

# Geological Modelling Grieves Siding Project

Notes on the methods and outputs of modelling  
geological elements at the Grieves Siding project in  
western Tasmania for Kingfisher Exploration Pty Ltd

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Contributions: Sean Westbrook  
Date: February, 2017



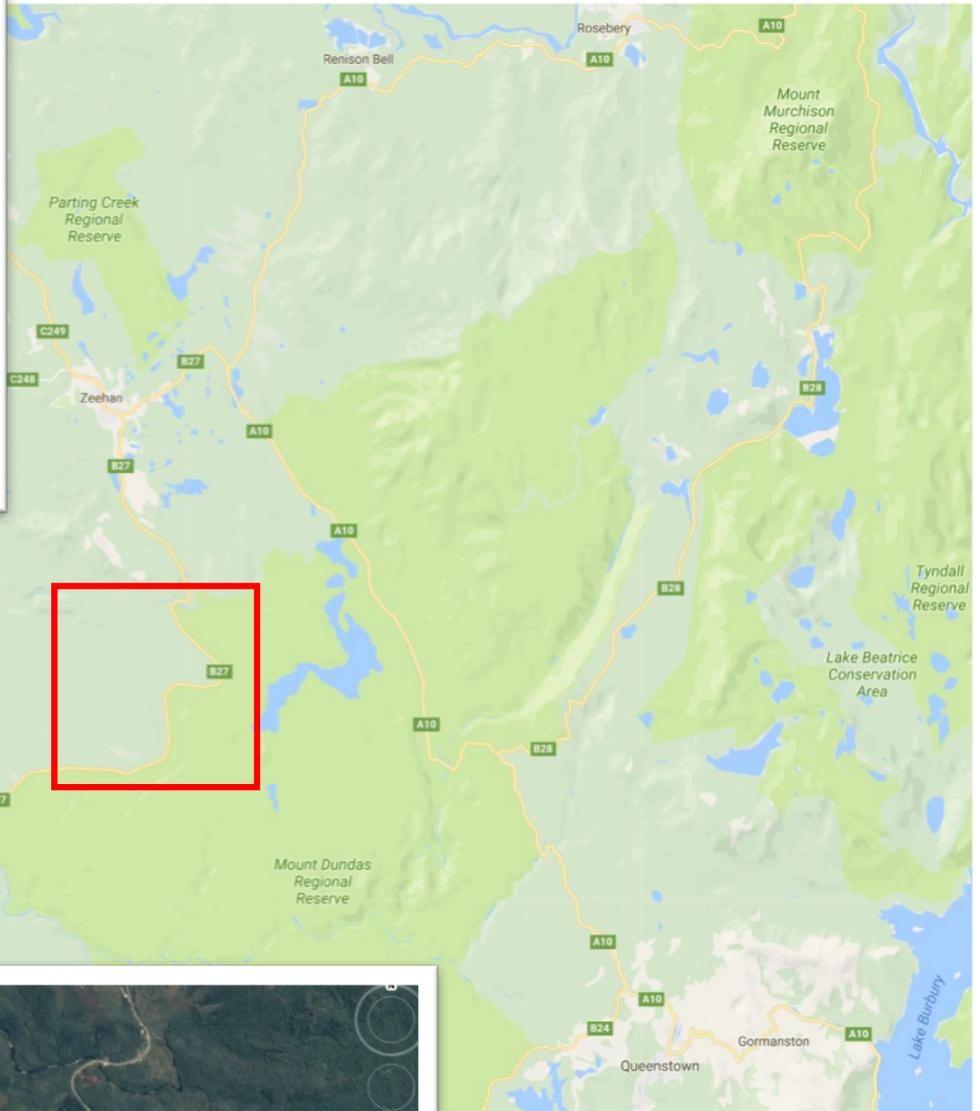
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Datgeo Sdn Bhd

## Location and Setting

Located 10km to the south of Zeehan in the west coast of Tasmania, the Grieves Siding zinc (Zn) project is in the vicinity of well-known large tin (Sn) Renison Bell and polymetallic (Zn-Pb-Cu-Ag-Au) Rosebery mines as well as historical mines Queenstown and Zeehan.

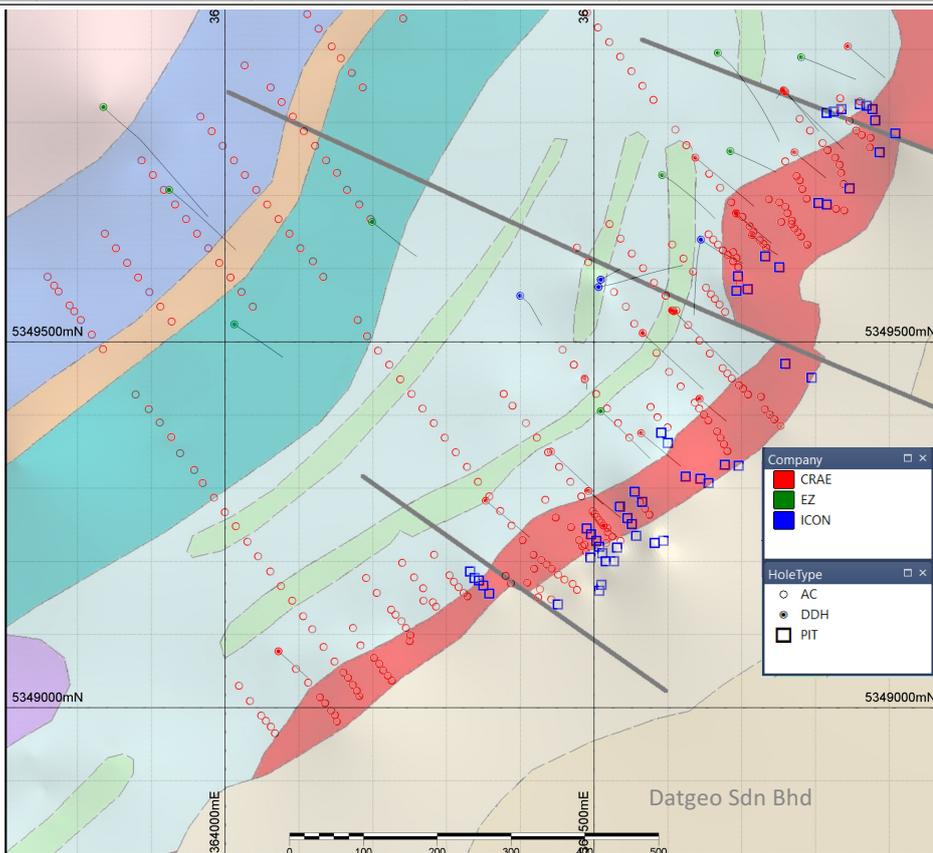
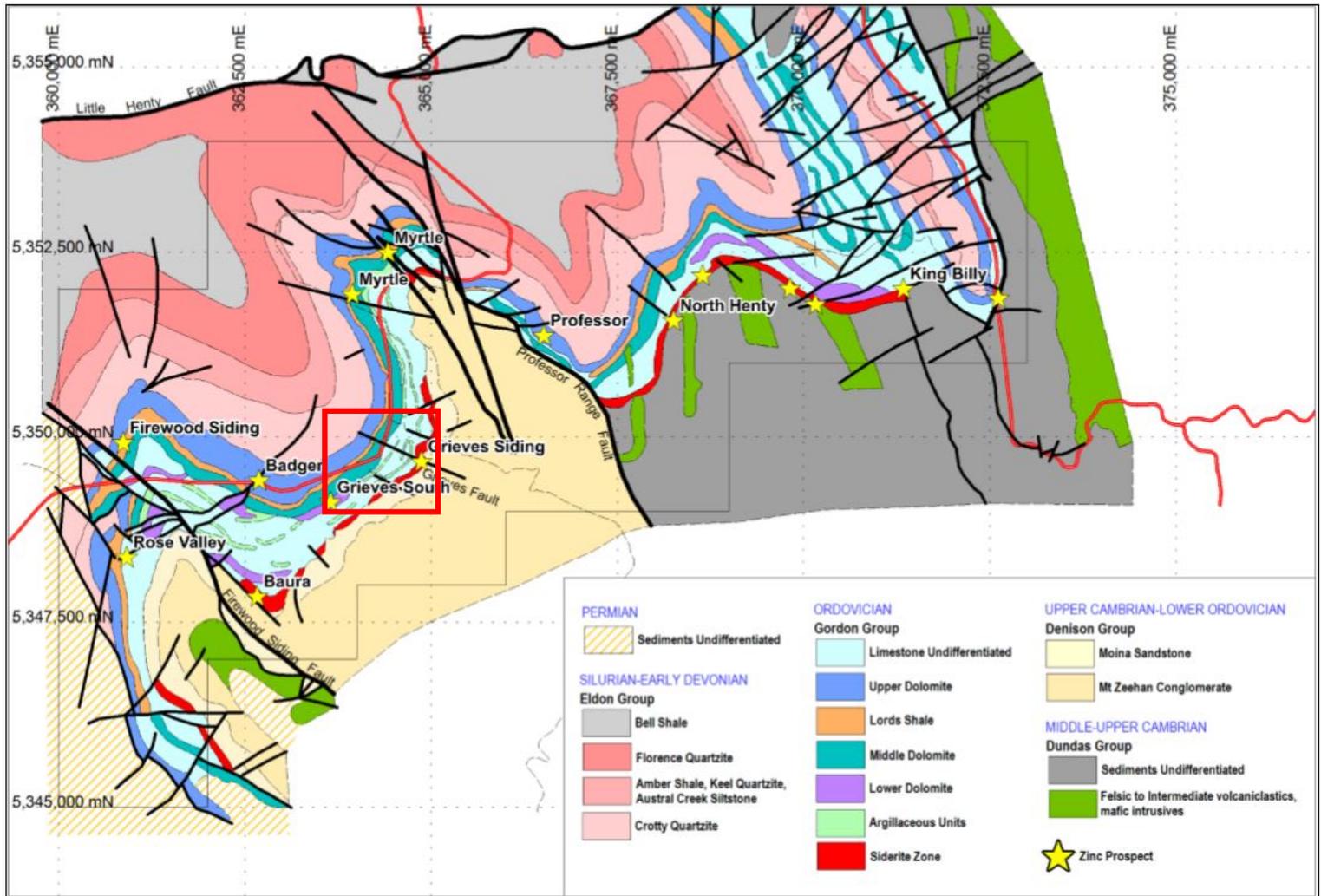


The Grieves Siding project is situated within a moderate to tightly folded northwest facing syncline. The host sequence forms a local topographic low, resulting in a shallow valley parallel to the district folding. The main mineralised area is located at the base of the escarpment.

Datgeo Sdn Bhd was contracted by Sean Westbrook of Kingfisher Exploration Pty Ltd to construct a geological model of the Grieves Siding zinc project. The aim of the project was to identify extensions to mineralisation plus planning of infill and extension drillholes.

## District and local geology

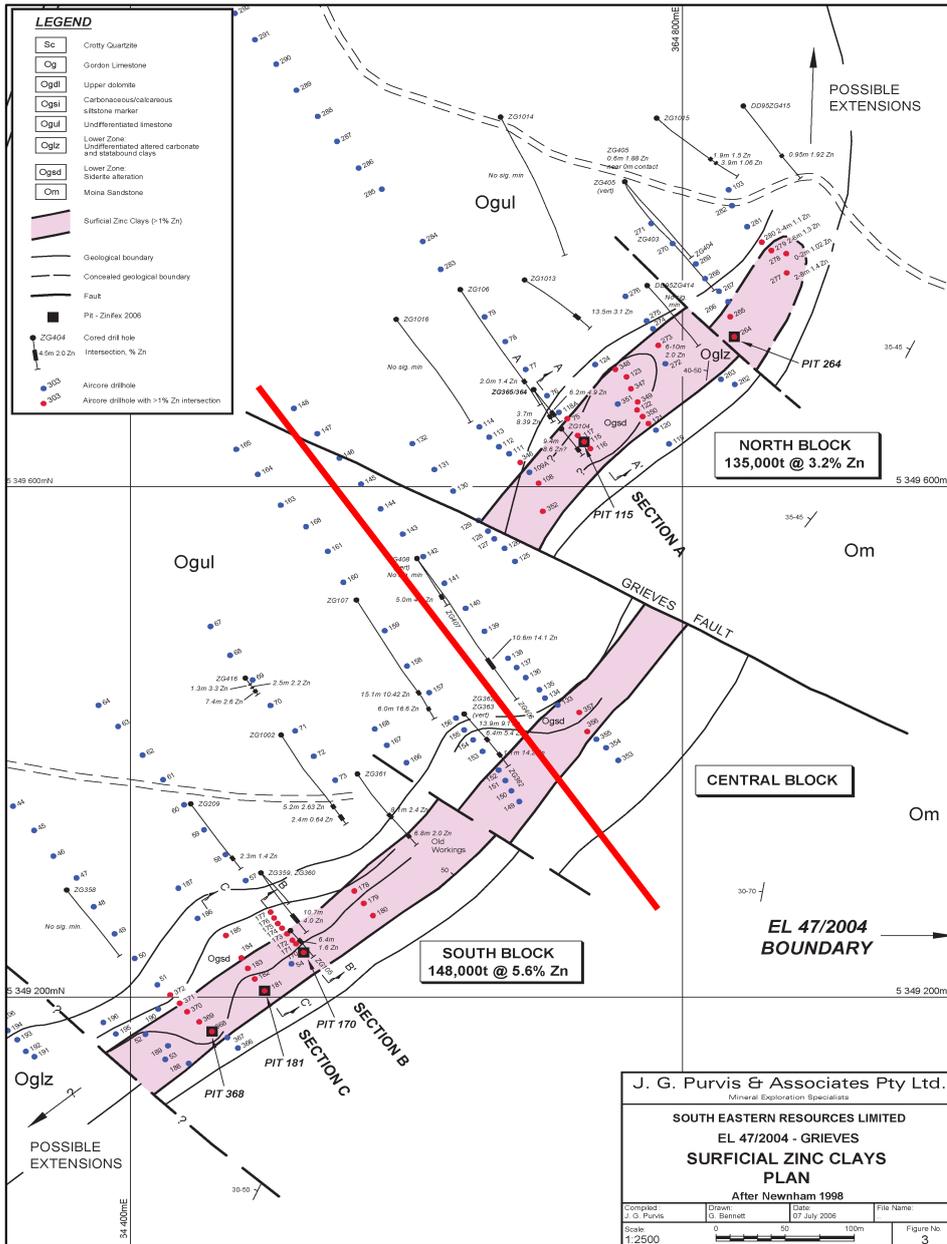
The Grieves Siding project is one of a number of zinc prospects within the same stratigraphic sequence. The mineralisation style is hosted at the base of a an Ordovician carbonate sequence. The mineralisation is associated with dolomitization and ferruginous carbonates.



Zinc mineralisation at Grieves Siding, and at other deposits in the district, occurs within a stratigraphic horizon known as the Siderite Zone, the basal unit of the Ordovician Gordon Group. The group is dominated by limestone and dolomite units. It is underlain by Cambrian-Ordovician conglomerate and sandstone and overlain by Silurian-Devonian quartzite and silt and shale.

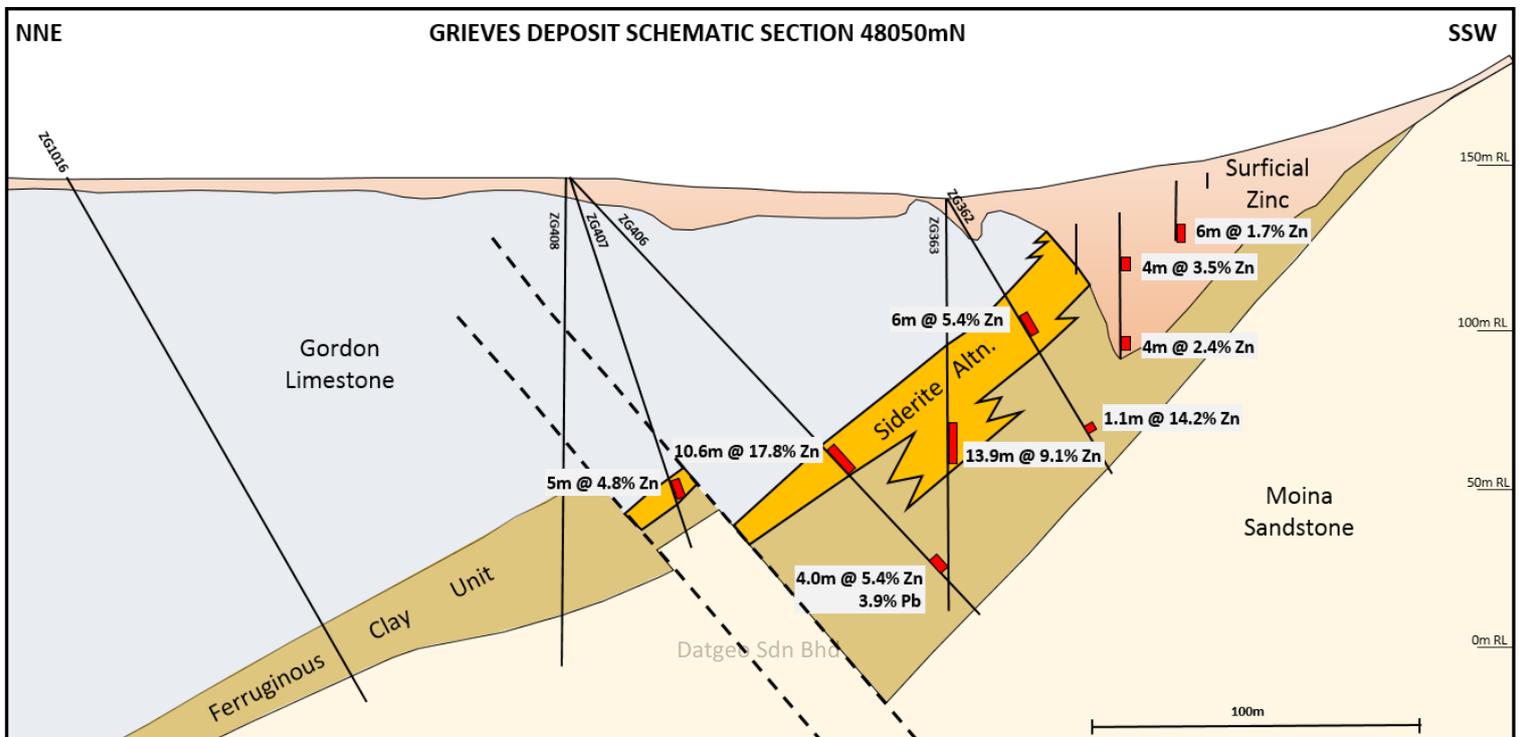
Within the project area there are also a series of northwest trending faults; the central one referred to as the Grieves Fault. The faults appear to locally displace the Siderite Zone but do not appear large scale. These faults may be related to axial planar district faulting.

# Potential Zinc Resources



Prior exploration has focussed on surficial zinc mineralisation. The surficial mineralisation does not extend to significant depth but has been tracked along much of the strike length of the deposit. Surficial mineralisation zones occupy the outcrop expression of the Siderite Zone. JORC-compliant Inferred Resources of 409,000 tonnes grading 3.9% Zn by Burrows (2005) and then again by Purvis (2006), based on more accurate bulk density data, to 283,000 tonnes grading 4.5 % Zn, 0.4% Pb.

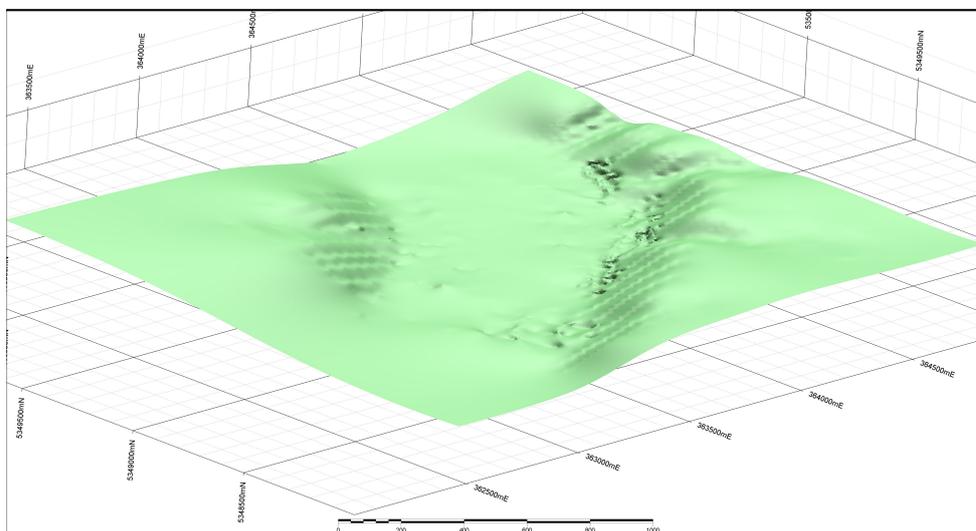
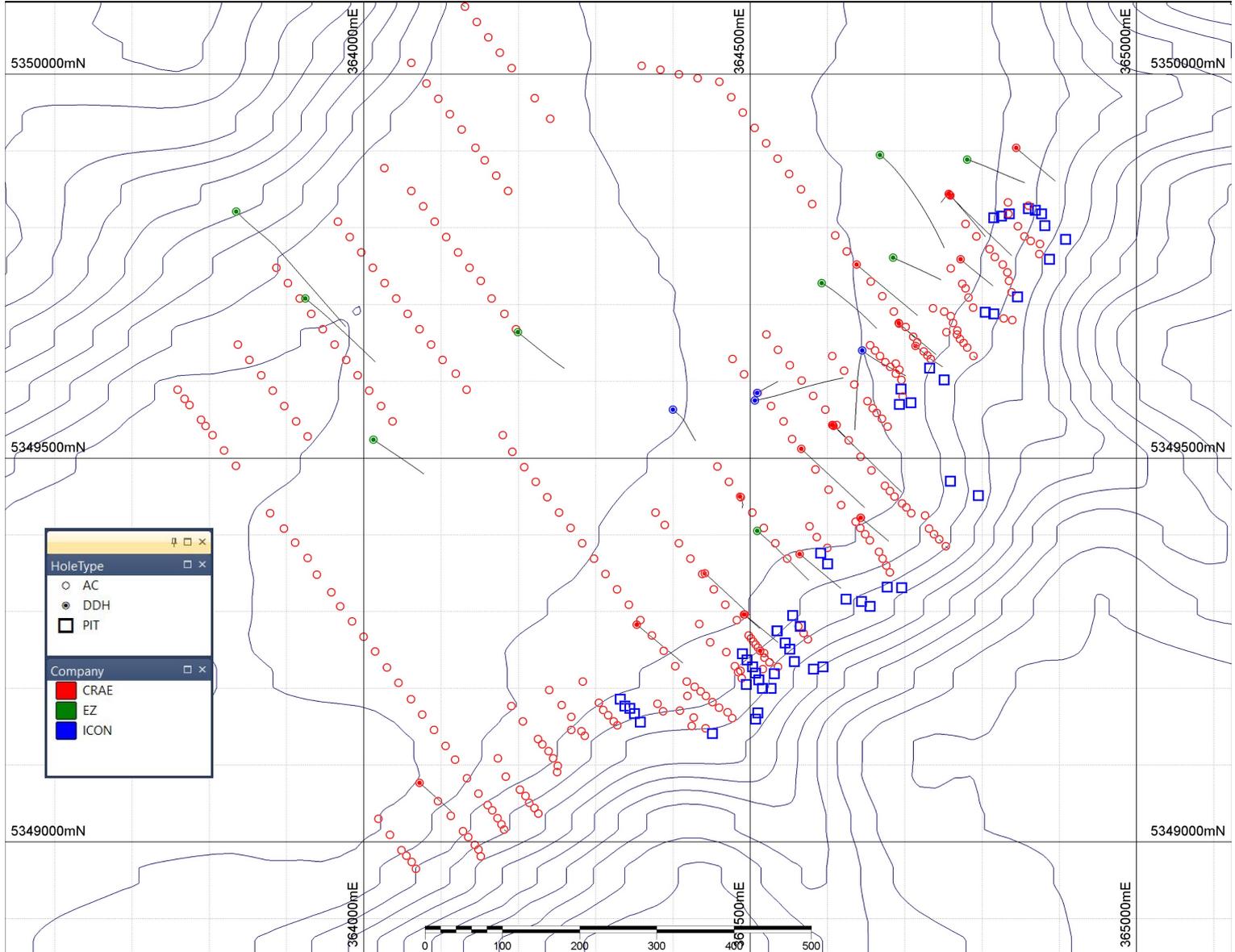
The primary mineralisation has only been reported as an exploration target by CRA. In their 1998 exploration activity report they suggest a potential primary mineralisation resource of 650,000-750,000 ore tonnes grading 7-9% Zn. The primary mineralisation is hosted within the Siderite Zone at the base of the Gordon Group. Primary mineralisation is also hosted in "ferruginous alteration" zones below and above the Siderite Zone.



# Project Datasets

DH\_Lithology\_DD  
grieves\_dh\_lithology  
collar  
grieves\_dh\_assay\_Xx (9)

The prospect has been drilled by three different companies using three different methods. The AC drilling was spaced 25m apart on 50-100m spaced lines. The drillholes have different logging and geochemical datasets for each generation and within generations. The drillhole data is all located using datum AMG66.



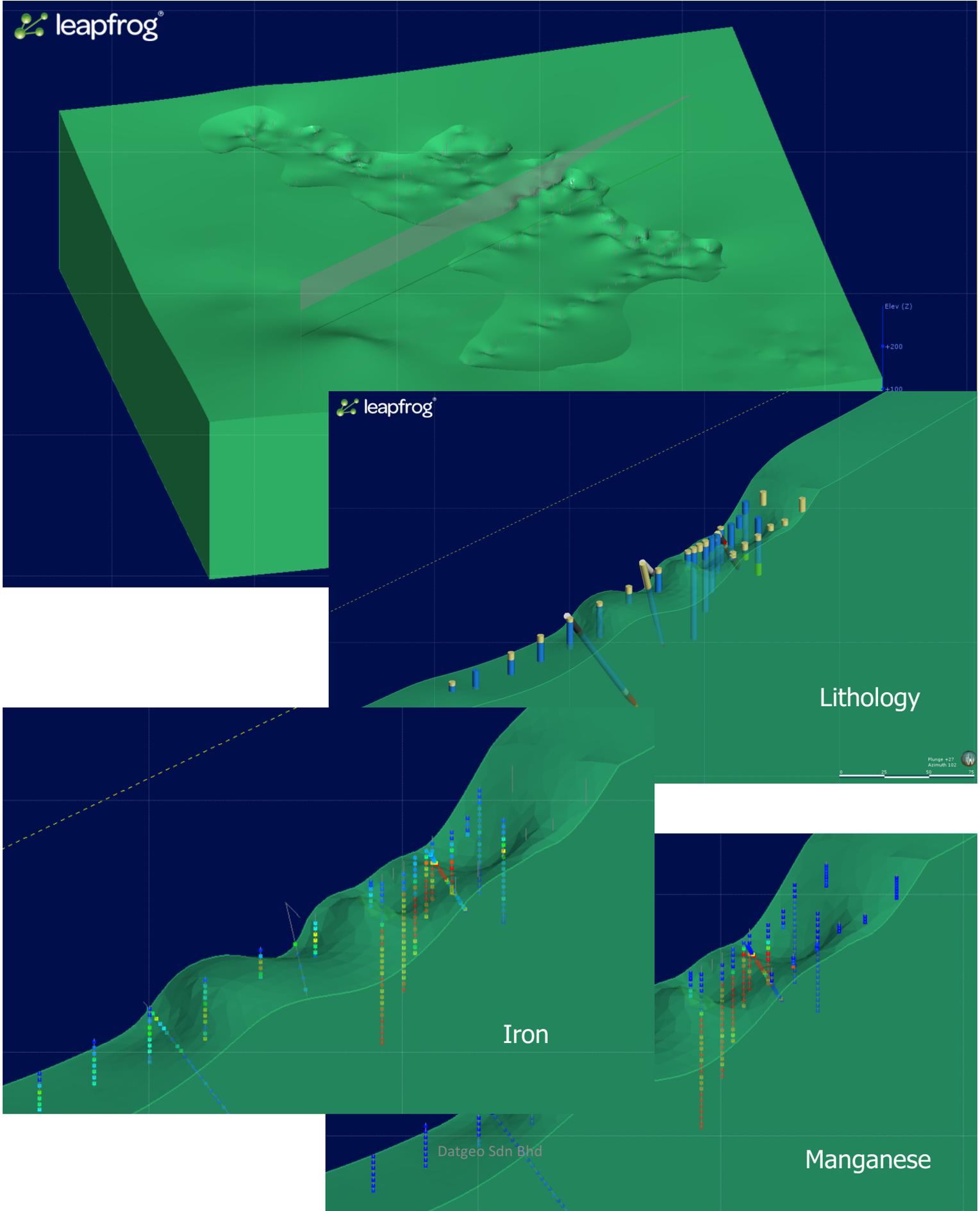
CRA exploration conducted an air-core (AC) program which covered the entire width of the Gordon Group. Later diamond coring focussed on the Siderite Zone.

The contours were combined with collar elevations to make a DTM. Dimpling at the drillhole collars showed that the two datasets were incompatible. A DTM constructed only from collar elevations has been used as the surface boundary.

# Primary Domains

DOM\_Bedrock  
DOM\_Surficial

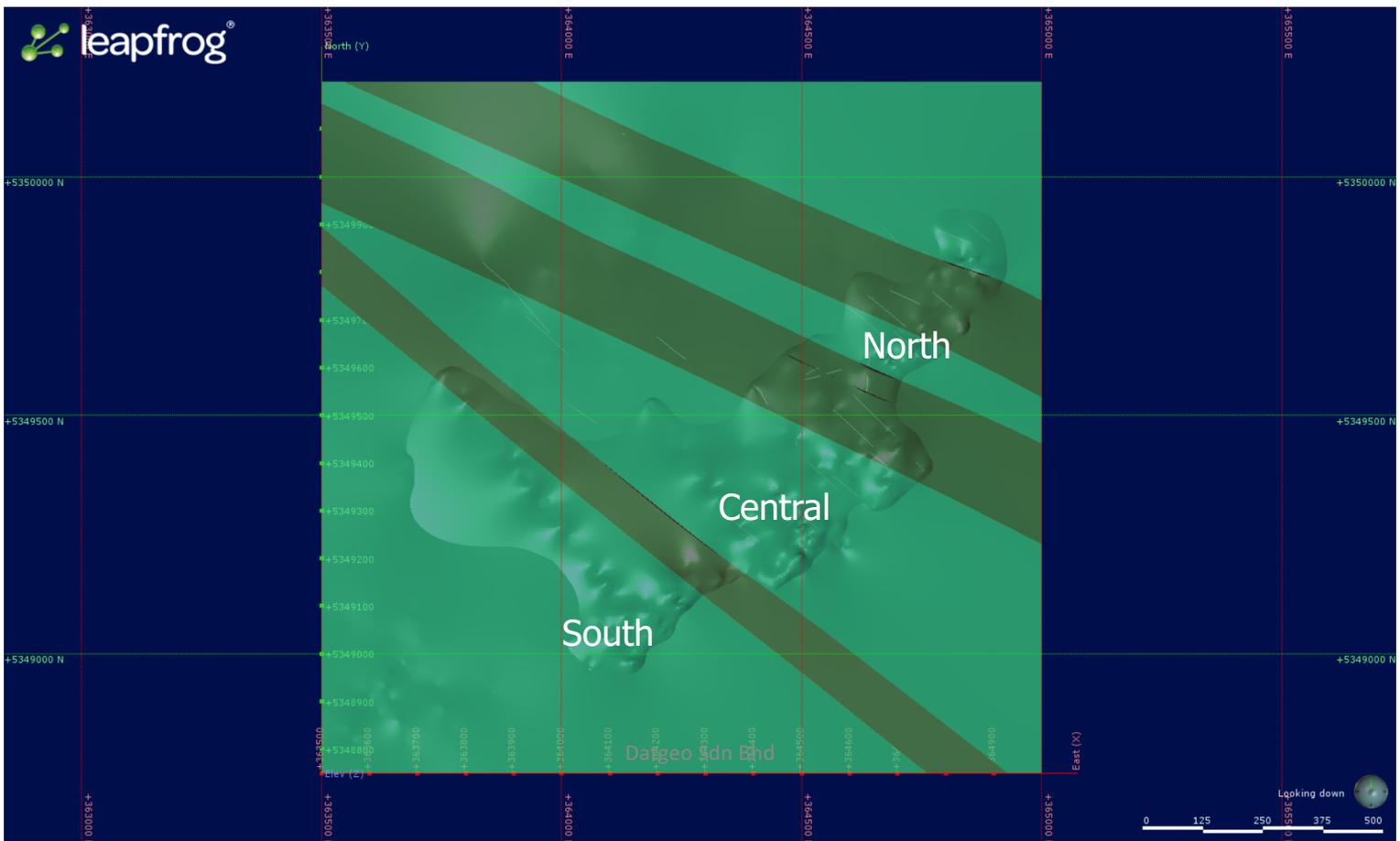
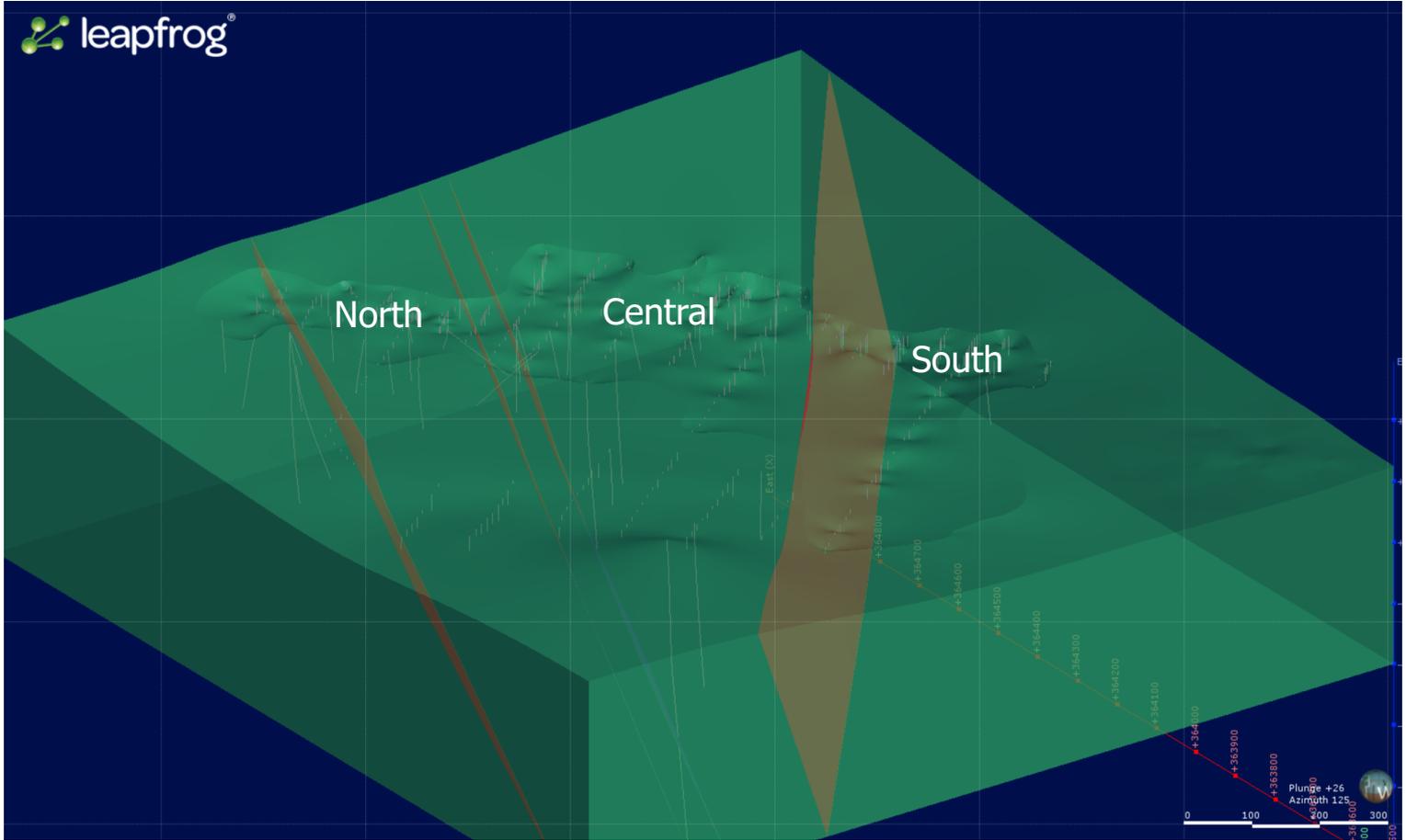
The drillhole data was initially subdivided into Surficial and Bedrock zones. Logging data did not differentiate the zones but a combination of Mn & Fe (lows) plus S (high) could generally distinguish the surficial from bedrock. The surficial-bedrock boundary was developed by section interpretations.



# Secondary Domains

- FaultGrievesPLAN\_BOT Trend Surface 0.0
- FaultGrievesPLAN\_TOP Trend Surface 0.0
- FaultNorthPLAN Trend Surface 0.0
- FaultSouthPLAN Trend Surface 0.0

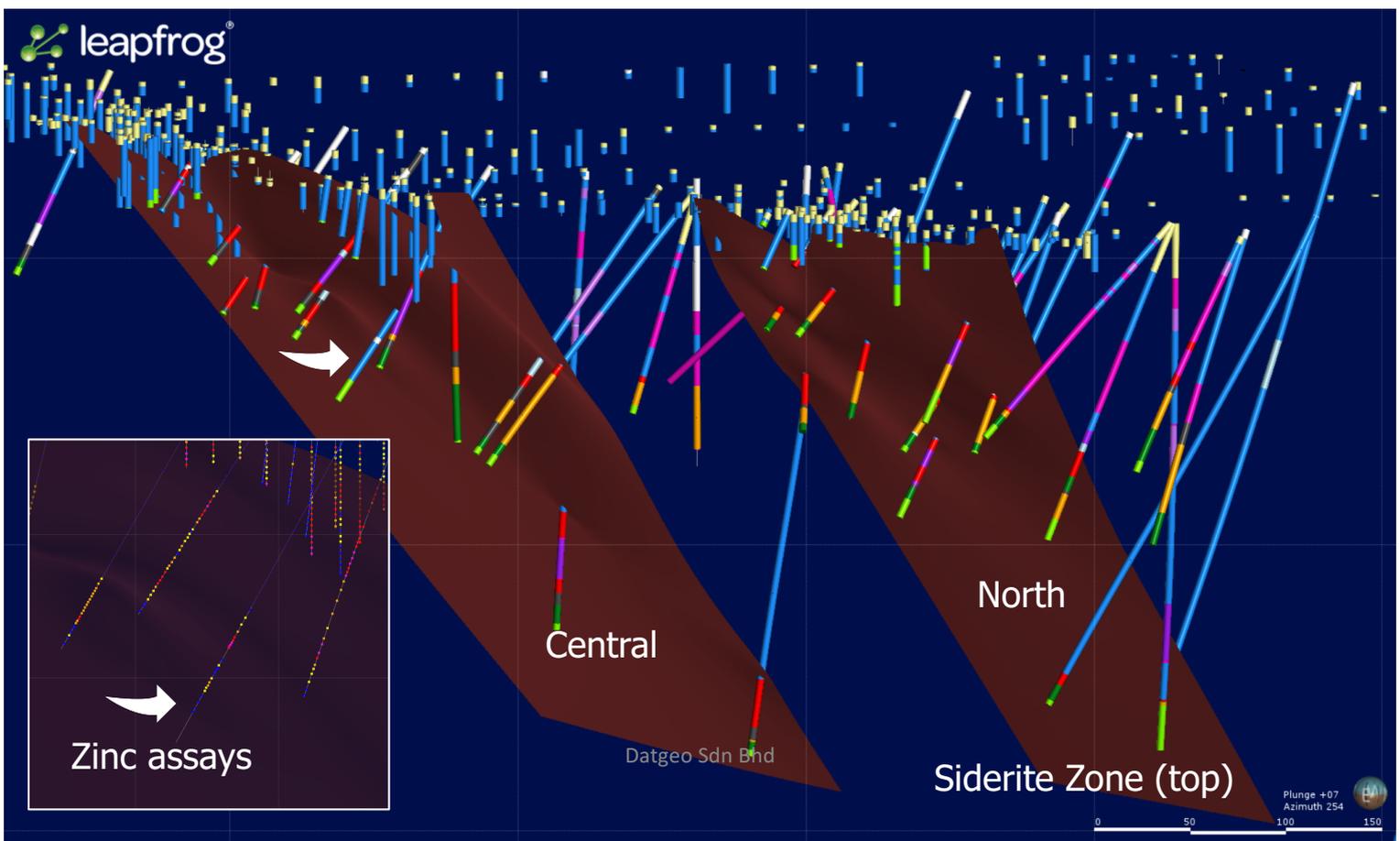
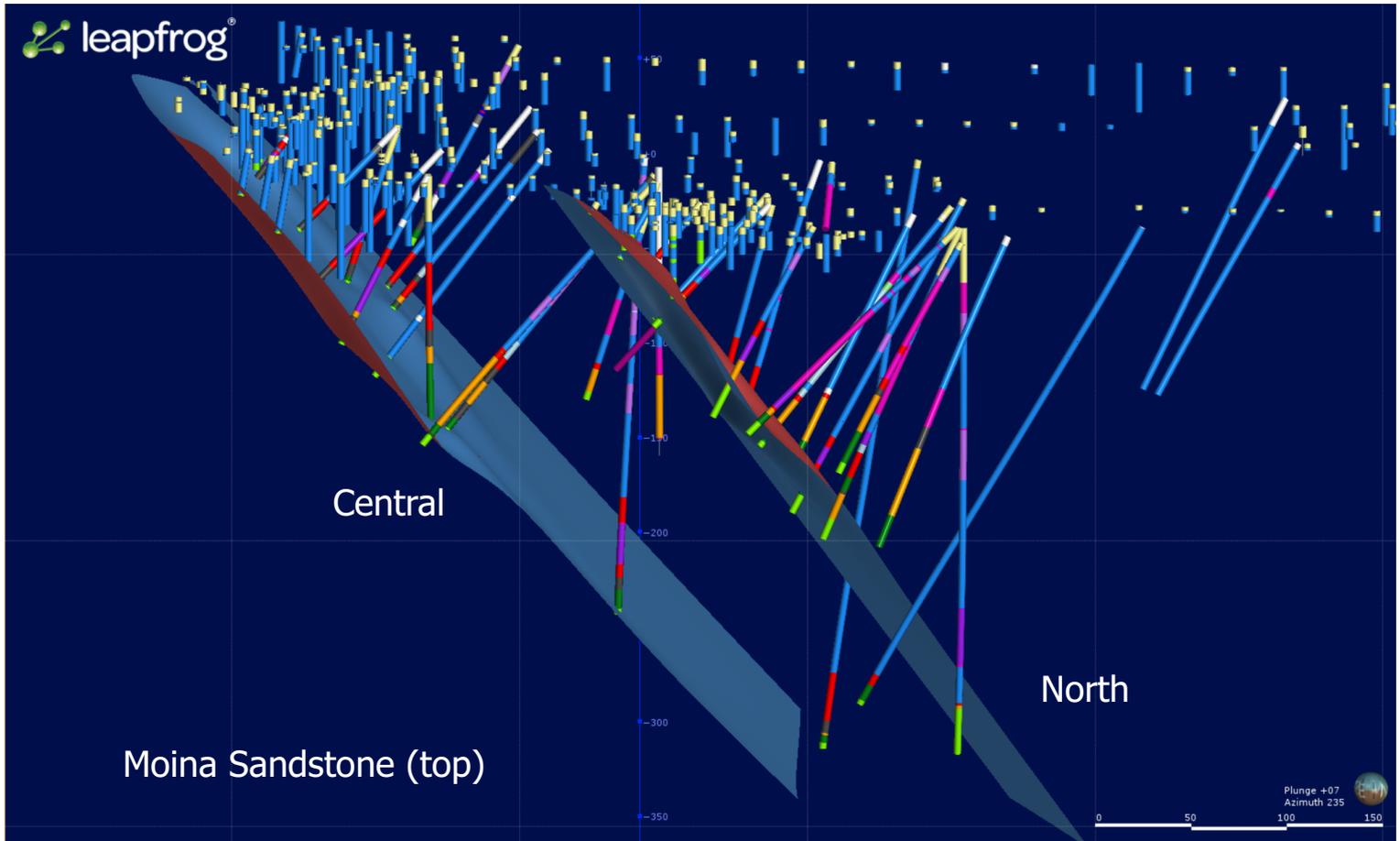
The bedrock domain was sub-divided via the various faults in the project area. The main Grieves Fault was interpreted as having a top and bottom surface based on sub-surface drilling lithology and geochemistry. The North and South Faults were given general attitudes based on surface maps and topographic features. The sub-domains are referred to as North Central and South.



# Marker Horizons

- CENTRAL\_Moina\_top Boundary
- CENTRAL\_Siderite\_top Boundary
- NORTH\_Moina\_top Boundary
- NORTH\_Siderite\_top Boundary

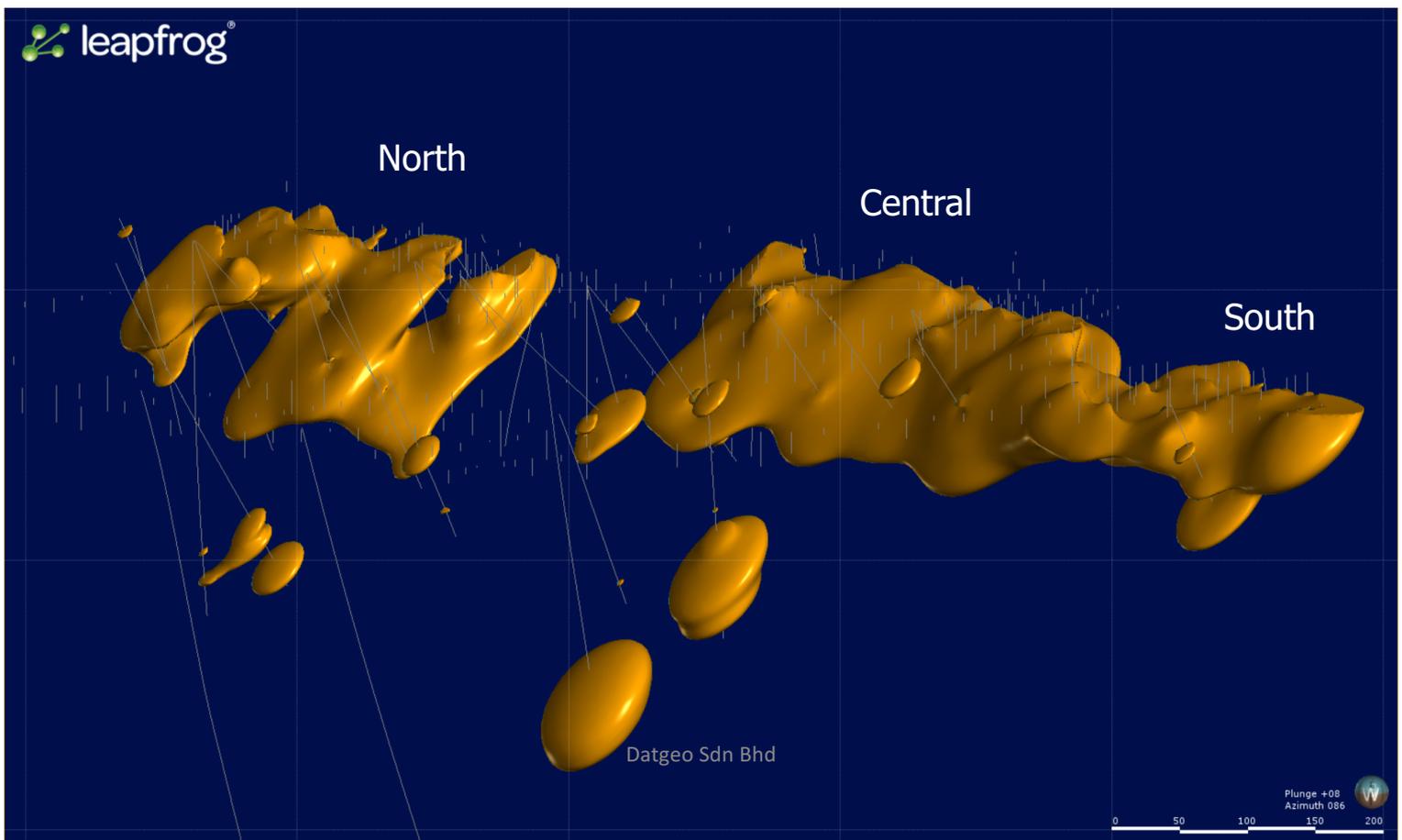
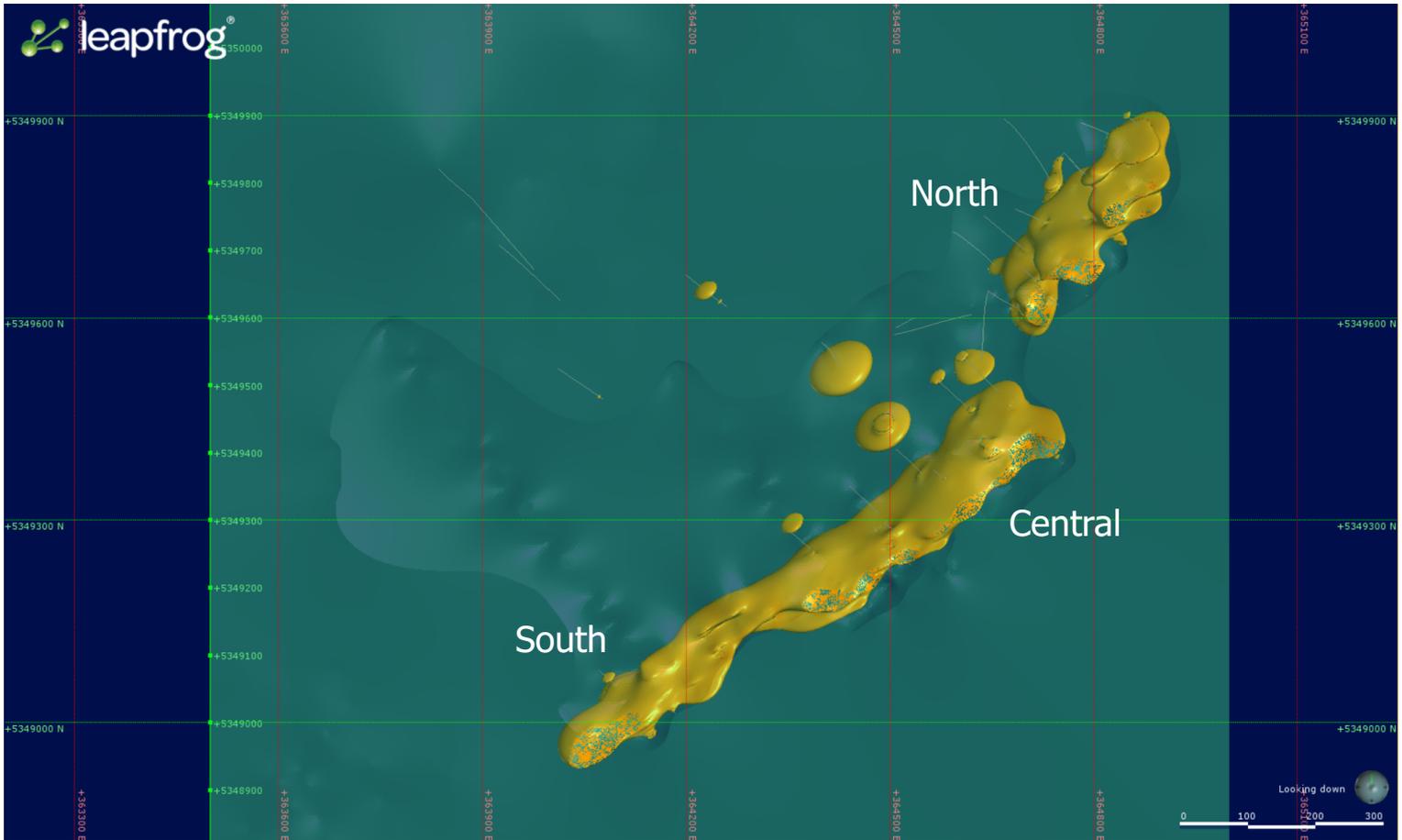
A surface for the top of the Moina Sandstone was modelled from lithology logs. The top of the Siderite Zone was more complex. The lithology logs were generally consistent with geochemistry, but in places the boundary was placed using geochemistry alone. The surfaces were traceable in the Central and North domains but not the South domain.



# Geochemistry (Mn)

Mn\_PPM (Spheroid 50, 325, 90; 3:3:1): Mn\_PPM 250.0  
Mn\_PPM (Spheroid 50, 325, 90; 3:3:1): Mn\_PPM 500.0  
Mn\_PPM (Spheroid 50, 325, 90; 3:3:1): Mn\_PPM 1000.0

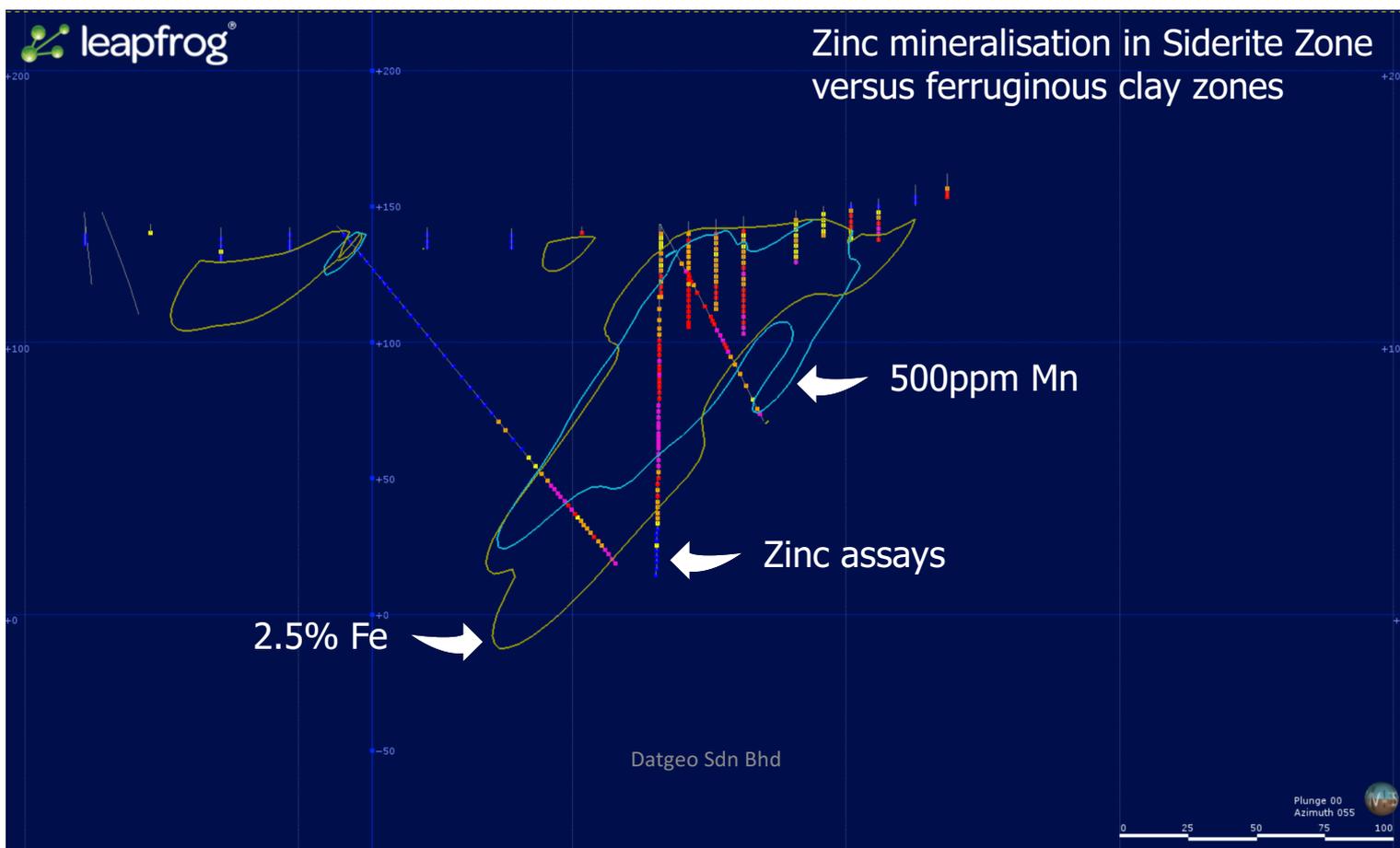
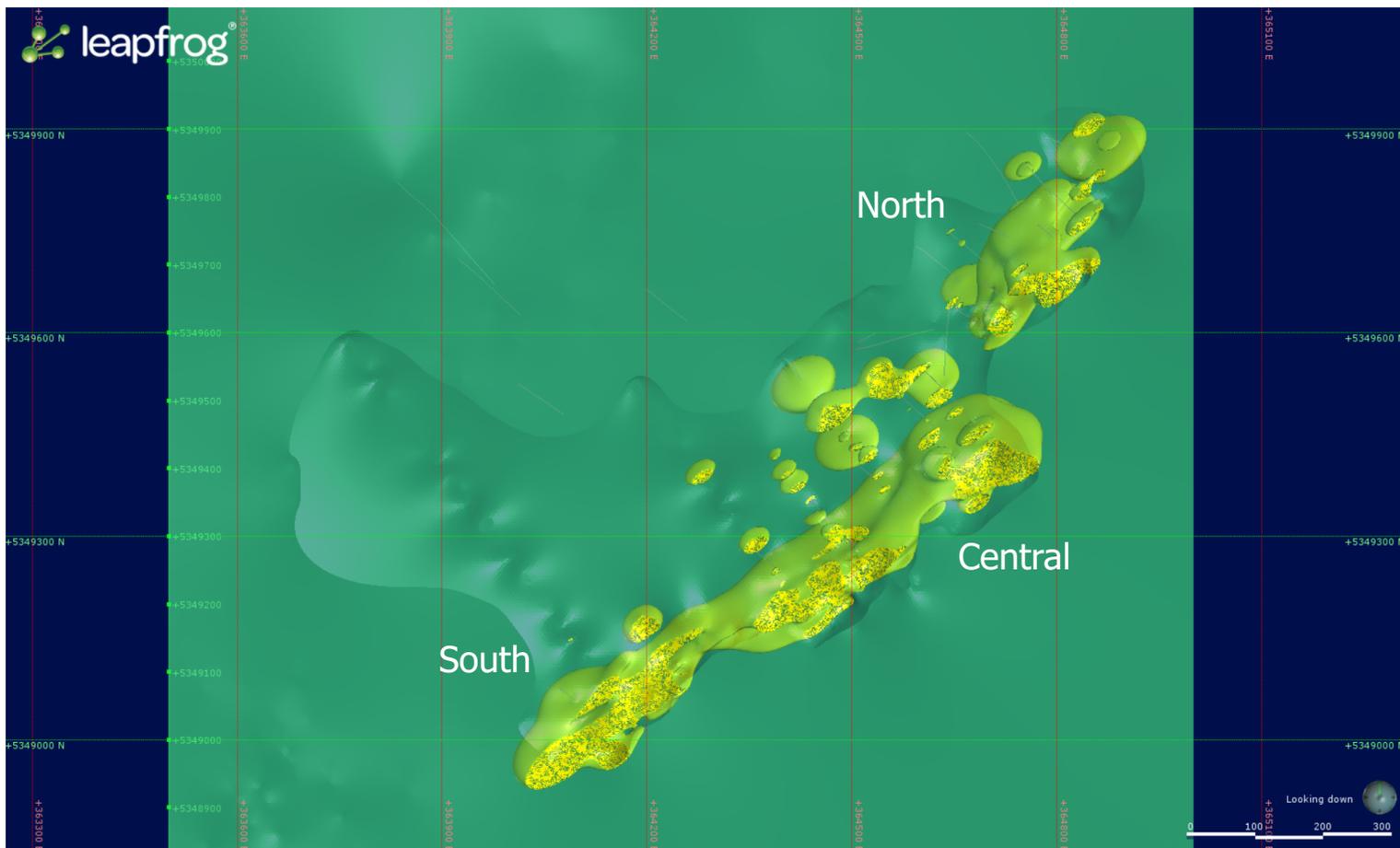
Isosurface wireframes were created for manganese (Mn) as it was considered an indicator of the Siderite Zone. The interpolant for the Mn isosurfaces are global rather than domain-based. The interpolation used a spheroidal variogram with a primary axis trending 50° towards 325° and an anisotropic ratio of 3:3:1. The wireframe of 500ppm Mn is consistent with the Grieves Fault Zone.



# Geochemistry (Fe)

Fe\_pc (Spheroid 50, 325, 90; 3:3:1): Fe\_pc 2.5  
Fe\_pc (Spheroid 50, 325, 90; 3:3:1): Fe\_pc 5.0  
Fe\_pc (Spheroid 50, 325, 90; 3:3:1): Fe\_pc 10.0

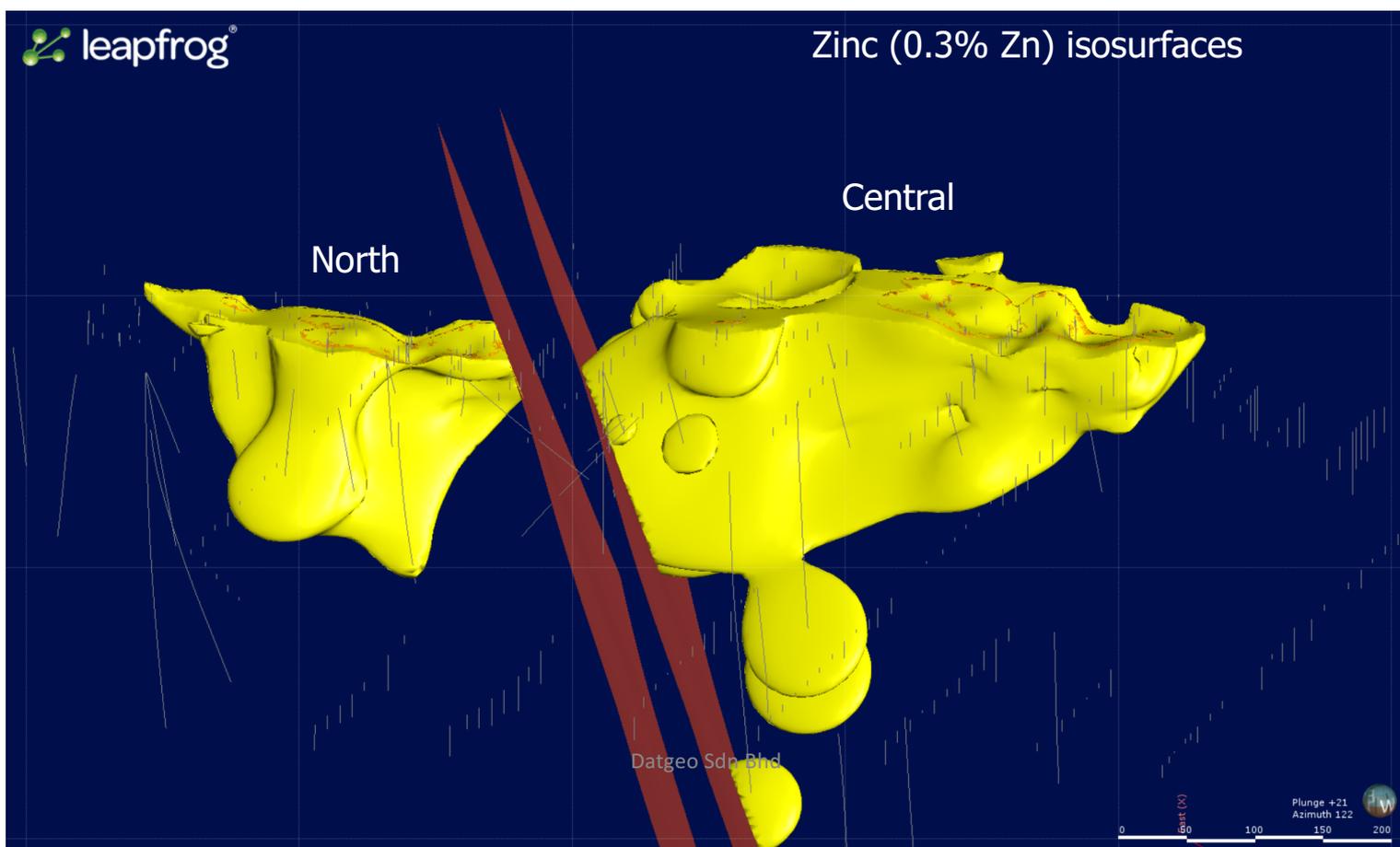
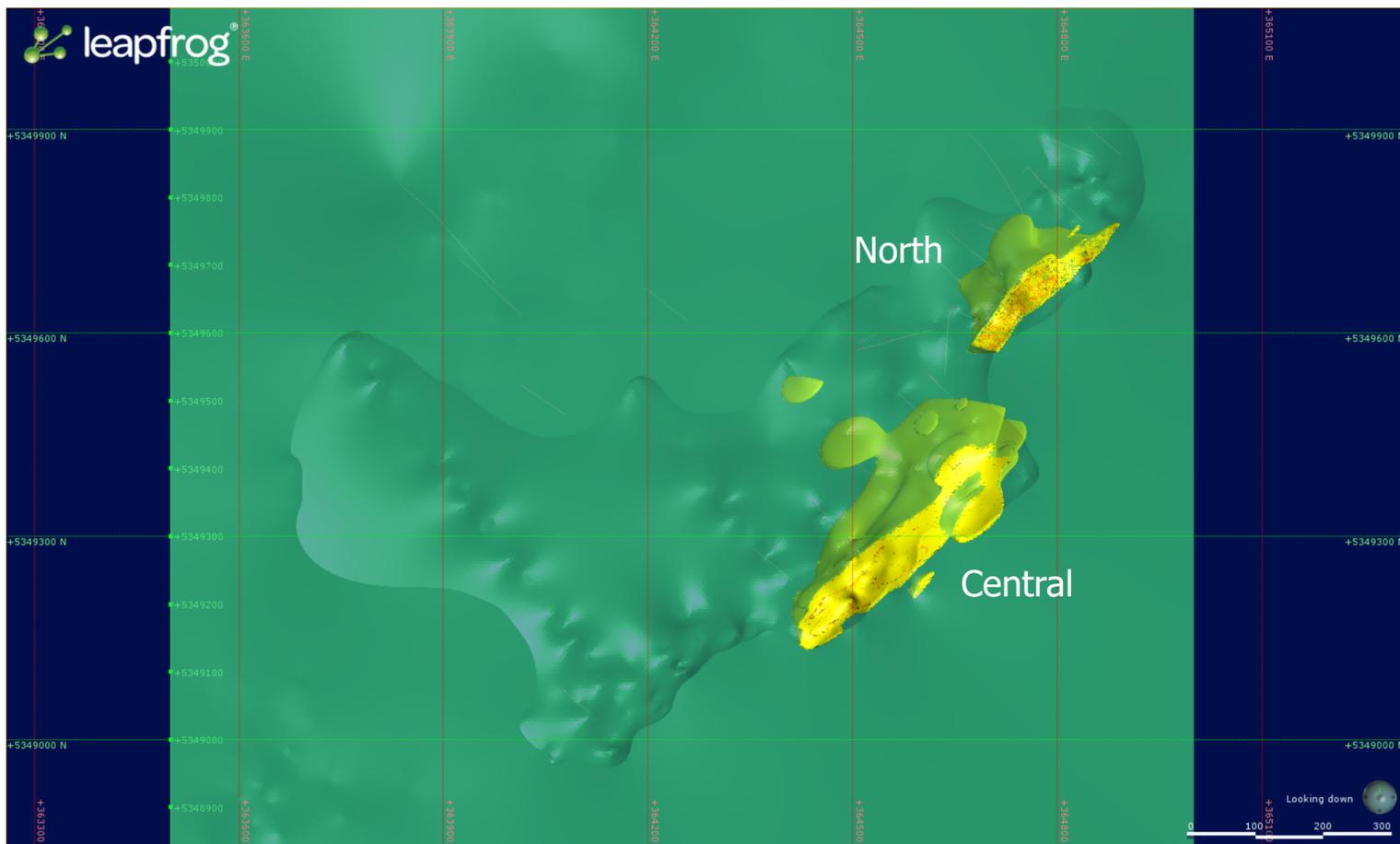
Isosurface wireframes were created for iron (Fe) to compare with Mn to discriminate zinc mineralisation in the Siderite Zone from ferruginous clay zones. The interpolant for the Fe isosurfaces is global rather than domain-based. The interpolation used an interpolation process the same as for Mn. The wireframe of 2.5% Fe is consistent with the Grieves Fault Zone location.



# Geochemistry (Zn)

- Zn\_pc in CentralZone (): Zn\_pc in CentralZone 0.3
- Zn\_pc in CentralZone (): Zn\_pc in CentralZone 1.0
- Zn\_pc in CentralZone (): Zn\_pc in CentralZone 3.0
- Zn\_pc in NorthZone (): Zn\_pc in NorthZone 0.3
- Zn\_pc in NorthZone (): Zn\_pc in NorthZone 1.0
- Zn\_pc in NorthZone (): Zn\_pc in NorthZone 3.0

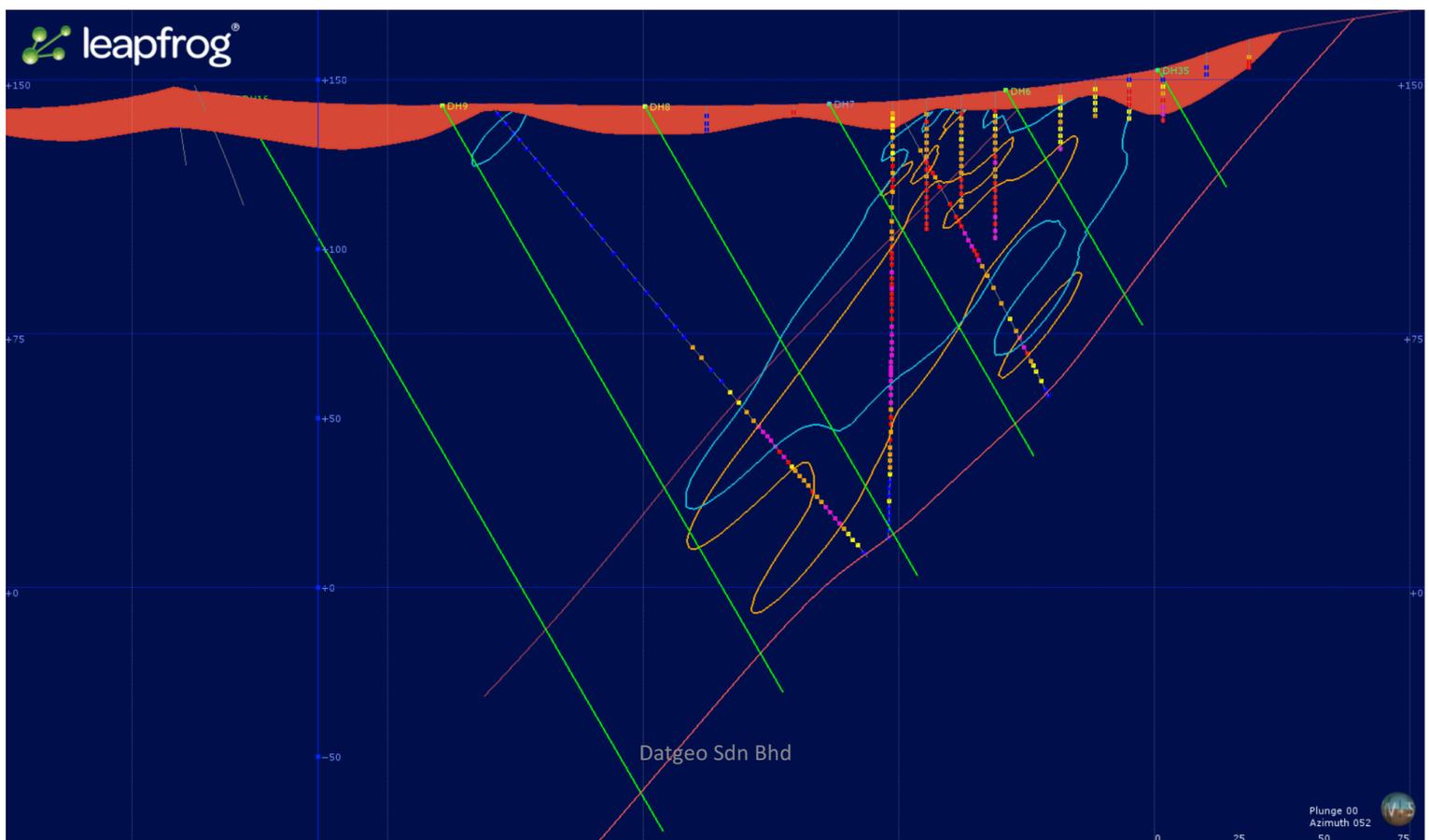
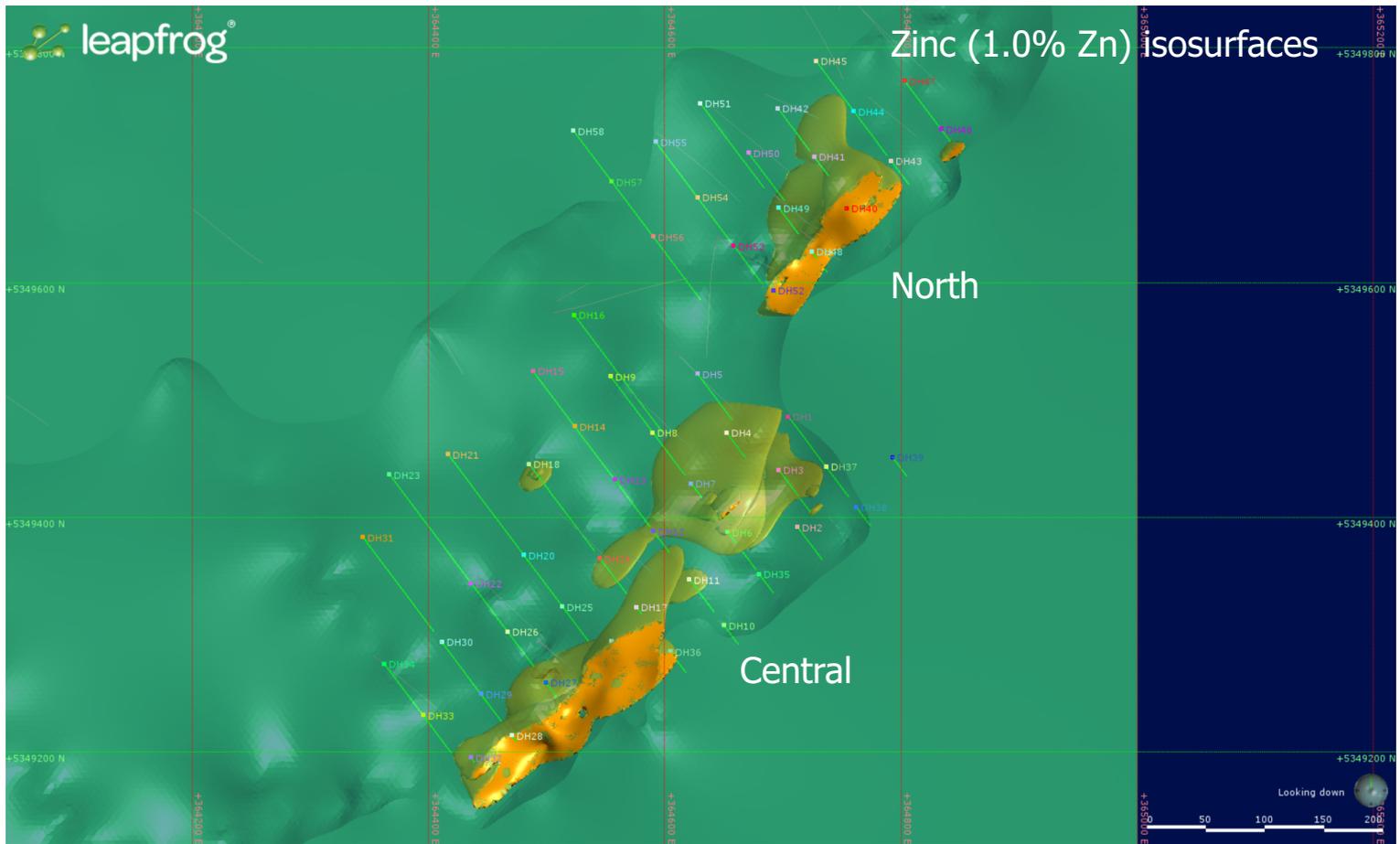
Isosurface wireframes were created for zinc (Zn) independently in the Central and North domains. The interpolation used a spheroidal variogram, anisotropy ratios of 5:5:1 and individual axis orientations of 51° toward 318° (Central), and 55° toward 310° (North).



# Drillhole Planning

DH\_Grieves\_Plan\_201701\_collars  
DH\_Grieves\_Plan\_201701\_Surpac

Drillhole planning focussed on the Central and North domains. Drillholes were planned to infill and confirm existing drilling, including near-surface mineralisation, as well as extensions to depth, particularly near to the Grieves Fault Zone. Drillholes were planned at 60° dip, 143° azimuth and 50m down-dip spacing



# Drillhole Planning

DH\_Grieves\_Plan\_201701\_collars.csv

A spreadsheet was supplied to Kingfisher Exploration Pty Ltd with the collar coordinates for each drillhole as well as the drillhole length, azimuth and inclination.

EAST	NORTH	RL	Holeid	Length	Azimuth	Inclination
364,704.5	5,349,486.4	148.6	DH1	120	143.25	-60
364,712.3	5,349,392.4	154.1	DH2	70	143.25	-60
364,696.4	5,349,441.0	142.8	DH3	90	143.25	-60
364,652.4	5,349,472.7	143.8	DH4	130	143.25	-60
364,627.6	5,349,523.0	144.1	DH5	180	143.25	-60
364,653.2	5,349,388.0	146.7	DH6	80	143.25	-60
364,622.2	5,349,429.6	142.8	DH7	120	143.25	-60
364,589.8	5,349,472.9	142.0	DH8	160	143.25	-60
364,554.2	5,349,520.6	142.2	DH9	200	143.25	-60
364,650.2	5,349,308.5	162.0	DH10	40	143.25	-60
364,620.9	5,349,347.8	152.7	DH11	70	143.25	-60
364,590.2	5,349,388.8	146.5	DH12	110	143.25	-60
364,557.6	5,349,432.5	142.8	DH13	150	143.25	-60
364,523.6	5,349,478.0	140.2	DH14	190	143.25	-60
364,488.3	5,349,525.3	142.0	DH15	230	143.25	-60
364,523.5	5,349,572.9	144.5	DH16	250	143.25	-60
364,576.2	5,349,324.0	155.7	DH17	80	143.25	-60
364,485.1	5,349,446.0	141.3	DH18	185	143.25	-60
364,555.0	5,349,295.0	152.0	DH19	70	143.25	-60
364,480.7	5,349,368.3	143.6	DH20	145	143.25	-60
364,416.4	5,349,454.5	140.1	DH21	225	143.25	-60
364,436.1	5,349,344.5	143.5	DH22	145	143.25	-60
364,367.0	5,349,437.0	141.0	DH23	230	143.25	-60
364,545.0	5,349,365.8	146.2	DH24	110	143.25	-60
364,513.3	5,349,324.6	147.0	DH25	100	143.25	-60
364,466.9	5,349,303.3	144.6	DH26	100	143.25	-60
364,499.2	5,349,260.0	148.1	DH27	70	143.25	-60
364,470.5	5,349,214.9	152.4	DH28	50	143.25	-60
364,444.2	5,349,250.1	147.2	DH29	75	143.25	-60
364,411.1	5,349,294.4	143.9	DH30	120	143.25	-60
364,344.5	5,349,383.5	139.8	DH31	200	143.25	-60
364,435.7	5,349,196.0	152.2	DH32	50	143.25	-60
364,395.2	5,349,232.1	146.7	DH33	80	143.25	-60
364,362.4	5,349,276.0	143.1	DH34	125	143.25	-60
364,680.0	5,349,352.2	152.8	DH35	40	143.25	-60
364,604.4	5,349,286.2	161.0	DH36	45	143.25	-60
364,736.3	5,349,443.8	154.2	DH37	65	143.25	-60
364,762.1	5,349,409.3	163.6	DH38	40	143.25	-60
364,792.9	5,349,451.7	164.6	DH39	40	143.25	-60
364,753.7	5,349,664.0	154.2	DH40	45	143.25	-60
364,726.3	5,349,708.0	150.8	DH41	90	143.25	-60
364,695.8	5,349,748.8	150.1	DH42	140	143.25	-60
364,791.5	5,349,704.2	155.0	DH43	50	143.25	-60
364,760.0	5,349,746.5	152.5	DH44	95	143.25	-60
364,727.8	5,349,789.5	153.0	DH45	140	143.25	-60
364,833.7	5,349,731.3	156.9	DH46	50	143.25	-60
364,802.9	5,349,772.5	155.1	DH47	100	143.25	-60
364,724.2	5,349,627.2	152.0	DH48	45	143.25	-60
364,696.6	5,349,664.2	150.3	DH49	90	143.25	-60
364,670.9	5,349,711.0	148.6	DH50	135	143.25	-60
364,630.1	5,349,753.3	149.0	DH51	180	143.25	-60
364,692.1	5,349,593.9	151.2	DH52	45	143.25	-60
364,658.4	5,349,631.8	146.3	DH53	80	143.25	-60
364,627.5	5,349,673.2	146.9	DH54	130	143.25	-60
364,592.3	5,349,720.3	147.1	DH55	180	143.25	-60
364,590.0	5,349,639.9	146.4	DH56	135	143.25	-60
364,555.2	5,349,686.4	145.9	DH57	180	143.25	-60
364,522.8	5,349,729.9	146.7	DH58	230	143.25	-60

## Project Output

The results of the modelling are provided in a Leapfrog Scene which can be viewed using the freely available Leapfrog Viewer (<http://www.leapfrog3d.com/products/leapfrog-viewer/downloads>).

Item	Description
DH_Lithology_DD	Completed drillhole traces annotated with Lith_BMR logging code
grieves_dh_lithology	Completed drillhole traces without any annotation
collar	Completed drillhole collar locations with Hole ID label
DH_Grieves_Plan_201701_collars	Planned drillhole collar locations with Hole ID label
grieves_dh_assay_Ag	Completed drillhole sample centroids with silver grades
grieves_dh_assay_Ba	Completed drillhole sample centroids with barium grades
grieves_dh_assay_Ca	Completed drillhole sample centroids with calcium grades
grieves_dh_assay_Fe	Completed drillhole sample centroids with iron grades
grieves_dh_assay_Mg	Completed drillhole sample centroids with magnesium grades
grieves_dh_assay_Mn	Completed drillhole sample centroids with manganese grades
grieves_dh_assay_Pb	Completed drillhole sample centroids with lead grades
grieves_dh_assay_S	Completed drillhole sample centroids with sulphur grades
grieves_dh_assay_Zn	Completed drillhole sample centroids with zinc grades
DH_Grieves_Plan_201701_Surpac	Planned drillhole traces
CENTRAL_Moina_top Boundary	Wireframe surface for top of Moina Sandstone in Central domain
CENTRAL_Siderite_top Boundary	Wireframe surface for top of Siderite Zone in Central domain
DOM_Bedrock	Solid wireframe of in situ bedrock
DOM_Surficial	Solid wireframe of surficial material including clay and alluvial
FaultGrievesPLAN_BOT Trend Surface 0.0	Wireframe of bottom surface of Grieves Fault Zone
FaultGrievesPLAN_TOP Trend Surface 0.0	Wireframe of upper surface of Grieves Fault Zone
FaultNorthPLAN Trend Surface 0.0	Wireframe surface of North Fault
FaultSouthPLAN Trend Surface 0.0	Wireframe surface of South Fault
Fe_pc (Spheroid 50, 325, 90; 3:3:1): Fe_pc 2.5 1	Global isosurface wireframe of iron at 2.5% limit
Fe_pc (Spheroid 50, 325, 90; 3:3:1): Fe_pc 5.0	Global isosurface wireframe of iron at 5.0% limit
Fe_pc (Spheroid 50, 325, 90; 3:3:1): Fe_pc 10.0	Global isosurface wireframe of iron at 10.0% limit

## Project Output

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Item	Description
GRIEVES_Siderite_top	Wireframe surface of top of Siderite Zone inside Grieves Fault Zone
Mn_PPM (Spheroid 50, 325, 90: 3:3:1): Mn_PPM 250.0	Global isosurface wireframe of manganese at 250ppm limit
Mn_PPM (Spheroid 50, 325, 90: 3:3:1): Mn_PPM 500.0	Global isosurface wireframe of manganese at 500ppm limit
Mn_PPM (Spheroid 50, 325, 90: 3:3:1): Mn_PPM 1000.0	Global isosurface wireframe of manganese at 1000ppm limit
NORTH_Moina_top Boundary	Wireframe surface for top of Moina Sandstone in North domain
NORTH_Siderite_top Boundary	Wireframe surface for top of Siderite Zone in North domain
Pb_pc (Spheroid 50, 325, 45; 3:3:1): Pb_pc 0.3	Global isosurface wireframe of lead at 0.3% limit
Pb_pc (Spheroid 50, 325, 45; 3:3:1): Pb_pc 1.0	Global isosurface wireframe of lead at 1.0% limit
Pb_pc (Spheroid 50, 325, 45; 3:3:1): Pb_pc 3.0	Global isosurface wireframe of lead at 3.0% limit
Topo_DH collars Boundary	Wireframe surface of completed drillhole collar elevations
Zn_pc in CentralZone (Speroid 51, 318, 155; 5:5:1): Zn_pc in CentralZone 0.3	Isosurface wireframe of zinc at 0.3% limit using data in Central domain
Zn_pc in CentralZone (Speroid 51, 318, 155; 5:5:1): Zn_pc in CentralZone 1.0	Isosurface wireframe of zinc at 1.0% limit using data in Central domain
Zn_pc in CentralZone (Speroid 51, 318, 155; 5:5:1): Zn_pc in CentralZone 3.0	Isosurface wireframe of zinc at 3.0% limit using data in Central domain
Zn_pc in DOM_Surficial (Spheroid 45, 325, 0; 3:3:1): Zn_pc in DOM_Surficial 0.3	Isosurface wireframe of zinc at 0.3% limit using data in Surficial domain
Zn_pc in DOM_Surficial (Spheroid 45, 325, 0; 3:3:1): Zn_pc in DOM_Surficial 1.0	Isosurface wireframe of zinc at 1.0% limit using data in Surficial domain
Zn_pc in DOM_Surficial (Spheroid 45, 325, 0; 3:3:1): Zn_pc in DOM_Surficial 3.0	Isosurface wireframe of zinc at 3.0% limit using data in Surficial domain
Zn_pc in NorthZone (Spheroid 55, 310, 115; 5:5:1): Zn_pc in NorthZone 0.3	Isosurface wireframe of zinc at 0.3% limit using data in North domain
Zn_pc in NorthZone (Spheroid 55, 310, 115; 5:5:1): Zn_pc in NorthZone 1.0	Isosurface wireframe of zinc at 1.0% limit using data in North domain
Zn_pc in NorthZone (Spheroid 55, 310, 115; 5:5:1): Zn_pc in NorthZone 3.0	Isosurface wireframe of zinc at 3.0% limit using data in North domain