

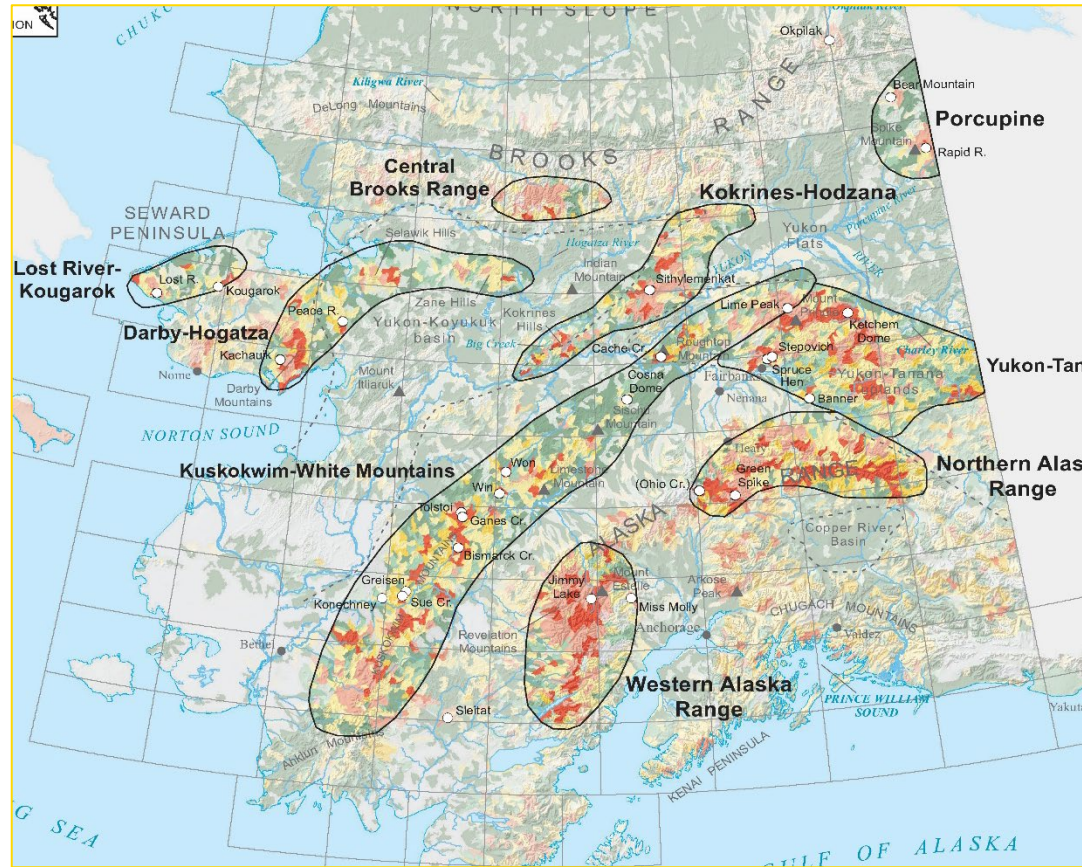


Digitalization and Preservation of Legacy Geologic Information

**Kurt Johnson, Curator, Alaska Geologic Materials Center
Alaska Division of Geological & Geophysical Surveys**

**Alaska Miners Association 2025 Convention
Anchorage, Alaska Nov. 6, 2025**

Information Transition



Alaska legacy critical mineral information map.



Information is a product of work.

Exploration Information Support



Recognizing industry risk to legacy data and sample loss.



Industry identified damaged mineral core.



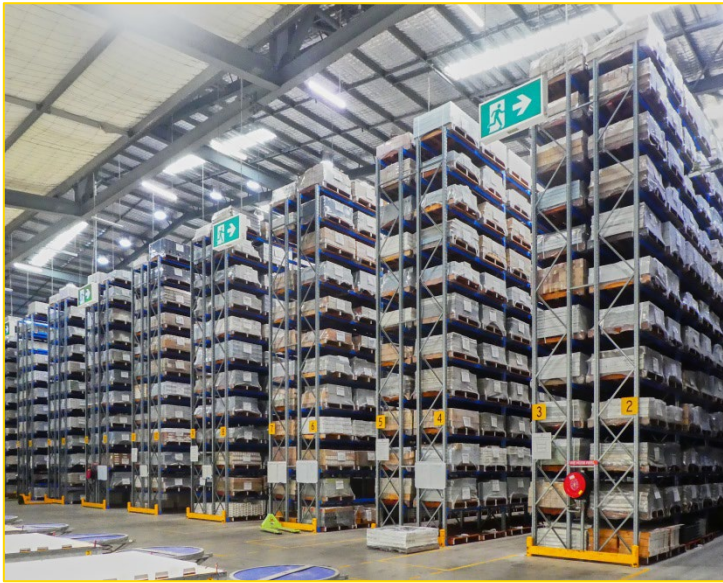
Mineral core rescue performed at the GMC.

Building a Broad Geoscience Process

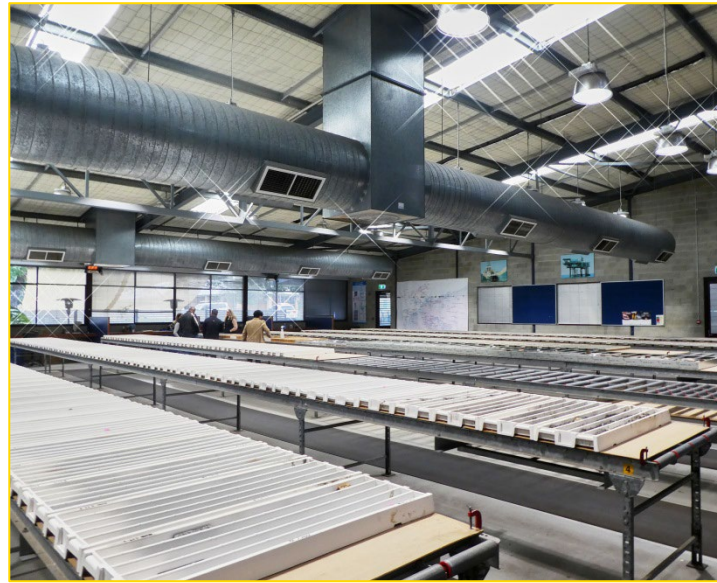


AuScope provides integrated research infrastructure to address **Australia's** geoscience challenges.

Perth Core Library, Western Australia



Main warehouse core racks.



Main core viewing area.



HyLogger 3 core scanner.

Information Lost is Work Lost



Disorder destroys information

- Corporate sale or RIF
- Retirement or death
- Loss of money or space
- Information type is obsolete
- Information storage failure
- Systems shortcomings



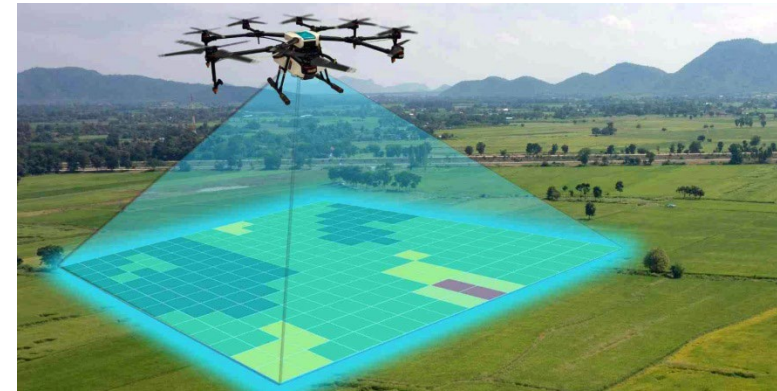
Natural forces peel rocks from cliff face.

Information Affects Business Workflow

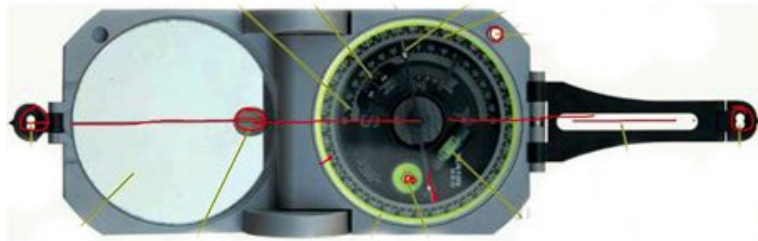


Digitization - convert something into digital information

Digitalization - convert business (scientific) processes over to use these digital technologies



(Digital)



(Legacy)

Digitization targets

- Legacy documents and data
- Non-destructive scanning

Building Information Stability



Organizational requirements

- Funding
- Staff
- Commitment
- Infrastructure
 - Workflow
 - Digital
 - Physical



Nearly 1.5% of GMC warehouse rack space.

- Java
- Supporting Android application



GMC Information Architecture

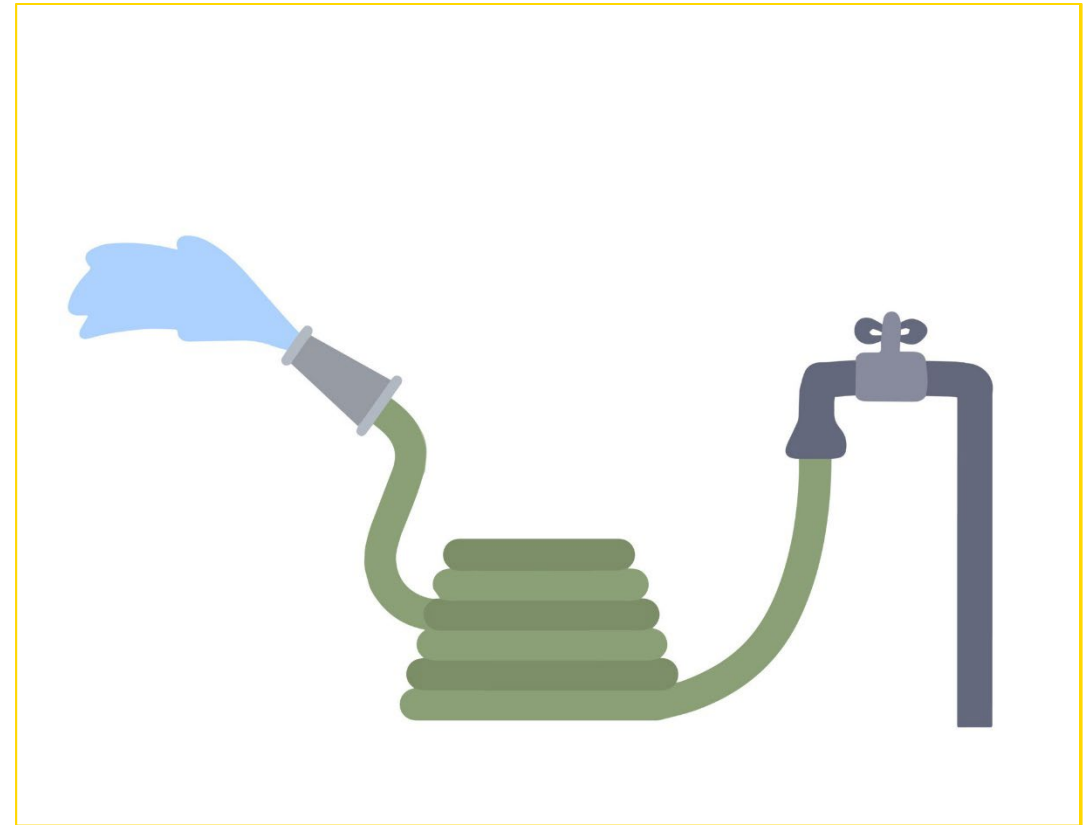


Services *internal* to app

- web/application server
- MinIO - S3 file storage
- PostgreSQL - database backend
- Elastic - search/indexing

Modular coding

- Go (golang)
- Supporting Android application



More abstracted GMC application flowchart.

Massive Digital Datasets

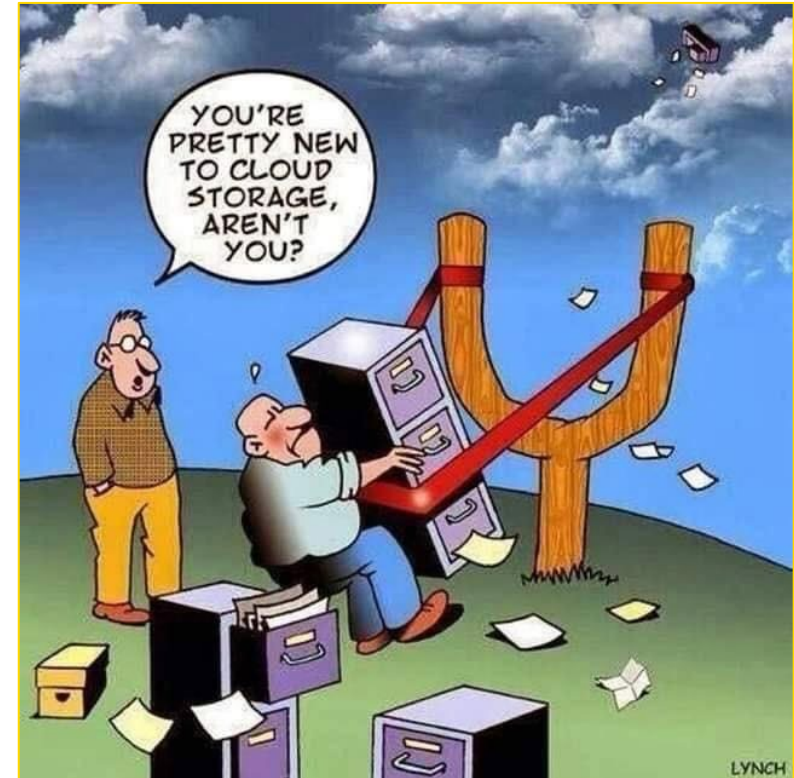


Increase GMC IT capacity

- Build massive local server hardware
 - Multi-petabyte data storage racks
 - Floating point analysis of very large spectral matrices (GPUs)

Five-year data cost comparison

- Cloud - \$220,000
- Local - \$64,000



Cloud is wrong storage approach for GMC.

GMC Database Architecture

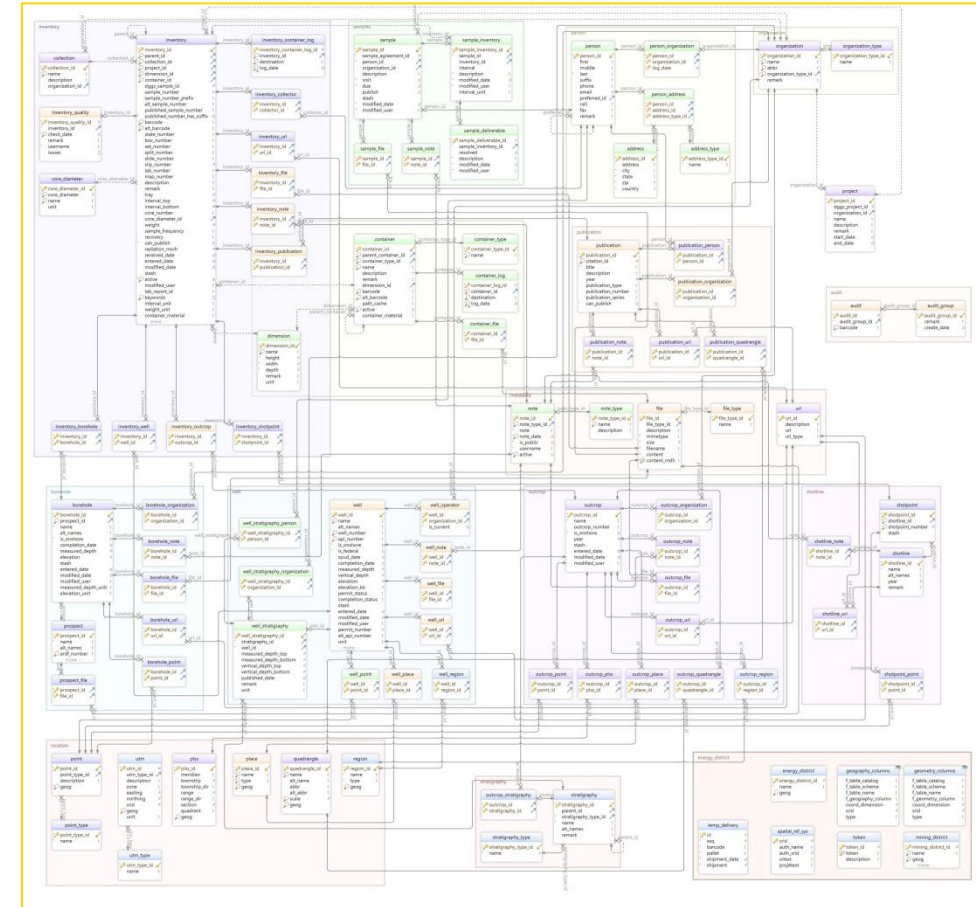


Qualities

- Twelve+ years of honing
- Both inventory and metadata retention
- Open framework

Achievements

- 100,000 box move to Anchorage
- Online inventory web service
- Massive efficiency advances



GMC geologic sample inventory schema.

GMC Archive Room



Highlights

- Only facility in Alaska with clean room to read and archive old media formats
- Equipment to scan old documents and run cutting-edge OCR
 - Using MS Azure LLM to digest and classify data.
 - *Handwriting is largely recognized*



Legacy tape reading corner in archive room.

HSI Project Timeline



- Staff assembled 2025
- HySpex instrument is delivered to the GMC
 - Installation and operation beginning Dec 2025
- First datasets available 2026

Non-destructive Core Scanning



Hyperspectral core scanners to provide high-resolution data on the GMC collection.

- Wide spectral range **sensitive** to clays, carbonates, oxides, REE
- Consistent **digital mineral logs** on thousands of meters of core from scores of prospects across Alaska
- Proximal core identification of **alteration zones**

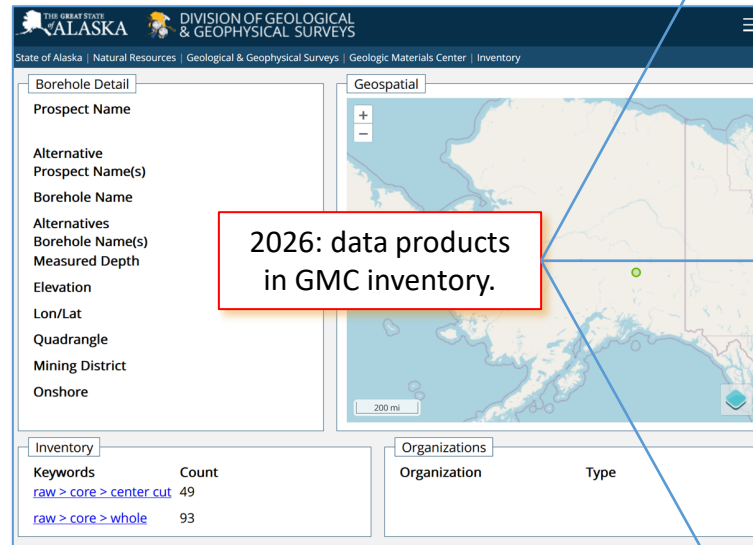


Hyperspectral Data Availability

Hyperspectral data to be available through the GMC interface.

Data products: RGB images, mineral maps, and normative searches.

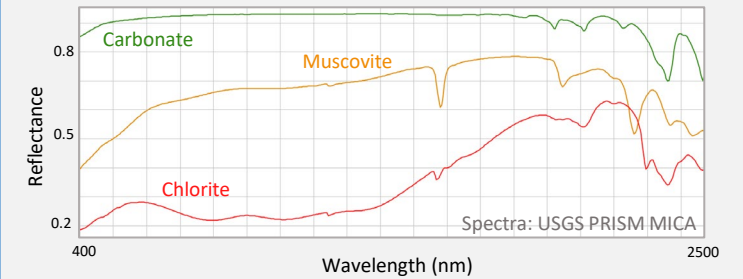
Initial focus on cores of mineral interest integrated into a contemporary framework.



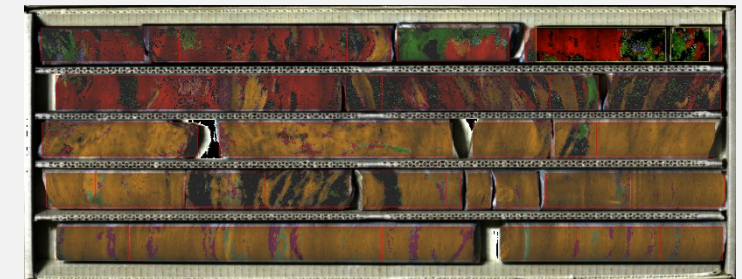
RGB images of scanned core



Spectral data for each pixel at scanned core surfaces



First-order mineral maps

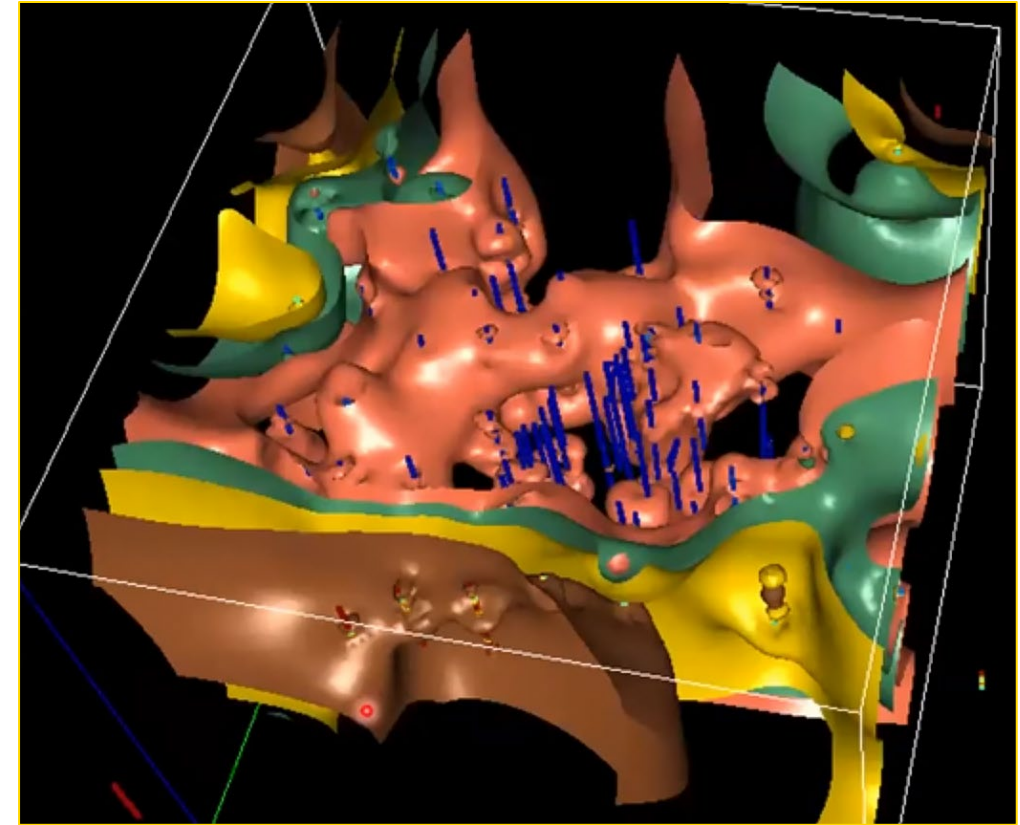




You May Think This is ...

Olympic Dam, a massive polymetallic copper, uranium, and gold underground mine, or an albite vector map to mineralization.

From Jessica Stromberg presents *Hyperspectral mineralogy for exploration: More than white mica & chlorite*, 08/18/2021,



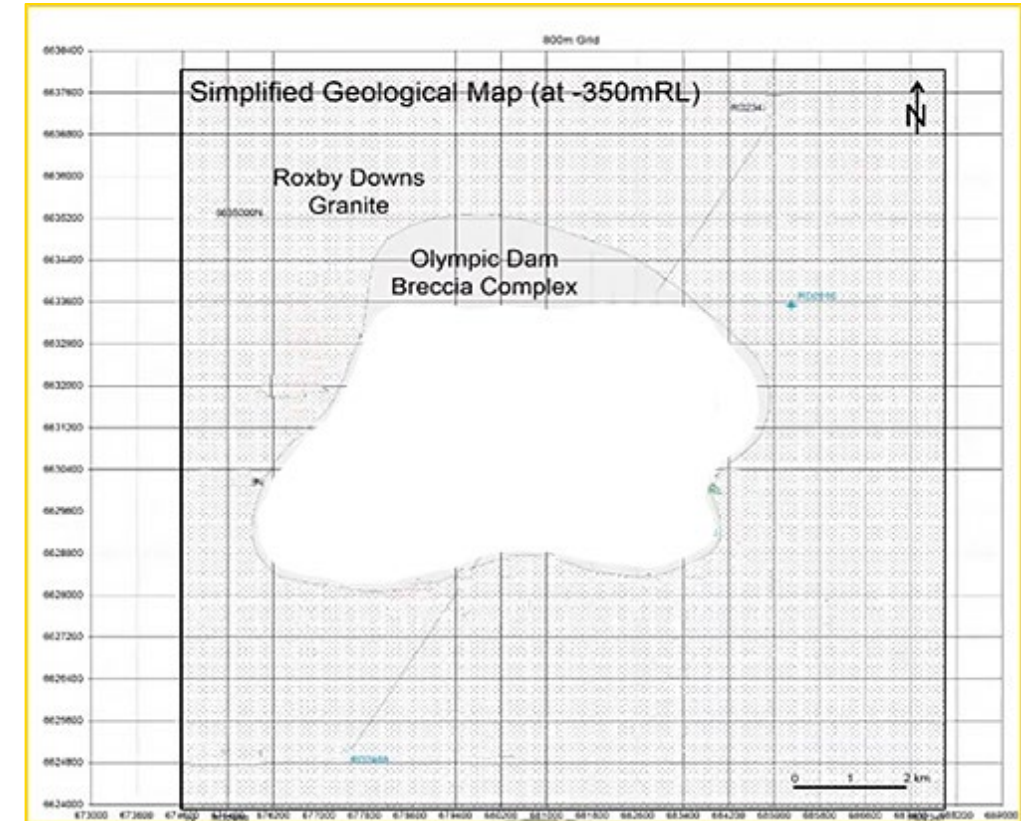
Albite distribution around deposit.

But This is ...



This represents the critical importance of basic borehole location, inclination, and azimuth metadata.

From Jessica Stromberg presents *Hyperspectral mineralogy for exploration: More than white mica & chlorite*, 08/18/2021,



Alaska-style legacy drill collar location map.



At Risk Legacy Information

GMC information sanctuary

- Reports
- Maps
- Analyses
- Geologic samples



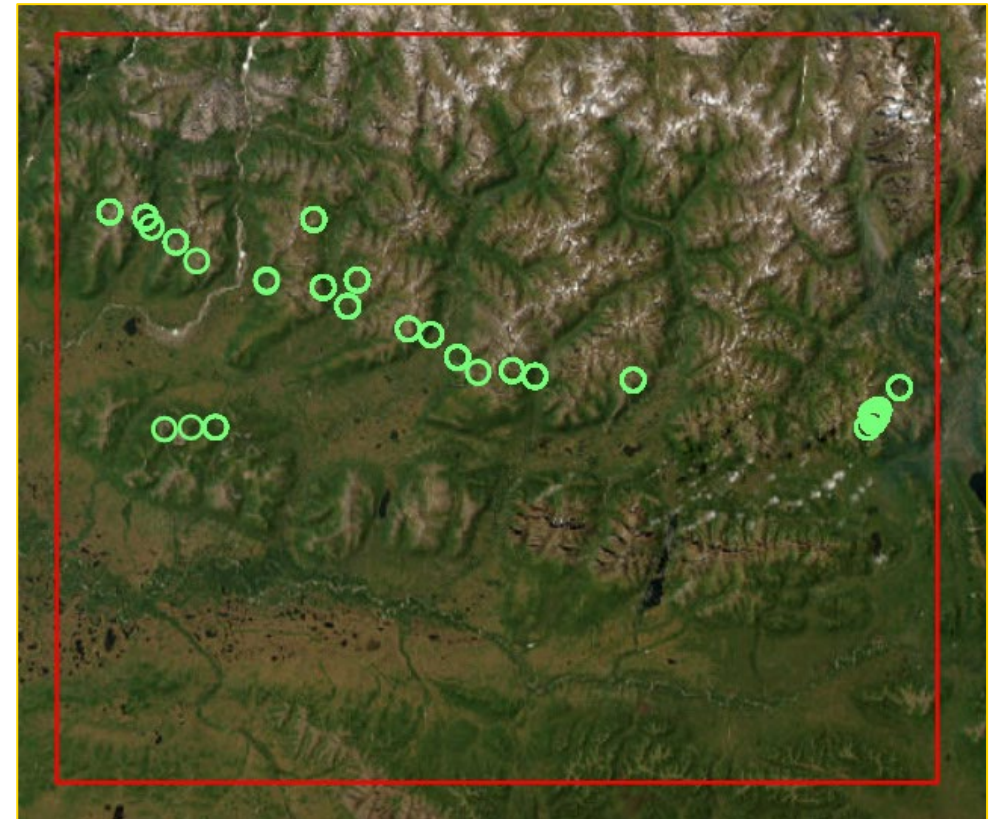
USGS sample rescue wall at GMC.

Crowd Source: Where's that Borehole



Build **metadata** foundation

- Basic information
 - Drill logs
 - Drill collar location
 - Inclination
 - Azimuth
- Primary assay data
 - Geochemistry
 - XRF
 - Reports



Ambler prospects lacking drill collar locations.

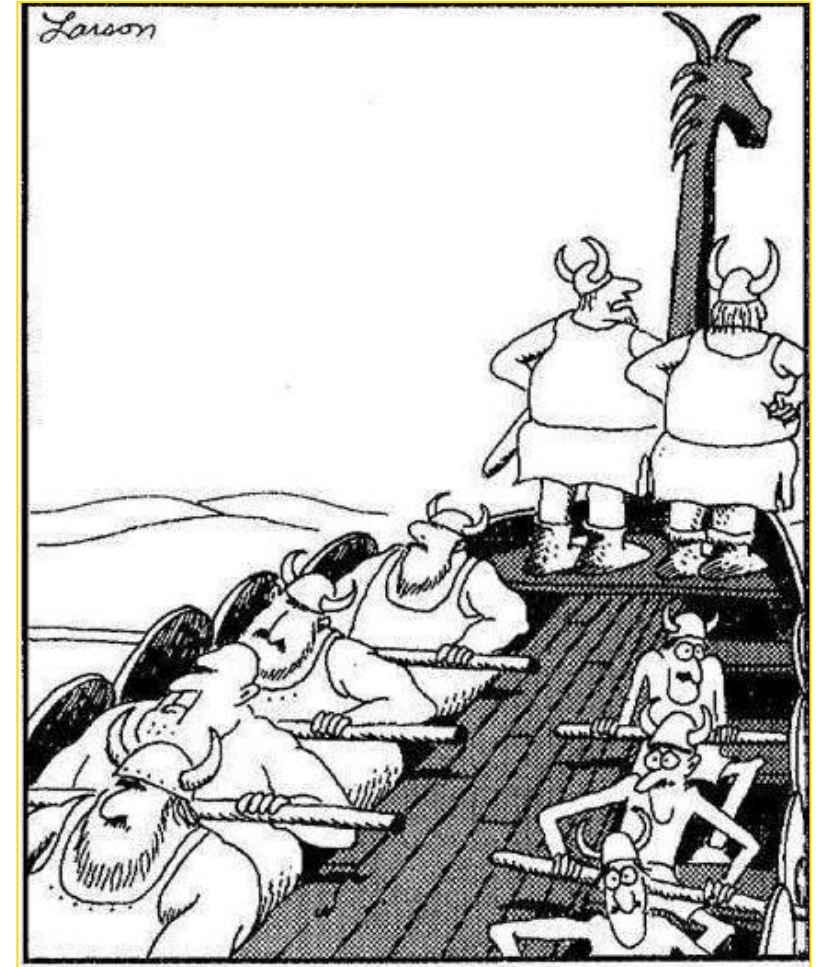
Exploration Industry Working Group



Establish a continuing group to identify and improve exploration practices.

ADGGS

- Dialogue with DGGS Director
- Continue to define pragmatic DGGS partnerships
- State mineral exploration priorities
- Research and share basic metadata
- Continue transitions conversation



A good process helps pull us together.

How Can We Assist



DGGS

Director: erin.campbell@alaska.gov

Alaska Geologic Materials Center

Curator: kurt.johnson@alaska.gov

Thank you



GMC staff curating and XRF scanning Bokan core.