
Photo courtesy: Teck [Red Dog Exploration 2017]

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AMEBC Mineral Exploration Roundup – Vancouver, BC Canada – January 22, 2018
The State of Alaska hosts Important Reserves & Resources:

- **Coal**: 13% of world’s coal resources; 2\textsuperscript{nd} most in the world
- **Copper**: 5.8% of world’s copper reserves; 2% of world resources
- **Lead**: 2.7% of world’s lead reserves; 0.2% of world resources
- **Gold**: 2.5% of world’s gold reserves; 40% of U.S. resources
- **Zinc**: 3.9% of world’s zinc reserves; 1% of world resources
- **Silver**: 1.2% of world’s silver reserves

*(USGS 2016 world estimates; DGGS Alaska 2016 data)*

Diverse metallogenic provinces

Top area of the world for under-explored mineral-resource potential

Over 7,400 documented prospects
2017 Alaska Mineral Industry Overview

• 5 major lode mines producing Zn, Pb, Au, Ag; all conducting near-mine exploration
• ~ 230 small placer Au mines
• 1 coal mine
• 48 active exploration projects
Fort Knox Mine [Kinross]

Intrusion-hosted gold deposit

-Produced 285,933 oz Au (as of 3rd quarter 2017)

-1.315 M oz Reserve (Nov. 2017)

-3.919 M oz Resource (Nov. 2017)

-New mineral rights on Parcel G land adjacent to open pit

Kinross gained mineral rights to Parcel G land in 2017
**Pogo Mine** [Sumitomo Metal Mining Pogo LLC]

Shear zone/quartz vein-hosted gold lodes
-Produced >271,000 oz Au (2017)
-1.2 M oz Au Reserve (Dec. 2017)

Currently Mining:
- Liese
- East Deep
- North Zone

-Near-mine exploration = new discoveries

Near-mine exploration in the Fun Zone (FZ), North Zone (NZ), East Deep (ED), South Pogo (SP), and 4021 Zones

Kensington Mine [Coeur Alaska, Inc.]

- Underground mine: structurally controlled, gold-bearing quartz veins
- Produced 80,162 oz of Au (as of 3rd quarter 2017)
- 497,000 oz Au Reserve; 1.3 M oz Au Resource (Dec. 2016)
- Exploration-investment levels at Kensington have nearly tripled

Jualin: NW section, veins 1-5 intercepts

Kensington Main: NW section view with drill intercepts

Map of Kensington deposits

http://www.coeur.com/
Greens Creek [Hecla Mining Co.]

Silver-rich VMS deposit; underground mine

-Produced 8.4 M oz Ag, 69,578 oz Au (2017)
-Mill averaged 2,086 tonnes/day (2017)
-Proven & Probable Reserves: 6.9 M tonnes @ 3.1 g Au/tonne, 401 g Ag/tonne, 8.1 % Zn, 3.0 % Pb (Jan. 2017)
-Exploration drilling: Deep 200 South, East Ore, Gallagher, and Upper Plate zones
-Woodgrove staged-floatation reactor improving Pb floatation circuit output
Sediment-hosted Zn-Pb-Ag deposits

- Projected 525,000 to 550,000 tonnes Zn (2017)
- Projected ~115,000 tonnes Pb (2017)
- Total Reserves: 50.9 M tonnes @ 15.0% Zn, 4.2% Pb, 76 g of Ag/tonne (Dec. 2016)

Currently mining Qanaiyaq and Aqqaluk

Red Dog Mine [Teck]

[Teck] https://www.teck.com/
2017 Exploration Drilling:

- **Mines:** Minimum of 50,000 m (very incomplete data)
- **Development/Advanced Exploration:** ~16,769 m
- **Early to Mid-Stage Exploration:** ~52,871 m
- **Total:** Minimum of 102,924 m

2017 Exploration Expenditures:

- **Mines:** Minimum of US$18,000,000 (very incomplete data)
- **Development/Advanced Exploration:** ~US$32,192,170
- **Early to Mid-Stage Exploration:** ~US$38,966,002
- **Total:** Minimum ~US$94.1 million (2017)
2017 Development & Advanced Exploration Projects

- Pebble
- Arctic & Bornite
- Graphite Creek
- Livengood
- Donlin Gold
Donlin Gold (Development project) [50% Barrick Gold Corp./50% NovaGold Resources Inc.]

- Proven and Probable reserves: 34 million oz. of gold
- Projected production of 1.1 M oz. of Au/year
- In 2017, US$8 million drill program (24 holes; 7,620 m) for project-economics optimization

- Corps of Engineers completed preliminary final EIS internal review in Sept.; scheduled for filing in 2018; COE’s Record of Decision soon after
- Most key State permits/approvals scheduled to be finalized concurrently with ROD

Open pit outline and gold-in-soils showing additional potential

http://www.novagold.com/investors/presentations/
Pebble Porphyry Cu-Mo-Au (Development project) [The Pebble Partnership]

- Jan. 6, 2018: Corps of Engineers accepted Pebble Limited Partnership’s permit application
- Initiated NEPA review process

**New proposed development plans:**
- Address stakeholder concerns
- Footprint <1/2 of prior envisioned size
- Single drainage for major site infrastructure
- Tailings storage facility designed for maximum safety
- Separation of potentially acid generating tailings from non-acid generating; fully lined tailings storage facility
- No permanent waste-rock piles or cyanide usage

**Proposed open-pit mine:**
~600,000 tons of Cu-Au concentrate/year (~287 M lbs. Cu, ~321,000 oz Au, 1.6 M oz Ag)
~15,000 tons of Mo concentrate/year (~13 M lbs. Mo)
Ambler Mining District Industrial Access Project [AIDEA]

Ambler Mining District Industrial Access Road

State Land with Mineral Potential

Arctic

Bornite

Carbonate-hosted Cu

VMS Belt

http://www.ambleraccess.com/
**Arctic VMS [Trilogy Metals Inc./South32 Limited]**

- Trilogy Metals – South32 Limited agreement
- Resource update: in-pit indicated 36.0 M tonnes @ 3.07% Cu, 4.23% Zn, 0.73% Pb, 0.63 g of Au/tonne, 47.6 g of Ag/tonne
- 2.4 billion lbs. contained Cu, 3.4 billion lbs. contained Zn

**2017 program (US$7.1 million):**
- Geotechnical and in-fill drilling
- Metallurgy, infrastructure, environmental, geophysical studies
- Initiated PFS; complete 2018; convert resources to reserves

**Resource Update:**
- Indicated 36.0 M tonnes @ 3.07% Cu, 4.23% Zn, 0.73% Pb, 0.63 g of Au/tonne, 47.6 g of Ag/tonne
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Bornite [Trilogy Metals Inc./South32 Limited]

2017 program:
-US$10 million budget; funded by South32 Limited
-9 holes; total 8,437 m; and, soil sampling
-Targeted high-grade carbonate-hosted copper mineralization north and east of previously identified resources
-Gravity; 3D inversion
-Doubled Bornite’s footprint to 1,500 m x 2,500 m

2018 program:
-~US$10 million budget; seismic; in-fill + expansion drilling
Graphite Creek [Graphite One Resources]

- USA's largest, large-flake graphite deposit
- 10.3 M tonnes indicated, 71.2 M tonnes inferred, both @ 6% Cg cut-off

Inaugural PEA Overview:
- Open-pit: 1.11 M tonnes graphite-bearing material/year
- Local mineral processing plant for extraction/recovery of graphite
- 60,000 tonnes of concentrate/year grading 95% carbon as graphite
- Transport concentrate to port of Nome
- Barge concentrate to product-manufacturing plant for:
  1) Thermal purification,
  2) mechanical-chemical processing (spheronization),
  3) classification,
  4) coating of spherical graphite, and
  5) heat treatment

Produce:
- 41,850 tonnes of high-grade coated spherical graphite/year for lithium-ion battery applications
- 13,500 tonnes of refined, sub-20-micron graphite powder/year for various end-uses.

http://www.graphiteoneresources.com/
Livengood [International Tower Hill Mines]

Intrusion-related gold system

2017 Initial PFS:
- Proven and Probable reserves: 391.7 M tonnes @ average grade of 0.71 g of Au/tonne (8.97 M oz. Au)

2017 program:
- Finalized purchase of mining claims
- US$6.3 million work program
- Implementing PFS’s recommendations:
  - Metallurgical testing
  - Assay ~20,000 prior drilling pulps for multi-elements (Sb)
  - Improve mineralization + alteration models
2017 Exploration Drilling Highlights

Aktigiruq
$16 M (US)

Round Top

Golden Zone

Pyramid

Shumagin

Golden Summit & Shorty Creek

Tetlin
$11.8 M (US)

Palmer
$7 M (US)

Herbert Gold

Zackly

Golden Zone

Base Metal
Polymetallic
Gold
Porphyry Cu-Au-Mo
U/Th, REE
Sn, Ta, Nb
Other
Coal
Cr, Ni-Cu, PGE
Fe, Ti (Au, Cu)
Hg, Sb
Aktigiruq Zn-Pb-Ag [Teck]

Sediment-hosted massive sulfide deposit 12 km NW of Red Dog Mine

Anarraaq: inferred 26 M tonnes @ 13.8% Zn, 4.3% Pb, 84.3 g of Ag/tonne

2017 Aktigiruq drilling program (US$16 million):
- 18,000 m in 16-20 planned holes
- Ore body is 400 to 1,000 m below surface
- 2016 drilling encountered 54.6 m @ 16.8% Zn, 3.63% Pb (DDH1737)

Figures courtesy of Teck Alaska

https://www.teck.com/
Tetlin Cu-Au Skarn [Peak Gold, LLC; JV between Contango Ore Inc./Royal Gold Inc.]

- Road-accessible, Au- and Cu-rich skarns (70 Ma)

2017 program (US$11.8 million):
- Alaska’s second-largest exploration program
- Drilling: total 15,000 m;
  Phase 1 = 47 DDH’s (N. Peak + True Blue Moon)
  Phase 2 = 41 DDH’s (N. & W. Peak + Main Peak)
  Phase 3 = 8 DDH’s (W. Peak)
- Measured, Indicated, and Inferred resource:
  1.5 M oz. Au, 7.38 M oz. Ag, 55 M lbs. Cu (June 2017)
- Stream-sediment sampling at Noah prospect, west of Tetlin property.

Gold in soils over magnetic survey
Figure courtesy of Peak Gold, LLC
Palmer VMS District

[Constantine Metal Resources Ltd. (51%) & Dowa Metals & Mining Alaska Ltd. (49%)]

http://www.constantinemetals.com/projects/palmer/

Long-section map of South Wall and RW Zone resources, Palmer deposit

Cross-section of South Wall, Palmer deposit
Palmer VMS District
[Constantine Metal Resources Ltd. (51%) & Dowa Metals & Mining Alaska Ltd. (49%)]

Nunatak Prospect (AG Zone) plan map: First drill hole [CMR17-89] intersected 9.2 m of massive barite-sulfide; 312 g of Ag/tonne, 0.9 g of Au/tonne]

AG Zone x-section and drill holes
Alaska Range Project:  
- Sediment-hosted Caribou Dome deposit and Senator prospect  
- Zackly Cu-Au skarn deposit; Moonwalk Au target  
- Jupiter, Mars, and Gemini porphyry Cu-Au-Mo targets

2017 Caribou Dome work:  
- JORC-compliant, resource estimate: 2.8 M tonnes @ 3.1% Cu; 
  ~86,000 tonnes Cu  
- Geological & structural mapping of outcrops and core

Caribou Dome:  
CD15-14 L7/8 >16% Cu

-Senator: Geochemical sampling, IP survey, mapping  
-Mars: IP surveying
Zackly Cu-Au skarn (+porphyry?) [PolarX Ltd.]

- Historical, non-NI43-101-compliant resource of 1.54 M tonnes grading 4.5 g of Au/tonne (218,944 ounces); 2.9% Cu (66.9 M pounds)

2017 program:
- Upgrade to JORC-compliant resource
- 13 holes; 2,050 m
Round Top Porphyry Cu [Western Alaska Copper and Gold]

Porphyry Cu + skarn + Pb-Zn-Ag-Au carbonate-replacement
~1 km x 1 km area: supergene chalcocite grading down into primary Cu

2017 program:
- 9 holes, 2,170m
- Hole RT-18: 3 intervals for 64.7 m @ 0.49% Cu
- Hole RT-19: 7 intervals for 166 m @ 0.43% Cu
- Discovered new area with hypogene sulfides

Magnetic susceptibility model: Existing (gray); planned 2018 DDH's (red)

Geologic map showing location of 9 drill holes (green dots):
Quartz monzonite porphyry (pink); fragmental quartz latite (purple)

Chalcocite & covellite in core

6-cm-wide quartz + chalcopyrite + pyrite vein offset by later-stage vertical pyrite vein
SHORTY CREEK: Porphyritic intrusions associated with Cu-Au & Cu-Mo
2017 program:
- 7 holes; 2,768 m

Hill 1835:
- Vertical step-out holes, 100 m and 200 m SW of 2016 drilling
- Hole SC17-01: 360 m, 0.24% Cu, 4.04 g Ag/tonne, 100 ppm Co, 0.03% WO3

Steel Creek:
- Initial drilling of magnetic high

GOLDEN SUMMIT:
Intrusion-related gold
Resources:
- Indicated 61.5 M tonnes
- Inferred 71.5 M tonnes
- Both @ 0.02 opt Au

2017 program:
- 27 holes; 1,890 m
- IP survey
- Expanded resource
Herbert Gold [Grand Portage Resources]

Mesothermal Au-quartz veins along trend and SE of Kensington Mine

Resources:
- Indicated: 821,079 tonnes @ 6.91 g of Au/tonne (182,400 oz.)
- Inferred: 51,611 tonnes @ 7.73 g of Au/tonne (12,800 oz.)

2017 Work:
- 12 holes; 3,700 m
- Parallel sets of quartz veins with disseminated arsenopyrite, pyrite, galena, sphalerite, and visible gold

Goat Vein:
- 8 DDH; 1,952 m; discovered subsidiary veins in hanging wall and foot wall
- 6.3 m w/weighted-average of 7.31 g of Au/tonne

Main & Deep Trench Veins:
- 4DDH; 1,757 m; discovered subsidiary veins with Au
- 5.06 m w/weighted-average of 2.83 g of Au/tonne
**Unga Epithermal Au-Ag**  [Redstar Gold Corp.]

**Spring 2017:**
- Mapping, rock and soil geochemical sampling
- Ground IP & magnetic surveys defined multiple blind structures; extended Shumagin Fault 600 m to SW
- 12 holes; 2,288 m; SW Extension Zone
- Hole 17-SH-34 intersected 2.2 m of 9.9 g of Au/tonne; 29.3 g of Ag/tonne

**Fall 2017:**
- 11 holes; 2,407 m; NE of Main Zone, Bunker Hill, & East Zone (Shumagin Zone)
- 2 holes; 233.9 m; Rising Sun (Apollo area)

**Outcome:**
- ↑ known strike length of Shumagin structure by 84% to 1,750 m
- Colloform textures = active boiling and mineral deposition = indicate proximity to precious-metal deposition zones
Pyramid Porphyry Cu-Mo-Au Deposit
[Copperbank Resources Corp.]

**Historical inferred resource:** 122 M tonnes at 0.41% Cu (1.3 B lbs.), 0.02% Mo (74 M lbs.), & 0.10 g/tonne Au (0.5 M ounces)

**2017 Work:**
- 13 holes, 3,690 m; test lateral extents of known mineralization + step outs
- DDH 17PY035: total 251 m with weighted-average grade 0.41% Cu over two intervals (137 m of 0.45% Cu and 114 m of 0.37% Cu)
- DDH 17PY036: 179.5 m of 0.37% Cu

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2017 Drill Holes shown in yellow
Golden Zone [Avidian Gold]

Resource (2016):
Indicated: 4.187 M tonnes @ 1.99 g of Au/tonne, 10.38 g of Ag/tonne

Breccia pipe (150 m by 80 m) in core of Cretaceous porphyry stock with arsenopyrite-chalcopyrite-pyrite

2017 work:
-11 holes, 2,579 m
-Intercepted 96 m @ 0.53 g of Au/tonne outside breccia pipe & current resource in BLT Zone
-43 line km of IP surveying
-970 grab & channel samples
-Trenching

-Sampling in Golden Zone and Long Creek Corridors defined an area with anomalous (>1 g of Au/tonne) over 8-km strike & >2 km width