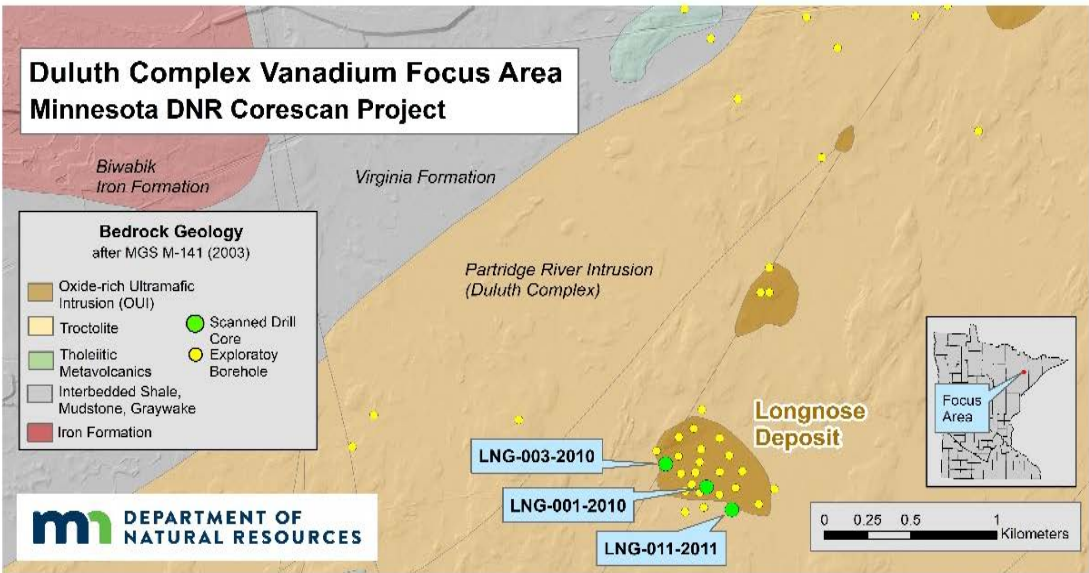


Duluth Complex Vanadium Focus Area

In northeastern Minnesota, a series of small oxide-rich ultramafic intrusions (OUIs) are located along the western margin of the Duluth Complex. These OUIs consist of primarily coarse-grained ilmenite (iron-titanium oxide) and titanium-bearing magnetite. Ilmenite is the most important ore of titanium. Some of the OUIs also contain appreciable quantities of vanadium, in the form of secondary vanadium-bearing titaniferrous magnetite.



Titanium and vanadium are high-value critical minerals. Development of these resources has historically been limited by the presence of magnesium impurities within ilmenite. A new hydrometallurgical process has been developed that removes magnesium and isolates high-purity titanium dioxide. At a commercial scale, this process could lead to development of these titanium resources, with vanadium a valuable secondary product.

The best-characterized titanium resource within the Duluth Complex is the Longnose Deposit, which was the subject of a 2011 NI43-101 technical report. There are intervals of drill core within the Longnose ore body that display relatively high vanadium content, and intervals of core within the host Partridge Ridge Intrusion that display Cu-Ni concentrations that are comparable to grades in nearby advanced-stage Cu-Ni development projects. This made drill cores from the Longnose Deposit ideal candidates for hyperspectral core imaging.

Three archived drill cores from the Duluth Complex Vanadium Focus Area were selected for hyperspectral imaging. A combined total of 2,099 feet (640 meters) of drill core was scanned in this Focus Area.

Focus Area Goals

- Evaluate the ability of hyperspectral core imaging to track variations in vanadium content with the ore body and, more specifically, within secondary titaniferrous magnetite.
- Investigate correlation between primary and secondary mineralogy and grade variations for titanium, copper, and nickel, within both the OUI ore body and host Partridge River Intrusion.
- Investigate the spectral response of Duluth Complex oxide minerals and related ore minerals within the VIS-SWIR range.

DDH	DNR ID	Core Start	Core End	Scan Start	Scan End	Total Feet	Total Meters
LNG-001-2010	12557	54	794	54	794	740	226
LNG-003-2010	12577	0	306	0	306	306	93
LNG-011-2011	13221	0	1053	0	1053	1053	321
					Total	2099	640

For more information, visit: [DNR Corescan Project Home Page](https://mndnr.gov/corescan) (mndnr.gov/corescan)