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Drill site selection process using geophysical (seismic, EM, magnetic) surveys and regional geochemical uranium deposit vectors within the Keefe Lake Uranium Property and its vicinity – Athabasca Basin, Saskatchewan, Canada

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This study was initiated at the request of Athabasca Uranium Inc. of Vancouver, Canada. The area of investigation is around 4000 km2 and includes the Keefe Lake (KL) property of the Company, located at the southeastern flank of the Athabasca Basin in Northern Saskatchewan. The intention of the program was multi-fold: to establish trends of regional uranium mineralization vectors, and incorporate these findings into the multidimensional integrated analysis of the currently available KL data set with an aim of providing an advanced priority ranking of drill hole selection process for the upcoming drilling programs. The information adapted for this investigation includes data from 450 boreholes, as well as drilling results of a recent KL prospect; data obtained from 114 Assessment Reports of the Saskatchewan Mineral Assessment Data Base (SMAD), and the analyses of 4 high-resolution 2D seismic profiles within the claims of Athabasca Uranium Inc. To establish more effective spatial perspectives, the results of the regional lithology study (investigating alteration, graphitic, structural, pelitic, and pegmatitic features) were displayed along with the EM conductors, whereas basement lithology and faults were obtained from the Geological Atlas of Saskatchewan (southeastern segment of the Athabasca Basin). The regional investigation also included a study of the depth variations of the unconformity (UC), spatial vectors in geochemistry of the indicative path finder elements (U, Co, Cu, Ni, Pb, Zn, As, and B), and also the clay mineralization (illite and kaolinite) indicative of uranium mineralization related to alteration zones. Local area investigations consisted of integrating the AEROTEM (2009) and VTEM (2013) airborne EM data, the associated magnetic observations, and computation of relevant attributes.

The comprehensive synthesis of the above geophysical information incorporated all the available and derived geological perspectives. The high-resolution 2D seismic data defined several highly favorable structural features in the basement; with some extending into the overlying sandstones. Close correlation between features of potential field data anomalies and the seismic signatures, together with the geochemical uranium deposit vectors, established the north-western corner of the property as a significant site for drilling.

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