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INNOVATIVE TARGETING
Round 18, 2025–2026

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Final Report – West Arunta Carbonatite Search: Innovative Targeting Geochemistry

Company: *GSW Resources Pty Ltd*

Titles: *EL33042 and EL33043 (part of Group Report GR597)*

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Cover photos: *Soil sampling for Ultrafine geochemistry during the gravity acquisition program.*

Copyright Statement

Abstract

GSW Resources' (GSWR) *West Arunta Carbonatite Search Project* is located on granted titles EL33042 and EL33043, which form part of GSWR's larger critical-metals-prospective West Arunta project area under Group Report GR597. The underexplored West Arunta region is part of the Proterozoic Aileron Province of central Australia and comprises a distinctive magnetic-gravity belt of about 350km east-west extent that straddles the NT-WA border (the 'West Arunta Magnetic Gravity Belt' or WAMGB). High-grade niobium resources, including the globally significant Luni deposit, have been discovered in carbonatite complexes of the WAMGB in Western Australia with high potential for future discoveries in the Northern Territory.

GSWR's focus is on exploration for mineralised carbonatites as well as other intrusive bodies with critical metals potential. In the 2024 season GSWR completed a high-resolution (100m-spaced) aerial magnetic and radiometric survey over its West Arunta project area. The magnetic imagery shows strong similarities with the carbonatite-prospective basement terrain across the WA border including the presence of crustal-scale fault zones within variably magnetic basement dominated by the ca 1.85Ga Lander Rock Formation and the ca 1.77Ga Carrington Suite. A first-pass analysis has identified numerous potential intrusion-related magnetic features.

Following the successful magnetic-gravity targeting methodology employed in the search for buried carbonatite bodies by explorers in the western WAMGB, GSWR undertook a gravity survey program at 400m station-spacing over an area of 840km^2 under Round 18 of the Geophysics and Drilling Collaborations Program (Taylor, 2026). The survey area, deemed the *Carbonatite Search* project area, represents the assessed most prospective part of GSWR's tenement package based on magnetic-structural interpretations, the likelihood of relatively shallow (<50m) regolith cover and the proximity of lamprophyre dykes as an indicator of potential carbonatitic magmatism. A total of 5,305 ground gravity stations were acquired during the survey. Of these stations, a subset of 3,060 sites, located away from major drainages, were selected for soil geochemical sample collection. Whole soils were collected from 10-20cm depth by the gravity field crews.

A successful application under Round 18 of the Collaborations Program enabled GSWR to undertake an Innovative Targeting soil geochemistry trial using the Ultrafine (UF) assay method. The UF method provides highly sensitive analysis of multi-elements in the ultrafine (<2µm) clay-rich fraction of soil samples. A subset of 768 soil samples from 11 prospect areas covering numerous magnetic-gravity targets and different surficial geological environments were selected for assay. Other sample subsets were selected for comparison with conventional mixed acid digest (MA) and borate fusion (AF) results. In the search for undercover carbonatites and related rocks, the objectives of the program are to both (a) explore the suitability of these methods and (b) develop new techniques to interrogate the geochemical datasets and hence target anomalous soils.

The soil geochemical datasets have been interpreted using the ratios of a number of key pathfinder elements that are characteristic of carbonatites and alkaline rocks. These include: La/Yb, Ce/Yb, Sr/Yb, Nb/Yb, Cr/Yb, Ni/Yb, Cu/Yb, Ti/Al%, Ti/Fe%, Ti/Yb, Mg/Fe%, Ca/U. The combination of ultrafine-fraction targeting and the use of element ratios is designed to minimise the diluting effects of transported regolith materials while enhancing the geochemical signature of buried intrusions. An alkaline index (ALK-Index) and an ultramafic plus copper index (UM-Index) have been developed to incorporate these ratios. High ALK-Index values are associated with a number of coincident magnetic-gravity anomalies including priority target RY15. Other targets show strong UM-Index signatures. The UF method provides useful anomaly definition; this is not always the case for MA assays, and the AF method appears unsuitable. The datasets and interpretations discussed here are expected to provide a useful geochemical reference guide in the evaluation and future drill-testing of magnetic-gravity targets in the Aileron Province.

Contents

Introduction

GSWR's *Carbonatite Search Project* is located in the West Arunta region of the Aileron Province, which hosts carbonatite intrusions (i.e. upper-mantle-derived, volatile and incompatible element enriched carbonate partial melts) within a newly identified alkaline and critical-metals-rich magmatic province of potential global significance (Kelsey et al., 2024). The region comprises a distinctive magnetic-gravity belt (the West Arunta Magnetic Gravity belt or 'WAMGB') of about 350km east-west extent that straddles the NT-WA border (Figure 1). The WAMGB is expected to emerge as a future hub for critical metal production, including carbonatite-hosted niobium and the rare-earth-elements (REEs), with potential for new discoveries, both in WA and the NT (see *'Critical Minerals in the Northern Territory 2025'*). The region has previously received little attention due to perceived remoteness, extensive cover over bedrock, patchy geophysical coverage, land access issues and past exploration focussed on single commodities.

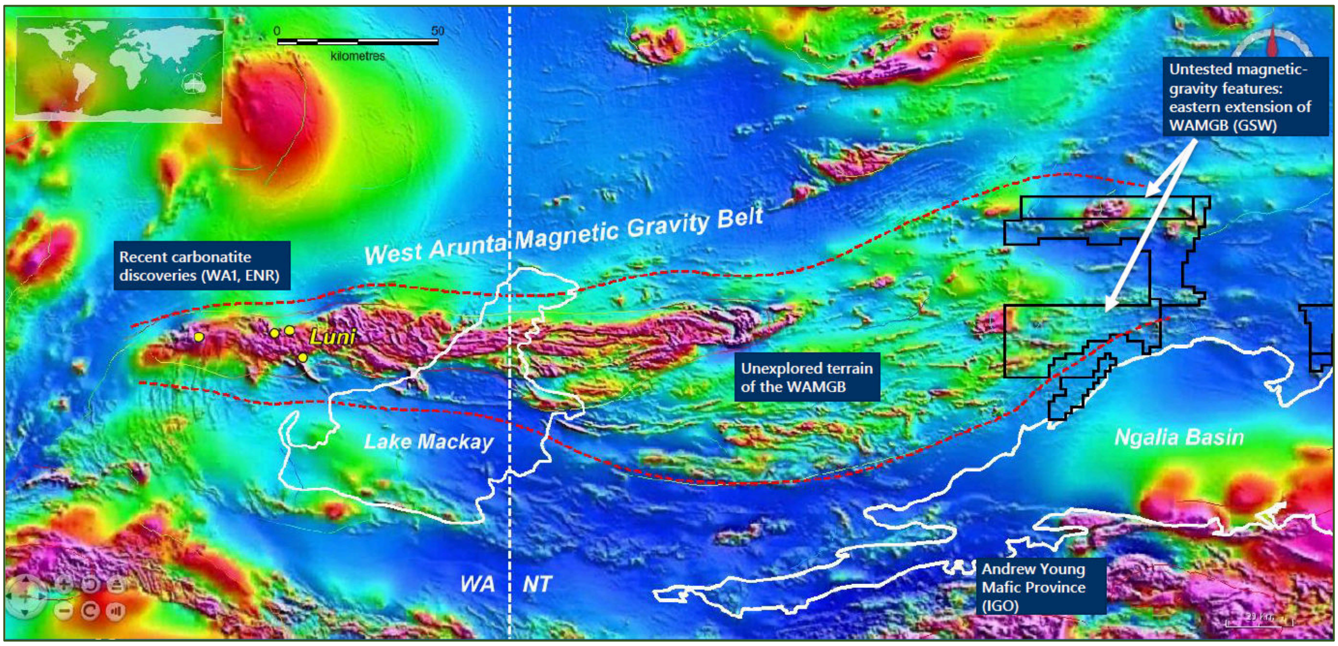

Figure 1: *Magnetic image showing extent of the WAMGB and location of recent carbonatite discoveries.*

GSWR's ground is positioned in the underexplored, but accessible, eastern end of the WAMGB, where there are strong signs of alkaline magmatic activity and fertile upper mantle and crustal domains. This is indicated by the presence of lamprophyre dykes, which are strong indicators for carbonatite magmatism, as well as incompatible-element-enriched granitoid suites; this includes the radiogenic Southwark Granitic Suite that is host to REE-in-clay mineralisation at the Callista prospect and Sn-Be-fluorite mineralisation at the Beryllia prospect (both GSWR prospects on adjacent title EL33195; Figure 2).

GSWR is exploring the eastern WAMGB for mineralised carbonatites analogous to those found in the western part of the belt by West Arunta exploration companies WA1 Resources Ltd (WA1) and Encounter Resources Ltd (ENR). Due to extensive regolith cover, exploration targeting in the WAMGB has focussed on geophysical methods with initial discoveries based on the interpretation of high-quality, high-resolution magnetic and gravity datasets and subsequent drill-testing of anomalies. GSWR's exploration strategy is based on this successful model but with the addition of soil geochemical targeting, which forms the subject of this report.

In the 2024 season GSWR completed a high-resolution (100m-spaced) aerial magnetic and radiometric survey for 22,185 line-kms over its West Arunta project area that substantially improved the previous wide-spaced regional survey. Interpretation of the new magnetic imagery reveals strong similarities with the WA1/ENR carbonatite-prospective basement terrain across the

WA border including the presence of major northwest and northeast-trending fault zones within variably magnetic basement dominated by the ca 1.85Ga Lander Rock Formation and the ca 1.77Ga Carrington Suite. Some of the fault zones are marked by prominent quartz blows and vein systems.

GSWR successfully applied under Round 18 of the Collaborations Program to undertake a high-resolution gravity survey at 400m-spacing over an 840km² area designated the *West Arunta Carbonatite Search* project area (Figure 2). GSWR was also successful under Round 18 in an Innovative Targeting application to undertake complementary soil geochemical sampling at selected stations using the innovative Ultrafine method (Noble et al., 2018).

The *Carbonatite Search* project area represents the assessed most prospective part of GSWR's tenement package based on magnetic-structural interpretations, the likelihood of relatively shallow regolith cover (less than approx. 50m) and the presence of known lamprophyre dykes as an indicator of potential carbonatitic magmatism. The overall objective is to create a high-quality, high-resolution integrated magnetic-gravity-geochemical dataset for target identification, refinement and later drill-test prioritisation.

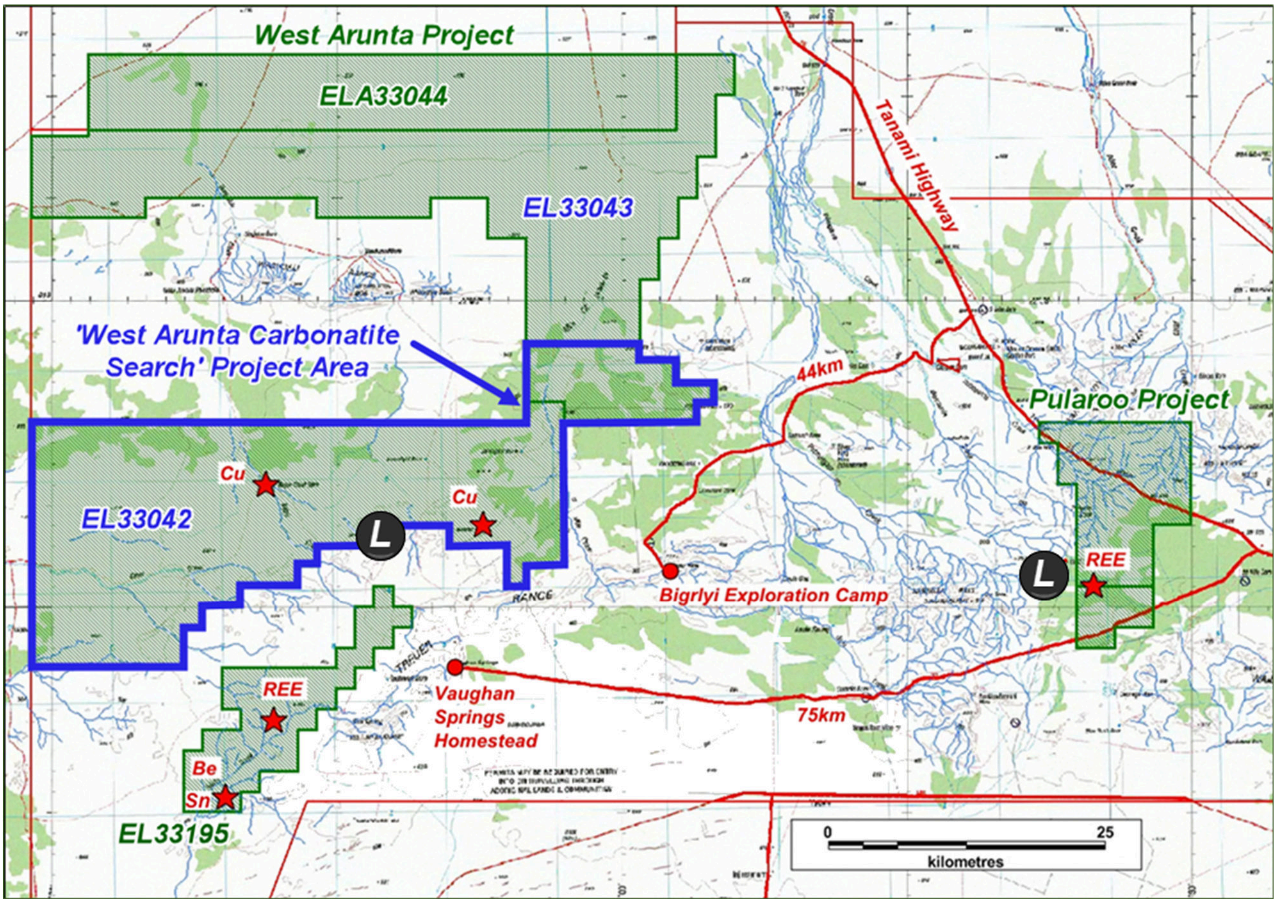

Figure 2: *Location map* showing *the* Carbonatite Search *project area* in blue *on Mt Doreen (aka Vaughan Springs) Station showing GSWR tenements, project boundaries, access, infrastructure and critical metal prospects and occurrences on GSWR ground. Black circles with the letter 'L' show the location of known lamprophyre dykes.*

GSWR's *West Arunta Carbonatite Search* project area lies in the western part of Mt Doreen pastoral station (aka Vaughan Springs) in the Central Desert region of the NT. The 840km² project area is located on titles EL33042 and part of EL33043 (both part of group report GR597), which lie north and west of the station homestead at Vaughan Springs (see Figure 2). Access is via the sealed Tanami Highway and station tracks.

Regional Context

The underexplored West Arunta region is part of the larger Proterozoic Aileron Province of central Australia. Discoveries of world-class niobium-mineralised carbonatite intrusions in the western WAMGB suggest the belt belongs to a significant, but previously unrecognised, alkaline province. Recent studies have constrained the ages of carbonatite and associated lamprophyre magmatism to ~830–800 Ma (Sudholz et al., 2023; Kelsey et al., 2024; Dröllner et al., 2025). The alkaline magmatism is likely the result of mantle-induced intracontinental rifting related to the breakup of the supercontinent Rodinia, which in central Australia is linked to opening of the Centralian Superbasin and Gairdner LIP magmatism. Carbonatite emplacement during ~800Ma extension is thought to have exploited pre-existing, structurally weak, transcrustal corridors which facilitated the ascent of volatile-rich, mantle-derived melts (Dröllner et al., 2025).

The western Aileron Province largely consists of ca 1.85Ga age metasedimentary and meta-igneous basement of the Lander Rock Formation (LRF), which is characterised by variable metamorphic grade from greenschist to granulite facies. The LRF includes interlayered pelitic schist, paragneiss, quartzite, granofels and migmatitic gneiss, and may contain magnetic meta-banded-iron-formation (BIF) and amphibolite units. The LRF basement is intruded by various suites of felsic and mafic igneous rocks, including granites and metagabbroic units of the ca 1.77Ga Carrington Suite and in the NT, granitoids of the ca 1.57Ga Southwark Granitic Suite.

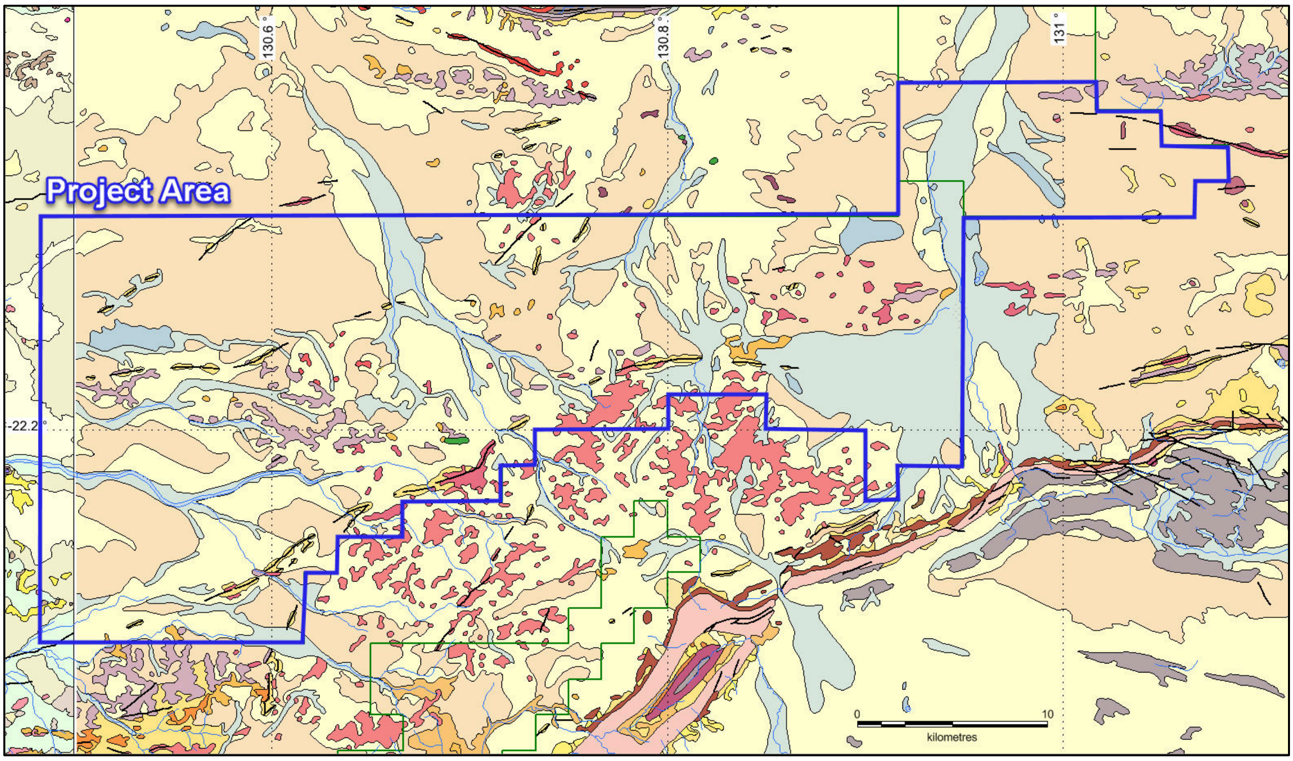

***Figure 3:** NTGS Geological Map over the Carbonatite Search project area, which is covered by parts of the Mt Doreen and adjacent Lake Mackay 1:250k map sheets (Young et al., 1996). Purple colour is Lander Rock Formation (LRF) outcrop; Red colours are Carrington Suite and Southwark granitic suite outcrop. Dark blue – Quaternary playa lake sediments; Light blue – Quaternary alluvial/fluvial deposits; Tan – Quaternary sand plain; Light yellow – Quaternary aeolian sands; Orange – Cenozoic quartz gravel;* Dark Yellow – *Quaternary colluvial gravels; Green – metagabbro outcrop. Note the extent of Quaternary cover units which exceeds 85% of the project land area.*

Within the broader Aileron Province to the east and southeast of the project area, a number of alkaline intrusions and associated mineral deposits, are well known. These include the ca 1.52Ga Nolans REE-phosphate deposit (related to deep-seated carbonatitic magmatism), the 1.13Ga Cu-Ni-

PGE-REE mineralised Mordor Alkaline Igneous Complex (related to a potassic lamprophyre primary magma) and the 731Ma Mud Tank carbonatite (previously mined for vermiculite).

The project area is extensively covered by Quaternary deposits including aeolian sands, and colluvial and alluvial deposits (Figure 3) with <15% outcrop of basement Proterozoic units that are dominated by the LRF, Carrington Suite and the Southwark Granitic Suite.

In the western part of the WAMGB across the NT-WA border, Hronsky & James (2025) have discussed the geological context of the alkaline rocks hosting niobium-REE mineralisation. They note that at the regional scale, alkaline-carbonatitic magmatism shows a strong spatial association with a series of major northeast and northwest-trending structures that can be seen in both regional magnetic and gravity imagery. Nb-REE mineralisation is hosted within alkaline magmatic complexes and is associated with strongly altered (fenitised) wall-rocks often marked by a ‘red-rock’ style of alteration, and in some cases, by the presence of blue amphiboles (Ashley, 2023). The alkaline complexes contain significant carbonatite units but also include mafic (and locally ultramafic) lamprophyres and glimmerite (mica-rich)-bearing zones. In addition, fenite-altered wall rocks may host magmatic and/or hydrothermal veining related to carbonatite intrusion. Niobium mineralisation is strongly associated with zones of supergene enrichment within the weathering profile. The alkaline complexes intrude high-grade LRF/Carrington Suite metamorphic basement dominated by paragneiss and felsic orthogneiss. Bedrock in the region is poorly exposed but the cover is relatively thin (as in the east).

Previous Exploration

The *West Arunta Carbonatite Search* project area and surrounds in the eastern part of the WAMGB have been sporadically explored by various companies over the years without much success mainly due to the extent of bedrock cover and access issues, lack of high-resolution geophysical survey coverage, and limited multi-commodity test-work. This is particularly so for the range of critical metals including the REEs, Nb, Ta, Li, Be, etc. It should be noted that:

- access and site infrastructure have improved with the Tanami Highway now being sealed past the Vaughan Springs access;
- most of the bedrock cover appears to be relatively thin, generally <20-50m, as identified in past sporadic drilling programs, though some areas of deeper regolith (~60m) at the Weaner prospect and shallower regolith (<10m) in the Pyramid prospect area are recognised.
- there has been a notable lack of targeted geophysics in past programs;
- few exploration holes have been drilled deeper than 50m, with most holes being shallow vacuum holes drilled to <5m depth during Au exploration programs;
- lithogeochemical and geochronological relationships have often been difficult to unravel;
- in the past, the exploration focus was often on single commodities (mostly either Au or U with limited multielement assaying) or on small historically-worked prospects such as the LRF-hosted polymetallic Silver King prospect.

Notable past exploration programs in the project area included:

- MIM Exploration-Roebuck Resources 1992-1995: targeted eight discrete aeromagnetic anomalies for Tennant Creek-style gold; the targets were tested by RAB drilling but only weakly anomalous gold and base metals were found.
- Poseidon Gold-Yuendumu Mining 1993-1996: targeted structurally controlled gold within LRF basement; the program included a vacuum drilling campaign for over 580 holes plus soil, lag and rock-chip sampling with a maximum Au value of 38ppb reported.

- Tanami Gold NL 2001-2006: targeted Tanami and Tennant Creek style gold; in the project area Cu anomalies were identified at the Budger and Weaner Bore prospects (both located on EL33042); at Weaner Bore, drilling intersected a pyrite-veined felsic porphyry system, which included unusual mafic and biotite-rich lithologies and associated chlorite-hematite-silica alteration zones but exploration was hampered by a lack of high-resolution geophysics.

Recently, a number of exploration companies including Litchfield Minerals Ltd (LMS) and Uro Corporation (URO) have moved to evaluate the critical minerals potential of areas bordering GSWR's project area.

Exploration Concept

Soil Geochemistry - Carbonatite and Alkaline Rock Focus

GSWR's focus is on exploration for potential Nb-REE-mineralised carbonatite bodies and other intrusive magmatic bodies that may host Cu-Au-critical metals mineralisation. In the latter case this includes IOCG-style mineralised systems, at least some of which, like carbonatites, have an alkaline, intraplate magmatic affinity (Vielreicher et al., 2000; Skirrow, 2022; Brauhart & Groves, 2026). GSWR's exploration concept is based on the use of high-resolution integrated gravity-magnetic datasets to target intrusive bodies. This methodology led to the discovery of the globally significant Luni carbonatite-hosted Nb-REE deposit (WA1 Resources, 2023a). The purpose of this study is to investigate how a complementary soil geochemistry dataset, as acquired during ground gravity surveying, could enhance targeting of buried carbonatite intrusions and related alkaline rocks. CSIRO's recently developed Ultrafine (UF) analytical method (Noble et al., 2018) has been selected as the primary analytical method for this study. In this method anomaly detection is based on the characteristic geochemical signatures of mobile pathfinder elements imprinted or adsorbed onto regolith materials surrounding undercover intrusive bodies (Noble et al., 2018).

Ultrafine Soil (UF) Geochemistry Method

The program is aimed at creation of an integrated high-resolution geophysical (magnetic and gravity) and soil geochemical dataset with whole soils collected on a 400m grid at selected gravity stations during the ground gravity acquisition program. The geochemical focus is on the Ultrafine (UF) method with comparisons to conventional mixed-acid digest (MA) and borate/alkaline fusion (AF) assay methods. No integrated dataset of this kind currently exists in the West Arunta region and no Ultrafine soil geochemical data, which only became commercially available in 2020, is publicly available for this region. One aim of this study is to evaluate the suitability of these methods in targeting potential Nb-REE mineralised carbonatites and related lamprophyres, as well as other intrusive bodies or hydrothermal systems with Cu-Au and/or critical metal potential, e.g. Li. Another aim is to develop new geochemical tools that can be used to assess soil geochemistry over buried magnetic-gravity targets of alkaline or critical minerals affinity.

The UF technique was developed through CSIRO/MRIWA research project M462 (Noble et al., 2018) and delivers highly sensitive analysis of gold and multi-elements in the ultrafine (<2µm) clay-rich fraction of soil samples. The method uses a dispersal agent to isolate fine clay minerals and iron oxides where mobile pathfinder elements bind. Labwest in Perth, WA is the licenced provider of the method and note the following desirable features of the method: enhanced sensitivity for low-level element detection; higher signal-to-background ratio; smaller sample size requirements thus lowering costs; reproducible results; no nugget effects and improved consistency. Labwest's UFF-PER procedure entails:

- Collection of <2µm fraction from oven-dried soil samples using a dispersal agent;

• Analysis and reporting of a 65-element suite by ICP-MS/OES including the full Rare Earth Elements suite;

Note: the key element phosphorus is not available by the UF method due to use of a phosphate-bearing dispersant in collection of the ultrafine fraction.

The CSIRO and Labwest provide documentation on the best-practice sampling procedures for UF soils (see Digital Data Appendices).

As noted by Noble et al. (2018): *"Greenfields exploration in Australia is in decline, and the technical challenge of exploring in deeply weathered and covered regions has not been fully addressed; yet exploration success in these areas is critical to the future economy. The <2 µm fraction represent the most effective and cost-efficient sample medium to use. The developed method proved the use of a small weight for analysis was effective (0.2 g) and microwave assisted aqua regia was the best analytical method for Au detection. Our research shows obvious benefits in using fine fractions for Au; Cu and Zn were consistently and abundantly extracted from the fine particle size fraction."*

The MA method is a Labwest-designed microwave-assisted mixed-acid digest method conventionally applied to soil sample fractions, such as the <2mm fraction or the <80mesh (<177µm) fine fraction. The method may not yield 100% recovery of 'refractory' or resistate metals. The AF method is a lithium borate fusion method used to obtain near 100% recovery of refractory elements.

For this study the sampling program is based on one sample per 0.16 km^2 which is designed for anomaly targeting rather than regional orientation such as that undertaken in the MacDonnell Ranges Ultrafine survey by Henne et al. (2022); that survey was based on one sample per 5.6km^2 and employed stream sediments rather than soils. Henne et al. provide a comparison between conventional MA digestion and the UF method for over 780 stream sediment samples from various landscape settings and confirmed that Ultrafine improves the recovery of certain trace metals (2 to >5 times higher for Au, Cu, Pb and Zn) and resolves concentrations near the detection limit, which enables the delineation of subtle geochemical enrichments, useful in picking outliers. GSWR has confirmed some of these results in an orientation study of 96 samples from its Beryllia prospect on EL33195 based on UF assay of residual soils developed on Southwark granite terrain. Ultrafine element enhancements of >2.5x on average were noted for As, Bi, Co, Cr, Cu, Mo, Ni, Pb, U, V and >1.25x enhancements were noted for Ag, Ce, REE, In, Li, Sb, Sc, Zn compared to the MA method. However, some of the more 'refractory' elements such as Nb, Ta, Sn, Th, Ti, Zr showed no particular enhancement or were under-reported by UF compared to MA. Other comparisons of UF and conventional soil assays are provided by Labwest (https://labwest.net/ultrafine/).

Features of the western Aileron Province carbonatites

The Luni carbonatite complex is ~2km x 1km in size with a resource estimate of 220 Mt @ 1.0% Nb_2O_5 and 10.3% P_2O_5 for a 0.25% Nb_2O_5 cut-off (WA1 Resources, 2024). The key niobium-bearing minerals present are pyrochlore and columbite, which both have high niobium contents (~70-74% Nb_2O_5). The main REE and phosphate-bearing minerals are monazite, rhabdophane and crandallite-group minerals (WA1 Resources, 2023b). Encounter Resources have published a resource estimate of 68 Mt @ 0.88% Nb_2O_5, 0.39% TREO and 6.4% P_2O_5 (for a 0.25% Nb_2O_5 cut-off) for their Aileron project, which comprises, at this stage, three carbonatite bodies (Green, Emily and Crean), two of which appear to be contiguous with Luni (Encounter Resources, 2025).

Carbonatite complexes in the western WAMGB are strike-extensive and are associated with major cross-cutting or bounding fault zones, with related lamprophyre intrusions and with local sodic metasomatism. The carbonatite bodies typically occur on or near gravity gradients, are marked by positive gravity anomalies and are associated with variable but often weakly magnetic features in contrast to magnetic LRF basement; this reflects the different geophysical properties of various intrusive and country-rock units, including magnetic BIF or amphibolite, and regolith cover materials. WA1 Resources Ltd (2023a) have commented on features of the Luni discovery as follows:

In the three Luni discovery drillholes, the geology profile from surface to end-of-hole consists of shallow (<15m thick) cover, before intersecting progressively weathered carbonatite. The upper extent of the carbonatite is intensely weathered. It consists of an initial leached clay zone depleted in mineralisation (~8-25m thick). This zone transitions sharply [at >30m] into a second moderate to highly weathered [supergene] zone significantly enriched in niobium, TREO, tantalum and phosphorus, generally representing the best mineralised grades. The enriched zone transitions into a less weathered and more competent unit in the weathering sequence.

WA1 have recently provided a technical overview of the Luni deposit (WA1, 2026) and have discussed details relevant to the regolith developed over the complex:

"The Luni carbonatite complex intruded the Palaeoproterozoic country rocks of the Lander Rock formation and Carrington Granite Suite, within the Aileron Province in the western portion of the Arunta Orogen. The Luni carbonatite and immediate surrounding units do not outcrop and are covered by transported regolith units that typically vary in thickness between 30m and 80m but are thicker in isolated parts. Fluids from the carbonatite have significantly altered the country rocks and earlier carbonatite intrusive phases, generating fenite alteration assemblages including carbonate alteration, phlogopite/biotite-glimmerite alteration and sodic alteration. The Luni carbonatite is strongly enriched in Nb, P, and REE. Subsequent weathering led to volume loss and the collapse of the carbonatite to create a topographical depression in the landscape. This formed a local colluvial depocentre where material was transported to and deposited in. Due to the dominance of carbonate mineralogy in the carbonatite, karstic weathering has created cavities and influenced the geometries present, which were later infilled with transported material. Colluvial and eluvial processes contributed significantly to the further enrichment of the resistate Nb, P, and REE-bearing minerals. The main Nb, P, and REE mineralisation zones in the weathering profile are sub-horizontal and reflect the degree of weathering (mass removal) of less-resistate minerals and typically more mobile elements, as well as primary enrichment. The carbonatite has a well-developed chemical weathering profile, commonly ranging from 30m to 80m. Local areas of deep weathering, over 180m in depth, likely represent complex karst geometries in the palaeosurface, deeper weathering along structural or contact corridors, or combinations of features. The weathering profile is less developed in the syenites, fenites and country rock, and is commonly 5m to 10m deep."

Carbonatite-related Regolith Geochemistry – Mud Tank Example

A key initial question in the use of soil geochemical methods in the search for carbonatites and related alkaline rocks is exactly what are the characteristic geochemical signatures of regolith materials developed over carbonatite bodies? In the context of the Aileron Province of central Australia it is fortunate that there is a known carbonatite body – the 731 Ma Mud Tank carbonatite – over which soil and stream sediment geochemical studies have been previously undertaken.

The Mud Tank Carbonatite is an elongate intrusion ~2 km long and 150 to 700 m in width located in the central-east Aileron province. The weathered carbonatite is exposed at surface and is drained by a small NE-trending creek. The carbonatite intrudes Proterozoic metamorphic rocks comprising metapelitic schists, gneisses and granitoids not unlike the LRF. The ground over the carbonatite body has been disturbed to some degree by fossicking activity and vermiculite mining downstream. Although the level of ground disturbance may have enhanced the dispersal of characteristic elements, Mud Tank is one of the few presently known significant alkaline rock intrusions located in the central Australian climatic zone.

An orientation survey undertaken in 2003 by Elkedra Diamonds NL (Taylor, 2003) included both stream sediment and soil sampling (the latter a 2 km north-south traverse along line 425,000E over the carbonatite) with different size fractions collected. Samples were analysed by 4-acid digest (MA) and ICPOES/ICPMS (the original data files from 2003 are provided in the Digital Data Appendices). The fine -100 micron soil fraction is most relevant to this study. The results (in order of most to least anomalous) show that P, Ni, Mn, Mg, Cu, Ca, Co, V, Cr, Nb, La, Ba, Sr, Ti are effective elements in defining a soil anomaly over a ~250m width of exposed carbonatite-derived regolith materials. Zr is not anomalous in the finer soils but is anomalous in the coarser fractions due the presence of coarse zircon crystals. U is enriched in soils over the country rock and the heavy rare earth elements, particularly Yb, are depleted over the weathered carbonatite due to the steep, fractionated LREE/HREE rare earth element pattern that is intrinsic to carbonatites. Element ratios, particularly those involving Yb and U on the denominator, will therefore be more effective discriminators than individual elements. Ratio diagrams (Figure 6) show that in order of most to least effective Ca/U, P/Yb, Cu/Yb, Mn/Yb, (Cr+Ni)/Yb, Co/Yb, V/Yb, Nb/Yb, Nb/U, Ti/Fe%, Mg/Fe%, (La*2+Ce)/Yb, Sr/Yb and Ba/Yb are valuable carbonatite discriminators. It is of interest that mafic/ultramafic-associated elements such as Cu, Cr and Ni appear to be the more effective discriminators compared to Sr, Ba or the LREE, perhaps due to leaching of the latter during weathering, their association with coarser size fractions or the presence of lamprophyres.

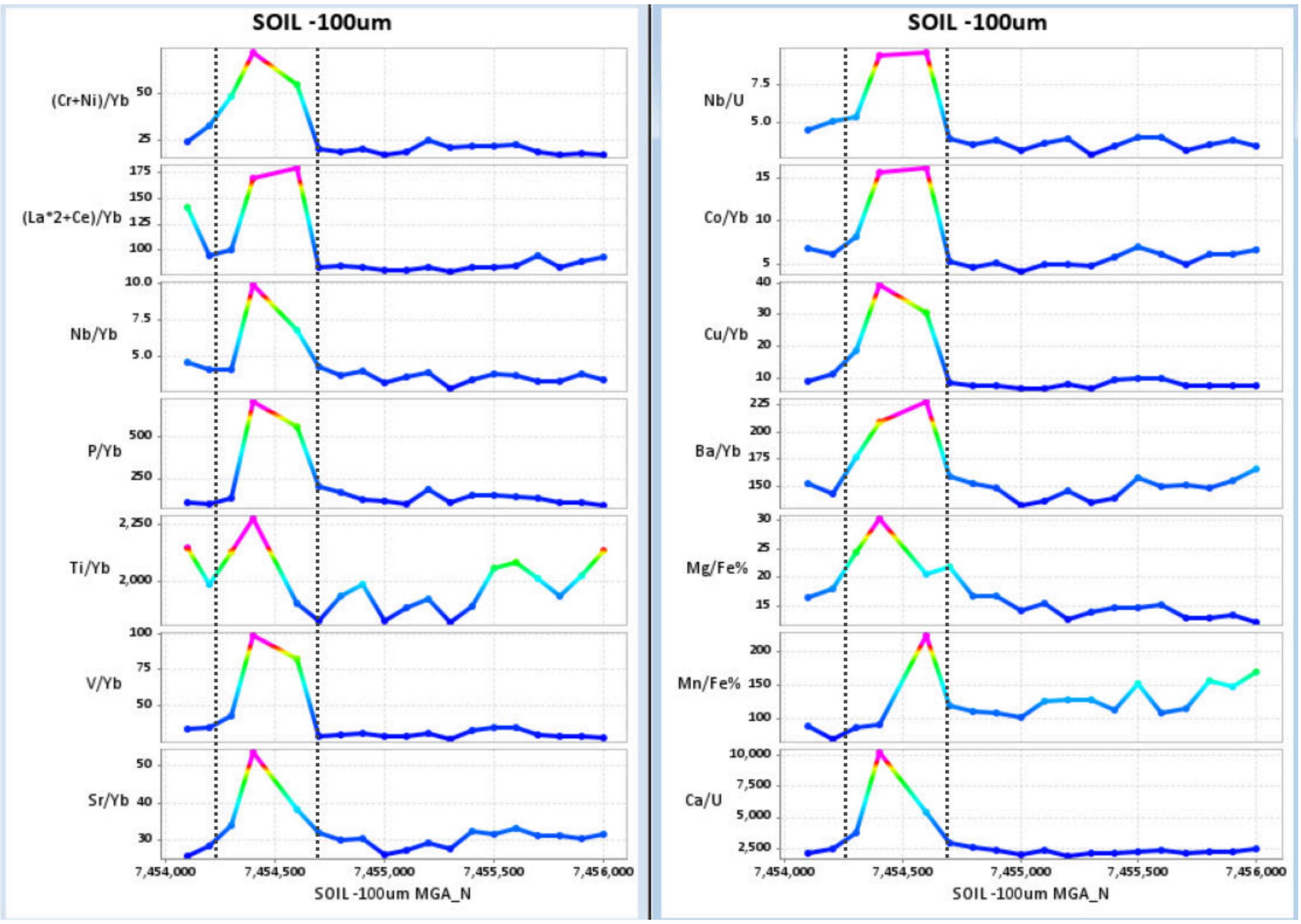

Figure 4: *Geochemical traverses across the Mud Tank carbonatite showing anomalous element ratios in -100 micron soils. Dashed line shows extent of exposed carbonatite-derived regolith.*

Application of Discriminant Ratios to Pachpadra Drill-Holes

WA1 Resources (2023c) reported downhole AF (lithium borate fusion) geochemical assays for the four discovery holes drilled at the Pachpadra prospect in the western WAMGB where carbonatite and lamprophyre intervals were intercepted at depth. This data allows further investigation of the effectiveness of trace element ratios in discriminating alkaline rocks in an Aileron province setting. Table 1 shows key ratios calculated for selected downhole intervals of various lithologies including carbonatite, lamprophyre, near surface clay-rich regolith and basement gneiss of different kinds. Collectively the ratios are most effective in picking the lamprophyre intervals, with one interval showing anomalous values in all 14 of the ratios and the others in 13 and 9 of the ratios (these values shown as a 'score' in the Table). The carbonatite interval is less effectively picked with a score of 6. Near surface regolith and saprolite is mostly not anomalous with the exception of elevated Nb/Yb, Nb/U +/- REEs in ferruginous clay from two holes but it is unclear how these anomalies might relate to buried alkaline rock units particularly since hole PARC002 contains no alkaline rock intercepts (note: hole PARC003 lacks a complete analytical dataset). Some basement gneiss intervals also show anomalism in several of the ratios.

The lesson from this exercise is that, if used collectively, the ratios are effective in picking lamprophyres and carbonatites downhole – a useful approach would be to develop a score or index that incorporates all the ratios. Such an index may also be applied to soils and may be particularly useful in identifying dispersal halos around weathered, near-surface lamprophyres. The other lesson is that soils may not necessarily show any definitive anomalism over deeply buried alkaline intrusions, at least in the case of the AF method.

Table 1. Application of Discriminant Ratios to Pachpadra Down-Hole Geochemistry

Drill Hole	from	to	Lithology	Ca/U	P/Yb	Cu/Yb	Mn/Yb	(Cr+Ni) /Yb	Co/Yb	V/Yb	Nb/Yb	Nb/U	Ti/Fe%	Mg/Fe%	(La*2+Ce) /Yb	Sr/Yb	Ba/Yb	Score
PARC001	0	4	Clays	1796	49	8.7	678	38.5	11.3	31.0	3.3	6.3	1077	5.6	101	20	264	0
PARC001	106	107	Lamprophyre	61508	2571	29.3	2571	1066.7	58.9	188.9	61.3	33.6	13373	70.5	272	717	722	13
PARC001	109	110	Dolerite	2143	103	5.1	330	43.1	8.0	30.2	3.5	8.9	1206	20.9	107	45	254	0
PARC001	138	139	Lamprophyre	64643	2518	84.3	1813	1181.3	65.6	191.1	78.2	54.8	15402	79.3	236	488	1848	14
PARC001	177	178	Granite	4884	367	2.9	207	14.9	5.0	17.7	19.5	10.0	1167	23.2	366	51	437	1
PARC001	226	230	Paragneiss	1758	33	16.2	479	36.3	6.7	24.2	2.9	18.6	1119	16.8	32	14	114	0
PARC002	0	4	Ferruginous Clays	23671	430	35.3	1516	65.8	10.4	34.8	71.2	62.3	911	2.6	261	106	247	4
PARC002	72	76	Gneiss	437	112	5.3	151	46.4	8.3	33.5	5.8	9.2	1864	15.4	102	28	228	0
PARC002	160	164	Paragneiss	14500	1231	31.2	1706	178.9	16.8	68.8	25.1	25.1	4413	19.5	151	147	225	0
PARC002	200	204	Gneiss	20598	2803	42.4	3325	108.5	18.4	58.1	19.7	38.5	2957	5.8	148	207	197	4
PARC003	2	3	Ferruginous Clays	-	258	-	-	61.4	-	86.1	38.0	34.8	1011	-	100	36	107	2
PARC003	55	56	Saprolite	-	48	-	-	16.6	-	16.6	5.8	5.4	1310	-	61	18	129	0
PARC003	74	78	Carbonatite	36082	4485	2.4	579	6.7	6.3	34.4	221.6	53.3	222	52.4	250	407	76	6
PARC003	138	142	Xenolith?	40588	138	0.6	1268	13.6	5.0	11.2	282.4	5.9	350	114.2	31	400	120	5
PARC003	162	166	Carbonatite	71582	5147	0.6	657	17.1	2.1	65.4	1053.6	45.4	448	37.0	285	1137	83	6
PARC004	0	4	Clays	4161	30	12.5	205	22.5	3.6	17.6	2.2	9.7	686	5.2	31	13	217	0
PARC004	36	40	Ferruginous Clays	414	118	12.4	128	86.7	9.8	76.3	8.0	11.3	2426	8.4	116	21	314	0
PARC004	72	76	Gneiss	909	159	108.7	223	122.5	18	90.2	7.6	5.6	2902	16.3	162	42	333	1
PARC004	84	88	Lamprophyre	5037	1267	99.3	731	514.1	39.5	133.3	34.0	35.3	9259	31.0	262	98	563	9
PARC004	164	168	Mafic Gneiss	13242	95	18.1	3978	29.1	9.0	19.7	5.1	25.4	771	18.7	62	35	127	2
PARC004	204	208	Paragneiss	257	70	22.7	186	54.8	10.0	37.1	4.6	24.8	1746	15.9	47	24	191	0
PARC004	211	212	Mafic Gneiss	9221	260	546.8	545	76.2	23.1	64.9	9.5	4.3	2727	97.6	172	21	65	2

Details of the Collaborative Program

GSWR contracted Atlas Geophysics Pty Ltd to provide a ground gravity survey at 400m station-spacing over the 840km^2 *West Arunta Carbonatite Search* project area following a successful grant under Round 18 of the NT Geophysics and Drilling Collaborations Program in May 2025. The field program commenced on 1st September 2025, and program ran for seven weeks with two ATV-assisted gravity crews operating for most of the period. A total of 5,305 ground gravity stations, including selected in-fill stations over anomalies at 200m-spacing, were acquired. Whole soils of ~300g size were sampled from 3,060 gravity station sites. A map showing the final survey station locations is shown in Figure 5.

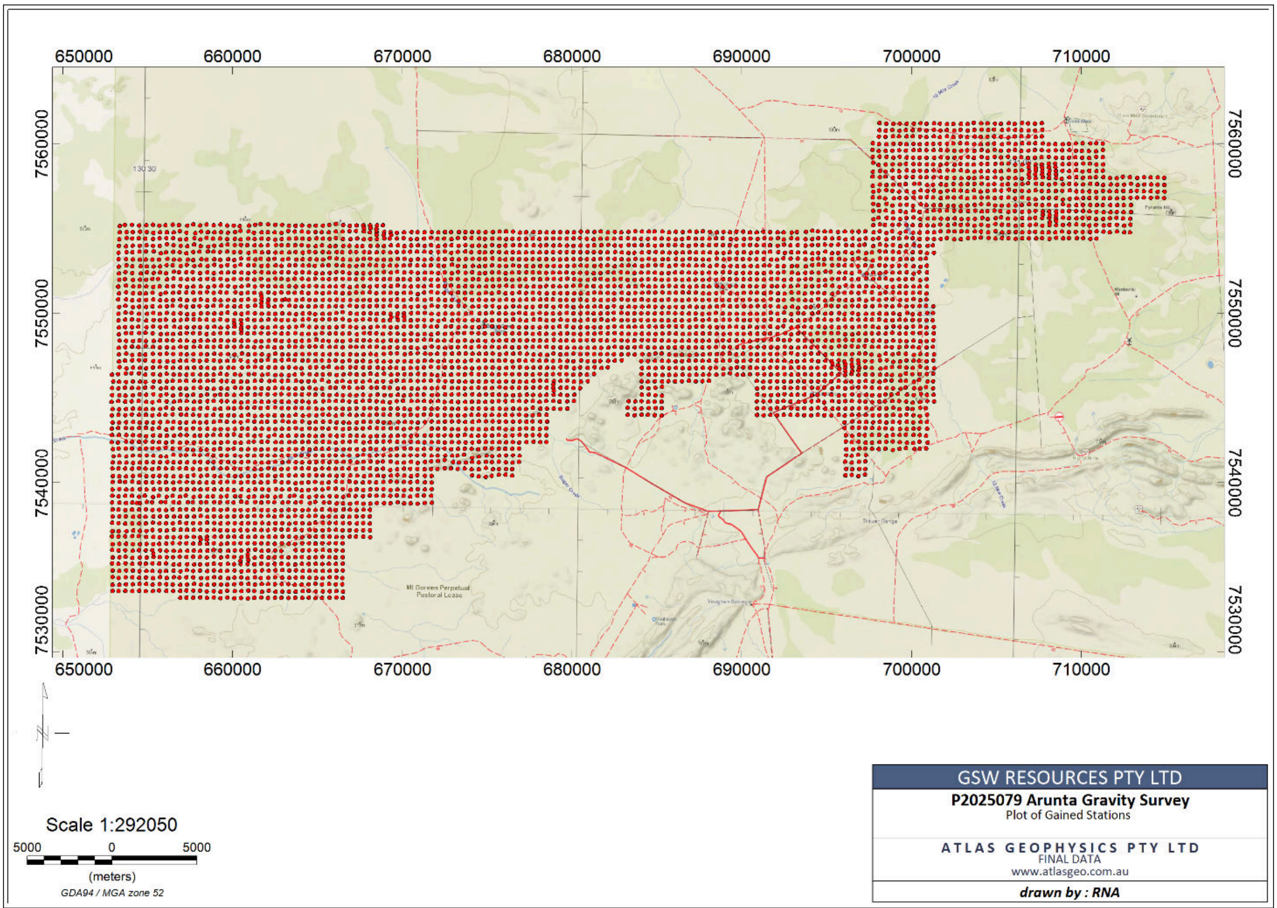

Figure 5: Final gravity station plan for the Arunta Gravity Survey P2025079 over the West Arunta Carbonatite Search project area.

For the Innovative Targeting program, a subset of 768 soil samples from 11 prospect areas covering numerous magnetic-gravity targets and different surficial geological environments were selected for UF assay (Phase 1 of the project). The total number of soil samples collected was 3,060 (covering ~58% of gravity stations) with 2,292 samples put into storage and available for future work by GSWR (note: the collection and storage of these additional samples is not part of the Innovative Targeting program funding).

In Phase 2 of the project smaller sample subsets (438 assays in total) were selected for comparisons between UF and conventional mixed acid digest (MA) and borate fusion (AF) assays (Table 2). A total of 1,206 assays were completed for the Innovative Targeting program. The locations of soil sites categorised by prospect area, are shown in Figures 6, 7 & 8 for the various assay methods. The analytical data is provided in separate files in the Digital Data Appendices.

Table 2. Sample counts for the various analytical methods split by prospect area

PROSPECT AREA	UF ASSAY	MA ASSAY	AF ASSAY
PYRAMID	200	160	19
PYRAMID WEST	157	89	
MOONLIGHT-CARRINGTON	110	30	
WEANER	127	41	
SOUTHWARK	26		
BUDGER	16	5	
BUDGER NORTH	13		
BUDGER GABBRO	3		
RYANS-13	6		
RYANS-15	55	55	14
RYANS-17	55	25	
TOTAL	**768**	**405**	**33**

While many of the soils were sampled from regolith over untested magnetic-gravity targets, soils from one prospect area were sampled specifically from a known outcrop for comparative purposes. This prospect is known as the Budger Gabbro, which is a 1,500 x 400m metamorphosed mafic-ultramafic body (metagabbro) possibly of the Carrington Suite. It is unusual in that it is intruded by a number of pegmatite dykes so it might be expected to have a mixed soil geochemical signature. The Budger Gabbro is characterised by a subdued magnetic response and a gravity anomaly, part of which appears to be offset to the southwest of outcrop against a major fault.

Another area of interest is the Weaner prospect area which is a Cu-Au target drilled by Tanami Gold NL in the 2000s. The prospect contains some unusual altered felsic porphyry and mafic lithologies and is deeply weathered. It is associated with a prominent magnetic anomaly and a smaller gravity anomaly (known here as target WE01) which is untested by drilling. The prospect borders the boundary between LRF/Carrington basement and the younger Southwark granite suite. Soil samples over the latter have been separately categorised (26 samples, see Table 2, Figure 6).

Figures 9-12 show the soil sample sites in relation to surface geology, topography, satellite and radiometric imagery. These images give a guide to the surface geological landscape context of sample areas. In the future, imagery of this type will be useful in constructing a formal landscape model for the project area.

Figure 13 shows the soil sample sites in relation to hvd-filtered residual gravity and assessed gravity targets (Taylor, 2026).

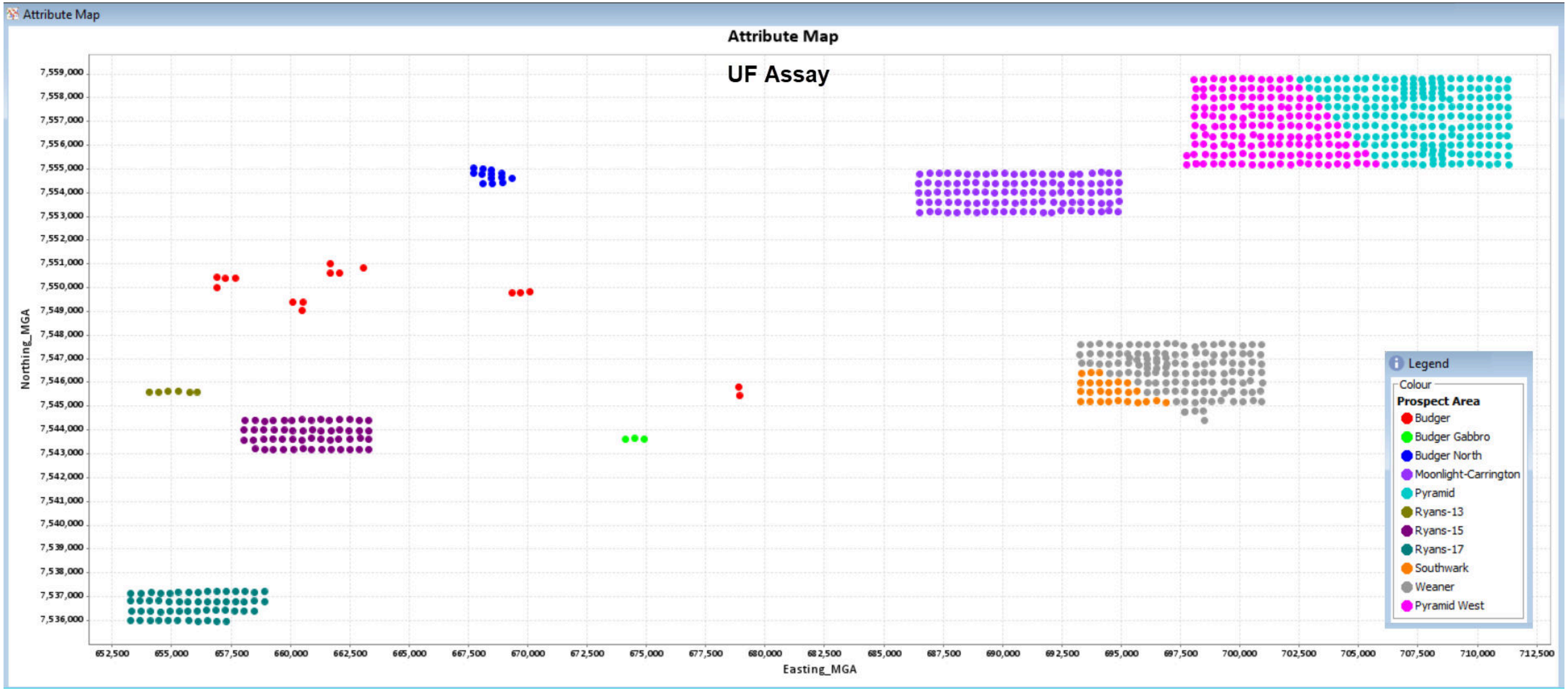

Figure 6: *Location map showing soil UF assay sites categorised by prospect area.*

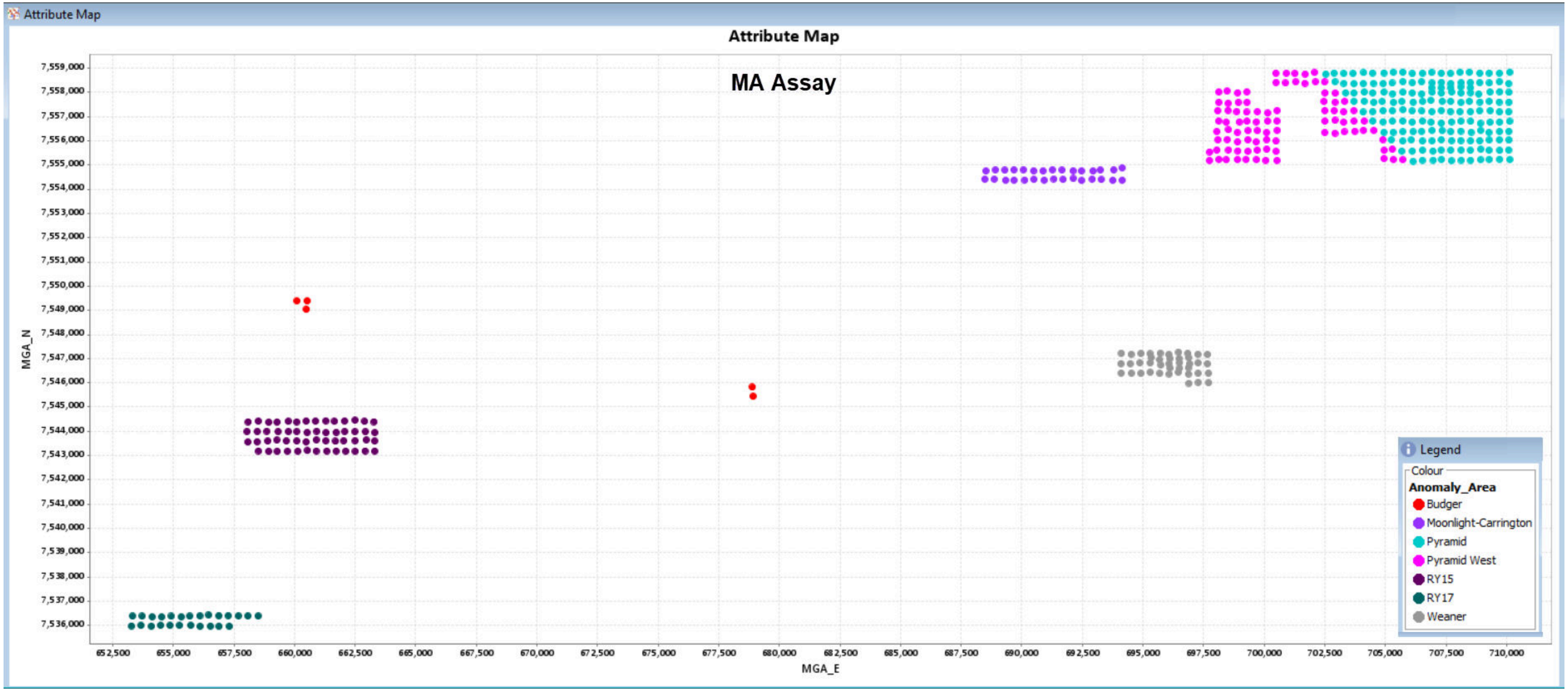

Figure 7: *Location map showing soil MA assay sites categorised by prospect area.*

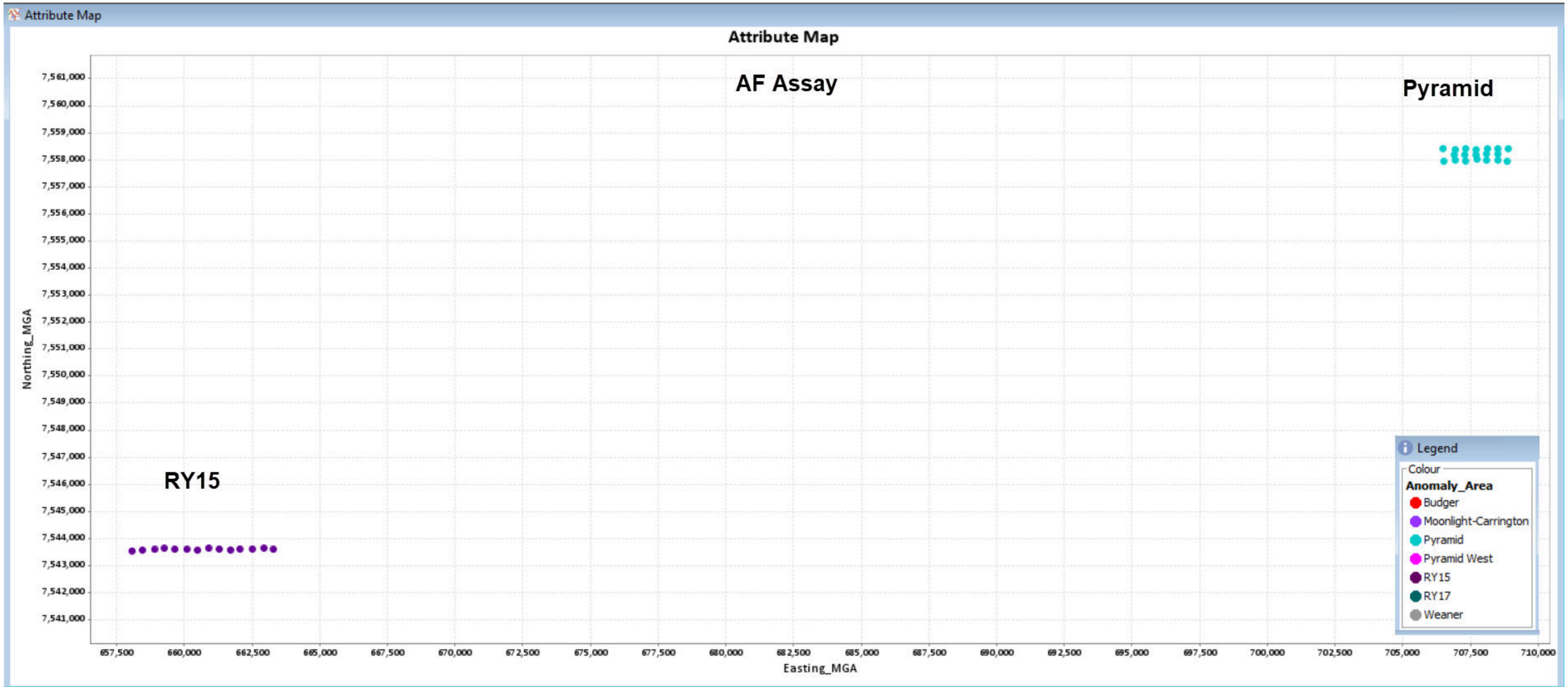

Figure 8: *Location map showing soil AF assay sites categorised by prospect area*

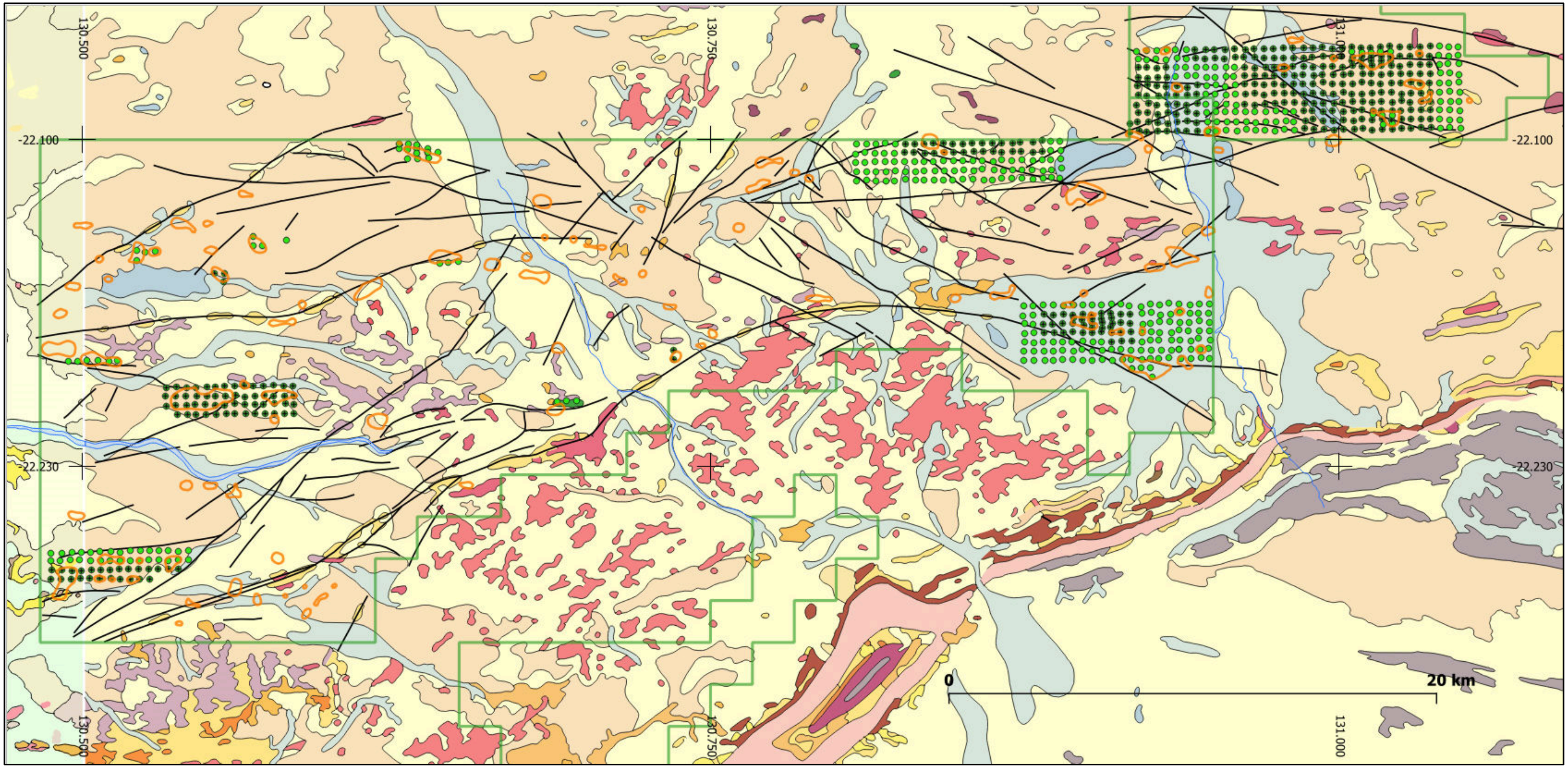

Figure 9: *Sample sites relative to Mt Doreen and Lake Mackay 1:250k map-sheet geology showing inferred fault zones (see also Figure 5). Green dots are UF sample sites; Green+black dots are UF and MA sample sites. Orange ovals are assessed gravity anomaly targets. Purple colour is Lander Rock Formation (LRF) outcrop; Red colours are Carrington Suite and Southwark granitic suite outcrop. Dark blue – Quaternary playa lake sediments; Light blue – Quaternary alluvial/fluvial deposits; Tan – Quaternary sand plain; Light yellow – Quaternary aeolian sands; Orange – Cenozoic quartz gravel;* Dark Yellow – *Quaternary colluvial gravels; Green – metagabbro outcrop (Budger gabbro).*

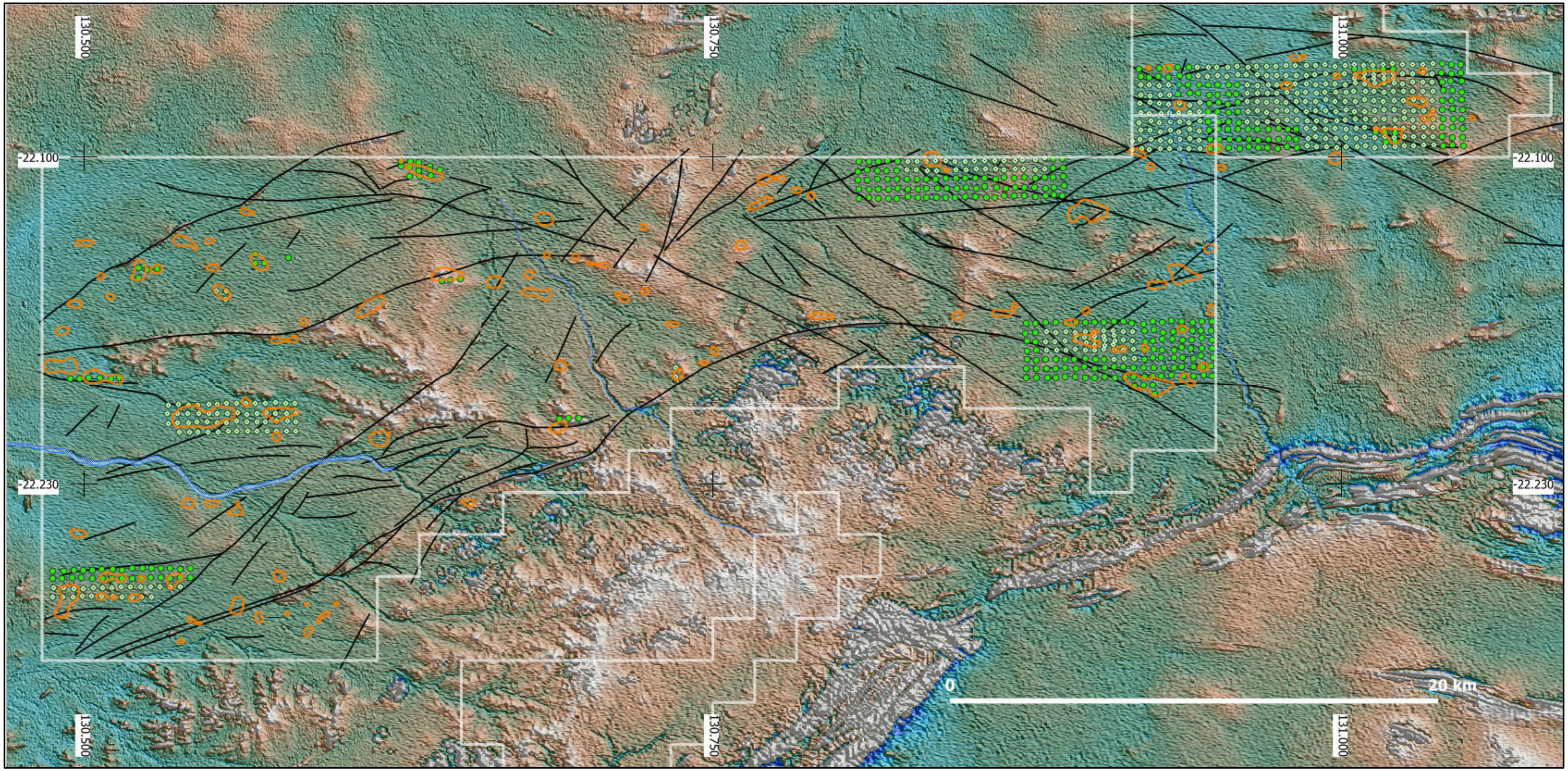

Figure 10: *Sample sites relative to hvd-filtered Copernicus GLO30 digital terrain model showing inferred fault zones. Green dots are UF sample sites; Green+black dots are UF and MA sample sites. Orange ovals are assessed gravity anomaly targets.*

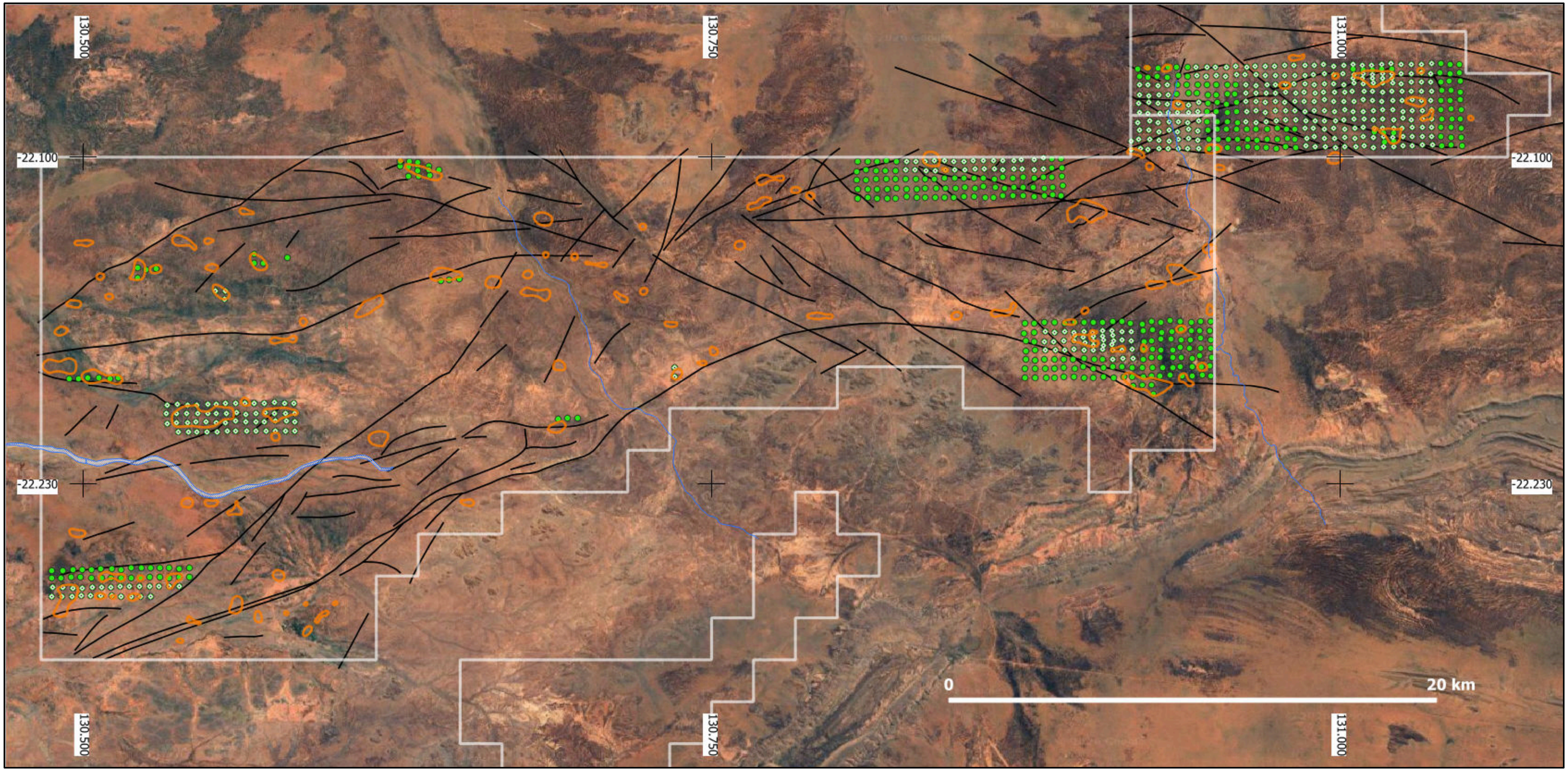

***Figure 11:** Sample sites relative to Google Earth staellite imagery showing inferred fault zones. Green dots are UF sample sites; Green+black dots are UF and MA sample sites. Orange ovals are assessed gravity anomaly targets.*

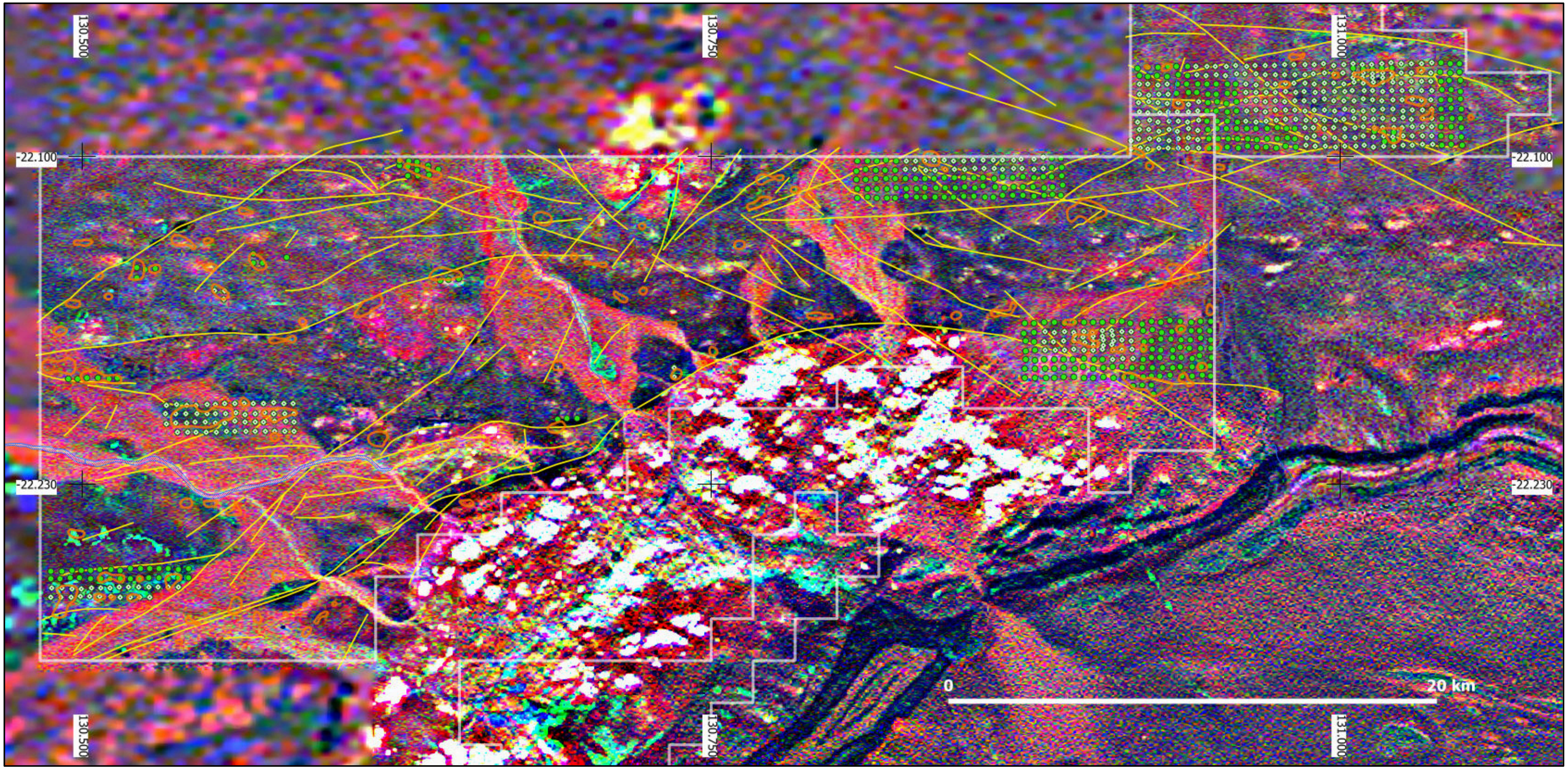

Figure 12: *Sample sites relative to hvd-filtered K-Th-U RGB imagery from the 2024 100m-spaced radiometric survey showing inferred fault zones (yellow lines). Green dots are UF sample sites; Green+black dots are UF and MA sample sites. Orange ovals are assessed gravity anomaly targets. Note: the red colours generally correspond to illite-rich soils associated with broad drainage systems; the darker blue colours correspond to sand plains likely with a significant aeolian component; the green colours correspond to Th-rich regolith that may be associated with lateritic deposits or in some cases kaolinite developed on radiogenic granites. Radiometric imagery of this type combined with ground truth mapping would be useful in constructing a future landscape model for this area.*

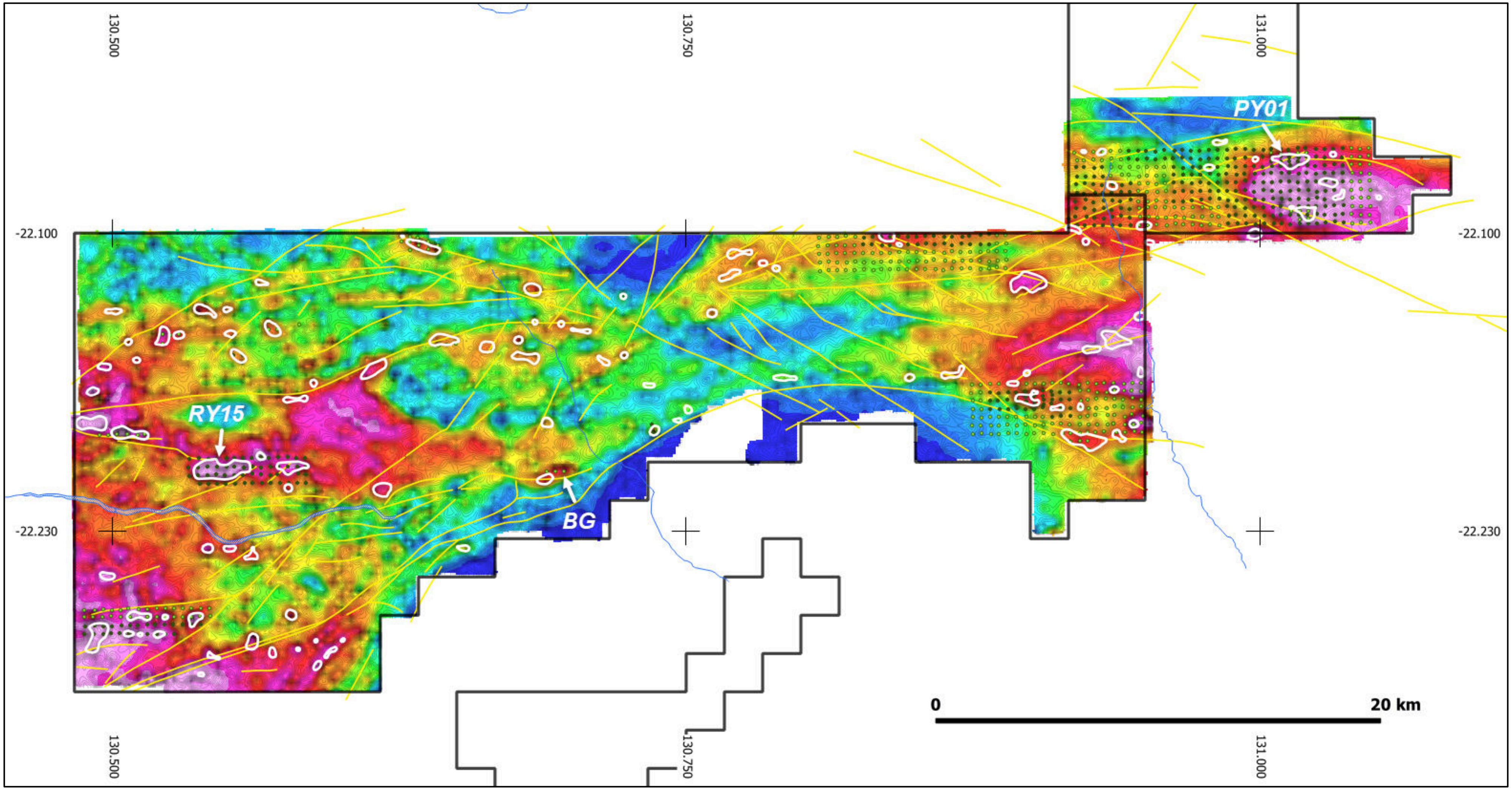

Figure 13: Sample sites relative to hvd-filtered Residual Gravity imagery from the 2025 survey (Taylor, 2026). Green dots are UF sample sites; Green+black dots are UF and MA sample sites. White ovals are assessed gravity anomaly targets. Targets RY15 and PY01 shown. BG = Budger Gabbro.

Results and Interpretations

Comparison between the Ultrafine, Mixed Acid and Alkaline Fusion Methods

Comparisons between the various methods have been investigated in two traverse lines over priority magnetic-gravity targets PY01 (Pyramid prospect area) and RY15 (Ryans-15 prospect area) (see Figure 13). Various key element ratios have been evaluated. Although the exact nature of the targets is unknown at present, the key ratios (La*2+Ce)/Yb, Ti/Yb, Cu/Yb and (Cr+Ni)/Yb in both cases show useful anomalism (i.e. enhanced peak to background ratios over the targets) for the UF method and no or very weak anomalism for the AF method.

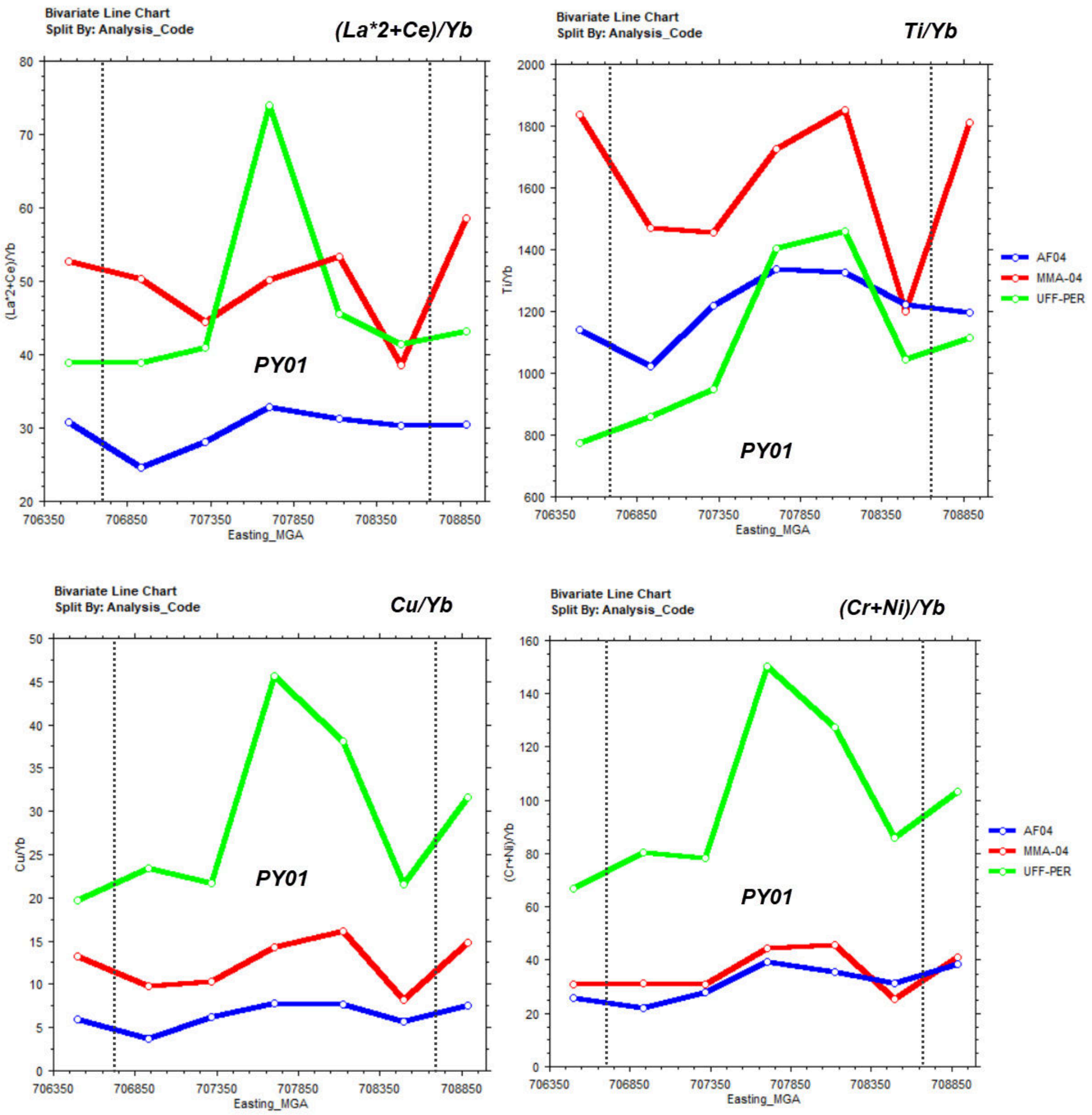

Figure 14: *(La*2+Ce)/Yb, Ti/Yb, Cu/Yb and (Cr+Ni)/Yb key ratios over an E-W transect (line 7,558,400N) over target PY01 showing pronounced REE, Ti, Cu and Cr+Ni anomalism for the Ultrafine method, and except for Ti, weak or no significant anomalism for the other methods. Dashed lines show gravity anomaly boundaries.*

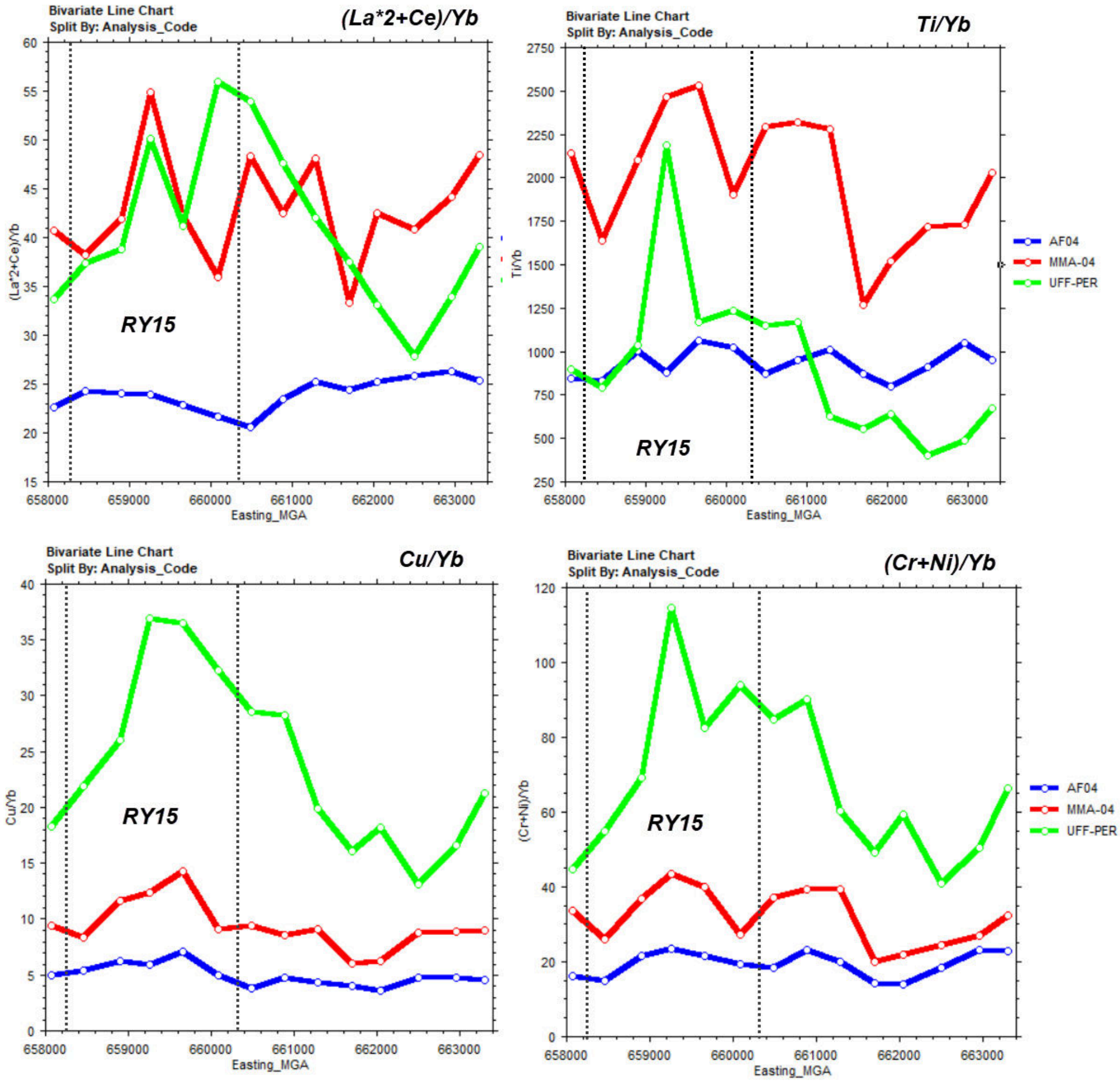

*Figure 15: (La*2+Ce)/Yb, Ti/Yb, Cu/Yb and (Cr+Ni)/Yb key ratios over an E-W transect (line 7,543,600N) over target RY15 showing pronounced REE, Ti, Cu and Cr+Ni anomalism for the Ultrafine method, and except for Ti, weak or no significant anomalism for the other methods. Dashed lines show gravity anomaly boundaries.*

In the case of key P/Yb and Nb/Yb ratios: Figure 16 shows that ratio plots over PY01 do not yield any useful information. Weak but observable anomalism accompanying low ratio values are seen for Nb/Yb over RY15 by the UF method. The MA method yields more observable anomalism, but both Nb/Yb and P/Yb anomalies appear to be offset to the east of the gravity feature.

Other ratio plots using different elements are provided in the Digital Data Appendices.

In conclusion, the AF method does not appear to be useful in defining any alkaline-rock-related anomalies as seen in the other methods. For the key ratios (La*2+Ce)/Yb, Cu/Yb and (Cr+Ni)/Yb the UF method yields enhanced anomalism. The MA method appears to be more useful in defining Nb/Yb and P/Yb anomalism, but the features are subtle and therefore difficult to evaluate at this early stage without knowledge of the target affinity. The UF method gives Nb/Yb values about 5x lower than the MA method, however, anomalies (i.e. peak to background ratios) appear to be of a similar order and no UF Nb values were found to be below the detection limit.

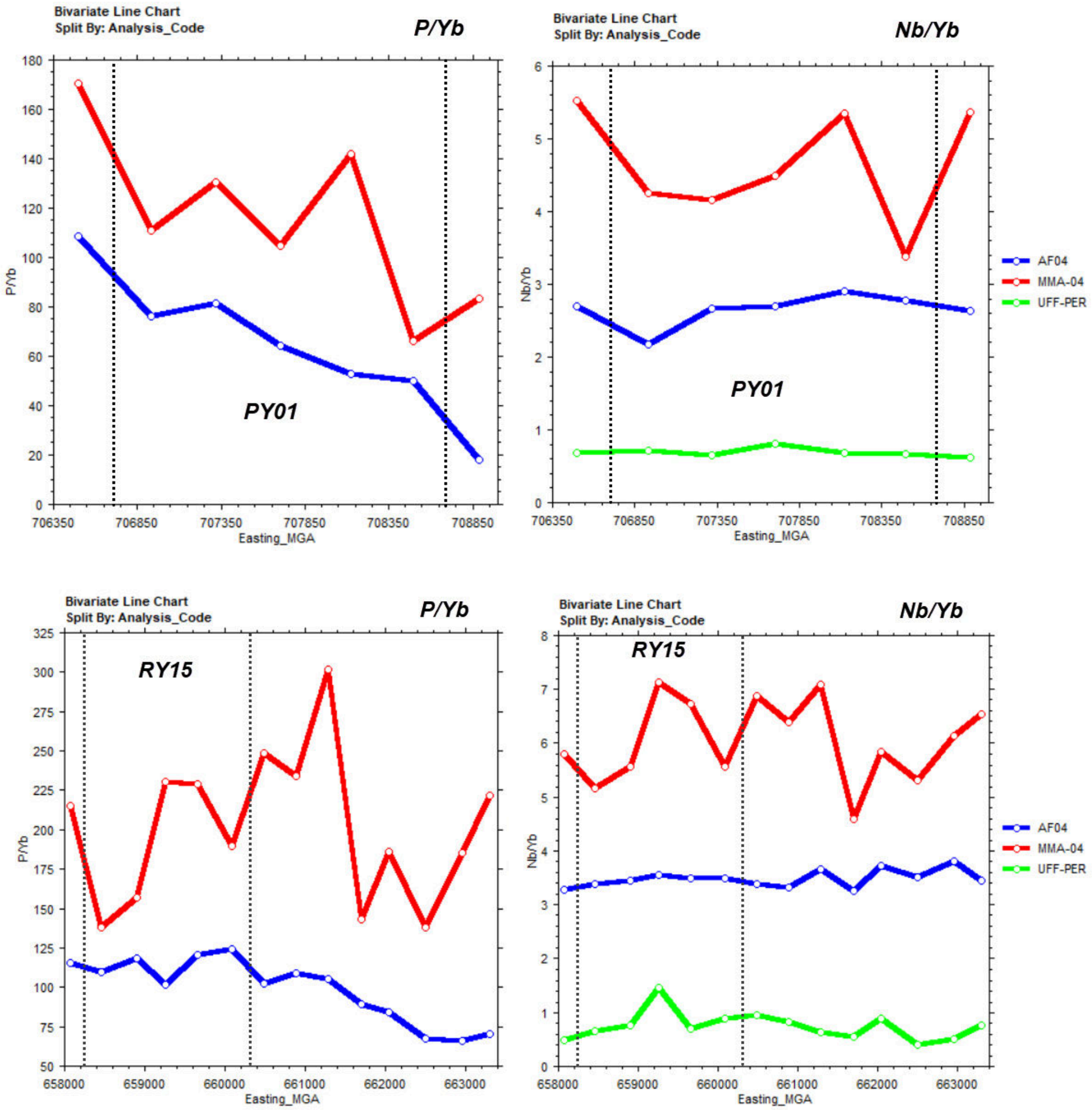

***Figure 16:** P/Yb and Nb/Yb ratio plots over PY01 do not yield any useful information. Weak but observable anomalism accompanying low ratio values are seen for Nb/Yb over RY15 in the UF method. The MA method yields more useful anomalism, but both appear to be offset to the east of the gravity feature. Dashed lines show gravity anomaly boundaries.*

Ultrafine Soil Results

As discussed above, the usefulness of various element ratios characteristic of alkaline rocks and other critical-metal-prospective rock types in soil geochemistry assessments is likely best achieved using a collective approach, i.e. grouping a number of key discriminant ratios together into the one index. To this end, several geochemical indices have been developed based on Ultrafine data.

ALK-INDEX (Alkaline Index – designed to detect carbonatites and carbonatite-associated lamprophyres of the UML variety using UF soil values – units of ppm unless otherwise specified).

[(Mg/Fe)*500+((Cr+Ni)/Yb)/3+(Co/Yb)+(Cu/Yb)/2+(Sr/Yb)+(Ti/Fe%)+(Ti/Yb)/10+((La*2+Ce)/Yb)*1.5+(Nb/Yb)*100]/10

Values over 80 are considered significant. The highest value of 106 occurs in soil sample 4990 from the centre of magnetic-gravity target RY15. Other significant ALK-INDEX values that coincide with magnetic-gravity anomalies occur at targets PY01, PY04, PY08, CR06 and BU05 (see Table 3).

Table 3. ALK-INDEX >80 values coinciding with magnetic-gravity anomalies

Sample_ID	Easting_MGA	Northing_MGA	Prospect Area	ALK-INDEX	Magnetic-Gravity Anomaly
1200	703665.081	7558770.572	Pyramid	80	PY04
1225	707701.094	7558372.565	Pyramid	81	PY01
1237	702907.943	7558431.362	Pyramid	81	PY04
1351	710077.492	7557186.414	Pyramid	81	PY08
1818	692913.909	7554420.324	Moonlight-Carrington	80	CR06
4990	659259.786	7543634.877	Ryans-15	106	RY15
6292	669693.314	7549800.483	Budger	87	BU05

UM-INDEX (Ultramafic + Copper Index – designed to detect mafic-ultramafic bodies associated with Cu, Ni, Cr +/- PGE mineralisation – units of ppm unless otherwise specified).

(Cr+Cu*3+Ni*3+Sc)/Fe%

Table 4. UM-INDEX >60 values coinciding with magnetic-gravity anomalies

Sample_ID	Easting_MGA	Northing_MGA	Prospect Area	UM-INDEX	Magnetic-Gravity Anomaly
1217	710893.939	7558385.854	Pyramid	62	PY09
1222	708887.778	7558403.657	Pyramid	62	PY09
1224	708125.762	7558400.674	Pyramid	63	PY01
1225	707701.094	7558372.565	Pyramid	72	PY01
1269	707731.330	7558014.882	Pyramid	61	PY01
6269	708097.902	7558213.630	Pyramid	68	PY01
1580	698439.655	7555208.495	Pyramid West	89	CR01
1880	668101.328	7554379.182	Budger North	62	BU15N
6286	668475.034	7554621.524	Budger North	66	BU15N
4101	695746.018	7546728.904	Weaner	64	WE01
4951	674917.538	7543628.585	Budger Gabbro	242	BG
4952	674503.385	7543635.566	Budger Gabbro	138	BG
4953	674125.145	7543603.272	Budger Gabbro	113	BG
6298	678920.539	7545430.914	Budger	110	BU19

Values of UM-Index over 60 are considered significant. Unsurprisingly, the highest values occur over the outcropping Budger Gabbro. Other high values are associated with magnetic-gravity anomalies BU19, BU15N, PY01, PY09, CR01 and WE01 (see Table 4). Four soils over anomaly PY01 have high UM-Index values with sample 1225 also having a high ALK-Index. Of interest, sample 1880 from target BU15N has the highest Pd value in the UF dataset of 15 ppb (cf. background values ~1 ppb).

CAPZ-INDEX (Co-Ag-Pb-Zn-Cd-Hg) Based on base metals and associated pathfinder elements that have correlated abundances in the dataset. The Fe normalising factor has a Mn correction to account for potential distortions in background values caused by Mn-oxide sequestration of elements such as Co - units of ppm unless otherwise specified.

$$(Co*4+Ag*500+Pb*4+Zn+Cd*100+Hg*100)/(Fe\%+Mn/200)$$

Values of CAPZ-Index over 45 are considered significant. The highest values associated with magnetic-gravity targets occur in the Weaner prospect area (Table 5).

Table 5. CAPZ-INDEX >45 values coinciding with magnetic-gravity anomalies

Sample_ID	Easting_MGA	Northing_MGA	Prospect Area	CAPZ-INDEX	Magnetic-Gravity Anomaly
4101	695746.018	7546728.904	Weaner	52	WE01
4219	695293.680	7546422.304	Weaner	48	WE01
6277	695337.317	7547040.750	Weaner	48	WE01
4639A	697688.897	7544765.425	Weaner	64	WE06
4214	697283.184	7546389.386	Weaner	45	WE07

Other indices, including pegmatite and gold pathfinder indices, are under development. Only four samples have Au levels over 3 ppb and only one sample (#4222 Southwark area) has >100ppm Li.

The Digital Data Appendices contains a collection of gridded and variable abundance maps showing elemental, element ratio and index imagery that are useful for anomaly picking and further study. Figures 20-22 show gridded images of the ALK-Index, UM-Index and CAPZ-Index.

Mixed-Acid Soil Results

The key ratios Nb/Yb and P/Yb in -2mm soils were investigated in the MA dataset. As noted previously, Nb being a relatively immobile, refractory element is not particularly enhanced in the UF dataset in comparison to the MA dataset (although no below-detection-limit values were found in either case). Phosphorus is unable to be analysed by the UF method, so the MA dataset gives the only guide to P distribution in the study area. Variable plots are shown Figures 17 and 18 below.

Nb/Yb is poorly correlated between the MA and UF datasets with high MA Nb/Yb values (~10-20) dominating in the Weaner prospect area (Figure 17). Elevated MA Nb/Yb values of ~7-8 and ~7-11 also occur in the Ryans-15 and Ryans-17 project areas, respectively. MA P/Yb values generally show a scattered distribution (Figure 18); except for three sample points with P/Yb >300 located within the envelope of the RY15 gravity anomaly, no strong association between P/Yb and magnetic-gravity anomalies is found. In the Ryans-15 and Ryans-17 prospect areas, P/Yb correlates strongly with Nb/Yb (Figure 19). Features of the MA soil geochemistry in the Ryans-17 area, such as elevated Nb/Yb, P/Yb, La/Yb, Ti/Yb, Sr/Yb, (Cr+Ni)/Yb and V/Yb in samples 5977, 5981, 6012 (which are within 1.5km proximity of each other) suggest a possible lamprophyre dyke or dyke swarm source requiring follow-up. Further investigation and interpretation of the MA dataset is in progress.

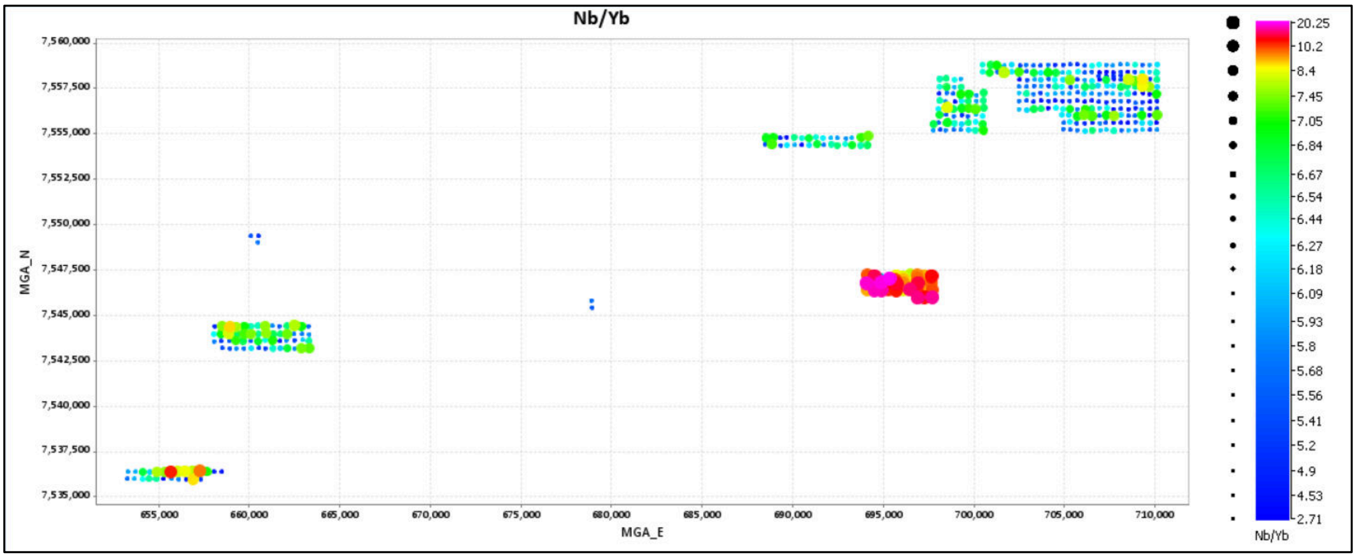

Figure 17: Nb/Yb variable plot for the MA dataset. Note elevated values in the Weaner prospect area.

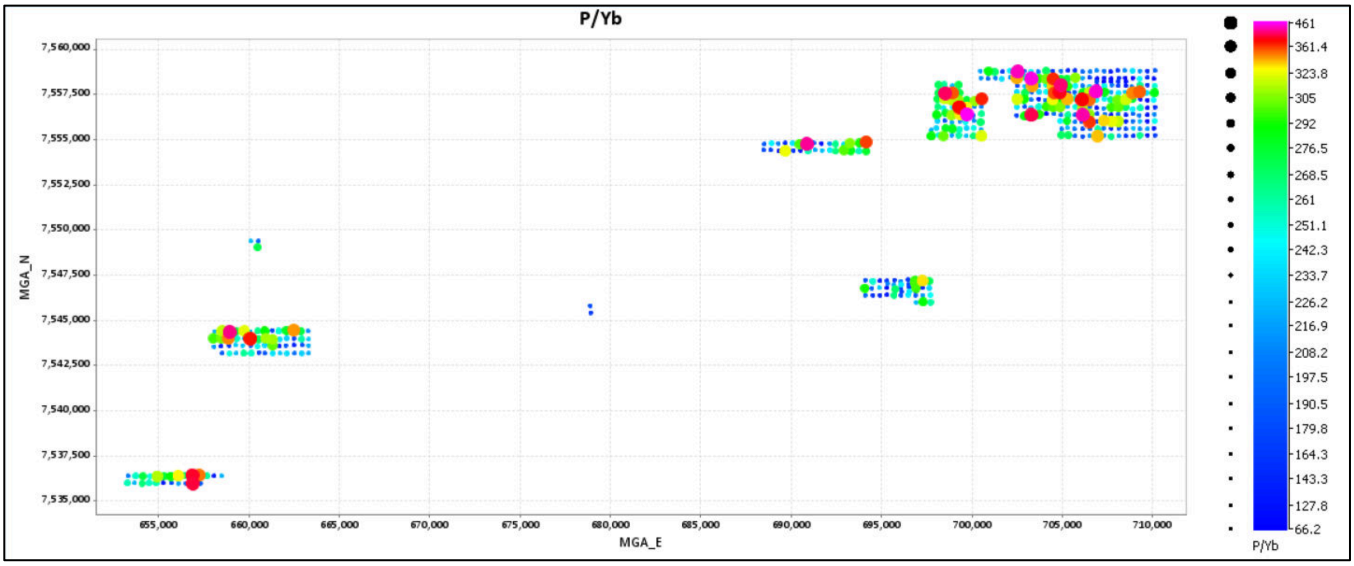

Figure 18: P/Yb variable plot for the MA dataset.

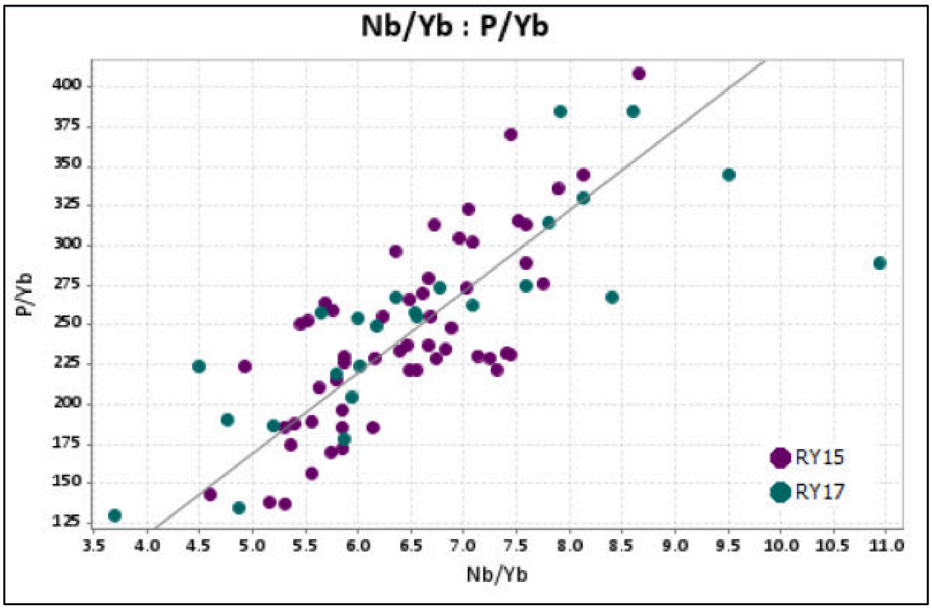

Figure 19: Correlation between Nb/Yb and P/Yb in -2mm soils in the RY15 and RY17 prospect areas.

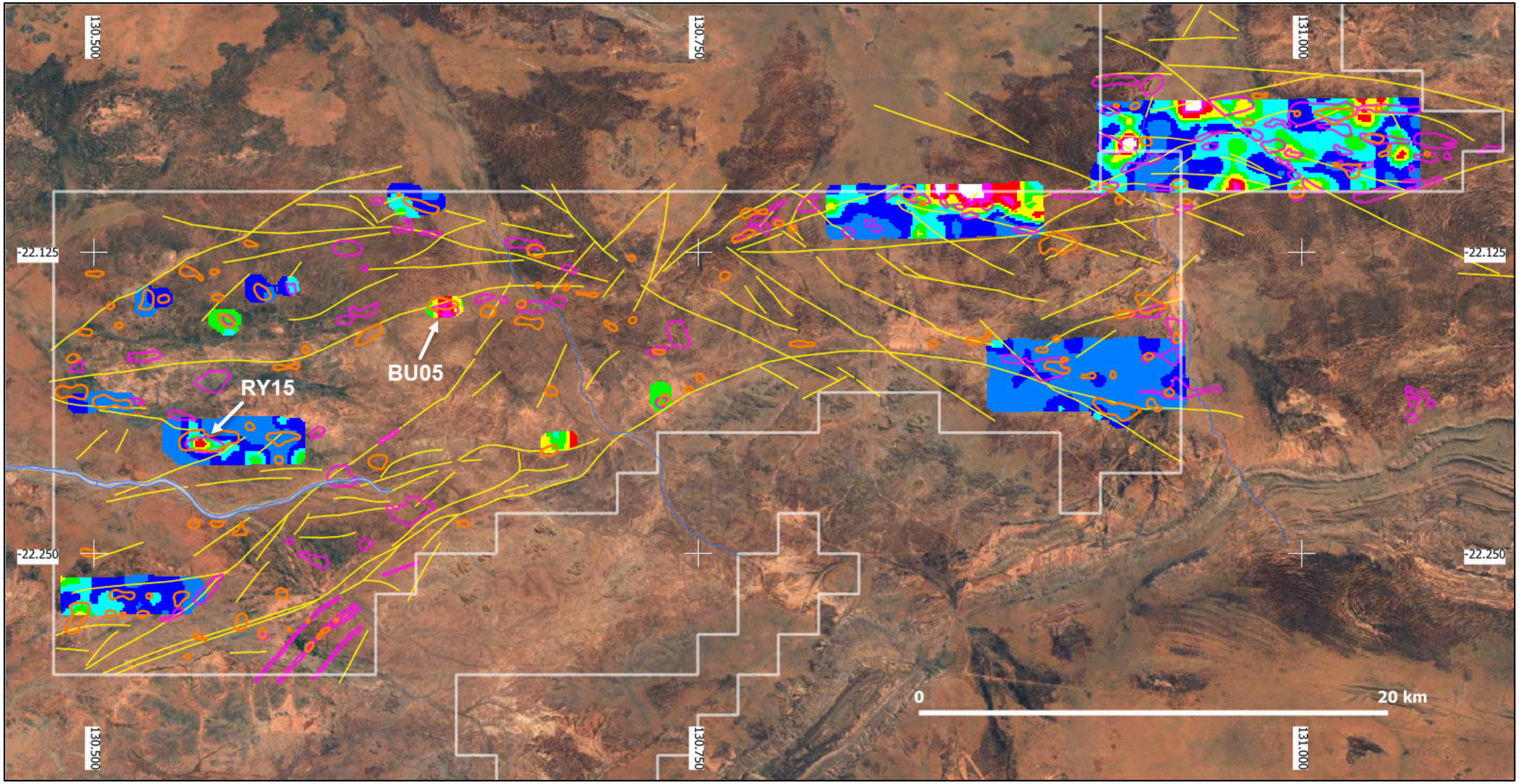

Figure 20: Gridded image of the UF ALK-Index. Orange ovals are assessed gravity targets; pink ovals are assessed magnetic targets. Coincident gravity-magnetic targets RY15 and BU05 with high ALK-Index values are identified.

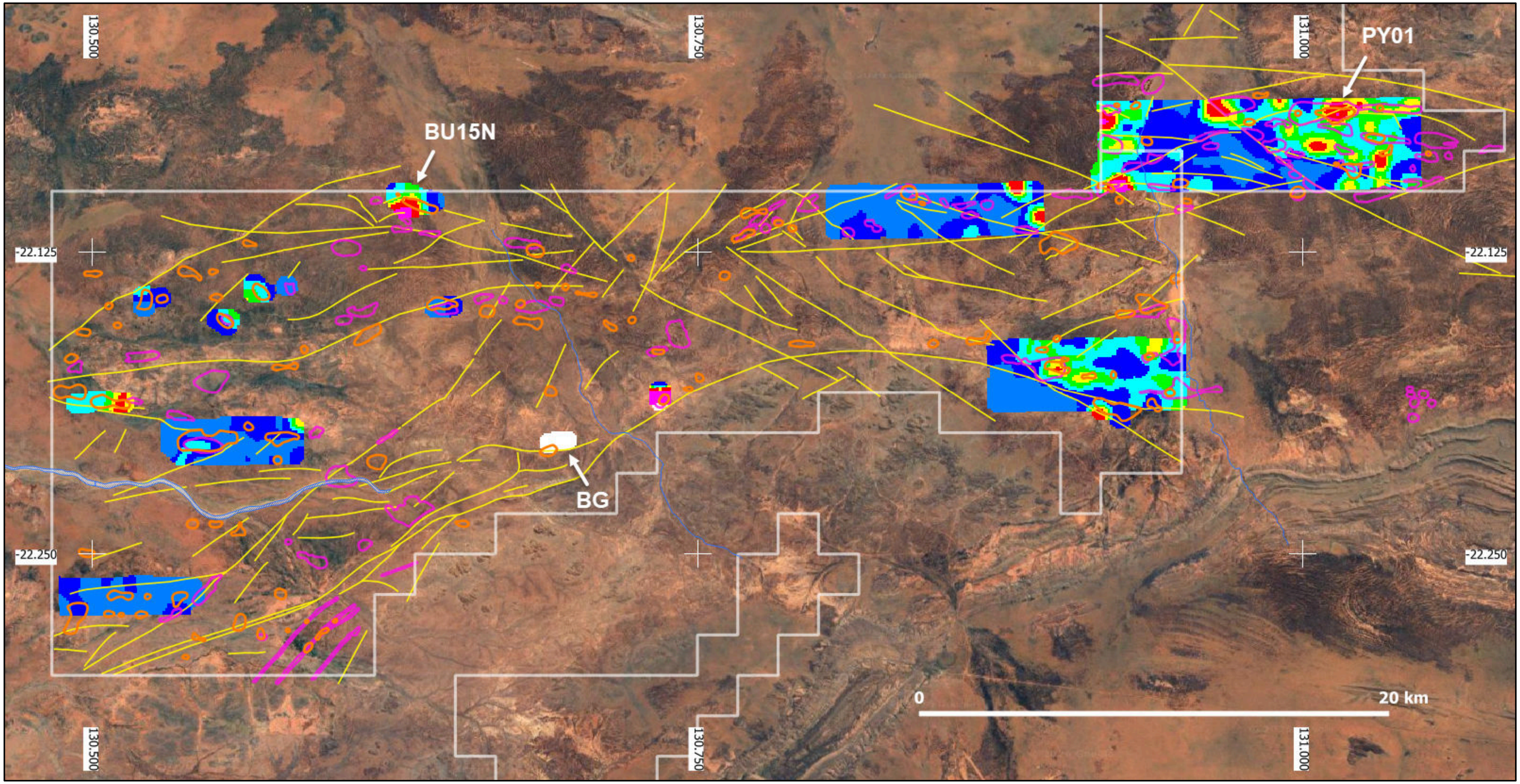

Figure 21: *Gridded image of the UF UM-Index. Orange ovals are assessed gravity targets; pink ovals are assessed magnetic targets. Coincident gravity-magnetic targets PY01 and BU15N with high UM-Index values are identified. BG = Budger Gabbro.*

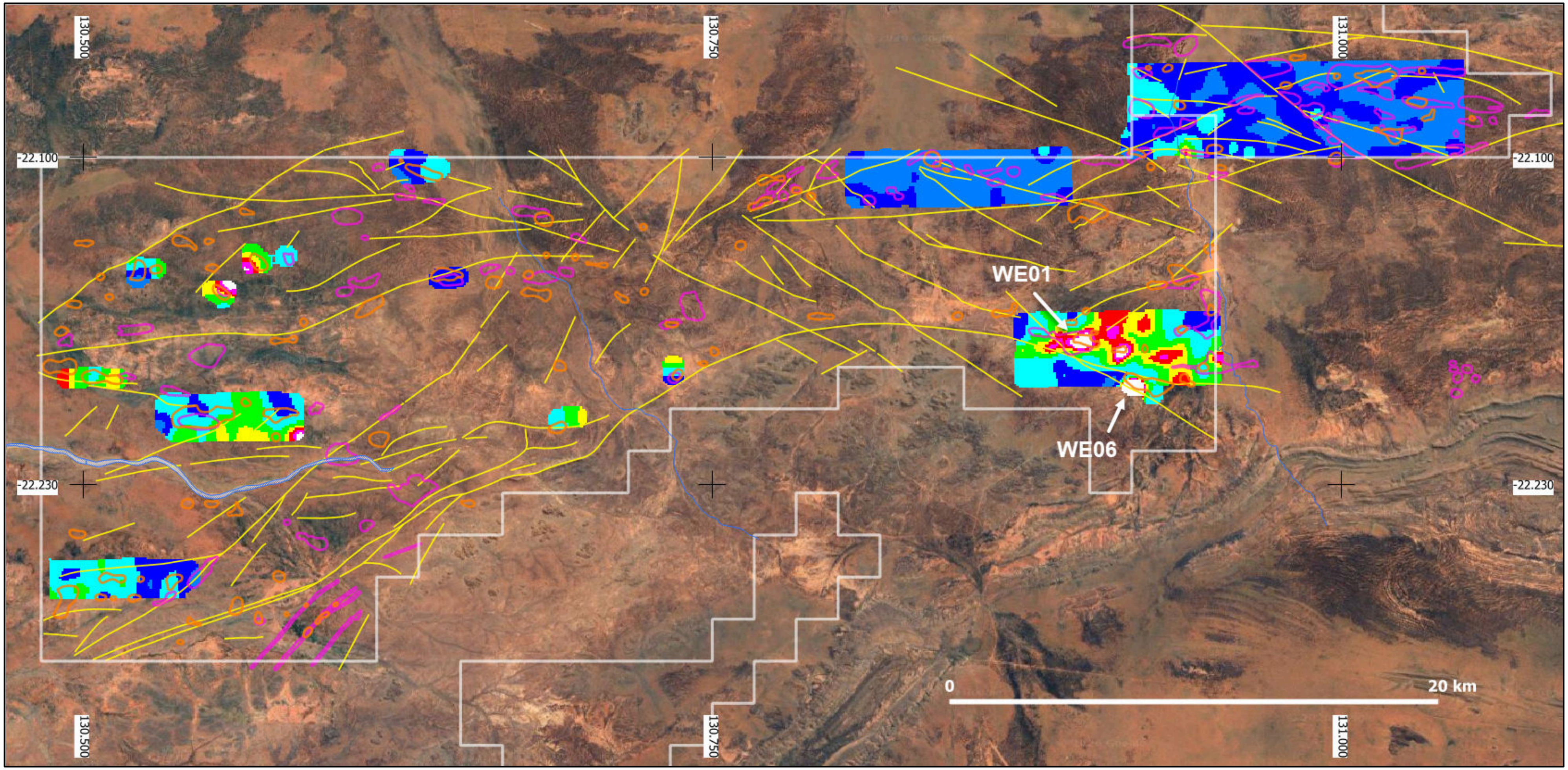

Figure 22: Gridded image of the UF CAPZ-Index. Orange ovals are assessed gravity targets; pink ovals are assessed magnetic targets. Coincident gravity-magnetic targets WE01 and WE06 with high CAPZ-Index values are identified.

Conclusion

With recent discoveries of carbonatite-hosted Nb-REE mineralisation in the western Aileron Province, GSWR is focussed on exploration for mineralised carbonatites and other intrusive bodies with critical metals potential on its western Aileron tenure in the NT. GSWR successfully applied under Round 18 of the Collaborations Program to undertake a high-resolution gravity survey at 400m-spacing over an 840km^2 area designated the *West Arunta Carbonatite Search* project area (Taylor, 2026). At the same time, GSWR was successful in its application for an Innovative Targeting application to undertake complementary soil geochemical sampling at selected gravity station sites using the innovative Ultrafine (UF) method. The *Carbonatite Search* project area represents the assessed most prospective part of GSWR's tenement package based on magnetic-structural interpretations, the likelihood of relatively shallow regolith cover (less than approx. 50m) and the presence of known lamprophyre dykes as an indicator of potential carbonatitic magmatism. A major objective of the Collaborative Program is the creation of a high-quality, high-resolution integrated magnetic-gravity-geochemical dataset for target identification, refinement and drill-test prioritisation.

The UF method provides highly sensitive analysis of multi-elements in the ultrafine (<2µm) clay-rich fraction of soil samples. A subset of 768 soil samples from 11 prospect areas covering numerous magnetic-gravity targets and different surficial geological environments were selected for assay. Other sample subsets were selected for comparison with conventional mixed acid digest (MA) and borate fusion (AF) results. In the search for undercover carbonatites and related rocks, the program aims are to both (a) explore the suitability of these methods and (b) develop new techniques or tools to interrogate the geochemical datasets and hence better target anomalous soils.

The soil geochemical datasets have been interpreted using the ratios of a number of key pathfinder elements that are characteristic of carbonatites and alkaline rocks as recognised by orientation studies over the Mud Tank carbonatite example. These ratios include: La/Yb, Ce/Yb, Sr/Yb, Nb/Yb, Cr/Yb, Ni/Yb, Cu/Yb, Ti/Al%, Ti/Fe%, Ti/Yb, Mg/Fe%, Co/U. The combination of ultrafine-fraction targeting and the use of element ratios is designed to minimise the diluting effects of transported regolith materials while enhancing the geochemical signature of buried intrusions. An alkaline index (ALK-Index) and an ultramafic plus copper index (UM-Index) have been developed to incorporate these ratios. High ALK-Index values are associated with several coincident magnetic-gravity anomalies including priority target RY15. Other targets show strong UM-Index signatures.

The UF method was found to provide useful anomaly definition over targets for many of the key element ratios; this is not always the case for the MA method, and the AF method appears to be unsuitable. The datasets and interpretations discussed here are expected to provide a useful geochemical reference guide in the evaluation and future testing of magnetic-gravity targets in the Aileron Province.

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Digital Data Appendices

- GR597_2026_C_05_UF_Soil_Sampling.pdf
- GR597_2026_C_06_Surface_Geochemistry_Soil_UF.xlsx
- GR597_2026_C_07_Surface_Geochemistry_Soil_MA.xlsx
- GR597_2026_C_08_Surface_Geochemistry_Soil_AF.xlsx
- GR597_2026_C_09_Mud Tank Data.zip
- GR597_2026_C_10_Site Attribute Maps.zip
- GR597_2026_C_11_Transect Anomaly Figures.zip
- GR597_2026_C_12_UF Grid Image Geotiffs.zip
- GR597_2026_C_13_UF Site Images.zip
- GR597_2026_C_14_MA Grid Image Geotiffs.zip
- GR597_2026_C_15_GIS Shape Files.zip
- GR597_2026_C_16_Original Assay Files.zip