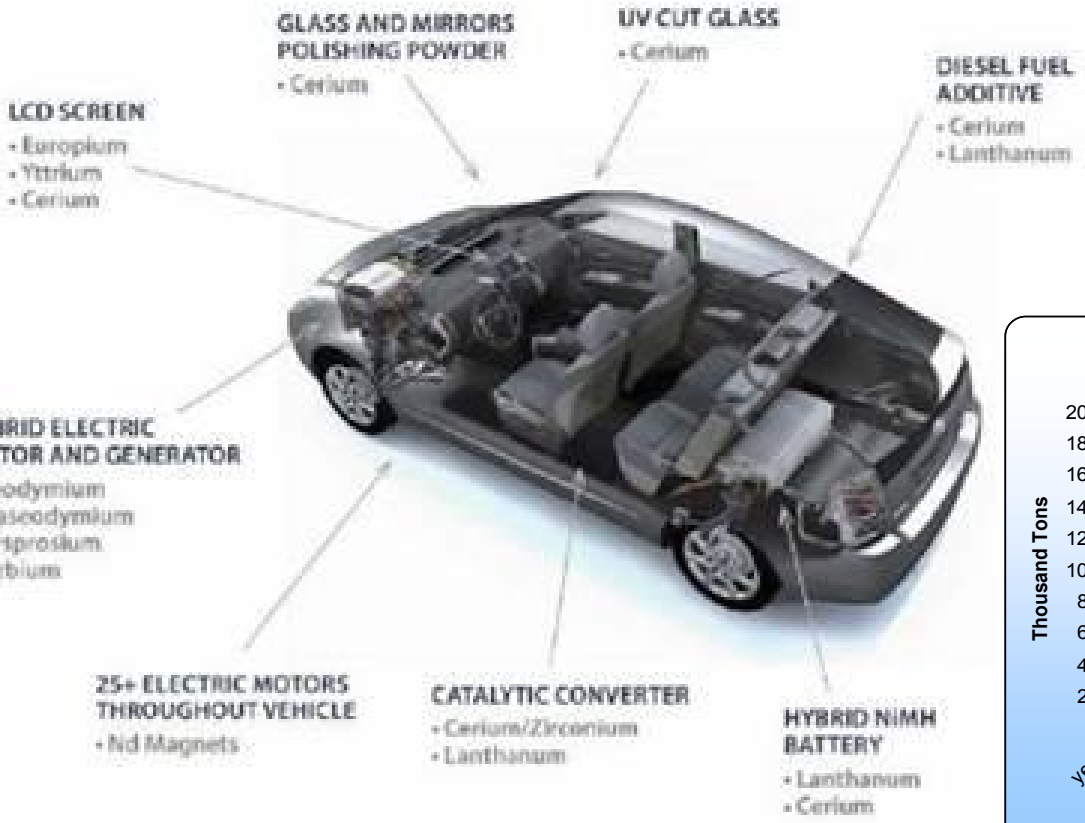
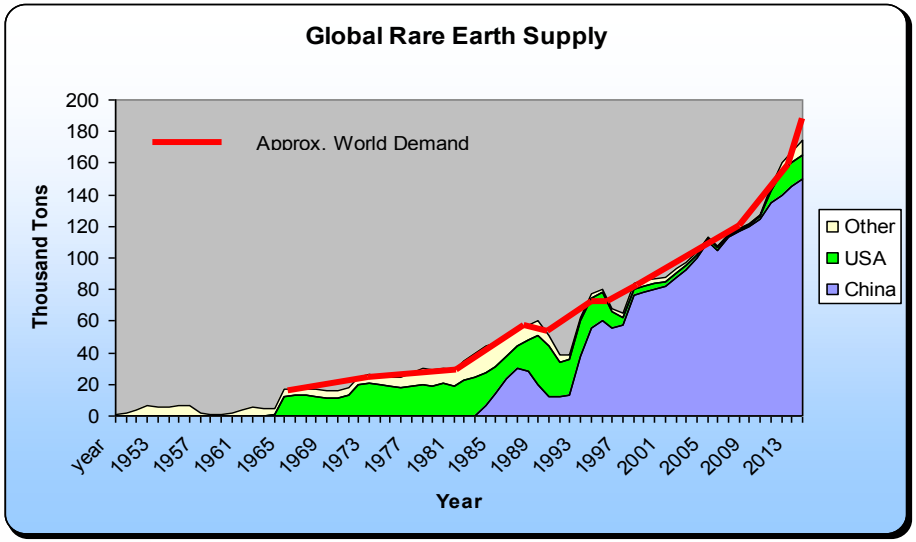
Rare Earth Element Deposits, Prospects, & Potential in Alaska


GLASS AND MIRRORS POLISHING POWDER
• Cerium
UV CUT GLASS
• Cerium
DIESEL FUEL ADDITIVE
• Cerium
• Lanthanum
LCD SCREEN
• Europium
• Yttrium
• Cerium
RID ELECTRIC
TOR AND GENERATOR
odymium
seodymium
sprosium
rbium
25+ ELECTRIC MOTORS THROUGHOUT VEHICLE
• Nd Magnets
CATALYTIC CONVERTER
• Cerium/Zirconium
• Lanthanum
HYBRID NiMH BATTERY
• Lanthanum
• Cerium


Global Rare Earth Supply
Approx. World Demand
Thousand Tons
200
180
160
140
120
100
80
60
40
20
0
year
1953
1957
1961
1965
1969
1973
1977
1981
1985
1989
1993
1997
2001
2005
2009
2013
Year
Other
USA
China

2015 Global Forecast Supply and Demand

Rare Earth Oxide	Demand @ 180,000tpa REO	Supply @ 208,500tpa REO
Cerium	63-68,000t REO	+ 80-85,000t REO
Neodymium	35-40,000t REO	30-35,000t REO -
Europium	725-775t REO	575-625t REO -
Terbium	450-500t REO	375-425t REO -
Dysprosium	2,500-3,000t REO	- 1,600-2,000t REO

Alaska

Source: IMCOA at Roskill 2010 Conference, Nov 2010

LREE vs HREE

Jurisdiction

State Land

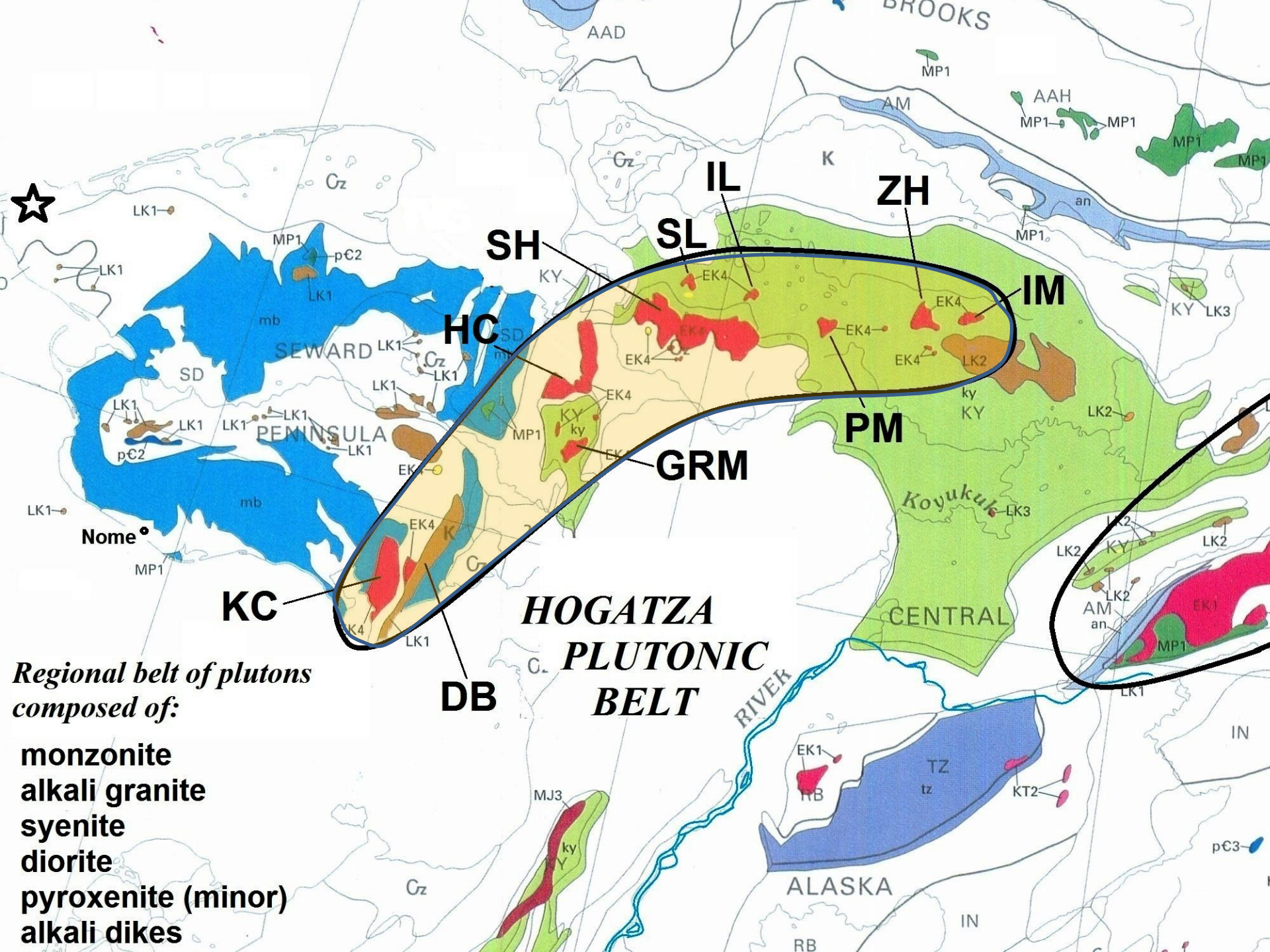
Access

LREE vs HREE

Jurisdiction

State Land

Access



Regional belt of plutons composed of:

monzonite
alkali granite
syenite
diorite
pyroxenite (minor)
alkali dikes

Allanite in pulaskite dike swarm

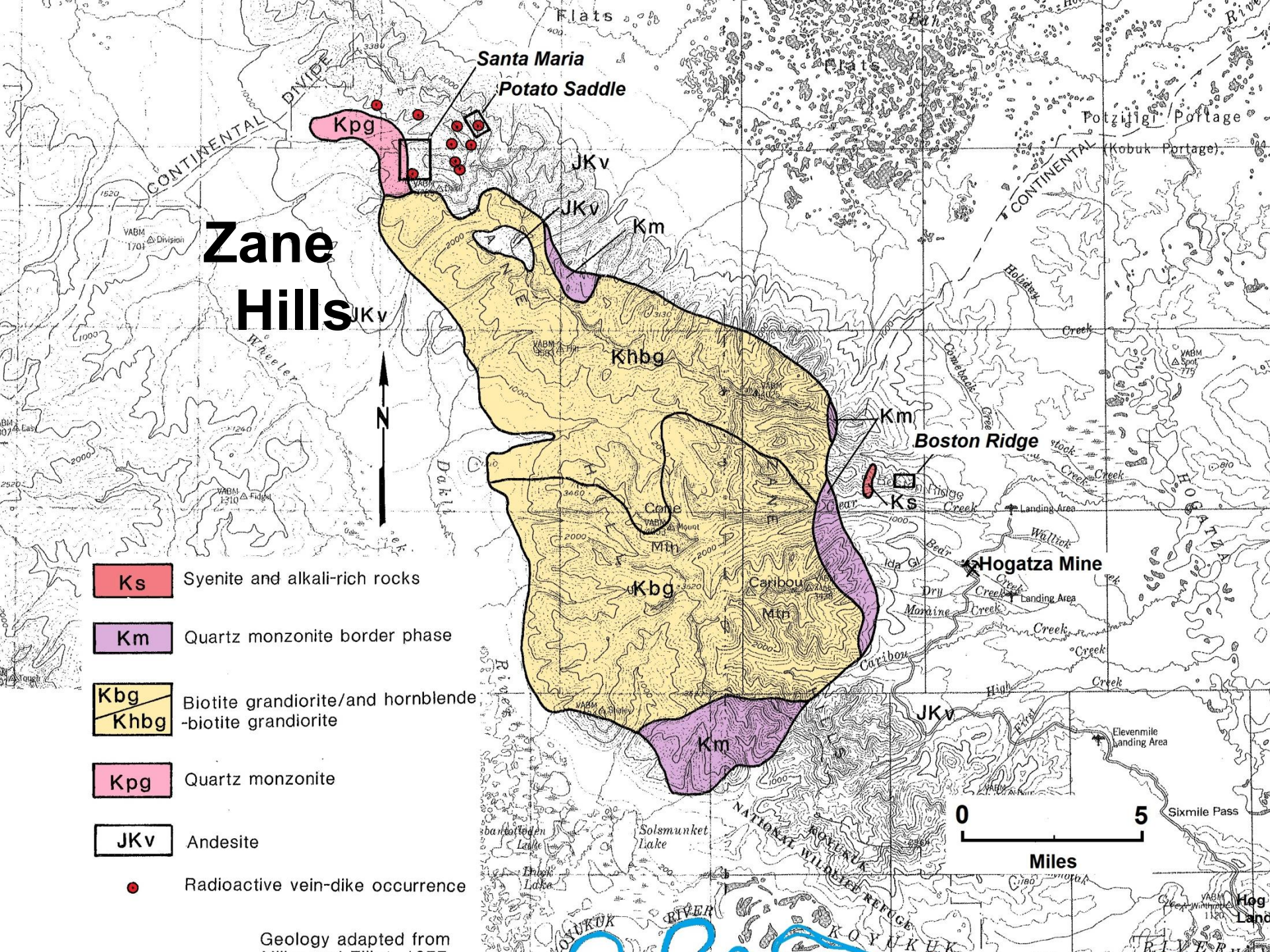
Kachauik Pluton

La+Ce/Y = ± 30

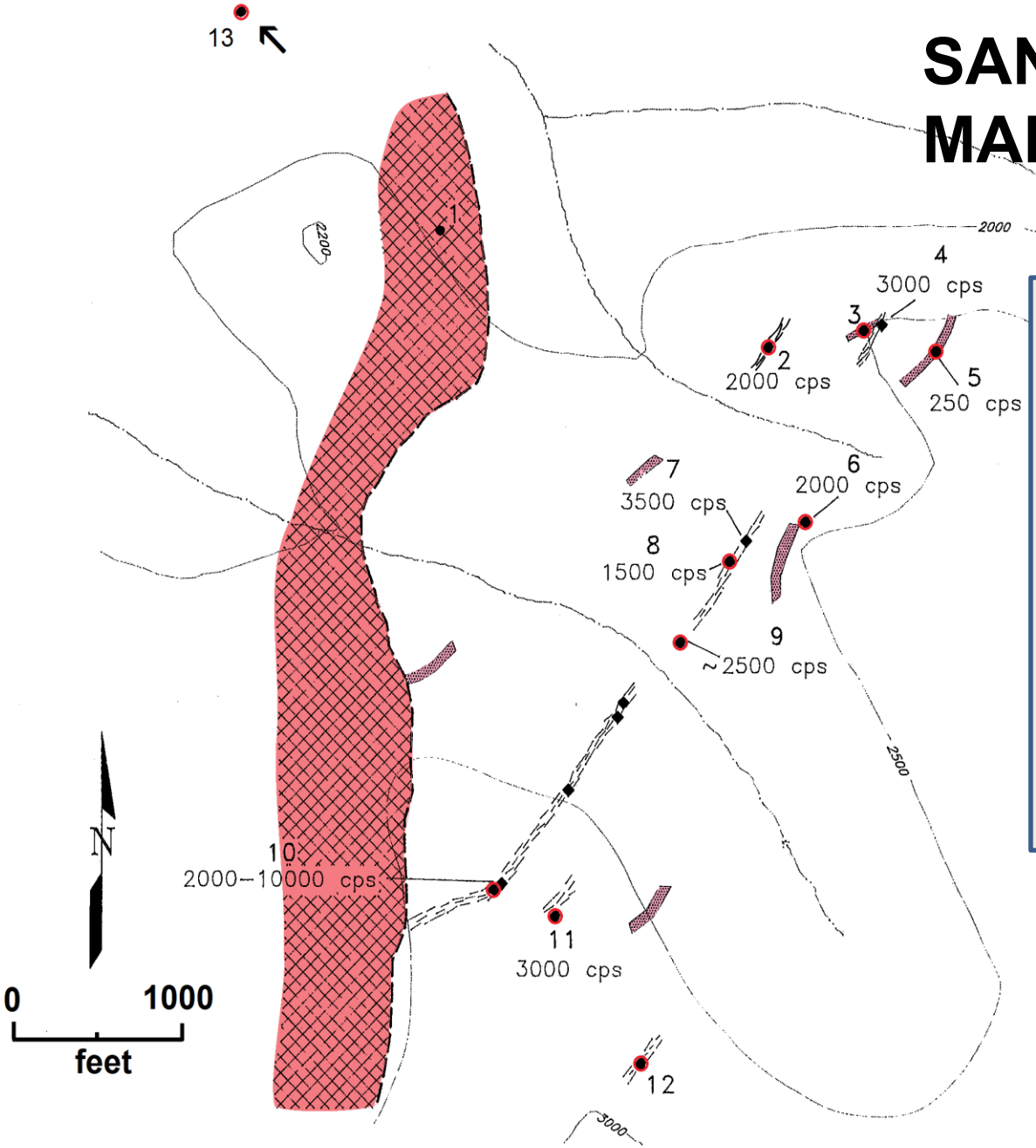
TREE = 2%

n=5

Samples by Miller, et al., 1976


Zane Hills
Santa Maria
Potato Saddle
Boston Ridge
Hogatza Mine
Kpg
JKv
Km
Khbg
Kbg
Ks
N
Ks Syenite and alkali-rich rocks
Km Quartz monzonite border phase
Kbg Khbg Biotite grandiorite/and hornblende -biotite grandiorite
Kpg Quartz monzonite
JKv Andesite
Radioactive vein-dike occurrence
0 5
Miles
Geology adapted from

SANTA MARIA



Site map of the Santa Maria prospect

Vein-dikes exhibit flow-banded o
schleiren mineralogy of K-spar
groundmass w/ aggregations of
sericite, epd,carb, chl, cut by vnlt
of black silica, mag, hem, fluorite
Sulfides – gal, cpy, moly.
Uranothorianite
Thorite
Betafite (U-Nb-Ta)
Allanite
Zircon

La + Ce / Y = 0. 38

Zane Hills Pluton

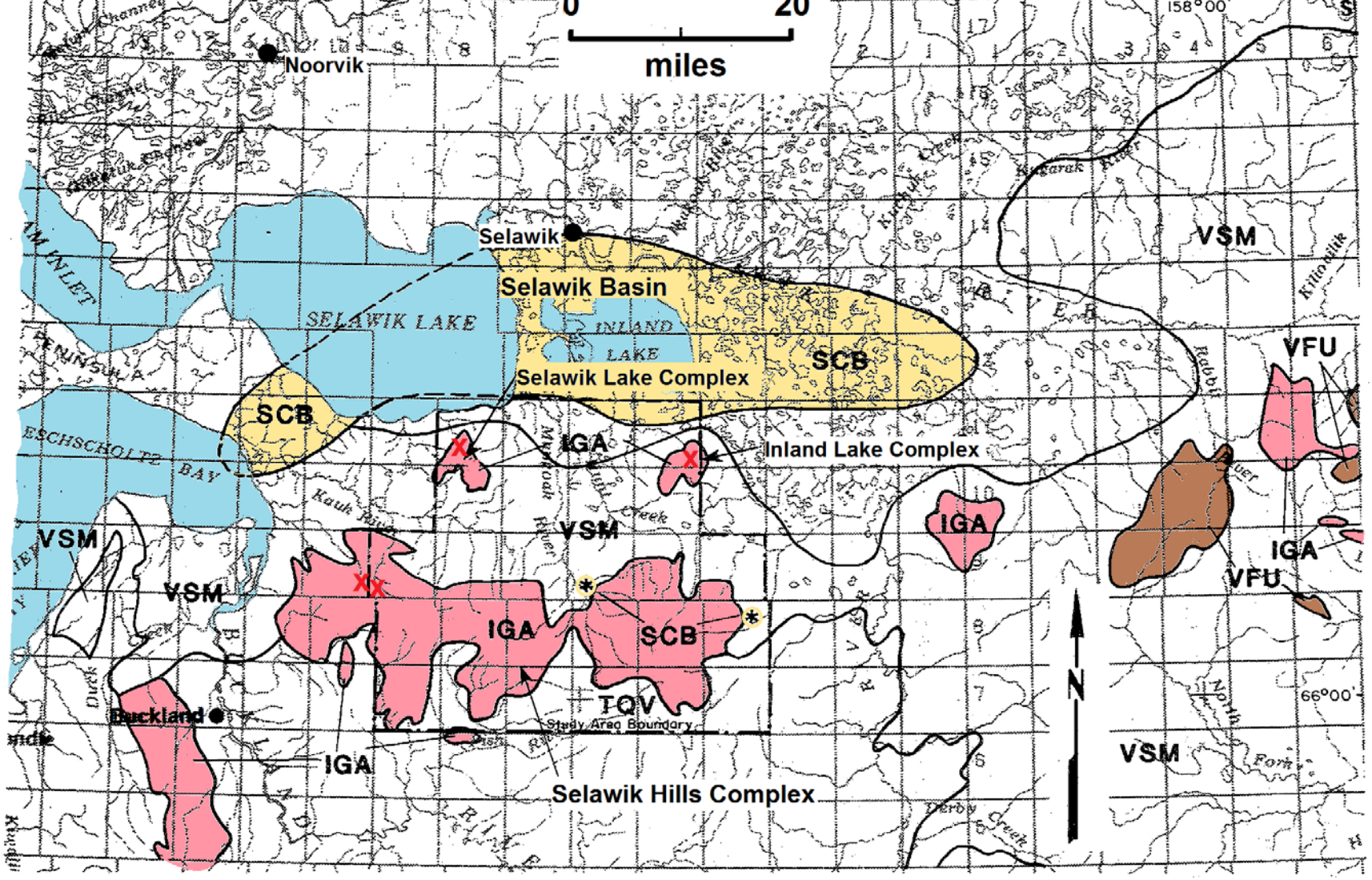
Alkaline feldspar porphyry dike, pink in color

Zone of radioactive vein rubble
blk silica, hem, fluorite, chl, mag, epidote

Prospect pit

Sample site

La + Ce / Y = 0. 38



X prospect area assoc. with quartz veins
lamprophyre dikes
alt. Hb syenite por.
alt. felsic dikes

IGA Alkaline granite rocks

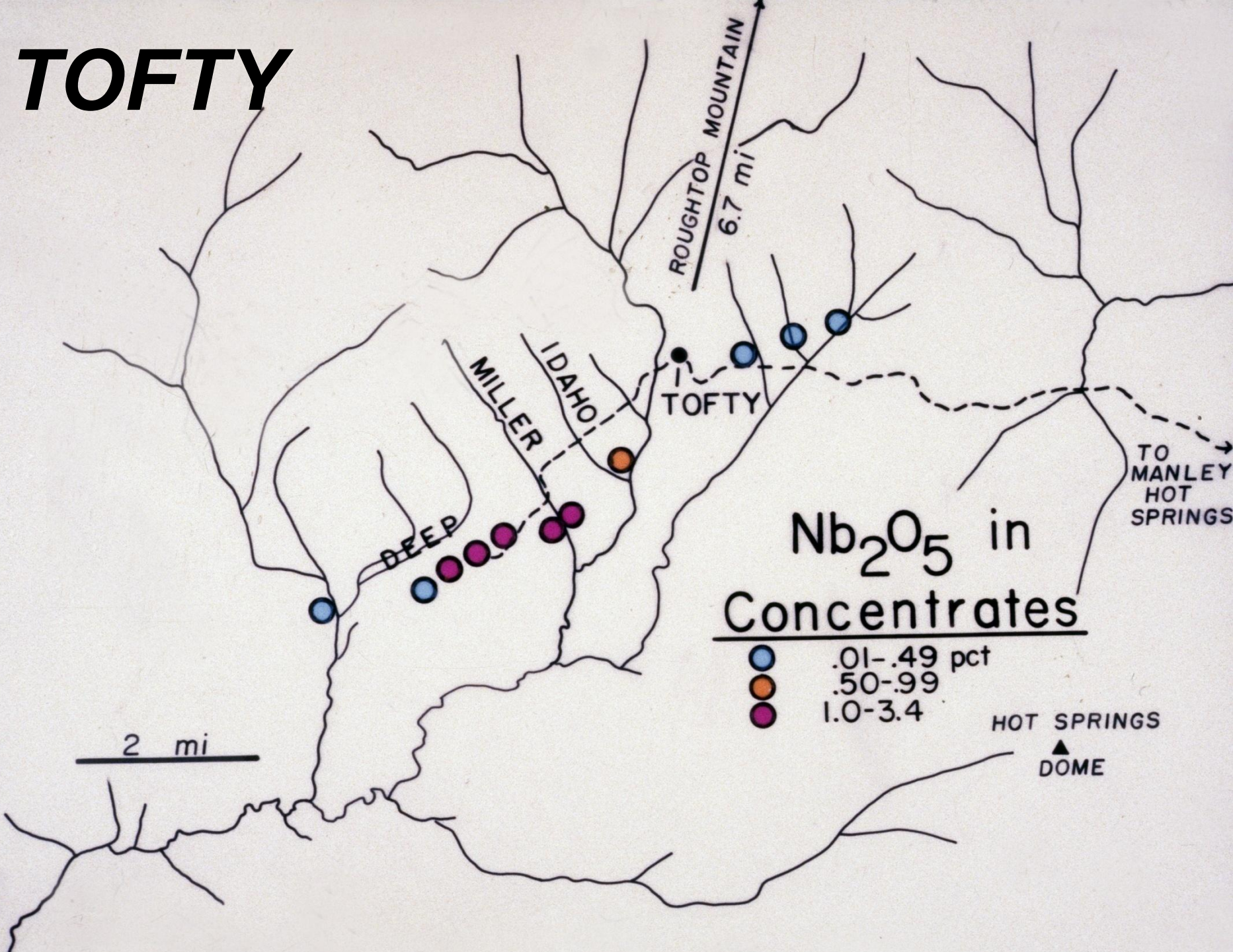
VFU Undivided felsic volcanic rocks

TQV Tertiary to quaternary vesicular basalt

SCB Tertiary – Continental coal–bearing sediments
(*) Outcropping coal–bearing sediments

VSM Cretaceous – Andesite and pelitic sediments

TOFTY


ROUGHTOP MOUNTAIN
6.7 mi
IDAHO
MILLER
DEEP
TOFTY
TO MANLEY HOT SPRINGS
Nb_2O_5 in Concentrates
.01-.49 pct
.50-.99
1.0-3.4
HOT SPRINGS DOME
2 mi

TOFTY CARBONATITE

- Carbonatite sills cut Triassic seds along NE trend for up to 12 miles, about 30m wide zone, no alkaline intrusions known

- Trenching/Drilling in 1956 by Maloney and Thomas, USBM
- Mapping in 1984 by D.Southworth, Mineralogy 1986 by Warner USBM
- 1998 by Reifenstohl, et al, AK DGGS

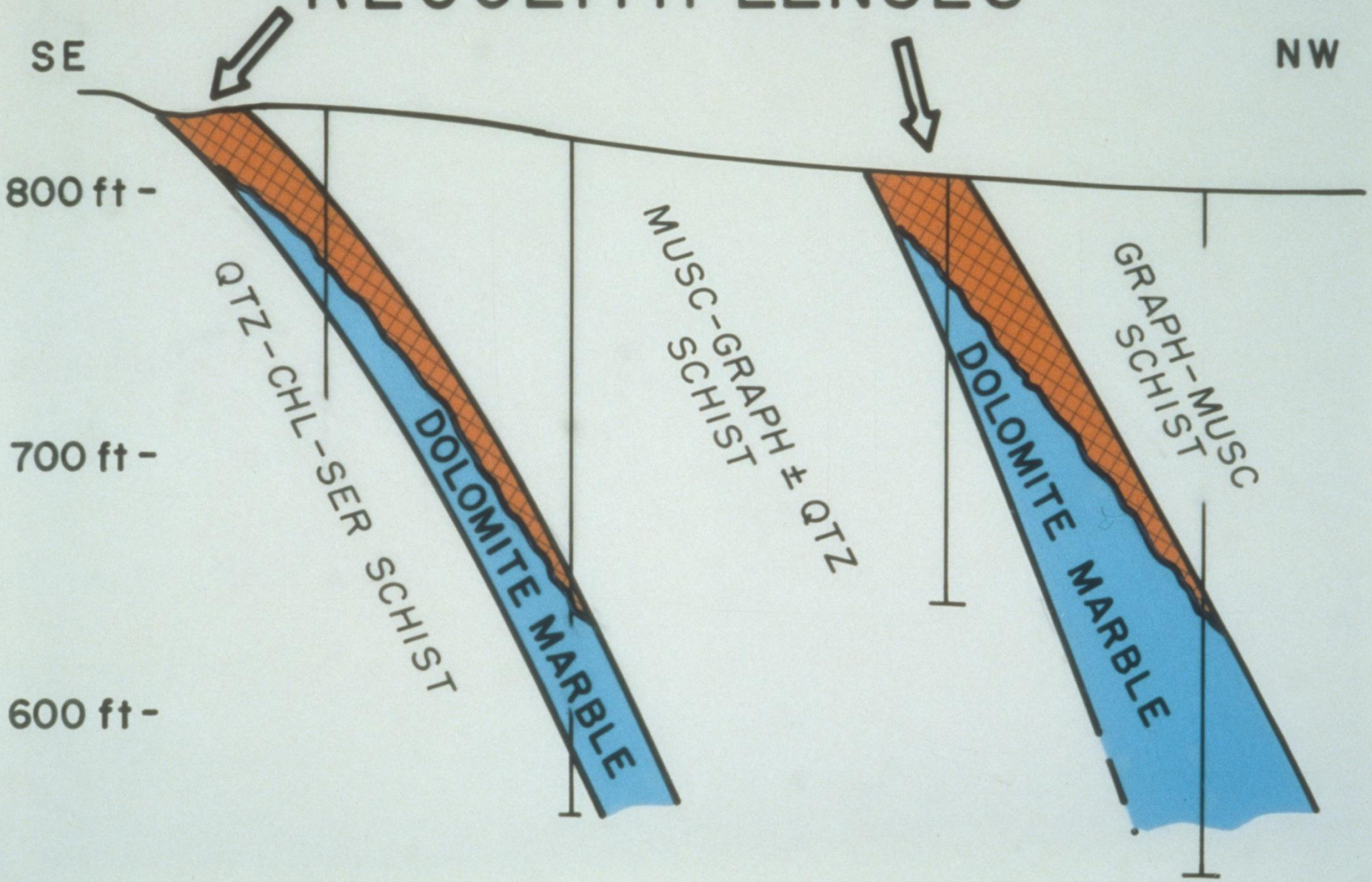
- Age- adjoining phyllite re-set 55 Ma, Hot Springs Dome is 62± 3 Ma, Roughtop Mtn is 92 ± 5Ma

- Mineralogy – magnetite, apatite, tremolite
- - barite, zircon, aeschynite, euxenite, monazite
- - columbite, melanite, phlogophite , py cpy aspy

- Mineralization < 1% La+Ce, trc Y, mostly <0.25%, Nb avg. 0.07%

- Possible genetic relation to M-UM rocks, but why coincident with Sn-Au???

REGOLITH LENSES



Regolith

ROY CREEK ALKALINE COMPLEX

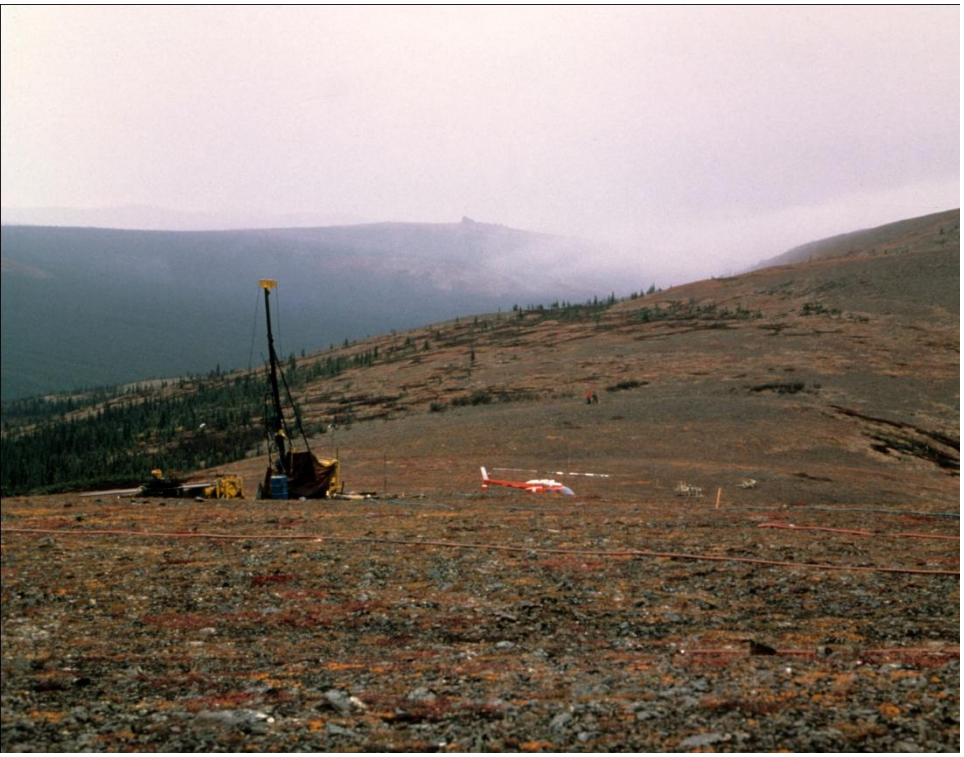
- **Syenitic complex intruding argillaceous**
- **quartzite**
  - **Alk syenite±quartz (riebeckite)**
  - **Nepheline syenite (aegirine-augite mafic min)**
  - **shonkinite**

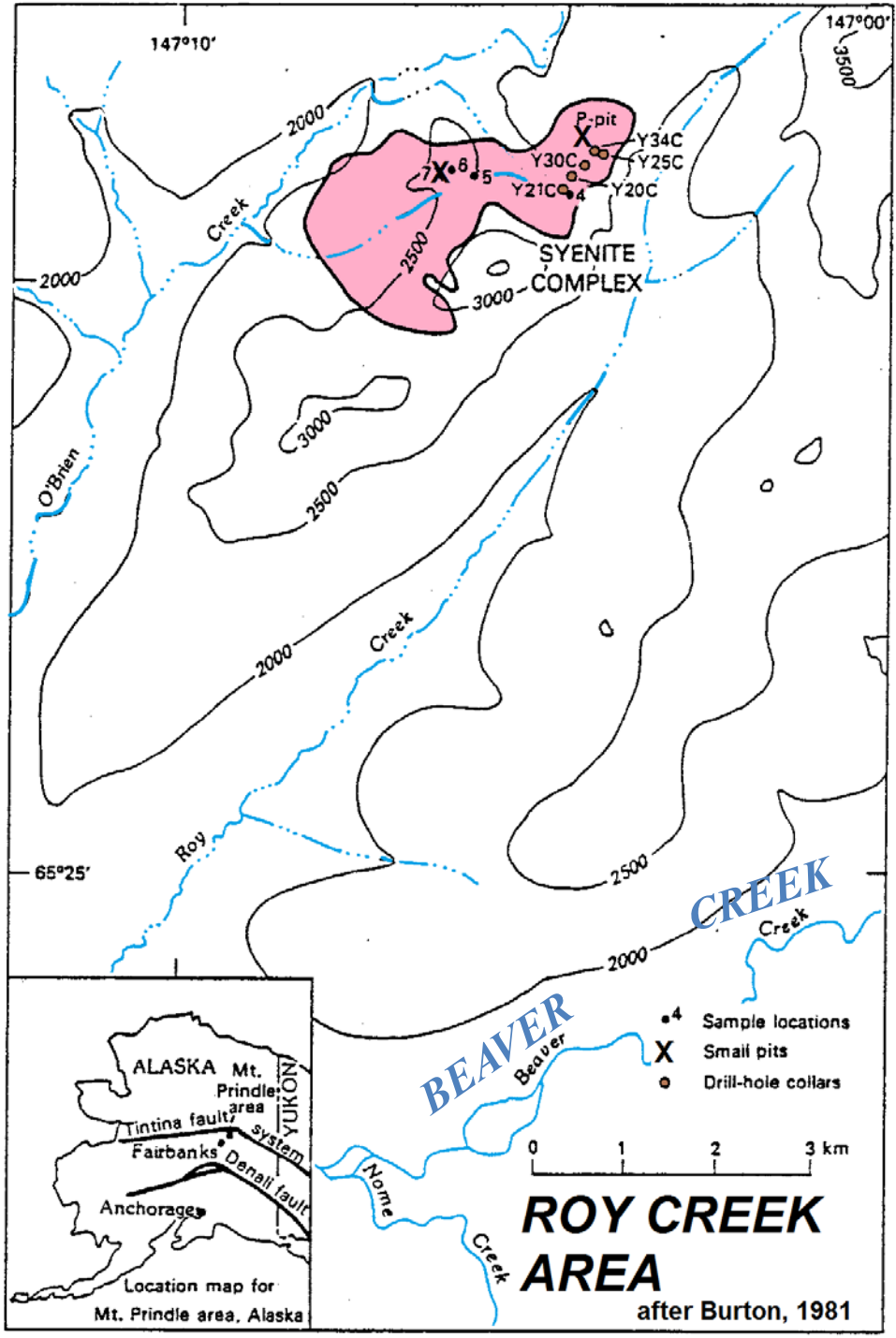
- **Age – 86.7 ± 3.6 (biotite)**
  85.4±6.4
  La + Ce : Y = 8.43

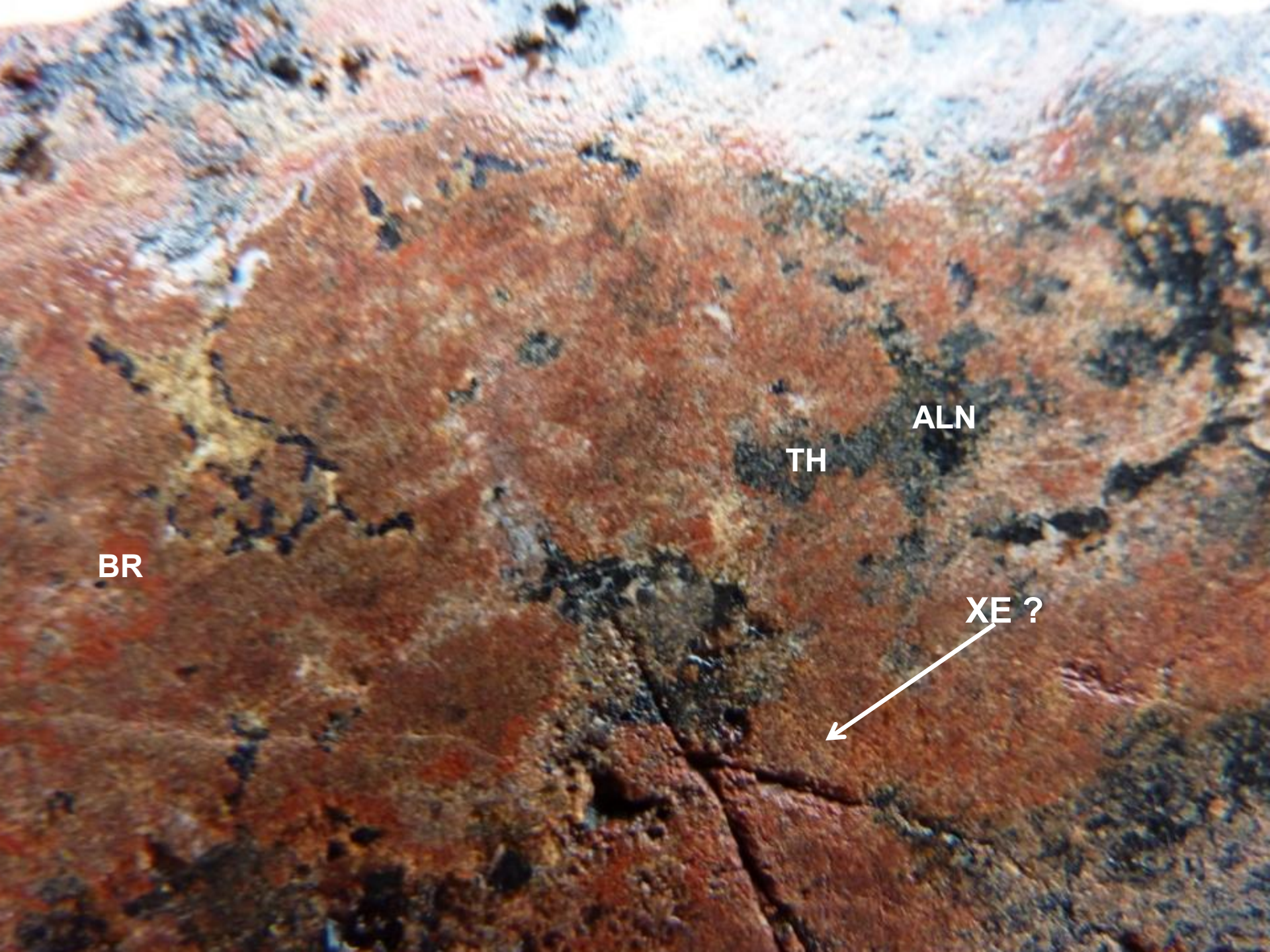
Mineralization structurally controlled, complex mineralogy in REE vein-type Deposit, high Th-U content

Geol by Burton, 1981, Armbrustmacher,1989

ROY CREEK




147°10'
147°00'
65°25'
P-pit
Y34C
Y25C
Y30C
Y21C
Y20C
SYENITE
COMPLEX
2000
2500
3000
3500
Creek
O'Brien
Roy
BEAVER
CREEK
Beaver
Nome
Creek
Sample locations
Small pits
Drill-hole collars
0
1
2
3 km
ALASKA
Mt. Prindle area
YUKON
Tintina fault system
Fairbanks
Denali fault
Anchorage
Location map for Mt. Prindle area, Alaska
ROY CREEK AREA
after Burton, 1981


ALN
TH
BR
XE ?

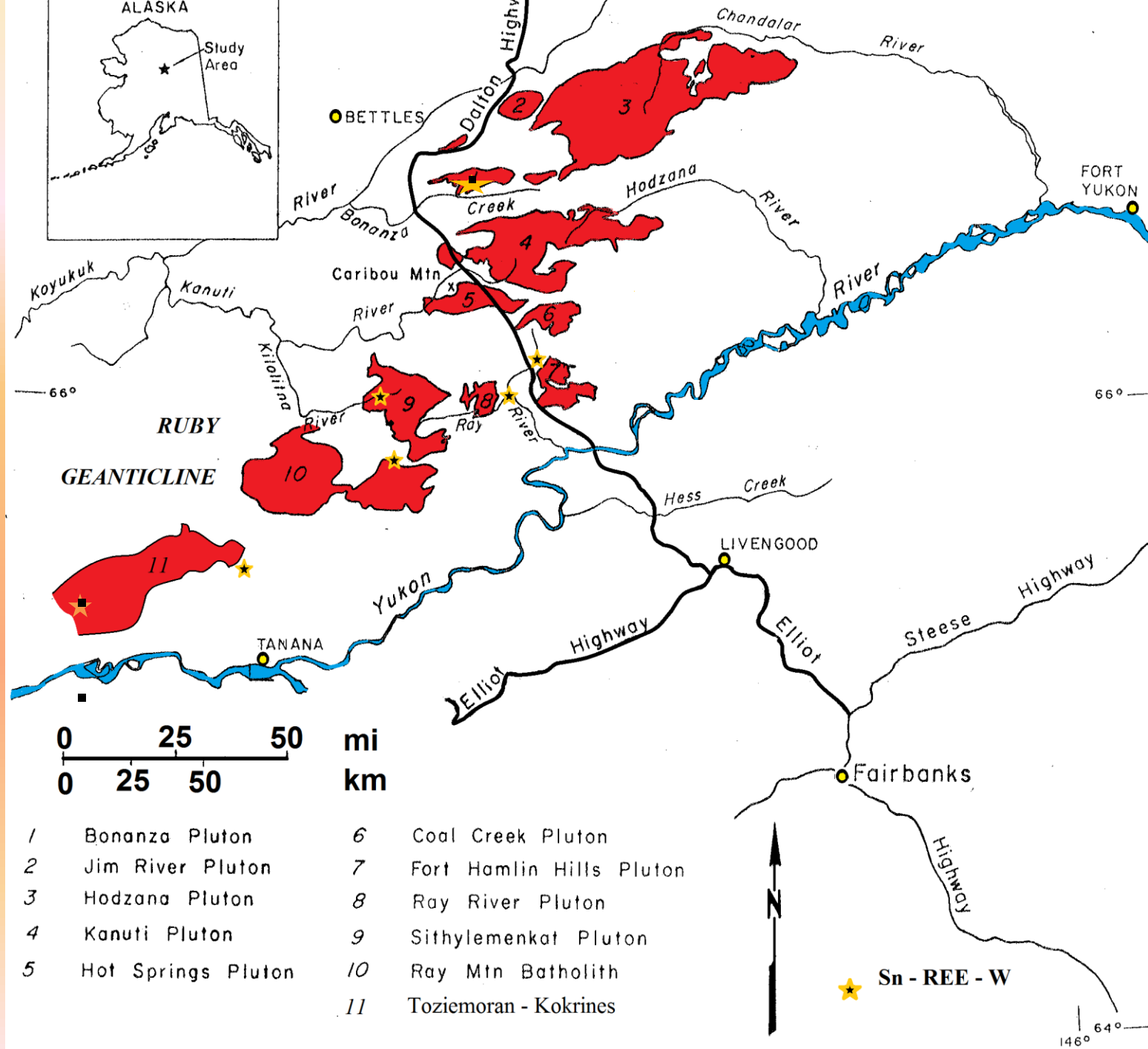
Roy Creek
REE+Y Analyses

La + Ce /Y=8.43

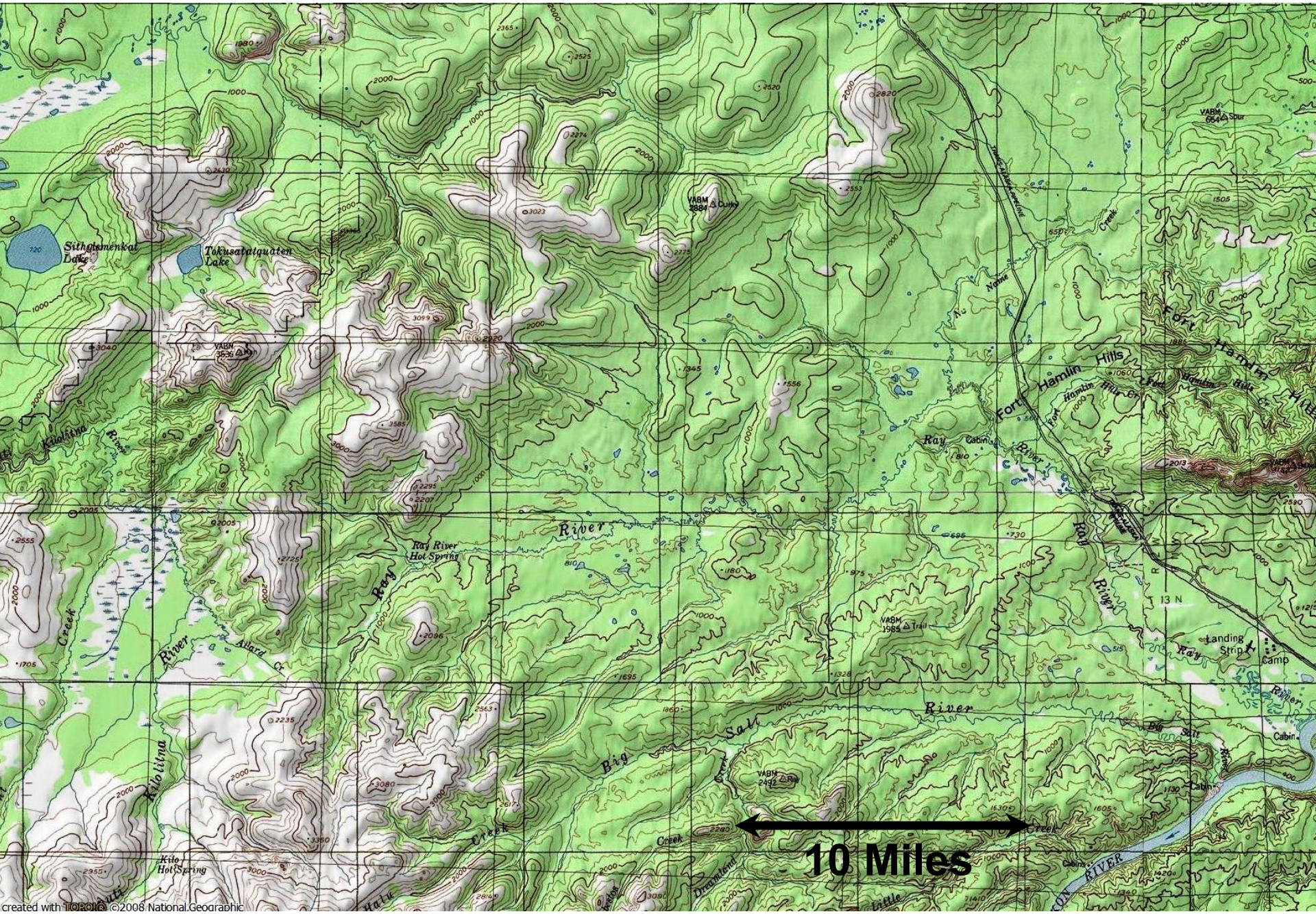
		Elemental Avg, PPM	Oxide Equivalent	Conversion	PPM Oxide	% REO + Y_2O_3
light	La	46,800	La_2O_3	.85	55,060	24.7
	Ce	79,600	CeO_3	.90	88,450	39.6
	Pr	8,800	Pr_6O_{11}	.83	10,600	4.8
	Nd	27,700	Nd_2O_3	.86	32,210	14.4
	Sm	4,500	Sm_2O_3	.86	5,230	2.3
	Eu	1,080	Eu_2O_3	.86	1,260	0.6
HEAVY	Gd	4,580	Gd_2O_3	.87	5,260	2.3
	Tb	524	Tb_4O_7	.85	616	0.3
	Dy	2,490	Dy_2O_3	.87	2,860	1.3
	Ho	450	Ho_2O_3	.87	517	0.2
	Er	1,100	Er_2O_3	.84	1,310	0.6
	Tm	129	Tm_2O_3	.88	150	0.1
	Yb	440	Yb_2O_3	.88	500	0.2
	Lu	58	Lu_2O_3	.88	66	Tr
	Y	15,000	Y_2O_3	.79	18,987	8.5
	Total REE+Y	193,251		Total REO + Y_2O_3	223,076	99.9

Ruby batholith

- Rare metal prospects
- Resource potential
- Access
- Selected state land
- Recent exploration

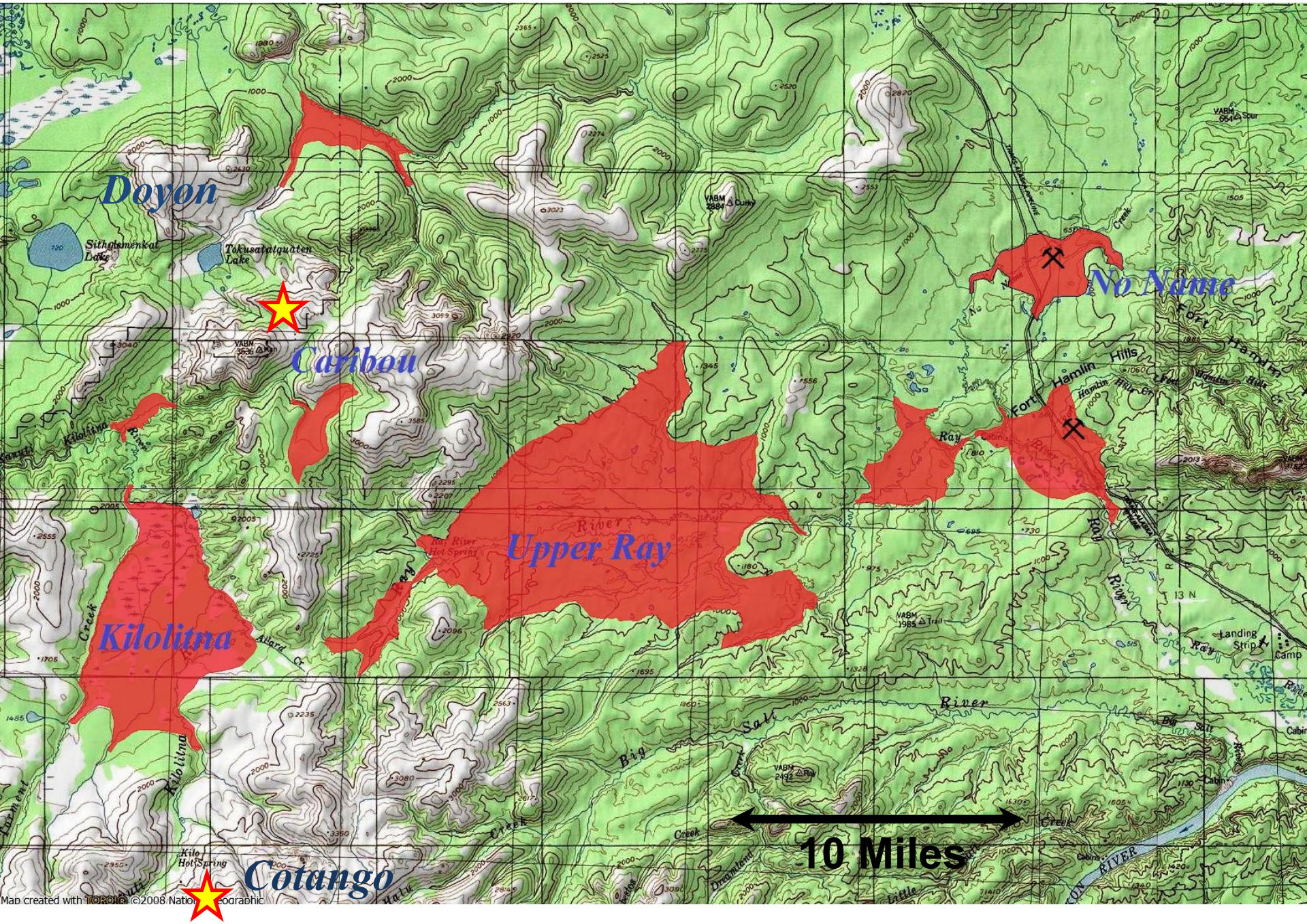


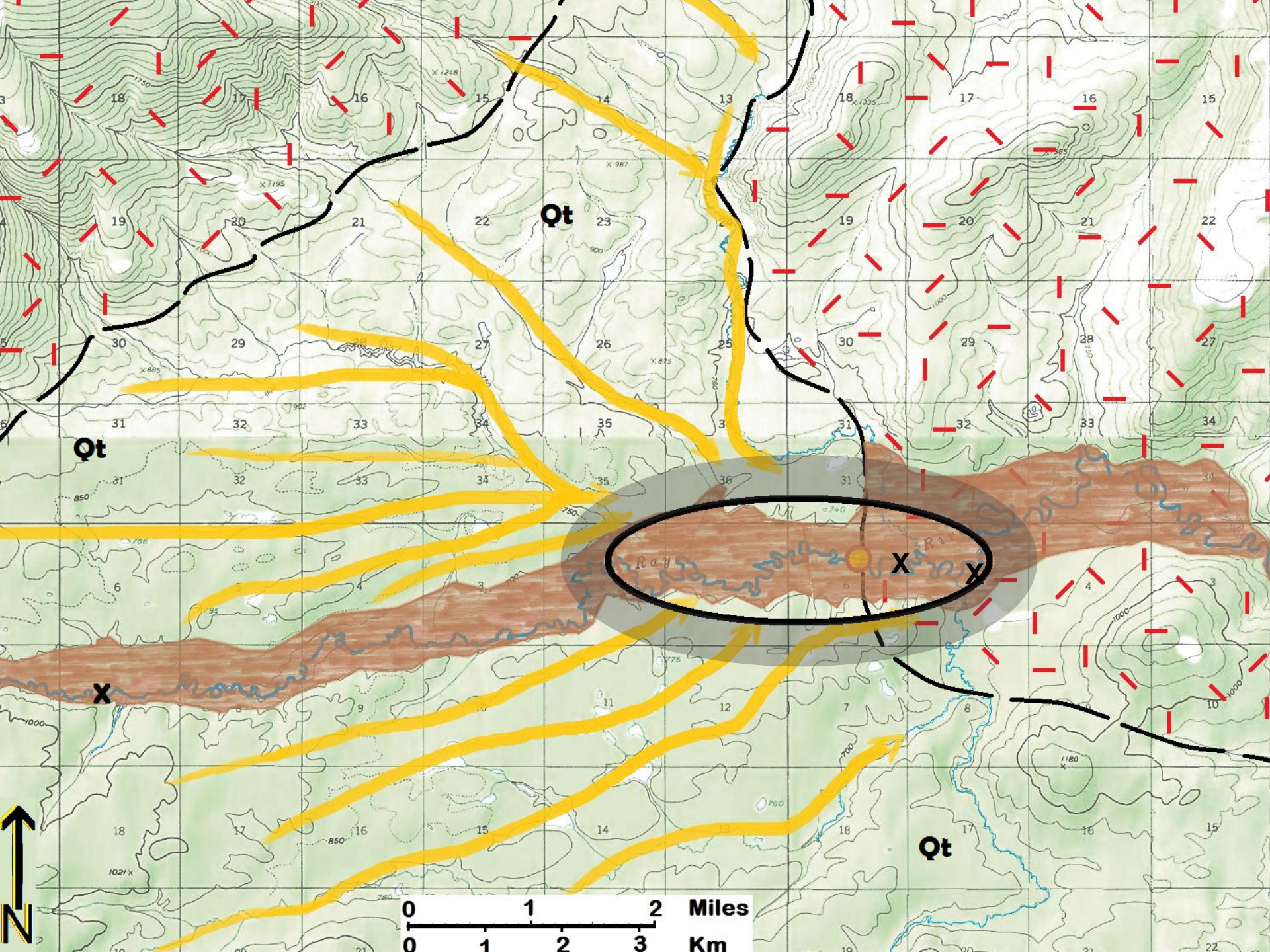
ntersecting greisen
tones



10 Miles

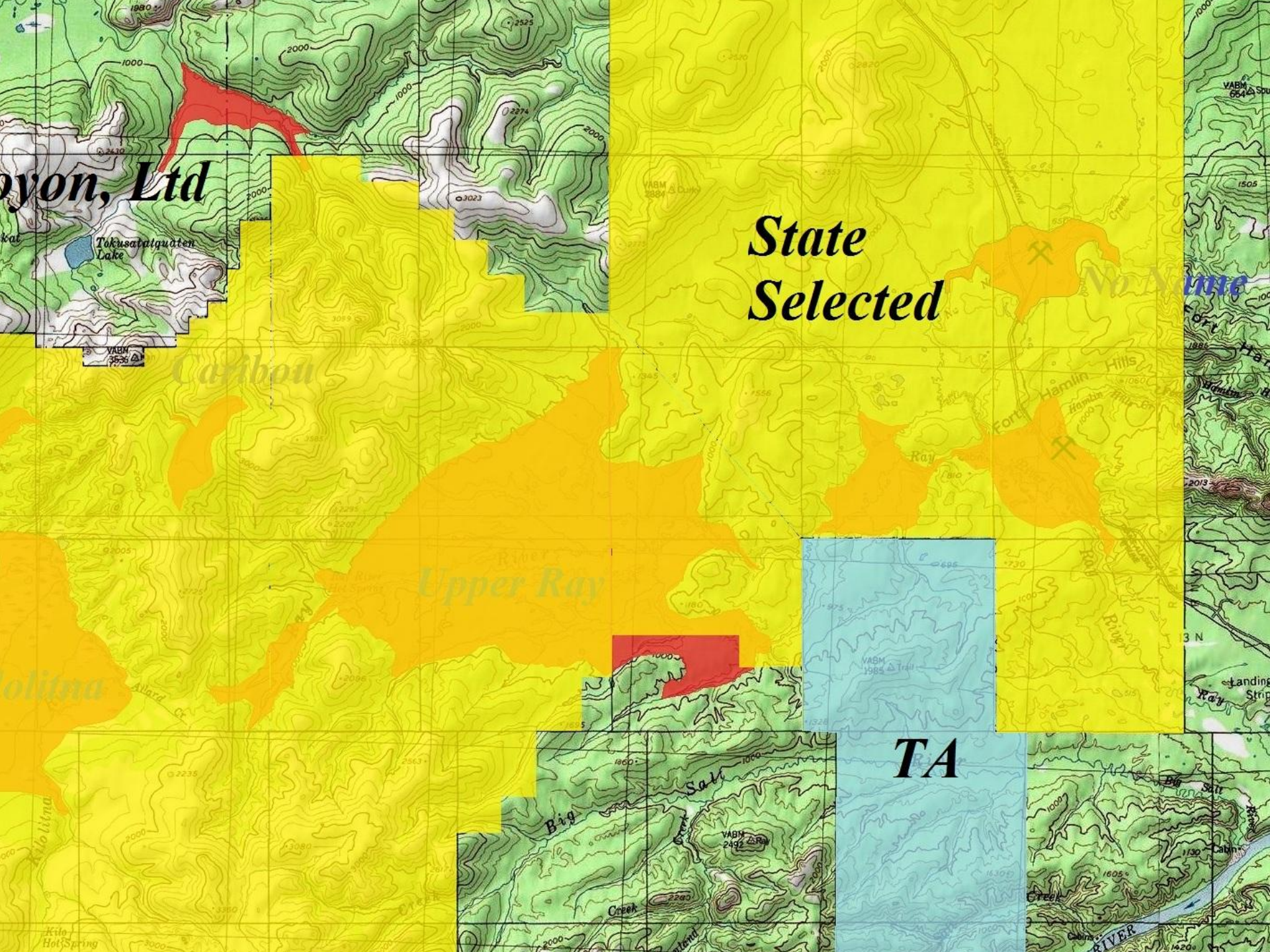
created with TOPO!® ©2008 National Geographic


Doyon
Caribou
Upper Ray
Kilolitna
Cotango
No Name
10 Miles
Sithglemenkat Lake
Tokusatatquaten Lake
Ray River Hot Spring
Kilolitna River
Fort Hamlin Hills
Big Salt River
Landing Strip
Camp
Kilo Hot Spring
Map created with TOPO! ©2008 National Geographic

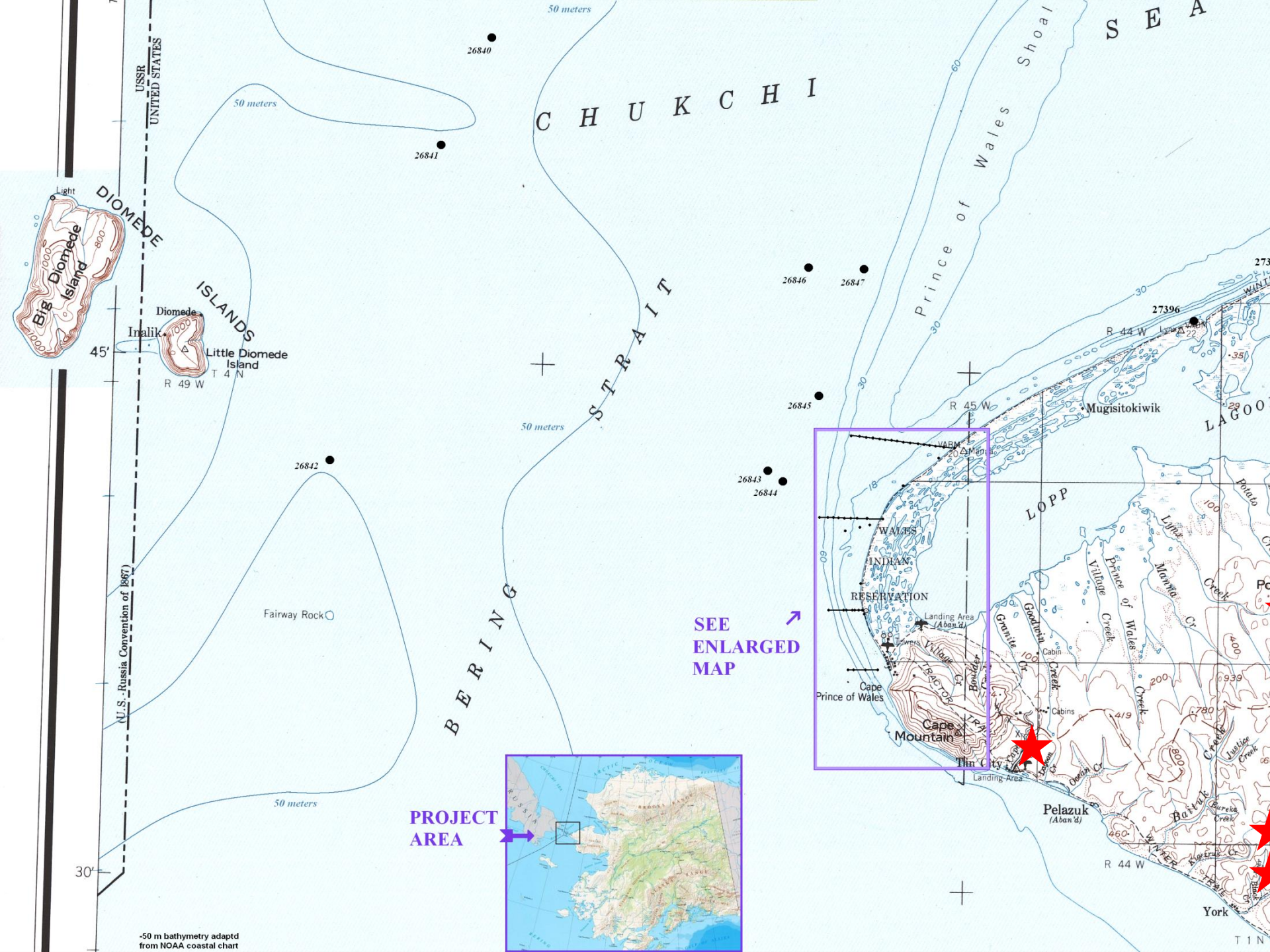

Qt
Qt
Qt
X
X
X
N
0 1 2 Miles
0 1 2 3 Km

Rare Metal Assays

No.	TREE+Y	%HREE	Sn by XRF	Sn [1] by assay	W	Nb
Upper Ray Basin						
39	1.75	17.8	3.4	6.04	0.07	0.03
67	1.53	14.9	1.89		0.1	0.06
68	1.87	14	3.97	1.88	0.08	0.03
No Name Basin						
83	1.17	37.4	2.81	5.83	0.07	0.1
115	1.36	57.7	>5.0	13.0	0.2	0.08



State
Selected
TA
Upper Ray
Caribou
Tokusatatquaten Lake
Big Salt Creek
Fort Hamlin Hills

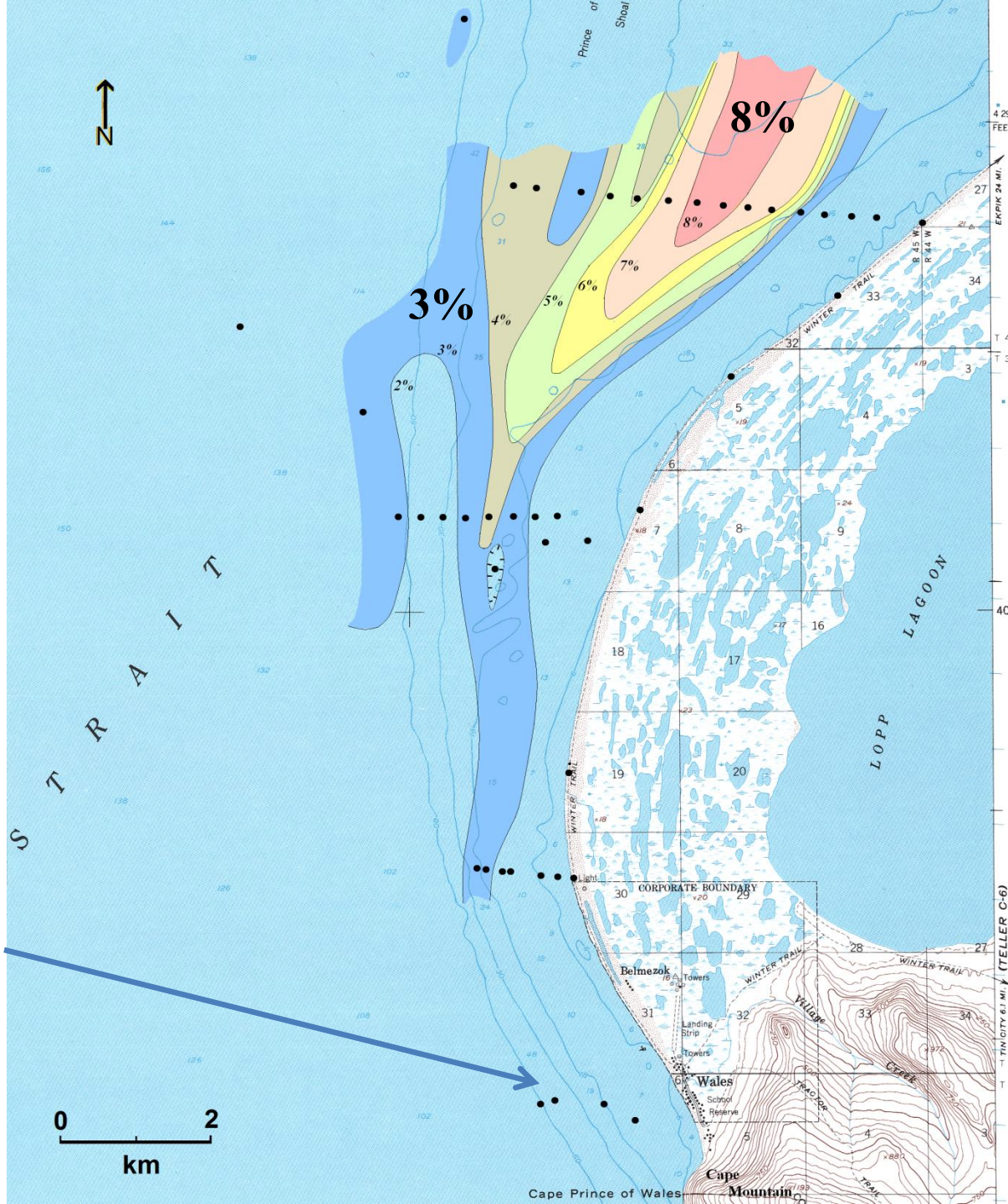


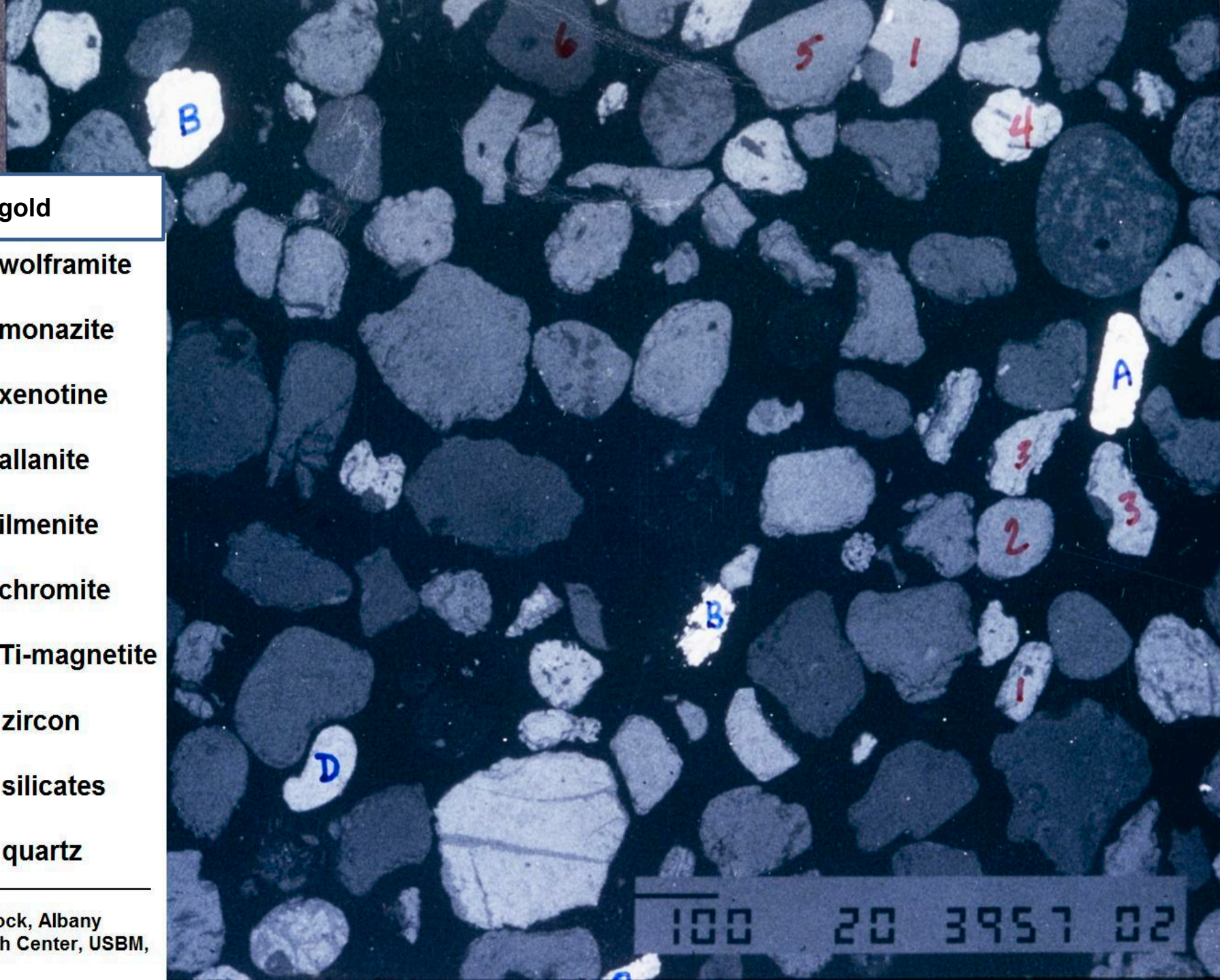
CHUKCHI
SEA
BERING STRAIT
Prince of Wales Shoal
DIOMEDE ISLANDS
Big Diomede Island
Little Diomede Island
Diomede
Inalik
Light
USSR
UNITED STATES
(U.S.-Russia Convention of 1867)
Fairway Rock
50 meters
26840
26841
26842
26843
26844
26845
26846
26847
27396
45'
30'
R 49 W
T 4 N
R 45 W
R 44 W
T 1 N
Mugisitokiwik
LAGOON
LOPP
WALES INDIAN RESERVATION
Landing Area (Aban'd)
Towers
Cape Prince of Wales
Cape Mountain
Tin City
Landing Area
Pelazuk (Aban'd)
York
Cabin
Cabins
Granite Cr
Goodwin Creek
Village Creek
Prince of Wales Creek
Manna Cr
Lynx Creek
Potato Cr
Boulder Cr
Ocean Cr
Justice Creek
Bureka Creek
Kigetruk Cr
WINTER TRAIL
SEE ENLARGED MAP
PROJECT AREA
-50 m bathymetry adaptd from NOAA coastal chart

Heavy Mineral percent of sand

Net one-way sediment transport by marine and eolian processes

Cassiterite found only in sub-beach at -13m sea-level

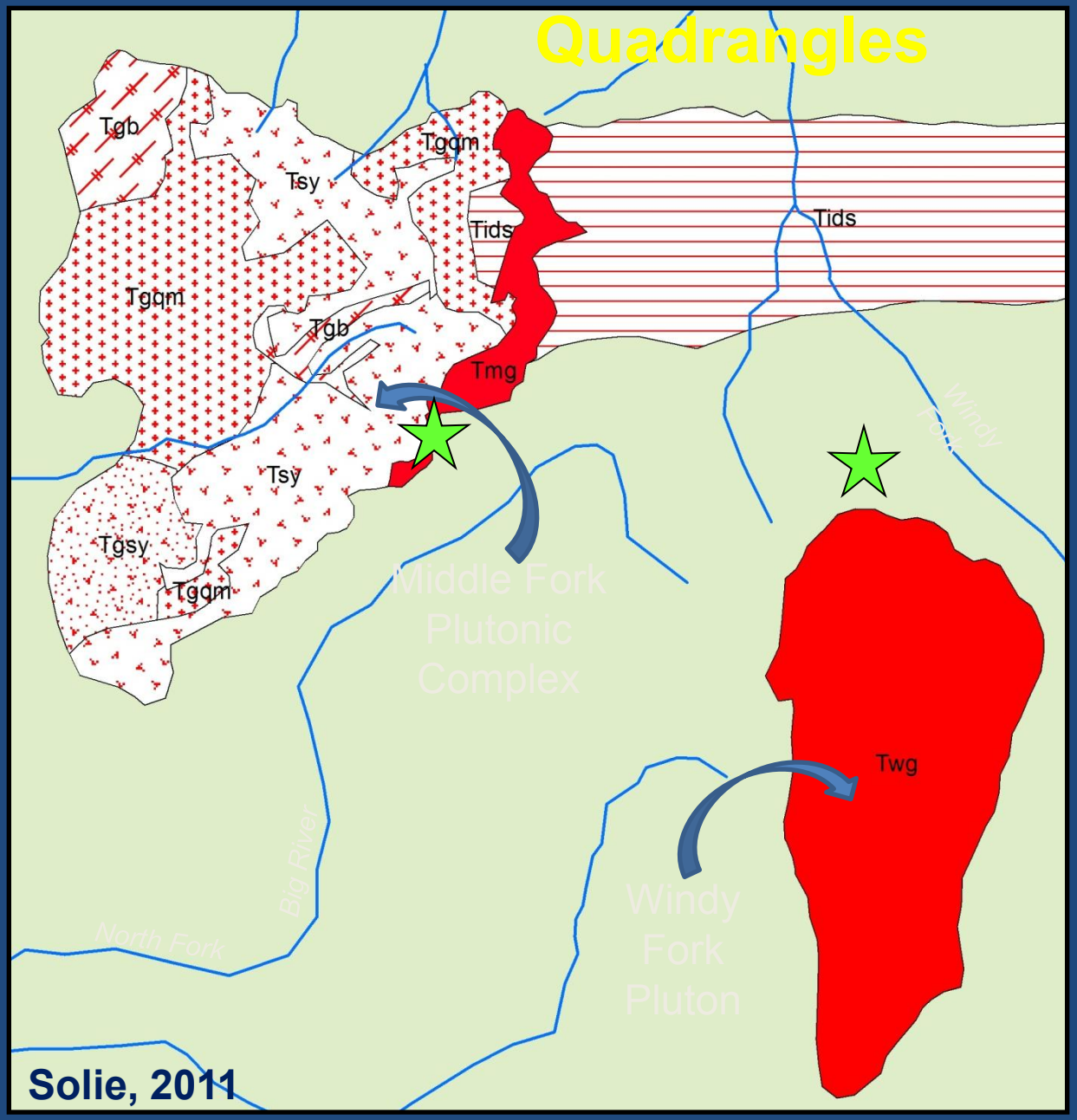




ns	gold
A	wolframite
B	monazite
C	xenotine
D	allanite
1	ilmenite
2	chromite
3	Ti-magnetite
4	zircon
5	silicates
6	quartz

C. Mardock, Albany Research Center, USBM, 1985.

Peralkaline Granites - McGrath & Lime Hills



Middle Fork Plutonic Complex

Tmg peralkaline granite
Tsy syenite
Tgqm granite, qtz monz.
Tgsy granite, qtz syenite
Tgb alkali gabbro
Tids dike swarm

Windy Fork Pluton

Twg peralkaline granite

★ Eudialyte locality

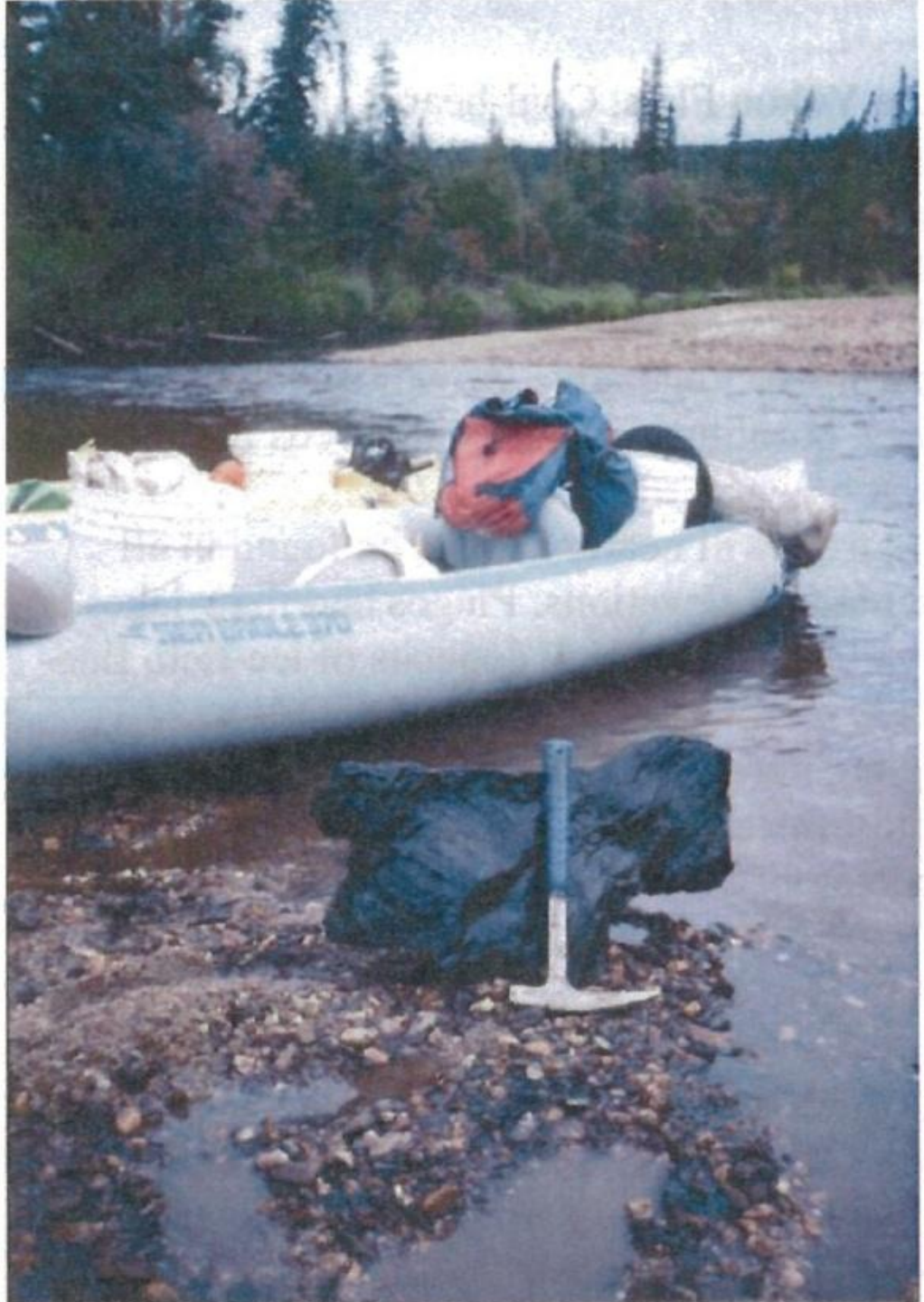
ZrO_2	11.0	10.1	10.5
Y_2O_3	1.4	0.4	0
Ce_2O_3	0.3	0.2	0

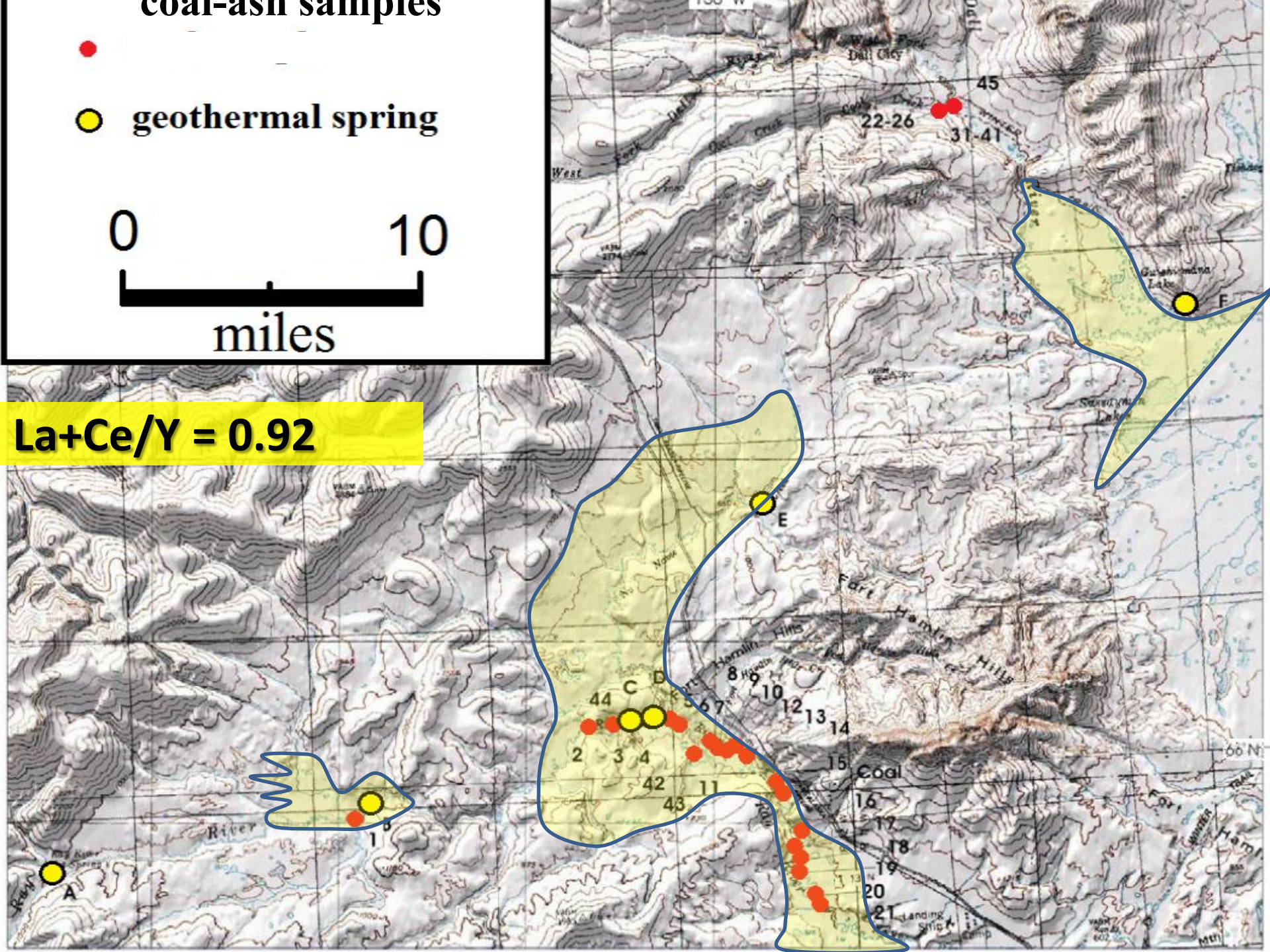
RAY RIVER METALLIFEROUS COAL ASH

- Unconventional REE occurrence associated with geothermal system

N=20 ash samples
W 4871 ppm
Ge 970
Pb 1907
TREE+Y 0.1 to 0.2%

La+Ce/Y = 0.92





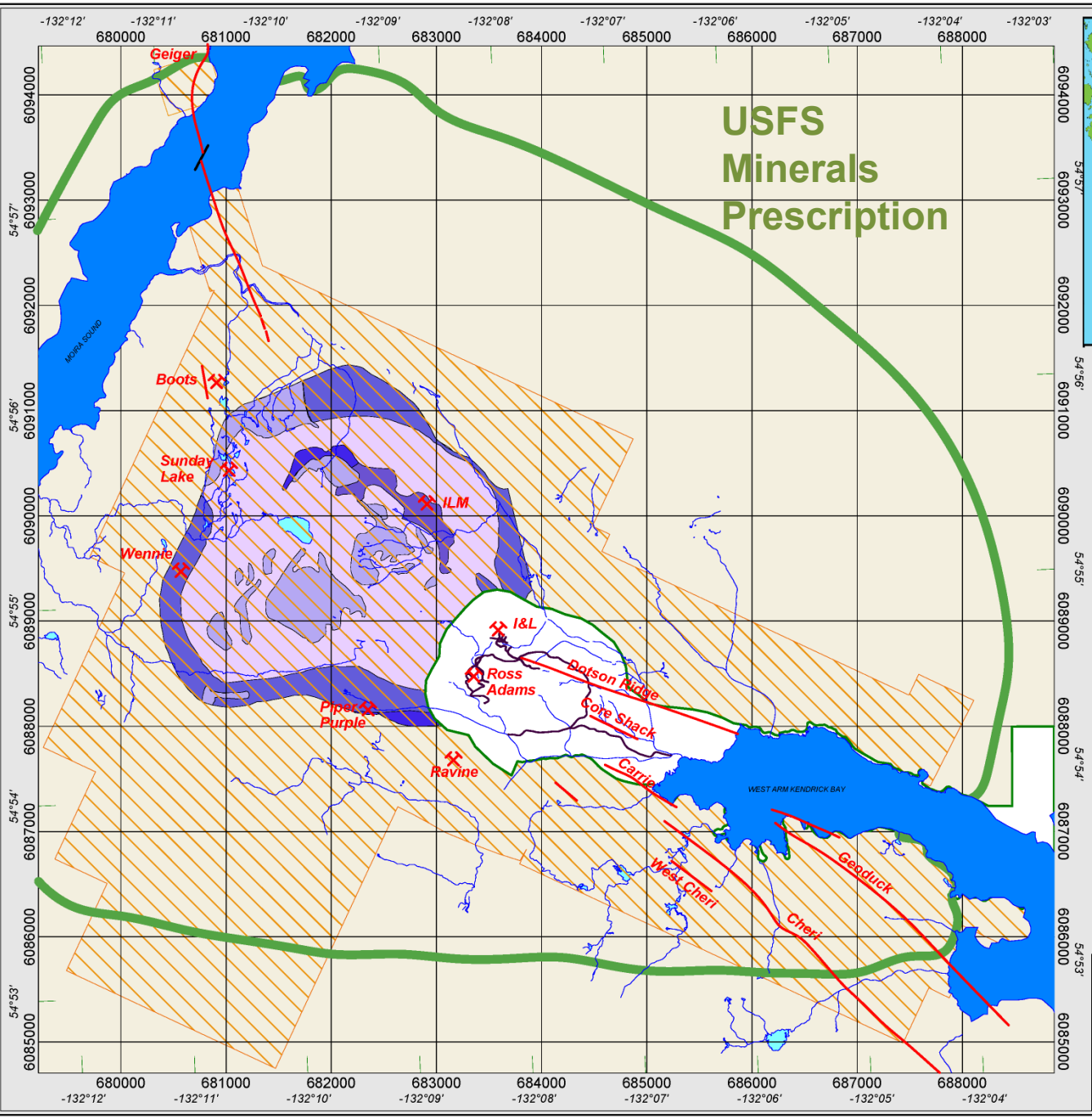
coal-ash samples
geothermal spring
0
10
miles
La+Ce/Y = 0.92
45
22-26
31-41
F
E
C
D
44
2
3
4
42
43
11
8
9
10
12
13
14
15
Coal
16
17
18
19
20
21
1
B
A
Fort Hamlin Hills
River

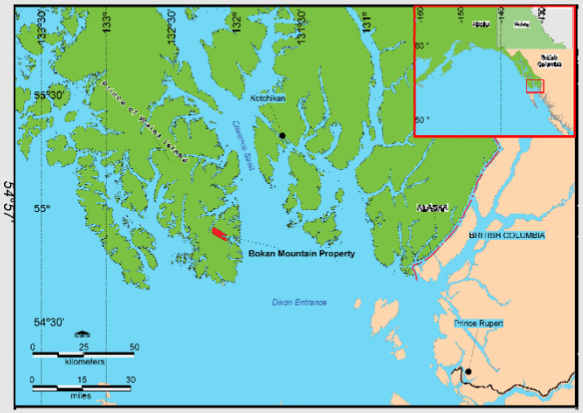
N300DB

BOKAN MOUNTAIN

West Arm

Kendrick Bay





Legend

AREA OF EXPLORATION AND DEVELOPMENT INTEREST

Bokan Mountain Granite (J)

- Jbr — Riebekite porphyry
- Jba — Aegerine granite porphyry
- Jbfr — Fine-grained riebekite granite porphyry
- Jbfa — Felty aegerine granite porphyry
- Jbu — Granite - undivided
- Oqd — Quartz Diorite & Diorite

Kendrick Exempt Area (Exemption to Federal Inventoried Roadless Area)

Claim Block Outline

Showings

Veins and Vein-Dykes

Roads

Pacific Ocean

Lakes and Ponds

Streams and Rivers

USFS Minerals Prescription Area (from Tongass Land Plan of 2008) (approximate)

Regional Scale Geology From Gehrels,(1992)
Property Geology - Aurora Staff (2009 / 2010)
Showings and satellite veins from Barker, J., (pers. comm.)

Scale 1:40000

500 0 500 1000 1500 2000

(meters)

NAD83 / UTM zone 8N

N

UCORE RARE METALS INC

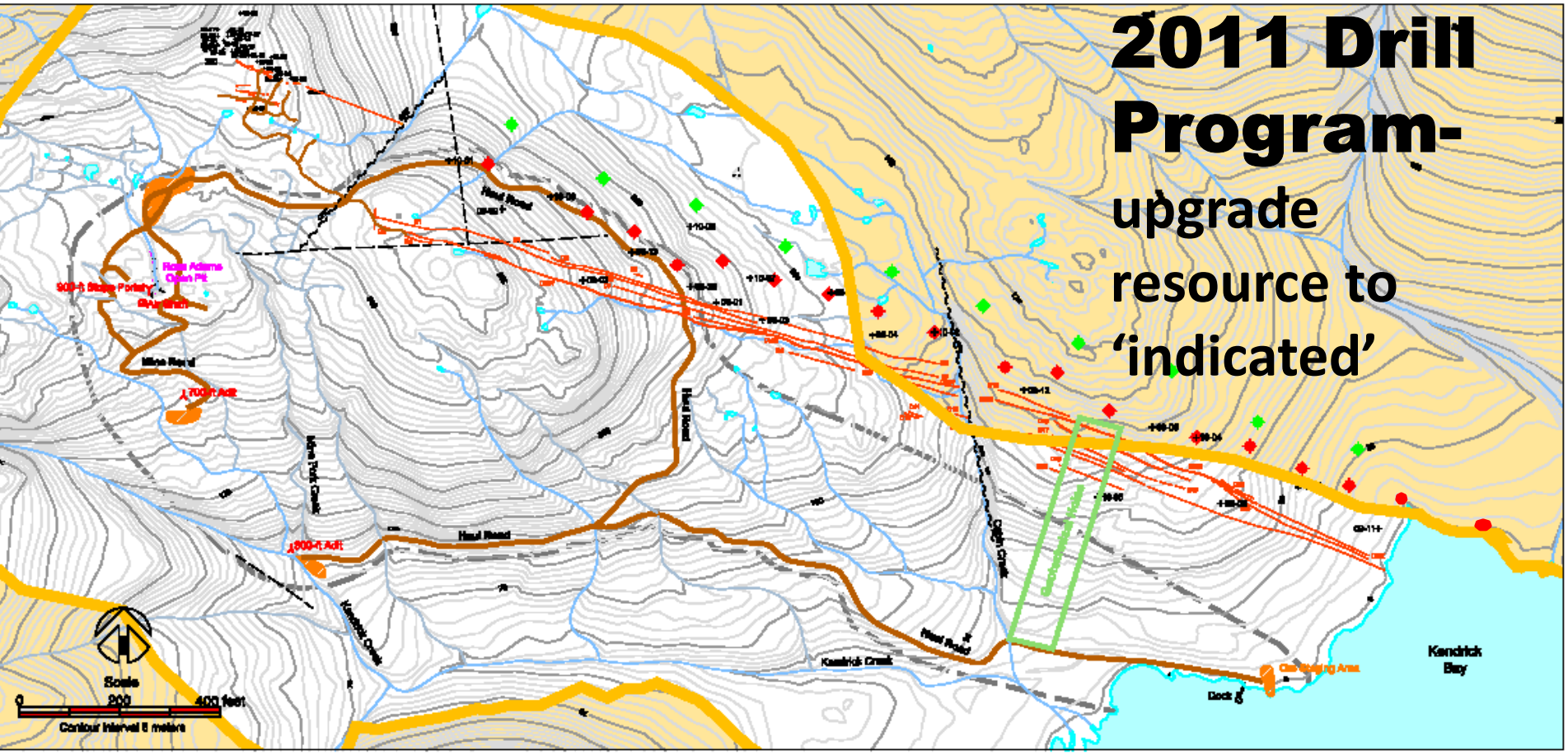
BOKAN MOUNTAIN PROJECT
CLAIM AREA AND AREAS OF EXPLORATION INTEREST

KENDRICK EXEMPT AREA
Date Drawn/By September 11, 2011/jr
File Name: Expanded Exploration Interest and Roadless Exemption.map

AURORA GEOSCIENCES LTD.

2011 Drill Program-

upgrade resource to 'indicated'



Mine adits / portals
Dumps / waste rock
Open Pit
Road
Tongass Roadless Area
Historical Site
Previous drill pad location
2011 Planned Drill Hole Collar (Indicated)
2011 Proposed Deep Drill Hole Collar (Inferred)
Inferred Vein
Defined Vein
Defined Vein - major
CFZ - Connector Fault Zone
CCFZ - Camp Creek Fault Zone
Fault Inferred
Geotechnical Holes
Stream
Intermittent Stream
Lake

Ucore Rare Metals, Inc.

Prepared by

Kent & Sullivan, Inc.

2011 Proposed Drill Pad Locations

2011 Minerals Exploration Plan of Operations

Bokan Mountain REE Project

FIGURE

3

April, 2011

Inferred Resource (NI 43-101 Compliant)

%TREO[1]	Tonnes	TREO	HREO/TREO	Contained TREO (lbs)
0.8	1,021,000	1.054	36.80%	23,712,000
0.7	1,549,000	0.951	37.70%	32,457,000
0.6	2,489,000	0.834	39.60%	45,661,000
0.5	**3,669,000**	**0.746**	**38.60%**	**60,214,000**
0.4	5,276,000	0.654	40.00%	75,926,000
0.3	6,126,000	0.613	40.80%	82,556,000
0.2	6,702,000	0.58	41.30%	85,465,000

[1]TREO includes Yttrium oxide.

Mineral resource estimate was completed by Mr. Jim Robinson, Senior Resource Geologist.

2011

Stage	Exploration Cycle Stage	Objective	Time Required
1	Grassroots	Conceptual, land acquisition	1 year
2	Target Generation & Drilling	Filtering for drill targets	1-2 years
3	Discovery Delineation	Defining the limits of a discovery - tonnage & grade	1-2 years
4	Infill Drilling	Producing a mineral resource estimate & scoping study 43-101 (3/11)	1-2 years
5	Bulk Sample & Metallurgy	Evaluating recoveries and optimal processing method	1 year
6	Prefeasibility	Produce a mineable reserve, establish a mining plan and associated costs	1-2 years
7	Permitting, Marketing & Feasibility	Securing approval, negotiating offtake, making a production decision	1-3 years
8	Construction	Building the mine	1-3 years
9	Production	Mining cash flow	10-20 years

2007-present

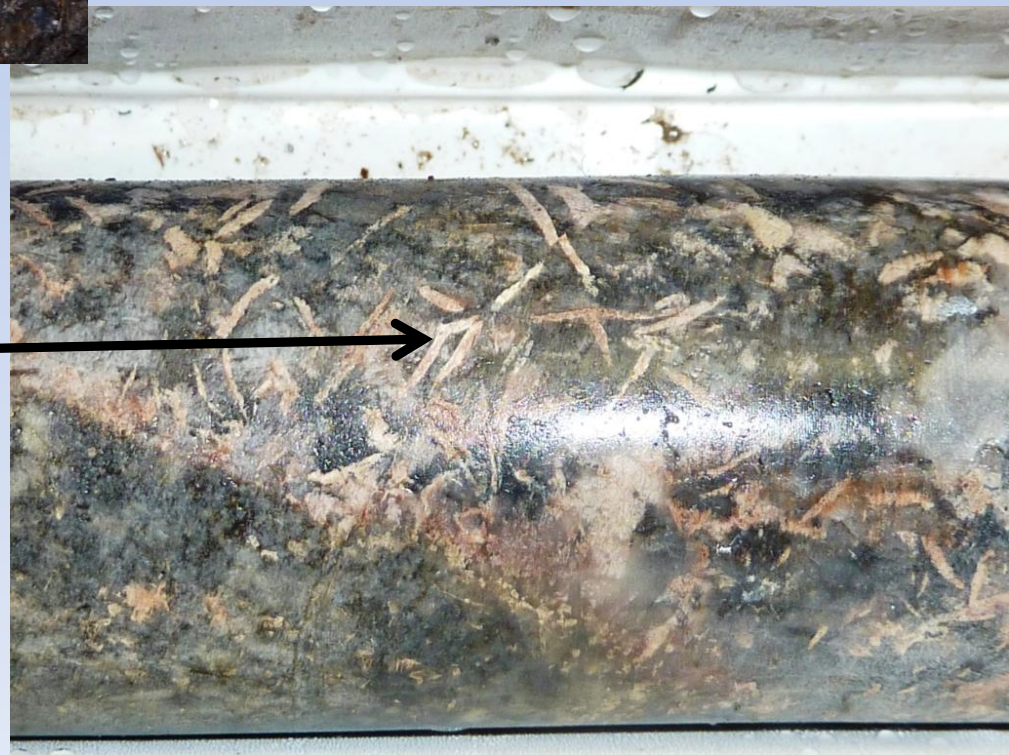
Landmark Alaska, LP (wholly owned Alaska subsidiary) of:
Ucore Rare Metals, Inc.

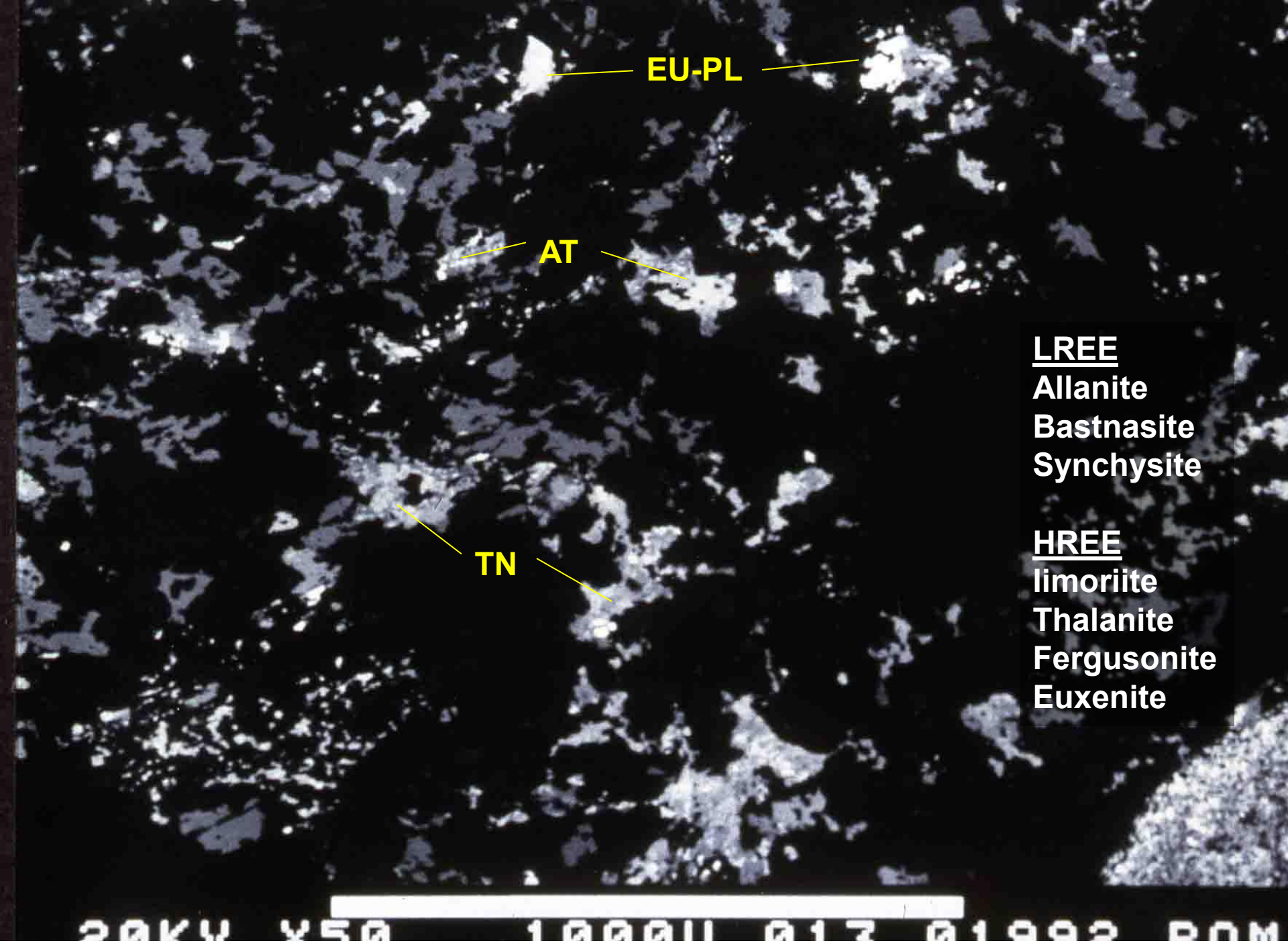
Over 40,000 feet of drilling on Bokan area prospects

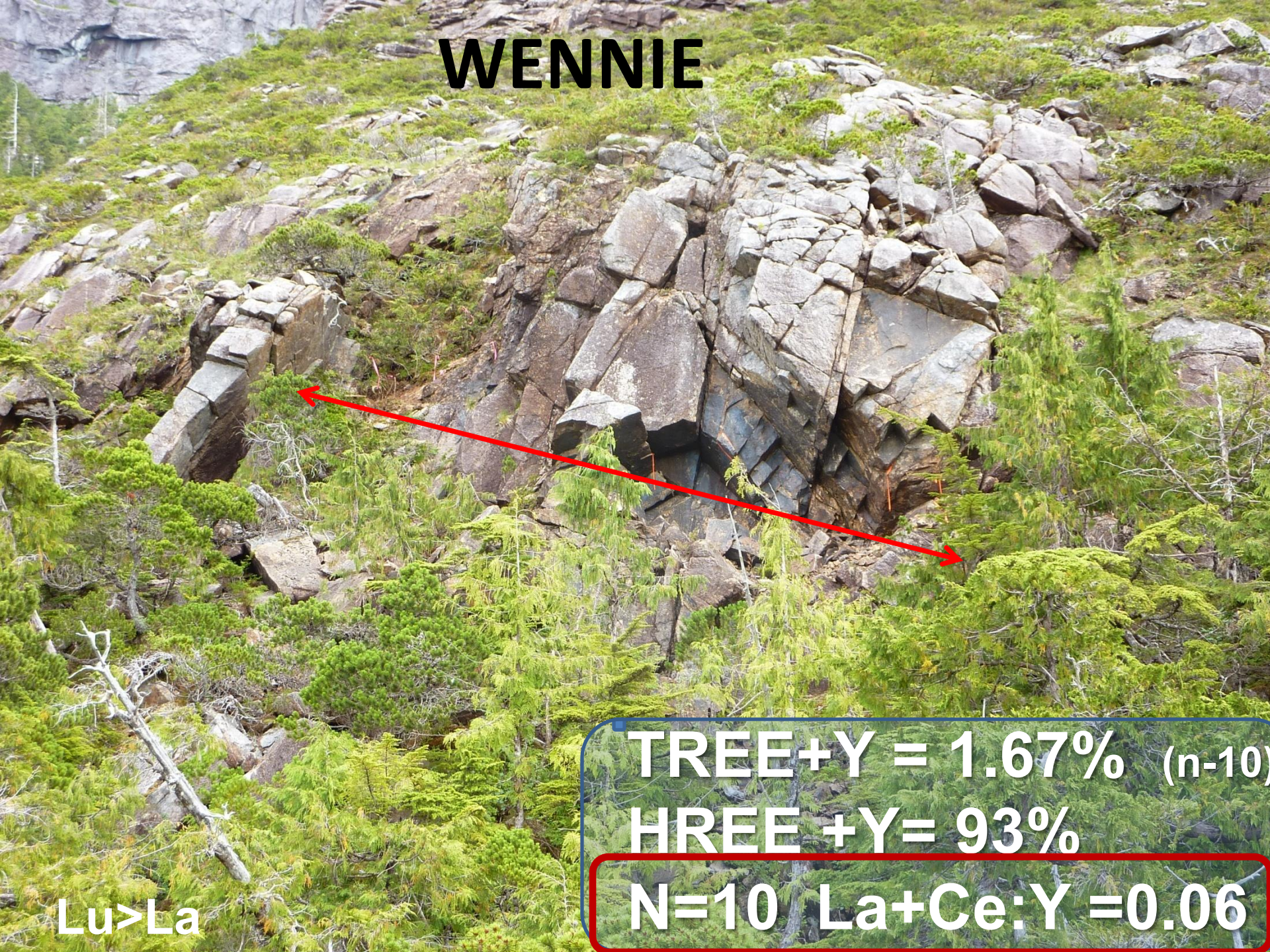
2 drills working

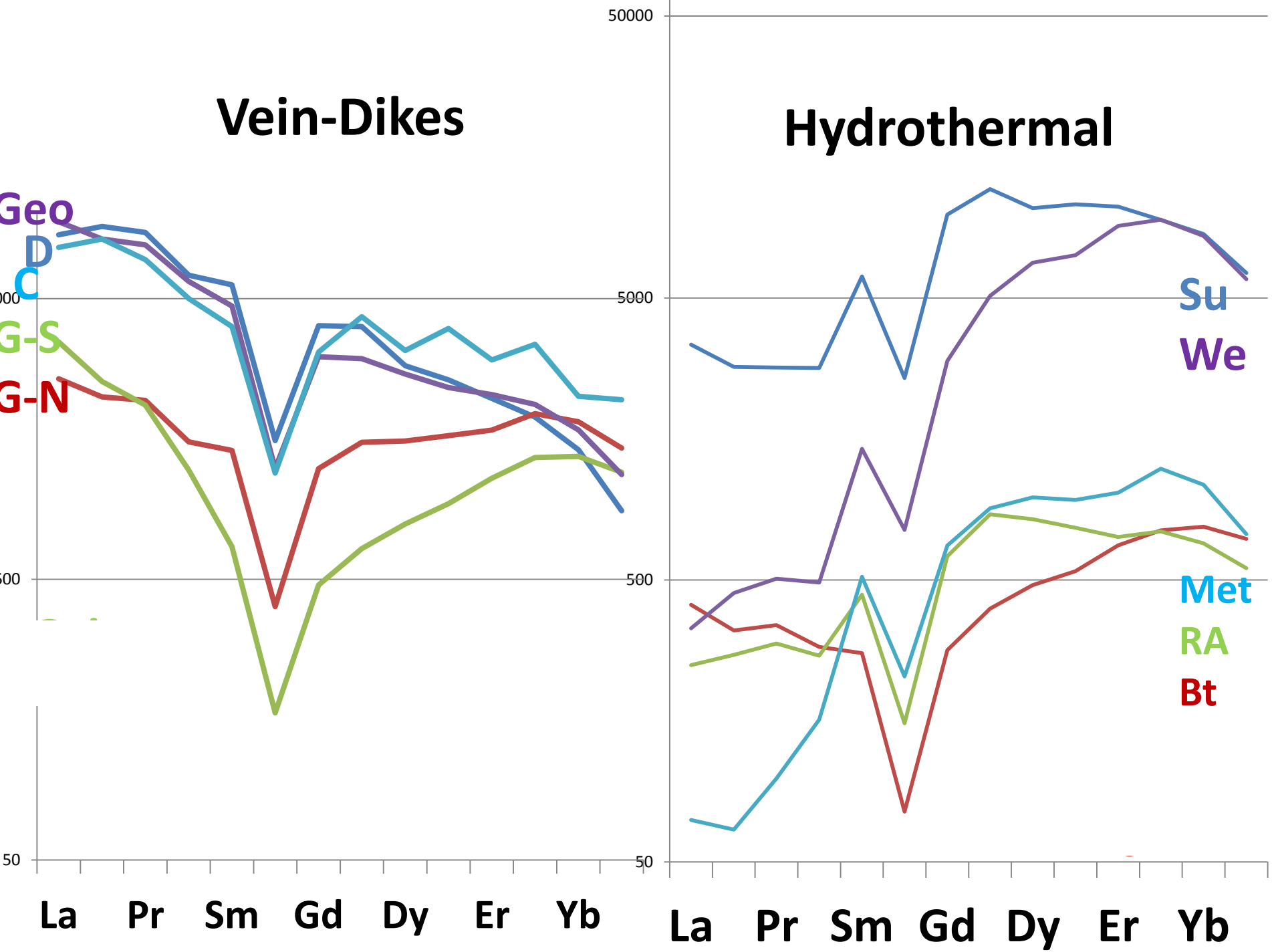
Allanite (?)

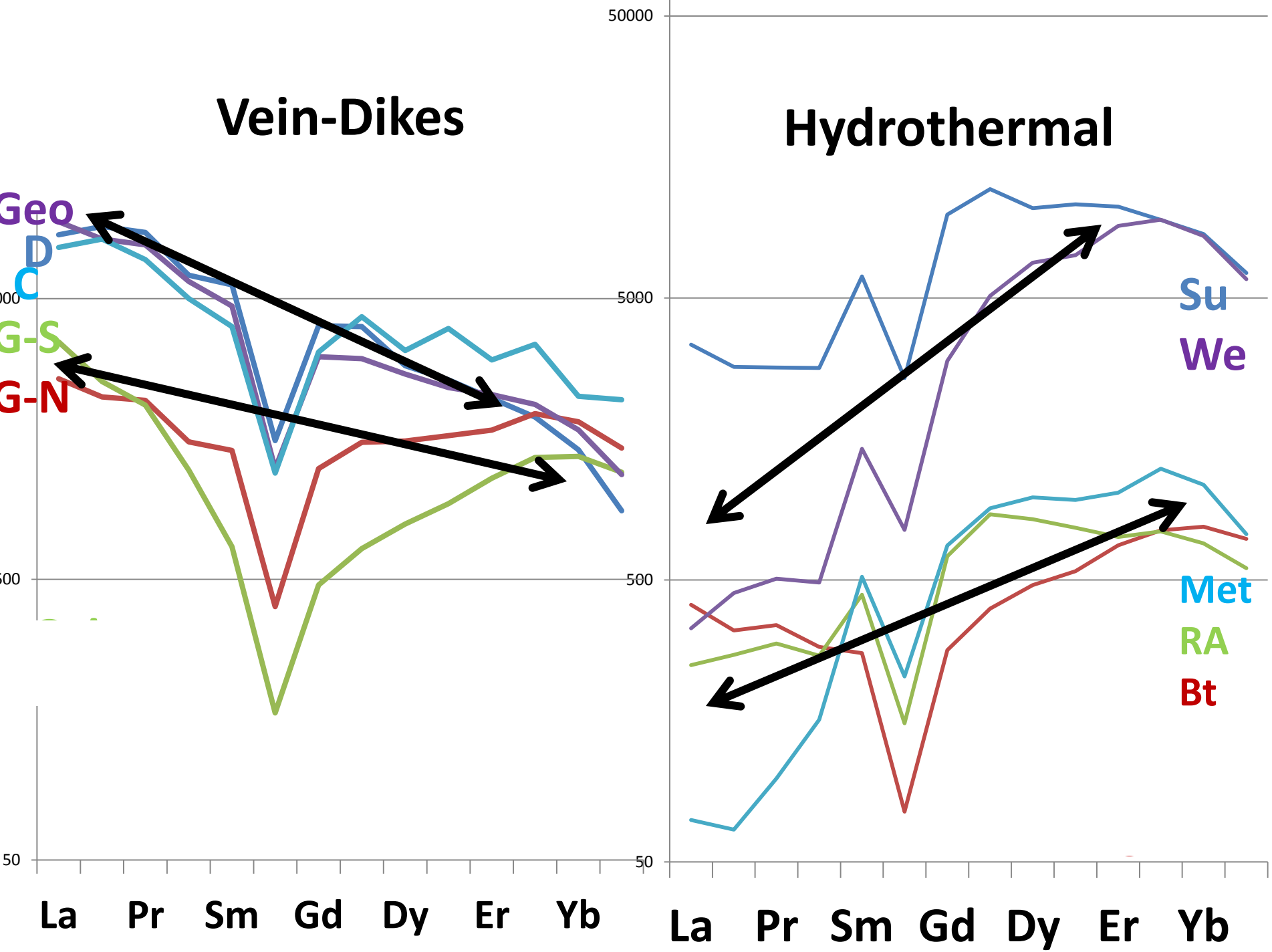
HREE-Y silicates after zircon, possible iimoriite (Mariano,2010)




EU-PL
AT
TN
LREE
Allanite
Bastnasite
Synchysite
HREE
limoriite
Thalanite
Fergusonite
Euxenite


WENNIE
TREE+Y = 1.67% (n-10)
HREE +Y= 93%
N=10 La+Ce:Y =0.06
Lu>La

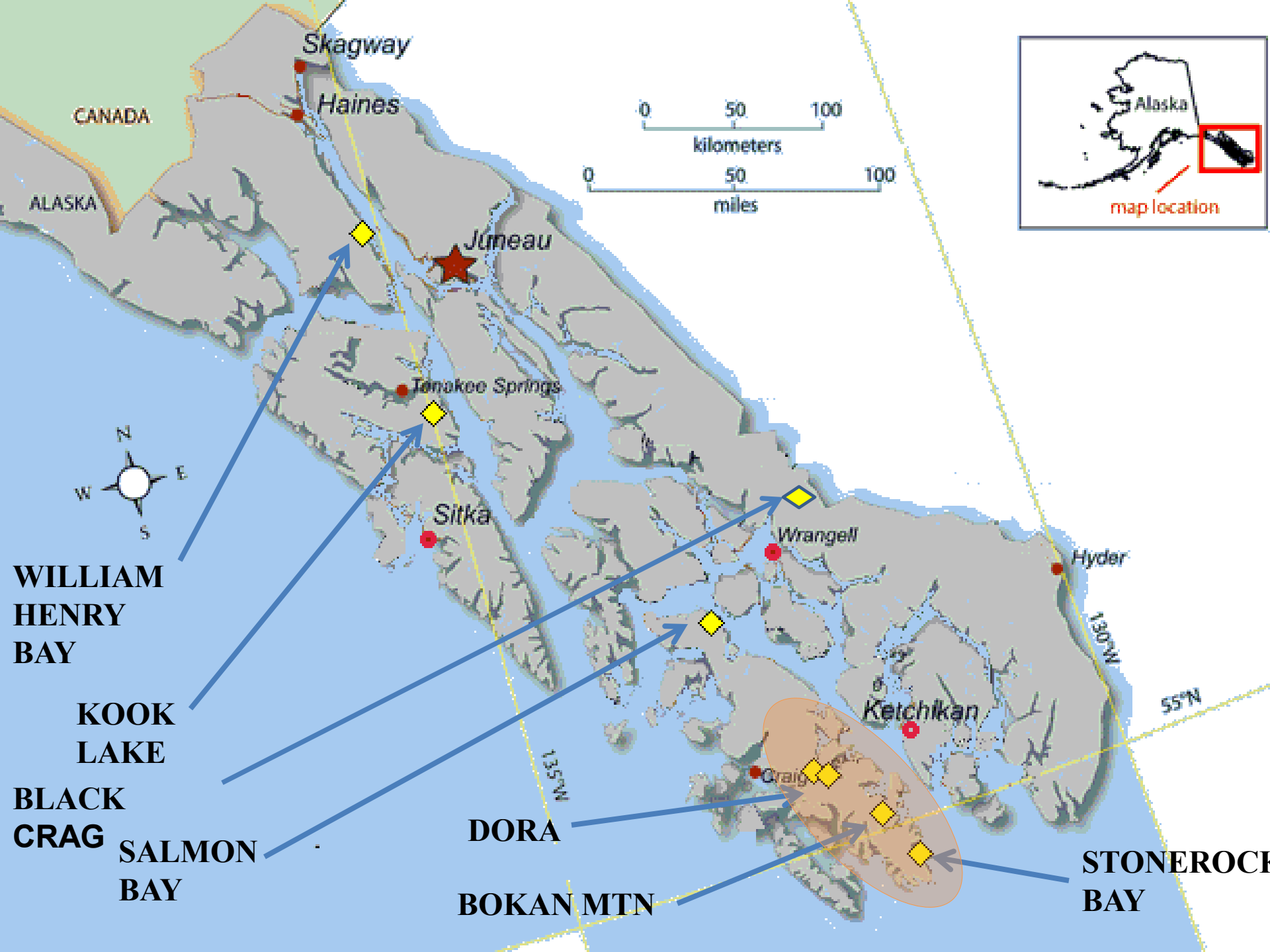

Vein-Dikes
Geo
D
C
G-S
G-N
000
500
50
La
Pr
Sm
Gd
Dy
Er
Yb
Hydrothermal
50000
5000
500
50
Su
We
Met
RA
Bt
La
Pr
Sm
Gd
Dy
Er
Yb

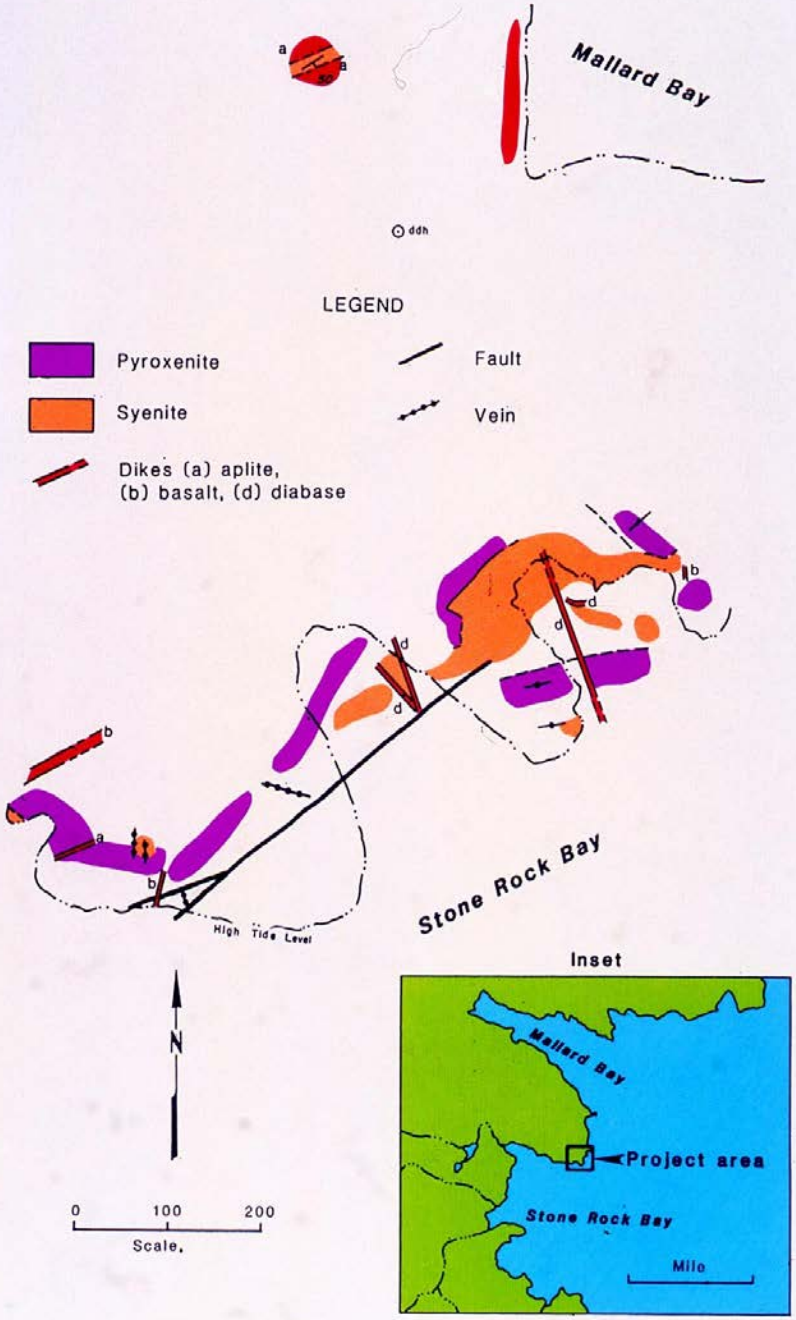

Vein-Dikes
Geo
D
C
G-S
G-N
000
500
50
La
Pr
Sm
Gd
Dy
Er
Yb
Hydrothermal
50000
5000
500
50
Su
We
Met
RA
Bt
La
Pr
Sm
Gd
Dy
Er
Yb

late stage magmatic-early hydrothermal vein-dikes contain 30 to 50% heavy REE+Y

the more highly evolved hydrothermal occurrences demonstrate a more pronounced bias to the HREE

structurally controlled hydrothermal systems exhibit an extreme concentration of the HREE+Y that can exceed 90%


Skagway
Haines
CANADA
ALASKA
Juneau
Tenakee Springs
Sitka
Wrangell
Hyder
Ketchikan
Craig
0 50 100
kilometers
0 50 100
miles
Alaska
map location
N
W
E
S
135°W
130°W
55°N
WILLIAM HENRY BAY
KOOK LAKE
BLACK CRAG
SALMON BAY
DORA
BOKAN MTN
STONEROCK BAY



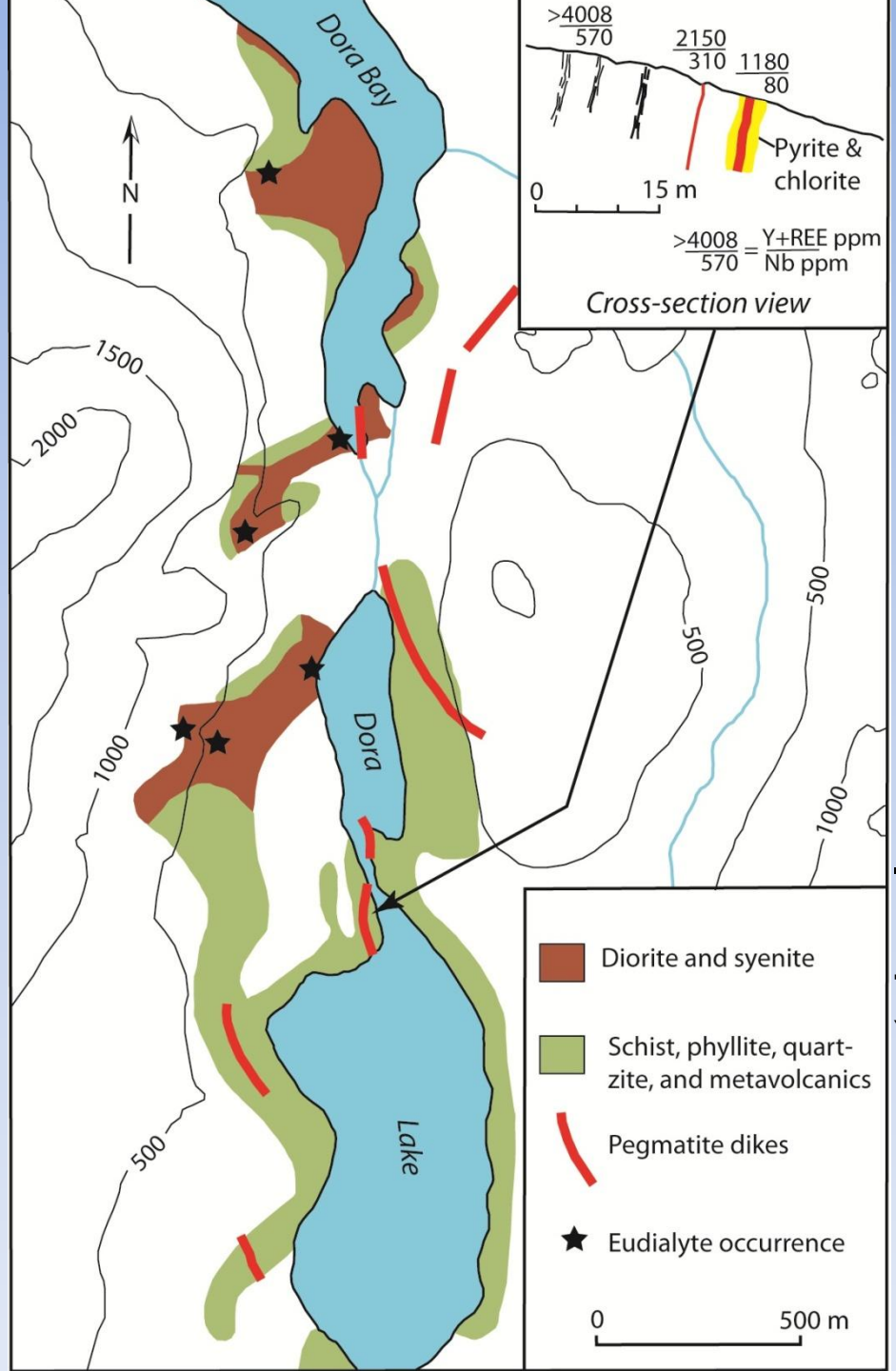
La	.31%
Ce	.69
Pr	.05
Nd	.20
Sm	L
Eu	L
Gd	.01
Dy	L
Ho	L
Er	L
Tm	L
Yb	L
Y	.03

REE + Y occurrences

Coarse-grain to pegmatitic Q-alb <3m
Vein-dikes <1 m
Silica-rich veins <30 cm
} La + Ce : Y = <1

Disseminated eudialyte La + Ce : Y = 1.01

Disseminated molybdenite and REE in syenite J. Philpotts, 1994

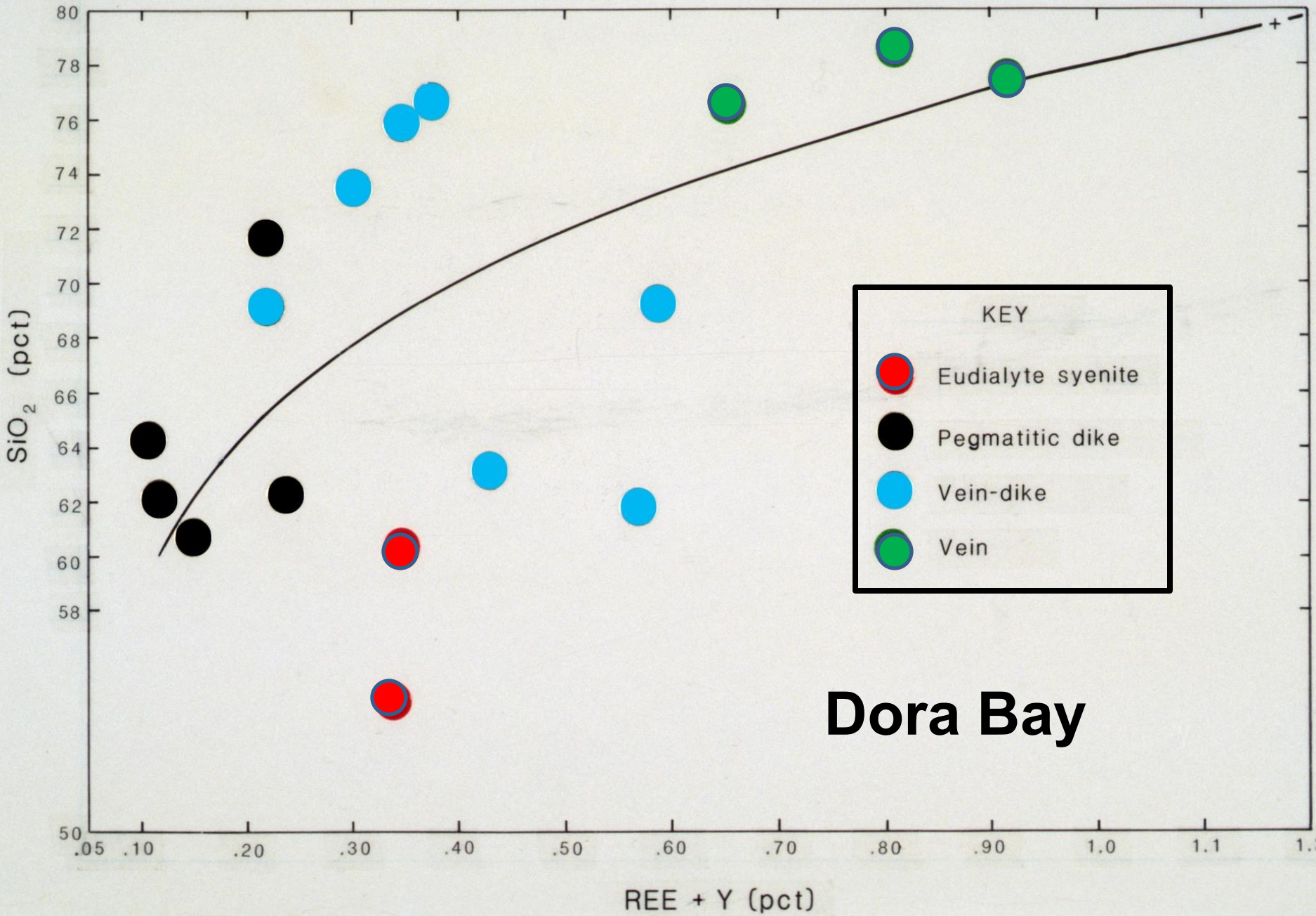


Dora Bay Complex

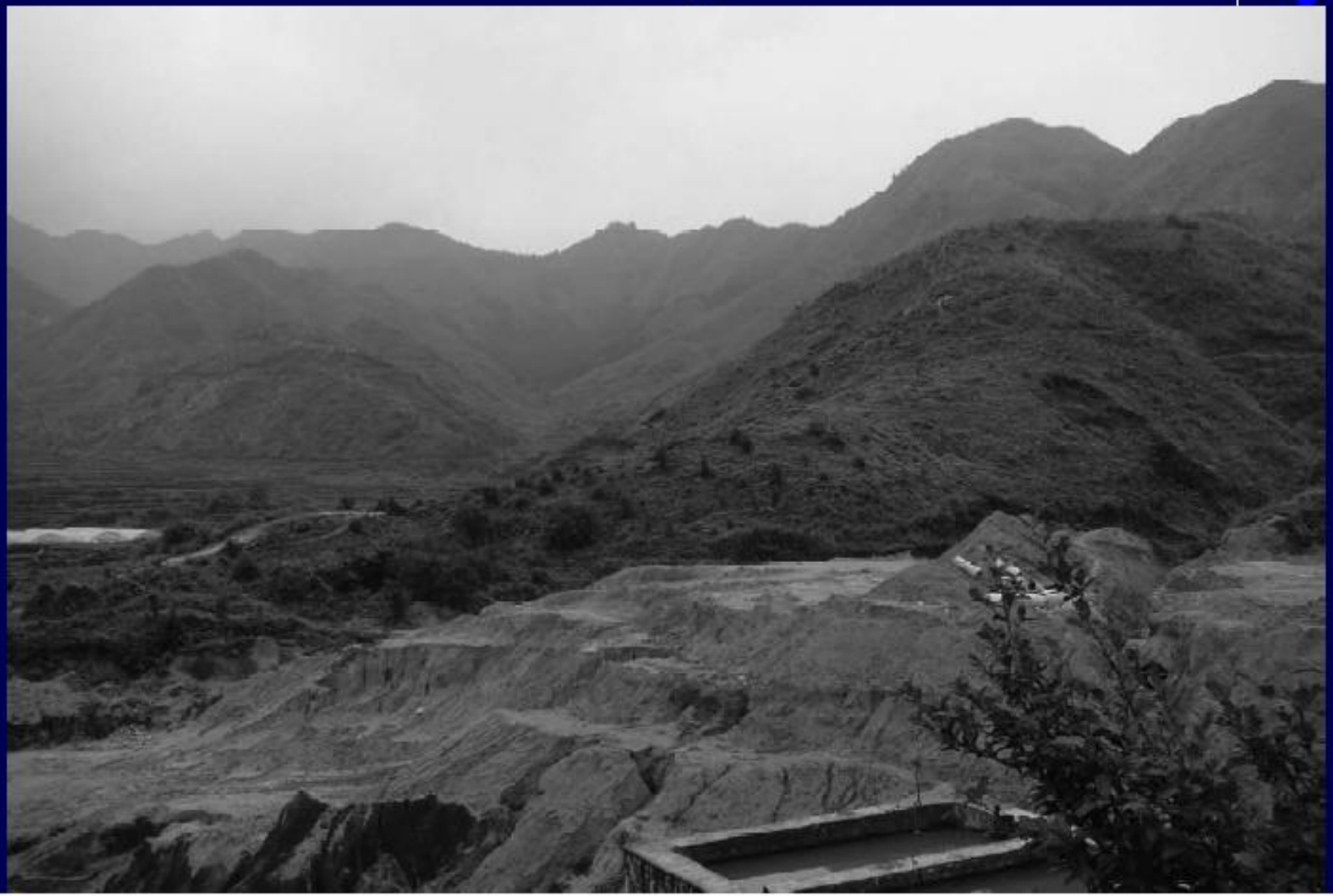
Nepheline syenite
Alkali syenite
diorite
Peralkaline granite
Pegmatite dikes
Alk olivine basalt dikes

Principle REE-Nb minerals

Major	Minor
thalenite	monazite
Y-bastnaesite	eudialyte
	euxenite


80
78
76
74
72
70
68
66
64
62
60
58
50
SiO_2 (pct)
.05
.10
.20
.30
.40
.50
.60
.70
.80
.90
1.0
1.1
REE + Y (pct)
KEY
Eudialyte syenite
Pegmatitic dike
Vein-dike
Vein
Dora Bay

Ion Exchange RE mining in Jiangxi China



FLAMMABLE
DIESEL
there are alternatives