Advances in Deep Electrical Earth Imaging Implications for improved targeting and planning for exploration





Discovery Rates Down!

20

2

\$600 \$400

\$200

SNL

50

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Gold Mining Discoveries per SNL 2013 Strategic Report

Source: SNL Metals & Mining

Be

50

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Copper Discoveries per S&P 2014

Source: S&P Global Market Intelligence

Why are Discovery rates down?

Discovery rates are generally falling because

- 1. The earth is complicated
- 2. Ore bodies are deeper and deeper
- 3. Drilling budgets are not limitless
 - 1. Exploration budgets are driven by drilling for most companies

How does the industry target?

Drill Targeting

- Geology
- Geochemistry
- Geophysics

Geoscience Information you gather will guide your decisions ...

1,000 Years Ago, Patients Survived Brain Surgery...

But They Had To Live With Huge Holes in Their Heads

The practice finally came to an end when the Spanish arrived in the 16th century and decided to make it illegal

Smithsonian Institute

With Innovation comes a period of adaptation

Today, sophisticated imaging is a prerequisite

Evolution of MRI from the 1950's - 1970's to practical use in the 80's and 90's and further advances in the 2000's

DEEP IMAGING HELPS

DRILL Here FIRST!

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Improved acquisition technology
Improved Processing
Improved Inversion
3D

Deep accurate multi-parameter 2D information

TITAN 24

17 years of proven success

- Copper Mtn
- This image helped the company raise

50 MILLION dollars !

- Changed Mine design
- Kemess

This image helped Geological team vector to New Discovery

2D Geophysics

Interrogating and Imaging in all directions

- True 3D measurement (DCIP)
- Simultaneous receiver sampling
- Omnidirectional data free from receiver geometry bias

Receiver dipole Data recorder Current injection "Conceptual" current path

Survey footprint

Sampling everything (from all directions)

ORION 3D surveys

- Accurate imaging for complex environments
 - Depth of investigation to 1,500 m for Resistivity, 750m for IP
 - Confidence in interpretation
- **True 3D acquisition**
 - Omni-directional supersampling
- Multi-parameter
 - DC Resistivity, IP, MT

The ORION 3D process

The best representation of the subsurface for drill planning

- Survey flexibility customized layouts
- **3D** geometry sample from all directions
- Depth penetration
- High resolution

3D resolution

Resistivity data acquisition from multiple lines (2D slice through a 3D inversion)

Resistivity data acquisition from 1 line (2D Inversion)

Broad exploration areas

More data = Accurate

Multi parameter Deep 3D surveys

- 3D inversions of 3D data
- Accurate representation of subsurface
- High resolution

Kitumba, Africa ORION 3D IP Model

750m x 1 km x 750m

Increase overall likelihood of success (survival !)

4sq km package explored from surface to depth

200000

Accurate imaging: More effective drilling

- More knowledge before drilling
- □ Improve drill planning
- More effective drilling

Save moneyImprove success rate

Increase overall likelihood of success

Case Studies Available rgordon@quantecgeoscience.com

Technology for Discovery

Simply ... better targeting

Quantec Technology

ORION 3D

- 2D Distributed Array DCIP & MT
- Full 3D Data Acquisition of DCIP & MT

• High Resolution MT

• Full Service Geophysics

- Deep high resolution imaging
- Complex deep surface to depth environments
- Shallow to deep resistivity surveys
- Multiple applications

3 reasons to use Quantec!

1. Reliable

- Proven record of client successes
- 2. Safe
 - □ High standards and safe record

3. Accurate

Most advanced technology

750m depth is routine with Quantec

Experience at over 60 minesites

Some of our mine site clients...

- Copper Mountain
- Tenke Fungurume
- Kidd Creek
- Tati Nickel
- o Raglan
- o Ren
- Red Lake Gold Mine
- o Geikle
- Voisey's Bay
- Levack
- San Nicolas
- Black Fox Gold Mine
- Fortitude
- Chelopech
- o Borroo
- Red Chris

Mine site applications with TITAN 24

Mine Planning

- Ground investigations pre tailings
- Ground condemnation
- Monitoring

Delineate

 Resource mapping, extensions and discover new ore

Explore

• At mine sites and near mine exploration

Final Product

VOLUME Exploration (2 x 2 x2 km shown)

Delineation

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