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REPORT NO. : GT-2358

ELECTRICAL IMAGING TO DETERMINE THE STRATIGRAPHY AT VARIOUS SECTION OF TURA – DALU ROAD OF NH – 51 IN

MEGHALAYA

PREPARED FOR:

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1. INTRODUCTION

The present report deals with Electrical Imaging to determine the Stratigraphy at various section of Tura - Dalu Road of NH - 51 in Meghalaya. The work was carried out on Behest of M/S KRISTI ENGINEERING SERVICES PVT. LTD.

2. SCOPE OF WORK

Electrical resistivity surveys, including both 1D and 2D imaging techniques, were conducted at various locations along the proposed road alignment in accordance with IS 15736:2007. These tests were aimed at investigating the shallow subsurface conditions and providing a detailed understanding of the lithological variations along the alignment.

The primary objective of the geophysical investigations was to delineate the near-surface geological stratification and identify zones of weak or variable ground conditions. 1D Vertical Electrical Sounding (VES) was employed to assess resistivity variations with depth at discrete points, while 2D Electrical Resistivity Imaging (ERI) was carried out to obtain continuous resistivity profiles along linear transects. Electrical imaging was particularly useful in visualizing the internal resistivity distribution of the subsurface, offering insights into changes in lithology, moisture content, and the presence of fractured or weathered zones. This spatial information is critical for evaluating the suitability of ground conditions for road construction and for identifying areas requiring ground improvement or further investigation.

3. DETAILS OF FIELD WORK

3.1. Survey location Identification

Electrical resistivity surveys were conducted to investigate the subsurface conditions in a narrow hill section of road. Survey lines were laid out—along the road alignment. The results are presented as vertical sections, illustrating the electrical properties of the sub surface below the existing route alignment. Electrical currents preferentially travel through the most conductive materials, helping delineate subsurface features.

At locations along the road alignment where a suitable linear stretch was available, 2D Electrical Resistivity Imaging (ERI) was adopted to obtain continuous subsurface profiles. This method enabled the detection of lateral and vertical variations in resistivity, providing a more detailed understanding of subsurface conditions.

However, in areas with spatial constraints—such as narrow corridors, congested zones, or terrain with limited access—where sufficient linear length for a 2D array could not be accommodated, 1D Electrical Resistivity Testing (Vertical Electrical Sounding or VES) was conducted instead. This approach allowed vertical profiling of subsurface resistivity at discrete points, helping to characterize the subsurface in restricted zones.

The combination of both 1D and 2D methods ensured comprehensive coverage of subsurface conditions along the alignment, tailored to the site-specific spatial limitations.

3.2. 1D Electrical Resistivity Testing (Vertical Electrical Sounding or VES) methodology

Vertical Electrical Sounding (VES) was conducted as per IS: 3043:2018 using a high sensitivity digital resistivity meter employing Wenner's four-electrode configuration (Fig - 1). The electrodes were spaced equi - distance. Measured D.C. current was passed through the two outer electrodes (current electrodes C1 and C2) and potential drop across two inner electrodes (potential electrodes P1 and P2) was noted. Two sets of measurements i.e. in north-south and east-west direction) were taken at each electrode separation. The electrode separation was increased progressively to obtain resistivity values of deeper layers.

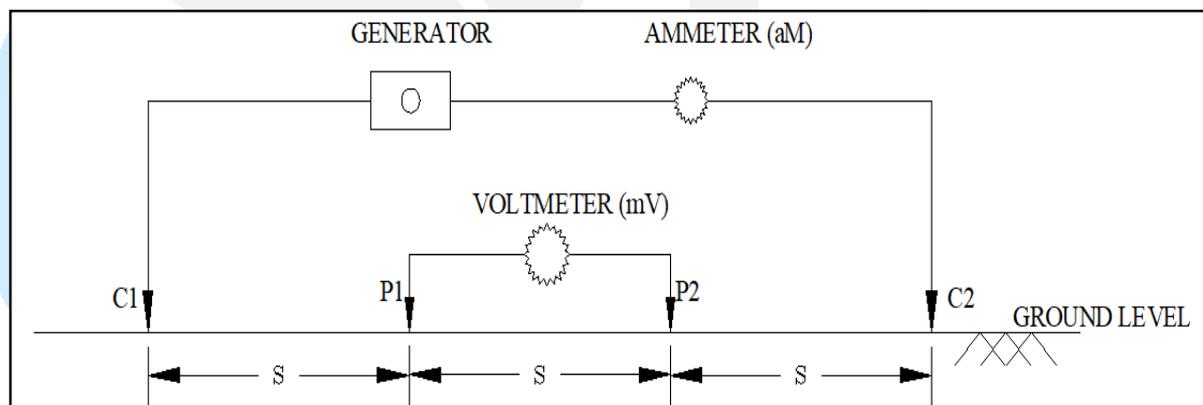


Fig - 1: General arrangement for 1 D ERT

3.3. 2D Resistivity Imaging Methodology

2D resistivity imaging was carried out using a linear array of electrodes. This setup produces a depth-resistivity profile, known as a *pseudosection*, which depicts variations in resistivity both laterally along the survey line and vertically with depth.

For each iteration, the spacing between the current and potential electrodes was kept constant, and the entire array was manually advanced along the profile line. This process was repeated by

increasing the electrode separation incrementally (based on the minimum electrode spacing), allowing for deeper investigation at each stage (Fig - 2).

Although manual, this method still allowed the systematic collection of resistivity data at different depths and lateral positions. The minimum electrode separation remained constant during each step, ensuring consistent lateral resolution across the profile.

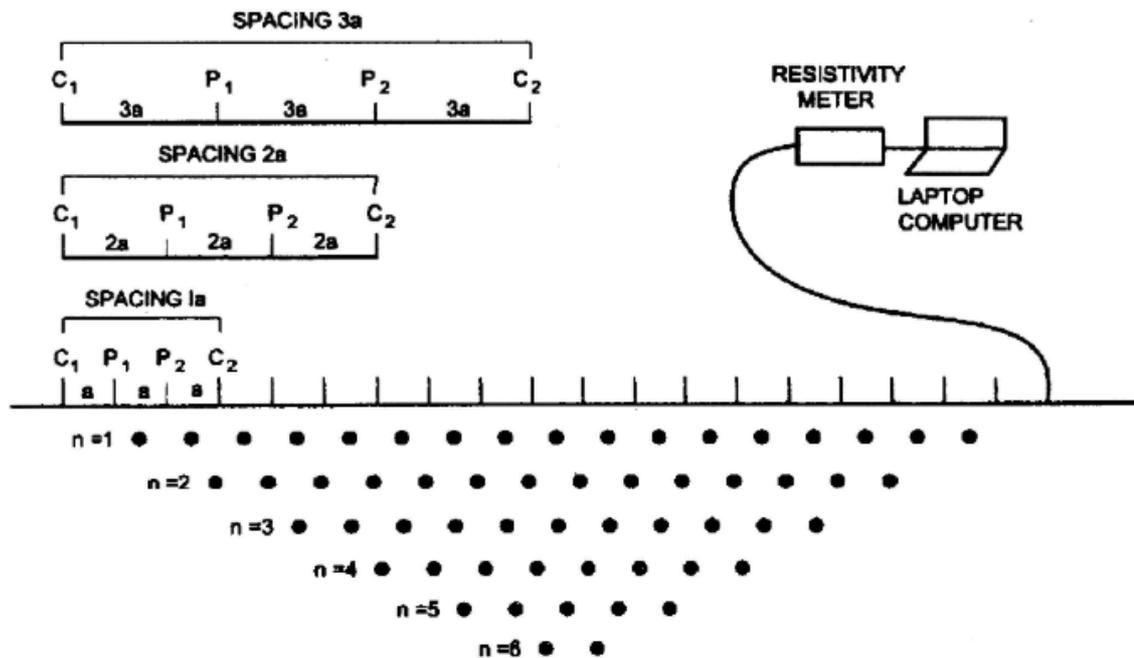


Fig - 2: General arrangement for 2D ERT

3.4. Calculation of Soil Resistivity from Observed resistance

The diameter of the electrodes used was 10 mm and the depth of electrode penetration into the ground was less than 10 cm. To make good contact with earth, the points of electrode penetration were kept moist. As depth of penetration of electrodes was small as compared to their separation, the following equation was used for computation of apparent earth resistivity values.

$$\rho = 2 \pi s V / I \quad \dots(1)$$

where:

- ρ = Resistivity of soil in ohm-meter
- s = $1/3$ rd distance between current electrodes in meters
- V = Potential drop across two inner electrodes (potential) in milli-volts
- I = D C current supplied at the outer (current) electrode in milli - amperes

3.5. Data Processing and Modelling

Raw field data is initially converted to *apparent resistivity* values using a geometric factor specific to the electrode configuration—commonly the Wenner array, where electrode spacing is uniform.

Electrical Imaging to determine the Stratigraphy at various section of Tura - Dalu Road of NH - 51 in Meghalaya

These apparent resistivity values are then modeled using finite element analysis and least squares inversion techniques to produce a *true resistivity pseudosection*.

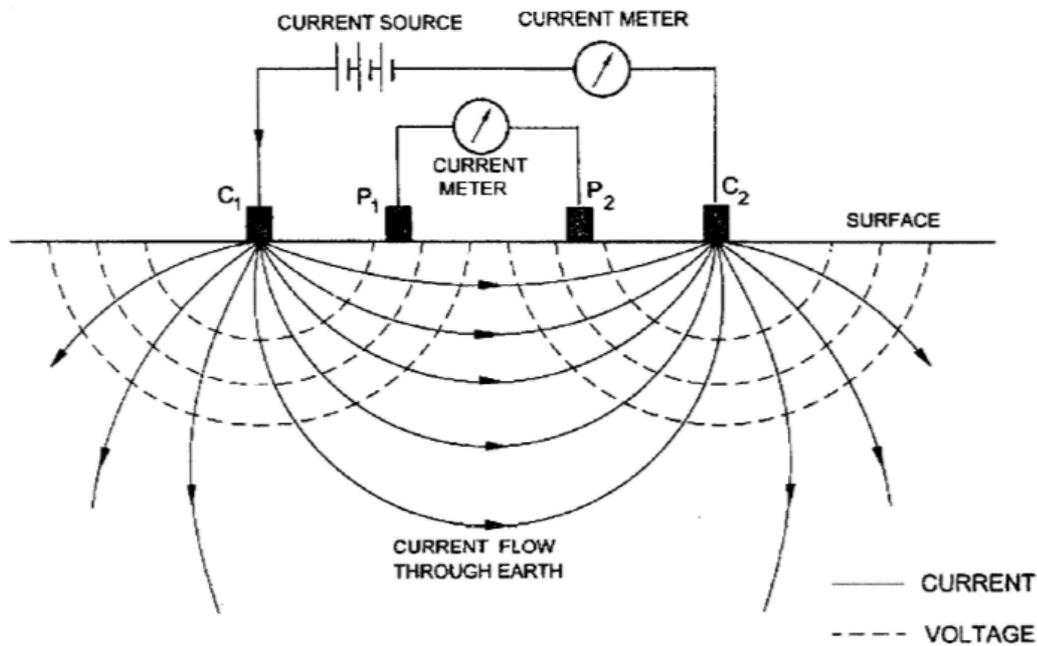


Fig - 3 Equipotential and current flow lines for Four Electrode Arrays

3.6. Visualization and Interpretation

The modelled data is displayed as color-coded resistivity-depth sections. Typically, blue tones indicate zones of low resistivity (indicative of saturated, clay-rich, or fractured zones), while red tones represent higher resistivity (dry, compact, or rocky zones). The pseudosection often appears wedge-shaped, reflecting a natural reduction in data density with increasing electrode spacing.

To improve depth coverage and data quality, the electrode array is progressively shifted, or "rolled along," the survey line. Final interpretations of subsurface conditions are either provided as separate annotated diagrams or superimposed directly onto the pseudosection.

4. Parameters Measured and Representative Values for Soil Conditions

4.1. Soil Resistivity Overview

Soil resistivity, expressed in ohm-meters ($\Omega \cdot m$), is primarily influenced by moisture content, salinity of pore water, grain size, and degree of compaction.

- Salinity of the water within the pores is the most critical factor governing resistivity.
- In moist soils, especially clay-rich or saline types, the resistivity is primarily influenced by the fluid resistivity.



- Dry soils with low moisture content or compact soils exhibit higher resistivity due to reduced fluid conductivity.
- Soils above the water table or under high pressure, where pore spaces are small or absent, will have resistivity dominated by the resistivity of the mineral grains themselves.

4.2. Resistivity Range for Soils

Soil resistivity can vary greatly, depending on soil type, moisture, and salinity, typically ranging from 10 Ω -m to 10,000 Ω -m:

- High Resistivity (Low Conductivity): Dry, sandy, or compacted soils (1,000 to 10,000 Ω -m).
- Intermediate Resistivity: Loamy or silty soils (100 to 1,000 Ω -m).
- Low Resistivity (High Conductivity): Wet, clay-rich, or saline soils (1 to 100 Ω -m).

Note: These ranges are influenced by local conditions such as temperature, water chemistry, and mineralogy. The resistivities of some common rocks, soils, waters and minerals are as shown in Table 1 as per IS 15736: 2007.

Table 1 : Resistivity values of Some common material

Material	Resistivity (ohm-m)
Igneous and Metamorphic Rocks	
Granite	$5 \times 10^2 - 10^6$
Basalt	$10^2 - 10^6$
Slate	$6 \times 10^{-2} - 4 \times 10^7$
Marble	$10^2 - 2.5 \times 10^9$
Quartzite	$10^2 - 2 \times 10^8$
Sedimentary Rocks	
Sandstone	$8 - 4 \times 10^3$
Shale	$20 - 2 \times 10^3$
Limestone	$50 - 4 \times 10^2$
Soils and Waters	
Clay	1 - 100
Alluvium	10 - 800
Groundwater (fresh)	10 - 100
Sea Water	0.2
Minerals	
Galena	$3 \times 10^{-3} - 3 \times 10^2$
Bauxite	$2 \times 10^{-6} - 6 \times 10^2$
Cuprite	$10^{-1} - 300$
Hematite	$3.5 \times 10^{-3} - 10^7$
Magnetite	$5 \times 10^{-5} - 5.7 \times 10^1$
Quartz	$4 \times 10^{10} - 2 \times 10^{14}$
Uraninite	1 - 100
Calcite	2×10^2
Rock Salt	$30 - 10^{11}$
Diamond	$10 - 10^{14}$
Mica	$9 \times 10^2 - 10^{14}$

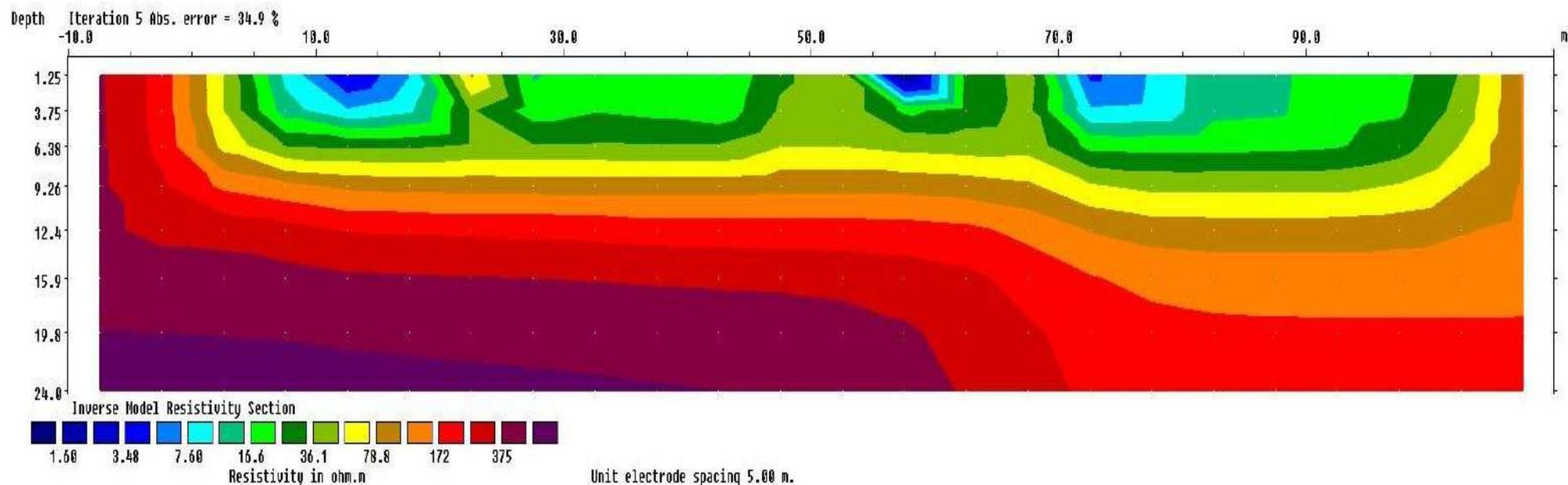
Note: The calculation sheet for Earth resistivity test has been provided in Annexure - 1.

ANNEXURE - 1

MODEL RESISTIVITY IMAGING SHEET



PROFILE - 1 : 115+449 to 115+536

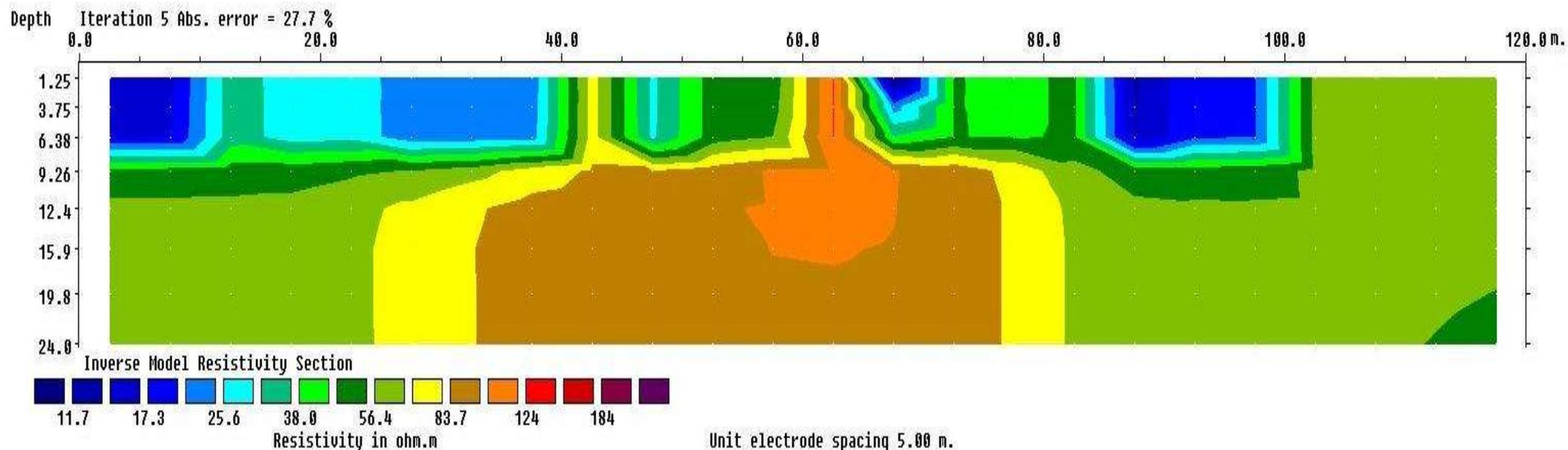
**Interpretation :**

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 24 meters). Resistivity values range from 1.60 to 375.0 Ohm.m.

The resistivity section shows three main zones. The shallow layer (0-3 m) has low resistivity (1.6-16.6 Ohm.m), likely indicating clay or water-saturated soil. The middle layer (3-10 m) has moderate resistivity (16.6-78.8 Ohm.m), suggesting Medium - Stiff consistency clay. The deeper layer (below 10 m) shows high resistivity (above 172 Ohm.m), which likely represents dry, compact material.



PROFILE - 2 : 115+329 to 115+449

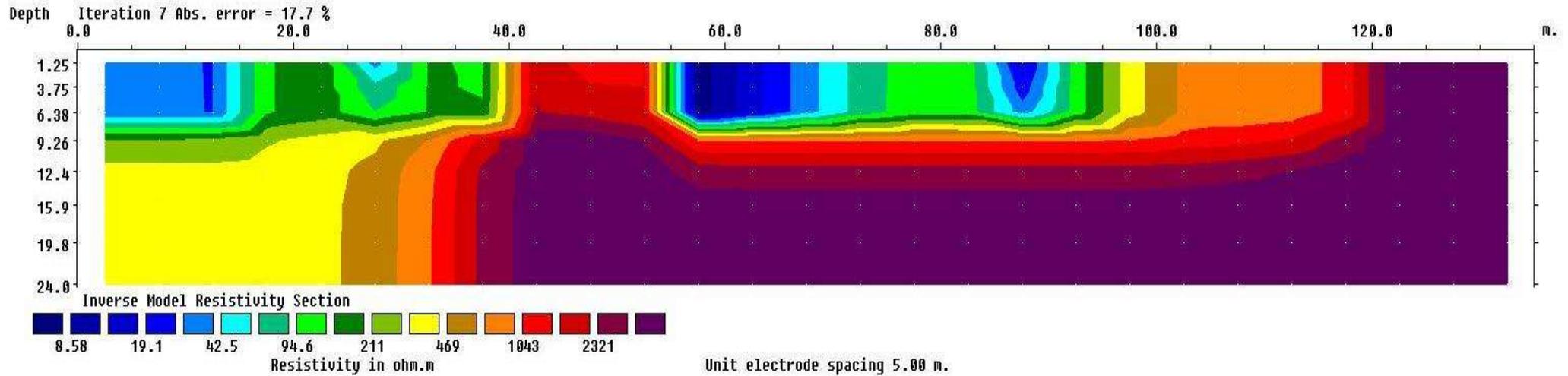
**Interpretation:**

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 24 meters). Resistivity values range from 11.7 to 184.0 Ohm.m.

The shallow zone (0-3 m depth) shows low resistivity (11.7-38 Ohm.m), likely representing clayey or water-saturated soils. Between 3 m and 12 m, medium resistivity values (38-83.7 Ohm.m) suggest medium - Stiff consistency Clay. Below this, high resistivity zones (up to 184 Ohm.m, especially around 50-70 m) may indicate dry compact layers.



PROFILE - 3 : 115+713 to 115+833



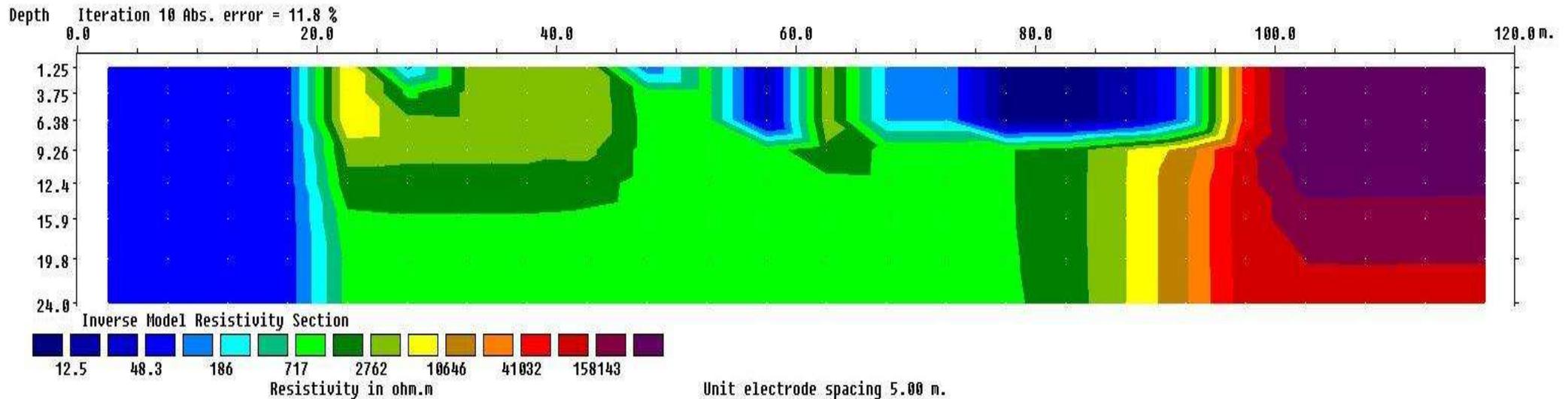
Interpretation:

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 24 meters). Resistivity values range from 8.58 to 2321 Ohm.m.

The top 6 m shows variable resistivity (8.6-211 ohm.m), indicating mixed surface soils, possibly clay, silty sand, or weathered materials. From 6 m to 15 m, the section transitions to high resistivity zones (211-1043 ohm.m), likely representing gravel, dry sand, or compact rock fragments. Below 15 m, the entire section is dominated by very high resistivity (up to 2321 ohm.m), suggesting dry compact layers. The central part around 60 m shows a vertical low-resistivity feature, possibly a moist zone or weak zone.



PROFILE - 4 : 115+885 to 116+005



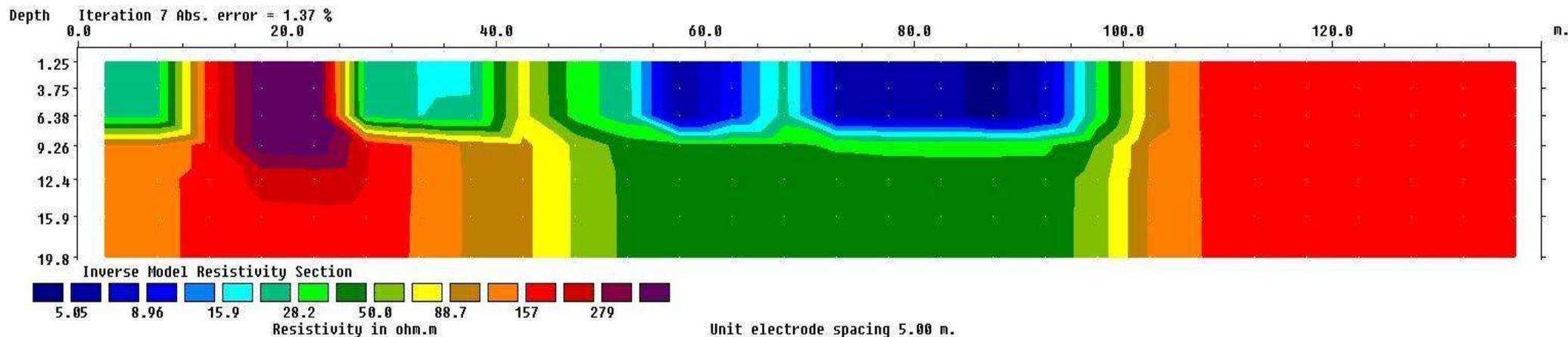
Interpretation:

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 24 meters). Resistivity values range from 12.5 to 158,143 Ohm.m.

The leftmost 0-30 m area shows very low resistivity (<50 Ohm.m) extending to the full depth, indicating saturated clay or possibly groundwater-bearing zones. In contrast, the right half (90-120 m) shows extremely high resistivity (up to 158,143 Ohm.m), likely representing massive dry rock or a highly resistive geological unit such as quartzite or granite. The transition zone between 40-90 m shows varied resistivity, indicating heterogeneous material—possibly dry compact layers, fractured zones, or mixed soils.



PROFILE - 5 : 116+410 to 116+510



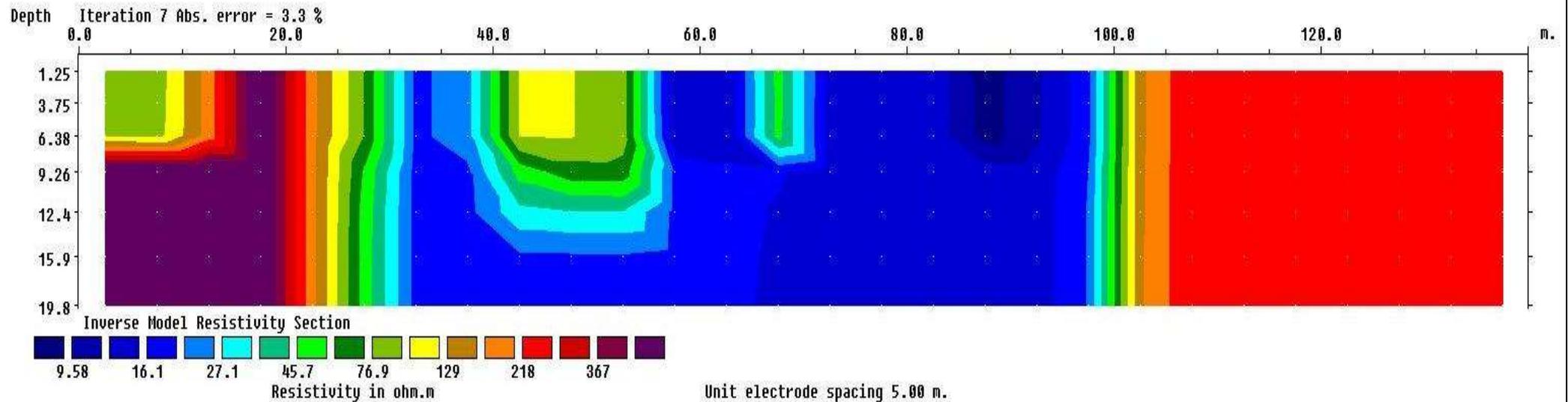
Interpretation:

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 20 meters). Resistivity values range from 5.05 to 279 Ohm.m.

The top ~6 m shows low to moderate resistivity (5.05–88.7 ohm.m), indicating mixed surface soils such as moist clay, silty sand, or weathered material. Between ~6 m and ~12 m depth, the resistivity increases (88.7–157 ohm.m), suggesting the presence of drier sandy soils, gravel, or partially weathered rock. Below ~12 m, especially from 40 m to 140 m horizontal distance, very high resistivity values (>157 ohm.m) dominate, likely representing compact dry layers. The section reflects a transition from soft, moist upper soils to more resistive, competent materials at depth.



PROFILE - 6 : 117+060 to 117+140



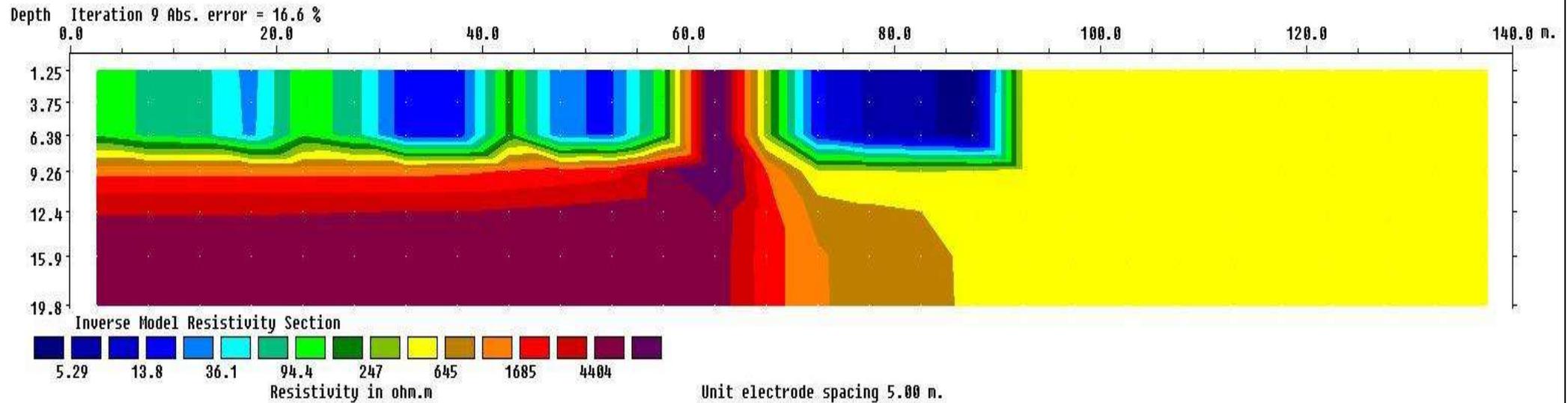
Interpretation:

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 20 meters). Resistivity values range from 9.58 to 367 Ohm.m.

The top ~6 m displays variable resistivity (16-218 ohm.m), indicating mixed surface soils like clay, silty sand, or weathered zones. From ~6 m to ~12 m, widespread low resistivity (9-27 ohm.m) suggests saturated clay or possible groundwater zones. Below ~12 m, the left section (0-40 m) and far right (beyond 100 m) show very high resistivity (>218 ohm.m), likely representing dry bedrock or compact resistive layers.



PROFILE - 7 : 118+920 to 119+010



Interpretation:

This image represents a 2D electrical resistivity tomography (ERT) section showing subsurface resistivity distribution. The x-axis represents the horizontal distance (in meters), and the y-axis shows depth (up to 20 meters). Resistivity values range from 5.29 to 4404 Ohm.m.

The top 6 m shows variable resistivity (13.8–247 Ohm.m), indicating a mix of surface soils—likely silty sand, clay, or compact layers. Below 6 m, most of the left half is dominated by very high resistivity (>1685 Ohm.m), likely representing dry, compact resistive formations. In contrast, the right half beyond 80 m shows a thick, extensive zone of moderate resistivity (~645 Ohm.m), suggesting dry sandy or gravelly soil.



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

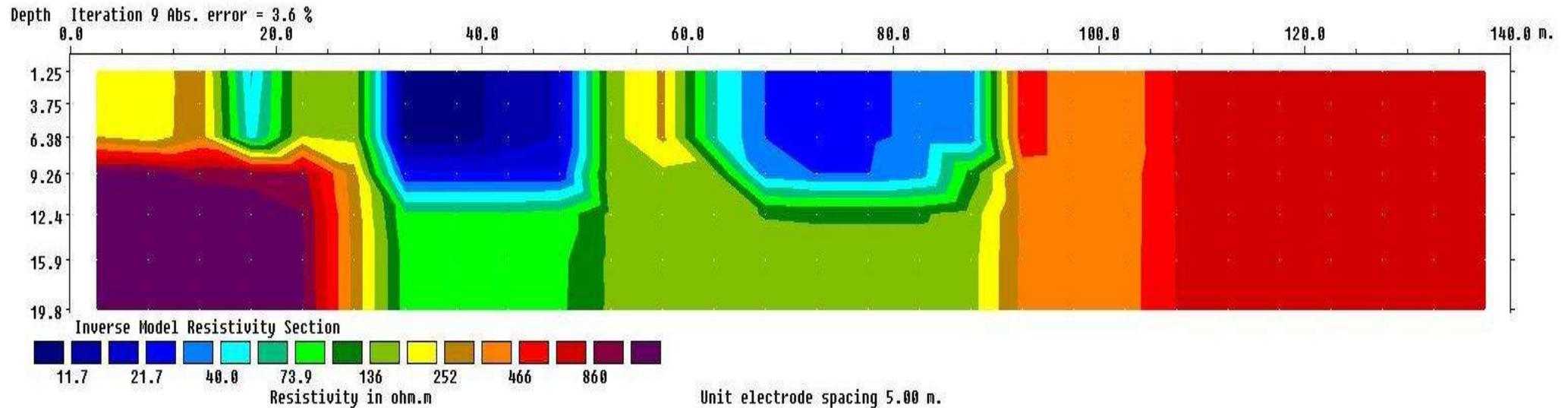
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PROFILE - 8 : 119+090 to 119+130



Interpretation:

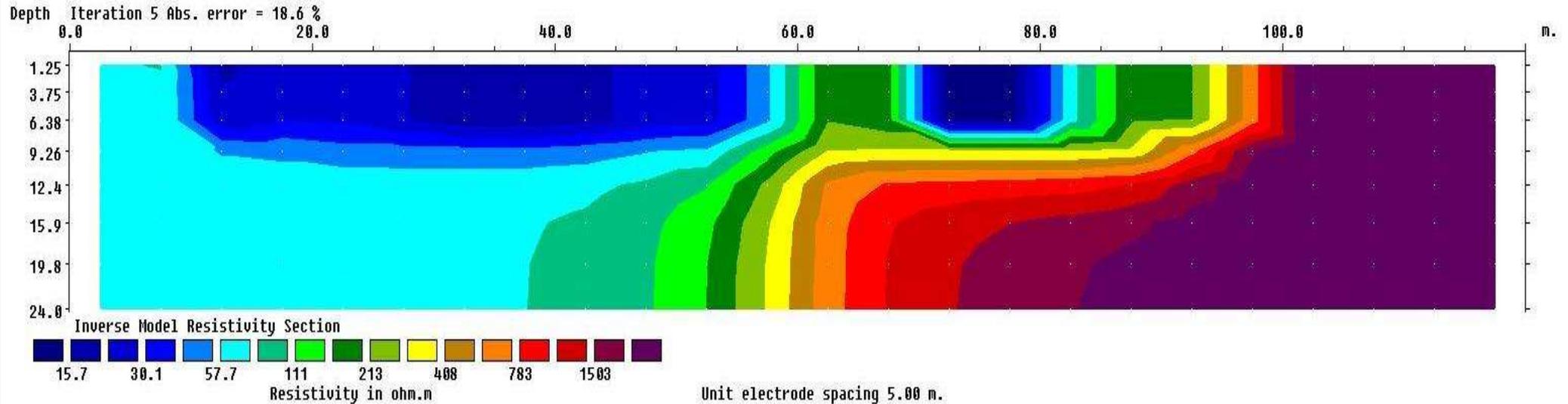
This 2D Electrical Resistivity Tomography (ERT) section shows subsurface resistivity variations along a 140-meter profile with a depth reaching approximately 20 meters.

Resistivity values range from 11.7 to 860 Ohm.m.

The color scale indicates different resistivity zones, where low resistivity (blue, <40 Ohm.m) suggests the presence of moist, clayey, or conductive materials, likely indicating water-saturated zones or soft clay. Higher resistivity values (yellow to red, >252 Ohm.m) represent drier, denser, or rocky materials, while the highest resistivity (purple, >860 Ohm.m) likely indicates very hard rock or dry compact soil. The central portion shows low-resistivity zones at shallow depth, which could imply potential water-bearing layers or weak zones.



PROFILE - 9 : 119+150 to 119+300



Interpretation:

This ERT section represents subsurface resistivity variation along a 100-meter profile with a depth of around 24 meters. Resistivity values range from 15.7 to 1503 Ohm.m.

The left half of the section is dominated by low resistivity values (light blue to dark blue, <57.7 ohm.m), indicating saturated clay, soft soil, or potential groundwater zones. In contrast, the right half shows a gradual increase in resistivity values (green to red and purple, >213 ohm.m), suggesting a transition from moderately resistive materials (possibly sandy or dry layers) to highly resistive zones (red to purple, >783 ohm.m), which likely represent compact dry soil.



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

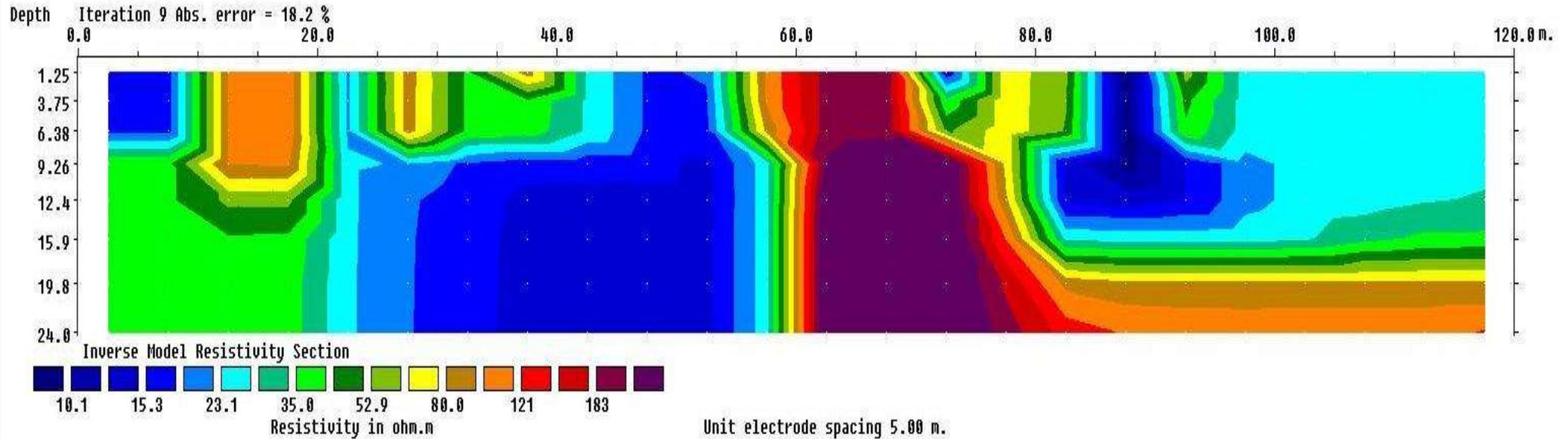
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10

PROFILE - 10 : 119+390 to 119+518



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section shows subsurface resistivity variations along a 120-meter profile with a depth reaching approximately 24 meters. The x-axis shows horizontal distance, while the y-axis indicates depth (up to 24 m). Resistivity values range from 10.1 to 183 Ohm.m. The top 6 m shows moderate to high resistivity zones (35-121 Ohm.m), suggesting mixed surface materials such as weathered rock or compacted soil. A low-resistivity zone (<23 Ohm.m) dominates the central and deeper parts, indicating the presence of moist clay or saturated soil. A high-resistivity (121-183 Ohm.m) appears around 60-80 m, possibly reflecting compact material.



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

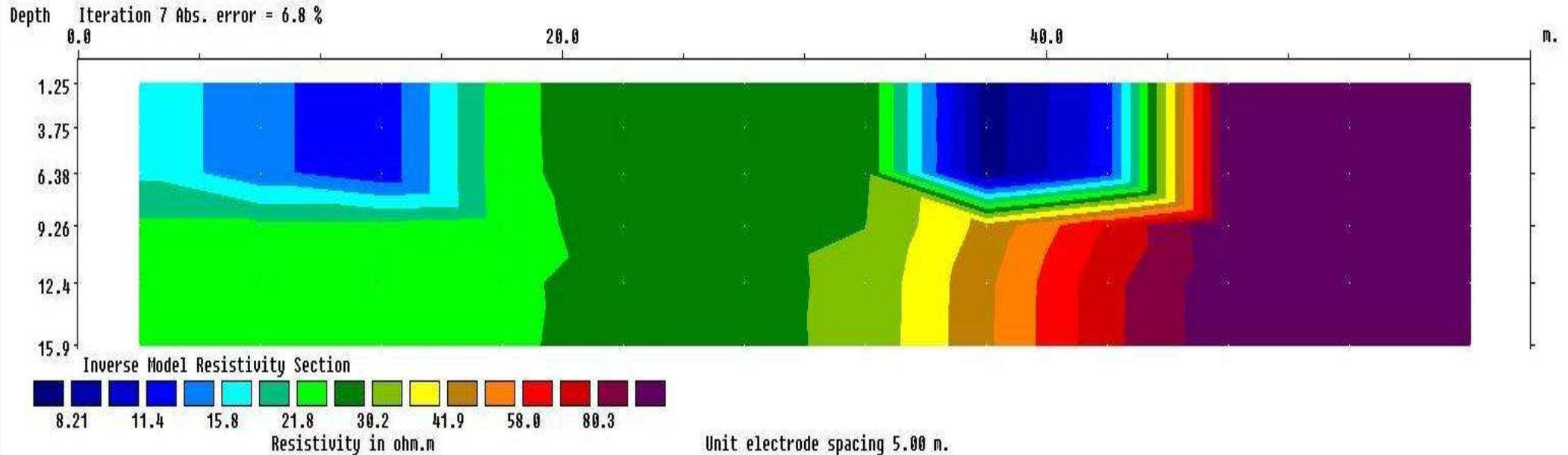
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11

PROFILE - 11 : 120+098 to 121+053



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section shows subsurface resistivity variations along a 60-meter profile with a depth reaching approximately 16 meters. The x-axis shows horizontal distance, and the y-axis indicates depth. Resistivity values range from 8.2 to over 80 Ohm.m. The left side (0-20 m) shows low to moderate resistivity (8-30 Ohm.m) in the upper 6 meters, likely indicating moist or clayey soils. In contrast, the right side (40-60 m) features a sharp increase in resistivity with depth, reaching over 80 Ohm.m, possibly representing dry, compacted soils material.



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

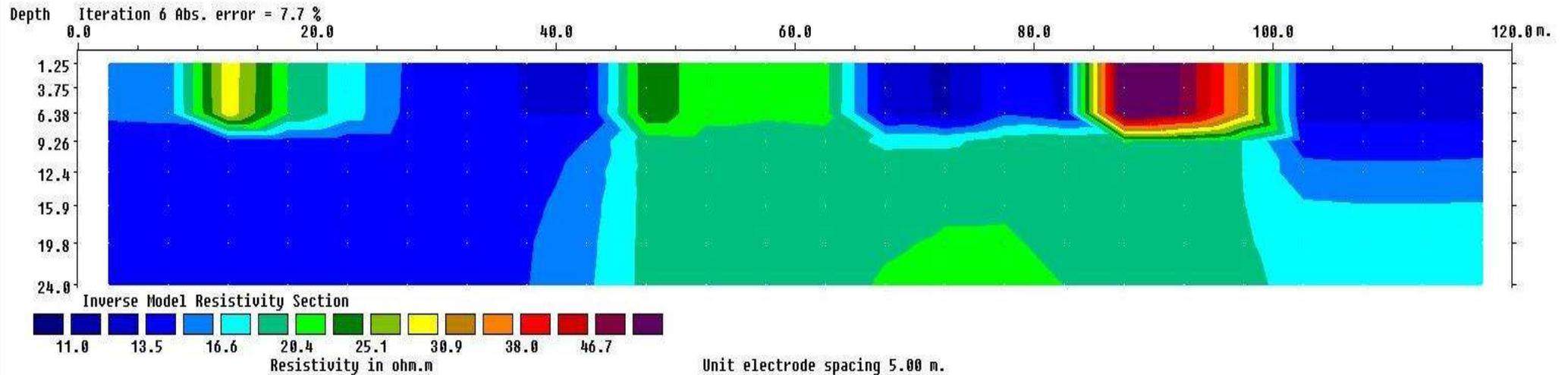
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12

PROFILE - 12 : 121+066 to 121+196



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section represents subsurface resistivity variations along a 120-meter profile with a depth of up to 24 meters. The x-axis shows horizontal distance, and the y-axis represents depth. Resistivity values range from 11 to over 46 Ohm.m. The majority of the section (below ~6 m depth) is dominated by low resistivity values (11-20 Ohm.m), indicating moist clay or saturated soil. Near the surface at ~20 m and 95-105 m, high resistivity zones (38-46 Ohm.m) appear, possibly representing compacted or dry materials. Central zones around 50-90 m exhibit mixed resistivity values, suggesting variation in subsurface materials such as sandy layers or compact layers.



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

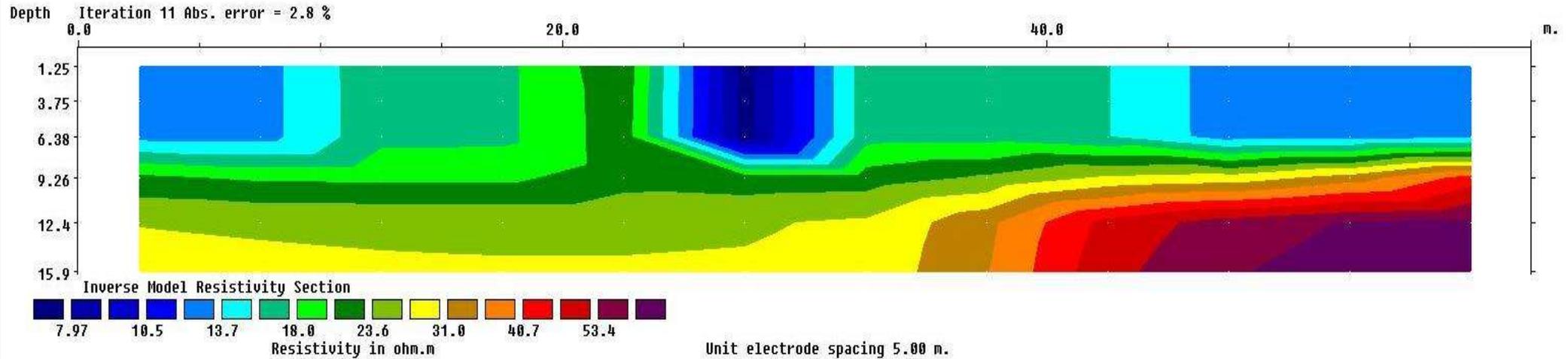
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13

PROFILE - 13 : 121+196 to 121+261



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section illustrates subsurface resistivity variations along a 60-meter profile to a depth of approximately 16 meters. The x-axis represents horizontal distance and the y-axis shows depth. Resistivity values range from 7.9 to over 53 Ohm.m. The shallow layers (0-6 m) show mostly low to moderate resistivity (8-23 Ohm.m), suggesting moist or clayey soils. A distinct low-resistivity zone (~7.9 Ohm.m) is visible near the center, indicating possible saturated material. In contrast, deeper layers across the right side (below 9 m depth) exhibit increasing resistivity up to 53 Ohm.m, suggesting compacted, dry soils or compact layers..



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

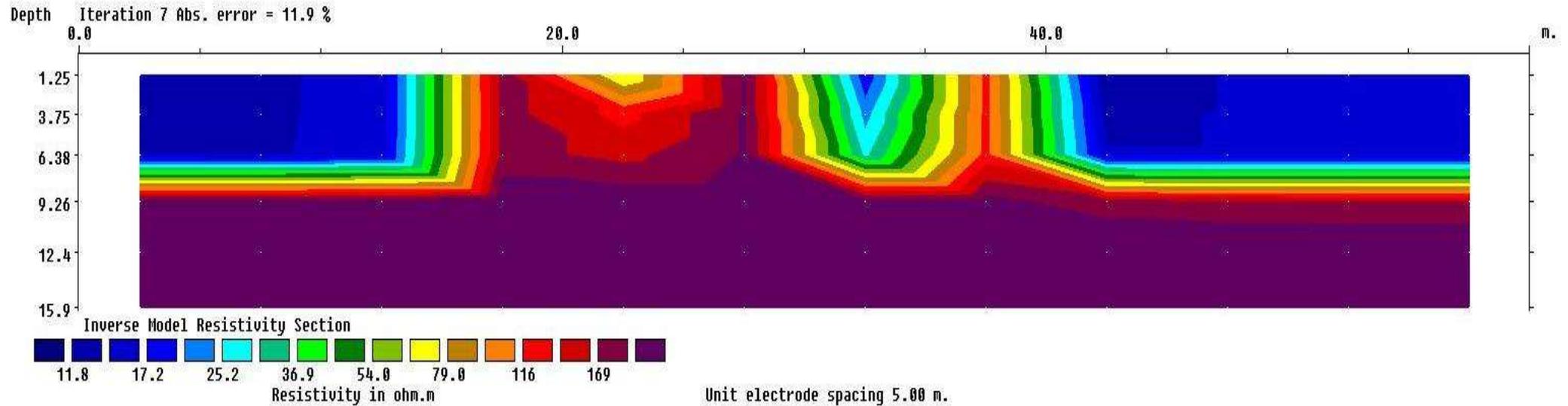
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14

PROFILE - 14 : 121+262 to 121+327

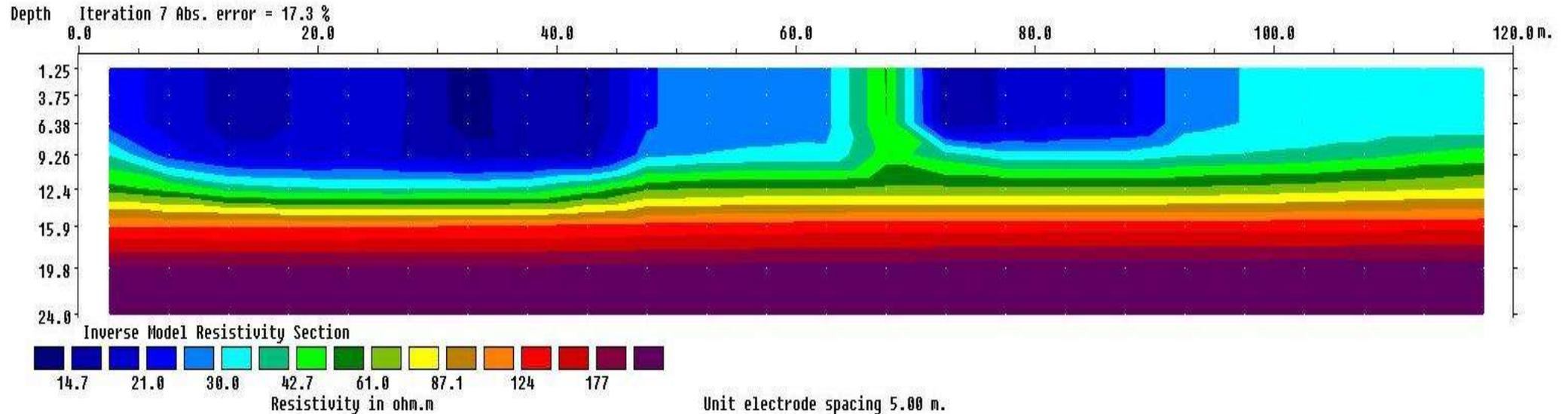


Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section presents subsurface resistivity variations along a 60-meter profile to a depth of about 16 meters. The resistivity values range from 11.8 to over 169 Ohm.m. The upper layers (0–6 m) show low to moderate resistivity (12–54 Ohm.m), possibly indicating clayey or moist soils. High resistivity zones (79–169 Ohm.m) are concentrated at mid-depths around 20–40 m distance, likely representing compact or dry materials. The lower portion of the section shows consistently high resistivity (purple), suggesting a massive dry or compact layers..



PROFILE - 15 : 122+853 to 122+983

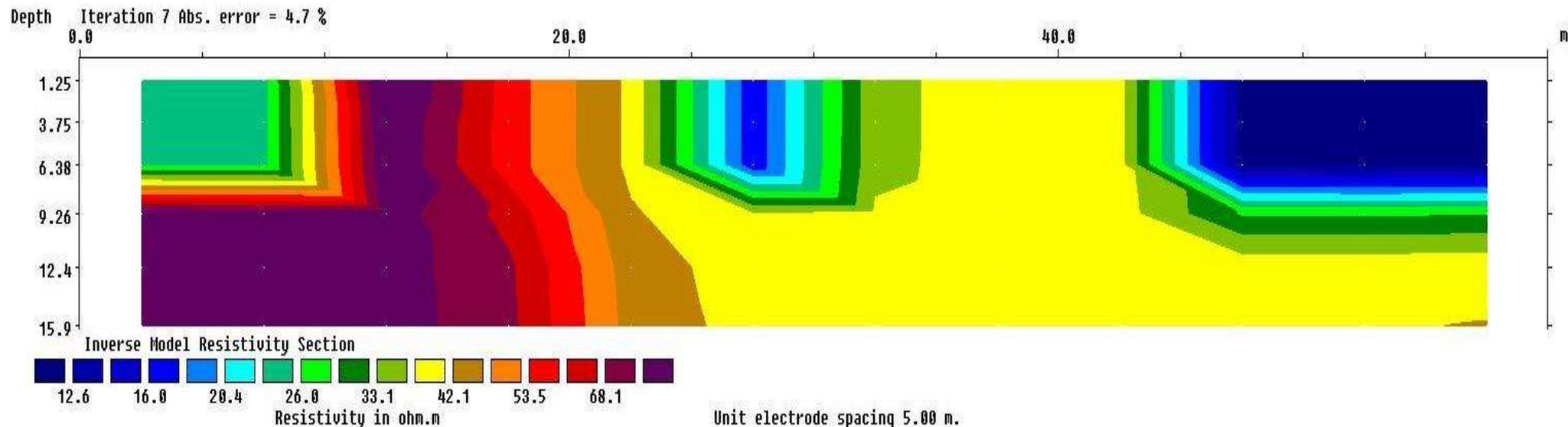


Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section covers a 120-meter profile to a depth of approximately 24 meters. Resistivity values range from 14.7 to over 177 Ohm.m. The upper layers (0–10 m) show low to moderate resistivity (15–61 Ohm.m), likely indicating clayey or moist soil conditions. A high-resistivity horizontal layer (124–177 Ohm.m) dominates the deeper zone (around 12–24 m), suggesting compact, dry material. Two vertical low-resistivity features near 40 m and 80 m may indicate possible water pathways or weak zones.



PROFILE - 16 : 122+993 to 123+058

**Interpretation:**

This 2D Electrical Resistivity Tomography (ERT) section covers a 60-meter profile with a maximum depth of approximately 16 meters. Resistivity values range from 12.6 to over 68 Ohm.m. The shallow zone (0-6 m) shows low to moderate resistivity (20-33 Ohm.m), likely indicating clay or silty soils. A high-resistivity zone (yellow to purple, >42 Ohm.m) dominates the deeper part on the left side, suggesting dry, compact material. Localized low-resistivity anomalies at 20 m and 40 m positions could represent water-saturated zones or weak spots.



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EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

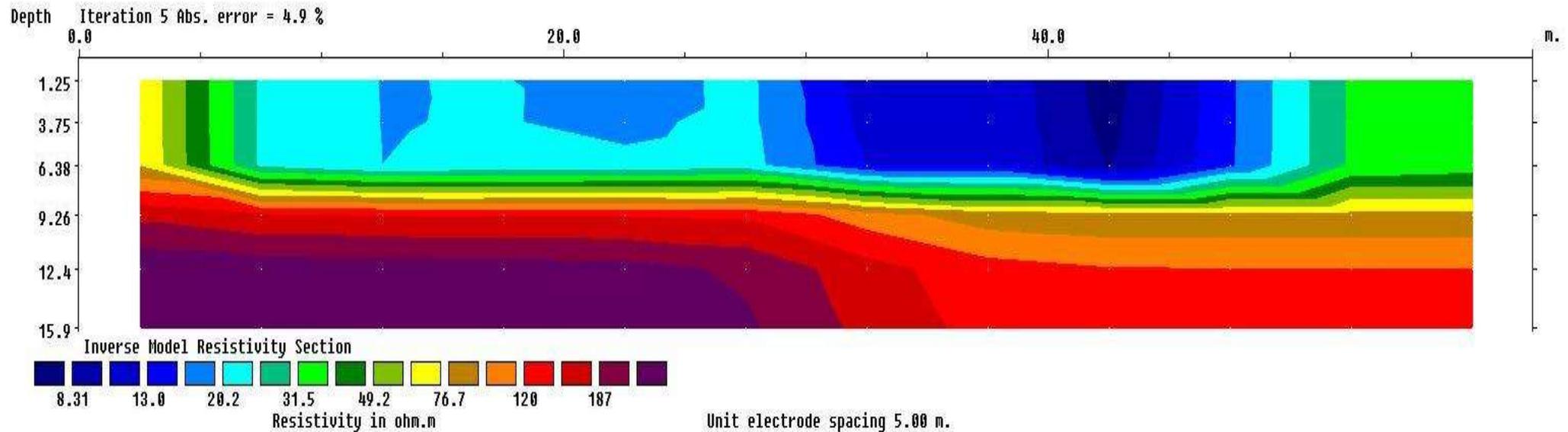
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17

PROFILE - 17 : 121+327 to 121+392

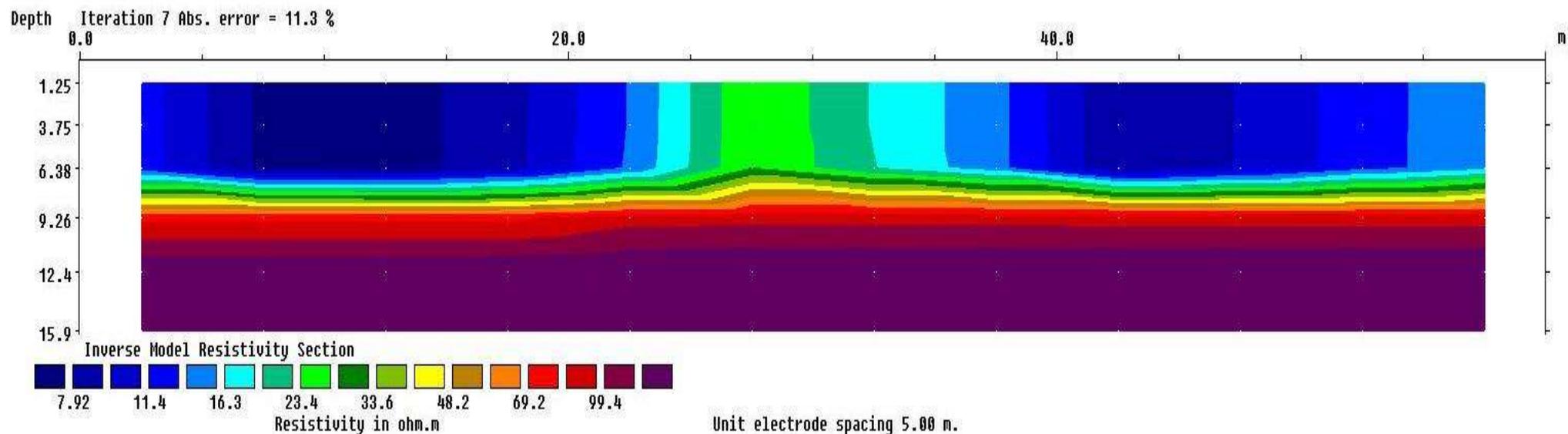


Interpretation:

This 2D ERT section spans ~60 meters laterally and ~16 meters in depth, with resistivity ranging from 8.3 to >187 Ohm-m. The shallow zone (0-6 m) displays relatively low resistivity (13-49 Ohm-m), typical of moist clays, silts, or weathered materials. Below this, a distinct high-resistivity zone (red to purple, >120 Ohm-m) appears between 6 m and 16 m depth, especially on the right half, suggesting compact/dry sands, gravels, or compact layers. A localized low-resistivity anomaly (~30-40 m position, blue tones) likely indicates a water-saturated or clay-rich pocket.



PROFILE - 18 : 123+063 to 123+128



Interpretation:

This 2D ERT section spans ~60 meters laterally and ~16 meters in depth, with resistivity values ranging from ~7.9 to >99 Ohm-m. The upper ~6 m shows low resistivity (8–33 Ohm-m, dark blue to green), indicating moist clay or silt-rich layers. Beneath this, a moderately resistive horizon (yellow to red, ~48–99 Ohm-m) extends from ~6 m to 10 m, likely representing compacted sands or lateritic soils. The deepest zone (>10 m) is uniformly high in resistivity (purple, >99 Ohm-m), suggesting a dry, consolidated layer such as compact layers or gravel.



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

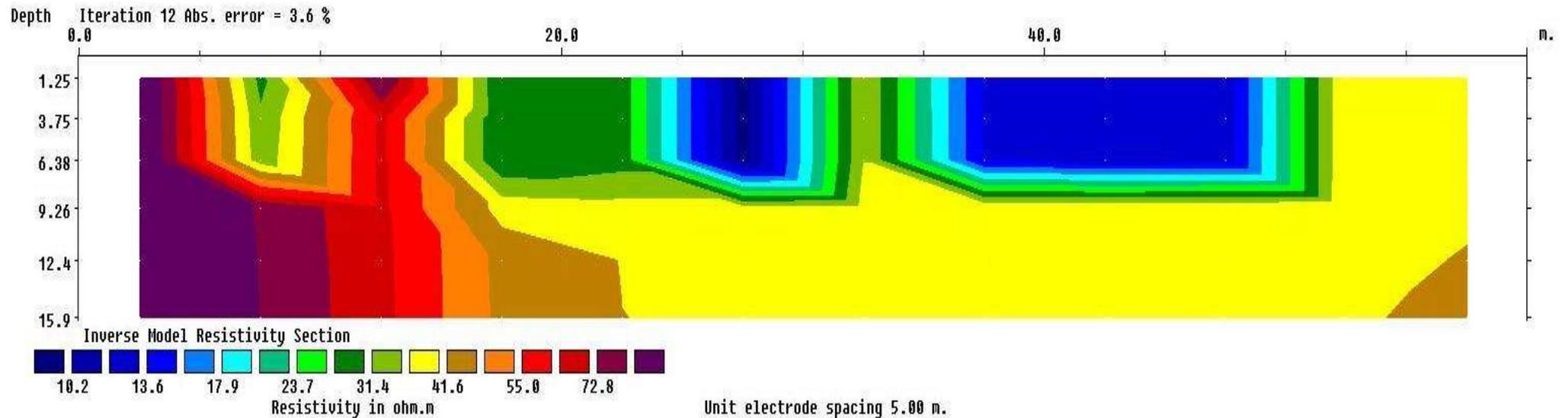
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19

PROFILE - 19 : 123+148 to 123+213



Interpretation:

The ERT section reveals a varied subsurface resistivity profile. The left side (0-20 m) shows high resistivity (red to yellow, ~41.6-72.8 Ω -m), indicating dry or compact soil, while the central area (20-30 m) displays very low resistivity (dark blue, ~10.2 Ω -m), likely representing moist clay or a potential groundwater zone. The right section also shows low to moderate resistivity, suggesting moist or clayey soil. Deeper layers below 9 m generally exhibit moderate to high resistivity, indicating or compact layers or consolidated soil.



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

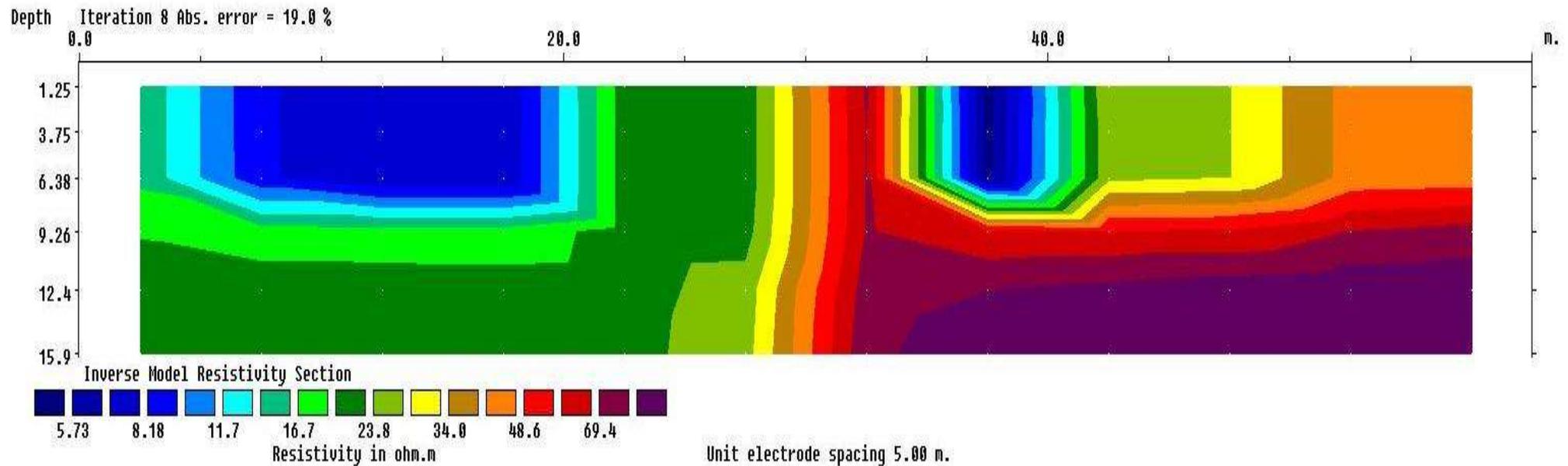
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20

PROFILE - 20 : 123+335 to 123+400



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section spans a 60-meter profile with a maximum investigation depth of around 16 meters. Resistivity values range from approximately 5.7 to over 69 Ohm.m. The left portion (0–20 m) shows predominantly low resistivity (6–24 Ohm.m), indicating moist clay or silty soils. In contrast, the right half exhibits a transition to high resistivity values (>48 Ohm.m), especially at depth, suggesting dry compact soil.



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

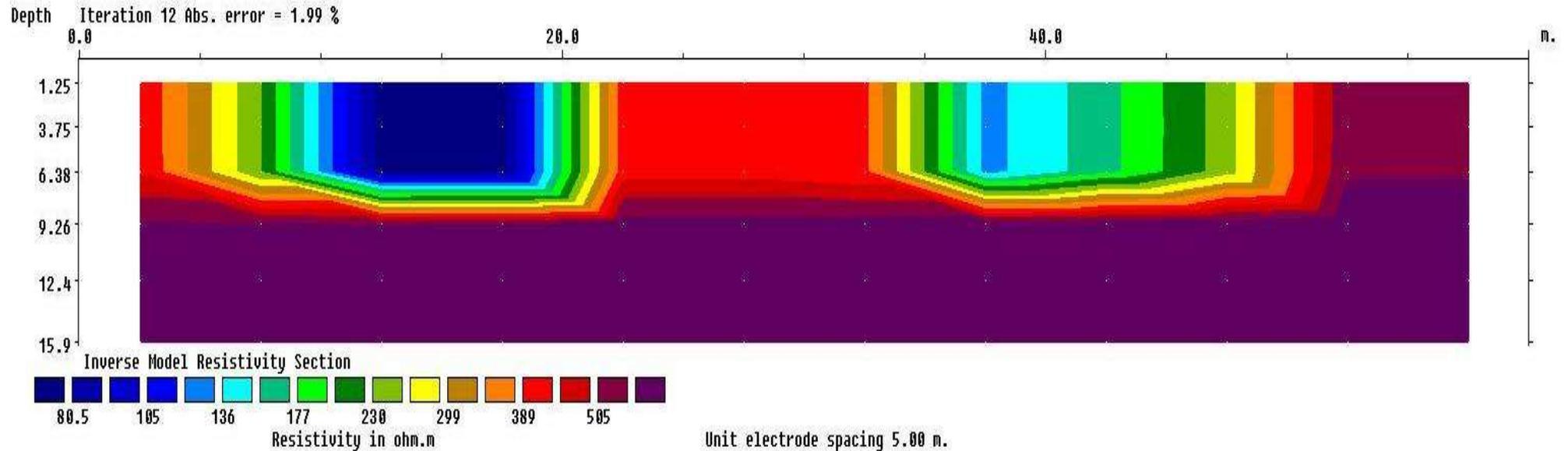
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21

PROFILE - 21 : 124+060 to 124+125

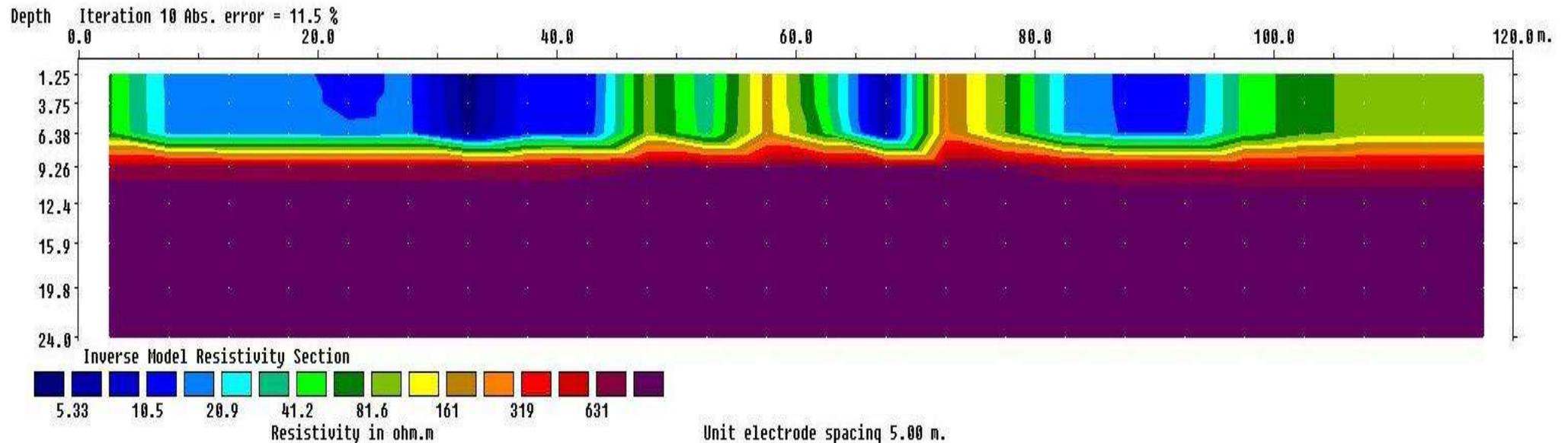


Interpretation:

This 2D Electrical Resistivity Tomography (ERT) profile covers a 60-meter line with a maximum depth of approximately 16 meters. Resistivity values range from about 80 to over 500 Ohm.m. The central and right-side shallow zones (15–45 m) show moderate resistivity (100–230 Ohm.m), likely indicating sandy or mixed soils. Very high resistivity values (>389 Ohm.m, shown in red to purple) dominate the deeper layers and outer zones, suggesting dry, compact material.



PROFILE - 22 : 124+420 to 124+550



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) profile spans a 120-meter line with a maximum depth of approximately 24 meters. Resistivity values range from as low as 5 Ohm.m to over 631 Ohm.m. The near-surface layers (0–6 m depth) display a mix of low to moderate resistivity (10–161 Ohm.m), indicative of clayey to sandy soils, possibly with varying moisture content. Several distinct low-resistivity zones (5–21 Ohm.m, shown in dark to light blue) appear around the 20 m, 40 m, 75 m, and 90 m marks, which may suggest water-saturated pockets or weak zones. The deeper zone (below ~9 m) is characterized by consistently high resistivity values (>319 Ohm.m, marked in red to purple), likely indicating dry compact layers..



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

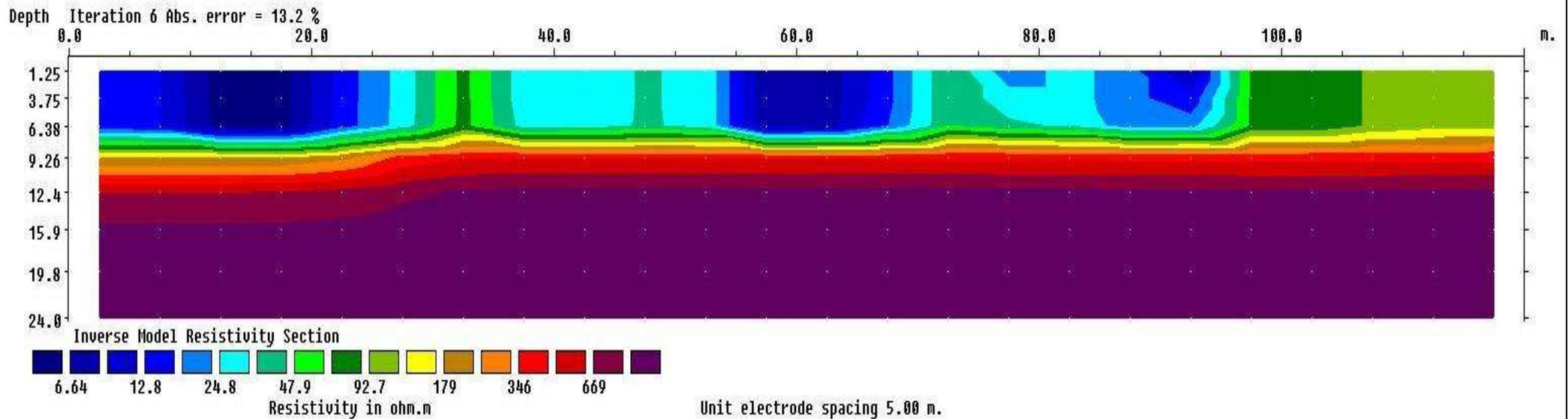
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23

PROFILE - 23 : 123+820 to 123+950

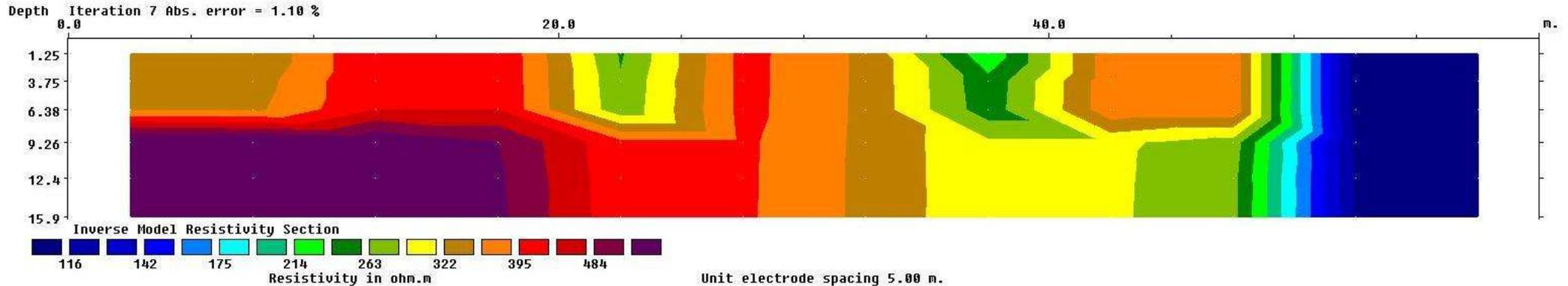


Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section covers a 120-meter survey line with a maximum investigation depth of approximately 24 meters. The resistivity values range from 6.64 Ohm.m to over 669 Ohm.m. The top 6-8 meters exhibit mostly low to moderate resistivity (6-93 Ohm.m), indicative of moist clayey to silty soil strata with possible localized saturation. Notably, blue to cyan zones (6-25 Ohm.m) at 20 m, 60 m, 80 m, and 95 m horizontal distances suggest high moisture content or clay-rich zones. Beneath this layer, resistivity sharply increases (>179 Ohm.m), with red to purple colors indicating a dense, compact stratum likely corresponding to dry weathered rock or compact layers.



PROFILE - 24 : 130+220 to 130+285



Interpretation:

This 2D Electrical Resistivity Tomography (ERT) section covers a 120-meter survey line with a maximum investigation depth of approximately 24 meters. The resistivity values range from 6.64 Ohm.m to over 669 Ohm.m. The top 6–8 meters exhibit mostly low to moderate resistivity (6–93 Ohm.m), indicative of moist clayey to silty soil strata with possible localized saturation. Notably, blue to cyan zones (6–25 Ohm.m) at 20 m, 60 m, 80 m, and 95 m horizontal distances suggest high moisture content or clay-rich zones. Beneath this layer, resistivity sharply increases (>179 Ohm.m), with red to purple colors indicating a dense, compact stratum likely corresponding to dry compact layers.



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

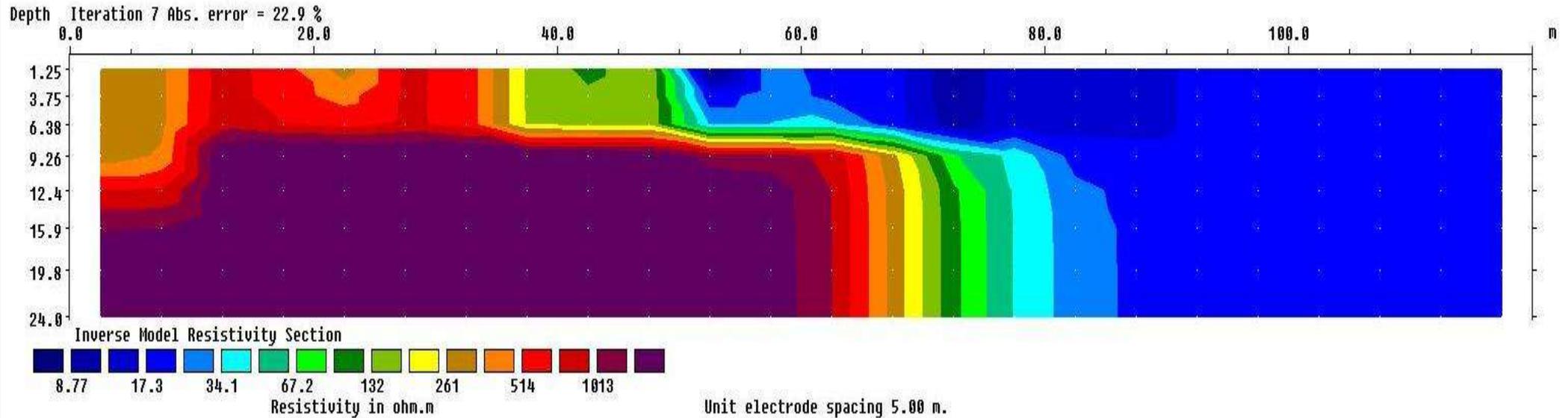
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25

PROFILE - 25 : 130+660 to 130+790



Interpretation:

This resistivity profile shows underground layers up to 24 meters deep across a 115-meter stretch. On the left, high resistivity values (261 to over 1013 ohm.m, shown in red to purple) suggest dry soil or compact layers.. On the right, low resistivity values (8.77 to 67.2 ohm.m, shown in blue to green) indicate water-saturated or clay-rich layers



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

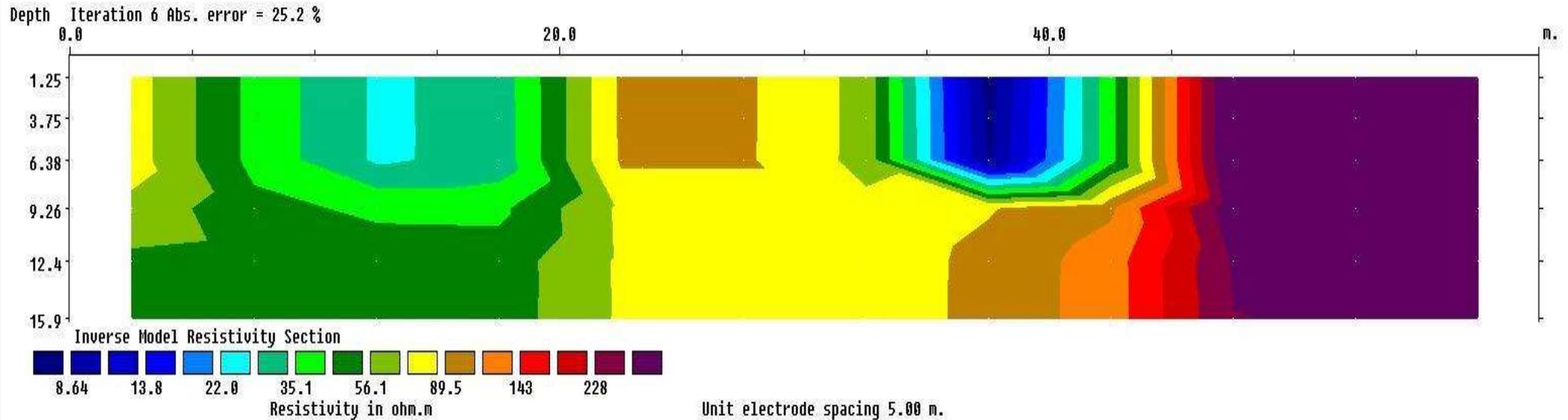
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26

PROFILE - 26 : 124+830 to 124+895



Interpretation:

The resistivity values, given in ohm.m, vary across the profile both horizontally and vertically. Lower resistivity zones (blue to green colors) appear prominently between 10–15 m depth and around 10–15 m and 35–45 m horizontally, which may indicate the presence of water-saturated soils or clay-rich materials. Higher resistivity areas (yellow to purple) suggest drier, more resistive materials such as sand, gravel, or compact layers., especially on the far right side of the profile.



SOIGNÉ ENGINEERING CONSULTANTS PRIVATE LIMITED
EARTH RESISTIVITY TEST REPORT
ANNEXURE - 1
MODEL RESISTIVITY WITH TOPOGRAPHY IMAGING

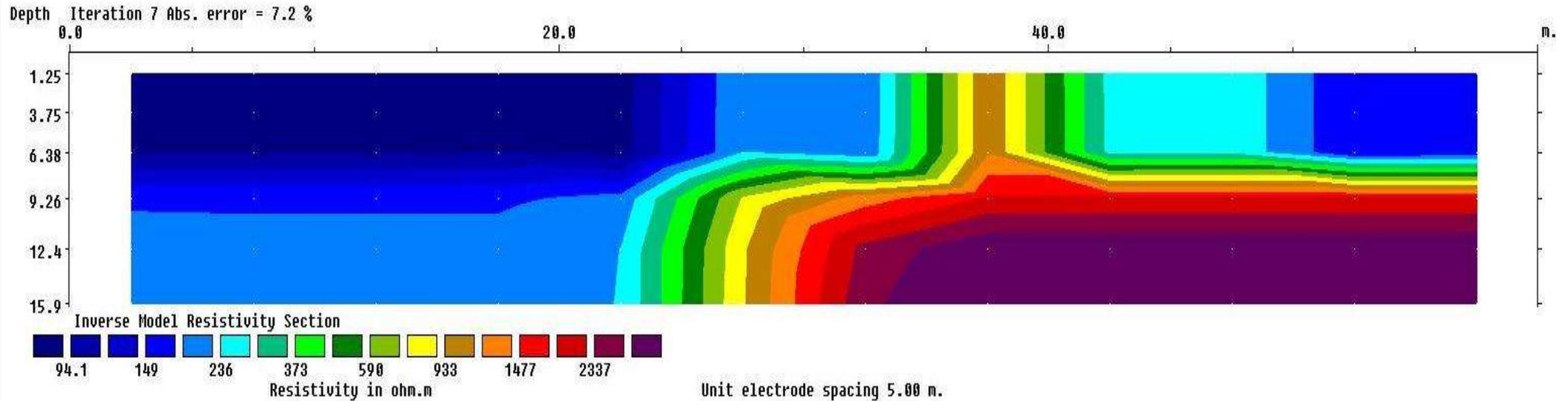
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27

PROFILE - 27 : 131+760 to 131+825

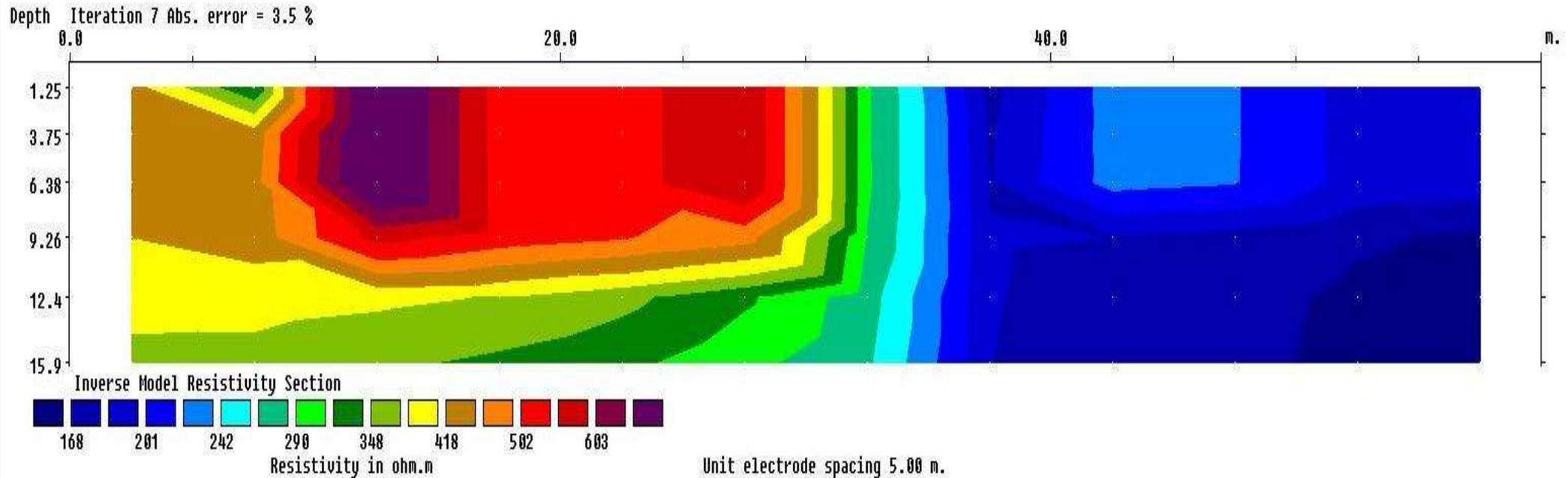


Interpretation:

This electrical resistivity tomography (ERT) section reveals subsurface resistivity variations along a 60-meter profile, with depths reaching approximately 16 meters. The left side shows predominantly low resistivity values (blue to green), indicating potentially moist or clay-rich materials. Toward the center and right, resistivity increases significantly (yellow to purple), suggesting the presence of dry compacted materials.



PROFILE - 28 : 133+500 to 133+565



Interpretation:

This 2D resistivity section shows subsurface resistivity variations along a horizontal profile. The central-left area, with high resistivity values (red to purple, >500 ohm.m), may indicate dry or rocky material, possibly bedrock. The right side and lower depths are dominated by low resistivity zones (blue to green, <200 ohm.m), suggesting the presence of water-saturated soil, clay, or other compact layers materials.

ANNEXURE - 2

SITE PHOTOGRAPHS

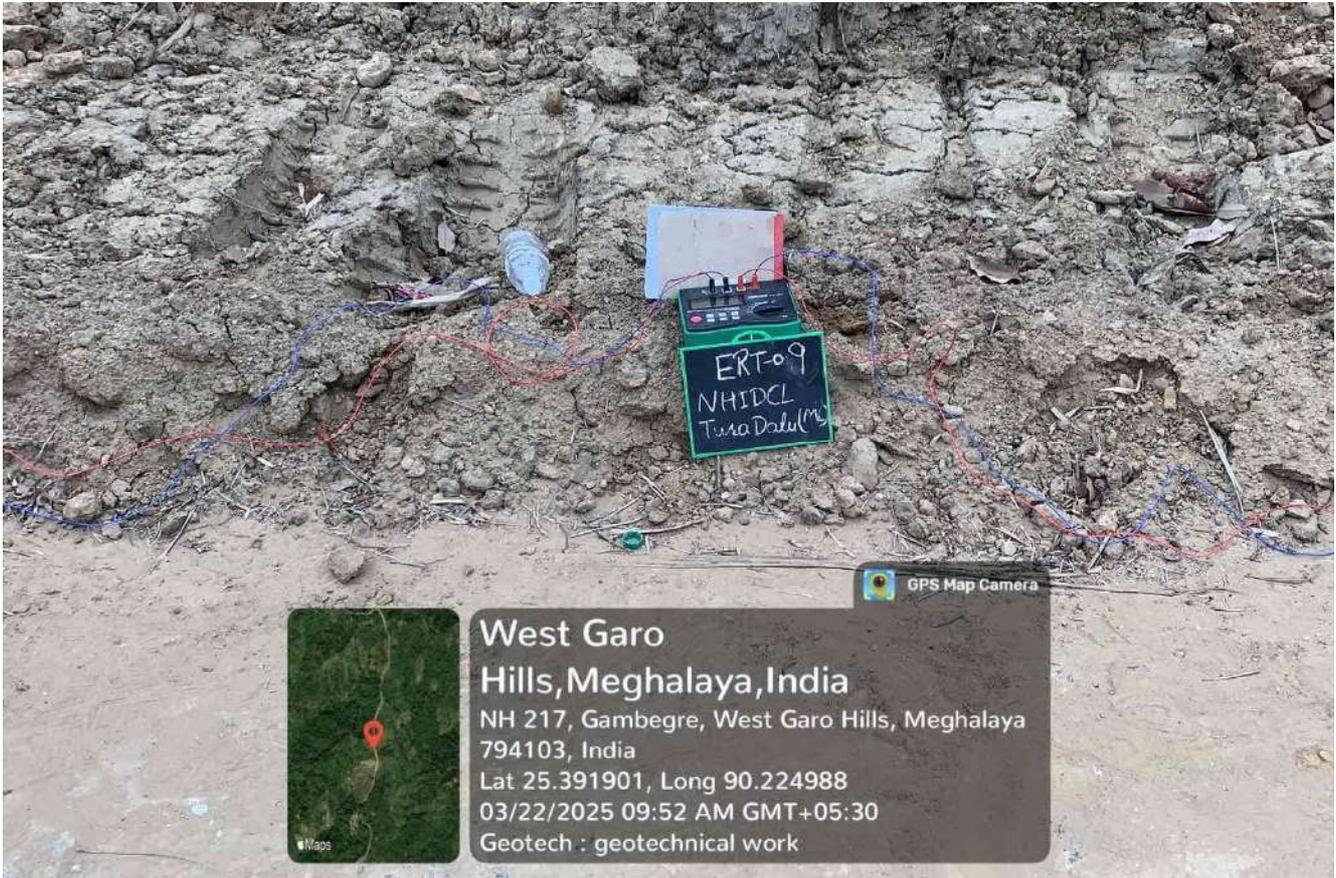


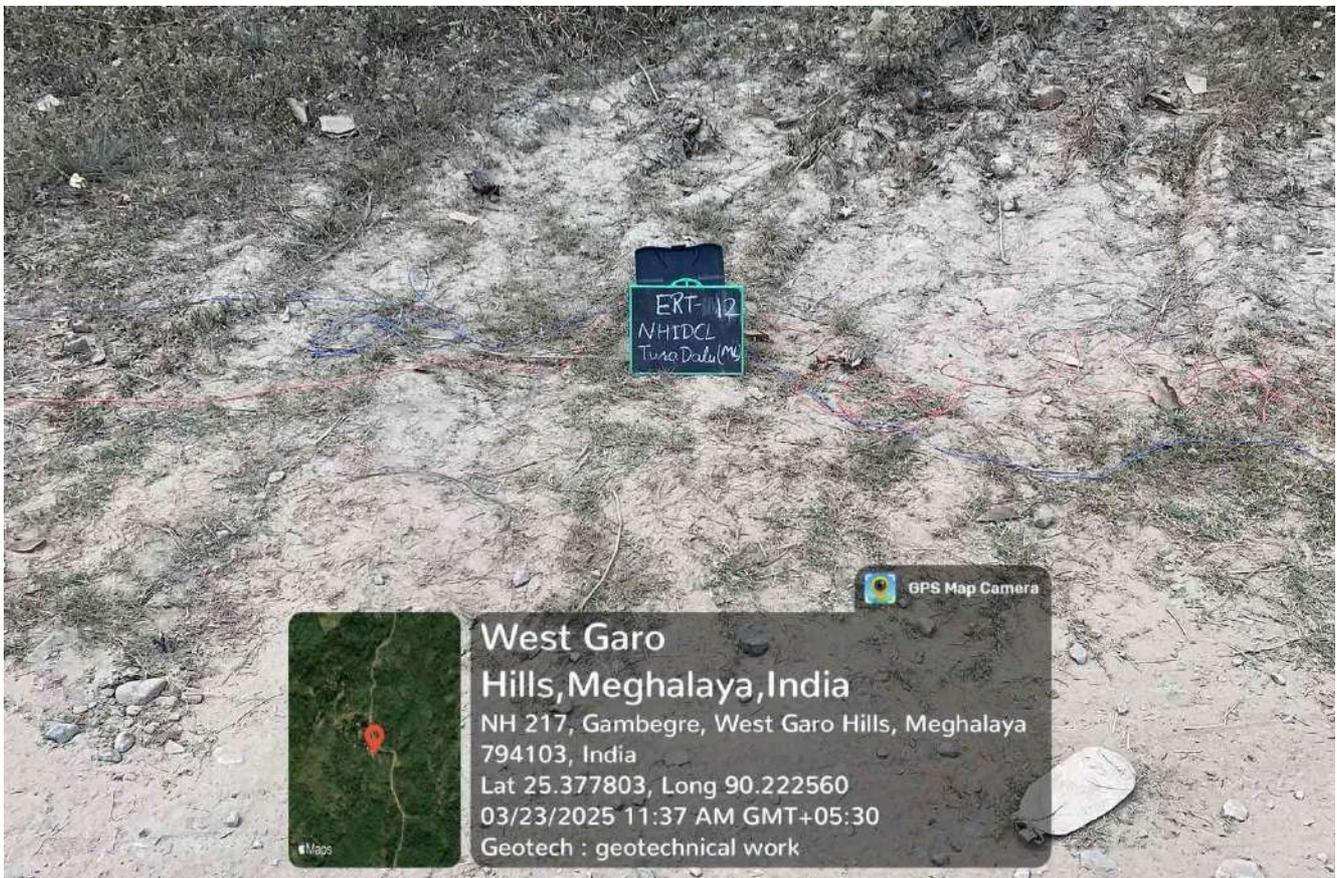
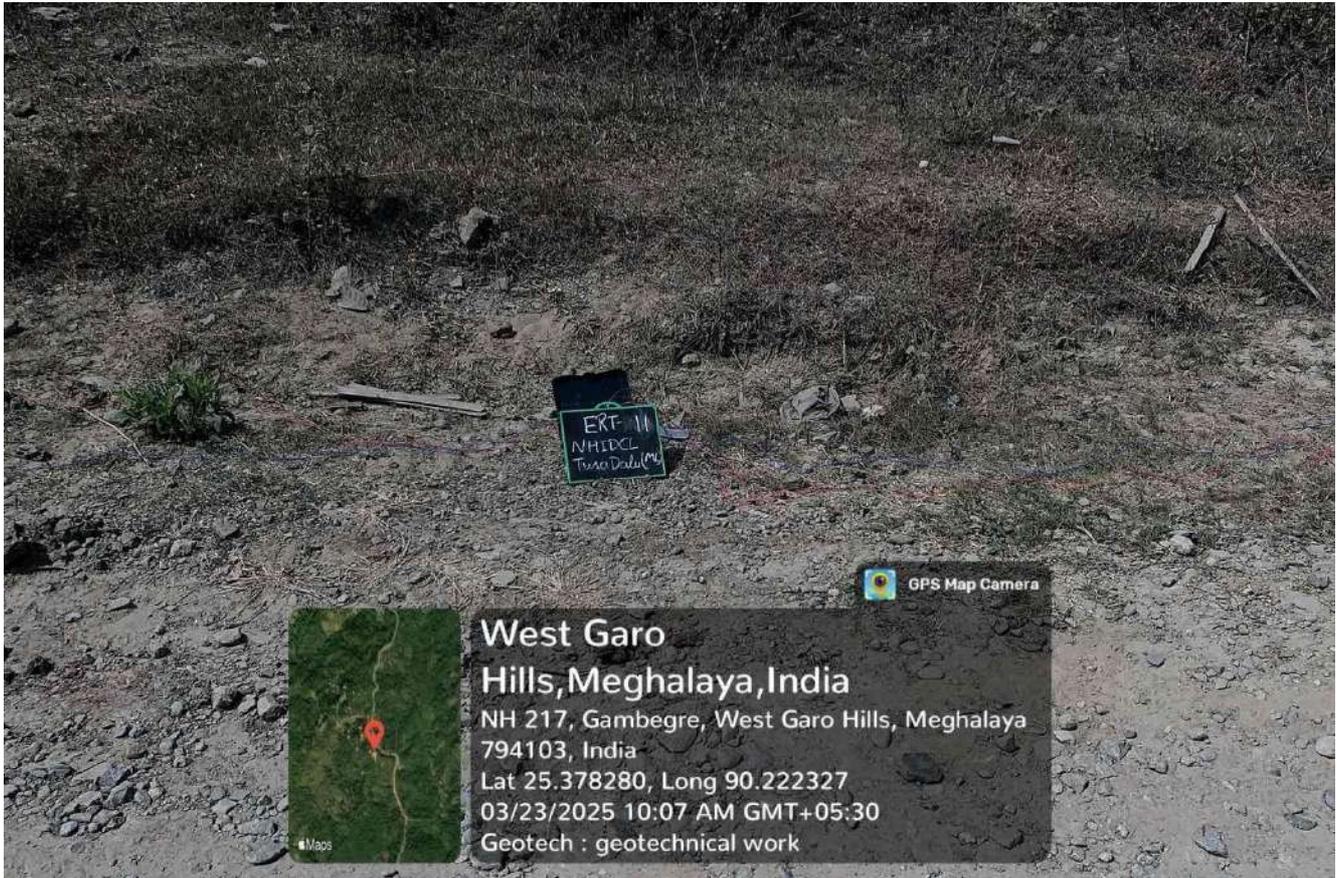


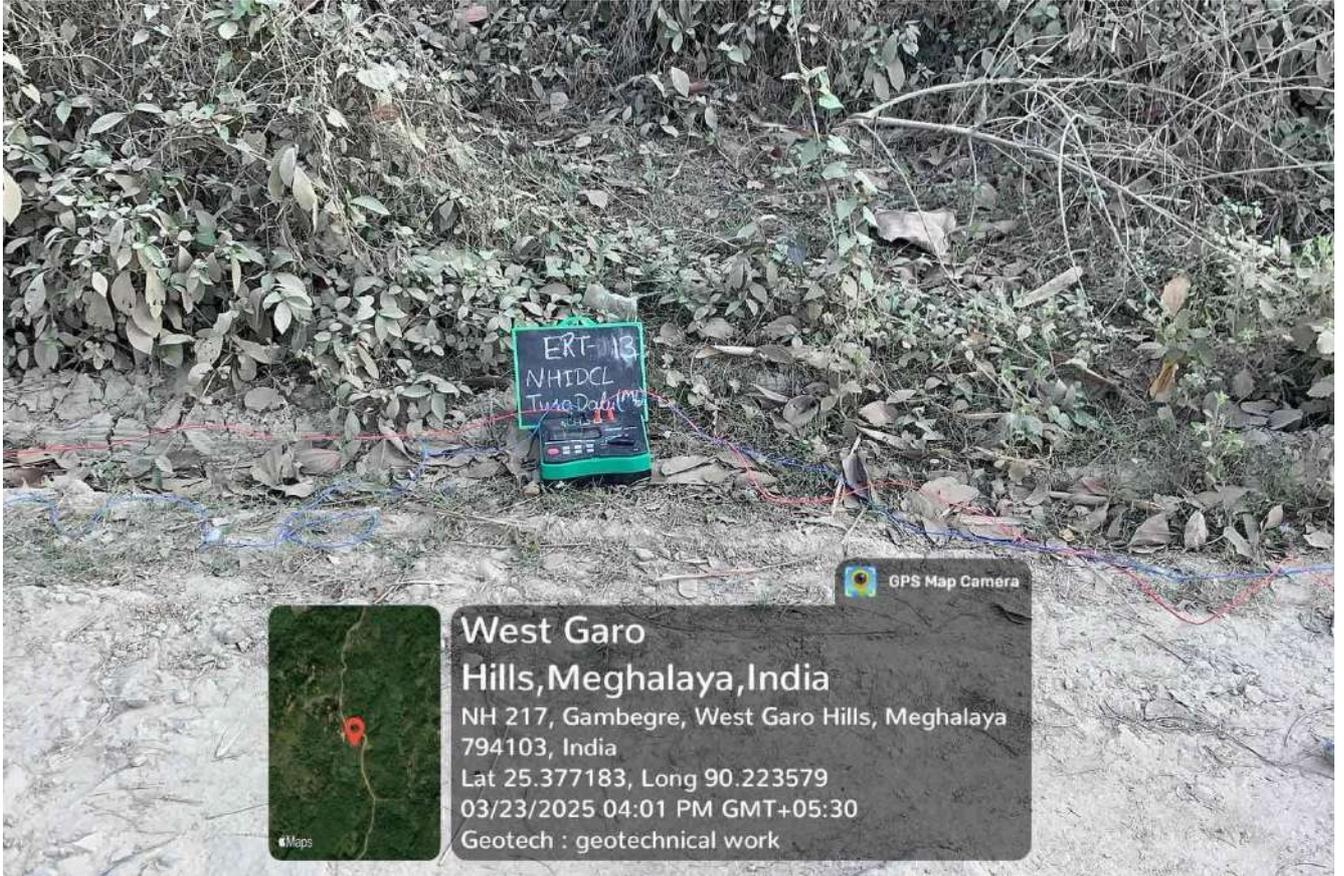








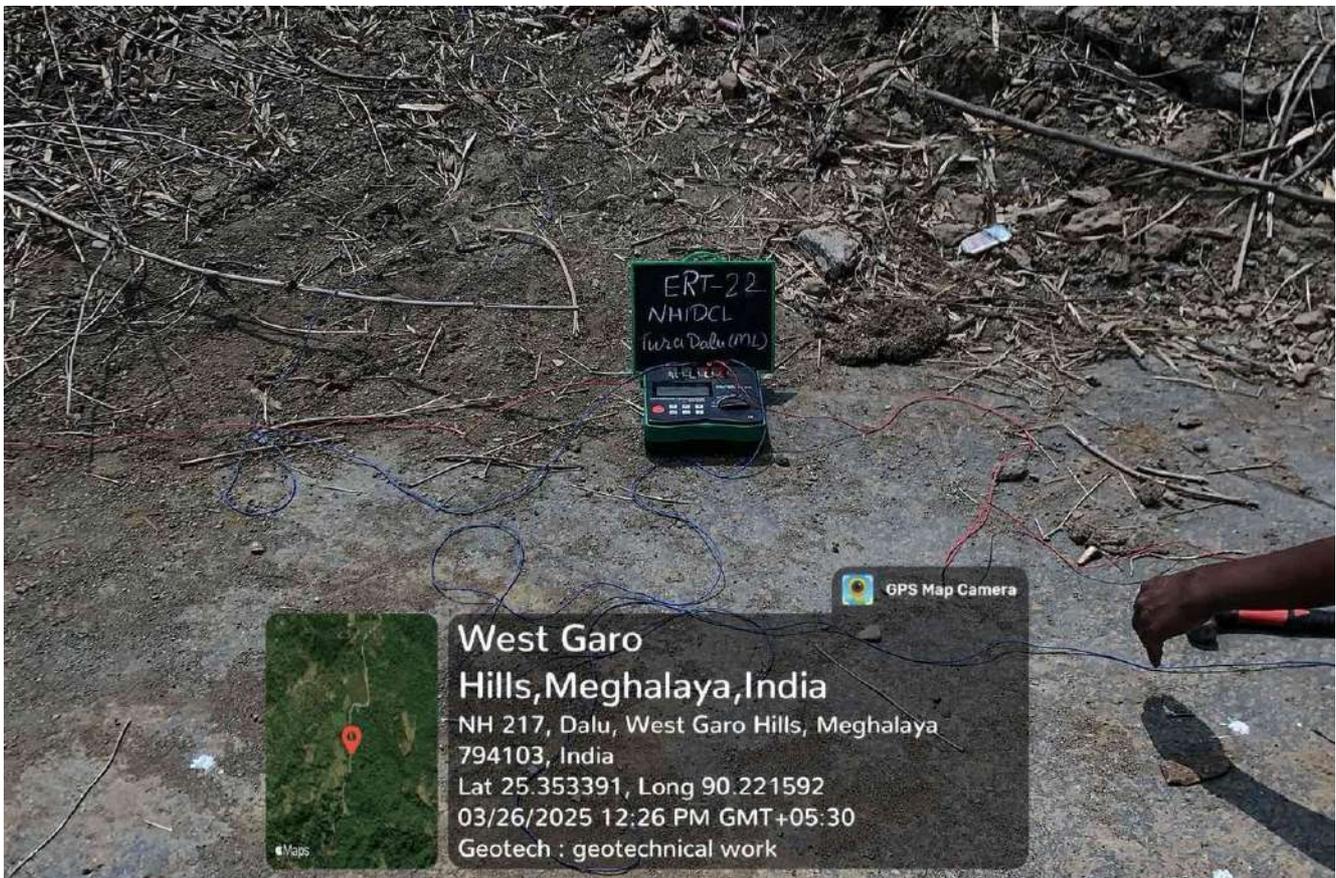


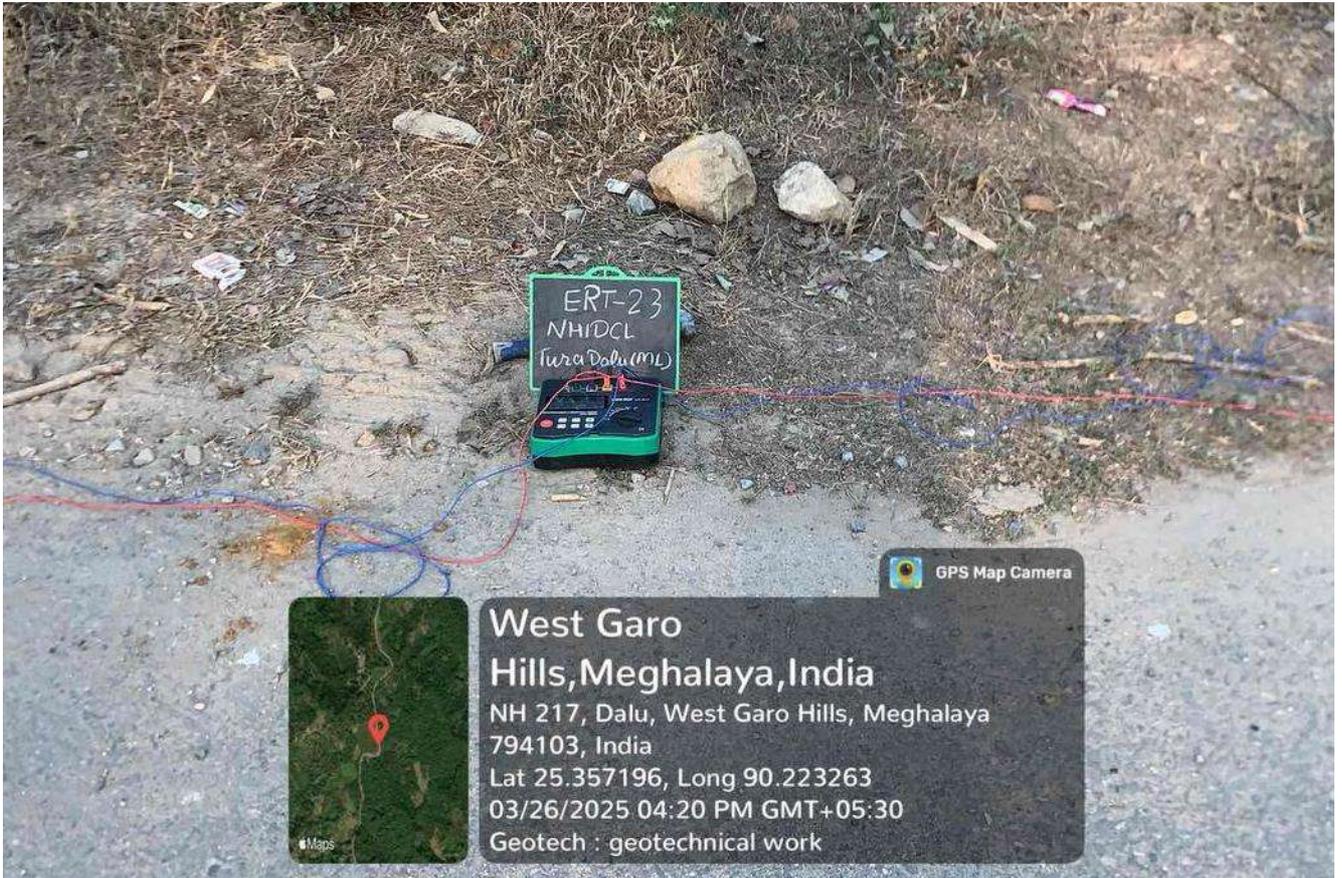










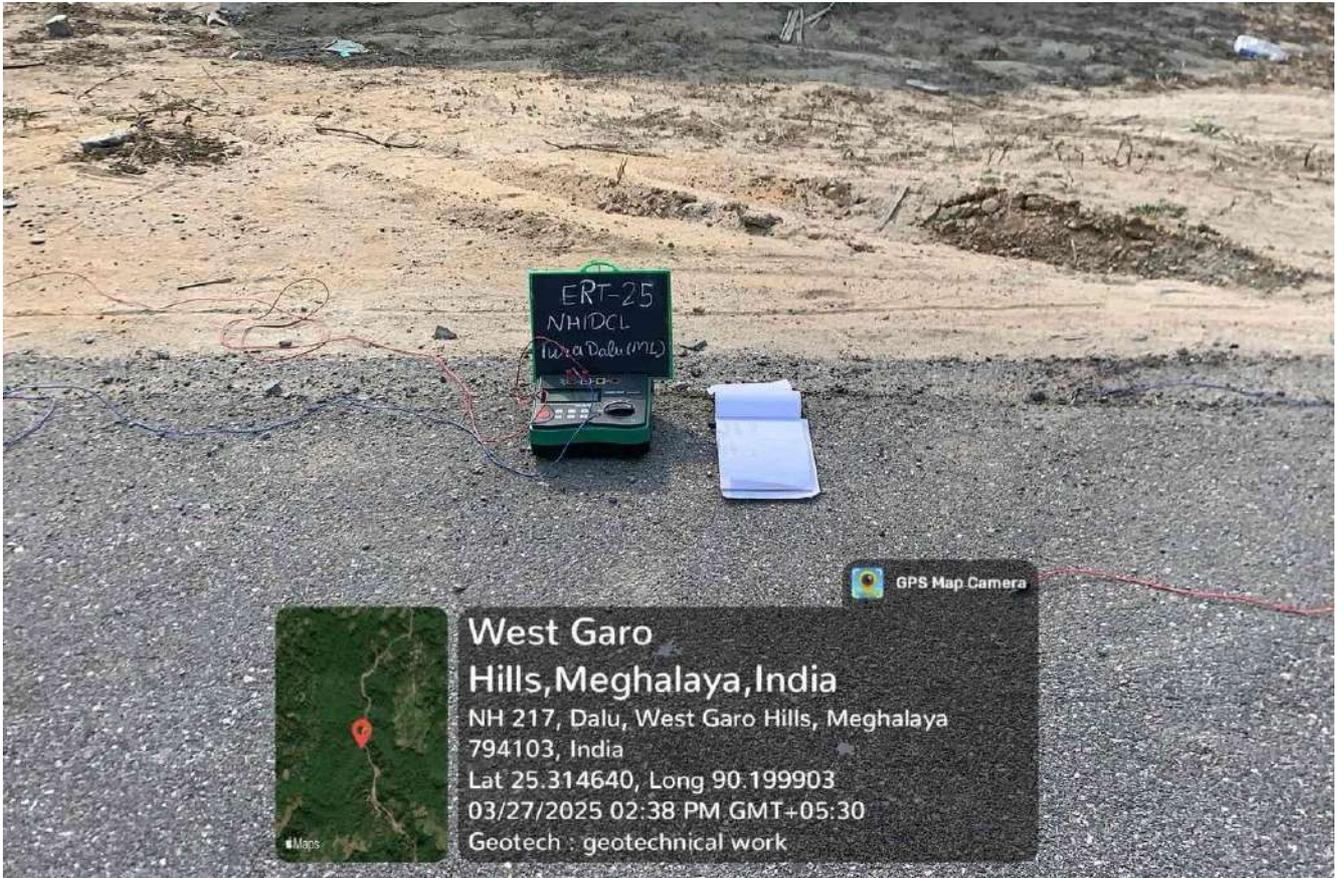




EARTH RESISTIVITY TEST REPORT

ANNEXURE - 2

SITE PHOTOGRAPHS





ANNEXURE - 3

CALIBRATION CERTIFICATE



TESTNCL LABORATORY

(An ISO/IEC-17025:2017 Accredited Laboratory)

(A DIVISION OF TESTING & CALIBRATION INDIA (OPC) PVT. LTD.)

Plot No-113, Pocket-A2, Sector-17, Dwarka, New Delhi-110075 (India)
Mob. +91-8882056269, 9990730550, E-mail-lostncl@gmail.com, Website - www.tnclab.com



Calibration Certificate

P-17 F03-00

Certificate/ULR No.: CC40582500003335F Page 1 of 1

Customer Details		Instrument Receipt Date	25-Feb-2025
M/s Solgne Engineering Consultants Private Limited		SRF No.	TNC1/JC/24-25/2673
Plot no - 1043, Street no - 1, Village - Haripur, Sector - 4, Panchkula., Haryana Pin Code : 134112		Date of Calibration	25-Feb-2025
		Next Calibration Date	24-Feb-2026
		Certificate Issue Date	26-Feb-2025

A) Identification On UUC (Unit Under Calibration)

Instrument Name	Earth Resistance Tester	Make / Model No.	Kusam - Meco/KM 2040
Range	As per Instrument	Instrument Condition	SATISFACTORY
Least Count	As per Range	Location of Calibration	At Laboratory
Serial No.	999449	Location	-
Instrument ID.	SEC/EQ/ERT/08	Parameter	Electro Technical
ENVIRONMENTAL CONDITION	Temperature:- 24±2°C ,Relative Humidity: - 55±10%	Calibration Reference Standard	IS:1248-2003
		Calibration Procedure	TNC -03-WI 2.0

Details of Test Equipments Used

Name	I.D. NO./ SR NO	Certificate/ULR No.	Certified By	Valid upto
Decade Resistance Box	TNC/ET/C/DRB/01	AMC/240252/01	ACUMEN	24/07/2025

Resistance: Range

Sl. No	UOM	Observed Value on Standard	Observed Value on UUC	Uncertainty at k=2 ±%
1	Ω	2	1.98	0.41
2	Ω	20	19.3	0.41
3	Ω	200	199	0.41
4	kΩ	2	1.94	0.31
5	kΩ	20	19.6	0.31

Note:

- The Calibration results reported in this certificate are valid at the time of and the started condition of measurement.
- This report should not be reproduced except in full without our prior permission in writing.
- Calibration certificate without signature are not valid and this certificate is intended of only for guidance and not for legal purpose or for advertisement.
- All our certificates are Traceable to national/International standard.
- This Certificate relates to the item Calibrated total liability of Testncl Laboratory will be limited to the invoiced amount only.
- Measurement Uncertainty reported at approximate 95% confidence level with k=2



(Amit Kumar)
CEO/QM

Issued & Approved By

Calibrated By