



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



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# Modelling peat stratigraphy using integrated geophysics

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# Outline

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## **The use and advantages of non-invasive techniques to investigate peat stratigraphy and its lateral extent**

- BGS peat research
- Case study: Talla Research Site
  - Briefly discuss techniques & results
  - Evaluation of techniques
- Wider applications of this research



# BGS' peat research

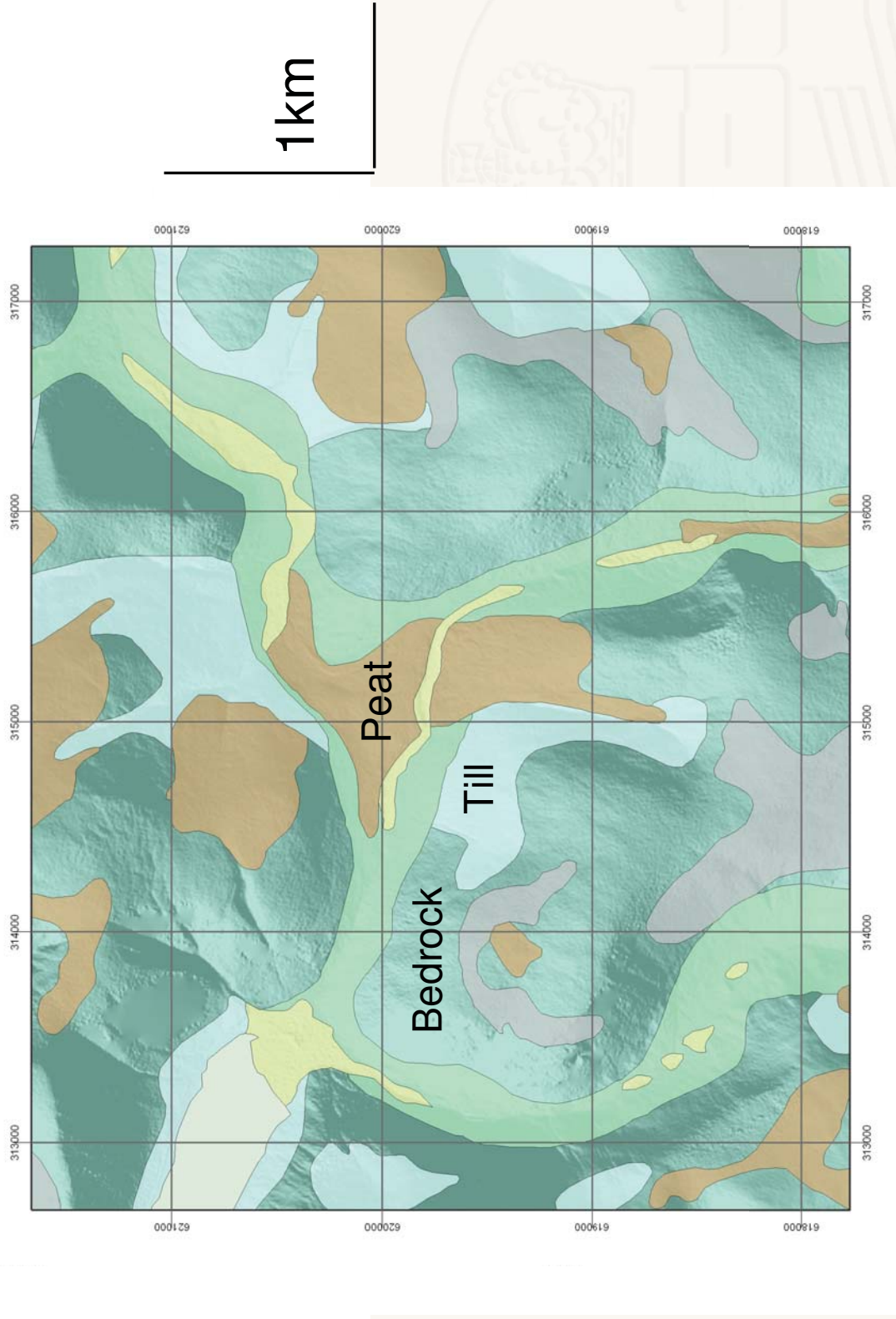
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- Hydrogeological: water storage, quality
- Black Carbon: modelling reserves & sink capacity
- Methane production: greenhouse gas
- Geo-diversity: Habitats, environmental impacts
- Quaternary Climate Change: **Case Study**

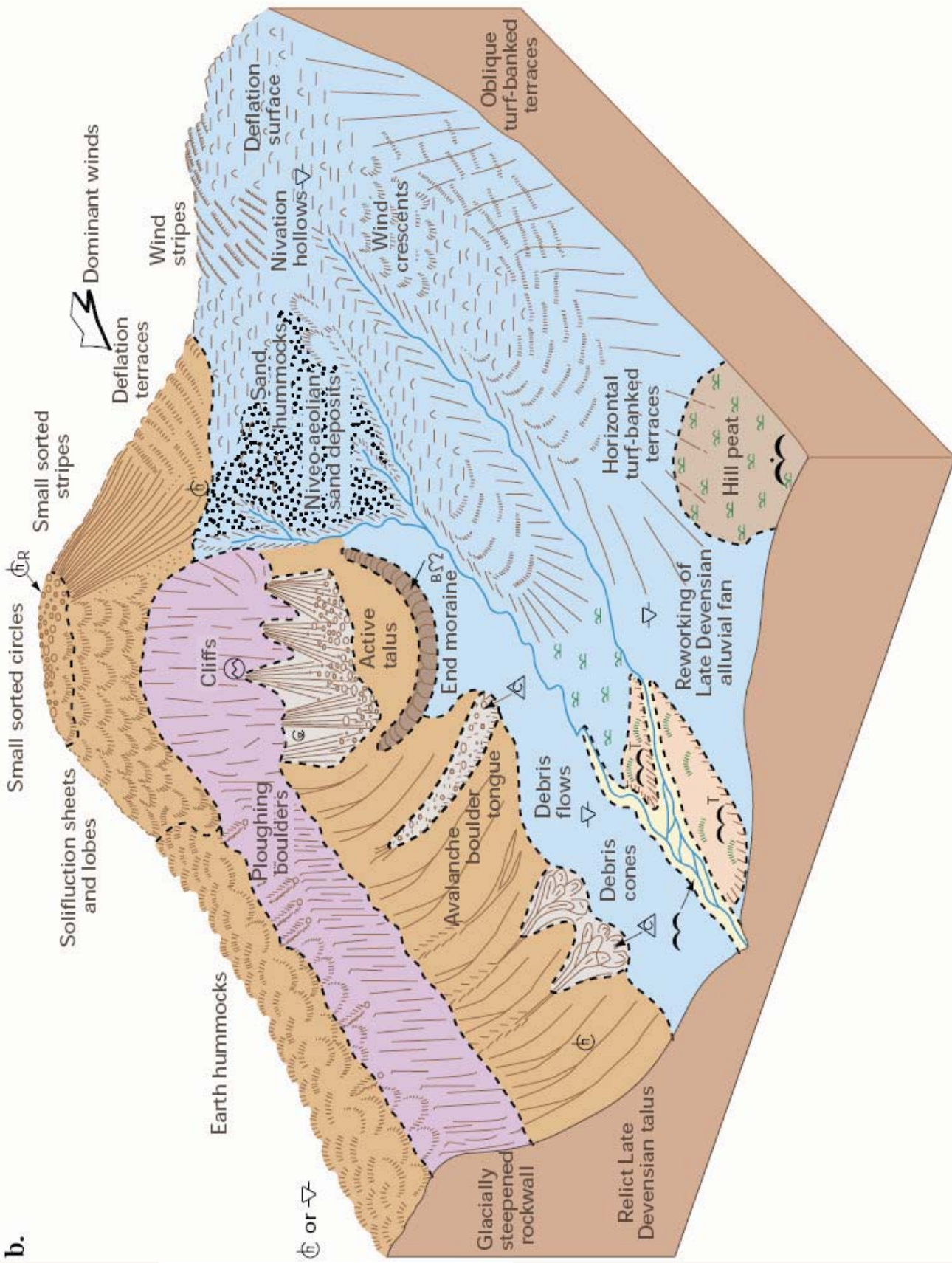


# Case Study: Landscape Evolution of Talla Moss

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b.



# Investigation Techniques

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## Geological Surveying & Soil mapping

- Complex quaternary deposits
- Augering Indicated variable thickness

## Boreholes & Trial Pits

- Sampling
- Access issues

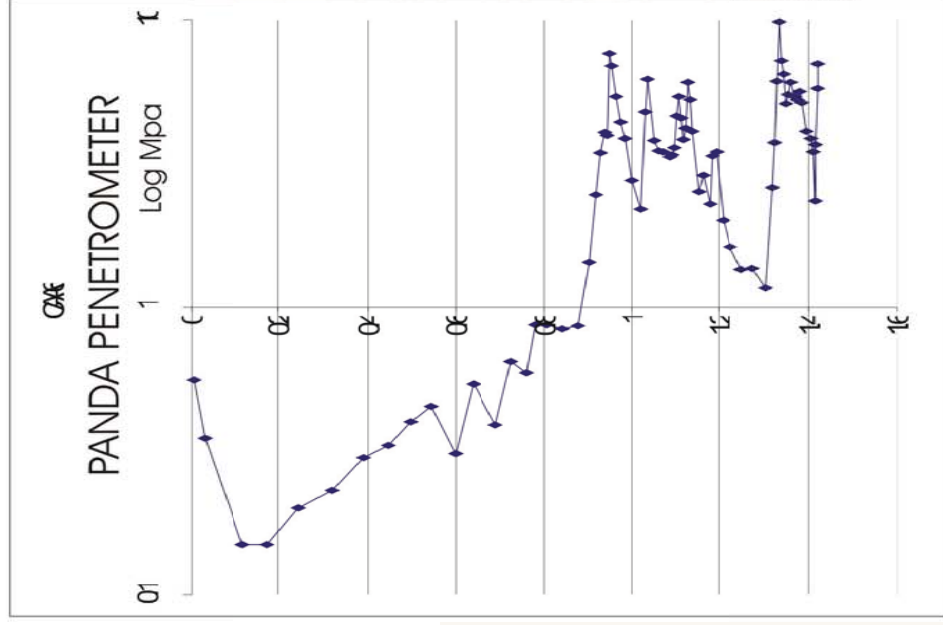
## Insitu testing

- Hand Penetrometer



# Peat Profiling: Panda Penetrometer

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Spongy Fibrous PEAT (MOSS)

Firm Fibrous PEAT

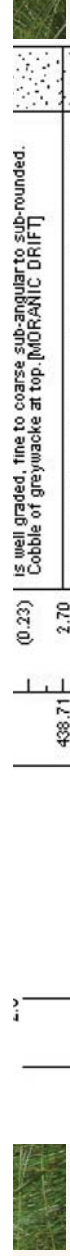
Very soft plastic pseudo fibrous very dark brown PEAT

Soft dark brown slightly sandy gravelly SILT (Alluvium)

Soft dark greyish brown sandy SILT

Cobble of very strong coarse greywacke

Cobbles set in brown silty sandy gravel



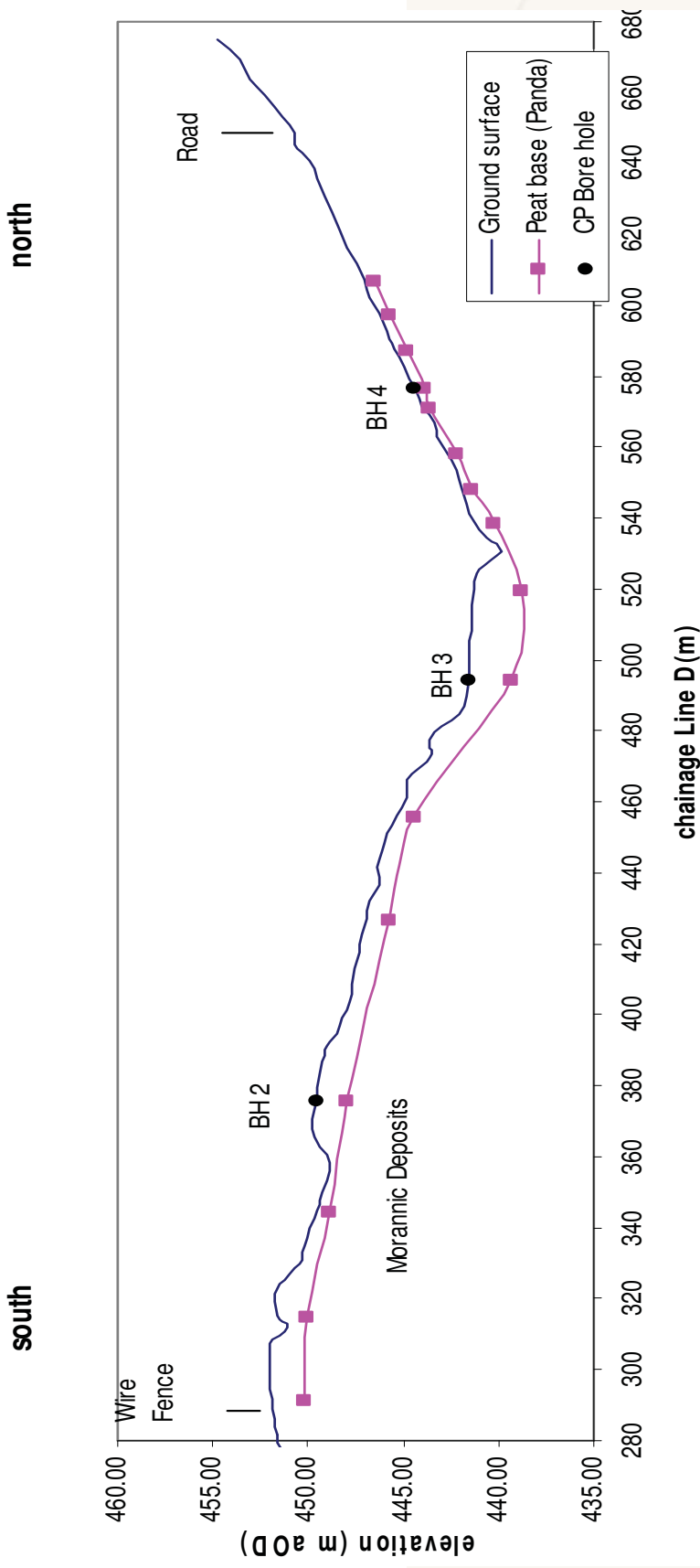
(0.23) IS well graded, fine to coarse sub-angular to sub-rounded.  
Cobble of greywacke at top. (MODERNIC DRIFT)

433.71 2.70



# Penetrometer based x-section

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- Depth control (<4m)
- Distinguish strength variability of underlying soils





# Non-invasive Techniques

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## Geophysics

- ERT
- ARP
- Seismic
- GPR

## Advantages

- Continuous lateral and vertical profiling
- Locate thickest peats for dating



# Electrical Resistivity Tomography (ERT)

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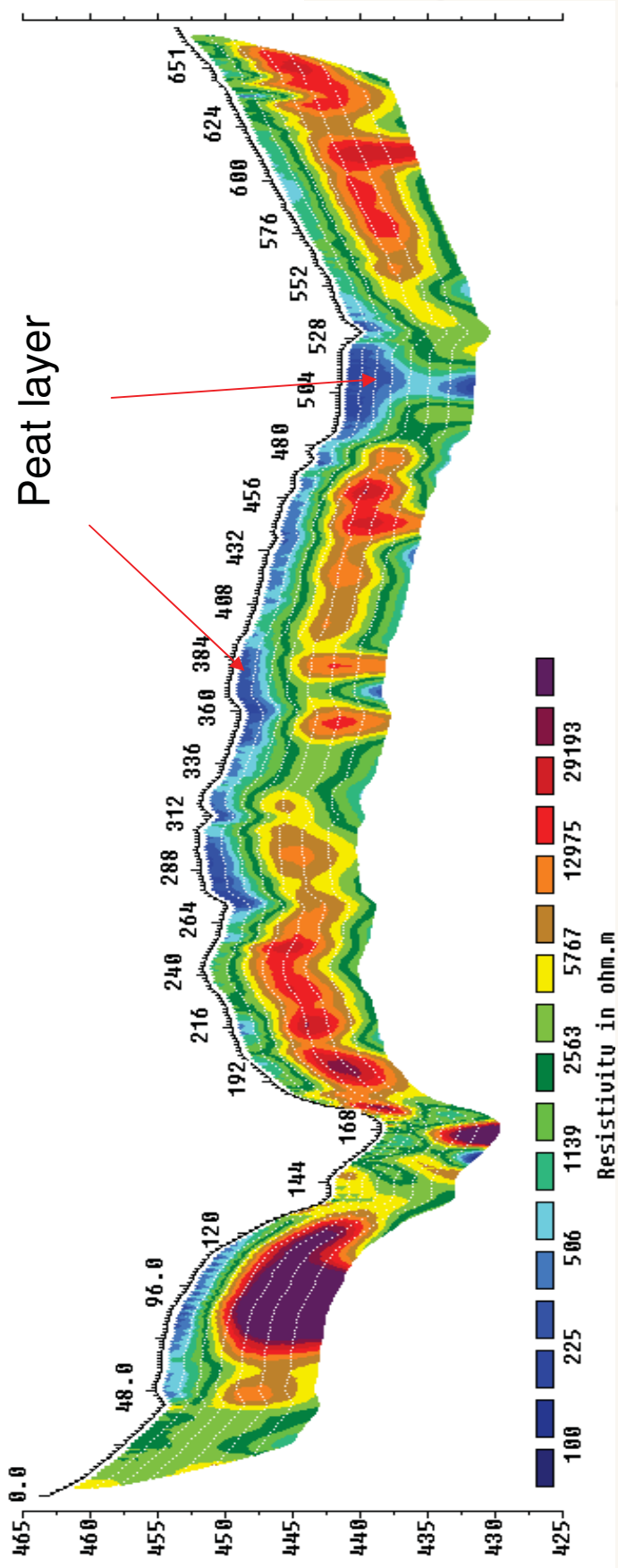


Acquisition of high-  
resolution resistivity  
images in steep terrain



# ERT - Results

Elevation Iteration 5 RMS error = 2.7



# Mobile electrical mapping - ARP

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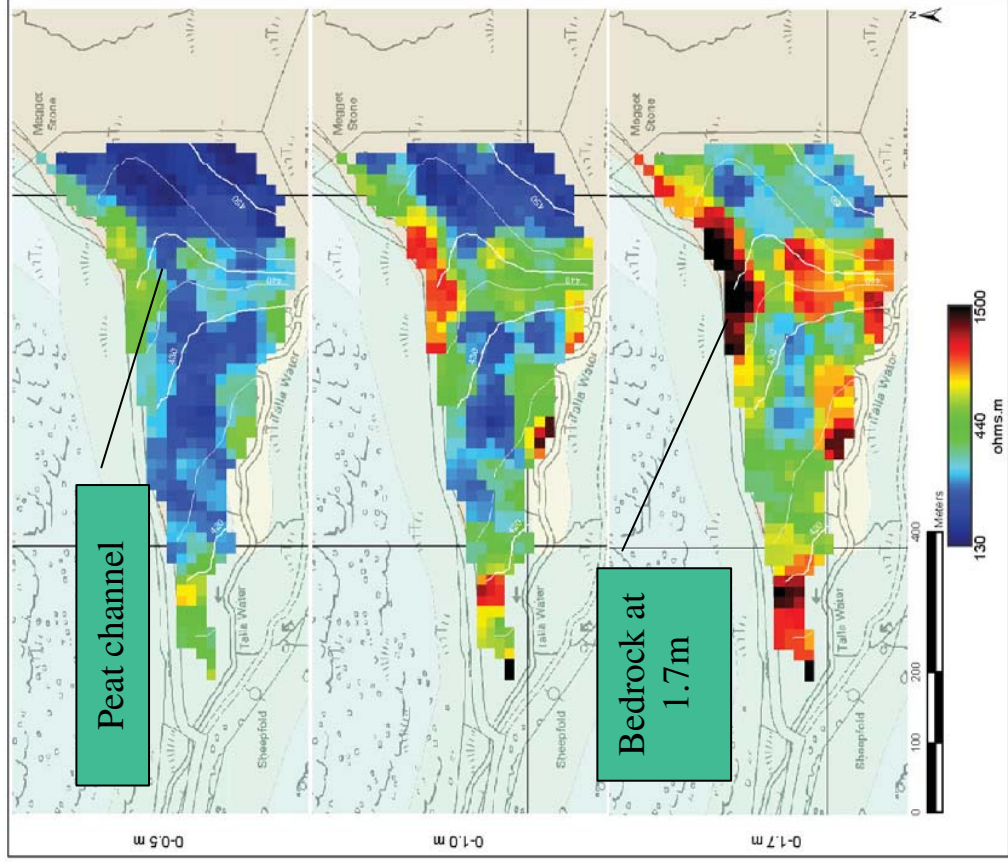
Geocarta Automated Resistivity Profile (ARP) system:  
Dynamic acquisition of apparent resistivity data



# Mobile electrical mapping - Results

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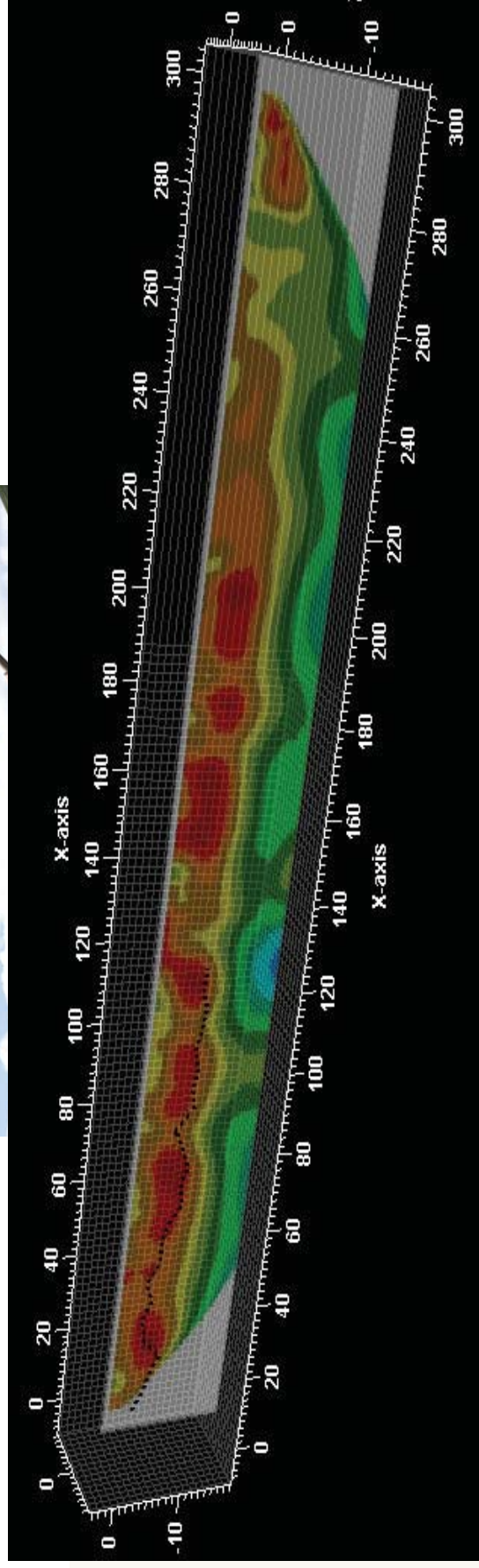
Horizontal sections of bulk resistivity



# Seismic Refraction

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- Determining stratigraphy & depth of deeper deposits or bedrock
- Correlation of Seismic Refraction Data with Electrical Resistivity Tomography (ERT) –
- Peat absorbed energy – need stronger source

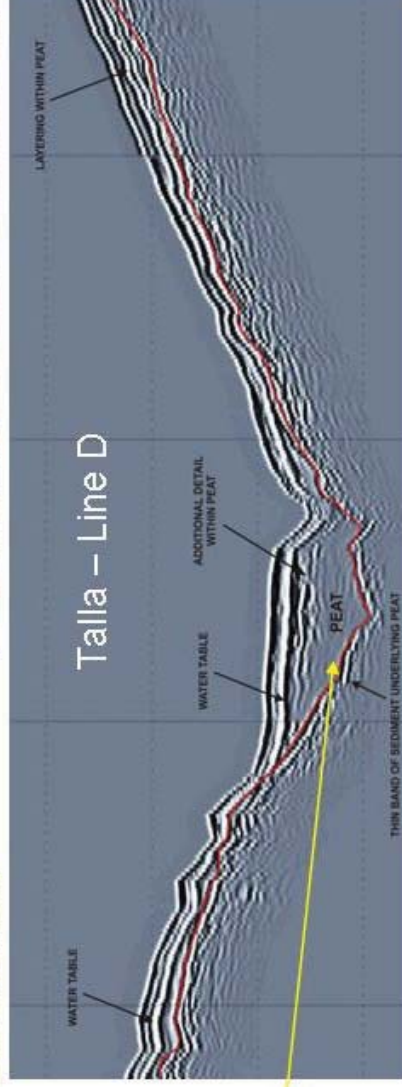


Dashed black line shows seismic velocity boundary. 'Slow' layer (1000 m/sec), overlying 'intermediate' layer (2,400 m/sec)



# GPR - Results

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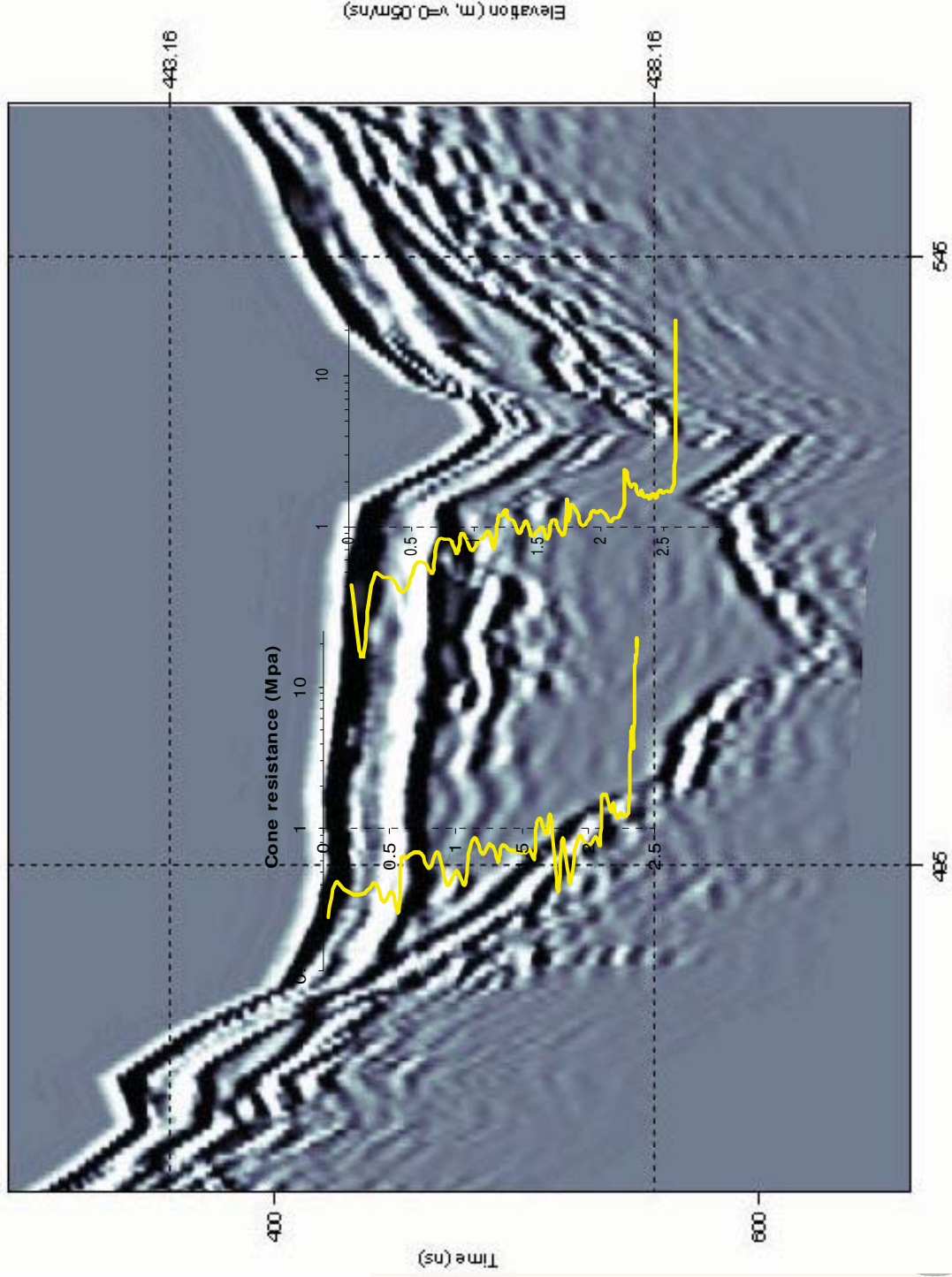


GPR - 50 & 100 MHz antenna used to define thickness and lateral extent of peat deposits



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# GPR - Results





# Conclusions - Techniques

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Technique	Lateral detail	vertical detail	Depth to water table	See through clay layers
<b>ERT (Resistivity)</b>	✓	✓		✓
<b>ARP - Mobile electrical mapping</b>	✓ ✓		x	
<b>Seismic Refraction</b>	x		✓	✓
<b>GPR (Radar)</b>	✓ ✓	✓ ✓		x



# Summary – Best Techniques

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## GPR & ERT

- Great lateral and vertical detail
- Environmentally benign
- Cost effective
- Interpretation enhanced by integration of techniques



# Summary – Use of geophysics in peat

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- **Essential for accurate peat volume calculation**
- **Increases confidence in ground model at minimal cost**





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