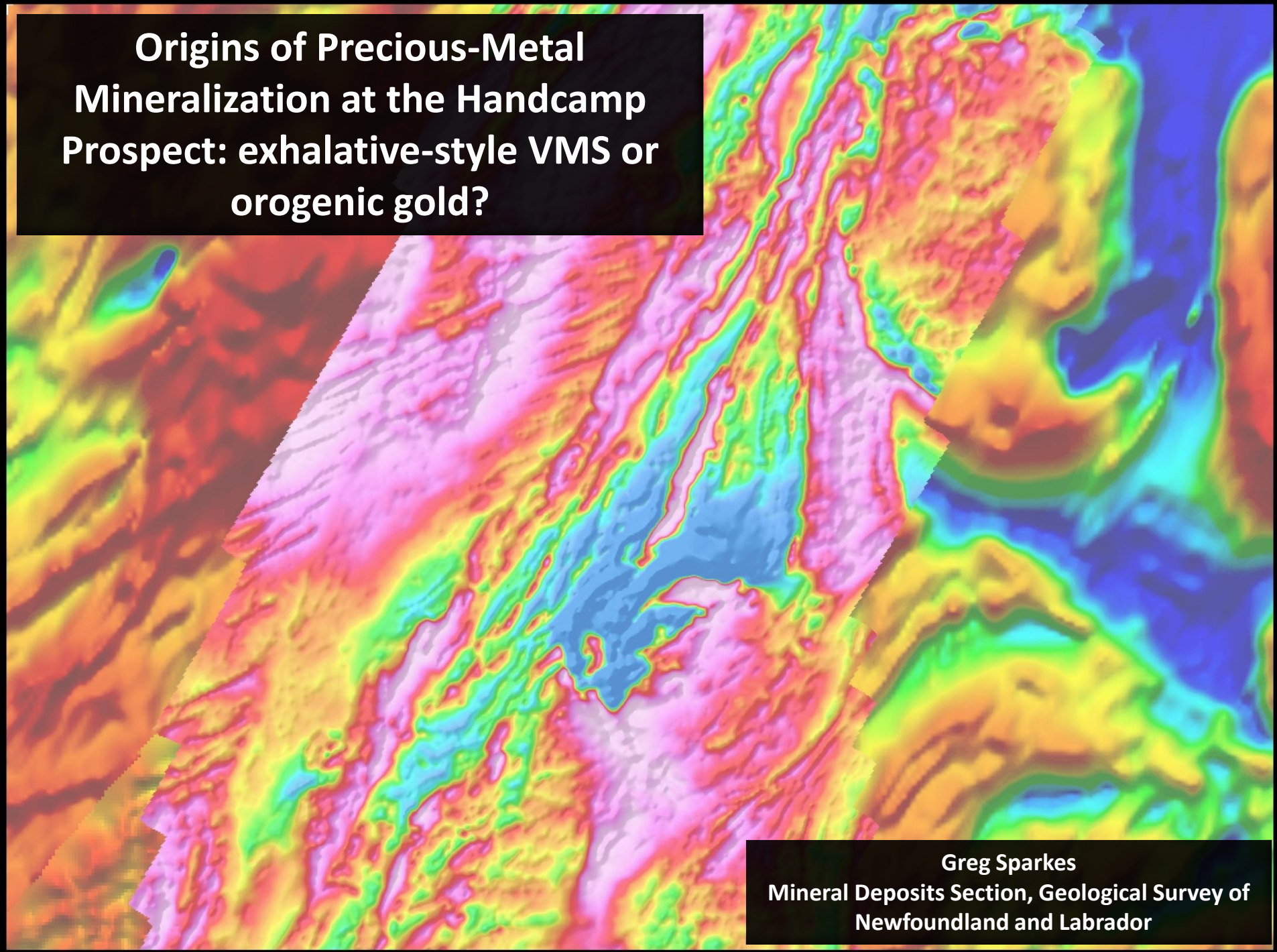
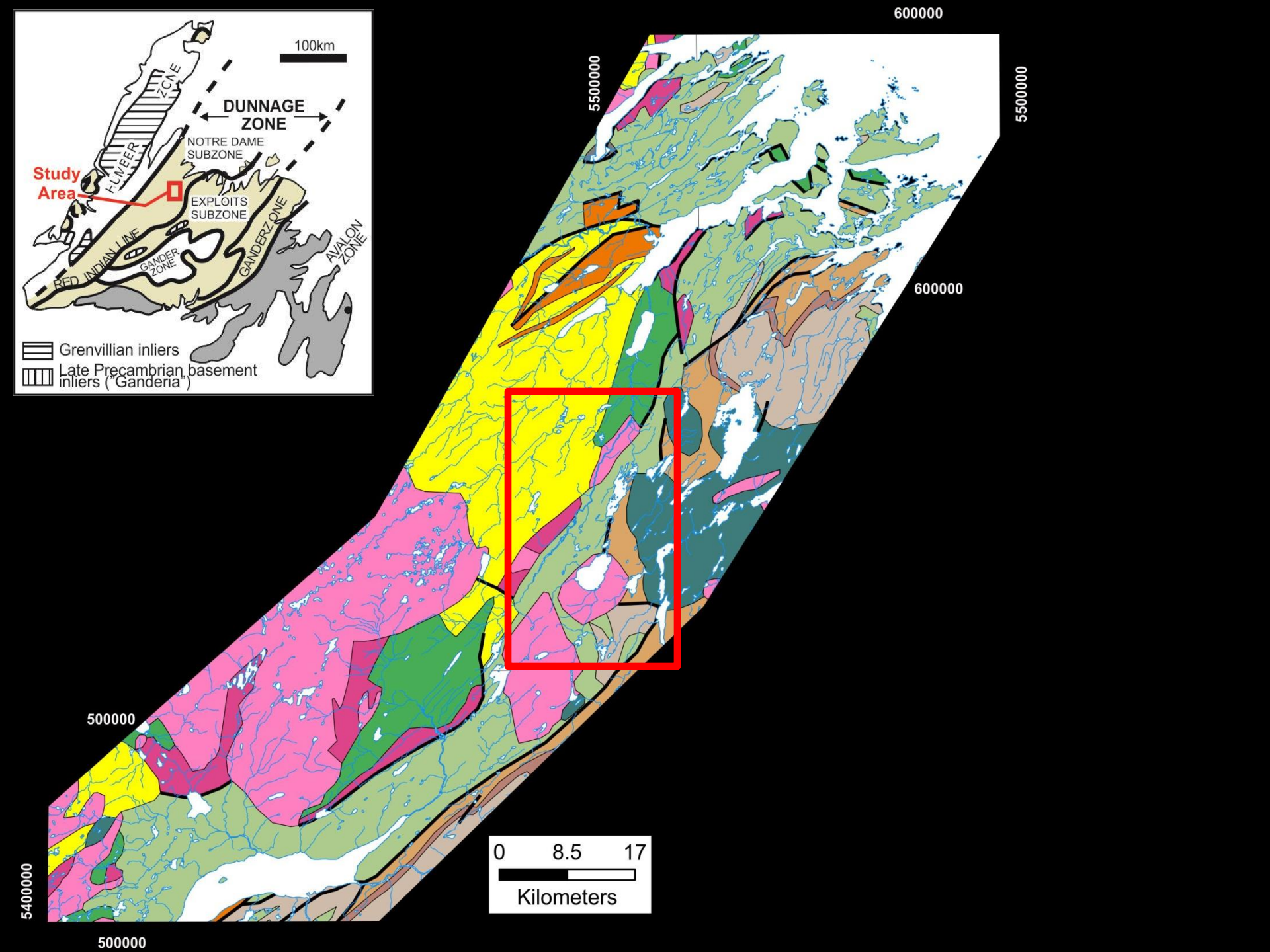
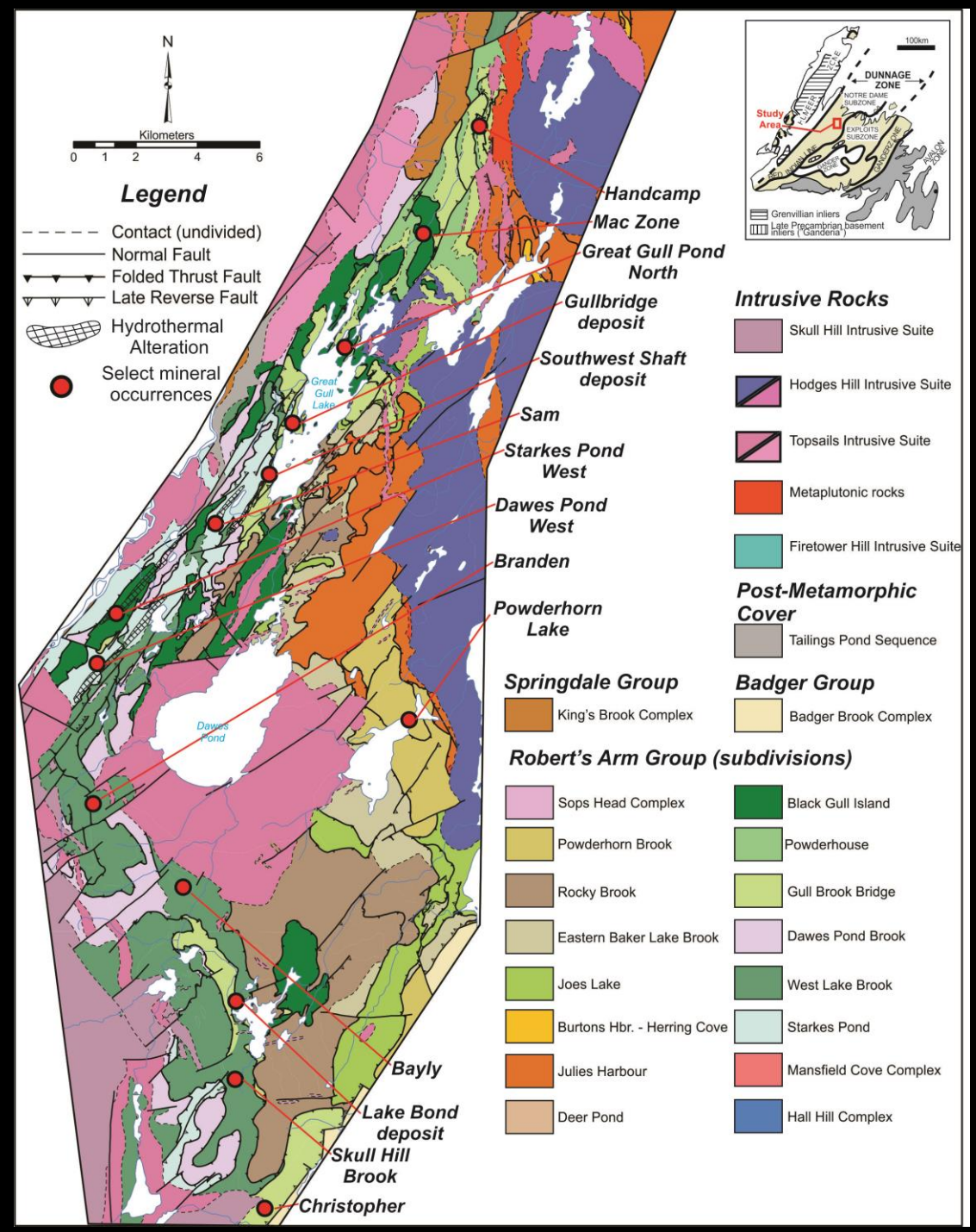
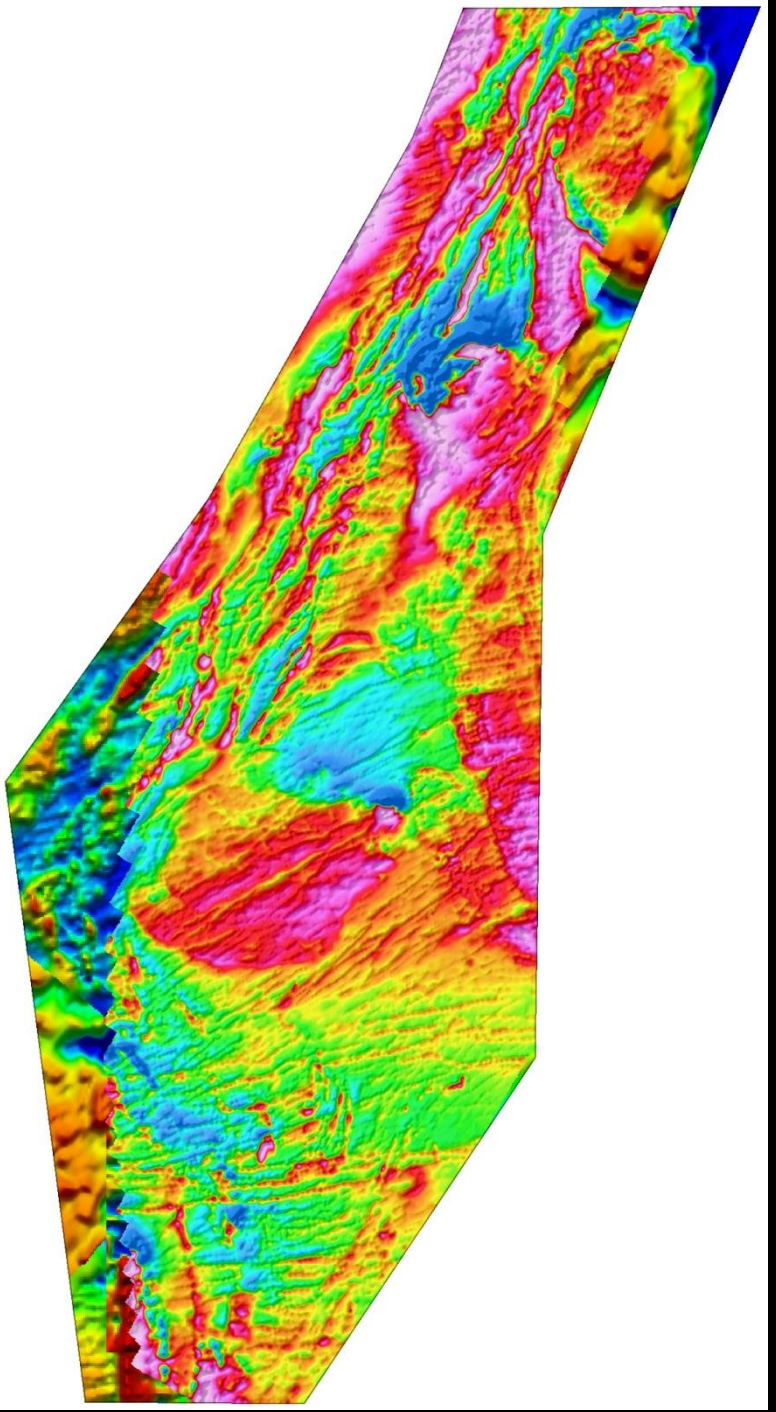
Origins of Precious-Metal Mineralization at the Handcamp Prospect: exhalative-style VMS or orogenic gold?

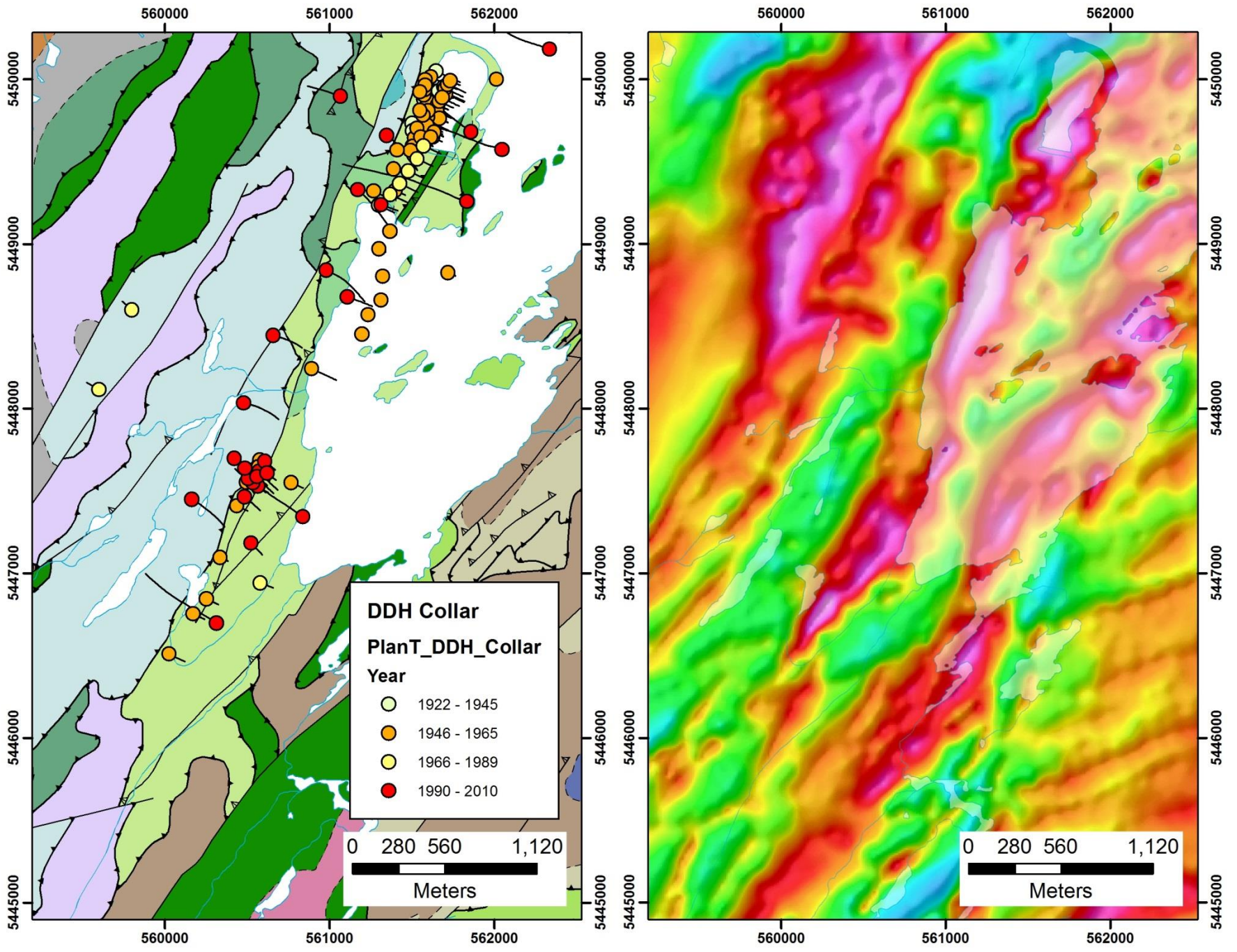


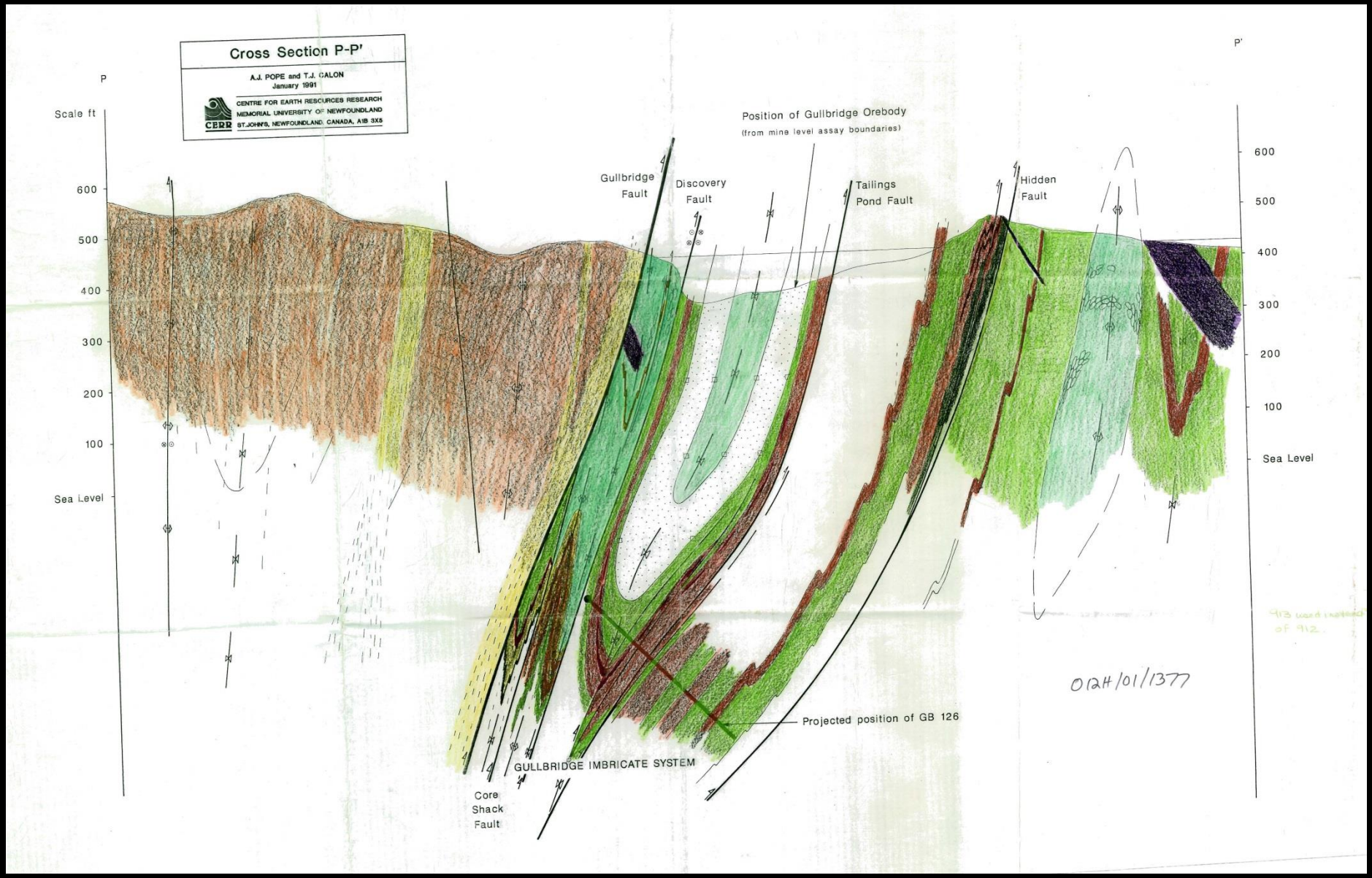
Greg Sparkes
Mineral Deposits Section, Geological Survey of Newfoundland and Labrador

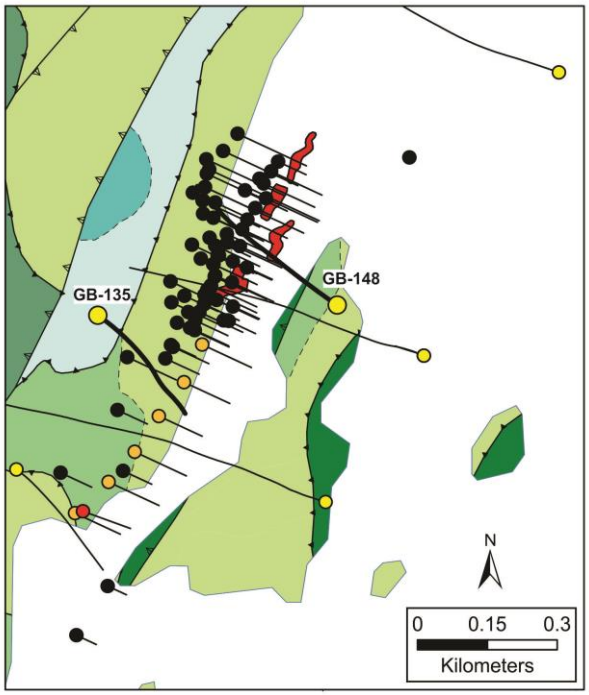

100km
DUNNAGE ZONE
NOTRE DAME SUBZONE
EXPLOITS SUBZONE
Study Area
HLMEER ZONE
RED INDIAN LINE
GANDER ZONE
GANDERZONE
AVALON ZONE
Grenvillian inliers
Late Precambrian basement inliers ("Ganderia")
600000
5500000
5500000
600000
500000
5400000
500000
0 8.5 17
Kilometers


N
Kilometers
0 1 2 4 6
Legend
Contact (undivided)
Normal Fault
Folded Thrust Fault
Late Reverse Fault
Hydrothermal Alteration
Select mineral occurrences
Great Gull Lake
Dawes Pond
Handcamp
Mac Zone
Great Gull Pond North
Gullbridge deposit
Southwest Shaft deposit
Sam
Starkes Pond West
Dawes Pond West
Branden
Powderhorn Lake
Bayly
Lake Bond deposit
Skull Hill Brook
Christopher
100km
DUNNAGE ZONE
NOTRE DAME SUBZONE
EXPLOITS SUBZONE
GANDER ZONE
AVALON ZONE
Study Area
Grenvillian inliers
Late Precambrian basement inliers ("Ganderia")
Intrusive Rocks
Skull Hill Intrusive Suite
Hodges Hill Intrusive Suite
Topsails Intrusive Suite
Metaplutonic rocks
Firetower Hill Intrusive Suite
Post-Metamorphic Cover
Tailings Pond Sequence
Springdale Group
King's Brook Complex
Badger Group
Badger Brook Complex
Robert's Arm Group (subdivisions)
Sops Head Complex
Powderhorn Brook
Rocky Brook
Eastern Baker Lake Brook
Joes Lake
Burtons Hbr. - Herring Cove
Julies Harbour
Deer Pond
Black Gull Island
Powderhouse
Gull Brook Bridge
Dawes Pond Brook
West Lake Brook
Starkes Pond
Mansfield Cove Complex
Hall Hill Complex




560000
561000
562000
5450000
5449000
5448000
5447000
5446000
5445000
DDH Collar
PlanT_DDH_Collar
Year
1922 - 1945
1946 - 1965
1966 - 1989
1990 - 2010
0 280 560 1,120
Meters


Cross Section P-P'
A.J. POPE and T.J. CALON
January 1991
CENTRE FOR EARTH RESOURCES RESEARCH
MEMORIAL UNIVERSITY OF NEWFOUNDLAND
ST.JOHN'S, NEWFOUNDLAND, CANADA, A1B 3X5
CERR
P
P'
Scale ft
600
500
400
300
200
100
Sea Level
Position of Gullbridge Orebody
(from mine level assay boundaries)
Gullbridge Fault
Discovery Fault
Tailings Pond Fault
Hidden Fault
Projected position of GB 126
GULLBRIDGE IMBRICATE SYSTEM
Core Shack Fault
012H/01/1377



Legend

DDH Collar (by year)

- 1922 - 1952
- 1953 - 1970
- 1971 - 1993
- 1994 - 2018
- Ore

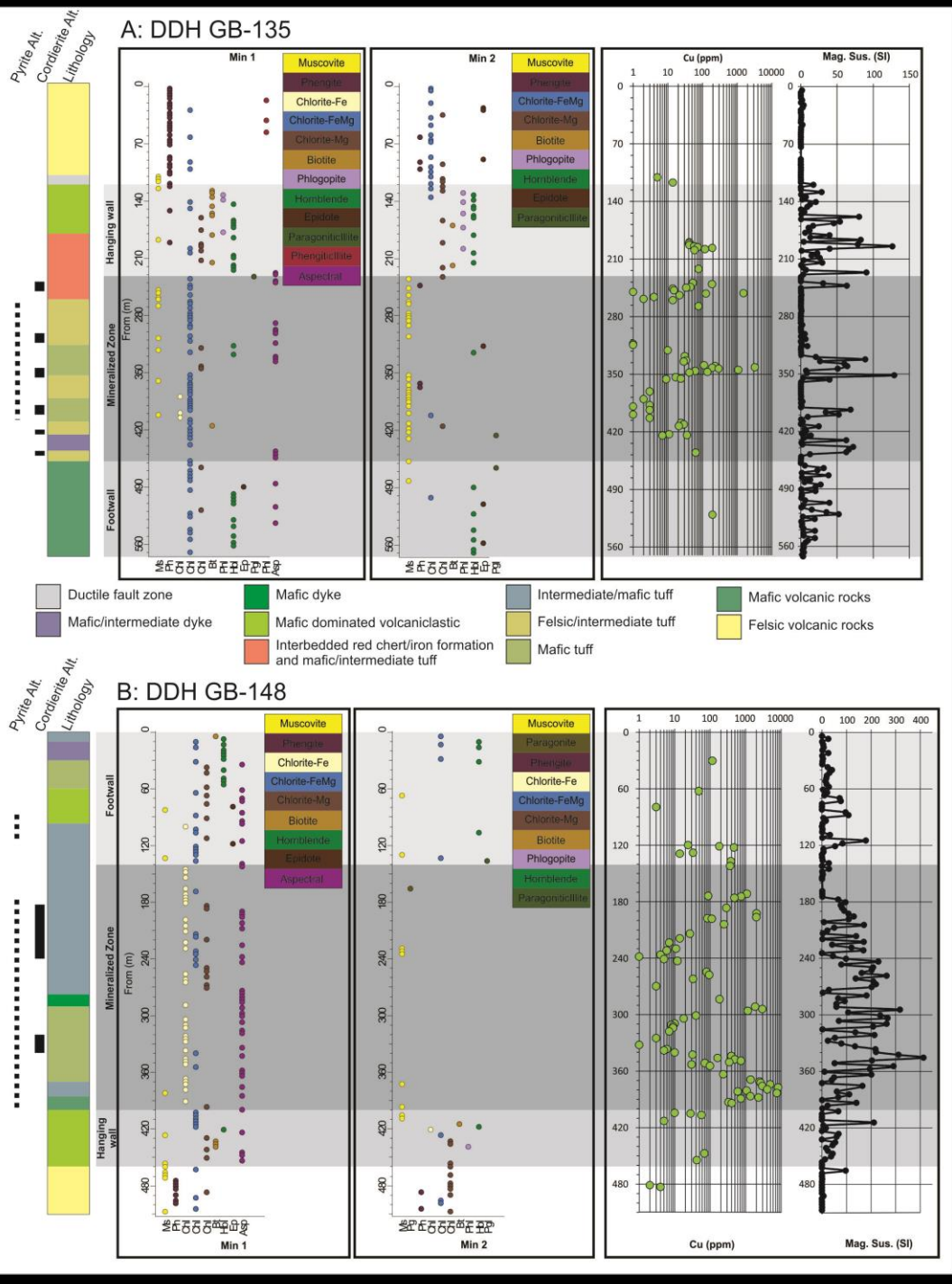
Intrusive Rocks

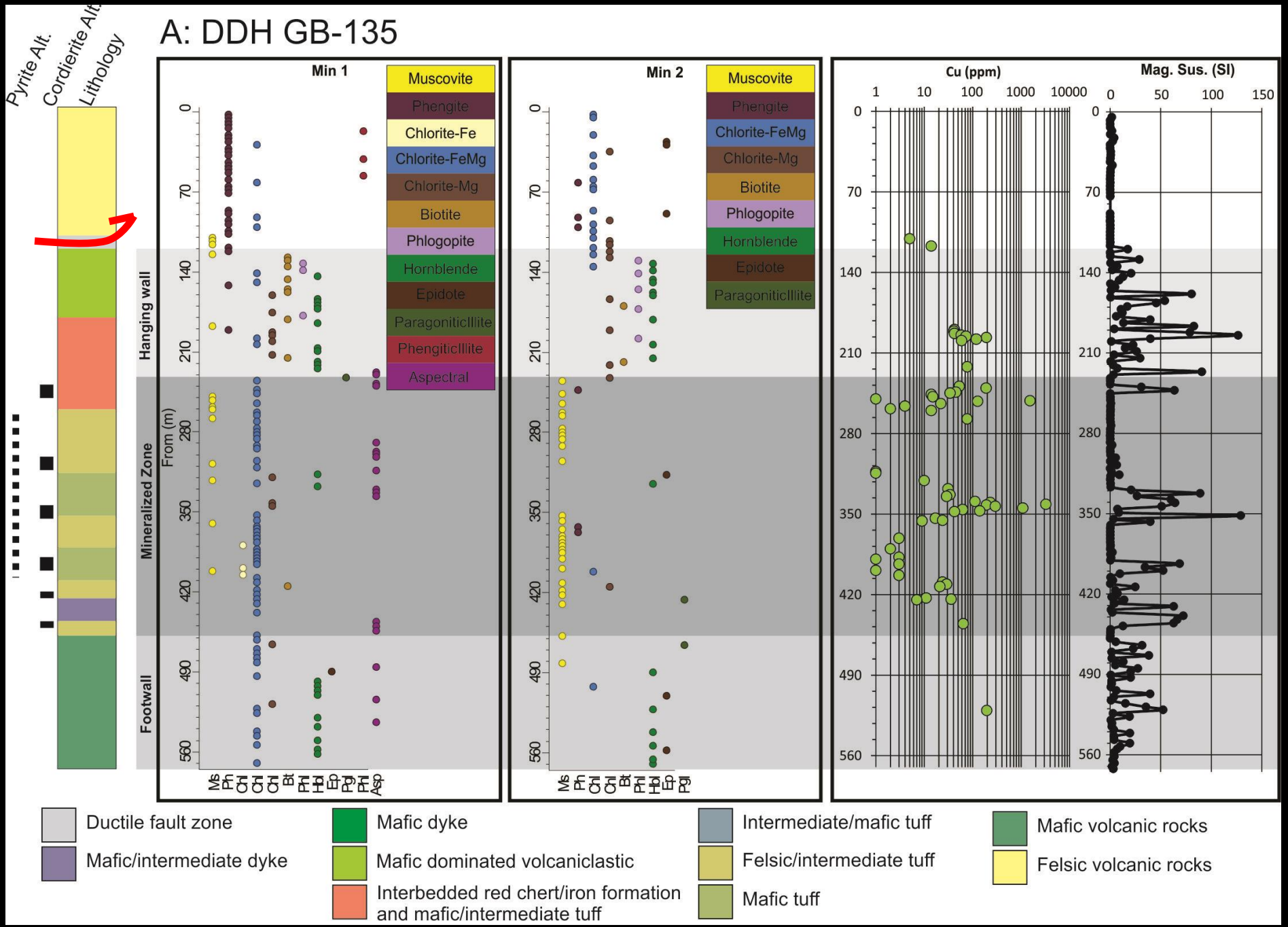
- Firetower Hill Intrusive Suite

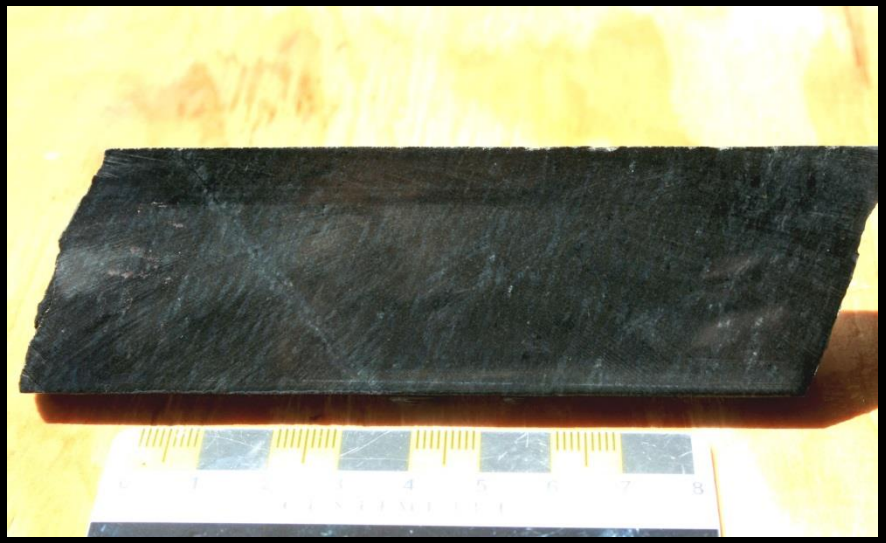
Robert's Arm Group (subdivisions)

- Black Gull Island
- Powderhouse
- Gull Brook Bridge
- West Lake Brook
- Starkes Pond

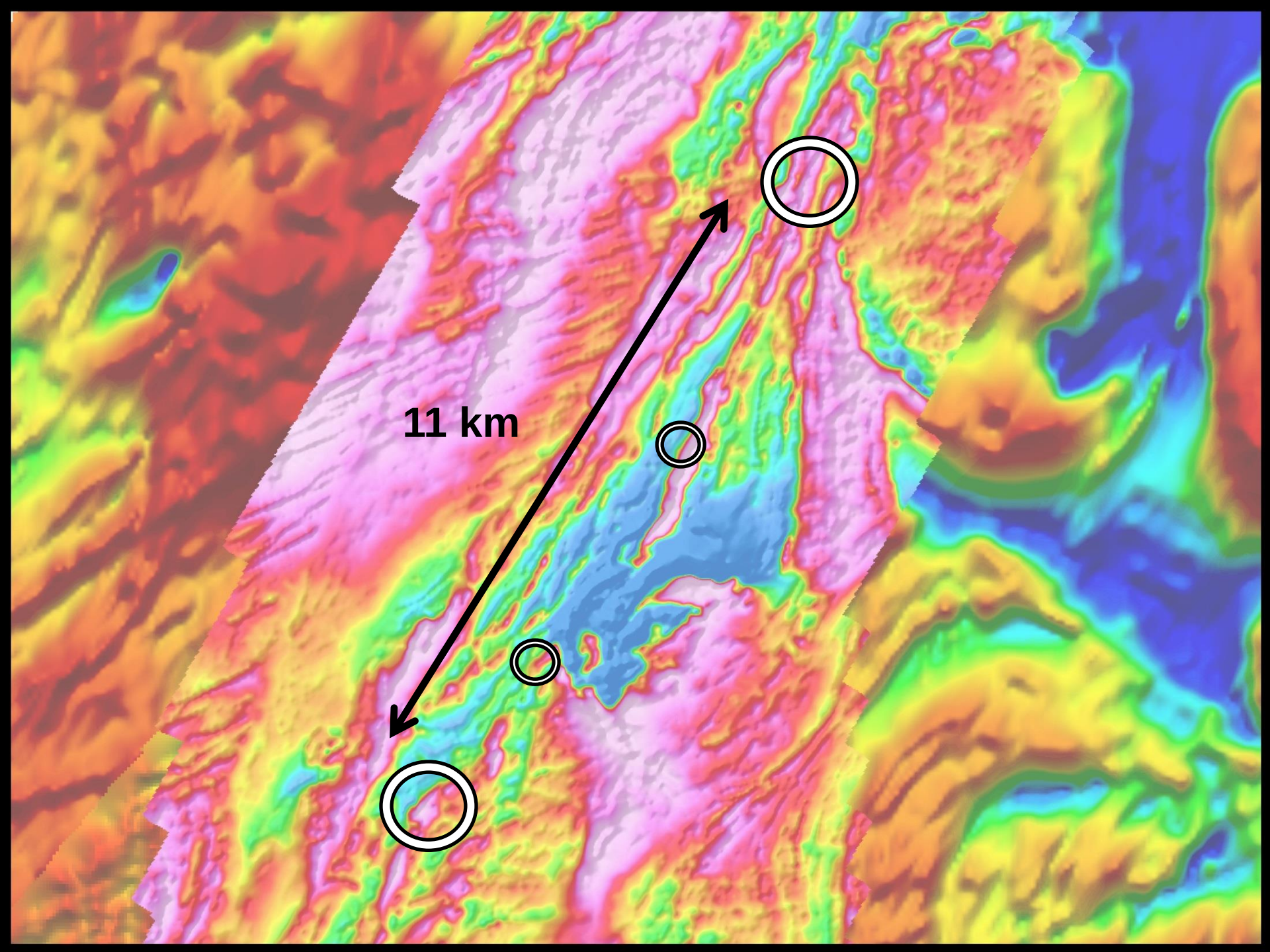
- Contact (undivided)
- Folded Thrust Fault
- Late Reverse Fault




A: DDH GB-135
Pyrite Alt.
Cordierite Alt.
Lithology
Min 1
Min 2
Muscovite
Phengite
Chlorite-Fe
Chlorite-FeMg
Chlorite-Mg
Biotite
Phlogopite
Hornblende
Epidote
ParagoniticIllite
PhengiticIllite
Aspectral
Hanging wall
Mineralized Zone
Footwall
From (m)
0
70
140
210
280
350
420
490
560
Ms
Ph
Chl
Chl
Chl
Bt
Phl
Hbl
Ep
Pgl
Phl
Asp
Cu (ppm)
1
10
100
1000
10000
Mag. Sus. (SI)
0
50
100
150
Ductile fault zone
Mafic/intermediate dyke
Mafic dyke
Mafic dominated volcaniclastic
Interbedded red chert/iron formation and mafic/intermediate tuff
Intermediate/mafic tuff
Felsic/intermediate tuff
Mafic tuff
Mafic volcanic rocks
Felsic volcanic rocks




0 1 2 3 4 5 6 7 8
CENTIMETRES

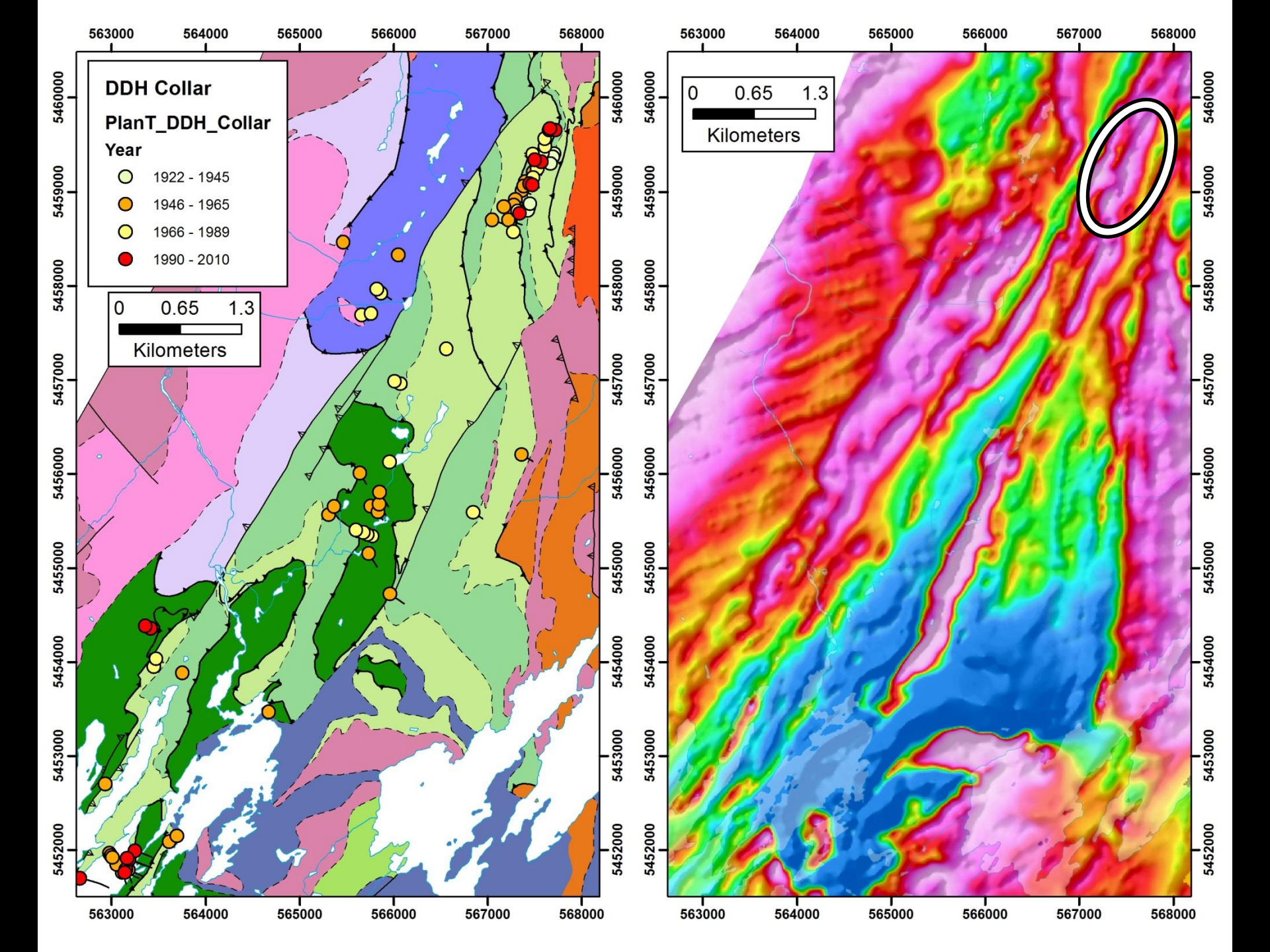

11 km

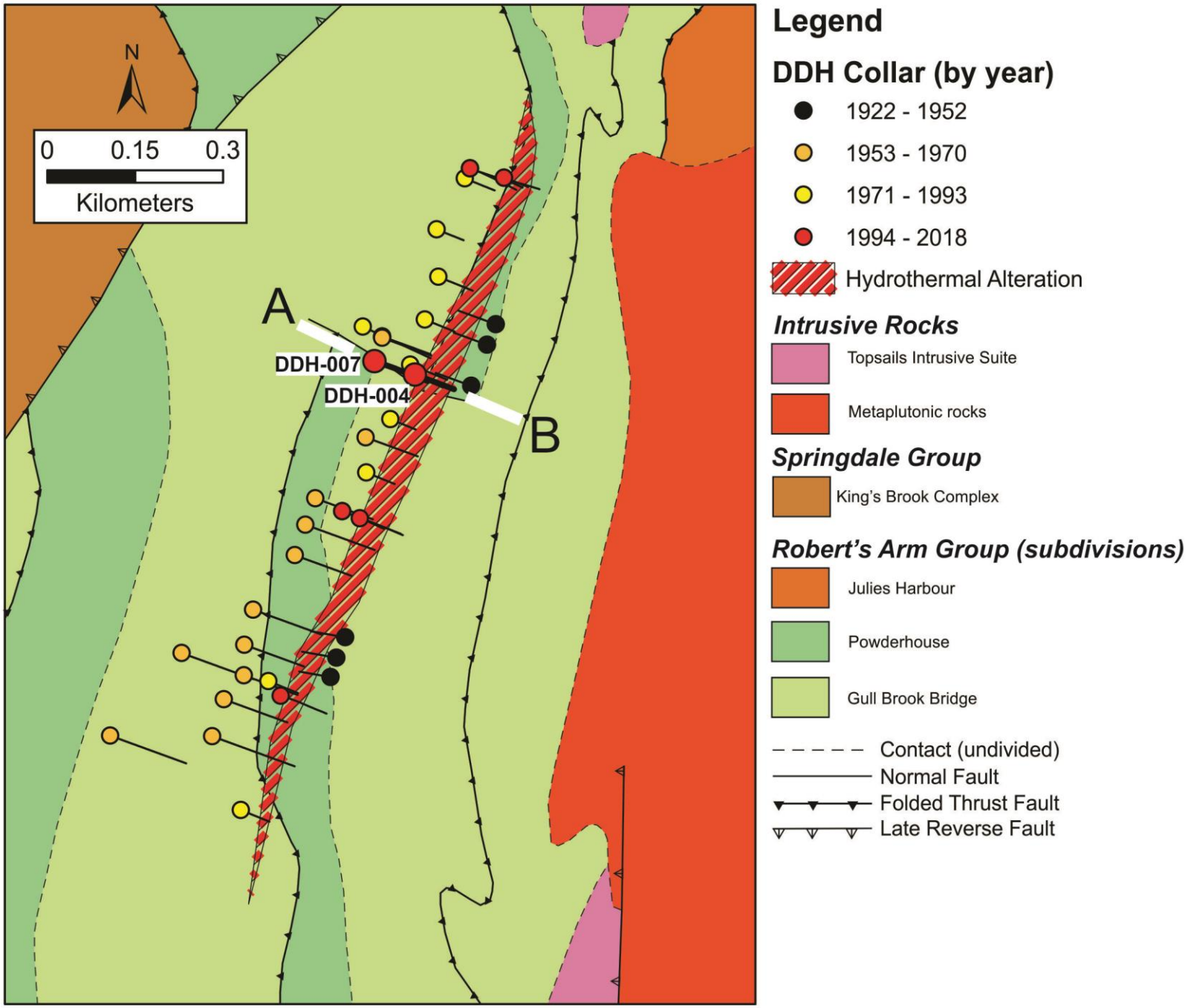
PREVIOUS INTERPRETATIONS OF GOLD MINERALIZATION:

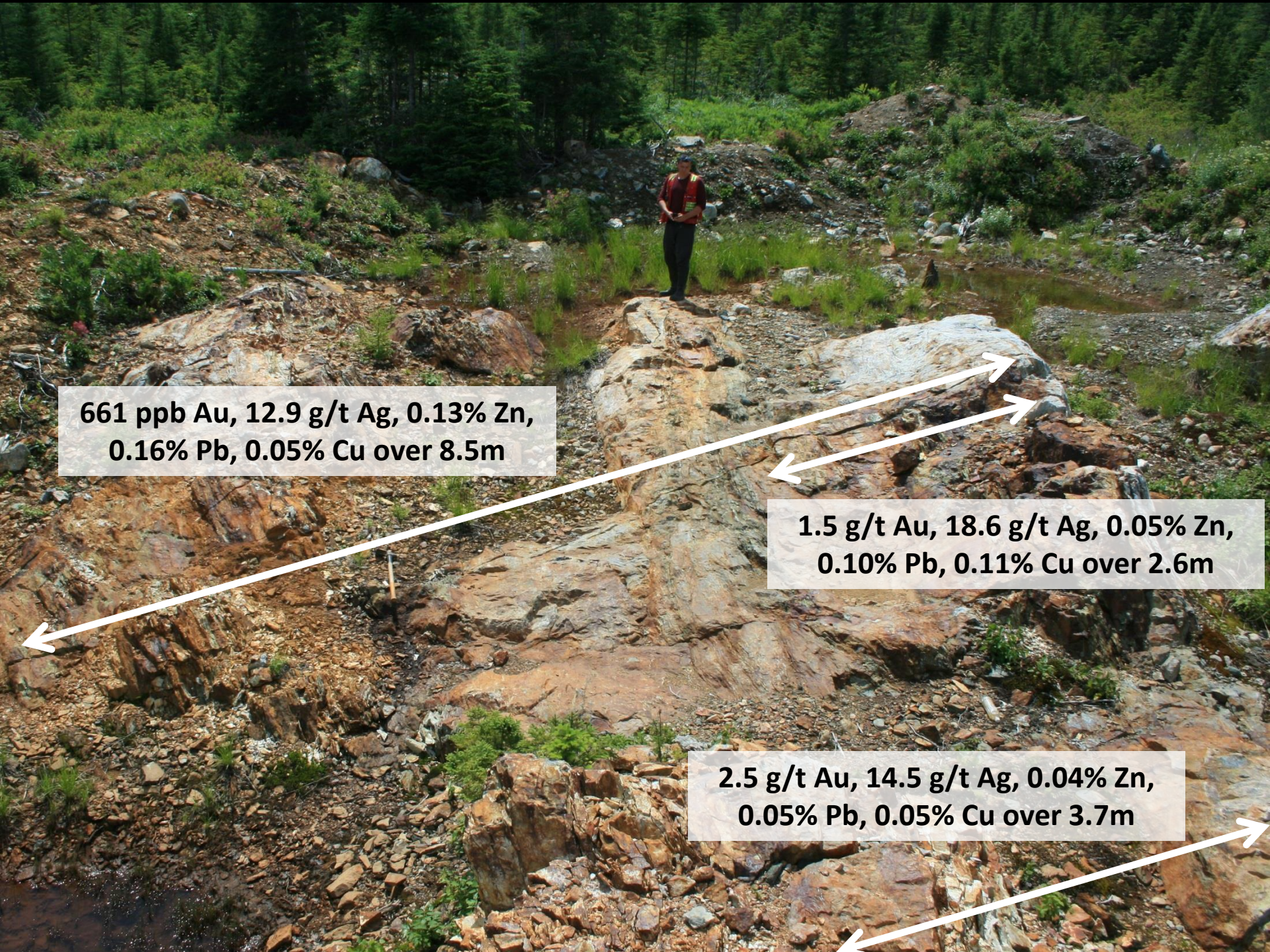
- Epigenetic (Corlett, 1930)
- Shear-zone related (Lea and Neilson, 1972)
- Stratabound volcanogenic (DeGrace, 1976)
- Epithermal (Burton and Woolham, 1983)
- Shear-zone related (Hudson and Swinden, 1989)
- Shear-zone related (Evans, 1996)
- Volcanogenic (Pickett *et al.*, 2011)

Shear-related Model (Hudson and Swinden, 1989)

- Association of As, Sb, Mo and the abundance of Ca-rich minerals (epidote, wollastonite, calcite, grossularite, clinozoisite, tremolite) with Au
- Spatial association of Au with pyritic-sericitic schist


DDH Collar
PlanT_DDH_Collar
Year
1922 - 1945
1946 - 1965
1966 - 1989
1990 - 2010
0 0.65 1.3
Kilometers
0 0.65 1.3
Kilometers
563000
564000
565000
566000
567000
568000
5460000
5459000
5458000
5457000
5456000
5455000
5454000
5453000
5452000


N
0
0.15
0.3
Kilometers
A
B
DDH-007
DDH-004
Legend
DDH Collar (by year)
1922 - 1952
1953 - 1970
1971 - 1993
1994 - 2018
Hydrothermal Alteration
Intrusive Rocks
Topsails Intrusive Suite
Metaplutonic rocks
Springdale Group
King's Brook Complex
Robert's Arm Group (subdivisions)
Julies Harbour
Powderhouse
Gull Brook Bridge
Contact (undivided)
Normal Fault
Folded Thrust Fault
Late Reverse Fault


661 ppb Au, 12.9 g/t Ag, 0.13% Zn,
0.16% Pb, 0.05% Cu over 8.5m
1.5 g/t Au, 18.6 g/t Ag, 0.05% Zn,
0.10% Pb, 0.11% Cu over 2.6m
2.5 g/t Au, 14.5 g/t Ag, 0.04% Zn,
0.05% Pb, 0.05% Cu over 3.7m

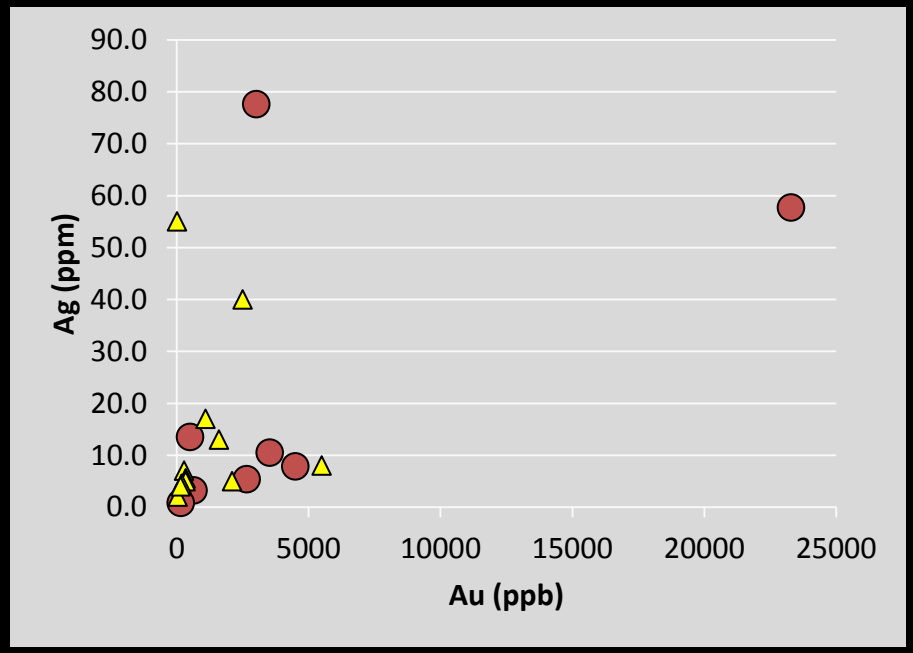
3.5 g/t Au, 10.5 g/t Ag, 0.60% Zn, 0.14% Pb, 0.09% Cu, and 1.5% Ba

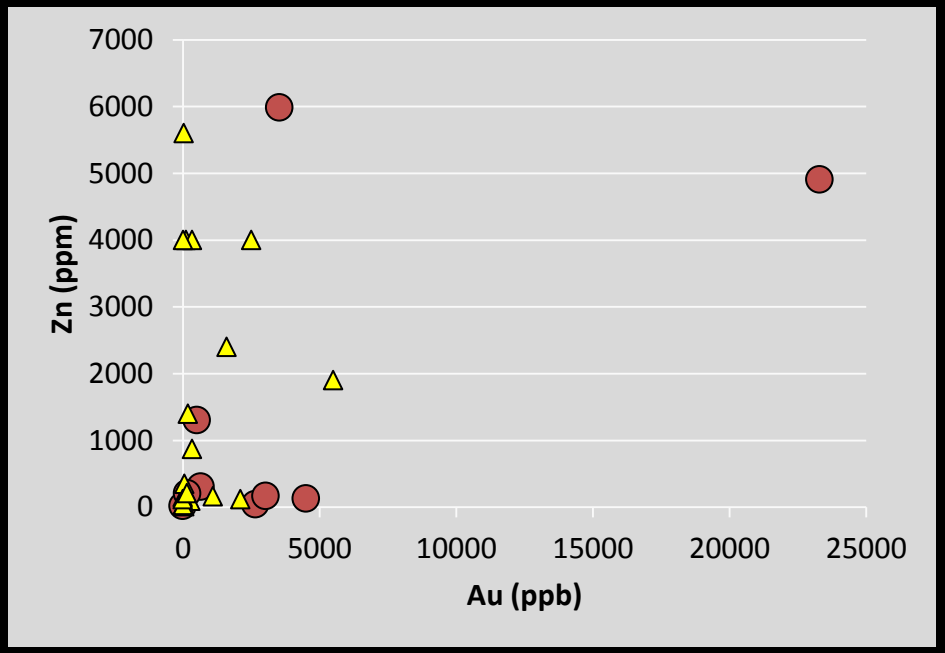
23.3 g/t Au, 57.7 g/t Ag, 0.49% Zn, 0.14% Pb, 0.07% Cu and 29.8% Ba

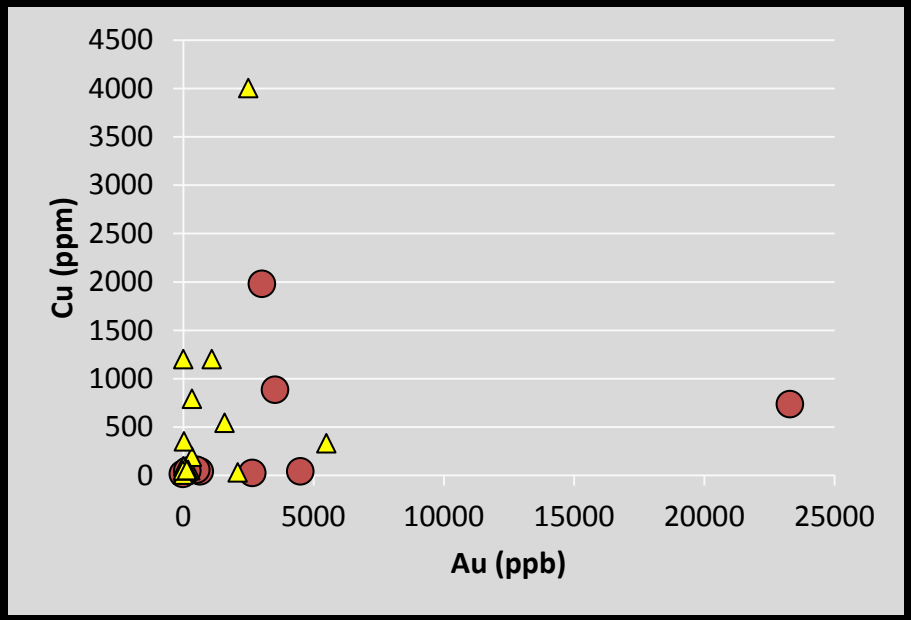

5 mm

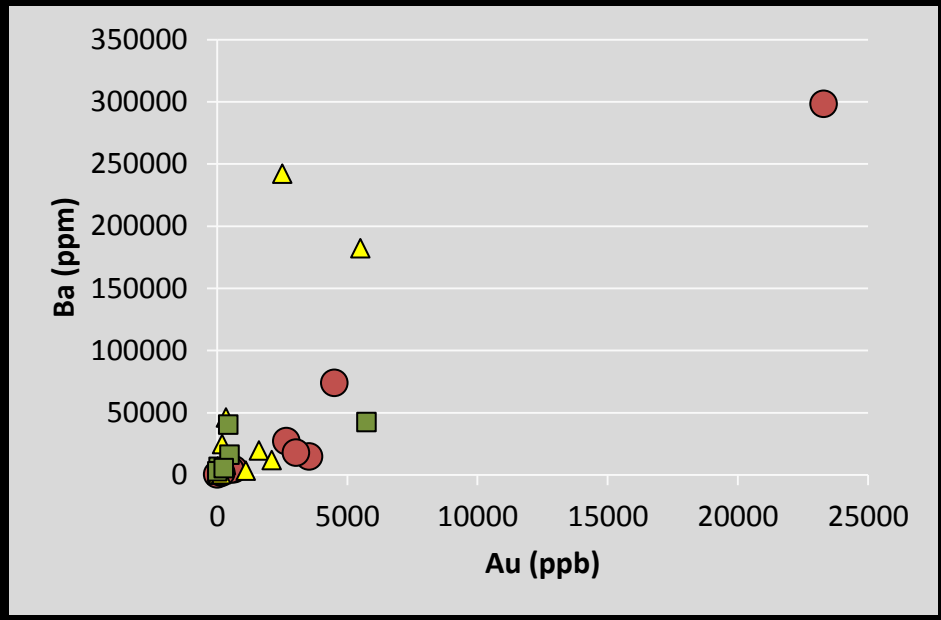

0 1 2 3 4 5 6 7 8
CENTIMETRES
GEOLOGICAL SURVEY
Newfoundland and Labrador
Department of Natural Resources

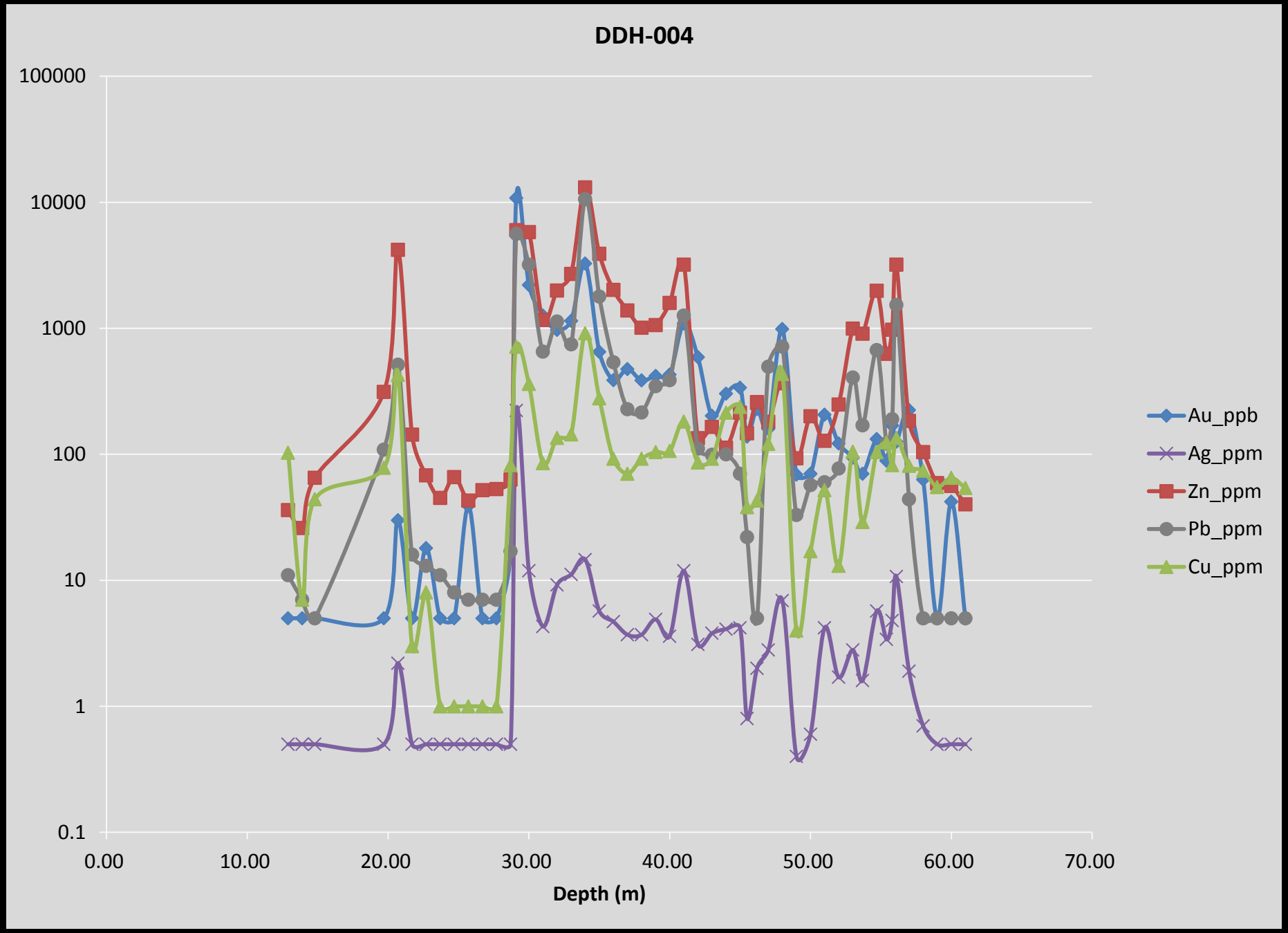

5 mm


90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Ag (ppm)
0
5000
10000
15000
20000
25000
Au (ppb)

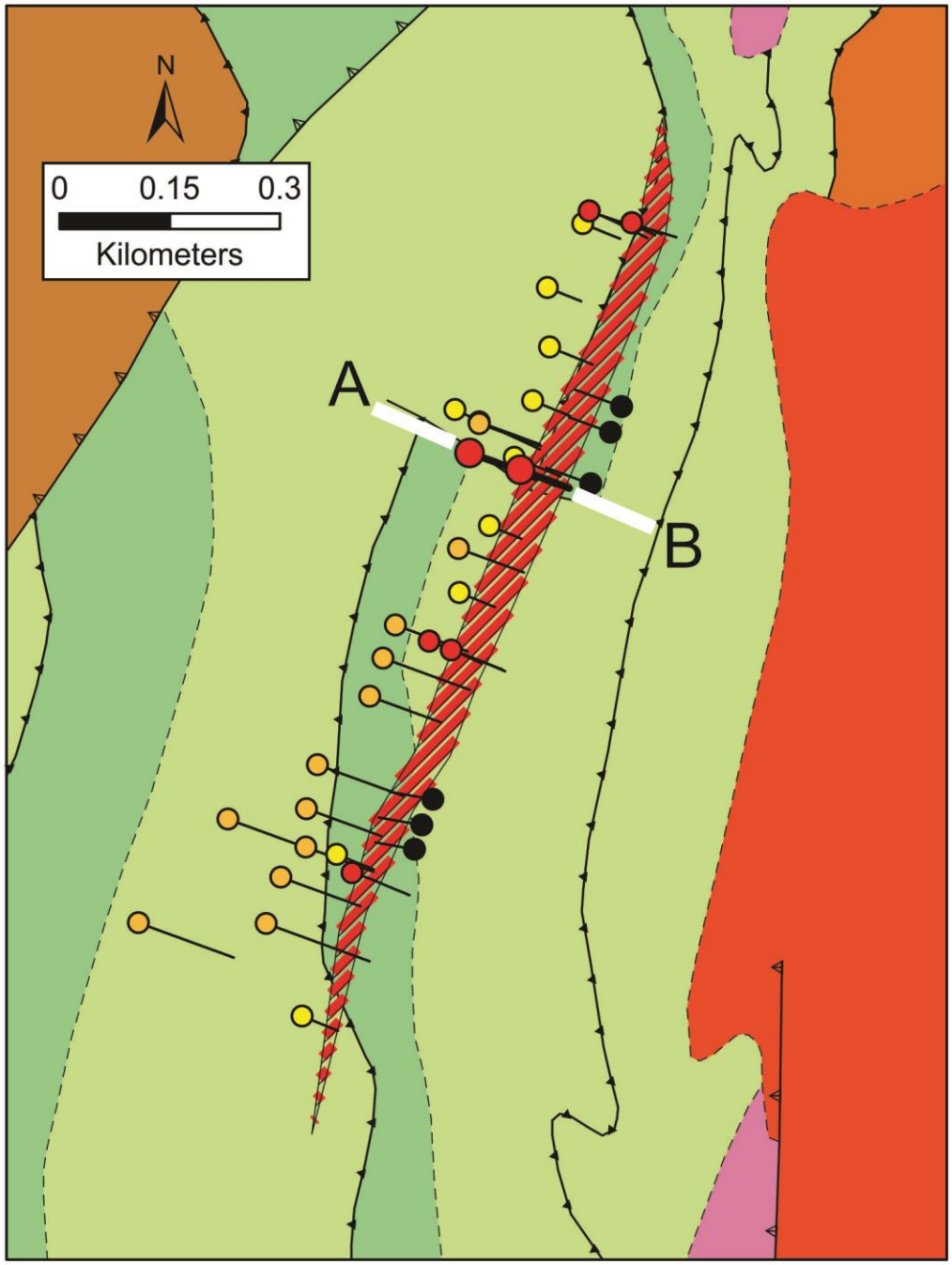

7000
6000
5000
4000
3000
2000
1000
0
Zn (ppm)
0
5000
10000
15000
20000
25000
Au (ppb)


4500
4000
3500
3000
2500
2000
1500
1000
500
0
Cu (ppm)
0
5000
10000
15000
20000
25000
Au (ppb)


350000
300000
250000
200000
150000
100000
50000
0
Ba (ppm)
0
5000
10000
15000
20000
25000
Au (ppb)


DDH-004
100000
10000
1000
100
10
1
0.1
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
Depth (m)
Au_ppb
Ag_ppm
Zn_ppm
Pb_ppm
Cu_ppm


0 1 2 3 4 5 6 7 8
CENTIMETRES



Legend

DDH Collar (by year)

- 1922 - 1952
- 1953 - 1970
- 1971 - 1993
- 1994 - 2018

Hydrothermal Alteration

Intrusive Rocks

- Topsails Intrusive Suite
- Metaplutonic rocks

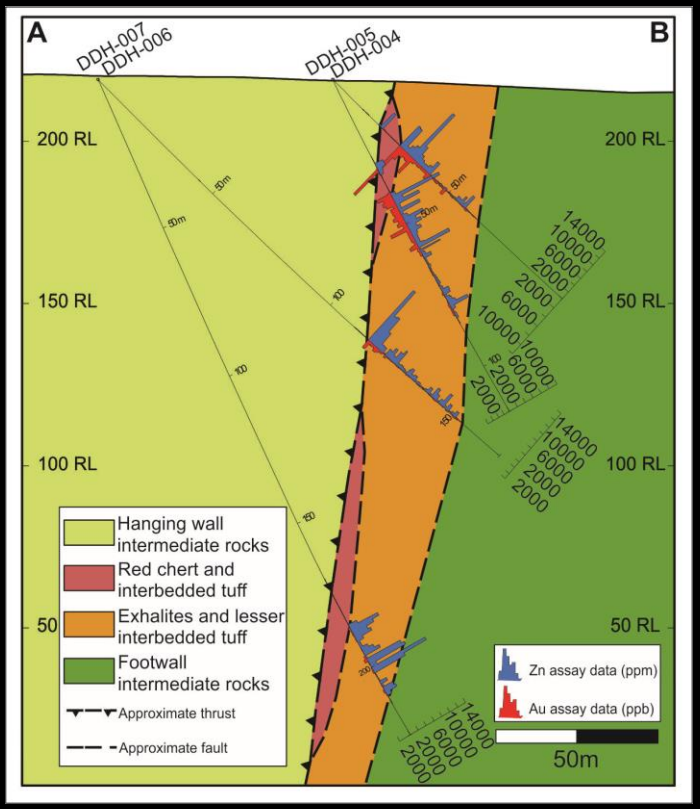
Springdale Group

- King's Brook Complex

Robert's Arm Group (subdivisions)

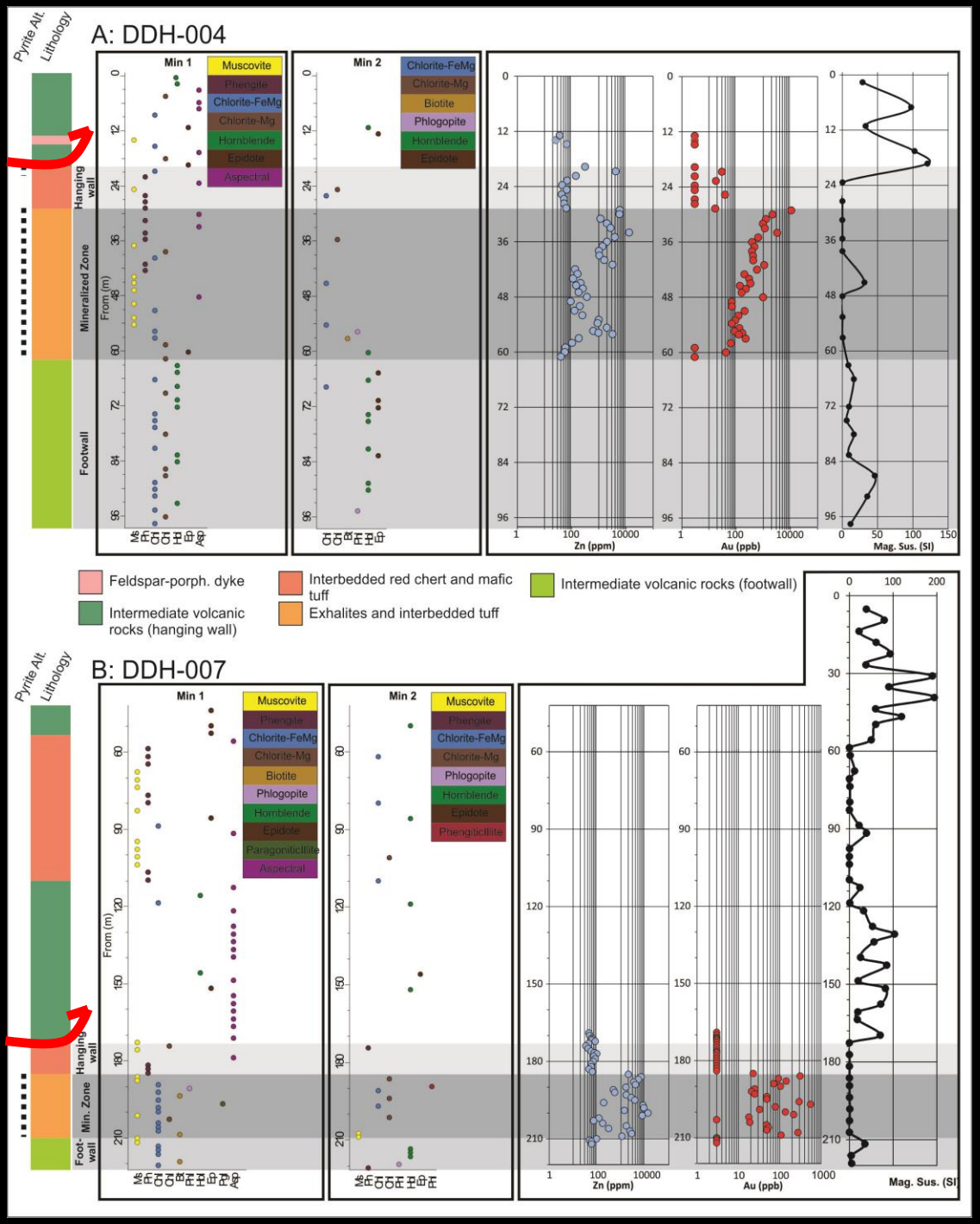
- Julies Harbour
- Powderhouse
- Gull Brook Bridge

- Contact (undivided)
- Normal Fault
- Folded Thrust Fault
- Late Reverse Fault



Highlights From Central Section

- DDH-004: 0.18% Zn and 890ppb Au over 28m
- DDH-007: 0.32% Zn and 110ppb Au over 25m



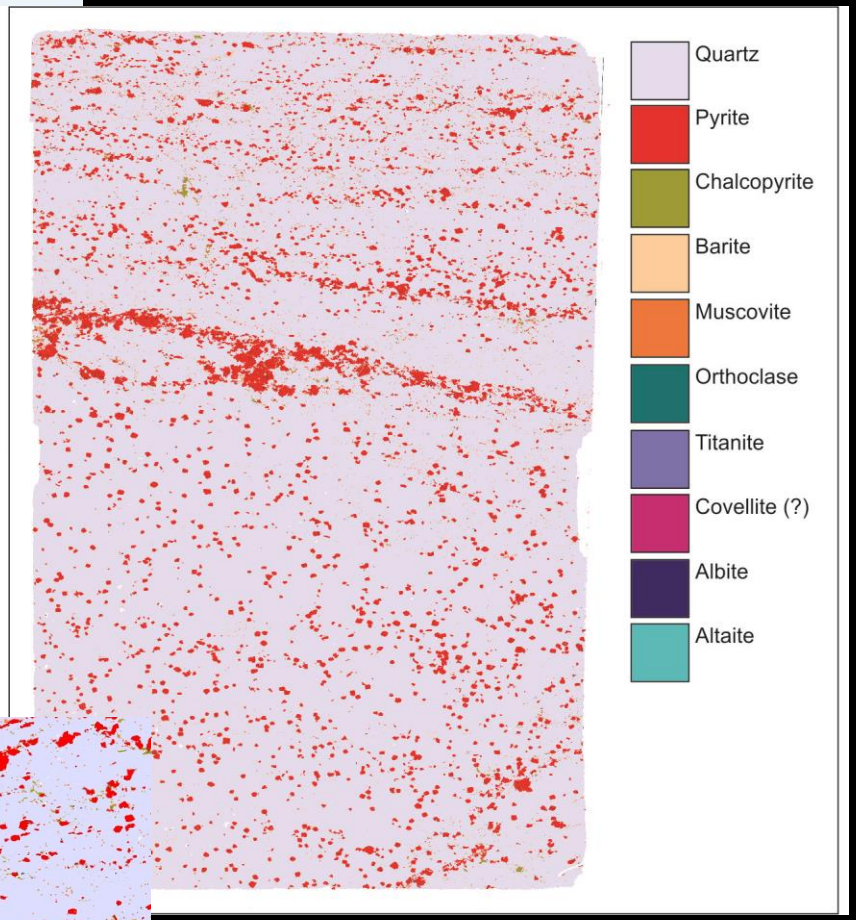

GEOLOGICAL SURVEY

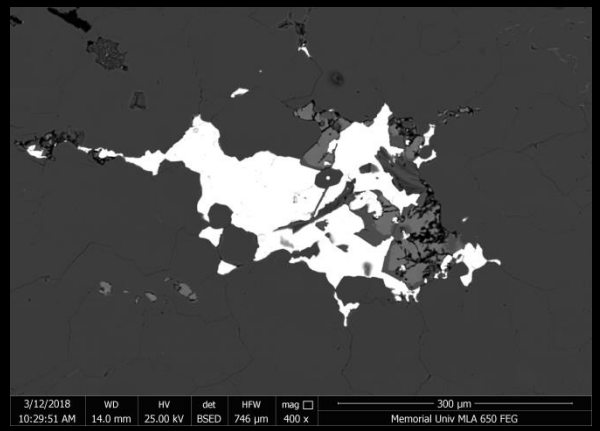

0 1 2 3 4 5 6 7
CENTIMETRES

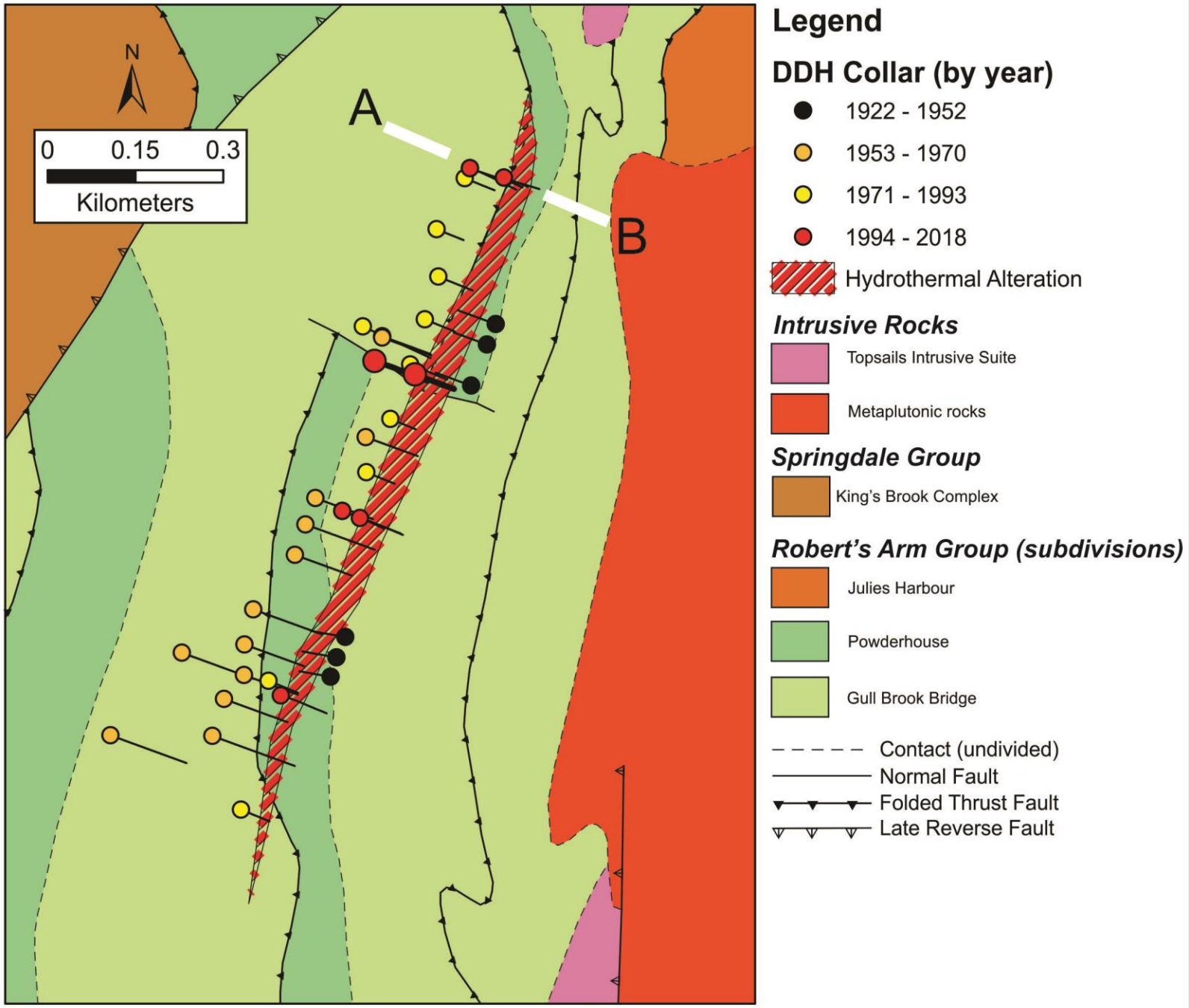

GEOLOGICAL SURVEY

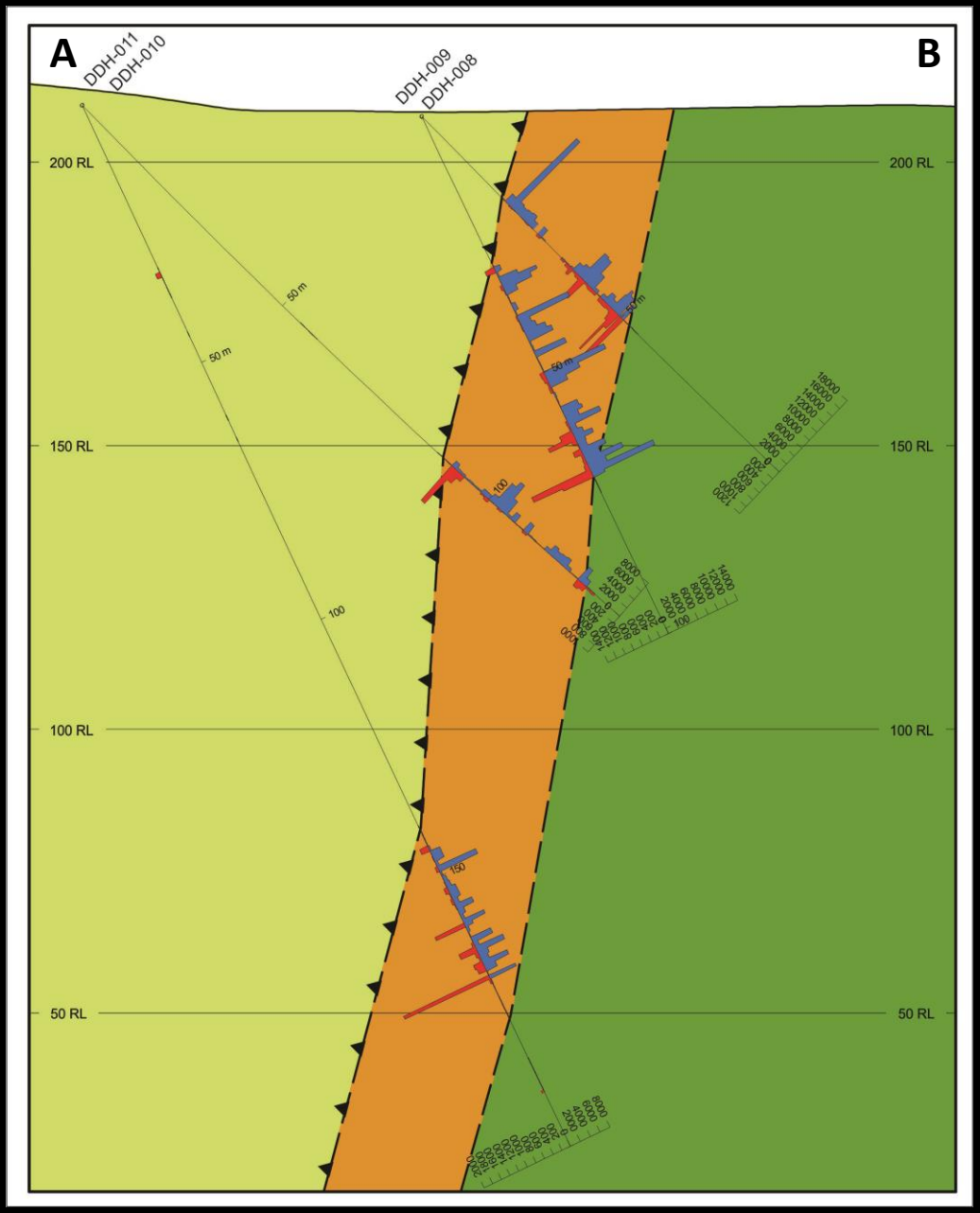

0 1 2 3 4 5 6 7 8
CENTIMETRES
GEOLOGICAL SURVEY
Newfoundland and Labrador
Department of Natural Resources


0 1 2 3 4 5 6 7 8
CENTIMETRES


Quartz
Pyrite
Chalcopyrite
Barite
Muscovite
Orthoclase
Titanite
Covellite (?)
Albite
Altaite

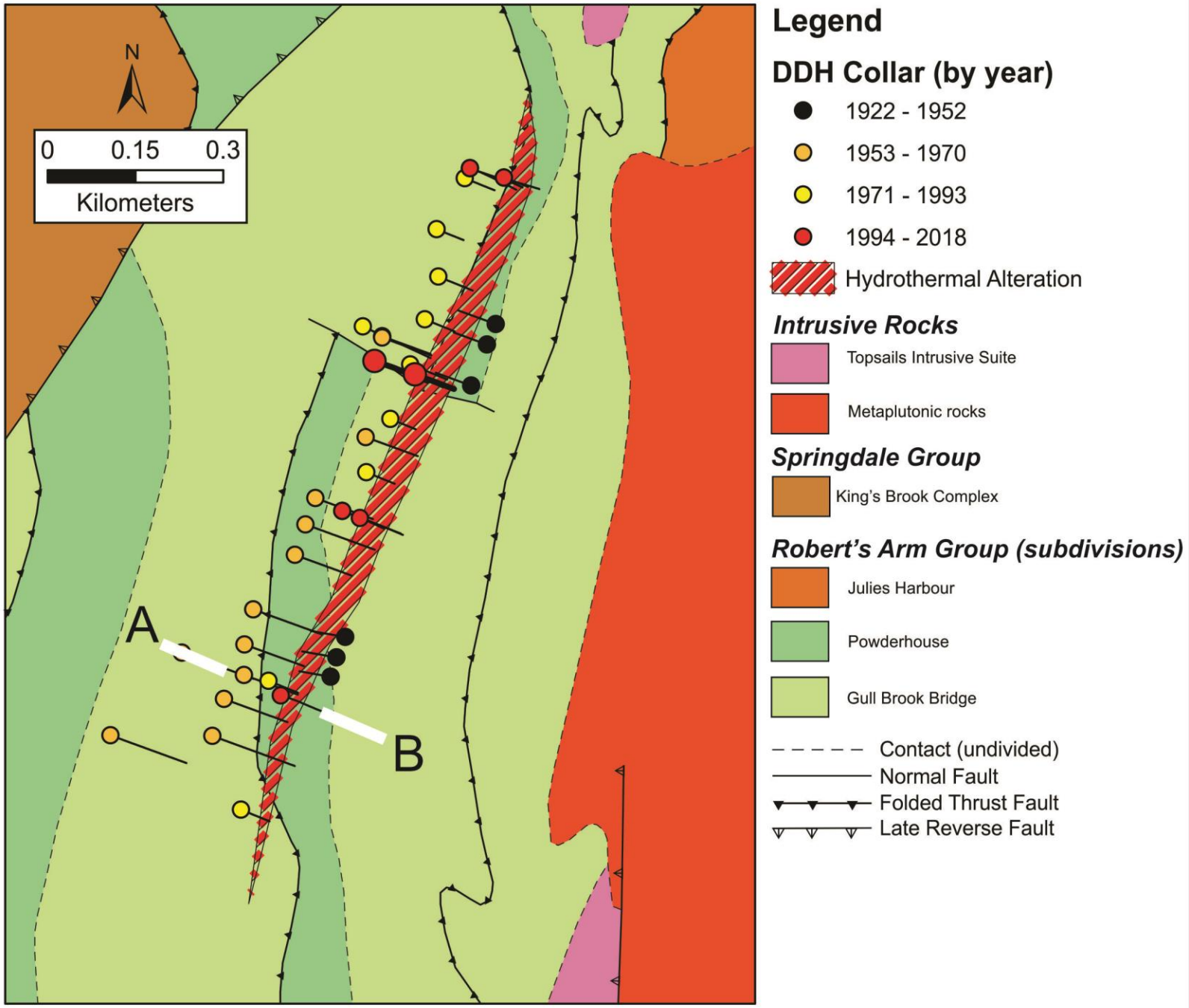

3/12/2018
10:29:51 AM
WD
14.0 mm
HV
25.00 kV
det
BSED
HFW
746 µm
mag
400 x
300 µm
Memorial Univ MLA 650 FEG


N
0
0.15
0.3
Kilometers
A
B
Legend
DDH Collar (by year)
1922 - 1952
1953 - 1970
1971 - 1993
1994 - 2018
Hydrothermal Alteration
Intrusive Rocks
Topsails Intrusive Suite
Metaplutonic rocks
Springdale Group
King's Brook Complex
Robert's Arm Group (subdivisions)
Julies Harbour
Powderhouse
Gull Brook Bridge
Contact (undivided)
Normal Fault
Folded Thrust Fault
Late Reverse Fault



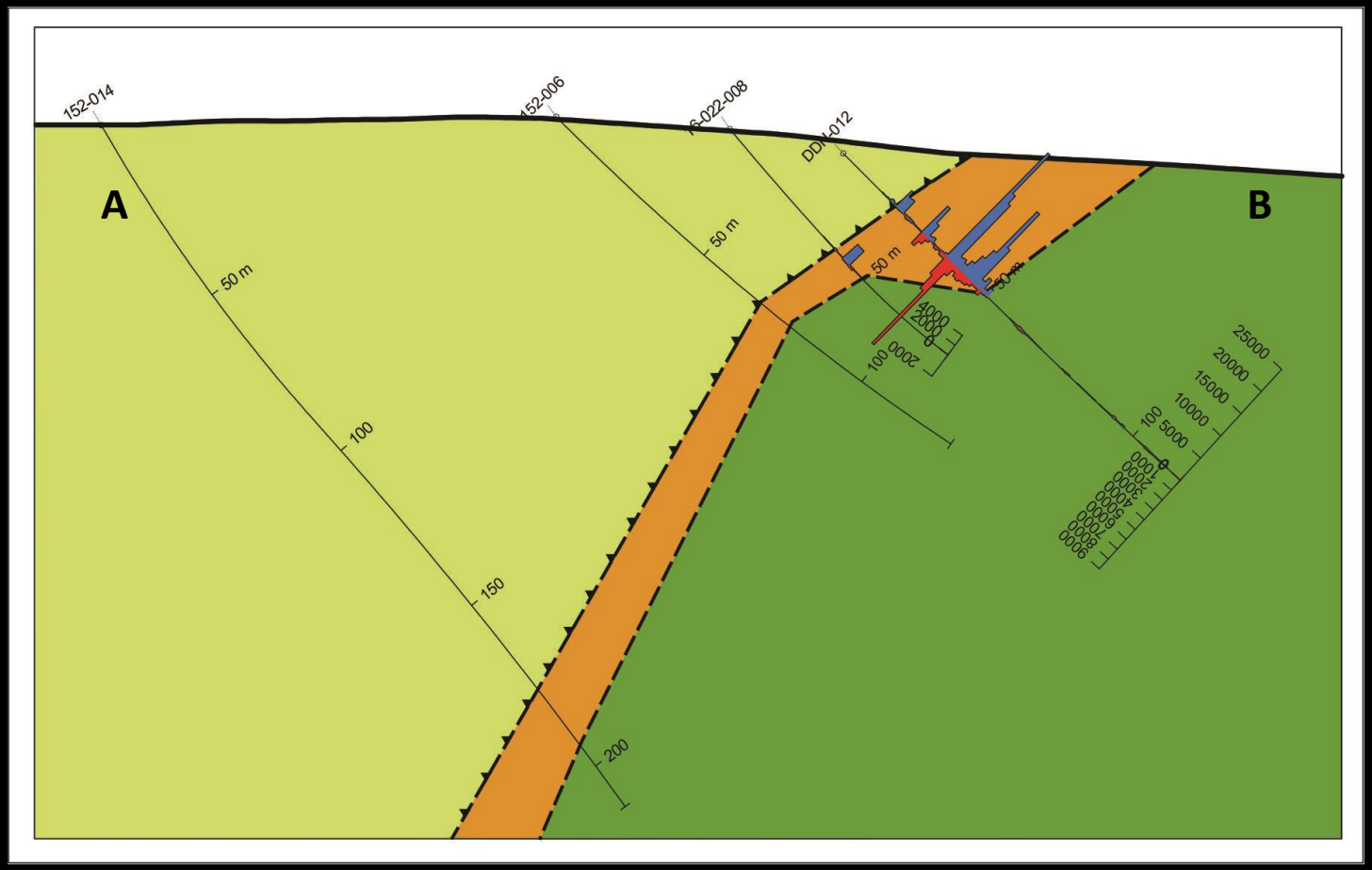
Highlights From Northern Section

- DDH-008: 0.41% Zn over 7m and 0.23% Zn and 200ppb Au over 16m
- DDH-011: 0.22% Zn and 149ppb Au over 25m; including 0.53% Zn, 0.25% Pb, 0.12% Cu, 1.9 g/t Au and 32.2 g/t Ag over 0.6m
- Main alteration zone dominated by Mg-chlorite, muscovite, biotite and lesser phlogopite


N
0
0.15
0.3
Kilometers
A
B
Legend
DDH Collar (by year)
1922 - 1952
1953 - 1970
1971 - 1993
1994 - 2018
Hydrothermal Alteration
Intrusive Rocks
Topsails Intrusive Suite
Metaplutonic rocks
Springdale Group
King's Brook Complex
Robert's Arm Group (subdivisions)
Julies Harbour
Powderhouse
Gull Brook Bridge
Contact (undivided)
Normal Fault
Folded Thrust Fault
Late Reverse Fault

Highlights From Southern Section

- DDH-012: 0.47% Zn and 900ppb Au over 23m
- Limited data – but alteration zone contains Fe–Mg-chlorite, biotite and lesser phlogopite



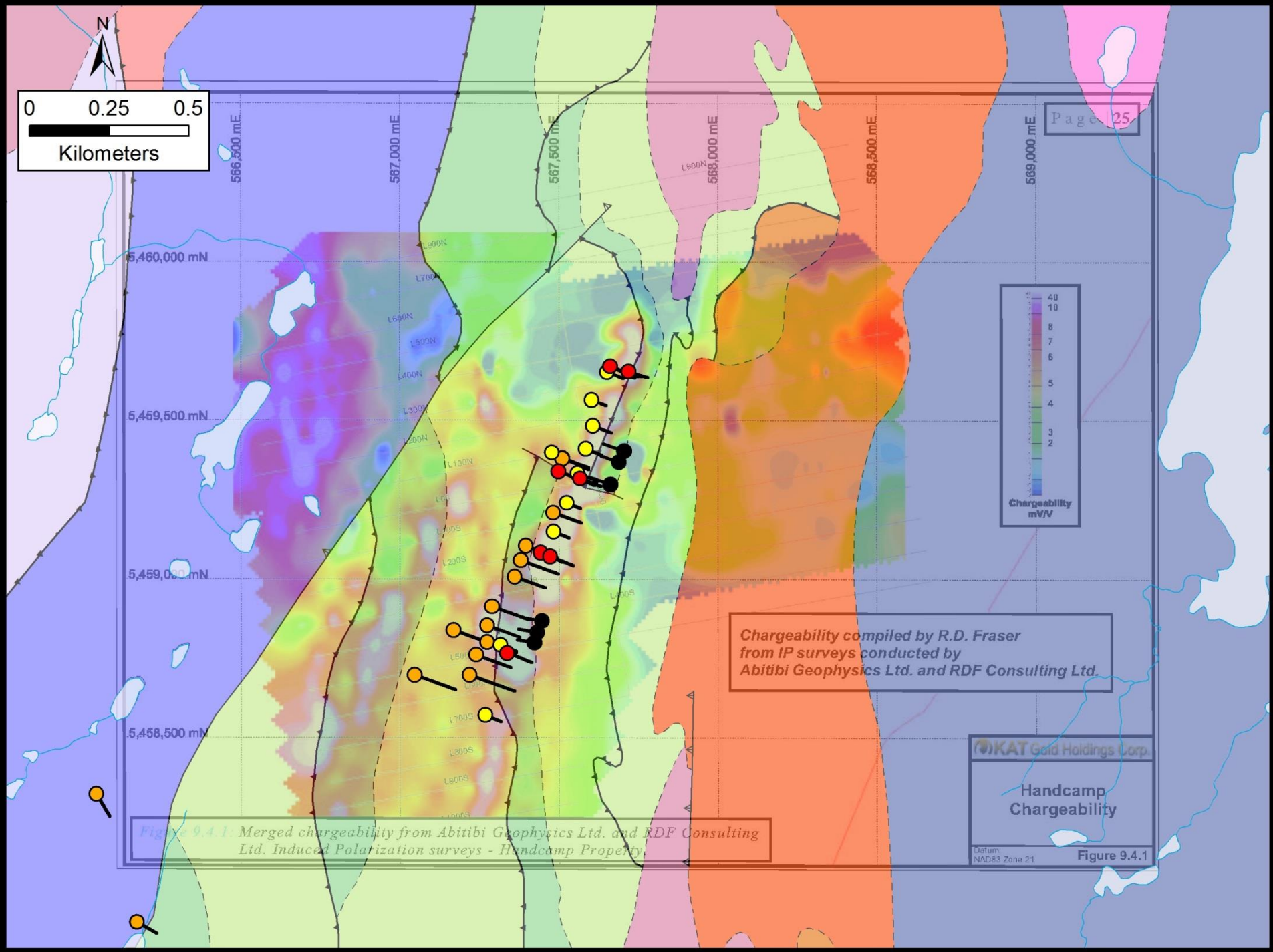


Figure 9.4.1: Merged chargeability from Abitibi Geophysics Ltd. and RDF Consulting Ltd. Induced Polarization surveys - Handcamp Property

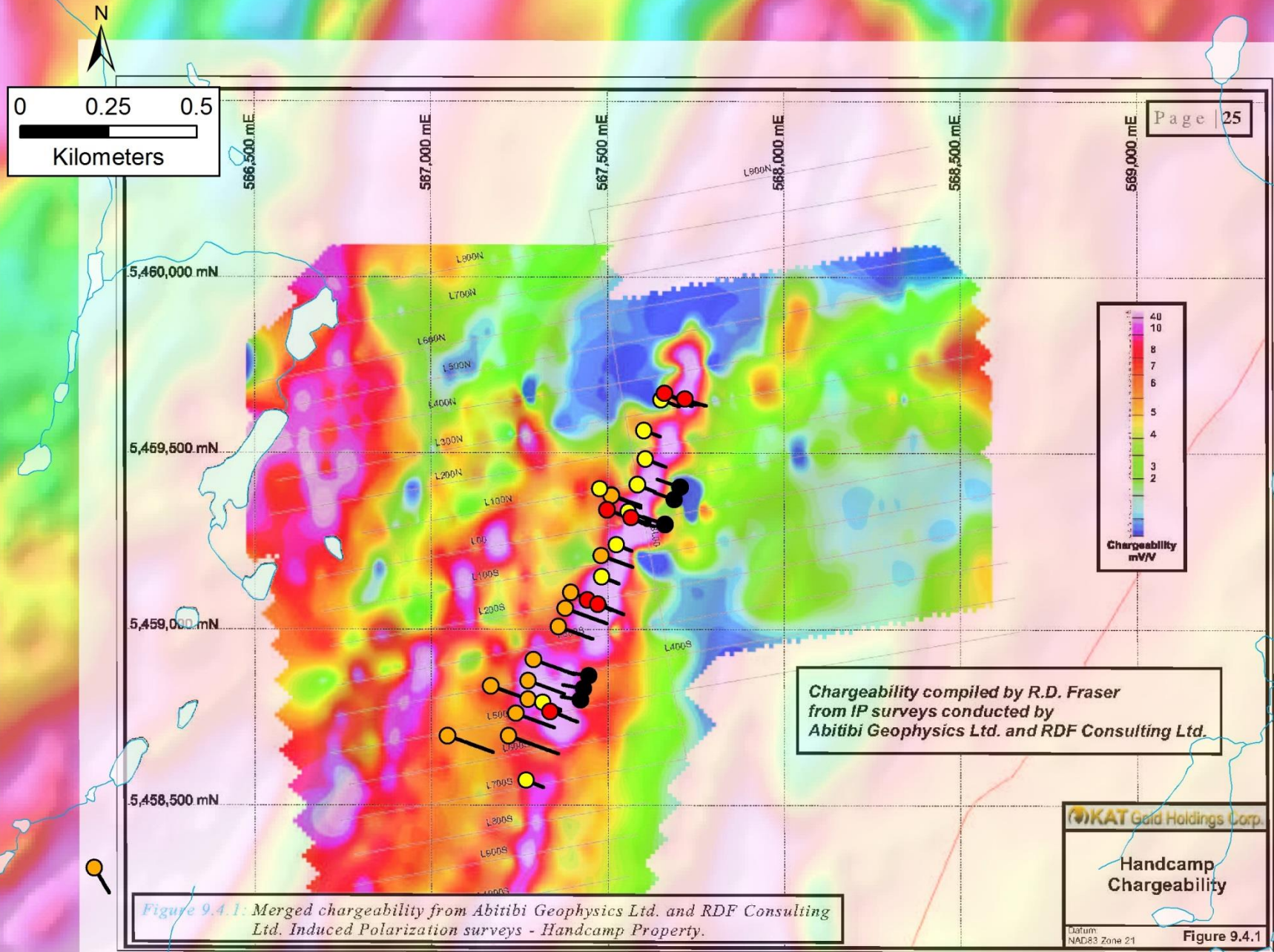
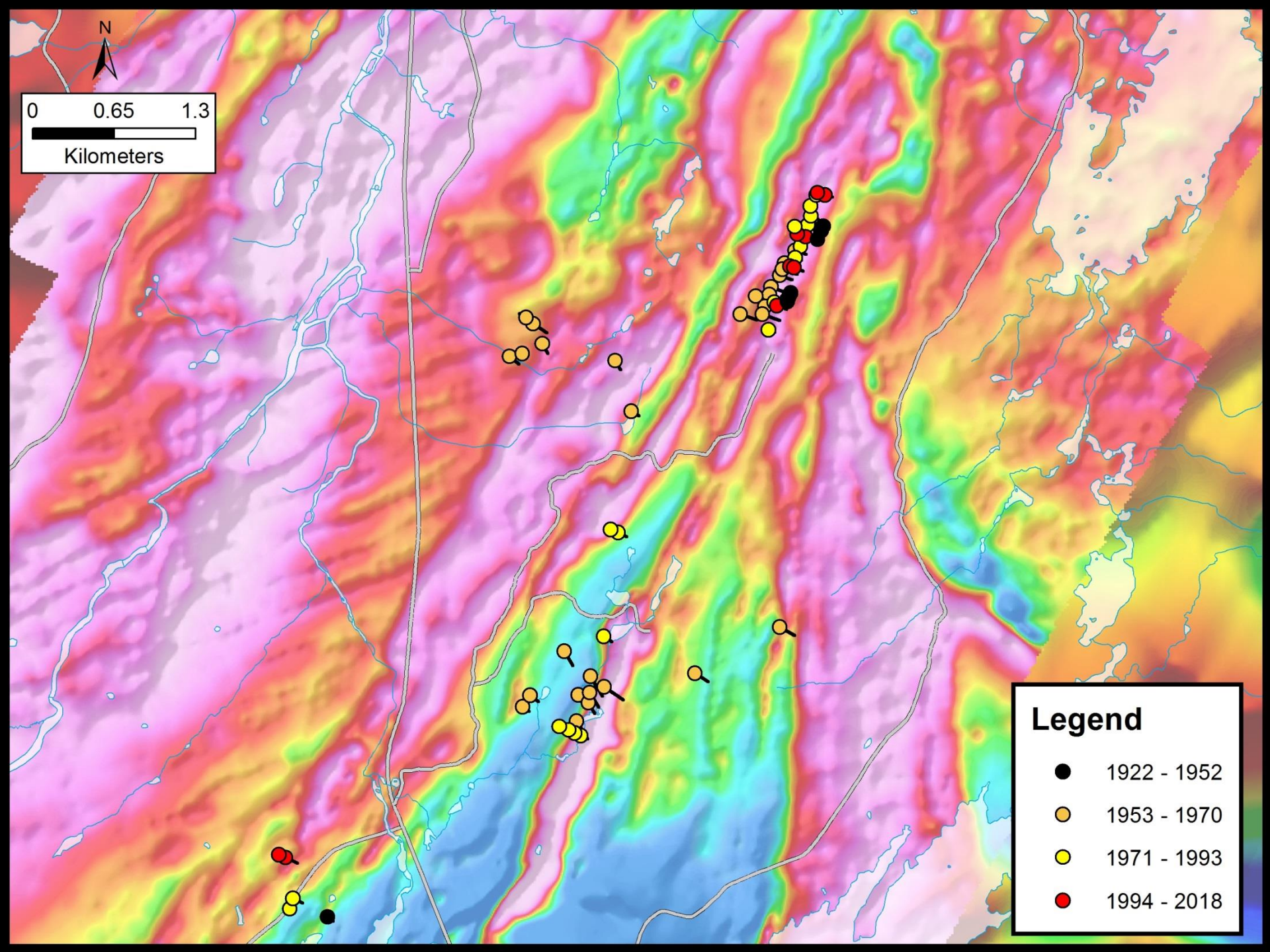
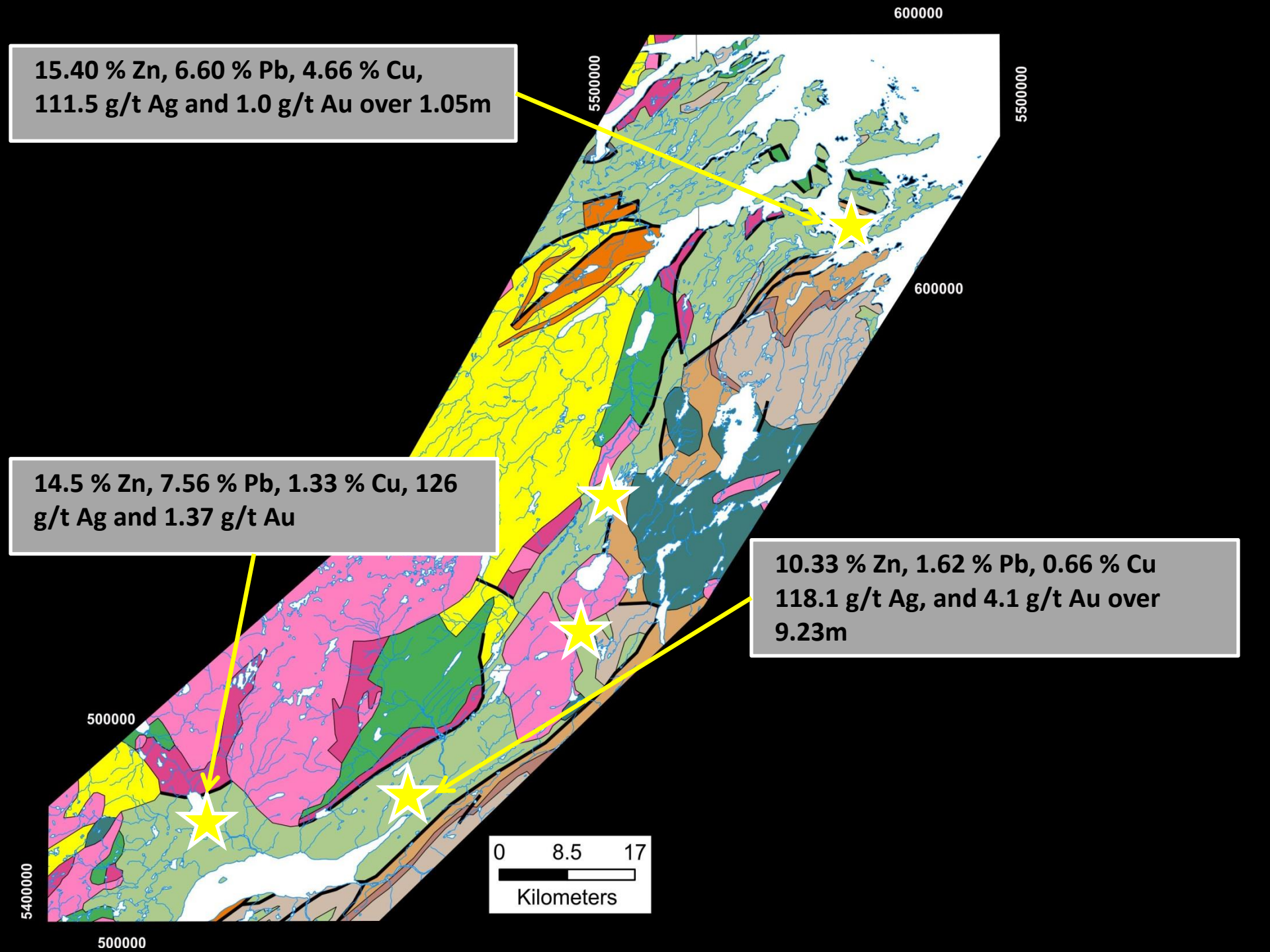


Figure 9.4.1: Merged chargeability from Abitibi Geophysics Ltd. and RDF Consulting Ltd. Induced Polarization surveys - Handcamp Property.


N
0
0.65
1.3
Kilometers
Legend
1922 - 1952
1953 - 1970
1971 - 1993
1994 - 2018

SUMMARY:

- Spatial association of precious metal mineralization and barite with siliceous horizons indicative of an exhalative origin
- Stratiform nature of the precious-metal enrichment
- Abundance of red chert and local iron formation within and immediately above the mineralized horizon in association with phlogopite, similar to that observed in the Gullbridge stratigraphy
- Similar metal enrichment demonstrated elsewhere in the region


15.40 % Zn, 6.60 % Pb, 4.66 % Cu, 111.5 g/t Ag and 1.0 g/t Au over 1.05m
14.5 % Zn, 7.56 % Pb, 1.33 % Cu, 126 g/t Ag and 1.37 g/t Au
10.33 % Zn, 1.62 % Pb, 0.66 % Cu 118.1 g/t Ag, and 4.1 g/t Au over 9.23m
600000
5500000
600000
5500000
500000
5400000
500000
0
8.5
17
Kilometers

June 26, 2018

Thank you!