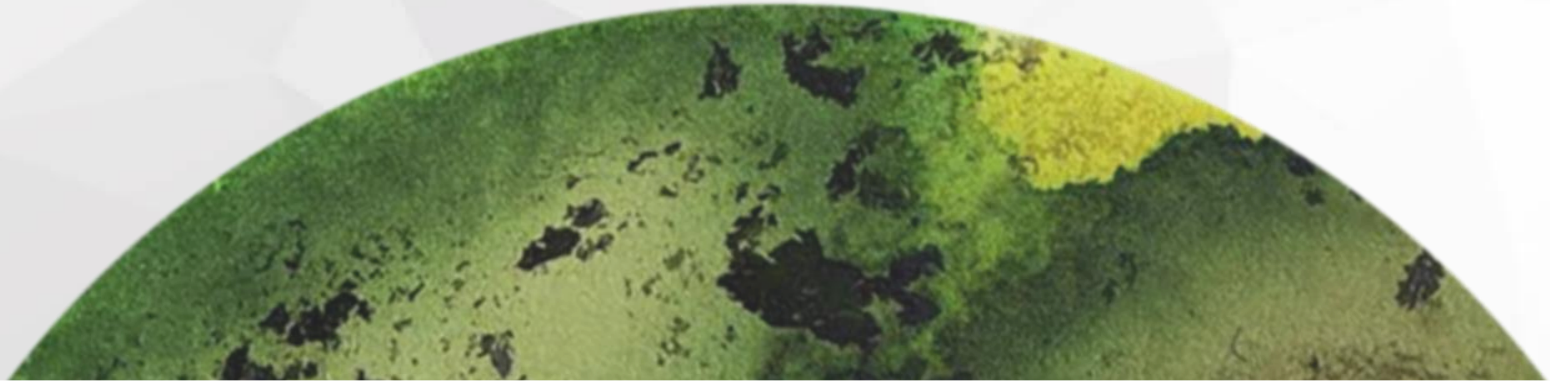


EXPANDING 3D DCIP SENSITIVITY APPLICATIONS FOR ARCHEAN PRECIOUS METAL EXPLORATION

JEFF WARNE
Quantec Geoscience Ltd.

CANADIAN EXPLORATION GEOPHYSICAL SOCIETY

Expanding 3D DCIP Sensitivity Applications for Archean Precious Metal Exploration

Benoit Tournerie, Mehran Gharibi, Jeff Warne*, Ken Tylee

2021 KEGS Virtual Symposium, "Geophysical Advances: Case Studies and New Techniques"

KEGS CANADIAN EXPLORATION GEOPHYSICAL SOCIETY

QUANTEC Geoscience

McEWEN MINING

Leading Innovation in IP Surveying

Deep 3D Imaging
ORION 3D DCIP & SWATH DCIP
ORION PLUS

QUANTEC
Geoscience

World Leaders in Ground Geophysics

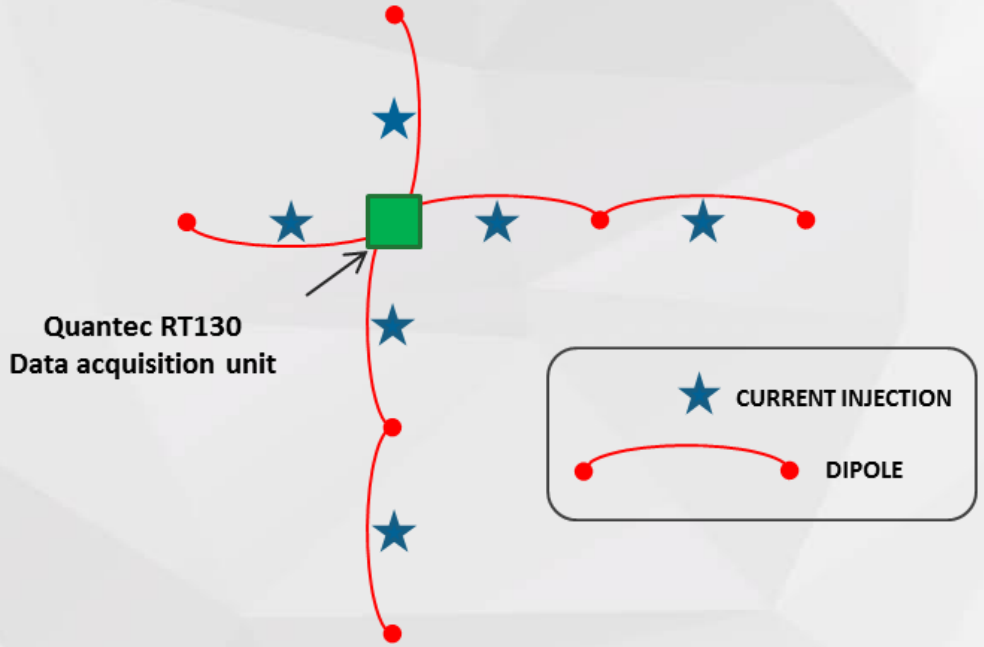
Since 1986

Presentation Agenda for Expanding 3D DCIP Sensitivity

- ORION 3D DCIP configuration
- Expanding the region of investigation
- Initial test results
- Application at the Black Fox Mine

3D DCIP - Measuring orthogonal dipoles

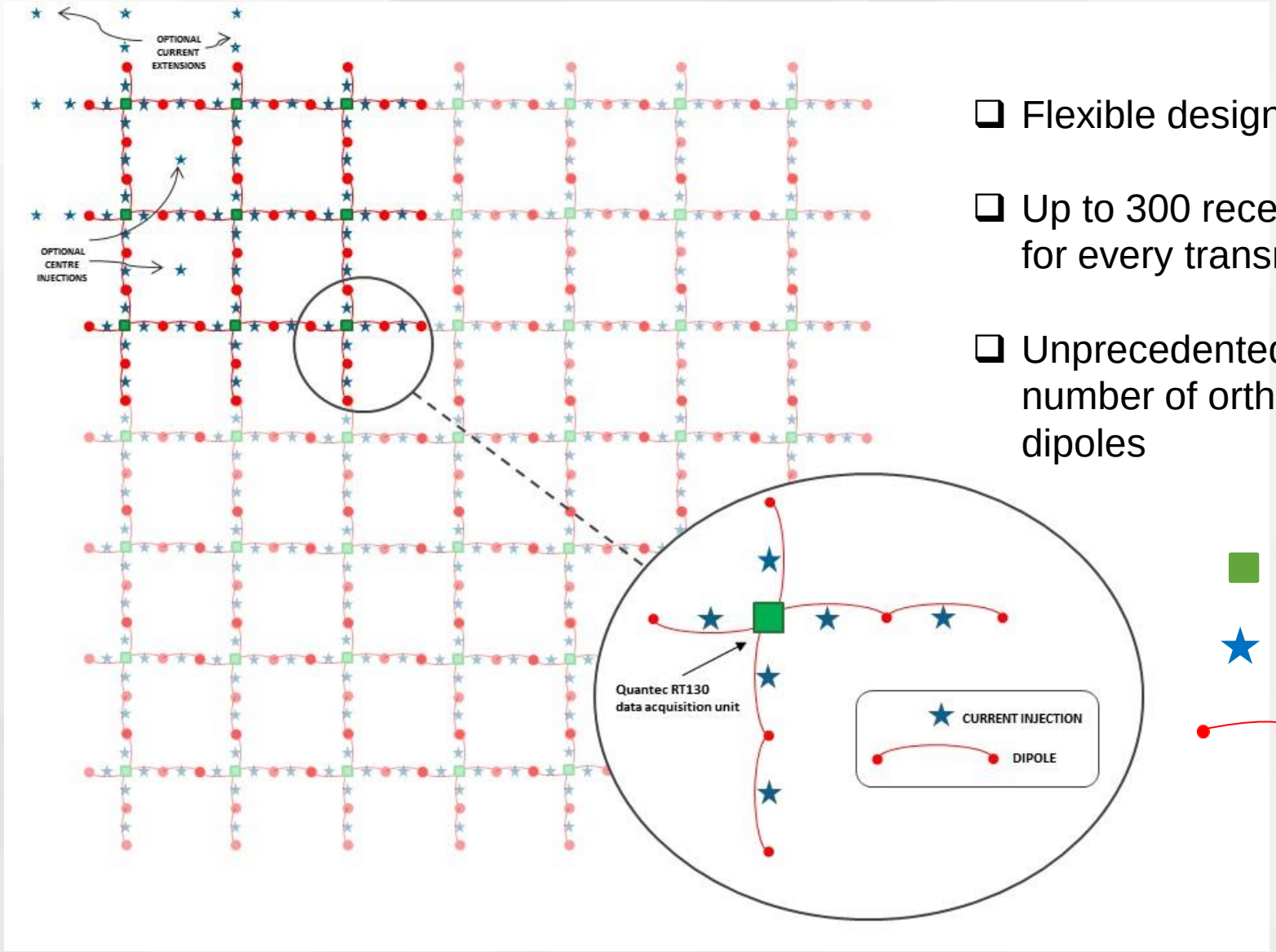
- Built on the strengths of:
  - **TITAN 24** Technology & Processing (over 15 years of technical **Success** and **Discovery**) (RT 120)
  - **SPARTAN MT** Flexibility (RT130 and RT160)



- **ORION 3D** & **ORION SWATH**
- **TITAN 130** & **TITAN 160**

ORION 3D

Survey Footprint – Flexible designs for 3D Acquisition



- Flexible designs
- Up to 300 receiver channels for every transmit
- Unprecedented: equal number of orthogonal dipoles

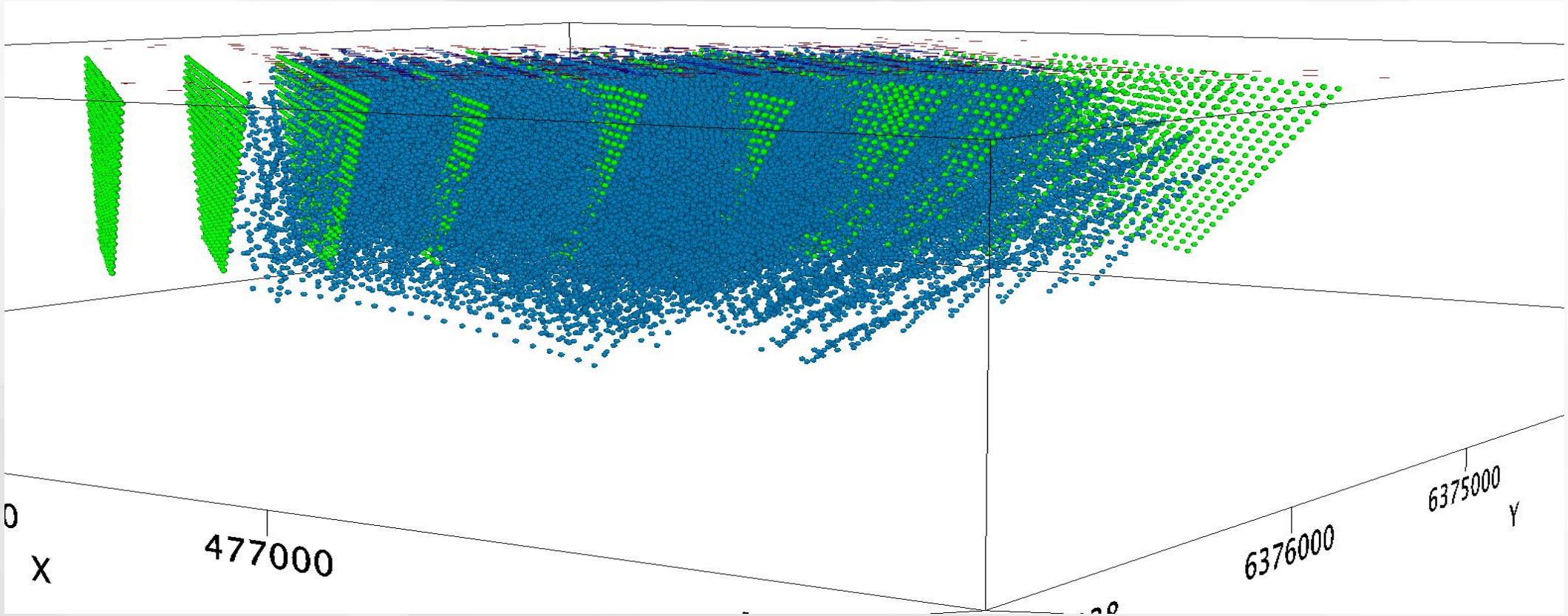
Receiver RT130/QRT160

Transmit locations

Measured dipole

ORION 3D

Volume Sampling from 3D Acquisition



2D lines (green dots) ~ 6000 data points
3D Grid (Blue Dots) ~ 140,000 data points

ORION 3D

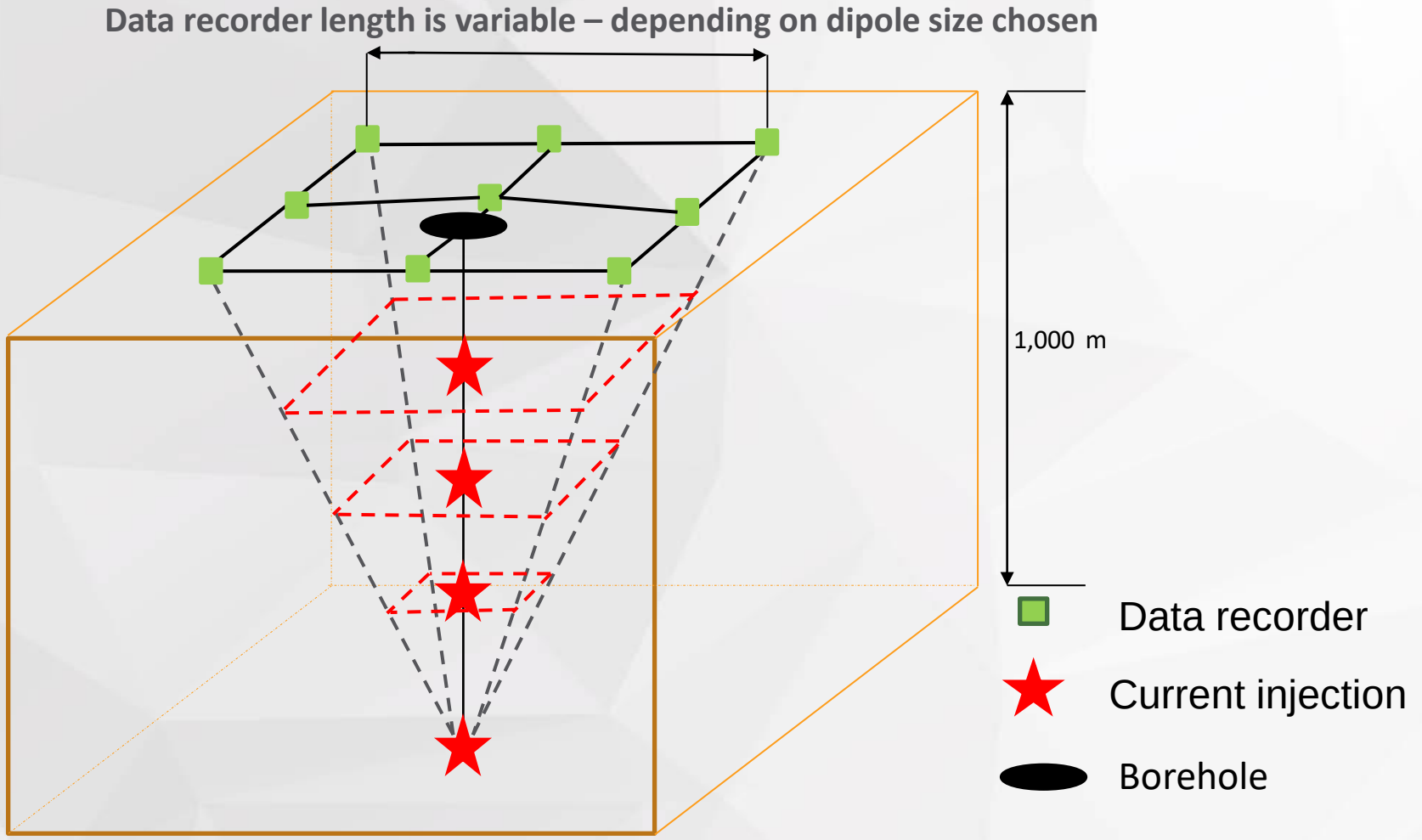
ORION 3D

The ORION 3D PLUS Concept

ORION 3D Plus – Using boreholes to enhance the sub-surface investigation

Benefit of down hole injections:

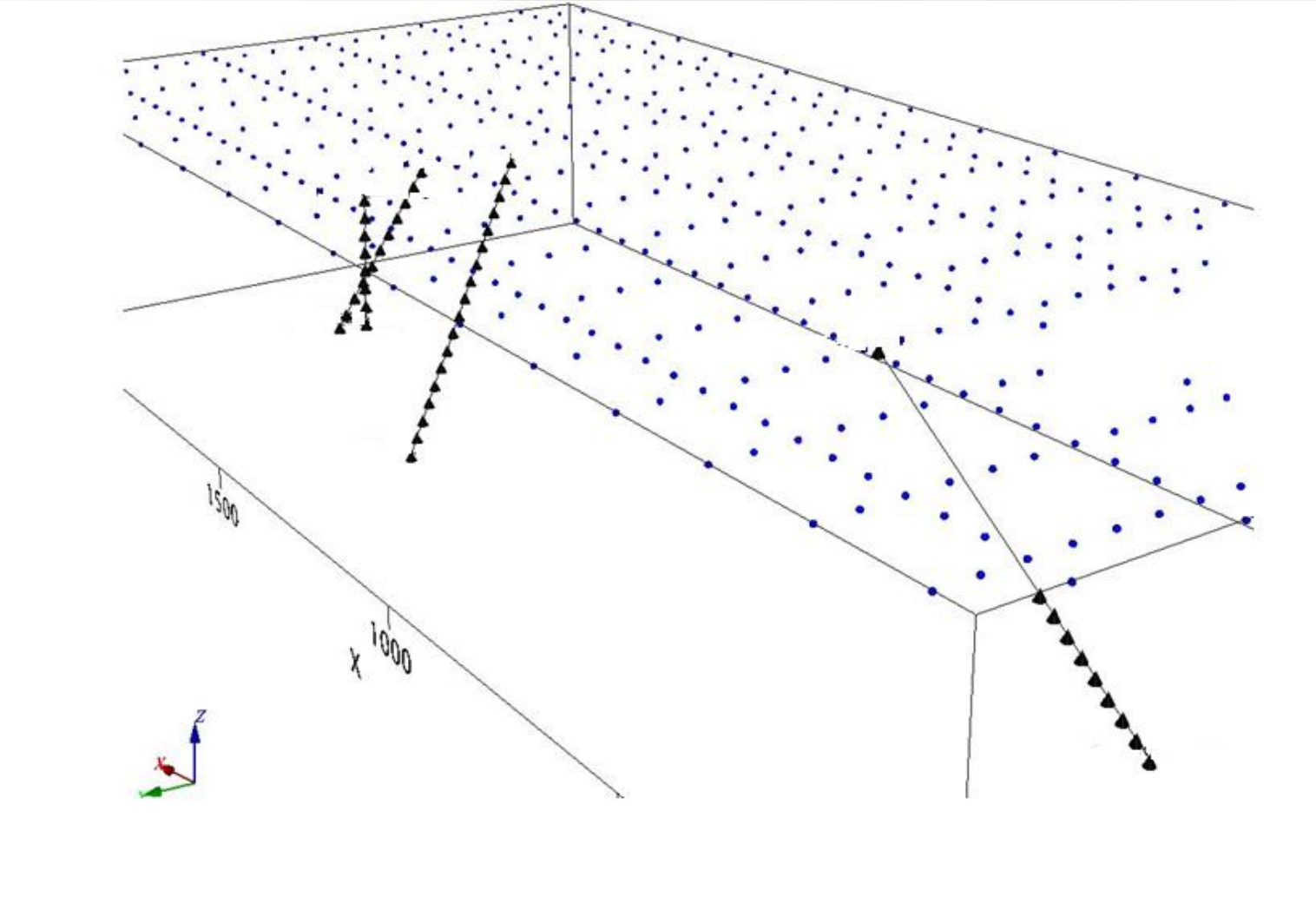
1. Energy at depth – does not need to penetrate at depth from surface
2. Helps overcome attenuations from surface injections
3. The affects of conductive cover is minimized
4. Adds third dimension to the array expansion



Typical current injections spaced at 20 to 25 meter intervals down the hole

ORION 3D

EXAMPLE –ORION 3D PLUS

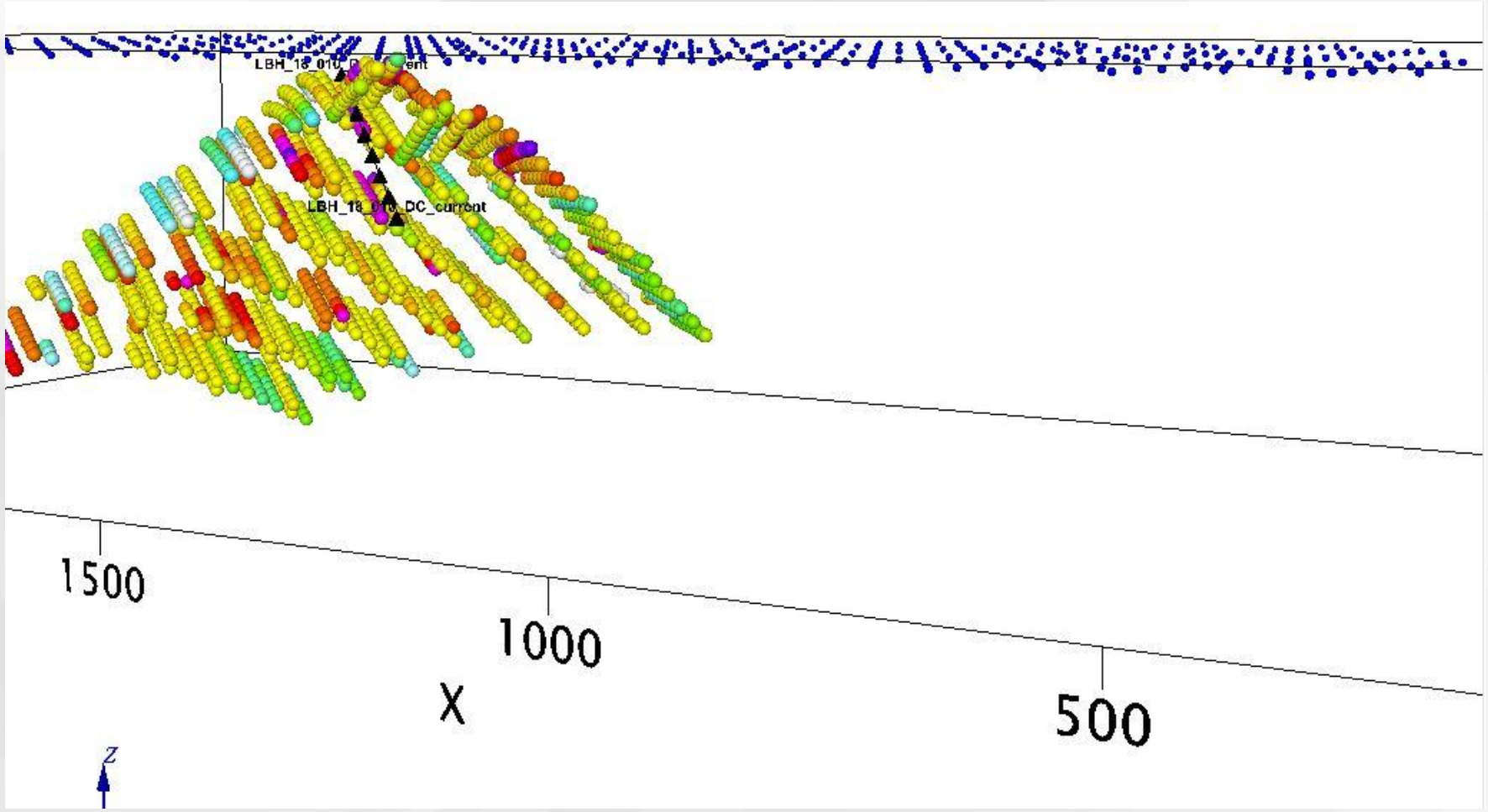


- 4 boreholes with a total of 47 transmit stations
- 1 km x 2 km array of receive dipoles

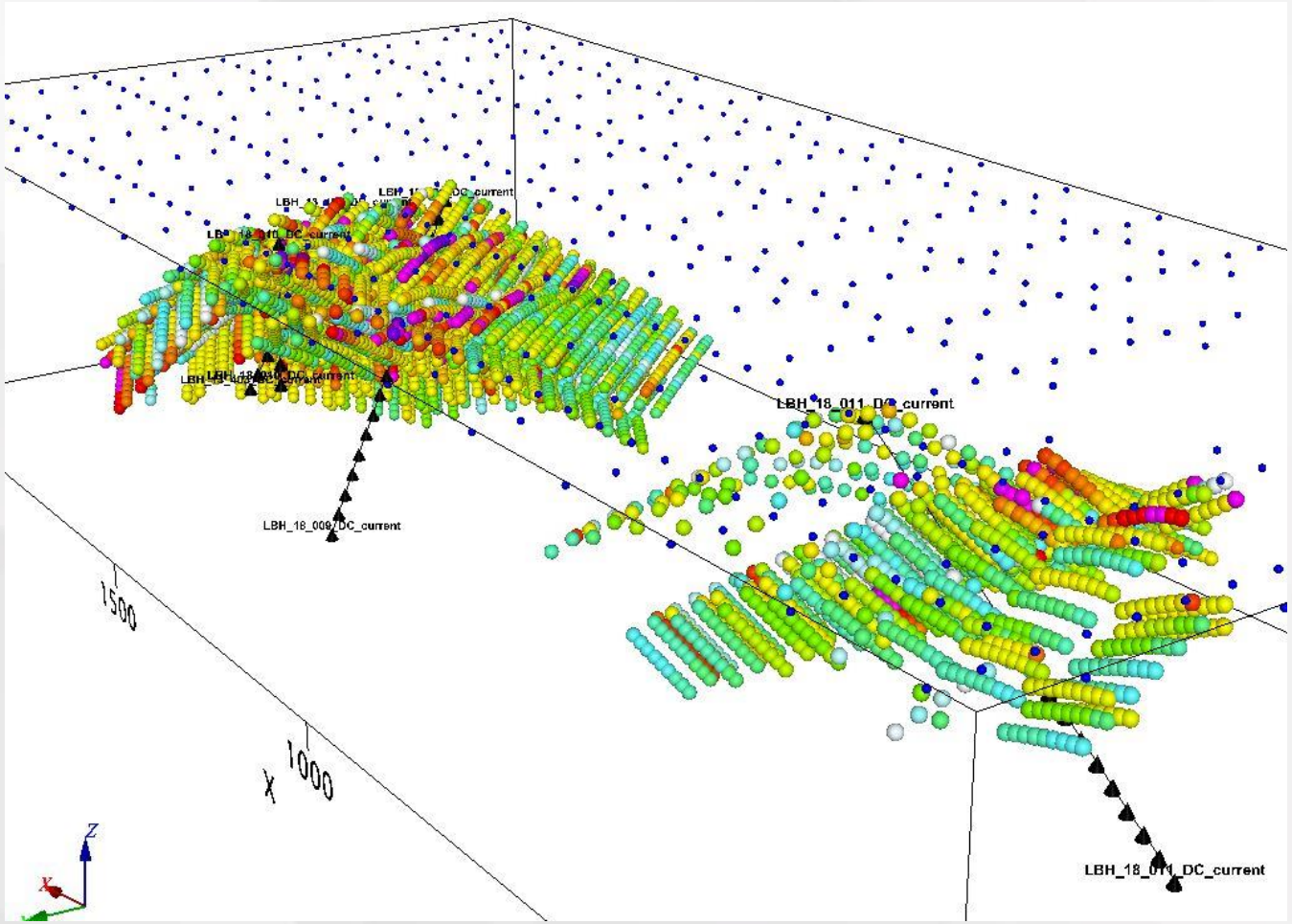
Sample data courtesy of North American

ORION 3D

Data plot point distribution for current injections from 1 hole (matched with receiver dipoles on surface; nominal locations shown)

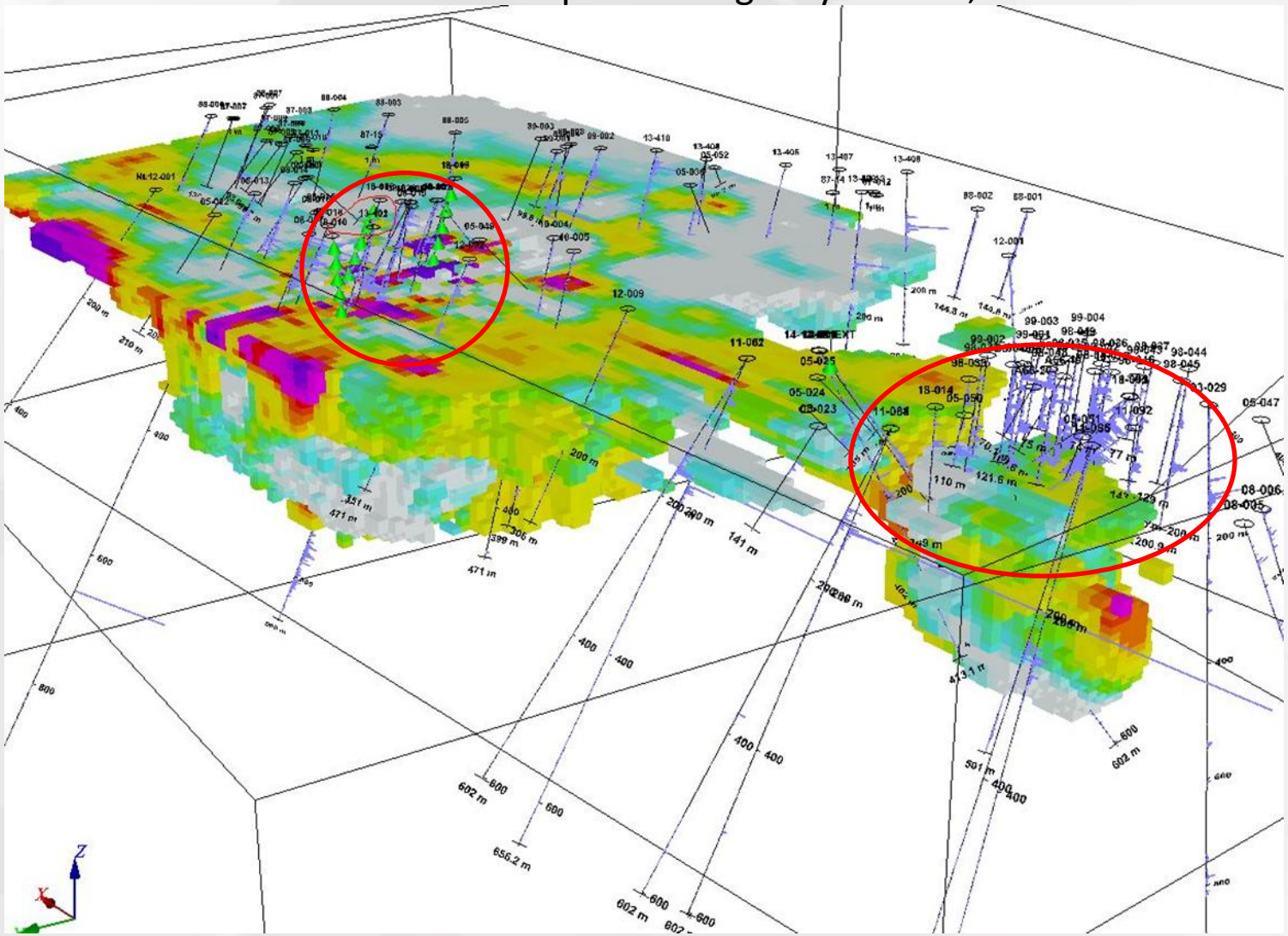


Data plot points from injections in 4 holes – Color coded by Apparent Resistivity (spheres) and the injection points (black cones)



Top of model shown at 120 m depth – Palladium assays shown in violet, injection points shown in green.

The 3D resistivity distribution is modeled from data acquired using only 4 DDHs, measured with surface logger array



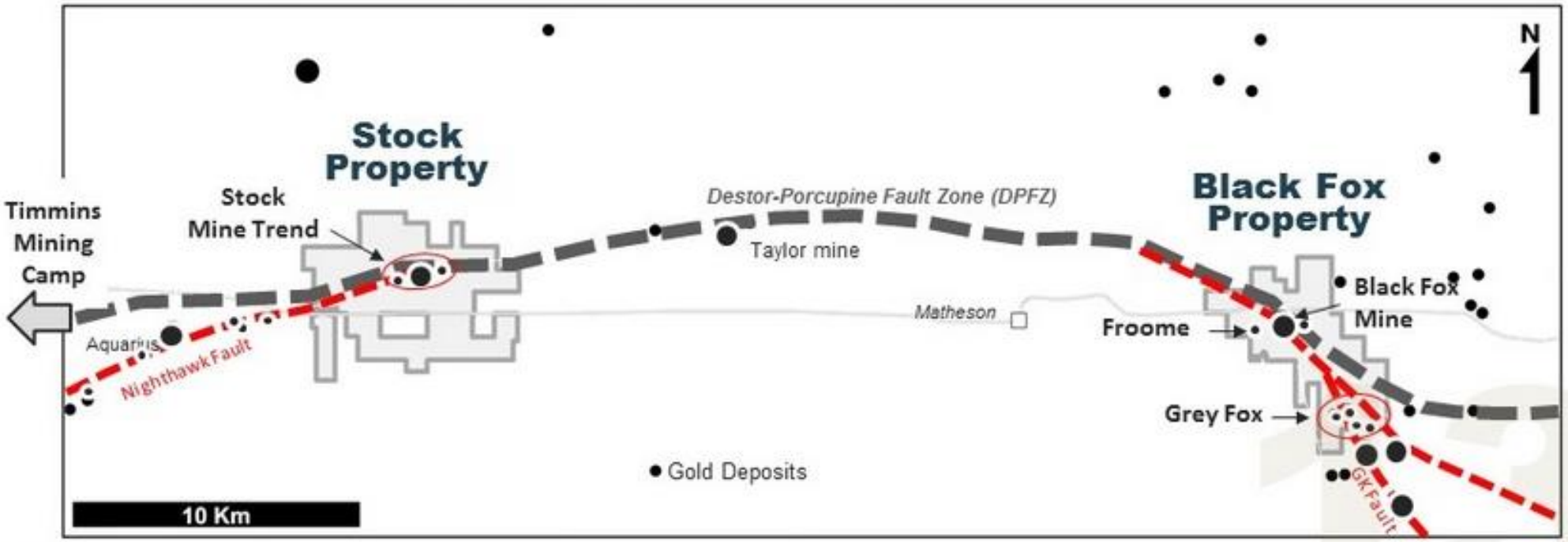
ORION 3D

Application for Archean Precious Metals Exploration

Black Fox Mine Location

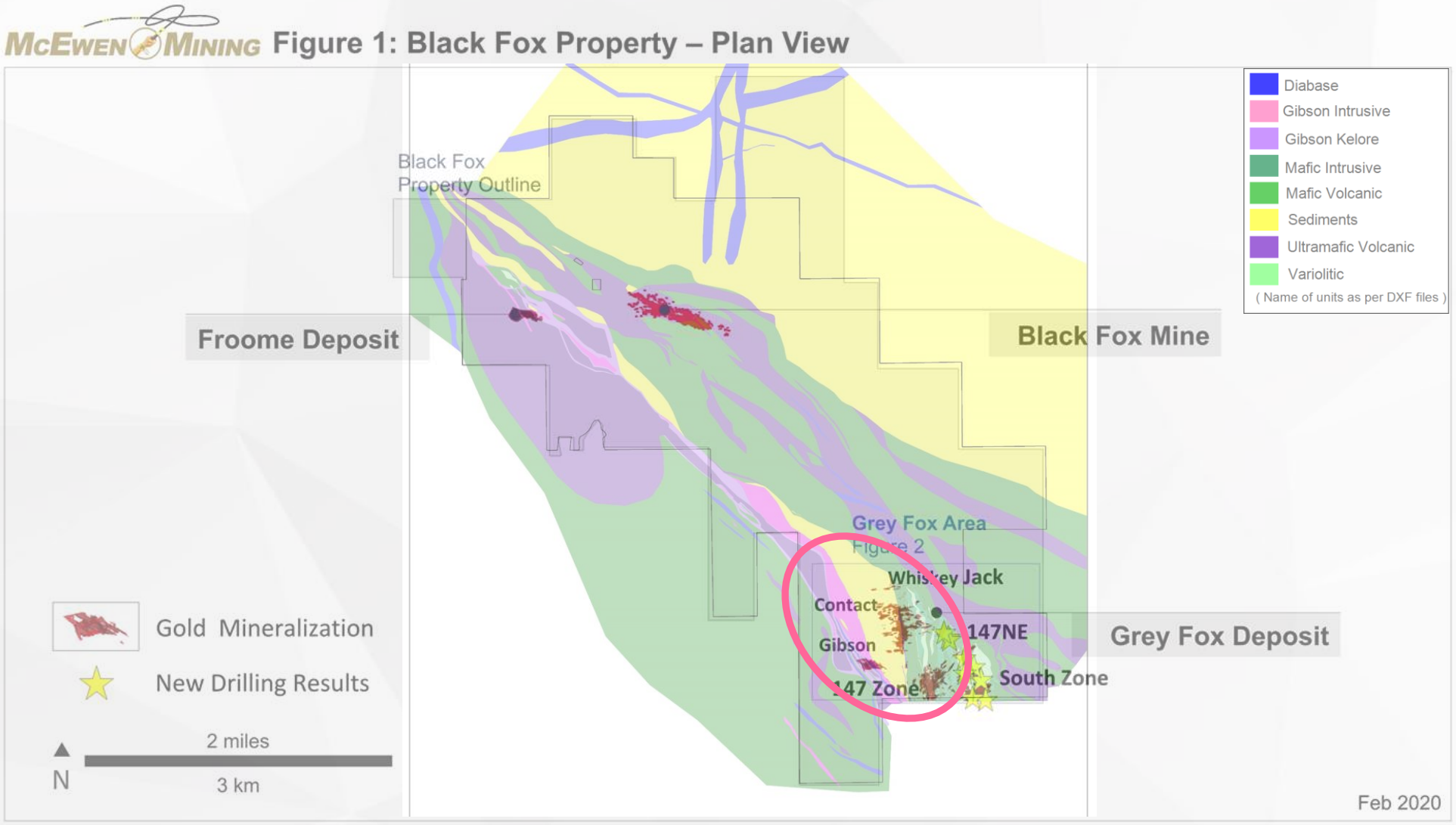
Black Fox Complex Located on Prime Segments of DPFZ

- Proven mineralized gold systems at each property
- +20 km cumulative strike length prospective structures
- Major splay faults intersect the main Destor-Porcupine Fault Zone (DPFZ)
- Still underexplored and near infrastructure (near Mine and Mill)



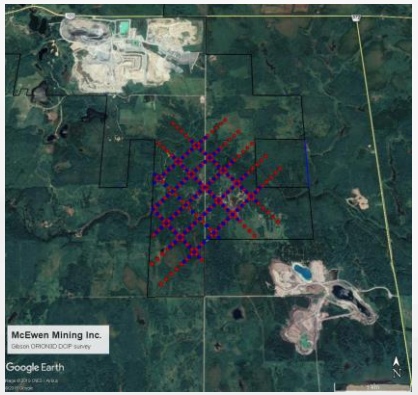
ORION 3D

Property Geology and Deposits



ORION 3D

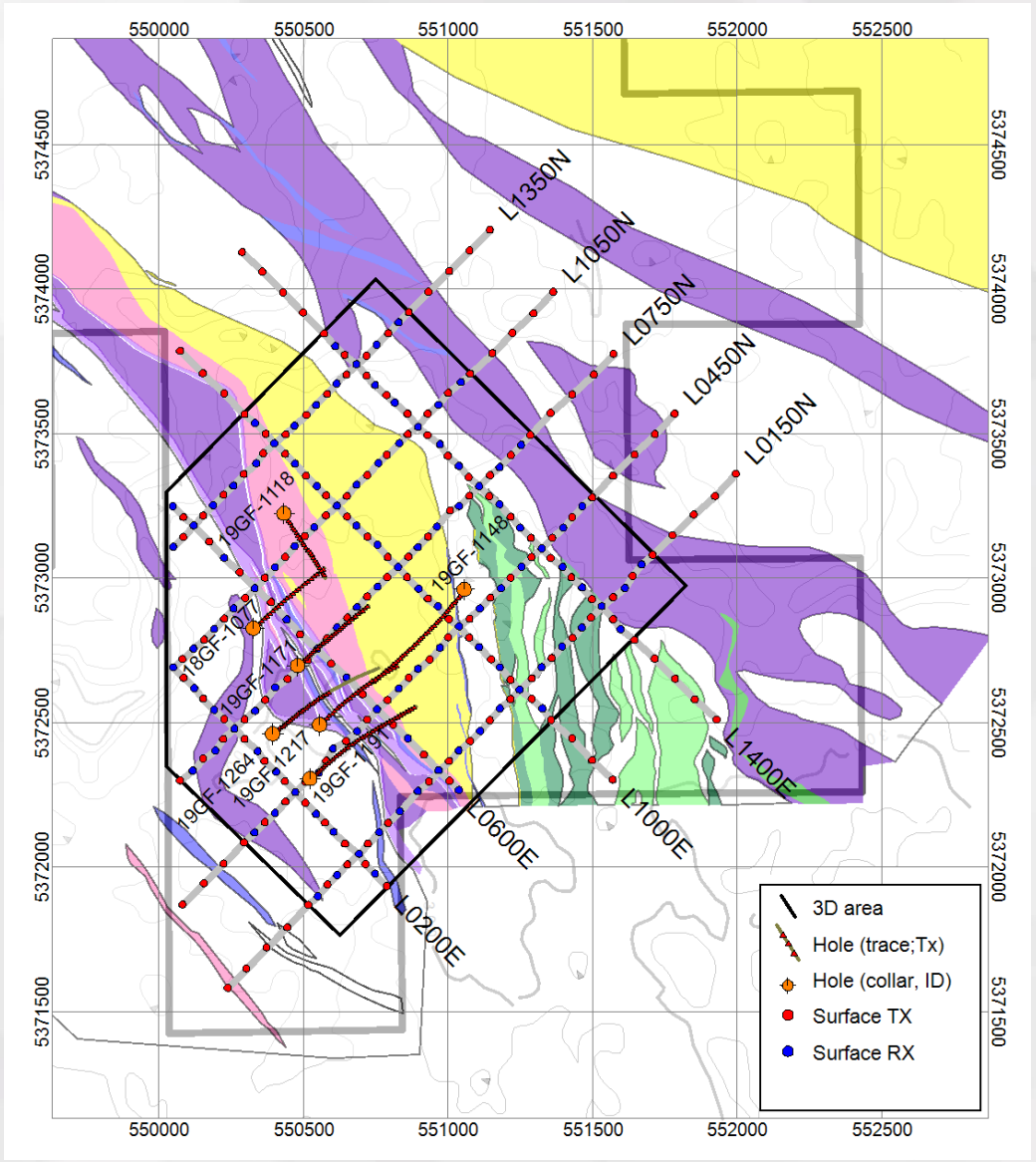
ORION PLUS Acquisition over Grey Fox



Field acquisition
Area: ~1.5 x 1.8 km

ORION 3D
110 receiver dipoles on surface
176 current injections on surface
(~ 19,000 data pts)

Plus:
256 current injections distributed along **7** boreholes
(~ 23,000 data pts)



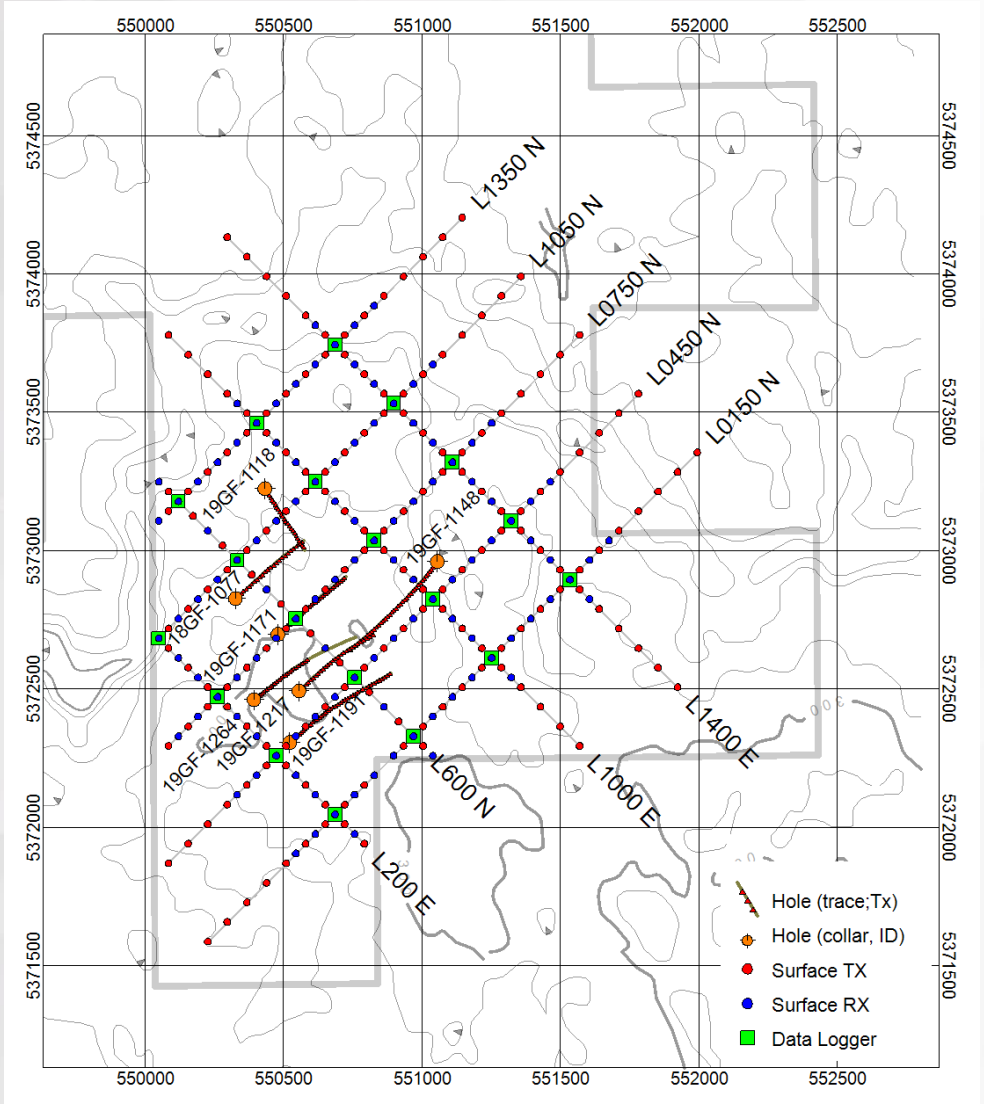
ORION 3D

ORION PLUS Inversion of Results

Inversion of the measured data

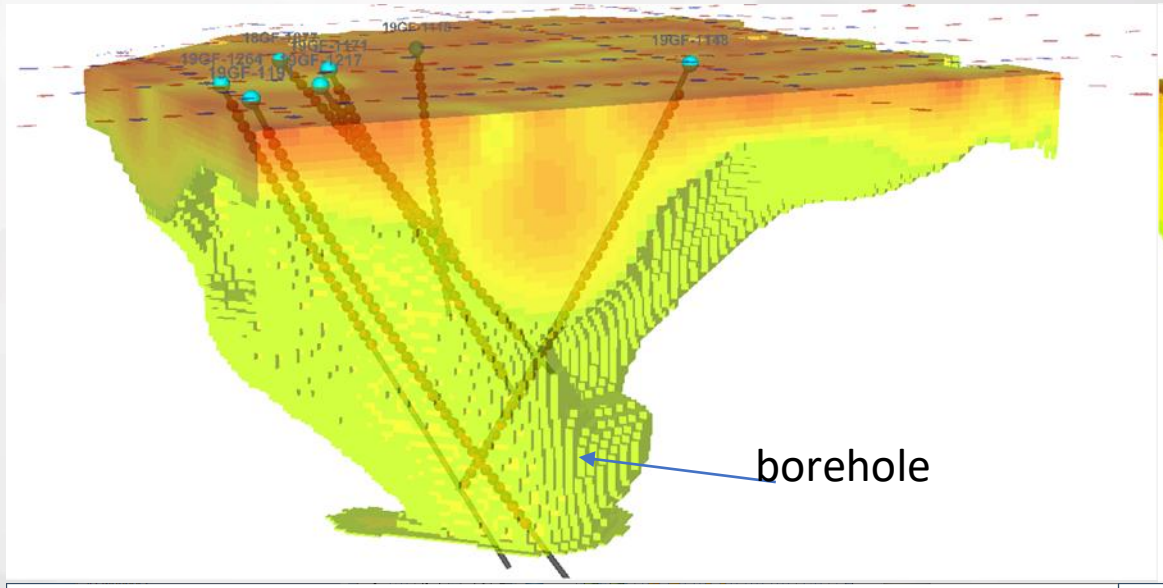
2D inversion of the ORION 3D (surface) data;
3D inversion of the ORION 3D (surface) data;
3D inversion of the ORION 3D (borehole) data;
3D inversion of the ORION 3D merge (surface + borehole) data;

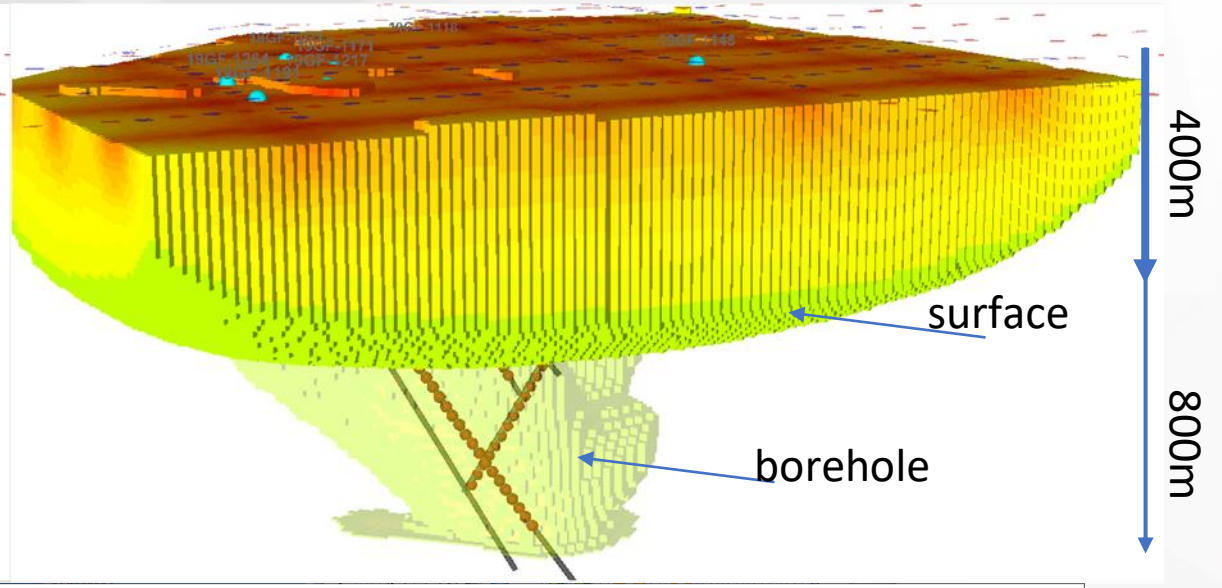
ORION 2D Lines:	
L0150N to L1350N	@300m
L0200E to L1400E	@400m

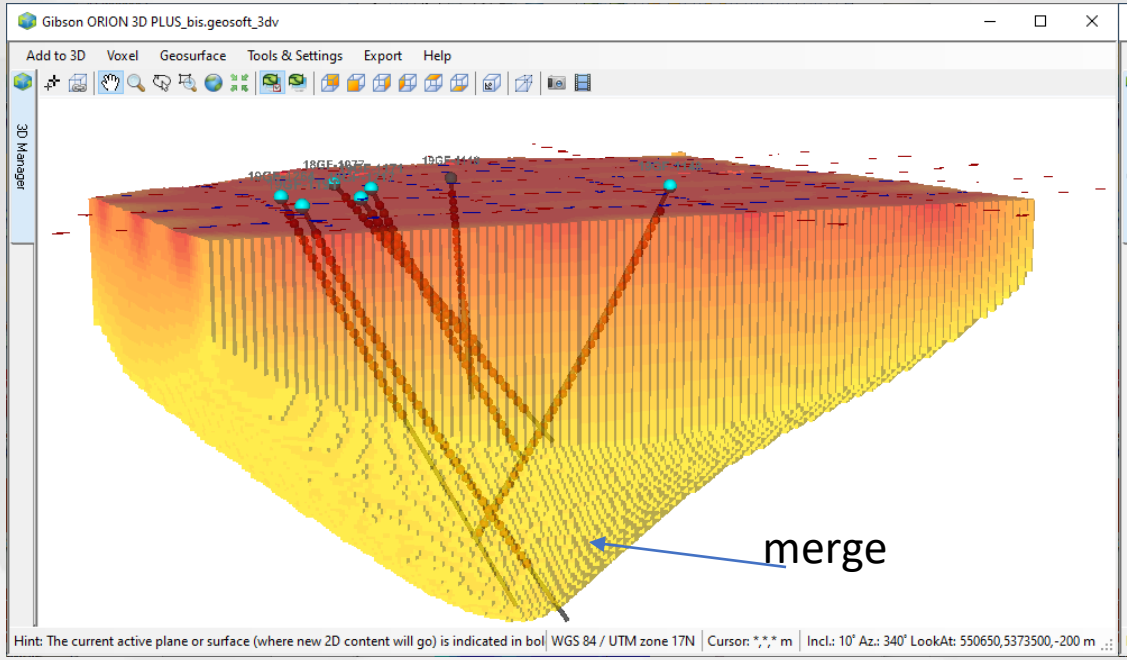


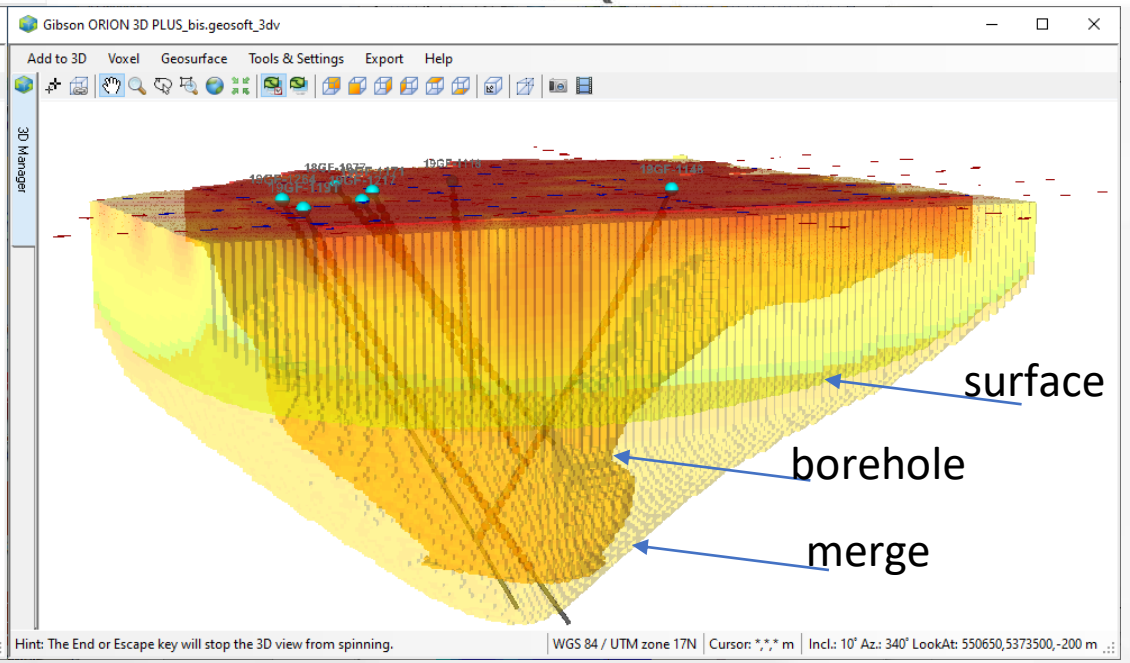
ORION 3D

ORION PLUS 3D Sensitivity







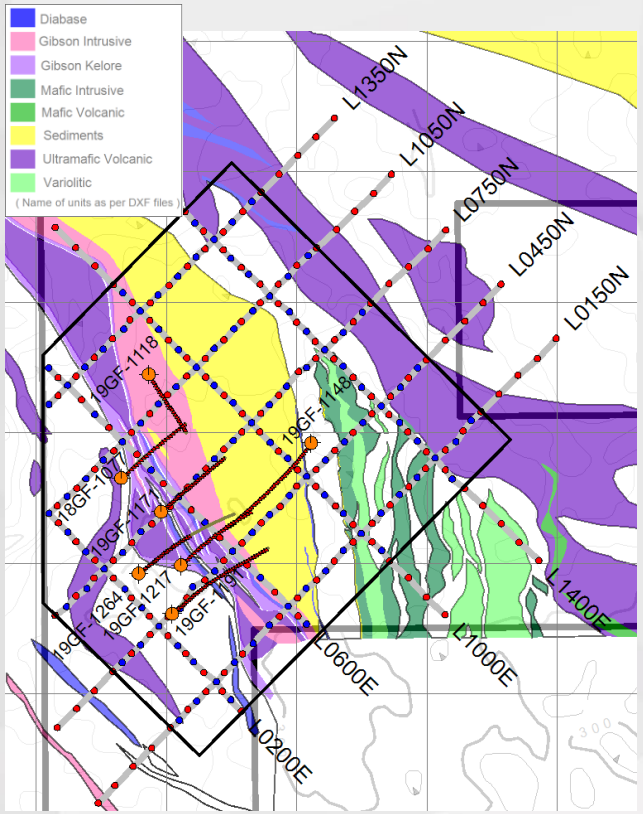


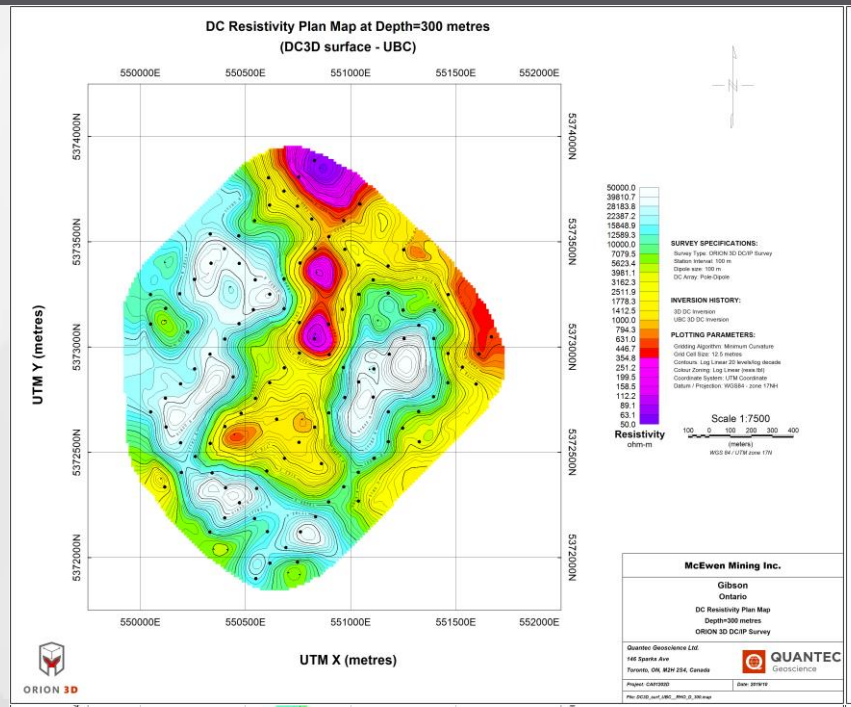
ORION 3D

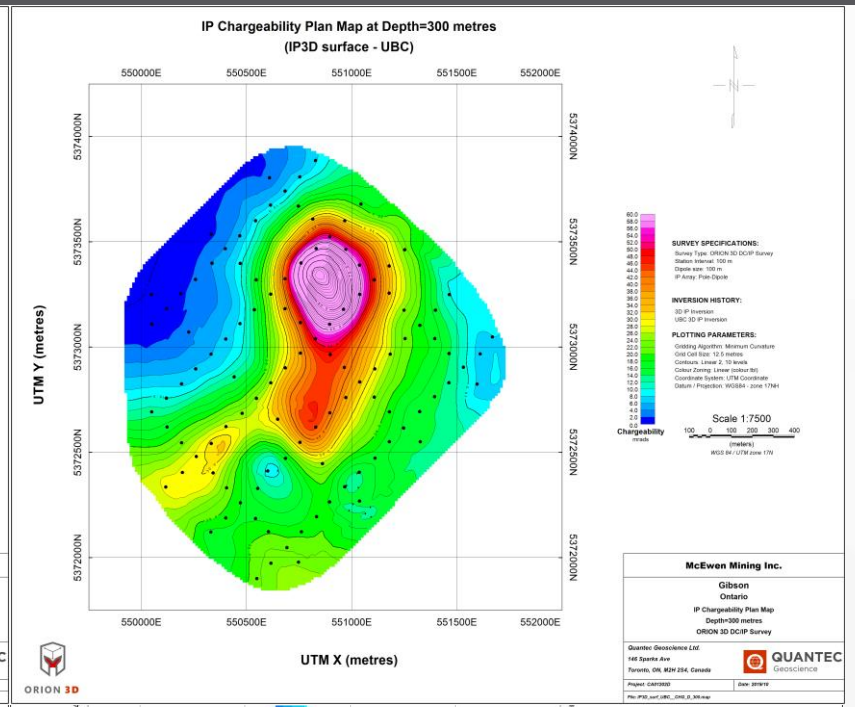
ORION3D-Depth=300m – DC3D and IP3D models

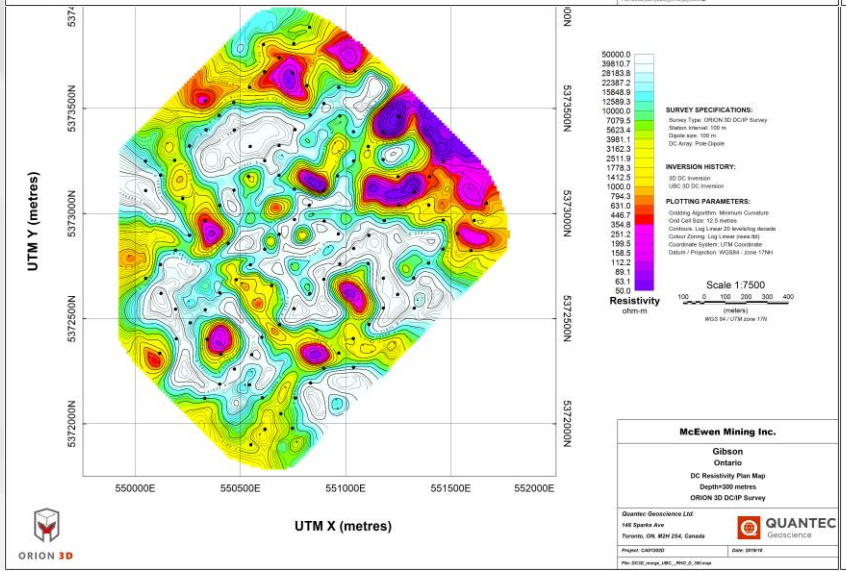
Row 1: SURFACE DATA only

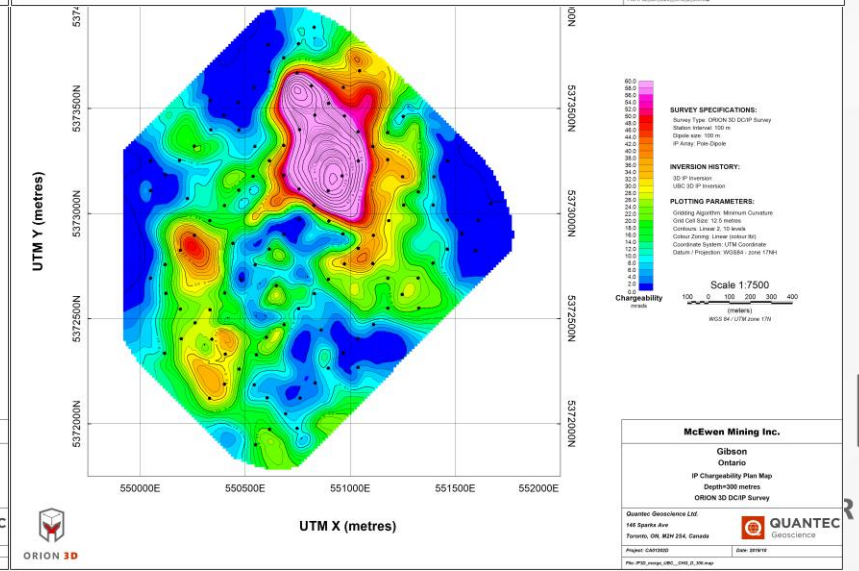
Row 2: Merged DATA







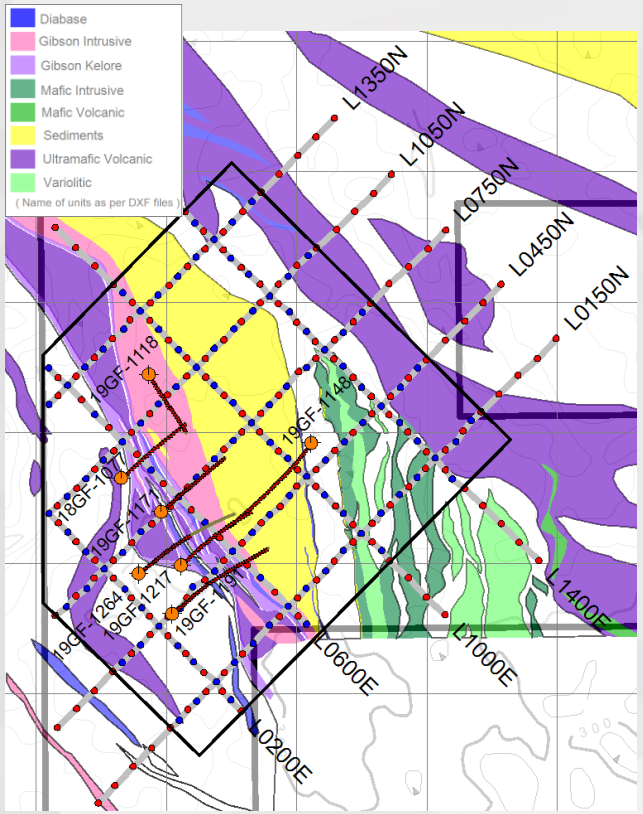


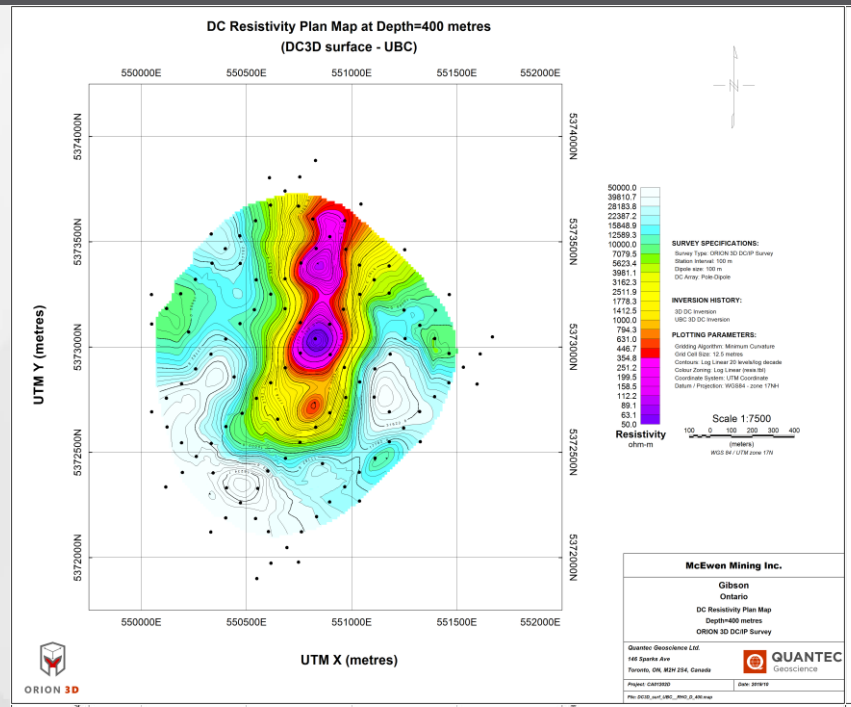


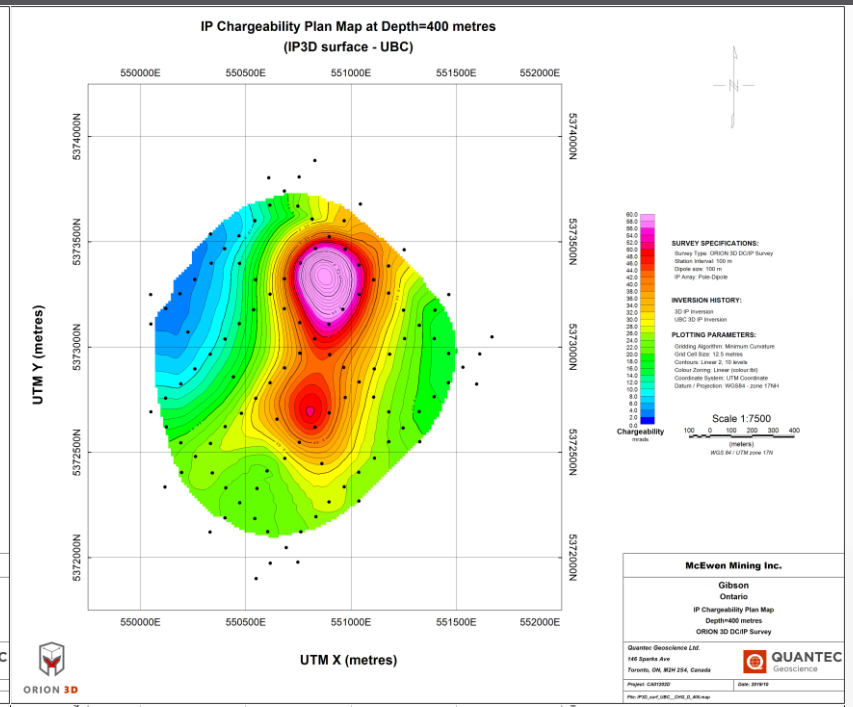
ORION3D-Depth= 400-500m – DC3D and IP3D models

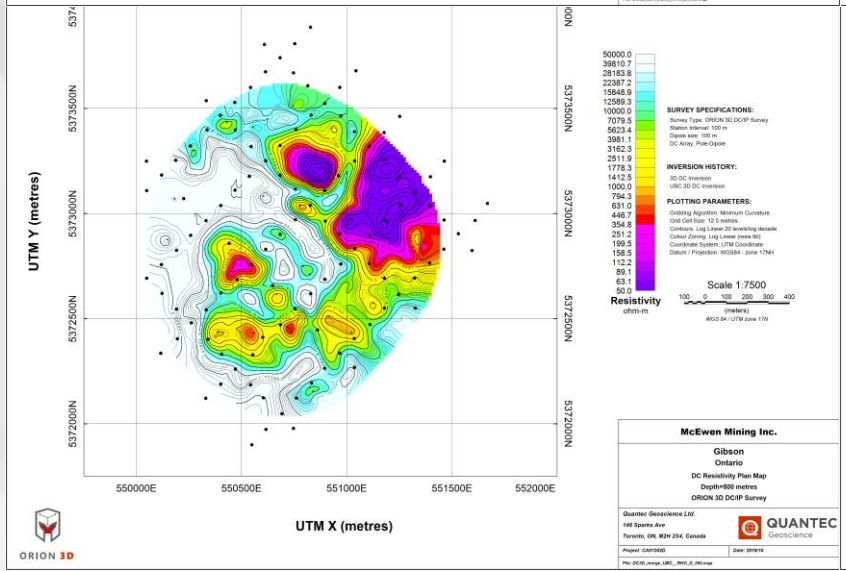
Row 1: SURFACE DATA only
at depth = 400m

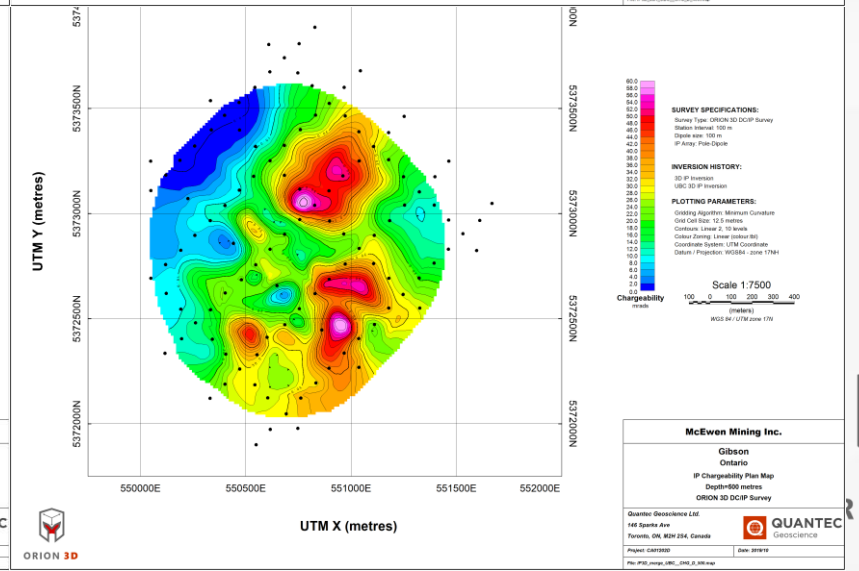
Row 2: Merged DATA
At depth =500m





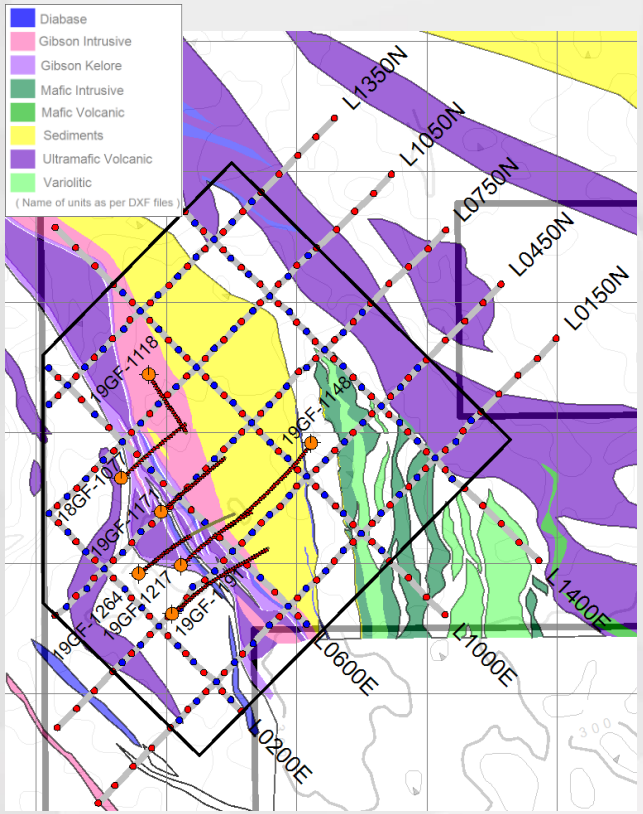


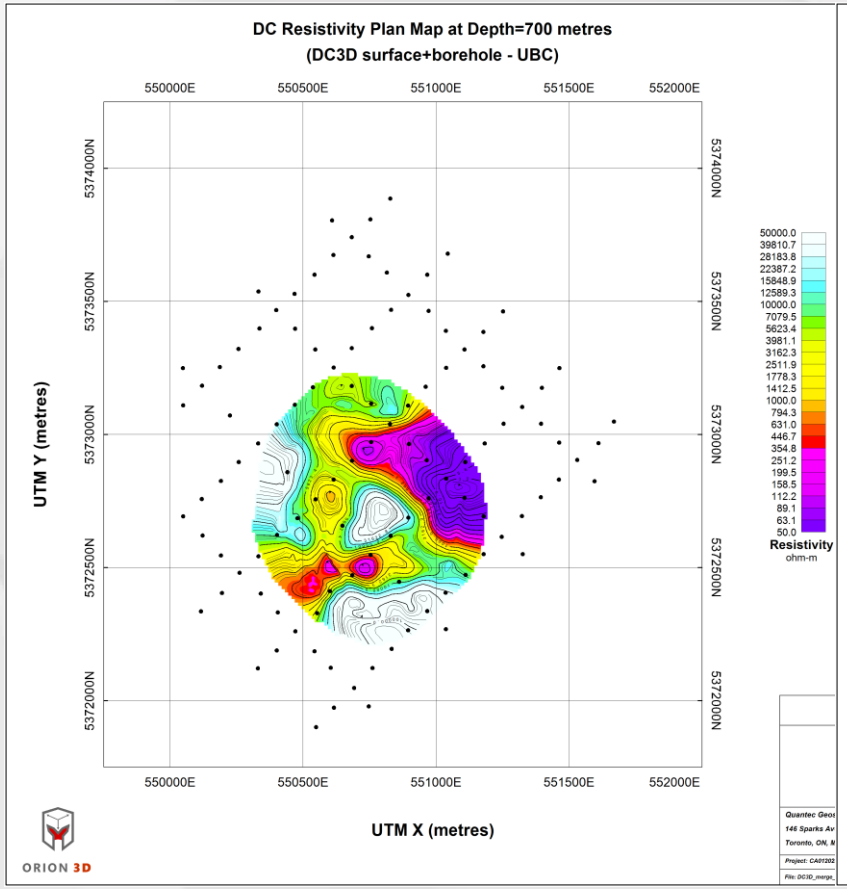


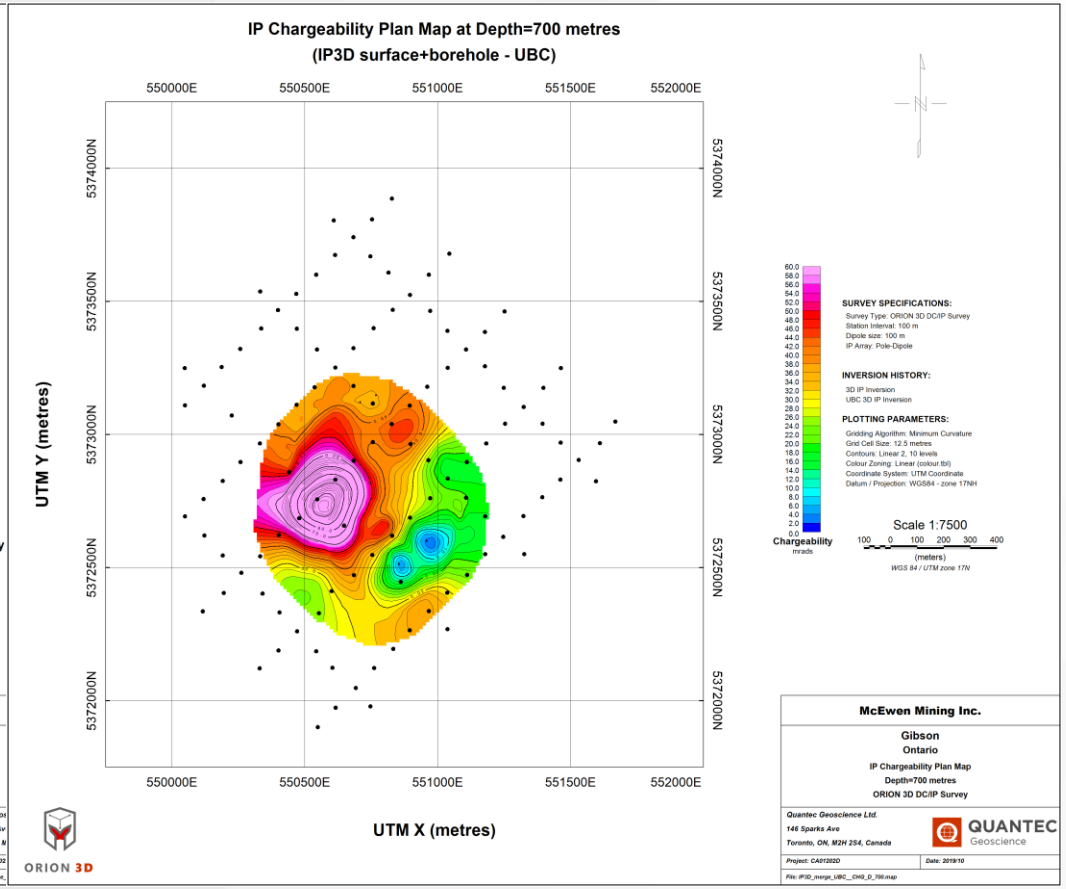


ORION3D-Depth= 700m – DC3D and IP3D models

Row 1: Merged DATA
at depth = 700m



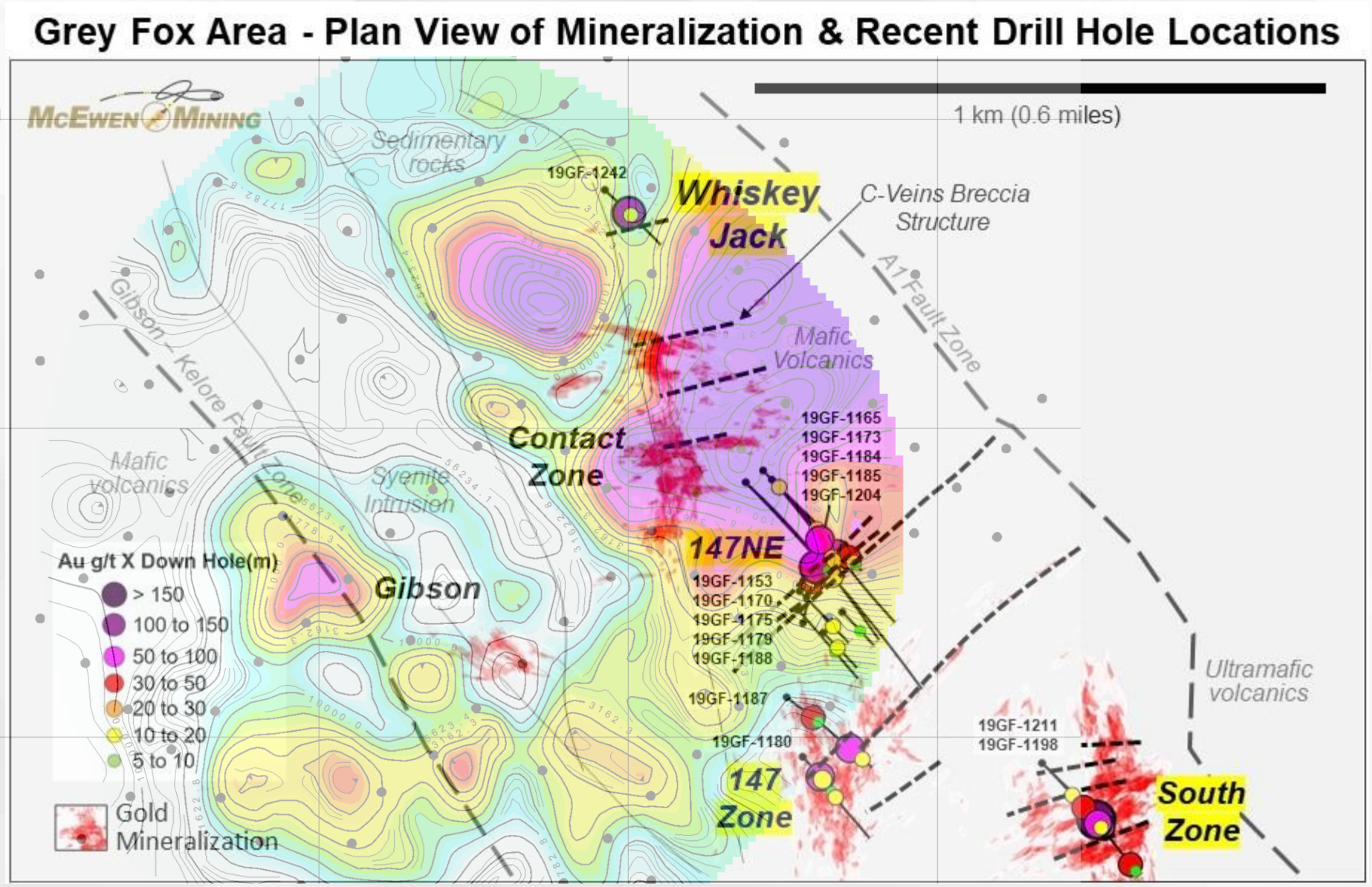




ORION 3D

Grey Fox Zone and Gibson Intrusive

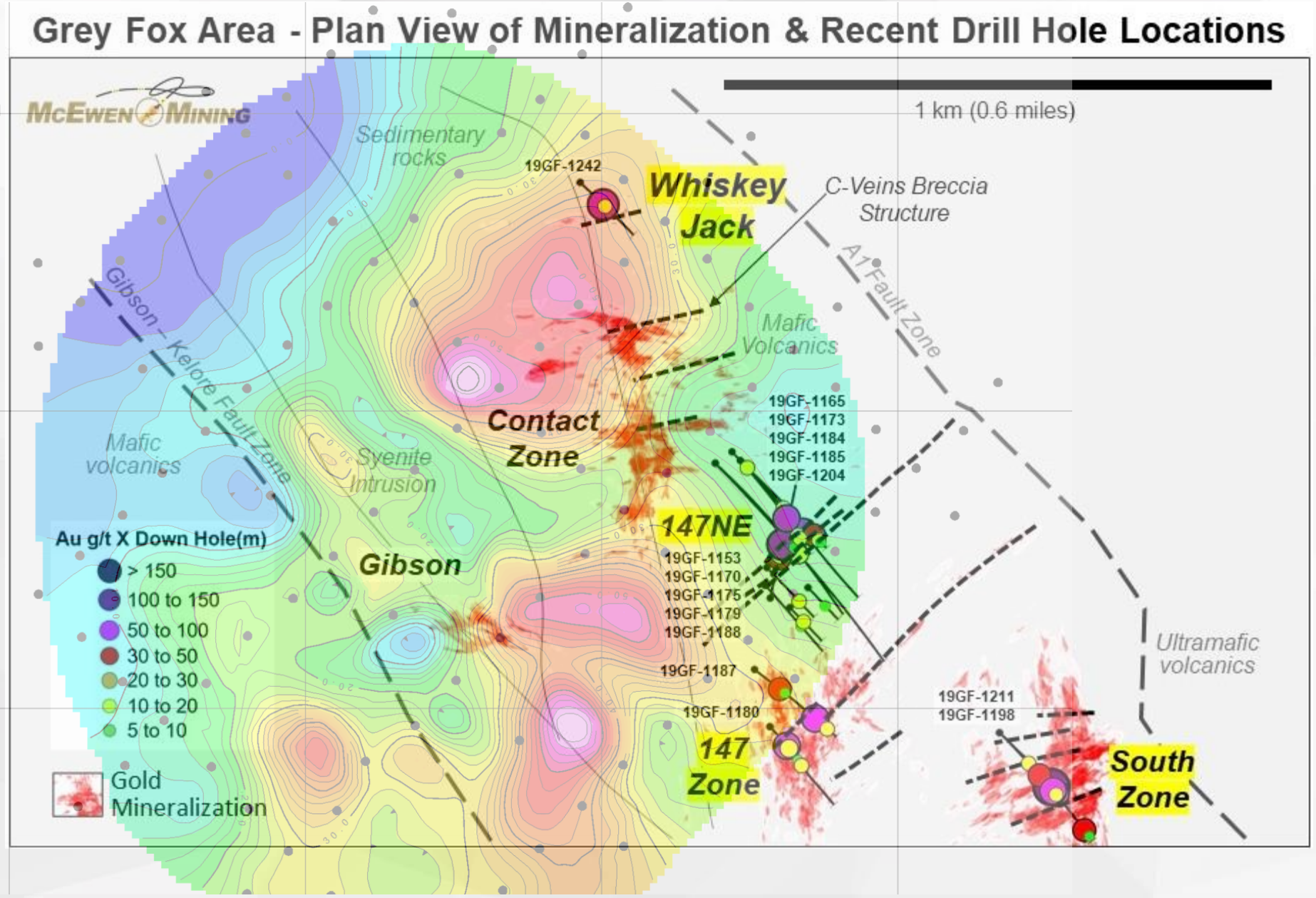
Resistivity
at depth = 500m



ORION 3D

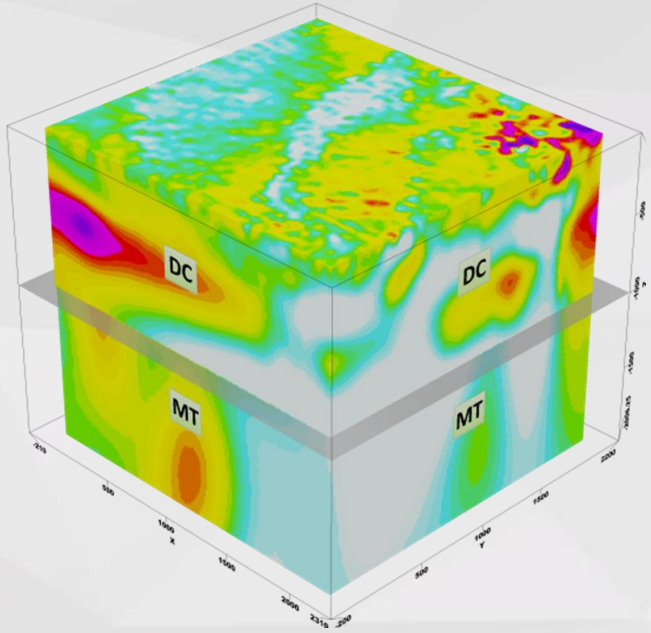
Grey Fox Zone and Gibson Intrusive mineralized zones

Chargeability
at depth = 500m



ORION 3D

ORION 3D



Because … the World is 3D

THANK YOU

Please submit any questions via the GoToWebinar chat box.