



Operator: Crossland Strategic Metals Limited

# McGrath Hill

Lake Eyre Basin

Annual Report for EL 5279 for the period 21 June 2013 to 20 June 2014

Tenement Holders: Crossland Strategic Metals Limited

## Summary

EL 5279 is located in the Lake Eyre region approximately 210 km northwest of the Moomba project area and 245 km north of the settlement of Marree. The licence is one of five original applications that were made by Crossland Strategic Metals Limited (formerly Crossland Uranium Mines Limited) on the 14th May 2012 to explore the region for alluvial-regolith hosted REE mineralisation.

Crossland's attention was drawn to the region following the release of a report by Geoscience Australia (GA) of a detailed, nation-wide sampling survey project conducted between 2007 and 2009. The report, titled 'The National Geochemical Survey of Australia' (NGSA, Caritat P. 2011), was a collaborative effort between GA and State and Territory geoscience agencies.

Crossland, which is in the process of investigating a large, alluvial-hosted REE resource near Alice Springs, noted that results of the GA sampling within the massive drainage complexes of the Lake Eyre region exhibited certain encouraging Rare Earth elemental values. These results fell within the maximum grouping for those element populations over the national survey area.

A field visit in July 2012 was made by Crossland technical staff to assess the various areas of interest by collecting bulk samples. Once processed and analysed, the sampling results would enable the company to make an informed decision on land retention.

## Bibliographic Data

|                     |                                                                                       |
|---------------------|---------------------------------------------------------------------------------------|
| Report Title        | Annual Report for the period 20 <sup>th</sup> June 2013 to 19 <sup>th</sup> June 2014 |
| Author              | Paul Melville                                                                         |
| Project Name        | McGrath Hill (Gypsum Cliffs Project)                                                  |
| Tenement Number     | EL 5279                                                                               |
| Tenement Holder     | Crossland Strategic Metals Limited                                                    |
| Operator            | Crossland Strategic Metals Limited                                                    |
| Commodities         | Rare Earth Elements (REE)                                                             |
| Tectonic unit       | Lake Eyre Basin                                                                       |
| Stratigraphic Units | Quaternary and Recent deposits                                                        |
| 1:250,000 MapSheet  | Gason                                                                                 |
| 1:100,000 MapSheet  | Cowarie                                                                               |
| Keywords            | Lake Eyre Basin, Quaternary, REE Anomalies, NGSA Survey                               |

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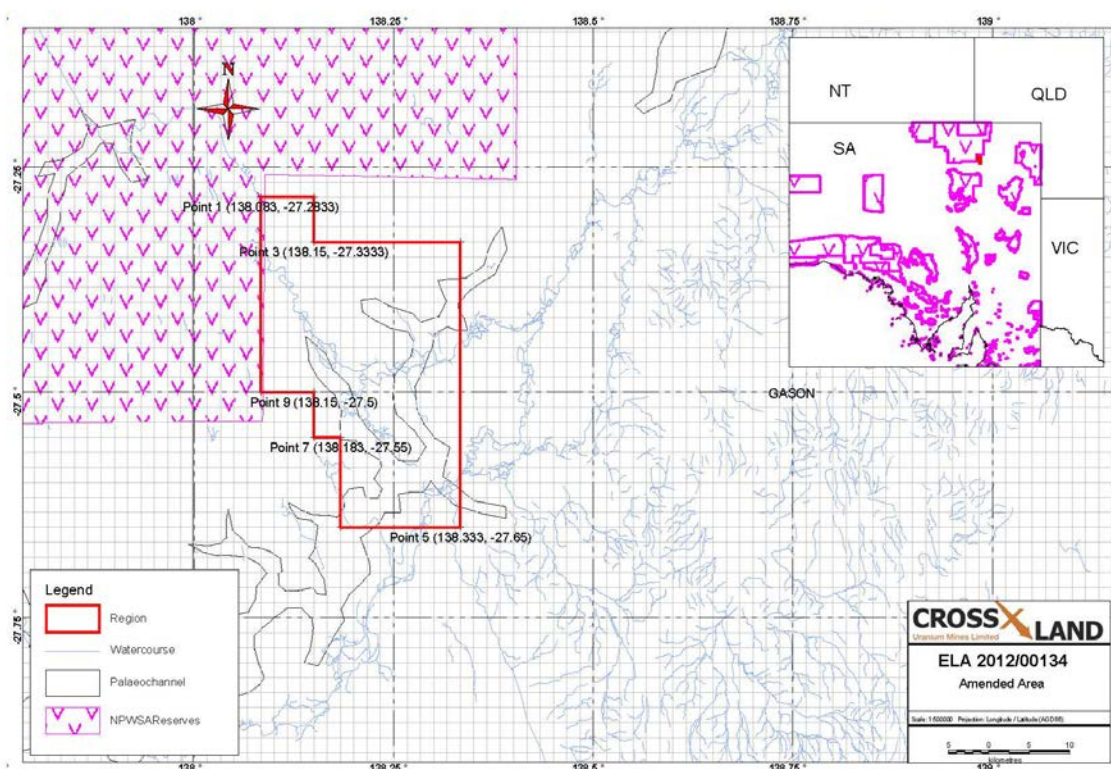
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# 1 Introduction

Exploration Licence EL 5279 McGrath Hill, comprising 968 km<sup>2</sup>, is located approximately 210 km northwest of the Moomba gas project area and 245 km north of the settlement of Marree. The licence is one of five original applications that were made by Crossland Strategic Metals Limited (formerly Crossland Uranium Mines Limited) on the 14th May 2012 to explore the region for alluvial-regolith hosted REE mineralization.



**Figure 1.** Location and outline of EL 5279 McGrath Hill (from Application document)

Attention was drawn to the region following Crossland's assessment of the NGSa nation-wide sampling results. Crossland has been exploring for REE in the Alice Springs region for several years (Charley Creek Project) following the discovery of widespread anomalies in alluvium and overburden during an exploration program focussing on sedimentary uranium. The NGSa program identified what appeared to be anomalies of REE in various samples collected in the major drainage systems north of Lake Eyre.

Following the application process and preliminary landholder contact, two of Crossland's Geologists mobilized from Darwin on 14 July 2012 arriving at the Mungerannie Hotel 17 July 2012. The next two days (18<sup>th</sup> and 19<sup>th</sup>) involved driving to the various Stations to hold talks with the pastoralists, explaining the exploration processes that Crossland wished to carry out on the land. There was mostly a favourable response for gaining access to the land and all land owners were very helpful. Stations visited were Etadunna / Mulka, Cowarie, Clifton Hills and Mungerannie.

On 20 July sample locations 2 and 3 were accessed via station tracks on Cowarie Station. Philip Island Helicopter's Robinson 44 was contracted out of Marree on 21 July to access the remote sample location 4 on Cowarie. On 22 July 2012 Crossland's geologists left the project area and demobilised back to Darwin.

During the time spent in the area, most of the stations were busy mustering, which affected the timing of the meetings. Previous work by gas exploration companies had influenced dealings with some of the landholders. An impression was gained by Crossland that the landholders appreciated the effort the company made to establish a good working relationship.

All samples collected were transported to and stored at Crossland's Alice Springs base, Milton Park Homestead. The company has facilities at the homestead where the samples are processed. Processed samples are then transported to Alice Springs where they are submitted to the lab for geochemical analysis.

## **2 Tenure Details**

EL 5279 was granted to Crossland Uranium Mines Pty Ltd on 20 June 2013 for a period of two years over an area of approximately 968 square kilometres. Of the five original applications, three including McGrath Hill were granted on the above date. The other two granted licences, ELs 5277 and 5278, were surrendered by Crossland on 19<sup>th</sup> June 2014. See Figure 1 for tenement detail.

## **3 Geology – Regional and Local**

The following are excerpts taken from an article in MESA Journal 8, dated February 1998.

Tertiary and Recent sediments of the Lake Eyre Basin (LEB) unconformably overlie Jurassic-Late Cretaceous sediments of the Eromanga Basin. The LEB is composed of two sub-basins, the Tirari and the Callabonna. The subject licence is located in the former. The region is covered by Quaternary and Recent unconsolidated to partly consolidated deposits comprised of sand, silt and clay deposited in Fluvial Channel, Saline Lake and Aeolian environments.

## **5 Previous Exploration**

There have been no exploration licences applied for within the area bounded by the subject licence.

## **6 National Geochemical Survey of Australia**

The National Geochemical Survey of Australia (NGSA) project was a collaborative effort between Geoscience Australia (GA) and State and Territory geoscience agencies. The aim of the project was to collect and analyse transported regolith samples representative of catchments covering most of Australia providing an internally consistent geochemical dataset. Below is an excerpt of the Executive Summary taken from Caritat, 2011 which lists some details of the NGSA.

“From 2007 to 2009, the National Geochemical Survey of Australia (NGSA) project collected sediment samples from 1315 sites located in 1186 catchments (~10 % of which were sampled in duplicate) from across Australia. The total area covered by the survey is 6.174 million km<sup>2</sup>, or ~81% of Australia. The resulting average sampling density is 1 site per ~5200 km<sup>2</sup>.

Catchment outlet sediments, in most cases similar to overbank sediments, were chosen as the sampling medium, with a near-surface sample (Top Outlet Sediment, TOS, from 0-10 cm below the surface) and a bottom sample (Bottom Outlet Sediment, BOS, between on average 60-80 cm below the surface) being collected. The sample sites were selected to be near outlets or spill points of large catchments, so that overbank sediments there could reasonably be assumed to represent well-mixed, fine-grained composite samples of all major rock and soil types present in the catchment.

A number of parameters were recorded in the field, including GPS coordinates, and dry and moist Munsell® colour and field pH of the soil. The sampling sites were described and photographed, with all field data captured digitally for easy subsequent upload into databases. In the laboratory, the samples were air-dried, homogenised and split into an archive sample for future investigations and an analytical sample for immediate analysis. The latter was further split into a bulk subsample, a dry sieved <2 mm grain size fraction subsample and a dry sieved <75 µm grain size fraction subsample. The bulk subsample was analysed for electrical conductivity of 1:5 (soil:water) slurries (EC1:5), pH of 1:5 (soil:water) slurries (pH1:5) and grain size analysis using a laser particle size analyser.

During 2009 to 2010, the coarse (<2 mm) and fine (<75 µm) fractions were analysed using a variety of analytical methods to determine (1) Total element content, (2) Aqua Regia soluble element content, and (3) Mobile Metal Ion (MMI™) element content (only done on the TOS coarse subsamples). Thus, with two depths sampled, two grain size fractions separated, and three analytical methods applied, up to nine element determinations were obtained per sampling site. This data is collated in spreadsheets and graphically represented as a series of maps.”

The report is a compilation of 529 geochemical maps providing valuable information for explorers across a wide range of commodities throughout most of Australia.

## 7 Work Completed

### *Sample Collection and Processing*

Samples were collected at three locations within the Warburton River system. The locations chosen corresponded to those where the NGSA personnel acquired their samples, which gave the high REE values. To replicate the NGSA procedures, all samples were collected from a depth of 60 to 80 centimetres with approximately 100 kilograms taken from each site. Following sample collection all excavations were back-filled. At the time of the visit, additional sites were not accessible, either due to flooding or landholder concerns.

Upon completion of the field work, the samples were taken to Crossland's facility near Alice Springs. A "head grade" sample was sent for assay. Results are listed in Appendix 1. Twenty five (25) kilograms of material from each sample location was then processed. Sample processing included sieving, desliming, Wilfley tabling, attritioning and magnetic separation. The full procedure is illustrated in the Flowsheet Diagram on page 11. Each sampling product was then sent for assay. Processing data is located in Appendix 2.

Table 1 lists and Figure 2 illustrates the sample locations.

Below are descriptions of the sample sites; photos of these sites are on the following pages.

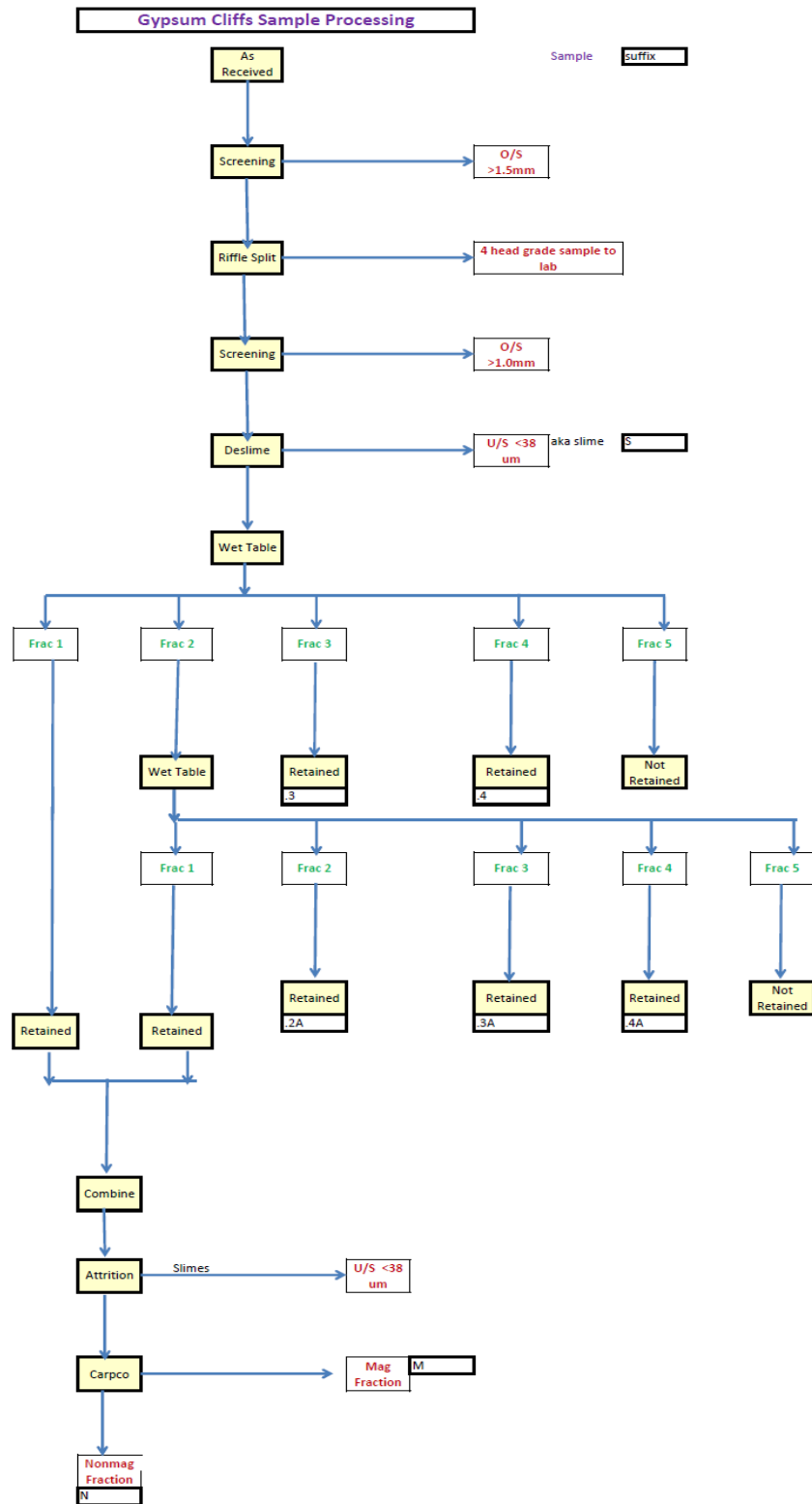
- Sample location 2 was located on Cowarie Station in a floodplain between two drainages. Just to the south is the Warburton River (Sample Location 3) and to the north is Sample Location 4. This area was accessed via station track. Sample material was collected from 60 to 80 centimetres depth and consisted of silty sandy clay. Five bags numbered 204407-204411 were collected, each with an estimated mass of 20 kg
- Sample location 3 was located on Cowarie Station and taken from the bank of the Warburton River. Access was gained via station track. Five calico bags numbered 20412-20416 were collected each with an estimated mass of 20 kg. Collected material was silty sand with 10% clay.
- Sample location 4 on Cowarie Station was accessed via Helicopter. Five calico bags of 20 kg each were collected and given individual sample numbers 204417-204421. The sample was taken within 10 metres of the original sample from the National Survey. Collected from the overbank of the creek (drainage of Warburton River), in an area that would be underwater during flooding; material collected consisted of fine to medium sand from between 60 and 80 centimetres depth.

**Table 1.** Sample location details

| Sample Location | Samples    | Zone | E_GDA_94 | N_GDA_94 | Date      |
|-----------------|------------|------|----------|----------|-----------|
| 2               | 204407-411 | 54   | 232312   | 6943260  | 7/20/2012 |
| 3               | 204412-416 | 54   | 234151   | 6942661  | 7/20/2012 |
| 4               | 204417-421 | 54   | 212716   | 6970791  | 7/21/2012 |



**Figure 2** Google Earth Image of EL 5279 showing sample locations



Crosslands Sample Processing Procedure Flowsheet



**Photo 1.** Sample location 2. Floodplain.



**Photo 2.** Sample location 3 Warburton River bank. Shovel in background is sample location.



**Photo 3.** Sample location 4. Aerial view.

### *Sampling Results*

Initial REE results from the head grade assays were found to be much lower than NGSA results. This was attributed to grain size whereby, Crossland sent the whole sample and not the 0-75 µm fraction.

Assays from sample processing proved to be much more promising. Titanium minerals, Zircon, Rare Earth bearing minerals, and other valuable metals (Ag, Cr, Hf, Nb, Sn, Ta, Th, U, and W) were found to be easily concentrated using simple mechanical processes. Rare earth concentrate returned up to 59 times bulk continental crust concentration for individual REE. Maximum Ratios of REE ppm/average bulk continental crust (BCC) are listed below. All analytical results are listed in Appendix 3.

Ce 13, Dy 15, Er 31, Gd 14, Ho 20, La 14, Lu 59, Nd 13, Pr 14, Sm 12, Tb 14, Tm 42, Y 20, Yb 52.

It is of note that some of the HREE are more concentrated than the LREE, and the HREE/TREE ratios are over 50% in some of the samples. Zircon and Hafnium were by far the most abundant within concentrates providing 100 – 600 times average crustal abundance.

It is anticipated that areas of higher initial heavy mineral content could be readily located with further exploration. Given the valuable composition of concentrate, a high enough initial concentration of heavy minerals may translate into an economically profitable product.

## 8 Expenditure

Expenditure on EL 5279 has been 47,881.27 during the period 20 June 2013 to 19 June 2014.

**Table 2** below lists the expenditure categories.

| <b>EL 5279 McGrath Hill -<br/>20/06/2013 To 19/06/2014</b> |                    |
|------------------------------------------------------------|--------------------|
| Acomm and meals                                            | \$1,317.43         |
| Airfares Australian Domestic                               | \$367.63           |
| Assays, analysis                                           | \$1,302.61         |
| Consultants - Geological                                   | \$2,798.34         |
| Consultants - Geophysics                                   | \$56.25            |
| Geologist/Field Superannuation                             | \$1,843.79         |
| Geologist/Field Wages                                      | \$21,068.52        |
| Payroll tax                                                | \$55.70            |
| Field expenses & consumables                               | \$1,117.48         |
| Tenement Fees / Rental                                     | \$10,012.00        |
| Travel exps - taxi bus parking                             | \$38.94            |
| Vehicle fuel, maintenance                                  | \$3,456.56         |
| Vehicle Hire (ground)                                      | \$1,260.00         |
| Helicopter                                                 | \$2,736.00         |
| Tools and Equipment                                        | \$450.02           |
|                                                            |                    |
| <b>TOTAL EXPENDITURE</b>                                   | <b>\$47,881.27</b> |

## 9 Conclusions

The results demonstrate most elements that were strongly anomalous in the original NGSA survey are strongly anomalous in the samples collected by Crossland. This confirms there are regional anomalies in these sediments that are probably unique in a continental sense. The exercise has also confirmed that the elements of interest concentrate in the heavy mineral fraction of the sediments. It will be relatively easy to confirm that this fraction will be readily recoverable using conventional technologies, in the same manner that REE bearing heavy minerals are recoverable using mineral sands technology at Charley Creek. The presence of zircon and probably rutile will dominate the value of the HM samples obtained; these two minerals alone seem to make up over 50% of the non-magnetic concentrate mix by mass in the most promising sample site.

The other valuable elements are consistently associated with these. The percentage of heavy mineral recovered from the samples is low; this is of less concern in the first pass reconnaissance than the fact that the valuable metals are consistently present and can be concentrated to worthwhile grades very simply.

## 10      **References**

Caritat, P. de, and Cooper, M., 2011. National Geochemical Survey of Australia: The Geochemical Atlas of Australia, Geoscience Australia Record 2011/20, Geocat #71973

Caritat, P. de, Cooper, M., Lech, M., McPherson, A., and Thun, C., 2009. National Geochemical Survey of Australia: Sample Preparation Manual, Geoscience Australia Record 2009/08, Geocat #68657

Lech, M., Caritat, P. de, and McPherson, A., 2007. National Geochemical Survey of Australia: Field Manual, Geoscience Australia Record 2007/08

Whedepohl, K.H., 1995. The composition of the continental crust. *Geochimica and Cosmochimica Acta*, 59: 1217-1232.



Operator: Crossland Strategic Metals Limited

# McGrath Hill

Lake Eyre Basin

Final Annual Technical Report EL 5279 for the period 21 June 2014 to 20 June 2015

Tenement Holder: Crossland Strategic Metals Limited

P. Melville  
11 August 2015

## Summary

EL 5279 is located in the Lake Eyre region approximately 210 km northwest of the Moomba project area and 245 km north of the settlement of Marree. The licence is one of five original applications that were made by Crossland Crossland Uranium Mines Limited, now Crossland Strategic Metals Limited (Crossland) on the 14th May 2012 to explore the region for alluvial-regolith hosted REE mineralisation.

Crossland's attention was drawn to the region following the release of a report by Geoscience Australia (GA) of a detailed, nation-wide sampling survey project conducted between 2007 and 2009. The report, titled 'The National Geochemical Survey of Australia' (NGSA, Caritat P. 2011) was a collaborative effort between GA and State and Territory geoscience agencies.

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A field visit in July 2012 was made by Crossland technical staff to assess the various areas of interest by collecting bulk samples. Once processed and analysed, the sampling results would enable the company to make an informed decision on land retention.

The on-going difficulties in acquiring funding has affected Crossland's ability to carry out worthwhile exploration on the tenement. As a result, the company surrendered the licence in June 2015.

## Bibliographic Data

|                     |                                                                                           |
|---------------------|-------------------------------------------------------------------------------------------|
| Report Title        | Final Annual Technical Report for the period 21st June 2014 to 20 <sup>th</sup> June 2015 |
| Author              | Paul Melville                                                                             |
| Project Name        | McGrath Hill (Gypsum Cliffs Project)                                                      |
| Tenement Number     | EL 5279                                                                                   |
| Tenement Holder     | Crossland Strategic Metals Limited                                                        |
| Operator            | Crossland Strategic Metals Limited                                                        |
| Commodities         | Rare Earth Elements (REE)                                                                 |
| Tectonic unit       | Lake Eyre Basin                                                                           |
| Stratigraphic Units | Quaternary and Recent deposits                                                            |
| 1:250,000 MapSheet  | Gason                                                                                     |
| 1:100,000 MapSheet  | Cowarie                                                                                   |
| Keywords            | Lake Eyre Basin, Quaternary, REE Anomalies, NGSA Survey                                   |

## Figures in Text

**Figure 1** : Location and Outline of EL 5279 ..... Page 6

## Tables in Text

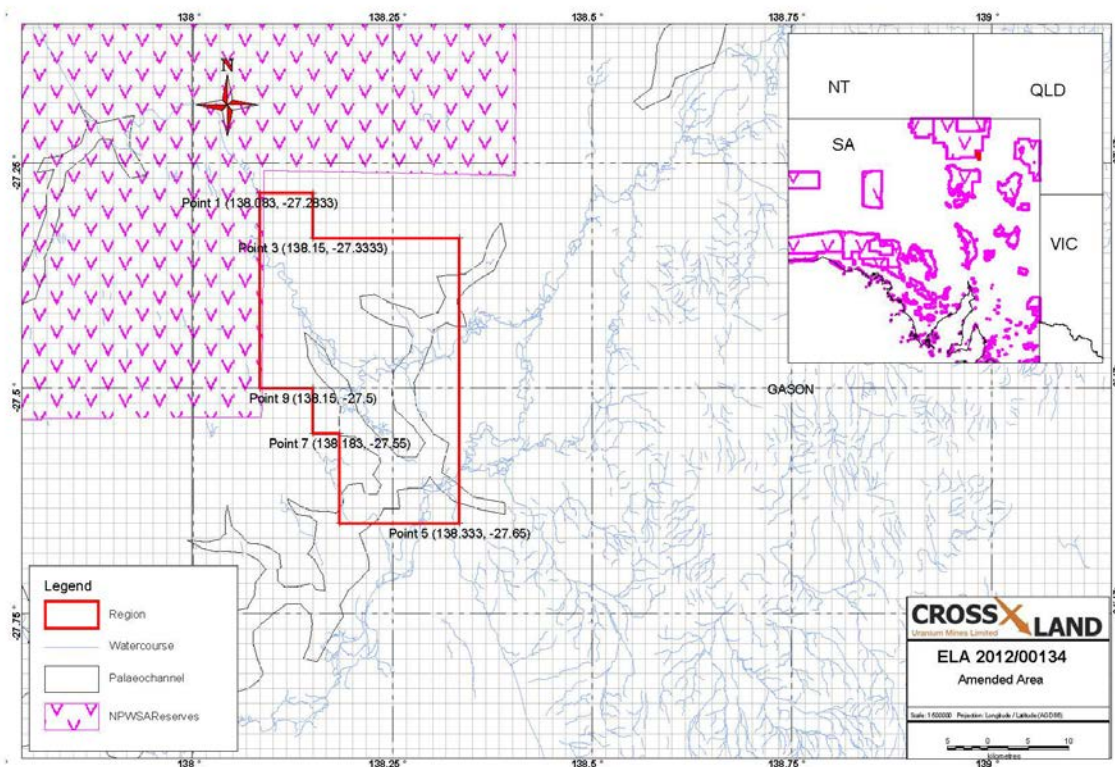
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# 1 Introduction

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**Figure 1.** Location and outline of EL 5279 McGrath Hill (from Application document)

Attention was drawn to the region following Crossland's assessment of the NGSa nation-wide sampling results. Crossland has been exploring for REE in the Alice Springs region for several years (Charley Creek Project) following the discovery of widespread anomalies in alluvium and overburden during an exploration program focussing on sedimentary uranium. The NGSa program identified what appeared to be anomalies of REE in various samples collected in the major drainage systems north of Lake Eyre.

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## **2 Tenure Details**

EL 5279 was originally granted to Crossland Uranium Mines Pty Ltd on 20 June 2013 for a period of two years over an area of approximately 968 square kilometres. Of the five original applications, three including McGrath Hill were granted on the above date. Two of the granted licences, ELs 5277 and 5278, were surrendered by Crossland on 19<sup>th</sup> June 2014. See Figure 1 for tenement detail.

EL 5279 was surrendered in June 2015.

## **3 Geology – Regional and Local**

The following are excerpts taken from an article in MESA Journal 8, dated February 1998.

Tertiary and Recent sediments of the Lake Eyre Basin (LEB) unconformably overlie Jurassic-Late Cretaceous sediments of the Eromanga Basin. The LEB is composed of two sub-basins, the Tirari and the Callabonna. The subject licence is located in the former. The region is covered by Quaternary and Recent unconsolidated to partly consolidated deposits comprised of sand, silt and clay deposited in Fluvial Channel, Saline Lake and Aeolian environments.

## **5 Previous Exploration**

There have been no exploration licences applied for within the area bounded by the subject licence.

## **6 National Geochemical Survey of Australia**

A full account of this project and how it influenced Crossland's exploration strategy is contained within the previous Annual Report.

## 7 Work Completed

For the period covered by this report, no further on-ground activities have taken place.

## 8 Expenditure

Expenditure on EL 5279 has been \$12,427.75 during the period 21 June 2014 to 20 June 2015.

**Table 2** below lists the expenditure categories.

| <b>EL 5279 McGrath Hill -<br/>21/06/2014 To 20/06/2015</b> |                    |
|------------------------------------------------------------|--------------------|
| Geological Consultants                                     | 4,218.75           |
| Tenement Fees / Rental                                     | 8,209.00           |
|                                                            |                    |
| <b>TOTAL EXPENDITURE</b>                                   | <b>\$12,427.75</b> |

## 9 Conclusions

The results of the initial research and the follow-up work by Crossland has demonstrated that most elements, which were strongly anomalous in the original NGSA survey, are also strongly anomalous in the samples collected by Crossland. This confirms there are regional anomalies in these sediments that are probably unique in a continental sense. The exercise has also confirmed that the elements of interest concentrate in the heavy mineral fraction of the sediments. It will be relatively easy to confirm that this fraction will be readily recoverable using conventional technologies, in the same manner that REE bearing heavy minerals are recoverable using mineral sands technology at Charley Creek. The presence of zircon and probably rutile will dominate the value of the HM samples obtained; these two minerals alone seem to make up over 50% of the non-magnetic concentrate mix by mass in the most promising sample site.

The other valuable elements are consistently associated with these. The percentage of heavy mineral recovered from the samples is low; this is of less concern in the first pass reconnaissance than the fact that the valuable metals are consistently present and can be concentrated to worthwhile grades very simply.

Although initial results proved very encouraging, the global economic factors that have affected Crossland's ability to raise funds has had a serious impact on the company's ability to carry out worthwhile exploration on its tenements, including McGrath Hill. As a result, the company has had to surrender the tenement.

## 10      **References**

Caritat, P. de, and Cooper, M., 2011. National Geochemical Survey of Australia: The Geochemical Atlas of Australia, Geoscience Australia Record 2011/20, Geocat #71973

Caritat, P. de, Cooper, M., Lech, M., McPherson, A., and Thun, C., 2009. National Geochemical Survey of Australia: Sample Preparation Manual, Geoscience Australia Record 2009/08, Geocat #68657

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