MEMORANDUM

TO: Mo Munshi, Sean Delaney, Phung Nguyen, Tim Hronsky
FROM: Neil Rutherford
DATE: 7 January 2010
SUBJECT: Some comments on Tennant Creek Targets

Introduction

This memo outlines some features and suggests a couple of targets that we might consider exploring (again) following a review of historic exploration undertaken. One of these (WG2) was proposed in the report of my field visit in September 2008. This falls within Hronsky’s AOI-2 “core zone”.

Anomaly WG2

This sits in an area of highly elevated magnetic (hornfels?) anomalism at the NW corner of the Tennant Creek Granite batholith as shown in Figure 1 below (arrowed) in the regional magnetics data. (More detail in Figure 7).

Figure 1: Location of Prosperity Tenements, recognised anomalies and AOI-core zones (yellow) over regional magnetics.
Figure 2: WG2 Target. Prosperity geophysical target drilling designed to cross “EM geophysical target” circled in red. Hole “D” was not drilled. Other holes would not pass through zone with outcropping Fe-stone.

Figure 3: Site of Prosperity WG2 drilling. Fe-stones off left of picture. Site probably better drilled from left (southern) side of hill to test Fe-stones. Historic drilling site on other Fe-stone development circled. Blue polygon is an area tested by WMC by IP and traverse drilling. (A= PTWCRC4; B=PTCRC5; C=PTCRC3).

Figure 2 illustrates the discrepancy between the Prosperity drilling of Southern Geoscience EM targets (red circles on the figure) and outcropping geology. Only three holes were drilled and these were unlikely to have tested the potentially more interesting geological part of the section based on...
field mapping (boxed in blue). The outcrop pattern of the Fe-stone shows recognised folding along the general strike trend. There may have been some issue in obtaining drill access to the south of the outcrop area to drill from south to north but I cannot recall the detail, however a vehicle track does run along the ridge next to the Fe-stone outcrop along the ridge top.

The outcrop pattern suggests dilatant structural deformation along the section that, although of limited strike length in outcrop, it might be considered worth testing at depth. Field mapping may suggest a pitch direction to the Fe-stone bodies. Locally there does seem to be cleavage or joint alteration and dips indicate series of syn- and anticlinal folds in the outcrop.

Figures 3 and 4 illustrate the field setting of the site and wider area. The wider area is largely covered by thin skeletal soil with low outcrop of metasediment, often strongly cleaved, with occasional Fe-stone horizon outcrop. The most prominent of these have been drilled by several drill traverses (circled in black in Figure 3 and see Figure 6). In Figure 2 the yellow drill pad location from previous exploration suggests that the Fe-stones may have been tested, but a collar is not obvious so an assessment of available records for drill information should be undertaken.

The ridges which host the mapped Fe-stones are quartz sandstone horizons typical of many of the higher ridges in the region. These are shown in Figure 4. Field inspection and rock chip sampling was undertaken by Rod Graham and this and other company site information should be reviewed before drilling to determine the geochemical character of the Fe-stone and whether or not they are simply deeply ferruginised sandstone, rather than being as a result of magnetite alteration or Fe metasomatism and alteration related to mineralisation.

Figure 4: Outcrop of Fe-stones at WG2 site. Ridge track is just off right edge of photo.
Figure 5: Chip sampling of Fe-stones at WG2 (R Graham) and outcrop on ridgeline. North and drilling to right of photo.

Figure 6: Outcrop of Fe-stone and drill collars to NW of WG2 site (black circle Figure 3). Float and low outcrop is typical of much of the AOI-2 core zone. Erosion has for the most part stripped weathered rock and soil profile to saprock so available surface and shallow bedrock multi-element geochemistry and standard geophysics should be satisfactory.
Limited composite rock chip samples from WG2 and for comparison WG1 to the east and White Devil are shown below. (See Figure 1 for location of WG1). Mineralised Fe-stones show elevated Au-Cu-Bi-Mo-Pb-Ag-As-Sb-Co-P values.

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The WG1 values represent more typical values from mineralised Fe-stone associated with old mines however elevated Cu-Bi-Mo and weakly anomalous Au, slightly elevated P may be indicative of anomaly at the WG2 site. The higher Ba may reflect a different host lithotype. The lower Fe may reflect distance from mineralisation or simply that the Fe-stone is related to surface ferruginisation. Additional rock chip sampling may be merited.

The relationship of old mines and Prosperity drilling is shown in Figure 7 below. This area was extensively explored and various sites drilled by Geopeko during the 1970s, (Explorer naming of everything period of Geopeko), and various others since then following up from Orlando to east.

Figure 7: Location of Prosperity drill holes, old workings, core areas, over magnetics EL 23846. High values from WG1 hole PTCRC02 are illustrated below. Holes at WG1 were drilled in the vicinity
of old workings but PTCRC02 illustrates a lack of characteristic chlorite-magnetite-hematite alteration although the area is anomalous magnetically. Drilling here was also focused on testing an “EM Anomaly” with the geological target seemingly being disregarded with one hole drilled away from the inferred geological target.

Figure 8: Cu-Au mineralised intercept in PTCRC02 from Great Western Anomaly (WG1). Notably visible are chalcopyrite chips in cuttings. Intersection lacks characteristic chlorite-magnetite alteration, hematisation or deformation (cleavage or shearing) as seen in outcrop.

Figure 9: View from top of hill and Fe-stone at WG1 over workings toward drill sites and Warrego Road. The Fe-stone area has a number of pits developed along its strike and has been drilled at depth. Only the PTCRC02 hole intersected the chalcopyrite bearing interval.
**Fassifern - Juno Area Anomalism**

For the most part anomalies drilled by Prosperity in this area sit either in areas of lower magnetic anomalism or are marginal to some high magnetic zones. One key area, the extension of the Juno line into Prosperity tenements, is inaccessible due to Aboriginal access issues. This notable area includes a zone of elevated magnetic anomalism. The known prospects are illustrated in Figure 10 below plotted over the magnetics, some reprocessed, which shows tenement outlines and two “core zones”. Figure 12 gives a more regional perspective of magnetics and Figure 13 geological setting.

![Image](image-url)

**Figure 10:** Relationship of known workings magnetics and magnetics Fassifern-Juno area. Red dashed area about Juno is excluded due to aboriginal access issues. Boxed areas are target areas for review.

Figure 11 illustrates the marked contrast in magnetic response directly associated with recognised ore bodies, even for small deep bodies of mineralisation such as at TC8 and Chariot which sit within a narrow structure developed along the southern margin of a significant porphyry intrusive.

![Image](image-url)

**Figure 11:** Location of mineralisation in relation to small intense magnetic features. Size of magnetic anomaly does not appear to directly relate to deposit size but there is a close spatial relationship of mineralisation with the more intense magnetic features. Size is related to extent and character of dilatant deformation at a site.
Figure 12: This area was the centre of much of the production from the Tennant Creek Field, including Juno, Peko, Nobles Nob, Eldorado, Argo etc. There is generally moderately good exposure with only thin Quaternary cover. It has had extensive detailed exploration. Target areas are boxed.

The Fassifern site has an unusual outcrop that may reflect non-chlorite-magnetite alteration. This is seen as what might be inferred to be silicified dolomitic alteration a feature that characterises the upper sections of deposits such as TC8 and other ore bodies above the magnetite bodies. Examples of dolomitisation are shown below in Figure 13 and position above ore zone is shown in Figure 14.

Figure 13: Dolomite-chlorite alteration From near TC8 ore body. This can be massive and crystalline.
Figure 14: Position of dolomitic alteration in ore zone about Juno, TC8 and Nobles Nob (light blue) at top of main ore zone. Warrego represent a slightly different style of mineralisation being more silica-sulphide-rich and probably a deeper higher, temperature system.

Figure 15: Fe-stone (upper) and possible silicified carbonate alteration (lower) at Fassifern. Right bottom characteristic pinkish dolomitic carbonate at 261-262m depth in RC hole at Fassifern.
An assessment of historic exploration should be undertaken from Fassifern south toward the Eldorado area incorporating the Dolomite and Pup workings and for the Juno east west magnetic ridge to assess the completeness and nature of exploration. The areas are boxed in Figure 12. The most prospective zones are (surprise surprise) under Aboriginal access restriction. Any exploration undertaken over a prominent magnetic peak northeast of the Ajax and Pinnacles workings (yellow circled Figure 10) should also be assessed. Much of the area has shallow Quaternary cover, often with small windows of outcrop, so routine geochemical and geophysical methods should be suitable for assessment. Historic exploration will help resolve characteristics of covered areas.

Excalibur Resources who hold the Juno mining leases are interested, one assumes, in the continuation of the magnetic ridge to the west and northwest of Juno (Figure 10). The nature of this ridge may be well defined from historic drilling but Excalibur may have an interest in near surface
supergene concentration of Cu-Au in shears and fracture zones extending from their Juno Mining Leases into Prosperity Licences. It falls within Aboriginal restricted access zone. Excalibur comments on their targets at Juno, taken from their website, are given below:

**Proposed Exploration Targets and Program**

Three main exploration targets on which further work is recommended:

- Extensions to the Juno mineralisation outside the existing mine workings, includes possible very thin but very high grade supergene enriched zone at the base of oxidation, remnant mining pillars, depth extensions; low grade haloes surrounding the old workings and possibly mineralised stope fill. Limited surface drilling and drilling from refurbished and extensions of existing underground workings is recommended.

- Two targets close to each other, one known as M10 and another EM geophysical anomaly called JE1, warrant immediate drilling. The M10 deposit has already been intersected by a limited number of diamond holes.

Due to the very high economic cut-off grades prevailing at the time of its discovery, when the gold price was considerably lower than current prices, follow-up drilling to determine the dimensions and average grade of this mineralisation was never done. The JE1 EM target is parallel and very close to M10 so they can be drilled as part of a single program. Further drilling on a regular grid from a refurbished and extended underground development at Juno, or possibly the surface, to determine the grade and dimensions of this mineralisation is recommended.

Of lower priority are two other gravity targets, JG1 lying 200-400 metres southeast of Juno ore body and adjacent to a thick sequence of haematite shales potentially forming Juno type orebodies in structurally favourable settings and JG2 along the postulated down plunge extension of the Juno East mineralisation. These targets will need to be tested with inclined diamond drill holes drilled from the surface to determine their significance.

It is recommended to conduct an EM survey over the whole of the Juno and Nobles Nob tenements along regular survey lines to update and extend an earlier successful EM survey. This work should better define the anomalies already identified after interpreting existing gravity and magnetic data and earlier drilling results. The EM geophysical method seems to be particularly suited for the style of mineralisation found at Juno and readily detects the alteration halo surrounding the gold/copper mineralisation.

After the EM surveys and interpretation of the results has been completed, follow-up inclined RC drilling approximately 200–250m deep along fences over any anomalies will be required.

Drilling for possible un-mined depth extensions to the Nobles Nob mineralisation including a possible M10 look alike en-echelon to the main ore body is recommended. It will however be difficult to gain access to drill hole collar sites due to the location of existing open cut and underground mine workings.

**Other Areas**

Mineralisation and alteration seen to the immediate north of Tennant Creek seems trivial in comparison to the area to the west (Warrego-Orlando-White Devil-Gecko) and south east of Tennant Creek (Juno-Peko-Argo-Eldorado-Nobles Nob) and it is difficult to model viable new targets in those areas. There is plenty of evidence of previous exploration activity and results from Prosperity work were not encouraging.

The Rover anomaly of Westgold to the south west of Tennant Creek is in an area of thick superficial cover (100-150m+) which makes for difficult exploration and reliant for the most part on geophysics (magnetics) for the first pass. The approach has however been reasonably successful although targets are deep and consequently small targets would be likely be uneconomic.