#### COMBINED ANNUAL EXPLORATION REPORT GR042-09 (CR109) EL25222, EL25223, EL25224, EL25229, EL28970, EL29026, EL29242

FOR PERIOD ENDING 8<sup>TH</sup> November 2012

### DALY RIVER PROJECT NT

PINE CREEK SD5208	1:250,000
FERGUSSON RIVER SD5212	1:250,000
Batchelor 5171	1:100,000
Daly River 5070	1:100,000
Fergusson River 5269	1:100,000
Jinduckin 5169	1:100,000
Pine Creek 5270	1:100,000
Reynolds River 5071	1:100,000
Tipperary 5170	1:100,000
Wingate Mountains 5069	1:100,000

Target Minerals: Uranium and Rare Earth Elements

**Titleholder: TUC Resources Limited** 

Report No. 2012-05 Prepared for TUC Resources By A. Chapman December 2012

## CONTENTS

CON	ITENTS	. 2
Lis	st of Figures	. 2
Lis	st of Tables	. 3
Lis	st of Appendices (attached)	. 3
1.	SUMMARY	. 4
2.	LOCATION AND ACCESS	. 5
3.	TENEMENT STATUS AND OWNERSHIP	. 7
4.	GEOLOGY	. 8
5.	PREVIOUS EXPLORATION	. 9
5.	1 Exploration by Other Companies	. 9
5.3	2 Previous Exploration by Territory Uranium (Years 1 - 5)	10
6.	EXPLORATION DURING YEAR 6	12
6.2	EL25222	13
	Drax	13
	Stromberg	13
	Scaramanga and Skyfall North	22
6.2	EL25229	24
	Quantum	24
	Regional reconnaissance rock and soil sampling	24
6.2	EL28970	25
	Regional reconnaissance rock and soil sampling	25
6.2	EL25223	25
	Regional reconnaissance rock and soil sampling	25
6.2	EL25224	25
6.2	EL29026	25
6.2	EL29242	25
6.	Conclusions/Recommendations	26
7.	REFERENCES	27

# List of Figures

Figure 1: Location Map showing project tenements and ground relinquished in	
2012	6
Figure 2: Daly River Group Regional Geology (AGSO 500K Geology map)	9
Figure 3 Section showing STRC53 results and interpreted geology (>0.2 TRE cut of	f
and <1m internal dilution) 14	4
Figure 4 Section showing STRC28 results and interpreted geology (>0.2 TRE cut of	f
and <1m internal dilution)1	ō
Figure 5 Section showing STRC16,20,23 results and interpreted geology (>0.2 TRE	
cut off and <1m internal dilution) 1	ō
Figure 6 Section showing results in STRC58 and how step out drilling extends	
mineralisation (>0.2 TRE cut off and <1m internal dilution)	3
Figure 7 Geology and drill result plan with significant intercepts (>0.2% TREO).	
Target zone is shown in red 1	7
Figure 8 Significant Scandium intersects at Stromberg 19	9
Figure 9 Screening results sample 6000102, Stromberg. 95% of the contained	
HREE is within a particle size of approximately 200um.	С
Figure 10 Scanning electron microscope SEM images of HREE bearing xenotime	
associations with clay (kaoling and haloysite), left discrete grains and right	
agglomerations2	1

Figure 11	Weathering profiles and mineralised zones (red dotted line) at Stromber	g.
		22
Figure 12	Scaramanga recent RC significant drill intersections over gridded	
radio	ometrics and topography	23
Figure 13	Surface sampling results over Stromberg, Scaramanga, Skyfall nth	24

### List of Tables

TABLE 1 Tenement Status and Ownership	7
TABLE 2 Exploration Summary for GR042 2012	13
Table 3 Significant intersects from Stromberg RC drilling year 6	18
Table 4 Significant intersections at Scaramanga	23

## List of Appendices (attached)

- Appendix A Exploration Data
- Appendix B Location Maps
- Appendix C Metallurgy Reports
- Appendix D Mineralogy Reports
- Appendix E Lidar Geophysical Data

### 1. SUMMARY

The project area is approximately 140km due south of Darwin and consists of four tenements: EL25222, EL25223, EL25224 and EL25229. EL25222, EL25223, EL25224 and EL25229 reached the end of year 6 in 2012. EL25222 and EL25229 were renewed for 2 years; EL25223 and EL25224 were not renewed. Applications EL28970, EL29026 and EL29242 were submitted in 2012 to explore for rare earth potential and were granted in 2012. These tenements have subsequently been added to the technical reporting group in Nov 2012.

During Year 6, exploration was undertaken primarily on EL25222 of the Daly River Group. RC drilling was undertaken at Stromberg (16 RC holes were drilled for 418m with 229 samples taken and 5 diamond holes with 44 samples) and Scaramanga (7 RC holes for 220m and 165 samples). Surface geochemical samples were taken over the TUC's Daly tenements to test district wide rare earth element potential which included EL25222 (443 soil samples), EL25223 (1 soil sample), EL25229 (11 soil samples and 1 rock chip sample) and EL28970 (6 soil and 3 rock chip samples). Also metallurgical and petrographic work was completed on samples from Stromberg.

Significant results were returned for the year with continued return of excellent rare earth intersections with excellent mineral distribution of approximately 85% heavy rare earths at Stromberg. Also heavy rare earth mineralisation similar to Stromberg was discovered at Scaramanga and a number of regional rare earth element anomalies were identified in the surface sampling program.

A Lidar survey was completed over the Stromberg project to give accurate elevations for drill hole positioning and eventual resource modelling.

Exploration will continue to test the projects rare earth element potential with focus on the continuation and extents of mineralisation at Stromberg as well as follow up on the anomalous results identified in the district surface sampling.

## 2. LOCATION AND ACCESS

The project area is approximately 140km due south of Darwin and consists of 5 tenements: EL25222, EL25223 (dropped), EL25224 (dropped) and EL25229 with newly added EL28970, EL29026 and EL29242 (Figure 1).

EL25222 and EL29242 are accessed from Darwin via the Stuart Highway onto the Douglas Daly Road to Oolloo Crossing; after which, a track to Fish River transects the southern and western portion of the Licence. Access is only possible in the dry season, as the crossings at Oolloo Crossing and Cattle Creek are impassable after rains. The eastern boundary of the Licence is defined by the Daly River and other NS-trending river systems within EL25222 include Fish River and Bamboo Creek. Most of the ground is open and with low relief and numerous sinkholes. To the south, a series of ridges and mesas trend SE along the southern boundary of the tenement.

EL25223 and EL29026 are accessed from Darwin via the Stuart Highway onto Dorat Road (from Adelaide River) then west onto the Daly River Road. Tipperary Station lies on the central eastern part of EL 25223. Tracks extend west and south of Tipperary Station, with the southern track accessing the Daly River at Beeboom Crossing. Access is possible in the dry season only as the crossings at Beeboom Crossing and smaller tracks to the west are impassable after rains. The southern boundary of the Licence is defined by the Daly River, while Green Ant Creek roughly marks the eastern boundary. Most of the ground is open and with low relief and numerous sinkholes, except for the Rock Candy Range to the southeast of EL 25223.

EL25224 is cut by the old Stuart Highway (Dorat Rd) which roughly marks part of the tenements western boundary. The tenement has an elongate shape running roughly N-S, with the southern boundary being approximately 32km south of Adelaide River township. Access to EL 25224 is via the Stuart Highway, Dorat Road and in the north along the Ringwood road, plus some minor tracks. Access to the Licence boundaries is year-round, but away from the sealed roads access is limited to the dry season. Topography for most of the tenement is characterised by elongate ridges rising out of the black soil plains. The southern part of the tenement is very hilly, with a plateau in the SE corner, making access difficult. The Burrell Creek runs roughly N-S through most of EL 25224, while the Adelaide River cuts through the northern portion of the tenement. The Adelaide River itself is excised from the tenement.

EL25229 is accessed via the Stuart Highway to Douglas Crossing via Hayes Creek. Tipperary Station provides access to the north western part of EL 25229. Tracks extend west in all directions from Douglas Crossing. Access to the southern part of the tenement is via the Stuart Highway heading west through Umbrawarra Gorge. Access is limited during the wet season. Most of the ground is open and with low relief. The tenement boundary in the east follows the approximate geological boundaries of outcropping Depot Creek Sandstone and Stray Creek Sandstone.

EL28970 is situated within the Dorisvale station and is accessed from dorisvale station access roads from the Stuart Highway and the dorisvale crossing. Access is only possible in the dry season, as the crossings are impassable after rains. Most of the ground is open and with low relief with occasional ridges and cut by the Daly River.



Figure 1:Location Map showing project tenements and ground relinquished in 2012.

## 3. TENEMENT STATUS AND OWNERSHIP

Tenement Status and Landowner information is summarised in the table below:

Tenement	Blocks	Grant Date	Year	Anniversary	Covenant	Cadastre	Owner	Station Name	
							Northern Territory Land		
EL25222	362	9/11/2006	6	9/11/2010	\$90,000.00	Crown Lease	Coorportation - Fish River	Fish River	
						Crown Lease	Tovehead	Tipperary Station	
						Crown Lease	Tovehead	Douglas Station	
EL25223	254	23/11/2006	6	23/11/2010	\$64,000.00	Crown Lease	Branir Pty Ltd	Daly River	
						Perpetual Pastoral			
						Lease	Tovehead	Tipperary Station	
						Crown Lease	Tovehead	Douglas Station	
						Crown Lease	Silkwood Ventures Pty Ltd		
EL25224	30	7/12/2006	6	7/12/2010	\$17,000.00	Free Hold	89 various land owners		
							Australasia Railway		
						Crown Land	Corportation		
							Australasia Railway		
						Crown Lease	Coorportation		
EL25229	125	9/11/2006	6	9/11/2010	\$60,000.00	Crown Lease	Tovehead	Douglas Station	
						Crown Lease	Tovehead	Tipperary Station	
						Crown Lease	Tiamatsu (Australia)	Jindaire Station	
							Australasia Railway		
						Crown Lease	Corportation		
						Perpetual Pastoral			
EL28970	93	5/03/2012	1	5/03/2013	\$20,000.00	Lease	Harrower, Anthony Norman	Dorisvale	
						Perpetual Pastoral			
EL29026	17	13/04/2012	1	13/04/2013	\$10,000.00	Lease	Branir Pty Ltd	Tipperary Station	
						Crown Lease	Indigenous Land Corporation	Tipperary Station	
EL29242	125	26/07/2012	1	26/07/2013	\$10,750.00	Crown Lease	Indigenous Land Corporation		

TABLE 1 Tenement Status and Ownership

EL252222, EL25223, EL25224 and EL25229 reached the end of year 6 in 2011 the following actions were taken (Figure 1): EL28970, EL29026 and EL29242 were granted in 2012 and added to the technical reporting group in Nov 2012.

- EL25222 renewal application submitted Nov 12, partial waiver from reduction (95 blocks kept, 56 blocks dropped).
- EL25223 tenement not renewed (fully relinquished).
- EL25224 tenement not renewed (fully relinquished).
- EL25229 renewal application submitted Nov 12, partial waiver from reduction (56 blocks kept, 39 blocks dropped).

## 4. GEOLOGY

The tenement group is situated near the western margin of the Pine Creek Orogen (Figure 2). Descriptions of the regional geology can be found in several texts, including Ahmad et al., 1993; Ahmad, 1998; Pontifex & Mendum, 1972; Dundas et. al., 1987; Edgoose et. al., 1989 and Pietsch 1989.

Middle Proterozoic sediments of the Tolmer Group are mapped as overlying the western portion of EL 25222 and EL25229. The Tolmer Group is a sequence of arenite, siltstone and dolomite up to 1600m thick unconformably overlying Early Proterozoic Finniss River Group sediments. The Stray Creek Sandstone and Hinde Dolomite are the most common stratigraphic units of the Tolmer Group within EL 25222 and EL25229. Fault splays from the Giants Reef Fault to the west offset and thrust blocks of Stray Creek Sandstone adjacent to Hinde Dolomite.

The Cambrian Antrim Plateau Volcanics is mapped as overlying portions of the Tolmer Group. Further east, limestones and quartzarenites of the Cambro-Ordovician Daly River Group (comprising Tindall Limestone and Jinduckin Formation) form the Daly Basin.

To the north in EL25224 mostly the Early Proterozoic Finniss River Group Sediments, dominantly feldspathic greywacke with interbedded siltstones, are exposed. The outcrop of the middle proterozoic unconformity strikes up the western boundary. Regional maps show some NNW-trending (north plunging) symmetrical folds throughout the tenement. Quartz veins parallel to these folds and within fold noses are common. Sandstones and conglomerates of the Cretaceous Petrel Formation unconformably overlie the Proterozoic Burrell Creek Formation the southern part of the License, forming mesas.

In the east EL25229 covers the eastern edge of the Daly Basin with Proterozoic sediments exposed along the western boundary. Simplified stratigraphic components and geological relationships are described as follows:

- Early Proterozoic folded (NW trending axial plane doubly plunging) South Alligator Group (iron and carbonate rich siltstones, shales, tuffs and greywackes) and Burrell Creek Formation (Finniss River Group sediments) have been intruded by a later, Early Proterozoic granitoid suite.
- These rocks are unconformably overlain by Early to Mid Protorezoic, westerly dipping shallow marine sandstones known as Depot Creek and Stray Creek Formations.
- These rocks are further unconformably overlain by a Mid to Late Proterozoic, semi concordant, limestone sequence (known as the Daly River Group (Tindal Limestone, Jinduckin Formation and Oolitic Dolomite).
- These rocks are disconcordantly overlain by a Jurassic and Cretaceous sequence of sands and silts.

 Multiple periods of erosion show many sequences on lapping onto different aged rock groups.



A number of NW trending faults are interpreted to offset geology.

Figure 2:Daly River Group Regional Geology (AGSO 500K Geology map)

## 5. PREVIOUS EXPLORATION

### 5.1 Exploration by Other Companies

Previous exploration from the 1960's to the present has been reviewed and summarised in previous annual reports for these tenements. Exploration ranged from airborne geophysics to drilling exploring for phosphate, and basemetals, geochemical exploration was also undertaken for diamonds, uranium and nickel.

On EL25222 and EL25223, Suttons explored for uranium basemetal deposits with drilling at the Beeboom crossing area and around the boundary between EL25222 and EL25223.

Phosphate exploration within the Daly basin showed limited potential with only thin horizons carrying just over  $1\% P_2O_{5.}$ 

On EL25224 uranium exploration was limited within with some occurring to the northwest, southeast and west of the Licence. Most of the work concentrated on exploration for gold although a stream sediment program indicated numerous gold and basemetal anomalies with little follow-up.

Old copper workings at Douglas are adjacent to EL25229 and also a soil exploration program was undertaken by CRA on the northern boundary of the tenement for basemetals and manganese.

## 5.2 Previous Exploration by Territory Uranium (Years 1 - 5)

During Year 1, a historical data compilation was completed for all tenements in the project. The results of this work are outlined in detail in the previous annual reports. Work included:

- a) Checking historic tenure in MapInfo, using a MapInfo file supplied by DPIFM (containing exploration tenure, but not mining tenure). Historic mining leases were checked for EL25224 by checking scanned paper maps from the 1:50,000 Sheet 14/2 (1 per year);
- b) Checking NTGS datasets, such as COREDAT, MODAT, Explorer 3;
- c) Checking open file company reports submitted for previous tenure covering the tenements;
- d) Georeferencing relevant maps and plans into MapInfo to obtain locations of samples and mapped geology;
- e) Checking the sacred sites register (AAPA);
- Review of existing geophysics (from both regional NTGS airborne surveys and open file company surveys) by a consultant geophysicist for EL25224.

During Year 2, exploration focussed on EL25222 and EL25223. In addition, target identification and ranking were performed for all tenements. An airborne radiometric and magnetic survey (7,116 line km) was completed on EL25222 and EL25223. A full assessment of uranium targets within 3 tenements (EL25222, EL25223 and EL25229) based on structure, stratigraphic setting and radiometrics was undertaken and highlighted over 20 targets for reconnaissance work. Helicopter based reconnaissance of these targets identified five high priority areas for follow up geochemical and ground based geophysics programs. Geochemical samples were collected with 71 rockchips, 271 soil samples, and 18 stream samples over all tenements. Three costeans were also completed on EL25223. Significant uranium results outlined several potential areas for drilling next year.

In Year 3 Territory Uranium applied for and was awarded an NT government drilling collaboration at the Green Prospect to assist Territory Uranium in testing the depth to uranium prospective basement rocks beneath the Tolmer sediments in an area where cover may be much shallower than previously believed.

Exploration during the year included infill geochemical sampling on EL25223, EL25222 and EL25229, with 548 soil and 125 rock chip samples taken. Reconnaissance sampling at a new target was undertaken on EL25229, 5 geochemical samples and seven spectrometer assays were completed. A soil auger program was commenced on EL25222, 23 holes were completed. A 4,030 line km radiometric and magnetic survey was flown over EL25223, EL25224 and EL25228 with 3,330 line km completed within the tenements relevant to this report. RC drilling was completed on EL25222 targeting uranium mineralisation discovered at the Energy prospect in year 2. A total of 20 holes for 1,147m were drilled, with assays pending (Results included in this report – Appendix A).

During Year 4, exploration was undertaken primarily on EL25222, EL25223, and EL25229 of the Daly River Group. RC drilling was undertaken at Green Ant and at Quantum (newly discovered uranium, gold and REE deposit), diamond drilling was undertaken at Green and Quantum and RAB drilling was undertaken at Wildcard. A total of 4770m were drilled.

Geochemical sampling was undertaken at various prospects on EL25229 (8 samples) and on EL25222 at Green (14 rock chip). Also results from 268 soil auger samples taken in 2009 from EL25222 (Green) were returned, results from which confirmed uranium anomaly targets with corresponding multi-element highs.

Drilling was undertaken at Green Ant (4 holes for 310m, 253 samples). No significant mineralisation was intersected, but uranium prospective Proterozoic basement beneath the Tindal Cover was intersected at shallow depths. Drilling at Green (part of the Northern Territory Government's "Bringing Forward Discovery" collaboration initiative, 2 holes for 1066.9m, 64 samples) did not reach the unconformity between the Tolmer group and the lower Proterozoic sediment but did demonstrate that the unconformity was shallower to the north.

Reinterpretation of geology across the group revealed a new prospect on EL25229, named Quantum. Re-sampling of historic drill core returned significant uranium intercepts including  $0.5m @ 4,224ppm U_3O_8 (0.42\% U_3O_8 \text{ or } 4.24kg/t U_3O_8$ . Also other elements were associated with mineralisation including gold-silver-bismuth-zinc. A down hole gamma logging programme was completed on 7 of the historic drill holes in the area. This confirmed the presence of several additional target zones.

RC drilling (8 RC holes for 802m, and 2 RC precollars, 753 samples) and diamond drilling (2 diamond tails for 524.8m, 179 samples) was completed to test the prospect. Significant mineralisation was intersected including 50m @ 1.55% TREO (Rare Earth Oxide) from 245m and 2.3m @ 2.75% TREO from 374m. Gold and Silver mineralisation was also noted associated with mineralisation.

During Year 5, exploration was undertaken primarily on EL25222, EL25223, and EL25229 of the Daly River Group. RC drilling (54 RC holes for 1,698m) was undertaken at Energy (now named Stromberg) and at Quantum (19 RC Holes for 2,447m and 18 DDH Holes for 3,482.5m). Shallow RC drilling (22 RC holes for 604m) and geochemical sampling (14 Rock Chip pulps and 278 soil auger pulps from EL25222 and 3 Rock Chip pulps and 13 soil auger pulps from EL25223) was also undertaken at Green (now named Drax). Reconnaissance with a hired hand held XRF machine exploration was also undertaken on EL25222. Also metallurgical and petrographic work was completed on samples from Stromberg and Quantum.

## 6. EXPLORATION DURING YEAR 6

During Year 6, exploration was undertaken primarily on EL25222 of the Daly River Group. RC drilling was undertaken at Stromberg and Scaramanga. A helicopter reconnaissance program for REE potential was completed over the TUC's Daly tenements which included EL2522 and EL25229 and more detailed soil programs were completed at prospects within EL25222. Also metallurgical and petrographic work was completed on samples from Stromberg.

All samples were submitted to Amdel for analysis. Sample prep was performed in Darwin and analysis was completed in Adelaide.

Meters drilled and number of samples submitted are summarised below. Exploration data and location maps are given in Appendix A and B respectively:

Tenement	Work Done	RC	Diamond	soils	Rock Chips	TOTAL
EL25222	Nos Holes	23	5			28
	Nos meters	638	83.6			721.6
	Nos Samples	420	44	443		907
EL25223	Nos Holes					0
	Nos meters					0
	Nos Samples			1		1
EL25224	Nos Holes					0
	Nos meters					0
	Nos Samples					0
EL25229	Nos Holes					0
	Nos meters					0
	Nos Samples			11	1	12
EL28970	Nos Holes					0
	Nos meters					0
	Nos Samples			6	3	9
EL29026	Nos Holes					0
	Nos meters					0
	Nos Samples					0
EL29242	Nos Holes					0
	Nos meters					0
	Nos Samples					0
Total	Nos Holes	23	5	0	0	28
	Nos meters	638	83.6	0	0	721.6
	Nos Samples	420	44	461	4	929

TABLE 2 Exploration Summary for GR042 2012

#### 6.2 EL25222

## Drax

22 RC holes for 604m and 201 samples were drilled in year 5 to test the shallow potential of the REE mineralisation within the Tolmer sediments. Assays results were returned during the period with no significant results.

## Stromberg

### Drilling

16 RC holes were drilled for 418m with 229 samples taken and 5 diamond holes (44 samples) were drilled for metallurgical sampling (see metallurgy below).

Drilling has confirmed both the presence of significant near surface HREE mineralisation, and TUC's exploration models. Importantly, mineralisation is now clearly defined over the prospect strike length. Also step out drilling has significantly increased mineralised envelopes with results returned in hole STRC58 having doubled the extent of the mineralised

envelope. Xenotime hosted mineralisation remains open in both cross section and strike. Significant Intersects include:

- STRC53 8m @ 0.72% TREO (93.5% HREE, Dy 7.9%/TREO);
- STRC27 3m @ 0.74% TREO (81.5% HREE, Dy 8.8%/TREO);
- STRC20 5m @ 0.47% TREO (80.5% HREE, Dy 8.7%/TREO);
- STRC16 5m @ 0.42% TREO (81.2% HREE, Dy 8.8%/TREO).
- STRC64 5m @ 0.43% TREO from 6m including 1m @ 0.92% TREO from 8m.

These intersections indicate high proportions of HREE with an approximate average of 85% HREE from all drilling to date above a cut-off of 0.2% TREO. Of this HREE content, the critical and valuable metal distributions are:

- Dysprosium (Dy) 7.5%/TREO;
- Yttrium (Y) 64.9%/TREO;
- Erbium (Er) 4.8%/TREO;
- Terbium (Tb) ~1%/TREO.

These metal oxides remain highly sought after on the global market. Importantly, Dysprosium, Yttrium, Erbium and Terbium are critical in the development of Government driven clean energy technologies.



Figure 3 Section showing STRC53 results and interpreted geology (>0.2 TRE cut off and <1m internal dilution).

Multiple flat lying zones have now been identified (Figure 4) also mineralisation is interpreted to be thicker closer to faults which are believed to been feeder structures to the flat lying mineralisation (see figure 4 below).



Figure 4 Section showing STRC28 results and interpreted geology (>0.2 TRE cut off and <1m internal dilution).



Figure 5 Section showing STRC16,20,23 results and interpreted geology (>0.2 TRE cut off and <1m internal dilution).



Figure 6 Section showing results in STRC58 and how step out drilling extends mineralisation (>0.2 TRE cut off and <1m internal dilution).



Figure 7 Geology and drill result plan with significant intercepts (>0.2% TREO). Target zone is shown in red.

Hole Id	From	Width (m)	Average Grade (TREO %)	Dy,O, /TREO %	Tb <sub>i</sub> O, /TREO %	Y,O, /TREO%	HREO /TREO%
STRC02	4m	2	0.32%	8.00%	1.00%	65.50%	87.50%
STRC03	4m	2	0.25%	10.30%	1.40%	59.60%	84.30%
	2m	1	0.21%	8.30%	1.30%	49.70%	69.80%
STRC04	6m	1	0.23%	5.20%	0.60%	69.40%	85.20%
etboas	2m	1	0.26%	7.60%	1.40%	40.10%	57.70%
STRU08	4m	1	0.22%	8.20%	1.10%	59.40%	80.50%
STRC10	9m	1	0.21%	5.80%	0.90%	42.40%	57.60%
STRC11	3m	2	0.24%	8.60%	1.10%	57.60%	79.40%
STRC13	12m	1	0.92%	8.90%	1.20%	60.40%	84.00%
	Surface	1	0.30%	5.20%	1.60%	5.10%	13.20%
STRC16	5m	5	0.40%	8.80%	1.30%	59.40%	81.20%
	Inclu	iding: 1m @ 0.5	2% from 6m	9.50%	1.40%	60.80%	84.50%
STRC17	7m	1	0.22%	7.80%	1.10%	66.40%	85.60%
STRC20	1m	5	0.47%	8.70%	1.20%	57.30%	80.00%
	Incl	uding 2m @ 0.7	6% from 1m	8.70%	1.10%	64.20%	87.90%
	10m	3	0.39%	7.40%	0.90%	71.20%	91.80%
	1m	5	0.32%	7.90%	1.00%	66.50%	88.10%
STRC21	Incl	uding 1m @ 0.5	1% from 5m	6.90%	0.70%	76.30%	97.00%
	11m	2	0.28%	7.00%	0.80%	72.40%	91.10%
OTD COO	1m	4	0.30%	8.20%	0.90%	69.70%	92.60%
51RG22	9m	1	0.42%	6.70%	0.90%	52.10%	69.90%
STRC23	10m	1	0.57%	8.70%	1.20%	63.40%	85.30%
	16m	3	0.74%	8.80%	1.20%	60.10%	81.50%
STRC27	Including: • 2m @ 0.91% from 16m;			9.00%	1.20%	60.30%	82.00%
		1m @ 1.18% fro	om 17m	9.20%	1.10%	66.90%	89.60%
STRCOM	7m	1	0.22%	5.00%	1.10%	17.30%	27.20%
31R020	14m	3	0.23%	6.90%	0.80%	52.50%	70.50%
STRC29	17m	1	0.34%	5.70%	0.60%	54.70%	72.60%
STRC33	19m	1	0.22%	7.00%	0.80%	66.10%	86.90%
STRC48	15m	1	0.33%	5.20%	0.50%	66.60%	87.30%
	Surface	8	0.72%	7.90%	0.90%	70.50%	93.50%
erposa	Incl	uding 3m @ 0.9	9% from 1m	8.40%	1.00%	71.30%	95.80%
SIRCOJ	Incl	uding 1m @ 1.1	5% from 1m	8.40%	1.00%	71.30%	95.90%
	Incl	uding 2m @ 0.9	2% from 5m	7.50%	0.90%	70.80%	92.50%

 Table 3 Significant intersects from Stromberg RC drilling year 6

In addition to a primary HREE based revenue stream, a secondary stream is possible from Scandium (Sc). Scandium was first identified at Stromberg from the recent results of metallurgical test work. From initial assays of six holes, Scandium appears to be located with the HREE mineralisation and a number of intersections of interest have been identified including:

- STRC53 8m @ 116ppm Sc from 0m including 6m @ 149ppm Sc from 0m (in 8m @ 0.72% TREO from 0m using 0.2% cutoff and 1m internal dilution);
- TURC0074 7m @ 81ppm Sc from 0m including 4m @ 121ppm Sc from 0m (in 7m @ 1.02% TREO from 0m using 0.2% cutoff and 1m internal dilution).



Figure 8 Significant Scandium intersects at Stromberg

### Mapping

Mapping undertaken at the stromberg assisted in the identification of structural and weathering controls on REE mineralisation and alsp assisted in the interpretation of extensions to known REE mineralisation. Results are provided in Appendix B.

## Mineralogy

A suite of samples was submitted for metallurgical testing in late 2011 to provide an early assessment of the physical processing properties of the mineralised material including:-

- Possible processing methods;
- Minimum cut-off grade and;
- Achievable concentrate grade.

Reports on the metallurgical and mineralogical test work are provided in Appendix C and D. Samples representative of the whole of the Stromberg HREE Prospect at a variety of grades underwent a number of tests (composite samples represent 0.1-0.2% TREO; 0.2-0.4% TREO; 0.4-0.7% TREO and +0.7% TREO). Initial screening and HMS (heavy medium separation) work on four bulk samples at a range of size fractions was followed by acid leach test work, alongside supporting mineralogical analysis. Results of initial screening indicated that firstly, significant levels of HREE are associated with clay, and secondly that more than 70% of REE are associated with the less than 45µm screen or the finest clay fractions (Figure

9). This finding suggests that the Stromberg material is suitable for direct leach of the heavy rare earths from the clay without first undergoing any physical mineral processing. Leaching of the HREE directly into solution results in a more direct route to a carbonate/intermediate material, which may allow TUC to generate a more competitively valued product when compared to other concentration methods or products.



Figure 9 Screening results sample 6000102, Stromberg. 95% of the contained HREE is within a particle size of approximately 200um.

Positive results were received from subsequent single stage acid leach test work with up to an impressive 77% recovery of REE. In addition, grade recovery curves for the work are flat highlighting the potential for a greater tonnage of treatable material with lower grade mineralised material (0.1 to 0.2% TREO) returning a 69% recovery.

High resolution scanning electron microscope (SEM) analysis of the before and after leach samples (Figures 10) indicated that Xenotime, a highly sought after mineral in REE processing terms, is the main HREE bearing mineral in this clay fraction. This SEM study shows that Xenotime is present at sizes ranging from 70 to sub 0.5µm (very fine) as discrete grains and agglomerations around clay and other particles. Figure 10 illustrates how the xenotime is not within the clay mineral. This free physical state and the fine nature should make the material more amenable to leaching.



Figure 10 Scanning electron microscope SEM images of HREE bearing xenotime associations with clay (kaoling and haloysite), left discrete grains and right agglomerations

A multi-stage leach process involving an initial caustic wash followed by acid leach at a range of concentrations produced up to 85% TREE recovery, a 10% increase in recovery, was achieved using leaching by sulphuric acid (one part acid to one part water) after an initial sodium hydroxide caustic wash. In addition, work indicated that recovery from lower grade material is comparable to higher grades, with a 0.2% to 0.4% TREO composite giving a 77% recovery of TREE.

24 leach optimisation tests were performed to analyse sensitivity to temperature, time and acid strength. Results showed that acid consumption does not increase with the strength of acid used. This is a good result because stronger acids do improve recovery and recovery time and potentially at no extra cost. Temperature was not found to affect recovery. In theory, strong acid at room temperature should obtain the maximum recovery in the shortest possible time.

To date +70% of recovery of Yttrium has been readily achieved with a respectable acid consumption of between 200kg/t and 371kg/t. Strong acids have been avoided to date as traditionally they mean that extra neutralizing agents have to be added to the process. However, test-work with the Stromberg ore suggests that a 'counter-current' leach circuit could be used to avoid this problem. This essentially means that the Stromberg mineralised material itself is used as a neutralizing agent.

In addition leach tests also extracted up to 88% of uranium mineralisation and 93% of Scandium present, possibly creating a secondary revenue for the product. Furthermore, all of the deleterious element Thorium was left behind in the residues, significantly upgrading the quality/marketability of any final product.

Interpretation of the weathered rocks at Stromberg and SEM based mineralogical study shows remarkably similar geological characteristics to descriptions of Southern China Clay rare earth deposits. These deposits are known for their efficient mineral processing options.

TUC considers that the application of this geological model substantially increases the prospectivity of the Stromberg District and Daly Project Area.



Figure 11 Weathering profiles and mineralised zones (red dotted line) at Stromberg.

#### Lidar

A Lidar survey was completed over the Stromberg prospect to provide accurate elevations for drill hole locations and for future resource modeling. Reflectance level 160 band hyperspectral data was collected although images were not found to be useful in this instance and limited images were created (Appendix E). A 3d model of the surface elevations have been provided in txt format and 160 bandwidth data is provided in Appendix E.

# Scaramanga and Skyfall North

224 Gridded soil samples were taken at Scaramanga (5km NE of Stromberg) and 139 samples from Skyfall North (Extension of Skyfall prospect on application EL27151 immediately to the south of EL25222). Results of up to 190ppm Yttrium were returned from Scaramanga associated with an airborne radiometric signature comparable to Stromberg. Anomalous results were also returned from Skyfall North (Figure below).

7 RC holes for 220m and 165 samples were completed. Drilling intersected shallow HREE mineralisation of a similar nature to the Stromberg mineralisation. Significant Scaramanga intercepts are listed in Table xx. Drilling remains open between the two sections (~800m apart).



Figure 12 Scaramanga recent RC significant drill intersections over gridded radiometrics and topography.

Table 4	Significant	intersections	at	Scaramanga
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Hole ID	Interval Width m	TREO Grade %	From m	Dy <sub>2</sub> O <sub>3</sub> /TREO%	Er <sub>2</sub> O <sub>3</sub> /TREO%	Tb <sub>4</sub> O <sub>7</sub> /TREO%	Y <sub>2</sub> O <sub>3</sub> /TREO%	HREO/TREO%
SCRC02	5	0.1	10	7.29	4.46	1.1	50.84	69.99
incl	1	0.15	10	7.8	4.81	1.1	53.85	74.18
incl	1	0.1	14	6.62	4.4	0.96	50.08	68.21
SCRC07	2	0.12	10	7	4.61	0.89	62.02	81.23
incl	1	0.18	11	8.48	5.01	1.13	63.95	85.83
SCRC07	1	0.05	15	6.77	4.05	1.04	53.67	71.8



Figure 13 Surface sampling results over Stromberg, Scaramanga, Skyfall nth.

## 6.2 EL25229

# Quantum

No further on ground exploration was completed at this prospect however considerable interpretation and data analysis is ongoing.

# Regional reconnaissance rock and soil sampling

11 soils and 1 rock chip sample were taken on EL25229 during a helicopter reconnaissance program to test district REE potential. Very weakly anomalous REE results were returned with best result of 345ppm TREE at a weak radiometric anomaly 3.5km NE of Quantum. Results are provided in appendix A and locations shown in appendix B.

6.2 EL28970

# Regional reconnaissance rock and soil sampling

3 rock chip and 6 soil samples were collected during a helicopter reconnaissance program to test district REE potential. Results were returned with anomalous results for uranium (37ppm U max) and REE (418.5ppm max TREE). Data is provided in Appendix A and locations show in Appendix B.

### 6.2 EL25223

# Regional reconnaissance rock and soil sampling

One soil sample was collected from this tenement during the period, with no significant results returned. The tenement was not renewed at the end of year 6. Results are provided in appendix A and locations shown in appendix B.

### 6.2 EL25224

No exploration was competed during the period and the tenement was not renewed at the end of year 6.

### 6.2 EL29026

EL29242 was added to the amalgamated group in November 2012. No exploration was competed during the period.

#### 6.2 EL29242

EL29242 was added to the amalgamated group in November 2012. No exploration was competed during the period.

### 6. Conclusions/Recommendations

Exploraiton for year 6 has seen significant increases in the Daly Districs HREE potential. Drilling has confirmed the continuation of HREE mineralisation across the Stromberg deposit with mineralisation still open along strike. Also the discovery of HREE mineralisation at Scaramanga has confirmed the districts regional potential.

Further exploration is planned to test both the district HREE potential (further soil geochemistry to develop first stage drilling targets and follow up on current regional prospects) and continue improving Stromberg and Scaramanga deposits towards resources status. Metallurgical studies are ongoing for work at Stromberg to define an economic processing technique.

# 7. REFERENCES

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Ahmad, M., Wygralak, A.S., Ferenczi, P.A., and Bajwah, Z.U. 1993. Explanatory Notes and Mineral Deposit Data Sheets. *1:250,000 Metallogenic Map Series, Department of Mines and Energy, Northern Territory Geological Survey* 

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Khan, M., Ferenczi, PA., Ahmad, M., and Kruse, P.D., 2007. Phosphate testing of waterbores and diamond drillcore in the Georgina, Wiso and Daly basins, Northern Territory. *Northern Territory Department of Primary Industry, Fisheries and Mines Geological Survey Record 2007-003*.

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APPENDIX A Drill Hole Data

List of files:

 $GR042-09_2012\_G_02\_surfacegeochem.txt$   $GR042-09_2012\_G_03\_surfacegeochemlabdetails.txt$   $GR042-09_2012\_G_04\_surfacegeochemspectrometry.txt$   $GR042-09_2012\_G_05\_surfacegeochemnitonXrf.txt$   $GR042-09_2012\_G_06\_Drillcollars.txt$   $GR042-09_2012\_G_07\_Downholesurveys.txt$   $GR042-09_2012\_G_08\_Lithologs.txt$   $GR042-09_2012\_G_09\_Downholegeochem.txt$   $GR042-09_2012\_G_10\_Downholegeochemsamplelabbatch.txt$   $GR042-09_2012\_G_11\_Downholemetsamples.txt$ 

# APPENDIX B Location Maps

List of files:

GR042-09\_2012\_G\_13\_surfacegeochemmap1All.pdf GR042-09\_2012\_G\_14\_surfacegeochemmap2stromb.pdf GR042-09\_2012\_G\_15\_surfacegeochemmap3ScarSkyNth.pdf GR042-09\_2012\_G\_16\_surfacegeochemmap4EL25229reg.pdf GR042-09\_2012\_G\_17\_surfacegeochemmap5EL28970reg.pdf GR042-09\_2012\_G\_18\_drillcollarsmap6stromb.pdf GR042-09\_2012\_G\_19\_Mappingmap7stromb.pdf

# APPENDIX C Metallurgy Reports

List of files:

GR042-09\_2012\_G\_Metallurgy\_3346 - Acid Leach in Vials Results QA 120321.pdf

GR042-09\_2012\_G\_Metallurgy\_3346 - Acid Leach in Vials Results QA 120321.xls

GR042-09\_2012\_G\_Metallurgy\_3346 - Acid Leach in Vials Results.pdf

GR042-09\_2012\_G\_Metallurgy\_3346 - Acid Leach in Vials Results.xls

GR042-09\_2012\_G\_Metallurgy\_3346 - RE leach Results 120629.pdf

GR042-09\_2012\_G\_Metallurgy\_3346 - RE leach Results 120629.xls

GR042-09\_2012\_G\_Metallurgy\_M6075.A-P630-001 - Feed Size by Assay.xls

GR042-09\_2012\_G\_Metallurgy\_M6075.A-P660-001 Rev A - Stromberg ore processing -Report 1.pdf

GR042-09\_2012\_G\_Metallurgy\_M6075.pdf

GR042-09\_2012\_G\_Metallurgy\_WHGMS Testwork T1002 - TUC Resources 21 July 2012.pdf

# APPENDIX D Mineralogy Reports

List of files:

GR042-09\_2012\_G\_mineralogy\_towned\_stromberg\_23138a\_080212.pdf GR042-09\_2012\_G\_mineralogy\_townend\_stromberg\_23171\_200212.pdf GR042-09\_2012\_G\_mineralogy\_townend\_stromberg\_23177\_300312.pdf GR042-09\_2012\_G\_mineralogy\_townend\_stromberg\_23197\_170412.pdf GR042-09\_2012\_G\_mineralogy\_townend\_stromberg\_201111.pdf GR042-09\_2012\_G\_mineralogy23340.pdf

# APPENDIX E Lidar Geophysical Data

GR042-09\_2012\_G\_Hyperspectral\_data\_report\_hs201207 GR042-09\_2012\_G\_HyperspectralGeorefimage.jpg GR042-09\_2012\_G\_HyperspectralGeorefimage.tab Portable Hard Drive from Dimap containing remote sensing full wavelength Data.