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Exploring Lithium Metallogenesis Within the Groundwaters of the Arid-Hyper Arid Environments of the Northern Cape, South Africa

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Ongoing demand for critical metals such as lithium and rare earth elements for the green energy transition necessitates exploration of other lithium deposits in various parts of the world. Due to the fact that, with the growing momentum of the transition, supply has not kept pace with the demand, known lithium deposits are being exhausted and facing environmental as well as social concerns. On a global scale, lithium production is from brines and hard rocks; the former is generally low-grade and the latter high-grade ore. In southern Africa, lithium mining is limited to hard rocks because of the high-grade ore and limited extent of the mineralized rock. The low-grade lithium ore in brines in South Africa is underexplored. With the increased demand for lithium brines and development in mining technology, brines could be a valuable source for lithium in the future. This research looks at the potential of extracting lithium from groundwater in Namaqualand, South Africa. The area is known for its lithium-caesium-tantalum pegmatites, a potential lithium source, as well as its arid climate making it favourable for brine formation. This research reports on the Li content in groundwater from the Northern Cape in relation to the brines. It also looks at the potential resources and further discusses the possible social and environmental effects extraction would have on the communities living in water-sparse areas.