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Multi-Scale Insights Into the High-Grade Mt Weld REE Deposit from 2D and 3D Active Seismic Survey Data

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The Mt. Weld mine, which is located 35 km southeast of Laverton in central Western Australia, is one of the world's highest-grade rare earth elements (REE) mines. The mine currently extracts ore from the weathered material sitting at the top of a carbonatite intrusion.

In 2022 seismic investigations were carried out to:

- Explore for potential additional REE resources and groundwater resources in proximity to the existing mine; and
- Better inform the structural setting of the current Mt. Weld REE deposit and the underlying carbonatite intrusion.

Both 2D and 3D seismic reflection and refraction surveys were performed together with reprocessing of a deep-crustal seismic line acquired by Geoscience Australia.

The refraction data showed a strong correlation between deeper near-surface zones of low seismic velocity and both high-grade REE concentrations and high porosity. These deeper low-velocity zones correlate well with where existing drilling indicates deeper weathering and highlight additional deep zones as yet untested by drilling.

The reflection data highlighted the existence of a series of steep faults in the fresh carbonatite, which appears to play a key role in the location of deeper weathering by potentially focussing groundwater flow and migration.

The reprocessed deep-crustal line highlighted a zone of low seismic reflectivity extending to at least 9 km below the surface. We interpret this to represent the multi-phase carbonatite intrusive pathway, breaking through Archean sedimentary country rock. The edge of the low-reflectivity zone has a complex shape, suggesting the carbonatite was preferentially squeezed out into different parts of the stratigraphy and along structures. There are also indications of lenses of rafted Archean stratigraphy within the carbonatite body.

Overall, the combination of the seismic data sets over multiple different scales has provided vital input into further understanding potential groundwater and REE sources.