Shea Clark Smith / MEG, Inc.

Minerals Exploration & Environmental Geochemistry
P.O. Box 18325, Reno, Nevada 89511-0325
Tel: 775-849-2235 SheaClarkSmith@aol.com
www.SheaClarkSmith.com

Osborne Mine, Queensland, Australia

Introduction

Speciated mecury soil gas (GAS'm) results indicate a partially oxidized copper ore body 400 meters from the surface at Lilly Creek. A second area (Kulthor) was tested closer to the Osborne Mine in Queensland, Australia, with similarly encouraging results. Both studies demonstrate the extreme depths to which GAS'm can detect mineralization.

Fig 1. Location of the Osborne and Mt. Isa Mines, Queensland, Australia.

History

Fifty-two samples were first received from Placer Exploration Ltd. in July, 2000 for a test of the GAS'm method. These arrived from an undisclosed area near the Osborne Mine in Queensland, Australia. The test soils were taken from archived samples that had been originally used to test a suite of developing selective soil extraction methods, the results from which were compared to "redox" analyses (aqua regia digestion). It was revealed a few months later that selective soil extraction methods did not indicate deeply sourced mineralization, yet the GAS'm results did. It was also stated that "depth to known mineralization is 400 meters, with at least 300 meters of that through massive limestone, and 100 meters of unconsolidated overburden and regolith".

In February, 2001, sixty-three additional samples were analyzed. These additional samples extended several of the original lines further to the west. Favorable results were shared in March, 2001. Unfortunately, rapid personnel changes and a severely constrained exploration budget brought further work to a halt by June, 2002.

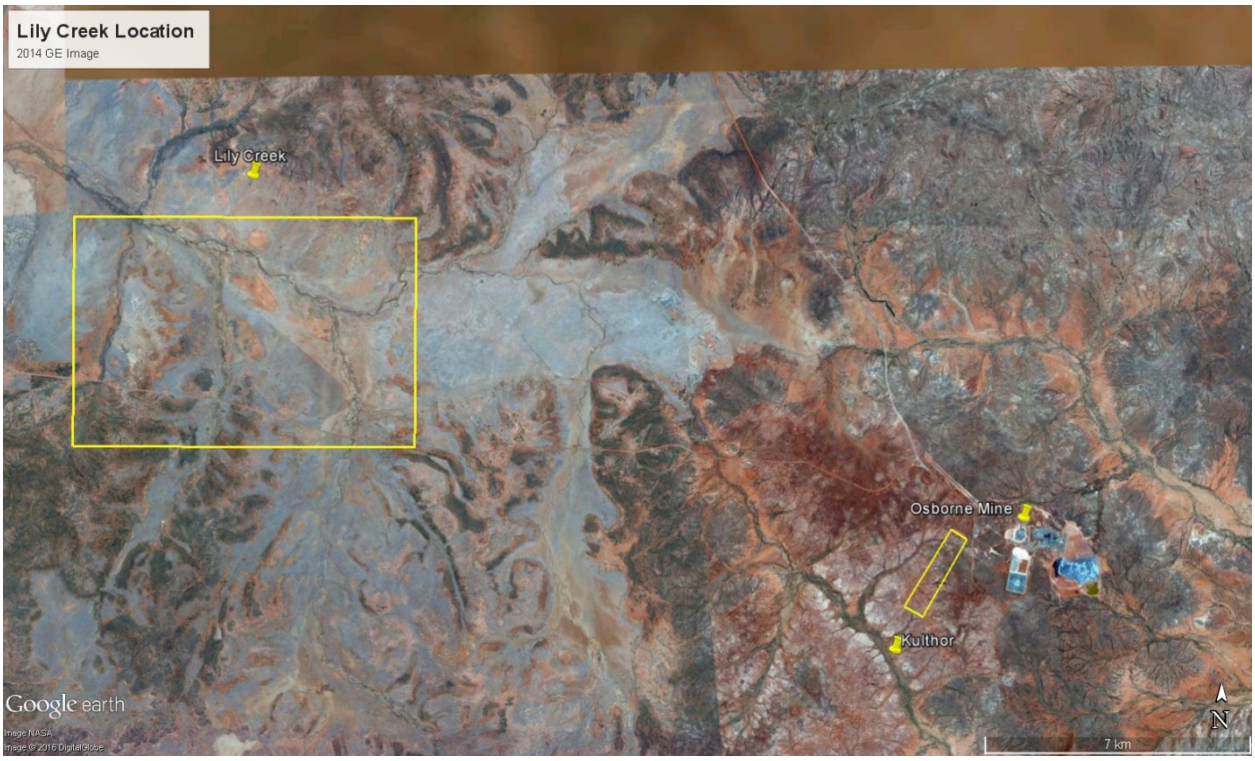


Fig 2. Location of the Lily Creek soil gas survey area, approximately 20 Km west of the Osborne Mine. Also shown is the Kulthor Project area.

Geology & Geophysics

The geology, as known at the time of the survey, was used to determine the reliability of the GAS'm method. Figure 3 shows the important features. Houdini granite dominates the eastern side of the survey area. It is bordered on the west margin by a NW-trending series of magnetic highs (after S. Massey & J. Coggon). The magnetic anomalies fall between a NW-trending system of steeply dipping normal faults that are post-Cambrian and which developed during rifting prior to the deposition of Cover Sequence 2. There is a system of later N-trending, steeply E-ESE dipping thrusts with shearing, which appear to be offset by the later NW-trending rift-related faults.

Gravity anomalies (2nd vertical derivative) generally trend in a northwest direction which is sympathetic with the trend of the magnetic anomalies and post-Cambrian NW-trending normal faults. The best soil geochemistry and GAS'm geochemistry are spatially correlated with the largest gravity footprint and highest gravity values (Fig 4).

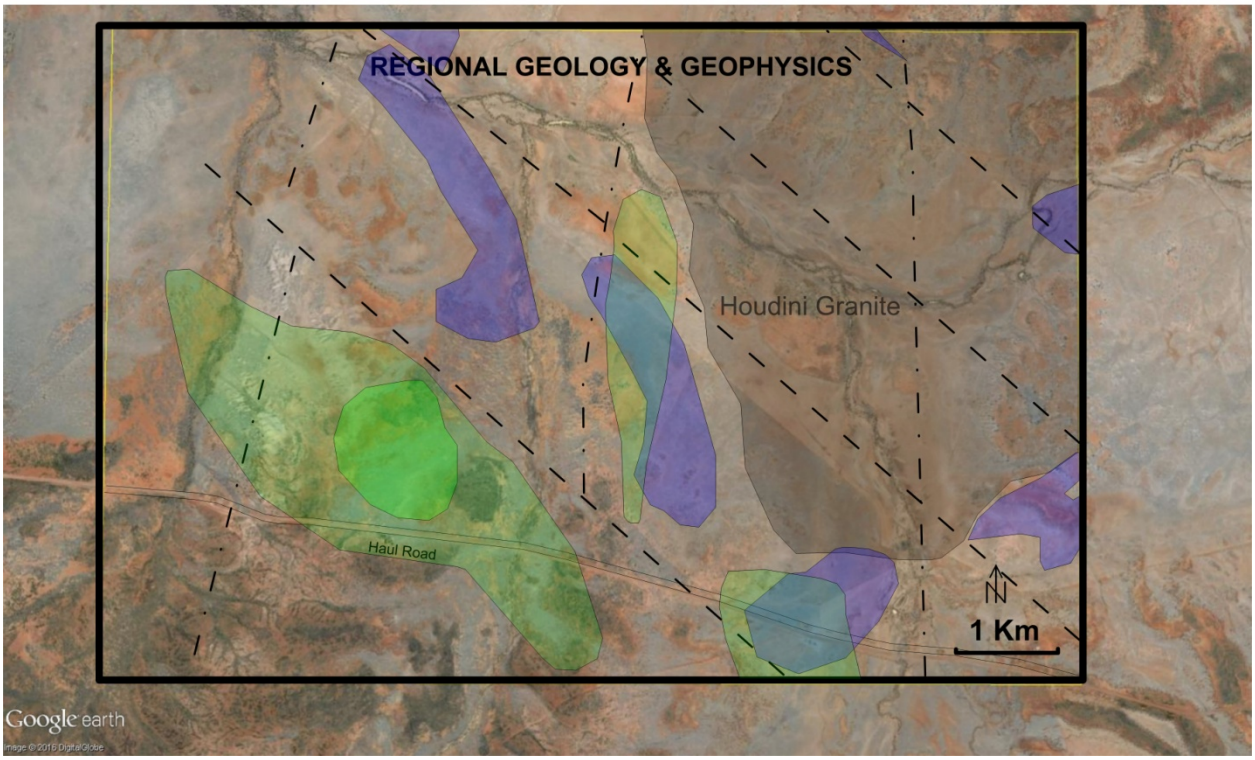


Fig 3. Geology and geophysics of the Lily Creek area. Magnetic highs (blue) and gravity (green) with interpretive structure.

Geochemistry

Soil geochemistry reveals several discrete zones of anomalous (>120 ppm Cu) copper mineralization the most important of which lie along the NW-trending series of magnetic highs which bound the west margin of Houdini granite (Fig 4). Two of these zones lie west of the NW-trending magnetic anomaly, and exceed concentrations of 190 ppm Cu. One of these is intimate with a gravity high, and this area in particular was chosen to test GAS'm.

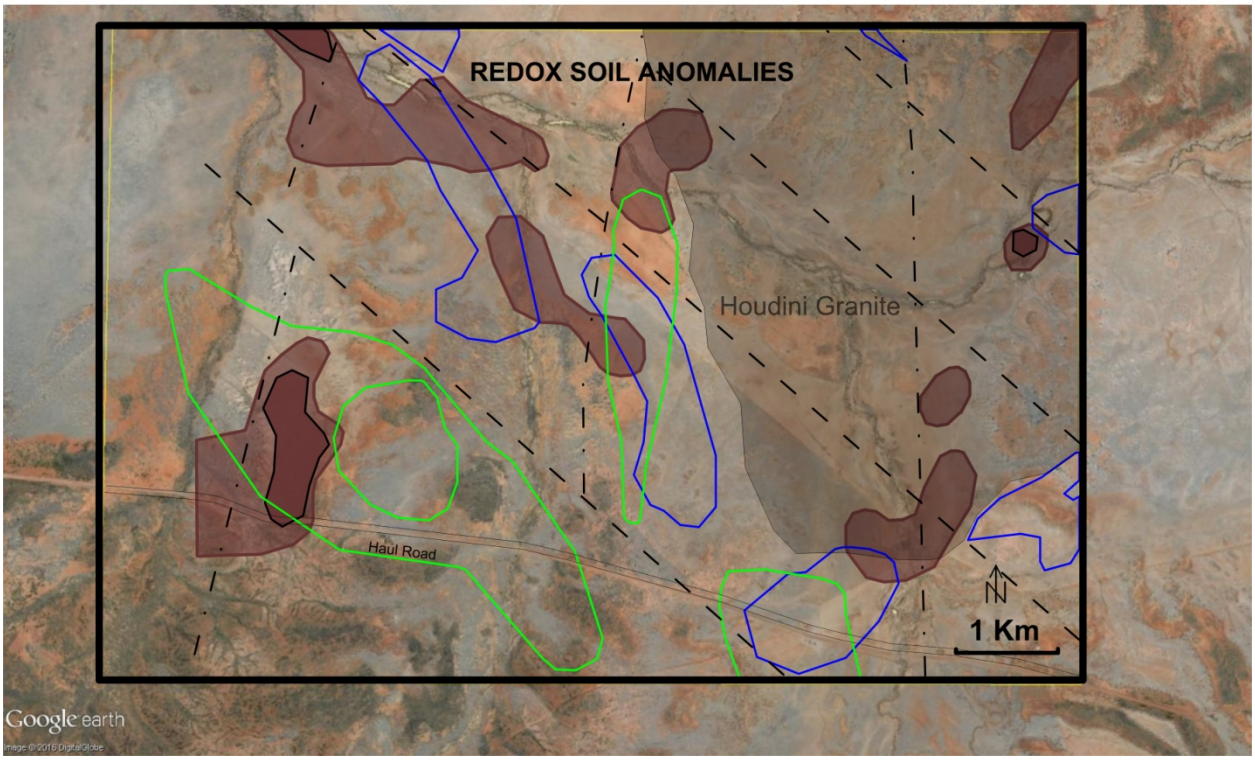


Fig 4. Redox soil copper anomalies (brown, >120 ppm and >190 ppm Cu) of the Lily Creek area relative to gravity (green outline) and magnetic anomalies (blue outline).

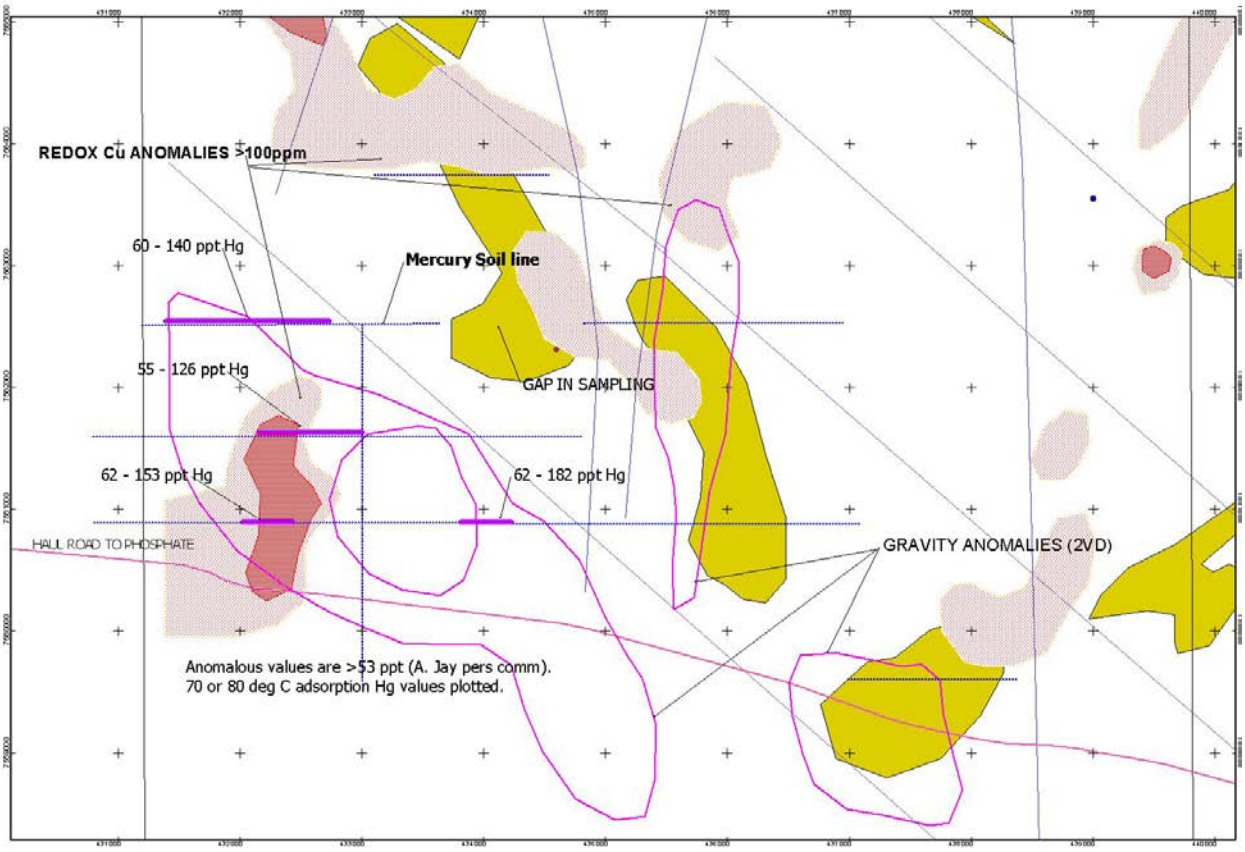


Fig 4a. Composite map of the geophysical, soil-geochemical, and GAS'm results of the Lily Creek Project area. Note that GAS'm anomalies occur west and east of the gravity high.

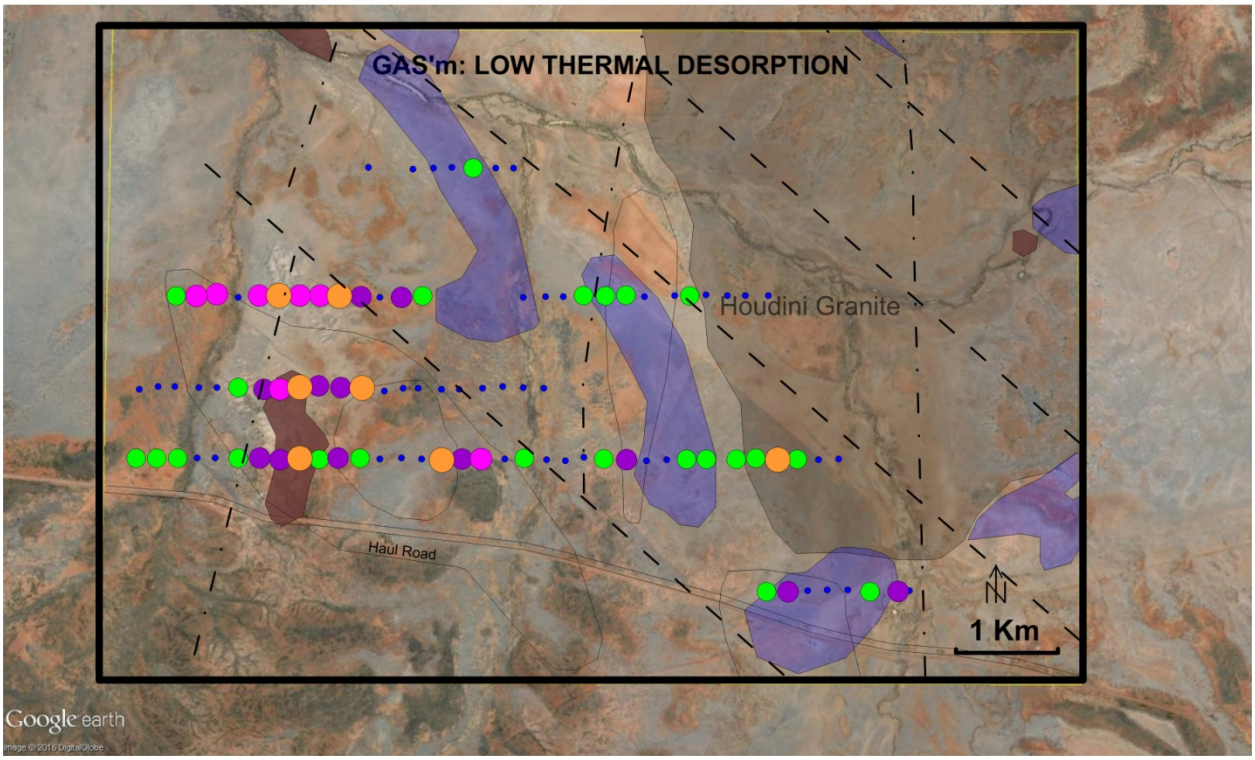


Figure 5. GAS'm results from the Lily Creek area. Background mercury concentrations (blue & green) correspond to generally background gravity & background magnetic areas. Anomalous mercury concentrations (purple, magenta, orange, in increasing order) highlight known redox copper mineralization, and extend the prospective area approximately 2Km further to the north. Anomalous mercury concentrations are color coded for concentrations of 55 to 182 ppt Hg.

Lily Creek Discussion

As the results came in, there was much discussion about differing anomaly patterns and the absolute concentrations of mercury as a function of temperature. It was not appreciated that specific molecular species release mercury at low desorption temperatures, while a completely different suite of molecular species release mercury at higher temperatures, resulting in different mercury concentrations (some lower, some higher). Consequently, anomaly patterns differ as higher desorption temperatures are applied. The method does not test the behavior of one mercury species. Rather, the bonding energies of several molecular species are broken as desorption temperatures are increased. To interpret these data correctly, the geochemist has to understand that mercury concentrations are related to the substrate to which the mercury is bound, and not as a free (native) molecule. With this understanding, the differences between mercury related to structures, and mercury related to mineralization can be appreciated.

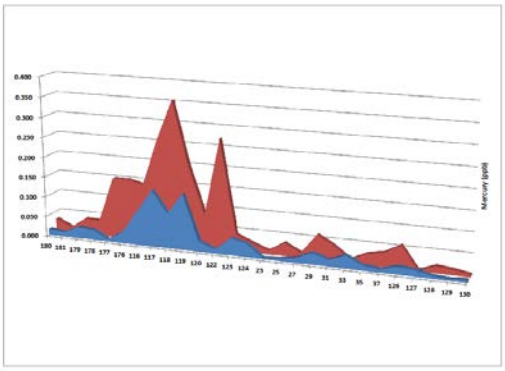


Fig 6. North Line (62500). Spikes in the high thermal desorption pattern indicate structure, while the plumes of overlapping low and high thermal patterns indicate mineralization. Mineralization appears to increase from south (Fig 8) to north (Fig 6).

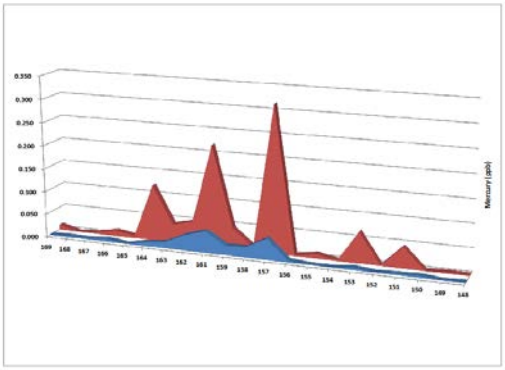


Fig 7. Mid Line “61600”. Three prominent structures are indicated by the high thermal pattern in the mineralized zone.

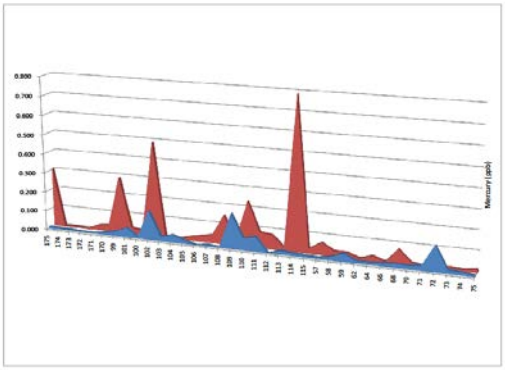


Fig 8. South Line “60900”. Two mineralized zones (west and east of the gravity high) are shown.

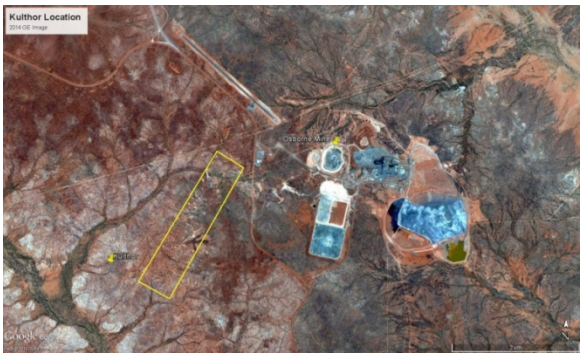
Another issue under discussion related to mercury anomalies that are offset from interpretive structures. Northwest-trending, post-Cambrian normal faults lie parallel to normal faults that were developed after rifting, and are overlain by Sequence 2 overburden that includes steeply dipping NE-ENE trending faults. Dips are generally to the east and east-southeast. These cut northwest trending magnetic anomalies that are generally SW-dipping, but with a few NE-

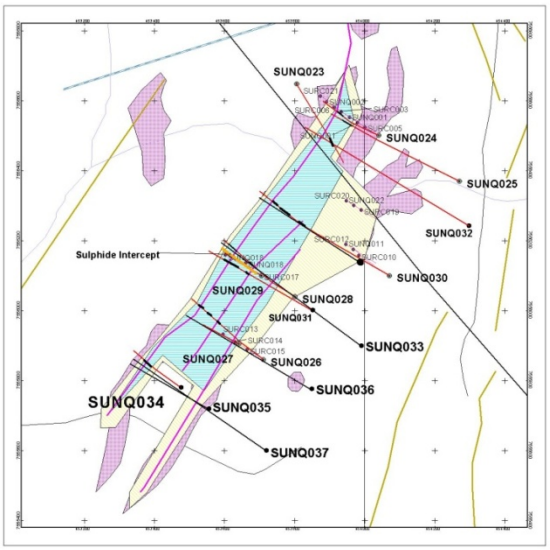
dipping intervals (modeled after Massey & Coggon). There is yet a third set of north-trending thrusts with steep E-ESE dips. In other words, the area is structurally complex, and association of anomaly offset is very complicated.

Sample spacing was 200 meters along lines that are one to several kilometers apart. In hindsight, this is very wide spacing for a gas survey, which is considered now to be too low a sample density for reliable structural interpretation. As a result, there was much discussion about the offset of the GAS'm anomalies (100's of meters) relative to steeply dipping structures and magnetic anomalies. A workable conclusion at the time of the survey postulated that given a Cambrian thickness of 400 meters, easterly dips of 70-80 degrees could account for gas displacement of 200-300 meters.

Kulthor Project

The Kulthor Project area was sampled in February, 2001. Samples were analyzed for speciated mercury (GAS'm) with additional samples from the Lily Creek Project. The submittal was for orientation purposes only and included only nine samples. It is presumed that these samples were taken from a generally east-west line across the Kulthor Project area, where a sulphide zone had been encountered by drilling. The project geologist reported that: "This is a sub-vertical structural target with Cu mineralization over a maximum true thickness of 50m, though generally <30m. The sulphide zone in the structure is overlain by 50m of barren cover, then 250m of oxidized, partially leached mineralization. The mineralization extends over at least 1000m strike, possibly 3000m. Mineralization is associated with carbonate/quartz veining and breccia infill, with carbonate infill and veining extensive in the upper parts of the structure. We have conducted detailed [selective soil extraction geochemistry] sampling (200m x 50m) over the structure with no apparent anomaly. We are planning to trial a [soil gas] survey over the highest grade portion of the sulphide zone after the wet season (~April) …" (pers. comm. D. Esser, 1/22/2002). The larger survey was never undertaken, as personnel changes and continuity were lost by June, 2002.





Figs 9 & 10. Location map showing the Kulthor Project area, the Osborne Mine, and the geology (without description). The sulphide discovery hole was SUN-RC-17.

Results from this nine-sample orientation were very encouraging. Low and high thermal desorption results were complementary and showed a zone of high mercury concentration. Relationships between the profiles suggest the mineralized structures are east-dipping. Drill orientation to the west indicates the same easterly dip of the mineralized structures.

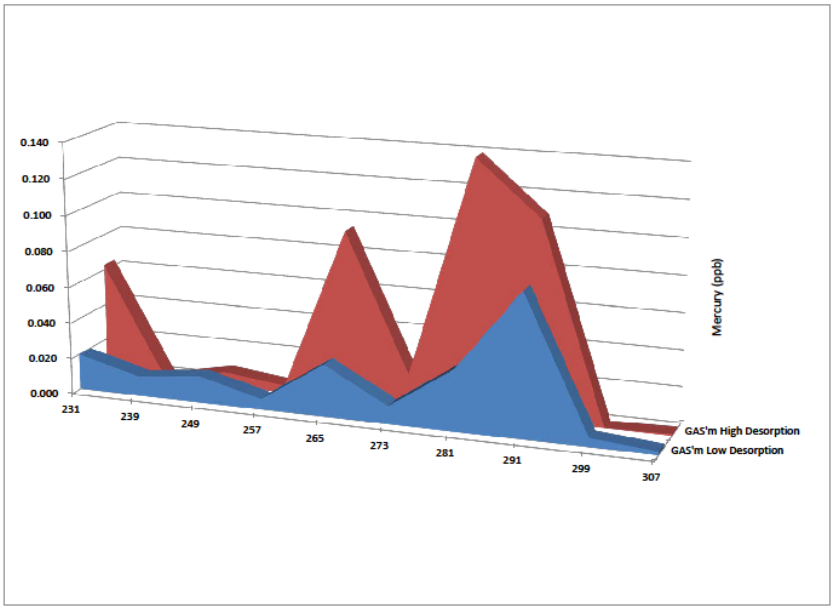


Fig 11. High-thermal and low-thermal desorption results from nine samples taken over a deep sulphide vein at the Kulthor Project area. The pattern offsets volatile mercury species to the east of more refractory species, indicating an east dipping structure.