HICKS DOME ILLINOIS RARE EARTHS AND THORIUM RESOURCES

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INTRODUCTION

The 38th parallel structures, also known as the 38th parallel lineament, are a series of seven circular depressions or deformations stretching 700 kilometers or 430 miles across southern Illinois and Missouri and into eastern Kansas, in the USA, at a latitude of roughly 38 degrees north.

Estimated at 300 million years old, three of them are believed to be meteorites impact craters, The other structures are remnants of instinct volcanos.

It is postulated that some are the remains of a serial meteorite strike during the late Mississippian or early Pennsylvanian periods (320 ± 10 Ma). The possibility of serial impacts on Earth was piqued by observations of the Shoemaker–Levy 9 meteorite impacting Jupiter in 1994. There is also evidence of serial impacts on the lunar surface. One of these structures, Hicks Dome in Illinois, is volcanic in origin.

HICK'S DOME

Hicks Dome is a structural dome which has its central Devonian core displaced upward some 4,000 feet or 1,200 m in relation to the surrounding strata. The dome has small associated igneous dikes around its flanks.

Hicks Dome is surrounded by the world-renowned Illinois-Kentucky Fluorspar District (IKFD), which produced over 90% of the nation's fluorspar until the late 20th century.

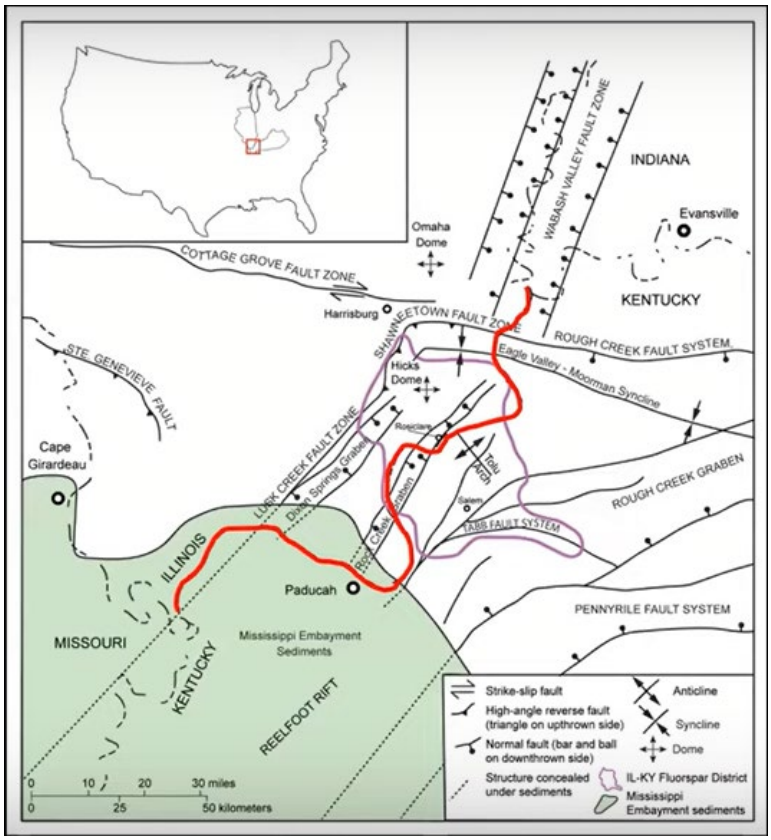

Figure 1. Location of Hick's dome west of the Ohio River. Illinois Geologic Basin.

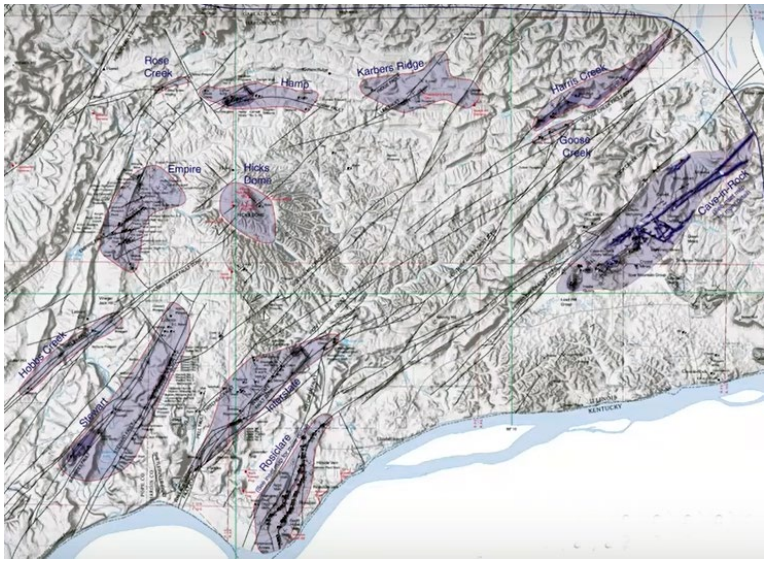

Figure 2. Hick's dome in the Early-Cretaceous earlier-on thought as (Permian: 272+/- 17 Ma Sm-Nd million years before present (bp) Wauboukigou Igneous Province PWIP of Illinois. It is surrounded by eleven mining sub-districts.

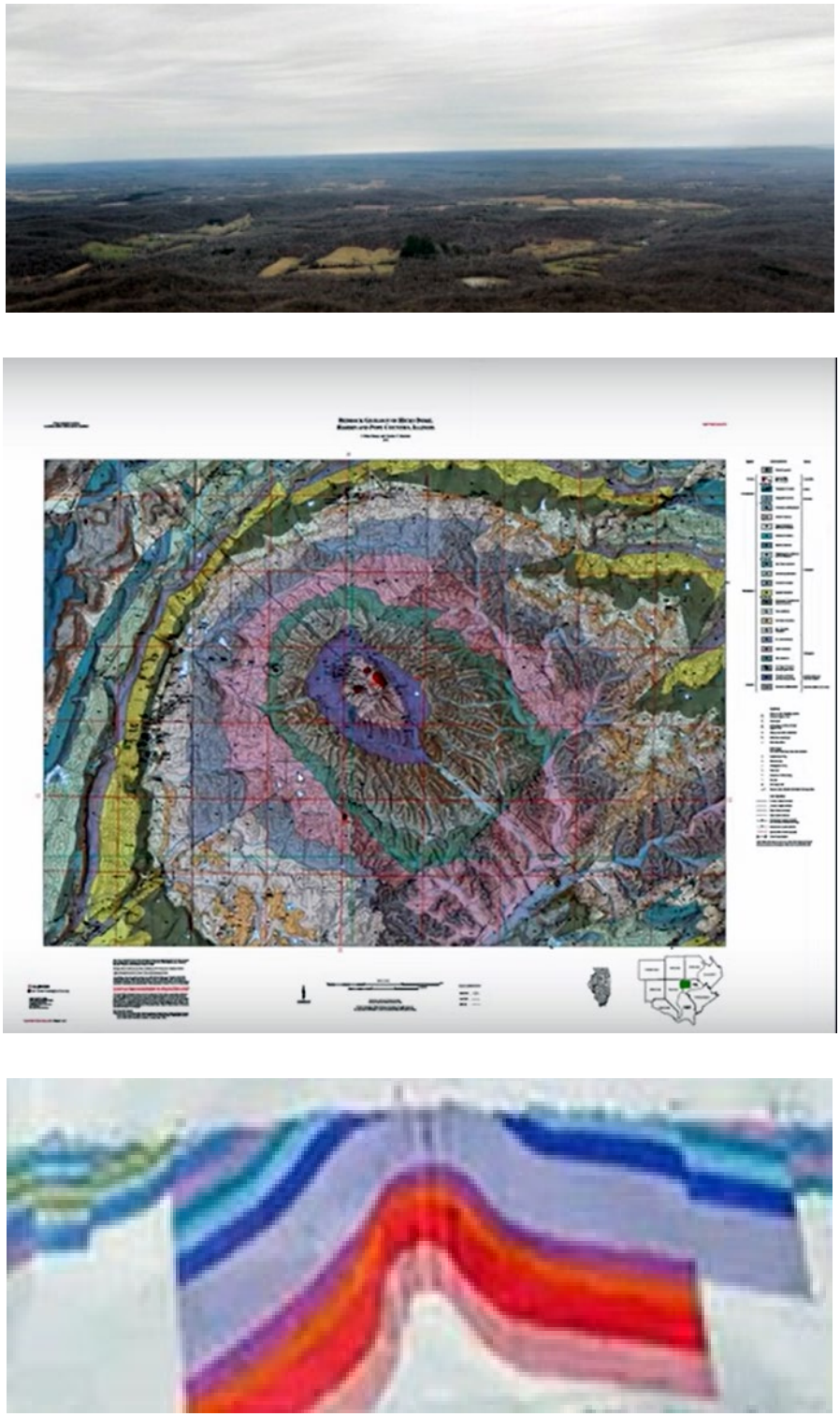

Figure 3. Views of Hicks Dome, Illinois Extinct Volcano. Magma never reached the surface. Contains anomalous occurrence of Thorium mixed with Rare Earth elements. Source: USGS.

Hicks Dome is unique compared to other critical mineral prospects in the United States such as Mountain Pass in California and Bear Lodge in that it is anomalously one order of magnitude more enriched in the scarcer more desirable heavy Rare Earths Elements relative to the light ones. Hicks Dome is likely to possess one of the largest fluorspar reserves in North America.

The Illinois State Geological Survey ISGS estimates that there are 12 - 65 million raw tons of critical minerals ore within various deposits at the site. Hicks Dome is particularly enriched in the rare earth elements Dysprosium Dy, Scandium Sc and Yttrium Y.

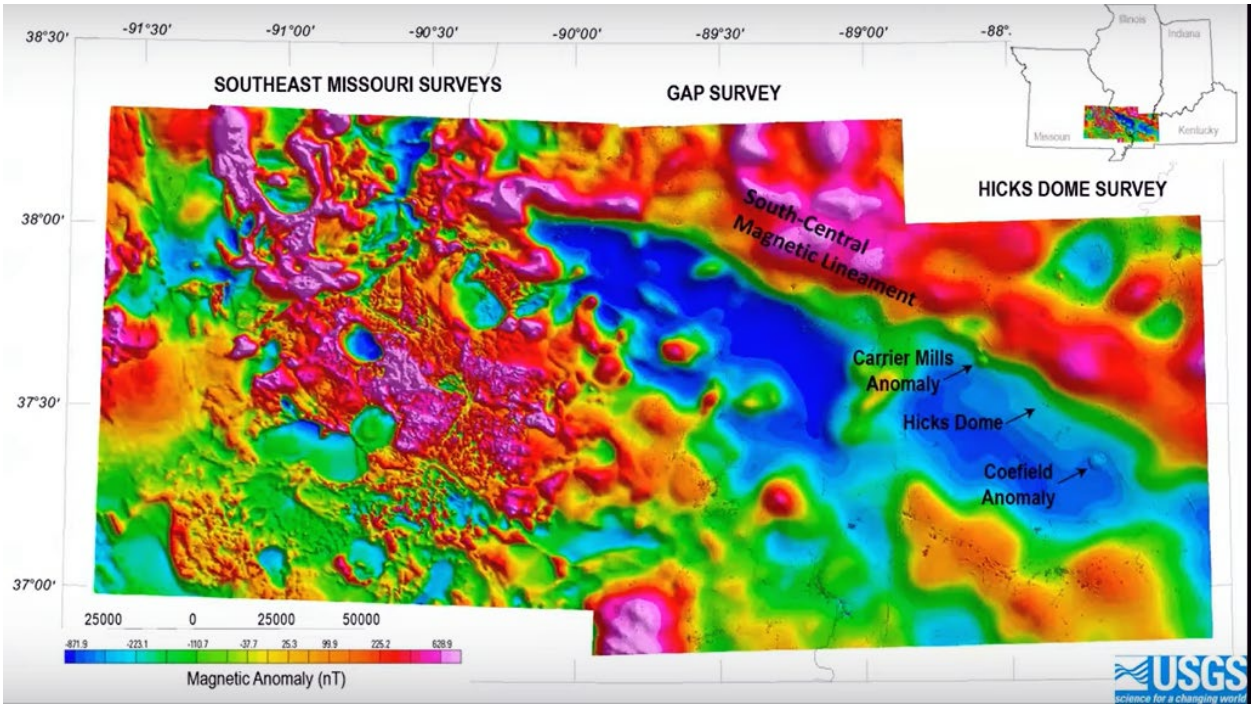

Figure 4. Hicks Dome Magnetic Survey. South-East Missouri Survey. Source: USGS.

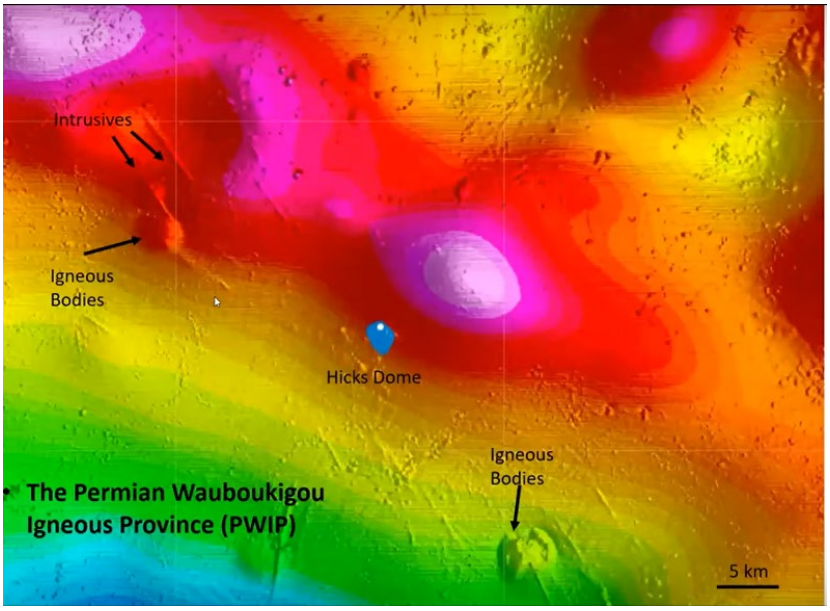

Figure 5. Hick's Dome Intrusive Zones. Early-Cretaceous (Permian) Wauboukigou Igneous Province, PWIP.

MOUNTAIN PASS DEPOSIT, CALIFORNIA

The Mountain Pass Rare Earth Mine and Processing Facility, owned by MP Materials, is an open-pit mine of rare-earth elements on the south flank of the Clark Mountain Range in California, 53 miles southwest of Las Vegas, Nevada. In 2020 the mine supplied 15.8% of the world's rare-earth production. It is the only rare-earth mining and processing facility in the United States.

The rock at Mountain Pass contains an average of 7 to 8 percent rare earth elements—a remarkably high concentration by industry standards.

Discovered in 1949 while prospectors searched for uranium, the Mountain Pass deposit instead revealed Bastnaesite, an ore rich in rare earth elements like Neodymium Nd, Europium Eu, and Dysprosium Dy.

BEAR LODGE DEPOSIT, WYOMING

The Bear Lodge Project is positioned to be a major North American source of Rare Earth Elements (REEs). The quality and quantity of mineralization at Bear Lodge make it a world-class mining district and a dependable, long-term source for the REEs that technology demands.

The Project has a well-defined and drilled mineral asset, it is also one of the highest-grade deposits for the critical magnet REEs Neodymium, Nd and Praseodymium Pr as well as Samarium Sm and Terbium Tb.

The deposit is rich in the REEs critical to high-strength permanent magnet manufacturing and are higher-valued and expected to experience faster demand growth and better price support over the long term. It is situated in one of the best mining districts in the world. The mine site is ideally located in northeastern Wyoming, just off of Highway I-90, and has easy access to the power and supporting infrastructure. The processing facility would be located nearby, in the town of Upton, Wyoming, in an established industrial area.

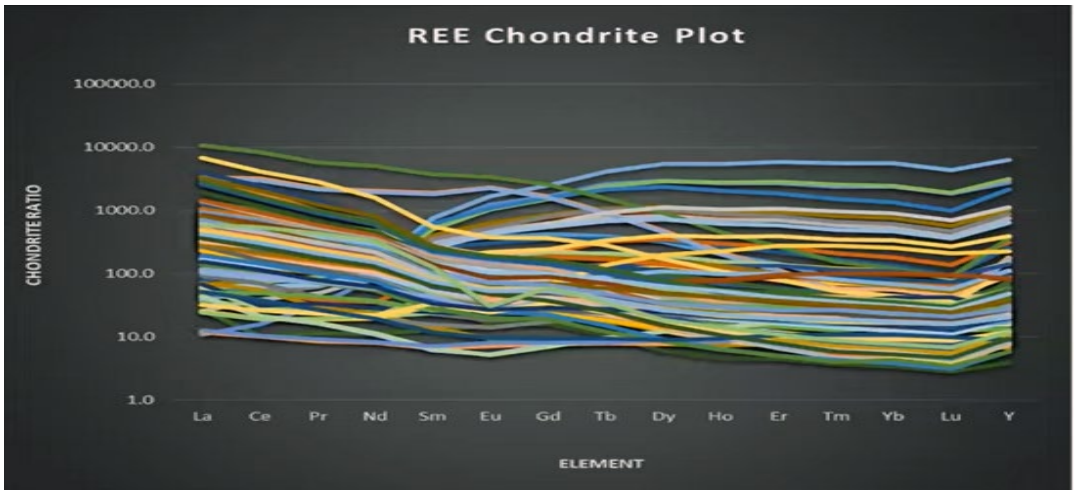

Figure 6. Rare Earth Elements in Hick's dome Breccias.

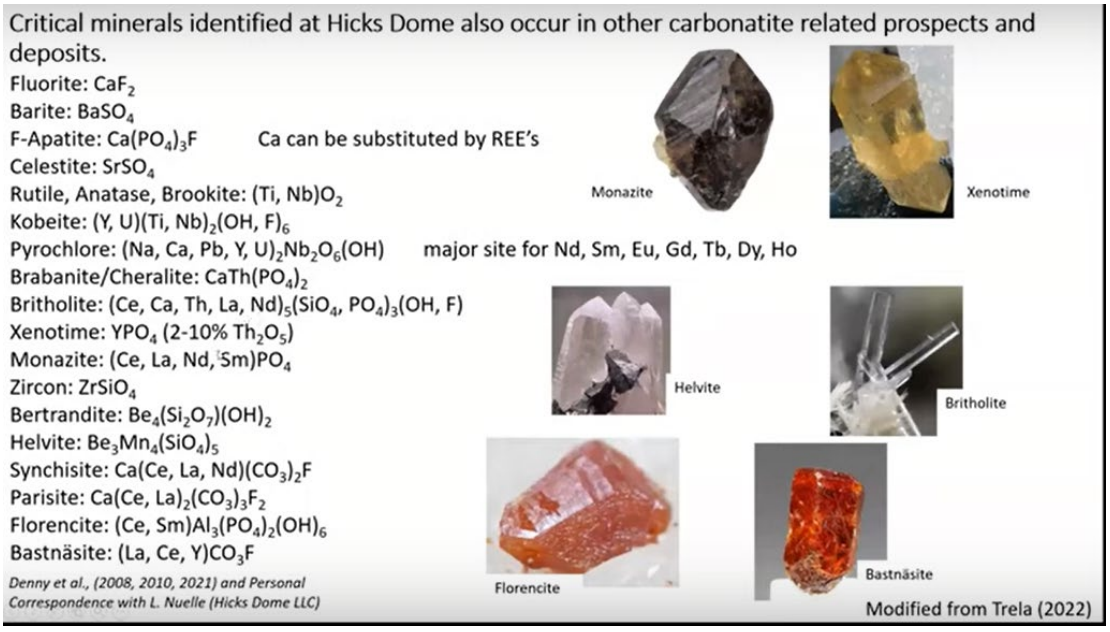

Figure 7. Rare Earths and Thorium occurrence in Hick's dome Breccias. Thorium is anomalous since uranium is usually encountered under similar circumstances.

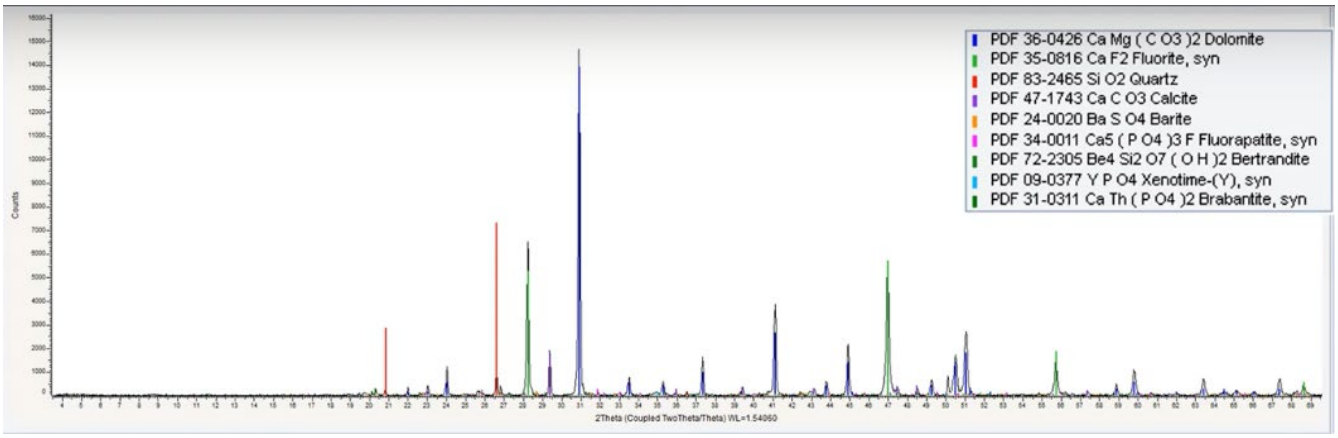

Figure 8. X-ray diffraction signature of Thorium presence in the form of Branbantite, $CaTh(PO_4)_2$ Ca Thorium Phosphate.

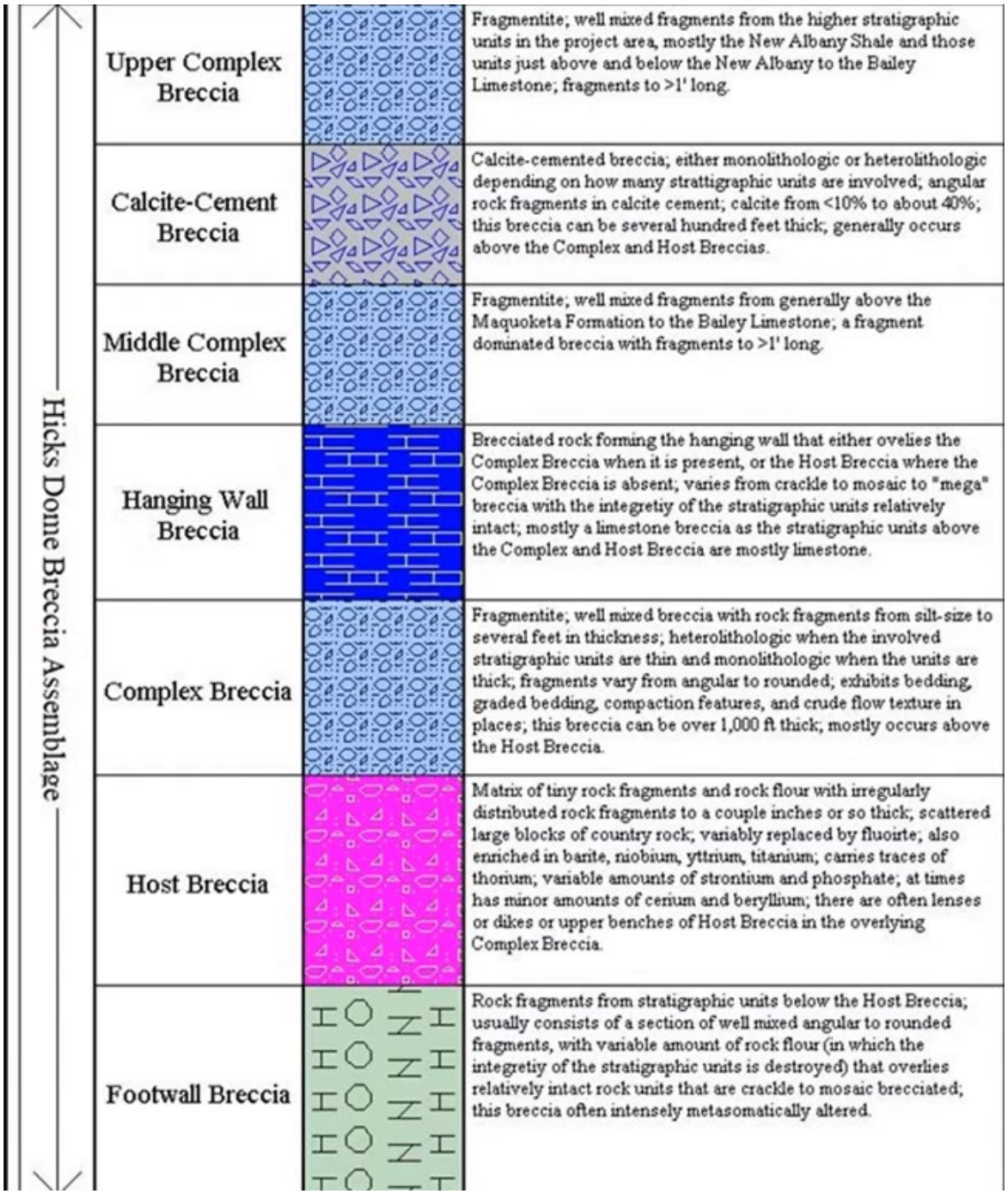

Figure 9. Hick's dome Breccias composition showing Thorium inclusion.

HICK'S DOME, ILLINOIS

Hicks Dome, is a crypto volcanic feature in the northwestern part of the Fluorspar Area Fault Complex. It played a key role in the structural evolution of the region.

The roughly circular dome has prominent topographic expression on aerial photos and satellite images. Middle Devonian chert and limestone form a hill at the center. Surrounding this

is a circular valley underlain by shale of the New Albany Group. Farther outward, alternating resistant and weak Valmeyeran and Chesterian strata produce concentric cuestas and strike valleys. Hicks Dome is approximately 10 miles (16 km) in diameter and its total structural relief is approximately 4,000 feet (1,200 m). Flanking dips increase to a maximum of about 20° (as much as 45° locally) about 1 mile (1.6 km) out from the apex and gradually diminish farther outward.

HICK'S DOME GEOLOGIC DESCRIPTION [5]

Hicks Dome (37.53139°N 88.36833°W) is a geological feature in Hardin County, Illinois. The Hicks Dome is underlain by ultramafic igneous rocks and igneous diatremes or breccia pipes. Most geologists accept the theory that the older rocks at the center of the uplift are a result of this deep-seated igneous activity. This activity may also have provided the fluorine in the fluorspar deposits in the region. Fluorspar, or calcium fluoride, was mined in Hardin County until the early 1990s.

"Ultramafic dikes, small stocks, and diatremes radiate from the center of Hicks Dome along a northwest-trending axis coinciding with the broad Tolu Arch that crosses the Fluorspar District. The rocks are dated radiometrically as early Permian (Zartman et al. 1967). Highly brecciated rock crops out near and at the apex of Hicks Dome (fig. 41) and was also encountered in a test well drilled there. Rotary drill cuttings from this site were radioactive and contained unusual concentrations of fluorite, apatite, and metal sulfides (Brown et al. 1954). Bradbury et al. (1955) reported small quantities of uranium in outcrop samples from the dome.

The small radial and arcuate faults that surround Hicks Dome apparently developed during its formation. The northwest- trending mineralized block faults that cross Hicks Dome are younger than the dome and ultramafic intrusions."

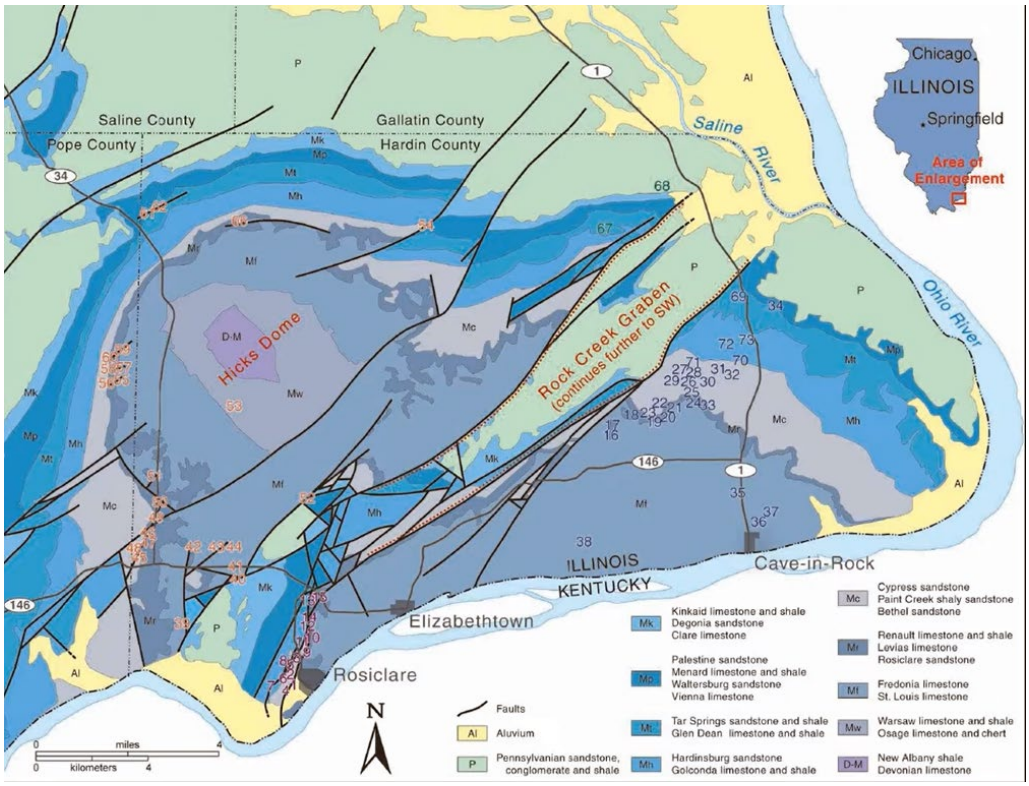

Figure 10. Hick's Dome mining district, Hardin County Illinois.

Figure 11. Hicks Dome Fluorspar district mineral samples.

DISCUSSION

Hick's dome in the Early-Cretaceous earlier-on thought as (Permian: 272+/- 17 Ma) million years before present (bp) Wauboukigou Igneous Province PWIP of Illinois. It is surrounded by eleven mining sub-districts.

It is considered as an extinct volcano that never reached the surface. It is characterized with an anomalous occurrence of Thorium Th rather than the expected Uranium U, as well as the occurrence of the heavy rare earth elements. Thorium as an energy resource is 4 times more abundant in the Earth's crust than uranium. It is detected also on the Moon and Mars surfaces.

Hicks Dome is unique compared with the two main other critical mineral prospects in the USA such as Mountain Pass in California and Bear Lodge in that it is anomalously one order of magnitude more enriched in the scarcer more desirable heavy Rare Earths Elements relative to the light ones. Hicks Dome is also likely to possess one of the largest fluorspar reserves in North America.

It is estimated that there exist 12 - 65 million raw tons of critical minerals ore within various deposits at the site. Hicks Dome is particularly enriched in the rare earth elements Dysprosium Dy, Scandium Sc and Yttrium Y.

REFERENCES

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APPENDIX

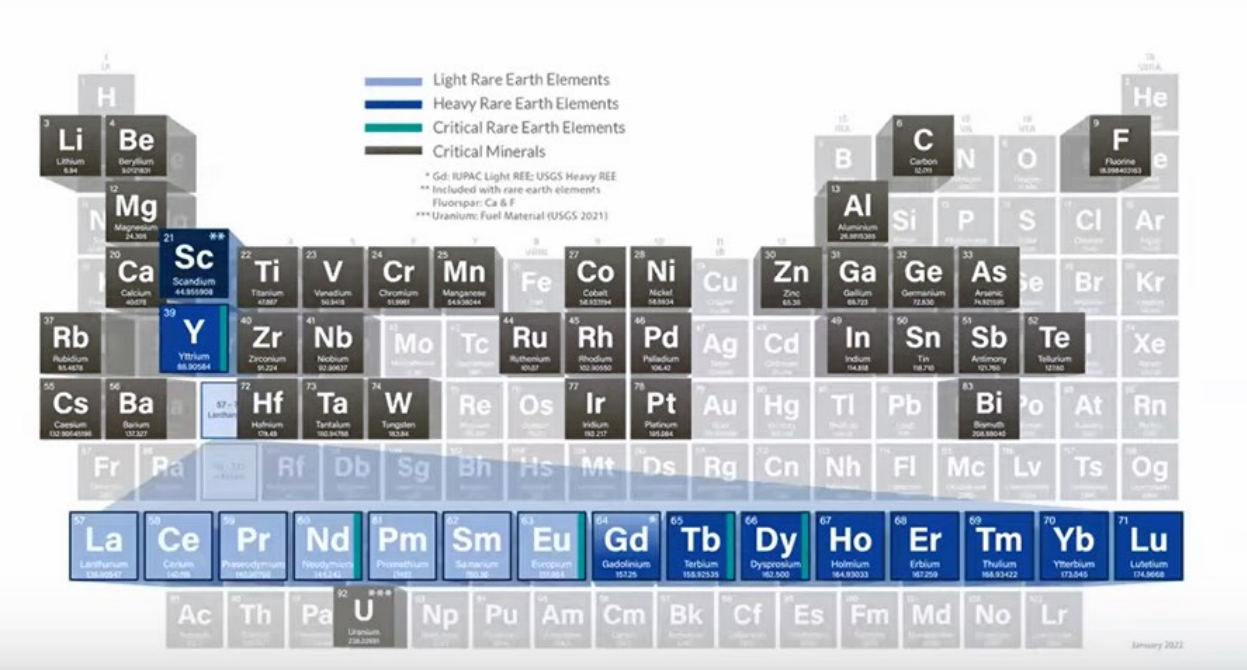

Figure A1. Light and Heavy Rare Earths Elements include the Lanthanides plus Yttrium and Scandium among the critical elements.