



**EL27373 Bloodwood**

**Arunta Project**

**Annual Report**

**21 December 2010 to 20 December 2011**

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**Tenure Holder: Paradigm Mexico Pty Ltd**

**Submitter of Report: Crossland Uranium Mines Ltd**

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**Target Commodities: Uranium, rare earth elements, base metals, precious metals**

**Mapsheets: Mt Theo and Mt Doreen (1:250,000)**

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## **Abstract**

In early 2010 Crossland Uranium Mines Limited (Crossland) purchased Paradigm Mexico P/L (PMPL) from its parent company Global Geoscience Limited. As part of that purchase the subject granted tenement was 100% acquired. The Bloodwood tenement, which forms part of a package of licences (all others 'in application' as of the date of this report) is located within the Arunta Region of the Northern Territory. The licence is located approximately 400 km NW of Alice Springs.

The Palaeoproterozoic Arunta Region is highly prospective for uranium mineralisation as demonstrated by the presence of calcrete-related deposits at New Well (Napperby) and basement hosted mineralisation at Crystal Creek, Cockroach Dam and Macallan. The ground in northern Arunta is tightly held by uranium exploration companies such as Deep Yellow, Energy Metals and Yellow Rock Resources. Crossland has been exploring for uranium and rare earth elements in the Arunta region and this purchase is a significant addition to its portfolio of prospective property holdings.

The licence area is underlain by Palaeoproterozoic to Mesoproterozoic meta-sediments that have been intruded by granitic rocks of various age (1820-1600Ma) and is considered to be prospective for uranium and base metal mineralisation. Previous exploration has been almost exclusively for gold. The Bloodwood project is located on pastoral leasehold land.

Reconnaissance work was undertaken by the company in the form of stream sediment and rock-chip sampling. No airborne Mag-Rad was undertaken.

Over the reported period, total expenditure for EL 27373 was \$25 585.

## **1. Introduction**

Crossland commenced exploration activities in central Australia in 2004. Both nickel (initially) and uranium were targetted in a broad swath of country located immediately north of the MacDonnell Ranges National Park, approximately 100 km WNW of Alice Springs. With the increased knowledge gained over the intervening years of exploration, Crossland has significantly increased its property holding where the geological setting favours the occurrence of significant uranium accumulations as well as deposits of rare earth elements, base and other metals.

The Bloodwood licence is one of five tenements acquired by Crossland from PMPL in the Arunta region. The other four properties, which are currently under application, are collectively termed the 'Highland Rocks Project'. The Highland Rocks Project is located approximately 95 km NW of Bloodwood and has a near identical geological setting and prospectivity rating.

During the reported period, a reconnaissance exploration programme which targeted uranium, gold, REE, base metals and other viable economic mineralisation was conducted. The programme comprised stream sediment sampling of the creeks across the EL and rock-chip sampling in areas of past mining activity and anomalous geochemistry (figure 2).

## **2. Location, Title History, Physiography and Access**

The licence straddles the Mt Theo and Mt Doreen 1:250,000 map sheets.

The Bloodwood tenement is situated 40 km northwest of the Bigryli uranium deposit, 175 km south southeast of The Granites, and approximately 45 km west of the Tanami Track. It covers an area of about 172 km<sup>2</sup> on the Mt Doreen pastoral lease. See Figure 1.

EL 27373 was granted for a six-year term on 21 December 2009 (expiring 20 December 2015). The title covered an area of 54 sub-blocks (171.89 km<sup>2</sup>). The EL is held by Paradigm Mexico Pty Ltd, which is wholly owned by Crossland Uranium Mines Limited.

## **3. Geological Setting, Exploration/Mining History and Exploration Rationale**

### **3.1 Geological Setting**

#### **3.1.1 Regional Geology**

The Bloodwood project is located within the Arunta geological province. The geology of the area is not well understood due to a lack of outcrop and extensive regolith cover and therefore interpretation is based largely upon airborne geophysics, regional gravity and seismic reflection surveys. To the north-west the adjoining Tanami-Granites province is better understood due primarily to the degree of previous exploration undertaken since the 1980's and it has been postulated that lithostratigraphic units within the Tanami-Granites province have lateral equivalents in the Arunta block. The relationship between the Tanami-Granites and Arunta Province is unclear however the basement meta-sedimentary sequences have similar magmatic, metamorphic and deformational histories.

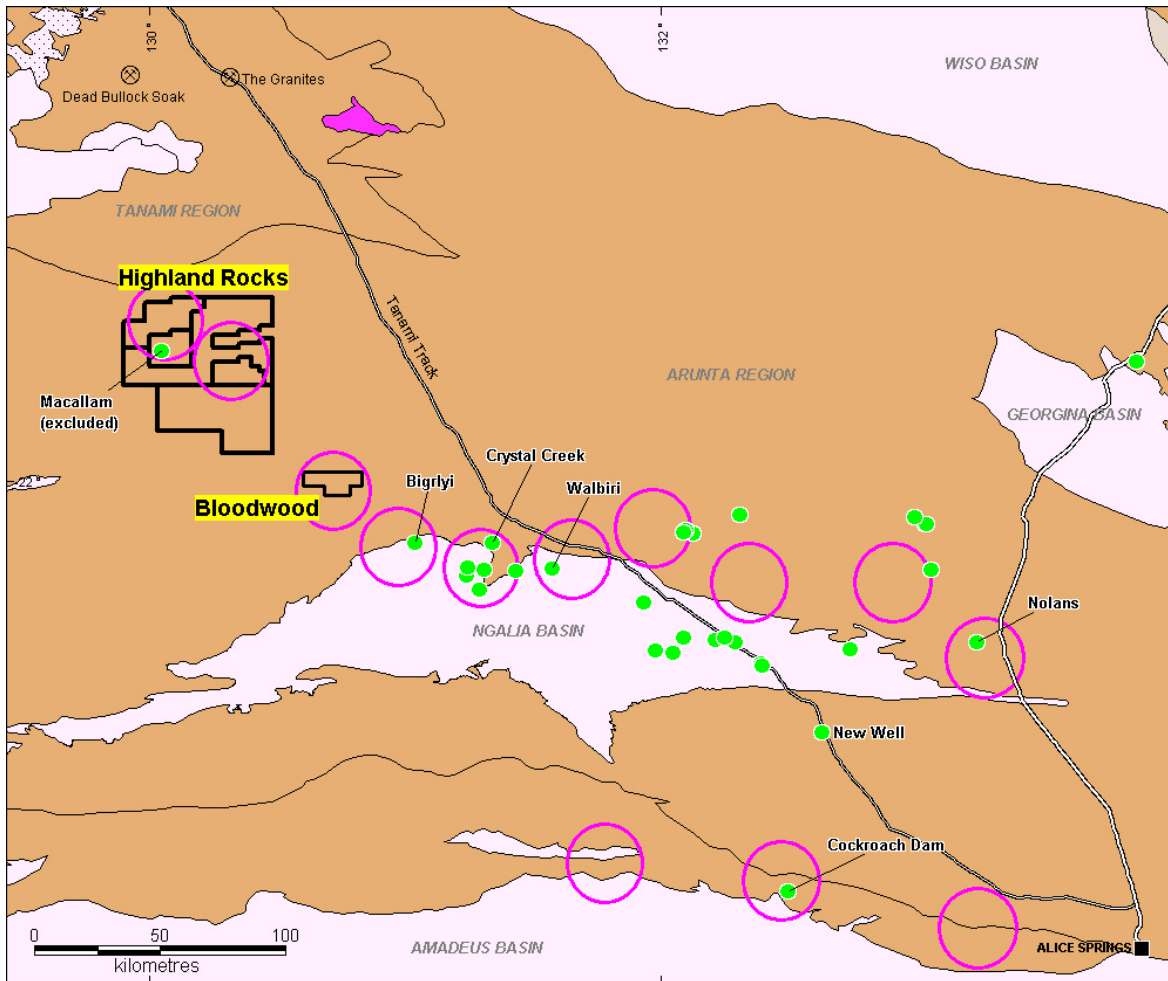


Figure 1. Location Plan of EL 27373 Bloodwood

### 3.1.2 Local Geology

The oldest rocks in the project area comprise metasediments (turbidites) of the Lander Rock Beds (1860-1830 Ma). They are unconformably overlain by metasediments of the Reynolds Range Group (Pine Hill Formation and Mt Thomas Quartzite), which form a prominent east-west ridge (Wabudali Range) running through the northern half of the project area. Both units are intruded by granite and granophyre of the Wabudali Granite (1820-1730 Ma). Some of the poorly exposed/mapped intrusive rocks could also be part of the younger (1600 Ma) Southwark Granite which is exposed further to the south. The Reynolds Range Group rocks have been tightly folded to form an overturned syncline with an east-west fold axis and gentle plunge to the east. Some units within the Reynolds Range Group are strongly magnetic and are readily visible in airborne magnetic data. Metamorphic grade ranges from low to high (amphibolite/granulite).

Reynolds Range Group rocks dominate the northern part of the property whereas the southern third is mostly the older Lander Beds. The two areas are separated by an extensive area of aeolian sand cover with very little bedrock exposure. A second, smaller, narrow ridge in the southern half of the property trends in a WNW direction over a length in excess 10 km. The ridge is mapped as granite and whilst it appears to be dyke-like, it is almost certainly reflecting silicification and veining along a major structure that can be

traced over a distance of at least 40 km. Uranium mineralisation occurs along this structure at the Venerable Creek prospect.

### **3.2 Exploration/Mining History**

The Bloodwood area has been previously held under licence by the following companies:

- 1976-1977 Swiss Aluminium Mining – Uranium.
- 1988-1990 Track Minerals - Gold
- 1994-1996 Yuendumu Mining/Poseidon Gold - Gold
- 1996-1997 BHP Minerals – Copper and Gold
- 2001-2006 Tanami Gold - Gold
- 2008-2008 Matilda Minerals Uranium

All exploration since 1976 has been of a reconnaissance nature and consists mainly of lag sampling and vacuum drilling with restricted rock chip sampling at several locations. Most exploration activity was undertaken in the period 1989-2002 following major gold discoveries in the Tanami-Granites Province.

The only known uranium exploration in the area was that undertaken by Swiss Aluminium Mining (Swiss) in 1976-1977. Swiss carried out a programme of reconnaissance geological mapping, shallow percussion drilling, reconnaissance ground radiometric surveys, shallow seismic work and petrology over nine calcrete areas. Two of the areas are within the project area: Venerable Creek and Bloodwood Bore (partly within).

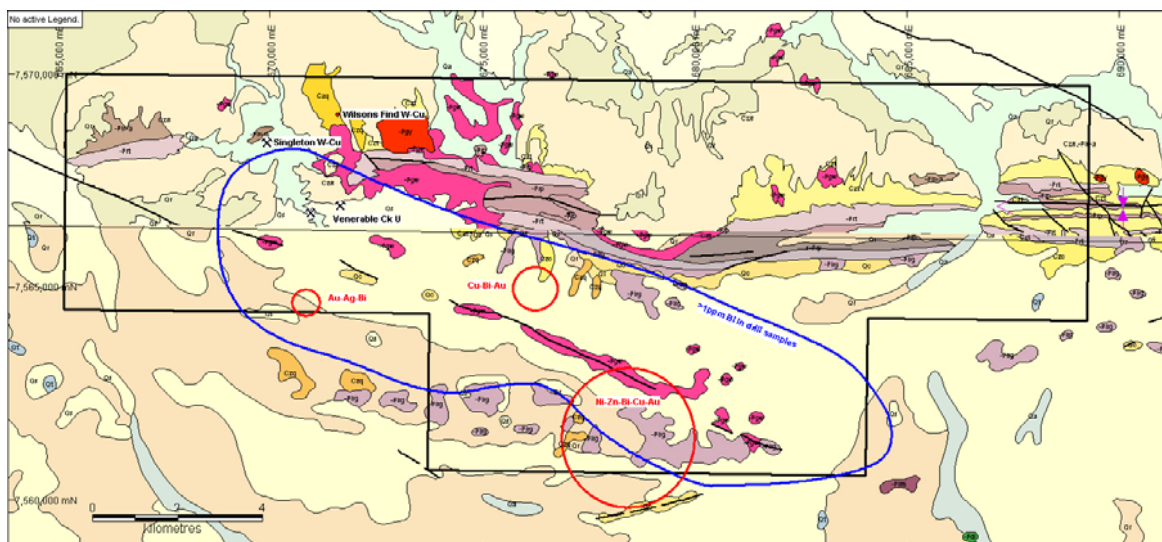
Track Minerals collected 18 BCL stream sediment samples from streams draining the north side of the Wabudali Range. No anomalism was detected. Sixteen rock samples, mostly coming from the Singleton W-Cu prospect, contained anomalous copper and silver.

Normandy Mining (PosGold) completed programs of soil sampling and vacuum drilling over the southern half of their area (Grasshopper grid on EL 8435) as part of much larger gold exploration program that targeted structures within the Lander Beds in close proximity to K-U-Cu bearing granites (Southwarke Granite). Soil samples (<125 microns) were collected on a 250 x 500 m grid. Drilling was done on a 500 x 2000 m grid and holes were generally less than 10 m deep. Samples were analysed for a suite of elements which did not include uranium. Maximum gold values of 2.4 ppb and 6 ppb were reported for the soil and drill samples respectively and occurred as single point anomalies.

The Bloodwood area is covered by two modern airborne geophysical surveys:

- 1993 Mt Theo – Highland Rocks Survey by AGSO at 90 m height and 500 line spacing.
- 1995 Mt Doreen by Poseidon Gold at 80 m height and 400 line spacing.

Data from the 1995 Mt Doreen survey has been merged into the larger Mackay Geophysical Survey (1998).



**Figure 2.** Surface Geology and location of Prospects and Anomalous Geochemistry

The **Venerable Creek prospect** is located on a 12 km long linear WNW-ESE trending airborne radiometric anomaly (high U, low Th). This trend coincides with a topographic ridge of exposed granite porphyry and a fault/structure of the same orientation. The granite is mapped as part of the Palaeoproterozoic Wabudali Granite that intrudes the older metasediments of the Reynolds Range Group. A parallel linear radiometric (U) response occurs 3 km to the north and coincides with the main Wabudali Range. There is also suggestion of a NE trending uranium anomaly passing through the Venerable Creek prospect.

Swiss Aluminium identified the Venerable Creek prospect (part of the broader area referred to as Calcrete Area 1 “CA1”) as an area of interest based on surface calcrete sampling. Three anomalies separated by a distance of about 2 km were tested with two programs of shallow drilling (10-20 m depth). Twenty-one holes were drilled into the central (Venerable Creek) anomaly, six at the western anomaly and four at the eastern anomaly. The Venerable Creek prospect returned the best results with six of the first eight holes returning anomalous uranium with values up to 810 ppm. No analytical data was provided for the other 15 holes.

Drill logs indicate that the highest values were in fact obtained in a bedrock mica schist unit immediately underlying the calcrete with the values tailing off in the hornfelsed mafic unit that underlies the mica schist. A 500 m long ground radiometric traverse east of Hole 1F gave Total Count values in the range 600-900 (low Th, high U) from an outcropping muscovite-biotite granite porphyry close to drill hole 1F. Pitchblende was suspected in a petrographic sample taken from nearby granite outcrop (TS12308).

The **Singleton tungsten-copper prospect** consists of a series of parallel quartz veins hosted within meta-sediments and pegmatite. During the reconnaissance programme, this prospect was identified as having been missplotted; it is in fact the same as Wilson’s Find. It should be noted that the annual report of the period 21/12/2009-20/12/2010 stated Wilson’s Find as being miss plotted, contrary to this, on-site inspection found the reverse to be true.

**Wilson's Find** is an occurrence of scheelite-copper bearing quartz veins. The veins strike northwest and dip steeply to the southwest and are up to 0.3m wide. They have been worked to shallow depths over lengths of 30-300 m. Track Minerals collected 13 rock chip samples from the workings, six of which contained >1000 ppm copper (1.4% max) and >3 ppm silver (22 ppm max). Gold levels were below 0.01g/t. In the period covered by this annual report, 11 rock samples were collected by Crossland from this prospect.

### 3.3 Exploration Rationale

The Arunta Region is particularly prospective for uranium:

- **Age.** The Arunta Province is a continental block and broadly synchronous in time with the Pine Creek Orogen with a maximum Palaeoproterozoic age and a minimum Neoproterozoic age. The Pine Creek Geosyncline is considered to be early Proterozoic, with meta-sedimentary rocks deposited in an intracratonic structure formed as a result of rifting of the Archaean gneissic and granitic basement.
- **Stratigraphy.** The Tanami-Granites Province, and by inference the Arunta Block, consist of two major subdivisions separated by a major unconformity. The lower lithostratigraphic unit termed the Tanami Complex is postulated to rest unconformably on an Archaean basement. The Tanami Complex is comprised of turbidites, siltstones, chloritic and sericitic shales plus carbonaceous shale, banded iron formation and mafic and felsic volcanics. The majority of the gold mineralisation in the Tanami-Granites Province is hosted by reactive lithologies such as BIF's and carbonaceous shales. The Tanami Complex was then deformed and metamorphosed prior to the emplacement of volcanics and a cover sequence of sandstones. The Arunta Block has analogous depositional environments, lithotypes and stratigraphy to that of the Pine Creek Orogen and is therefore prospective for uranium.
- **Structure.** The Arunta Block was strongly deformed in several periods during the Proterozoic and Late Palaeozoic, with pre-existing structures inherited from the Mesoproterozoic terrain being reactivated.

In the Pine Creek Orogen, unconformity related uranium mineralisation is associated with structurally disrupted Palaeoproterozoic graphitic metasediments and carbonates in stratigraphic proximity to Archaean granitic gneiss domes. The deposition of uranium and its probable remobilisation is concentrated along dilatant structures, which cut both the cover and the basement sequences. The geological interpretation by the NTGS suggests the Bloodwood (and Highland Rocks) areas are mainly underlain by Palaeoproterozoic metasediments which are cut by a number of NE and E faults. The relationships of Proterozoic rocks to Archaean domes in Central Australia is unresolved.

The tenement is located to the north of the Neoproterozoic-Palaeozoic Ngalia Basin, which hosts sandstone-type uranium mineralisation including the Bigrlyi deposit. Numerous sub economic sandstone-type uranium occurrences exist on the periphery of the Ngalia basin. The primary source of the uranium is inferred to be from the younger, megacrystic granites of the Arunta Inlier.

Crystal Creek is a recent uranium discovery in the Arunta Region. The mineralisation occurs within a 3 km long ENE striking fault zone, hosted by the Southwark Granitic Suite (1600Ma).

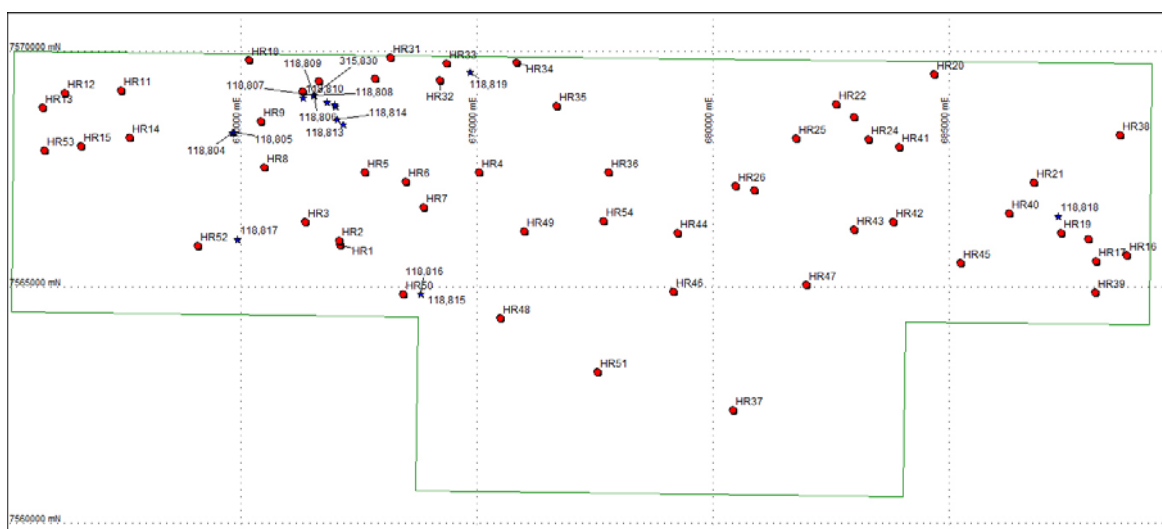
In addition to uranium, there are several geochemical anomalies of interest:



- An area of 3x3 km in the southern central part of the project with elevated Ni-Zn-Bi-Cu-Au in soil and in drill hole samples (including bedrock);
- Cu-Bi-Au anomaly in drill hole samples including 612 ppm Cu in bedrock in the centre of the project;
- Au-Ag-Bi anomaly in drill hole samples located on the south-western boundary of the project;
- A broad WNW trending area (17x4 km) of anomalous Bi (>1ppm) in drill hole samples. The trend coincides with a major structure of the same orientation that is known to host uranium mineralisation at Venerable Creek.

#### 4. Exploration Index Map

Samples taken during the reported period can be seen in figure 3.



**Figure 3.** Sample points in relation to tenement boundary.

#### 5. Surface Geochemistry

Reconnaissance work was undertaken in the form of surface geochemistry; comprising stream sediment and rock-chip sampling. Stream sediment sampling targeted drainages and ephemeral creeks within the EL (figure 4); a total of 54 samples were collected. The samples were processed on-site using a Wilfley table. This provided a heavy mineral concentrate; from which aliquots were submitted for geochemical analysis (original sample and aliquot weight's can be seen in Appendix 3). Method of analysis was aqua regia digestion (25g), elements analysed are tabulated in figure 5. Of the 54 samples analysed, 8 recorded Ce values of >700ppm, with a maximum of 892.6ppm.

Rock chip samples were taken from old workings and in areas of geochemical anomaly. In all, 18 rock samples were collected; 11 of which were taken from the prospect known as 'Wilson's Find'. The samples were analysed for a range of elements (figure 6) using aqua regia digestion at 0.50g and 25g digestion, in addition one of the samples had anomalous readings of Cu (1.64%) and was analysed using 4 acid digestion. The sample containing anomalous Cu is tabulated in figure 7.

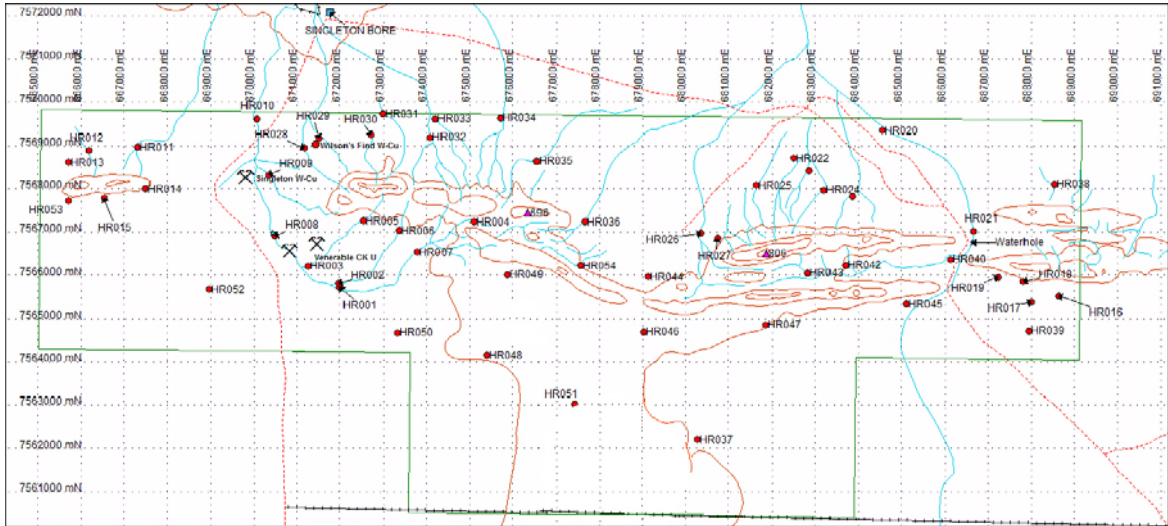


Figure 4. Stream sediment locations (HR001-HR054), in relation to the drainage.

Au	Ce	K	P	Sn	W
Ag	Co	La	Pb	Sr	Y
Al	Cr	Li	Pd	Ta	Zn
As	Cs	Mg	Pt	Te	Zr
Ba	Cu	Mn	Rb	Th	
Be	Fe	Mo	Re	Ti	
Bi	Ga	Na	Sb	Tl	
Ca	Hf	Nb	Sc	U	
Cd	In	Ni	Se	V	

Figure 5. Elements analysed in the stream sediment samples.

Au	Be	Cs	In	Na	S	Te	Y
Ag	Bi	Cu	K	Nb	Sb	Th	Zn
Al	Ca	Fe	La	Ni	Sc	Ti	Zr
As	Cd	Ga	Li	P	Se	Tl	
Au	Ce	Ge	Mg	Pb	Sn	U	
B	Co	Hf	Mn	Rb	Sr	V	
Ba	Cr	Hg	Mo	Re	Ta	W	

Figure 6. Elements analysed in the rock-chip samples.

Sample		Location				Sample assays		
Sample Type	Sample No.	Zone	Geodetic Datum (GDA)	East	North	Cu (ppm)	Zn (ppm)	W (ppm)
Rock chip	118812	52	94	672006	7568819	16400	322	310

Figure 7. Assay results for anomalous rock chip sample; taken from Wilson's Prospect.

## 6. Conclusion and Recommendations

Surface geochemistry by both Crossland and Track Minerals, has identified significant Cu values at Wilson's Prospect, W mineralisation also appears to be likely. The veins have only been worked to a shallow depth, the variability of Cu-W mineralisation with depth and along strike of the quartz veins should be investigated in the 2012 programme. Also, the potential for U mineralisation at Venerable Creek should be followed-up; hence the programme for 2012 will include the following:

- Airborne radiometric-magnetic survey. The best available airborne data is at 400-500 m line spacing.
- The stream-sediment programme of 2011 was at a regional scale; hence sampling at a smaller scale in the vicinity of anomalous geochemical data which has arisen from the stream-sediment sampling will be conducted.
- Trenching on the outcropping vein systems of Wilson's Find to test mineralisation along strike of the quartz veins and at depth.
- Reconnaissance RAB or Vacuum drilling along the NW-SE structure that appears to host the U mineralisation at Venerable Creek.

Prior to any further work a comprehensive Sacred Sites Survey should be undertaken.

Estimated cost of the exploration programme for 2012 is \$23,500.

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