Cameco Australia Pty. Ltd.

WELLINGTON RANGE PROJECT

Aeromagnetic Interpretation

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SOUTHERN GEOSCIENCE CONSULTANTS

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SUMMARY

Processing and project scale interpretation of aeromagnetic data covering Cameco Australia's Wellington Range project have been completed by S.G.C. The magnetic data used was a combination of Cameco's 2004 Wellington Range survey (200m line spacing) and a 2000 AGSO/NTGS survey (400m line spacing). The interpretation was based on images and contours generated by S.G.C. from these merged, low to moderate resolution data sets, mainly using enhancements of normal total magnetic intensity data rather than reduced to pole magnetics.

The effectiveness and reliability of the interpretation is restricted by the mediocre data quality (particularly resolution) and the limited geological control. Contrasts within the merged magnetic data set are low to moderate (amplitude range of 500-600nT) and are dominated by complex, normally and reversely magnetized responses related to the Oenpelli Dolerite. The complex magnetic patterns in the southern part of the area are thought to be predominantly mapping the distribution of the Oenpelli Dolerite. However, some relict stratigraphy, including possible equivalents of the Cahill Formation, could also be present.

The relatively narrow, elongate magnetic domain extending along the western side of the project area is thought to be mapping prospective Cahill Formation lithologies surrounded by non-magnetic Nimbuwah Complex granitoids. First pass quantitative modelling of selected magnetic profiles crossing this Cahill Formation trend indicates that basement is likely to be overlain by 200m to 400m of non-magnetic Kombolgie Subgroup and younger sediments.

A suite of broad target areas has been selected using the aeromagnetic interpretation. The majority of these are structural targets related to the inferred major, basement faults, assuming that these are part of a sinistral, strike slip regime. However, the character of the fault system has not been conclusively determined during the interpretation. A number of possible alteration zones ± late intrusives (not related to the Oenpelli Dolerite) have also been identified during the interpretation. Targets associated with possible Cahill Formation equivalents are considered high priority than those within normal, non-magnetic Nimbuwah Complex.

1. INTRODUCTION

This report describes the processing and project scale interpretation of low to moderate resolution aeromagnetics covering Cameco Australia Pty. Ltd.'s Wellington Range project (EL5893). The project is located in western Arnhem Land immediately to the north-east of the Aboriginal settlement of Gunbalanya (Figure 1). The Ranger uranium mine is situated approximately 100 km to the south-west and the rehabilitated Nabarlek site is to the south-east of the project area.

The terrain in the project area is described as 'variable, ranging from flat lying woodland, river estuary, coastal mangroves and swamps to heavily dissected sandstone plateau' (Otto et al, 2005).

Cameco's exploration is focussed on unconformity-related uranium deposits similar to the nearby Ranger, Jabiluka, Koongarra and Nabarlek deposits. Gold, palladium and platinum mineralization commonly associated with the uranium deposits are secondary targets

2. GEOLOGY

Descriptions of the regional and project geology provided by Cameco (e.g. Otto et al, 2005) plus the published geology (Coburg Peninsula-Melville Island; SC 53-13, SC52-16) have been used as guides for the magnetic interpretation. Exposure of the prospective Proterozoic stratigraphy is reasonable in the southern half of the project area but sparse in the northern half, where it is covered by variable thicknesses of Mesozoic to Recent sediments. The existing mapping for the exposed areas provides a general guide to the major, regional stratigraphic sub-divisions and correlations, but contains little detailed information on local lithological variations.

The possible presence of Cahill Formation within the western part of the Wellington Range area is of particular interest to Cameco. The elongate, semi-continuous, northerly trending magnetic unit along the north-western side of the project area has been tentatively correlated with the lower section of the Upper Cahill Formation by Cameco.

3. SURVEY DETAILS

Cameco Wellington Range Survey

Data Collection:	UTS Geophysics
Survey Date:	August, 2004
Magnetometer:	Scintrex CS2
Sampling Interval:	0.1S (~4-5m along line)
Flight Line Separation:	200m
Flight Line Direction:	090°-270°
Tie Line Direction:	0°-180°
Tie Line Separation:	2000m
Mean Terrain Clearance:	60m
Navigation:	Novatel 3951R Real Time GPS

AGSO/NTGS Regional Survey

Data Collection:	UTS Geophysics
Survey Date:	2000
Magnetometer:	Scintrex CS2
Sampling Interval:	0.1S (~4-5m along line)
Flight Line Separation:	400m
Flight Line Direction:	0°-180°
Tie Line Direction:	090°-270°
Tie Line Separation:	4000m
Mean Terrain Clearance:	60m
Navigation:	Differential GPS

The data quality for the 2004 Cameco Wellington Range survey is fair for this project scale interpretation but lacks the resolution desired for prospect scale exploration. The relatively low spatial resolution limits the interpretability of the data in areas of complex magnetic activity (e.g. the Oenpelli Dolerite). Some minor, high frequency noise also appears to be present in the data. It does not significantly influence the data in magnetically active areas but is evident some areas of subdued magnetic relief. This low level noise may be instrumental, introduced during the data reduction and processing or it could reflect surficial magnetic material.

Apart from its lower spatial resolution, the AGSO-NTGS aeromagnetics is of similar quality to the 2004 Cameco survey.

Radiometric data were collected in conjunction with the Cameco and AGSO-NTGS surveys. These data have not been used in the current processing and interpretation exercise.

4. DATA PROCESSING

Cameco supplied located and gridded data plus an image for the Wellington Range survey and gridded data plus an image for the regional magnetics. S.G.C. tidied up the gridded data where necessary and merged the Wellington Range and regional data sets. Selective imaging and contouring of the merged magnetics was undertaken. A series of digital images and 1:50 000 scale image-contour maps were generated for use in the interpretation. The image maps generated included:

- TMI shaded with 75% 2VD-AGC, with TMI contours
- RTP/TMI shaded with 50% east AGC gradient, with RTP/TMI contours
- TMI 2VD greyscale, with TMI contours.
- FVD/TMI, shaded with 50% east FVD gradient, with FVD contours.
- Analytic Signal, shaded with 50% east Analytic Signal gradient, with Analytic Signal contours.

The TMI 75% 2VD-AGC shade/TMI contours image map and the FVD/TMI 50% east FVD gradient FVD contours image map are included as Figures 2 and 3 respectively.

All maps and images generated by S.G.C. are in AGD66, Zone 53S coordinates (AGD66 datum).

5. INTERPRETATION

The aeromagnetic interpretation of the Wellington Range area is presented as a structural/lithological compilation at 1:50 000 scales (Figure 4). This overlays the 1:50 000 scale image-contour plans generated by S.G.C. from the merged Wellington Range magnetics data set. The interpretation plan has been derived from analysis of the imaged data and TMI, RTP and FVD contours. The majority of the interpretation has been based on normal TMI data derived enhancements rather than reduced to pole (RTP) data. This is partly personal preference. However, in parts of the area, the reliability of the reduction to the pole process seemed questionable. In particular, the RTP transformation may not adequately handle the very complex responses associated with the juxtaposed, normally and reversely magnetized responses associated with the Oenpelli Dolerite. RTP data

At Cameco's request, no interpretation of the radiometric data has been attempted. In sub-cropping basement and residual soil covered areas, the radiometrics may be a useful mapping aid for positioning lithological boundaries and/or for sub-dividing the magnetic stratigraphy. It may also be possible to recognize exposed alteration zones or late intrusives as if these include significant potassium or uranium anomalism.

Where possible, the limited available geological control has been used to reconcile the magnetic stratigraphy and interpreted structures with the regional geology. Separation and sub-division of the major lithological-stratigraphic units can be difficult. This reflects a combination of the poor geological control over much of the area, the low magnetic contrasts in some of the major lithological units and the very complex magnetic patterns associated with the Oenpelli Dolerite and the surrounding host lithologies.

Contrasts within the overall data set are low to moderate, with the range of magnetic intensities being about 500-600nT. Numerous remanently magnetized responses are apparent. These mostly show up as the distinctive, negative anomalies evident in the normal, TMI data (e.g. Figure 2). These negative anomalies display a similar range of absolute amplitudes (eg -100nT-250nT) as the normally magnetized anomalies within the data.

The majority of the magnetic activity in southern and eastern parts of the Wellington Range project has been interpreted as derived from the Oenpelli Dolerite. This unit displays very complex and variable magnetic character, with juxtaposed strongly normally and reversely magnetized responses being common. Some sections of mapped Oenpelli Dolerite appear to be weakly to non-magnetic. The observed response patterns range from more or less flat-lying, sheet-like bodies (sills) to extensive, linear dykes. The prominent remanent magnetism discussed above may be present in both the dykes and sills. The presence of both normally and reversely magnetized phases indicates a complex intrusive history; i.e. multiple intrusive events or emplacement over an extended time period.

Some of the magnetic patterns that have been interpreted as Oenpelli Dolerite could be derived from either, flat-lying magnetic volcanics within the otherwise non-magnetic Kombolgie sequence or magnetic lithologies within the Nimbuwah Complex granitoids/migmatites. Separation of the dolerite from either of the other possible sources is difficult because of its tendency to follow pre-existing lithological contracts and/or structures. An attempt has been made to distinguish probable magnetic Oenpelli Dolerite from possible magnetic phases of the Nimbuhwah complex during the interpretation. In general, the reliability of this division is probably low. However, the possible presence of magnetic Nimbuwah Complex (including possible relict Cahill Formation) could be important for future exploration targeting within the Wellington Range tenements.

Based on information provided by Cameco, the elongate, disjointed, north-south striking magnetic unit near the western edge of the study area can be correlated with part of the Cahill Formation. Changes in the magnetic patterns suggest substantial variations in thickness ± magnetic susceptibility within this unit, with the southern section of the trend being broader and or more magnetic than the northern section. These variations could reflect primary compositional changes within the metasediments. Alternatively, decrease in magnetism to the north could indicate increasing assimilation of the magnetic Cahill Formation into the granitoids of the Nimbuwah Complex and, to an extent, increasing thickness of Kombolgie Subgroup and younger cover.

Several sub-circular to elliptical magnetic anomalies (e.g. **WR1**, **WR2**, part **WR8**, part **WR11**) within the Cahill Formation domain have been interpreted as possible later intrusives or localized zones of magnetic alteration. The presence of several dykes (± small sills) of Oenpelli Dolerite within or cross-cutting the Cahill Formation domain can make recognition of these possible discrete alteration or late intrusive responses difficult; i.e. some of them could be doleritic pipes or plugs related to the Oenpelli intrusives.

The boundaries between the predominantly non-magnetic Nimbuwah Complex and the non-magnetic component of the Cahill Formation domain are not well constrained in the magnetic data. Apart from the possible presence of relict magnetic units in the southern part of the Wellington Range area, the bulk of the Nimbuwah is weakly to non magnetic. Because of this, little attempt has been made to sub-divide the non-magnetic Nimbuwah Complex in the interpretation.

The bulk of the Kombolgie Subgroup and the younger stratigraphy overlying the Lower Proterozoic basement are non-magnetic. The expected distribution of the Kombolgie and the younger sediments has not been shown on the magnetic interpretation. The magnetic activity within known and inferred Kombolgie cover appears to be directly related to the Oenpelli Dolerite, with little indication of the Nungbalgarri Volcanic Member.

Numerous faults and joint/fracture zones have been inferred from the magnetics. These range from ‘old’, faults within the basement metamorphics and granitoids, parts of the subsequent block faulting regime thought to be active during deposition of the Kombolgie Subgroup and later (?), brittle fractures that probably have little displacement and little significance as potential hosts or controls for uranium mineralization. The larger, ‘old’ faults interpreted within the basement are generally consistent with the major, northerly to north-westerly regional fault system described by Cameco (Otto et al, 2005). Easterly to north-easterly fault sets have also been interpreted, but these tend to be less prominent than the northerly to north-westerly sets.

The large, northerly to north-north-westerly structures are assumed to provide the fundamental structural control for the Proterozoic basement and, to a lesser extent, the Kombolgie Subgroup and Oenpelli Dolerite distribution. Reliable tracking and interpretation of the nature of these significant faults is difficult within areas underlain by non-magnetic basement lithologies. The subsequent fragmentation of the early structural-lithological patterns by the subsequent block faulting adds to the interpretation difficulties. The overall patterns suggest that older fault sets are part of a regional, possibly sinistral, strike slip fault system with north-westerly trending principle faults. This has been used as a guide in the identification of most of the broad target zones outlined below.

Tracking fault pattens in areas that have been extensively intruded by the Oenpelli Dolerite can also be difficult. Though the dolerite commonly follows pre-existing faults and lithological contacts, quite complex magnetic patterns tend to be generated by the combination of steeply dipping dykes juxtaposed to flat lying sills or irregular extent and variable magnetic properties.

Overall, the character of and relationships between the various interpreted faults and fault sets are poorly resolved in the magnetic interpretation. Similarly, the nature of the 'older' regional fault set is not clearly defined.

Magnetic Modelling

At Cameco's request, quantitative modelling was undertaken over several profiles crossing the interpreted, northerly striking, Cahill Formation unit within the western section of the project. This modelling was done via the Potent modelling package, using selected profiles extracted from the located aeromagnetics data. The primary objective of the modelling was to determine the thickness of the Kombolgie Subgroup and younger cover overlying the inferred Cahill Formation within the basement, with dip directions being a secondary objective. The locations of the four magnetic profiles on which the modelling was undertaken are shown in Figure 4. Identification of profiles containing clean, well formed anomalies related to the inferred Cahill Formation proved to be difficult because of the comparatively low magnetic contrasts and the common presence of reversely magnetized anomalies adjacent to the normally magnetized response from the interpreted Cahill Formation. Summaries of the modelling are included as Figures 5a-5d.

Profile 1 (Figure 5a) targeted a 1.5km long, 7nT amplitude magnetic anomaly within the northern part of the Cahill Formation trend. The final magnetic model indicates a depth to top of about 260m and a steep easterly dip. This modelling is not well constrained because of the interference of a comparatively strong negative anomaly (Oenpelli Dolerite) to the east. Comparison of the wavelengths of the modelled and flight line data suggests that the actual depth to the magnetic Cahill Formation could be a little less than the modelled depth.

Profile 2 (Figure 5b) traverses a 40nT magnitude, roughly circular magnetic anomaly (**WR3**) which is about 1km in diameter. The anomaly has been modelled with a 1km long, steeply easterly dipping prism depth to top of about 370m. The fit between the actual and modelled data is quite good. Thus the modelled depth should be a reasonable approximation of the position of the Kombolgie Subgroup-basement unconformity in this area.

Profile 3 (Figure 5c) crossed a 2km elongate magnetic unit within the main Cahill Formation zone. The shape of the eastern part of this anomaly is affected by complex magnetic patterns associated with an easterly striking dyke (Oenpelli Dolerite). The final model is reasonably well constrained by the western flank of the anomaly. The depth to top of about 480m should be reasonably reliable, whereas the modelled, steep easterly dip is less definitive.

Profile 4 (Figure 5d) traverses the northern part of the more magnetic, southern section of the Cahill Fm. trend. The target anomaly has an amplitude of about 60nT, with a well-defined western flank. The eastern flank is distorted or obscured by a broad zone of elevated magnetics, gradually diminishing to the east. This could be produced by less magnetic Cahill Formation, or it could indicate the main magnetic Cahill continues at depth to the east, possibly below a shallow to moderately easterly dipping (thrust?) fault. The modelling of the main unit is controlled by the well-defined, western flank of the anomaly. The depth to the main horizon (~200m) should be reasonably well defined but the dip cannot be reliably estimated.

In summary, generation of robust magnetic models has been difficult due to interference from neighbouring magnetic bodies. The model from profile 2 that traverses the **WR3** magnetic anomaly is the most robust. This anomaly is quite strong (by local standards) and may represent localized magnetite alteration or an intrusive within the Cahill Formation. The dip is most likely steep but whether it dips east or west cannot be reliable determined from the magnetics. The variable model depths partially reflect the inaccuracy introduced by the adjacent anomalies.

6. Targets

A suite of areas of possible interest for uranium ± gold/PGE mineralization has been selected on the basis of the aeromagnetic interpretation, using a broad, generalized model of the basic controls on the Arnhem Land unconformity related uranium deposits as a guide. These are annotated on the interpretation plan (Figure 4), with brief descriptions included in Table 1. The majority of these are structural targets related to the inferred major, basement faults. These include potentially dilational situations developed within these fault systems, assuming that the early fault set is part of a sinistral, strike slip regime. As discussed above, the character of the fault system has not been conclusively determined during the interpretation.

A number of possible alteration zones ± late intrusives (not related to the Oenpelli Dolerite) have also been identified during the interpretation. These could also warrant checking out as possible loci for mineralization.

The rankings assigned to the various targets and the target selection process itself are very subjective. These should be reviewed by Cameco's geological/geophysical staff, using their local knowledge and other available exploration information. In general, higher priorities have been assigned to zones associated with the interpreted Cahill Formation belt along the western side of the project area. However, the depth of Kombolgie Subgroup and younger cover overlying some of these targets is quite substantial. This makes effective, first pass geological assessments of what are mostly not very well defined, conceptual targets difficult. Targets associated with areas containing possible relict Cahill Formation lithologies in the southern part of the area also warrant checking.

TABLE 1
WELLINGTON RANGE GEOPHYSICAL/STRUCTURAL TARGETS

TARGET	NORTHING	EASTING	PRIORITY	DESCRIPTION
WR/1	8731400	281754	1-2?	WNW dilational (?) fault ± alteration cutting possible Cahill Fm. Coincides with strong, easterly bend at the northern end of the interpreted Cahill Fm. trend.
WR/2	8729985	282646	2	Possible magnetic alteration zone or intrusive within northern Cahill Fm. domain.
WR/3	8726854	283548	1	Large, north-westerly, dilational (?) fault ± alteration. Offsets Cahill Fm. domain towards the west.
WR/4	8725176	284004	1?	Similar to **WR/3**
WR/5	8721044	286116	3	Possible northern continuation of major, NNW fault zone. Mostly within basement granitoids.
WR/6	8719768	284567	2	North-easterly faults ± alteration cutting a weakly magnetic section of the Cahill Fm. domain
WR/7	8716223	285140	1	Large, north-westerly, dilational (?) faults ± alteration cutting more magnetic section of the Cahill Fm. domain.
WR/8	8711149	284413	2?	Large, north-easterly fault-fracture zone ± alteration cutting magnetic, thicker (?) Cahill Fm. domain.
WR/9	8716950	288323	3	Possible northern continuation of major, NNW fault zone. Mostly within basement granitoids, ± relict metamorphics.
WR/10	8707734	282456	1?	West-north-westerly fault-fracture zone ± alteration and or intrusives. Cutting magnetic, thicker (?) Cahill Fm.
WR/11	8704808	282038	1	Similar to **WR/10**
WR/12	8697607	279809	1	Similar to **WR/10**

TARGET	NORTHING	EASTING	PRIORITY	DESCRIPTION
WR/13	8708823	294487	2	Large, north-north-westerly fault cutting Nimbuwah Complex ± relict metamorphics & dolerite. Near Kombolgie unconformity surface?
WR/14	8705852	295576	2	West-north-westerly fault zone linking NNW faults cutting Nimbuwah Complex ± relict metamorphics & dolerite. Near Kombolgie unconformity surface?
WR/15	8702727	298055	2	Large, north-north-westerly fault cutting Nimbuwah Complex ± relict metamorphics & dolerite. Near Kombolgie unconformity surface?
WR/16	8702824	295370	2	Similar to **WR/15**. Below unconformity?
WR/17	8696777	303482	2-3	Large, northerly fault cutting Nimbuwah Complex ± relict metamorphics. Near Kombolgie unconformity surface?
WR/18	8697441	290700	1	Major, NNW fault zone cutting through Nimbuwah Complex containing possible relict metamorphics beneath the Kombolgie unconformity.
WR/19	8695243	287757	1?	Similar to **WR/18**, but smaller fault. Significant dolerite presence in both zones?
WR/20	8692848	286001	1	Large, WNW (dilational?) fault-fracture zone cutting through Nimbuwah Complex and possible relict metamorphics beneath the Kombolgie unconformity. Significant dolerite in zone.
WR/21	8688941	294118	1-2	Southern continuation of **WR/18** zone. Near unconformity surface?
WR/22	8689970	299019	2-3	NW (dilational?) fault-fracture zone cutting through Nimbuwah Complex, with abundant dolerite and possible relict metamorphics. Away from Kombolgie unconformity?
WR/23	8687482	298657	3	NW (dilational?) fault-fracture zone cutting through Nimbuwah Complex adjacent to dolerite and possible relict metamorphics. Near from Kombolgie unconformity.
WR/24	8687253	288171	2	NW (dilational?) fault-fracture zone cutting through Nimbuwah Complex and possible relict metamorphics. Dolerite also in zone. Beneath Kombolgie unconformity?
WR/25	8688964	279674	2	Similar to **WR/24**. Larger fracture/fault zone. May be slightly away from the unconformity surface.
WR/26	8682659	287285	2?	Similar to **WR/24**. Magnetic patterns predominantly dolerite related? At the unconformity surface.
WR/27	8682299	294388	3	South-eastern continuation of the **WR/24** fault zone. Cutting Nimbuwah Complex and dolerite adjacent to unconformity.
WR/28	8678058	295553	2-3	Large, NW (dilational?) fault-fracture zone cutting through Nimbuwah Complex, with abundant dolerite. Mostly away from Kombolgie unconformity?
WR/29	8676914	290074	3	Similar to **WR/28**. Smaller structure?
WR/30	8681490	297887	2?	Southern continuation of **WR/18** & **WR/21** zones. Near unconformity surface? Magnetic patterns dominated by dolerite response.

Notes:
Coordinates are from the centroid of the target areas as defined by MapInfo, in AMG Zone 561S, AGD66 Datum
Large, northerly to north-north-westerly structures are assumed to provide the fundamental structural control for the Proterozoic terranes. North-westerly to west-north-westerly structures developed as part of this regime should be dilational trends if the primary, NNW fault set is sinistral in character.
Target rankings are highly subjective. They do not take geochemistry or other exploration data or access issues into account.

7. Conclusions & Recommendations

The effectiveness and reliability of the Wellington Range aeromagnetic interpretation is restricted by the mediocre data quality (particularly resolution) and the limited available geological control in what is a complex setting. Contrasts within the merged magnetic data set are low to moderate and dominated by the complex responses from the Oenpelli Dolerite. These dominate the magnetic patterns in the southern half of the area.

Most of the magnetic zones within exposed or sub-cropping Nimbuhwah Complex (referred to as magnetic Nimbuwah in the Cameco reference material) could well be related to Oenpelli Dolerite at shallow to moderate depth. The response patterns from the possible magnetic phases of the Nimbuwah are very similar to those from areas of exposed or shallow dolerite. It should be possible to resolve this ambiguity via a combination of reasonably detailed geological mapping accompanied by magnetic susceptibility measurements. The field mapping and measurement approach would go some way to determining if significant relict Cahill Formation lithologies are preserved within the Nimbuwah Complex in this southern section of the Wellington Range area. Some possible zones of relict stratigraphy have been indicated on the interpretation. If the presence of these favourable host lithologies can be confirmed, the exploration potential in their vicinity should be significantly increased, using Cameco's exploration and mineralization criteria as a guide (Otto et al, 2005).

The postulated belt of Cahill Formation stratigraphy along the western-north-western side of the study area is reasonably well-defined. However, the thickness of the cover rocks will increase the difficulty and cost of effective exploration. The possible alteration and dilational targets interpreted from the magnetics should provide some initial focus for follow-up.

The degree of correlation of the structural component of the magnetic interpretation with faults included in Cameco's summary geological maps (from satellite/scanner imagery ± aerial photography?) is inconsistent. The faults interpreted from the magnetics should be more representative of the 'older' structures within the basement, whereas the faults and fractures included in the geological mapping will probably contain more information from the younger deformation events and from areas underlain by low magnetic contrast lithologies.

8. References

Otto, G., Melville, P., & Beckitt, G., 2005: Wellington Range Project, EL 5893 Annual Report. Annual report to the Northern Territory Mines Dept. prepared by Cameco Australia Pty. Ltd.; June, 2005