

# Alaska Mineral Resources 2015 *A Preliminary Summary*

Larry Freeman – Alaska Department of Natural Resources  
Division of Geological & Geophysical Surveys

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*Photo courtesy: SMM Pogo LLC*



# Alaska Mineral Industry – 2015

- Acknowledgements:
  - American Exploration and Mining Association
  - Companies and individuals who provided content
  - Alaska DML&W, OPMP, DCCED, DOT, and AIDEA
  - Curt Freeman of Avalon Development Corp
  - Shane Lasley of North of 60 Mining News
- All information is preliminary, incomplete, and subject to change:
  - Production data projected from Q3 reports
  - Exploration reports are based on press releases, websites, presentations, rumors, & black magic
- Forward Looking Statements are par for the course
- Minimal editorial or peer review of the content – may not meet editorial DGGs standards

Three Millionth Ounce  
Pogo Mine – October, 2015



**3M  
POUR**  
THREE  
MILLIONTH  
OUNCE  
8/30/2015  
POGO MINE

What can  
**9 years,**  
**273 days**  
**and 9 hours**  
of hard work make?

**3 MILLION OUNCES OF GOLD**

Cheers to all the  
hours poured into  
this achievement.

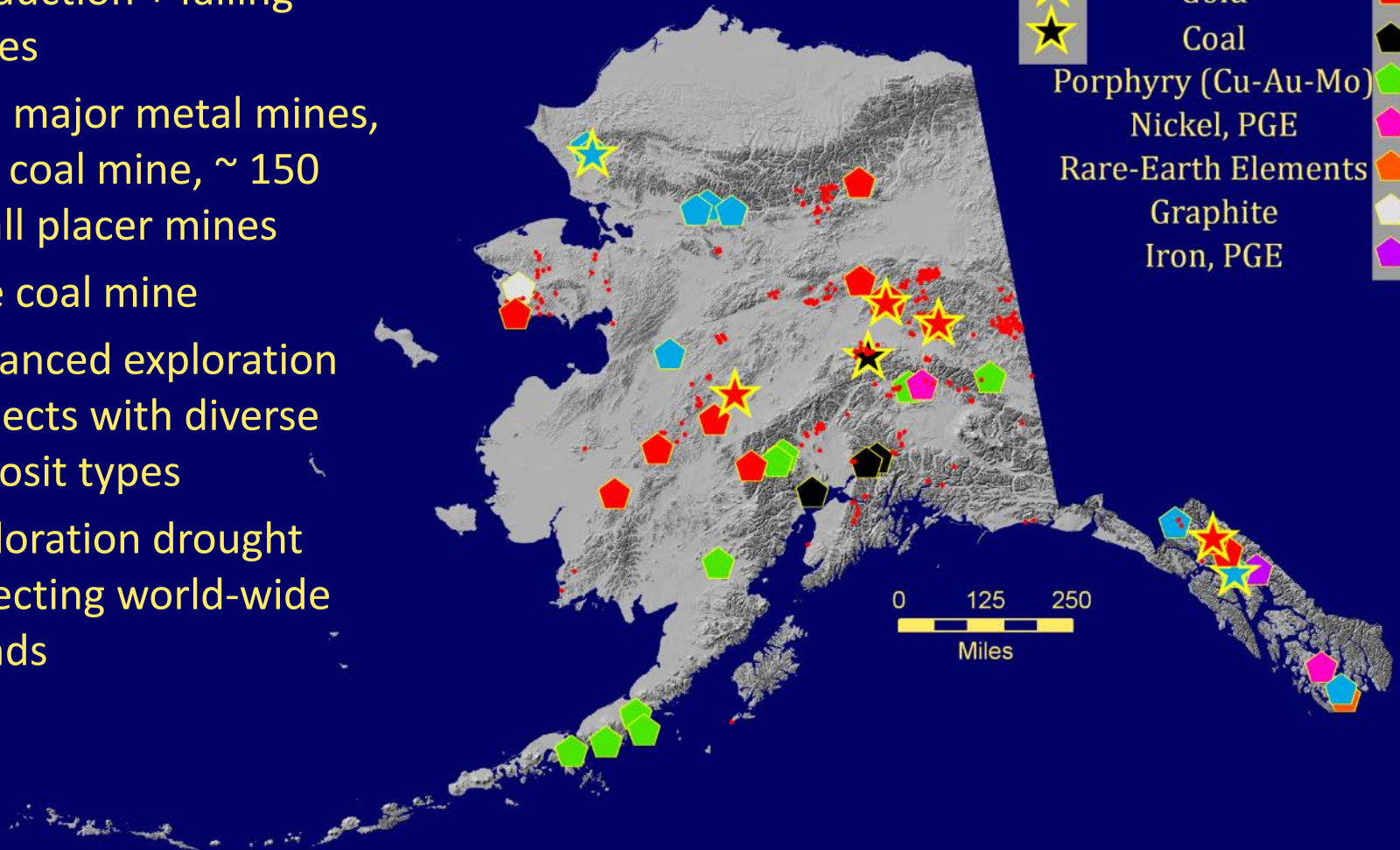
**POGO MINE**  
Sustainable Metals, Smart Power LLC

Graphic Courtesy SMM Pogo LLC



# 2015 Alaska Minerals Overview

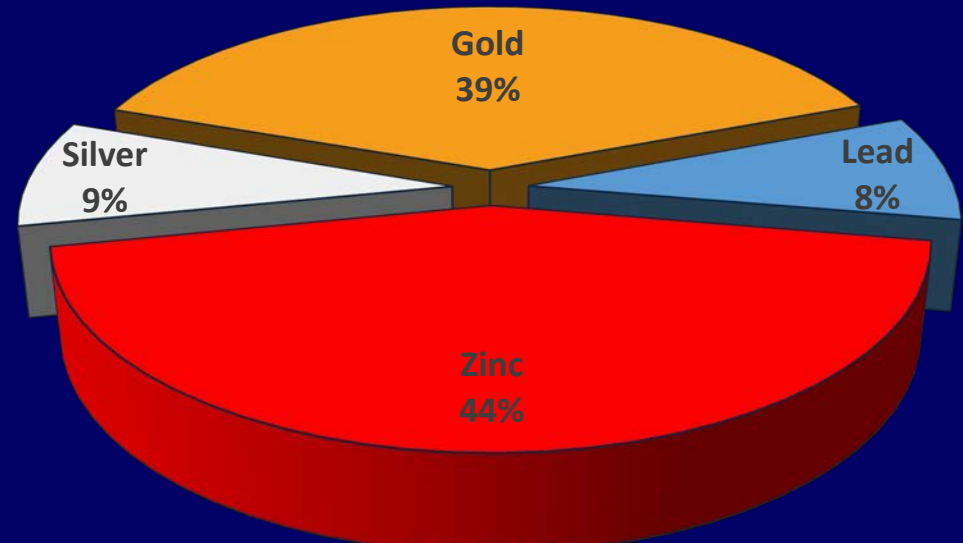
- Slightly lower metal production + falling prices
- Five major metal mines, one coal mine, ~ 150 small placer mines
- One coal mine
- Advanced exploration projects with diverse deposit types
- Exploration drought reflecting world-wide trends



# 2015 Alaska Production Forecast

- Production (metals)
  - 953,000 ounces Gold
    - 1 % increase
  - 14,981,000 ounces Silver
    - 3 % decrease
  - 147,000 tons Lead
    - 5 % decrease
  - 679,200 tons Zinc
    - 5 % decrease
- First Market Value \$2.76 B U.S.
  - 10.7 % decrease from 2014

**\$ 2.76 Billion First Market Value**



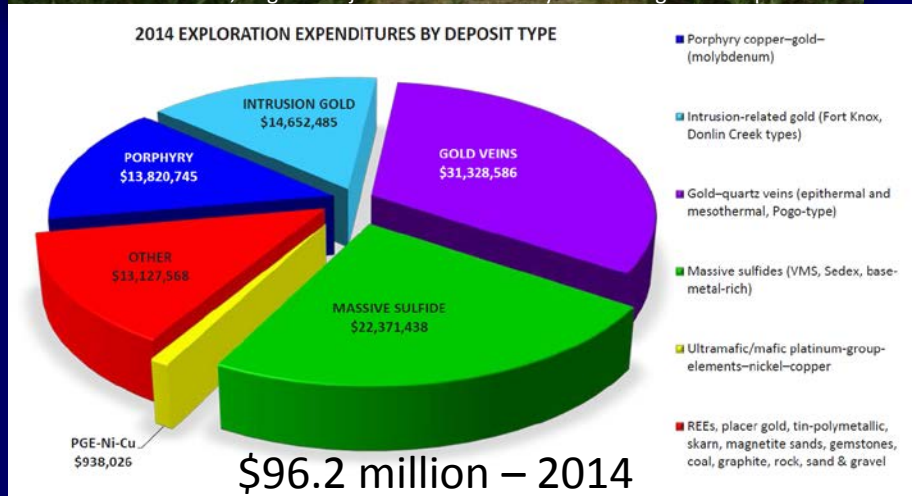


# 2015 Alaska Exploration

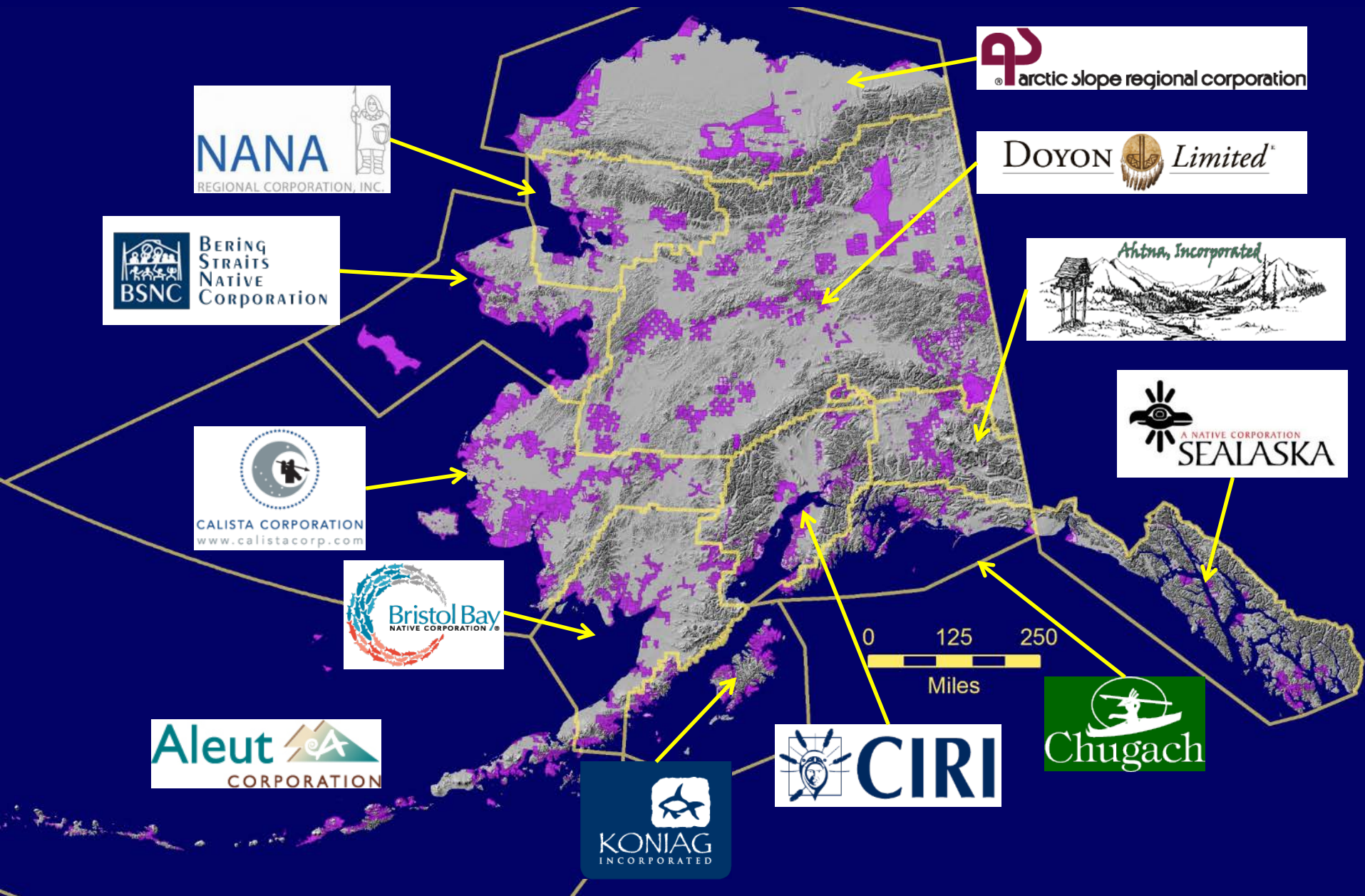
- 7 Major Projects
- 6 Advanced Projects
- 14 drilling projects (down from 15 in 2014)
- 48 Hard Rock Exploration Permits (down from 54 in 2014)
- 1 Advanced Coal Project
- Estimated 17 % decrease from 2014



Fairhaven drill site, Kugruk Project – Photo courtesy: NANA Regional Corporation

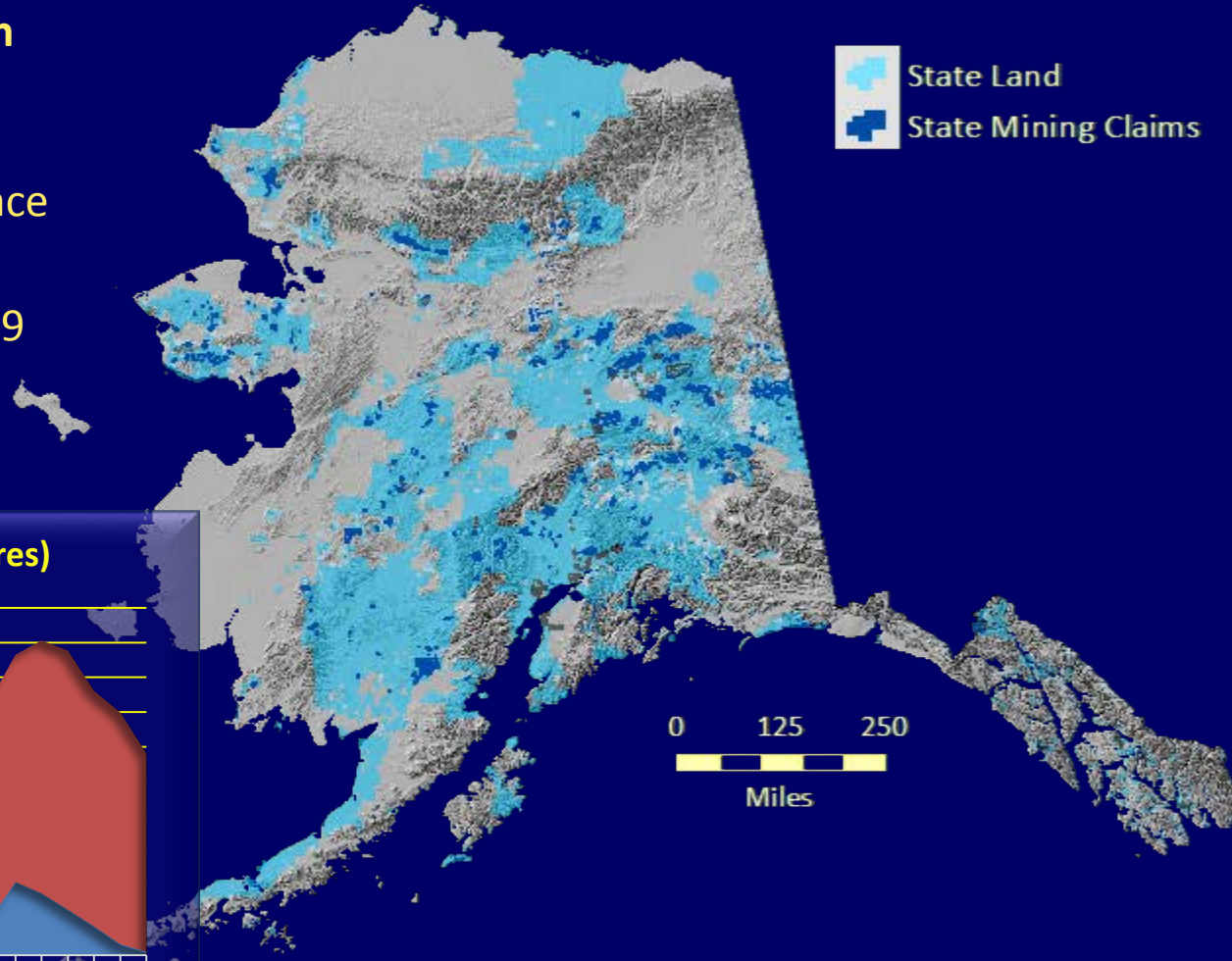


# Alaska Native Corporations – 1971 Alaska Native Claims Settlement Act

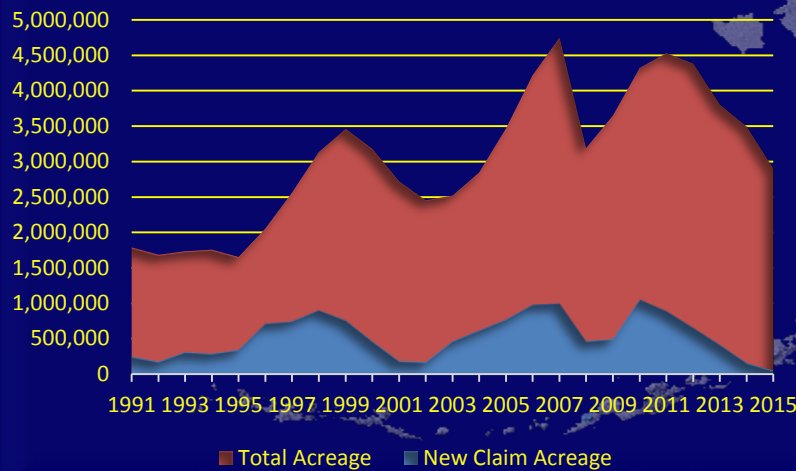


# State-Owned Lands & Mining Claims

- Approximately **100 million acres of state lands** – Conveyed and Tentatively Approved Mineral & Surface Estate
- **36,379 Mining claims** – 2.9 million acres (excluding claims on selected lands)



**Alaska State Mining Claims (acres)**





# DGGS & USGS Airborne Geophysical Surveys

## Modern Airborne Geophysical Data

### DGGS Helicopter EM and Mag (400 m line spacing)

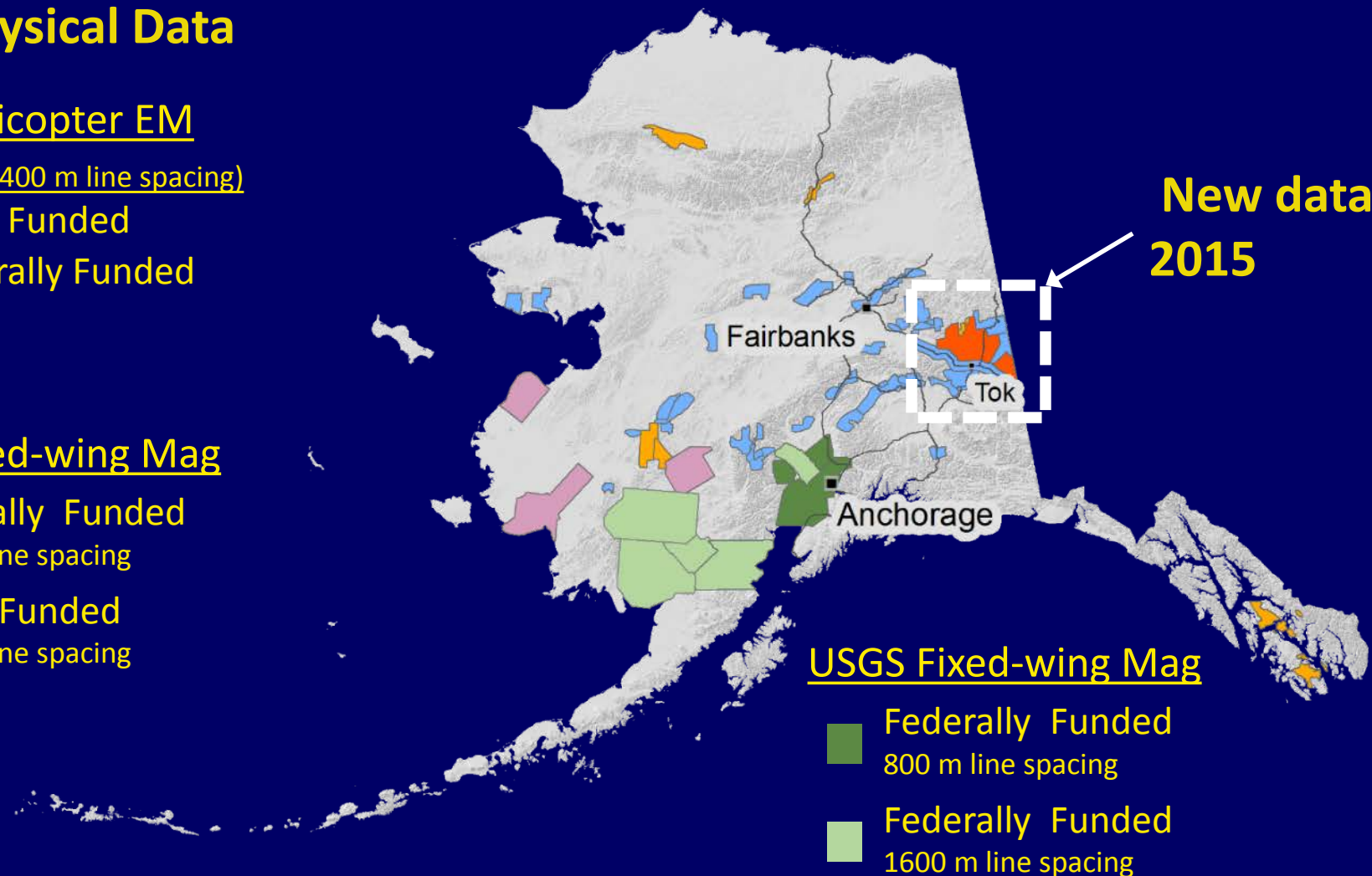
- State Funded
- Federally Funded

### DGGS Fixed-wing Mag

- Federally Funded  
500 m line spacing
- State Funded  
800 m line spacing

### USGS Fixed-wing Mag

- Federally Funded  
800 m line spacing
- Federally Funded  
1600 m line spacing



# DGGS & USGS Airborne Geophysical Surveys

## Modern Airborne Geophysical Data

29,000 sq miles = 9/10 of Ireland

### DGGS Helicopter EM and Mag (400 m line spacing)

- State Funded
- Federally Funded

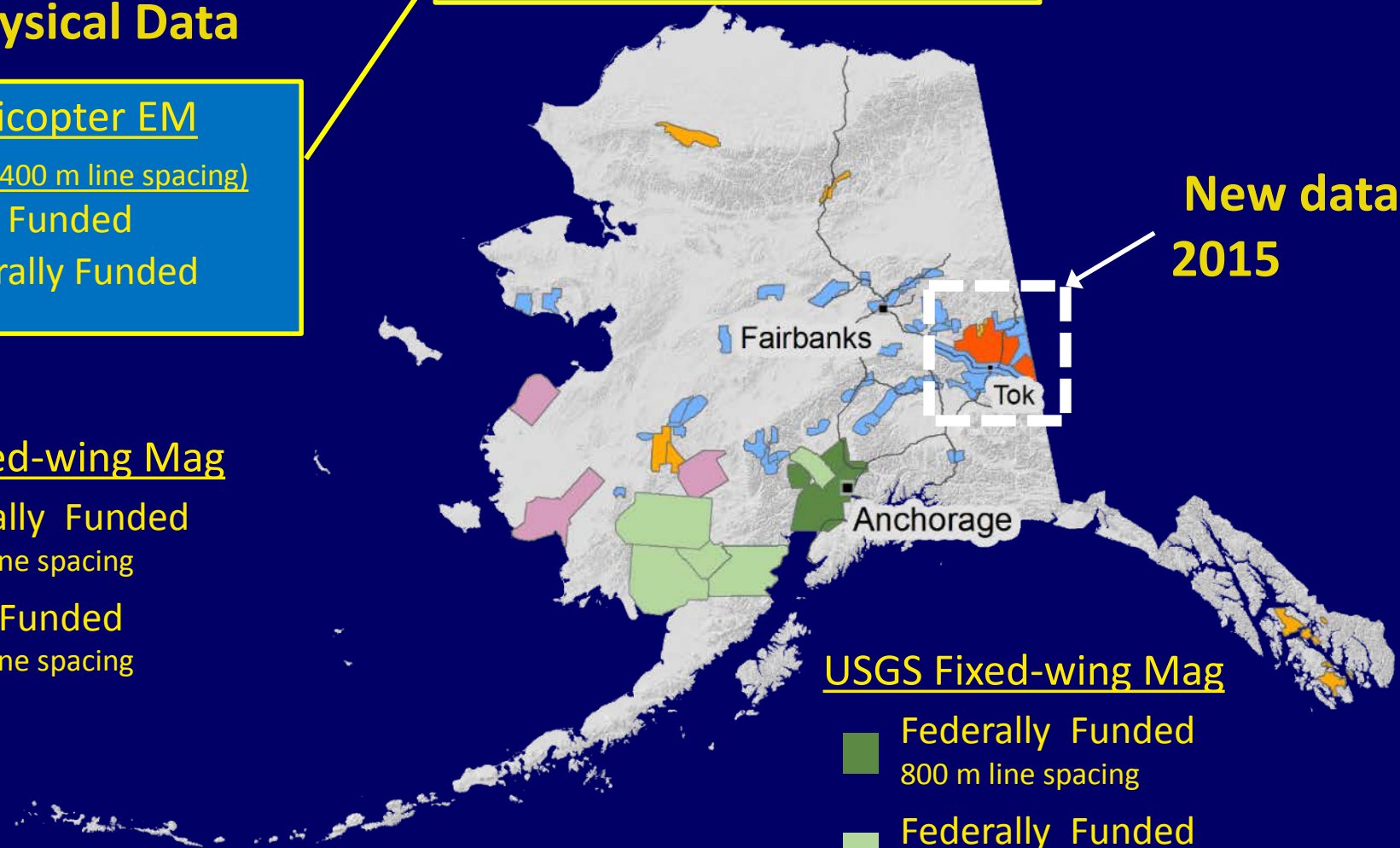
New data 2015

### DGGS Fixed-wing Mag

- Federally Funded  
500 m line spacing
- State Funded  
800 m line spacing

### USGS Fixed-wing Mag

- Federally Funded  
800 m line spacing
- Federally Funded  
1600 m line spacing



# Geologic Database – DGGS Interactive Maps

<http://maps.dggs.alaska.gov/>

## Mineral Resource Information:

- **Geologic Map Index:** Published Geologic Maps
- **Alaska Geologic Data Index:** Unpublished geologic and mineral company data
- **Airborne GeophysWeb:** Publically available airborne geophysical surveys
- **WebGeochem:** Published geochemical data (coming soon) contains 59,000 samples.
- **Geologic Materials Center:** New facility, >280,000 feet of mineral core, 100's prospects, online catalog

The screenshot shows the website interface for the Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys. The page is titled "Interactive Maps" and features six interactive map categories:

- Geologic Map Index of Alaska:** Map Index provides outlines of DGGS and USGS geology-related maps of Alaska. [See citation details for Geologic Map Index of Alaska](#)
- Elevation Datasets in Alaska:** This interactive map displays known public-domain elevation datasets in Alaska. [See citation details for Elevation Datasets in Alaska](#)
- Quaternary Faults and Folds (QFF):** This interactive map displays locations and relative activity of Alaska's faults and folds. [See citation details for Quaternary Faults and Folds \(QFF\)](#)
- Historically Active Volcanoes of Alaska:** This interactive map displays the location of historically active volcanoes of Alaska. [See citation details for Historically Active Volcanoes of Alaska](#)
- Alaska Geologic Data Index (AGDI):** AGDI includes information about industry reports and maps, field notes, drill logs, and other unpublished geology-related data. [See citation details for AGDI](#)
- Airborne GeophysWeb:** This interactive map is a compilation of publicly available airborne geophysical surveys conducted in Alaska since 1993 by DGGS and other cooperating agencies. [See citation details for Airborne GeophysWeb](#)



# 2015 Alaska Roads to Resources Projects



Alaska Department of Transportation & Public Facilities  
Roads to Resources



Road widening using B-70s to dump material, Dalton Highway 274-289, August 2011. Photo by Raquel Ream, Alaska DOT&PF

## Mines



Polymetallic

Gold

Coal

Porphyry (Cu-Au-Mo)

Nickel, PGE

Rare-Earth Elements

Graphite

Iron, PGE

## Projects



## Dalton Traffic Forecast Study

Ambler Mining District Access

Tanana Road Access

West Susitna Surface Access  
Reconnaissance Study

Trans-Border  
Transportation  
Task Force

Gravina Mill  
Access Road

Niblack Ferry Dock Study



<http://dot.alaska.gov/roadstoresources/index.shtml>



Taylor Highway to Eagle. Photo by Joanna Reed, Alaska DOT&PF



# Alaska Industrial Development and Export Authority



Ambler Mining District access road

Evaluating LNG as a fuel source for future mining operations.

## Mines

- |  |                     |  |
|--|---------------------|--|
|  | Polymetallic        |  |
|  | Gold                |  |
|  | Coal                |  |
|  | Porphyry (Cu-Au-Mo) |  |
|  | Nickel, PGE         |  |
|  | Rare-Earth Elements |  |
|  | Graphite            |  |
|  | Iron, PGE           |  |

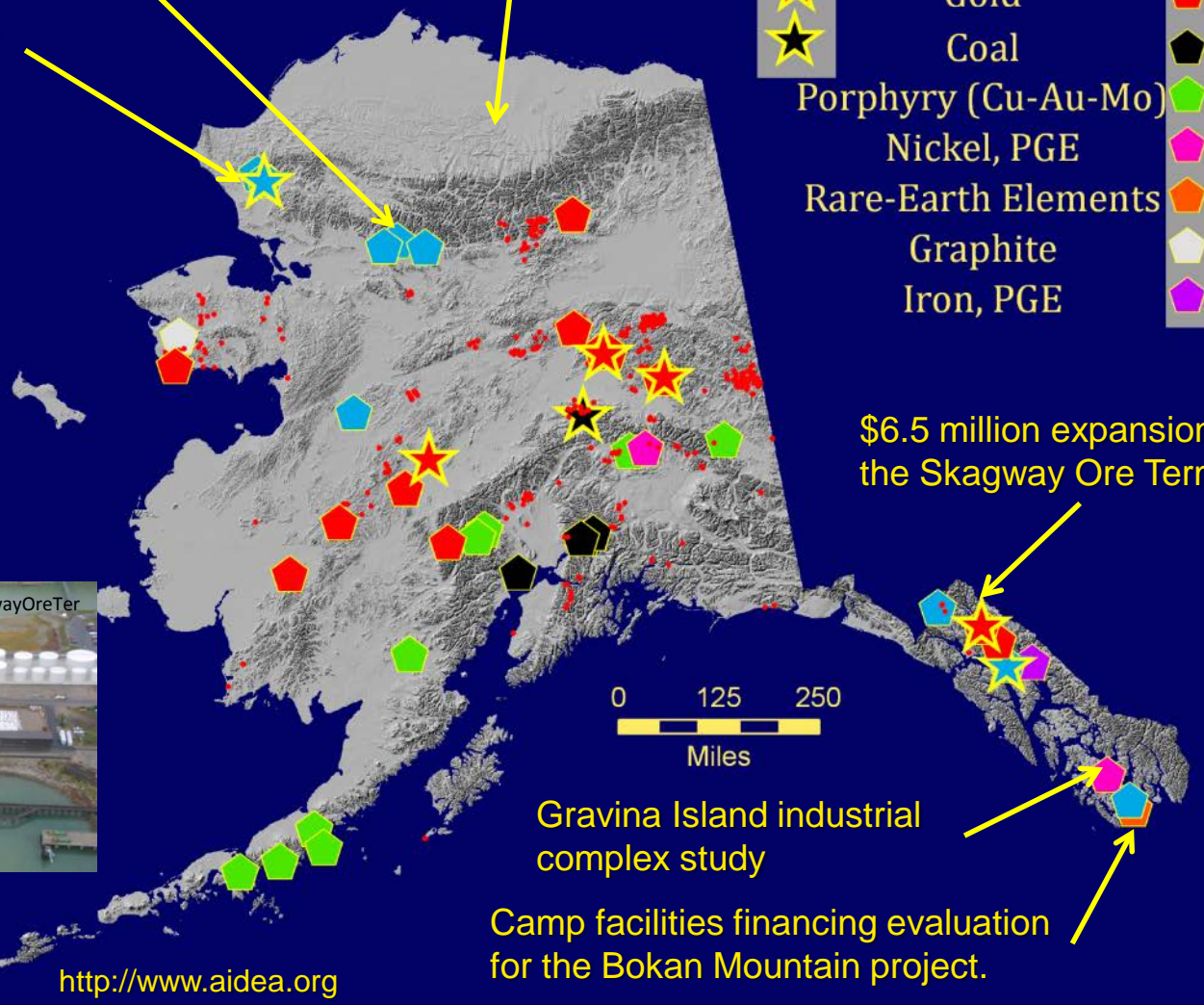
## Projects

Delong Mountain Transportation System expansion study

[http://www.aidea.org/Portals/0/AIDEA%20Documents/AIDEA\\_DMTS.pdf](http://www.aidea.org/Portals/0/AIDEA%20Documents/AIDEA_DMTS.pdf)



<http://www.aidea.org/Programs/ProjectDevelopment/SkagwayOreTerminal.aspx>



\$6.5 million expansion to the Skagway Ore Terminal

Gravina Island industrial complex study

Camp facilities financing evaluation for the Bokan Mountain project.

<http://www.aidea.org>



# Alaska Office of Project Management and Permitting

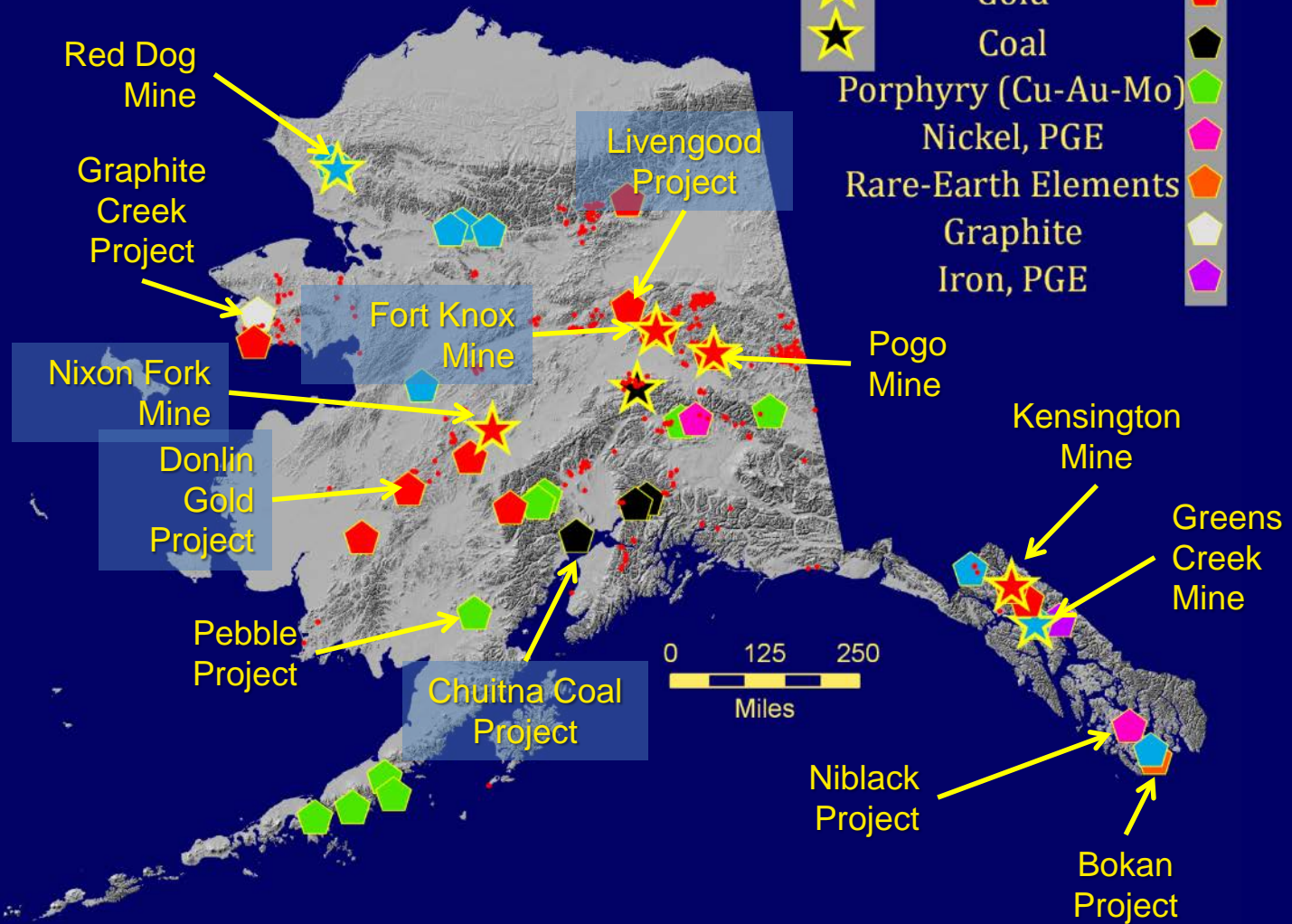


Alaska Department of Natural Resources  
Office of Project Management & Permitting

The Large Mine Permitting Team is responsible for coordinating the permitting activities for large mine projects in the state, in accordance with state law

<http://dnr.alaska.gov/mlw/mining/largemine/>

Mines	Projects



# Application for Permits to Mine in Alaska (APMA).



Alaska Department of Natural Resources

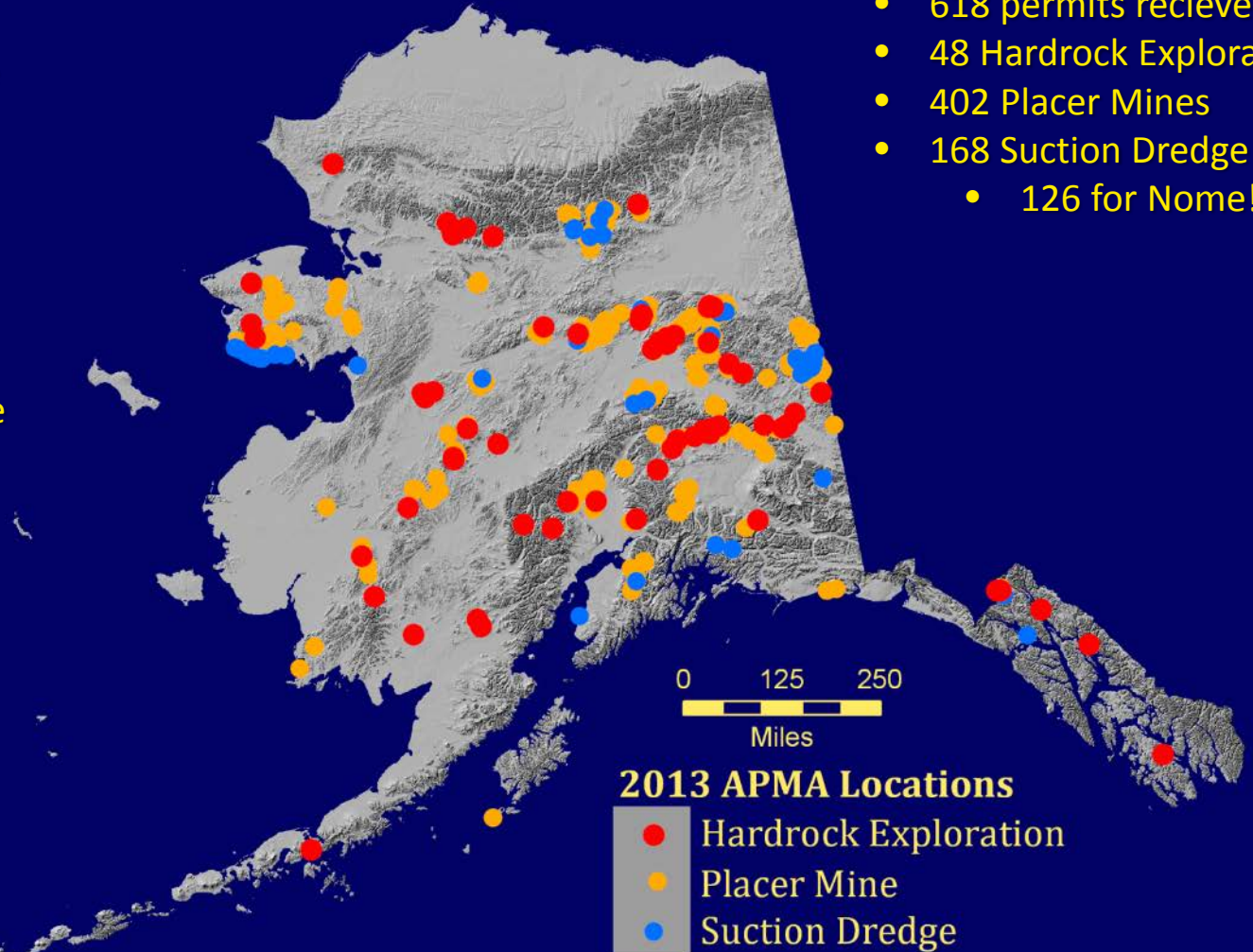
Mining, Land & Water

Permits and licenses are required by as many as 12 State and Federal agencies to conduct exploration or mining activities in the State of Alaska. To assist the mining industry navigate this complex permitting process, the State designed the Application for Permits to Mine in Alaska (APMA).

<http://dnr.alaska.gov/mlw/mining/placer.cfm>

## APMA Permits 2015:

- 618 permits received
- 48 Hardrock Exploration
- 402 Placer Mines
- 168 Suction Dredge
  - 126 for Nome!



# 2015 Alaska Gold Production – 953,000 ounces



Photo courtesy of Kinross Fort Knox Mine



## Pogo (vein):

- ~340,000 oz Au – steady
- 3 millionth ounce 2<sup>nd</sup> qtr
- 1.8 M oz Au Reserve (Dec 2014)
- 2.7 M oz Au Resource

<http://www.smm.co.jp/E/csr/environment/pogo/>



Photo courtesy of SMM Pogo LLC

## Fort Knox (intrusion host):

- ~ 404,000 oz Au – 3% increase
- 2.4 M oz Reserve (Dec 2014)
- 1.6 M oz Resource

<http://www.kinross.com>



## Kensington (vein):

- ~ 121,000 oz Au – 2 % increase
- 630 K oz Au Reserve (Dec 2014)
- 953 K oz Au Resource
- SAG pebble reject XRT sorting pilot plant

<http://www.coeur.com>



## Nixon Fork (skarn):

- In caretaker status since 2013

<http://dnr.alaska.gov/mlw/mining/largemine/nixonfork/>

## Statewide Placer Gold:

- ~ 30,000 oz Au from
- ≤ 150 operations (decrease)

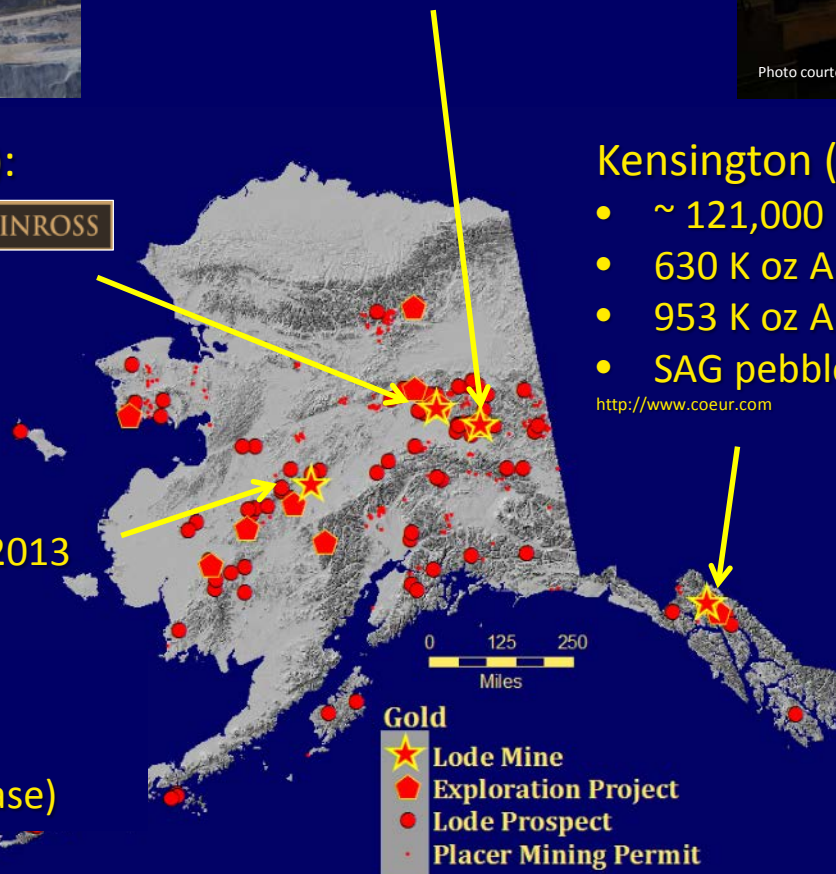


Photo courtesy of Coeur Alaska, Inc.





# 2015 Gold Exploration / Development – Southwest

## Donlin (intrusion related):

- Draft EIS Public Comment period through April
- 33.8 M oz Au Reserve
- 1.1 M ounce per year projected production
- NOVAGOLD & Barrick Gold partnership

<http://www.donlingold.com>

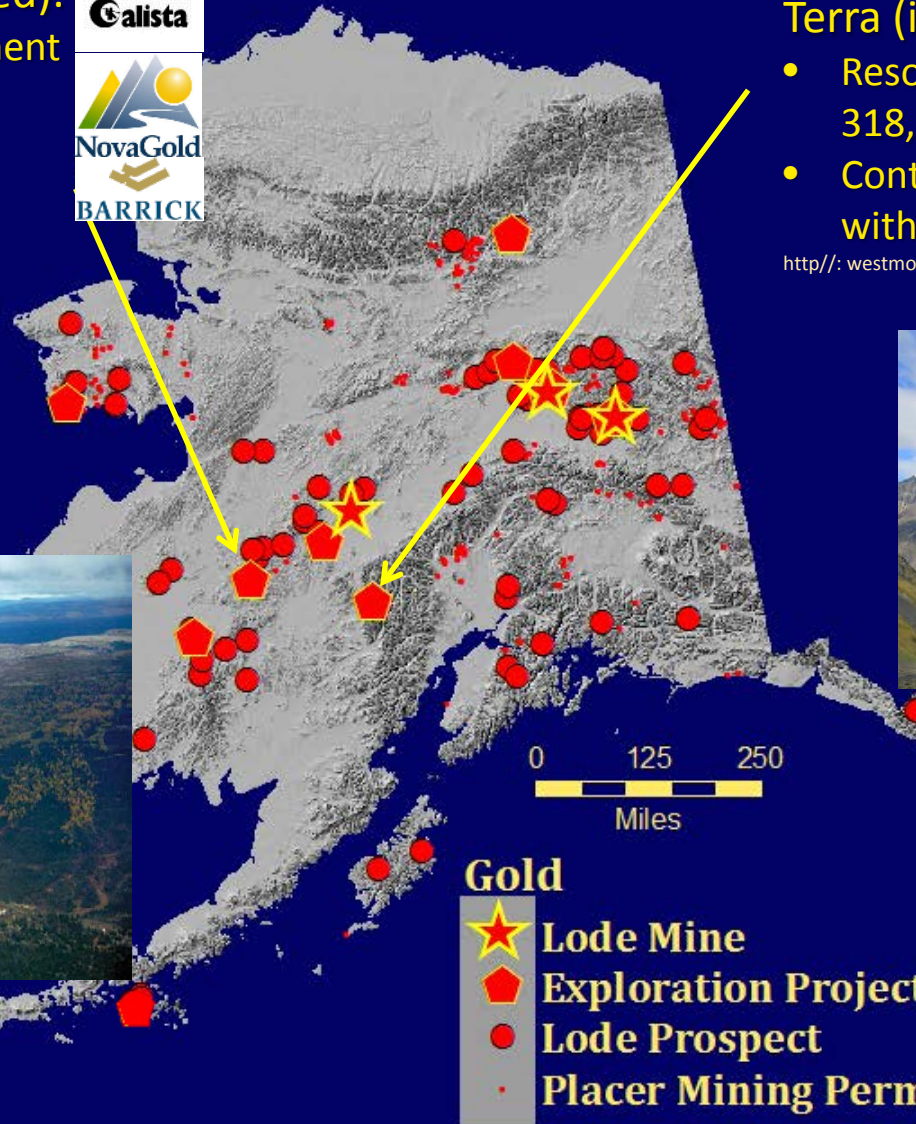


## Terra (intrusion related):



- Resource: 168,000 oz Au & 318,000 oz Ag
- Continued bulk sample program with onsite mill

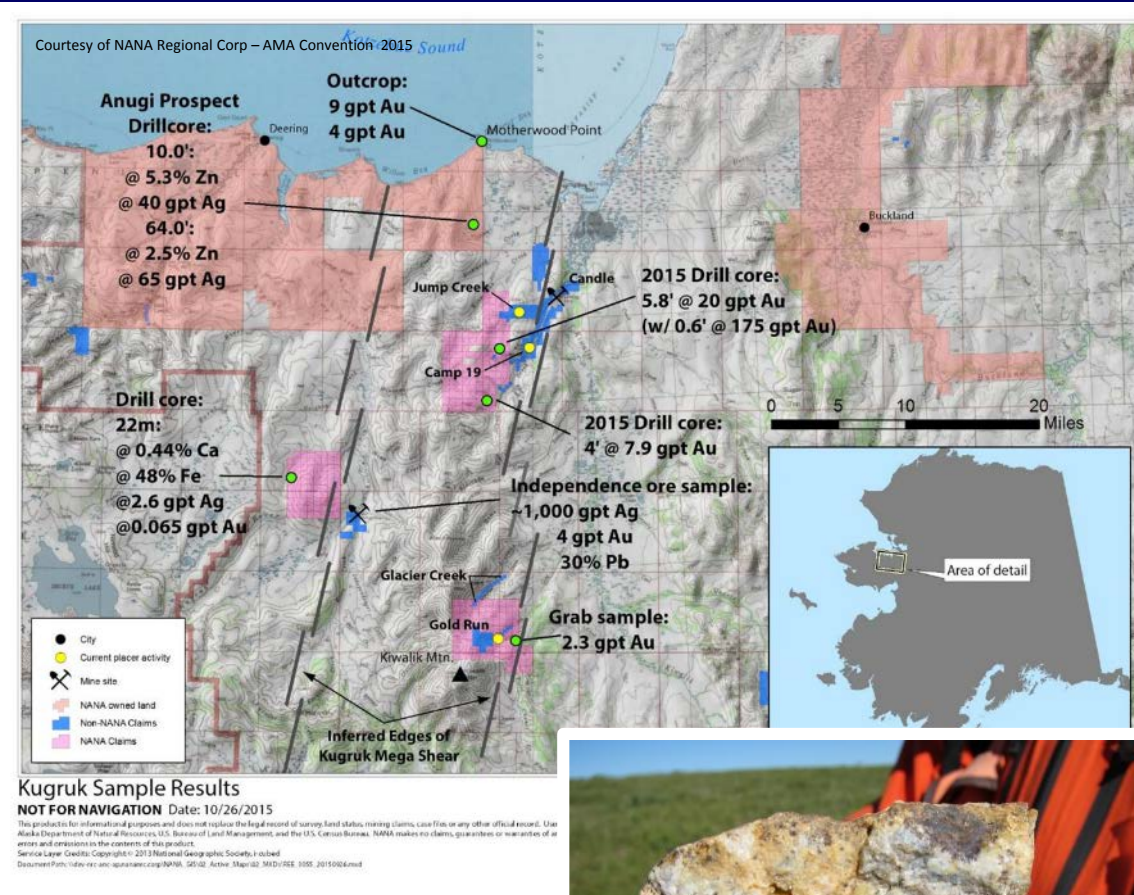
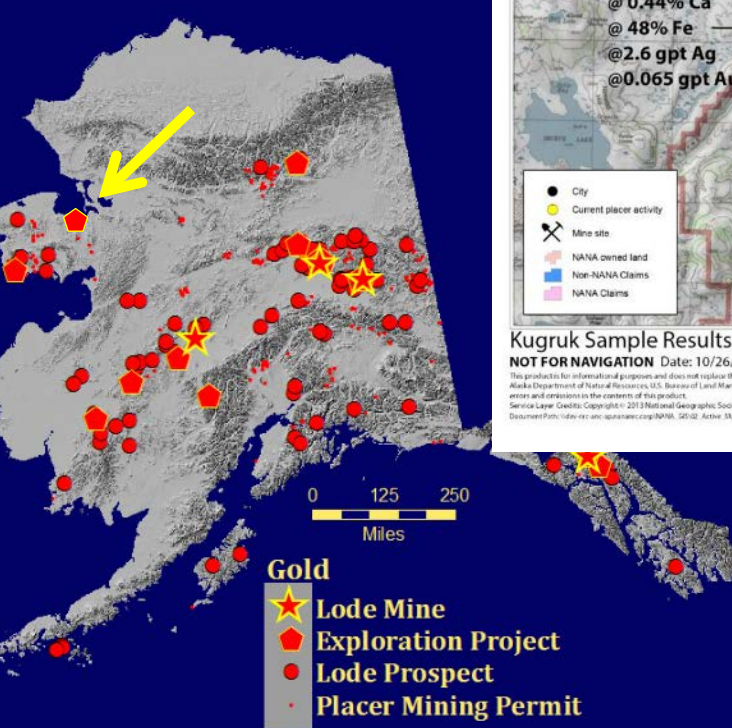
<http://westmountaingold.com>



# 2015 Gold Exploration – Western Region

## Fairhaven (orogenic gold & polymetallic):

- Helicopter support, 6 holes, 3100 feet.
- Quartz vein associated mineralization
- 3 holes with >10 gpt Au intervals
- NANA Regional Corp – AMA Convention 2015



# 2015 Gold Exploration – Eastern Interior

Fort Knox (intrusion host):

- Resource expansion to west
- Drilling ongoing year-round
- Replacing Reserves & Resources

<http://www.kinross.com>

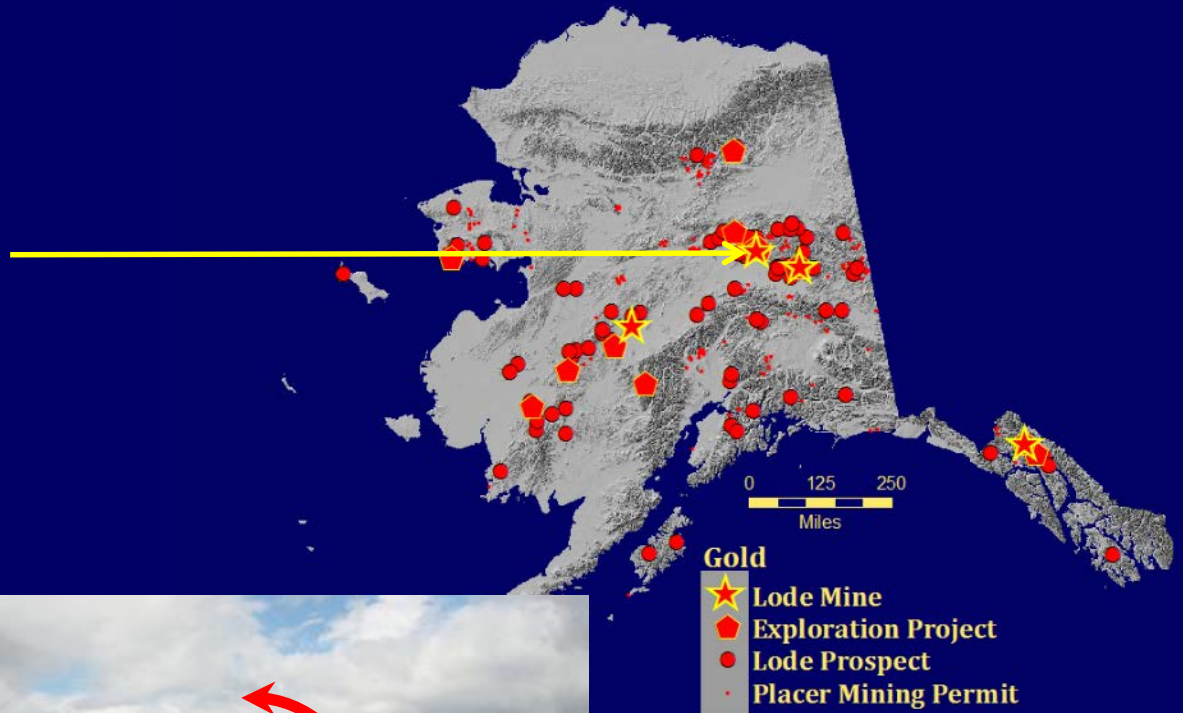


Photo courtesy of Fairbanks Gold Mining, Inc.



# 2015 Gold Exploration – Eastern Interior

## Exploration 2015

### Pogo Mine 2015 Exploration Drilling Program

- 9 Target Areas
- 174,000 ft Surface Drilling
- 45,500 ft Underground Drilling
- 103,000 ft Definition Drilling
- \$15m Exploration Budget
- 9 Drill Rigs
- 3 miles of strike length
- Goal of adding 339 koz to reserve

#### Legend

- Underground Drilling
- Surface Drilling



Courtesy of SMM Pogo LLC – AMA Convention 2015

### South Pogo Surface Drilling

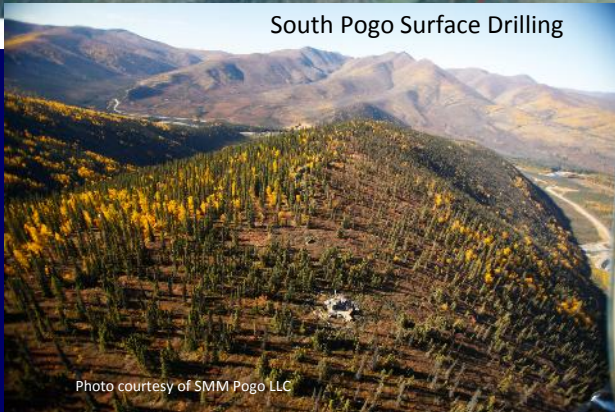
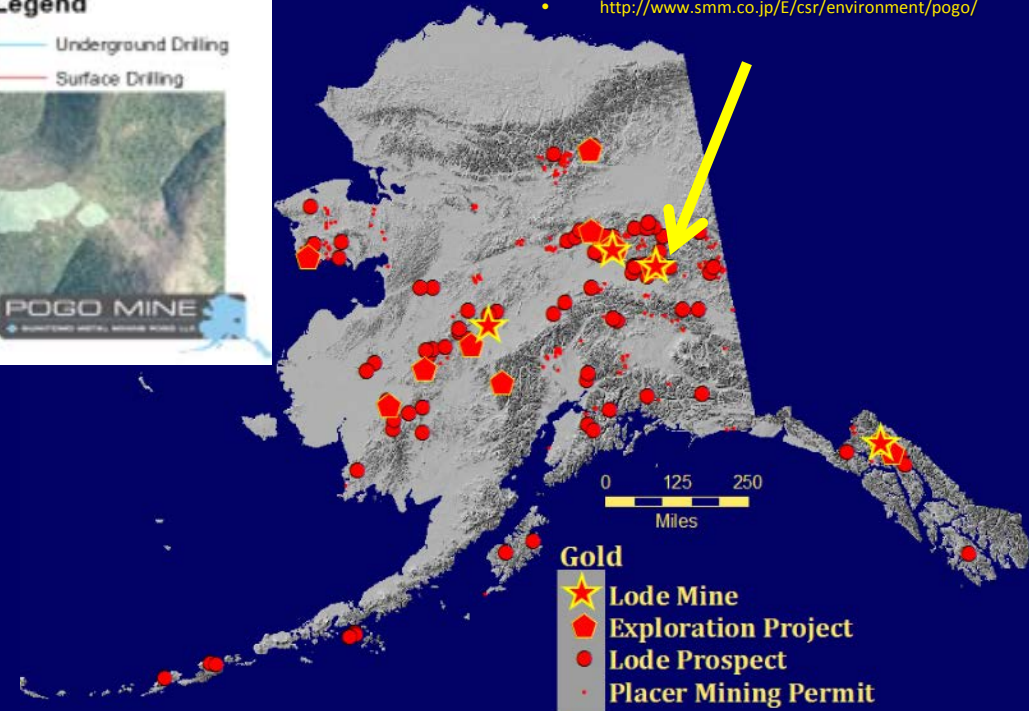


Photo courtesy of SMM Pogo LLC

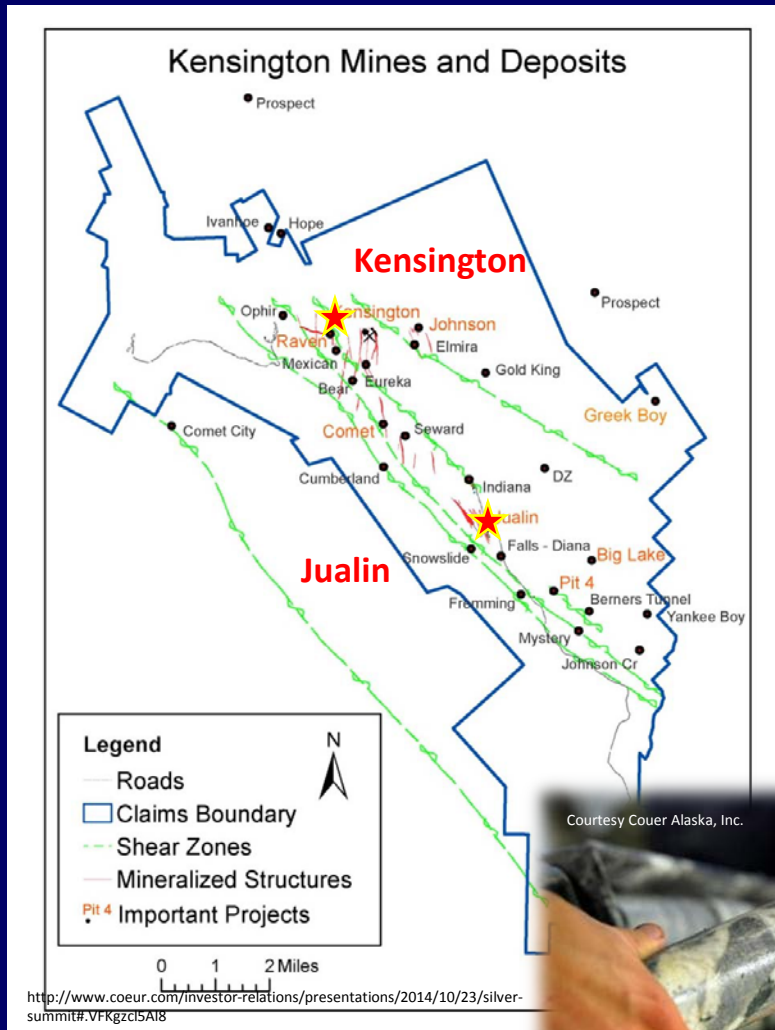
### Pogo (vein):



- \$15 million budget
- North zone drifting
- North zone definition
- East Deep definition
- South Pogo & 4021 surface exploration
- <http://www.smm.co.jp/E/csr/environment/pogo/>



# 2015 Gold Exploration Southeast Alaska



## Kensington (orogenic gold vein):

- Definition of richer parts of Kensington with some intercepts > 10 feet of > 1 oz/ton gold
- Resource expansion in higher grade Jualin inferred resource 289,000 tons @ 0.619 oz/ton
- Commenced Jualin decline in 2<sup>nd</sup> qtr, 750 feet of advance by 3<sup>rd</sup> qtr.
- Expect underground Jualin drilling to commence in 2016

<http://www.coeur.com>



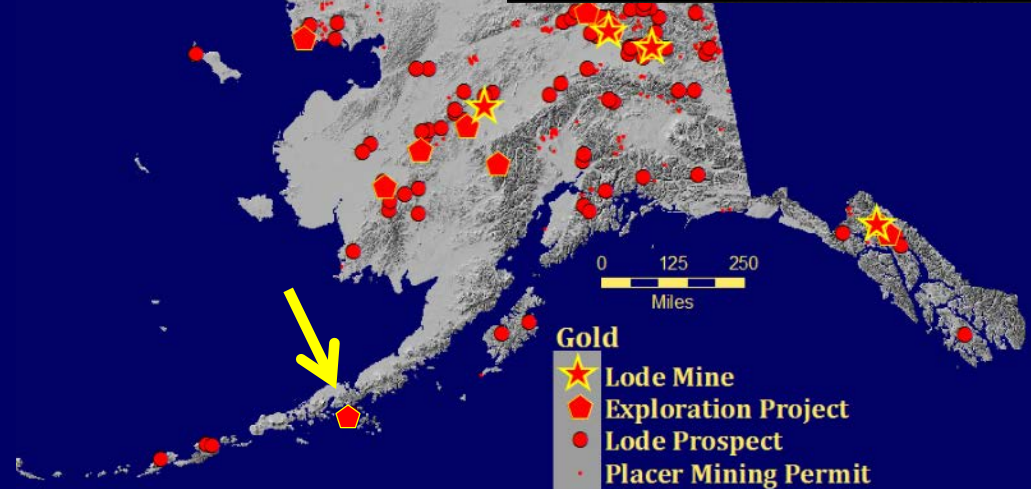
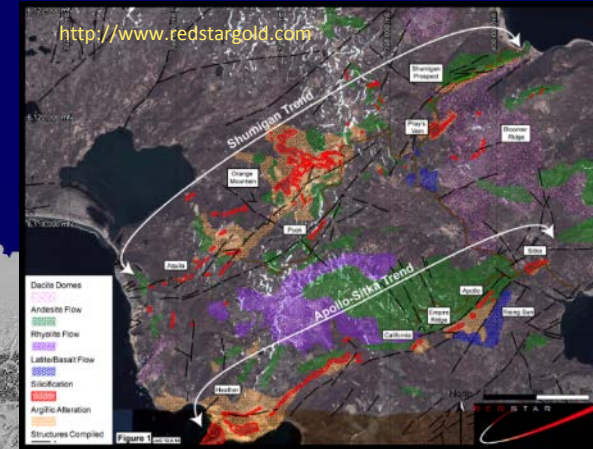
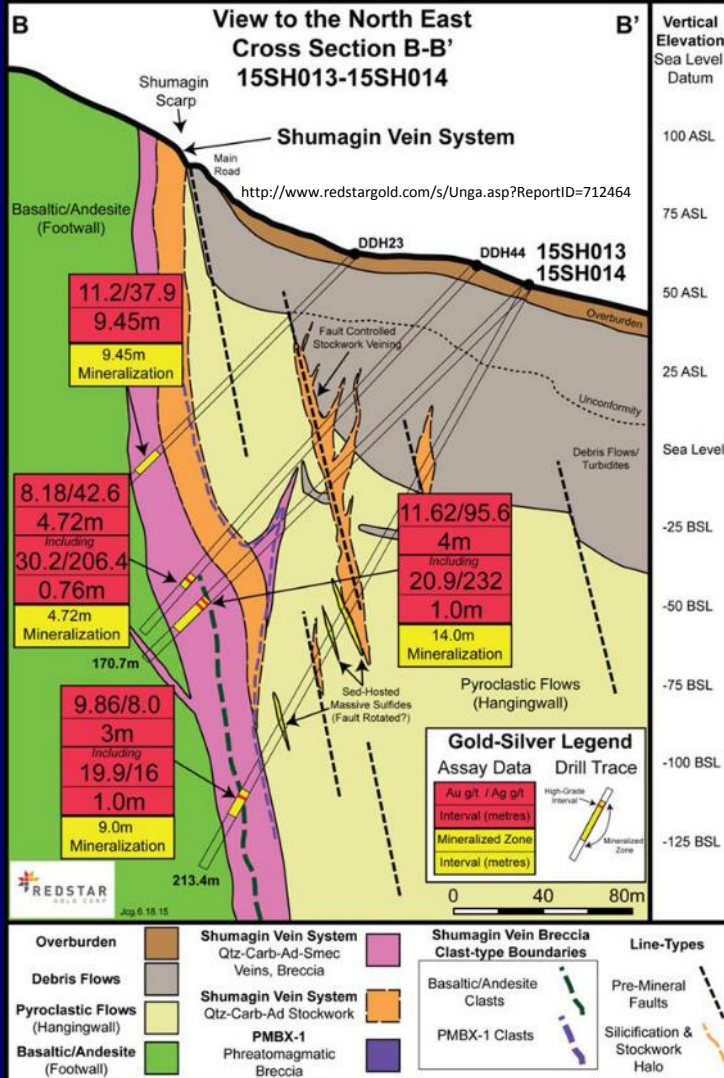
# 2015 Gold Exploration Alaska Peninsula



## Unga (epithermal Au-Ag):

- $\geq 100,000$  oz Au historic production
- 700,000 oz Au (unclassified resource) Ag:Au 4:1 (ARDF PM064,079)
- 4900-foot, 8-hole drill program

<http://www.redstargold.com>



# 2015 Gold Resources– Interior

## Livengood (intrusion related):

- 2013 Feasibility Study
- \$1,500/oz Au basis
- 10 M oz Au Reserve (P&P) @ 0.02 oz/ton
- \$ 1,474/ oz Au cost
- 20 M oz Au Total Resource



<http://www.ithmines.com>



Photo credit: [http://www.ithmines.com/\\_resources/presentations/ITH\\_Presentation.pdf](http://www.ithmines.com/_resources/presentations/ITH_Presentation.pdf)

## Golden Summit (intrusion related):

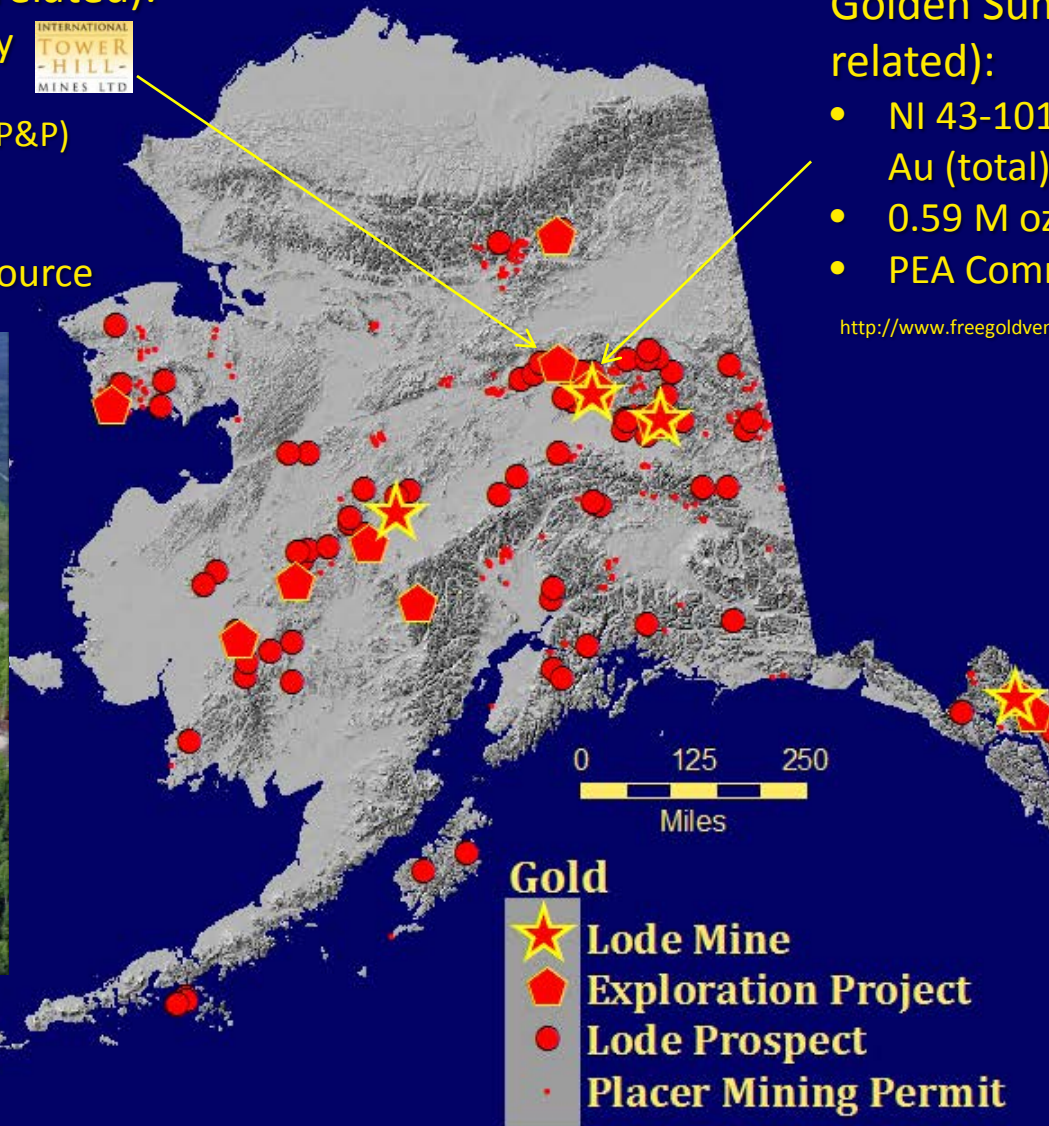


- NI 43-101 Resource: 6.52 M oz Au (total) @ 0.018 oz/ton
- 0.59 M oz in Oxide zone
- PEA Commenced March 2014

<http://www.freegoldventures.com>



Credit Shane Lasley



### Gold

- ★ Lode Mine
- ⬠ Exploration Project
- Lode Prospect
- Placer Mining Permit



# 2015 Alaska Zinc, Lead & Silver Production

## Red Dog – SedEx Zn-Pb-Ag:

**Teck**

**NANA**



Photo provided by Teck Alaska Inc.

- 615,000 tonnes Zn (Q1-3)  
2% decrease
- 96,700 tonnes Pb (Q1-3)  
4% increase
- Total Reserve: 52.8 M tonnes @ 16.5% Zn, 4.3% Pb, 80.0 g/T Ag (Dec. 2014)
- 63% of payroll to NANA shareholders

www.teck.com

## Greens Creek – VMS Ag-Zn-Pb-Au:

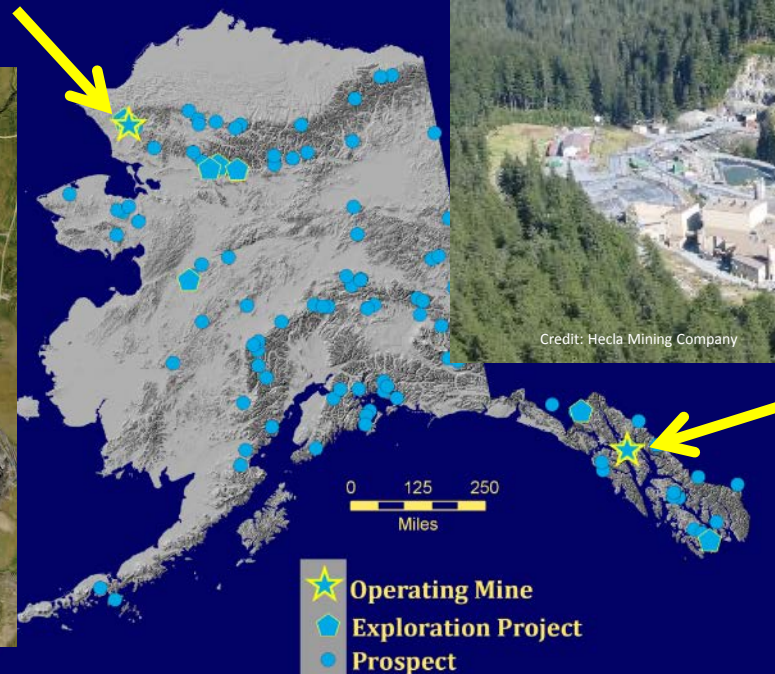
- \$ 3.75/ oz Ag cash cost
- 5.88 M oz Ag (Q1-3) 10% decrease)
- 43.4 K oz Au (Q1-3) steady
- 2233 tons per day
- P&P Reserve 7.7 M tons @ 12.2 oz/t Ag, 0.1 oz/ton Au, 8.3 % Zn, 3.1 % Pb

(Dec 2014) <http://www.hecla-mining.com>

**Hecla**  
GREENS CREEK



Credit : Teck Resources Limited / www.teck.com



Credit: Hecla Mining Company





# 2014 Polymetallic Exploration – Arctic Alaska

## Arctic VMS – Cu-Zn-Pb-Ag-Au:



- Open Pit PEA: 125 M lbs Cu, 152 M lbs Zn, 24 M lbs Pb, 2.5 M oz Ag & 29,000 oz Au

[www.novacopper.com](http://www.novacopper.com)

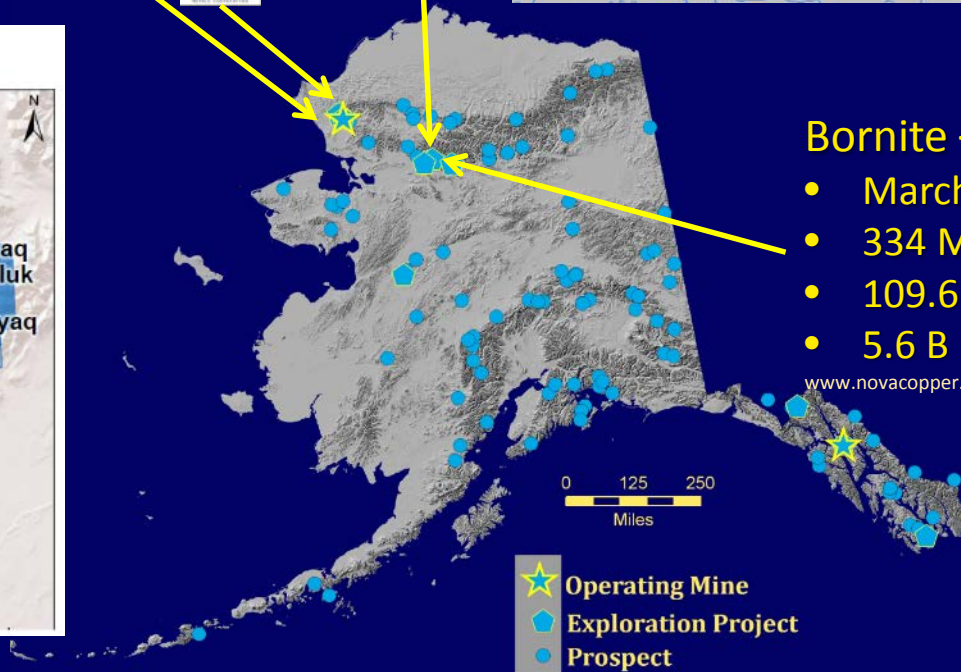
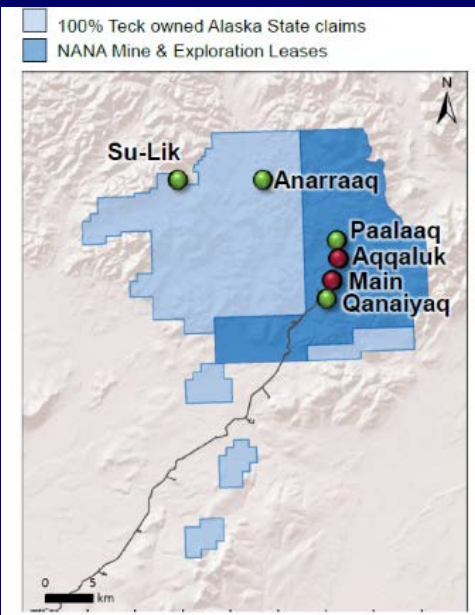
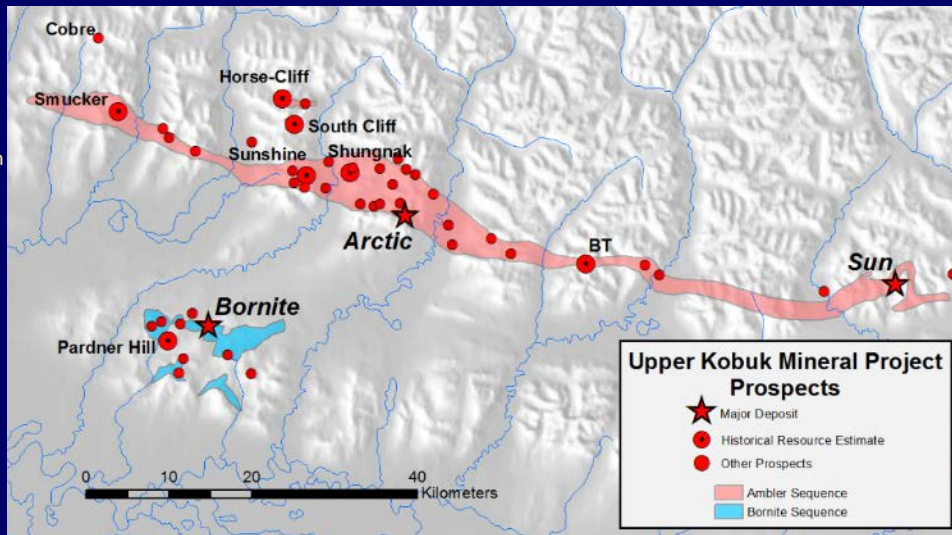
## Red Dog – Zn-Pb-Ag:

- Mine site exploration
- District focus on Paalaaq, Anarraaq

[www.teck.com](http://www.teck.com)



## Lik – Zn-Pb-Ag



## Bornite – Cu-(Ag-Co):

- March 2014 NI 43-101 Resource:
- 334 M lbs Cu In-Pit Indicated
- 109.6 M lbs Cu In-Pit Inferred
- 5.6 B lbs Cu Below-Pit Inferred

[www.novacopper.com](http://www.novacopper.com)



# 2015 Polymetallic Exploration – Arctic Alaska

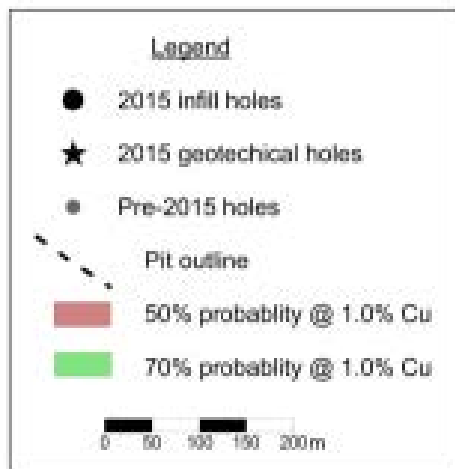
Arctic VMS 2015  
10,200-foot drill  
program:

- 12 infill holes to upgrade inferred to indicated resource.
- 2 geotechnical holes

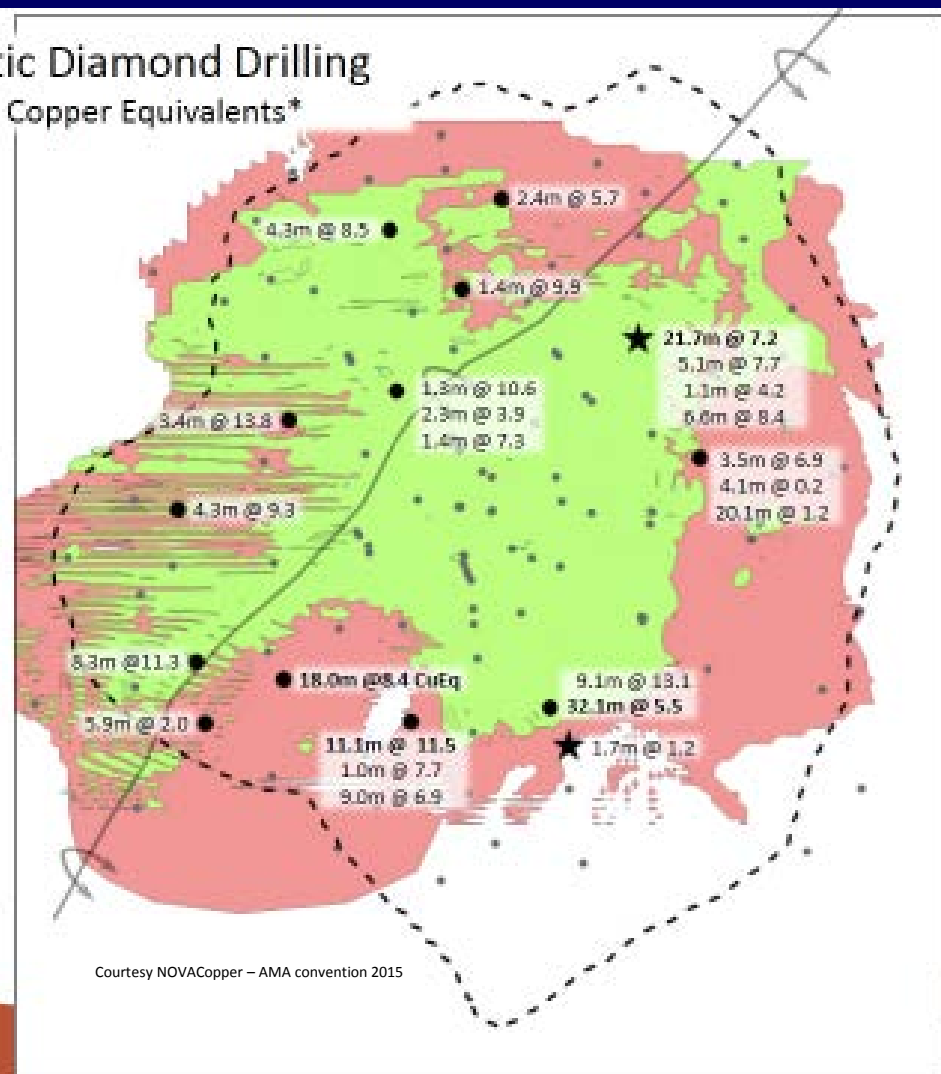
**2013 PEA:** 12 year open pit, 210 M lbs Cu Eq annually

- Indicated & Inferred resource: 27.2 M tonnes @ 3.25% Cu, 4.37% Zn, 0.74% Pb, 51.8 ppm Ag, 0.70 ppm Au

2015 NovaCopper Arctic Diamond Drilling  
Assay Results as Percent Copper Equivalents\*



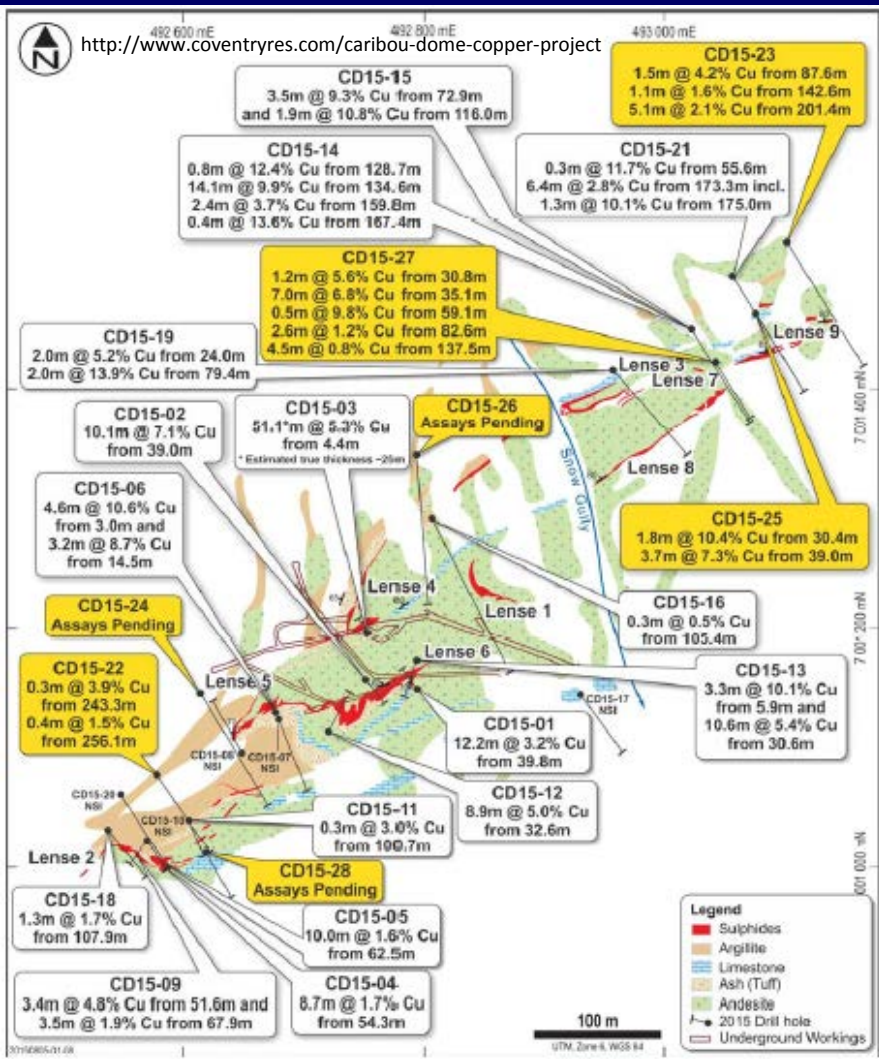
CuEq metal prices: Cu: \$2.90/lb, Pb: \$0.50/lb, Zn: \$0.82/lb, Ag: \$0.20/oz, Au: \$21.70/oz



Courtesy NOVA Copper – AMA convention 2015



# 2015 Polymetallic Exploration – South-central

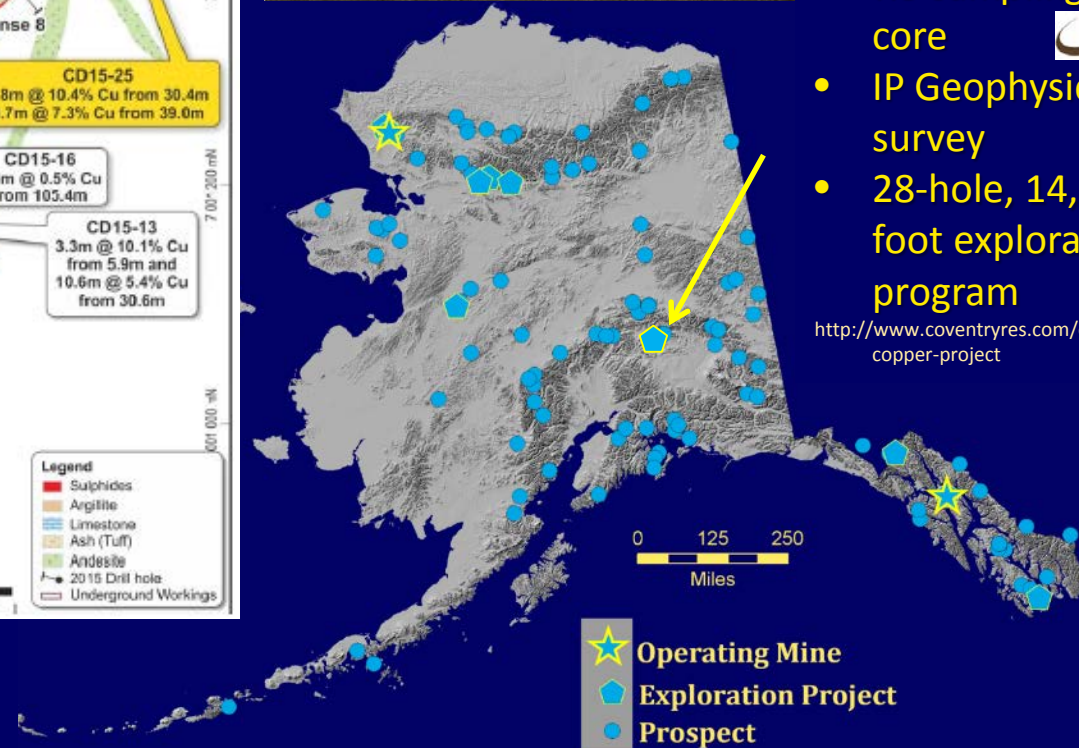


## Caribou Dome sediment-hosted – Cu(-Ag-Co)

- Re-sampling historic core
- IP Geophysical survey
- 28-hole, 14,000-foot exploration drill program



<http://www.coventryres.com/caribou-dome-copper-project>



## Polymetallic Exploration – Southeast



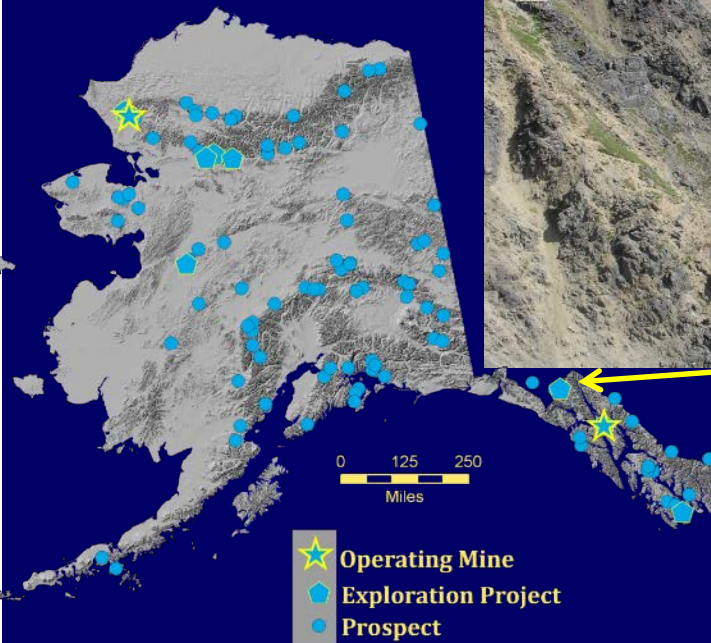
### Palmer – Zn-Cu-Pb-Au-Ag

- Dowa Metals JV – JOGMEC funding – expanded land
- Expanded Inferred Resource: 8.96 M tons @ 1.4% Cu, 1.3 % Pb, 5.3% Zn, 0.039 oz/t Au, 0.59 oz/t Ag
- 25,400-foot 10 hole drill program
- Down-dip extensions of southwall, new prospects

<http://constantinemetals.com/projects/palmer>

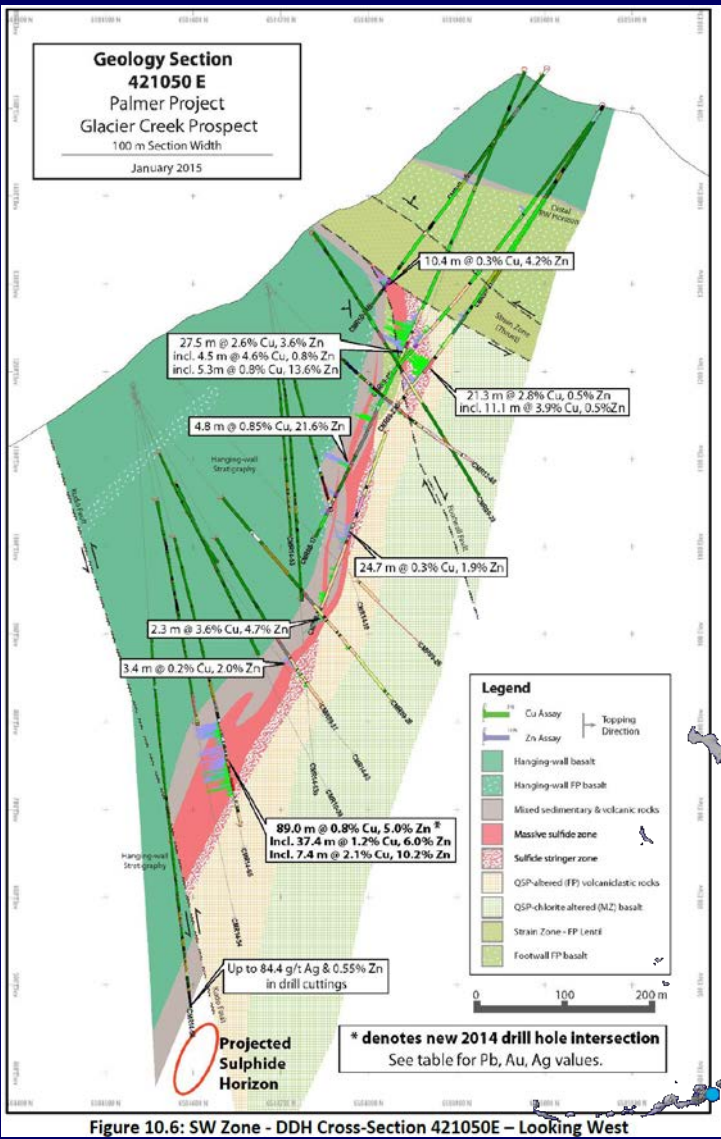


Photo Courtesy Constantine metals Corporation



- ★ Operating Mine
- Exploration Project
- Prospect

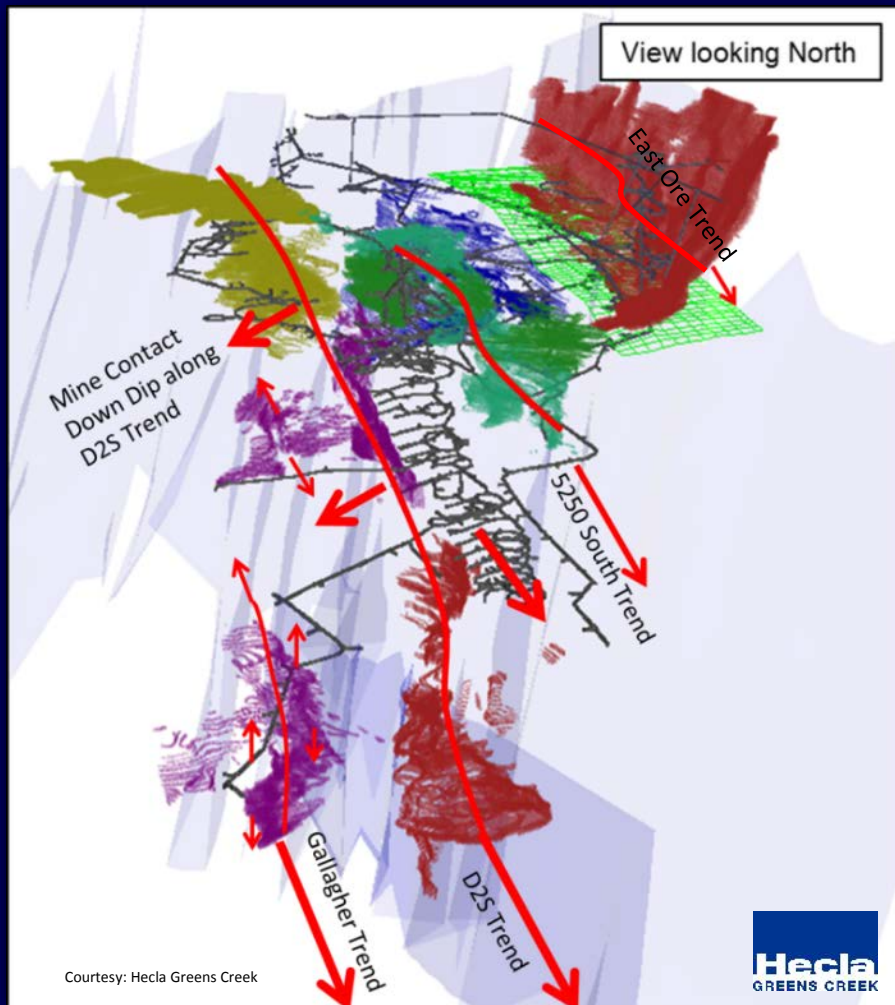
0 125 250  
Miles



\* denotes new 2014 drill hole intersection  
See table for Pb, Au, Ag values.



# 2015 Polymetallic Exploration – Southeast



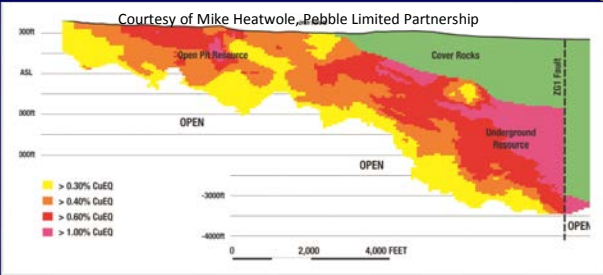
## Greens Creek VMS-Sedex – Ag-Zn-Pb-Au

- Budgeted 170,000 feet underground drilling (infill and step-out five separate zones)
- Budgeted 10,000 feet surface drilling @ Killer Creek
- 30 miles unexplored mine contact

<http://www.hecla-mining.com/>



# 2015 Porphyry Cu-Au-Mo Resources



## Whistler:

- Indicated & Inferred resource: 769 M lbs Cu
- 3.13 M oz Au
- 13.2 M oz Ag

<http://brazilresources.com/projects/whistler/>

## Tetlin – Skarn (porphyry related):

- Peak Zone Resource: 9.8 M tonnes containing 1.1 M oz Au eq (Ind+Inf)

[http://www.contangoore.com/pr/pr13\\_130716.pdf](http://www.contangoore.com/pr/pr13_130716.pdf)



Courtesy of Avalon Development & Contango ORE

## Pebble:

- 2014 resource (M&I+I):
- 12 B tons ore
- 81.8 B lbs Cu,
- 5.8 B lbs Mo &
- 107.9 M oz Au



<http://www.pebblepartnership.com/geology.html#section-deposit>

## Pyramid:

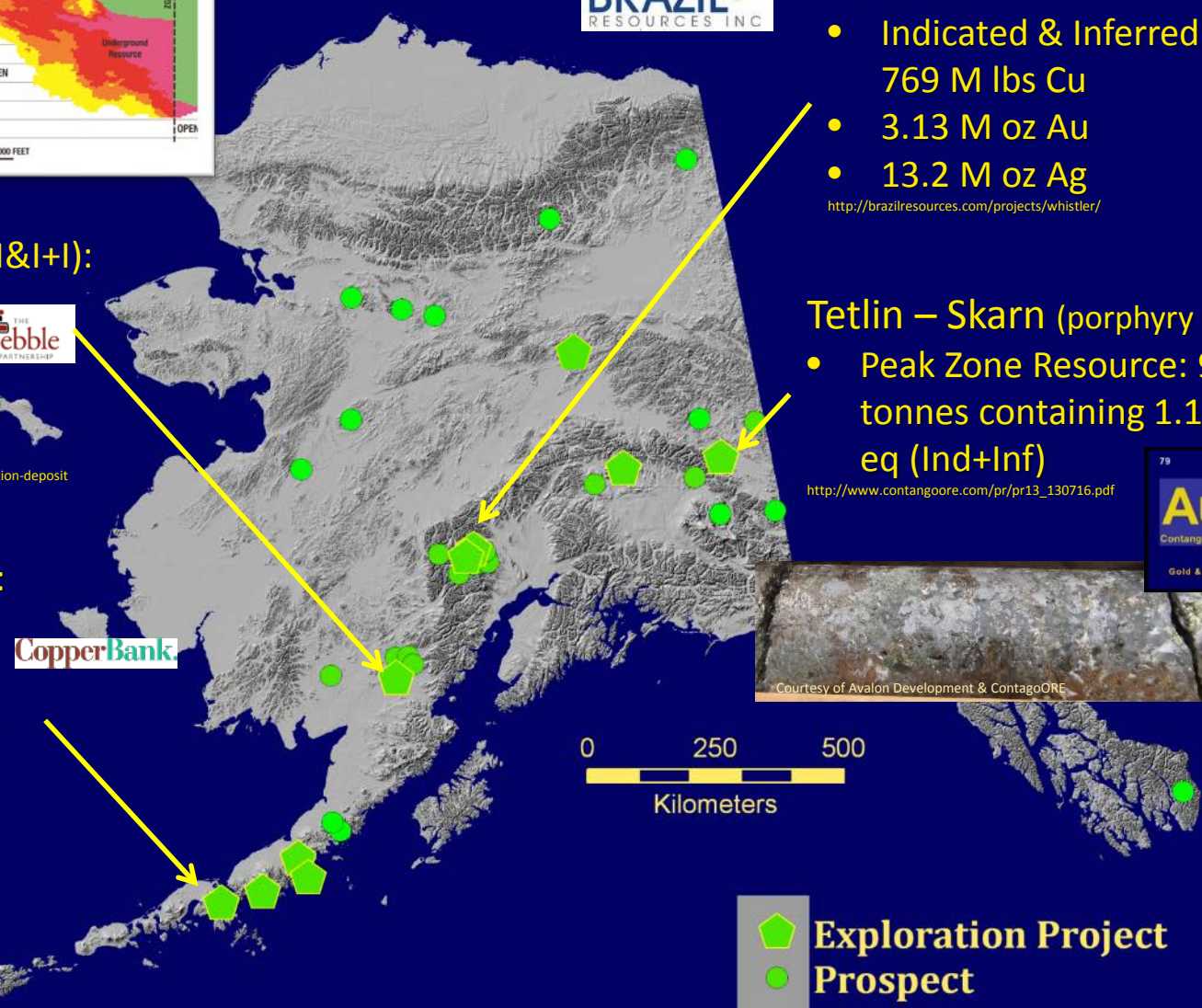
- Inferred resource:
- 1,338 M lbs Cu
- 74 M lbs Mo
- 488,000 oz Au



<http://www.fullmetalmaterials.com/properties/pyramid>



Credit: <http://www.fullmetalmaterials.com/>



 Exploration Project  
 Prospect



# 2015 Porphyry Cu-Au-Mo Exploration

## Shorty Creek:

- 20 historic holes
- 9800-foot drill program
- 91.4 m of 0.71 % Cu eq.

www.freegoldventures.com



[http://www.freegoldventures.com/ir/mpe/sc/mc\\_2015\\_03\\_15\\_13\\_02\\_05\\_44.jpg](http://www.freegoldventures.com/ir/mpe/sc/mc_2015_03_15_13_02_05_44.jpg)

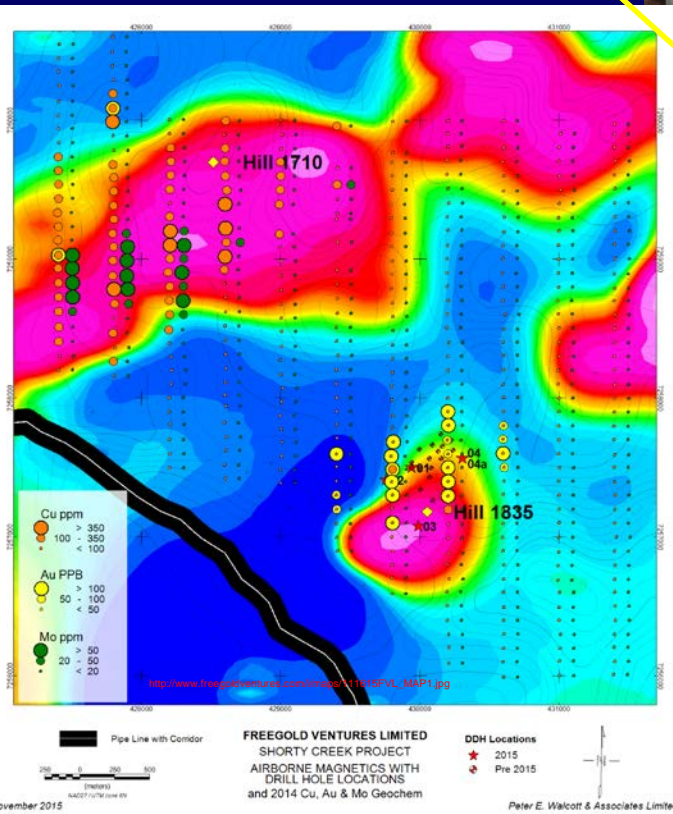
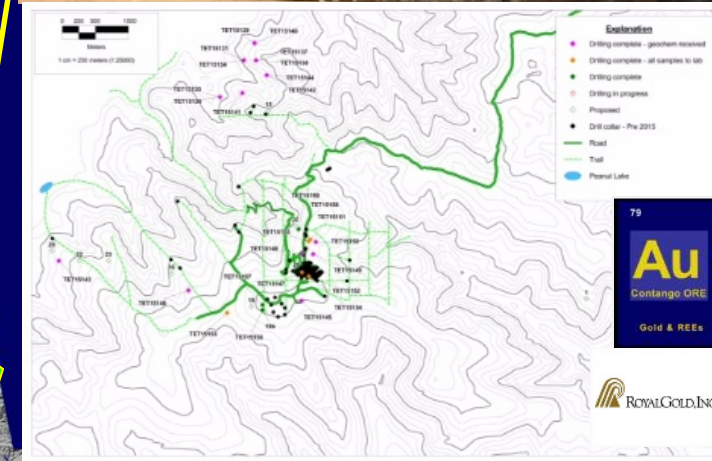
## Tetlin – Skarn (porphyry related):

- \$8.8 M two phase program
- 45,264 feet – 61 holes
- Intercepts >5 m w/ >15 g/T Au +Ag +Cu

<http://www.contangoore.com> – North of 60 Mining News



Courtesy of Avalon Development & ContangoORE



**FREEGOLD VENTURES LIMITED**  
SHORTY CREEK PROJECT  
AIRBORNE MAGNETICS WITH  
DRILL HOLE LOCATIONS  
and 2014 Cu, Au & Mo Geochem

**DDH Locations**  
★ 2015  
◆ Pre 2015

Peter E. Walcott & Associates Limited

**Exploration Project**  
**Prospect**

0 250 500  
Kilometers

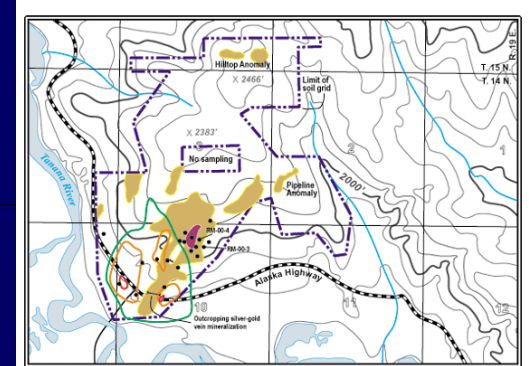
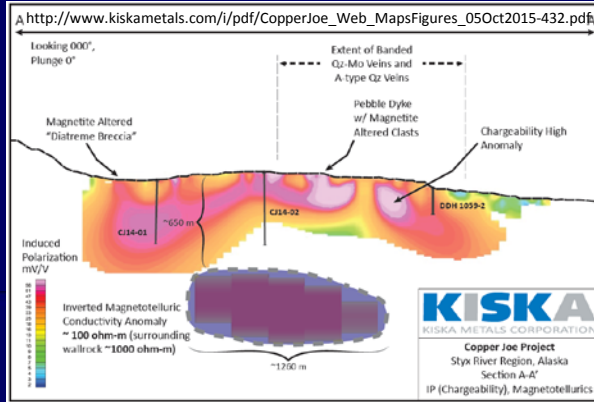


# 2015 Porphyry Cu-Au-Mo Exploration

## Copper Joe:

- 10 Ma Porphyry System

[http://www.kiskametals.com/s/Copper\\_Joe.asp](http://www.kiskametals.com/s/Copper_Joe.asp)



### EXPLANATION

Gold geochemical anomaly in soils (majority of samples  $\geq 10$  ppb Au), and highway roadcut chip samples ( $\geq 100$  ppb Au)

**3D IP anomaly**  
 20 millisecond response  
 25 millisecond response  
 40 millisecond response

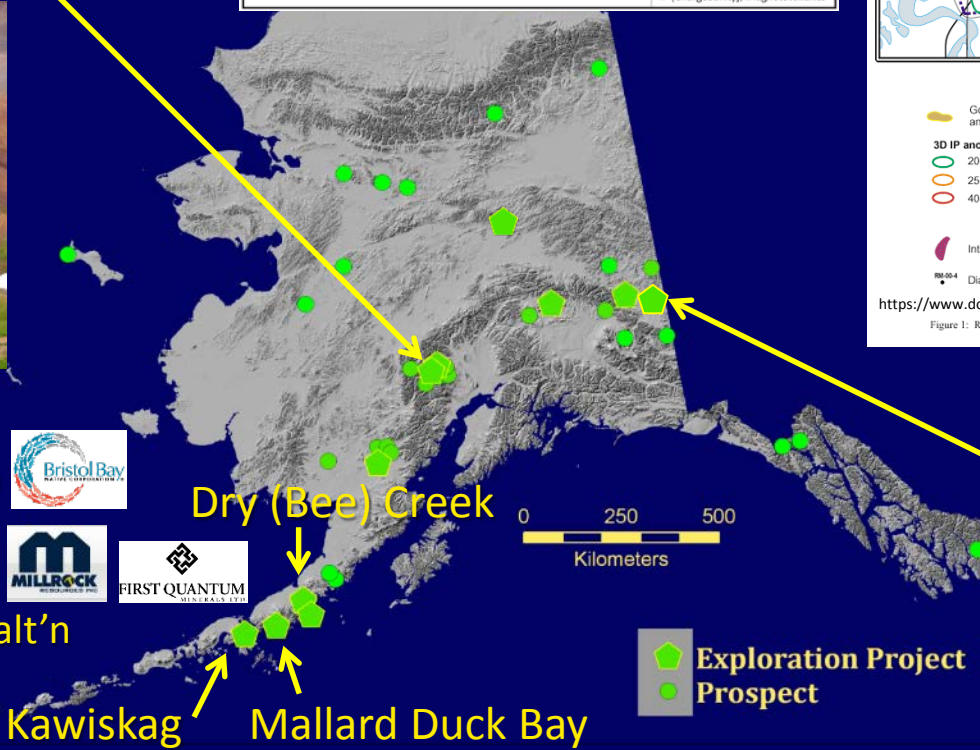
Intrusion breccia; granite and apatite clasts in porphyritic granite matrix.

Diamond Drill hole collar with hole number

[https://www.doyon.com/wp-content/uploads/2015/08/prospect\\_nwf1.gif](https://www.doyon.com/wp-content/uploads/2015/08/prospect_nwf1.gif)

Figure 1: Road Metal Prospect gold geochemistry, IP response and diamond drill hole locations.

Courtesy: Millrock Resources Inc



## Northway



## Alaska Peninsula:

- \$2 M 2015 Drill Program
- 7900 feet – 8 holes
- Dry (Bee Creek)
- 91 m w/ 0.19 % Cu QSP alt'n
- Mallard Duck Bay

<http://www.fullmetalmaterials.com/properties/pyramid>



Kawiskag

Mallard Duck Bay

Exploration Project  
 Prospect





# 2015 Graphite & REE Resources

## Graphite Creek – Graphite:

- Updated NI 43-101 Resource
- 19.8 M tons @ 6.3% Cg Indicated
- 170.2 M tons @ 5.7 % Cg Inferred
- Total resource of 9.9 M tonnes graphite
- 4.5 km of 18 km strike is drilled

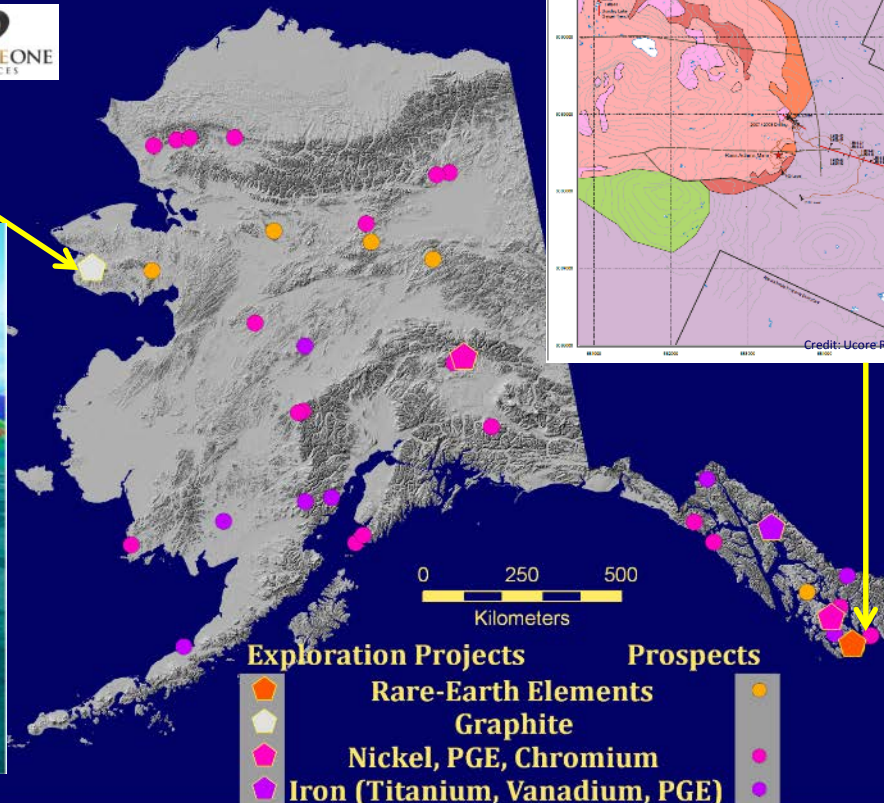
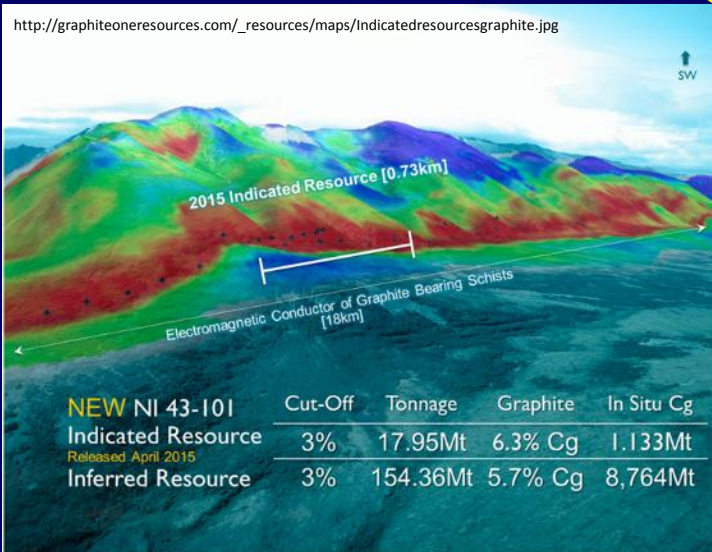
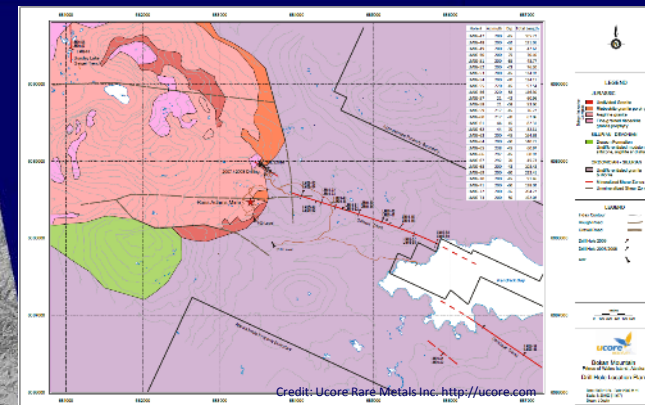
[www.graphiteoneresources.com](http://www.graphiteoneresources.com)



## Bokan – Dotson Ridge – REE:

- Bankable feasibility study in progress
- Updated Resource 5.28 M tons Indicated, & 1.16 Mtons Inferred.
- 77.5 M lbs TREO (HREE enriched)

<http://ucore.com>



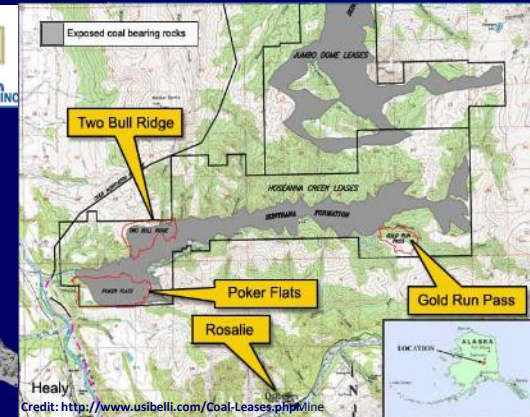
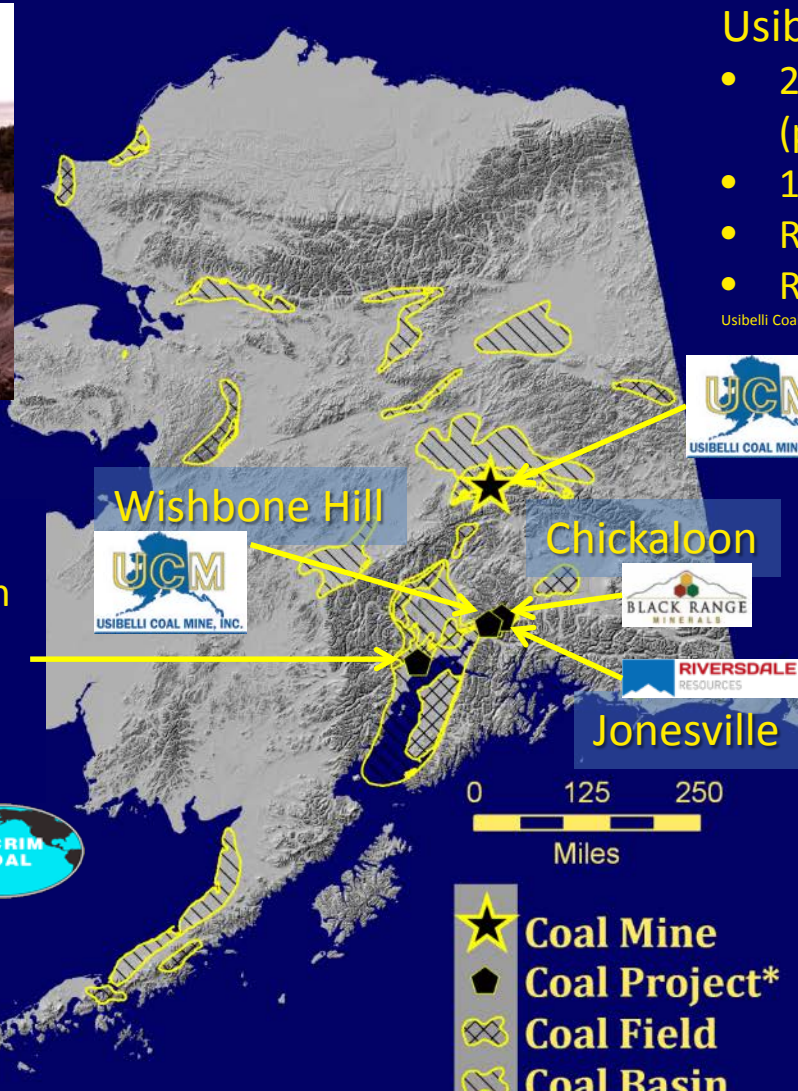
# 2015 Alaska Coal Highlights



## Usibelli Coal Mine:

- 2015 Production 1.4 million tons (producing since 1943)
- 15% Japan export
- Reserves ca 750 million tons
- Regional electrical generation

Usibelli Coal – personal communications <http://www.usibelli.com/Coal-Leases.php>



## Chuitna Coal Project:

- Proven reserves 300 million tons (LMU-1)
- Draft EIS – 2016 public review

<http://www.chuitnacoalproject.com/background.html>



# Reclamation – Success in Northern Regions

Nugget Creek Placer Mine - Fairbanks



Pre-Reclamation 2009



Four years later 2015

Usibelli Coal Mine - Healy



July 2003

Poker Flats - 11 Years Later



September 2014

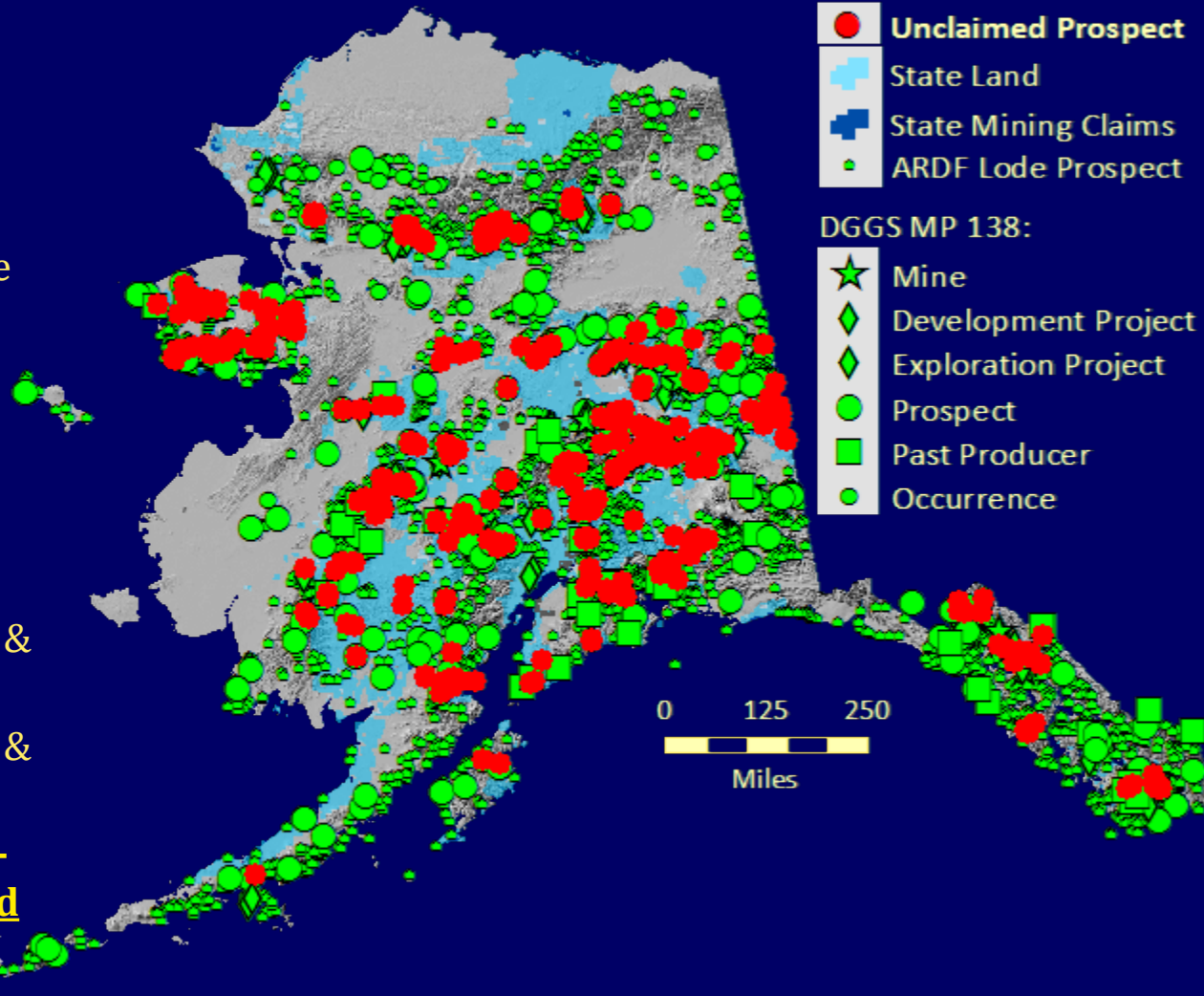
# Available Lode Prospects

## Alaska Resource Data File (ARDF)

- 3,323 lode prospects total statewide
- 795 ARDF lode prospects are on state-owned land
- **459 ARDF prospects on state-owned lands are not staked**

## DGGS MP 142 – Mineral Resources Map

- 307 lode prospects, projects & mines statewide
- 104 lode prospects, projects & mines on state-owned land
- **33 lode prospects on state-owned lands are not staked**



# Annual Mineral Industry Report – Since 1981

## DGGS Mission:

Determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material, and the potential geologic hazards to buildings, roads, bridges, and other installations and structures (AS 41.08.020).

## The Annual Mineral Industry Report:

The department shall conduct a continuing survey of the mineral resources and mining operations of the state and shall disseminate information regarding them to assist prospectors and miners, safeguard the lives and health of miners, protect investors in the mining industry, and foster and promote the best interests of the mining, mineral, and related industries of the state (AS 27.05.050).

## Alaska's Mineral Industry 2014

Special Report 70

