



**QUANTEC**  
Geoscience

## **MINE SITE IMAGING**

### **INVESTIGATIONS & CASE STUDIES**



**QUANTEC**  
Geoscience

Since 1986

## MINE SITE IMAGING

**Technology advances:** over the last 18 years Quantec has developed significant systems for mine site exploration. Starting with the **TITAN 24** system. This system can rapidly produce images to depths of from surface to **2000** metres by measuring vast amount Resistivity and IP data. This data is often directly related to critical features of the subsurface such as geology, structural information and ore.

The distributed network of sensors collects full waveform data and the system and advanced processing features sophisticated digital signal processing which translates to the ability to pick up small signals that can represent real structure and targets within the realm of large ambient noise to provide detailed and accurate images of key parameters in the subsurface

TITAN 24 has been carried out at over 50 mine sites. In almost all cases the results have led to cost savings and in some cases new discoveries.

Full 3D surveys utilizing ORION 3D technology may provide even greater imaging capability in geologically complex environments.

### APPLICATIONS HAVE INCLUDED MINE PLANNING TO EXPLORATION:

- Delineation surveys to highlight productive zones and extend mine life
- Near mine exploration surveys to identify nearby targets to feed infrastructure
- Condemnation surveys for mine planning
- Target production drill holes
- Add information to geometric and volumetric analysis
- Pre- tailings pond planning
- 4D tailings monitoring



**In mine deployment of data receiver network**

## Typical Challenges

Cultural noise and power lines are not the only challenges at the mine sites. Some of the biggest aspects to getting successful work done at mine sites are dealing with scheduling and Health and Safety. Quantec has been doing this type of work for 15 years. The teams of people we send to your project are experienced and adhere to the most stringent of Health and Safety Policies in the world. Our clients include; **TECK, BHP, Freeport McMorran, Rio Tinto, Goldcorp and Newmont.**

Haul roads

Cultural Noise

Power Lines

Active Pits



- Cultural Noise & Powerlines
- Scheduling
- Health and Safety

## Experience

- Quantec has been providing Mine site services for over 15 years
- Quantec has completed over 100 Mine site and near mine studies globally

Some 2D and 3D surveys have included:

Bolivar Mine, Yauricocha, Sierra Metals	Cerro Lindo, Nexa (Milpo)
Charcas, El Pilar, Campo Medio Grupo Mexico	Copper Mountain Mine, Copper Mountain
Gold Strike, Pueblo Viejo, Barrick	Black Fox Mine, Apollo (McEwen)
Lac de Isles Mine, North American Palladium	Red Chris, Imperial Metals
Chelopech, Dundee Precious Metals,	DEBEERS, Venetia Pit
KIDD Creek, Falconbridge	Kemess, Northgate (Alamos)



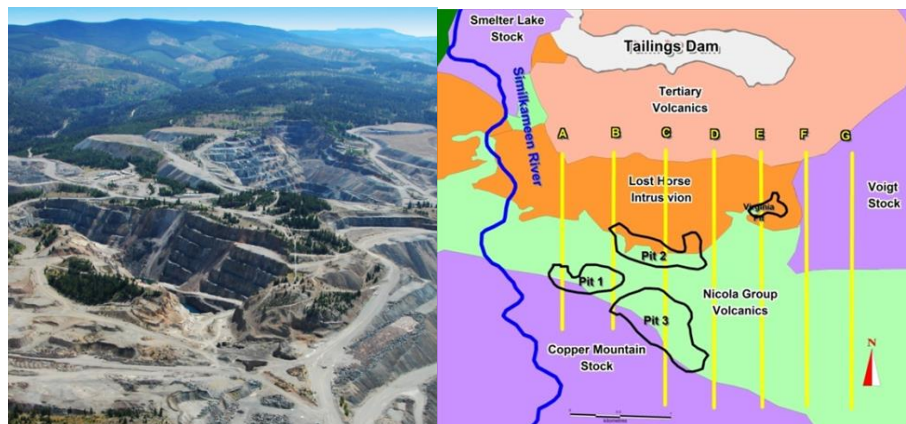


Laying out the network, typical data acquisition is over a 2-3-week period

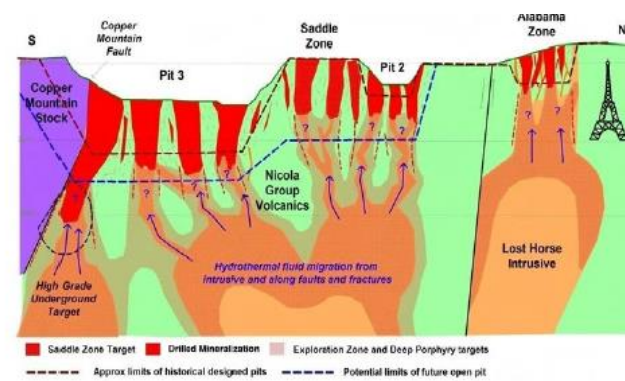
## Examples

### Copper Mountain – Mine site investigation

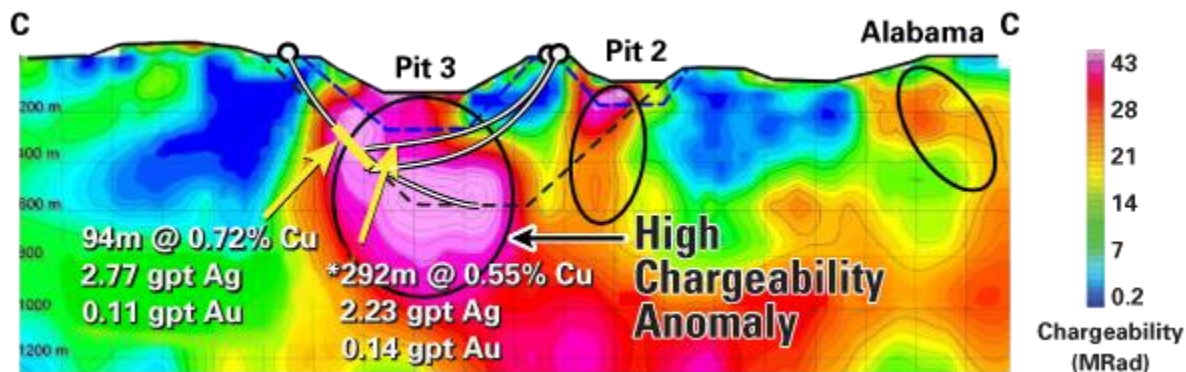
- To confirm continuity of mineralization between the pits.
- To test and possibly expand reported resources between existing pits in order to identify a new merged pit- known as the “Super Pit.”
- To identify the potential for large, deep-seated porphyry deposits through a comprehensive mine site exploration program.



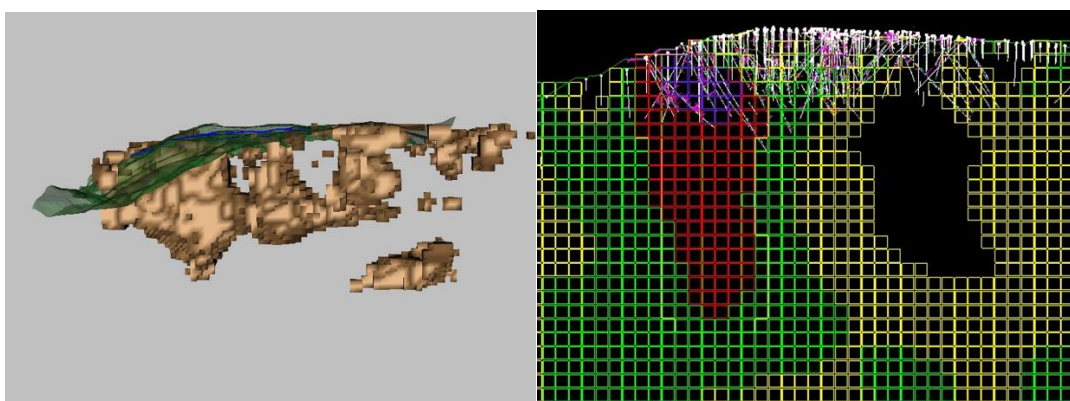
Copper Mountain Mine and survey plan



Conceptual geological model



Line C – New discovery, pit design changed



3D chargeability block model

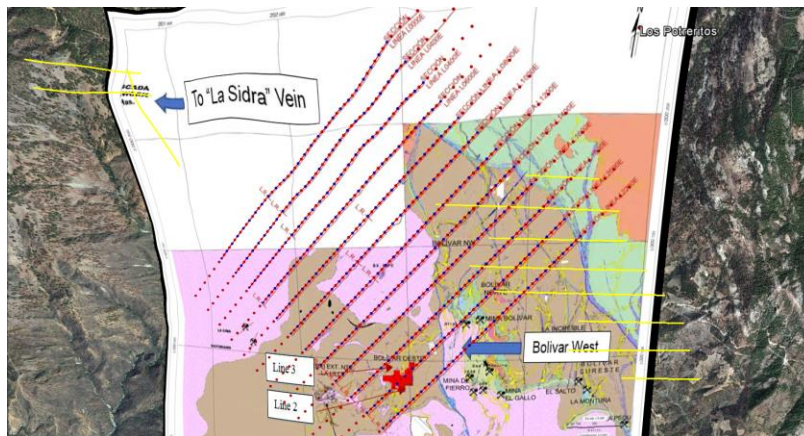


Unexpected but positive results (From CIM 2018 talk by Peter Holbek)



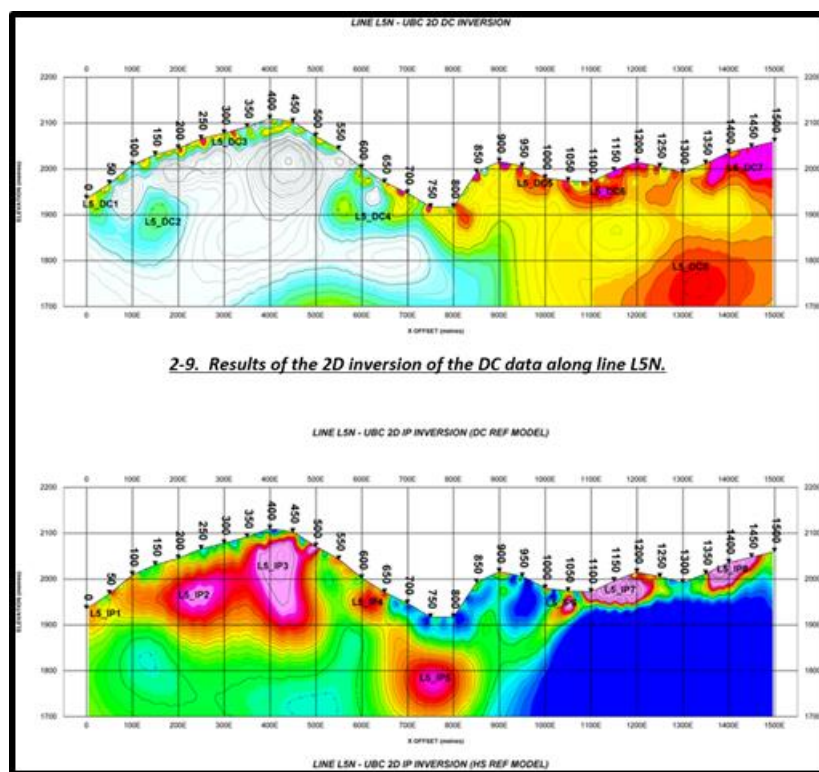
## Bolivar Mine Project, 2018 – Mine site investigation

- Use TITAN 24 DC/IP & MT to help delineate the Bolivar deposit for drill targeting.
- Map and delineate near-surface zones associated with Skarn mineralization.
- Map and delineate deep-seated alteration zones that could control or host mineralization.
- Focus drilling thereby reducing overall drilling costs.
- Mine Planning

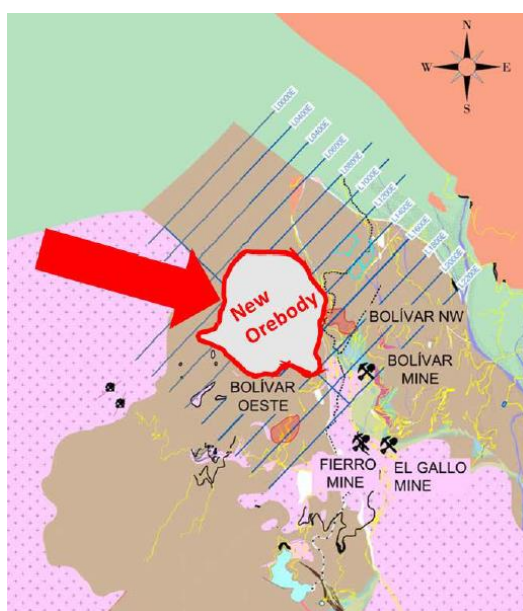


Bolivar, location and TITAN 24 survey plan directly over mine property

## Results

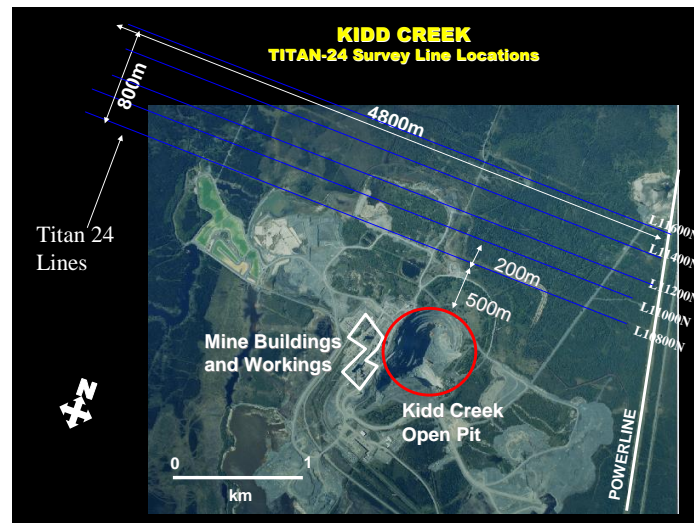


SIERRA METALS CONFIRMS NORTHERN EXTENSION OF THE BOLIVAR NORTHWEST OREBODY CONTAINING AN AVERAGE GRADE OF 1.37% COPPER AND AN AVERAGE TRUE WIDTH OF 8.1 METERS AT THE BOLIVAR MINE, MEXICO (Press from 2018)



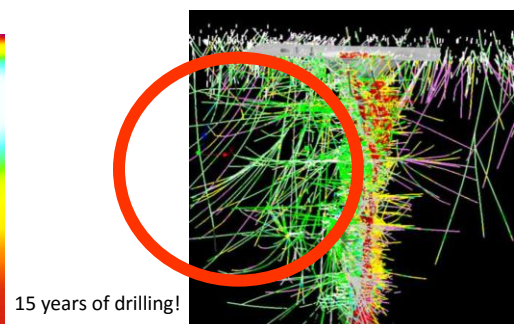
New Orebody Discovered

**Kidd Creek Mine – Near Mine investigation:** The TITAN 24 system was deployed over an area of 5 km by 1 km only 500m from the pit at the top of the mine. The approach and system were successfully demonstrated as a significant exploration tool for near mine application.



**TITAN 24** Survey lines near mine and power lines

**Results:** The survey was able to penetrate thick (50m) conductive overburden. The blind test survey was successful at identifying 100 % of the known targets previously drilled within the top 800 metres. In addition, new target areas based on these results were identified for further exploration. A significant region where the survey indicated little further investigation would be warranted was confirmed by hundreds of barren drill holes that had been previously drilled over 15 years at an estimated cost of over 15 million dollars.



DC Resistivity section, line 10800 section shown to 1200m depth, warm colours represent increased conductivity.

Data examples used by permission



