# Spectrum Rare Earths Ltd.

# Combined Annual Technical Report

## For period ending 7th November 2014

## GR349-14

## Skyfall - EL27151, EL30109 (dropped), EL30110 (dropped)

## Commodity: Rare Earths

| | |
|---|---|
| **FERGUSSON RIVER SD5212** | **1:250,000** |
| **Jinduckin 5169** | **1:100,000** |

**Report No. 2015- 001**

**Prepared for Spectrum Rare Earths Ltd.**

**By L. Petrella**

**December 2014**

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# 1 SUMMARY

EL27151 is 220km south of Darwin (by road). Spectrum Rare Earths Ltd is exploring for rare earths. No exploration for rare earths has ever been undertaken in the lease, however Spectrum has already been exploring for rare earths in the region on its Quantum and Stromberg Prospects.

Work before Year 1 of tenure consisted of a review of both NTGS data, compilation of significant results from Industry reports and geophysical data review. The previous work showed that early exploration (in the 1960's and 1970's) focussed on diamond and base metal exploration. Base metal mineralisation has been found in a number of locations within EL27151 with varying levels of exploration activity. Uranium mineralisation has been investigated by Euralba Mining but no significant discovery has been made. Before Year 1, Spectrum also sampled some rock outcrops over Skyfall and Largo under a preliminary Exploration Permit.

During year 1, Spectrum managed to investigate the Skyfall Prospect in great detail. First a rock chip and soil sampling reconnaissance programme was undertaken allowing Spectrum to clearly identify the best drilling targets. In total, 699 samples of soil and rock chips combined were taken.
Following the sampling program, Spectrum started digging trial pits and very shallow RAB holes to better investigate the type of mineralisation at surface. 13 RAB holes were drilled for a total of 12.6m and 8 trial pits were dug for a total of 20.02m. The results from the trial pitting demonstrated that the surface mineralisation was very rich containing high Magnetic End Use Rare Earth distributions which range from 34% to 44% of TREO including high averages of 19.9% Neodymium and 4.2% Dysprosium Oxide of TREO.
Spectrum drilled 8 diamond holes including 7 relatively shallow holes and one deep hole to better understand the regional stratigraphy. A total of 465.1m was drilled. This drilling program highlighted the greater rare earth potential at surface in several sheets of flat lying mineralisation. Two zones of different rare earth enrichment were identified. The weathering profile of Skyfall's mineralisation appears to be clearly segregating the more valuable rare earths. The Magnetic End Use Rare Earths are enriched in the upper surface zones, while the Heavy Rare Earths are present with depth. This metallurgical profile offers Spectrum the potential for a full suite of higher value rare earths.
Spectrum has already begun metallurgic work on Skyfall's surface mineralised material. Results to date are extremely encouraging and still ongoing.

This report includes details on the lease, a summary of previous work undertook within the lease, a summary of the geology of the area and then a review of the work done by Spectrum in EL27151 during Year 1 of tenure.

# 2 LOCATION AND ACCESS

EL27151 (Skyfall Prospect), EL30109 and EL30110 are located approximately 93km South-West of Pine Creek, Northern Territory on the Fergusson River (SD 52-12) 1:250,000 and Jinduckin 1:100,000 topographic map sheets.

Surface land types in and around the prospect consist mainly of plateaus, cliff faces, alluvial floodplains, with open grassland or woodland. Other land types include gentle, undulating crests and slopes as well as flat or gently undulating areas. Rainforest exists in areas surrounding the creeks.

Access to GR349-14 from Darwin is via the Stuart Highway onto Dorat Road to Oolloo Crossing, and then a track to Fish River transects the northern and western portion of the Licence, Figure 1.
Alternate access is from Tipperary Station along the Fish River Tracks to Beeboom Crossing and onto Indigenous Land Corporation (ILC) land, Figure 1.

Spectrum has established good communication with both the ILC and the Tipperary land owners and has contributed for the tracks used over a 7 year period. The road between Oolloo Crossing and Skyfall is a Government gazetted road therefore no access permission is required.

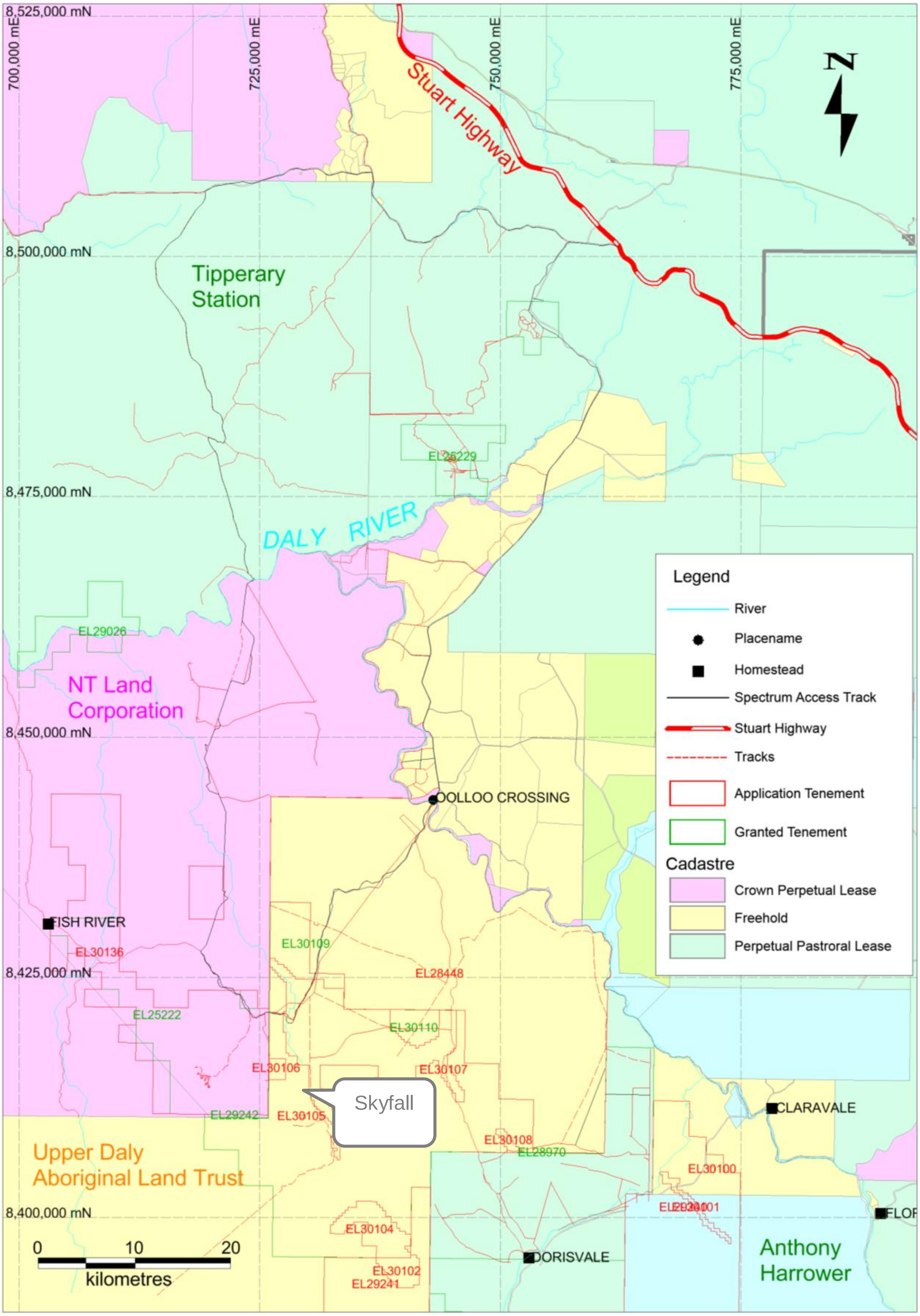



**Figure 1: Project Area and Prospect Location with Underlying Cadastre– GR349-14 (coordinates in GDA94 z52).**

# 3 TENEMENT STATUS AND OWNERSHIP

Full access to the Skyfall Tenement (EL27151) was granted to Spectrum on 8/11/2013 after due processes, (Table 1). Tenements EL30109 and EL30110 were granted on 8/11/2013 and have been relinquished on 4/11/2014 with no work done on them. Details on these grouped tenements are summarised in Table 1.

These tenements overlay the following 1:250,000 mapsheets: PINE CREEK SD5208 and FERGUSSON RIVER SD5212 and the following 1:10000 mapsheets: Daly River 5070, Wingate Mountains 5069 and Jinduckin 5169.

**Table 1: Spectrum Tenement Details**

| Group Report Number | Company | Group Report Name | Status | Commence ment Date | Reporting Period |
|---|---|---|---|---|---|
| GR349-14 | Spectrum Rare Earths Ltd. | Skyfall - EL27151, EL30109 (dropped), EL30110 (dropped) | Granted | 8/11/2013 | **8 November - 7 November**<br>EL 27151, Yr 1, 08/11/2013 to 7/11/2014<br>EL 30109, Yr 1, 08/11/2013 to 7/11/2014<br>EL 30110, Yr 1, 08/11/2013 to 7/11/2014 |

At Skyfall (EL27151, EL30109, EL30110) the underlying cadastre is Aboriginal Freehold Land and is owned by the Upper Daly River Land Trust under the care of the Wagaman People. There are also Pastoral lease holders within the Aboriginal Freehold Land, detailed in

Table 2 below.

Spectrum has established an Aboriginal Land Use Agreement with the Land Trust through the NLC. A Mine Management Plan (MMP 0773-01) was approved on 15/11/2013. A work program was approved for the MMP area by the Traditional Land Owners on 17/09/2013.

Pastoral Lease holders are made aware of spectrum's activities and work, on an ongoing basis, as programs develop. No formal agreements are required with the Pastoralists.

Spectrum has worked with the Wagaman People on the adjoining tenement EL25222 at its Stromberg Rare Earth Prospect since 2008 and a strong working relationship exists.

Spectrum has contacted the appropriate land owners prior to any work commencing as per Spectrum's land owner consultation procedure.

The underlying cadastre and land ownership details for Spectrum's Skyfall Tenement are outlined in Table 2.

**Table 2: Land Owners Details**

| Table 2: Land Owner Details | | |
|---|---|---|
| Land Owner | Location Address | Phone Numbers |
| Upper Daly Aboriginal Land Trust | Northern Land Council, P.O. Box 42921, Casuarina NT 0811 | Via the NLC |
| NT Portion: 4059 | | |
| Lease Holders in EL27151: | | |
| Tony Harrower | Dorisvale Station | 89767007 (Pell Airstrip) |
| | | 8975 4735 (Dorisvale) |
| Alan Fisher | Wombunji Station | 0889 754 148 |
| Keith Phelps | Oolloo block | 0419 612 476 |
| Nick Krebs | Benung block | 8975 0589 |

# 4 GEOLOGY

The project area sits within the Fergusson River (1:250000) and within the Jinduckin (1:100000) geological maps (Figure 2).

## *4.1 Summary of Regional Geology*

The Fergusson River geological map is cut in its centre by a major structure: the Dorisvale Fault trending NW-SE, (Figure 2). The fault divides the geology into two main areas: the eastern part is mainly covered by the Daly River Basin sediments estimated as Cambrian to Ordovician age. The western part is largely covered by the Victoria basin with Carpentarian intrusive bodies. These formations are partially covered by flat-lying Mesozoic and Cainozoic cover.

EL27151 contains both Daly River Basin sediments in its eastern part and Victoria Basin sediment in its western part. These two major groups are separated by the Dorisvale Fault located in the middle of EL27151. The Skyfall Prospect sits on this fault.

Figure 3 describes Spectrum's interpretation of the geology, structure, tectonic history and mineralising events in relation to the Skyfall area.

Folded Lower-Proterozoic Finniss River Group rocks (greenschist to amphibolite facies) rest on an Achaean granitic-gneissic complex. Lower-Proterozoic granites were intruded into this sequence. In Spectrum's tenements these include: the Soldiers Creek Granite, the Allia Creek Granite, and further away the Cullen Granite. This intrusion episode is displayed in Figure 3 and is considered to be the first event supplying rare earths into the system. These granites will be discussed further in 5.1 Regional Conceptual Model as they are important in Spectrum's exploration model.

Lower-, Mid-Proterozoic sedimentary rock including the Tolmer Group lie unconformably on the Lower-Proterozoic unit described above and were laid down in shallow seas. One unit known to outcrop in the area is the Hinde Dolomite. Both these units are weakly folded.

The previously described Lower-Mid-Proterozoic rocks are unconformably overlain locally by the Lower-Cambrian Antrim Plateau Volcanics. Uplift and erosion preceded the regional extrusion of these volcanics. They consist of massive and vesicular tholeiitic basalt. In places, medium grained feldspathic sandstone is interbedded with the basalt.

Unconformable to the Volcanics is the Daly River Group consisting of a gently dipping sequence of limestone, sandstone, and siltstone laid down during an extensive marine transgression in the Mid-Cambrian. These sediments are confined to the Daly Basin, the western margin of which is defined by the Dorisvale Fault. This unit is carrying the base metal mineralisation implying a fluid circulation and mineralisation event at that time as illustrated in Figure 3. The Palaeozoic Daly Basin is believed to have resulted from Tertiary movements. Other work has suggested that a basin existed in Precambrian times since a thickening of the Precambrian sequence is implied beneath the basin.

Unconformably overlying the Daly River Group are Mesozoic Mullaman Sedimentary Beds. The Mullaman Beds have been extensively laterised; in places the laterite profile has been silicified and forms a tough cap rock on hilltops.

Superficial deposits overlying the above strata are the Cainozoic sediments. These are widespread across the district and consist of pisolitic laterite, ferruginous rubble and alluvium. Spectrum believes that these sequences host a third phase mineralisation event where rare earths were re-concentrated due to weathering, (Figure 3).

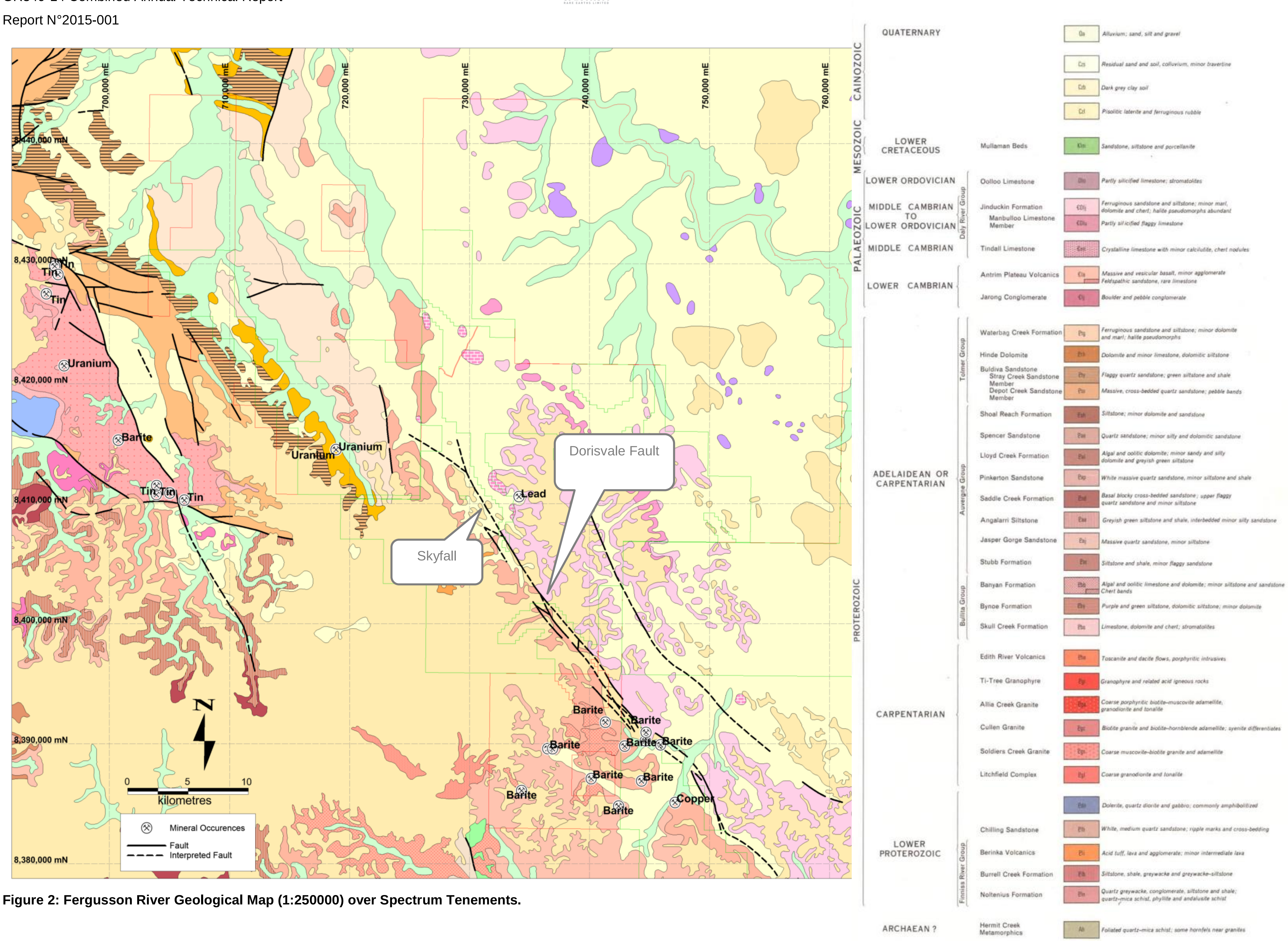



**Figure 2: Fergusson River Geological Map (1:250000) over Spectrum Tenements.**

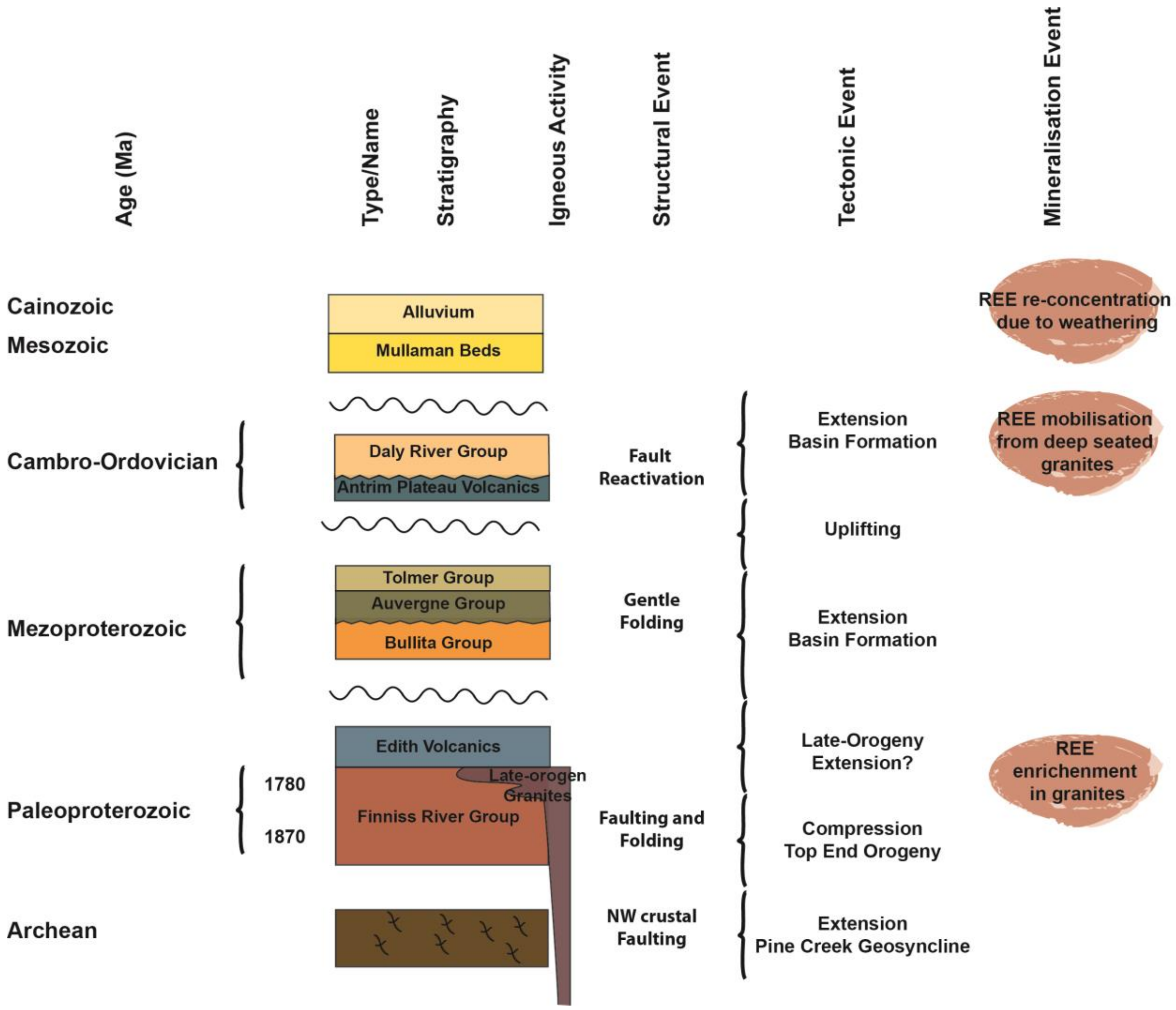



**Figure 3: Stratigraphic Column and Mineralising Events for the Project Area.**

## *4.2 Summary of Project Area Geology*

The Skyfall Prospect is cut by numerous NW-SE faults forming a positive flower structure that uplifted older, folded Lower-Proterozoic rock units. These structures are associated with smaller east-west trending tension (riedel) faults mapped by Spectrum. The larger faults are showing a closing pattern towards the south of the prospect, therefore Skyfall is interpreted to sit on the closing edge of the positive flower structure. The Dorisvale Fault would then be a strike-slip fault with its north-east side moving southward and its south-west side moving northward.

The Lower-Proterozoic units are covered by flat lying Cambrian rock mainly constituted of sandstone, siltstone and nodular siltstones cut by coarse conglomeratic channels potentially from an estuarine environment.

The latter rock units are covered by more recent lateritic plateaus.

# 5 PREVIOUS EXPLORATION

## 5.1 Historical Exploration on GR349-14

Spectrum completed a data compilation of previous companies' exploration efforts in the area through the Mineral Exploration Reports provided by the NTGS. Useful results and reports are summarised below and in Appendix A.

Most of the exploration work undertaken over GR349-14 was from 1967 to 1995. Different companies have been successively looking for diamonds, base metals and gold. Diamond was the most targeted commodity over the exploration licences; however the most advanced exploration was for base metals. No rare earth exploration has ever been undertaken in this area.

A number of geophysical surveys have been conducted.

Figure 4 displays the different geophysical surveys conducted in the area. Four types of surveys cover the Skyfall Prospect (aeromagnetic, radiometric, electromagnetic and IP surveys), however, line spacing is generally wide (Figure 5); 1km for electromagnetic survey and 400m for the radiometric survey. Despite the broad line spacing radiometric data pointed out interesting radiometric anomalies over GR349-14.

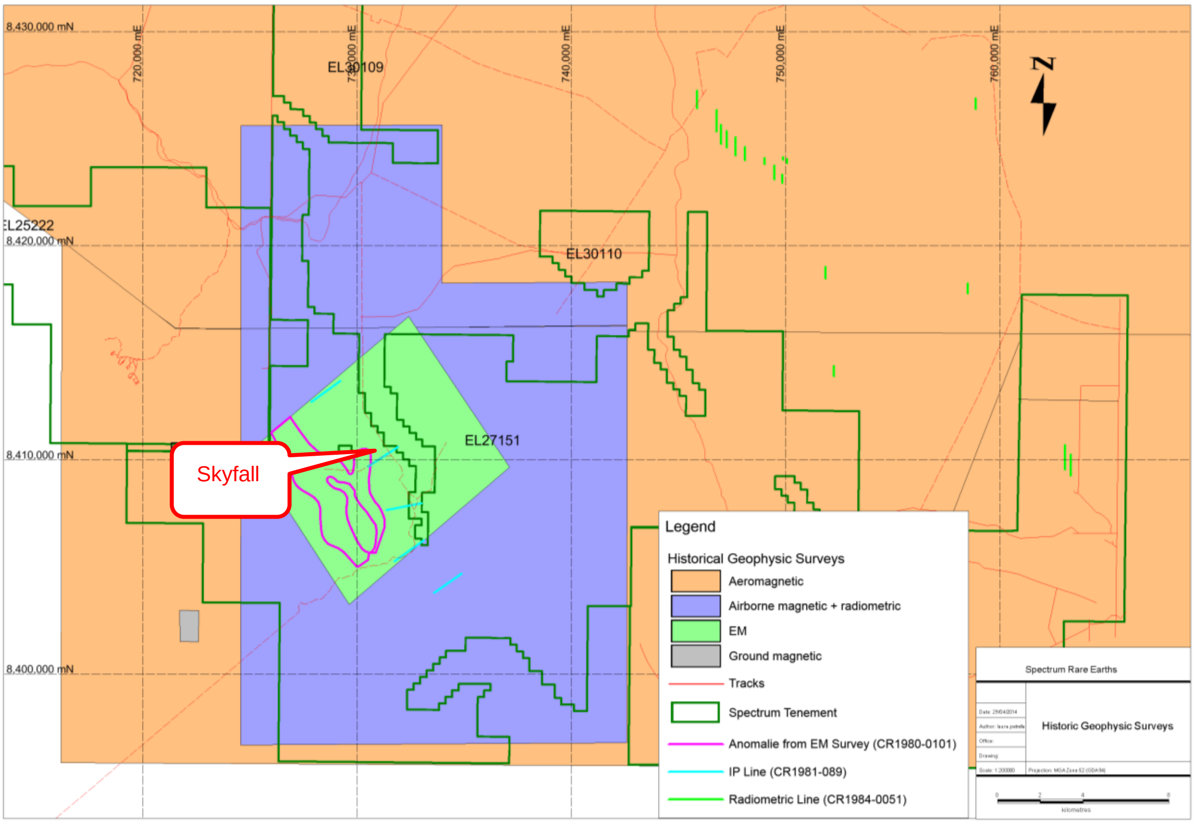



**Figure 4: Historic Geophysics Surveys over Spectrum's Skyfall Prospect.**

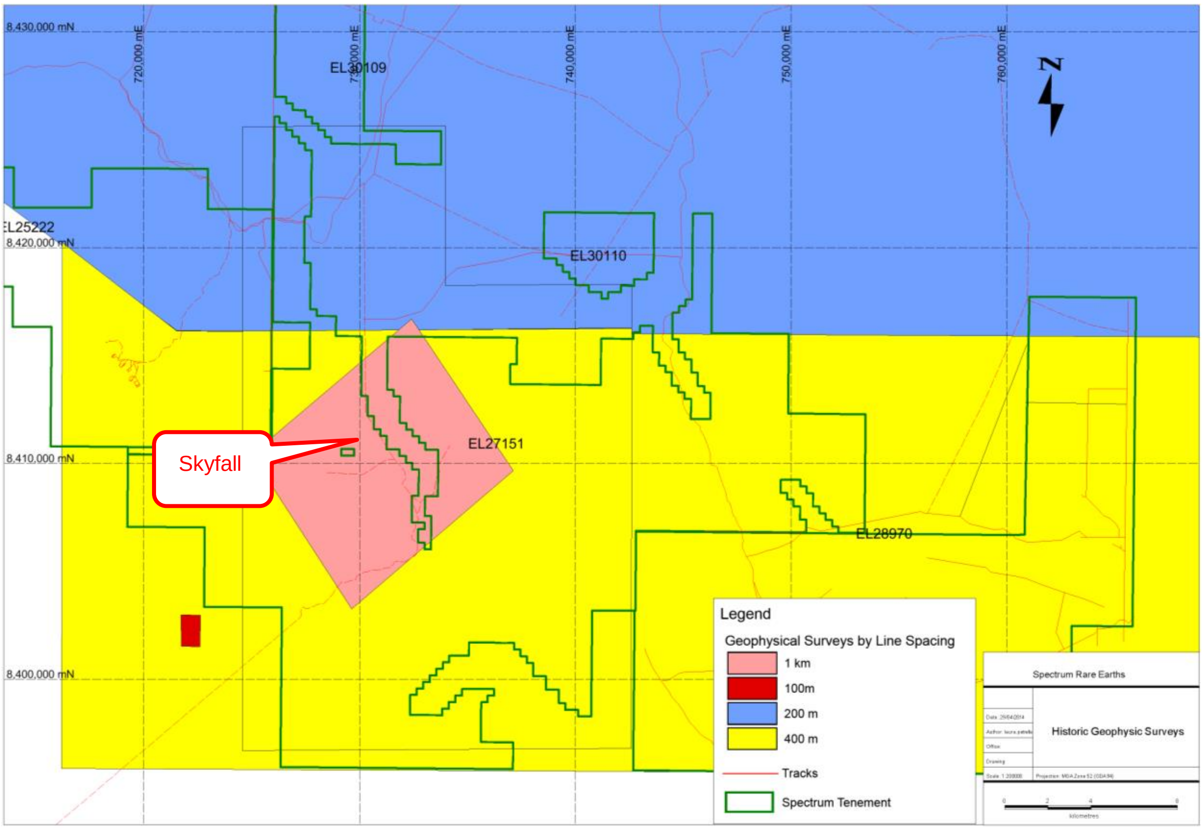



**Figure 5: Flight Line Spacing for Geophysics Surveys over Spectrum's Skyfall Prospect.**

Greenfield exploration including stream sediment, soil and rock chip sampling was conducted by previous companies. Best results highlighted base metals and uranium anomalies along the Dorisvale Fault mostly concentrated on the now named Skyfall radiometric anomaly. Results obtained from the previous companies are summarised in tables in Appendix C and displayed in Figure 6. A general base metal anomaly was noted. The mineralisation has been interpreted to be a carbonate-hosted base metal type. Notable values included up to 320ppm uranium, 800ppm copper, 19.3% lead and 1.65% zinc.

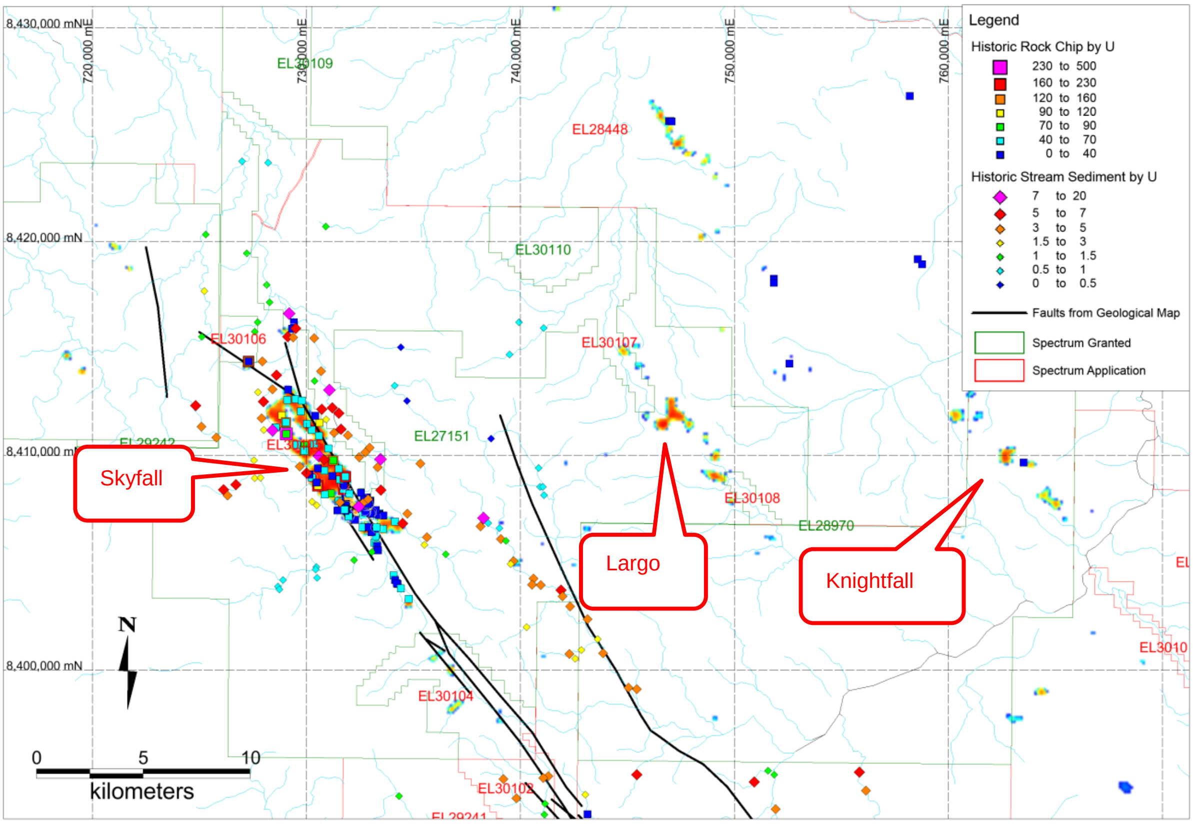



**Figure 6: Historic Surface Geochemistry Thematically Mapped by Lead across the District.**

Subsequently, drilling was completed over the Skyfall area first by Euralba Mining and then by Esso Australia, summarised in Figure 7 and Appendix A. Euralba Mining drilled 10 percussion/diamond holes and found values up to 47 ppm uranium, 20,000 ppm zinc and 48,000 ppm lead. Following this, Esso Australia drilled 3 holes identifying sulphides associated with sediment breccia interpreted as a carbonate-hosted epigenetic type deposit. The best values were up to 1,000ppm lead, 220ppm copper and 7,500ppm zinc. Importantly, these holes were not tested for rare earths.

Spectrum has digitally compiled the geological logs from these holes and plotted them on cross sections. Attempts have been made to correlate the described drilling to recently mapped geology but have been unsuccessful in some cases. Spectrum has made every attempt to locate the core from these holes but to no avail. No core photography has been located despite a significant search.

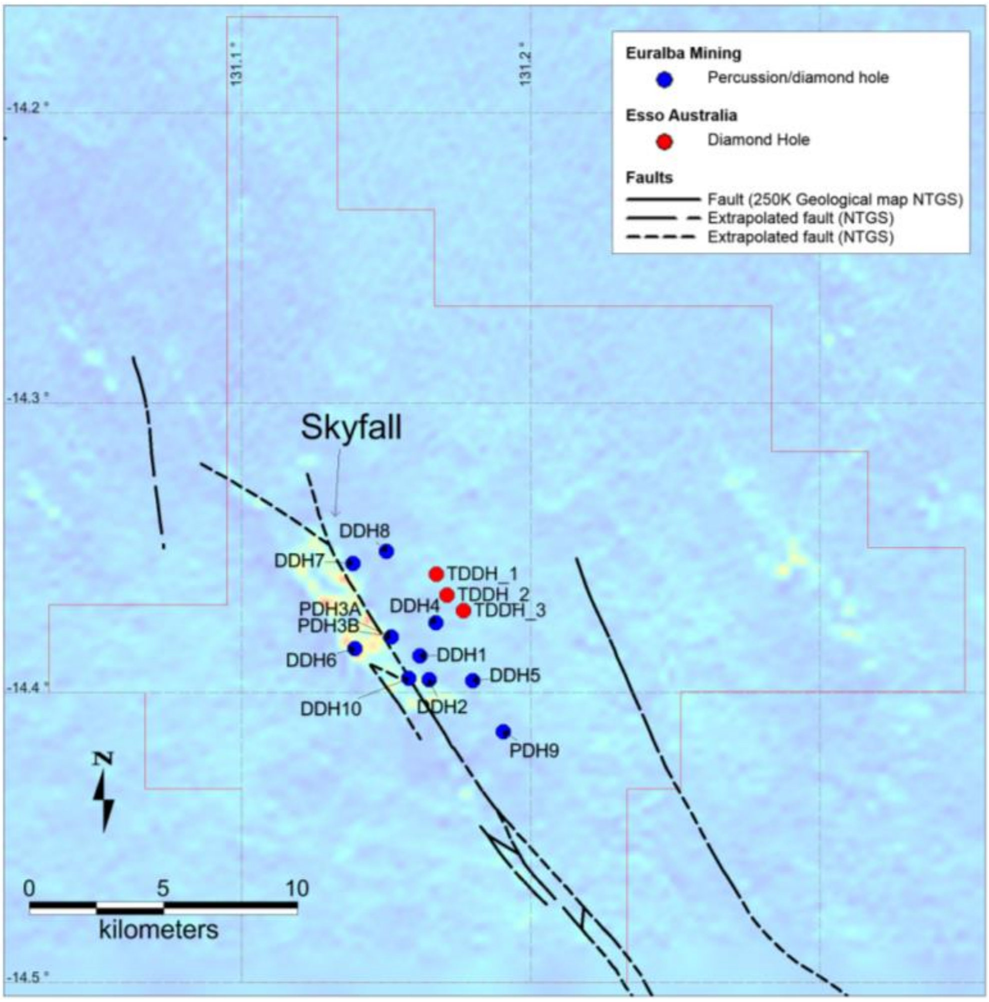



**Figure 7: Historic Drill Hole Locations over the Skyfall Prospect.**

## 5.2 Known Mineralisation around the Prospects Area

More recently Spectrum's Greenfields exploration efforts have led to the discovery of two Heavy Rare Earth Prospects; Stromberg and Scaramanga (Figure 8).

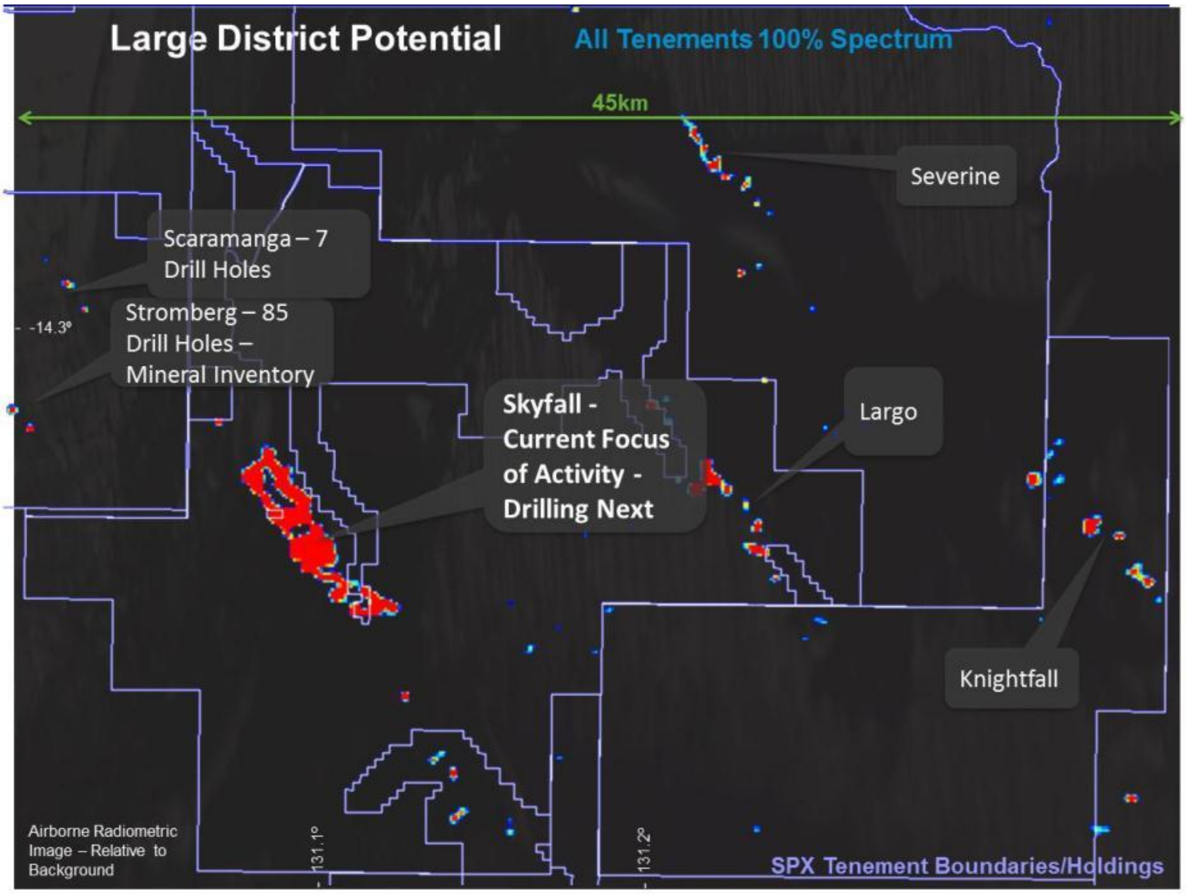



**Figure 8: Prospect Locations**

Geological modelling at Stromberg defined a robust mineral inventory, next stage JORC Inferred Resource Conversion, of ~1.5Mt @ 0.46% TREO from 85 drill holes within a mineralised envelope at a 0.1% TREO cut off and 0.05% mineralised envelope.

Stromberg consists of multiple at surface flat lying zones in a sedimentary setting. Mineralisation is seen to be thicker closer to faults which are believed to be feeder or concentration structures for the mineralisation (Figure 9).

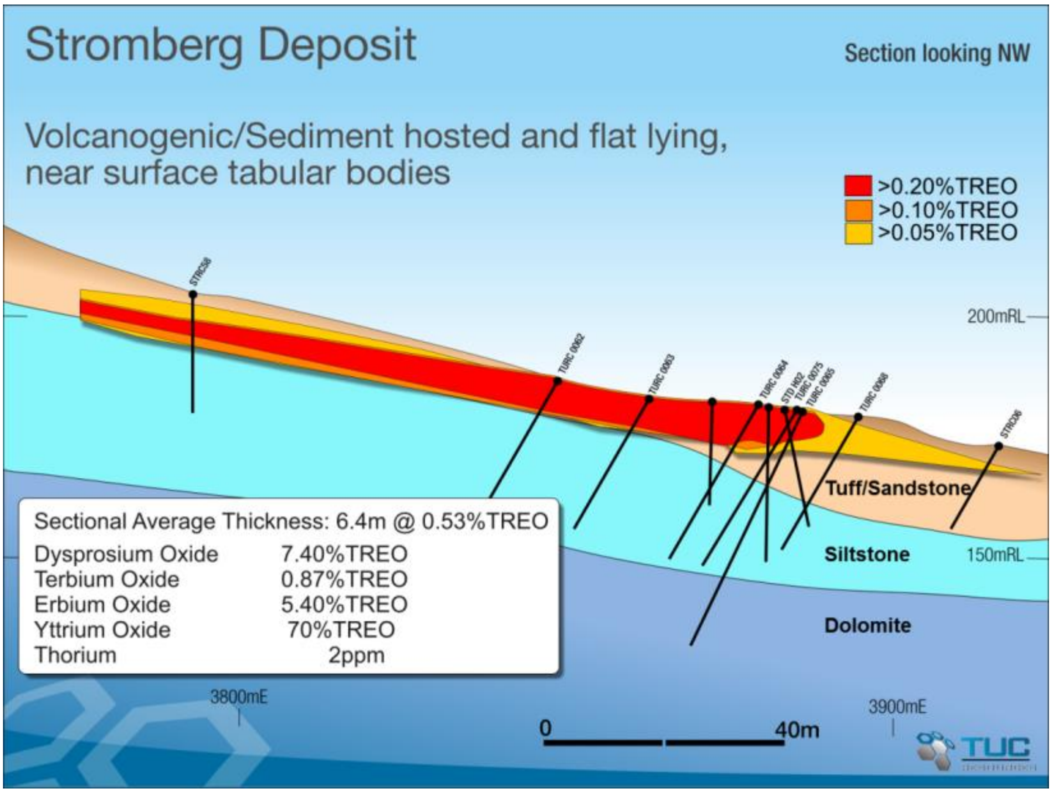



**Figure 9: Section showing Interpreted Geology at Stromberg (>0.2 TREO cut off and <1m internal dilution).**

The intersections at Stromberg contain high proportions of Heavy Rare Earths (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 on average:

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

Mineralogy by XRD (X-Ray Diffraction) and optical methods has confirmed Xenotime-(Y) mineralogy as the rare earth element (REE) host (Young and Prince, 2013). Xenotime is arguably the second most efficient mineral for rare earth extraction.

Approximately 5km from Stromberg; drilling successfully defined additional mineralisation at the Scaramanga Prospect highlighting the broader district potential. Significant intersections include:

- SCRC07 - 2m @ 0.12% TREO (81.2% HREO/TREO) from 10m;
- SCRC02 - 5m @ 0.1% TREO (70% HREO/TREO) from 10m.

Mineralisation at Scaramanga is interpreted to be in the same geological setting as Stromberg.

# 6 EXPLORATION DURING YEAR 1 on EL27151

## 6.1 Before Year 1

Spectrum commenced exploration on EL27151 during 2012 under a Preliminary Exploration Permit issued by the Northern Land Council and Traditional Owners. This allowed early stage exploration to be undertaken on the Skyfall and Largo Prospects, whilst the final tenement grant process was finalised. 49 rock chips and 2 soil samples were collected at Skyfall and 7 rock chip samples were taken at Largo, displayed in Figure 10. The results were anomalous with rare earth elements and significant results include:

- 1.25% TREO (37% Heavy Rare Earth Oxide (HREO)/TREO);
- 0.81% TREO (14.8% HREO/TREO),
- 0.48% TREO (27.8% HREO/TREO).

Data is provided in Appendix B and illustrated below in Figure 10.

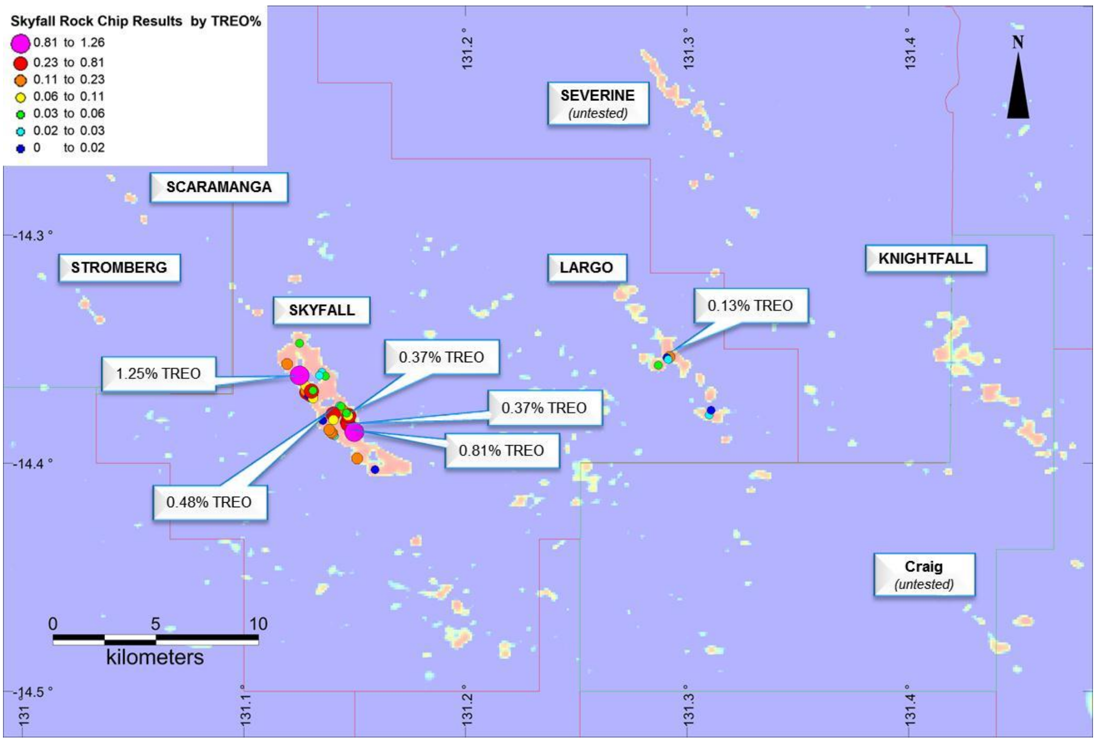



**Figure 10: Spectrum Surface Geochemistry Locations at EL27151.**

## 6.2 During Year 1

### 6.2.1 Remote sensing

Spectrum undertook a remote sensing (airborne topographic) survey above the Skyfall and Largo Prospects, located in EL27151, in October 2013. This image can be found in Appendix C.

This survey helped Spectrum in planning work using the topography, and was also very useful to interpret the structural geology. Structures can be seen in Figure 11.

### 6.2.2 Geophysical activities

No geophysical work has been undertaken; however, Spectrum has used the airborne geophysical data held in Geoscience Australia's National Airborne Geophysical Database (NAGD). Different sets of data cover the area of interest with narrower line spacing over the north of Skyfall compared to more sparsely covered data over Largo.

Magnetic data sets allowed Spectrum to define and highlight major tectonic structures in the area.

Radiometric data used by Spectrum was downloaded from the Geoscience Australia Website. Spectrum focused on radiometric anomalies sitting along major structures implying a tectonic related type of mineralisation/target for mineralisation. For example, the Largo prospect sits on a fault and the Skyfall prospect sits along a major structure.

### 6.2.3 Surface geochemistry

A total of 699 surface samples were taken over the Skyfall and Largo radiometric anomaly including 161 rock chips and 539 soil samples. The sampling grid varied between 250 meters to 120 meters spacing in more interesting areas (Figure 11 and Figure 13). The grid was oriented perpendicular to Skyfall major structure, the Dorisvale fault as seen in Figure 11.

Surface sample locations and assay results are displayed in Appendix B.

The best soil sample result returned is an impressive 2,579ppm Total Rare Earth Oxide (TREO). Other high grade results including 993ppm TREO are known in the immediate vicinity providing strong data support.

Soil Sampling has clearly defined a single Magnetic End Use Rare Earth* soil anomaly (averaging 200ppm MEU REO*) measuring over 170,000m$^2$ (Figure 11). This provided an excellent target for diamond drilling which was undertaken in May 2014. Magnetic End Use Rare Earths, including Neodymium and Dysprosium, supply key growth markets in fixed permanent magnets (Figure 12).

The Magnetic End Use Rare Earth Anomaly is surrounded by a 5km long and 500m wide 200ppm TREO soil anomaly (defined by over 600 geochemical samples) with ten soil samples returning over a 500ppm Total Rare Earth Oxide (TREO) threshold. This 500ppm TREO threshold is more typically used to define mineralised envelopes from drilling and as such is extremely significant.

Assays of rock chips continue to show a very high proportion (39% of TREO) of Magnetic End Use Rare Earths. Their abundance in a single defined location at Skyfall could be evidence of an increasingly promising mineralogical setting.

Both rock chip and soil geochemical anomalies show a strong affinity (Figure 11) to mapped geological fault patterns adding extra confidence in the results.

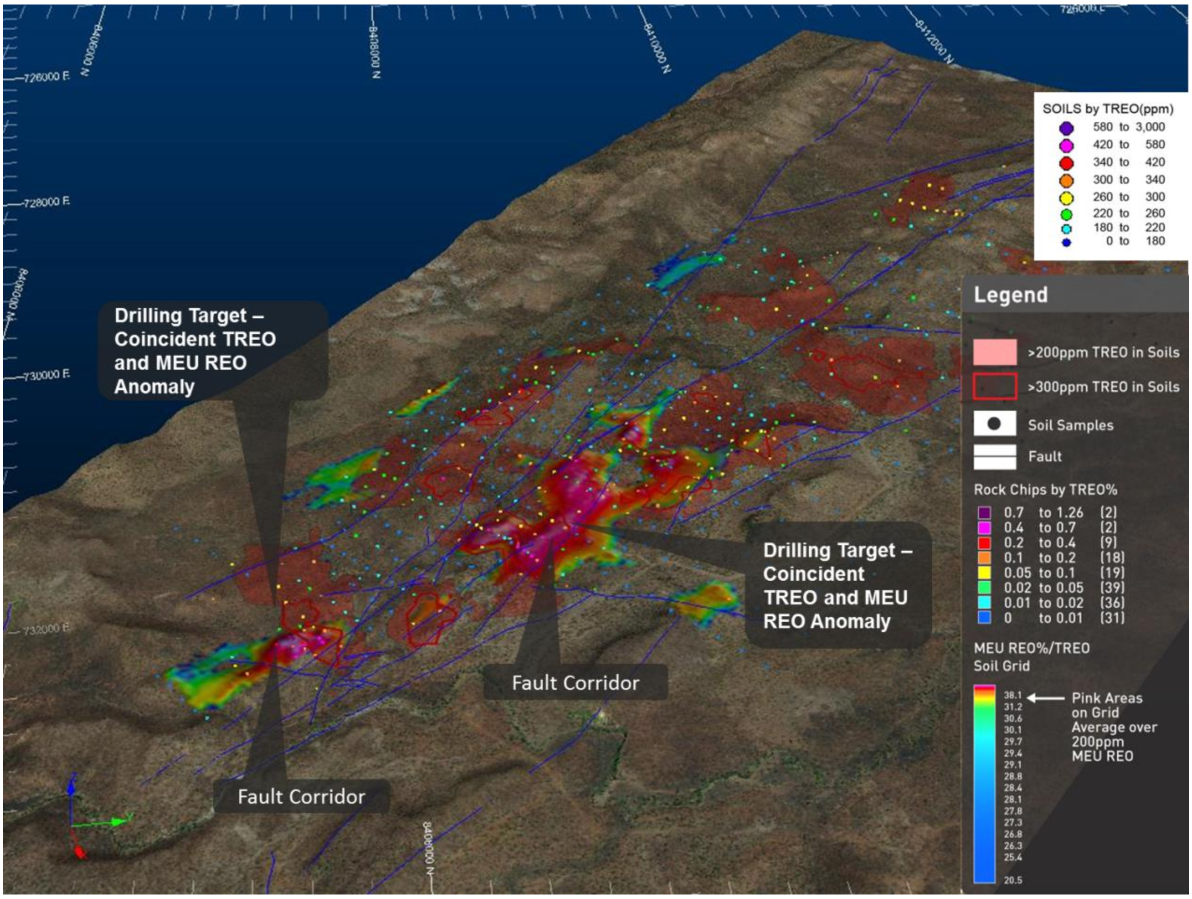



**Figure 11: Skyfall Prospect showing all soil and rock chip assay results to date. Mapped geological fault patterns are also illustrated on recent airborne photography and 3D topology.**

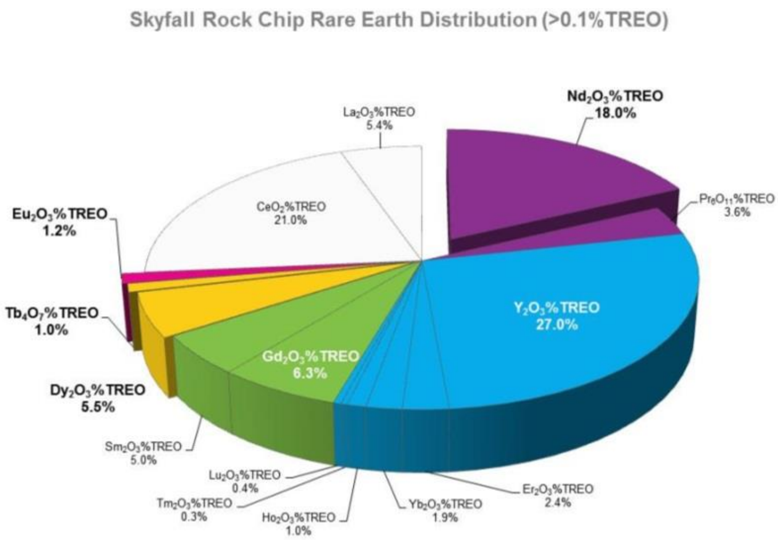



**Figure 12: Skyfall's Rare Earth Distribution; results expressed as average % of TREO for all rock chips >0.1%TREO (30 samples).**

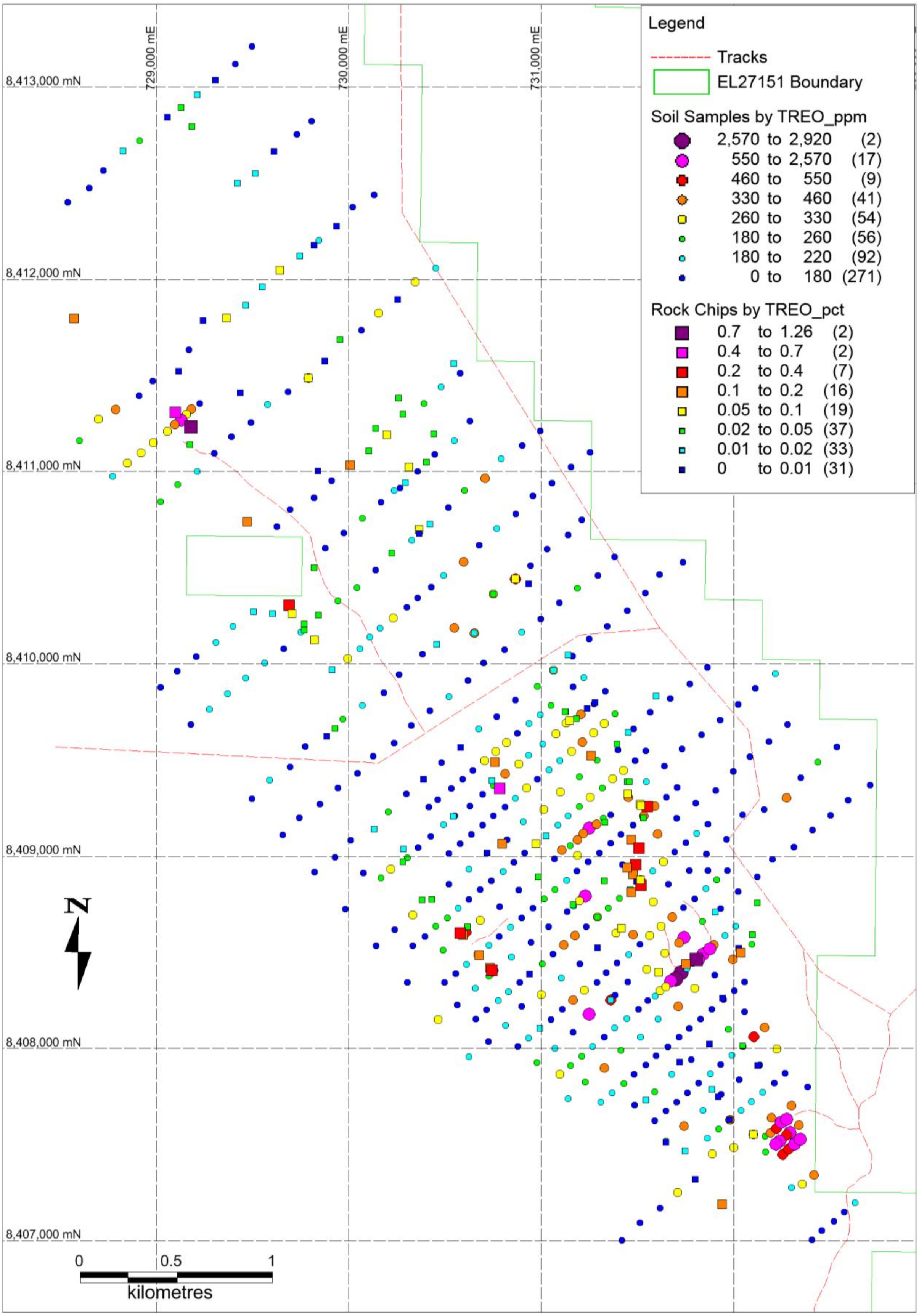



**Figure 13: Skyfall Prospect showing all soil and rock chip sample points in relation to title boundary.**

#### 6.2.4 Trial Pit and RAB Drilling

The company has discovered at surface, large, flat lying sheets of weathered rocks that contain high levels of Magnetic End Use and Heavy Rare Earths. To better assess the inportance of this surface flat lying mineralisation Spectrum undertook the digging of 8 trial pits and drilling of 13 shallow RAB holes (up to 1m deep). Results and hole details are dispayed in Appendix B.

Trial pit results have proven an unusually high distribution of Magnetic Rare Earths when compared to other rare earth prospects around the world. Magnetic Rare Earths are experiencing the strongest growth rates across the sector due to their demand in efficient energy technologies, primarily in the automobile industry. High Magnetic End Use Rare Earth distributions in the pits at Skyfall range from 34% to 44% of TREO including high averages of 19.9% Neodymium and 4.2% Dysprosium Oxide of TREO. The average grade of recent trial pit intersects is a significant 0.58% Total Rare Earth Oxide (TREO), (39% Magnetic End Use Rare Earth Oxide (MEU REO)). Table 3 shows significant intersections from recent trial pit results TP3 -TP6. Trial pit TP5 (2m @ 0.66% TREO (42% MEU REO)) has extended mineralisation to over 350m in cross section, Figure 14.

Importantly, trial pits have provided bulk samples for comprehensive mineralogical and metallurgical testing.

**Table 3: Latest trial pit results above 0.1% TREO cut off. The average content of potentially deleterious elements Uranium and Thorium for the intersections reported in this table are 5.5 ppm Th and 23.1 ppm U. These levels are very low when compared to other rare earth mines currently operating around the world.**

| Trial Pit ID | From (m) | To (m) | Interval width | TREO% | MEUREO/ TREO% | HREO/ TREO% |
|---|---|---|---|---|---|---|
| TP3 | 0.4 | 1.8 | 1.4 | 0.93 | 44 | 16 |
| TP4 | 0.6 | 1.5 | 0.9 | 0.20 | 36 | 8 |
| TP5 | 0 | 2 | 2 | 0.66 | 42 | 32 |
| TP6 | 0 | 1.8 | 1.8 | 0.43 | 34 | 55 |

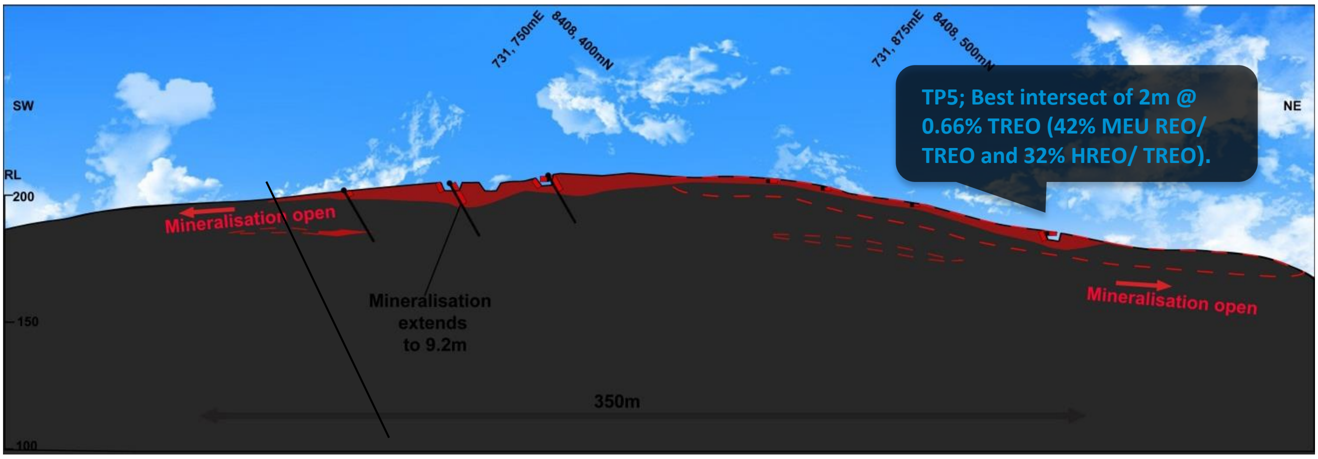



**Figure 14: Cross Section illustrating significant extension of mineralisation from Trial Pit 5.**

### 6.2.5 Diamond Drilling

During Year 1 Spectrum did two phases of diamond drilling.

During the first phase, in May, Spectrum drilled 3 shallow holes to test the flat lying surface mineralisation in the middle of the prospect. During the second drilling phase, in September, Spectrum drilled a deep stratigraphic hole and 3 other shallow holes in the south of the Skyfall prospect.

The deep stratigraphic hole (SKDH05) was drilled thanks to the collaboration with the NT Government. Drill hole locations are displayed on Figure 15; drill hole coordinates, details and assay results are displayed in Appendix B.

The shallow drilling confirmed the presence of thick rare earth mineralisation at surface. Two sections have been drilled; one in the centre (Figure 16) and one in the south (Figure 17) of the prospect.

Mineralised intersections include significant assays of over 0.9% Total Rare Earth Oxide (TREO) (44% Magnetic End Use Rare Earths (MEU REO)).

Best intersections are displayed in Table 4 for the first phase of drilling and in Table 5 for the second phase of drilling.

Drilling has outlined both MEU REO rich zones and deeper (3-6m) HREO rich zones. This metallurgical profile offers Spectrum the potential for a full suite of higher value rare earths. Moreover, the level of contaminant elements thorium and uranium in the mineralised zone is exceptionally low at 12.5ppm and 32ppm respectively.

The results from the first phase of drilling, summarised in Table 4, show suitable grade potential, despite significant core loss within the mineralised body. Interestingly, core loss occurred within similar horizons of multiple holes such as between 1m and 1.5m, this is considered by Spectrum to be due to the presence of soft clays. These clays are known to host the higher grade mineralisation as directly seen in the immediately adjacent trial pit (TP2) in which this interval contains higher grades (up to 0.88% TREO). Furthermore, in drill hole SKDH02 the highest individual assay grades 0.77% TREO, and 0.93% TREO.

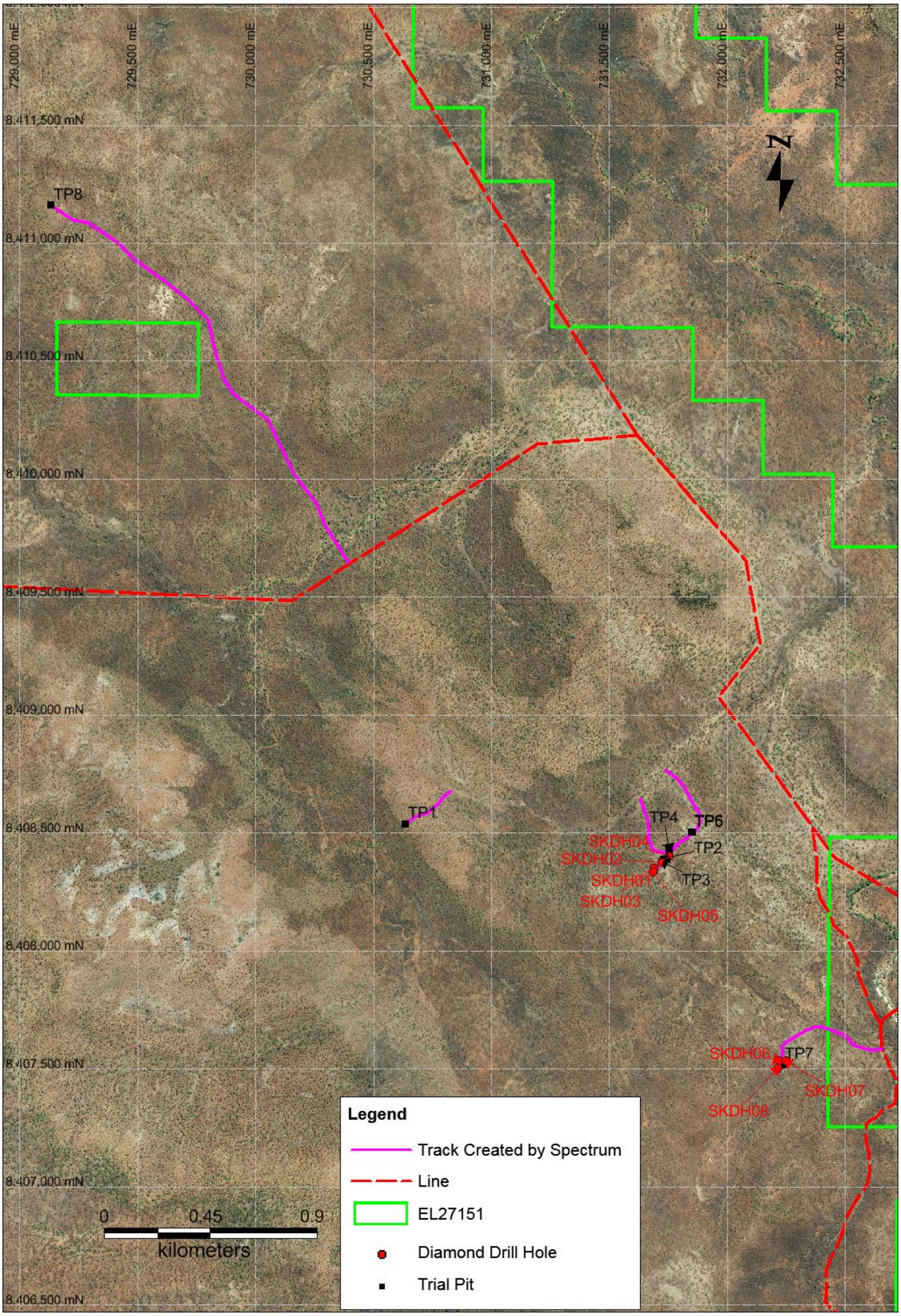



**Figure 15: Trial Pit and Drill Holes completed in 2014 by Spectrum Rare Earths.**

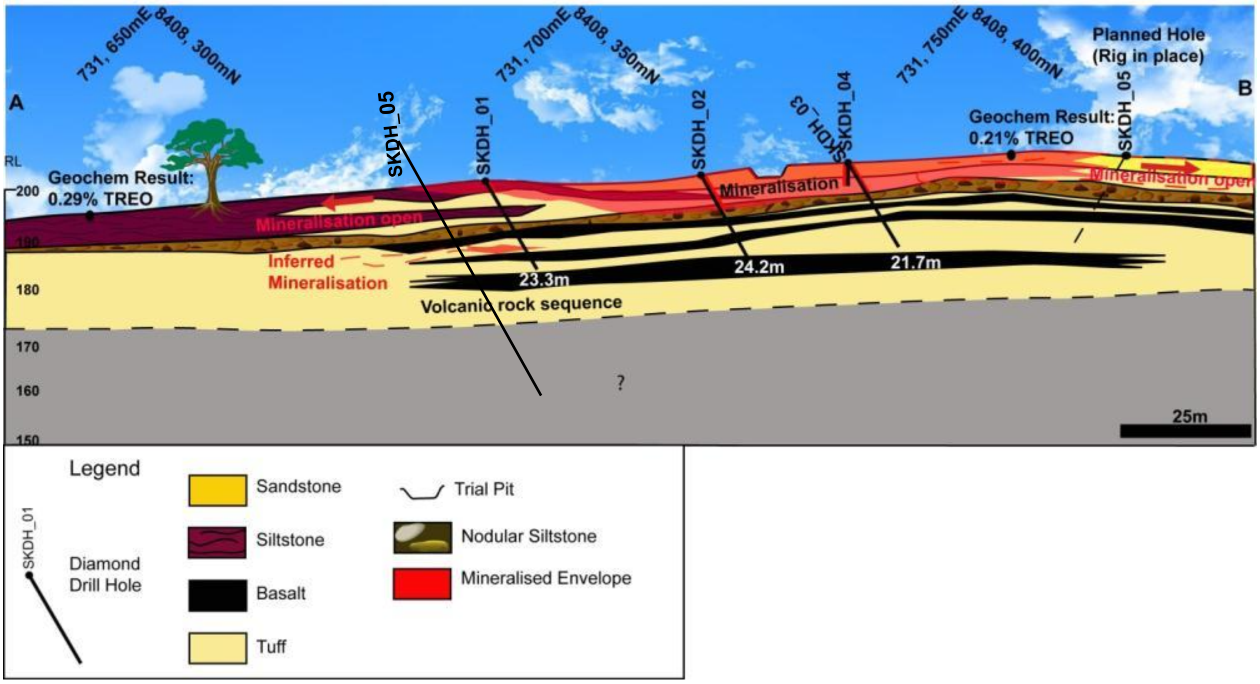



**Figure 16: Cross Section of the mineralised envelope (500ppm or 0.05% TREO cut off) and geology in the centre at Skyfall as defined by Spectrum's diamond drilling program.**

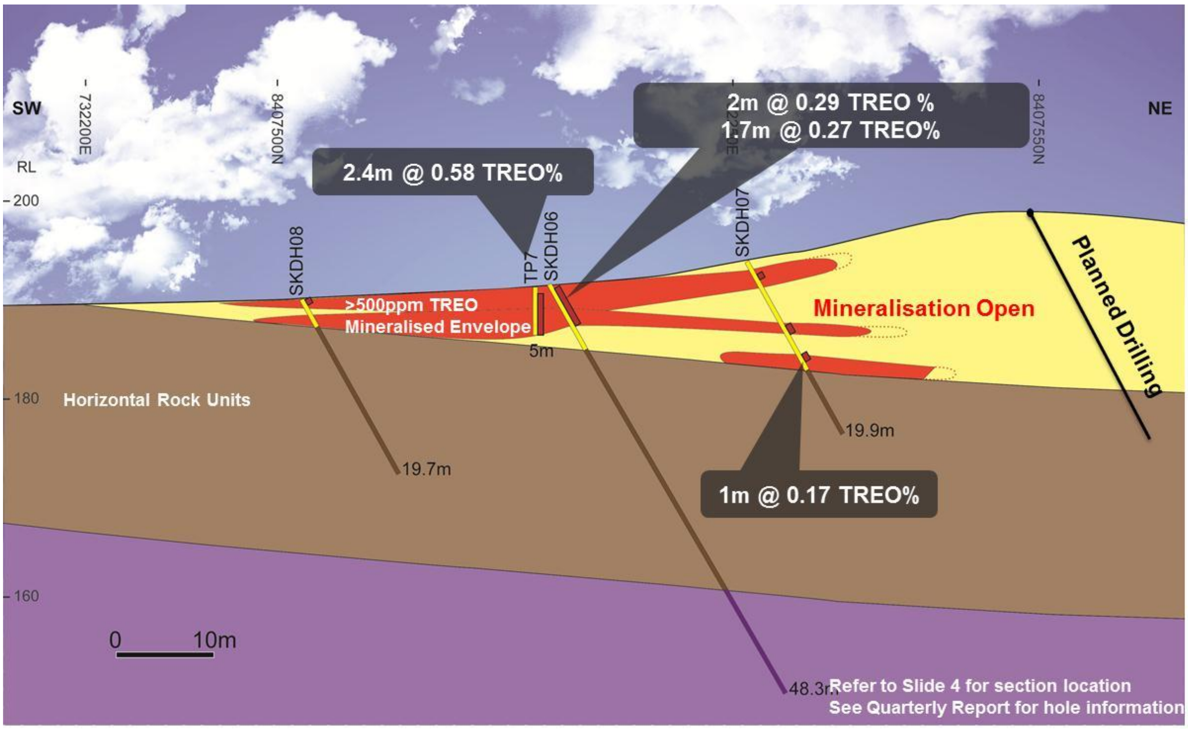



**Figure 17: Cross Section of the mineralised envelope and geology in the south of Skyfall as defined by Spectrum's diamond drilling program.**

## Results

**Table 4: Summary of diamond drilling results for the first phase of diamond drilling at Skyfall and corresponding core loss; above 0.1% TREO cut off.**

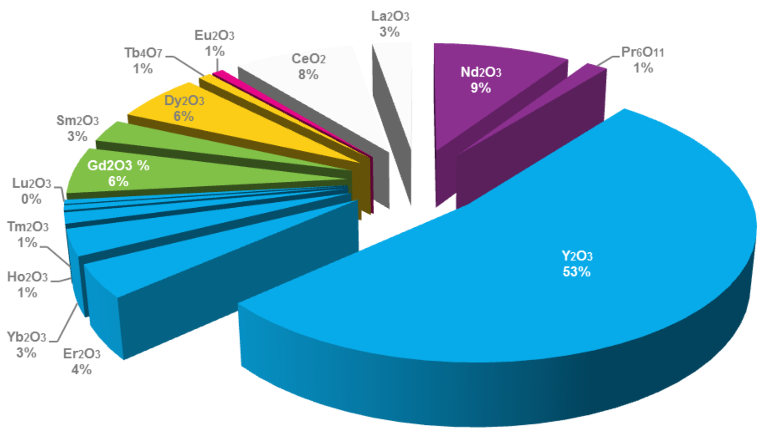
| Hole ID | From (m) | To (m) | Interval width | TREO% | MEUREO/ TREO% | HREO/ TREO% |
|---|---|---|---|---|---|---|
| SKDH01 | 0 | 1 | 1 | 0.14 | 38 | 27 |
| SKDH01 | 1 | 2 | 1 | Core Loss | | |
| SKDH02 | 0 | 1 | 1 | 0.56 | 39 | 14 |
| SKDH02 | 1 | 1.5 | 0.5 | Core Loss | | |
| SKDH02 | 1.5 | 2.4 | 0.9 | 0.61 | 42 | 32 |
| SKDH02 | 2.4 | 2.6 | 0.2 | Core Loss | | |
| SKDH02 | 2.6 | 3.8 | 1.2 | 0.16 | 30 | 86 |
| SKDH02 | 3.8 | 5.8 | 2 | Core Loss | | |
| SKDH02 | 6.3 | 7.2 | 0.9 | Core Loss | | |
| SKDH02 | 7.2 | 7.9 | 0.7 | 0.28 | 21 | 73 |
| SKDH02 | 8.4 | 9.2 | 0.8 | 0.10 | 15 | 83 |
| SKDH03 | 0 | 1 | 1 | 0.39 | 40 | 6 |
| SKDH03 | 1 | 1.5 | 0.5 | Core Loss | | |
| SKDH03 | 1.5 | 2.2 | 0.7 | 0.45 | 47 | 6 |
| SKDH03 | 2.2 | 2.5 | 0.3 | Core Loss | | |
| SKDH03 | 2.5 | 4.6 | 2.1 | 0.29 | 42 | 66 |
| SKDH03 | 4.6 | 5.1 | 0.5 | Core Loss | | |
| SKDH03 | 5.1 | 7.1 | 2 | 0.47 | 26 | 69 |
| SKDH04 | 0 | 2 | 2 | 0.27 | 38 | 12 |

**Table 5: Best intersect for the second phase of diamond drilling at Skyfall above 0.1% TREO cut off.**

| Hole ID | Width (m) | TREO% | MEUREO/TREO% | From (m) |
|---|---|---|---|---|
| SKDH06 | 2 | 0.29 | 36.01 | 2.40 |
| SKDH06 | 1.7 | 0.27 | 39.63 | 0.50 |
| SKDH07 | 1 | 0.17 | 32.10 | 10.00 |
| SKDH07 | 0.6 | 0.16 | 31.33 | 1.60 |
| SKDH05 | 0.8 | 0.12 | 39.86 | 0.00 |
| SKDH05 | 0.8 | 0.12 | 38.38 | 1.20 |
| SKDH07 | 0.8 | 0.12 | 43.65 | 7.90 |

The weathering profile of Skyfall's mineralisation appears to be clearly segregating the more valuable rare earths. The MEU REO's are enriched in the upper surface zones, while HREO's are present with depth. This metallurgical profile offers Spectrum the potential for a full suite of higher value rare earths and points to the potential for some lower cost extraction methods (Figure 18).

HREO Distribution; SKDH03, 5.1 – 5.6m; 0.47% TREO




MEU REO Distribution; SKDH02, 1.5 – 2.4m; 0.61% TREO

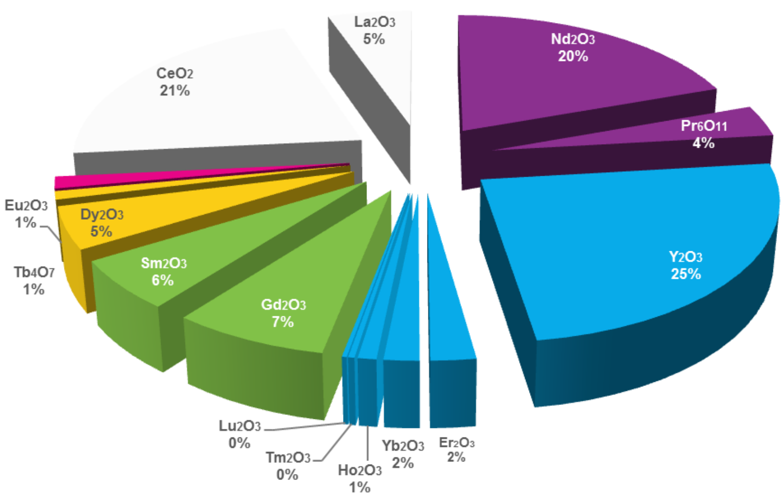



**Figure 18: Pie Charts comparing concentrations of HREO and MEU REO; HREO Weighted % from SKDH02 (top), MEU REO Weighted % from SKDH03 (bottom).**

**Stratigraphic Hole SKDH05**

The diamond drill hole SKDH05 drilled by Spectrum in September 2014 is interpreted to have intersected different layers of the Daly Basin from the Mid-Cambrian to the Adelaidean. Spectrum believes that the stratigraphic units intersected are as follows: Jinduckin Formation, Tindall Limestone, Antrim Plateau Volcanics and possibly the Hinde Limestone inter-bedded with irregular layers of K-Feldspar Tuffite. The drill hole and the associated section interpreted by Spectrum are displayed in Figure 19.

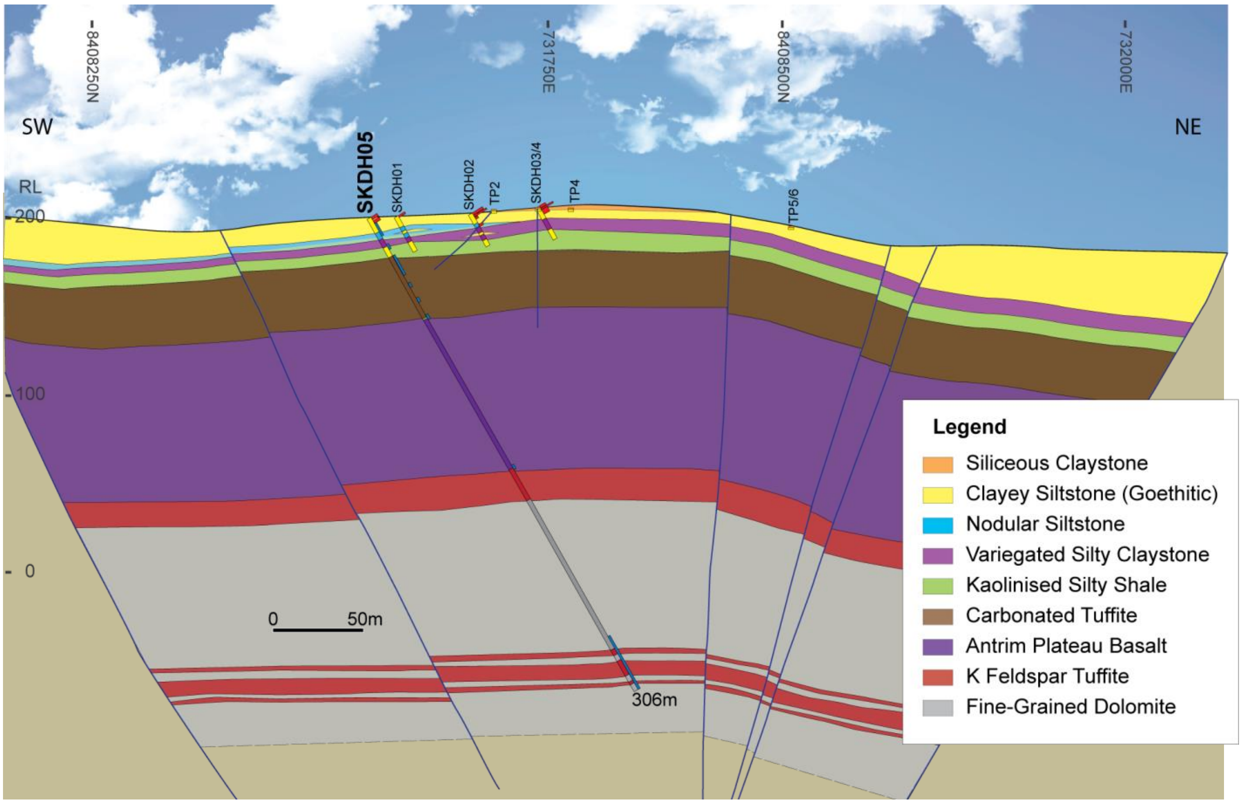



**Figure 19: Section including Hole SKDH05 drilled by Spectrum in September 2014.**

### 6.2.6 Petrography and Mineralogy

Rock units described below have been interpreted by Spectrum to be part of different sediment groups known in the region. The first six rock units are believed to be part of the Daly River Group. The Unit below corresponds to the Antrim Plateau Volcanics and the dolomite intersected may be part of the Tolmer Group. These rock units are displayed on the cross section in Figure 19.

Petrographic and mineralogical analyses of core samples presented below were done by Townend Mineralogy Laboratory.

**Daly River Group**

Siliceous Claystone

The sediment consists of very fine-grained partly goethite impregnated kaolin with a subordinate content of fine silt sized (<50 μm) quartz. The matrix shows variation in translucence due to apparent variation in this goethite content. On the margin of the section, there is a narrow band of sand size quartz vein.

This fine grained texture is host to occasional fine quartzite/chert fragments, the largest measuring 6 mm. Within this latter body there is a millimetre area of chert containing a concentration of curved probable organic palimpsests. Within the clay matrix, there are several other silica replaced/filled small structures that were interpreted as sponge spicules.

Numerous LREEs aluminium phosphates were located in the polished thin section, >2micron fraction and <2 micron fraction, that have complex chemical compositions somewhat approaching florencite composition. Ubiquitous calcium, and commonly detected barium, sulphur and strontium suggests intimate mixtures or solid solutions amongst the following APS (aluminium phosphate sulphate) end members: florencite, crandallite, goyazite, gorceixite, woodhouseite and/or svanbergite.

The LREEs present are cerium, neodymium, subordinate lanthanum and occasionally samarium and europium.

Clayey Siltstone (Goethite impregnated)

The sediment is mostly a uniformly fine brown coloured translucent rock with grainsizes below 50 μm and quartz only very sporadically visible. There is slight evidence of bedding due to an increase in goethite content.

There were several small quartz filled structures plus a porous structure, that were also interpreted as sponge spicules (see Figure 20).

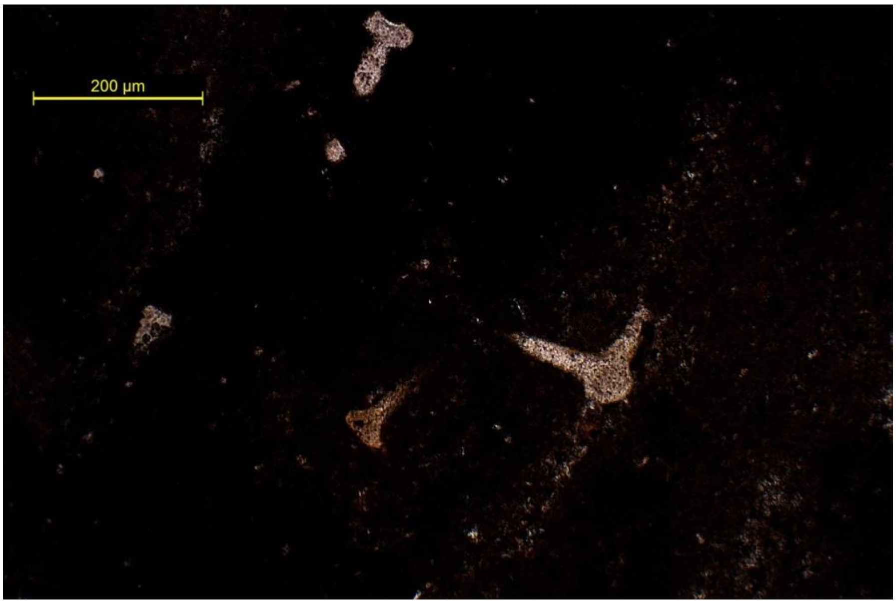



**Figure 20: Sponge spicule fossil from clayey siltstone.**

SEM analyses found several REE instances within the thin section and no examples within the >2 microns and the <2 microns fractions. These appear to be LREE (aluminium) phosphates that have complex chemistry somewhat approaching florencite composition. The presence commonly of calcium, sulphur, strontium and barium indicates these may be intimate mixtures or solid solutions amongst the following APS end members: florencite, crandallite, goyazite, gorceixite, woodhouseite and/or svanbergite. These LREE phosphates all appear to be sub 3 micron sized grains and/or aggregates.

The LREEs present are cerium, neodymium, and intermittent lanthanum, praseodymium and samarium. Additional phases found include biotite, quartz, titanium oxides and kaolinite.

Nodular Siltstone

The rock unit is dark brown to reddish siltstone with well-rounded nodules of regular siltstone layers, their size varies from a few cm's to 50cm. This unit is very iron-rich and outcrops the most at surface across the prospect.

Variegated Silty Claystone

Much of the sediment consists of a fine-grained claystone containing some silty quartz and showing a coarse patchy colour variation due to sporadic apparent goethite impregnation. The rock also contains coarse 1-5 mm areas essentially composed of very fine kaolin.

The analyses of the thin section, the >2 microns fraction and the <2 microns fraction predominantly found xenotime plus rare aluminium phosphates. Fine (sub 2 microns) xenotime grains and aggregates litter the thin section. The REEs detected in the xenotime were typically dysprosium and intermittently gadolinium, neodymium and samarium.

Rare LREE aluminium phosphates were located in the thin section and >2 microns fraction. These all appear to be somewhat approaching cerium-neodymium florencite composition. However, these have complex chemical compositions, with the detection of barium, calcium and sulphur that may be a solid solution or intimate mixtures of APS minerals; namely gorceixite, florencite, crandallite and/or woodhouseite.

Within the clay fraction several aluminium phosphates were found; possibly wavellite or augelite.

Kaolinised Silty Shale containing extensive chalcedony vein structures

The sediment is fine-grained showing banding. However, there is also a considerable disruption of these bands, possibly soft sediment structures. Part of the slide features quite extensive chalcedony vein material that in part is lining cavities.

Analyses of the polished thin section, >2 microns fraction and the <2 microns fractions, found both xenotime and calcium aluminium phosphates. The xenotime are typically very fine (sub 2 microns) grains and/or aggregates that typically contain dysprosium and intermittent detectable gadolinium, sometimes associated with zircon.

The calcium aluminium phosphates typically are approaching crandallite composition. Detection of barium, strontium and sulphur was intermittent whilst only one example contained cerium. This may suggest that these are solid solution or intimate mixtures of APS minerals; crandallite, florencite, gorceixite, goyazite, svanbergite and/or woodhouseite.

Carbonated Tuffite containing numerous euhedral quartz crystals

The dominant matrix consists of fine-grained (30-50 μ) carbonate (dolomite), potash feldspar, muscovite and quartz.

There are fine grained strips of more shaley material that are probably a combination of chlorite, and clays. This matrix texture is interrupted by occasional linear zones/veins of coarse-grained carbonate (probably calcite).

The sample is distinguished by quite common perfectly idiomorphic quartz crystals, with some examples exceeding 0.5mm and some containing inclusions of carbonate. This euhedral quartz is clearly related to finer examples found in the 36.5 interval .Some examples are grouped.

Haematite is identified as common 20-30 μ rather angular grains, and may be also present as fines.

Rare earths are contained by detrical monazites. A field emission SEM examination found three examples of a thorium bearing cerium monazite. One was a discrete 40 μ length triangular fragment. The other two were poorly defined 4 and 6 μ examples. The very angular nature of this 40 μ monazite does suggest a clastic origin rather than in situ crystallisation (Figure 21).

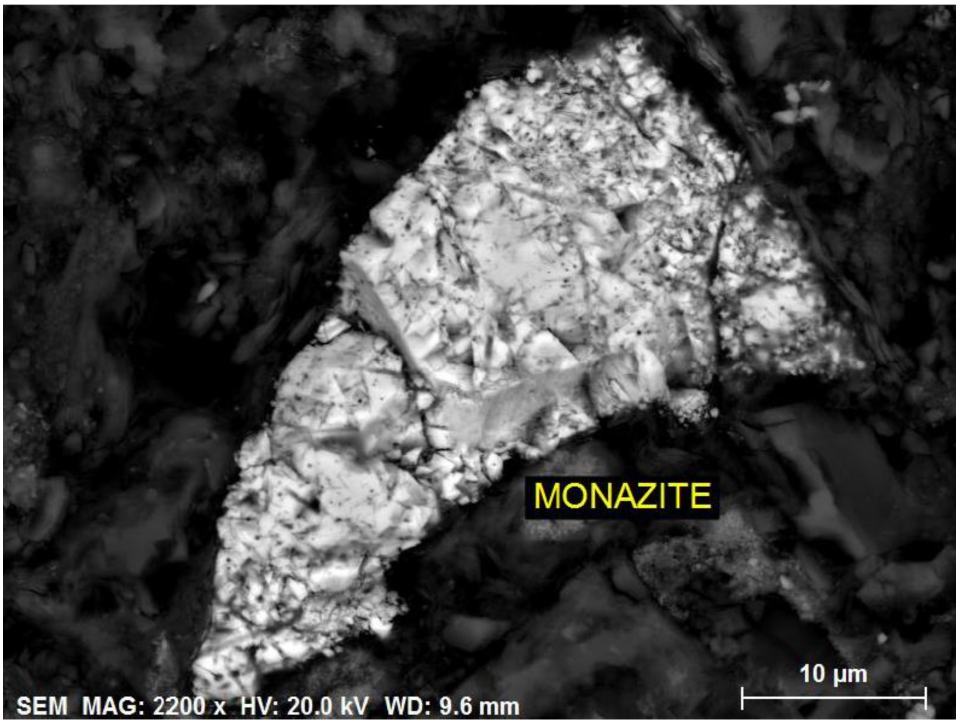



**Figure 21: Very angular monazite found in Carbonated Tuffite**

**Antrim Plateau Volcanic**

This rock unit is a vesicular, coarse-grained basalt with around 20% vesicles mainly filled in with calcite, quartz and chlorite and occasionally by crude oil as seen in Figure 22.

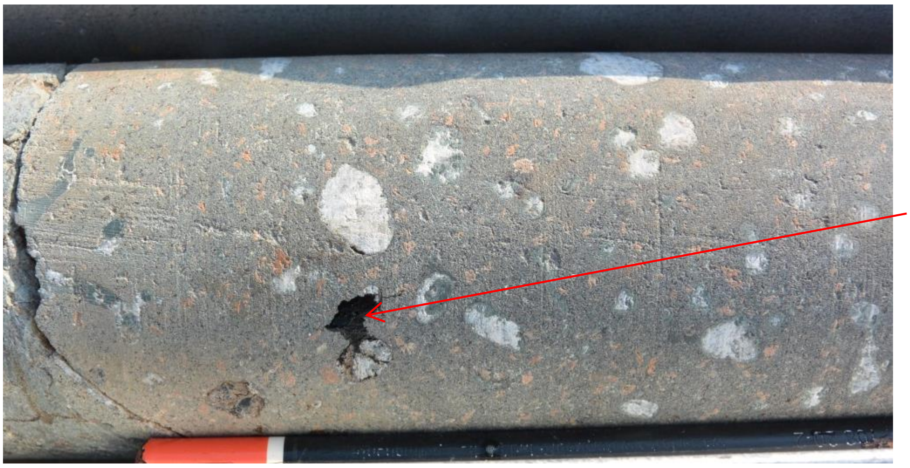



**Figure 22: Photograph of vesicular basalt in SKDH05. Some vesicles were filled with crude oil.**

**Possible Tolmer Group**

Fine-Grained Dolomite, containing irregular layers of K-feldspar tuff, crossed by veins of coarse grained dolomite.

The dominant lithology is a uniformly fine-grained micritic dolomite (30 μ). It is essentially monomineralic apart from low levels of fine quartz. Marginally it contains a zone of a very fine grained foliated matrix that is rich in K feldspar (staining/XRD). This is in contact with a similarly fine grained ferruginous dolomite that becomes paler towards the margin of the drill core. It contains a little K-feldspar. The micritic dolomite is irregularly veined by coarse-grained dolomite.

A field emission SEM scan failed to detect any rare earths. However the SEM detected a composite mass (30 μ ) of a uranium silicate, maybe coffinite that enclosed pyrite, an adjacent 12 μ coffinite and a separate 5 μ scheelite (Figure 23).

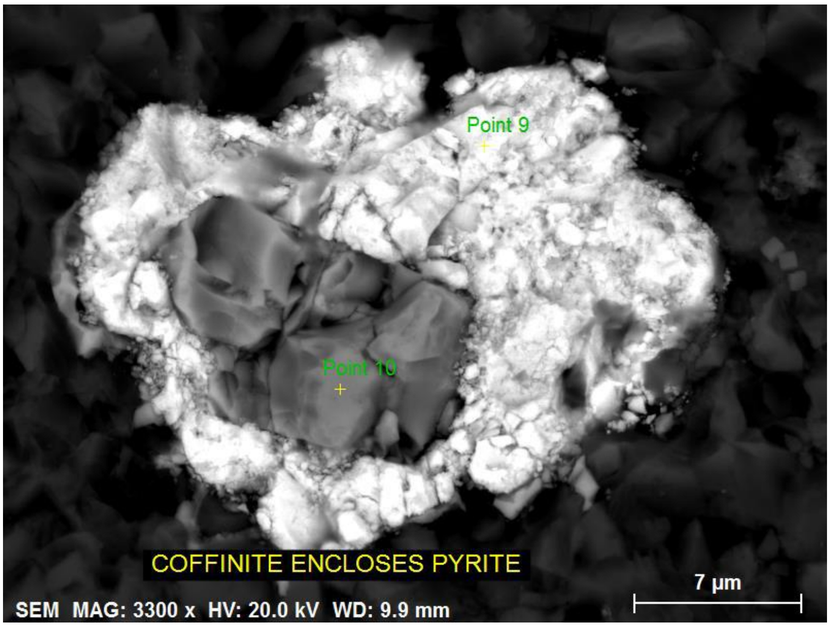



**Figure 23: Coffinite enclosed in pyrite in the Fine-grained Dolomite.**

### 6.2.7 Metallurgy; Test Work and Results

Results from the most recent round of beneficiation testing (third round only) show a strong direct rougher, cleaner response and a re-cleaner response.

A combined or 'end result' rougher, cleaner and re-cleaner float concentrate grade of 5.7% TREO was achieved to recover 46% of the REE's with only 5.6% mass pull of the original sample. This represents an 18% improvement in grade from previous test work and a respectable 6.4 x upgrade from the feed material which graded 0.89% TREO. The final tails grade was 1% TREO. Improved mass rejection and higher concentrate grades can lead to lower processing plant (smaller plant) and re-agent costs. A full optimisation run is planned on this work to investigate, amongst other matters, the effect of grind size, temperature and froth flotation agents.

Scanning Electron Microscope examination of froth flotation tailings has identified a new REE mineral not previously seen (comprised primarily of yttrium, cerium and neodymium). This mineral will now be targeted with a tailored froth flotation agent towards improving the REE recovery process. An overall concentrate grade of 10% is considered a good target for Spectrum's next stage testing on the Skyfall material.

The rougher float feed material was ground to 80% passing 40 micron, the cleaner feed material was re-ground to 80% passing 20 micron and the re-cleaner was ground to 80% passing 10 micron.

The soft, friable, weathered nature of the Skyfall feed material (clay and fine interspaced quartz) means that fine grinding is not currently posing significant time or cost issues. Formal tests are planned to quantify this matter.

Importantly, potentially deleterious elements uranium and thorium were a low ~200ppm and ~20ppm respectively in the resultant re-cleaner mineral concentrates. In addition, the iron content of the cleaner concentrates (potential acid/re-agent consumer and cost factor) was very low at ~10%.

# 7 EXPLORATION DURING YEAR 1 on EL30109 (dropped)

No work has been completed on EL30109.

# 8 EXPLORATION DURING YEAR 1 on EL30110 (dropped)

No work has been completed on EL30110.

# 9 CONCLUSION/RECOMMENDATIONS

During Year 1, Spectrum managed to investigate the Skyfall Prospect in great detail. First, a rock chip and soil sampling reconnaissance programme was undertaken allowing Spectrum to clearly identify the best drilling targets.

Following the sampling program, Spectrum started digging trial pits to better investigate the type of mineralisation at surface. The results from the trial pitting demonstrated that the surface mineralisation was very rich containing a high Magnetic End Use Rare Earth distribution which ranges from 34% to 44% of TREO, including high averages of 19.9% Neodymium and 4.2% Dysprosium Oxide of TREO.

Two phases of diamond drilling have then highlighted the greater rare earth potential at surface in several sheets of flat lying mineralisation. Two zones of different rare earth enrichment were identified. The weathering profile of Skyfalls mineralisation appears to be clearly segregating the more valuable rare earths. The Magnetic End Use Rare Earths are enriched in the upper surface zones, while the Heavy Rare Earths are present with depth. This metallurgical profile offers Spectrum the potential for a full suite of higher value rare earths.

Spectrum already started metallurgic work on Skyfall’s surface mineralisation. Results to date are encouraging and still ongoing. Further metallurgy work is planned in order to identify the economic potential of Skyfall’s flat lying mineralisation. If the latter metallurgy results are positive a new drilling program will start at Skyfall next dry season to obtain a JORC Resource estimate.

# 10 CONFIDENTIALITY STATEMENT

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# 11 REFERENCES

**Bajwah, Z.U., 1994**. A Contribution of Geology, Petrology and Geochemistry to The Cullen Batholith and Related Hydrothermal Activity Responsible for Mineralisation, Pine Creek Geosyncline, Northern Territory. Report 8, Northern Territory Geological Survey.

**Edgoose, C.J., Fahey, G.M., and Fahey, J.E., 1989**. Wingate Mountains 5069 Explanatory Notes *1:100,000 Geological Map Series; Northern Territory Geological Survey.*

**Pontifex I.R. and Sweet, I.P., 1972: 1**:250 000 geological map series explanatory notes. Fergusson River, Northern Territory. Sheet SD/52-12 International Index. Bureau of Mineral Resources, Geology and Geophysics.

**Pontifex, I.R., and Mendum, J.R., 1972**. Fergusson River 1:250,000 Geological Series – Explanatory Notes. *BMR 250,000 Geological Series*.

**Young, B., and Prince, K. E., 2013.** Mineralogy of the Stromberg Deposit STDH03 Sample. TECHNICAL MEMORANDUM: AM/TM/2013_06_18. *Ansto Minerals*.

# 12 APPENDICES

## *12.1 Appendix A*

### 12.1.1 List of Historical Tenure & List of Historical Reports.

### 12.1.2 List of Historical Drillhole.

## *12.2 Appendix B*

Surface, diamond drilling, RAB drilling and trial pitting location and geochemistry results.

### 12.2.1 SKYFALL AND LARGO SURFACE GEOCHEMISTRY RESULTS.

SKY_NTSG4_SURF2014A.txt

### 12.2.2 SKYFALL DRILLING (including, Diamond drilling, RAB drilling and Trial Pits).

SKY_NTDG4_ASS2014A.txt

SKY_NTDS4_SURV2014A.txt

SKY_NTSL4_COLL2014A.txt

## *12.3 Appendix C*

### 12.3.1 Remote Sensing Image of Skyfall.

### 12.3.2 Remote Sensing Image of Largo.