### Alaska's Mineral Industry in 2019: Mines, Development, & Exploration

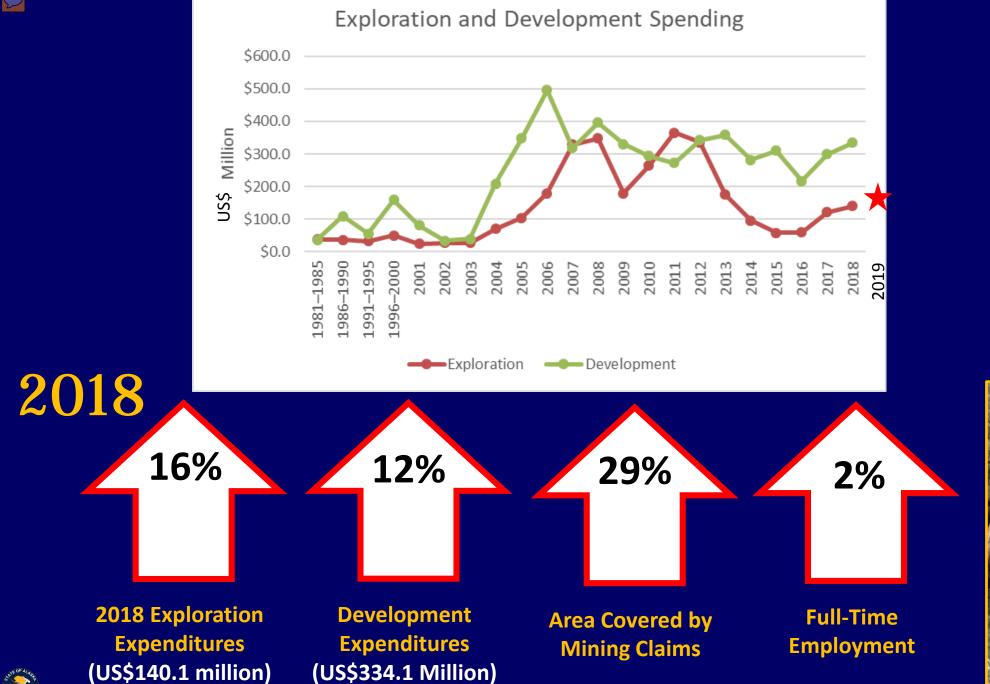


Melanie Werdon– Alaska Division of Geological & Geophysical Surveys www.dggs.alaska.gov – melanie.werdon@alaska.gov Mineral Exploration Roundup – Vancouver, BC Canada – January 20, 2020 8-millionth-ounce gold pour Fort Knox mine (photo credit: North of 60 Mining News)

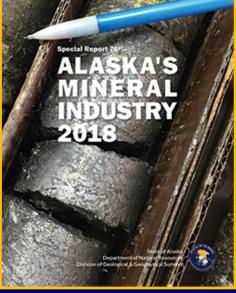








# 2019 7% **2019 Exploration Expenditures** (~US\$150 Million)

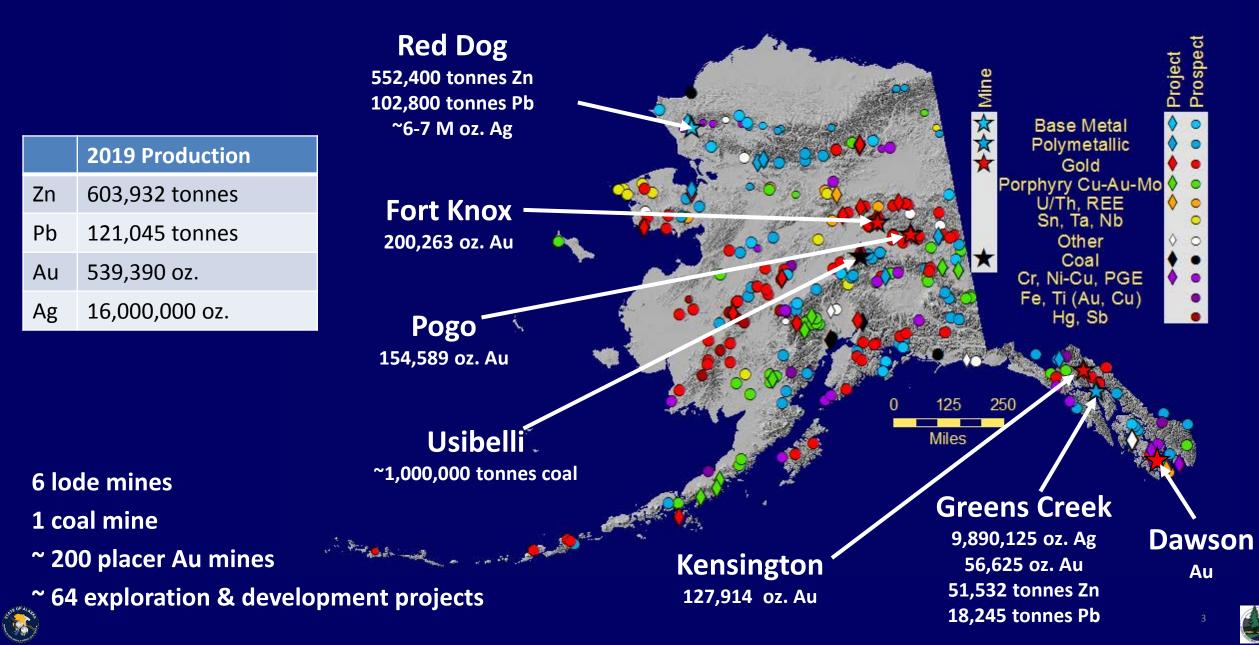






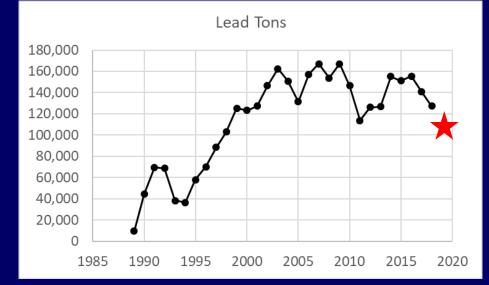


### **2019 Alaska Production**

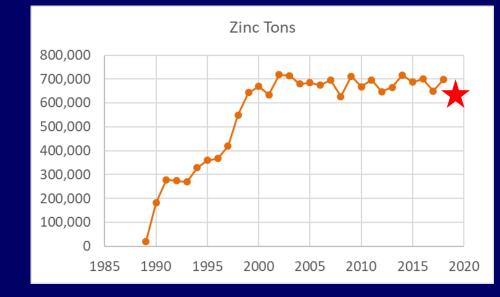


### **Mine Production Trends**



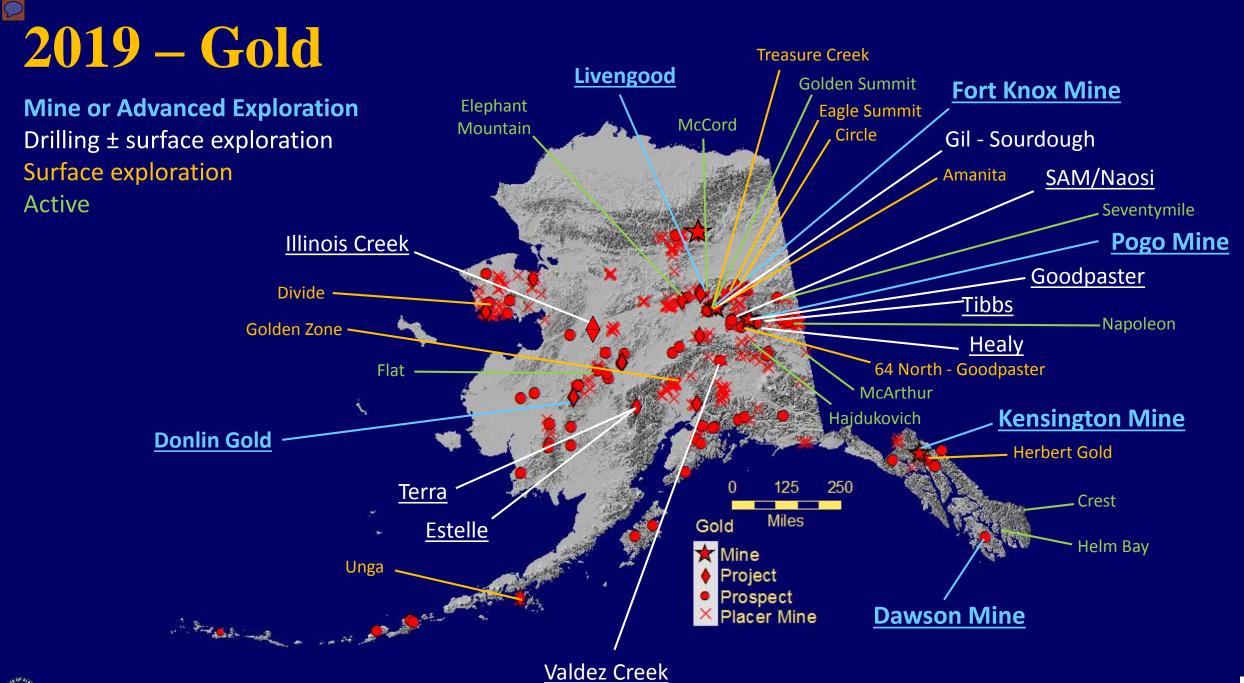








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## Kensington Mine [Coeur Alaska, Inc.]

-Underground mine: mesothermal-gold quartz-vein system

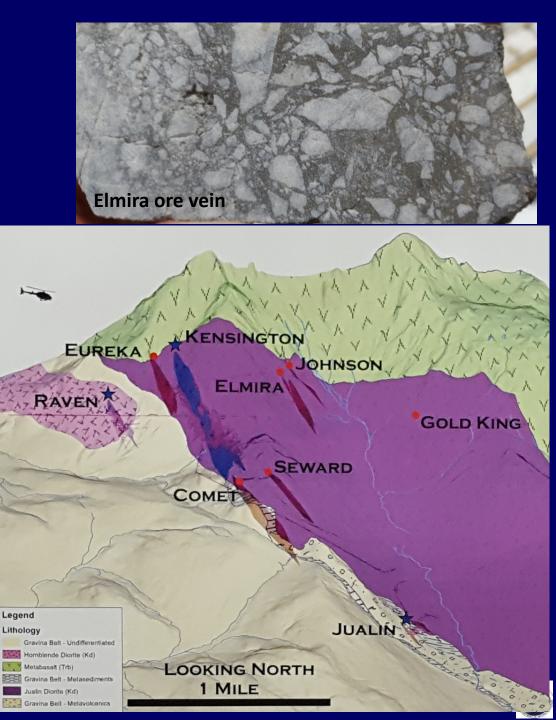
-2019 production: 127,914 oz. Au -Current mine life through 2022

Dec. 31, 2018	Million Tonnes	Au (g/T)	Au Ounces (million)
Reserves	2.345	7.29	0.552
Measured & Indicated	2.432	8.56	0.671
Inferred	0.644	9.49	0.161
Total	5.421	8.12	1.384

#### <u>Jualin</u>:

at the OF AL as a

- -First production Dec. 2018
- -~15% of Kensington's Au production in 2019 -Driving improved cash flow and lower costs
- -Exploration drilling:
  - -Elmira vein: 1.1 m @ 150.7 g/T Au -Eureka vein: 4.7 m @ 11.7 g/T Au -Johnson vein: 0.8 m @ 72.7 g/T Au



### Dawson Mine [Sundance Mining Group LLC] Alaska's new lode mine

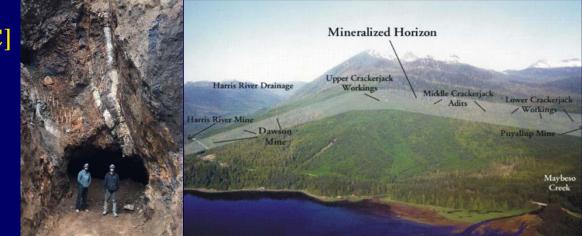
-Historical production throughout area
-Initiated production in April 2019
-Block-and-pillar underground mine
-Mill 150 short tons/day
-2019 production not reported; ~30,000 oz. Au (est.)

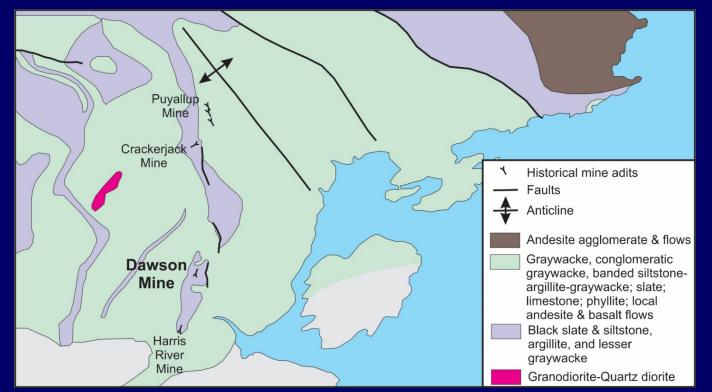
-2.4-km-long, north-south-oriented, orogenic gold vein-fault system; typical 34 g/T Au, 68 g/T Ag
-Veins located just off crest of anticline in Descon Formation

-Development is on Humboldt vein system -Vein thickness: 0.6 m to 1.2 m (up to 1.8 m)

-Pyrite, galena, sphalerite, chalcopyrite, ± bornite -Higher Au grades in pyrite/base-metal-rich areas







Geologic map of Dawson mine area showing historical mine adits (Herreid and Rose, 1966)

### **Fort Knox Mine** [Kinross Gold corporation]

Open-pit gold mine; intrusion hosted

-8 millionth ounce of gold poured Oct. 9, 2019 -2019 Production: 200,263 oz. Au

#### **Gilmore expansion:**

-Added 2.4 M oz. Au to resource; IRR 17%
-Initial production in late 2019
-Extends mine life through 2027
-2019-2027 production: ~245,000 oz. Au/year

#### **Barnes Creek Heap Leach:**

-New 172.4-M-tonne-capacity heap leach pad -Finished liner in 2019; leaching through 2027

Dec. 31, 2018	Million Tonnes	Au g/T	Ounces (million)
Reserves	267.6	0.4	3.036
Measured & Indicated	155.7	0.4	1.797
Inferred	88.7	0.3	0.808
Total	512.0	0.36	5.641



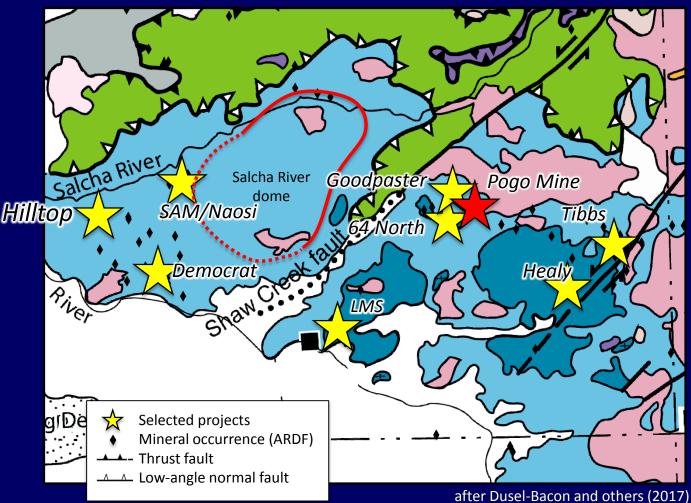
(photo credit: North of 60 Mining News)



### Pogo Area Regional Geology

RE OF ALAG

Legend	Cretaceous intrusions Seventymile (oceanic rocks) Butte Assemblage (greenschist grade)		Prizer Sta	at cot
	Blackshell, Dan Ck. (carbonaceous units)			<b>`</b> ]
	Lake George Assembl (amphibolite grade)	age	GIDe ☆ Selected projec Mineral occurre → Thrust fault	
(	Generalized Tim	eline:	Low-angle norr	
Pro	Devonian- Mississippian otolith deposition	Jurassic Peak metamorphism	Early Cretaceous extension, exhumation, metamorphic cooling	~ 105 Ma Magmatisr <mark>Pogo</mark>



~ 90 Ma

Magmatism

Ft Knox



~ 55 Ma

Extensional

magmatism

# Pogo Mine [Northern Star Resources Limited]

-Underground, shear zone/quartz vein-hosted gold mine

<u>2019 Production</u>: 154,589 oz Au -Guidance (through June 2020) = 200,000 to 240,000 oz. Au/year

#### Accomplishments:

-Since acquiring Pogo mine in Q3 2018, reduced AISC/T by 29%
-New mining fleet significantly improving tonnage productivity
-Development rates increased 76% since March 2019
-Transitioning to longhole stoping; goal 60% of ore tonnes by 2020

#### 2019 Mine Drilling:

Underground reserve definition & extension drilling: -All Liese Vein systems (L1, L2, L3), North Zone, X-Vein, South Pogo,

& Fun Zone areas

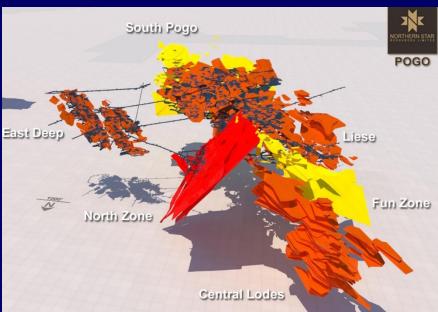
-Excellent intersections from extensions to all known vein systems

#### Plans through 2021:

-Expand processing plant from ~1M T/year to 1.3 M T/year (US\$30 M)



June 30, 2019	Million Tonnes	Au g/T	Ounces (million)
Reserve	6.103	7.5	1.472
Resource	13.225	10.57	4.477
Total	19.328	9.6	5.949



#### Underground ore shells at Pogo mine

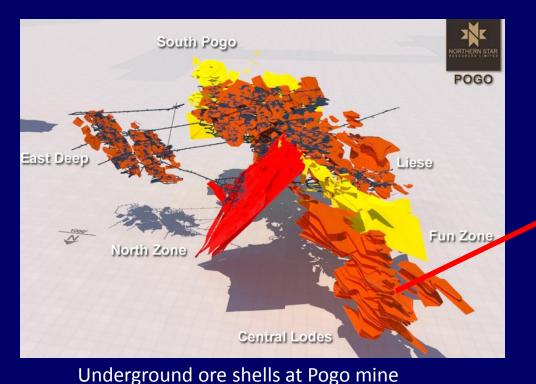


# Pogo Exploration [Northern Star Resources Limited]

#### 2019 Goodpaster Veins Exploration:

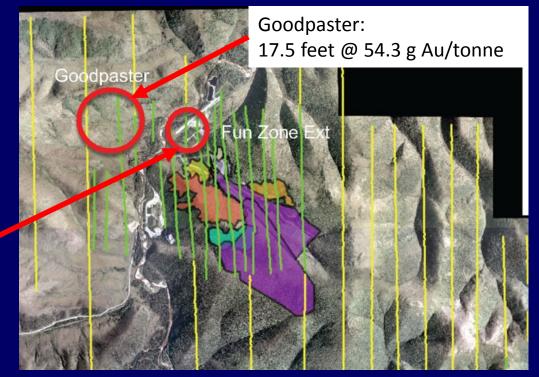
- -4 drill rigs for surface exploration
- -Select 3Q exploration drilling results:
  - 4.0 m at 67.5 g/T Au
  - 5.2 m at 15.7 g/T
  - 8.9 m at 5.0 g/T

#### -2.3 km strike, 500 m depth, open in all directions -Series of stacked, flat- & steeply-dipping veins



#### 2019 Goodpaster Intercepts (true widths):

-DDH19-073: 0.5 m at 44.1 g/T Au; 1.1 m at 23.0 g/T Au -DDH19-085: 0.9 m at 15.7 g/T Au; 1.4 m at 19.3 g/T Au -DDH19-087: 0.2 m at <u>588.7 g/T Au</u>; 4.5 m at 21.0 g/T Au -DDH19-086: 0.3 m at 24.9 g/T Au -DDH19-091: 1.0 m at 11.4 g/T Au

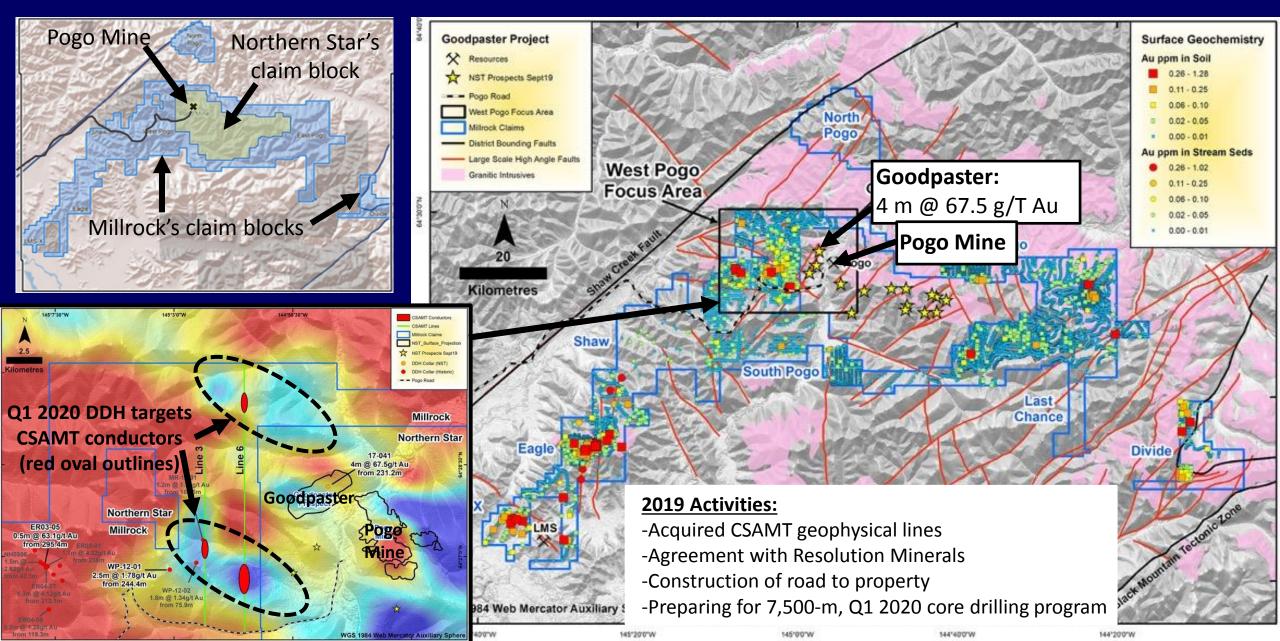


North-South CSAMT lines over Pogo area, and newly discovered Goodpaster & Central vein systems (circled in red)





### 64 North – Goodpaster [Millrock Resources Inc./Resolution Minerals Ltd.]



# SAM / Naosi / MON [Sam Alaska, LLC/Great American Mineral Exploration, Inc.]

#### Naosi (pit-constrained, sulfide + oxide, draft resource):

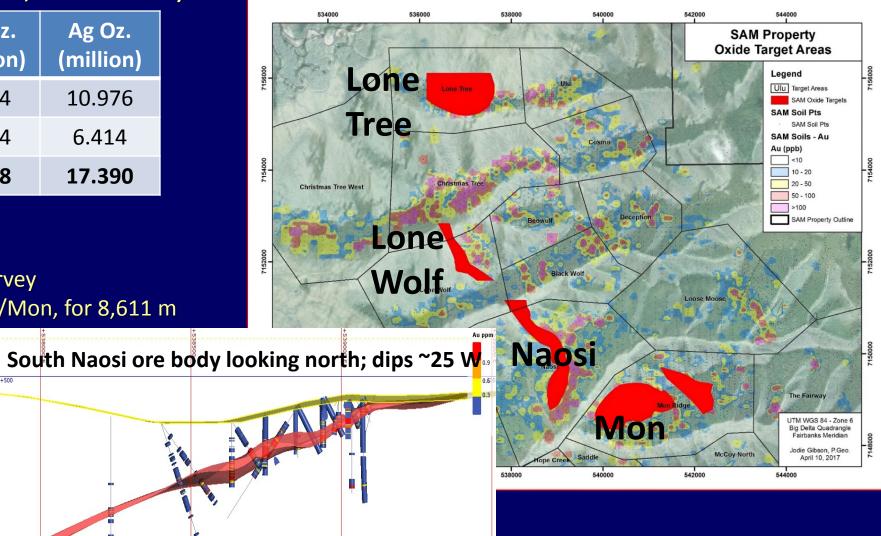
Dec. 2019	Million Tonnes	Au Oz. (million)	Ag Oz. (million)
Indicated	8.144	0.844	10.976
Inferred	10.398	0.524	6.414
Total	18.542	1.368	17.390

#### 2019 Program:

- -1,572 line-km airborne magnetic survey
- -72 HQ core & 10 RAB holes at Naosi/Mon, for 8,611 m

North section +9149084.25

- -10 HQ core, 514 m at East Mon -DDH NA19-146:
  - -8.8 m at 16.76 g/T Au
- -Low-angle, gold-bearing veins /breccias
- -High-angle, higher-grade zones





# Tibbs [Tectonic Metals Inc.]

-At least 21 targets; 35 km east of Pogo mine
-Au-As-Sb-Bi-W signature
-Historical lode Au production in 3 locations
-Gold in intrusive & metamorphic rocks
-Controlled by district-scale, NE-trending, Black Mountain Tectonic Zone

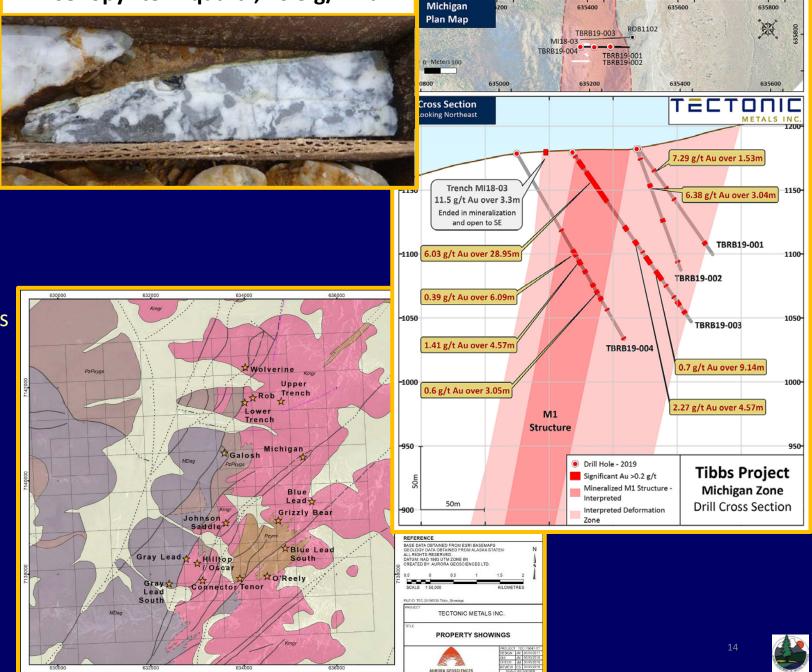
-High-grade, near-surface gold in:
-high-angle quartz-arsenopyrite veins
-sheeted to stockwork quartz-sulfide veins
-sericite alteration

#### 2019 Program:

-Guided by 2017/2018 DIGHEM geophysical survey; heli-portable excavator trenching
-2,184-m Rotary Air Blast (RAB) drilling
-Tested 9 priority targets
-Michigan Zone: 6.03 g/T Au over 28.95 m
-Discoveries:

Upper Trench & Hilltop/Oscar Zones

#### Arsenopyrite in quartz; 10.5 g/T Au



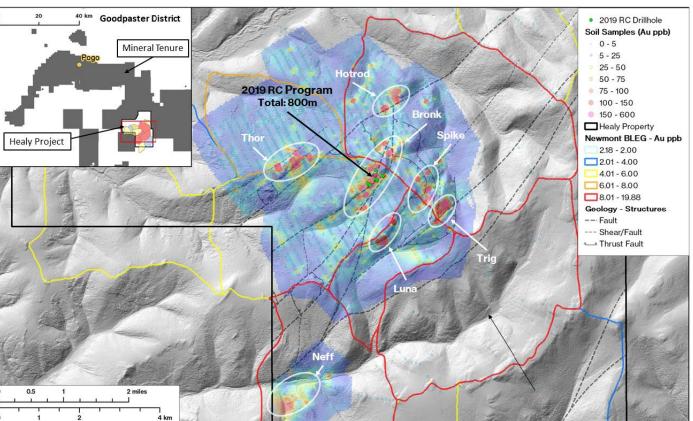
# Healy [Northway Resources Corp./optioned from Newmont GoldCorp]

-Greenfields Au-As-Sb property SE of Pogo mine
-Prospective regional contact between intrusions & metasedimentary units
-Major NE-trending high-angle fault system
-Au spatially associated with both steeply dipping

& low-angle fault zones



Track-mounted RC rig tests Bronk target Au-in-soil anomaly (Photo credit: North of 60 Mining News)



#### 2019 Program:

-Focused on Bronk prospect; 1 of 7 Au-in-soil targets
-10 reverse-circulation holes, total 800 m
-HRC19-01 intersected 53.4 m @ 0.35 g/T Au
-HRC19-02 intersected 49.4 m @ 0.42 g/T Au



# Livengood [International Tower Hill Mines]

-Metasediment-hosted, intrusion-related gold system -Easy access to road and power

April 2017	Million Tonnes	Au g/T	Ounces (million)
Proven/Probable	392	0.71	8.9
Measured, Indicated & Inferred***	578	0.68	12.6

\*\*\*Inclusive of reserves

#### 2017 Initial PFS: -6.8 M oz of Au produced over 23-year mine life

2019 program (US\$3.7 M): -Metallurgical studies: -Evaluate optimum grind size -Evaluate multi-recovery parameters -Define & refine project flow sheet -Ongoing environmental studies





#### Aerial view looking southeast at Livengood Gold Deposit



Drilling atop the Money Knob area of the Livengood Proje



# Donlin Gold (Development stage) [50% Barrick Gold Corp./50% NovaGold Resources Inc.]

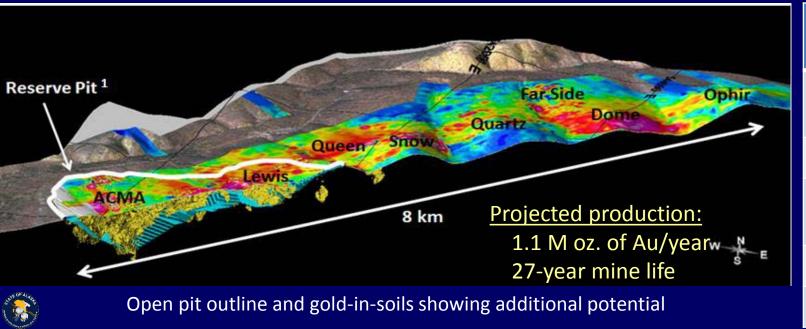
#### 2019 Milestones:

-Advancing State permits; completed federal permitting in 2018 -Incorporated 2017 drill results into geologic/resource models

#### 2019 Program (US\$26 M):

-State permitting, including Dam Safety Certification -Geotechnical drilling of tailing storage & water dam areas -Updating 2011 feasibility study to reflect optimized development plan





Jan. 2012	Million Tonnes	Au (g/T)	Ounces (million)		
Proven & Probable	504.8	2.09	33.849		
<b>Resources, inclusive of reserves</b> *					
Measured & Indicated*	541.3	2.24	39.0		
Inferred	92.2	2.02	5.99		
Total	633.6	2.21	45.0		

### Estelle [Nova Minerals Limited]

-Cretaceous intrusion-related Au system -Maiden inferred resource of 2.5 M ounces of Au

<b>Sept 2019</b>	Million	Au g/T	Ounces
0.18 g/T CO	Tonnes		(million)
Inferred	181.29	0.43	2.5

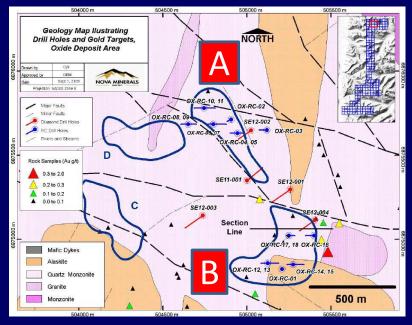
#### 2019 Program (US\$1.39M):

- -18 RC holes (1,367 m) @ Targets A & B, Korbel Oxide deposit area -Resampled 3 historical core holes; 1 hole from RPM prospect yielded 177.4 m @ 0.79 g/T Au
- -Ground magnetometer survey @ Oxide deposit
- -3D magnetic, resistivity, & IP chargeability modeling/interpretation -Demonstrated 76% Au-leach recoveries at Korbel deposit

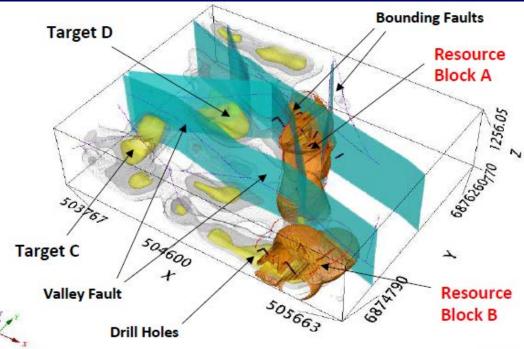




Gold-bearing sheeted quartz veins



#### Oxide deposit area geology and 3D geophysics modeling



### Terra [West Mountain Gold, Inc.]

Epithermal, banded multi-stage quartz veins with high-grade visible gold Primarily hosted within dioritic intrusive rocks

2019 Program:

-20 holes, total of 5,128 m
-13 holes, 3,510 m at Ben Zone
-7 holes, 1,618 m at Fish Zone
-Soil, rock, and continuous-chip samples from outcrops and magnetic-high anomalies identified in 2018 VLF-magnetic surveys

<u>Resource:</u> -1 million tons @ 0.446 opt Au -445,000 oz. Au







## Valdez Creek [Valdez Creek Mining and Exploration]

-Orogenic Au system

-Located along secondary fault splays off of crustal-scale thrust faults

#### 2019 Program:

-Drilled 3 holes, 1,163 m

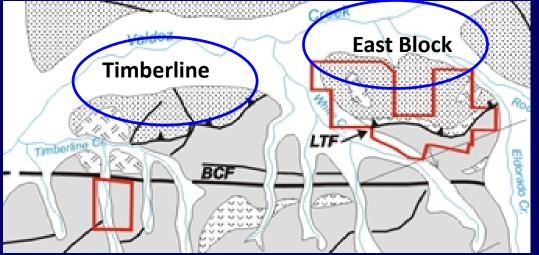
- -Oriented core indicates ore shoots hosted
  - in intersection lineations

-Exploration included:

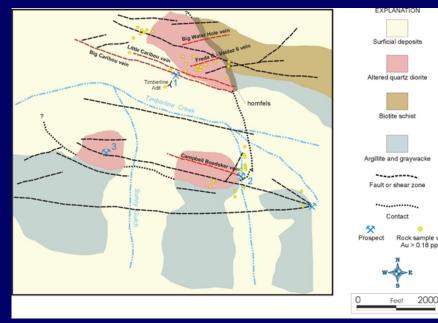
- -Mapped alteration in Timberline intrusion
- -Trench mapping & sampling, ground resistivity & IP surveys, geochemical sampling at Timberline Ridge & White Creek
- -1,200-sample soil grid over East Block



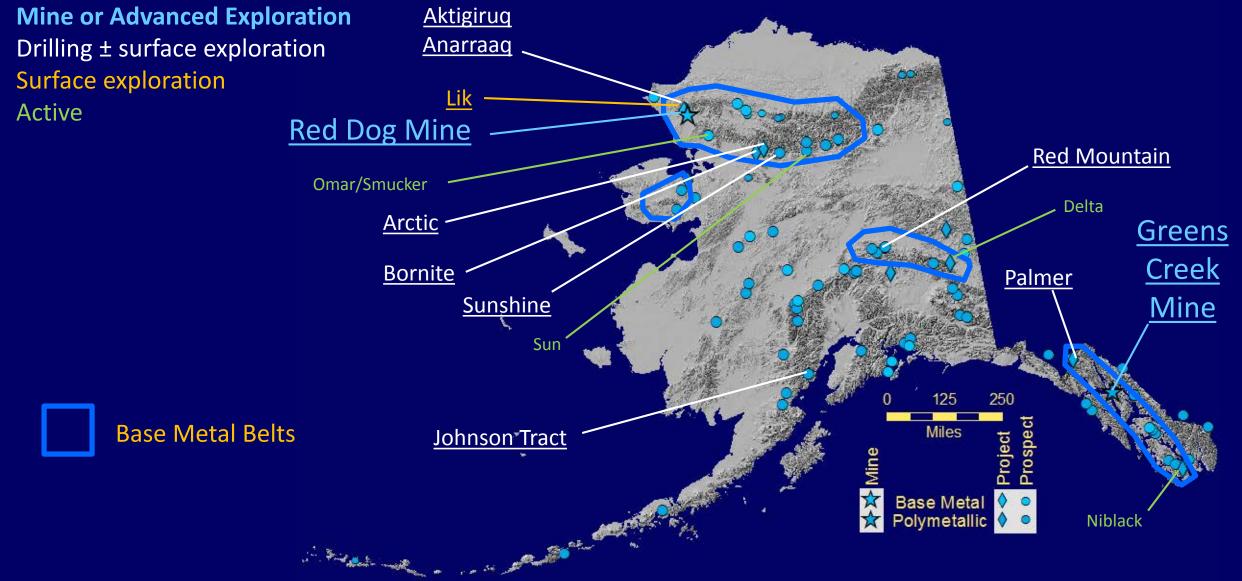




#### Location of 2019 exploration programs (outlined in blue)

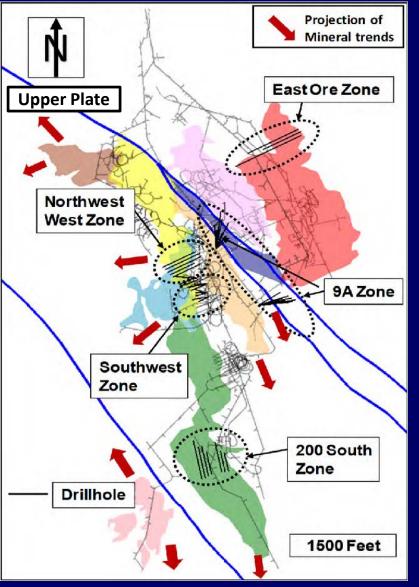


### **2019 – Base Metals & Polymetallic**





### Greens Creek VMS [Hecla Mining Co.]



First quarter 2019 drilling

2019 Production:

9.89 M oz. Ag; 56,625 oz. Au; 51,533 tonnes Zn, 18,245 tonnes Pb

-Expanding high-grade, near-surface resources at East Ore & Upper Plate Zones
-Drilling in the NWW, 200 South, SW, and 9A Zones
-Increasing revenues starting in 2019 & decreasing development costs over

next 4 years

Dec. 31, 2018	Million Tonnes	Zn %	Pb %	Au g/T	Ag g/T
Reserves	8.42	7.6	2.8	3.08	394
Measured & Indicated	6.77	8.2	3.1	3.42	445
Inferred	2.24	2.6	3.0	3.08	500
Total	17.43	7.2	2.9	3.21	427







## **Palmer VMS District** [Constantine Metal Resources Ltd. (51%) & Dowa Metals & Mining Alaska Ltd. (49%)]

Nov 2018

Indicated

Inferred

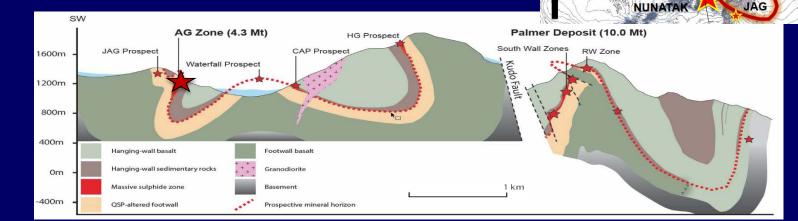
#### June 2019 PEA Highlights:

- -US\$354 M pre-tax NPV (7%)
- -US\$266 M after-tax NPV (7%)
- -21% post-tax IRR
- -11-year mine life after 24 months pre-production -3,500 T/day
- -US\$278 M pre-prod. development capital cost
- -Post-tax payback 3.3 years
- -LOM recovered metal: 1,068 M lbs Zn, 196 M lbs
- Cu, 18 M oz Ag, 91 K oz Au 2.89 M tonnes BaSO4

#### 2019 Program:

- -8 DDH's, 3,165 m
- -355-m step out testing extension of RW Zone yielded 4.6 m @ 0.52% Cu, 4.65% Zn, 27.7 g/T Ag,

0.20 g/T Au, & 43.7% BaSO4 -Step-out drilling at AG Zone -HG prospect geophysical anomaly test



#### VMS horizon (red line) & prospects (stars 🛧)

Total 10.1 1.21 5.21

**Cu %** 

1.49

0.96

Zn %

5.23

5.2

Ag g/T

30.8

29.2

29.9

WATERFALL

Au g/T

0.30

0.28

0.29

Million

Tonnes

4.7

5.3

Based on 108 DDH's totaling 44,900 m, \$75 NSR cutoff



Zn Eq %

11.67

9.9

10.72

South Wall

Resource

**Barite %** 

23.9

22.0

22.9

# Red Dog Mine [Teck]

Sediment-hosted Zn-Pb-Ag deposits; open-pit mine Began operation in 1989

#### 2019 Production:

552,400 tonnes Zn 102,800 tonnes Pb ~7 M oz. Ag

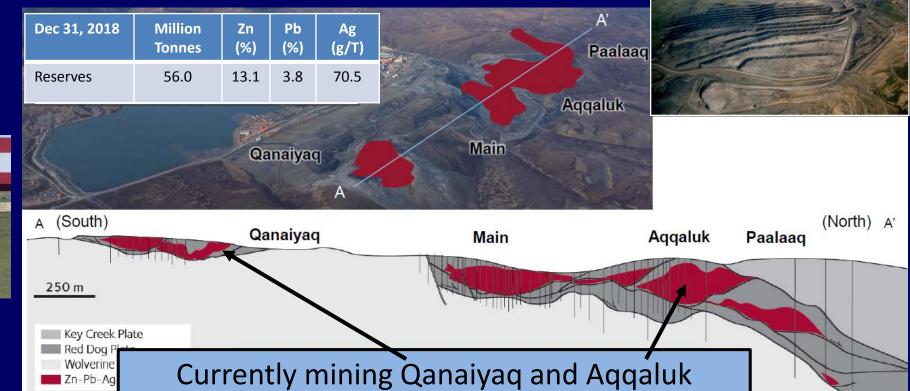
 -VIP2 mill-upgrade project is advancing to commissioning in 2020 & expected to improve throughput by ~15%



Red Dog port facilities and road



#### Red Dog mine facilities and tailings pond



### Aktigiruq/Anarraaq Zn-Pb-Ag [Teck]

Sediment-hosted massive sulfide deposits

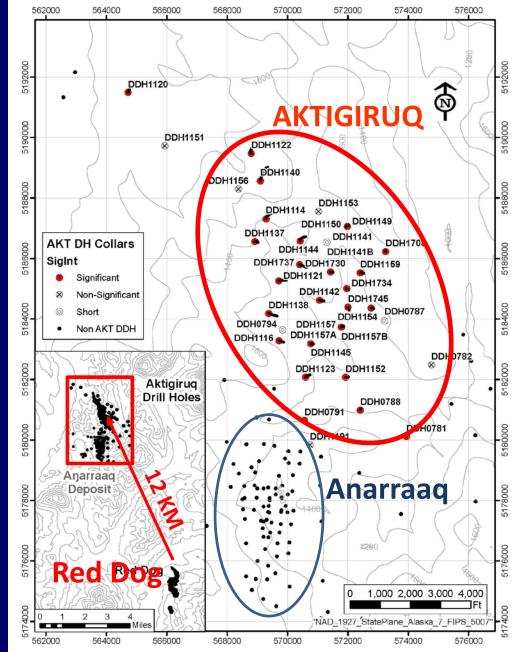
Anarraaq inferred resource (Dec 2016): 19.44 M T @ 14.4% Zn, 4.2% Pb, 73 g/T Ag Aktigiruq exploration target: 80-150 M tonnes @ 16-18% Zn+Pb

#### 2019 program (US\$1.246M):

-Resource-definition drilling; 18 holes, 6,821 m -Ground gravity, geologic mapping, geochemical sampling -Prior 2016 drill hole: 54.6 m @ 16.8% Zn, 3.63% Pb (DDH1737) -Applied for a permit to build road







# Lik (Su) Zn-Pb-Ag [Solitario Exploration & Royalty Co. & Teck Resources Ltd.]

Sediment-hosted massive sulfide deposit -New partnership; **Teck** taking exploration lead

#### 2014 PEA for Lik South:

-Open-pit mine, initial 9-year life

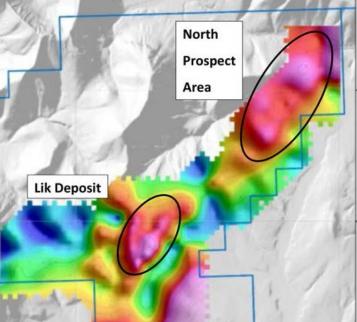
-Produce 234,000 tonnes Zn & 55,800 tonnes lead concentrates/year

-IRR = 9.7%; NPV(8%) of \$25.0 million

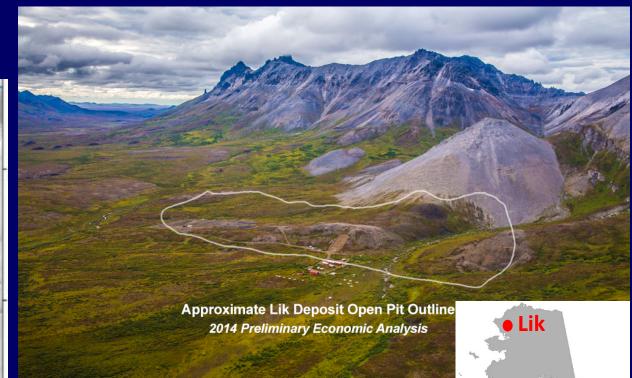
-Assumed constructed with no Red Dog infrastructure benefits -Doesn't include the adjacent Lik North deposit

#### 2019 work:

-Geologic mapping -Gravity surveying -Geochemical sampling at North Prospect -XRF & re-logged 20 select historical cores -Re-model Lik geology

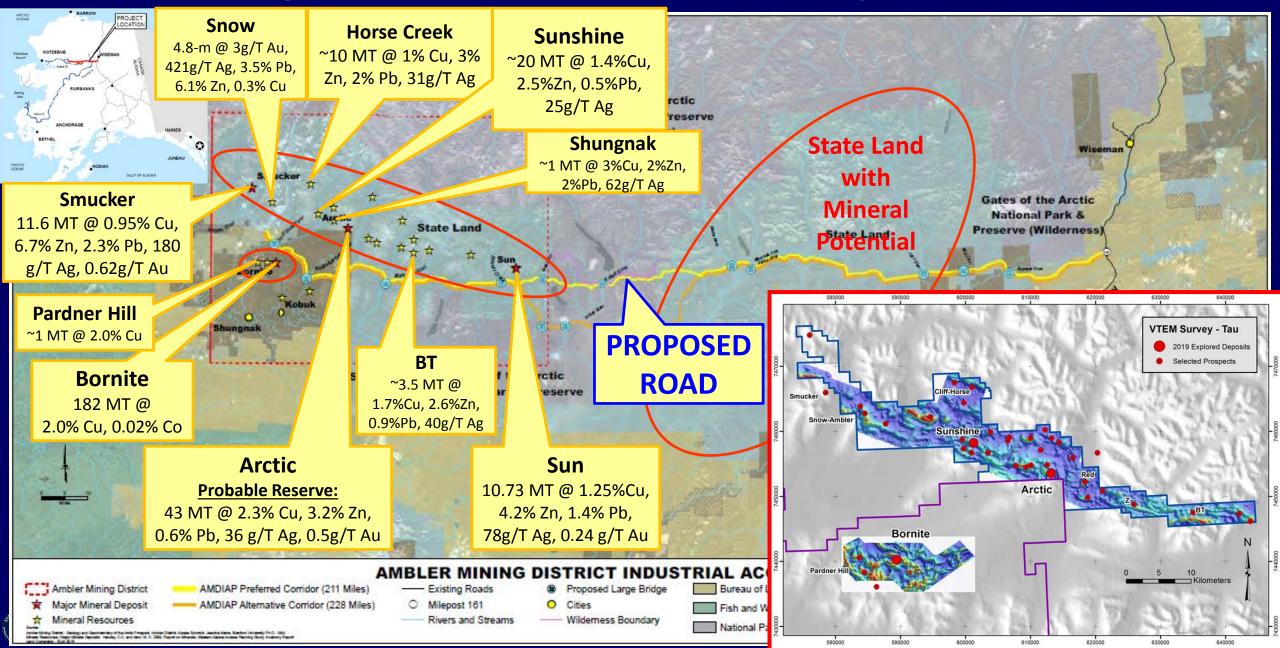


	Million Tonnes	Zn %	Pb %	Ag g/T
Indicated	17.3	8.0	2.7	51
Inferred	2.9	8.6	2.6	37
Total	20.2	8.1	2.7	49





### Ambler Mining District Industrial Access Project [AIDEA]



### Arctic VMS [Trilogy Metals Inc./South32 Limited]

#### PFS (April 2018):

-Ave. annual production: >159 M lbs. Cu, 199 M lbs. Zn, 33 M lbs. Pb, 30,600 oz. Au, 3.3 M oz. Ag

-12-year mine life

-Estimated after-tax payback within 2 years

-After-tax 33.0% IRR; \$1,412.7 million NPV at 8%

**Resources:** (based on 152 DDH; inclusive of reserves); plans for recalculation to JORC standards in 2020)

-	Million Tonnes	Cu %	Zn %	Pb %	Au g/T	Ag g/T
Probable	43	2.32	3.24	0.57	0.49	36.0

#### 2019 program (US\$7 M):

-11 holes, total 2,405 m

-Geotechnical & hydrological studies to support Feasibility Study

-Working with AIEDA to advance Ambler Mining District Industrial Access Road project; BLM completed Draft EIS.

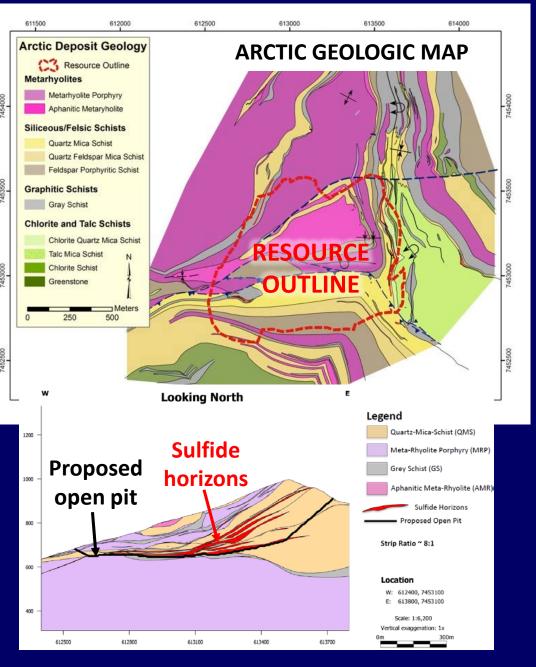
#### 2020 plans:

AL AS A LASA

-Complete feasibility study in 2Q 2020

-Final EIS expected in late 2019/early 2020

-Initiate permitting once receive BLM/USACOE Record of Decision regarding road



### Bornite Carbonate-Hosted Cu-Co [Trilogy Metals Inc./South32 Limited]

Stratabound "reefs" of Cu-Co mineralization

#### 2019 program (US\$9.2 M):

-10 holes; total 7,610 m

-Infill & exploration drilling to test VTEM, ZTEM, & gravity anomalies -RC19-0264: 18 mineralized intervals (1.5% Cu cut-off):

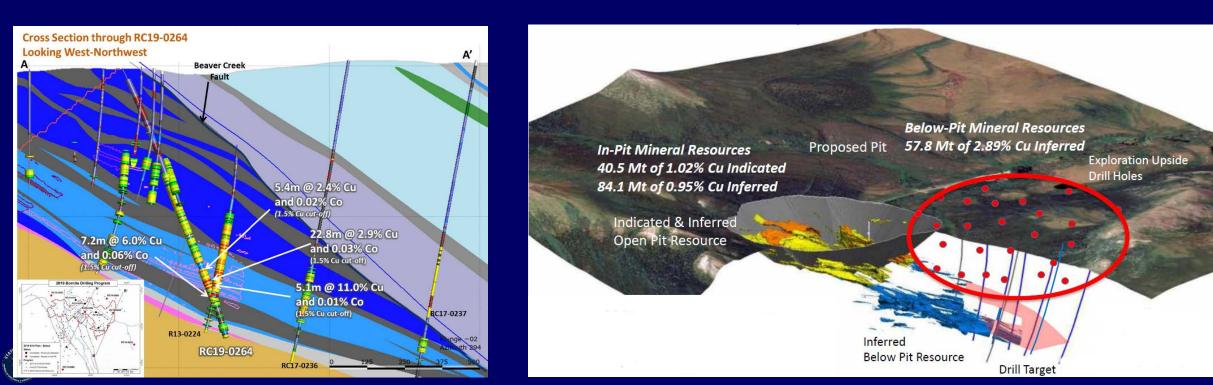
e.g., 22.8 m @ 2.86% Cu; 5.1 m @ 11.01% Cu; 7.2 m @ 5.98% Cu

#### <u>2020 events:</u>

-South 32 Limited decision regarding forming a 50/50 JV by Jan. 31, 2020

Oct. 2017 Cu July 2018 Co	Million Tonnes	Cu %	Со %
Indicated	40.5	1.02	
Inferred	141.9	1.74	0.019
Total	182.4	1.24	0.019

#### Contained metal: 6.363 B lbs. Cu; 77 M lbs. Co



### Sunshine VMS [Trilogy Metals Inc./South32 Limited]

Volcanogenic massive sulfide deposit in Ambler Mineral District 13 km west of Arctic VMS; same stratigraphy & massive/semi-massive sulfides

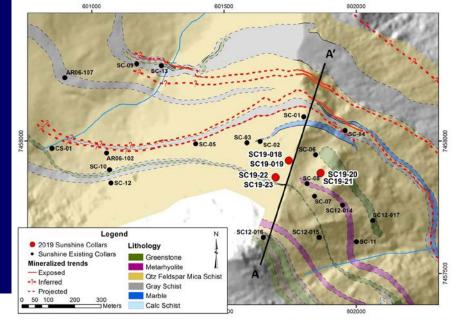
#### Historical resource: (Kennecott, 1997)

1997	Million Tonnes		Zn %	Pb %	Au g/T	Ag g/T
Inferred	20	1.4	2.5	0.5		23.75

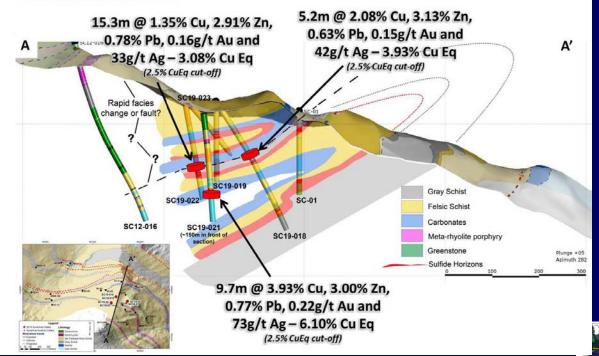
#### 2019 program (US\$2 M):

#### -6 holes; total 1,357 m

-Hole SC19-019: 5 mineralized intervals (1.5% Cu-eq. cut-off):
9.1 m @ 3.02% Cu, 1.42% Zn, 0.27% Pb, 0.14 g/T Au, 24.65 g/T Ag
3.3 m @ 1.68% Cu, 1.77% Zn, 0.47% Pb, 0.12 g/T Au, 27.57 g/T Ag
3.7 m @ 4.74% Cu, 0.97% Zn, 0.13% Pb, 0.15 g/T Au, 28.96 g/T Ag
3.0 m @ 0.75% Cu, 1.40% Zn, 0.35% Pb, 0.08 g/T Au, 21.02 g/T Ag
7.88 m @ 2.23% Cu, 5.62% Zn, 1.10% Pb, 0.18 g/T Au, 46.95 g/T Ag
-Additional drill hole assay results pending



#### Cross Section through SC19-018, SC19-021, & SC19-022 Looking West-Northwest





# Sun [Valhalla Metals Inc.]

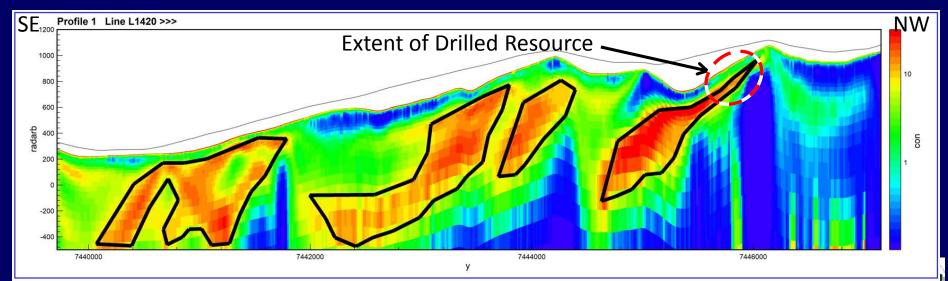
-VMS deposit in Ambler Mineral District-60 km east of Arctic VMS; same stratigraphy-5 km from proposed road route

#### NI 43-101 Resource:

June 1, 2018	Million Tonnes	Zn %	Cu %	Pb %	Ag g/T	Au g/T
Indicated	1.71	4.32	1.48	1.11	60.0	0.21
Inferred	9.01	4.18	1.21	1.46	81.7	0.25
Total	10.73	4.20	1.25	1.40	78.24	0.24

AdTau\_with SfX axis **VTEM Conductivity** Scale 1: 125000 660000 665000 670000 675000 680000

2019 Airborne VTEM survey: -Extent of drilled resource at Sun deposit extends to 200 m -Wider, stronger geophysical target extends 900 m further down-dip of the resource





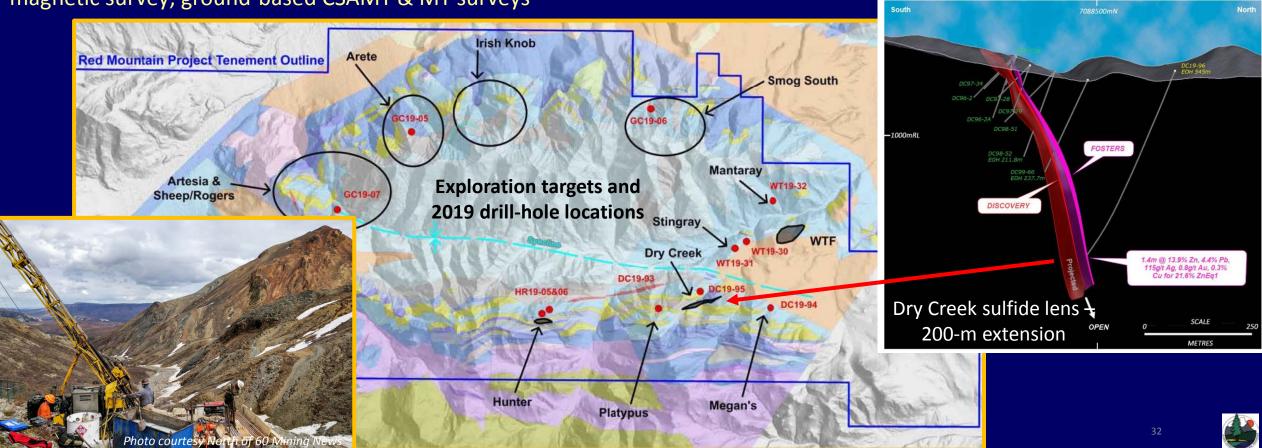
Contraction of the local division of the loc

### Red Mountain VMS District [White Rock Minerals Ltd./Sandfire Resources NL]

#### 2019 program (US\$ 5.4 M):

-12 holes; total 4,451 m; down-hole EM
-Drilled new targets & Dry Creek massive sulfide extensions
-Geologic mapping, hyperspectral data analysis
-3,128 soil & 388 rock chip geochemical analyses
-3,000 line-km, 500 sq.-km, SkyTEM airborne EM & magnetic survey; ground-based CSAMT & MT surveys

April 2017 3% Zn cut-off	Million Tonnes	Cu %	Zn %	Pb %	Ag g/T	Au g/T	Zn Eq %
Dry Creek Main	2.4	0.2	4.7	1.9	69	0.4	8.7
West Tundra Flats	6.7	0.1	6.2	2.8	189	1.1	14.4
Total Inferred	9.1	0.1	5.8	2.6	157	0.9	12.9



# Johnson Tract [HighGold Mining Inc.]

-Epithermal or VMS(?) district last explored 25 years ago -Historical drilling: 87 DDH's, 27,317 m total

Historical Resource: (Westmin, 1994)

	Million Tonnes	Cu %	Zn %	Pb %	Au g/T	Ag g/T
Inferred	~1	0.75	8.32	1.13	10.05	7.63

#### 2019 Program:

-9 holes, total 2,247 m Johnson Tract deposit

-Hole JT 19-085: 59.2 m @ 8.16 g/T Au, 5.9 g/T Ag, 0.39% Cu, 8.8% Zn, 0.72% Pb

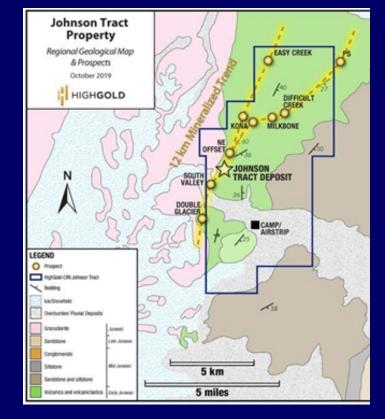
- -Re-sampled/assayed historical cores
- -Prospecting at regional targets & 1:5,000-scale mapping
- -201 rock-chip & 258 soil and silt samples

-Planned NI43-101-compliant resource estimate 1Q 2020





Historical DDH JT-83-012 – massive sphalerite



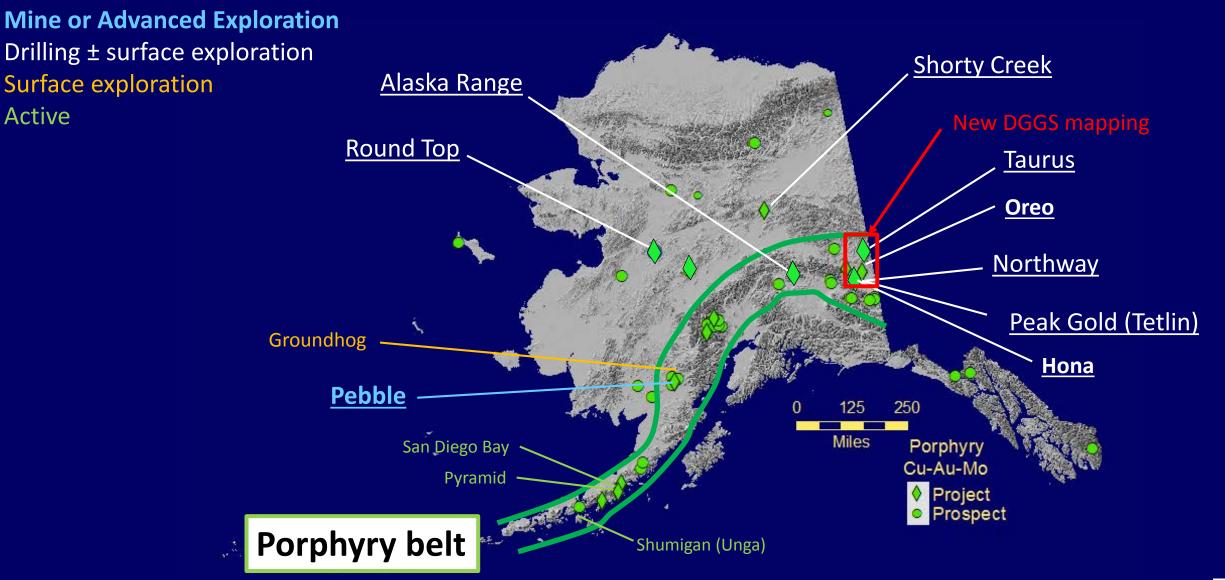


Quartz-sulfide banded vein textures

Laminated sphalerite-galena bands - brecciated



# 2019 – Porphyry + Skarn





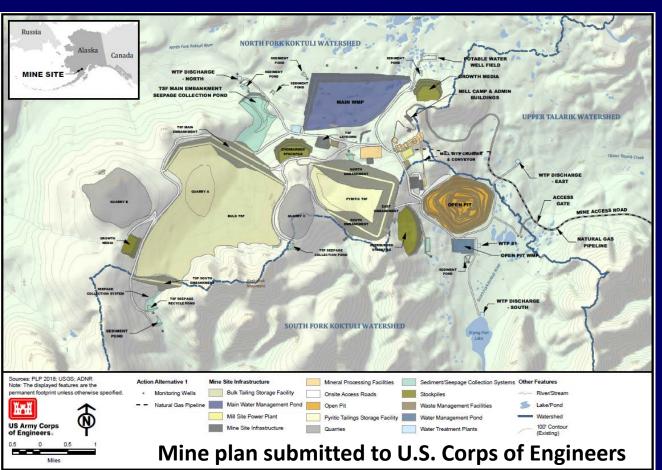
# Pebble Porphyry Cu-Mo-Au [Pebble Limited Partnership]

-Jan. 6, 2018: U.S. Army Corps of Engineers accepted PLP's permit application

-USACOE timeline: Finalized EIS and ROD mid-2020

#### 2019 Work:

-Geotechnical drilling proposed: 27 ODEX/Sonic sites, 3 DDH's, & repair 2 boreholes.



Dec. 2017	Million Tonnes	Cu Billion pounds	Cu (%)	Au (g/T)	Mo (ppm)	Ag (g/T)
Measured	527	4	0.33	0.35	178	1.7
Indicated	5,929	53	0.41	0.34	246	1.7
Inferred	4,454	25	0.25	0.25	226	1.2
TOTAL	10,910	82	0.34	0.30	235	1.5

#### Proposed development plans:

-Footprint <1/2 of prior envisioned size</li>
-Single drainage for site infrastructure
-Open-pit mine; ~20-year mine life
-Tailings storage facility designed for maximum safety
-Separation of potentially acid generating tailings from non-acid generating; fully lined tailings storage facility
-Annual production: 287 M lbs. Cu, 321,000 oz Au, 1.6 M oz Ag, ~13 M lbs. Mo

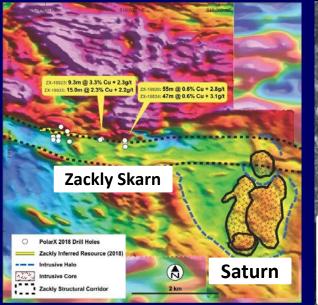
### Alaska Range Project [PolarX Ltd./Lundin Mining]

Cu-Au Skarn and Porphyry systems; Sediment hosted Cu

-Strategic partnership with Lundin Mining for Stellar project

#### 2019 program:

-6 holes, 3,041 m at Saturn and Mars
-Discovered Cu-Au-Mo porphyry at Mars
-102.1 m @ 0.22% Cu, 0.07 g/T Au, 20 ppm Mo
-28.7 line-km IP & gravity survey at Saturn (400 m x 200 m grid)
-Trenching and mapping at Zackly skarn to improve targeting



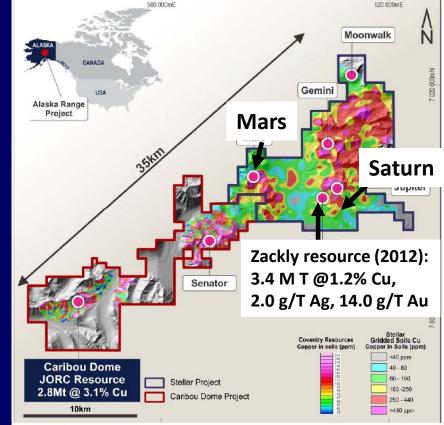
Regional magnetic data over Zackly deposit & Saturn prospect



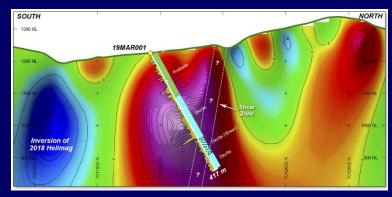
Chalcopyrite vein in Mars DDH 19MAR001 @ 327.8 m P<sup>C</sup> bringesbilling → D<sup>C</sup> bringesbilling 

and Cu-Au-Mo-As in soil anomaly

Mars



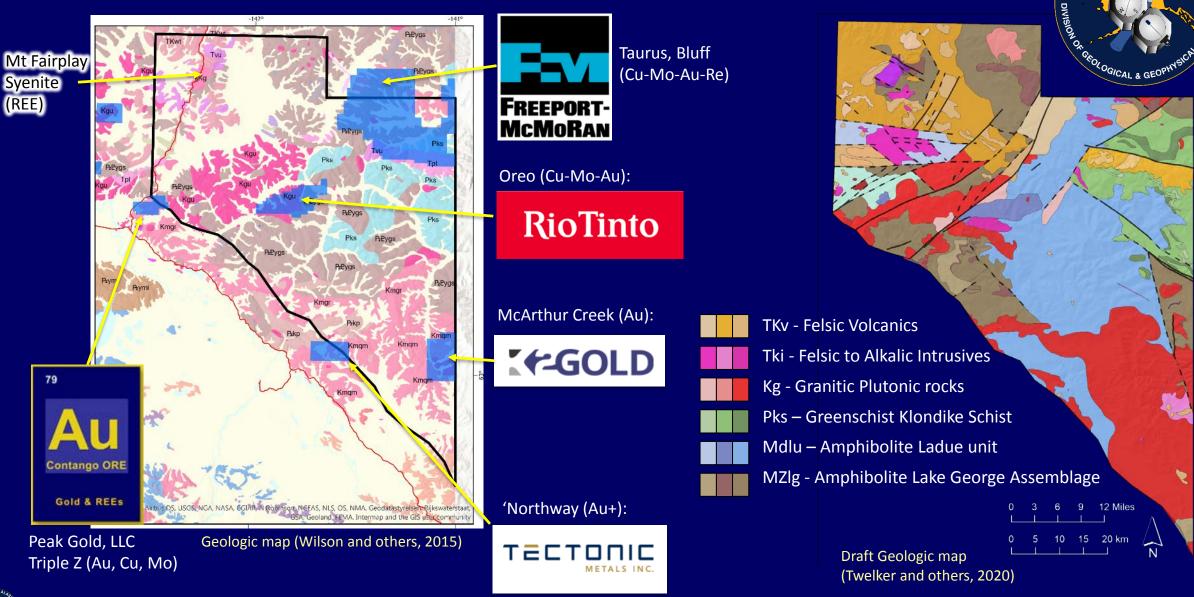
#### Alaska Range Project – Copper in soils



Mars: First DDH contains Cu-Au-Mo-bearing veins; 102 m @ 0.22% Cu, 0.07 g/T Au, 20 ppm Mo <sup>36</sup>



## **Earth MRI - Eastern Tanacross**





TE OF

## Taurus Porphyry Cu-Au-Mo (Re) [Kenorland Minerals/Freeport]

Historical resource: 68.2 M tonnes @ 0.275% Cu, 0.032 Mo, 0.166 g/T Au

2019 Program (US\$4.7M):

- -15 holes, 6,718 m
- -1,556 line-km ZTEM and Magnetic airborne survey -Geologic mapping and sampling





Main phase quartz monzonite w/K-alteration, Cu, Mo, Au, Ag; East Taurus (2008 DDH-40)



Quartz-sericite-pyrite alteration; West Taurus



Quartz-stockwork veining; West Taurus



2019 drilling at East Taurus (Photo credit: Evan Twelker, DGGS)

### Oreo Porphyry [Tubutulik Mining Company LLC/Rio Tinto]

-Very early stage porphyry copper-molybdenum-silver project

#### Prior exploration:

-1970's-1980's - soil and rock sampling; 2011 – State airborne magnetic/EM -2018 - Rio Tinto - 412 soil samples;

- Cu-Mo-Ag soil anomaly 8 km (E-W) by 1- to 2-km (N-S)

#### 2019 Program:

-6 HQ core holes, totaling 1,061 m.

-Oreo 19-001: ave. 0.0263% Cu, 37 ppm Mo, 1.7 ppm Ag over 166-m length; includes 71 m @ 0.029% Cu

-Oreo 19-003 & 3A: 66 m @ 190 ppm Mo; incl. 12 m @ 391 ppm Mo -Oreo 19-002: 88 m @ 4 ppm Ag



**Oreo 19-003A:** Multiple cross-cutting veinlets. Quartz-molybdenite vein



**Oreo 19-001:** Quartz-pyrite-molybdenite-chalcopyrite ± magnetite veins w/K-feldspar alteration halo at 143.4m



**Oreo 19-003A (92.1m):** Quartz-k-feldspar vein with molybdenite, pyrite, magnetite and chalcopyrite. Shreddy biotite halo surrounding the vein.



# Peak (Tetlin) Cu-Au-Ag Skarn [Peak Gold, LLC]

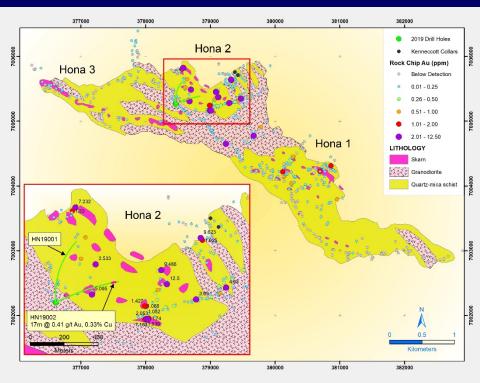
#### 2019 Program (~US\$7.3 M):

- -3 DDH at East Peak
- -1 DDH at North Saddle
- -2 DDH in Hona porphyry
  -DDH19002: 17 m @ 0.41 g/T Au, 5.4 g/T Ag, 0.333% Cu
  -1,006 line-km magnetic & VTEM survey over Hona

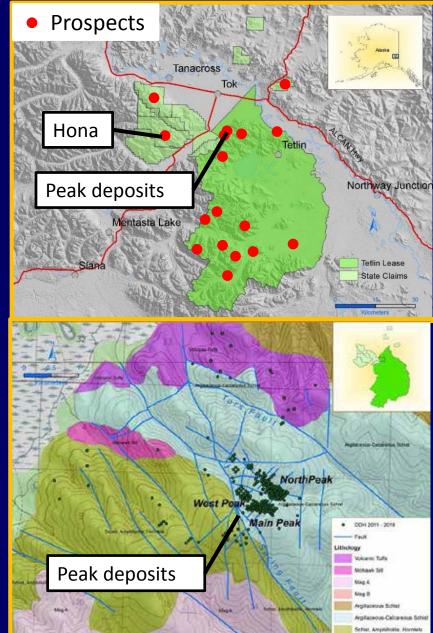
Peak Skarns PEA (Sept. 2018): -Produce 1.1M oz. Au; 2M oz. Ag -8-year mine life -3,500 T/day -91.6% Au, 57.0% Ag recovery -3.9:1 strip ratio -US\$294 M initial capital -US\$428/oz. Au recovered,

- total cash cost
- ~2-year, after-tax payback-29% post-tax IRR

Peak Skarns Sept. 2018	Million Tonnes	Cu %	Au g/T	Ag g/T
Measured & Indicated	9.2	0.153	4.08	14.2
Inferred	1.34	0.151	2.69	16.1
Total	10.54	0.153	3.9	14.43



Hona porphyry Cu-Au-Ag prospect





# **Round Top**

~74 Ma Cu-Mo-Ag Porphyry + skarn + carbonate-replacement

#### 2019 Round Top program:

-7 holes, 1,537 m infill
-Initiated NI 43-101 report to calculate resource based on 40 DDH (9,933 m); planned for release Q1 2020

### **Illinois Creek**

**Oxide Au-Ag-Cu** 

#### 2019 Illinois Creek program:

-3 holes, 366 m
-NI 43-101 report – Updated resource
-Initiated PEA in August; Q1 2020
-Existing leach pad resource: ~50-79,000
ounces Au + ~3 M ounces Ag

eaend

Fault

Survey

Gossan

2019 Drill Holes
 2016, 2017, 2018 Drill Holes
 1981 Drill Holes

-Drill Hole Azimuth

----Limit of alt-igx Float

Claim (1981 map)

DDH (1981 map)

Gossan Rubble

Quartz Stockwork

Quartz Monzonite Porphyry

Quartz Latite Fragmental

Biotite Hornblende Dacite

DRAFT WORK PRODUCT, NOT FOR DISTRIBUTION WITHOUT PERMISSION OF WACG

Quartz-Chlorite Mica Schist

Black Biotitic Breccia

ntrusive Breccia

Silicified Schist Breccia Graphite Schist

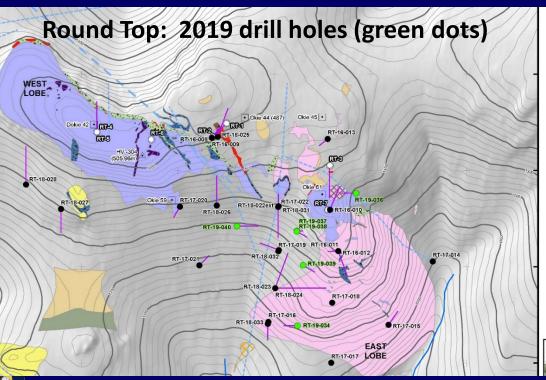
Quartzite

Contour Interval 20'

Ferricrete

Quartz Latite Fragmental Dike

----Fault - from Photo Linear



#### [Western Alaska Copper and Gold]

#### Illinois Creek Resource; >500 DDH

<b>Oct. 1, 2019</b> 0.4 AuEq cut-off	Tonnes (million)	Au (g/T)	Ag (g/T)	Cu (%)
Indicated	6.76	1.04	34.3	0.18
Inferred	2.03	1.06	38.8	0.22
Total	8.79	1.04	35.24	0.19

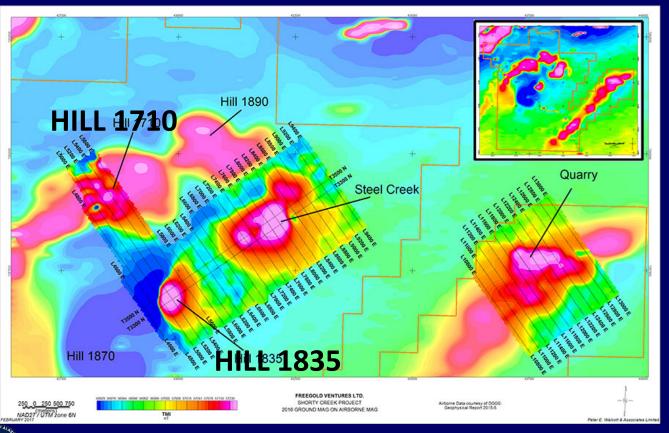


# Shorty Creek [Freegold Ventures Limited/South32 Limited]

Porphyritic intrusions associated with Cu-Au & Cu-Mo

#### 2019 program (~US\$2.3 M):

-South32 Limited provided funding -5 drill holes; 1,542 m targeting Hill 1835 & Hill 1710 -100 km of IP surveys & 98 km of ground magnetic surveys -543 soil samples





Copper mineralization in core sample

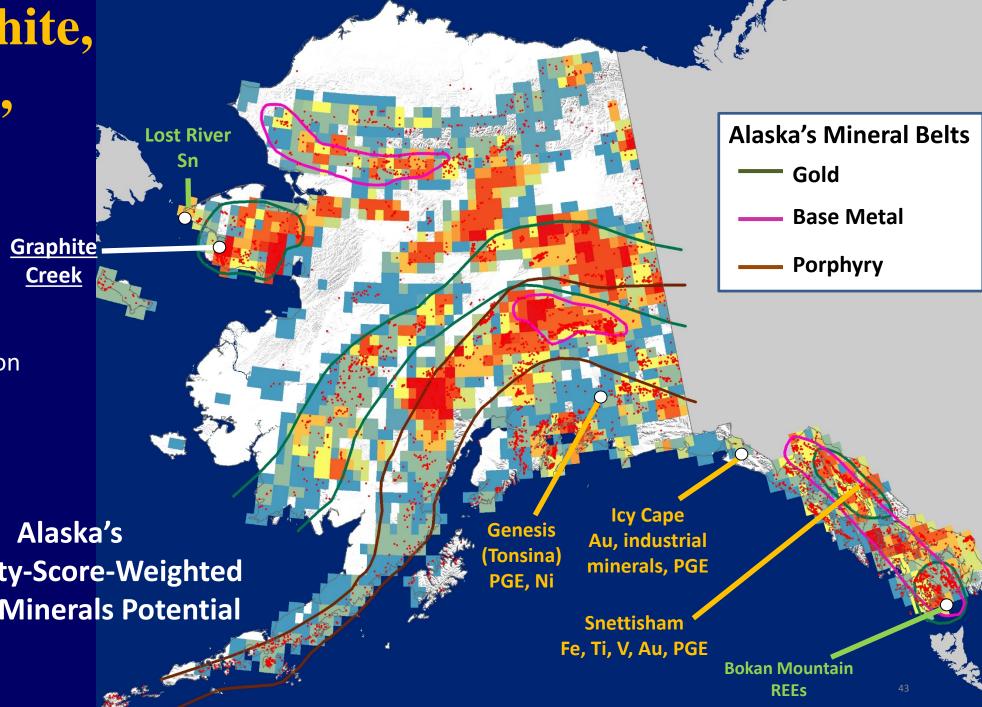


Airborne & ground magnetic-high anomaly drill targets

2019 – Graphite, REEs, PGEs, Ti-V-Au, Industrial Minerals

Drilling ± surface exploration Surface exploration Active

> **Criticality-Score-Weighted Critical Minerals Potential**





### Graphite Creek [Graphite One Inc.]

#### USA's largest, large-flake graphite deposit

-Major U.S. multi-national electric-vehicle manufacturer testing graphite -Coated spherical graphite is a major component in lithium-ion battery anodes

#### 2019 Program:

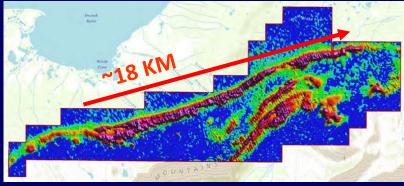
#### -800 m in-fill drilling

- -Geotechnical work & environmental baseline studies
- -Geochemical assays for future resource update -PFS by 2Q 2020

#### 2017 PEA:

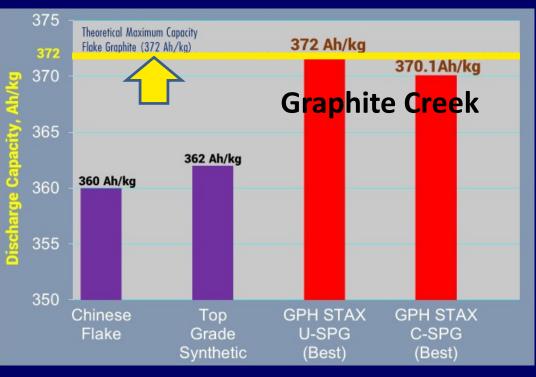
-Open-pit, 40-year mine life, 1.11 M tonnes graphite-bearing material/year -41,850 tonnes high-grade coated spherical graphite/year for Li-ion battery applications

-13,500 tonnes of refined, sub-20-micron graphite powder/year



~18 km of potential revealed by Time-Domain EM Survey (red=conductive graphitic units)





Battery-grade spheronized graphite from Graphite Creek is being tested by a major U.S. multinational electric vehicle manufacturer (preliminary results above are from prior testing)

March 2019 5% cut-off	Tonnes (Million)	Cg %	Graphite (Tonnes)
Measured	1.69	8.0	135,171
Indicated	9.26	7.7	715,363
Inferred	91.89	8.0	7,342,883
Total	102.84	8.0	8,193,417

## Snettisham [Northern Cobalt Ltd.]

Alaska-type mafic-ultramafic complex & Orogenic Juneau Gold Belt

-Potential for Fe, Ti, V, and Au

-Historical surface samples of magnetite-rich rock chips:

-Up to 0.56% V2O5, 35.9% Fe and 6.47% TiO2

-Historical drilling:

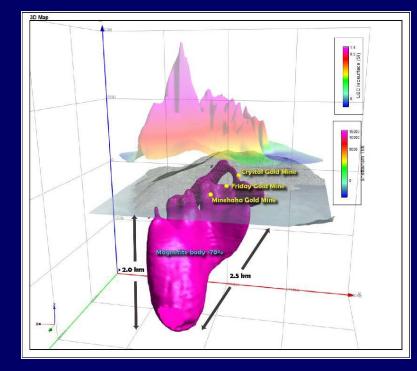
-Missed main magnetic target; ave. grades of 20% Fe

#### Nearby Infrastructure:

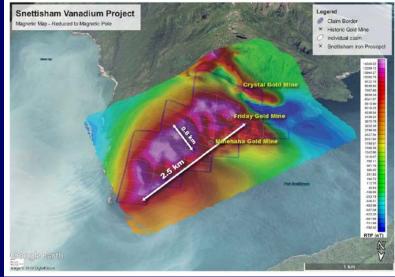
-Snettisham Hydroelectric Power Plant ~18 km NW; main transmission line runs within 2.5 km of project
-On coast, adjacent to deep-water channel
-50 km from Juneau, with large mining work force

#### 2019 Program:

-Helicopter-based airborne magnetic survey
-3D inversion, modeling indicates magnetic body is ~50-m deep, 2.5-km long, up to 600-m wide, & extends to depth of ~2 km.
-Model of >70% magnetite shell (= >40% contained Fe)



3D model of Snettisham. Reduced-to-magneticpole UBC inversion of >70% magnetite shell

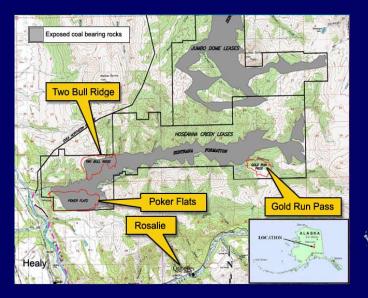


Mafic-ultramafic body magnetic anomaly and historical gold mines

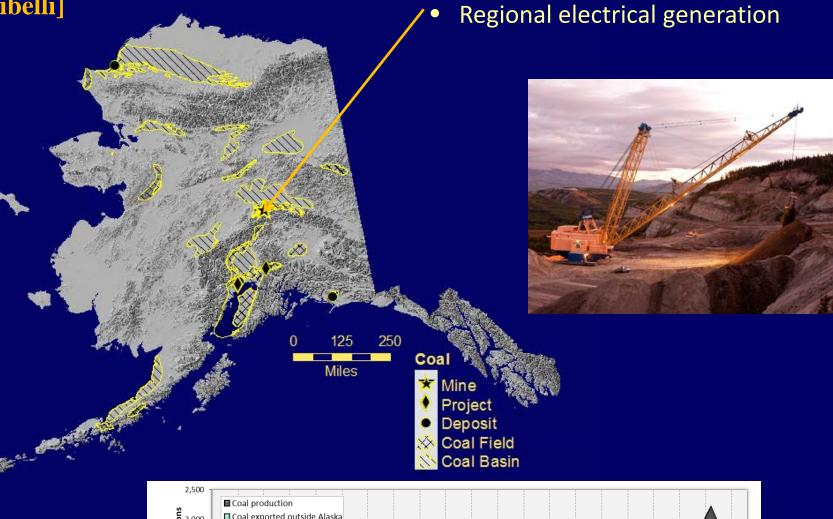




### Usibelli Coal Mine [Usibelli]

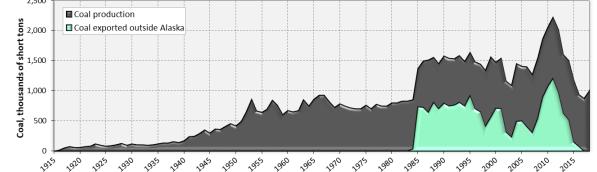






 $\bullet$ 

2019 Production ~1 M tonnes





### **Alaska's Mineral Resource Information**

#### **Division of Geological & Geophysical Surveys**

http://dggs.alaska.gov/



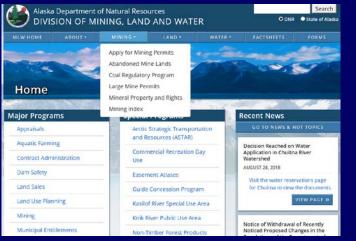
- Geochemistry
- Geophysics
- Geologic Maps
- Elevation Data
- Minerals Report
- Mineral Occurrences
- GMC

•



#### **Division of Mining, Land & Water**

http://dnr.alaska.gov/mlw/



- Land status
- Mining claims
- Mine Permitting
- Mine Regulation

#### **Geologic Materials Center**

http://dggs.alaska.gov/gmc/index.php

- Core Repository
- Indoor core viewing and storage
- Surface samples
- Geochemistry pulps
- Online Inventory
- Confidential storage and viewing



