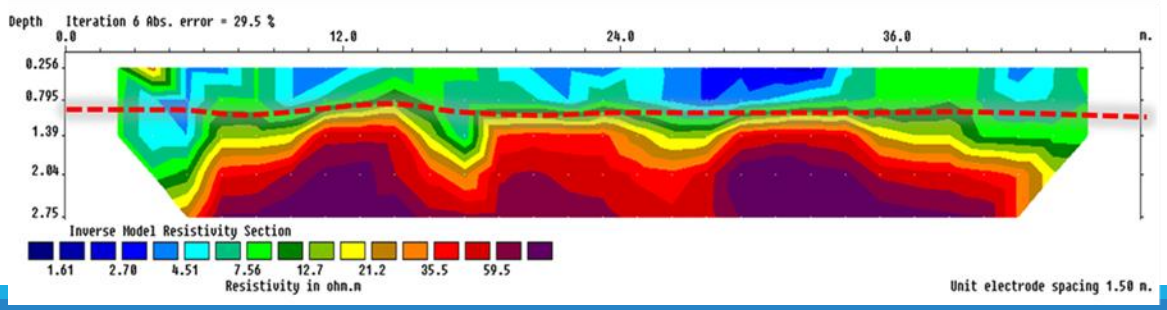
2A	2B
7.39526 LS 112.61977 BT	7.39508 LS 112.62014 BT

2B



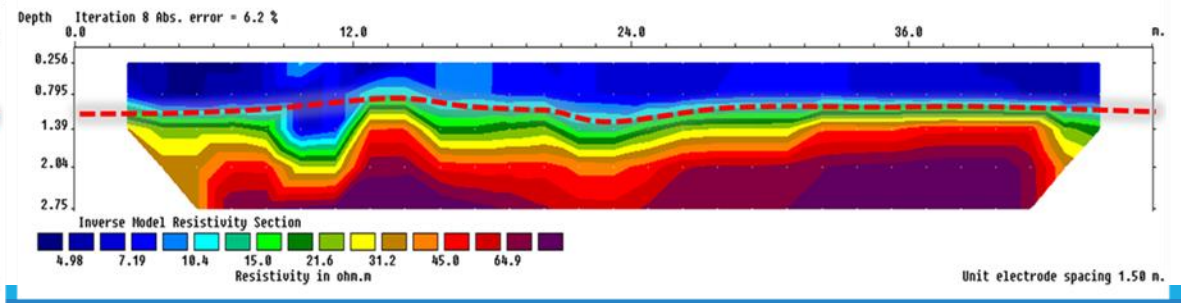
3A	3B
7.39513 LS 112.61981 BT	7.39548 LS 112.62003 BT

3B



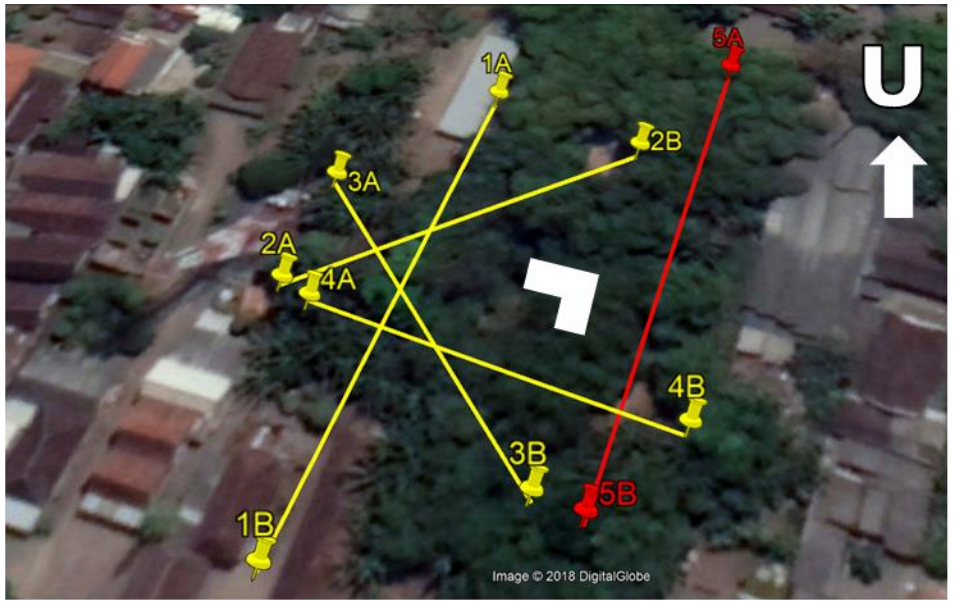
4A	4B
7.39528 LS 112.6198 BT	7.39541 LS 112.62018 BT

4B

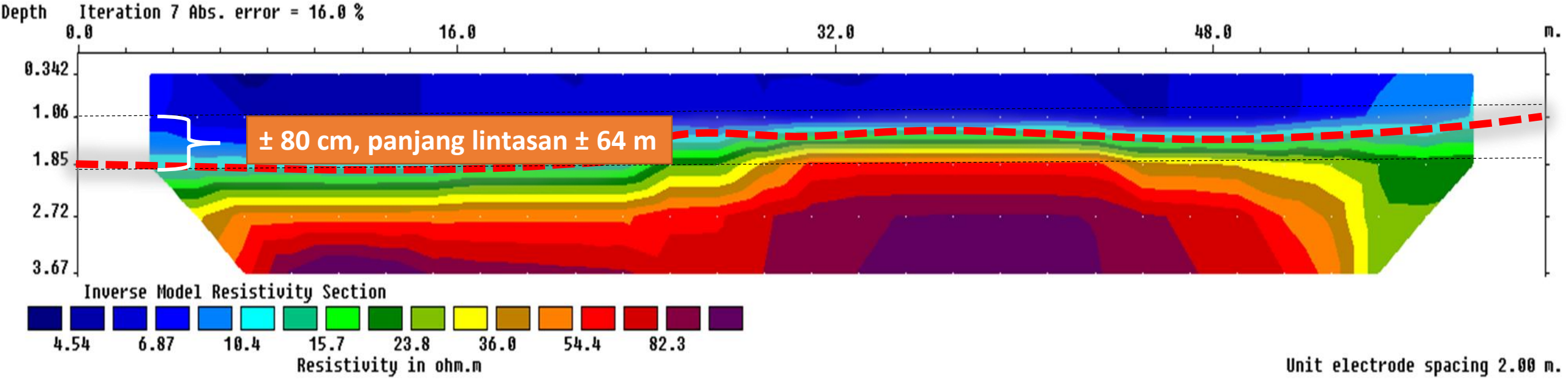


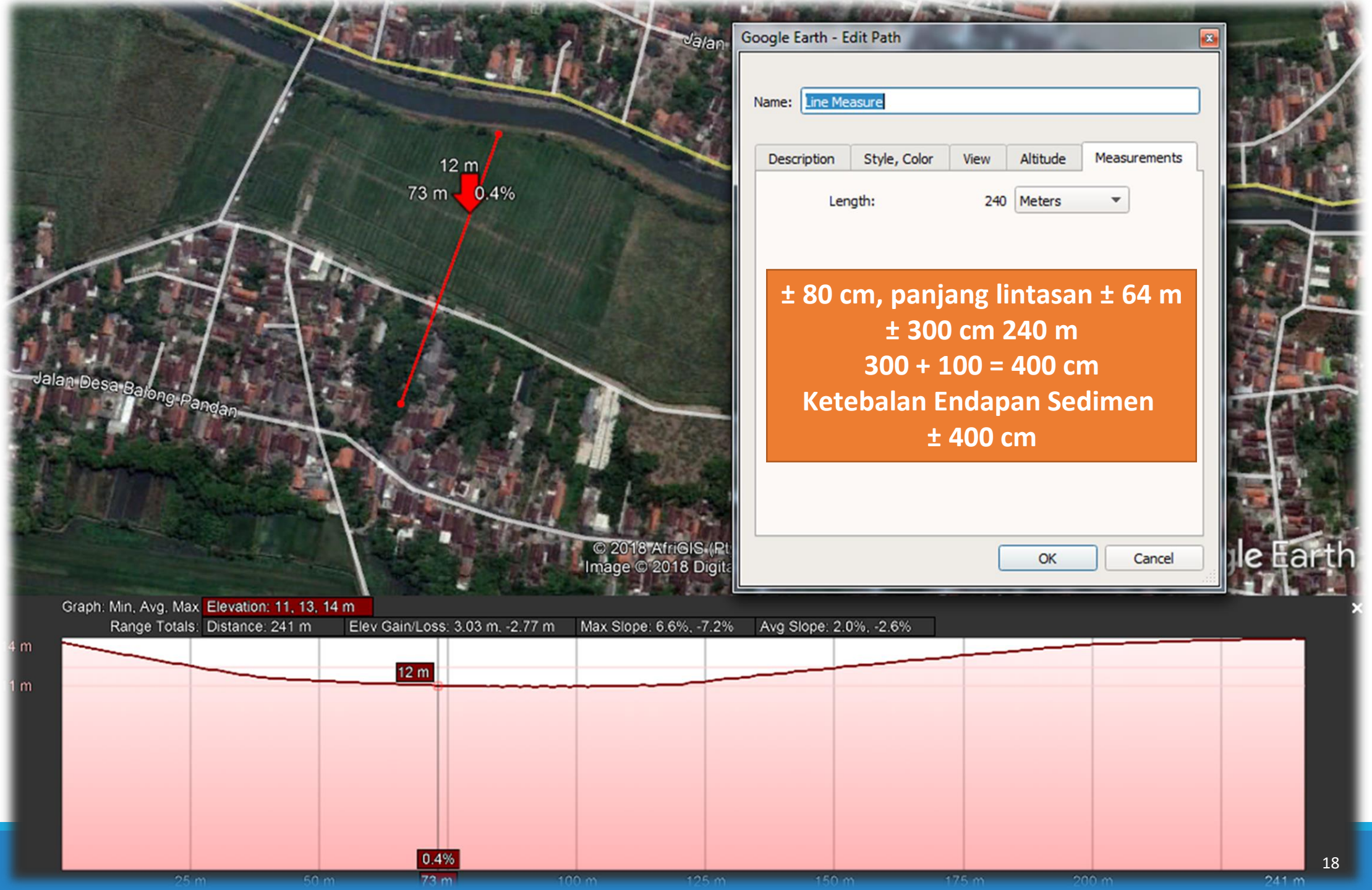
LINTASAN 5

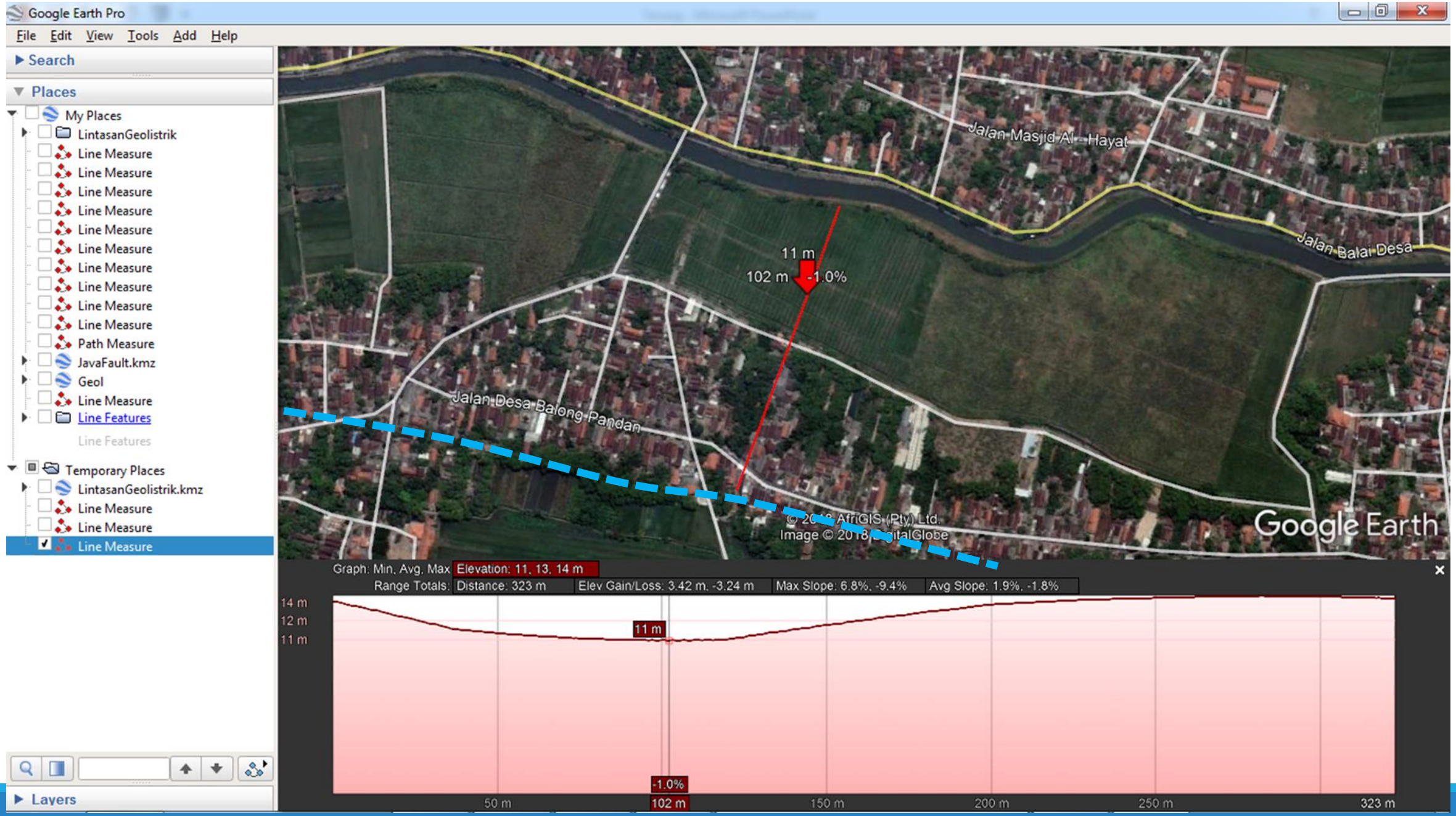
5A	5B
7.39496 LS 112.62025 BT	7.3955 LS 112.62008 BT



5B

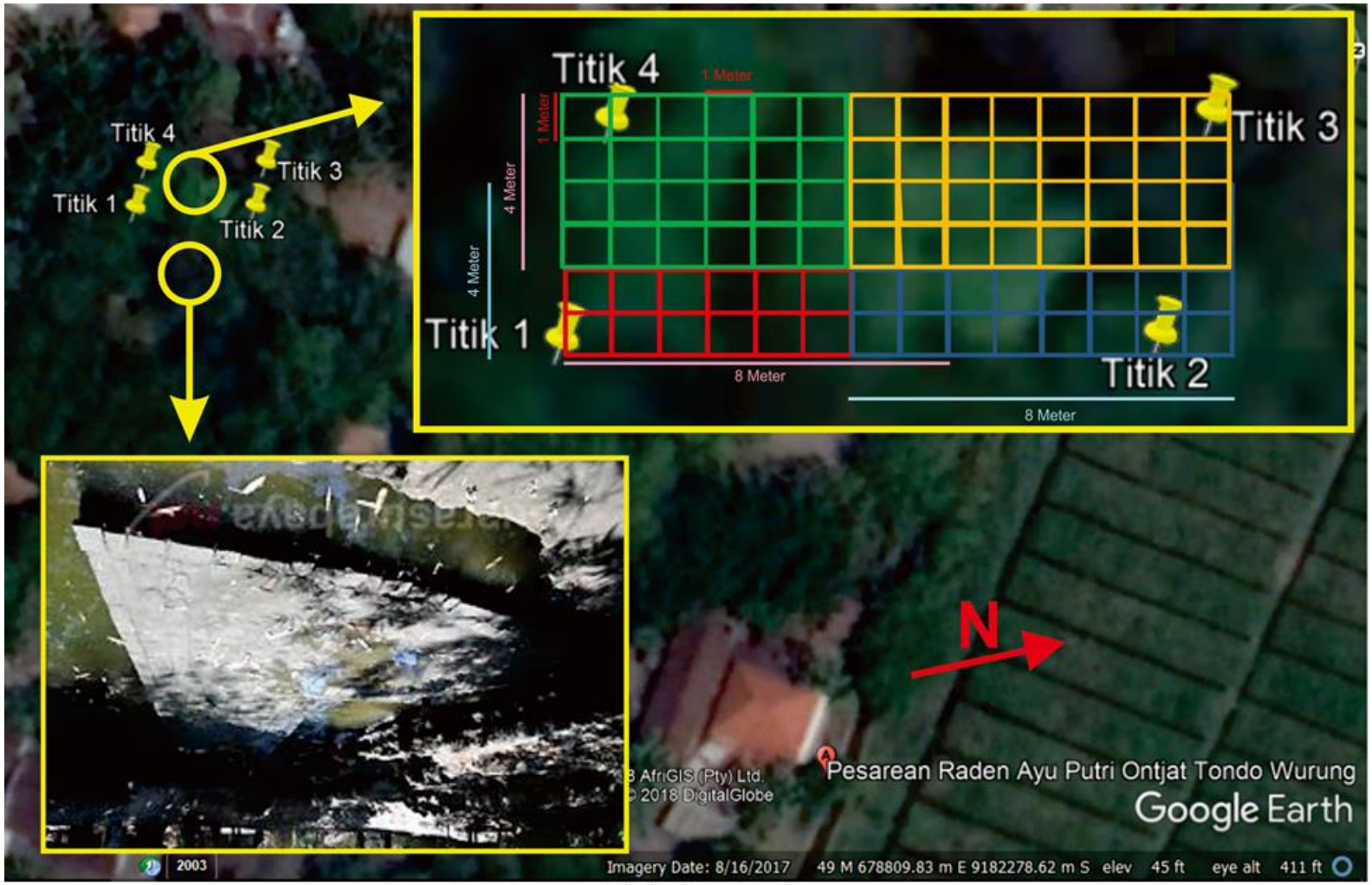



Jalan
12 m
73 m
0.4%
Jalan Desa Balong Pandan
© 2018 AfriGIS (Pt
Image © 2018 Digita
Google Earth - Edit Path
Name:
Line Measure
Description
Style, Color
View
Altitude
Measurements
Length:
240
Meters
± 80 cm, panjang lintasan ± 64 m
± 300 cm 240 m
300 + 100 = 400 cm
Ketebalan Endapan Sedimen
± 400 cm
OK
Cancel
Graph: Min, Avg, Max
Elevation: 11, 13, 14 m
Range Totals:
Distance: 241 m
Elev Gain/Loss: 3.03 m, -2.77 m
Max Slope: 6.6%, -7.2%
Avg Slope: 2.0%, -2.6%
4 m
1 m
12 m
0.4%
25 m
50 m
73 m
100 m
125 m
150 m
175 m
200 m
241 m


Google Earth Pro
File Edit View Tools Add Help
Search
Places
My Places
LintasanGeolistrik
Line Measure
Path Measure
JavaFault.kmz
Geol
Line Features
Temporary Places
LintasanGeolistrik.kmz
Layers
Jalan Masjid Al Hayat
Jalan Balai Desa
Jalan Desa Balong Pandan
11 m
102 m -1.0%
Google Earth
Graph: Min, Avg, Max Elevation: 11, 13, 14 m
Range Totals: Distance: 323 m
Elev Gain/Loss: 3.42 m, -3.24 m
Max Slope: 6.8%, -9.4%
Avg Slope: 1.9%, -1.8%
14 m
12 m
11 m
-1.0%
50 m
102 m
150 m
200 m
250 m
323 m

- **Identifikasi struktur bangunan bawah permukaan Situs Kadipaten Terung menggunakan metode geolistrik resistivitas 3 dimensi.**

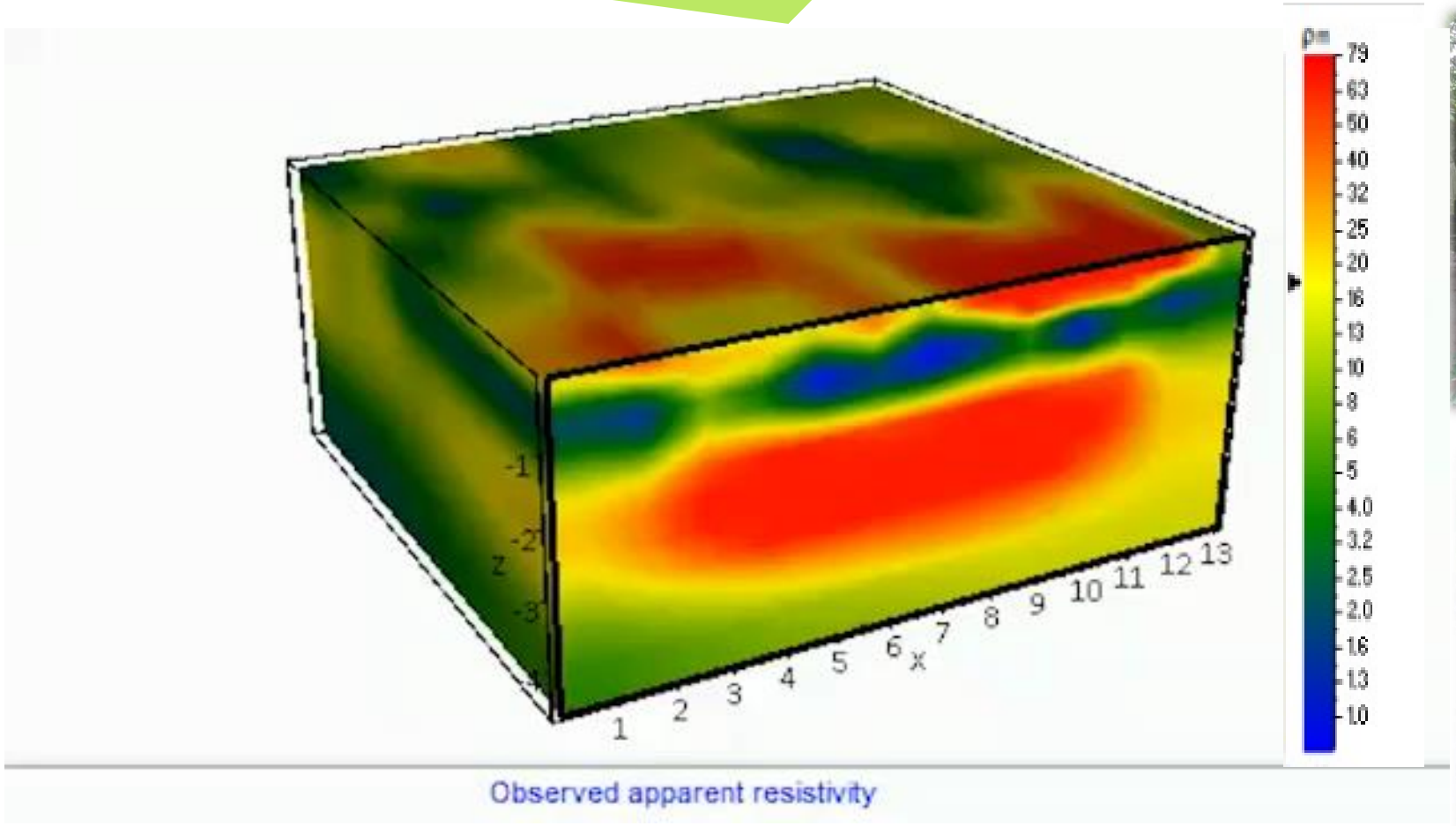
Pengukuran Geolistrik 3DSitus Kadipaten Terung



Desain akuisisi situs kadipaten terung

Hasil Pengolahan Data

Situs Kadipaten Terung

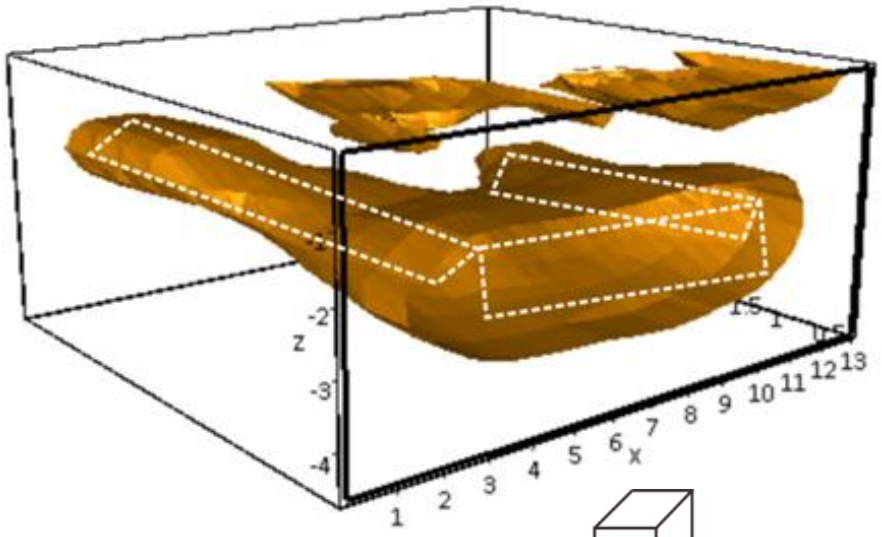


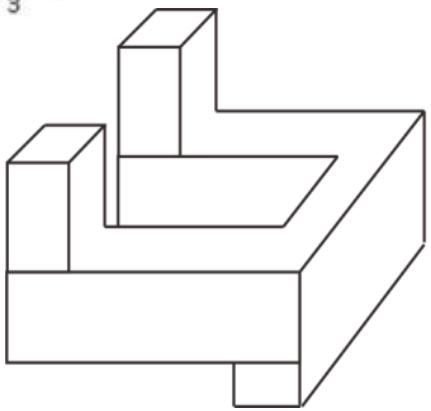
Observed apparent resistivity

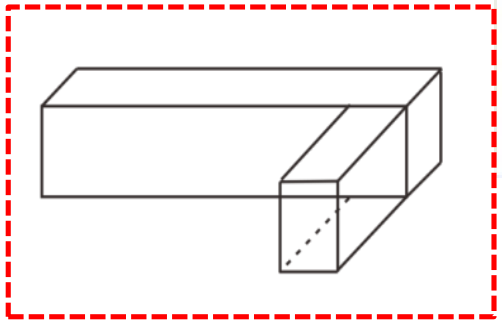
Interpretasi Data

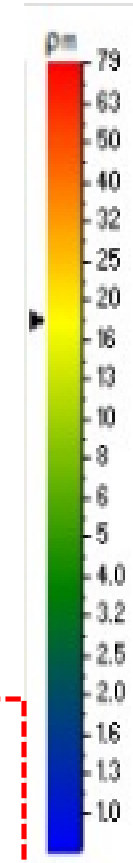
Situs Kadipaten Terung

Distribusi struktur bangunan bawah permukaan Situs Kadipaten Terung







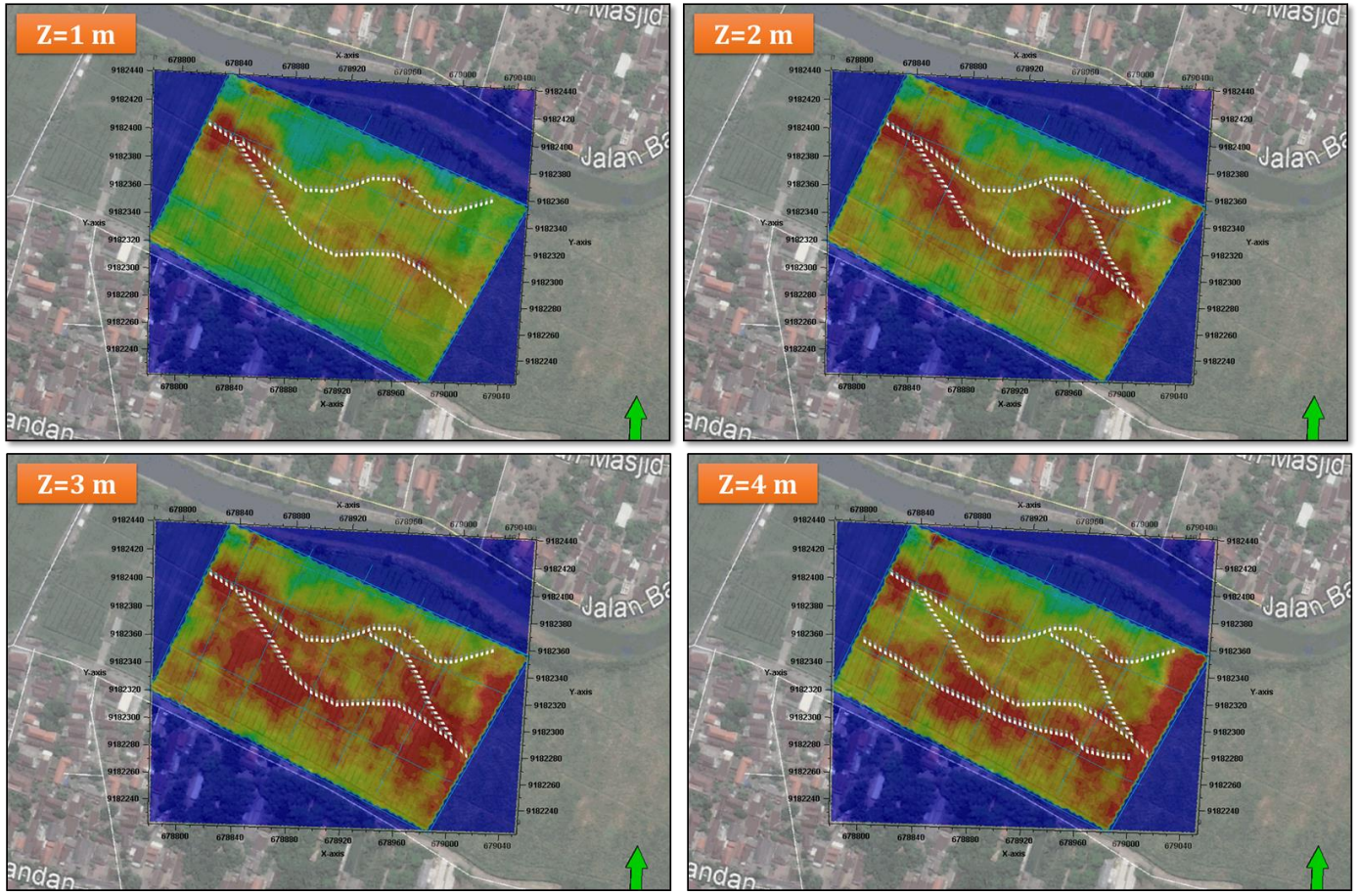


Hasil rekonstruksi situs Kadipaten Terung

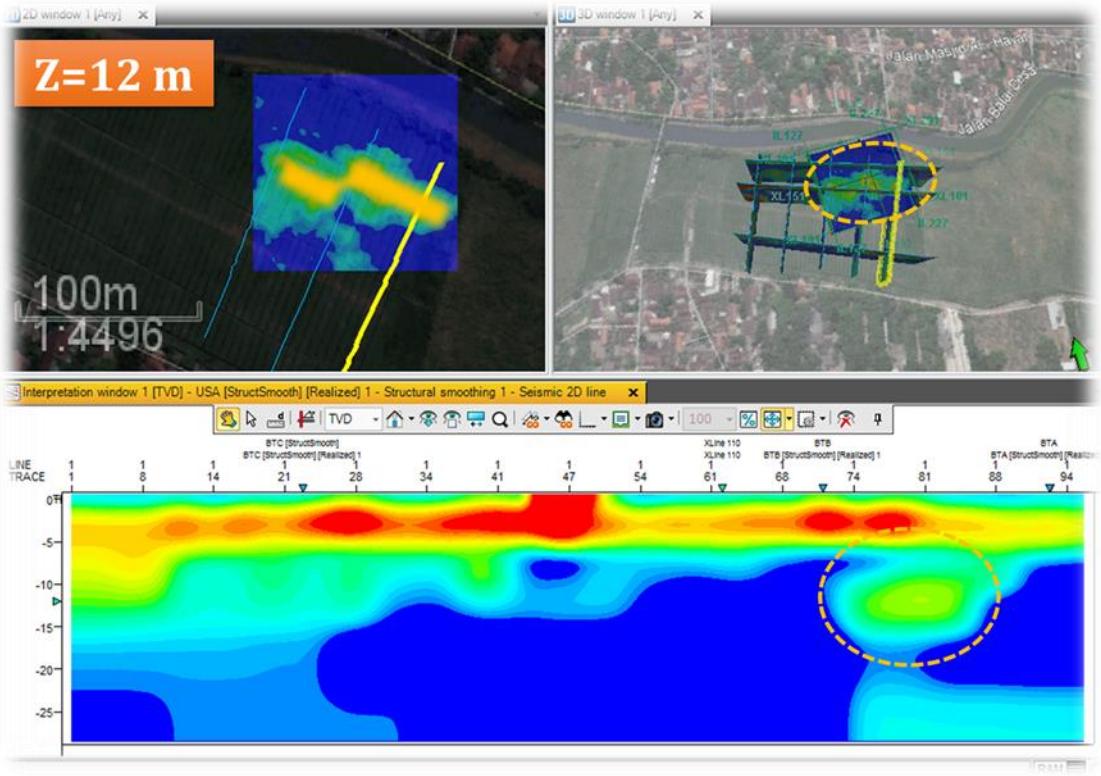
- **Analisis sedimen sungai dari hasil geolistrik resistivitas 2 dimensi.**

Rekonstruksi garis tepian sungai

Lintasan pengukuran geolistrik 2D tambahan

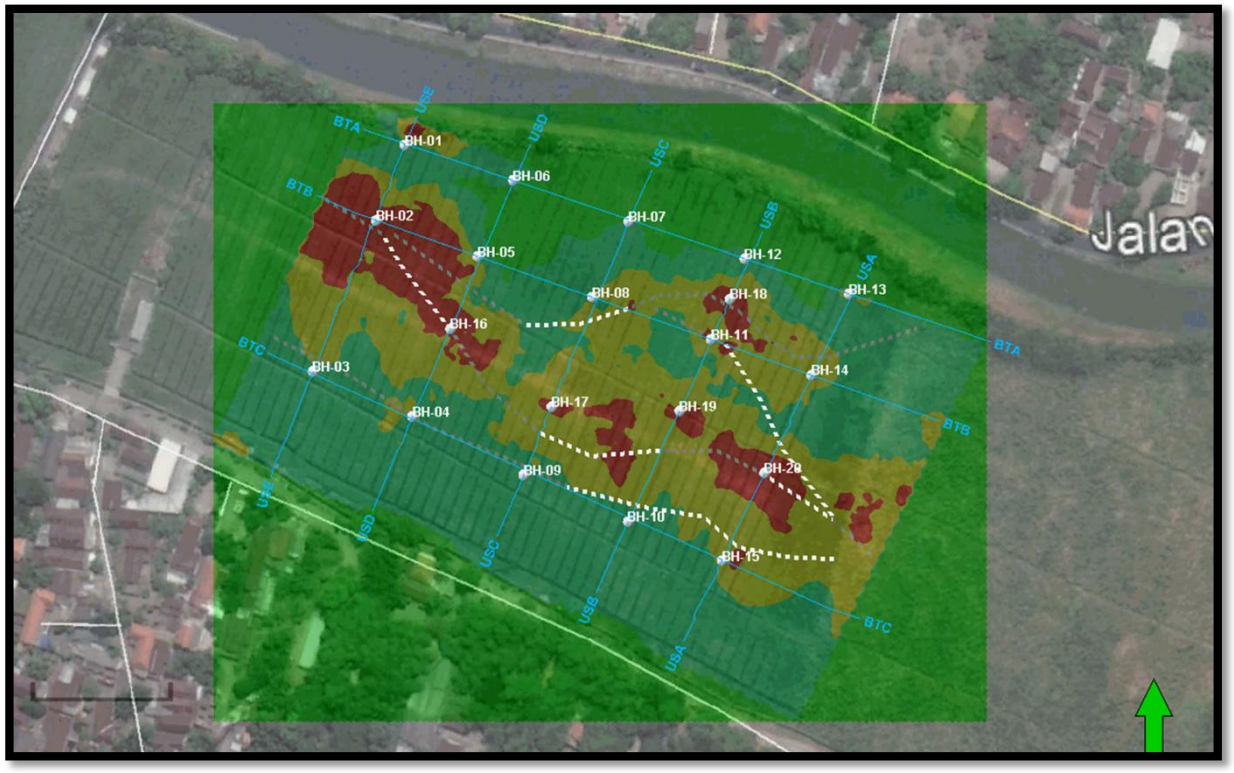


Interpretasi alur *paleochannel* pada kedalaman 1-4 meter

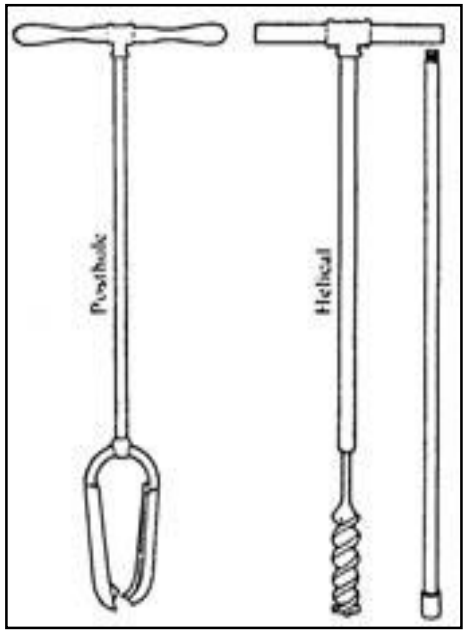


Identifikasi objek lain dari Hasil Geolistrik 2 Dimensi

- **Analisis *paleo-channel*, pola dan bentuk *channel* berdasarkan sampel tanah.**



Peralatan Auger (Hand Bor) dan Sieving Analyses :



Lokasi pengambilan sampel tanah hingga kedalaman sampai dengan 2 meter

Methodology

1. Preparation

- Sampel drying

- **Sample Pounding**

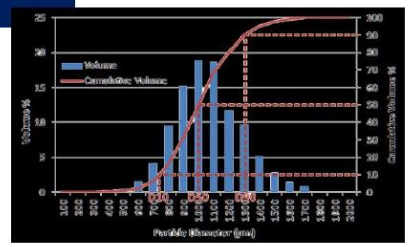
Pounding Parameter
-Time and tools of pounding process
-Grain size QC using handless microscope

Sieving Analysis

Source : Bashir, 2018

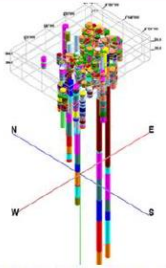
Sieve arrangement	No Ayakan
1.	16
2.	30
3.	50
4.	140
5.	200

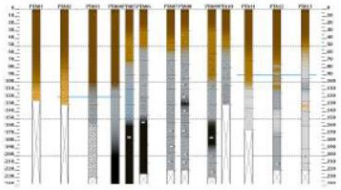
3. Parameter Static Calculation and Analysis



1. Retained samples mass
2. % Cumulative retained
3. Mean
4. Median
5. Skewness
6. Kurtosis

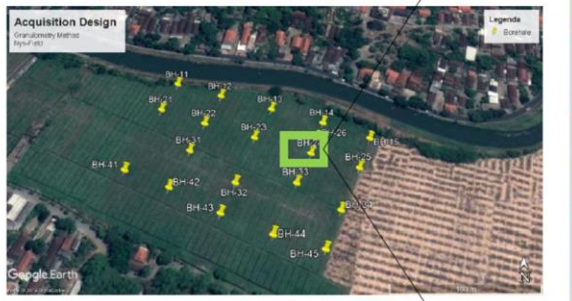
4. Modelling and Lithology Log Correllation

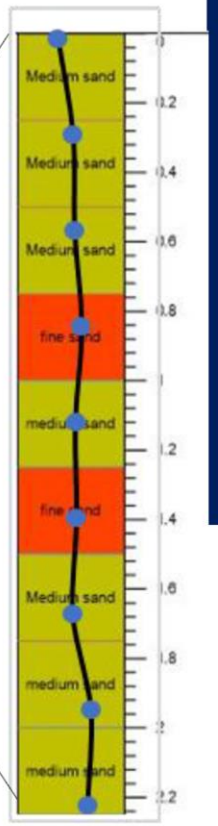




Parameter Input
-Depth
-Parameter Static
-Borehole coordinate

Corellation Static Parameter and Lithology

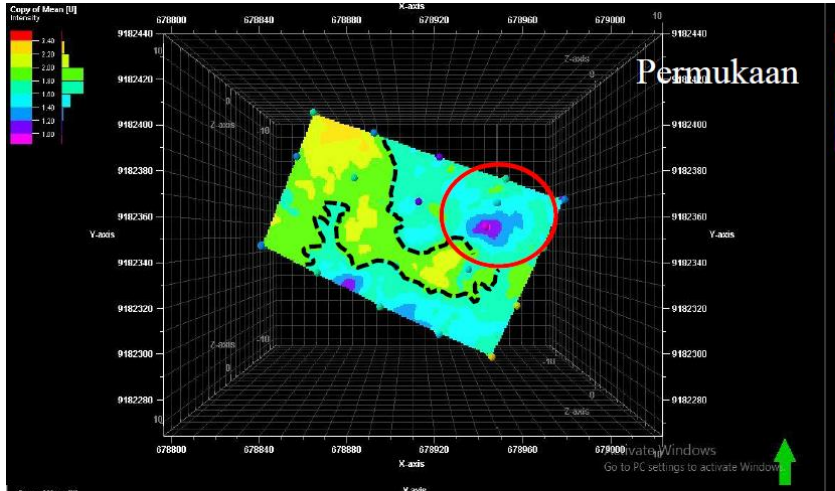


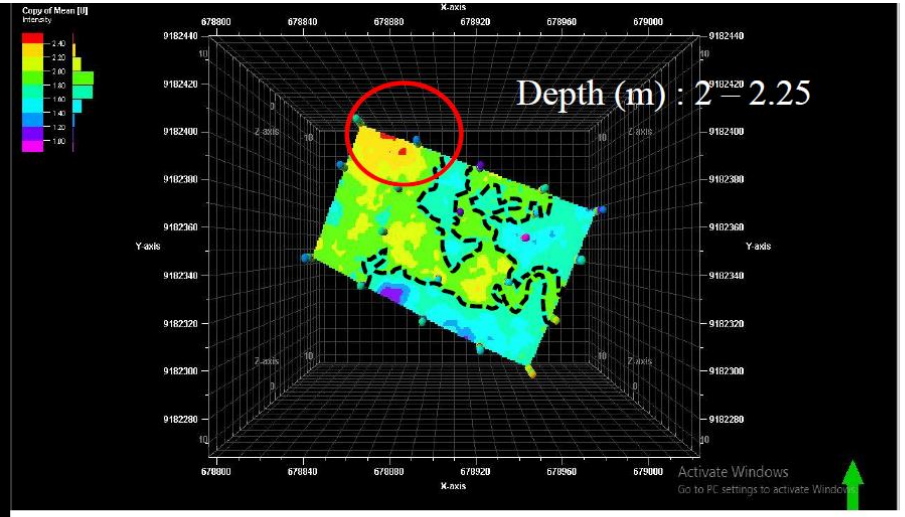


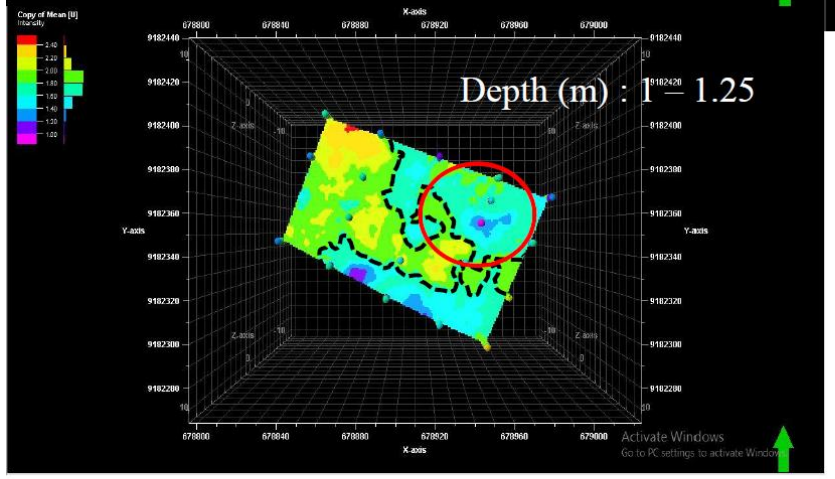
How to make an investigation?

Code : BH 21

Latitude	Longitude	Depth	Mean	Lithology
678837.3	9182398.94	0	1.2124	Medium sand
678837.3	9182398.94	0.25	1.707376	Medium sand
678837.3	9182398.94	0.5	1.8268	Medium sand
678837.3	9182398.94	0.75	2.370134	**Fine sand**
678837.3	9182398.94	1	1.852641	Medium sand
678837.3	9182398.94	1.25	1.9051	Medium sand
678837.3	9182398.94	1.5	1.7565	Medium sand
678837.3	9182398.94	1.75	2.4396	**Fine sand**
678837.3	9182398.94	2	2.3105	**Fine sand**





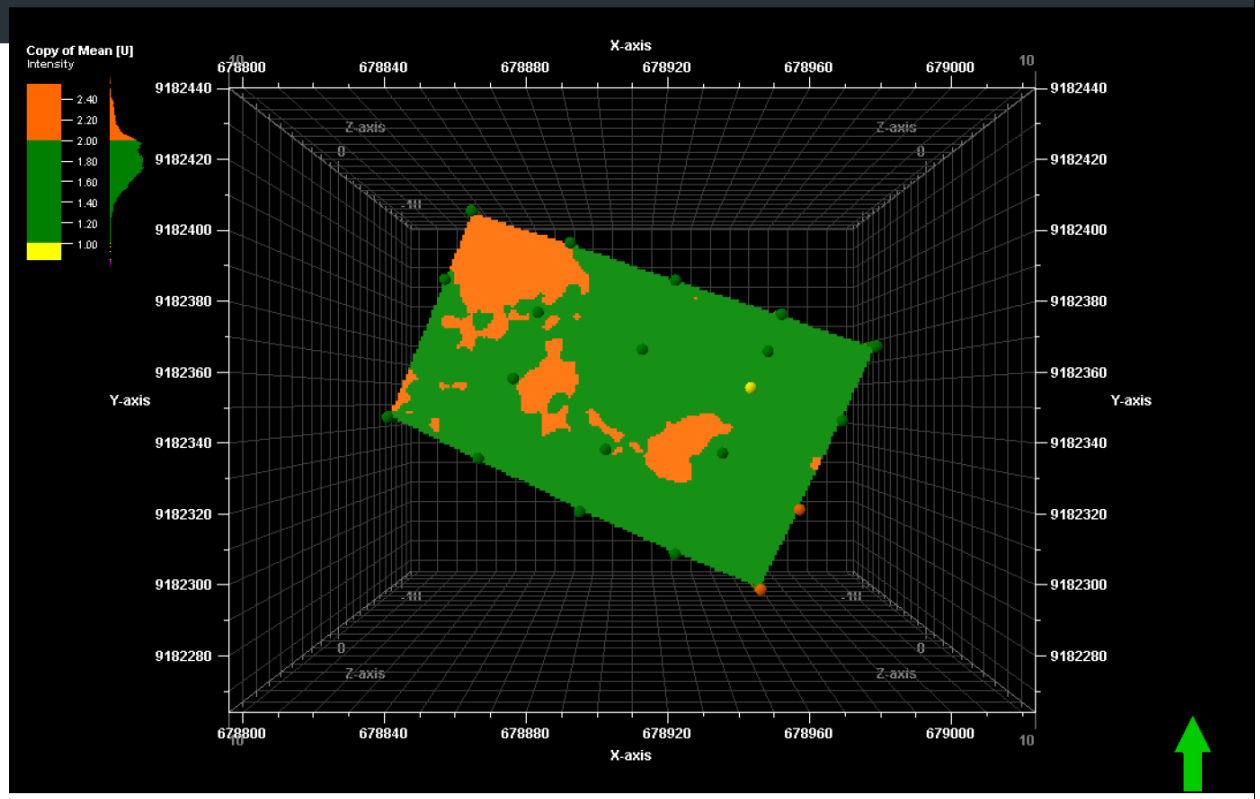


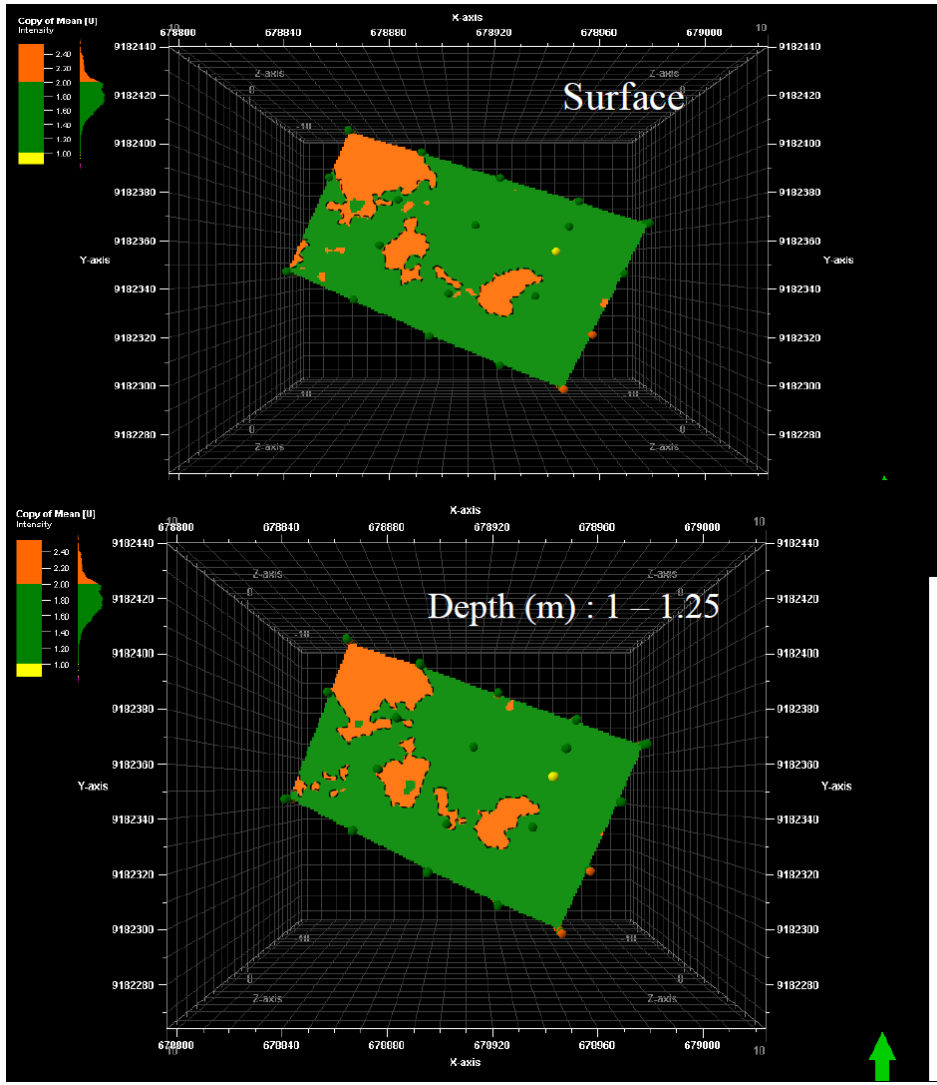
Depositional Channel Development

Spasial Map

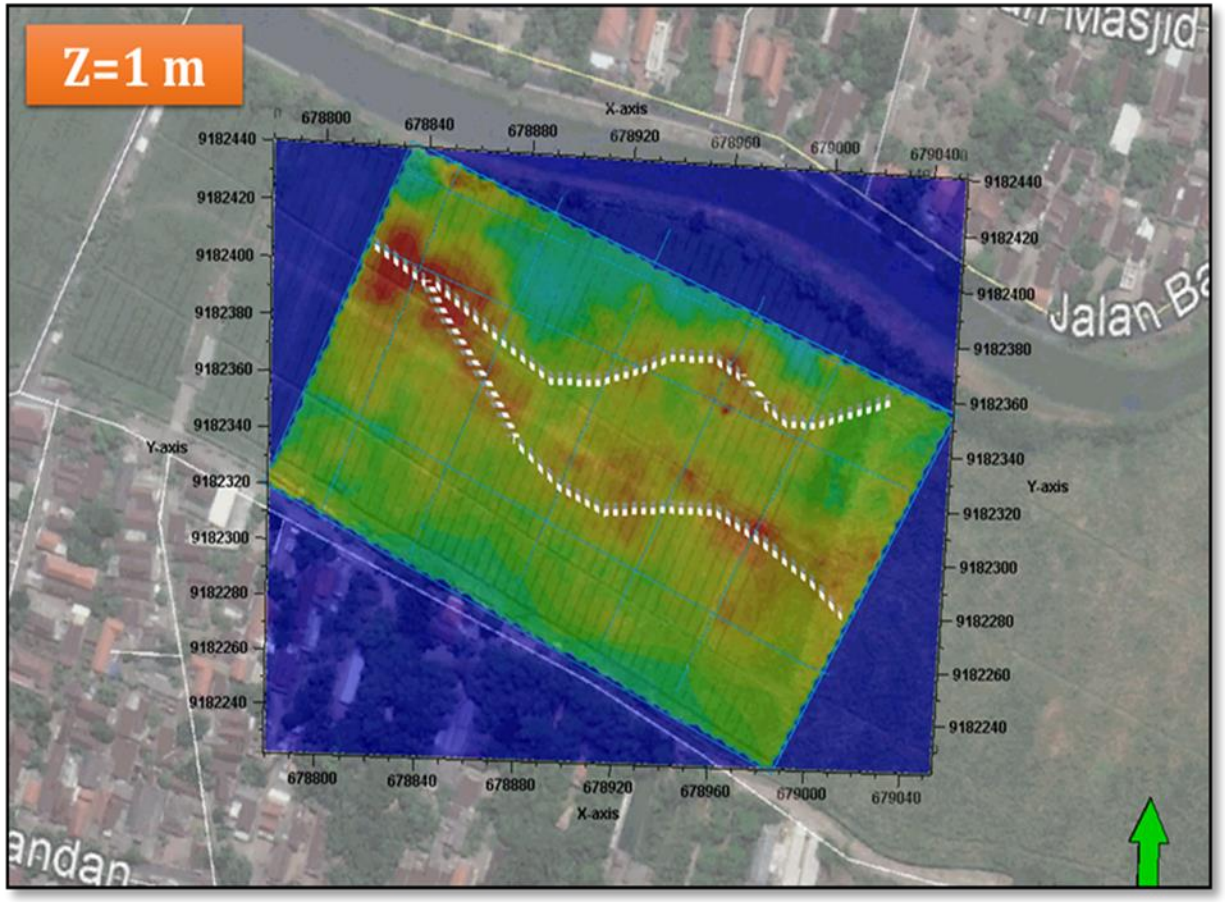
Legend

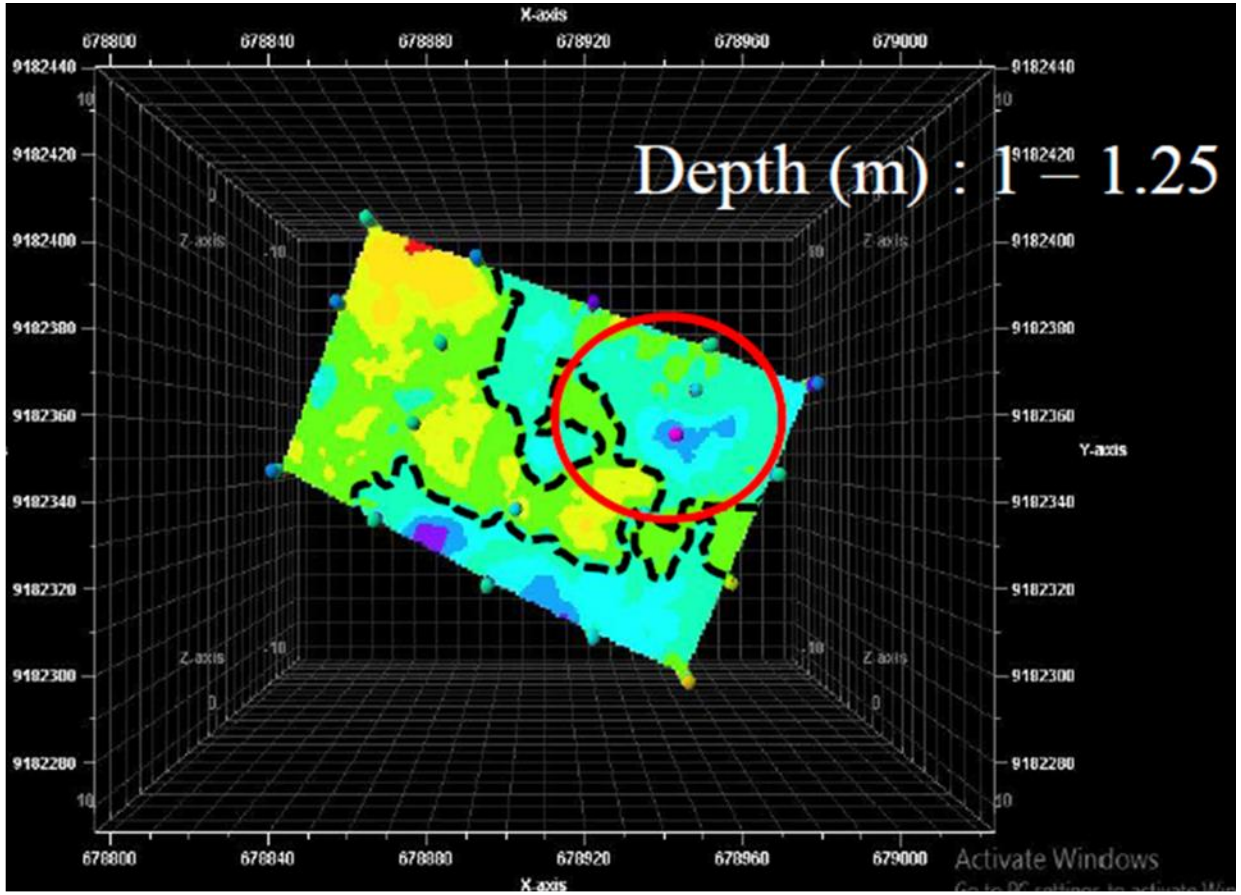
- Medium sand
- Fine sand
- Coarse sand

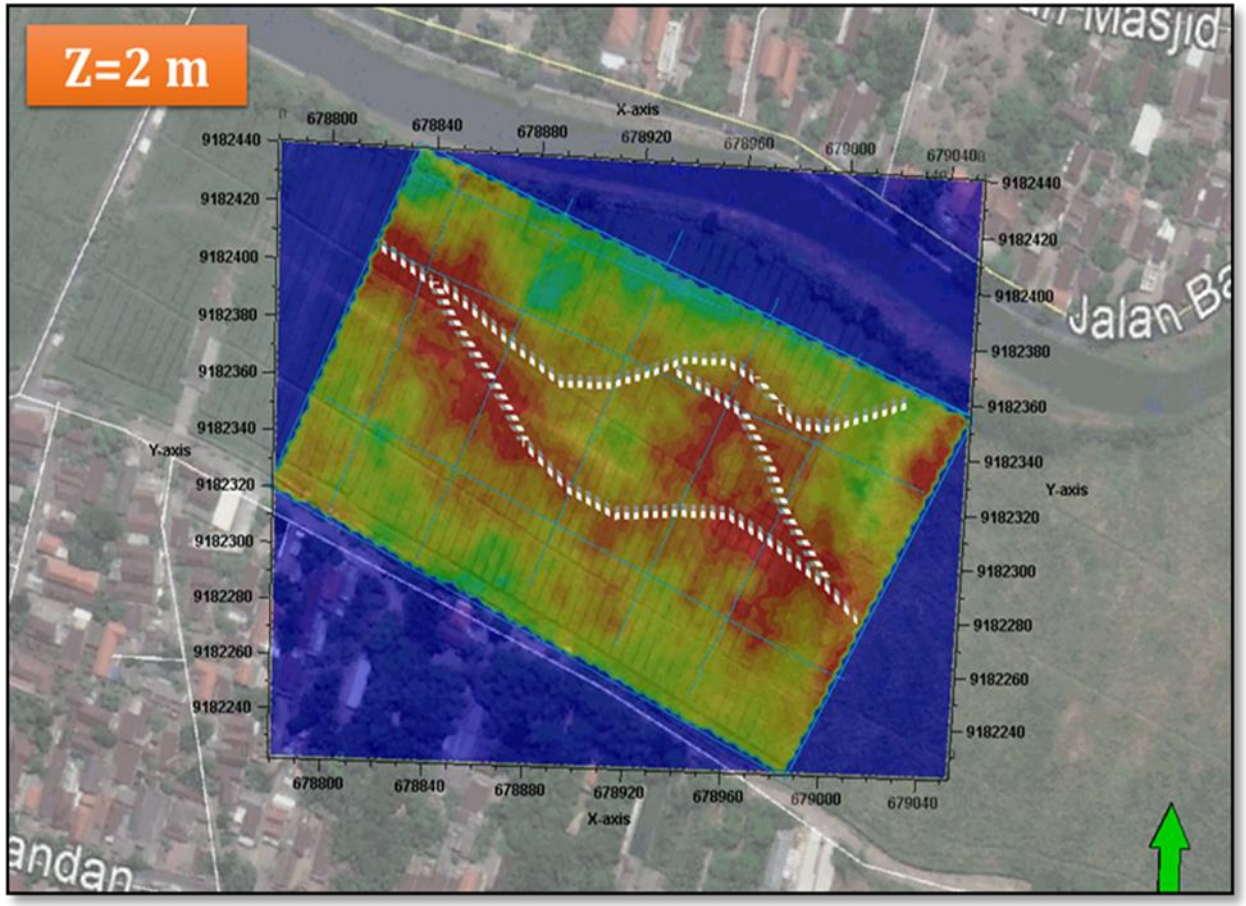


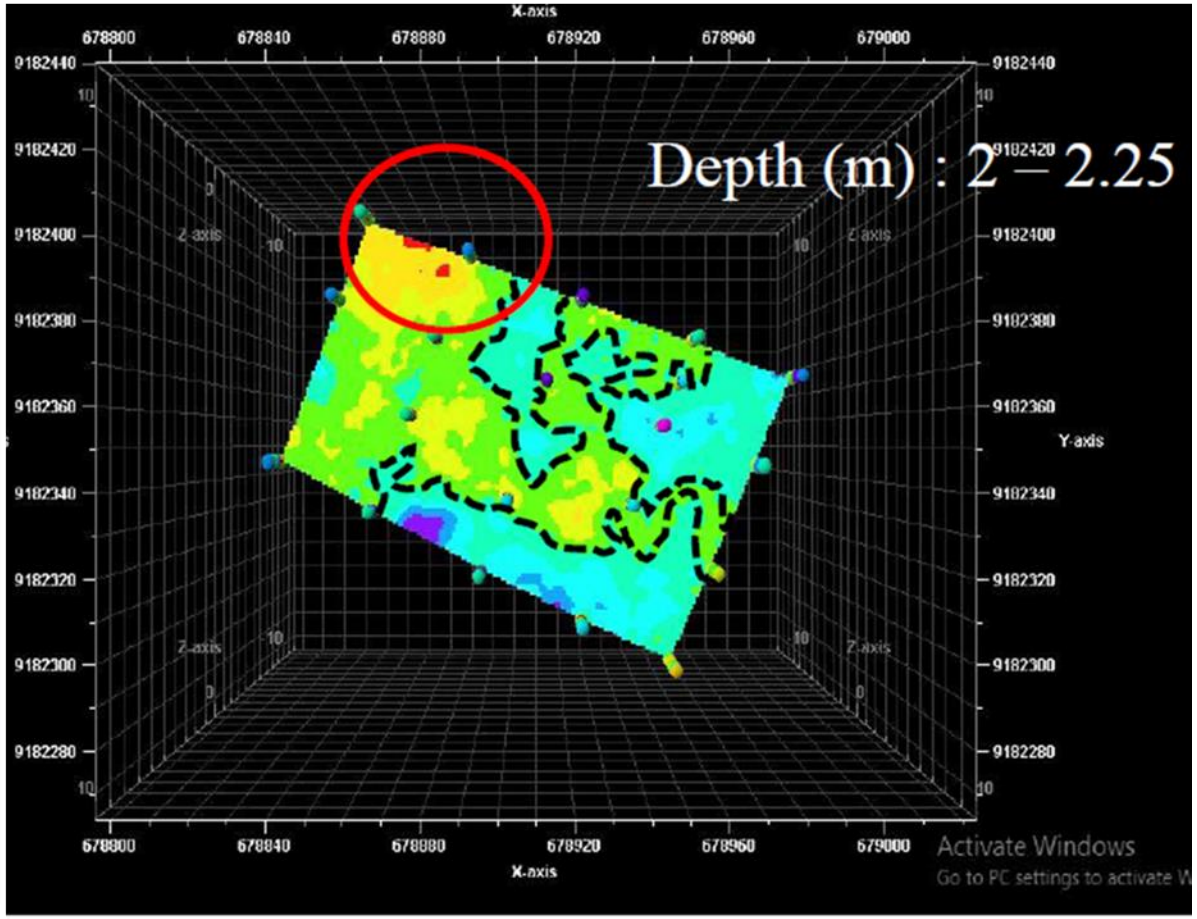


Depositional Channel Development


Z=1 m
X-axis
Y-axis
Jalan Ba
masjid


Depth (m) : 1 – 1.25
X-axis
Y-axis
Z-axis
Activate Windows


Z=2 m
X-axis
Y-axis
678800
678840
678880
678920
678960
679000
679040
9182440
9182420
9182400
9182380
9182360
9182340
9182320
9182300
9182280
9182260
9182240
Jalan Ba
andan


Depth (m) : 2 – 2.25
X-axis
Y-axis
Z-axis
678800
678840
678880
678920
678960
679000
9182440
9182420
9182400
9182380
9182360
9182340
9182320
9182300
9182280
Activate Windows
Go to PC settings to activate W

4 • Kesimpulan

Kesimpulan

- Delta Sungai Brantas memiliki laju sedimentasi yang cukup tinggi sehingga mengakibatkan perubahan alur mungkin terjadi dan erat kaitannya dengan jejak jejak peradaban yang tertimbun disekitar sistem sungai.
- Pemanfaatan Metoda Geofisika dapat membantu dalam menelusuri jejak jejak Peradaban Maritim Delta Sungai Brantas.
- Dugaan kuat bahwa Situs Terung merupakan Jejak Pelabuhan Kuno Daerah Aliran Sungai Brantas “Situs Pelabuhan Kadipaten Terung”

- Thank you -

Exploring The Earth, Empowering Society