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NEWS RELEASE | **FOR IMMEDIATE RELEASE** | July 11, 2023

A second zone of critical mineral enrichment discovered in southwestern North Dakota.

BISMARCK, ND - Three months after announcing their first critical mineral discovery, Lynn Helms, Director of the North Dakota Department of Mineral Resources, and Ed Murphy, North Dakota State Geologist, announce the North Dakota Geological Survey has discovered a second interval of rocks in western North Dakota that contains elevated concentrations of critical minerals, some of which are significantly enriched. Critical minerals are defined by the U.S. Government as essential to the economic or national security of the United States. They are increasingly vital components in the manufacturing of modern products. There is little or no U.S. production of critical minerals, such as the rare earth elements, gallium, and germanium, so we rely instead on foreign countries to supply them. Most of the global supply of many of these elements currently comes from China, which has proposed cutting supplies to U.S. defense contractors.

The North Dakota Geological Survey has identified significant rare earth and germanium enrichment in lignites beneath a thirty-foot-thick, brightly colored interval of rocks called the Rhame bed which is situated approximately 1,000 feet stratigraphically below the previous discovery, a similar interval of rocks called the Bear Den Member of the Golden Valley Formation. Both the Rhame bed and Bear Den Member are ancient soil horizons that formed 61 and 56 million years ago, respectively, when the climate in North Dakota was both warmer and wetter. The intense weathering of these rocks generally transformed the dull gray and brown colors to bright white, leaching trace amounts of critical minerals from the weathering sediment and concentrating them in the underlying lignites.

The Rhame bed outcrops across southwestern North Dakota, from southern Golden Valley County through Slope, Bowman, Adams, Grant, and Morton counties. It is exposed at the surface or just below ground over an area of 1.3 million acres with the most extensive outcrops found in Bowman and Slope counties. This important discovery is documented in a just-released 267-page report: ND Geological Survey Report of Investigation no. 134, available for free download on the DMR – Geological Survey website. This report contains the analyses of 552 new samples from

161 sites in Adams, Billings, Bowman, Golden Valley, Morton, and Slope Counties, by far the largest amount of data that has been presented in any of the previous seven reports, which now total over 1,700 samples of North Dakota lignite. Most of the new samples come from in and around Logging Camp Ranch (Ranger Township) where high concentrations of critical minerals were found in multiple lignites in 2017.

The U.S. Department of Energy has estimated that coal with a concentration of 300 parts per million rare earth elements is potentially economic. This may be especially true for lignites because of their ability to easily uptake and release rare earths, potentially making extraction relatively low-cost and environmentally friendly. Previous results from this project have shown that critical minerals are typically only enriched in the uppermost few inches of lignite bed, however, coals beneath the Rhame bed can be a foot or two thick and contain enriched rare earth element concentrations throughout. In one locality at Logging Camp Ranch in Slope County, an 18-inch Rhame bed coal contained a high concentration of 1,598 ppm at the top and averaged 567 ppm throughout the bed. Twelve miles to the west, the Geological Survey discovered a 17-inch-thick lignite where the top six inches averages 1,834 ppm of rare earth elements and the entire coal averages 1,153 ppm. One sample contained 2,790 parts per million rare earth elements, which is over 40 times higher than average U.S. coal. This is the highest sample collected during the project to date and perhaps the highest dry-coal basis sample in North America.

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