EXECUTIVE SUMMARY OF THE AIRBORNE ELECTROMAGNETIC, RADIOMETRIC AND MAGNETIC SURVEY OF THE WESTERN PART OF THE KINGDOM OF ESWATINI

Background and Purpose - The Kingdom of Eswatini contracted the Council for Geoscience to undertake an extensive multi-geoscientific study over the western part of the country as part of stimulating economic growth and investment in the Kingdom.

Methodology - The first-ever in-country regional helicopter-borne geophysical (electromagnetic, magnetic and radiometric) data were acquired at 1 km line spacing, totalling 7 086 line-km. The data was interpreted and modelled in one, two and three dimensions. A holistic methodology was used for the interpretation aimed at reducing the risk and increasing confidence in subsurface interpretations. The approach includes a comprehensive geological review; quality control of acquired datasets; geological constrained geophysical interpretations; tectonic and structural interpretation; geophysical characterisation of known deposits; plate modelling, field verification, mineral systems studies, groundwater potential mapping, geophysics training and detailed reporting.

The following are some of the highlights:

- All airborne data collected passed the quality control test and conforms to international standards and best practices for the acquisition of airborne data and is within the specifications of the contract.
- Electromagnetic, radiometric and magnetic data were interpreted for geological mapping and used proxies for mineral and groundwater potential mapping.
- 3D geophysics model of Usushwana Complex developed.
- A petrophysical database generated that will contribute to the national petrophysical database.

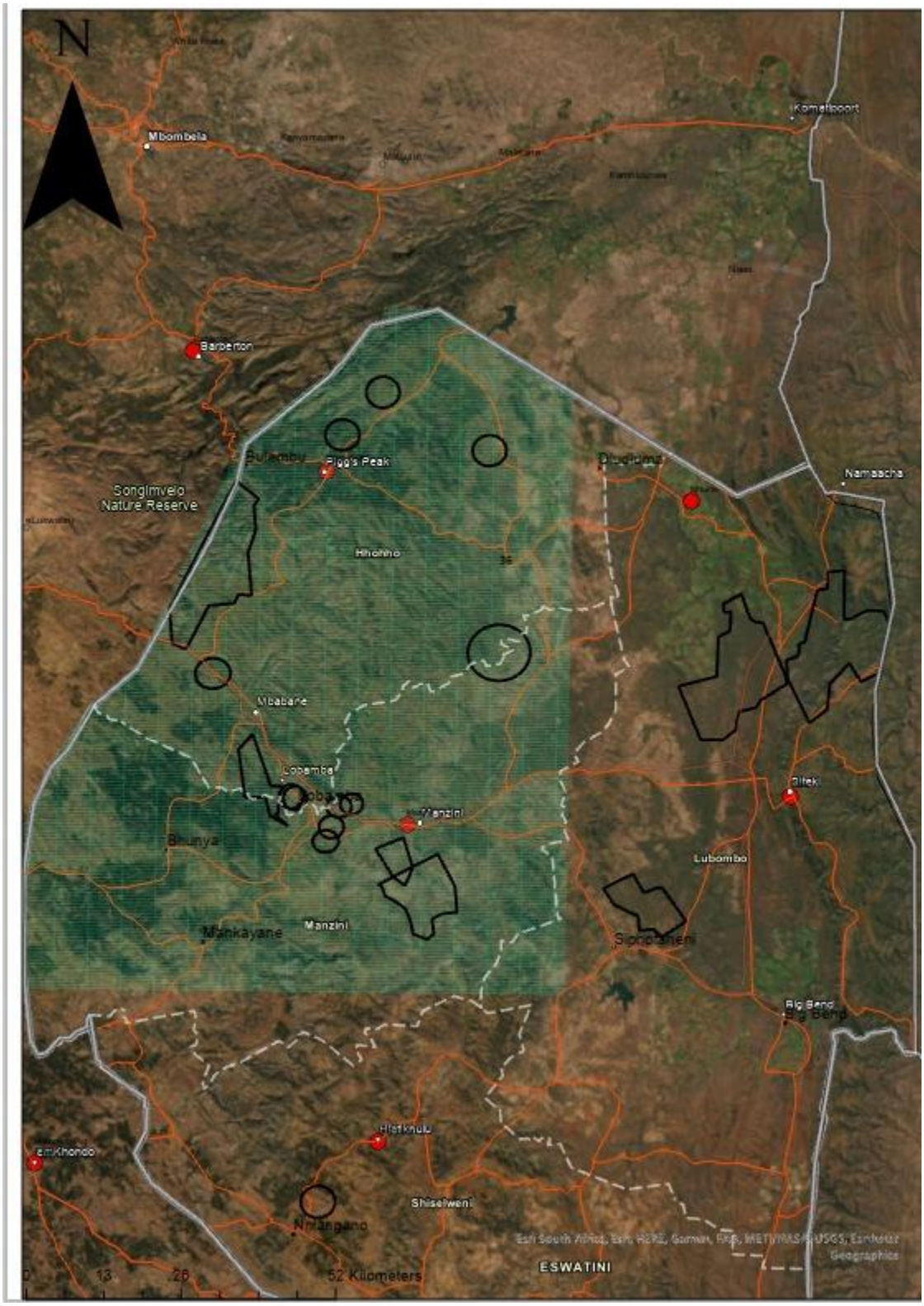

Figure 1:Survey plan line orientation for the survey

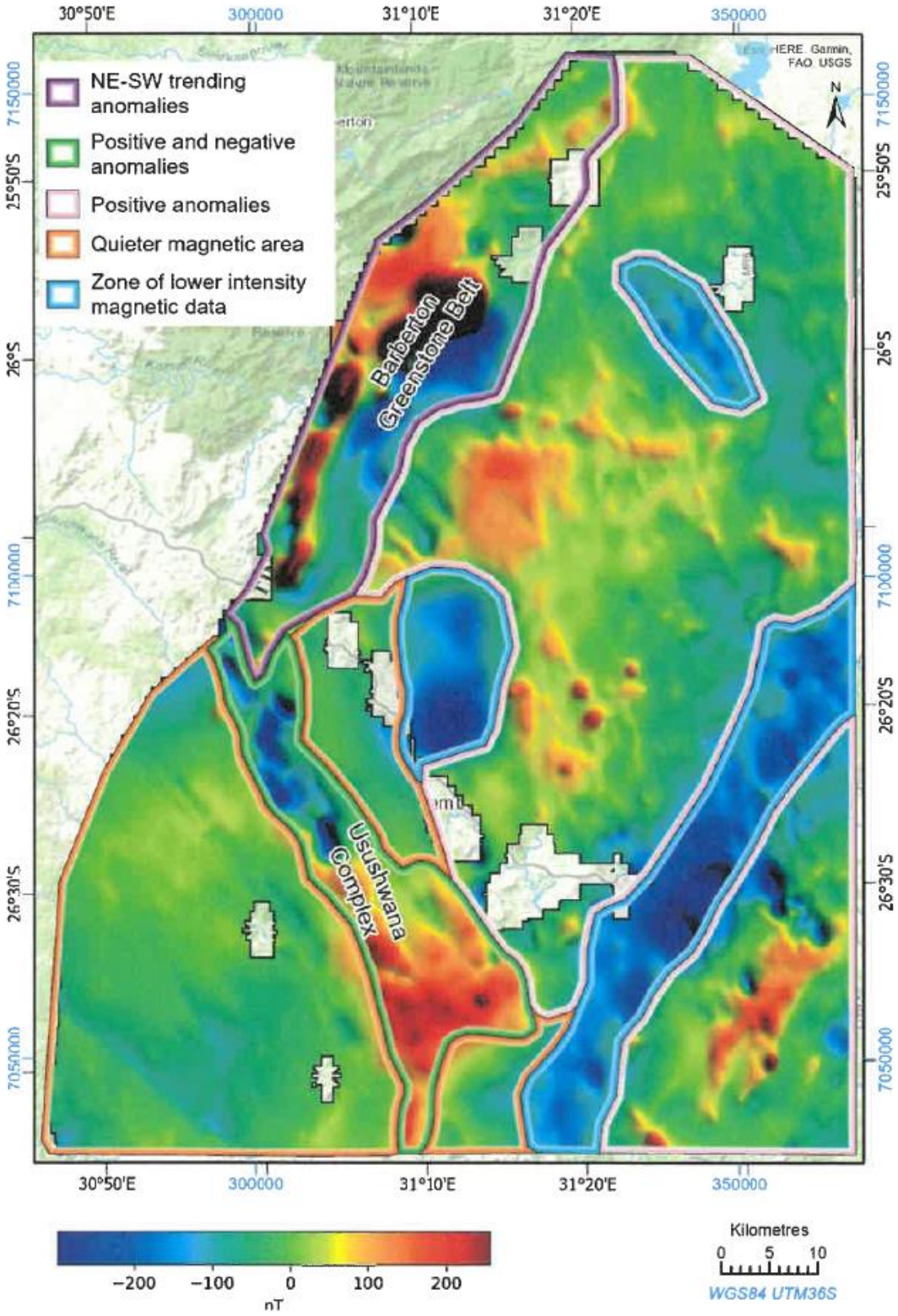

Figure 2: Magnetic data continued upward by 500 m. The major trends are indicated.

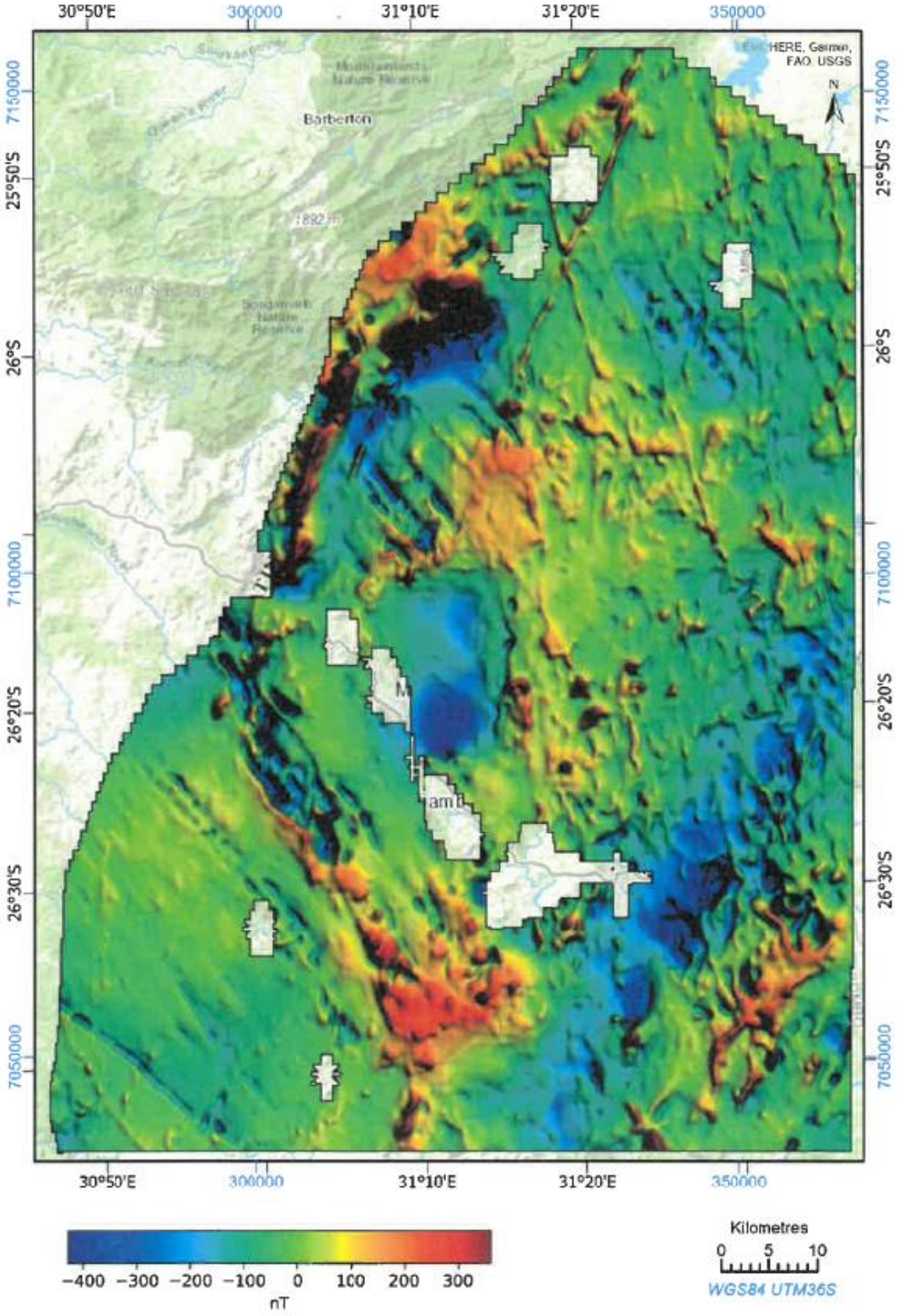

Figure 3: Magnetic data with the international geomagnetic reference field removed, over the northwestern surveyed part of Eswatini

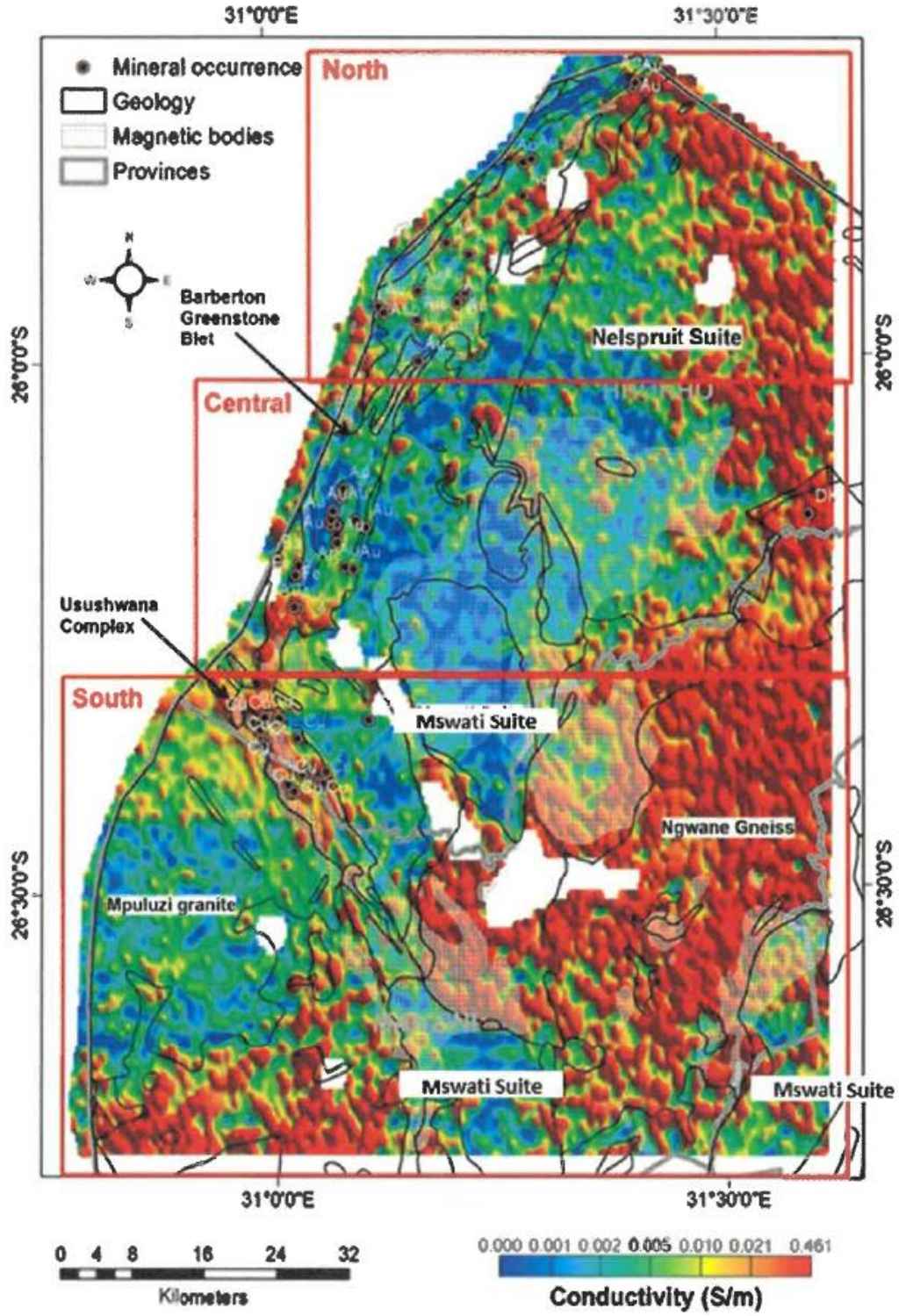

Figure 4: EM conductivity response at the surface level (0-5 m), overlaid with magnetic interpretation.

Mineral Potential - The mineral systems approach whereby the geodynamic setting, fertility and architecture parameters are integrated to generate mineral exploration targets.

- **Orogenic Gold** - The geodynamic setting for gold (Barberton greenstone belt), fertility criteria (metamorphic gradients, gold-bearing fluid flow, gold enrichment in fluid plumbing systems) and architecture (northeast-trending thrust faults, lithology boundaries and lineaments) were used to identify gold potential in the Barberton Greenstone Belt. The study highlighted prospective areas in an area ~ 13 km north of Pigg's Peak which expand the prospectivity beyond the known Daisey, Lufafa, and Kobolondo deposits. Four targets characterised by high conductivity, within the northeast gold controlling structure were identified for further exploration.

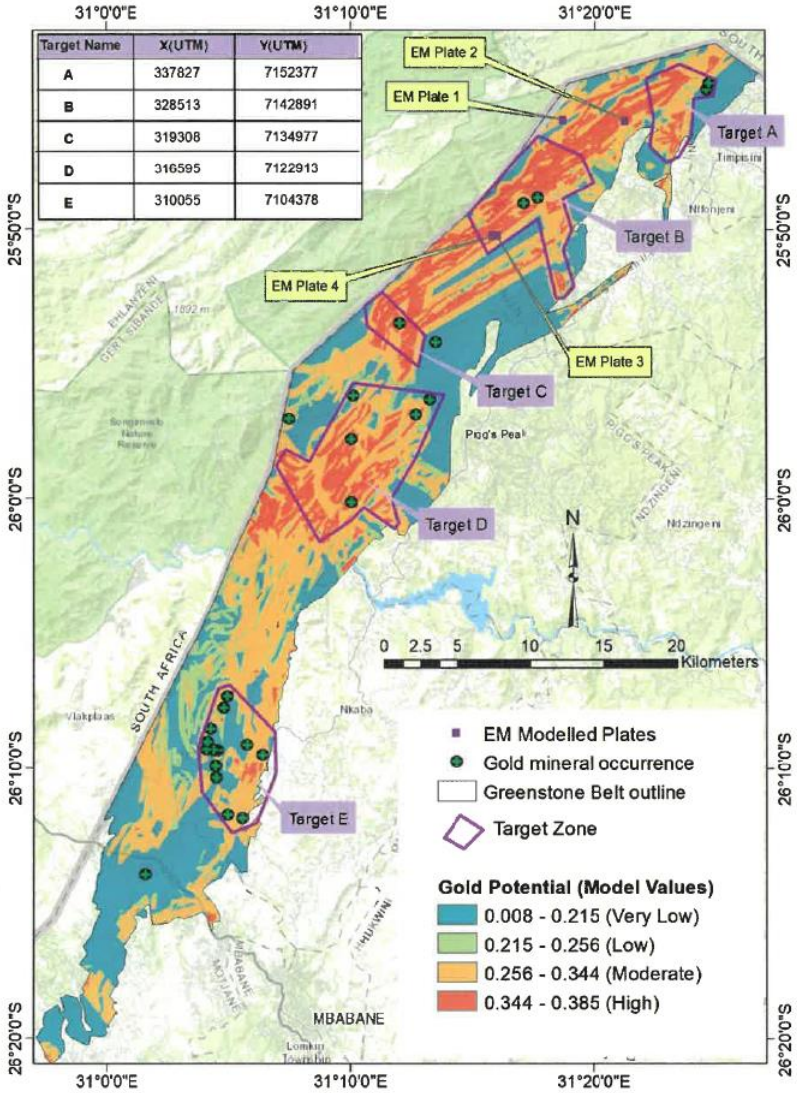

Figure 5: Prospectivity model for orogenic gold in the study area.

- **Stratabound BIF-hosted Iron Ore** - The geodynamic setting for iron ore (Barberton greenstone belt), fertility criteria (BIF within the Ngwenya Formation, shales and EM conductors) and architecture (regolith depth and fracture density) were used to identify iron ore potential in the Barberton Greenstone Belt. The study identified seven prospective areas southeast (one), east (one) and north (five) of the Ngwenya deposit.

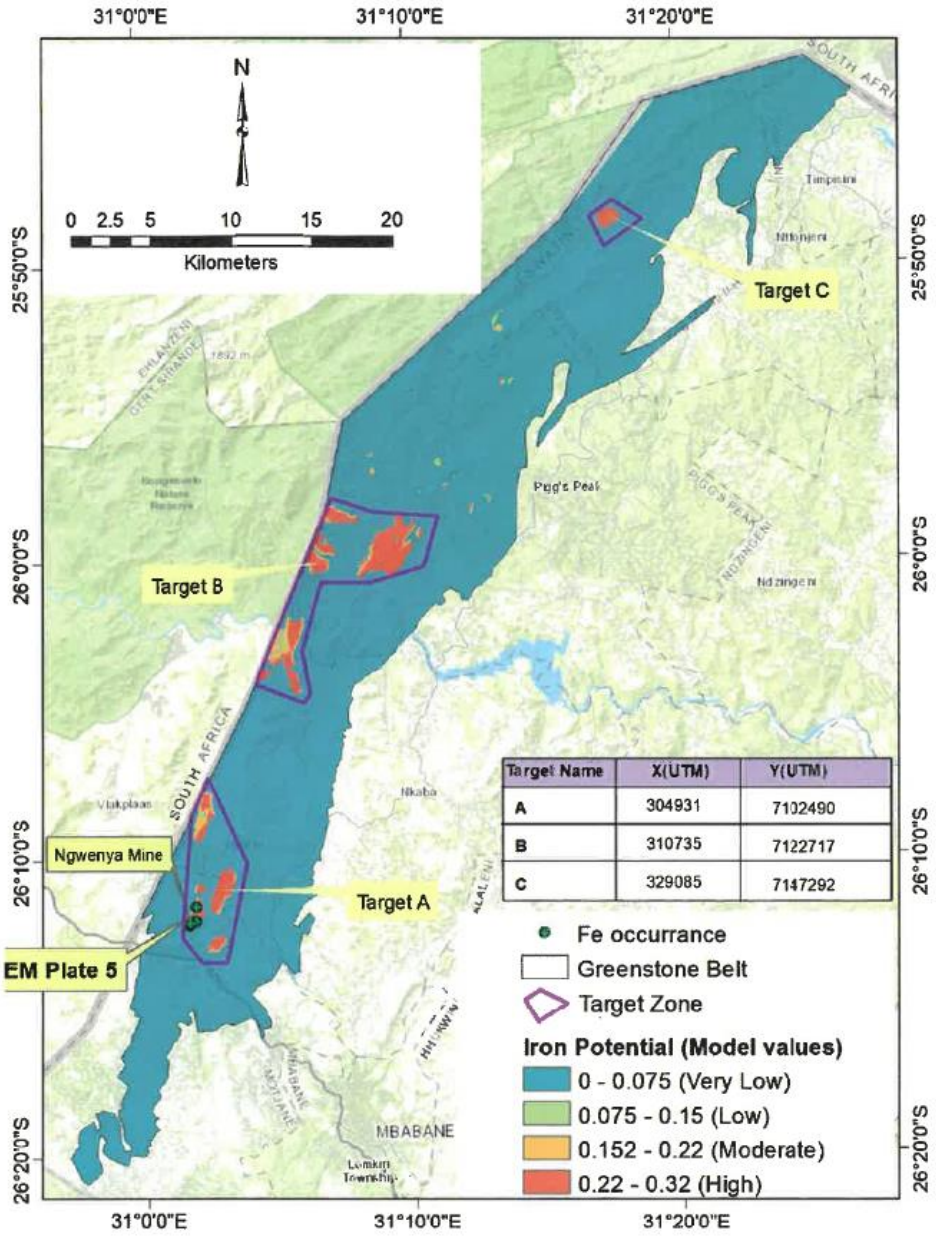

Figure 6: Prospectively map of the BIF-hosted iron ore deposits in the study area showing the target zones as purple polygons.

- **Magmatic Ni-Cu-PGE sulfide deposit** - The Geodynamic setting (margins of ancient Archaean cratonic blocks – Usushwana Complex), fertility criteria (stream sediment geochemistry results (Ni, Cu, Co), sulfur-bearing crustal rocks (shale, schist) and sulfur-bearing rocks (shale and schist), EM conductors) and architecture (dykes and sills). The potential for magmatic Ni-Cu-PGE sulfide around areas around Luyengo and Mahlanya, Siphocosini and Mhlambanyatsi were highlighted for further exploration.

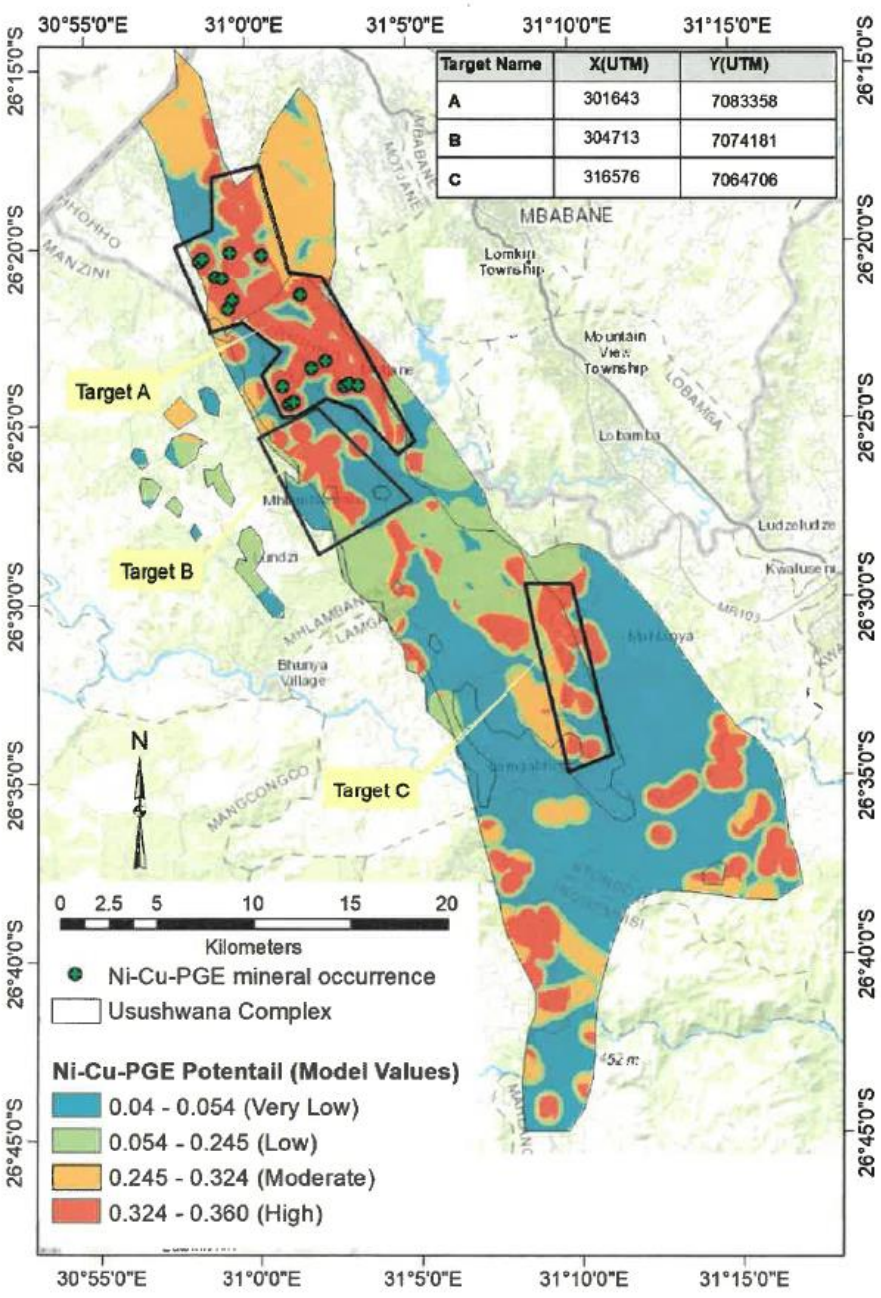

Figure 7: Prospectivity model for Ni-Cu sulfide deposits in the study area showing the three exploration target zones as black thick polygons.

- **Cretaceous kimberlite-associated diamonds** - Using geophysical signature (circular electromagnetic anomaly on depth section, conductivity top and resistive bottom (section view) on a magnetic anomaly at the Dokolwayo kimberlite pipe, three targets exhibiting similar characteristics were identified.

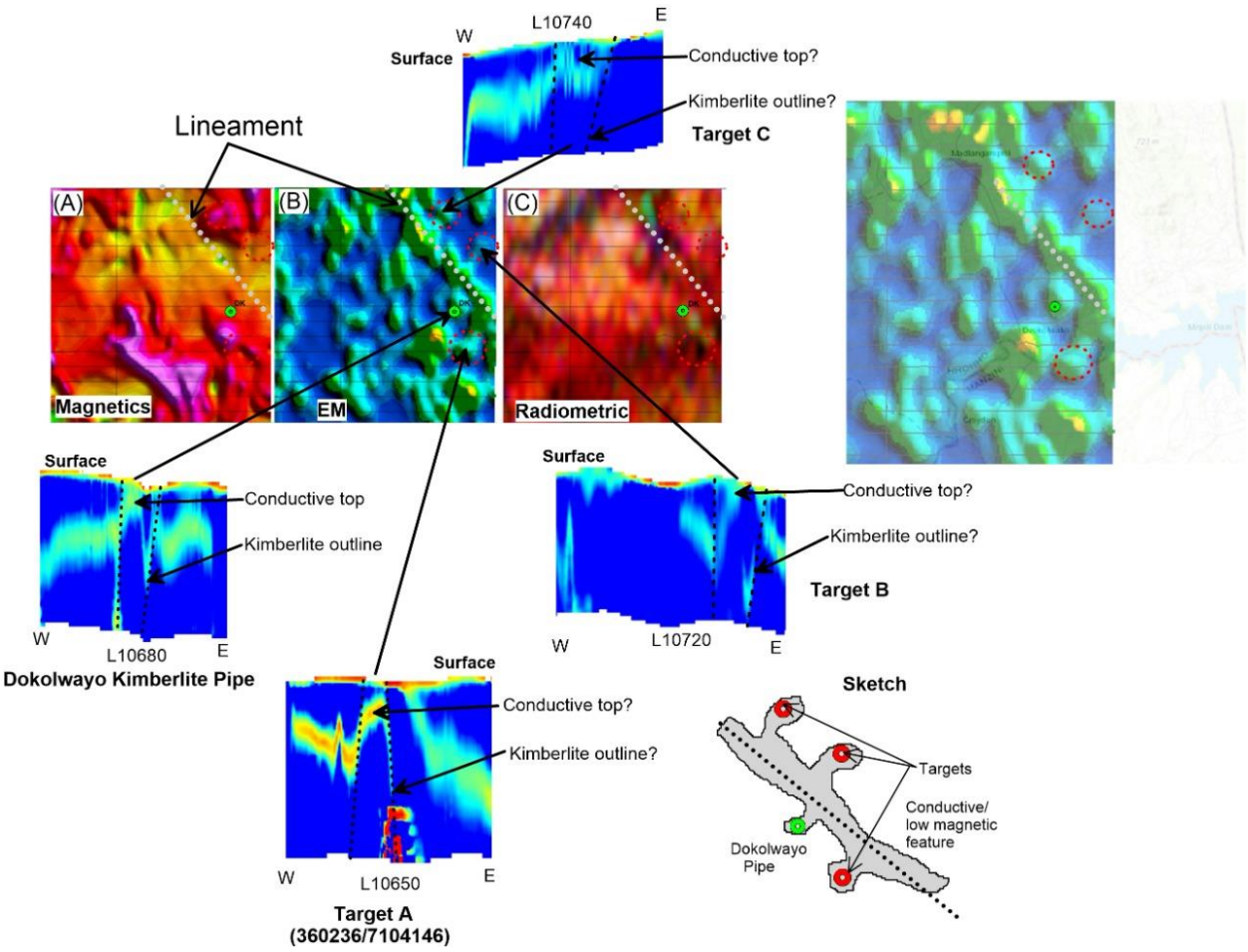

Figure 8: Geophysical characteristics of known kimberlite pipe and target generation.

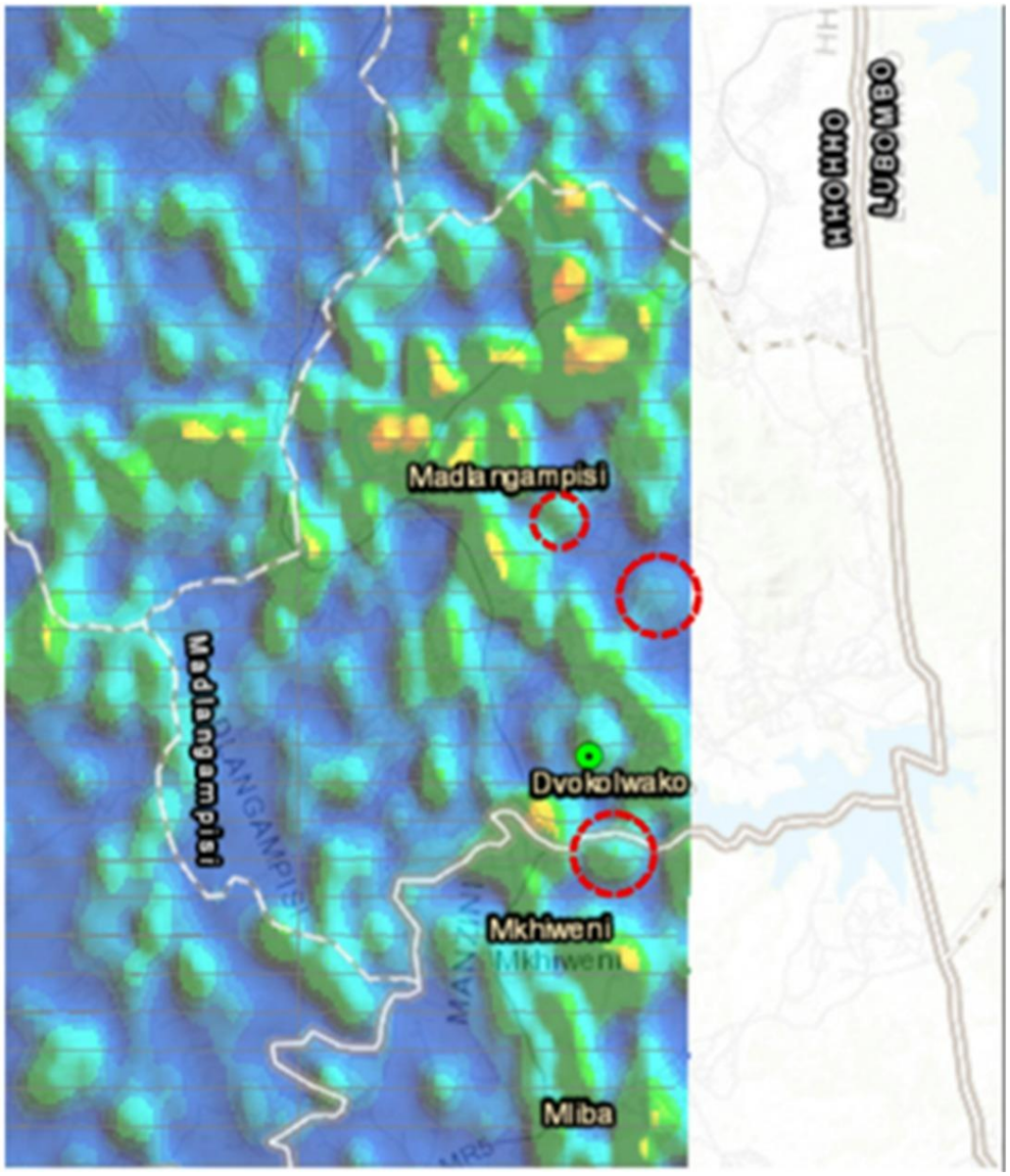

Figure 9: Proposed target areas for diamond exploration.

Groundwater Potential - The study was successful in delineating areas with groundwater potential. The approach produced a potential map that shows a high correlation with existing borehole data. The maps produced through this study serve as a reference to inform water sector policy and decision-making on groundwater potential and development. Furthermore, the maps are a good starting point to promote research development, particularly regarding issues related to groundwater occurrence and large-scale groundwater mapping of areas of concern.

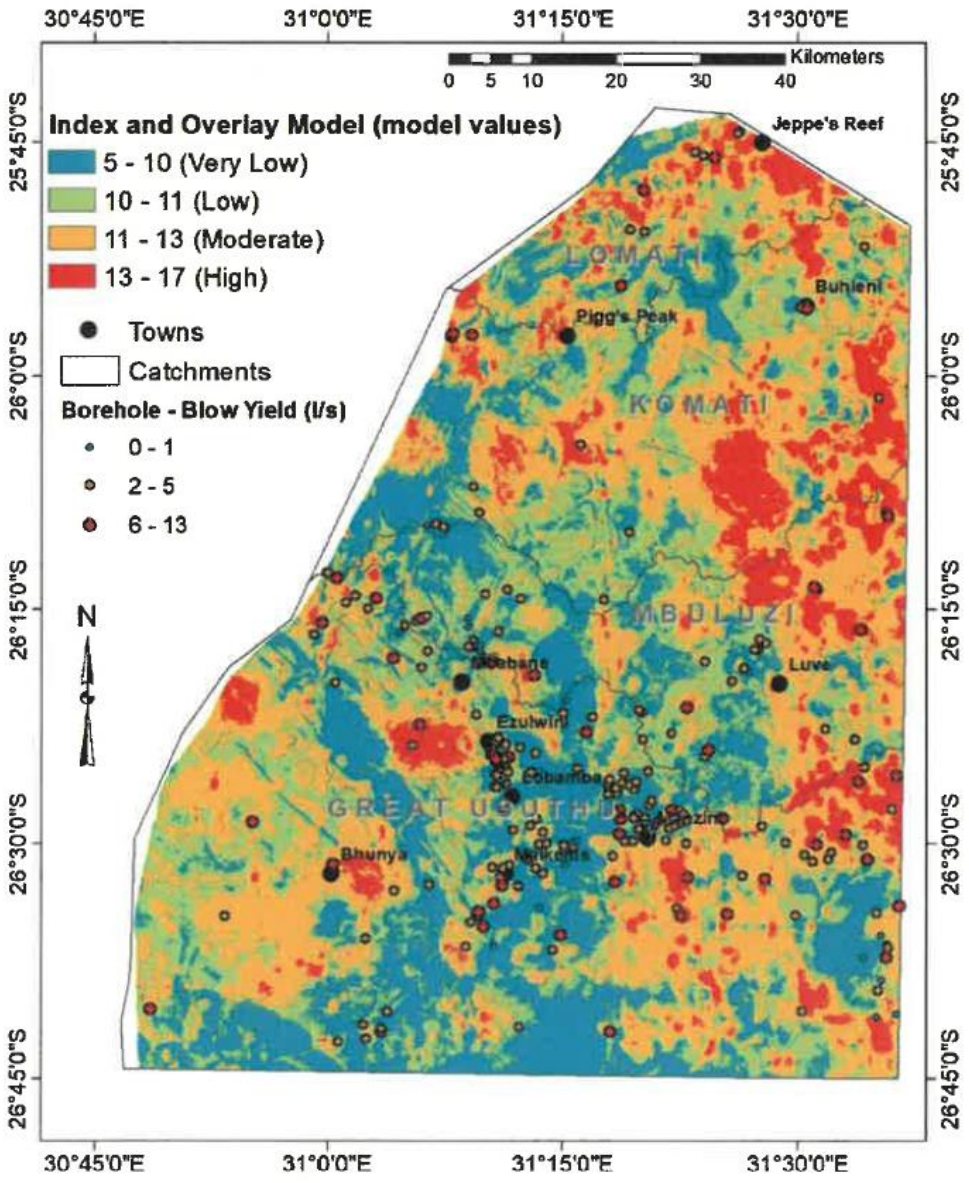

Figure 10: Groundwater potential map (index and overlay model) of the study area.

Conclusion and Recommendation –

The following recommendations are:

- Conduct soil (for soil geometry) and rock (for litho-geochemistry) sampling of all the areas that have been highlighted to have a high potential for orogenic gold, BIF-hosted iron ore and Ni-Cu-PGE sulphide deposits and analyse these samples using ICP-MS to obtain the full suite of elements. The initial pattern is recommended to be 1 km x 1 km.
- Conduct a detailed structural and geological mapping of the areas highlighted as having high potential for the mineral systems mentioned above.
- Conduct high-resolution geophysical surveys (magnetic, electromagnetic, radiometric and IP) in areas identified as having a high potential for the mineral systems mentioned above.
- Conduct a detailed mineral prospectivity modelling using the high-resolution data identified above.
- Once the detailed mineral prospectivity modelling has been completed, test drilling can be undertaken in areas identified as characterised by high prospectivity.