3D - Induced Polarisation

Presentation by Steve Collins

SMEDG - AIG

“New Technologies” Symposium

September 2009

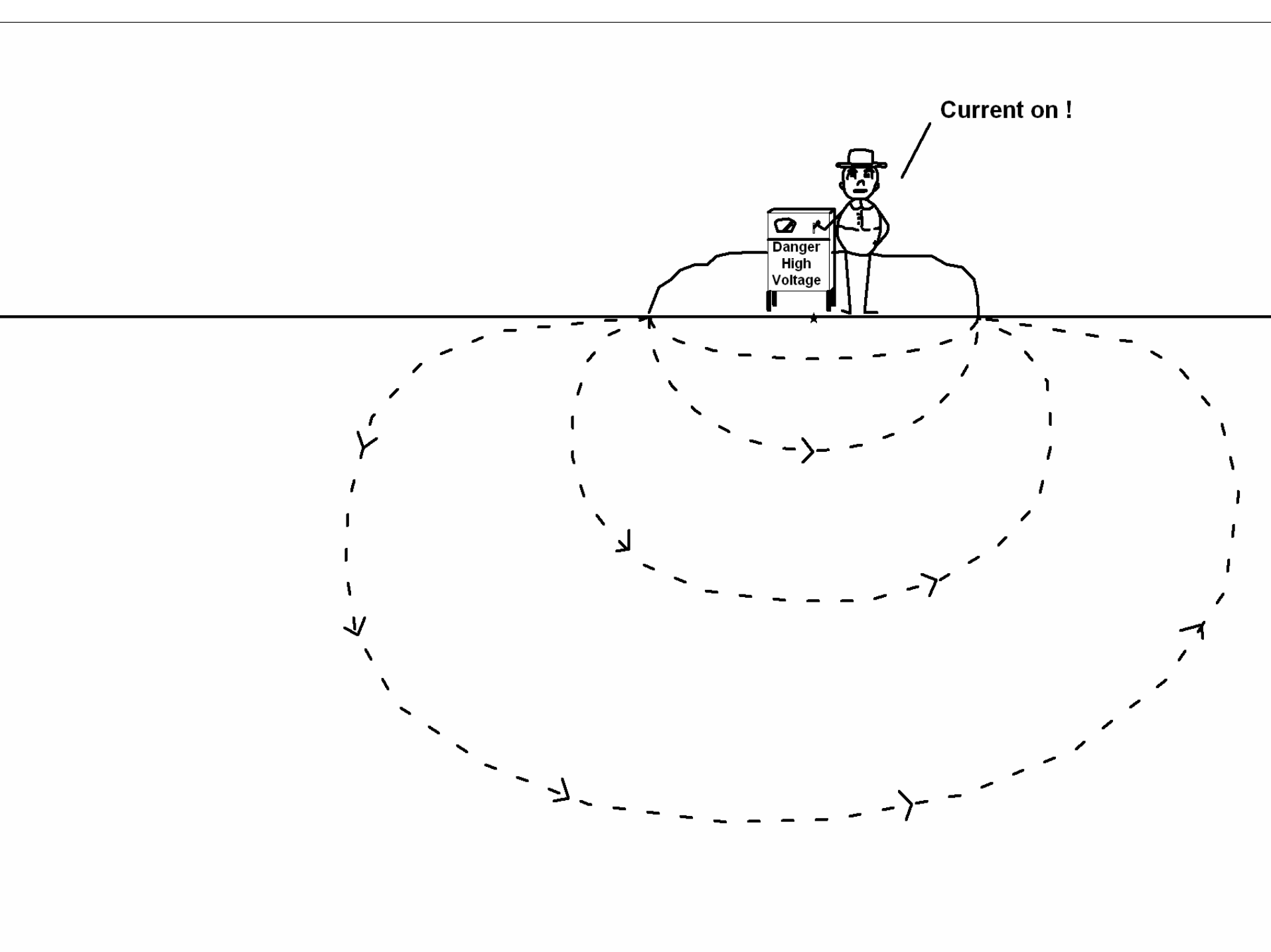
3D - Induced Polarisation

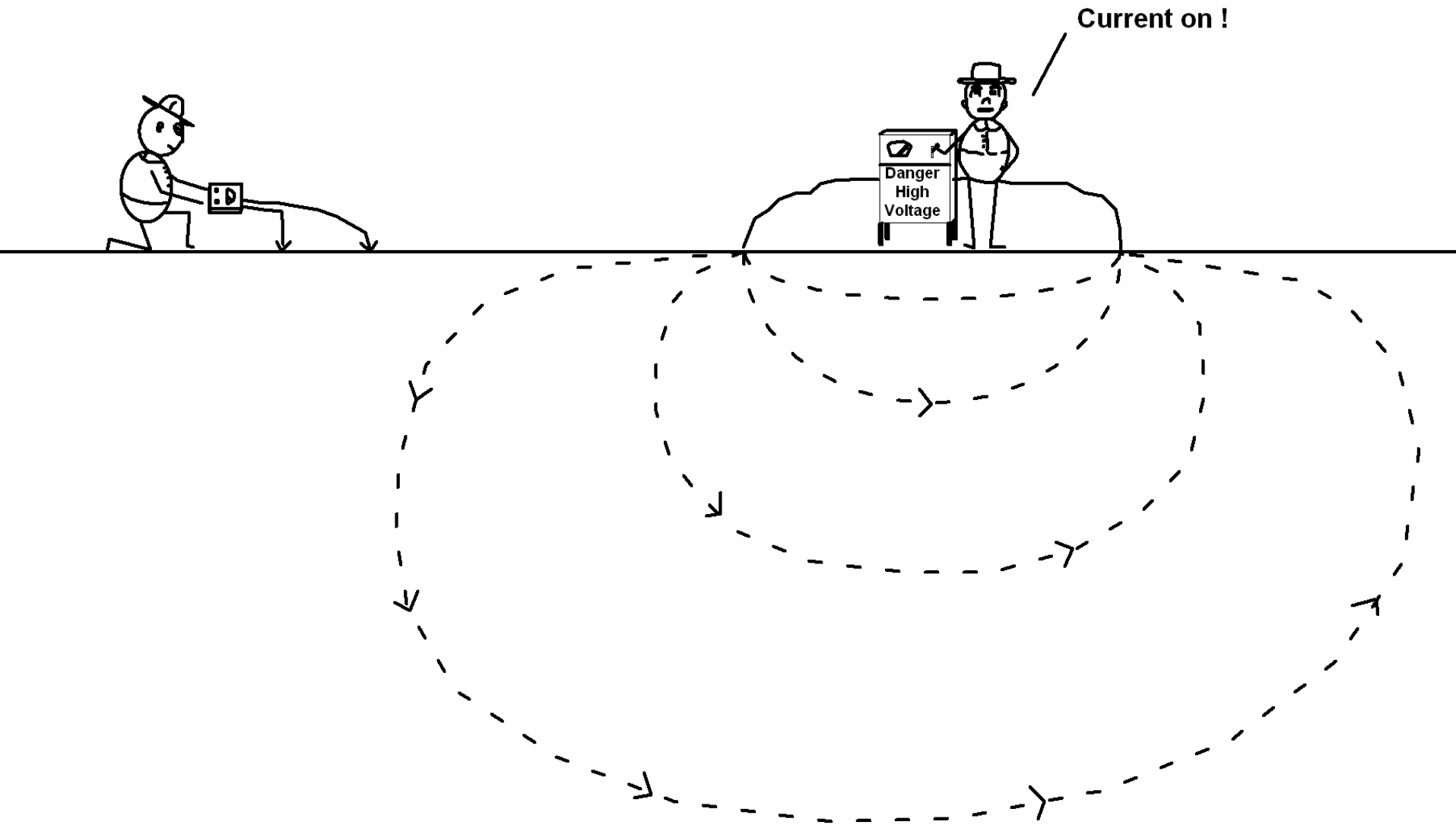
Mundane Stuff

What is IP

What is 3D IP

How is 3D IP different to 2D IP


Current on !
Danger
High
Voltage


Current on !
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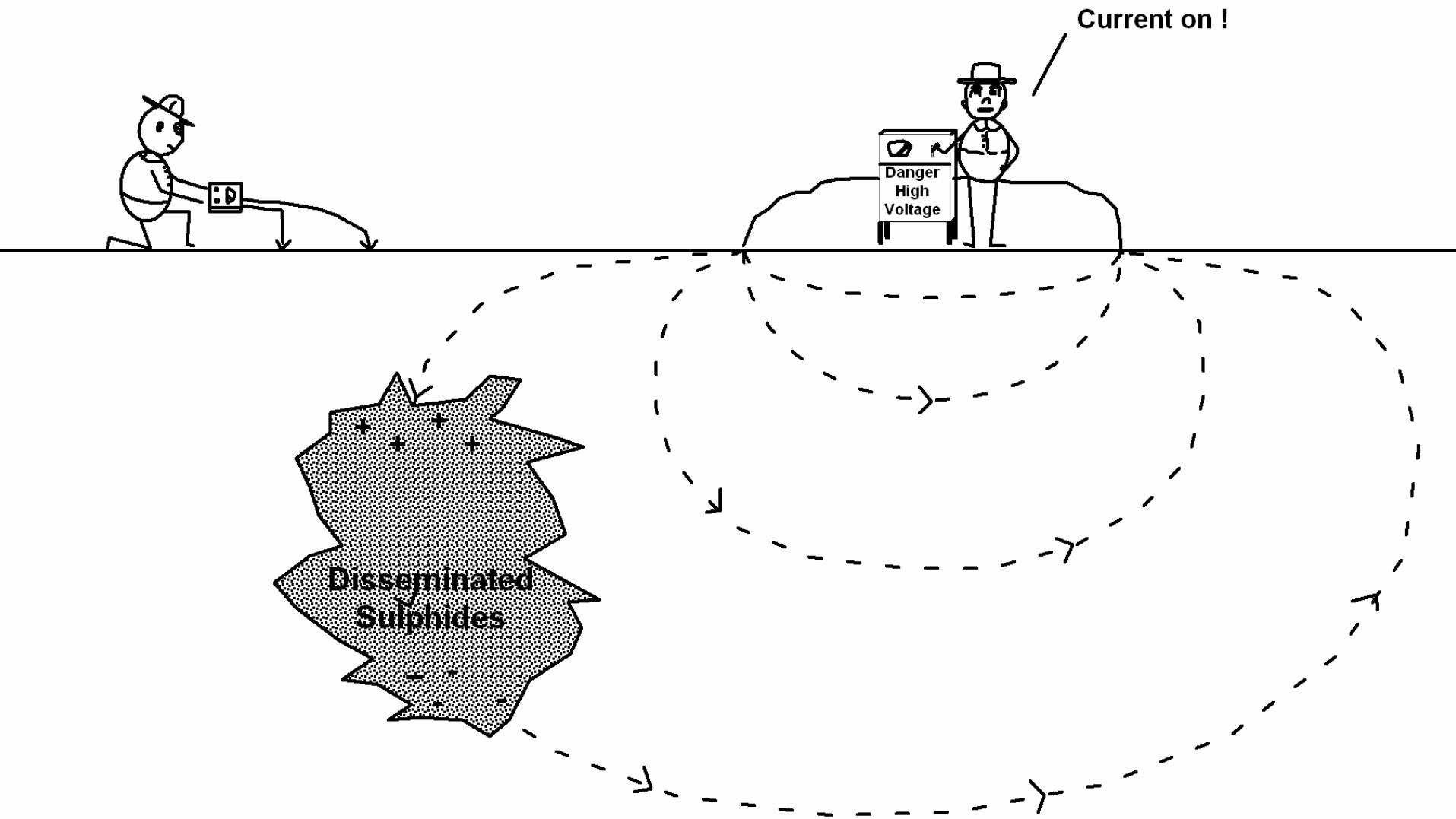
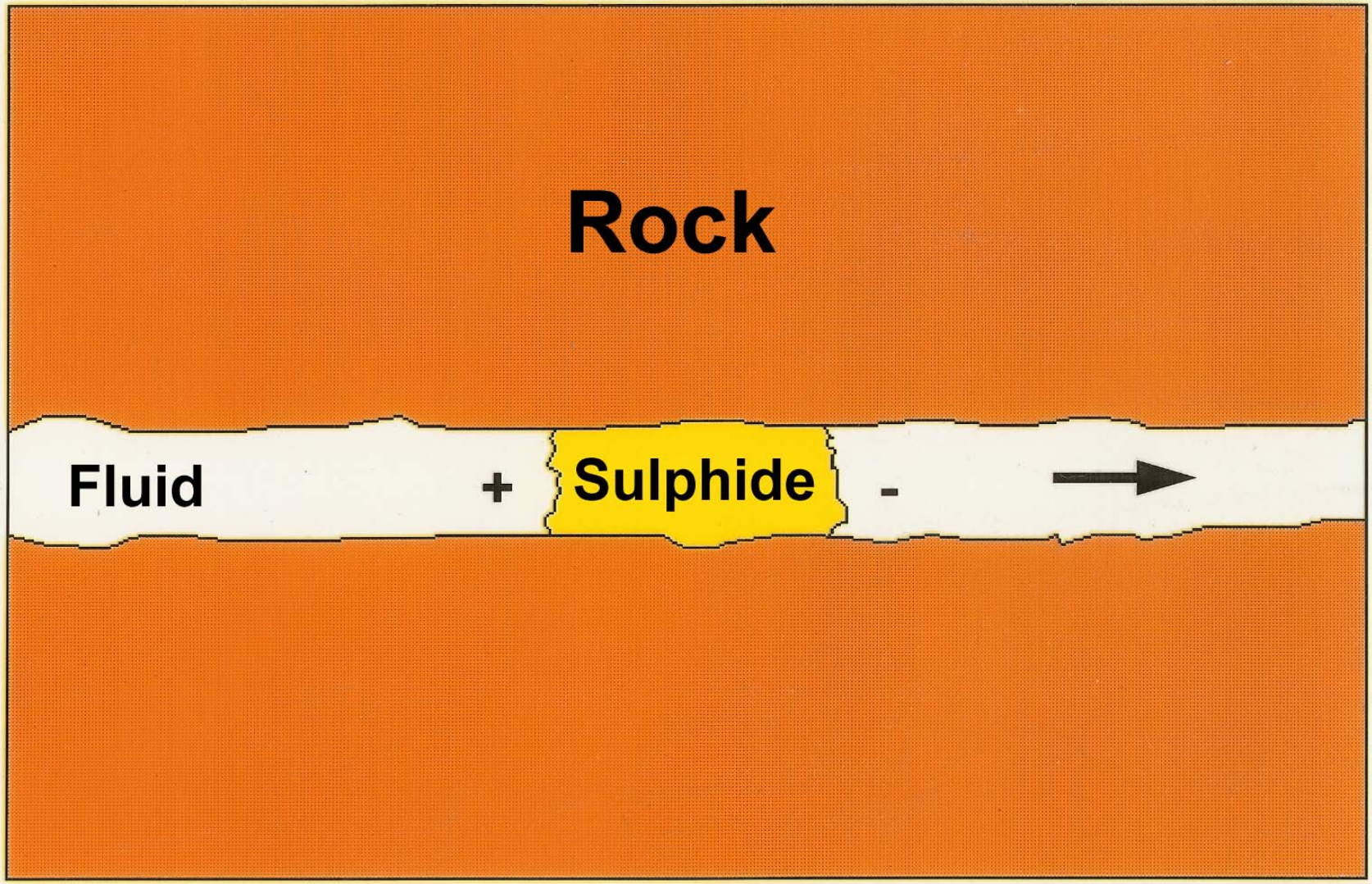
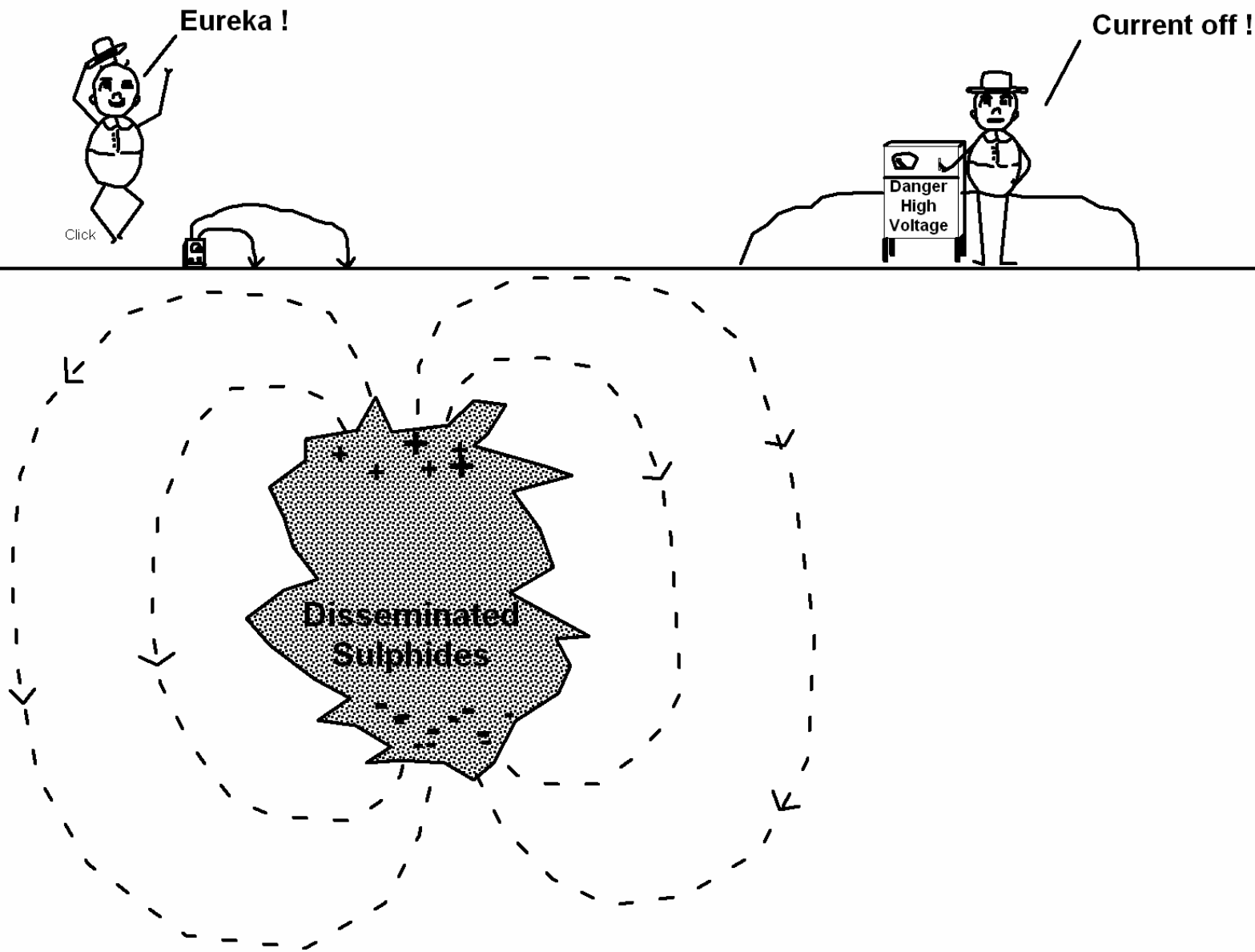
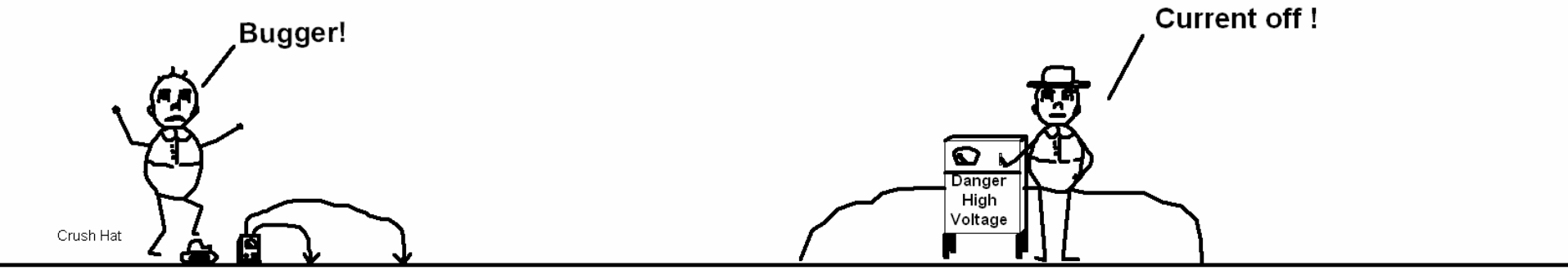

Current on !
Danger
High
Voltage
Disseminated
Sulphides

The IP Effect




Eureka !
Click
Current off !
Danger
High
Voltage
Disseminated
Sulphides

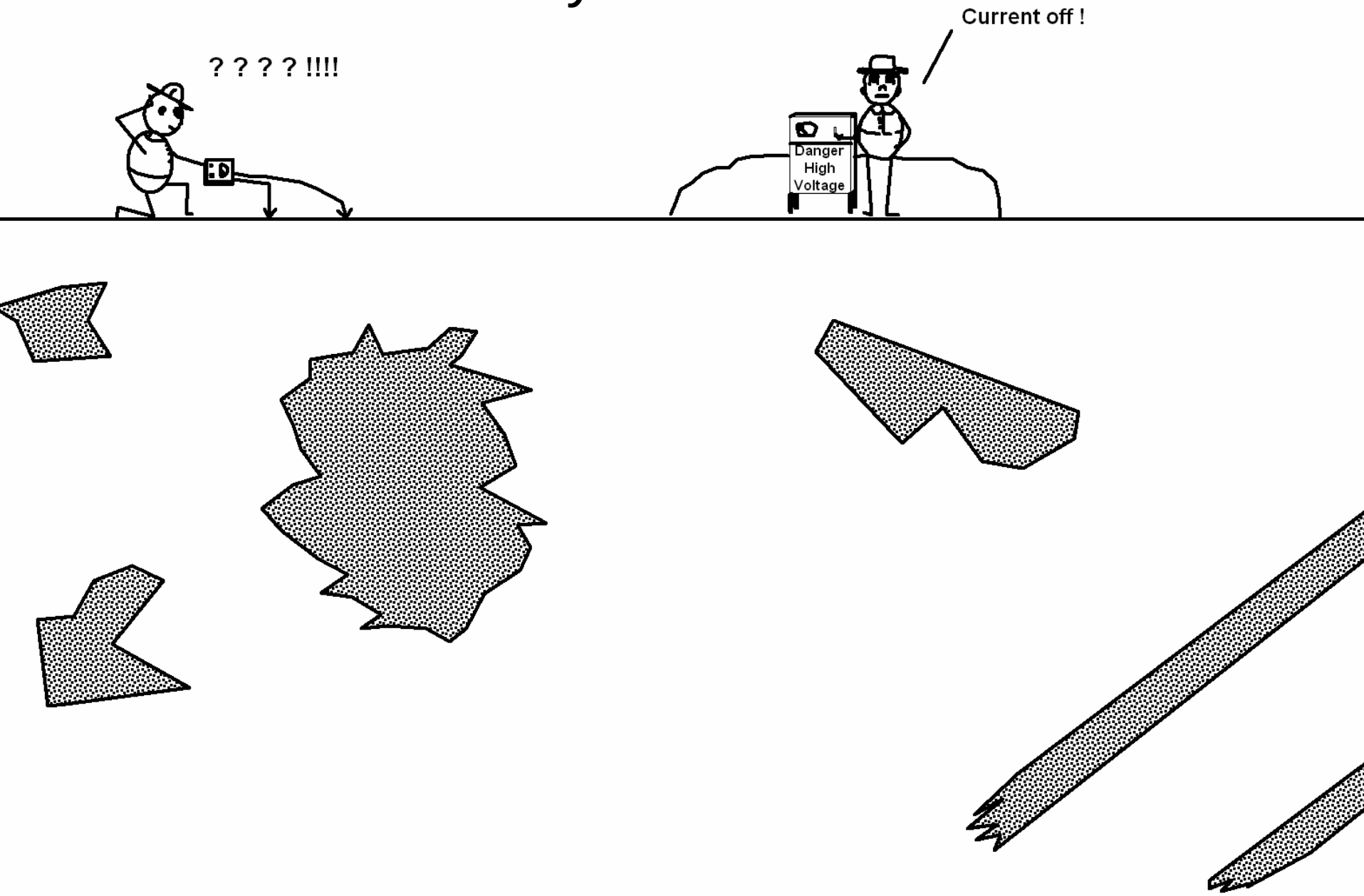

Bugger!
Crush Hat
Current off !
Danger
High
Voltage

Oh that discovering

An ore deposit

Was that simple!

Reality!



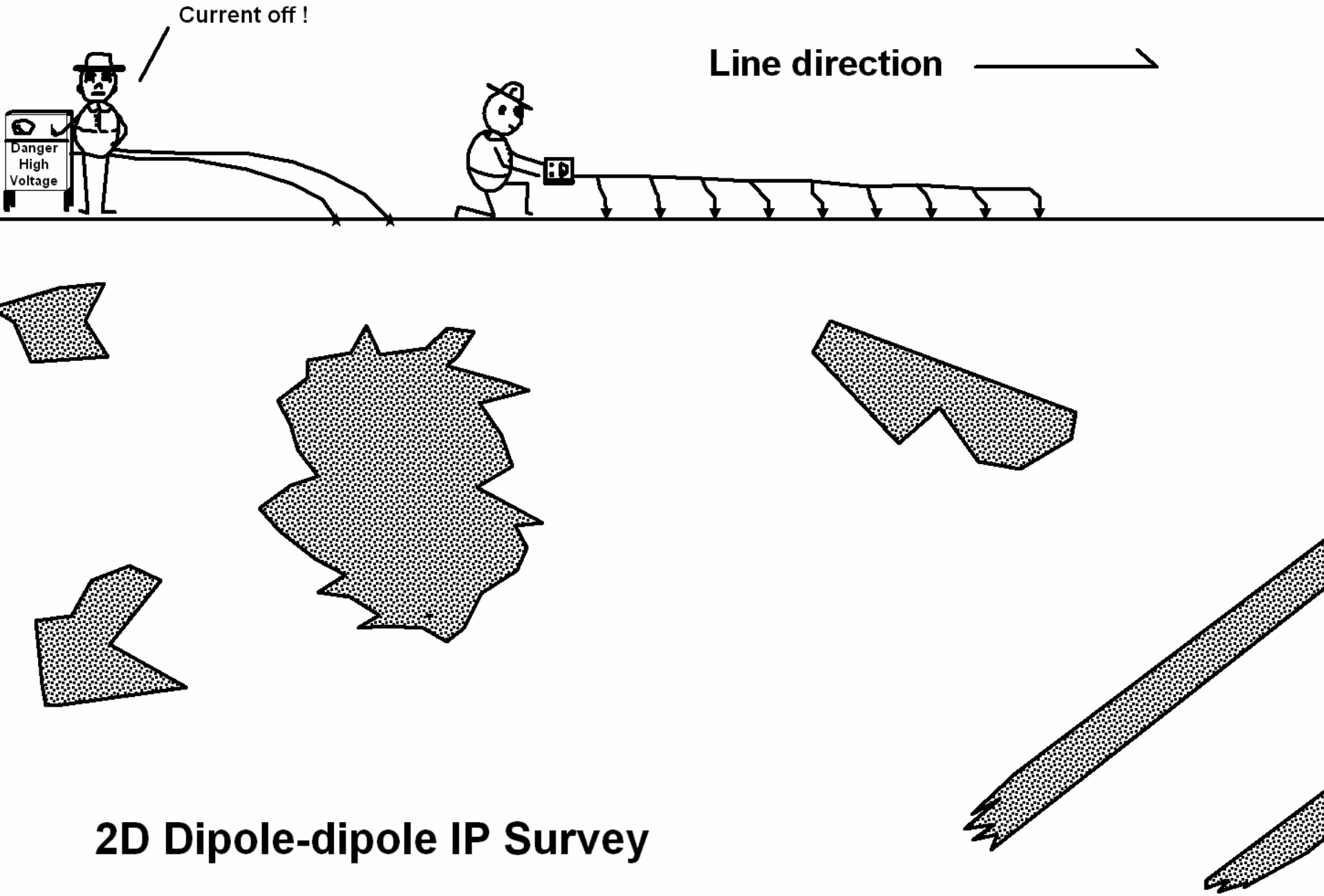
IP is a mapping tool

In a similar way to magnetic data mapping magnetite distribution…..

IP

Indicates

Pyrite



2D Dipole-dipole IP Survey

About 2000
2 MAJOR CHANGES

Multi-channel receivers

become cheap

Automatic 3D modelling software developed

Multitudinous channels

More efficient to set out many fixed receivers than to move the receiver control box around.

Because each transmitter operation records many more data points.

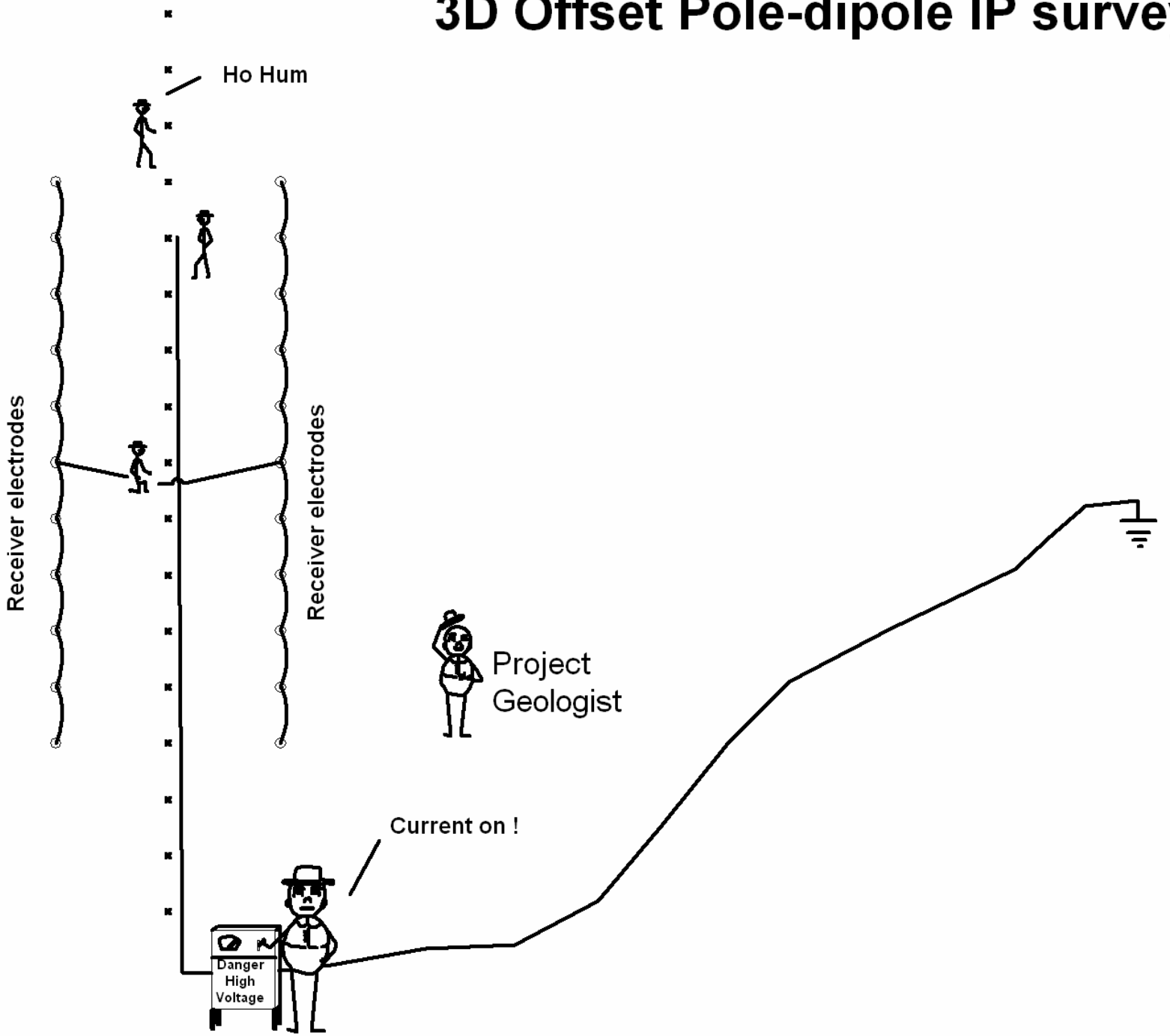
Automatic 3D Modelling

Significantly improves the interpretation where the geology is 3-dimensional

E.g. intrusive sources, cross faults etc.

Frees the interpreter from the need to have simple symmetric results.

3D Offset Pole-dipole IP survey



3D - Induced Polarisation Versus 2D IP

Slightly better near surface resolution

Deeper penetration

But most importantly……..

3D - Induced Polarisation Versus 2D IP

…….cheaper!

(So long as it is done properly)

However……

3D - Induced Polarisation Versus 2D IP

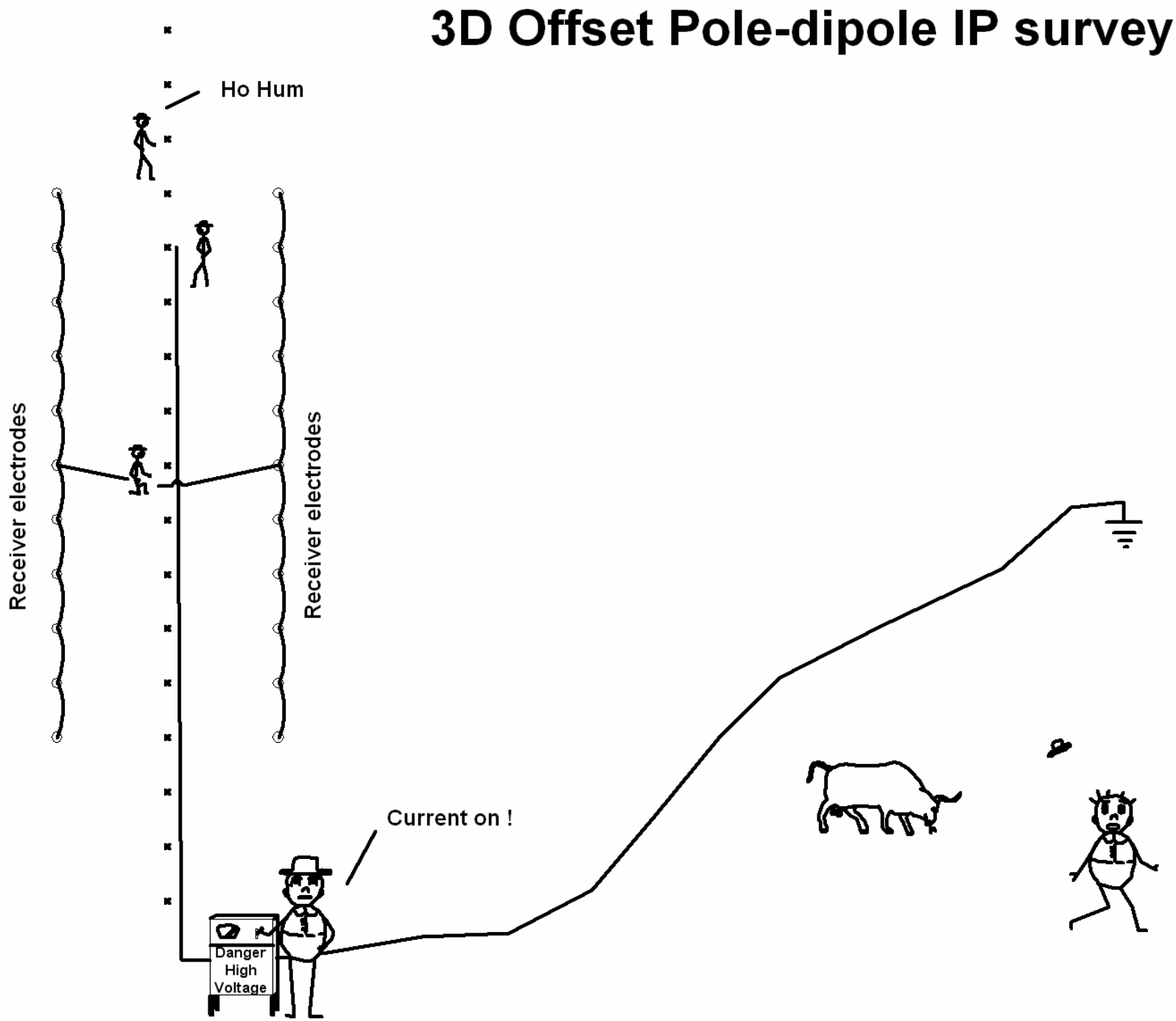
.....it is logistically more difficult!

The optimum number of receiver points becomes a balance between data volume and difficulty maintaining the survey array.

30 seconds for a Bovine

Up to 4 cables a day were eaten, greatly slowing production.

3D Offset Pole-dipole IP survey



3D - Induced Polarisation

More Interesting Stuff

What does it do?

What are its limitations?

What does it do?

It (approximately) maps the 3D distribution of metallic grains in the subsurface.

[Within reason to about 500m depth]

It is up to you to decide if this is relevant to your exploration program.

Limitations?

Models can be ambiguous and are coarse.

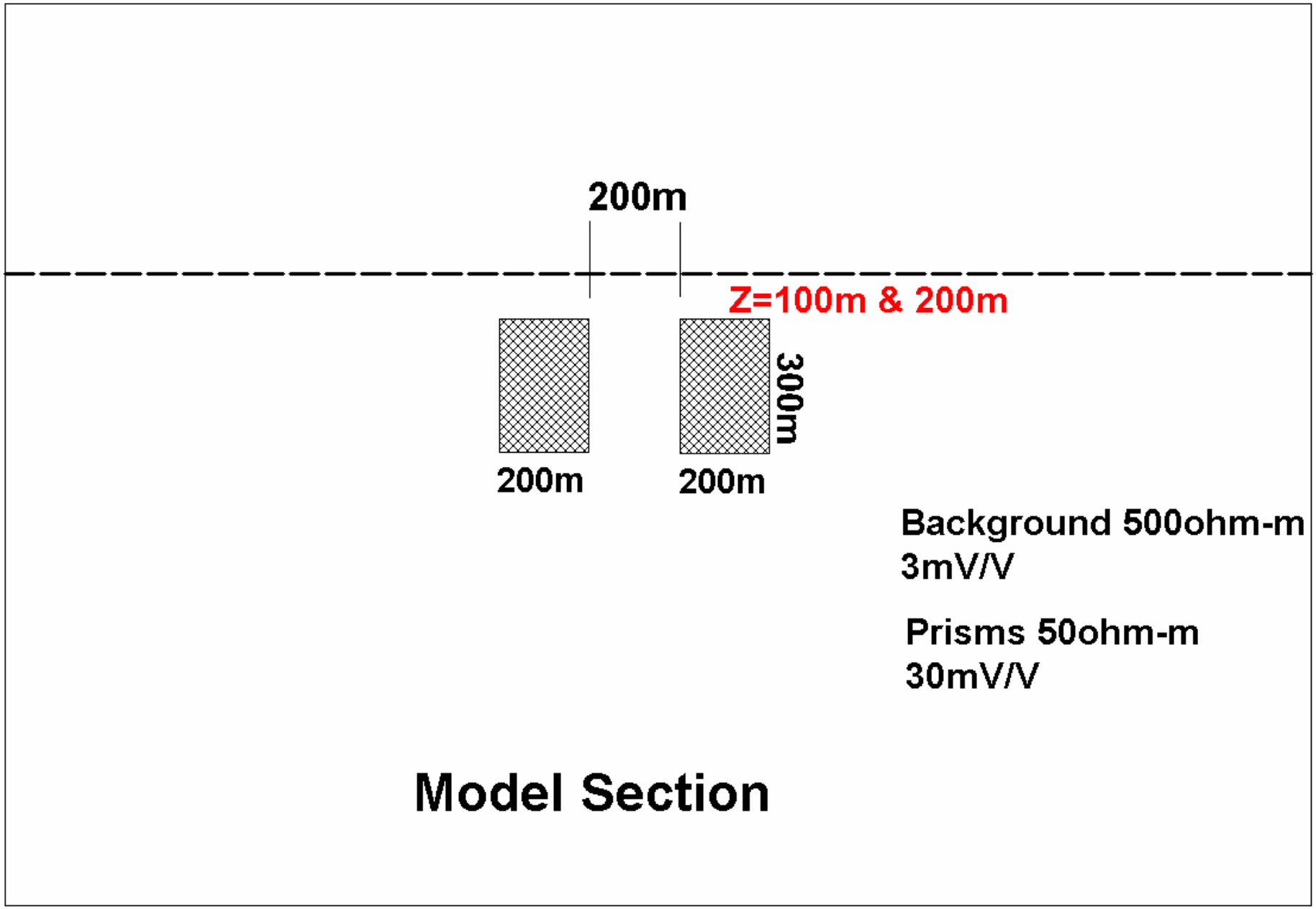
They are “plausible solutions” only.

In areas of highly resistive bedrock

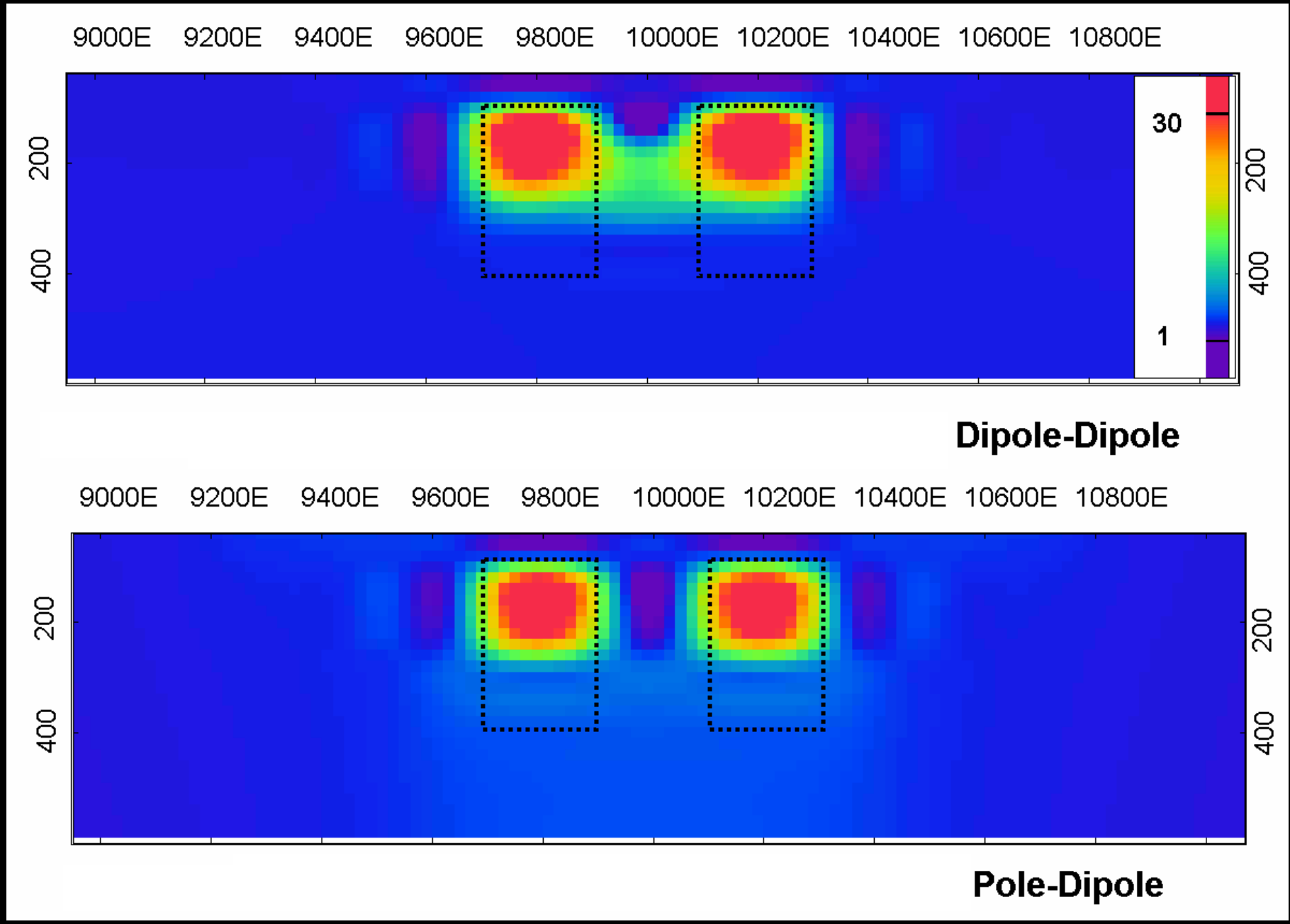
Current penetration may be limited.

All IP has very poor resolution.

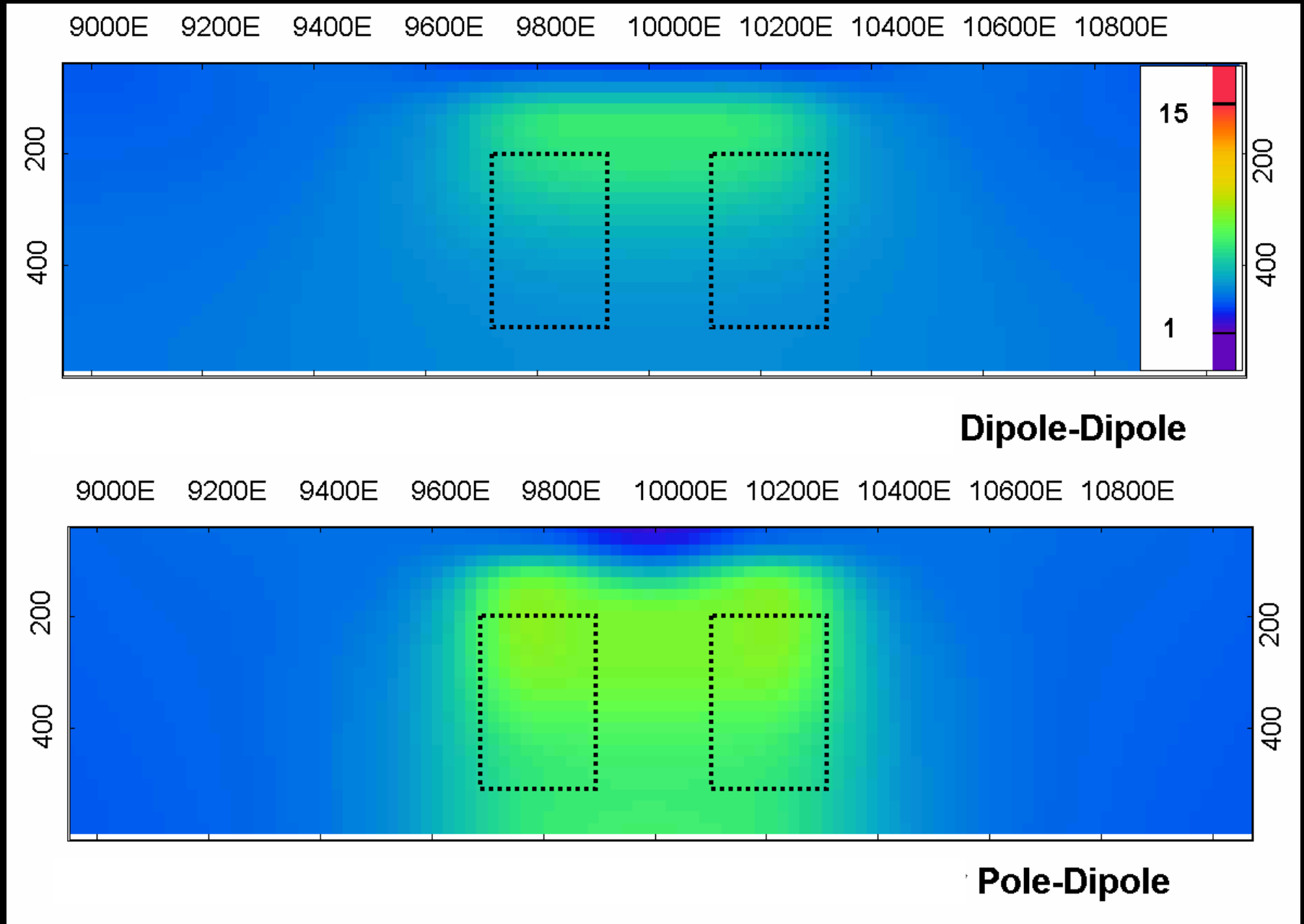
Which drops dramatically with depth.



Model Section



Model Cross Section for Z = 100m



Model Cross Section for Z = 200m

3D - Induced Polarisation

Even More Important Stuff

What does it cost

Where does it work

Where does it not work

Cost per square kilometre

About $7000 survey cost

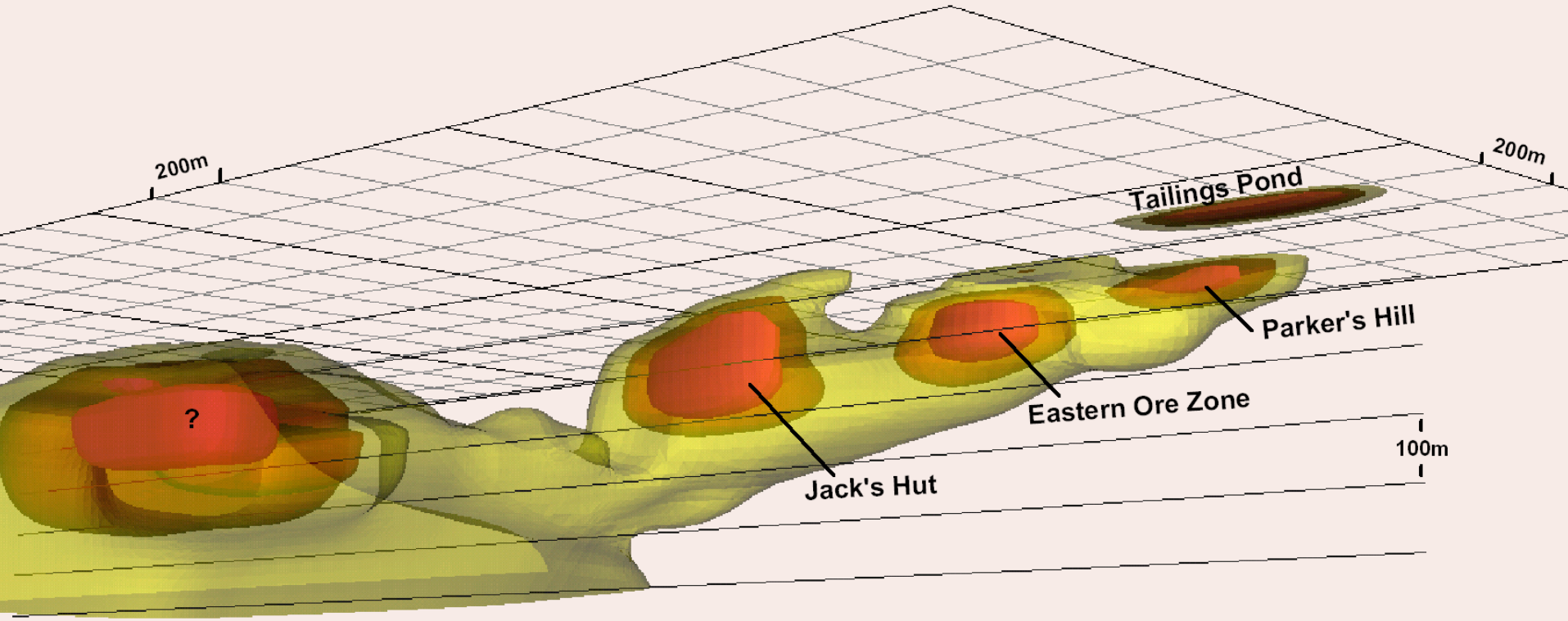
Plus about $5000 on costs

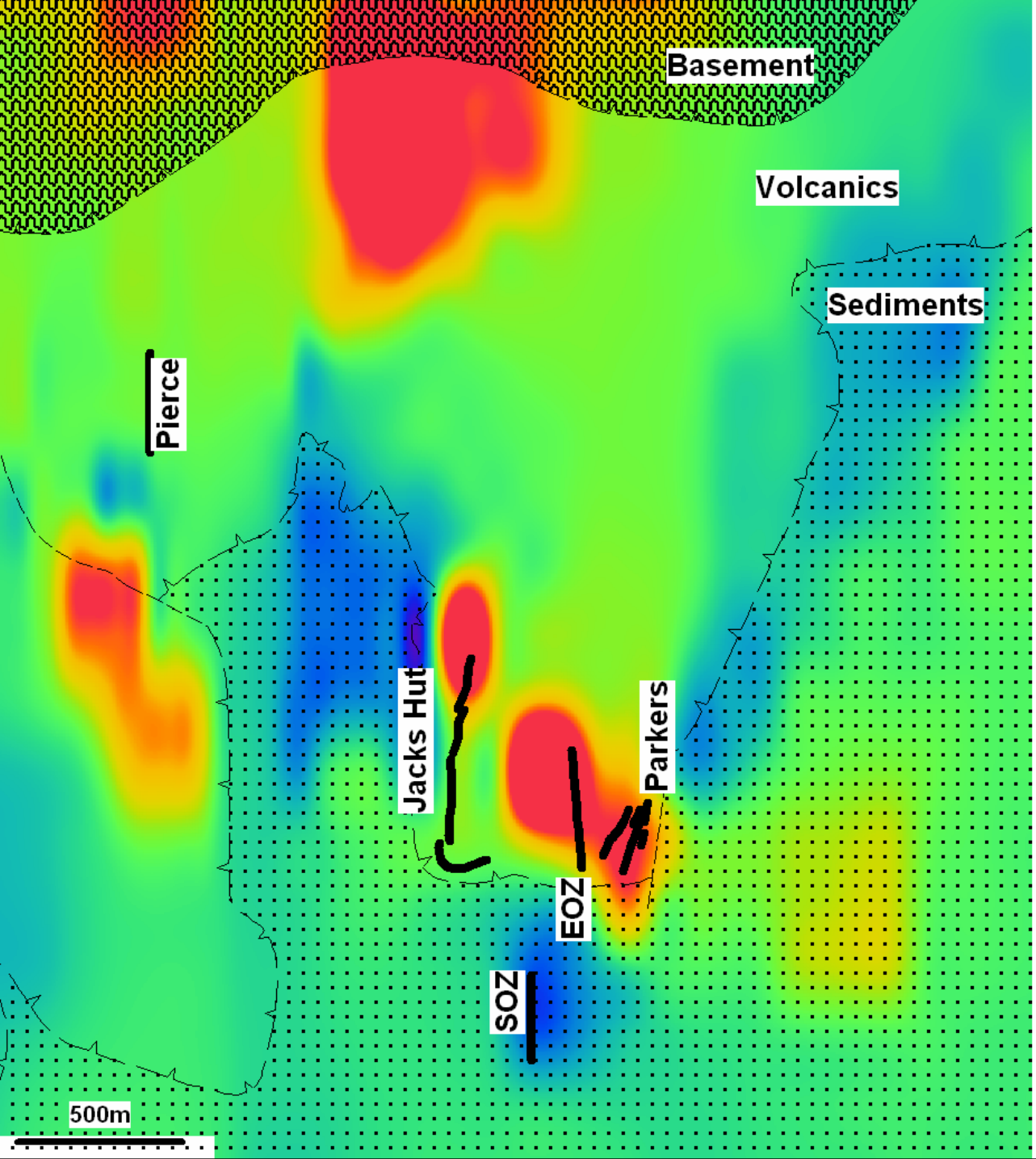
[Gridding, modelling, plotting, reporting]

All up total about $12,000 per squ. km.

Mineral Hill 3D IP Model

View from underneath looking northeast



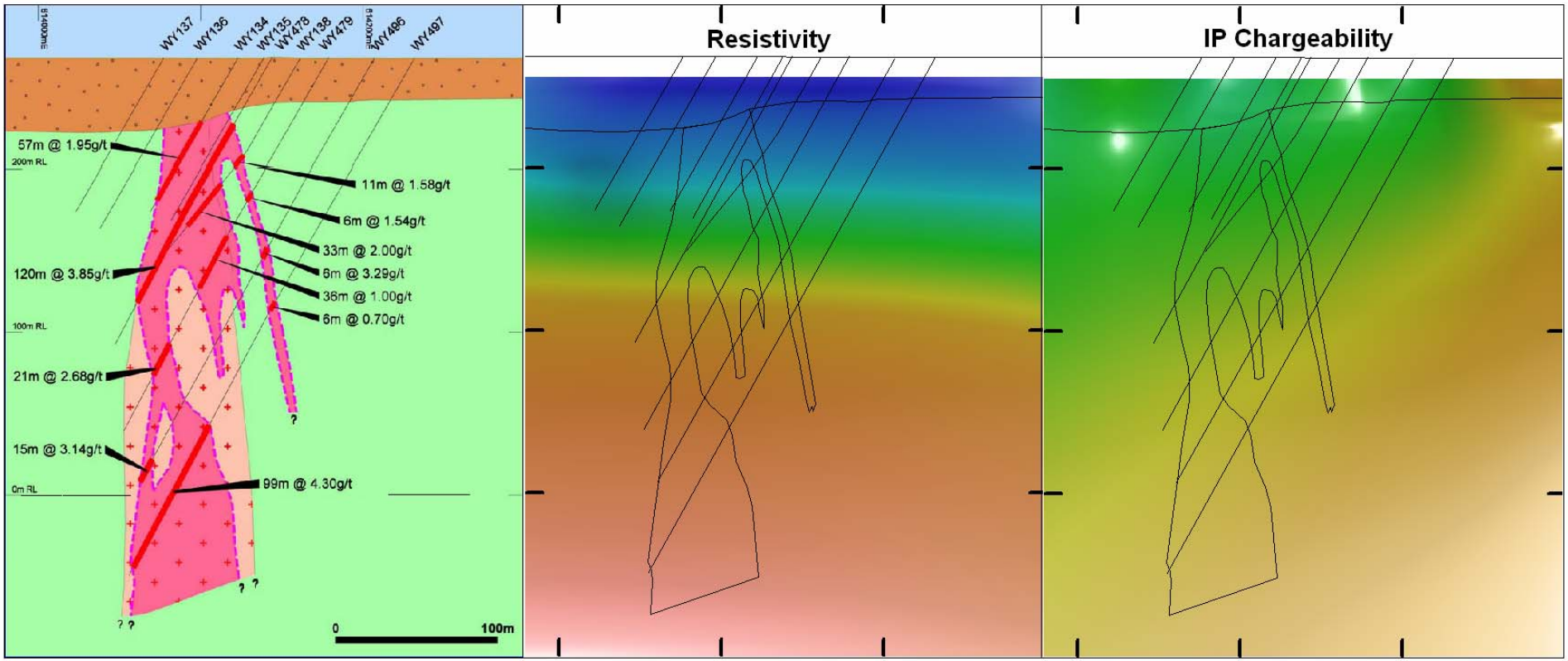


Mineral Hill

3D IP Model

Horizontal slice at 100m depth

= Surface projection of ore zones



Tomingley - Wyoming One

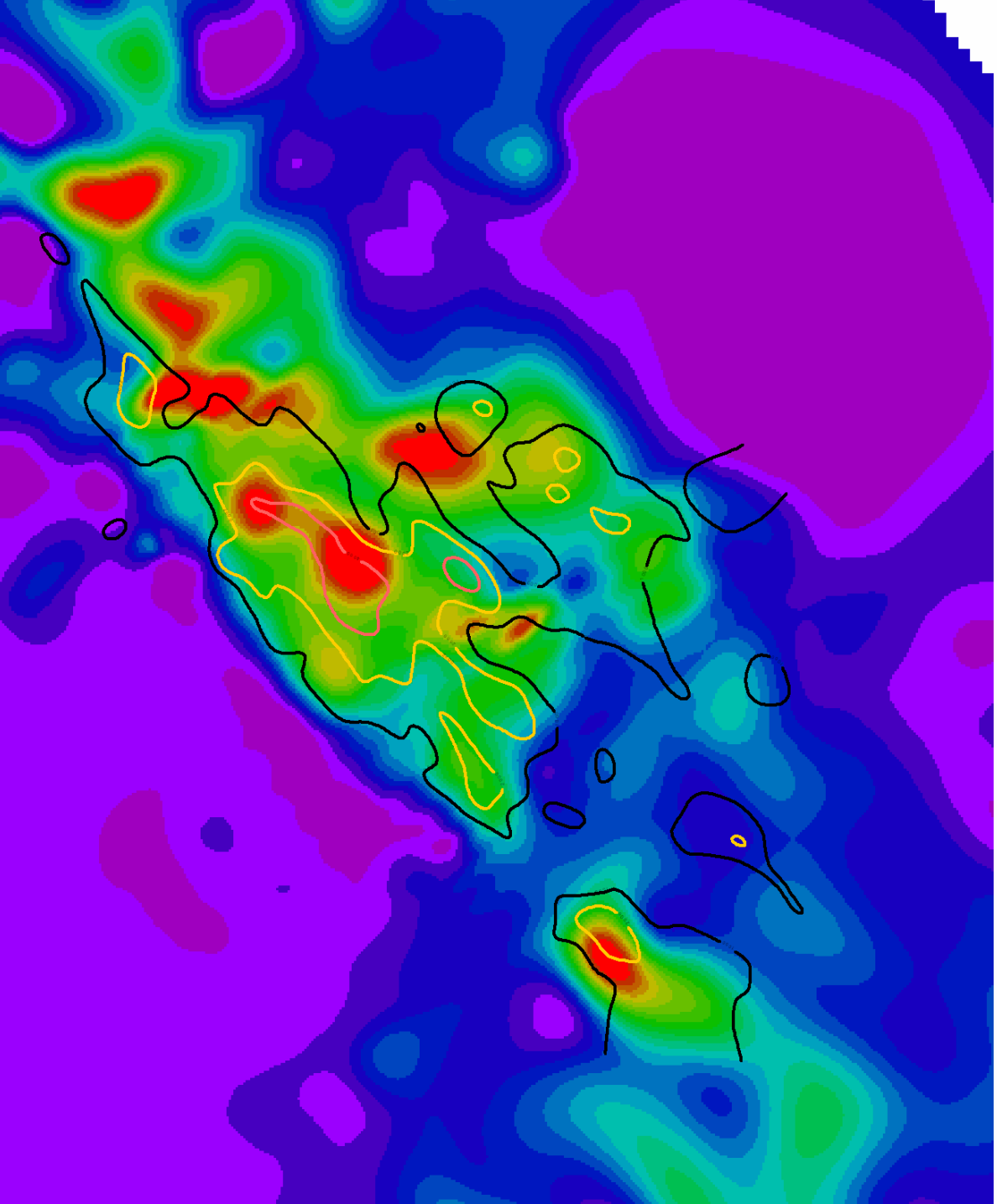
West - east Section Line 6,393,350N

Copper Hill NSW

Comparison of 3D IP model

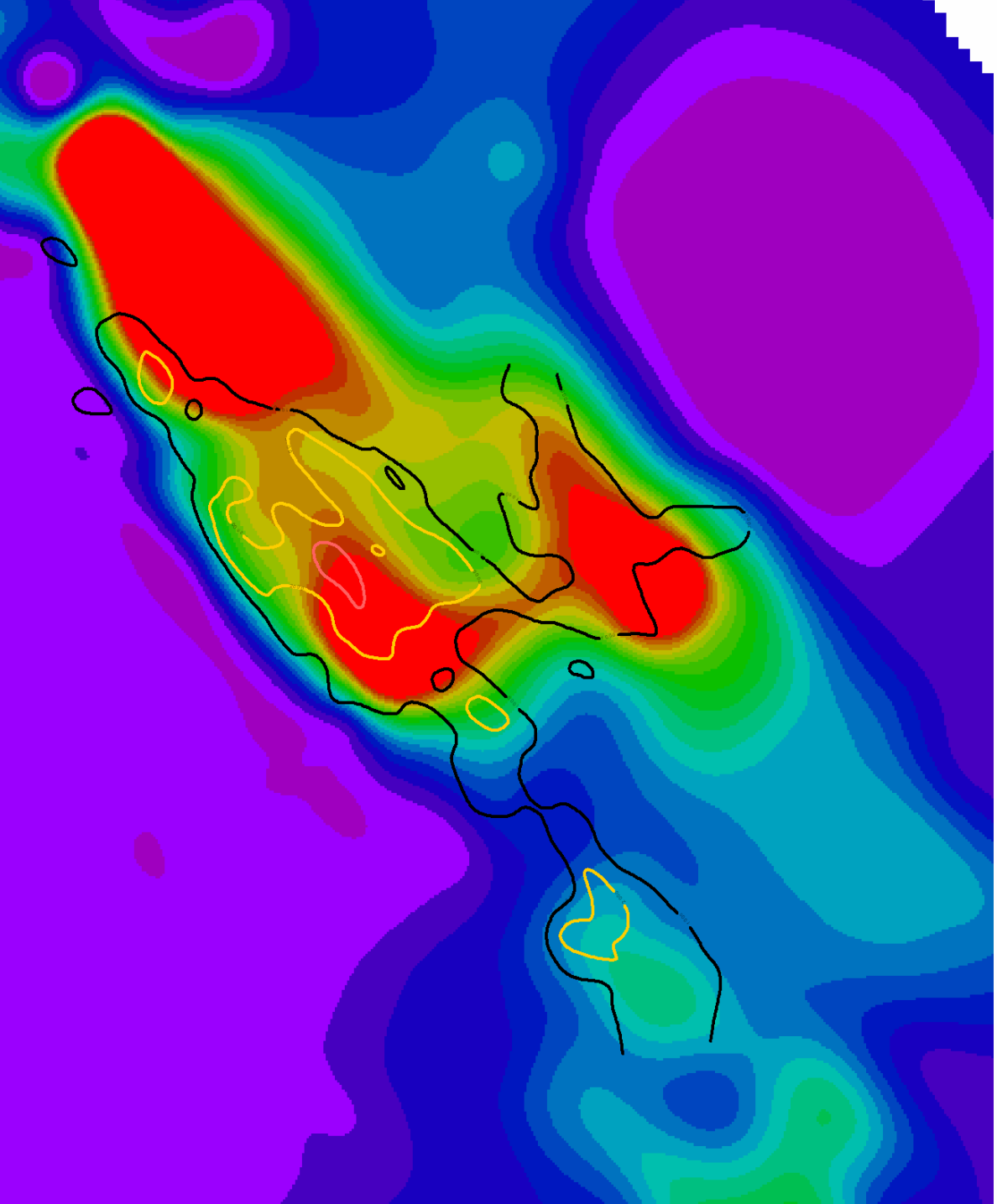
With

Kriged copper grades



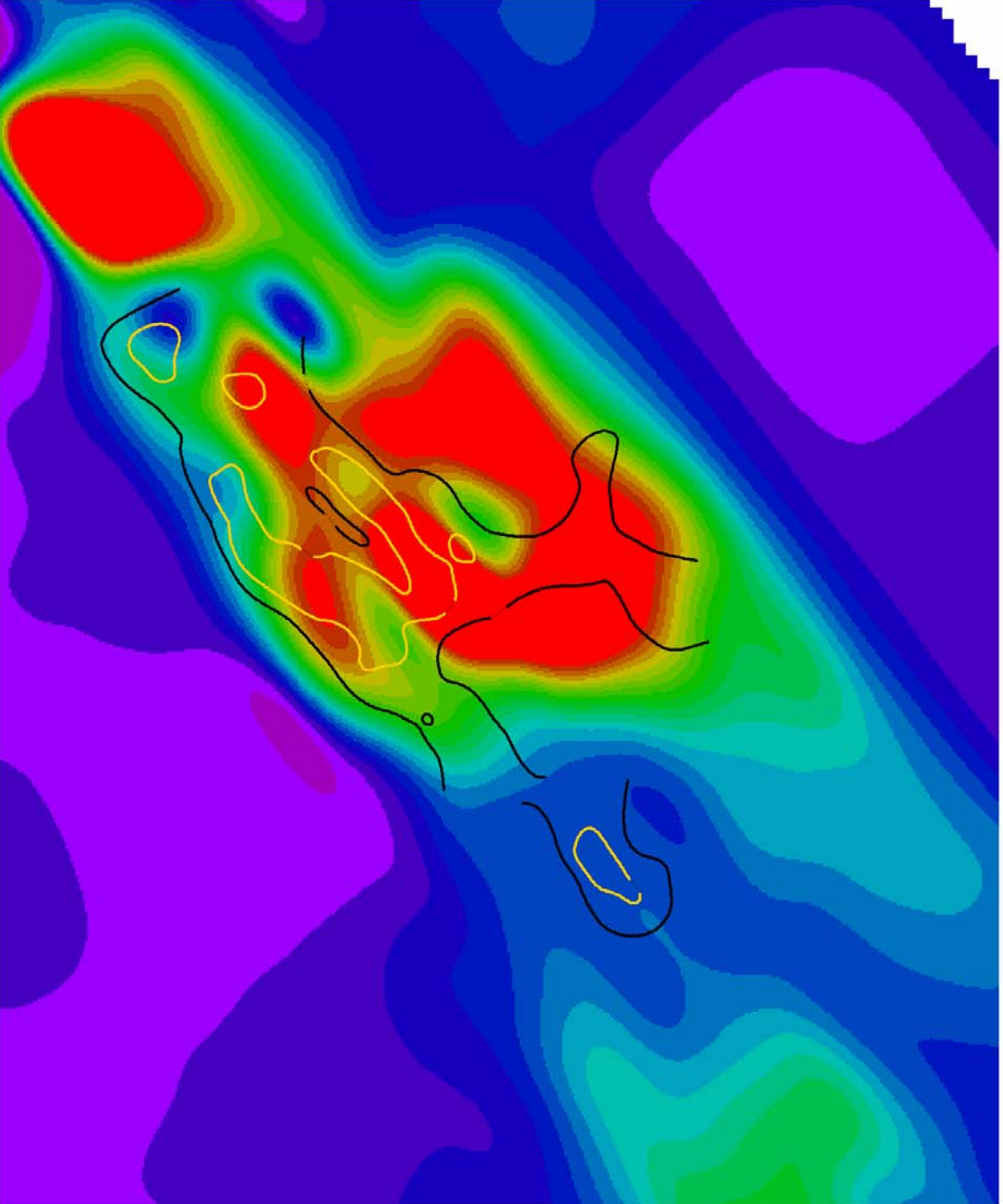
50 m
below
surface

1km



150 m
below
surface

1km



250 m
below
surface

1km

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