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BEFORE THE COMMITTEE ON NATURAL RESOURCES

SUBCOMMITTEE ON ENERGY AND MINERAL RESOURCES

U.S. HOUSE OF REPRESENTATIVES

Testimony on H.R. 9646, the Quantum-Enhanced Critical Minerals Mapping Act of 2026

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I. Introduction

Chairman Stauber, Ranking Member Ansari, and Members of the Subcommittee, thank you for the opportunity to testify today on the Quantum-Enhanced Critical Minerals Mapping Act of 2026, introduced by Representative Jeff Hurd of Colorado. My name is Matt Kinsella, and I was the founding investor in Infleqtion in 2018, and I have served as the company's CEO since April 2024.

The message I hope to leave the Subcommittee with today is simple: you cannot find, or secure, what you cannot see. That's the position America is in today with our own critical minerals. Our nation continues to grapple with its existing dependency on foreign adversaries - above all, the People's Republic of China, for the rare earth elements and critical minerals that power our defense systems, semiconductors, energy technologies, and advanced manufacturing. Yet some of the richest mineral deposits in North America lie beneath American soil, in the Colorado Mineral Belt and across the western United States, undiscovered and uncharted because the mapping tools available on the market today cannot see clearly enough, to find them. Quantum sensing technologies like the ones we build in the United States, change that. Quantum gravity gradiometry gives aircraft and vehicles insight underground, detecting and characterizing mineral deposits at greater depth and resolution in a single survey pass. By reducing speculative drilling, it can dramatically lower exploration costs, environmental impact, and time to decision. This legislation would put the most advanced subsurface sensing technology ever built to work for the American people - through a proven federal program, and in partnership with private industry.

II. About Infleqtion

Infleqtion is an American quantum technology company headquartered in Louisville, Colorado, with operations in Chicago, Illinois; Madison, Wisconsin; and allied nations including the United Kingdom and Australia. Our company was built on more than two decades of cold-atom physics research pioneered in Colorado's world-leading atomic physics community, and we have spent those decades turning Nobel Prize-winning science into deployable solutions.

Infleqtion was the first to establish quantum sensing in space in 2018 and Infleqtion's quantum hardware has operated aboard the International Space Station through NASA's Cold Atom Laboratory ever since. Infleqtion is collaborating with NASA's Jet Propulsion Laboratory on the Quantum Gravity Gradiometer Pathfinder mission, which will deploy the first space-based quantum gravity sensor to measure Earth's gravitational field with unprecedented precision. We

also build atomic clocks that keep time to extraordinary precision for national security and critical infrastructure missions, radio-frequency receivers for the Department of Defense that are the size of a sugar cube, quantum computers that are breaking new ground with each day, and the quantum gravity sensing systems that are the subject of today's hearing. We are proud that American quantum sensing is moving beyond a laboratory promise to manufactured, fieldable capability, made in America by American workers.

III. What is Quantum Sensing Specifically?

Quantum sensing deserves a brief explanation, because it is the rare emerging technology whose benefits are immediate, measurable, and unambiguous.

Every atom of a given element is perfectly identical to every other - nature's flawless measuring stick. Quantum sensors exploit this. Using lasers, we cool small clouds of atoms to temperatures colder than deep space, slowing them almost to a standstill. In that state, atoms become exquisitely sensitive to the world around them: to time, to motion, to magnetic fields, and critical for today's purposes, to gravity. Because atoms never drift, wear out, or need recalibration the way mechanical instruments do, quantum sensors deliver measurements of a fidelity that classical devices cannot match, even in principle.

This is not speculative technology. Congress needs to give early adopters the confidence to move now – rather than realize too late that the United States is just a customer of someone else's innovation and leadership.

IV. Quantum Gravity Gradiometry: Seeing Underground Without Digging

The specific instrument in this legislation is a quantum gravity gradiometer, or QGG for short. Everything beneath our feet – ore bodies, aquifers, voids, faults, and hazards – has density, and density shapes the local gravitational field in tiny but measurable ways. Gravity data alone doesn't identify what's causing a given signal – combined with existing magnetic and geologic data, it lets geologists distinguish a promising ore body from a void, an aquifer, or an ordinary rock formation with a level of confidence single-method surveys can't match. The instrument itself is what makes that resolution possible. A conventional gravimeter measures average gravity at a single point, a signal easily washed out by noise, vibration, and instrument drift. A quantum gravity gradiometer instead uses atoms to measure changes in gravity, specifically how gravity changes from one point to another. By comparing two identical atom clouds simultaneously, the instrument cancels out noise and drift, producing a stable, high-resolution picture of subsurface density.

In practical terms, quantum gravity gradiometry allows a survey aircraft or vehicle to do what previously required drill rigs:

- Reliably detect and characterize mineral concentrations at depths and resolutions impossible with classical instruments;
- Reduce the need for speculative drilling- the single largest cost driver and environmental barrier in minerals exploration; and
- Produce higher-fidelity subsurface maps in a single survey pass, at a fraction of the cost per square mile of ground-based exploration campaigns.

The technology has demonstrated commercial viability for mineral exploration, and the U.S. Geological Survey (USGS), through EARTH MRI, has the institutional foundation in place to put that data to public use. What is needed now is focus - which is exactly, and only, what this bill provides.

V. What the Quantum-Enhanced Critical Minerals Mapping Act Does

The legislation is very targeted and disciplined. Under section 3(a), not later than 180 days after enactment, the Secretary of the Interior, acting through the Director of the USGS, must establish and carry out a program of original quantum-enhanced geophysical surveys - surveys that improve upon existing USGS data- for the discovery and characterization of critical mineral and rare earth element deposits on or adjacent to federal lands. Specifically, the bill requires the Secretary to:

- Conduct mobile quantum gravity gradiometry surveys over not fewer than three priority critical minerals focus areas identified under the Earth MRI program, with priority given to western rare earth element zones (sec. 3(b)(1));
- Compare quantum gravity gradiometry data head-to-head against existing classical geophysical survey data from the same focus areas, quantifying detection improvements in resolution, depth penetration, and mineral deposit characterization (sec. 3(b)(2));
- Integrate all survey data into the Earth MRI national minerals database in a format compatible with existing Earth MRI platforms, make it publicly accessible, and provide it to mining and mineral exploration companies to facilitate private-sector investment in domestic critical mineral development (secs. 3(b)(3), 3(d));
- Coordinate with the Secretary of Energy through the relevant Department of Energy national laboratories, including the National Laboratory of the Rockies, and consult and coordinate with the state geological surveys of affected states in selecting focus areas and interpreting results (secs. 3(b)(4), 3(c)); and
- Carry out surveys, to the maximum extent practicable, under cooperative research and development agreements with private quantum sensing firms to leverage private-sector investment and reduce federal costs (sec. 3(b)(5)).

Section 4 then requires a report to the House Committee on Natural Resources and the Senate Committee on Energy and Natural Resources within 24 months of enactment. That report must cover eight elements, including the instruments and methodologies deployed; the minerals identified, with estimated deposit locations, depths, and economic significance; a quantitative quantum-versus-classical comparison with metrics for resolution, depth penetration, and cost per unit area surveyed; an assessment of the potential to reduce speculative drilling; an analysis of private-sector interest and investment resulting from the released data; recommendations for scaling quantum surveys across Earth MRI nationally; recommended legislative or regulatory changes to accelerate critical mineral permitting in areas the surveys identify; and a cost-benefit analysis comparing the federal investment with the estimated economic value of the deposits found.

The bill contains no new authorization of appropriations. It works through existing USGS authorities and directs the agency to stretch federal dollars through private-sector partnership. This is federal policy that enjoys bipartisan and longstanding purposes: government acting as an early adopter and delivering meaningful improvements in public data. The bill updates a core public

mapping function that has existed since the founding of the USGS in 1879, strengthens the information available to states and markets, and lets private investment do the rest.

VI. Earth MRI: A Proven Program Ready for Its Next Tool

The Earth Mapping Resources Initiative is genuinely important federal science policy.
Three-quarters of the country still lacks modern subsurface data, and the airborne magnetic and radiometric surveys that Earth MRI flies today, valuable as they are, cannot resolve the fine-grained density variations that distinguish an actual ore body from ordinary rock. Magnetics tell you where interesting geology is; gravity gradiometry tells you what is actually there, how deep, and how much. Without that final layer of fidelity, the gap between "prospective" and "confirmed" can only be closed by drilling, which is slow, expensive, and environmentally intrusive.
Quantum gravity gradiometry is the natural next instrument in Earth MRI's toolkit. This bill plugs a generational sensing upgrade into an existing, well-run initiative with established data platforms, state partnerships, academic users and industry users.

VII. The U.S. – China Strategic Quantum Competition

The Subcommittee should understand this legislation in the context of two intertwined competitions with the People's Republic of China: the competition for critical mineral supply chains, and the competition for quantum technology leadership. This bill strengthens America's position in both at once.

On minerals, China's dominance is well known to this Committee: commanding positions in the mining and, especially, the processing of rare earth elements and critical minerals, and a demonstrated willingness to weaponize that dominance through export controls. Every disruption reminds us that dependence on an adversary for defense-critical inputs is a strategic vulnerability, not merely an economic inconvenience.

On quantum, the picture is stark. Independent analysts estimate Chinese government investment in quantum technology at roughly $15 billion.[1] In March 2025, Beijing launched a state-backed venture fund of approximately $138 billion for emerging technologies, with quantum among its priorities, and China's current Five-Year Plan names quantum technology first among the "future industries" designated as engines of national growth.[2] Notably, Chinese policy gives specific, sustained attention to quantum precision measurement- the exact family of technologies we are discussing today - including for resource exploration. China intends to find its minerals, and likely everyone else's, with quantum sensors.

The United States is ahead in fielding deployable, manufacturable systems and I believe Infleqtion is part of this progress. But leadership in emerging technology is not kept by inventing first; it is kept by adopting first. Early government adoption is essential to retaining American companies and talent, building domestic supply chains and manufacturing scale, and securing U.S. market

[1] Sujai Shivakumar, Charles Wessner & Andreas Schumacher, *Quick Take: Quantum Technology Global Competition*, Center for Strategic and International Studies (Feb. 3, 2025), https://www.csis.org/blogs/perspectives-innovation/quick-take-quantum-technology-global-competition
[2] Nectar Gan & Juliana Liu, *China Announces High-Tech Fund to Grow AI, Emerging Industries*, CNN (Mar. 6, 2025), https://www.cnn.com/2025/03/06/tech/china-state-venture-capital-guidance-fund-intl-hnk

leadership. A modest survey program that simultaneously hardens our mineral supply chains and accelerates our domestic quantum industry is, dollar for dollar, one of the highest-leverage investments in strategic competition available to this Congress.

VIII. Conservation and Environmental Benefits

I want to share my thoughts on why I honestly describe these technologies as a conservation solution.

The most environmentally disruptive and costly phase of mineral and rare earth exploration is not knowing the ideal locations to drill. When explorers cannot see underground, they drill-speculatively, repeatedly, with the best data or insights they have access to. Each unnecessary borehole means access roads, drill pads, water use, habitat disturbance, and reclamation obligations, much of it on or near federal lands that Americans hunt, fish, graze, and treasure. In Colorado, we know how important these lands are to our way of life- especially for my colleagues at Infleqtion and even my own family.

Quantum gravity gradiometry attacks that problem at its source: a non-invasive survey, flown or driven over the landscape, that characterizes deposits before ground is ever broken. Fewer dry holes means smaller footprints, less surface disturbance, and exploration concentrated only where deposits actually exist.

Better subsurface information can improve the quality and speed of environmental review by providing more complete data and reducing reliance on assumptions. High-fidelity maps let agencies, states, tribes, and the public evaluate proposals using real data. These tools give agencies and communities a level of certainty prior instruments never could.

IX. Better Data for American Science

The benefits of this program extend well beyond minerals. Because the bill requires all survey data to be integrated into the Earth MRI national database and made publicly available, every gravity gradient map generated under this Act becomes a permanent, open scientific asset.

Gravity gradient data at quantum resolution illuminates far more than ore bodies. The same measurements characterize aquifers and groundwater systems in the water-stressed West; map faults, voids, and geologic hazards that threaten communities and infrastructure; inform models of geothermal resources; and give academic geoscientists a dataset of unprecedented fidelity for understanding the structure of the North American crust. USGS scientists, state geological surveys, and university researchers will mine these datasets for decades, just as they still use aeromagnetic surveys flown generations ago. And the head-to-head comparison with classical methods that the bill requires will itself be a landmark scientific product- proof of the quantum versus classical geophysics that the research community seeks.

This is public science in the best tradition: collected once, by federal initiative, and made available to every scientist, every state, and every entrepreneur in America.

X. Conclusion

A century and a half ago, Congress created the U.S. Geological Survey to map a continent, and the surveys that followed underwrote generations of American prosperity. The Quantum-Enhanced Critical Minerals Mapping Act asks the USGS to do for the twenty-first century what it did for the nineteenth- this time with instruments that measure the world one atom at a time, built by American companies, deployed on American soil, for the benefit of the American people.

The technology is ready. The program is ready. The need- strategic, economic, scientific, and environmental- is plain. I respectfully urge the Subcommittee to advance this legislation, and I look forward to your questions.

Thank you.