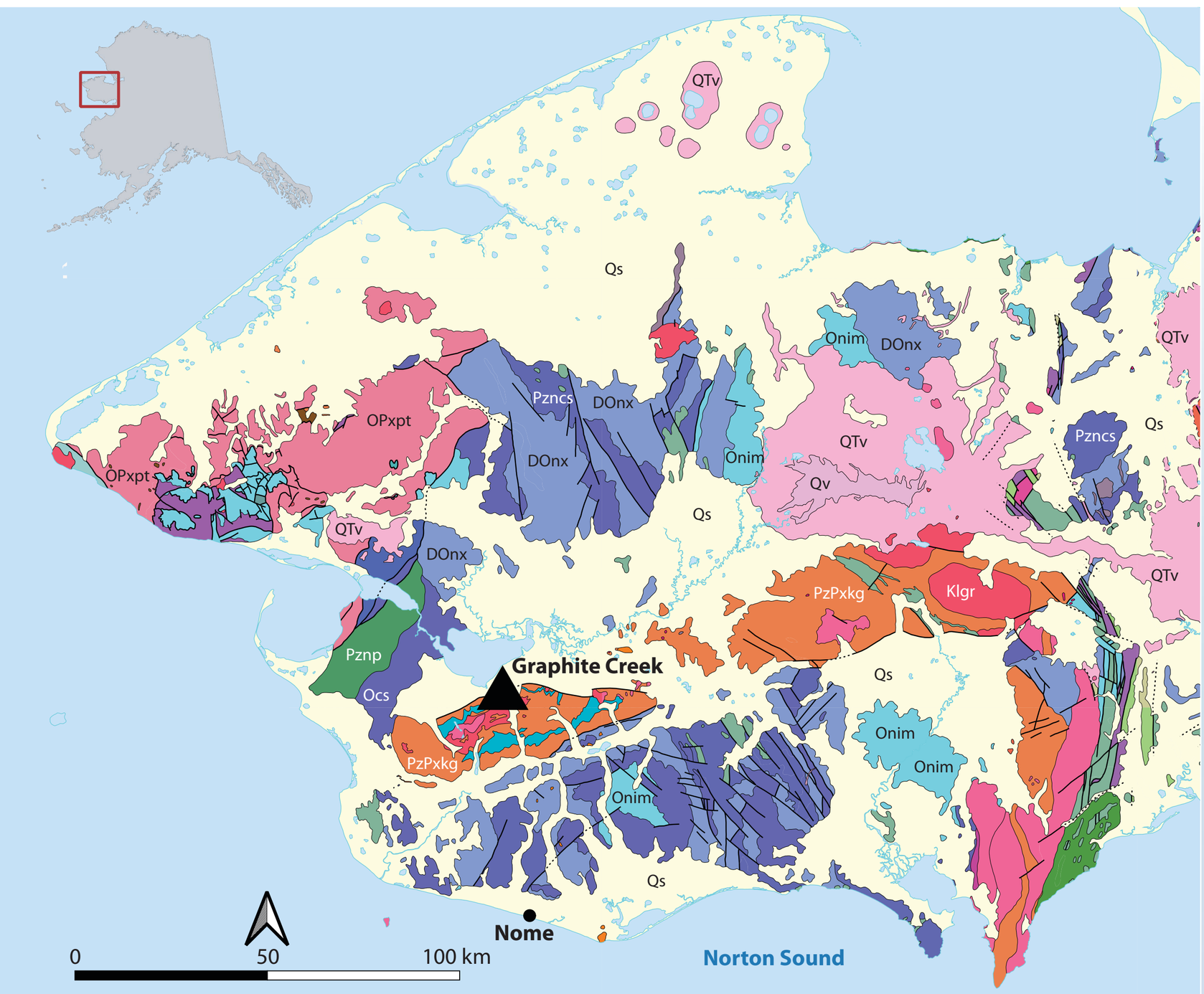
CELEBRATE GEOLOGIC MAP DAY

Examining Critical Minerals on Seward Peninsula, Alaska

A Remote Landscape with Global Importance

The Seward Peninsula in western Alaska is a landscape of mountains, tundra, and coastal plains along the Bering Sea and Norton Sound. On the peninsula's southern coast, the town of Nome played a major role in Alaska's 1900 gold rush and today sits at the center of the search for critical minerals. Farther north, in the Kigluaik Mountains, geologic mapping has helped scientists identify and better understand one of the largest known flake graphite deposits in the United States. Detailed maps of rock types and structures reveal how ancient geologic processes transformed carbon into graphite and concentrated thick graphite-rich zones within the metamorphic rocks exposed across this Arctic landscape.

Alaska contains some of the most geologically diverse and least explored terrain in the nation. Much of Alaska, including the Seward Peninsula, formed from rocks that originated in distant environments and later collided with North America over millions of years. These geologic events helped create conditions for critical mineral deposits to form. The remoteness of Alaska, harsh climate, limited road access, and vast distances make geologic mapping essential for understanding the region's history and resource potential. Mapping continues today through field investigations and airborne magnetic and electromagnetic surveys, which detect differences in rock properties beneath soil and tundra and help refine geologic maps of subsurface critical mineral resources.



Map Units

Qs	Kcc	Ksy	PzPxkg	Clgk	DCmt	Ocs	Unit contacts
Qv	Kgu	Kmig	DOnx	DSyl	SOyl	Onim	Faults
QTv	Klgr	Jit	Pzgp	Dogn	SOyld	PzPxgb	
TKs	Kmgr	MzPzmb	Pznp	Das	Oyl	Zgns	Shoreline or riverbank
TKv	Kmqm	Pzcn	PzPxnc	Pzncs	OPxpt	Zngn	

For the full key and associated learning resources visit: https://bit.ly/ESW-2026

A USGS geologist making field observations at the Graphite Creek deposit on the Seward Peninsula, Alaska.

How Did the Graphite Form?

The graphite on the Seward Peninsula formed deep underground during ancient mountain-building events. Intense heat and pressure transformed sedimentary rocks into metamorphic rocks such as schist and gneiss, allowing carbon-rich material to recrystallize into flakes of graphite. Geologic mapping shows that the deposit occurs within high-grade metamorphic zones of the Kigluaik Mountains. By mapping rock types, structures, and metamorphic conditions, geologists can reconstruct the region's geologic history and identify areas where similar mineral deposits may occur.

An exposed graphite deposit at an outcrop along Graphite Creek. (Tool included for scale.)

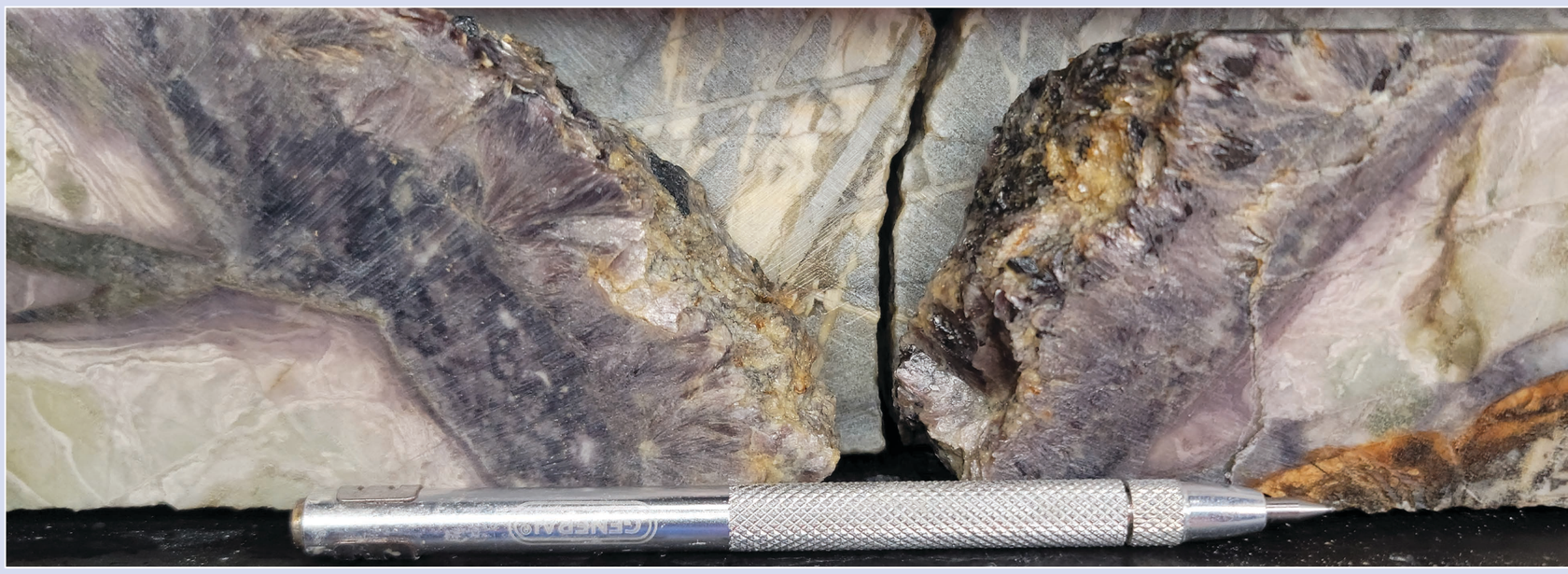
A Region Rich in Critical Minerals

Graphite is part of the broader critical mineral potential in northwest Alaska. Mapping of rock units and mineral belts suggests the Seward Peninsula may also host other important resources, including:

- Tin, used in electronics and solder
- Tungsten, valued for its strength and high melting temperature, and important national defense applications
- Lithium, a key element in rechargeable batteries with graphite

Just north of the Seward Peninsula, the Red Dog Mine in the Brooks Range is one of the world's largest zinc mines and a major global source of zinc, a metal used to protect steel from corrosion and support infrastructure development. Germanium, another critical mineral recovered from the zinc ore, is used in fiber optics, semiconductors, and night-vision technology.

From smartphones to electric vehicles, many modern technologies depend on graphite and other critical minerals. Geologic maps connect these everyday materials to Alaska's ancient rocks, helping society understand where resources come from and how they can be managed responsibly.



A fluorite-lepidolite-wolframite vein intersected in drill core from a mine on Seward Peninsula, Alaska. Lepidolite is a lithium-bearing mica, and wolframite an ore of tungsten. (Tool included for scale.)

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Geologic Map Day
Friday, October 16, 2026

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AGI american geosciences institute connecting earth, science, and people

AASG Association of American State Geologists

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