

# SEG 2022 Conference: Minerals For Our Future

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## **Geology and Mineral Resources of the Hicks Dome Fluorite - Barite - Rare Earth Elements Deposit, Hardin County, Illinois**

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Hicks Dome, a deep-seated structural feature in the Illinois-Kentucky fluorspar district, is host to a fluorite-barite deposit with appreciable amounts of beryllium, niobium, titanium, yttrium, and heavy rare earth elements; all considered critical minerals and elements by the U. S. Geological Survey. Devonian rocks at the dome's apex were uplifted 4,000 feet. Permian alkalic dikes and lapilli-bearing diatremes are indicative of an inferred igneous body at depth. Ubiquitous breccia bodies, 280 to over 2,200 feet in thickness exhibit graded bedding and flow lineation in places. Some intercepts have fragments from overlying stratigraphic units, however those units are relatively unbroken suggesting a lateral component of breccia emplacement. Rock-flour-matrix breccia hosts most resources at depths of 1,500 to 2,000 feet near the dome's apex and depths of 2,500 to 3,000 feet deep away from the apex. A fluorite cut-off grade of 10% (using a 300 feet search radius from drill-holes) yields a geologically inferred resource of 65.8 million tons of 15.8% fluorite, 4.8% barite, 0.16% BeO, 0.2% Nb<sub>2</sub>O<sub>5</sub>, 0.3% rare earth plus yttrium oxide, and 1.3% TiO<sub>2</sub>. A higher cutoff grade of 15% fluorite yields a 24 million ton resource increasing the grade of fluorite to 22.6%, and barite to 7.5%; other metals only slightly increase in grade. The 65.8 million ton resource is greater than the 35 to 40 million tons of fluorite produced from the entire 45-mile-long and 30-mile-wide district. The 24 million ton resource is larger than the largest 10 to 12 million ton deposits in the district. Resources are open-ended and could be increased with additional drilling. Access to drill core has been granted to the U. S. Geological Survey and the Illinois State Geological Survey so that their studies may better define the origin of the deposit, HREE enrichment processes, and the resources it may contain.