Modern exploration methods - locating hidden gold paleochannels in the Cariboo Mining District, BC, Canada.

Workshop – Opportunities in Canada's Resource Sector and Different Financing Instruments for Mining Projects
Embassy of Canada to Germany
11th and 12th December 2013

D. Eberle[1,2], D. Bastian[1,2], N. Ebel[1] , M. Pein[1],J. Wallisch[1] and R. Schwarz[1]
[1] geotec Rohstoffe, Berlin, Germany, n.ebel@rohstoffe.org
[2] Berlin Technical University, Germany

Outline/Preview

- Geology of placer gold in the Cariboo gold mining district
- SkyTEM applied over the Mary Creek, Toop and Beaver Pass concessions
- Ground geophysics applied on selected buried target
  - 2D Resistivity
  - Refraction Seismics
- Drilling a conductive buried channel feature
- Discussion of results and conclusions

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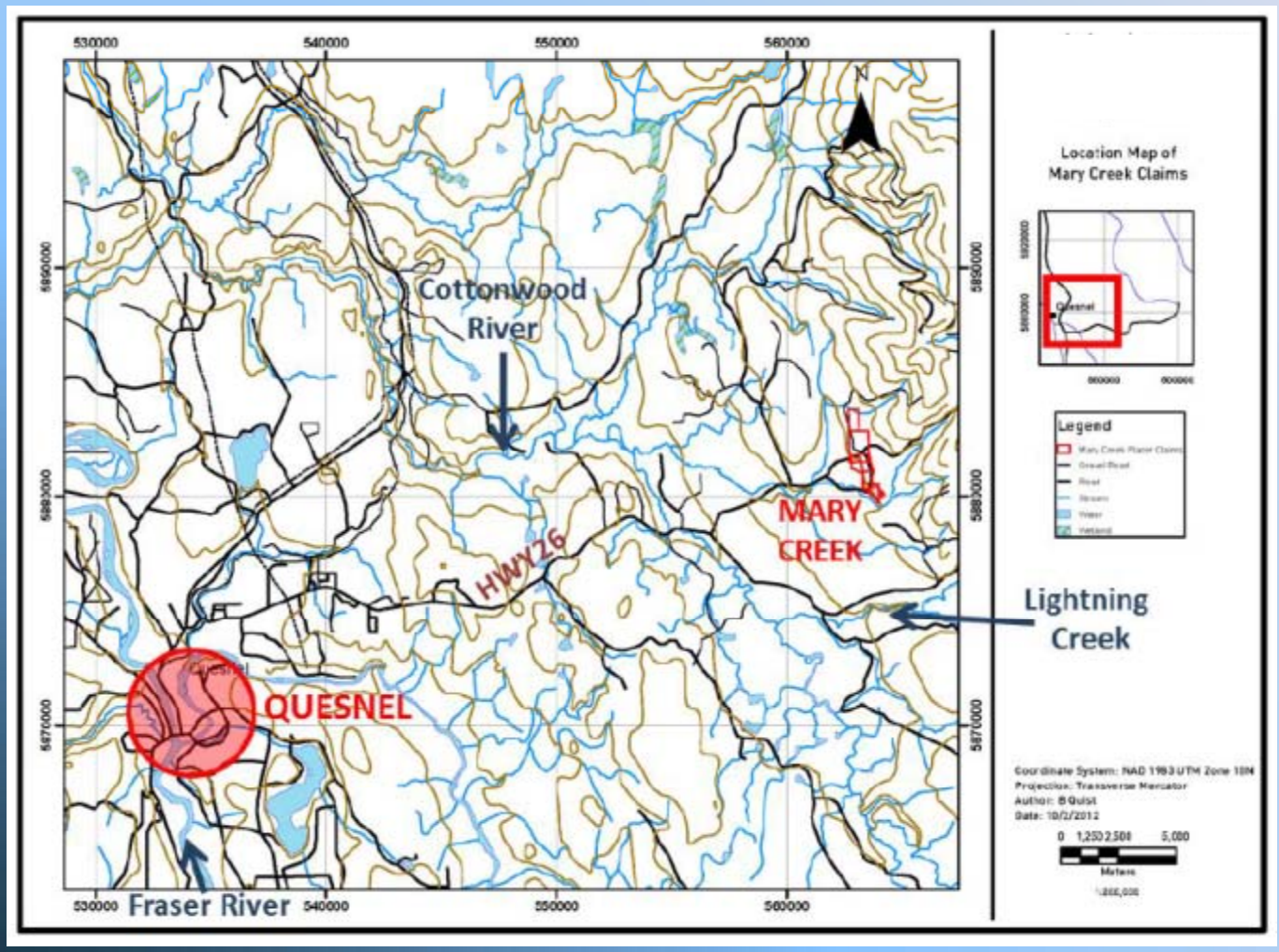
Location


530000
540000
550000
560000
5990000
5983000
5870000
Cottonwood River
MARY CREEK
HWY26
QUESNEL
Fraser River
Location Map of Mary Creek Claims
Legend
Lightning Creek
Coordinate System: NAD 1983 UTM Zone 10N
Projection: Transverse Mercator
Author: B Guist
Date: 10/2/2012
0 1,250 2,500 5,000
Meters

20 km

Slide Mountain Terrane

Early Mississippian-Late Permian

CP um — ***Manson Lakes Ultramafic, Crooked Amphibolite, Black Riders, Wasi serpentinite***

Serpentinite, sheared ultramafite rock, amphibolite, talc schist

Slide Mountain Group

CP SMv — ***Antler Formation***

Undifferentiated pillowed basalt, basalt breccia, gabbro, diorite, argillite and chert; minor serpentinite and ultramafic rocks

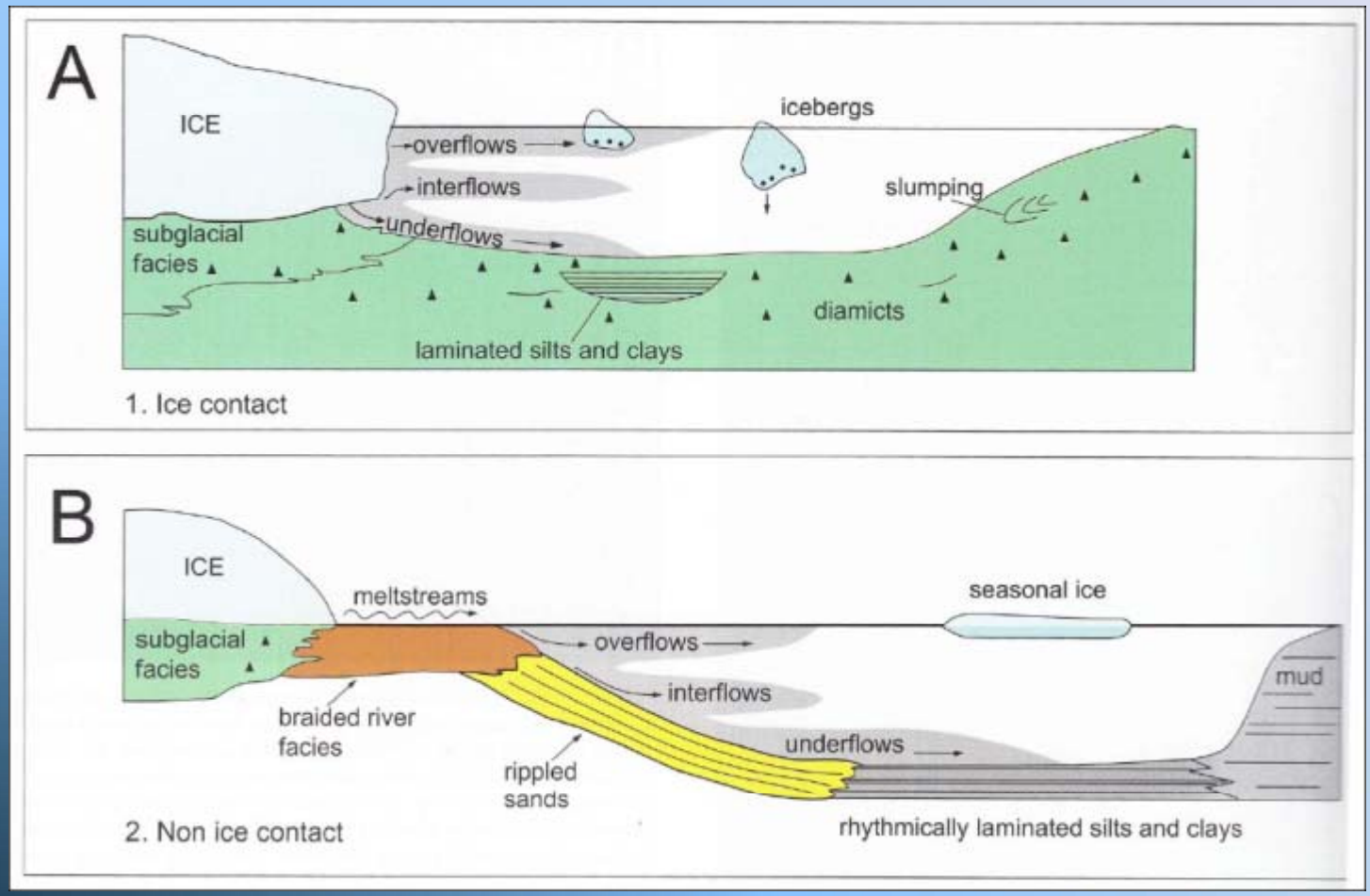
Kootenay Terrane

Late Proterozoic-Late Paleozoic

PIP Ks — Undivided quartzite, phyllite, siltstone, limestone, conglomerate, biotite-muscovite-quartz schist, quartzofeldspathic gneiss, diorite, diabase, pegmatite

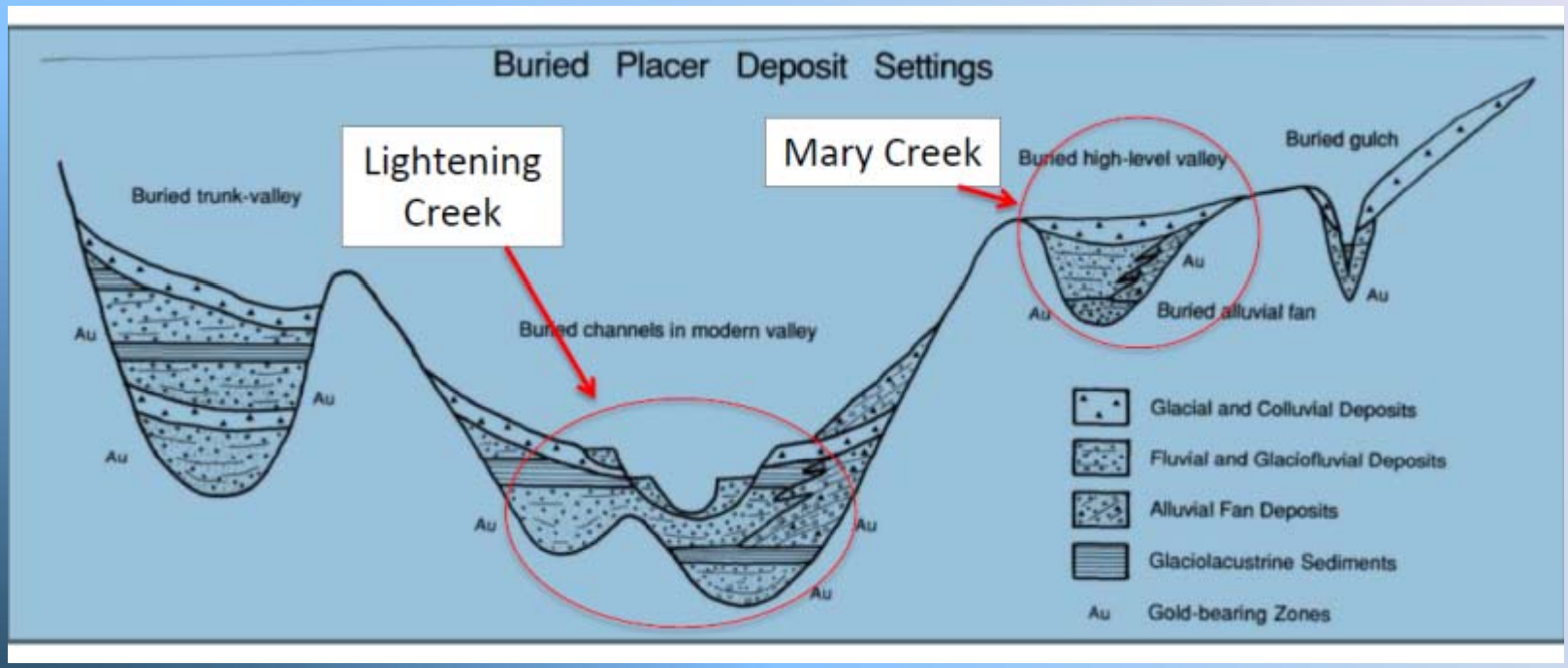
Regional geology showing survey areas

(GeoSci BC Geology Map, 2010)



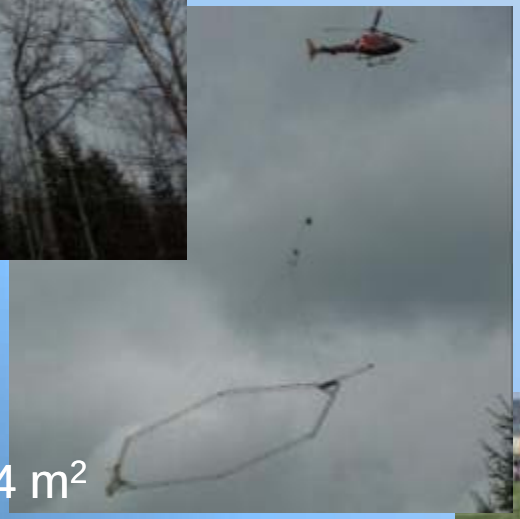
Two types of glaciolacustrine deposit sediments

(James and Dalrymple, 2012)



Schematic of buried placer deposit settings.
(Levson and Giles, 1995)

Data Acquisition



Line direction W – E
Spacing 50 m
Tie line direction N – S
Spacing 500m

Nominal terrain clearance of system 30 m
Flight speed 40 – 80 km/h

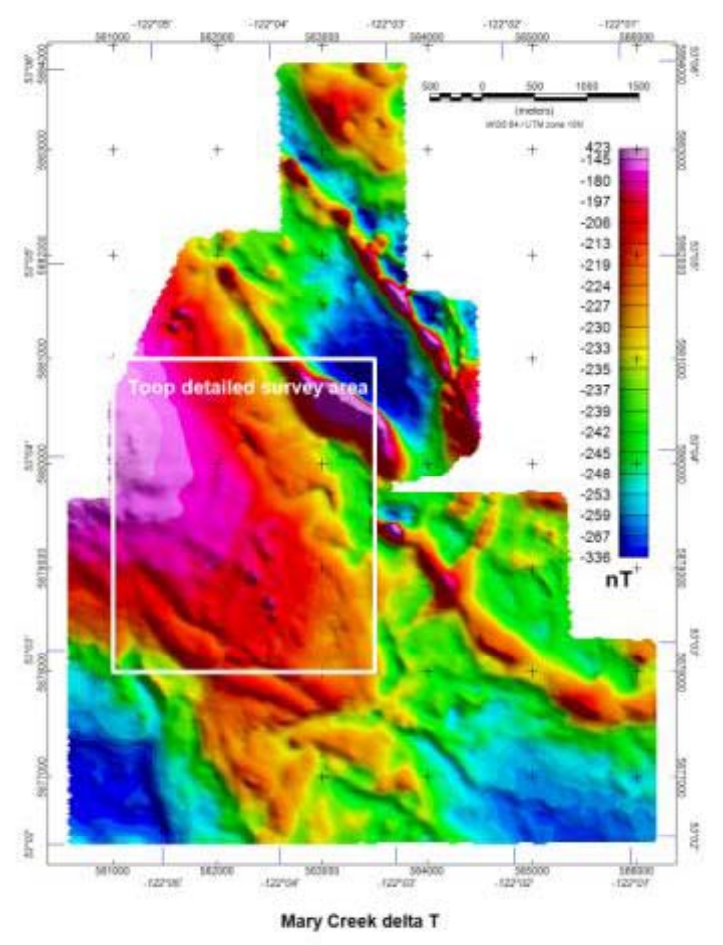
Transmitter area 314 m^2

- Tx Low Moment
  Repetition Frequency 210 Hz
  Peak Moment ca. 3300 NIA
- Tx High Moment
  Peak Moment ca.145 000 NIA
  Repetition Frequency 22.5 Hz

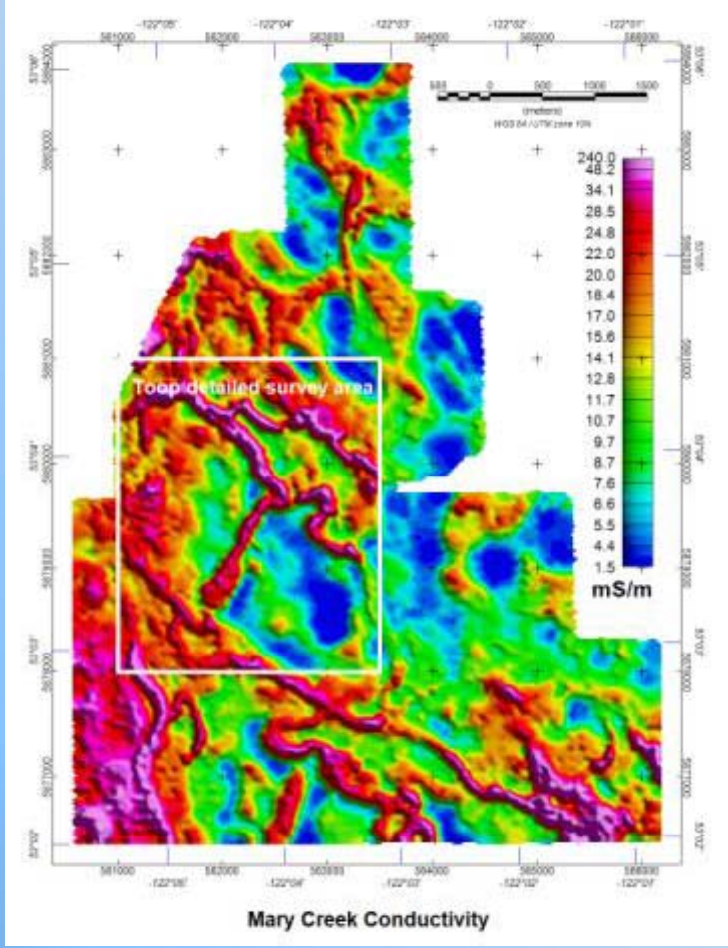
DGPS sensors on frame and base station

Generator
- flying 10 m beneath the helicopter
- powering the TDEM system

Mag sensor
Readings at 45 Hz are taken in between each HM pulse

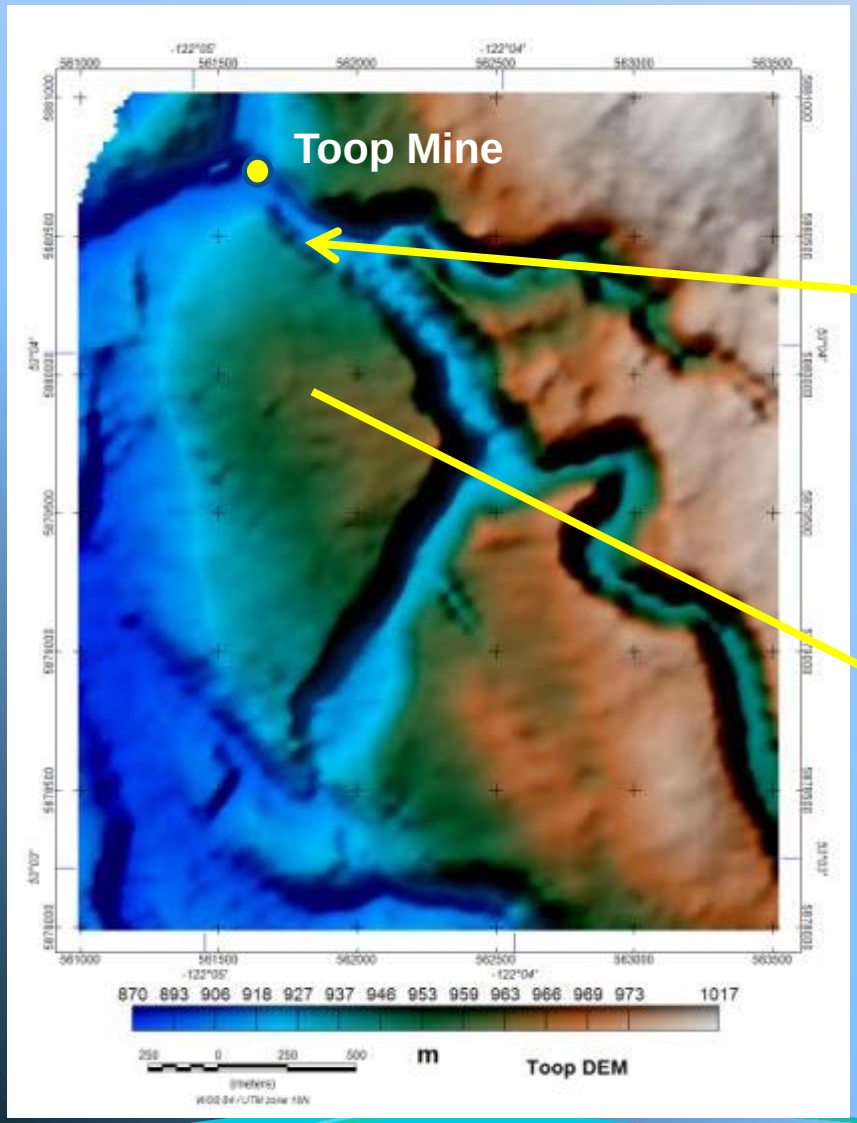


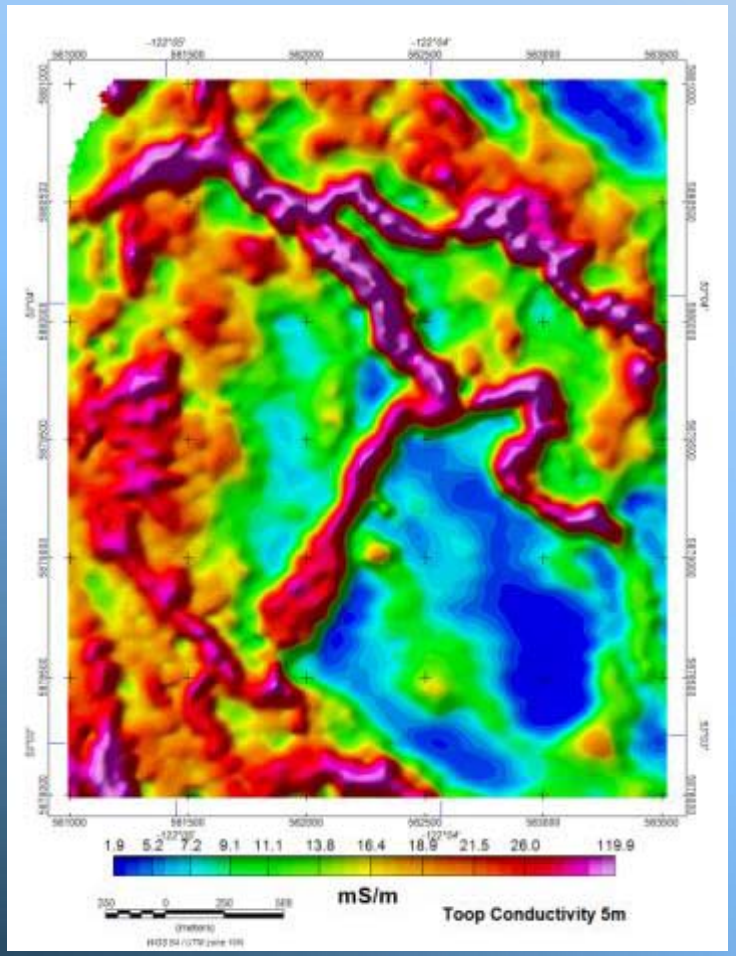
Mary Creek delta T

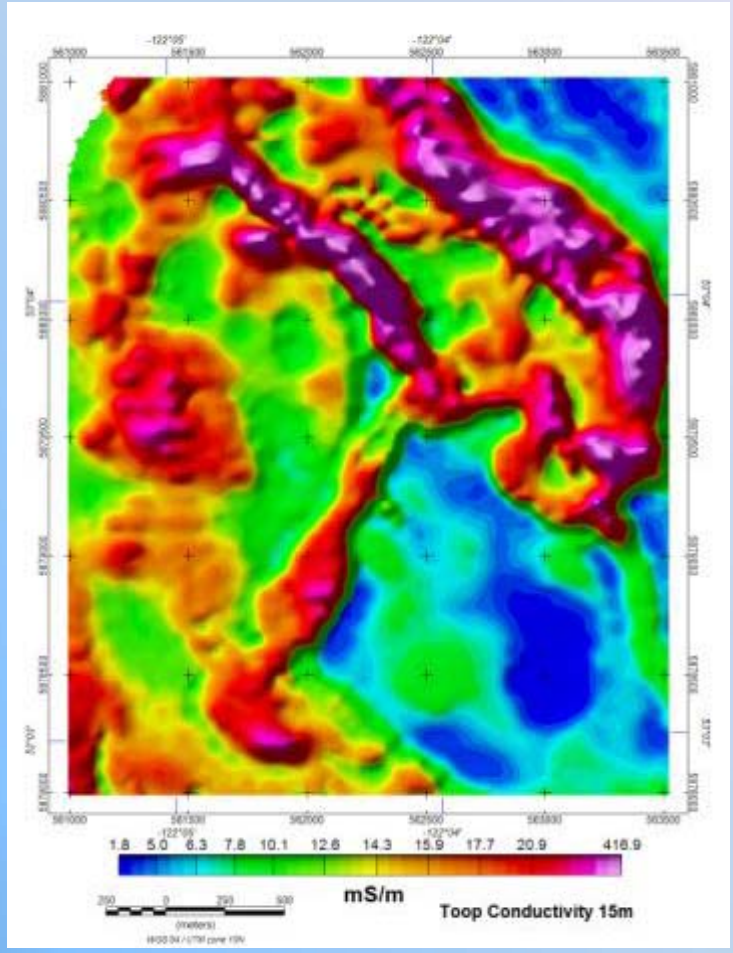


Mary Creek Conductivity

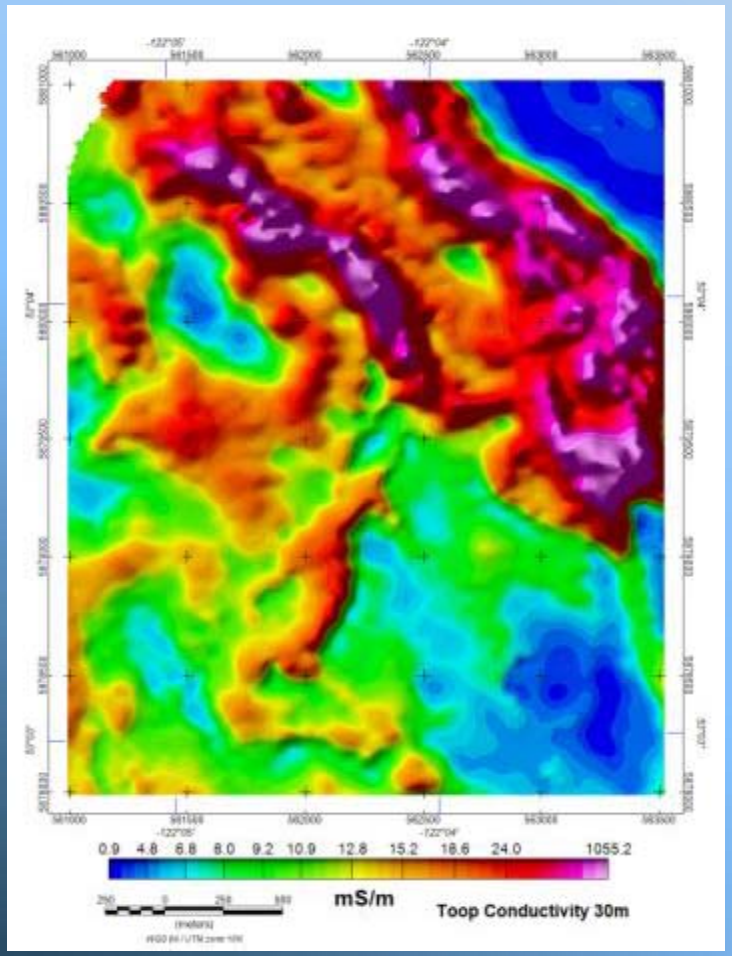
Mary Creek magnetic and conductivity survey data

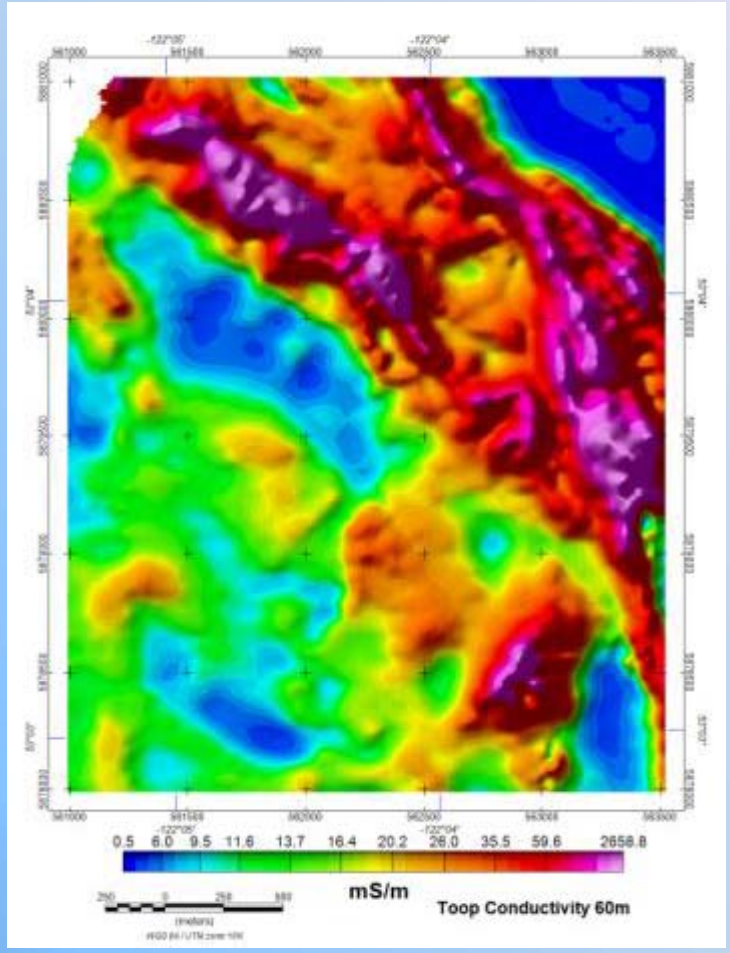

Toop Mine
870 893 906 918 927 937 946 953 959 963 966 969 973 1017
m
Toop DEM



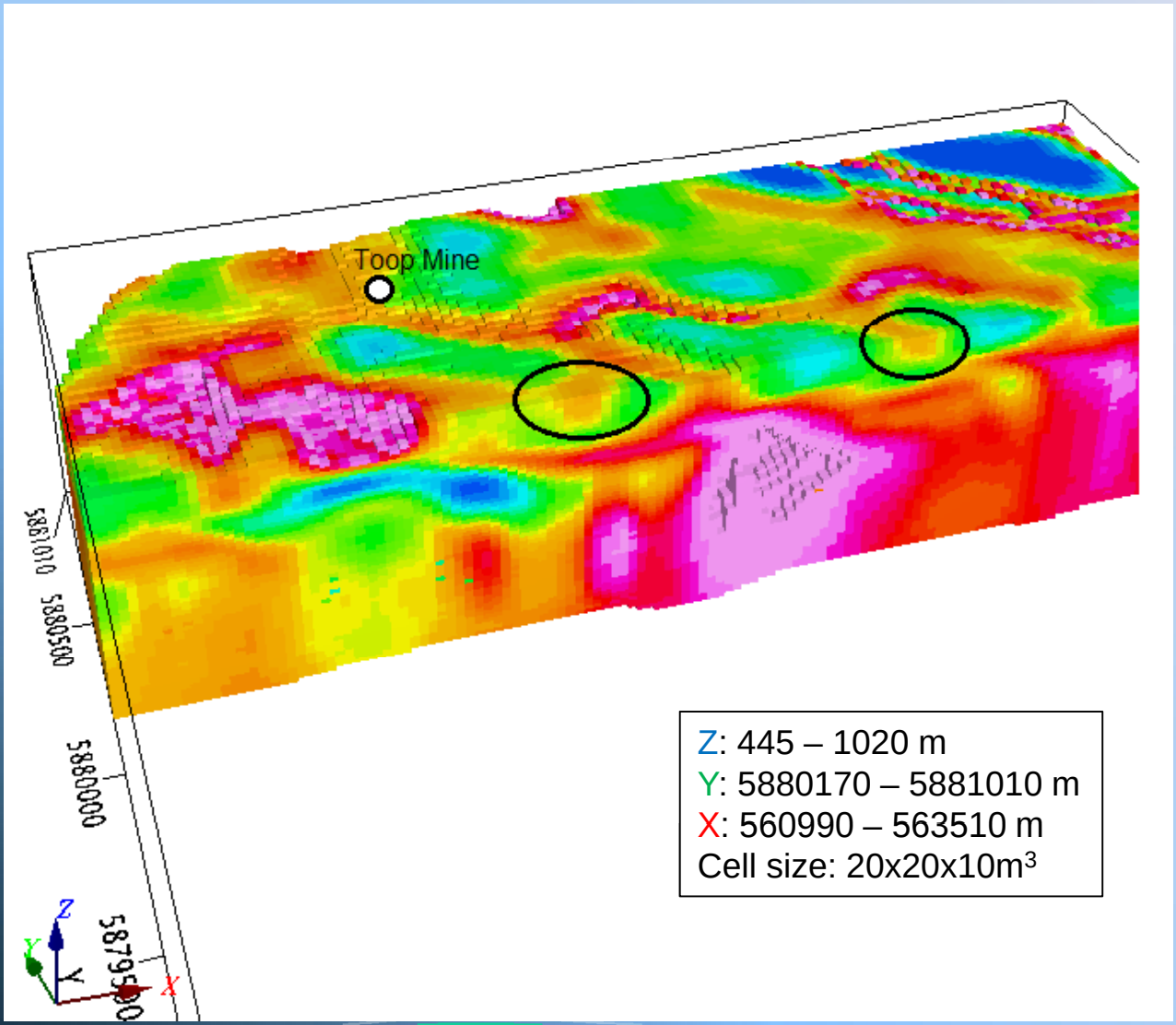


Conductivity at 5 m and 15 m below surface

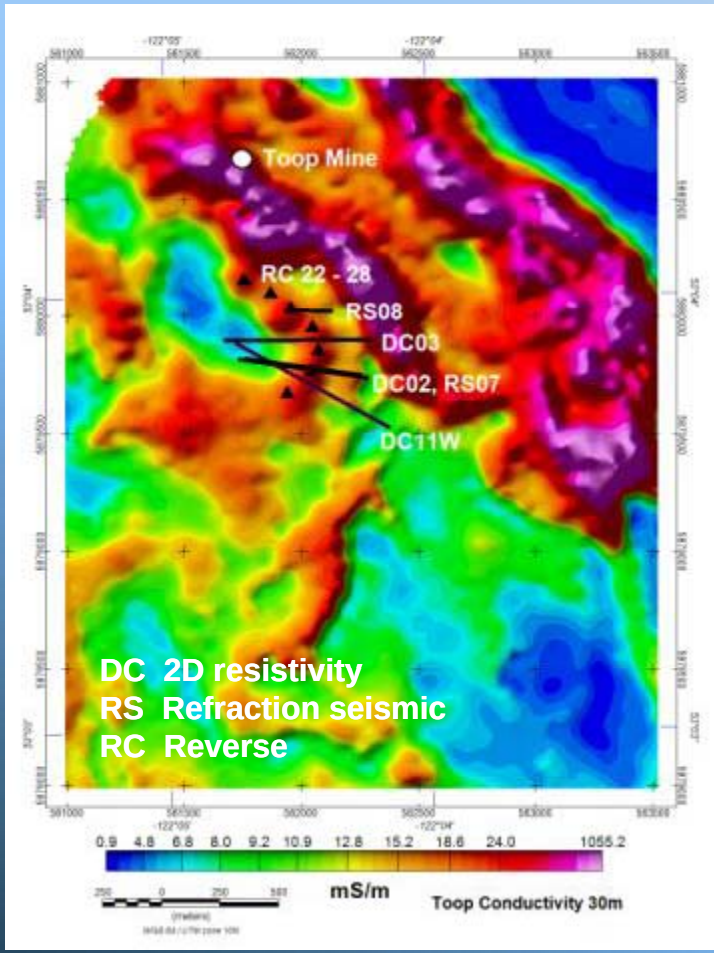


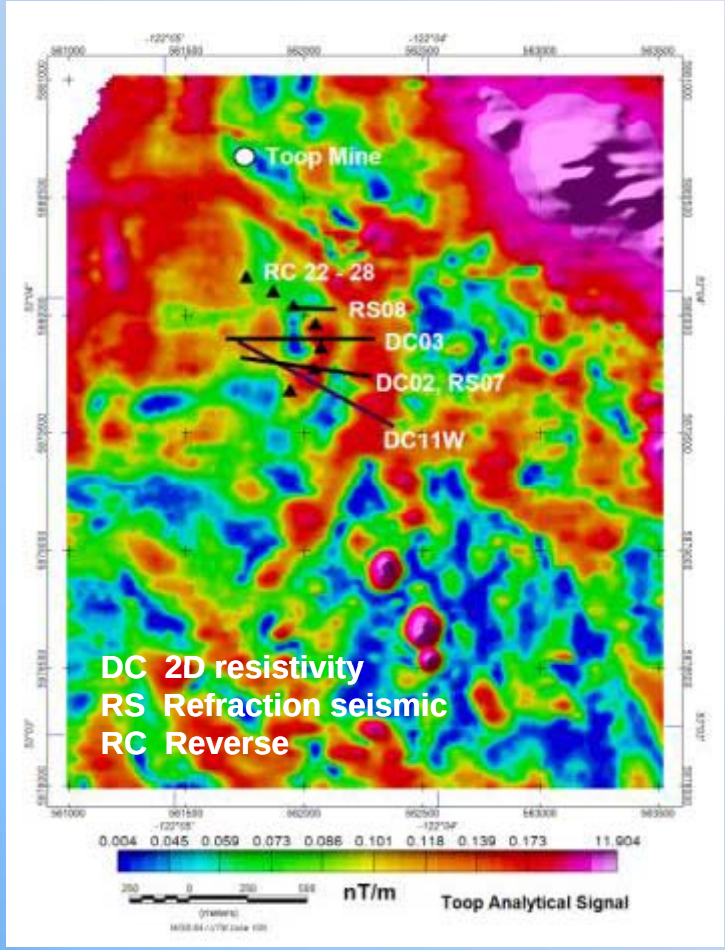


Conductivity at 30 m and 60 m below surface

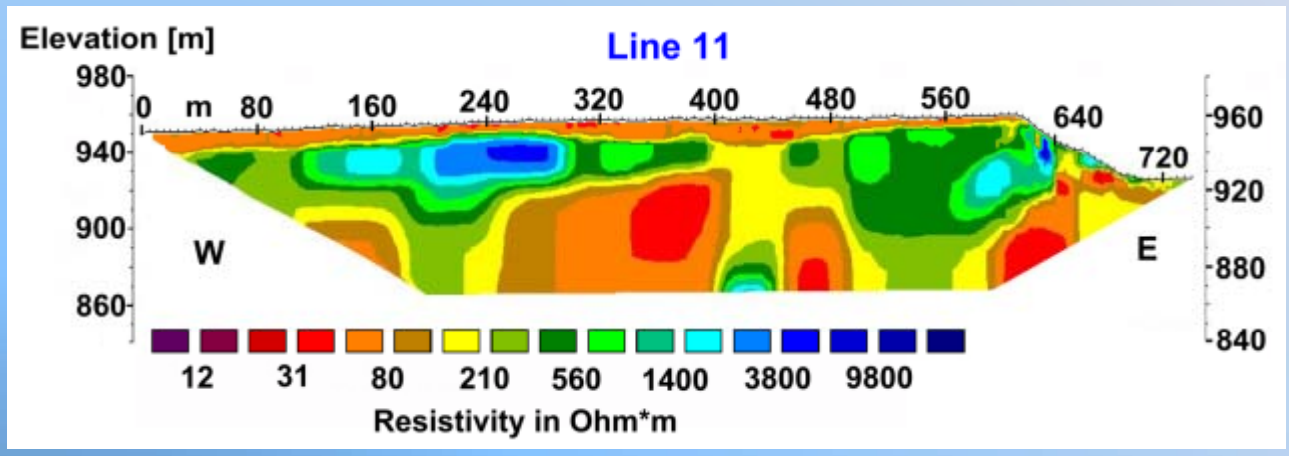


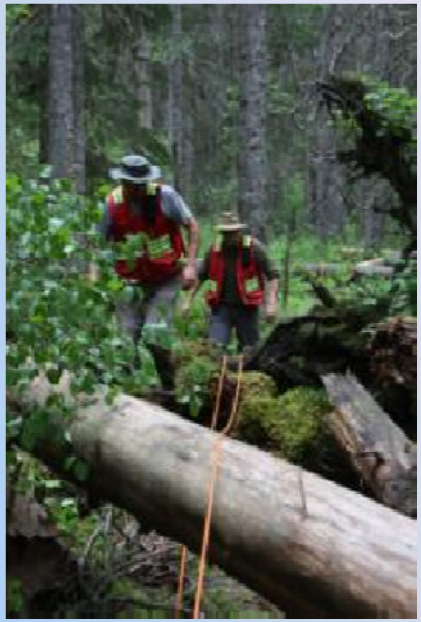
Z: 445 – 1020 m
Y: 5880170 – 5881010 m
X: 560990 – 563510 m
Cell size: 20x20x10m^3


Toop Mine
RC 22 - 28
RS08
DC03
DC02, RS07
DC11W
DC 2D resistivity
RS Refraction seismic
RC Reverse
0.9 4.8 6.8 8.0 9.2 10.9 12.8 15.2 18.6 24.0 1055.2
mS/m
Toop Conductivity 30m

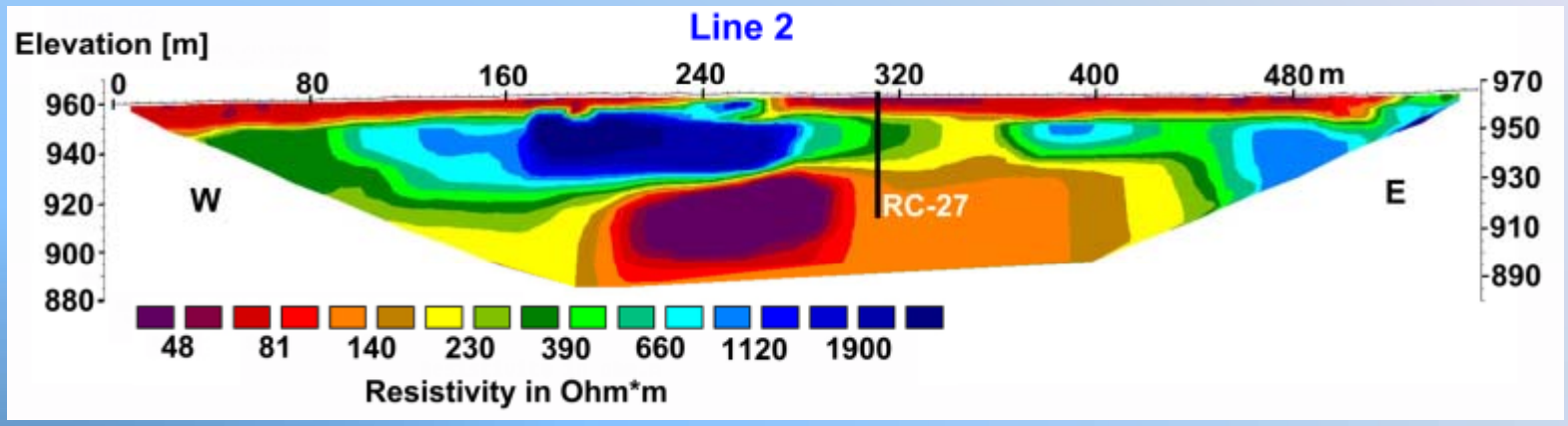

Toop Mine
RC 22 - 28
RS08
DC03
DC02, RS07
DC11W
DC 2D resistivity
RS Refraction seismic
RC Reverse
0.004 0.045 0.059 0.073 0.086 0.101 0.118 0.139 0.173 11.904
nT/m
Toop Analytical Signal

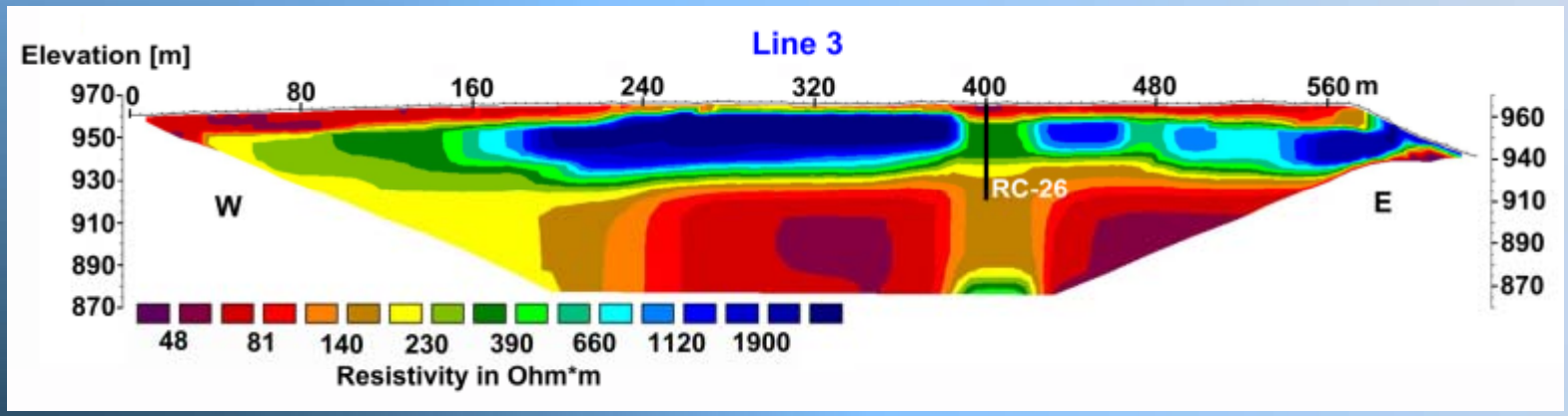
Lippmann IP and Earth Resistivity Meter combined with stainless electrodes manufactured by geoanalysis.de



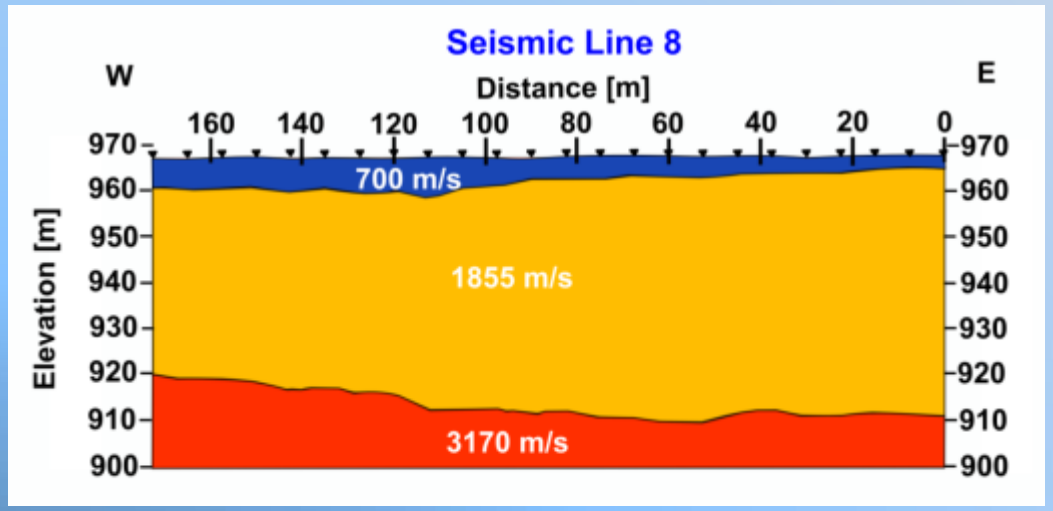


2D resistivity section with 5 m electrode spacing

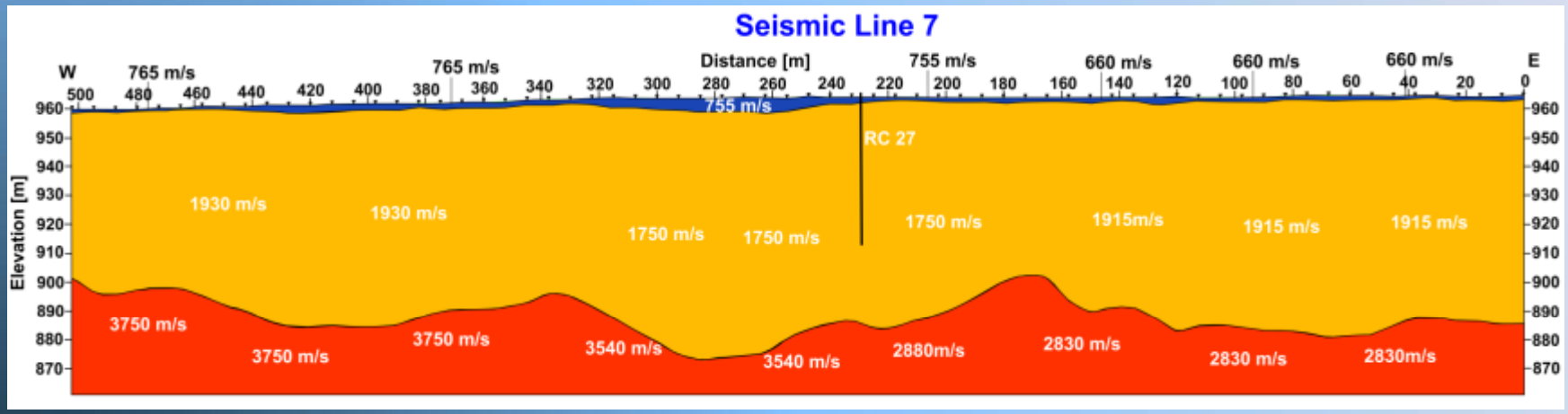




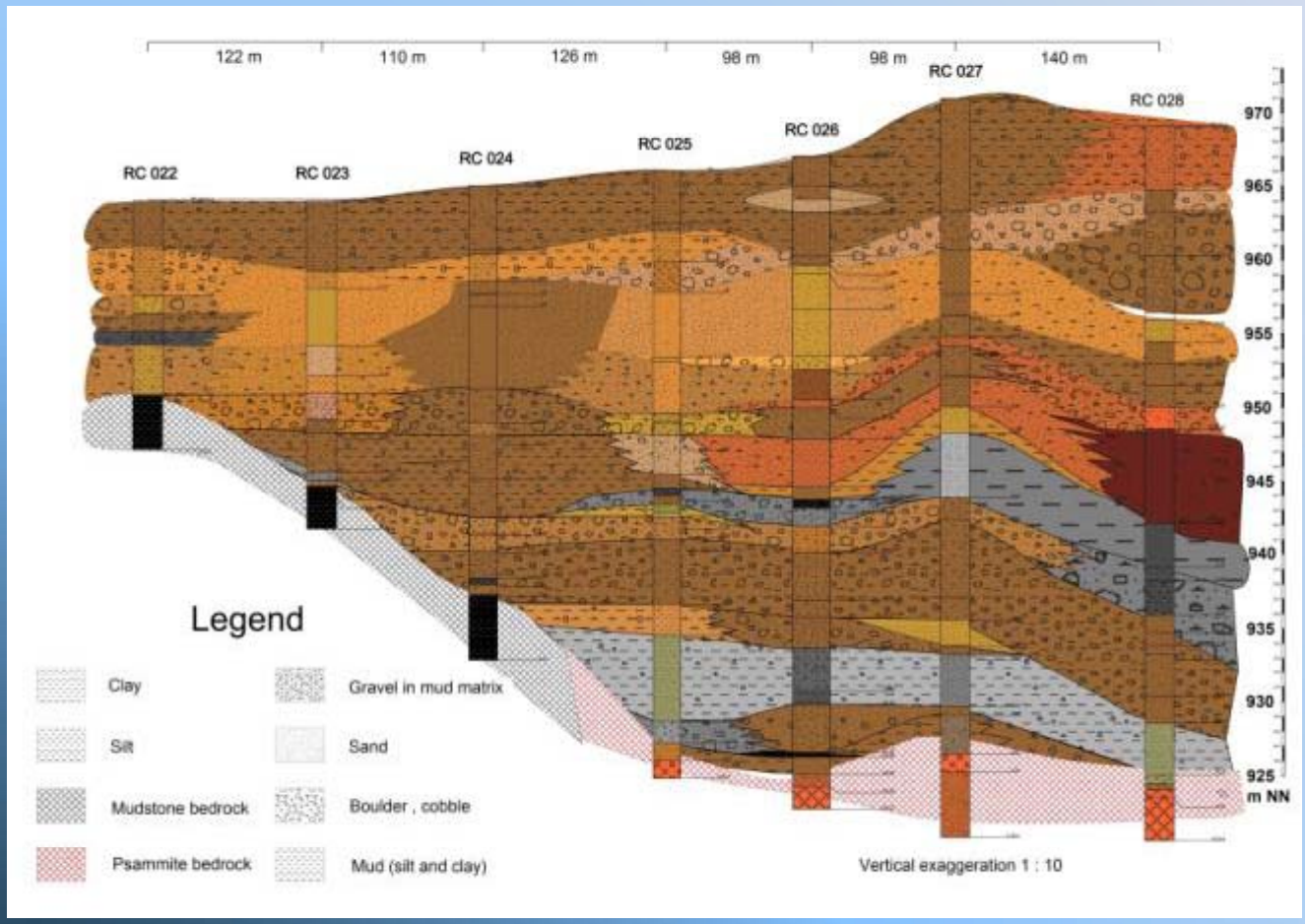
2D resistivity sections with 5 m electrode spacing



Mean thickness of glacial sediments between 40 and 60 m



Refraction seismics

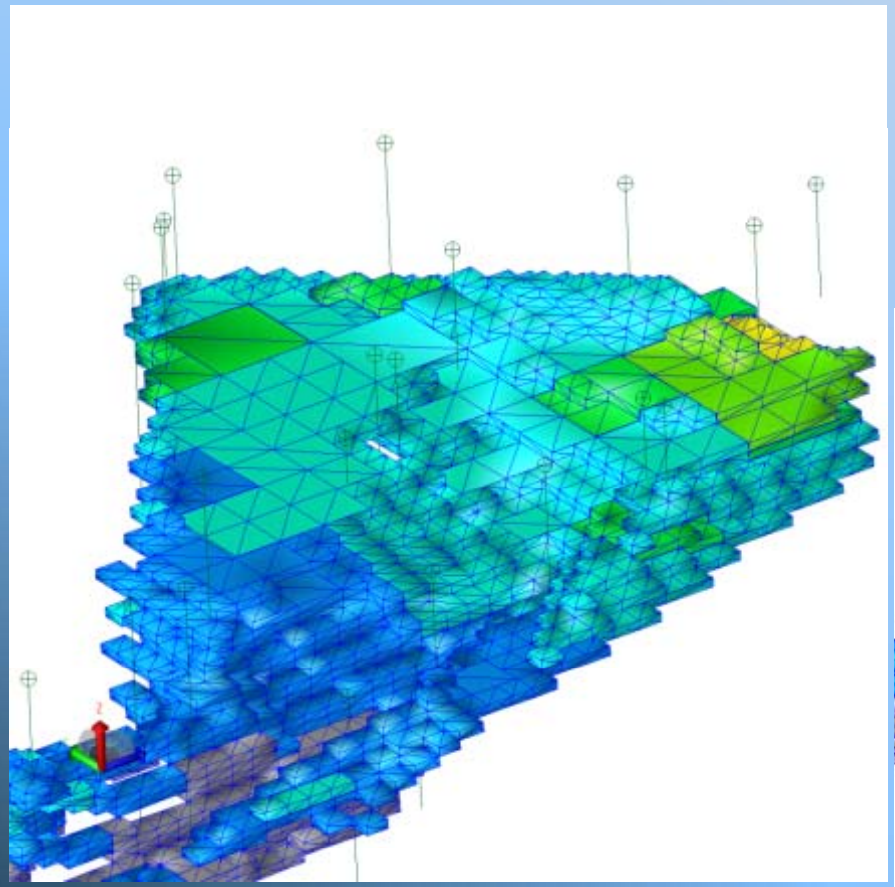


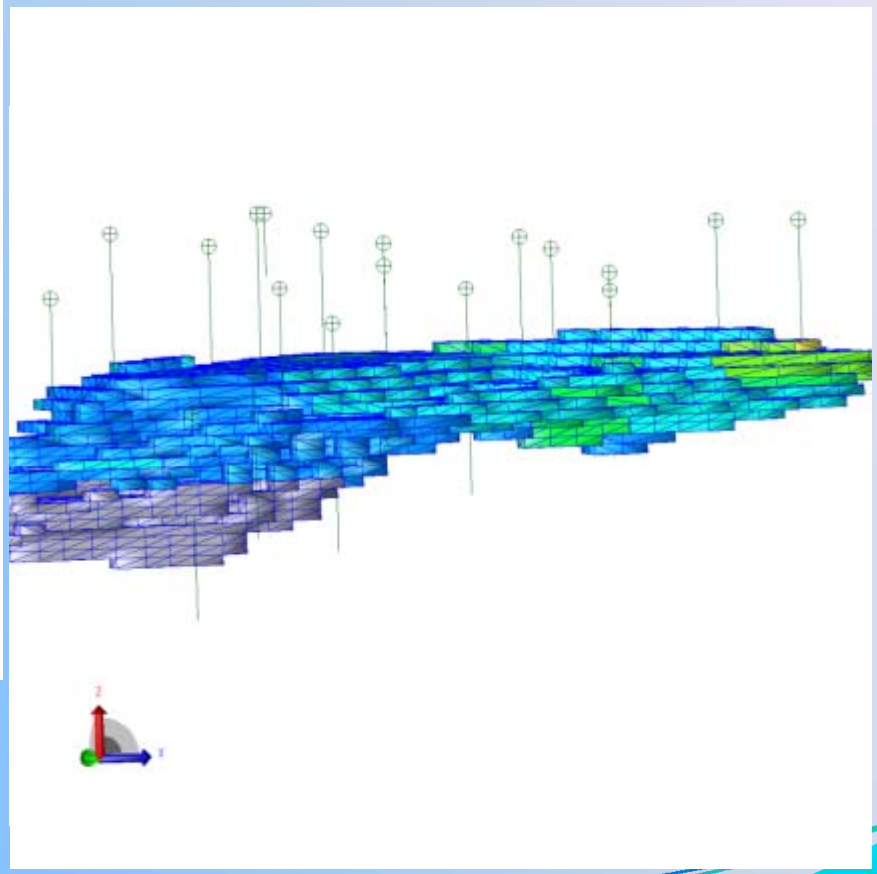
Vertical lithology section along conductive channel fill constructed from borehole logs

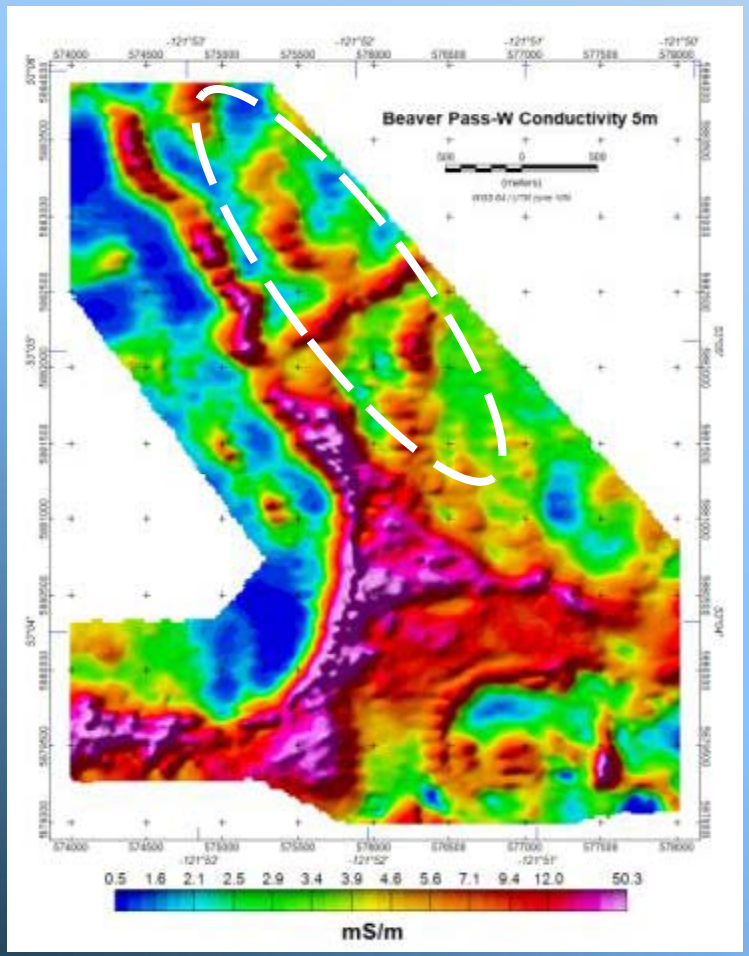
Synopsis

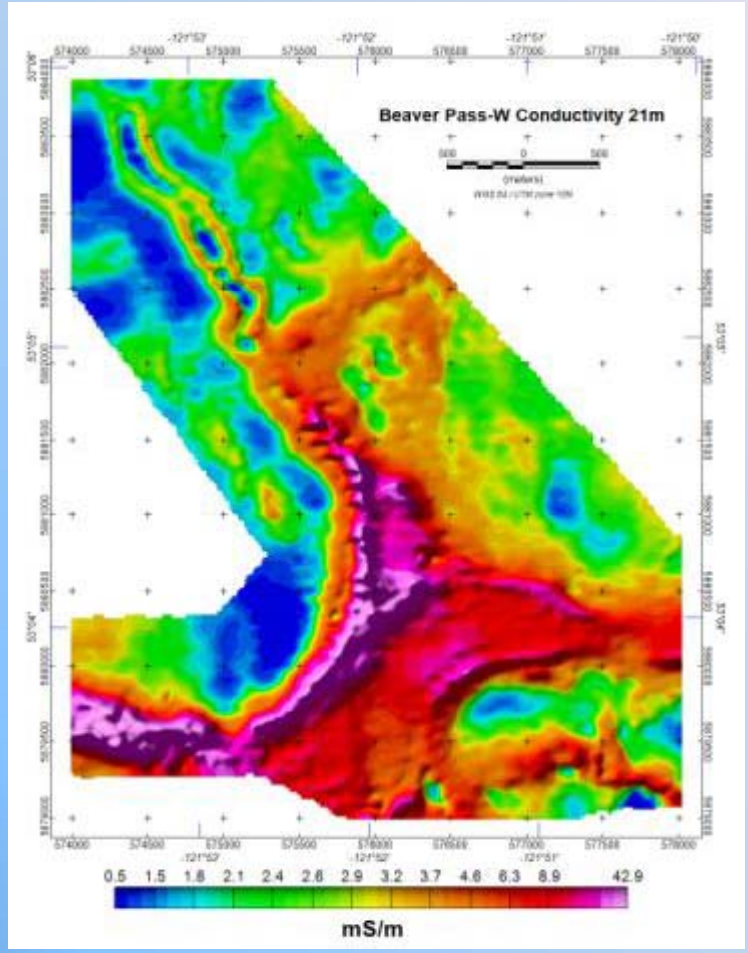
Method	Depth to bedrock
2D resistivity	Near-surface resistive layer of 25 - 30 m thickness underlain by good conductor, bottom of which was not recognised
SkyTEM	Conductor in depth interval 15 – 35 m. Depth to resistive bedrock ca. 40 m.
Refraction seismics	60 – 80 m (3000 - 3500 m/s)
Drilling	40 - 45 m

3D Model all measured data (Geovia Surpac Software)



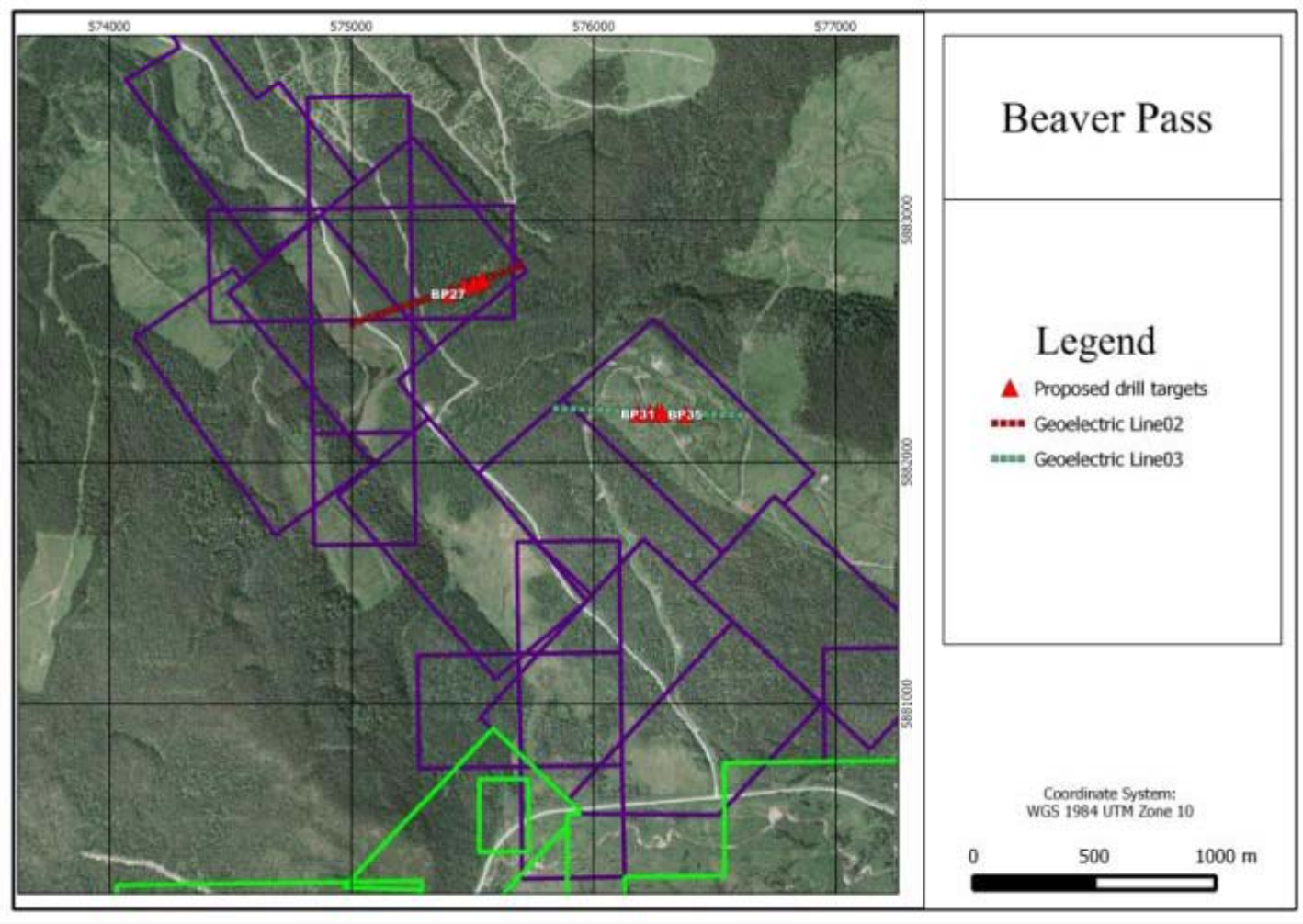




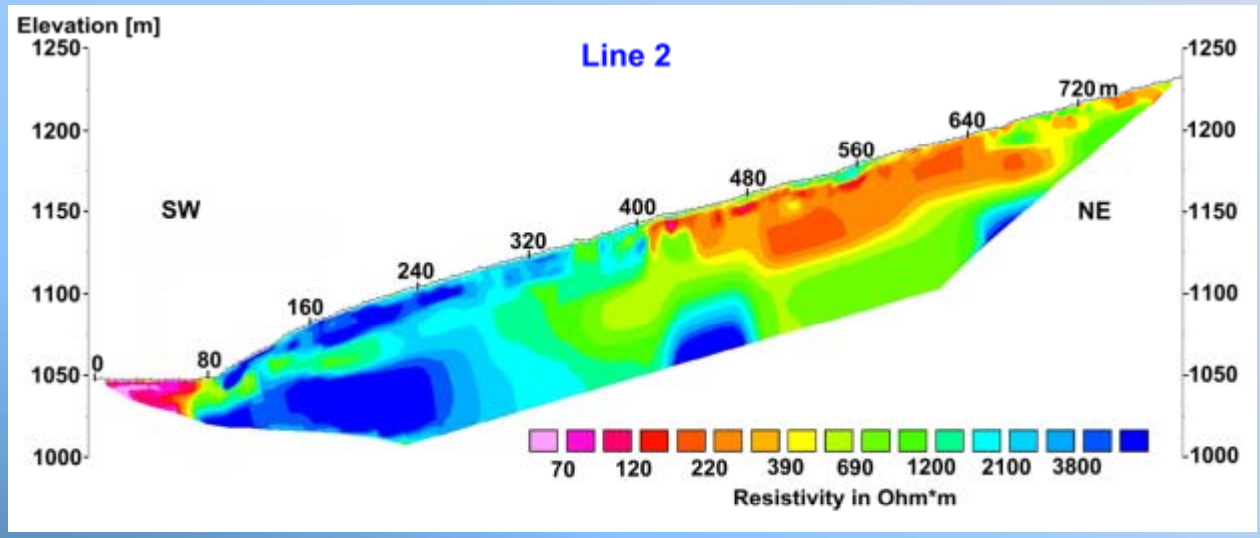


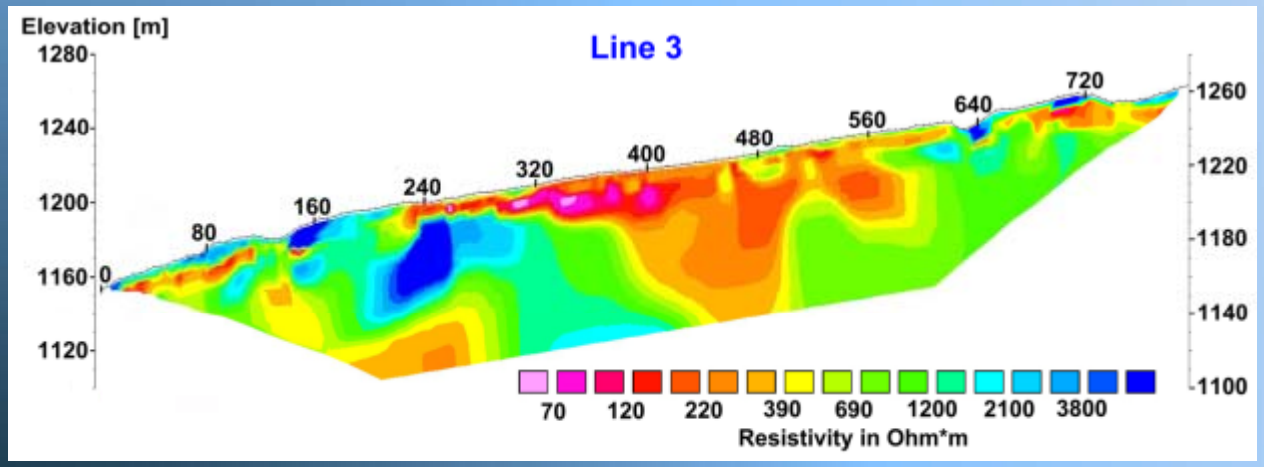
Pattern of buried high-level channels

Glacial moraine
or
dried channel?



DC 2D Resistivity





2D resistivity sections traversing up-hill channels

Conclusions

- SkyTEM survey data prove useful in the exploration of high-level buried channels in the Cariboo gold district
- Drilling hit conductive channel fill in depth of burial predicted by 3D conductivity voxel
- Channel fill is supposed to contain increased contents of heavy minerals, e.g. magnetite, as follows from Analytical Signal transform of the airborne magnetic field
- Results from ground geophysical data (2D multi-electrode resistivity and refraction seismics) are inclusive

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for granting access to data and permission to publish.

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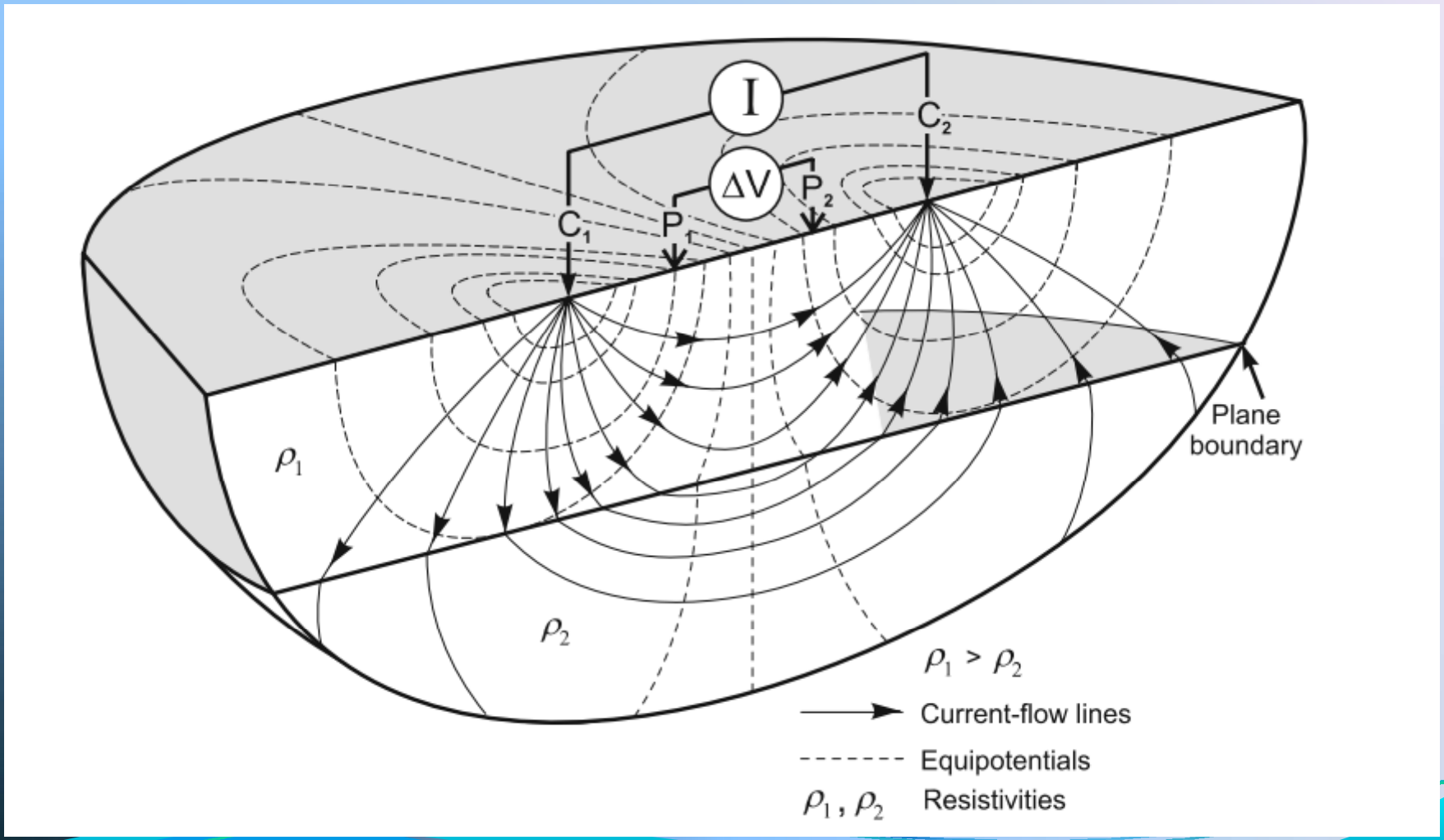
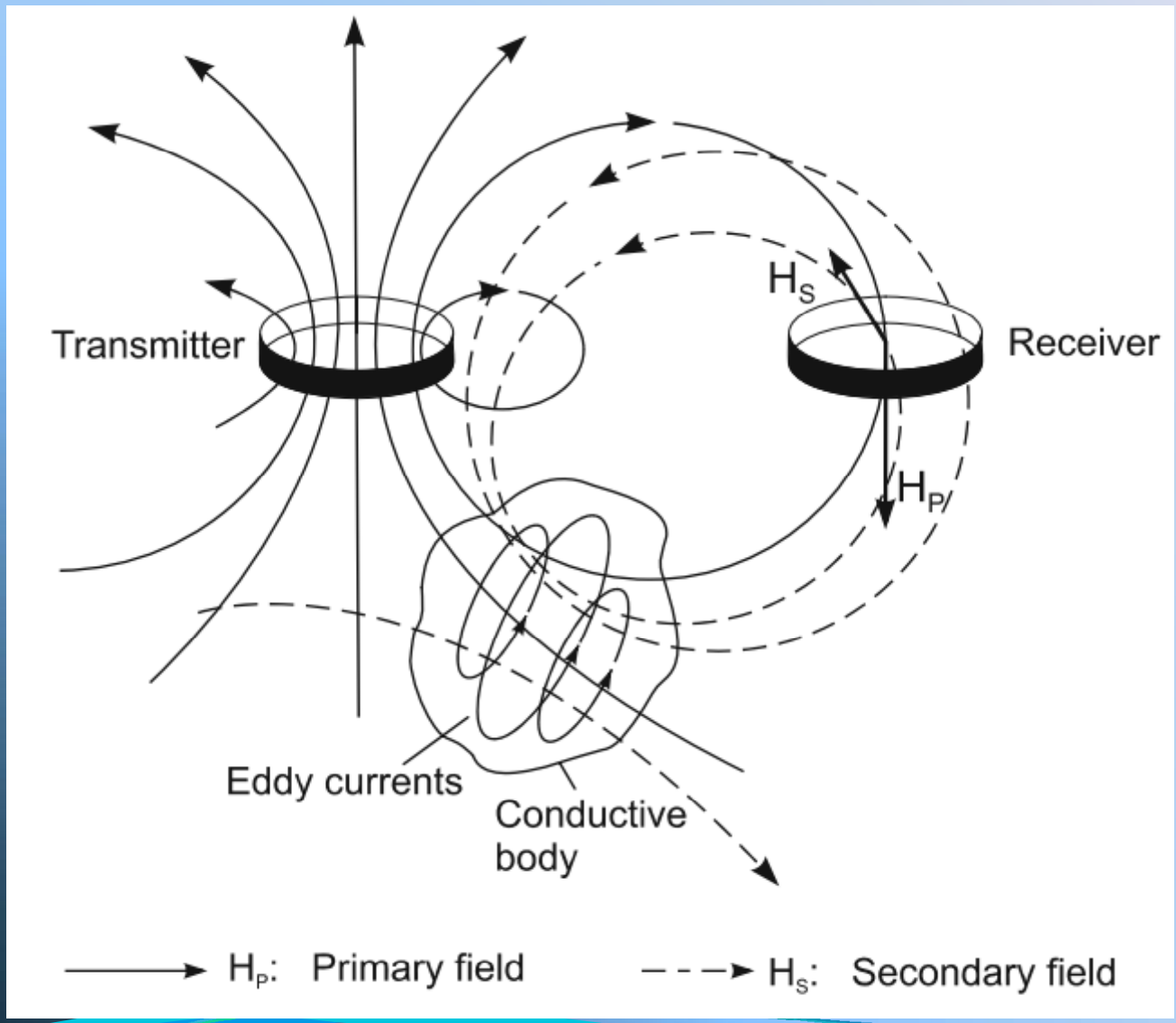
Thank you very much for your attention!


I
C2
ΔV
P2
C1
P1
ρ1
ρ2
Plane
boundary
ρ1 > ρ2
Current-flow lines
Equipotentials
ρ1 , ρ2 Resistivities


Transmitter
Receiver
H_S
H_P
Eddy currents
Conductive body
H_P: Primary field
H_S: Secondary field

References

- James, N.P. and Dalrympe. R.W., (2012), Facies Models, GEOtext 6, Geological Association of Canada.
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- Levson, Victor M. and Giles, Timothy R. (1995): Buried-Channel Placers, in Selected British Columbia Mineral Deposit Profiles, Volume 1 - Metallics and Coal, Lefebure, D.V. and Ray, G.E., Editors, British Columbia Ministry o Energy and Mines, Open File 1995-20, pages 25-28.