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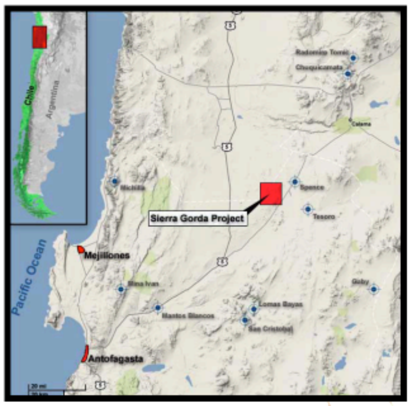
Inductive Source Resistivity - ISR - Chile
Sierra Gorda Project - Atacama Desert
ISR across a feasibility stage copper-molybdenum project

ISR Survey Background

A UTEM Inductive Source Resistivity (ISR) test was carried out in May/June 2011 over the Sierra Gorda Project . The Sierra Gorda Project is located in northern Chile and consists of a number of copper and copper-molybdenum mineral zones located within the property. The survey was carried out to showcase the capabilities of ISR and as a test of the ISR method as an exploration tool in the search for deposits related to porphyry copper hydrothermal systems.



Note: figure from: *Scoping Study for the Sierra Gorda Project Region II, Chile* July 2009 (available online as: 2009-07_SierraGorda_NI43-101.pdf)

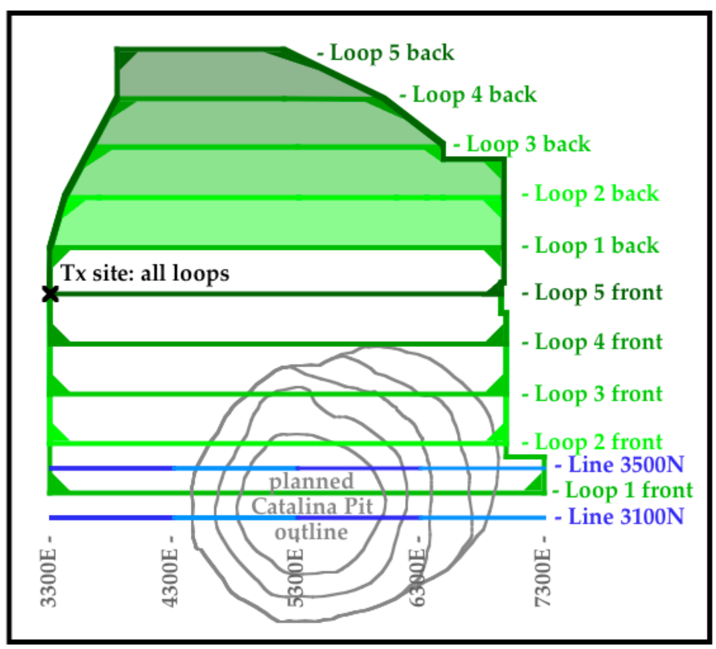
Sierra Gorda including the Salvadora deposit has MDA 2010 updated resource estimates total 2 billion tonnes of Measured and Indicated Resources in sulfides mineralization, and 237 million tonnes in oxides mineralization. These Mineral Resources are inclusive of the Sierra Gorda Project estimated Proven and Probable Reserves of 1.275 billion tonnes of sulfide ores. Additionally, the Resource estimates include 682 million tonnes of inferred sulfide plus oxide mineralization.
Technical Report for the Sierra Gorda Project,Chile
Prepared for Quadra FNX Mining Ltd. June 8, 2011 DE-00138

ISR Survey Layout and Setting

The ISR Survey Layout and Setting is shown on a property scale to the right - survey lines and transmitter loops are shown superimposed on the outline of the planned Catalina Pit at Sierra Gorda.

Line 31N and **Line 35N** were selected as the site of the test survey because they cross the centre of the planned pit. The site is also fairly ideal for a test - relatively flat with few cultural features at the time of the survey.

The in-line component of the electric field - Ex - was measured along **Line 31N** and **Line 35N** from a total of five 4000x2000m ungrounded Tx loops (loops conform to property boundaries). Each of the two lines was surveyed from 4 loops offset to the north of the line by: 200/600/1000/1400m.
E-field measurements were collected with capacitive electrodes and 50m electrode dipoles.



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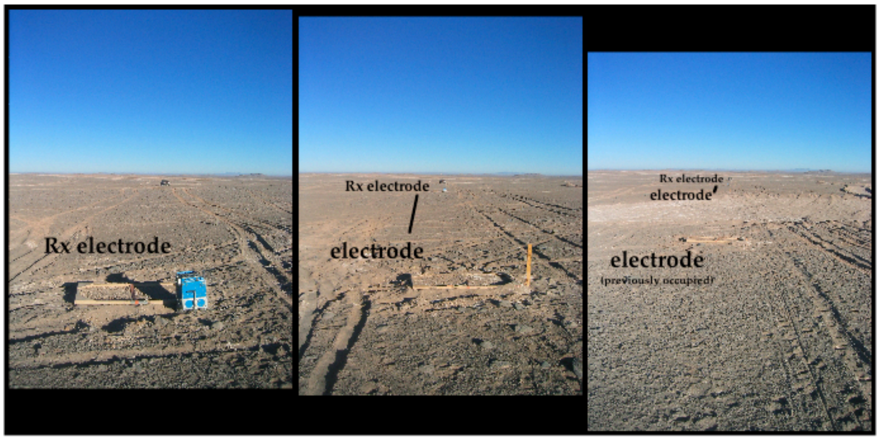


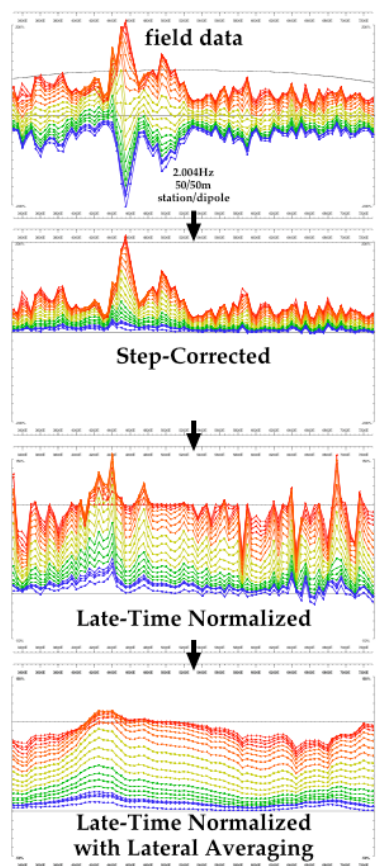
ISR Equipment Modifications

This set of images shows the UTEM survey equipment as developed for collecting ISR data in the conditions which occur in the Atacama . Capacitive electrodes are employed. The UTEM receivers have been modified to enable the collection of E-field data at the required 2Hz

Line 31N Loops

Loop 1 - 200m north
Loop 2 - 600m north
Loop 3 - 1000m north
Loop 4 - 1400m north

Line 31N Ex Loop 2



ISR Survey data

Two sets of four Ex profiles were collected - Lines 31N and 35N. Transmitter Loops are summarized in the Tables. All loops surveyed @ ~2Hz - 20-channel data. All data was collected at a station/dipole spacing of 50m.
An example profile (Line 31N Loop 2) is shown at the right.

Line 35N Loops

Loop 2 - 200m north
Loop 3 - 600m north
Loop 4 - 1000m north
Loop 5 - 1400m north

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ISR Processing

The E-field data collected during this test was processed with the goal of obtaining an ISR - **I**nduced **S**ource **R**esistivity - resistivity-depth section for the line surveyed. The method used to obtain the resistivity section involves two processes: 1) **E**-field **C**onductivity **D**epth **I**maging and 2) **ISR E-field Imaging**.

1) ECDI (E-field Conductivity Depth Imaging)

The **ECDI** process is as follows:

- Step Correct the field data - this converts the periodic waveform into a single step response.
- normalise the data to the Late-Time (Last Channel) limit
- apply lateral averaging to the late-time normalised data

The averaged data are then fit to apparent diffusion time as a function of depth, creating a laterally-smooth conductivity distribution.

2) ISR E-field Imaging

E-field imaging is done on stacked, Step-Corrected data which are not late-time normalized. E-field imaging is simply a DC resistivity inversion process where the source E-field is inferred as a function of time from the ECDI results.

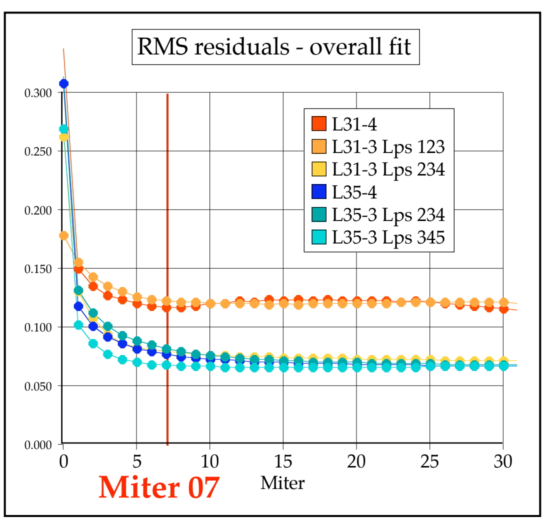
The ISR inversion is a 2-step process. At each outer (main) iteration (MITER) ithe Step-Corrected E-field data and the diffusion time data are jointly fitting using a trade-off parameter subject to smoothing conditions. The updated synthetic response and residuals in both data and diffusion times are recalculated after each miter.

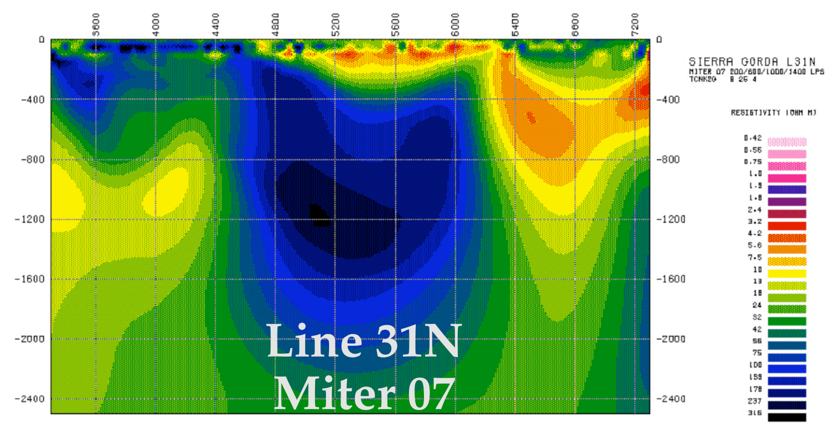
The number of anomaly profiles fitted is the number of channels (20) multiplied by the number of loops (4).

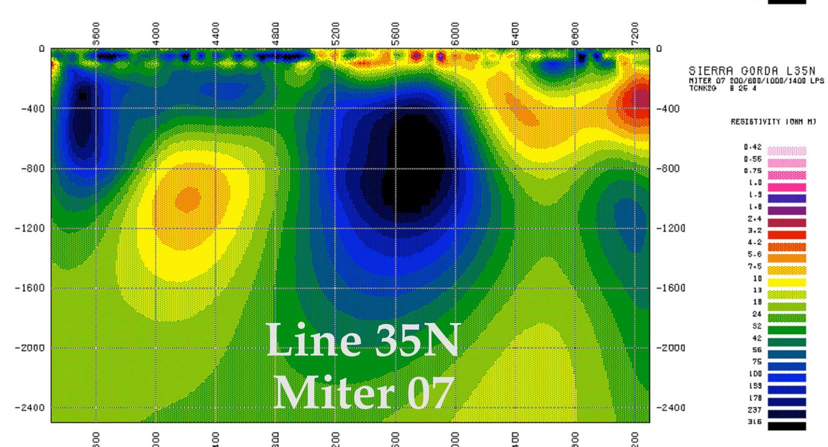
This process is repeated until the RMS (root mean square) residuals no longer appreciably decrease - the generally accepted practice. The number of main iterations (MITER) required to reach this point varies with the data set. Further iterations beyond this tend to lower the residuals marginally but generally result in increasing complexity in the model that is not supported by the structure of the data .

ISR Results

The Line 31N and Line 35N ISR Sections are presented to the right - both @ MITER 07. The RMS residuals - overall fit - are plotted below.







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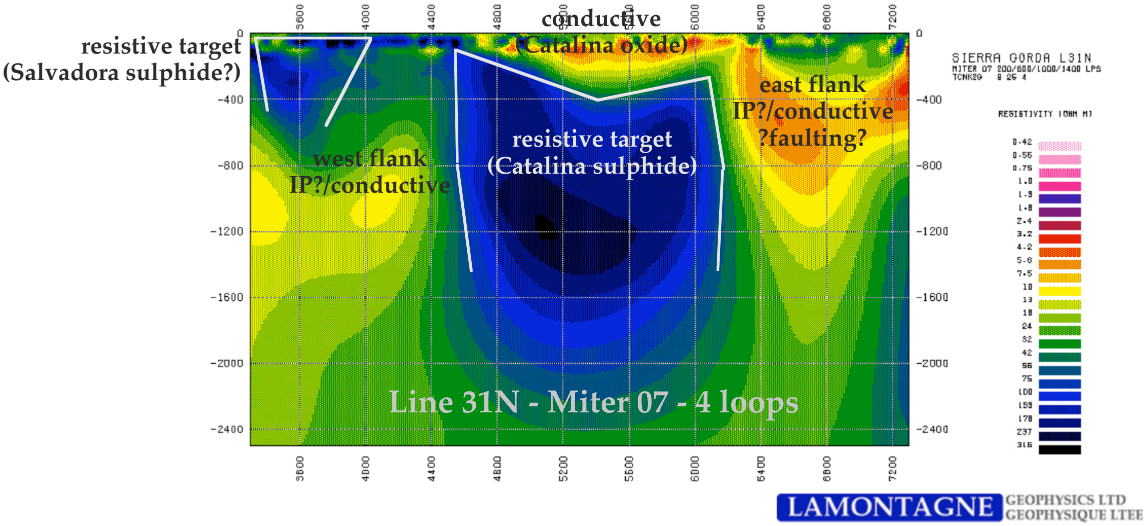
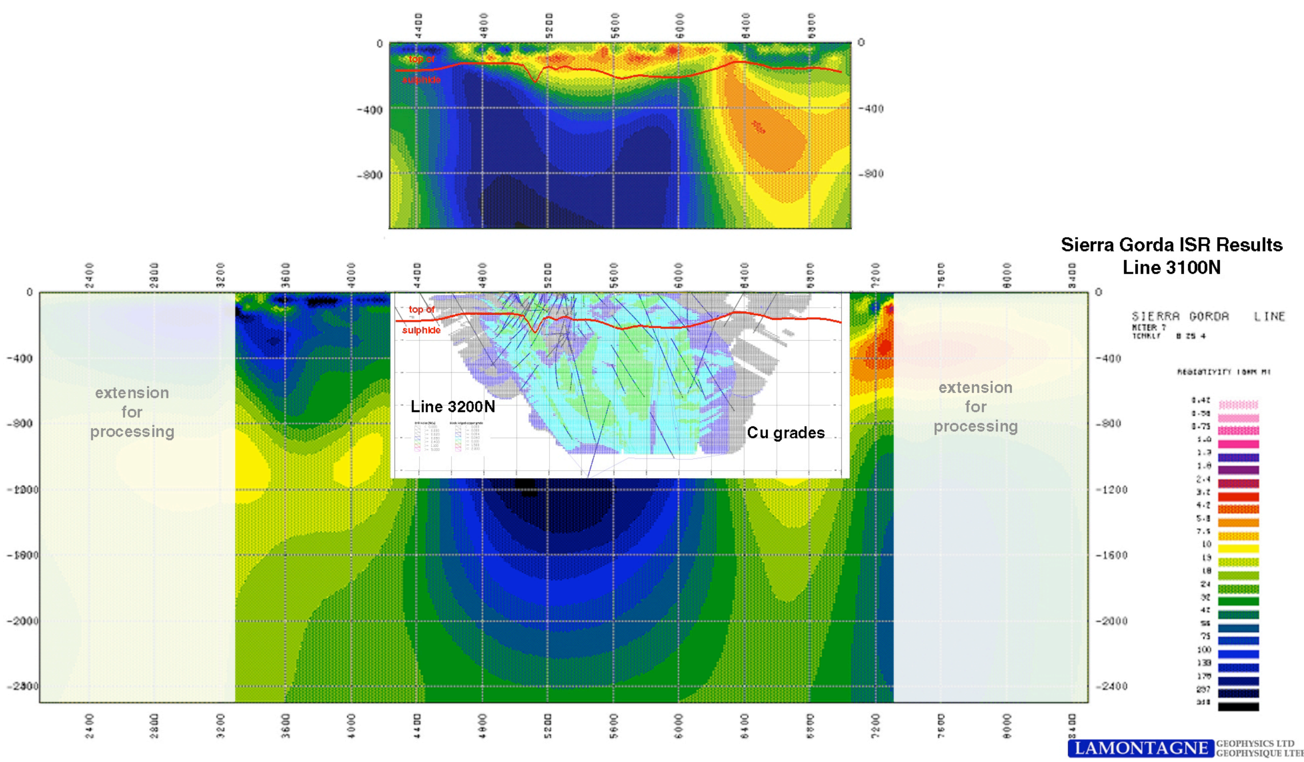


Line 31N ISR Section Interpretation

The Line 31N ISR Section is presented with a basic interpretation. The Catalina pit sulphide ore appears on the ISR section as a resistive target, the overlying oxide ore as relatively conductive. A smaller resistive target at the western end of both sections coincides with the proposed Salvadora pit.



Line 31 ISR Section comparison with Cu grades

The Line 31N ISR Section is presented with L32N Cu grades to allow for comparison.
The boundary marking the top of the sulphide zone/base of the oxide zone is shown in red in this figure.
- Cu grades in the sulphide zone correlate well with a resistive zone in the ISR section -
- Cu grades in the oxide zone correlates with a more conductive zone in the ISR section -

Notes:

- Cu grade figure from one of:
  Technical Report for the Sierra Gorda Project , Chile. July 8, 2011 240pg (online as: SierraGordaFeasibility2011.pdf)
  Scoping Study for the Sierra Gorda Project Region II, Chile. July 2009 533pg (online as: 2009-07_SierraGorda_NI43-101.pdf)
  Updated Technical Report on the Sierra Gorda Project, Region II, Chile. May 16, 2008 232pg (online as: Sierra_Gorda_43_101_2008_v15.pdf)

For more information, please visit us at PDAC booth 1103