September 1, 2010

To: Peter Walker

Ref: Brunchilly – Euler Depth to Basement Modeling

Introduction

As part of our ongoing exploration program for Phosphate in the Northern Territory it was determined that the basement architecture is an important guide to the location of Phosphate accumulations within the target stratigraphy. The overlying prospective Georgina Basin sequence contains little to no magnetic material and can almost be considered as invisible to the magnetic method. By contrast, the underlying basement in much of the prospective areas is the highly magnetic Tennant Creek formation. As such it should be possible to use a depth to magnetic source technique to model the depth to basement assuming that the response is close to that contact.

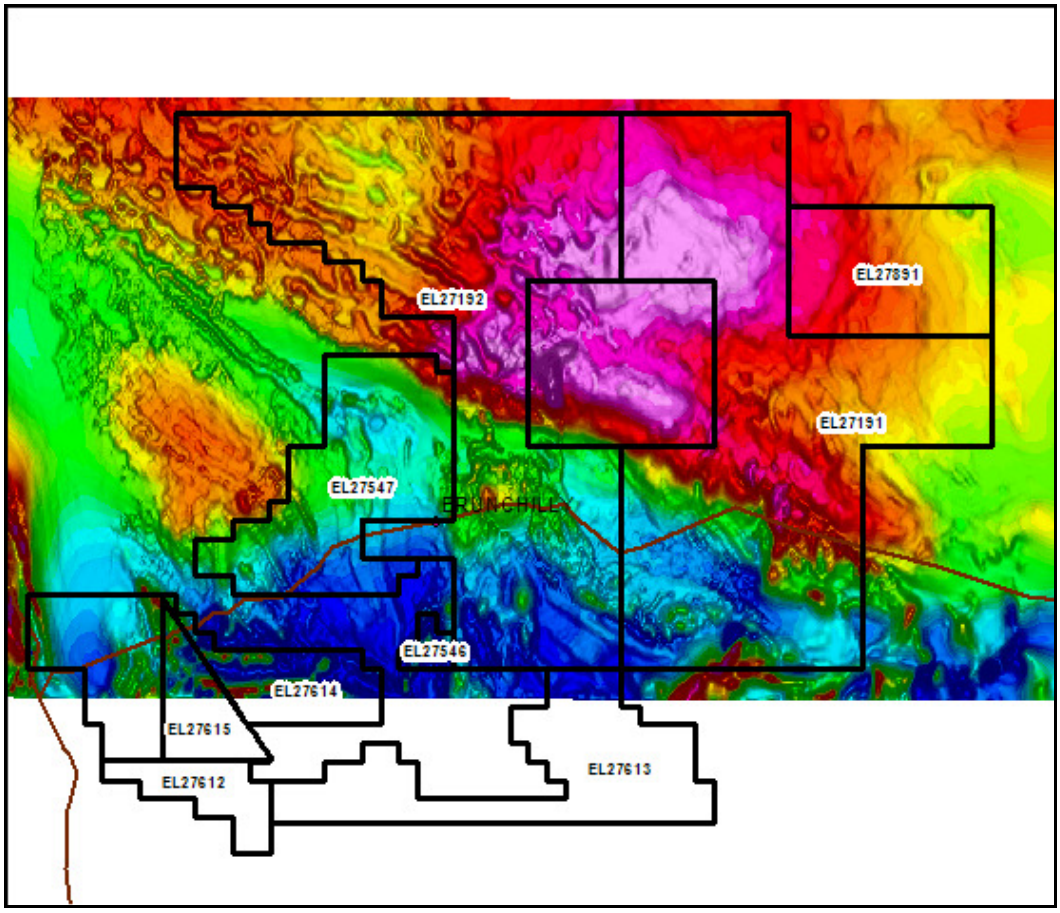

Figure 1: Brunchilly – Area of depth calculation shown over RTP Magnetic image

The Brunchilly project area is made up of nine tenements, EL27612, EL27613, EL27614, EL27615, EL27546, EL27547, EL27191, EL27192 and EL27891. The area of investigation for the estimation of depth to basement was limited by the extent of the more detailed regional airborne magnetic data available. The extent of the area of basement depth estimation with respect to the tenements and is shown above in figure 1. The method chosen to estimate the depth to magnetic source was the Euler Deconvolution which is explained here.

Depth to Basement Estimation Theory

The Euler method for calculating the distance to a magnetic source is proven and appropriate for large areas. The apparent depth to the magnetic source is derived from Euler's homogeneity equation (Euler deconvolution). This process relates the magnetic field and its gradient components to the location of the source of an anomaly, with the degree of homogeneity expressed as a "structural index". The structural index (SI) is a measure of the fall-off rate of the field with distance from the source. A structural index is an exponential factor corresponding to the rate at which the field falls off with distance, for a source of a given geometry. These are described in the standard processing as common geometries such as "Contact", "Sill", "Dyke", "Cylinder" and "Sphere".

The Euler deconvolution process is conducted on the gridded magnetic data and generates a series of results (depths) as a database. The results can be filtered by structural index (SI) and a range of depth or zone of interest. In this way solutions which relate to much deeper sources within the basement or surficial noise can be filtered out.

Results

The results of the Euler deconvolution can be presented in various forms. The most common of which is a simple colour and size ranged symbol plot. In this case each individual depth result is displayed as a coloured symbol where the colour and the size represent various depth ranges. The results for Brunchilly are presented in this form in figure 2 and draped over the grayscale 1VD magnetic image. Alternatively these located results can be gridded to produce a colour plan image of estimated depth to magnetic source as shown here in figure 3.

The results of this modeling at Brunchilly show several distinct zones of basement high in the western half of the block. These zones all trend roughly SSE-NNW and the western most zones are separated by a relatively deeper basement interface. These results should help focus drilling at the prospect.

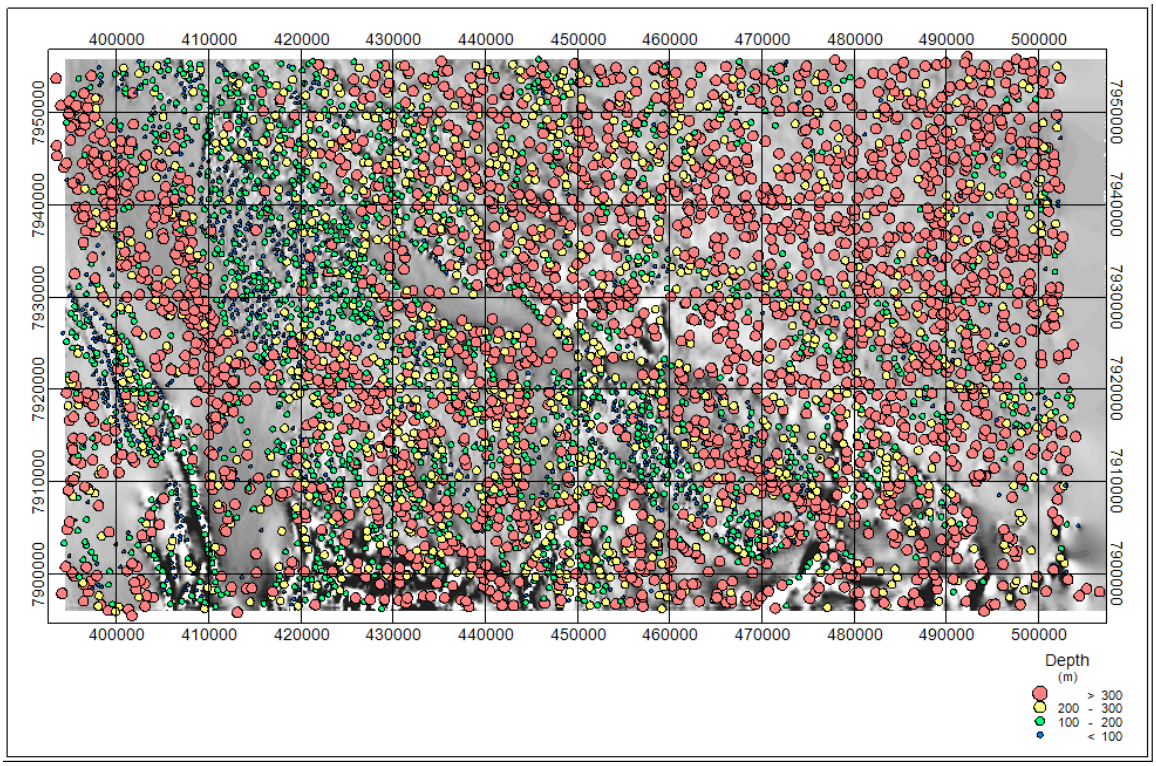

Figure 2: Brunchilly – Depth Symbols over 1VD Magnetic image

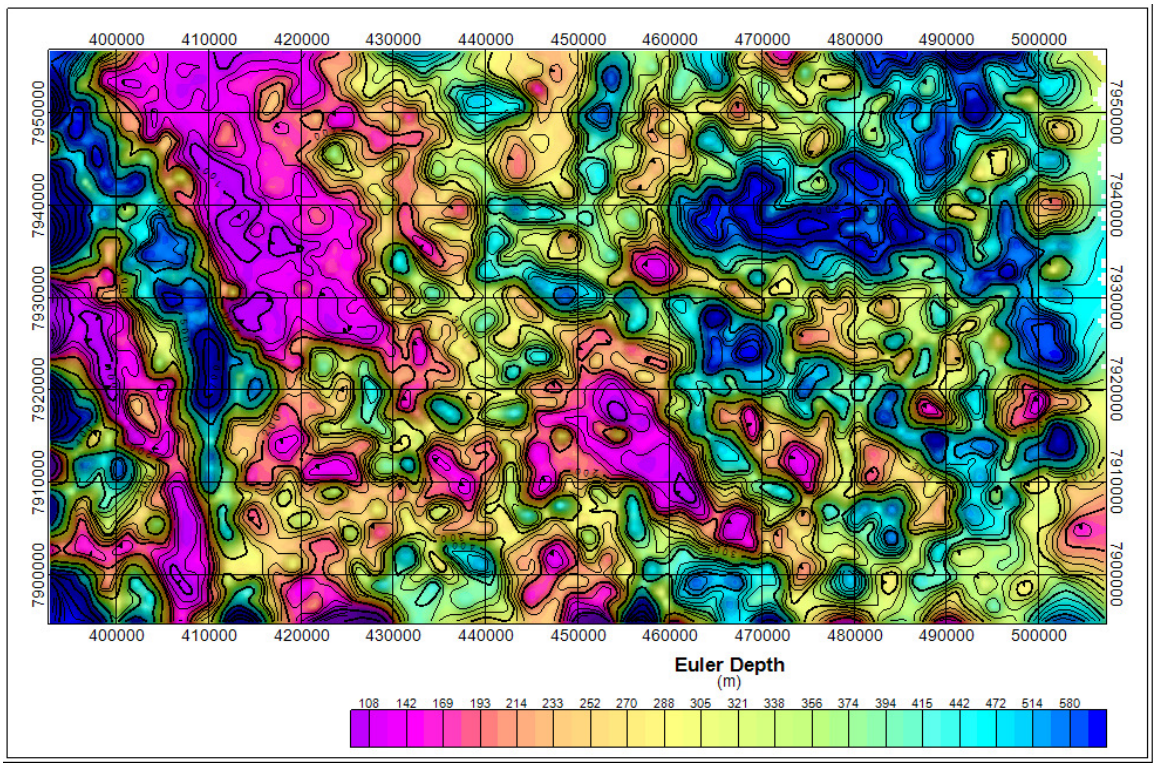

Figure 3: Lake Woods – Depth Grid

David Burt
Senior Geophysicist