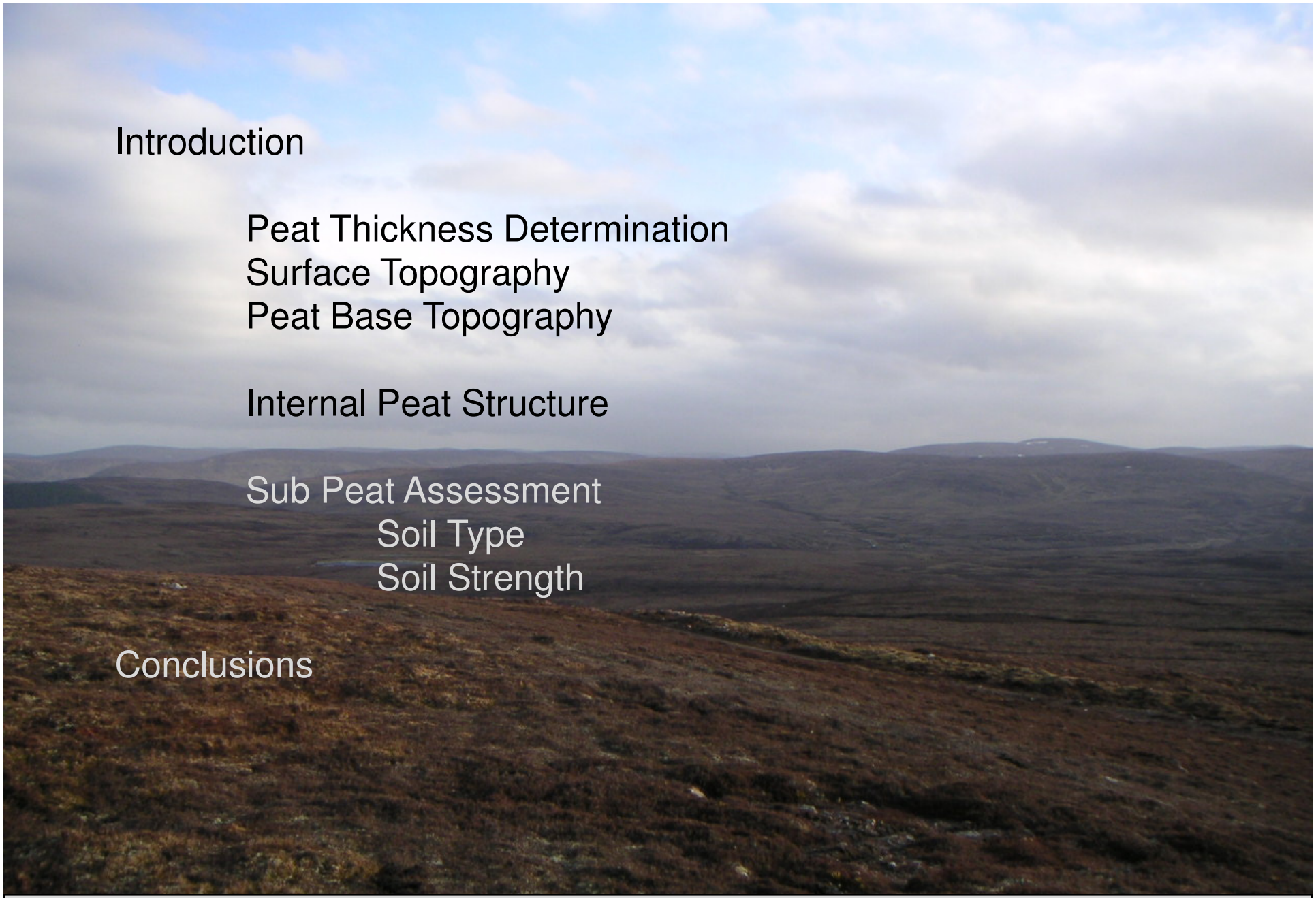
Peat Stability Seminar – October 2010
Geological Survey of Ireland

geophysics and peat site assessment

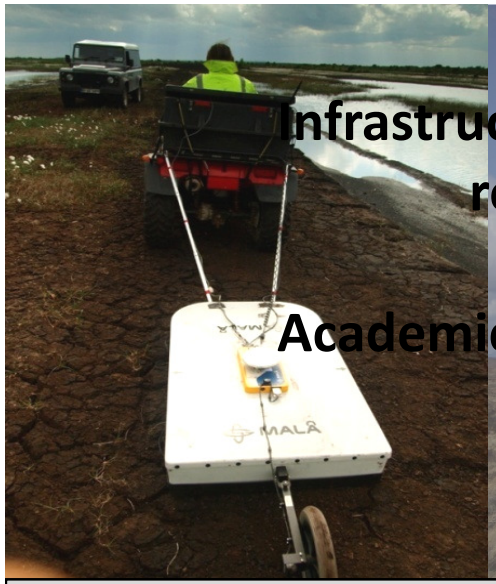
apex geoservices


Introduction
Peat Thickness Determination
Surface Topography
Peat Base Topography
Internal Peat Structure
Sub Peat Assessment
Soil Type
Soil Strength
Conclusions

peat assessment using GPR

resource assessment
BNM peat thickness determination
35,000 Ha

windfarm developments
Ireland and Scotland
turbine bases
access roads



Infrastructure projects
road and rail

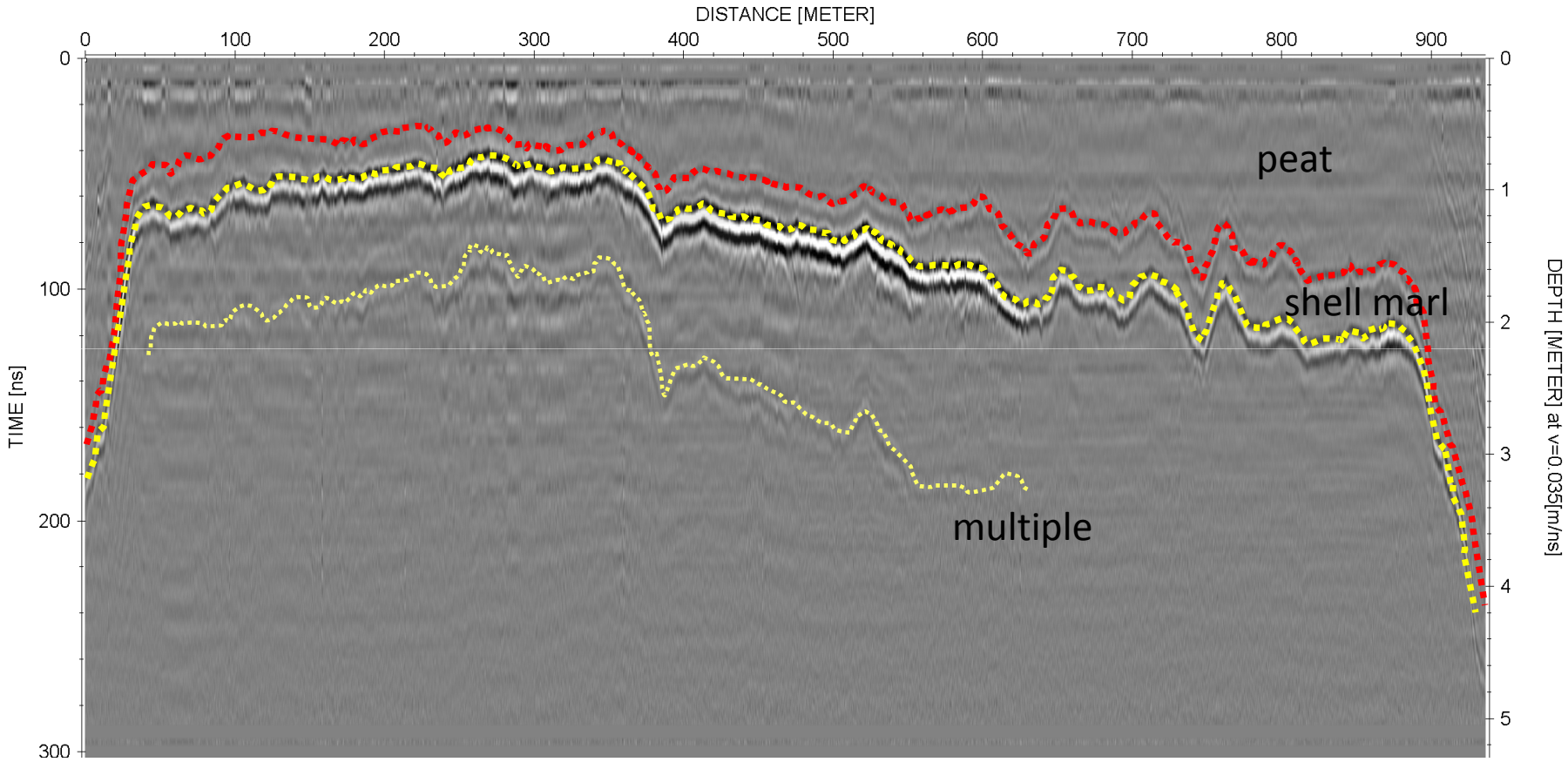
Academic studies

BNM peat thickness determination

- LIDAR data on 2m grid over 69,000 Ha
- GPR data over c. 35,000Ha
- 100MHz profile every 4th production field
- 0.2m trace interval
- RTK positional data
- physical soundings
- c. 25km/h acquisition

interpretation

probing GPR signature topography



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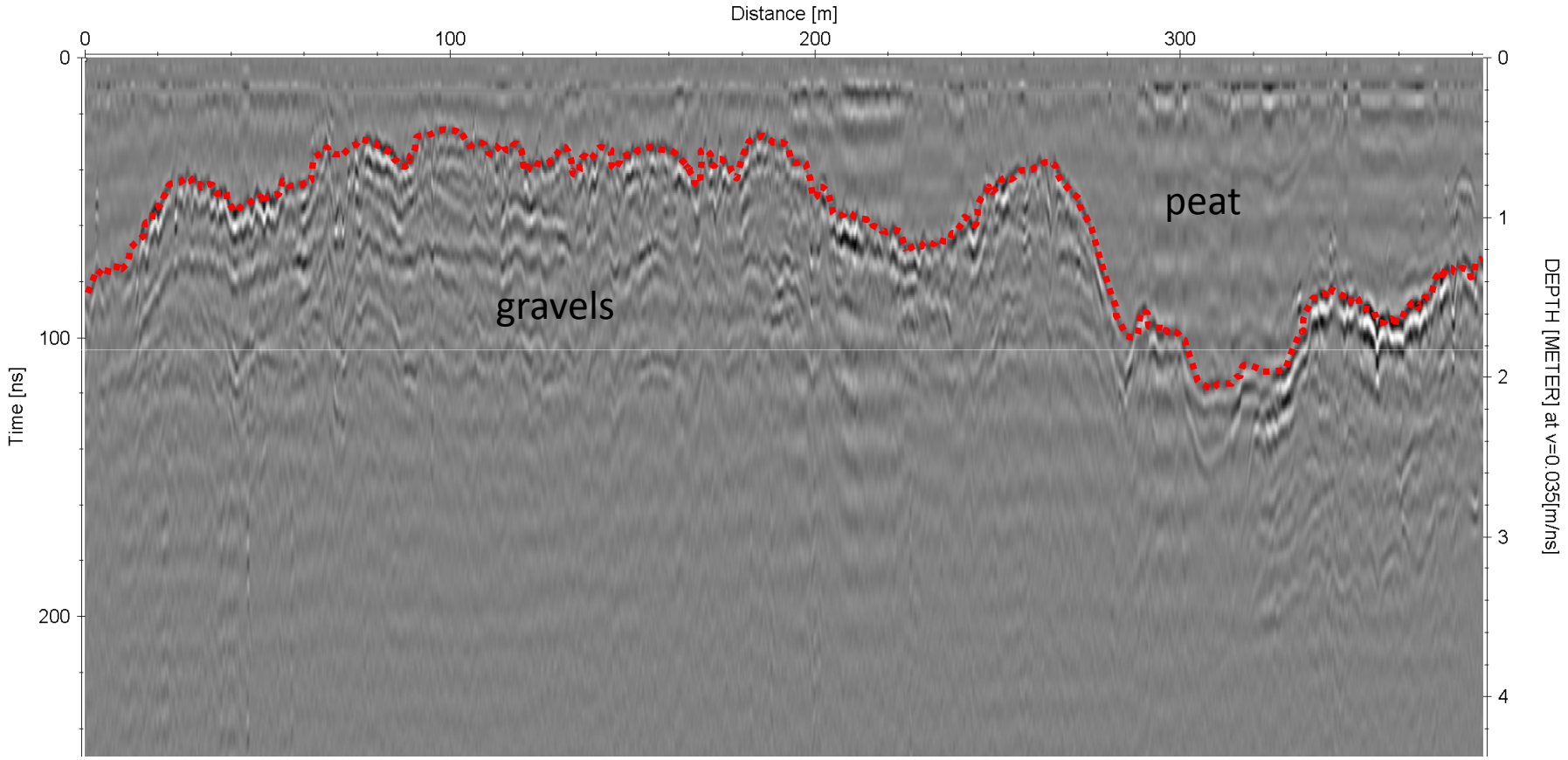
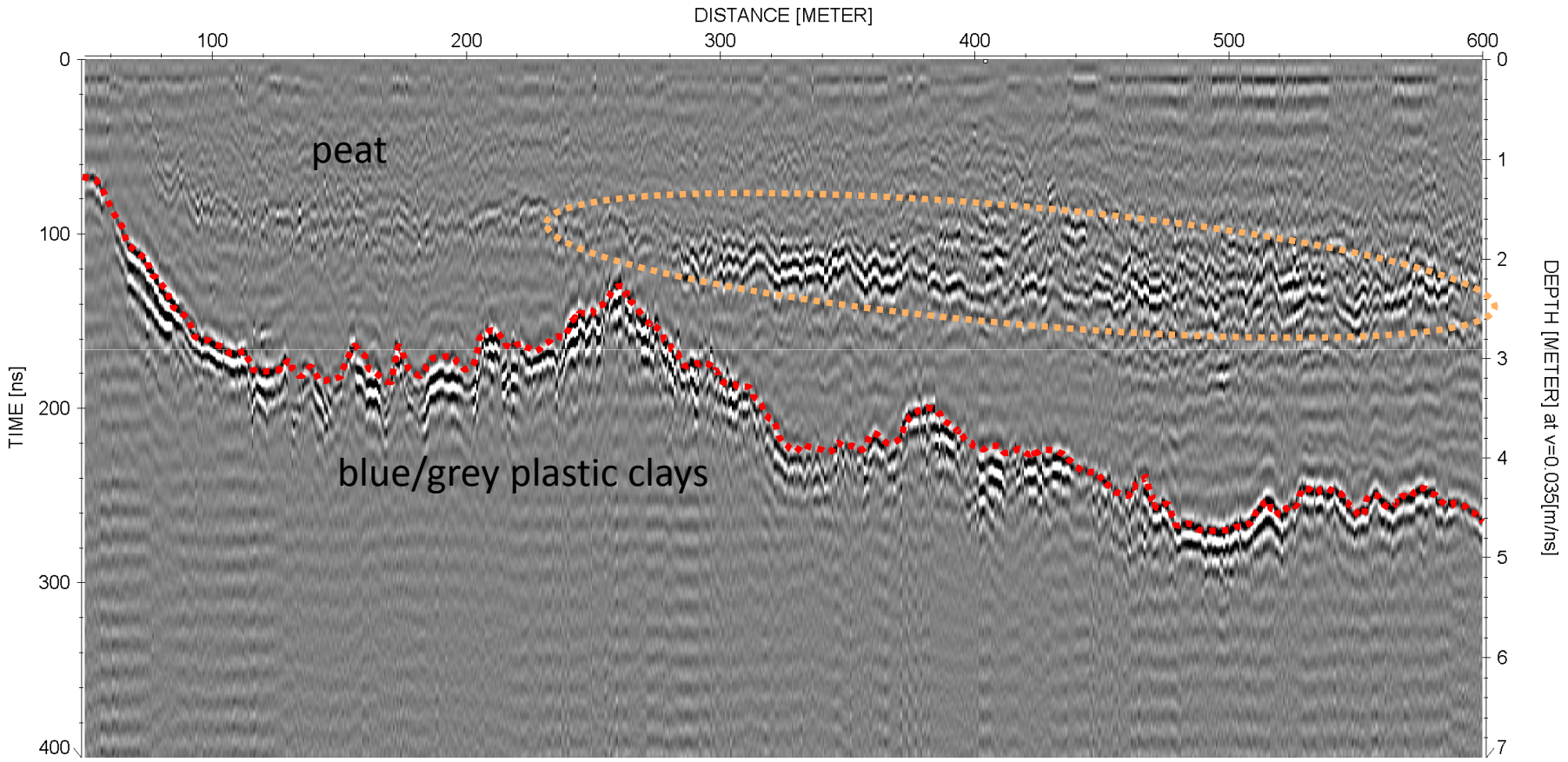


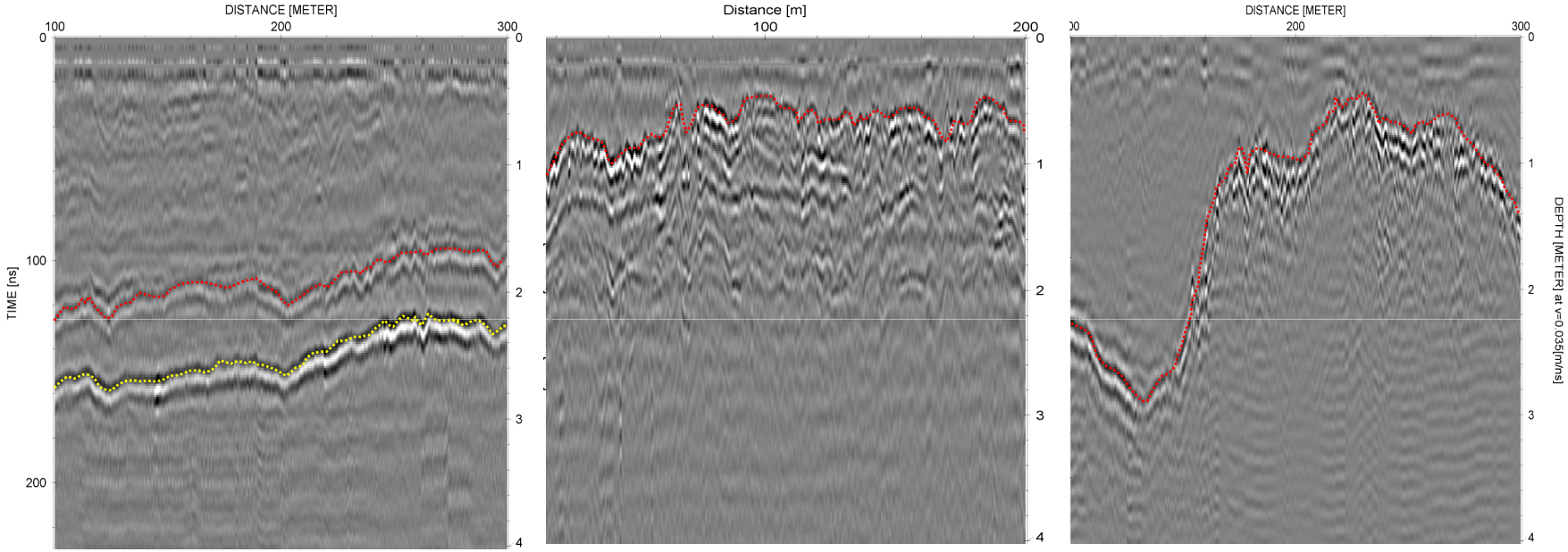
interpretation

probing | GPR signature | topography



interpretation

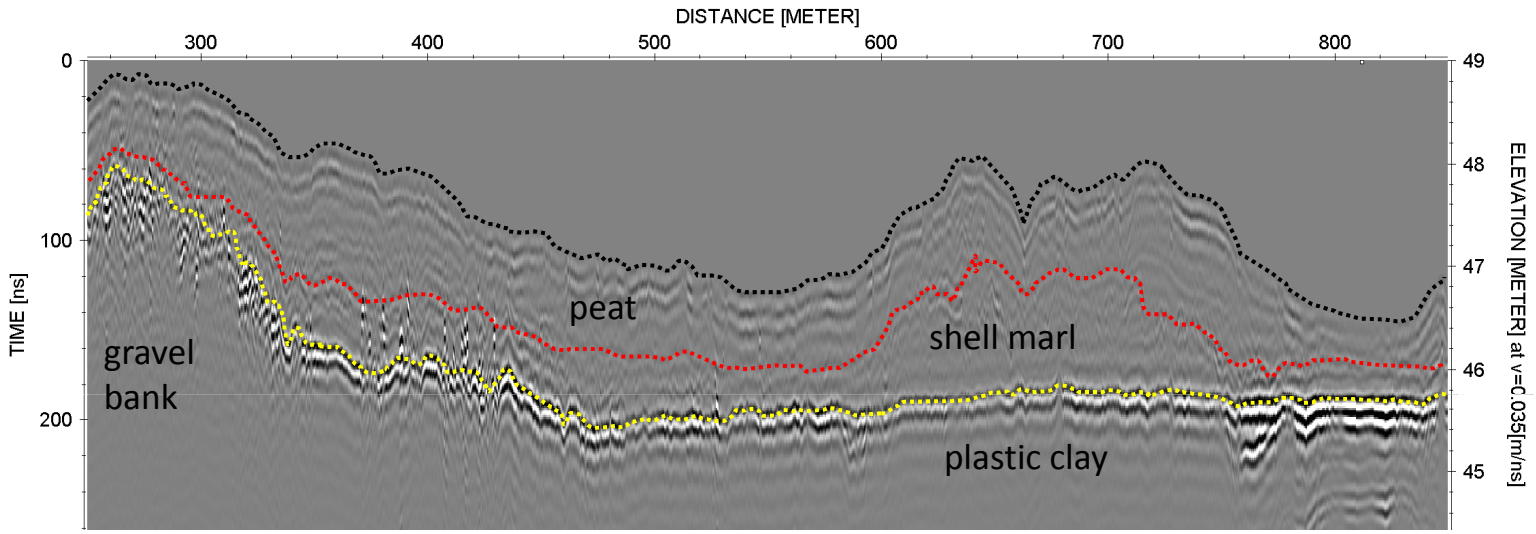
probing GPR signature topography

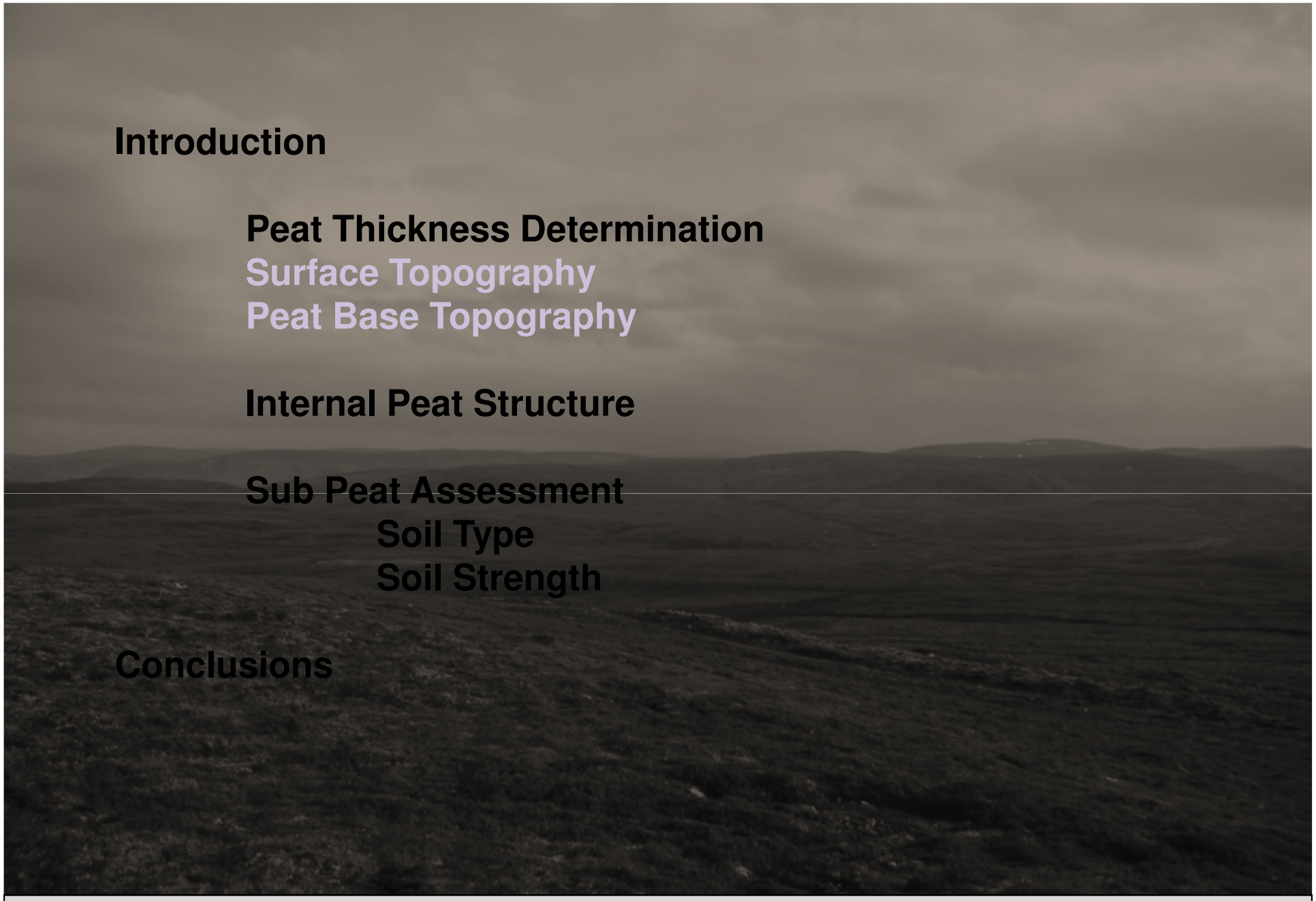


shell marl gravels grey plastic clay

interpretation

probing GPR signature topography





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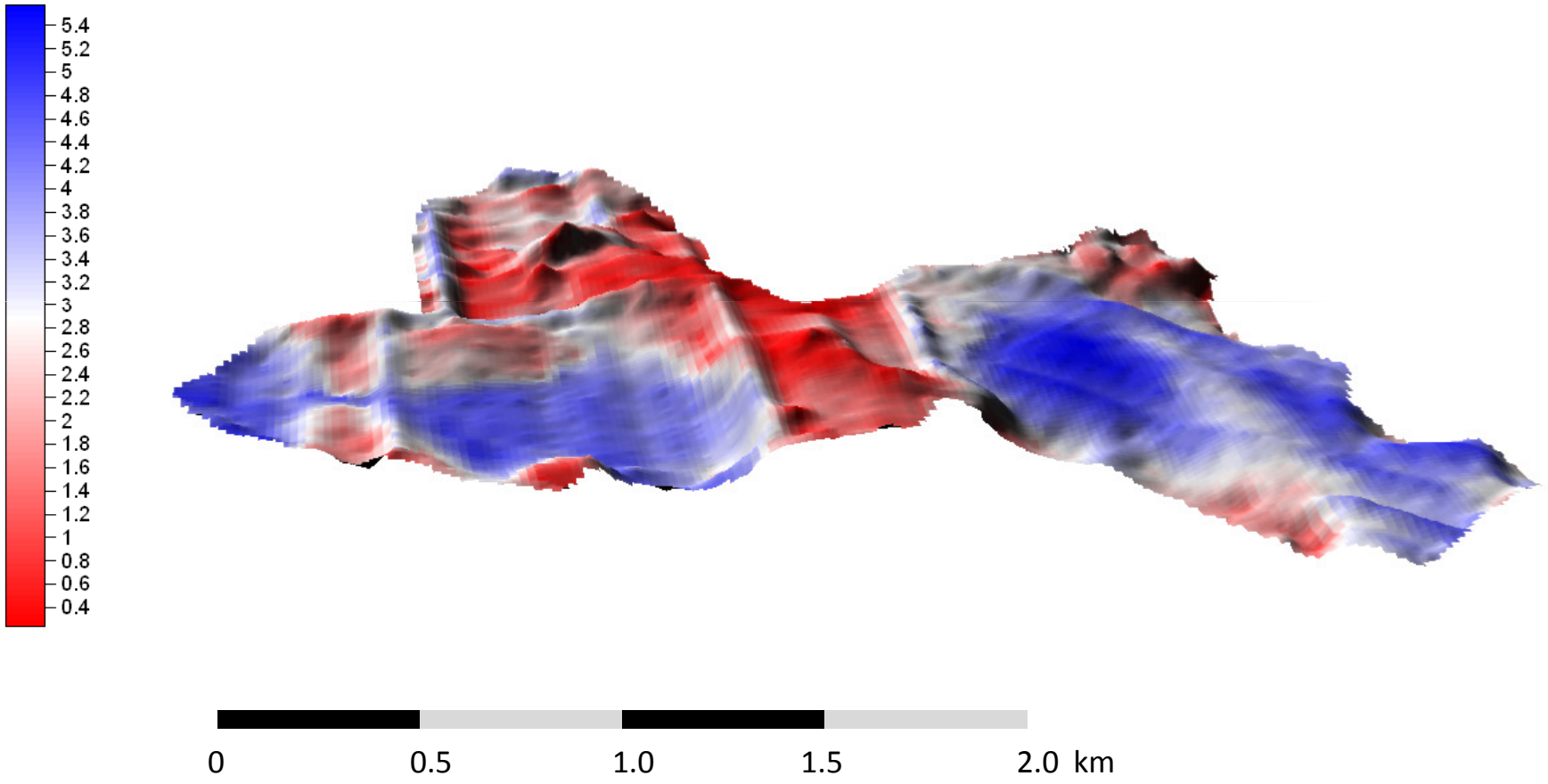
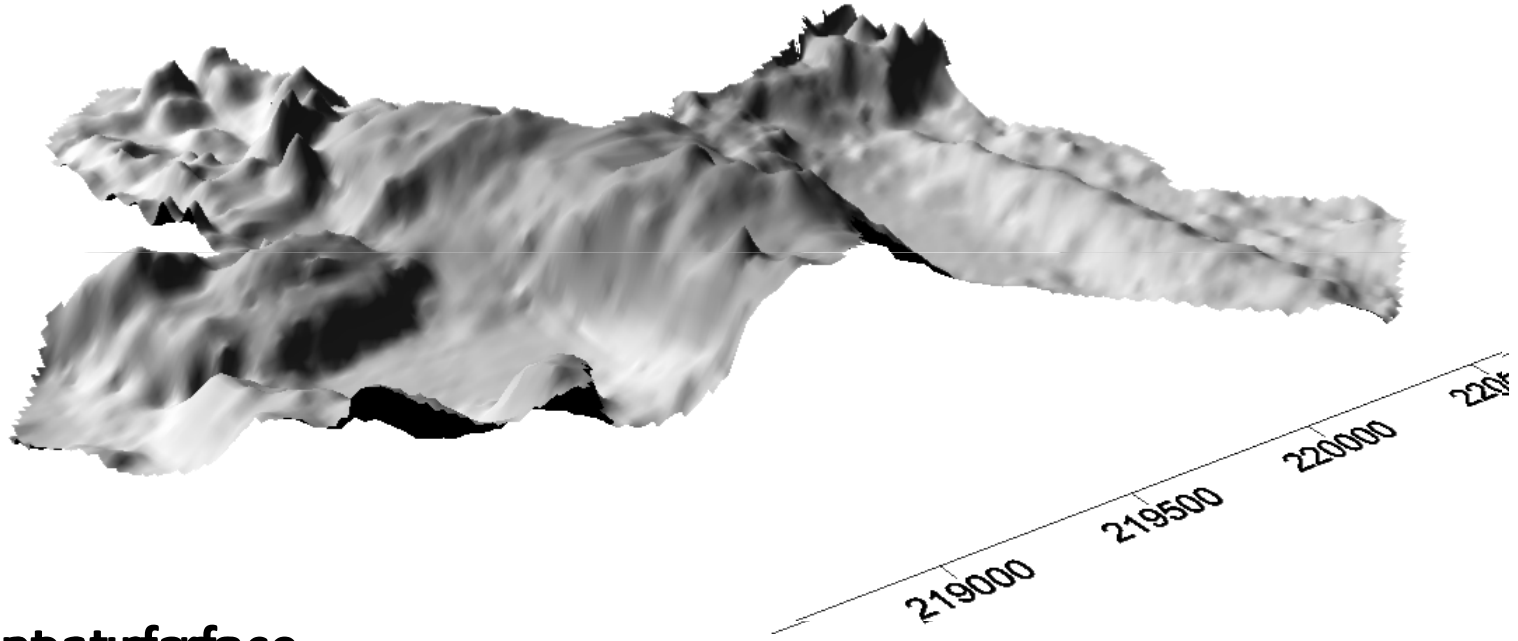
peat thickness map

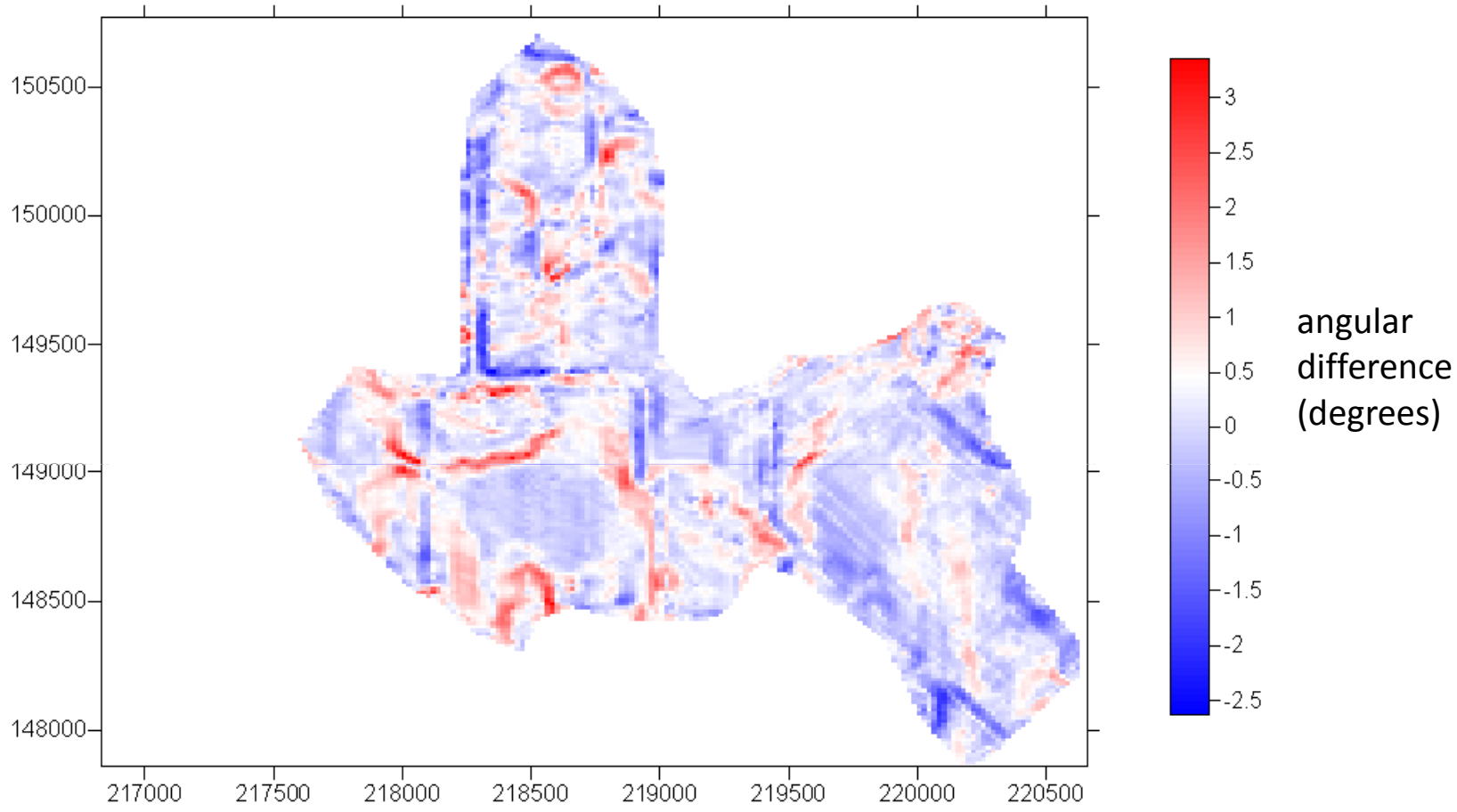


sub peat topography



sub peat surface

terrain slope

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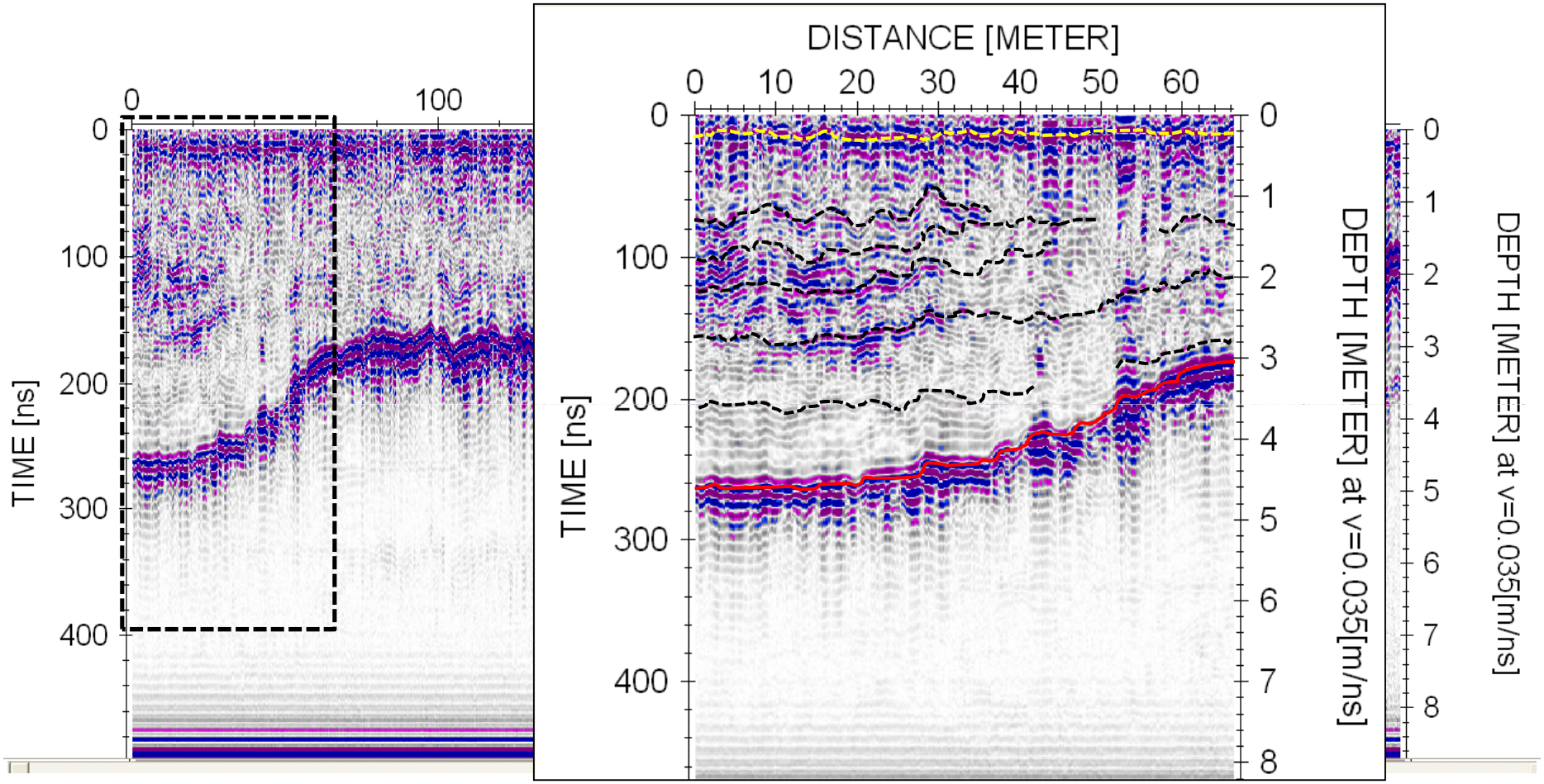
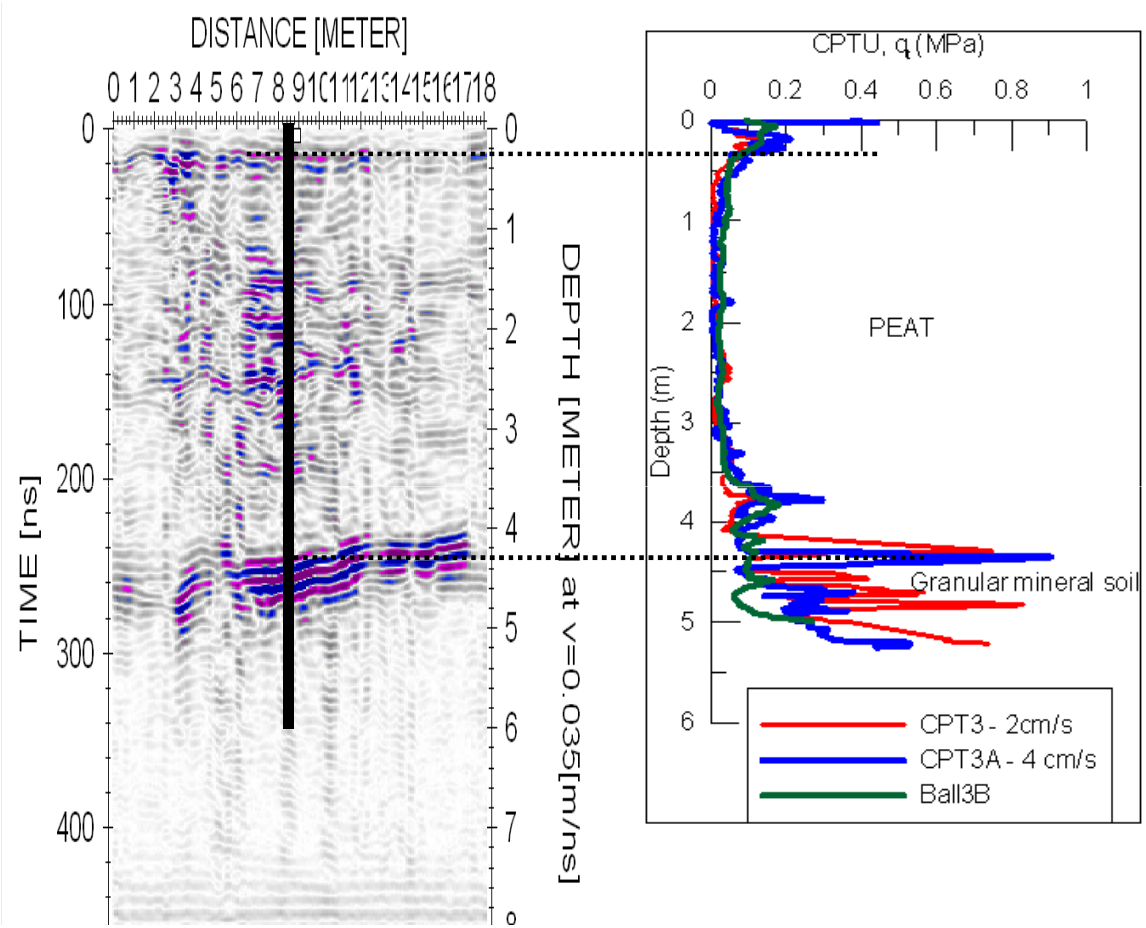
peat stratigraphy

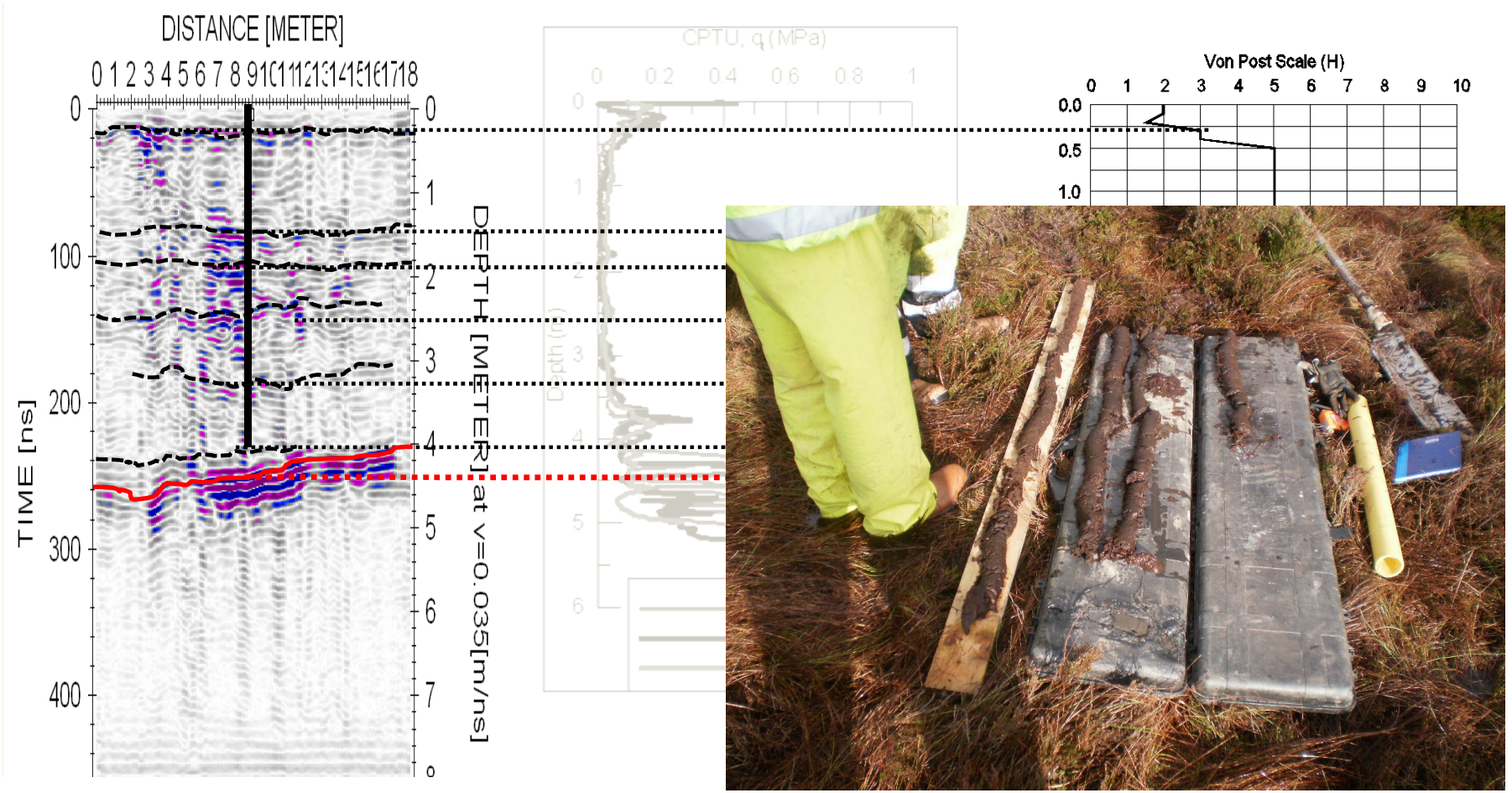


apex geoservices

peat stratigraphy



peat stratigraphy



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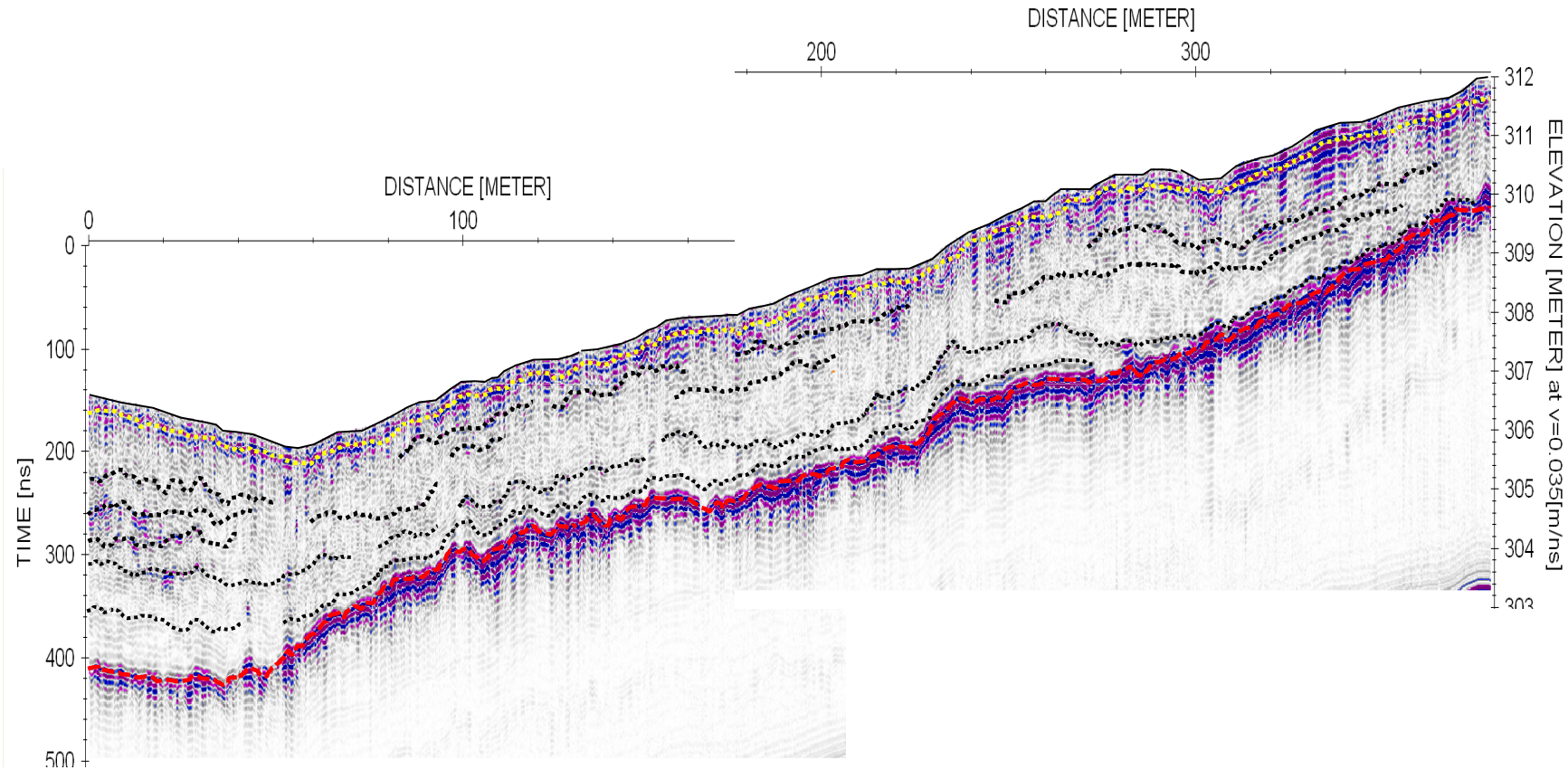
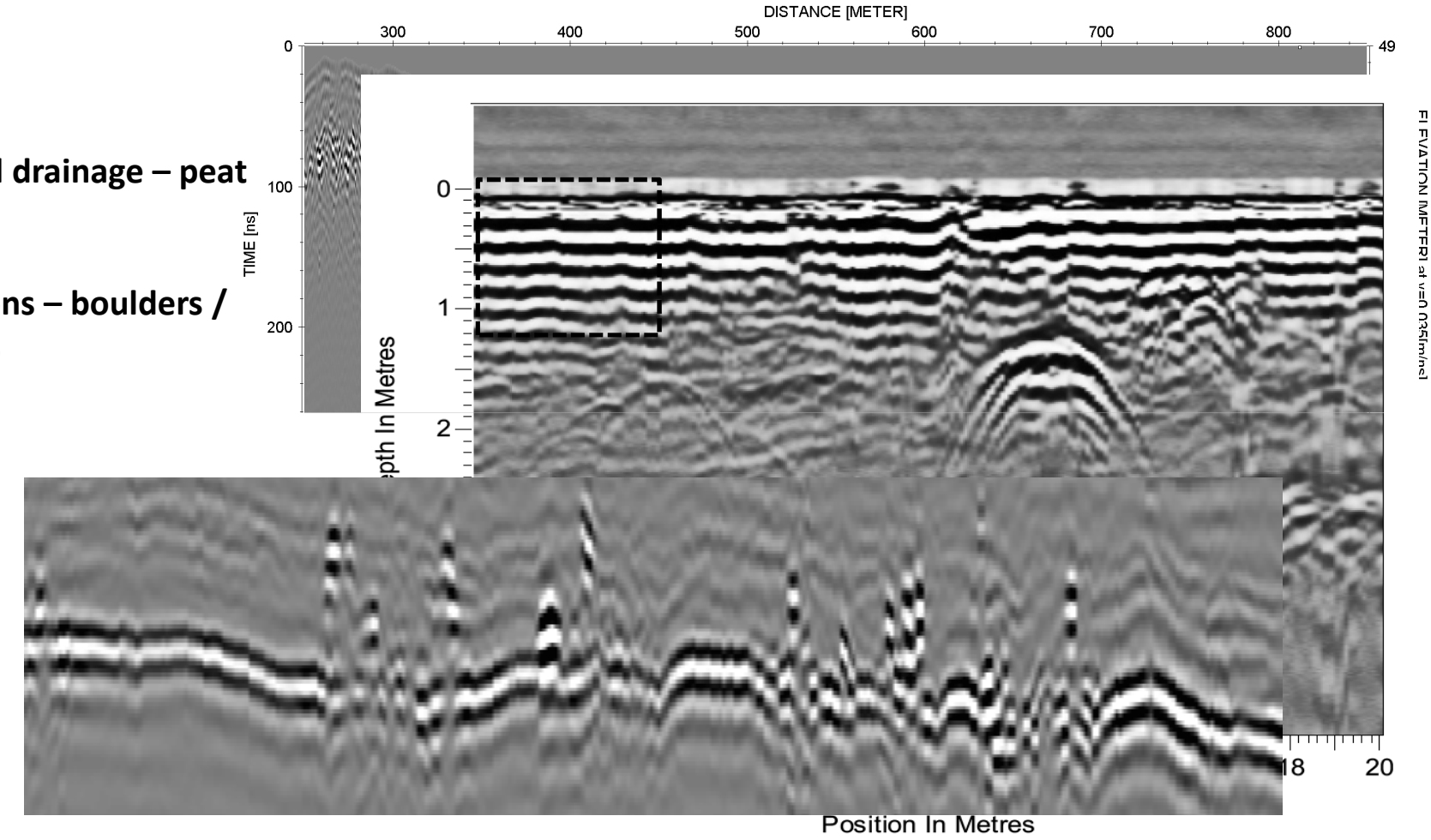
peat stratigraphy



peat stratigraphy

Internal drainage – peat pipes

Inclusions – boulders / timbers

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sub peat assessment

Objectives:

- **Determine soil type**
- **Determine depth to bedrock (competent rock)**
- **Strength of soil**
- **Excavatability**

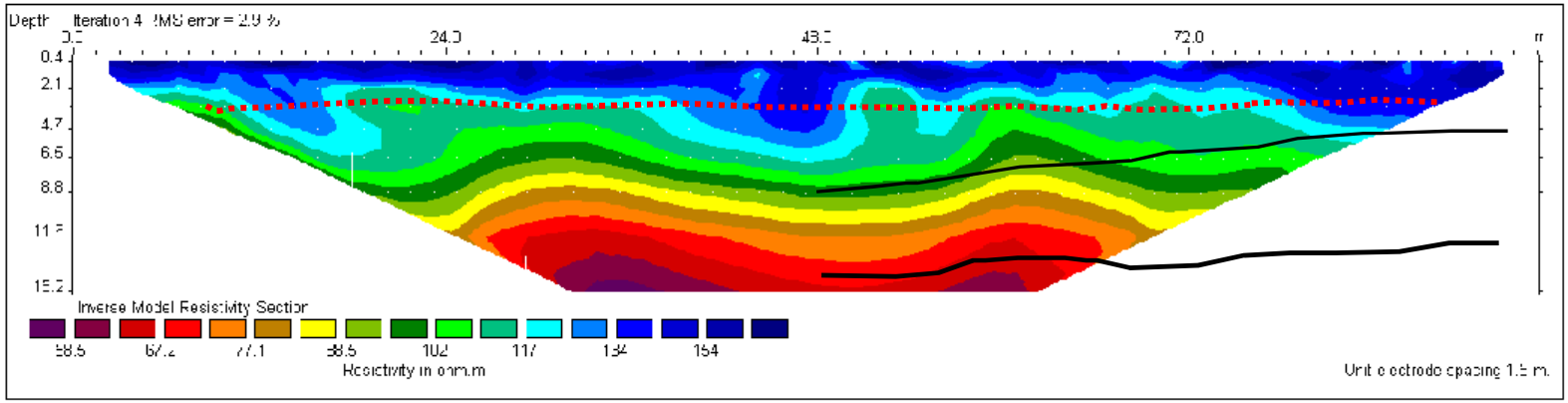
Geophysical Methodology

- **2D electrical resistivity**
- **2D seismic refraction**
- **MASW**

combined methodology

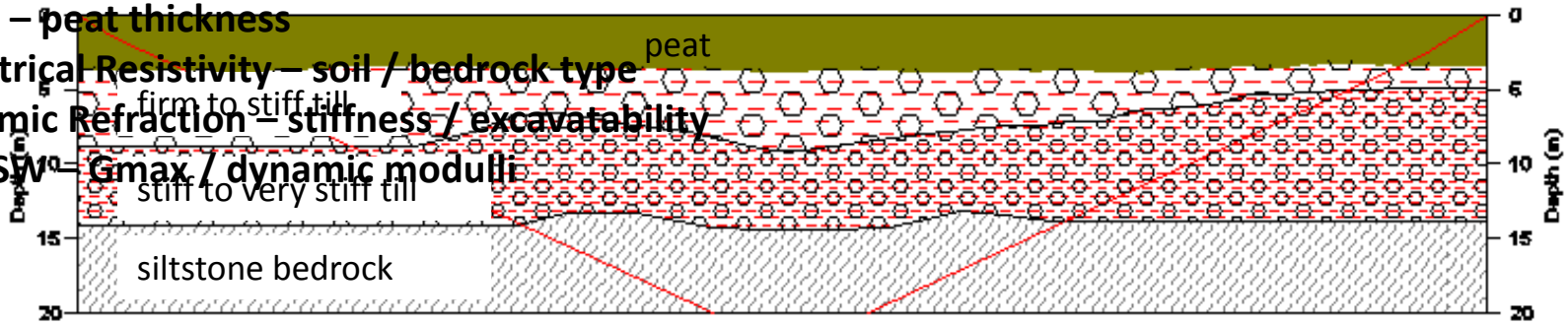
2D electrical resistivity profile

seismic refraction spread



Vs (m/s)

MASW Results



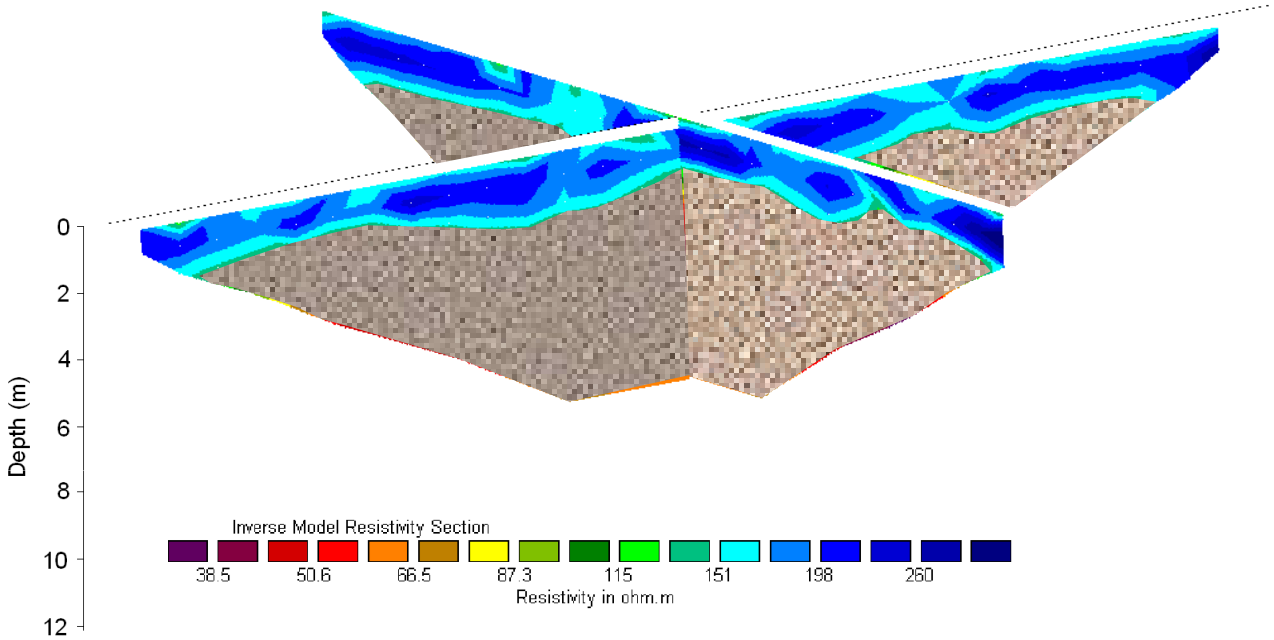
GPR – peat thickness

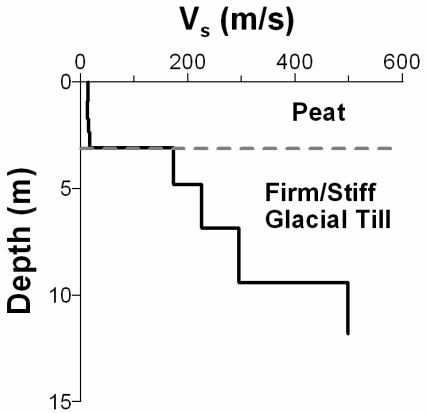
Electrical Resistivity – soil / bedrock type

Seismic Refraction – stiffness / excavatability

MASW – Gmax / dynamic moduli

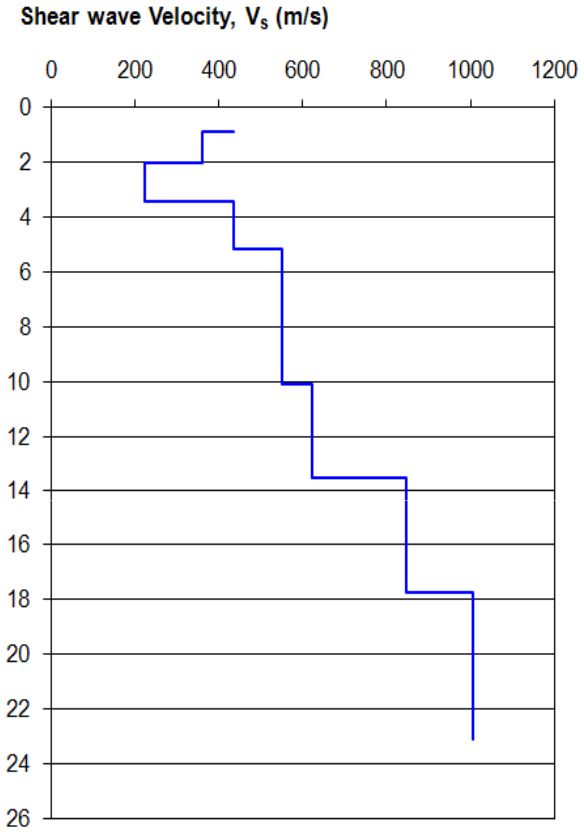
preferred approach





orthogonal profiles
3D appreciation
lateral stability issues
establish anisotropy in bedrock

dynamic moduli



Calculation of static and dynamic moduli - S29

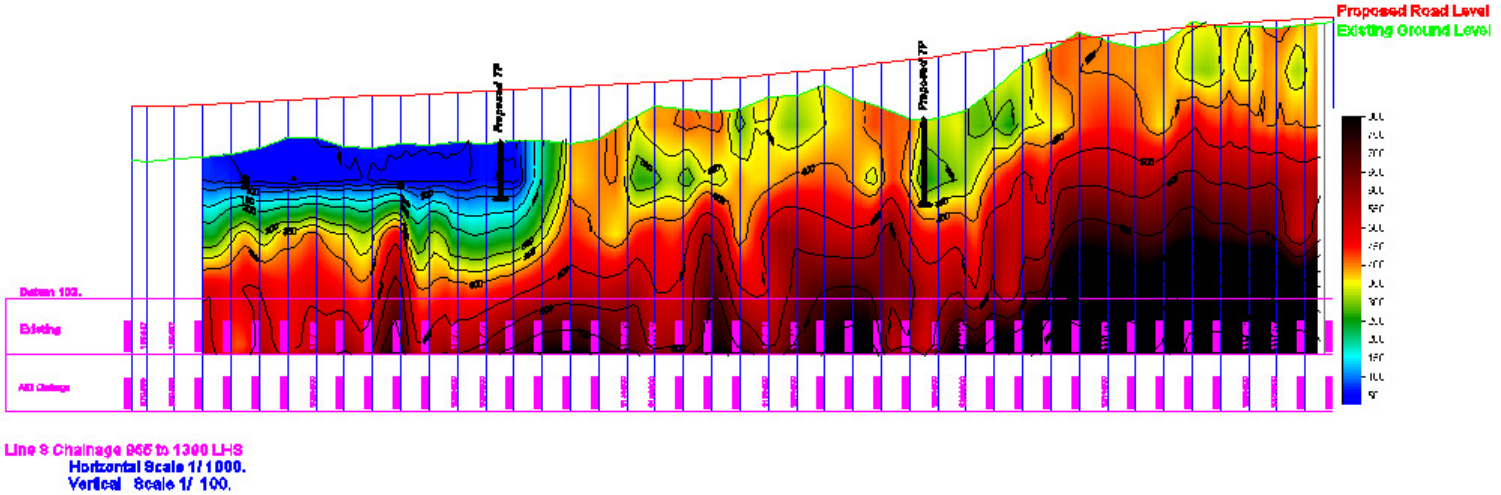
Depth (m bgl)	Vp m/sec	Vs m/sec	density kg/m^3	Poissons ratio	Shear* Mod. MPa Dynamic Gmax	Youngs * Mod. GPa Dynamic Emax	Bulk* Mod. GPa Dynamic	Youngs** Mod. MPa Static
0.895	787	434.955	2000	0.280	378.37	0.969	0.734	37.96
0.895	787	361.105	2000	0.367	260.79	0.713	0.891	22.88
2.014	787	361.105	2000	0.367	260.79	0.713	0.891	22.88
2.014	787	225.109	2000	0.455	101.35	0.295	1.104	5.34
3.413	787	225.109	2000	0.455	101.35	0.295	1.104	5.34
3.413	1333	434.654	2000	0.441	377.85	1.089	3.050	46.01
5.162	1333	434.654	2000	0.441	377.85	1.089	3.050	46.01
5.162	1333	550.08	2000	0.397	605.18	1.691	2.747	95.20
7.348	1663	550.08	2000	0.439	605.18	1.741	4.724	99.87
7.348	1663	551.085	2000	0.438	607.39	1.747	4.721	100.45
10.08	1663	551.085	2000	0.438	607.39	1.747	4.721	100.45
10.08	1663	622.232	2000	0.419	774.35	2.197	4.499	146.58
13.496	2980	622.232	2000	0.477	774.35	2.288	16.728	156.70
13.496	2980	848.137	2700	0.456	1942.21	5.655	21.387	697.64
17.766	2980	848.137	2700	0.456	1942.21	5.655	21.387	697.64
17.766	2980	1004.639	2700	0.436	2725.11	7.826	20.344	1192.31
23.103	2980	1004.639	2700	0.436	2725.11	7.826	20.344	1192.31

* from Davies & Schulteiss, 1980.
** converted to static equivalent using empirical correlation from Heerden, 1987.

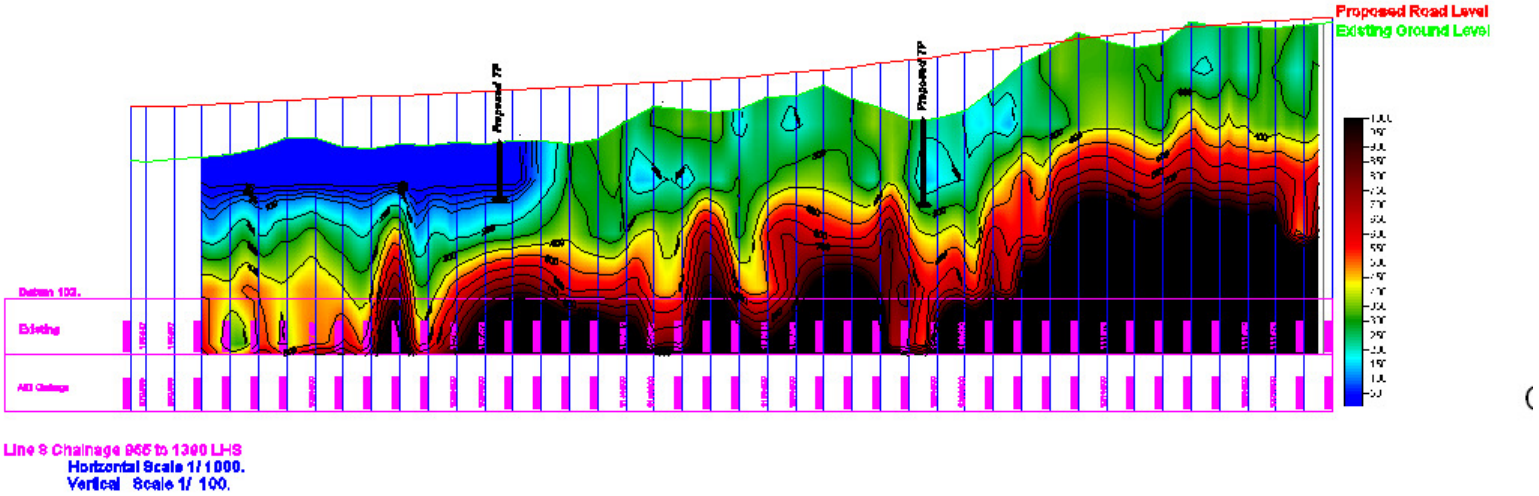
Soil density taken as 2000kg/m3
Rock density taken as 2700kg/m3

2D MASW profile

Vs



Gmax



Conclusions

variability of peat, thickness and distribution
variability of substrate
variability in basal slope

internal peat structure
relating to variations in Von Post
more work needed.

better understanding of depositional history

How useful is geophysics when looking at peat stability?