

Zeehan Zinc Limited

Seismic and Magnetic Data Interpretation

**Report Prepared for
Zeehan Zinc Limited**

Prepared by



ZEE001

August 2009

Seismic and Magnetic Data Interpretation

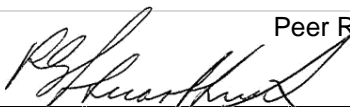
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Executive Summary

This report presents the results of seismic interpretation and magnetic and gravity interpretation/modelling results along the seismic lines acquired by Zeehan Zinc Ltd in 2007, and identifies several new targeting areas.

Zeehan Zinc Ltd has requested SRK to undertake the seismic interpretation of five seismic lines in conjunction with the MRT aeromagnetic datasets acquired in 2001, on the basis of the previous solely seismic interpretation conducted by R. H. Findlay. Previous seismic interpretation is performed on the post-migrated seismic sections processed by the Fugro Seismic Imaging Ltd. With a preliminary review on the Fugro processed seismic data, SRK recommended reprocessing the field seismic data collected by Terrex in 2007.

Seismic line TB02B_ZF has been selected to reprocess in consideration of its coverage of the magnetic and gravity high west of the Zeehan to evaluate the need to reprocess all seismic lines. Reprocessing has improved the quality of the seismic section TB02B-ZF significantly, but reprocessing wasn't applied to the rest of seismic lines without the Zeehan Zinc Ltd's approval. Giving the significant quality improvement of seismic section TB02B_ZF, the seismic interpretation and magnetic modelling of line TB02B-ZF was based on the newly processed TB02B-ZF, modelling and interpretation of the rest four lines were performed on the previous Fugro processed seismic data.

The main objective of this study is to interpret five seismic sections by utilising the magnetic and gravity data collected by the Mineral Resource Tasmania, to assist Zeehan Zinc Ltd to identify drill targets within their tenements.

Summary of Principal Objectives

The principal objectives of this study are to:

- Evaluate seismic reprocessing technology; and
- Interpret the seismic data in conjunction with the MRT magnetic data to provide a line-based understanding of the subsurface geology.

Outline of Work Program

- Re-process seismic line TB02B_ZF using both reflection and scattering seismic imaging methods;
- Interpret and model the Western Tasmanian Regional Minerals Program magnetic data along the Zeehan seismic lines;
- Interpret seismic data with input from magnetic interpretations and models; and
- Define nickel, zinc and lead mineralisation target areas.

Focus on Results

- High quality of TB02B-ZF seismic section;
- Blind intrusive/volcanic (Cambrian?) identified in the Zeehan area;
- Major faults identified from magnetic and gravity data;
- Ni-Cu mineralisation targets related to the Cambrian ultramafic and mafic complex; and
- The Gordon Limestone distribution, a host to zinc-lead mineralisation related to Heemskirk granite.

Recommendations

- Reprocess four seismic lines: TB02b-ZA, TB02b-ZB, TB02b-ZC and TB02b-ZD using the processing parameters applied to seismic line TB02b-ZF.
- Apply 3D magnetic inversion modelling to evaluate/confirm the seismic interpretation and magnetic modelling results.
- Conduct a 2D gravity modelling and/or 3D gravity inversion on the Heemskirk Granite to establish the subsurface geometry of the granite to locate high level stocks and define target areas for Zn-Pb mineralisation.
- Conduct a detailed regional magnetic and gravity structural interpretation.
- Conduct the petrophysical study on the selected drillholes to assist the magnetic and gravity modelling.

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (Australasia) Pty Ltd (SRK) by Zeehan Zinc Limited (ZZL). The opinions in this Report are provided in response to a specific request from ZZL to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

List of Abbreviations

Abbreviation	Meaning
DTM	digital terrain model
E	east
E–W	east-west
GIS	geographic information system
k	thousand
kg	kilogram
m	metre
M	million
m ³	cubic metre
N	north
NE	northeast
NW	northwest
S	south
SE	southeast
SRK	SRK Consulting (Australasia) Pty Ltd
SW	southwest
t	tonne
W	west
SI	magnetic susceptibility
TMI	Total Magnetic Intensity
2D	two dimensional

1 Introduction and Scope of Report

This report details the findings and results of joint magnetic modelling and seismic interpretation along five seismic lines carried out by Zeehan Zinc Pty Ltd from March to May 2007 (Figure 1-1), as well as the magnetic and gravity structural/intrusive interpretation and magnetic worming results. The geological interpretation is based on the available geophysical and geological data and is mainly focused on the area covering the seismic lines.

The reinterpretation of all seismic sections, integrated with magnetic modelling, enable a better understanding of subsurface geology of the area of interest. The interpretations show the region is multiply deformed, and north-westward thrust related. The Cambrian mafic complex has a both magnetic high and gravity high signatures. Modelling of magnetic data effectively defines the distribution of the Cambrian Gabbro unit, which is related to the volcanic host massive sulphide mineralisation (VHMS). Seismic interpretation defined the distribution of Gordon limestone. Magnetic and gravity data defines effectively the Heemskirt Granite depth extension. Both seismic and magnetic modelling confirms that thin-skinned thrust structures dominate the area.

The report also presents a brief review of the quality of the Fugro seismic sections and reprocessing seismic section by CAS. Reprocessing the seismic line TB02b-ZF allowed the enhanced structural interpretation of the line TB02b-ZF, which is not evident in the Fugro processed seismic section.

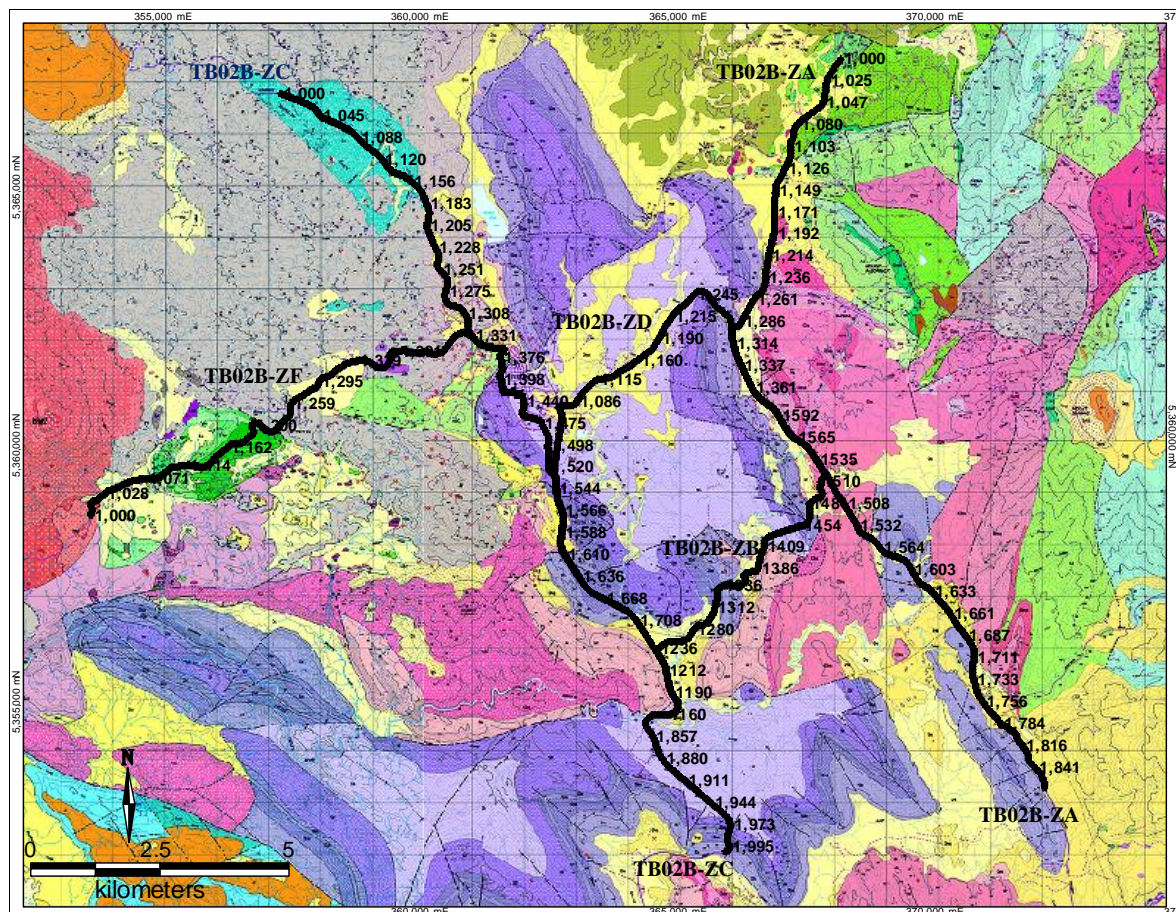


Figure 1-1: Seismic lines acquired by the Zeehan Zinc Limited in 2007, also shown is the geological map

2 Background and Brief

2.1 Background of the Project

Zeehan Zinc Pty Ltd carried out a 2D seismic program in the Zeehan area in 2007. The field data was acquired by Terrex Seismic crew 401. The seismic lines were recorded on existing roads with the exception of line TB02b-Zb which followed the Mariposa tram line. The survey has a shot/receiver interval of 20m and record length of 6 seconds. The acquired seismic data was originally processed using standard reflection processing procedure by Fugro Seismic Imaging Pty Ltd and was interpreted preliminary by R.H. Findly.

Following a discussion with Laurie Veska of Zeehan Zinc Pty Ltd, in order to utilise both seismic and potential field data, SRK committed to reinterpret the seismic data, integrated with modelling of the magnetic data, to unravel the subsurface geology more reasonably and highlight the potential for Zn-Pb-Ni etc. mineralisation zones in the region.

2.2 Nature of the Brief

Zeehan Zinc Pty Ltd is undertaking an exploration campaign within its tenements in Western Tasmania. While the exploration campaign is undergoing, Zeehan Zinc wants to reinterpret seismic profiles acquired in 2007 in conjunction with MRT 200m line spacing regional airborne magnetic and radiometric data to provide exploration targets for potential stratified zinc-lead-nickel mineralisation at depth.

To this end, a scope of work was prepared by Pat Hillsdon (SRK Proposal No. PHILL_2008_12_000) and approved by Laurie Veska (Zeehan Zinc Limited).

The results will assist Zeehan Zinc Ltd in identification of the exploration targets for the zinc-lead and nickel mineralisation in the area.

3 Program Objectives and Work Program

3.1 Program Objectives

The programme objectives are:

- Re-process the seismic data on the selected seismic line TB02B_ZF using both reflection and scattering seismic imaging method to see if reprocessing could improve image quality significantly.
- Interpret the seismic data in conjunction with the MRT magnetic data to provide a line-based understanding of the subsurface geology along the seismic lines.
- Identify the exploration targets for zinc-lead and nickel mineralisation at the depth.

3.2 Work Program

- Re-process seismic line TB02B_ZF using both reflection and scattering seismic imaging methods.
- Interpretation of Western Tasmanian Regional Minerals Program Magnetic Data: This includes magnetic data download/purchase, processing, image enhancements, detailed geologic/structural interpretation using Geosoft and Mapinfo.
- Interpret seismic data using interactive seismic software package.
- Model 5 magnetic profiles along the seismic lines using Encom ModelVision Pro, to validate, constrain and improve the seismic interpretation. Initial seismic interpretation will be imported into modelling software to provide the starting model.
- Tune and modify the seismic interpretation in conjunction with the modelled magnetic models. This will be an interactive process until an acceptable seismic interpretation and magnetic model results have been obtained, which will offer a line-based understanding of the subsurface geology of the project area.

3.3 Project Team

Seismic interpretation and magnetic modelling of unconstrained 2D profile was conducted by Bin Guo (SRK, Sydney). The modelled results were reviewed and evaluated by Pat Hillsdon. Peter Stuart-Smith (SRK, Sydney) peer reviewed the report, and the project was managed by Pat Hillsdon.

3.4 Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no prior association with Zeehan Zinc Ltd in regard to the mineral assets that are the subject of this Report. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the Report.

4 Program Results

Geological interpretation focused mainly on five seismic lines and adjacent areas. Magnetic data has been re-gridded and processed in order to highlight structures and intrusions of interest. First vertical derivative and the tilt angle filter significantly highlight the subtle magnetic features, while the upward continuation filter assists to outline the deep magnetic sources. Bouguer gravity data and its derivatives are also incorporated in the interpretation. One of five seismic profiles has been reprocessed using both reflection and scattering imaging technology to evaluate if the reprocessing could enhance the seismic section significantly. The processing results are very promising and considerably improved our structural interpretation of the seismic profile TB02B-ZF. The remaining four seismic profiles were not reprocessed owing to a limited budget for the work.

4.1 Geology

4.1.1 Regional Geology

The regional geology of West Tasmania involved initial rifting, arc-continent collision and later tectonic emplacement of thrust slices. Passive continental rifting occurred during the Late Pre-Cambrian to Early Cambrian time. This was followed by Early to Mid Cambrian arc-continent collision, subduction and emplacement of an ultramafic allochthon. A post-collisional extension phase followed in which the Dundas Group was deposited and the Mount Read Volcanics erupted on the sea floor. By the Middle Ordovician, the Gordon Group Limestone formed when the region was near the equator. A period of uplift followed in the Siluro-Devonian, in which the Eldon Group was deposited. Extensive folding and faulting took place during the Devonian Tabberabberan Orogeny. The Devonian granites such as the Heemskirk Granite, are associated, with a suite of mineral deposits of mainly zinc-lead and tin lode type, with some skarn mineralisation. Precambrian sediments were further deformed and metamorphosed. Subsequent geological events consist of Permo-Carboniferous glacial sedimentation, Jurassic dolerite sill intrusion and Tertiary basalt flows (Simon, 2002; Harris, 2004).

Stratigraphy

The Oonah Formation consists of variously deformed and metamorphosed interbedded quartz-sandstone and siltstone deposited by particle-driven gravity flows. It is unconformably overlain by Cambrian sediments, volcanoclastic, volcanic and mafic-ultramafic complexes. Near Zeehan, it is host to a number of Devonian vein, skarn and replacement-tin deposits.

Cambrian ultramafic-mafic complexes occur as fault bound blocks structurally overlying the early Cambrian and Precambrian rocks. Upper boundaries are conformable to later successions.

The Cambrian Mount Read Volcanics, the host sequence to Roseberry, Hellyer etc., consists of three groups: silicic, intermediate and mafic lavas; syn-eruptive volcanoclastic deposits; and syn-volcanic intrusions.

Cambrian Dundas Group sediments unconformably overlie deformed Precambrian sediments, and comprise a sequence of siliciclastic sediments with some volcano-sedimentary derived sources.

The Ordovician Owen Conglomerate is overlain conformably by the Gordon Limestone, the lower boundary of which is primarily conformable with the Dundas Group and unconformable with the Mount Read Volcanics.

The Ordovician Gordon Limestone consists mainly of platform carbonates. It conformably overlies on the Owen Conglomerate except north of Zeehan where it overlies pre-Ordovician rocks. It is overlain by the Eldon Group.

Siluro-Devonian Eldon Group sediments comprise shallow-marine interbedded quartz sandstone and mudstone with minor limestone. The group conformably overlies the Gordon Group.

The Devonian Heemskirk Granite is a semi-circular shaped body occupying about 120km² and is divided into two types: a red granite and a white granite.

Permian tillite unconformably overlies Precambrian basement rocks.

4.1.2 Mineralisation

The dominant mineralisation in the area is associated with the intrusion of the Mid Devonian Heemskirk Granite, and is hosted by a range of formations. The Gordon Limestone hosts a number of zinc mineral deposits, which are considered similar in type to the Irish carbonate hosted base metal orebodies (Simon Tear, 2002). The Oceana Lead mine is stratigraphically located in the middle/lower section of Gordon Limestone.

The second most important mineralisation is associated to the Cambrian mafic/ultramafic complexes, a host for nickel mineralisation in the region.

The third mineralisation is zinc-rich volcanogenic hosted massive sulphide, associated with the Cambrian Mount Read Volcanics beneath the Gordon Limestone.

The regional geologic history including stratigraphy, deformation and mineralisation events is given by Harris (2004) and is summarised in Figure 4-1.

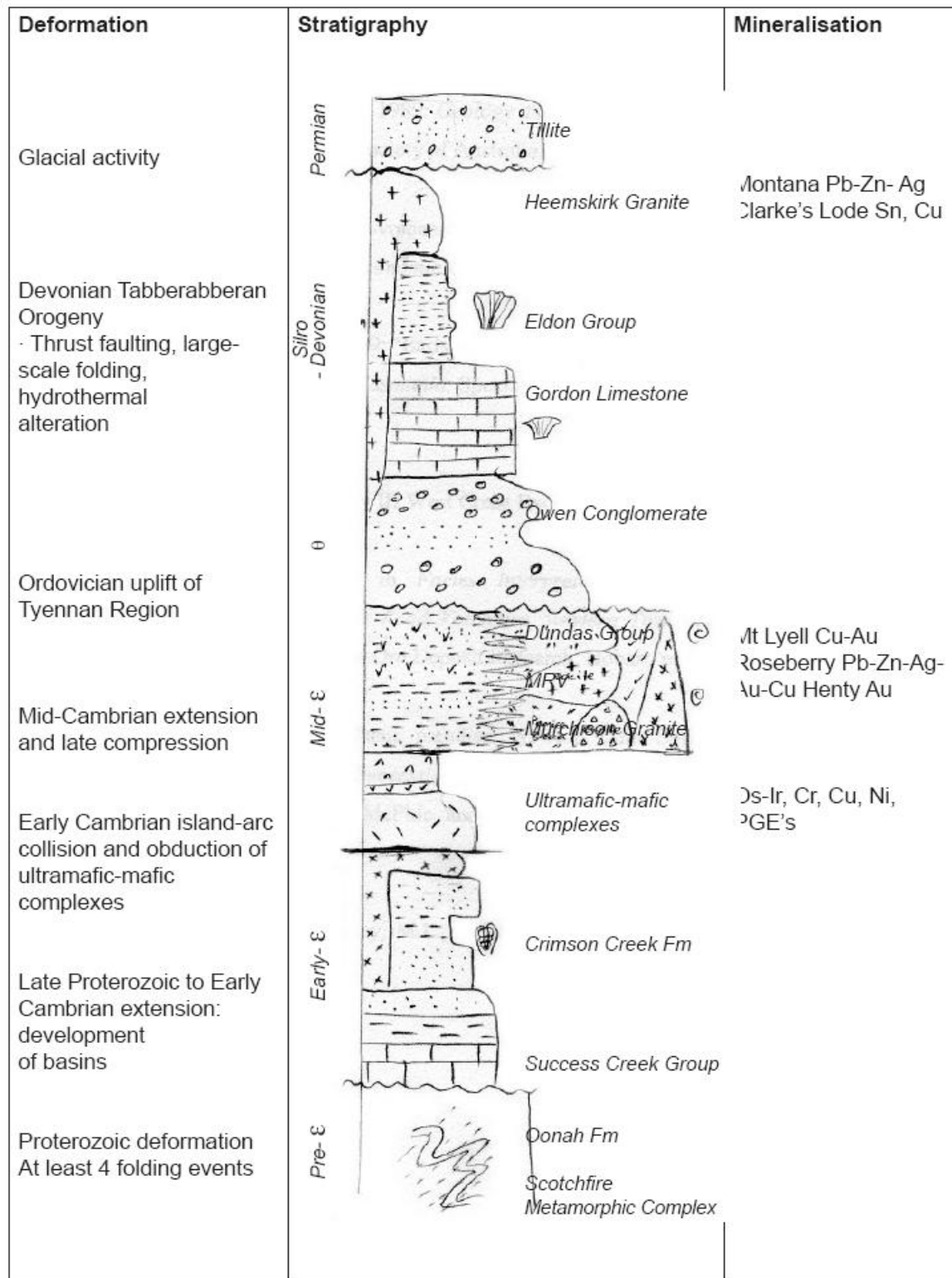


Figure 4-1: A summary of the regional geologic history including stratigraphy, deformation and mineralisation events (After K. Harris)

4.2 Airborne Magnetics and Gravity Interpretation

4.2.1 Data Acquisition and Processing

Magnetic line data acquired by Mineral Resources Tasmania has been downloaded from Government website. The data has collected by the Geoinstrument (Now Fugro) airborne survey company from 1 January to 22 March in 2001. Data was collected using a Bell 206B3 Jetranger VH-JWF helicopter along 100m line spaced 090-270 oriented traverses at 80m terrain clearance. Readings were collected every 1second, along the traverse for Magnetics, 5second for Radiometrics and Digital Terrain parameters respectively. Four thousand two hundred and eighty four km of line data was collected. All located data and grids are provided with this report.

The downloaded aeromagnetic line data was re-gridded to 40m cell size in order to improve the resolution and was processed using Geosoft®, an industry recognised potential field software package. The reduced to the pole (rtp) operation was first applied to the total magnetic intensity (tmi) image. When the first vertical derivative and further filter were applied to the rtp grid, a levelling problem was identified (Figure 4-2). This was effectively removed using a micro-levelling technique, which filters a gridded dataset to reduce or remove non-geological effects caused by long-wavelength noise along survey lines. Such noise manifests itself as apparent data shifts from one survey line to the next, often creating very streaky looking images. Then a reduced to the pole image has been generated (Figure 4-3).

Gravity data was downloaded from GADDS and then gridded with a cell size of 800 m.

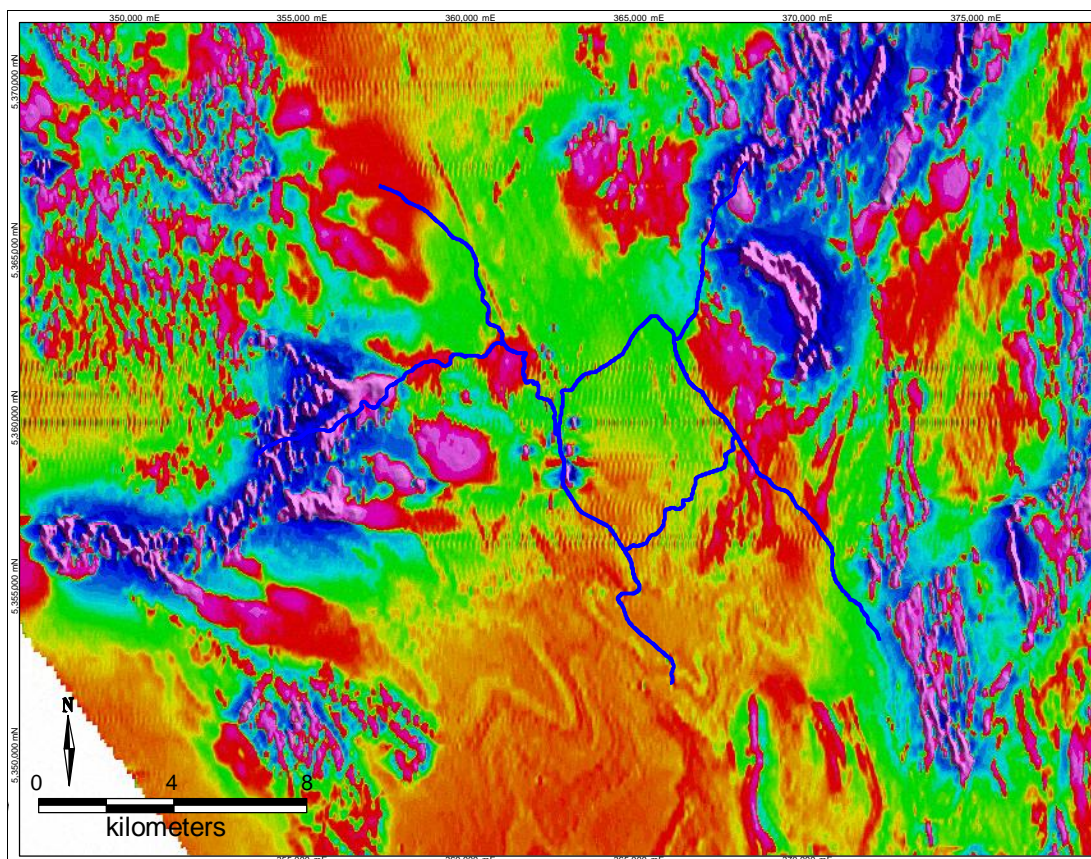


Figure 4-2: Levelling issue (horizontal streaks in centre image) created by the RTP filter

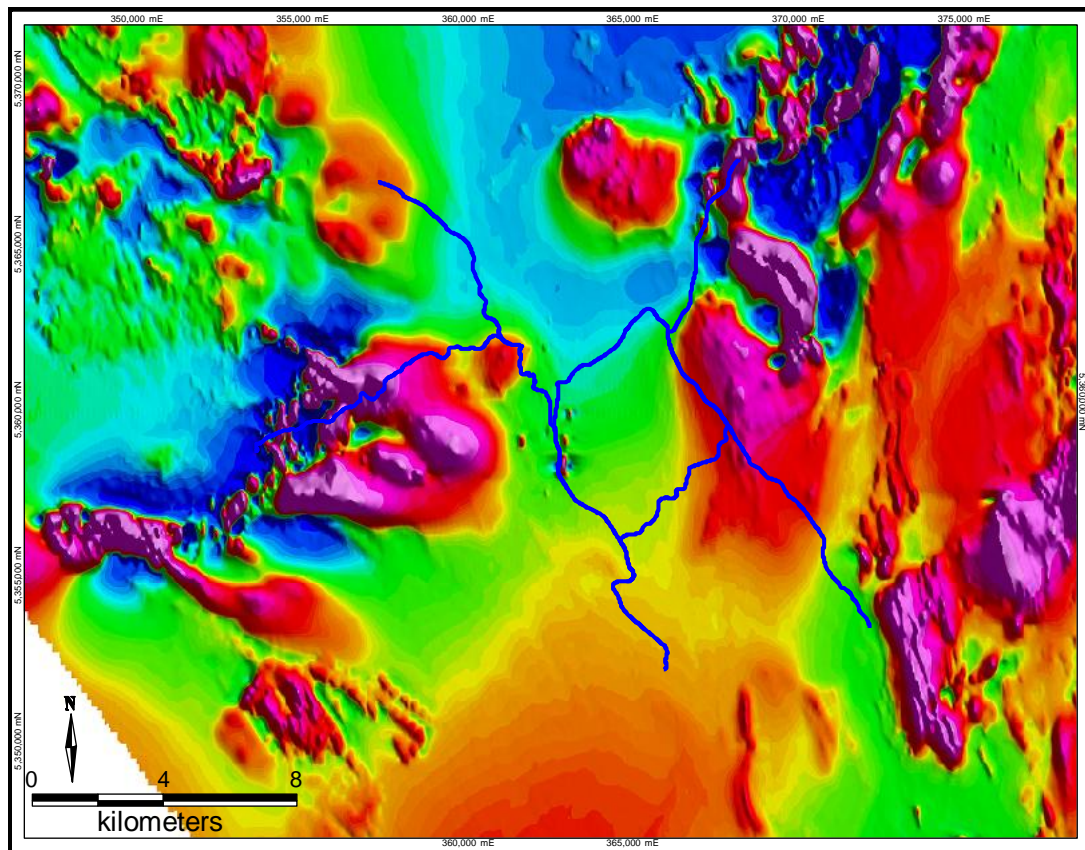


Figure 4-3: Reduced to the Pole of the TMI image, superimposed is the Zeehan seismic lines

4.2.2 Enhancements of Airborne Magnetic Data

Magnetics measures variations in the Earth's magnetic field caused by variations in the magnetic susceptibility of the underlying rocks, providing information on its structure and composition. The aim of the magnetic data enhancement of this project is to highlight structural effects at both the near surface and deep magnetic sources. Thus, while reduction to pole, first and second derivative images have been generated, the other enhancements have been derived from the reduction to pole data, including upward continuation, separation filtering, tilt angle filtering etc. The separation filtering has been based on subtracting the upward continued data from the original data, which emphasises the shallow responses. The main enhancement used for the structural interpretation are the tilt angle of the RTP data (Figure 4-5) and separation filtering enhancements for the shallow magnetic features, also the upward continuation at 500m enhancement for the deep magnetic interpretation (Figure 4-6). The sequence of processing used is as follows.

1. **Reduce the total magnetic Intensity (TMI) data to the pole (RTP)** to remove the effect of the inclination of the earth's magnetic field, which is -72.3° at centre of the project area. The reduction to the pole operator has the effect of simplifying anomalies, and centring the "highs" over the causative magnetic sources. The location of sources, particularly source edges, can more readily be determined when the magnetic data has been reduced to the pole.
2. Generate the **first vertical derivatives** from the TMI and RTP data. The first vertical derivatives of the magnetic anomalies enhance near surface contrasts in magnetization by amplifying the high frequency component of the spectrum (linear increasing filter). However noise is also enhanced in this process.

3. Generate serials of **upward continuation filters**. A continuation filter calculates the magnetic field at a different surface (height above ground) than the surface at which it was measured. Upward continuation is a calculation of what the magnetic field would look like at a greater distance from the source. Upward continuation enhances the lower frequencies (deeper sources) and suppresses smaller, near surface anomalies.
4. Generate **separation filtering** images. The data are upward continued to various heights and continued grid is subtracted from the original one. The approach is useful for discerning 'shallow' from 'deep' sources.
5. Generate **Tilt Angle and Horizontal Derivative of Tilt Angle** response from the RTP data. Tilt images highlight shallow (although not limited to shallow) structural response in the data. It responds equally well to shallow and deep sources.
6. A variety of **Automatic Gain Control (AGC) and Analytic Signal** scenes were also generated. The AGC filter is used to highlight features that may be obscured by other highly magnetised sources. AGC equalizes a range of amplitude variations across the grid, allowing the interpreter to observe subtle responses.

Similar to the magnetic survey, gravity measures the density variation of the underlying rock. Gravity readings were gridded to a cell size of 800m (Figure 4-6) and then image enhancement technology was used. Gravity enhancements include the residual gravity; first vertical derivative and separation filtering. The main purpose of the gravity processing is to highlight the near surface features due to the coarse sampling of the gravity data. The gravity separation filtering enhancement has been mainly used for gravity feature interpretation (Figure 4-7).

A summary of the airborne magnetic survey processed grids/enhancements and gravity grid/enhancements are presented in Appendix 1.

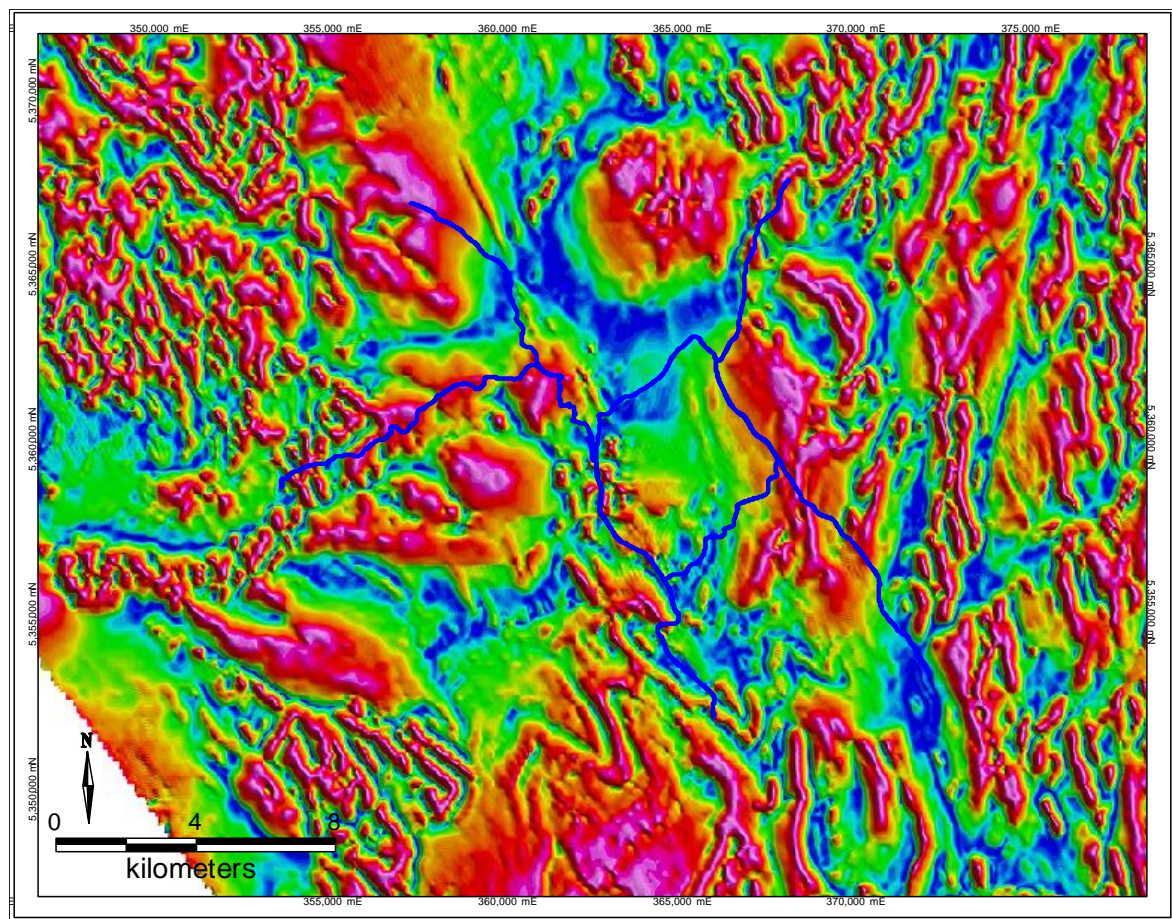


Figure 4-4: Tilt angle of the RTP data

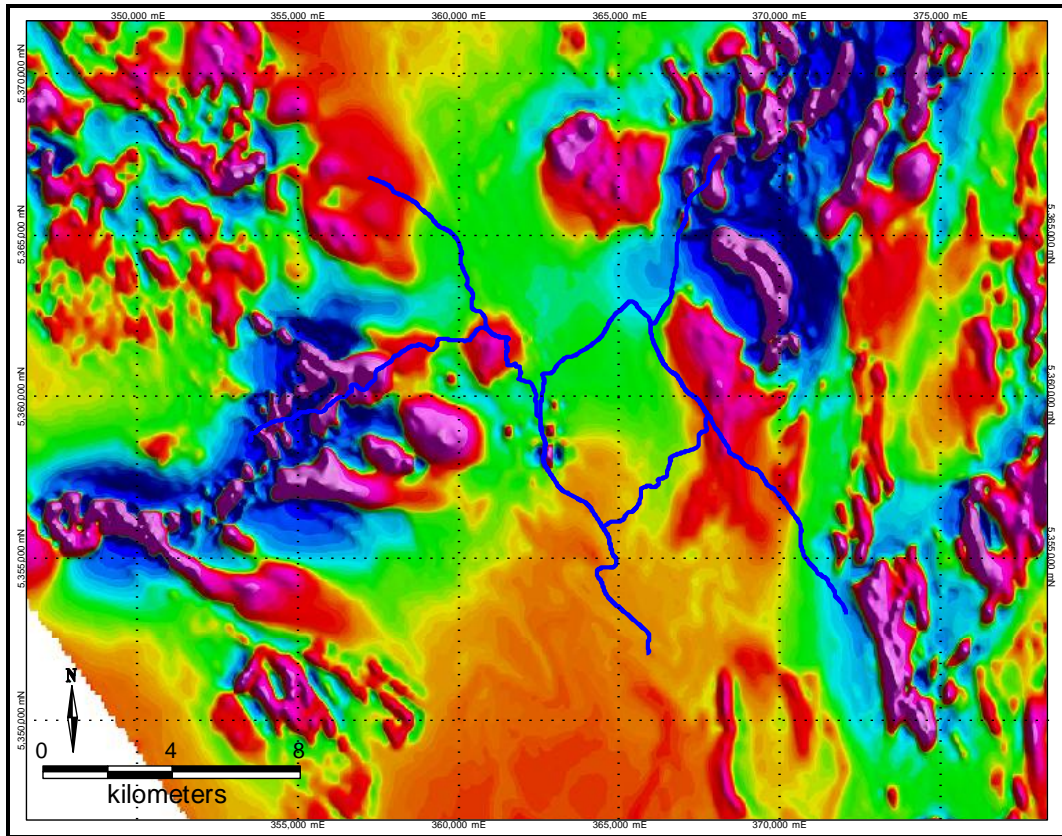


Figure 4-5: Upward continuation at 500m on the rtp data

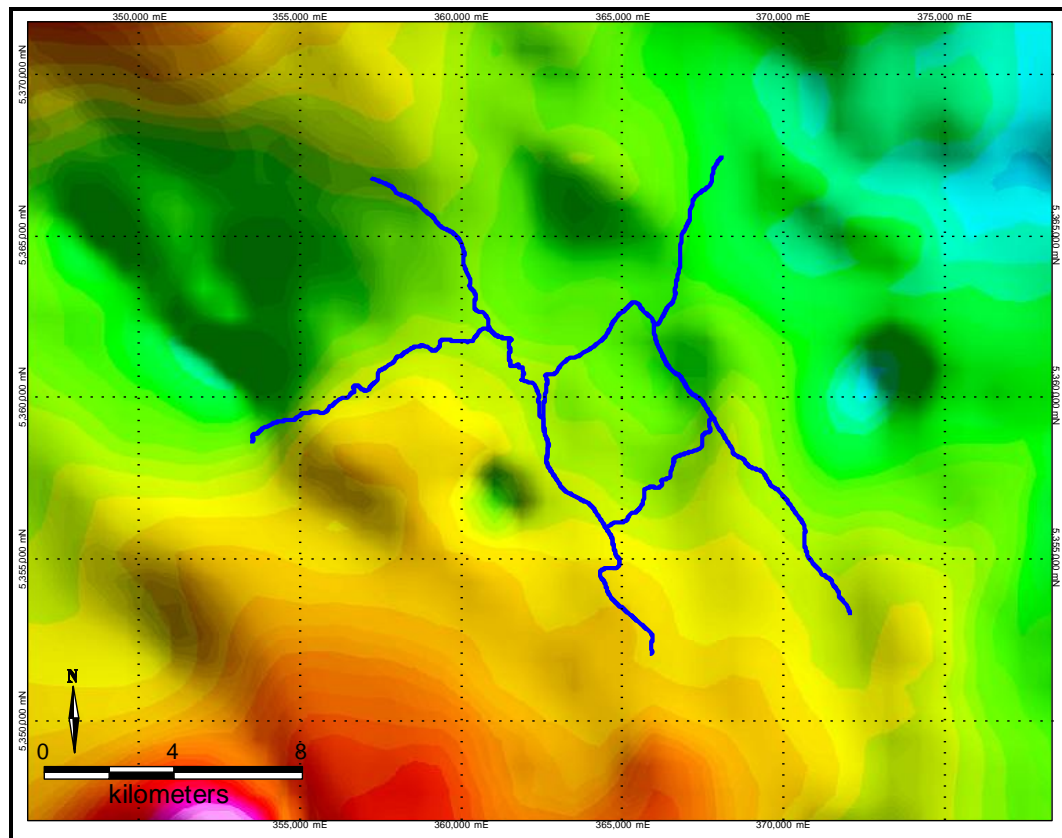


Figure 4-6: Bouguer Gravity of the Zeehan area, also shown is the Zeehan seismic Lines

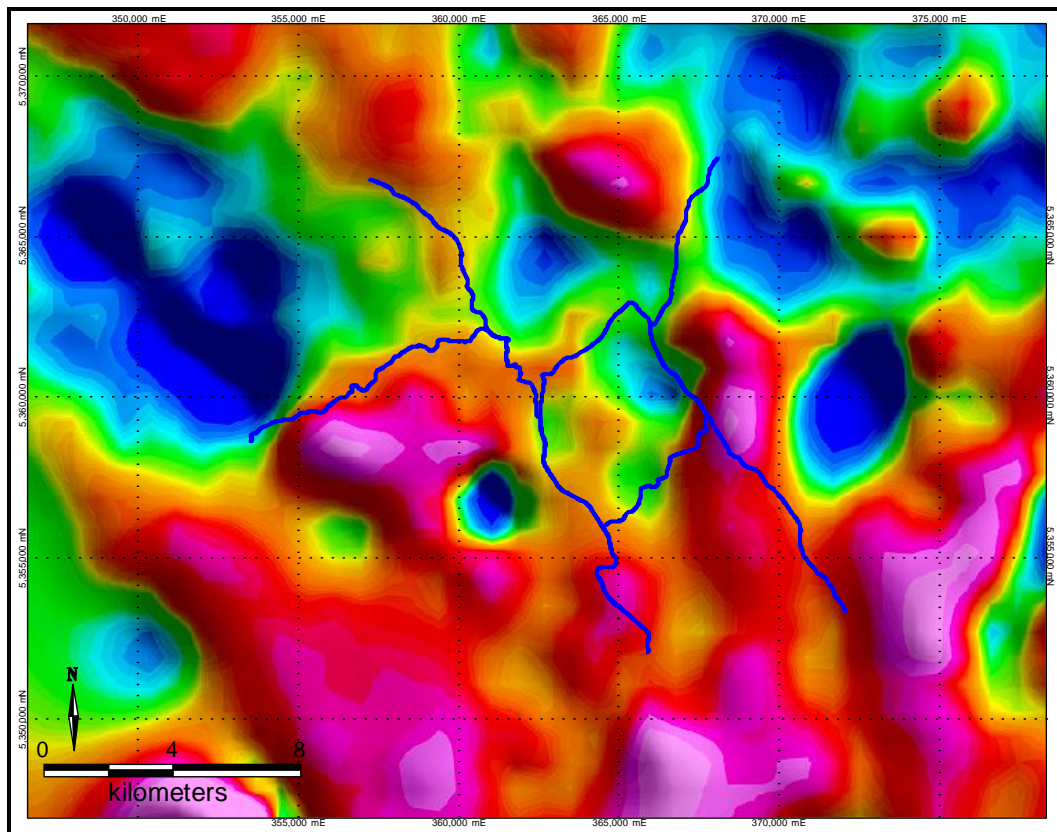


Figure 4-7: Gravity separation filtering enhancement, showing the shallow gravity features significantly

(difference between Bouguer gravity and gravity upward continued at 1km)

4.2.3 Worming

Worming, the multi-scale edge detection using potential field geophysics, is a recently introduced geophysical technology. A Worming algorithm was applied on magnetic data to locate edges (e.g. geological contacts) or peaks from magnetic data by analysing the local gradients to assist the geological interpretation. Worms comprise points of maximum gradient that are derived from a process of wavelet transformation and upward continuation of magnetic and gravity potential field data. Upward continuation uses measurement of a potential field at one elevation to determine the value of the field at a higher level. The process constrains the position and strength of potential field gradients, and the results can be interpreted in terms of the 3D architecture and depth extent of geological structures. Worm points can be joined to form worm sheets on fine to coarse, reflecting increasing height in upward continuation space (Austin and Blenkinsop, 2008).

Worm points record the 3D position and amplitude of maximum gradients. Low upward continuation worms are high frequency/shortwave-length gradients that relate to shallow sources, whereas high upward continuation worms are low frequency/long wavelength gradients that typically correspond to deeper crustal sources, thus produced synthetic models showing the dip direction of a geological contact mirrors its related worm sheet, up to the amplitude maxima.

Worms can be used for readily identify geological features such as faults, geological contacts, granitic intrusions, ironstones and mafic dykes as long as there is significant susceptibility variation and contrast in magnetic property.

In the project area, the worms were found to be related to major structures and intrusive margins (Figure 4-8), and were considered when defining the shape and dips of buried bodies in 2D modelling of cross sections. The method has added an additional degree of confidence in understanding the deep-seated tectonic fabrics of these regions. Figure 4-9 and Figure 4-10 show the worming results on the rtp enhancement and the geological map to show the relationship

between the mapped geological map and the major faults and the intrusive boundaries derived from the worming processing.

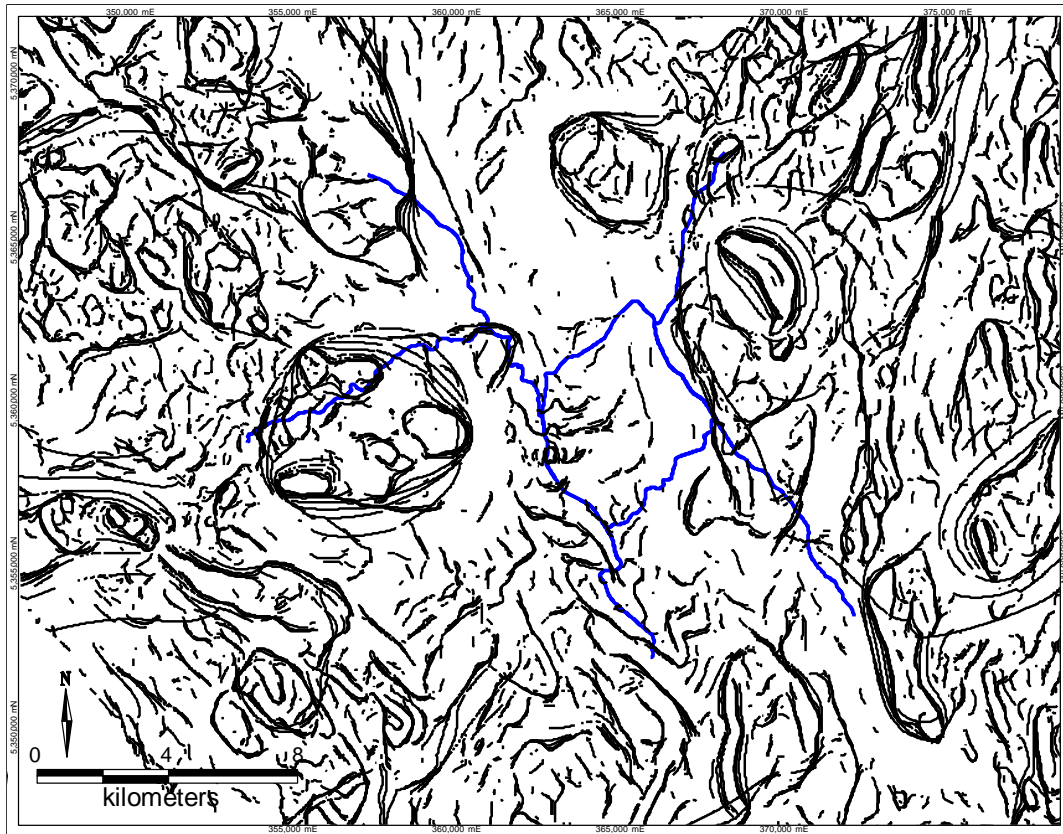


Figure 4-8: Worming results of the Zeehan RTP data

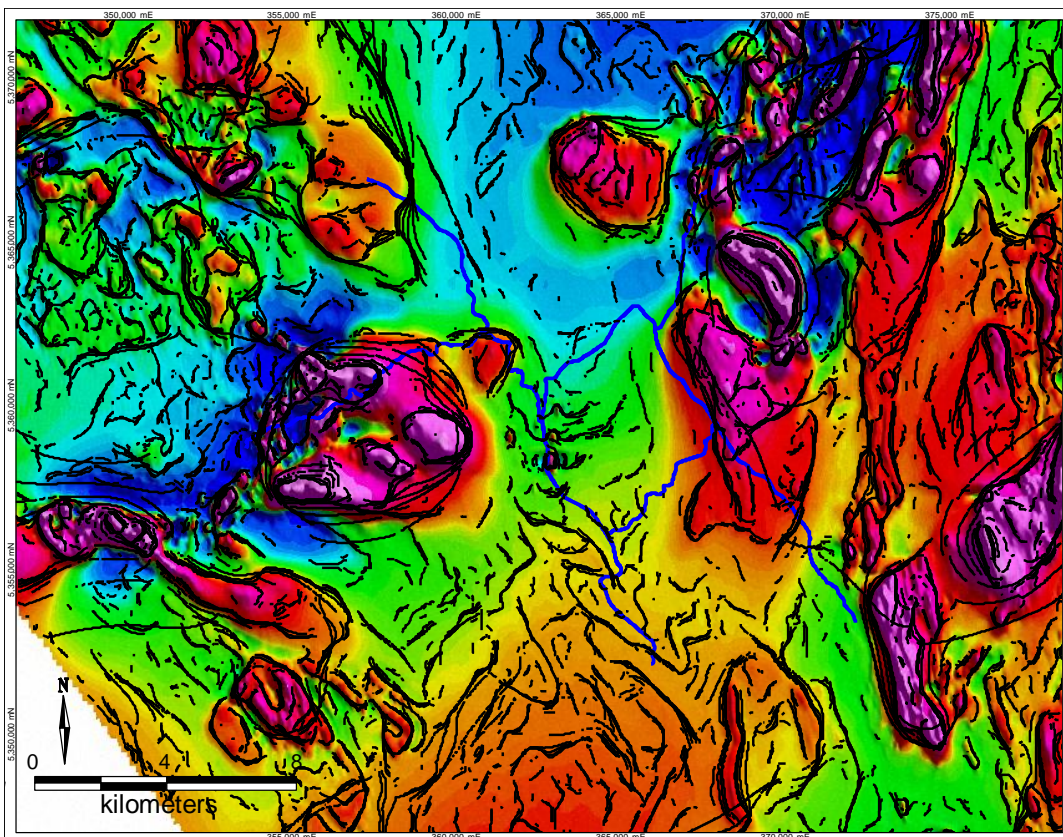


Figure 4-9: Worming results superimposed on the RTP image, showing the geological boundaries, structural features

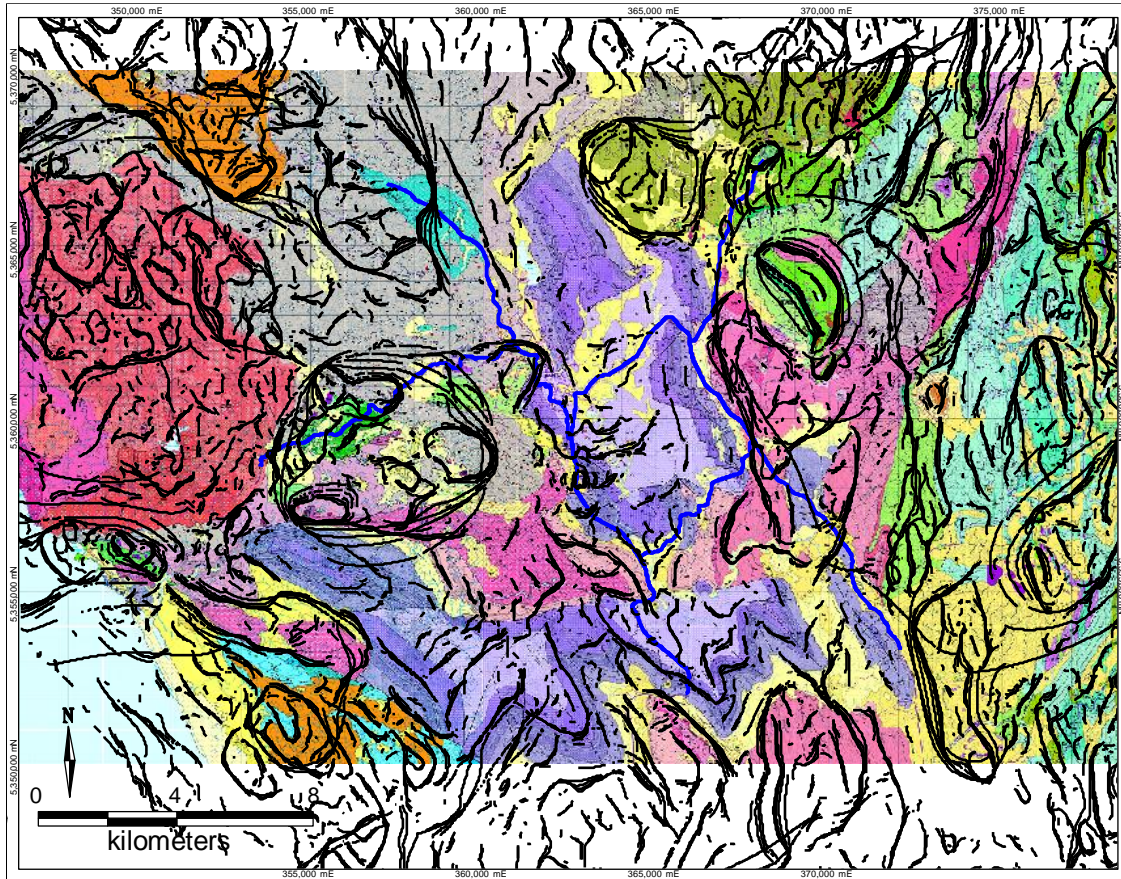


Figure 4-10: Geological map with worming results

4.2.4 Geological Interpretation

Geological interpretation in this study is mainly focused on the geophysical datasets: seismic, magnetic and gravity data. However, the regional geological framework has been developed from the geological map and seismic sections, showing the regional faults and their geometry (Figure 4-12). The geometry of the faults has been confirmed by the seismic sections, the detailed seismic interpretation can be found in the section 4.4 “Seismic Section Interpretation”.

The distribution of the Gordon Limestone, a host to a number of zinc-lead deposits has been also outlined and showed in the Figure 4-11. The outline of the Gordon Limestone is developed based on the geological map, seismic data and the Noranda Pacific Exploration Report prepared by Simon Sear. Parts of the boundaries of the Gordon Limestone are inferred from geological map and are approximate.

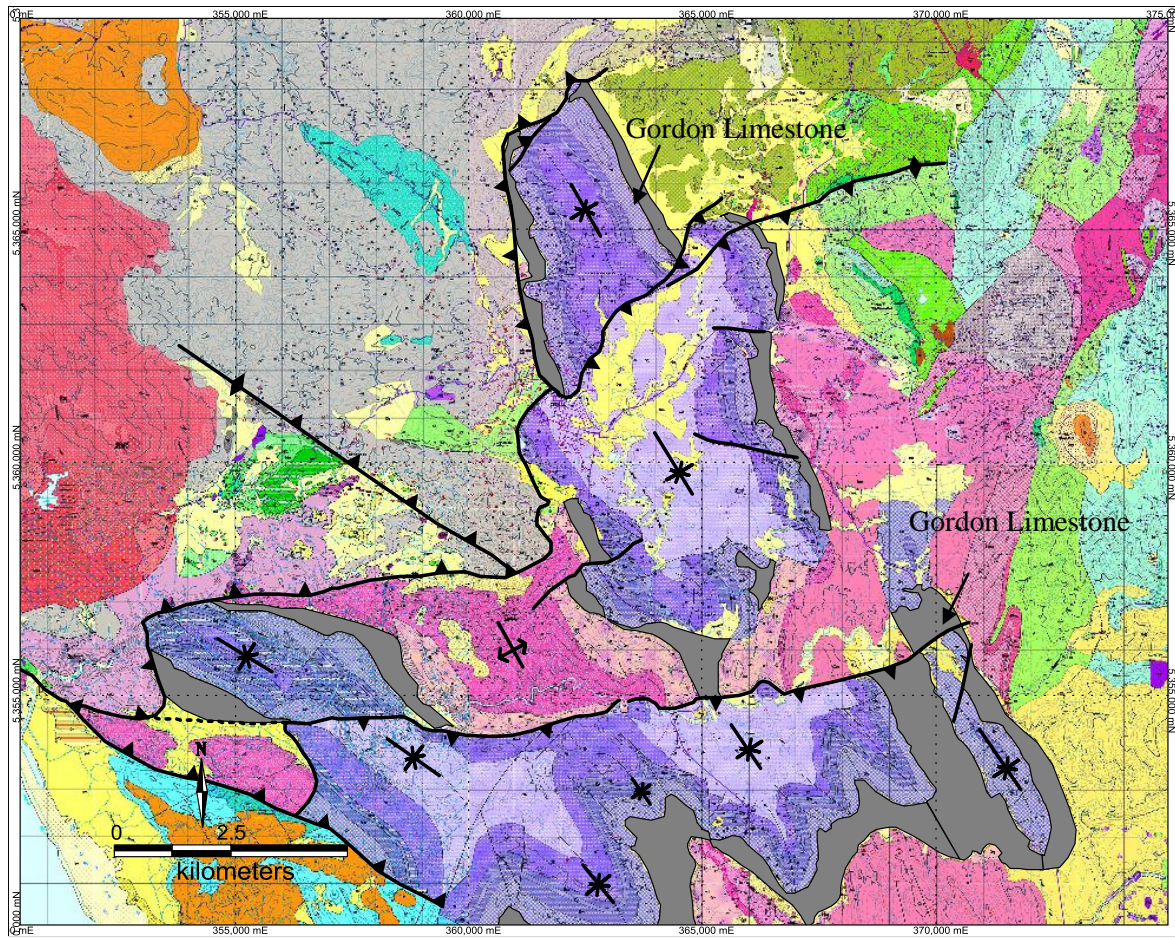


Figure 4-11: The Ordovician Limestone and major thrust faults

Interpretation of the magnetic and gravity enhancements and worm results, has defined several major features in the region, which not only confirm the geological observations in some cases, but also provide additional information not shown on the geological map, for example (Figure 4-12, Figure 4-13):

- The Heemskirk Granite has a moderate magnetic response and a low gravity anomaly. The boundary of the granite in the shallow subsurface can be readily defined by the magnetic data. However, the regional gravity data indicates that the granite extends to the north-east at depth. A 2D gravity modelling or a 3D gravity inversion will yield a more accurate subsurface geometry of the Heemskirk Granite.
- The Cambrian mafic/ultramafic complexes underlining the seismic line TB02B-ZF extend at depth, in particular, to the south. The complexes have high magnetic and gravity responses. Based on the geophysical anomalies associated with the Cambrian mafic/ultramafic complexes, several blind Cambrian mafic/ultramafic intrusives have been defined, of which the one at the east end of the seismic line TB02B-ZF is supported by seismic data. The Cambrian mafic/ultramafic complex has the potential to host significant nickel deposits. The newly identified body has a similar magnetic signature to that of the adjacent Avebury Nickel Mine and the recently discovered Saxon Nickel Deposit. Both deposits are located on magnetic highs. Additionally, it is worth noting that the Comstock lead-zinc- silver mine is located on a magnetic high.
- Jurassic dolerite at the northwest of the map area is associated with high amplitude anomalies in both the magnetic and gravity data. The dolerite extends to the southwest in the subsurface and to the northeast at depth. A 2D gravity/magnetic modelling or a 3D gravity/magnetic inversion will yield a more accurate subsurface geometry of the buried dolerite.
- Although the major mapped faults trend northeast, the interpreted faults from magnetic and gravity data trend both northeast and northwest. The northwest faults mostly post-date the northeast set.

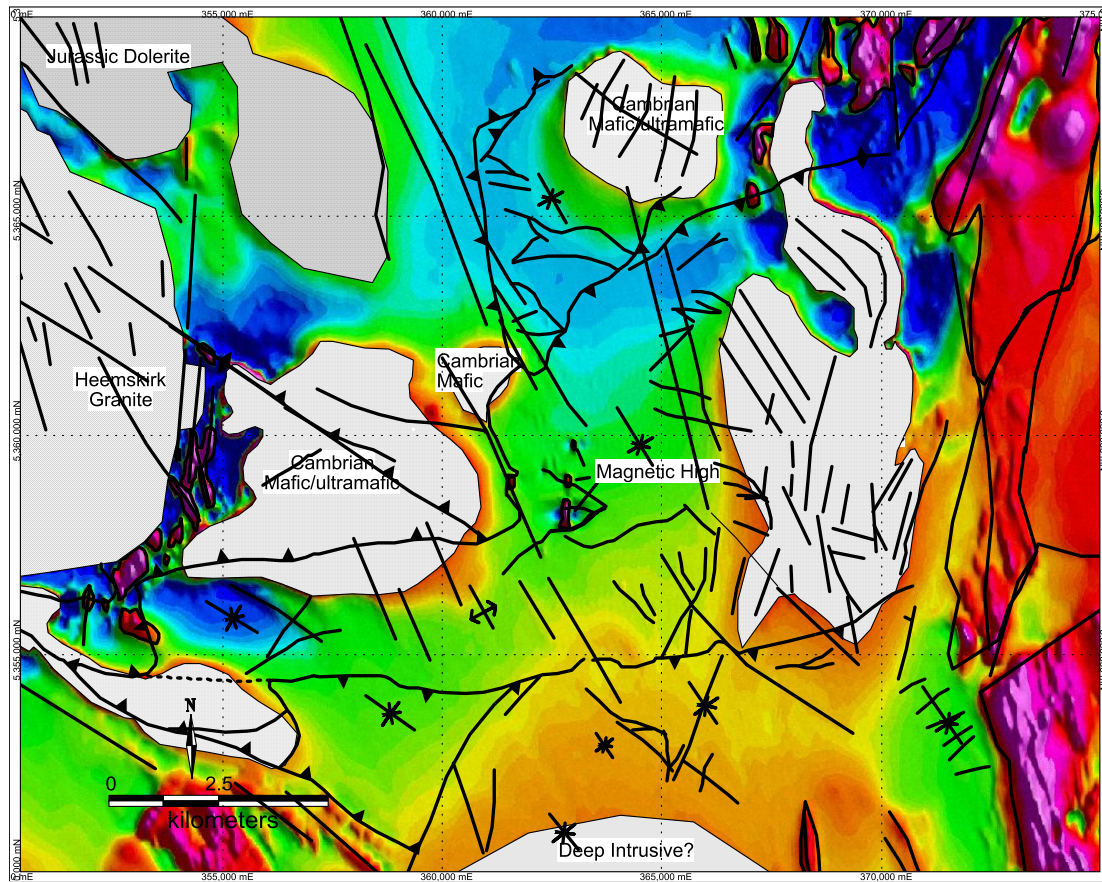


Figure 4-12: Interpreted intrusives and faults

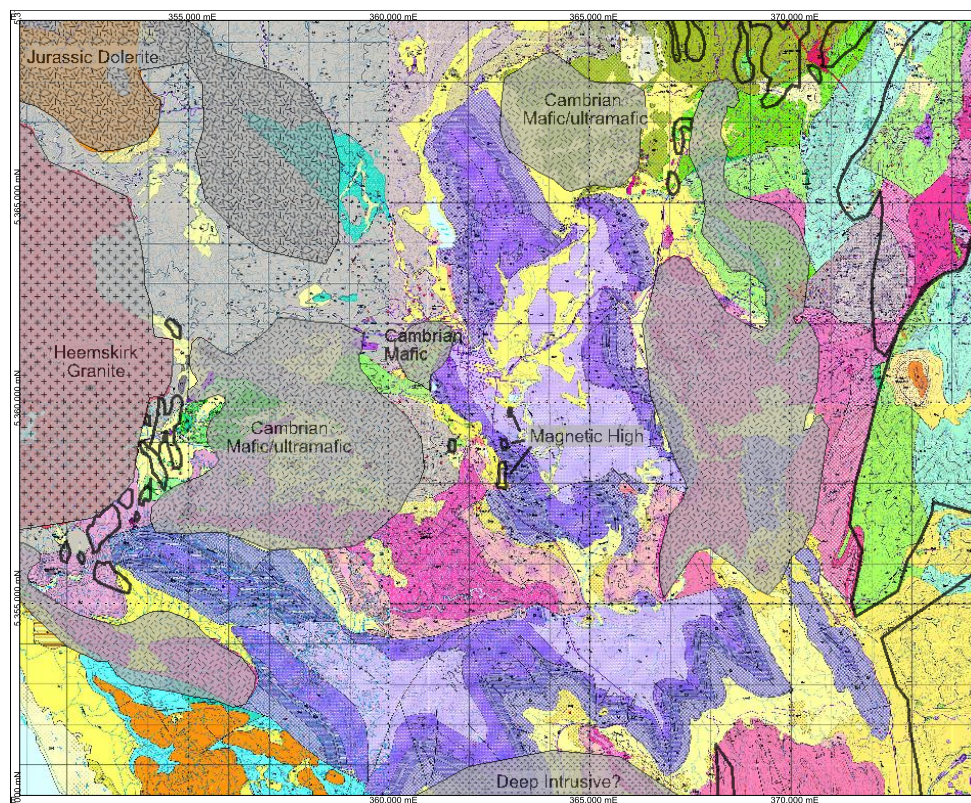


Figure 4-13: Interpreted intrusives superimposed on the geological map

4.2.5 Modelling

Magnetic forward models have been generated along five seismic lines to compliment and integrate with the seismic interpretation. The magnetic profiles were sampled from the aeromagnetic data described in section 4.1.1. The magnetic models were generated using Encom Model Vision Pro 7 software in an iterative process, using inputs from an initial seismic interpretation and key data calibration sets, such as surface geology, and the interpreted geophysical worms. The seismic sections were imported into ModelVision Pro and used as a template to construct bodies that were then assigned appropriate magnetic susceptibility values. The seismic data were converted from TWT time to depth using a linear depth conversion model based on velocity of 3000m/s. The calculated magnetic anomalies were compared to the actual magnetic profile and the model was adjusted to fit the profile as close as possible. Preliminary modeling results were then used to review and modify, where appropriate, seismic interpretations.

For each cross section, the upper panel is the magnetic data (red = calculated, black = observed, blue=regional trend), the lower panel is the modeled magnetic sources and final migrated seismic section as background. The total depth displayed is 5 km. All bodies were assigned a strike perpendicular to the traverse direction, and a strike length of around 5 km. The gravity data wasn't modeled due to the lack of significant amplitude variation along the seismic line although processed gravity (separation filtering) does show the significant gravity variation.

Magnetic profiles along the seismic lines are shown in green lines on Figure 4-14. Along seismic line TB02B-ZA, the seismic line was divided into two parts for magnetic modeling purposes to ensure that magnetic profile is close as possible to the seismic line. For both seismic lines TB02B-ZB and TB02B-ZD, only northeast parts of the lines were modeled.

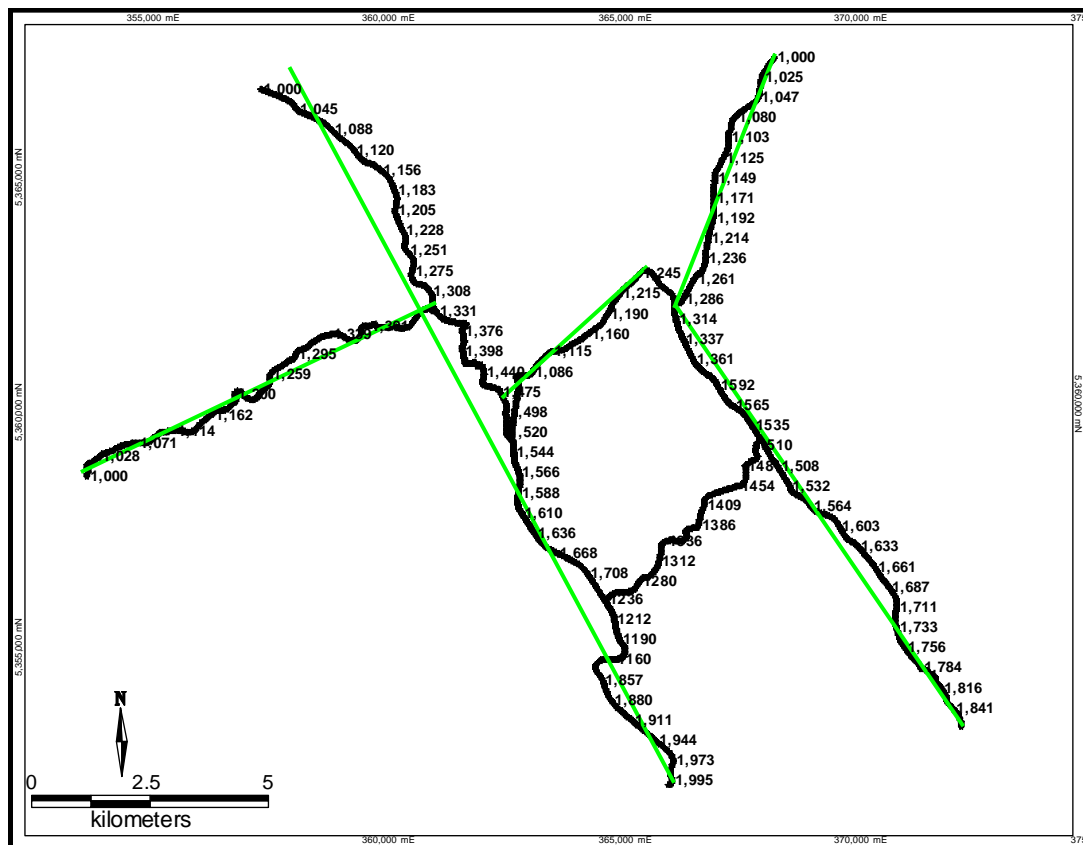


Figure 4-14: Location of Fugro seismic lines and magnetic profiles

4.3 Seismic Data Reprocessing

Seismic line TB02B-ZF was reprocessed as proposed in the contract to test whether reprocessing can improve the seismic image quality. Reprocessing was supervised by SRK geophysicists Bin Guo and Pat Hillsdon. Seismic line TB02B-ZF SEG-D data was first retrieved from SEG-D 3490E tape and converted to SEG-Y and DLT tape by Perth-based Australian Data Management Centre for further SRK assessing and processing in 20 February 2009. The processing parameters were discussed and selected when processing geophysicist Yun Wang visited the SRK Sydney office on 27 February. Both reflection and seismic scattering image methods have been used to reprocess seismic line TB02B-ZF. Reflection method processing was implemented using commercial seismic software package developed by BGP; Seismic scattering method processing was conducted using the software developed by Dr. Yun Wang's research team.

Reprocessing took longer than expected, in particular, the selection of parameters for the seismic scattering imaging method. Reflection seismic processing on line TB02B-ZF produced a high quality of seismic section. Compared to the previous seismic section of TB02B-ZF processed by the Fugro (Figure 4-15), the reprocessed seismic section (Figure 4-16) enhanced both the structural and stratigraphic/intrusive elements significantly. Major structures and intrusive bodies can be identified without difficulty on the reprocessed seismic line TB02B_ZF, such as the western dipping thrust and the Cambrian mafic/ultra mafic complexes. Seismic scattering imaging didn't produce a significant improvement on the seismic section as expected on the TWT seismic section. The strong horizontal features obscured the real structures on the seismic data. The strong horizontal features are possibly the result of side reflections produced from the excessively curved seismic line.

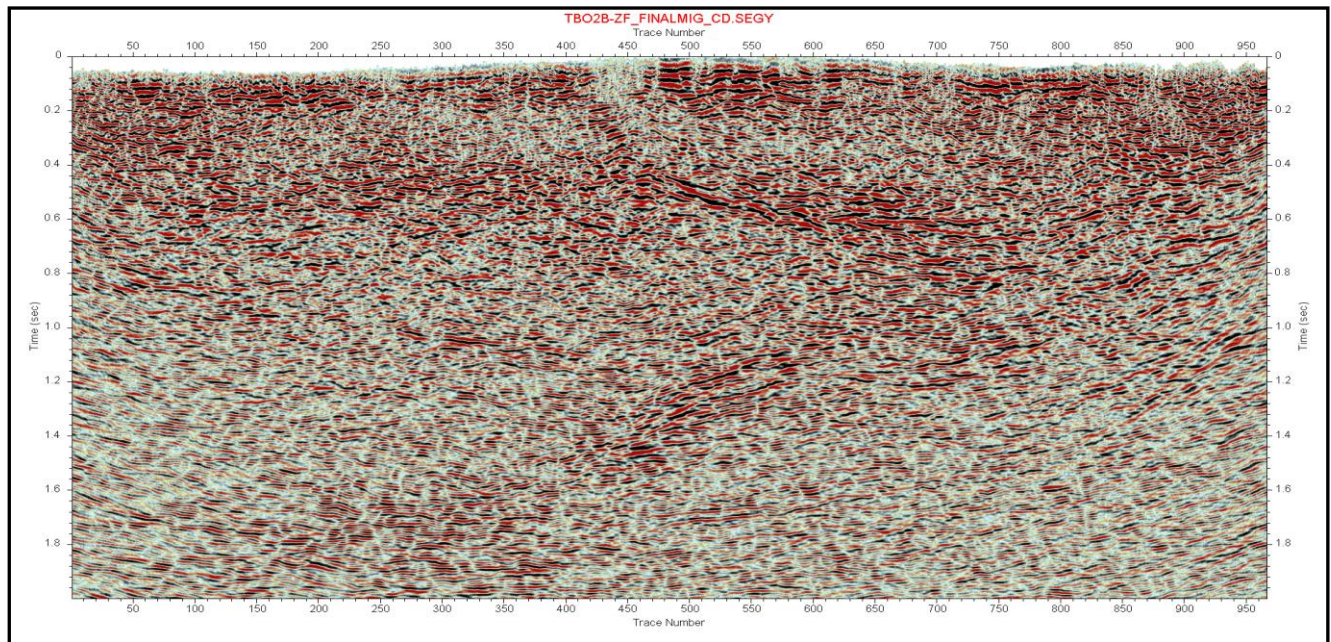


Figure 4-15: Fugro Processed Seismic Line

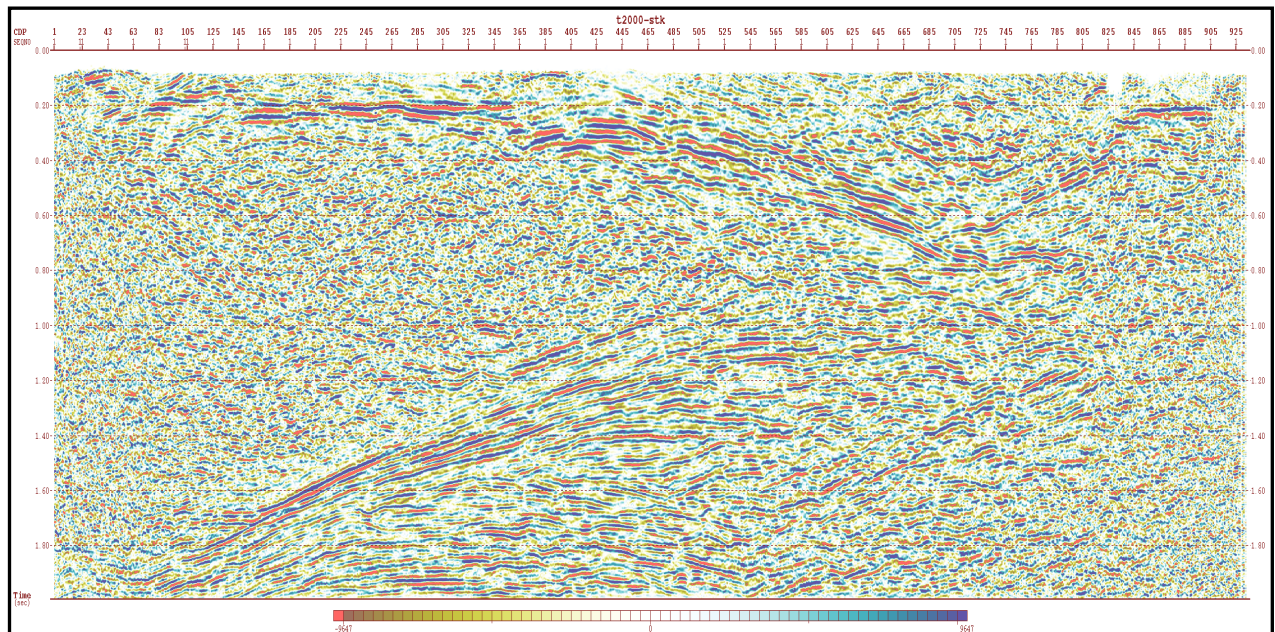


Figure 4-16: Reprocessed Seismic Line, showing the significant improvement on the quality of the seismic section

4.4 Seismic Section Interpretation

Only the seismic line TB02B_ZF has been reprocessed as the test line proposed in the contract. The remaining seismic lines were not reprocessed owing to the limited Zeehan Zinc budget. The interpretation and magnetic modelling of the seismic line ZF is based on the reprocessed seismic segy data by SRK associate Dr Yun Wang. The interpretation of the all other seismic lines was performed on the Fugro processed segy data.

4.4.1 Seismic Interpretation and Magnetic Model along line ZF

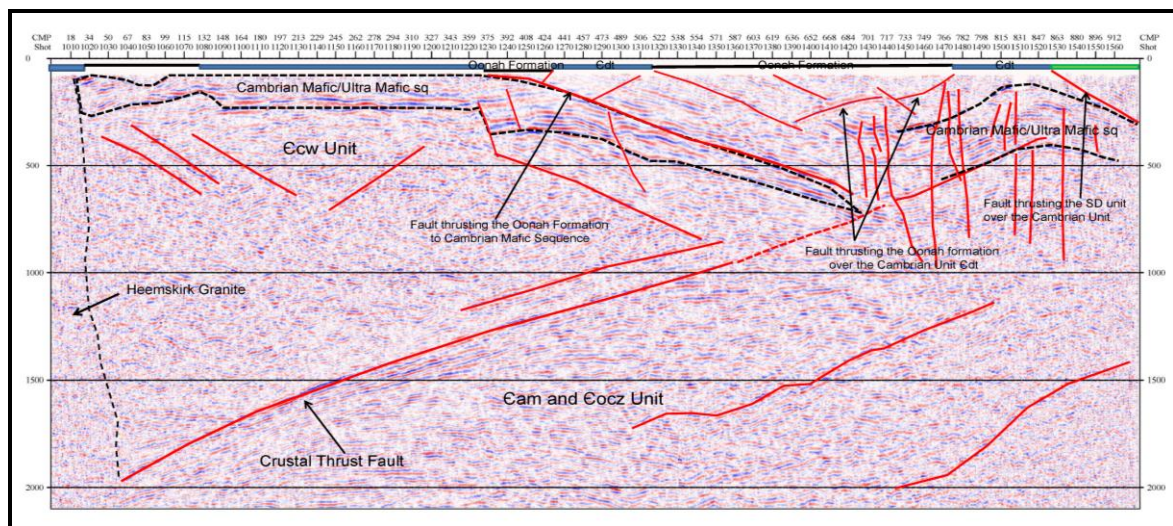
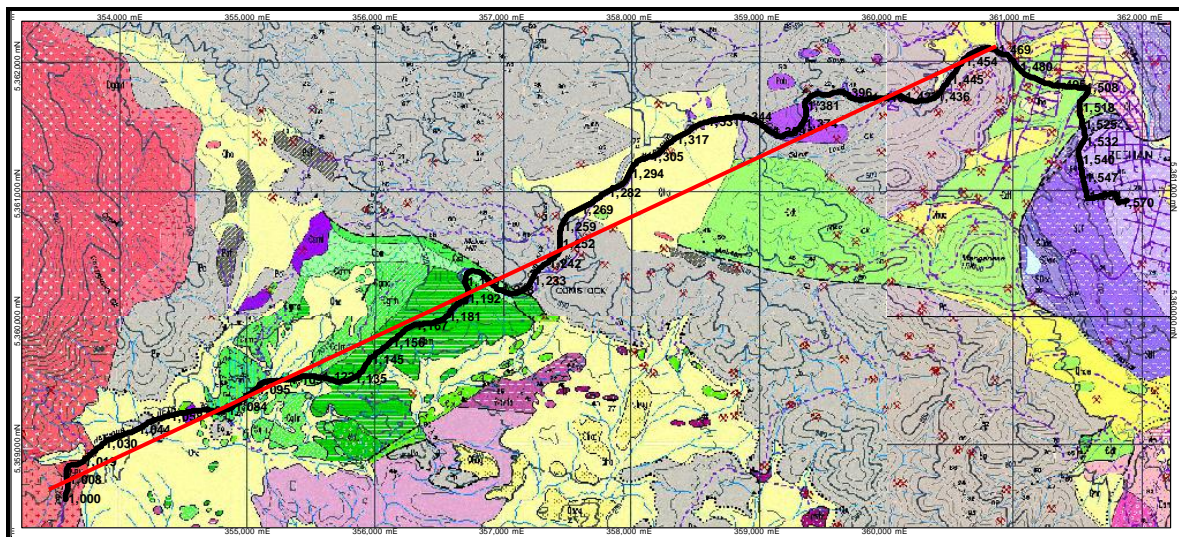
The seismic line TB02B_ZF starts at the eastern boundary of the Heemskirk Granite, and runs through the Cambrian intrusive/allochthonous igneous rocks, and the Oonah Formation, orthogonally crossing the contact between the Cambrian intrusive/allochthonous igneous rocks and the Oonah Formation. It terminates within the Eldon Group in the far east.

Magnetic modeling along the seismic line was not applied to far eastern part of the seismic line, where the survey line changes the direction from E-W to N-S, in order to ensure the magnetic modeling line was as close to the seismic line as practical.

Key results include:

- The Heemskirk Granite has a low gravity signature and low-intermediate magnetic anomalies. Both potential field signatures and seismic data indicate that the Heemskirk Granite has a near vertical contact with the country rock on the section, although the gravity data does indicate that the granite extends slightly to the north-east at depth. The Heemskirk Granite may extend deeper than 2 seconds twt, which is deeper than 1.1 seconds (approximate 2km) suggested by R H Findlay.
- The seismic section TB02B-ZF is dominated by a west-dipping strong reflection, inferred due to a poor quality of the seismic section as a thrust/shear zone in the Fugro processed seismic section by R. H. Findly. This thrust, linked to the Heemskirk Granite at depth, may form a mineralisation fluid pathway for the Zeehan mineralisation field.
- On the central part of the seismic section, the Cambrian Cdt unit and Precambrian Oonah Formation were thrust westwardly over the Cambrian mafic/ultra mafic complexes, consistent with surface geological mapping. However, the fault separating the Oonah Formation and Cambrian series (Cdt) at shot point 1475 dips to north shallowly.

- A major high Magnetic anomaly at the western part of the seismic section is sourced from a layered gabbro or its equivalent, which shows weak seismic feature on the top of the strong seismic reflector. The strong seismic reflector is possibly related to the pre-Cambrian/early Cambrian sediments or faults. A magnetic anomaly between 354490 and 354630m at longitude along the seismic line corresponds to the mapped serpentinite, the elongated magnetic anomalies may indicate buried N-S trending magnetic bodies emplaced along faults (massive serpentinite or gabbro?). Magnetic lows between 354700 and 355550 correspond to the mapped fine- to medium- and medium- to coarse-grained gabbro, the low magnetic response may be result of remanence contribution from the gabbro intrusive or its demagnetisation due to the post-intrusive tectonic evolution.
- To the east, mapped undifferentiated basalt and gabbro between 355610 and 357200m has very strong magnetic high signature. The unit extends underneath the Oonah Formation to the northeast to 357900m. Both the Oonah Formation and the undifferentiated volcanoclastic to polymict sandstone-mudstone-conglomerate sequences (Cdt) have low magnetic responses. The Cambrian ultra mafic/mafic unit is considered an exploration target for nickel and cobalt mineralisation.
- At the eastern end of the seismic section, dome-shaped strong reflectors at 0.2 seconds twt (around 500-600m) and between shot point 1490 and 1530, are interpreted as Cambrian mafic/ultra mafic rocks, as they coincide to both magnetic and gravity highs. The interpreted Cambrian igneous rocks also represent a exploration target for nickel and cobalt.



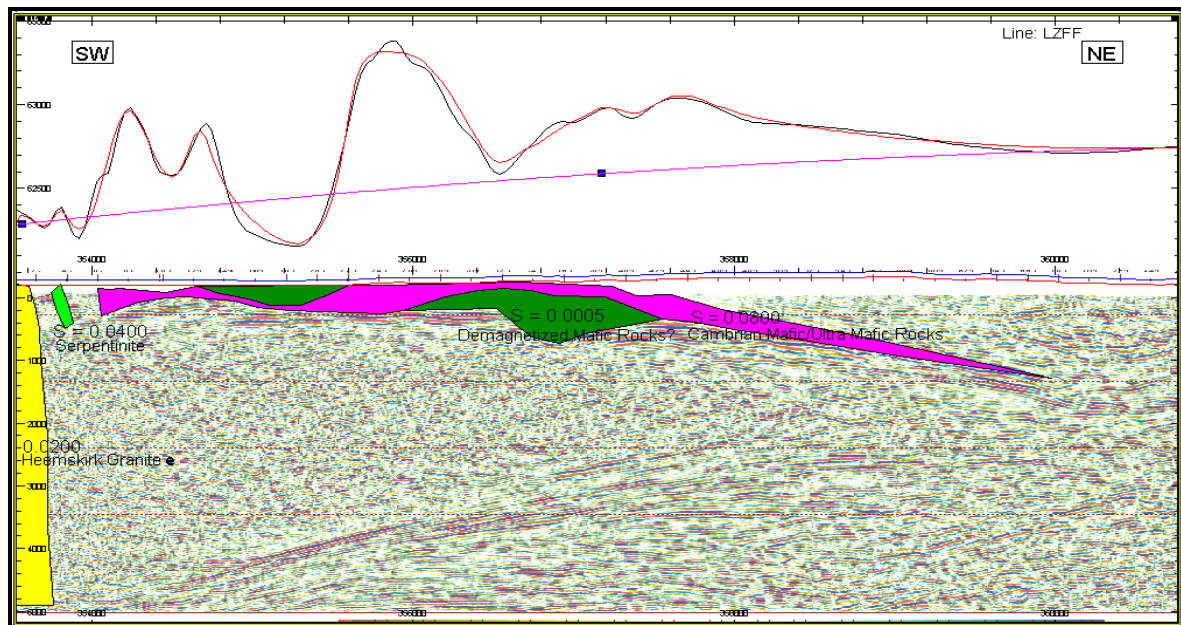


Figure 4-17: The seismic line TB02B_ZF superimposed on the geological map and its magnetic model
(See Appendix for enlarged seismic section)

4.4.2 Seismic Interpretation and Magnetic Model along line ZA

Seismic line TB02B-ZA extends along the Murchison and Zeehan Highway. The line starts in the north within the Cambrian intrusive/lava complex, in the central portion crossing faults separating the Cambrian rocks and the Gordon Limestone at a low angle, and terminates in the south where it obliquely ($\sim 45^\circ$) crosses the boundary between the Eldon Group and the Cambrian series. In general, most of the line runs oblique to the regional structure.

Magnetic modeling along the seismic line was divided into two parts as shown in Figure 4-18 in order to ensure the magnetic modeling lines were as close as practical to the seismic line.

- In the far north, outcropping Cambrian intrusive/lava complex rocks have high magnetic responses generally. The seismic line starts within Cambrian massive and multiple-intrusive two-pyroxene, granular textured gabbro (Cgp), which corresponds to a weak seismic feature (between shot point 1000 and 1028). Mapped Low Ti tholeiitic and boninitic lavas (Cbb), produce a strong horizontal reflector between shot point 1028 and 1117.
- At shot point 1120, seismic data confirms that a fault separating the Cambrian mafic sequence and the late Cambrian Cdtcc/COMss unit, dips shallowly to south.
- From shot point 1020 to 1254, weak seismic signatures dominate the seismic section.
- From shot point 1420 to 1545, COMs (Marine sandstone-siltstone-conglomerate sequence) produce strong reflectors. The unit also has high magnetic and gravity responses.
- From shot point 1611 to the end of the seismic line, strong seismic reflectors indicate continuity of the underlying Gordon Limestone beneath Quaternary alluvia.
- At shot point 1730, several domal structures on the seismic section between 0.3 to 1 second possibly reflect the presence of Devonian intrusives.
- The interpretation of a thick Devonian granite sill by R. H. Findlay in the section is not supported by the seismic data (although the seismic signal is very weak at that depth).
- The magnetic highs at shots point 1044, 1124 and 1515 are modeled as Cambrian mafic bodies.

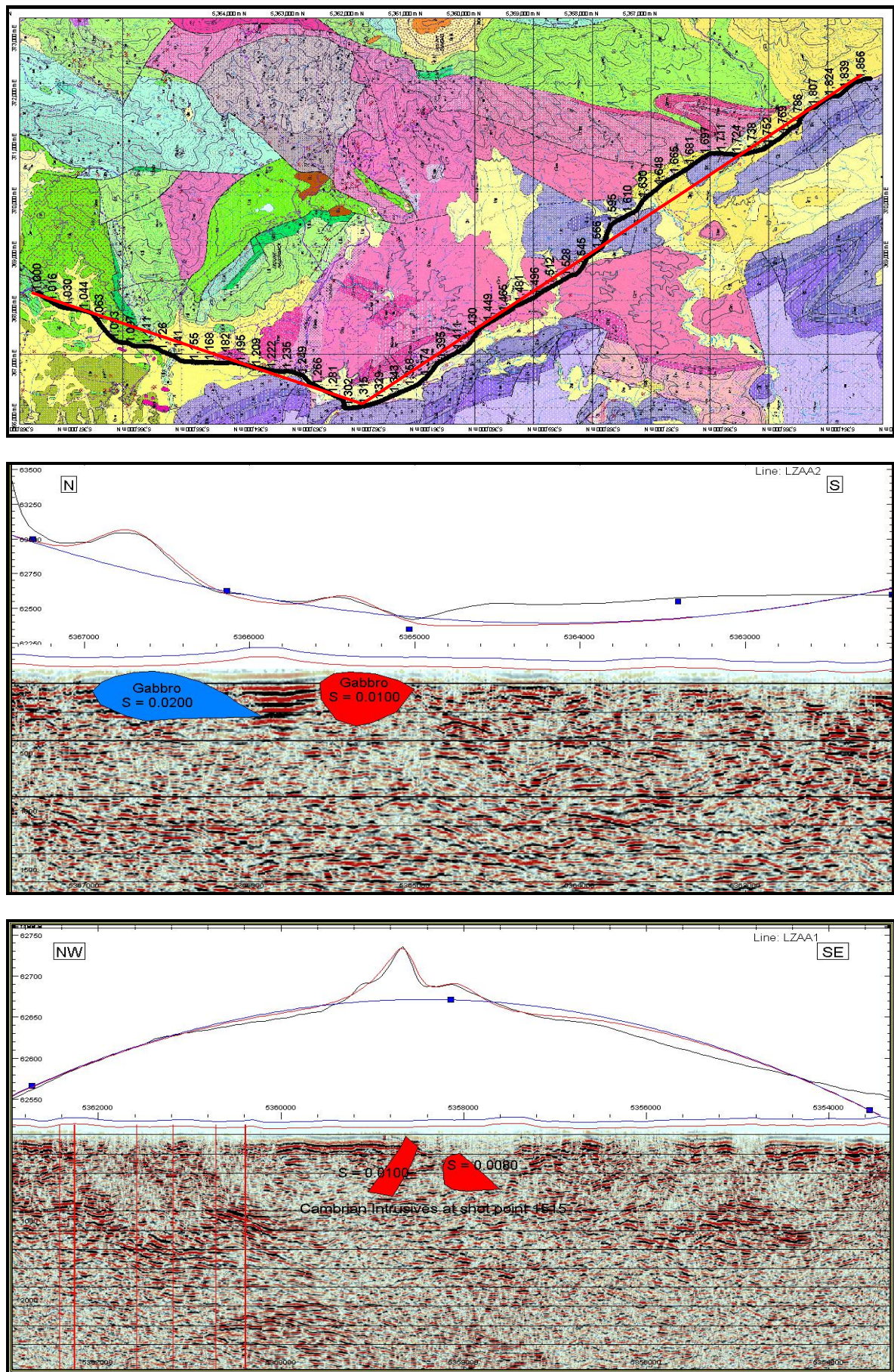


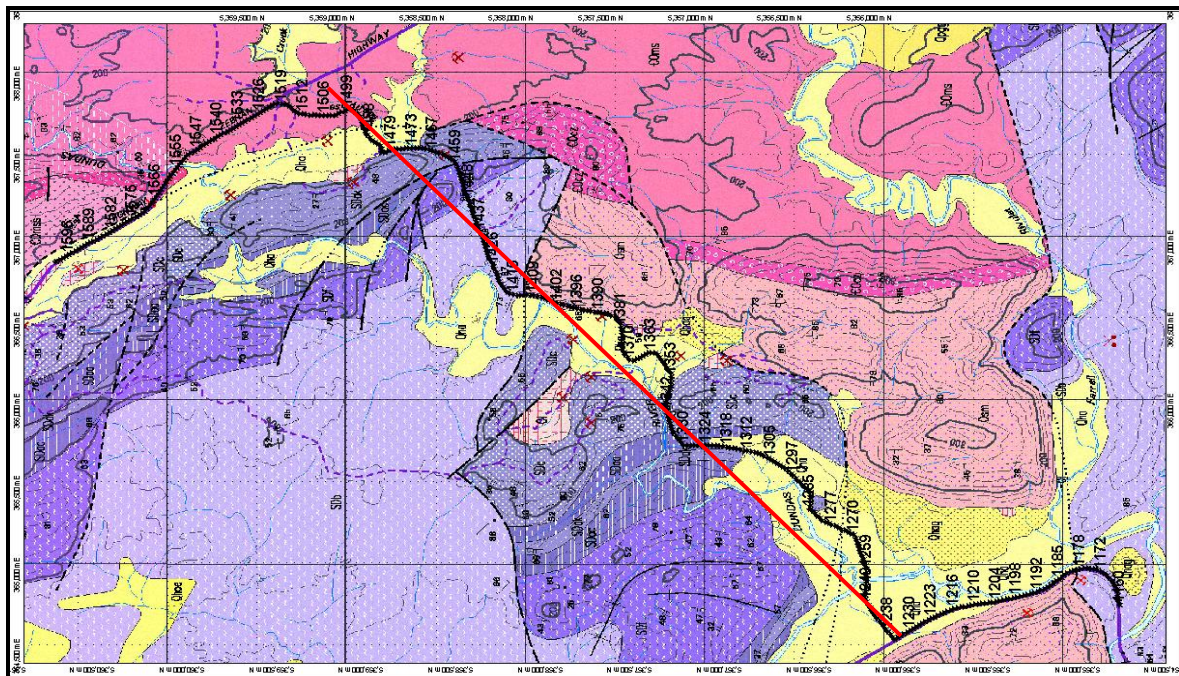
Figure 4-18: The seismic line TB02B_ZA superimposed on the geological map and its magnetic model
(See Appendix for enlarged seismic section)

4.4.3 Seismic Interpretation and Magnetic Model along line ZB

The seismic line TB02B-ZB runs along the old mining track between Oceania and Maiposa mines. The central section is almost perpendicular to the broad post-Early Devonian syncline trending NW in the project area. Both ends of the seismic line run almost parallel the strike of the sedimentary sequences, rendering interpretation difficult.

Magnetic modelling is not applied to the seismic section due to the lack of significant magnetic variation along the seismic line.

- On the seismic section, a strong seismic reflector is associated with Silurian-Devonian sediments (SDak).
- At shot point 1480, seismic data westward over thrusting of the SDak unit by the Cambrian units at the eastern end of the line, is supported by the magnetic data.
- The western part of the section is underlain by westward thrusts and thrust duplexes.
- Both ends of the seismic line have combined magnetic/gravity highs sourced from the Cambrian sequences.
- Along the central part of the seismic line, Silurian-Devonian sediments shows a relatively low magnetic and gravity responses.
- Continuation at depth of the Gordon Limestone, host to a number of zinc-lead deposits, has been interpreted along much of the seismic section.



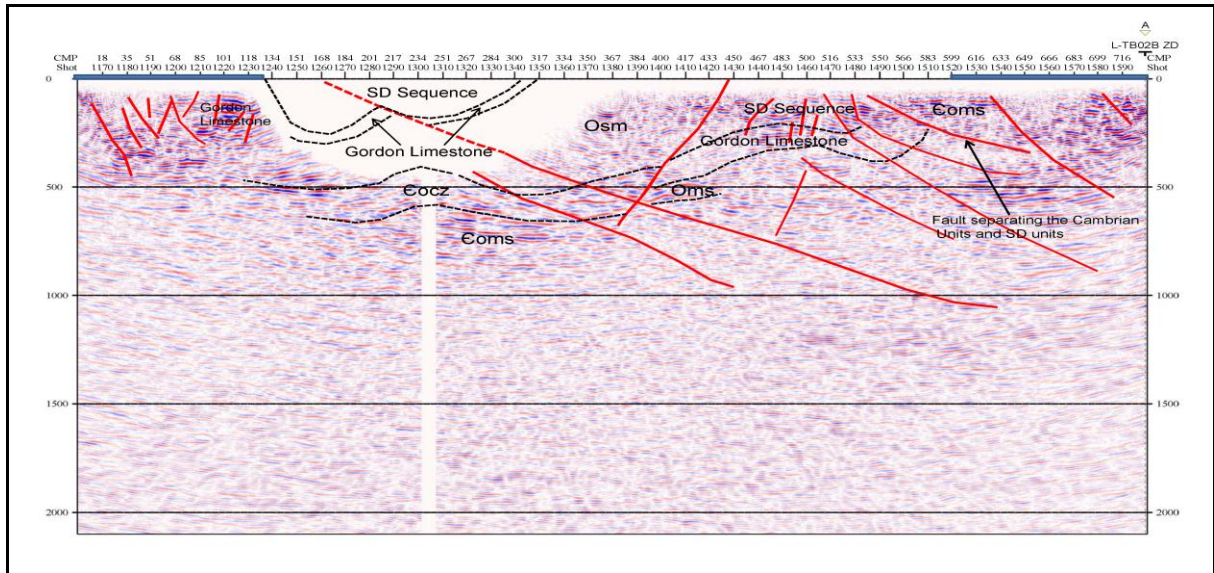
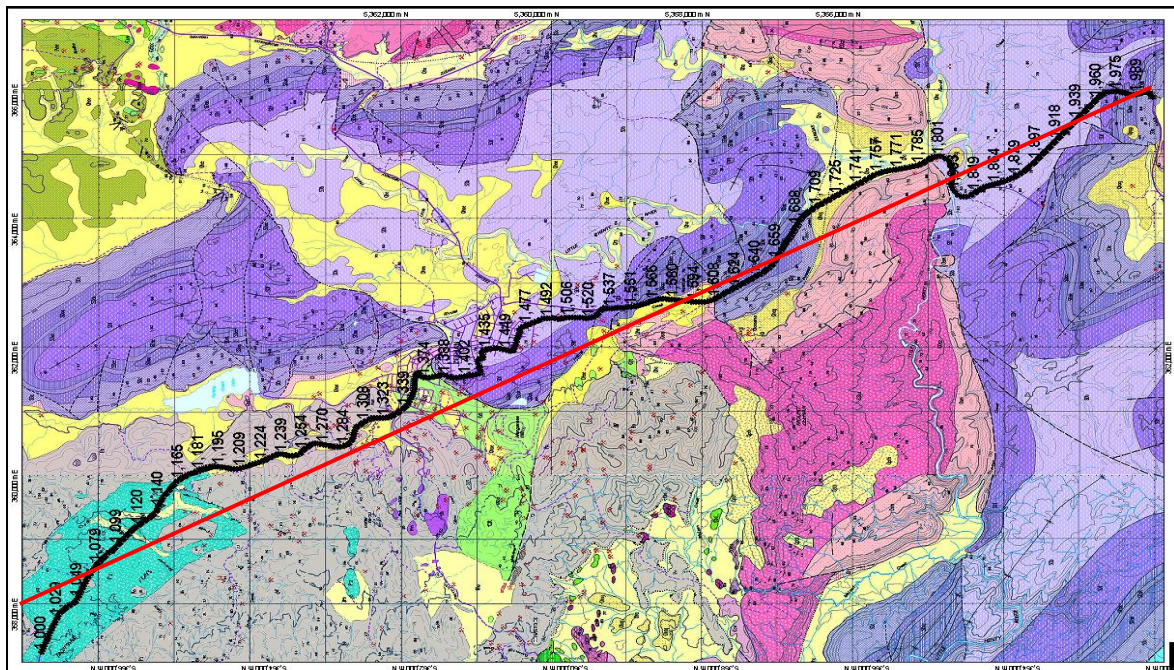


Figure 4-19: The seismic line TB02B_ZB superimposed on the geological map and its magnetic model
(See Appendix for enlarged seismic section)

4.4.4 Seismic Interpretation and Magnetic Model along line ZC

Seismic line TB02B-ZC commences north of Zeehan, within outcropping Permian tillite, and passes southwards through Zeehan Township. The seismic line runs geologically through the Permian tillite, the Oonah formation in the north, then the Cambrian unit Edt, and terminates in the south in Silurian-Devonian sediments. The line crosses the contact between the Oonah Formation and the Cambrian rocks north of Zeehan at a high angle; south of Zeehan it runs parallel to strike of both the Eldon Group and the Gordon Limestone. Towards the southern end of the traverse, the line crosses the Silurian-Devonian bedding orthogonally to strike between shot points 1964-1999.



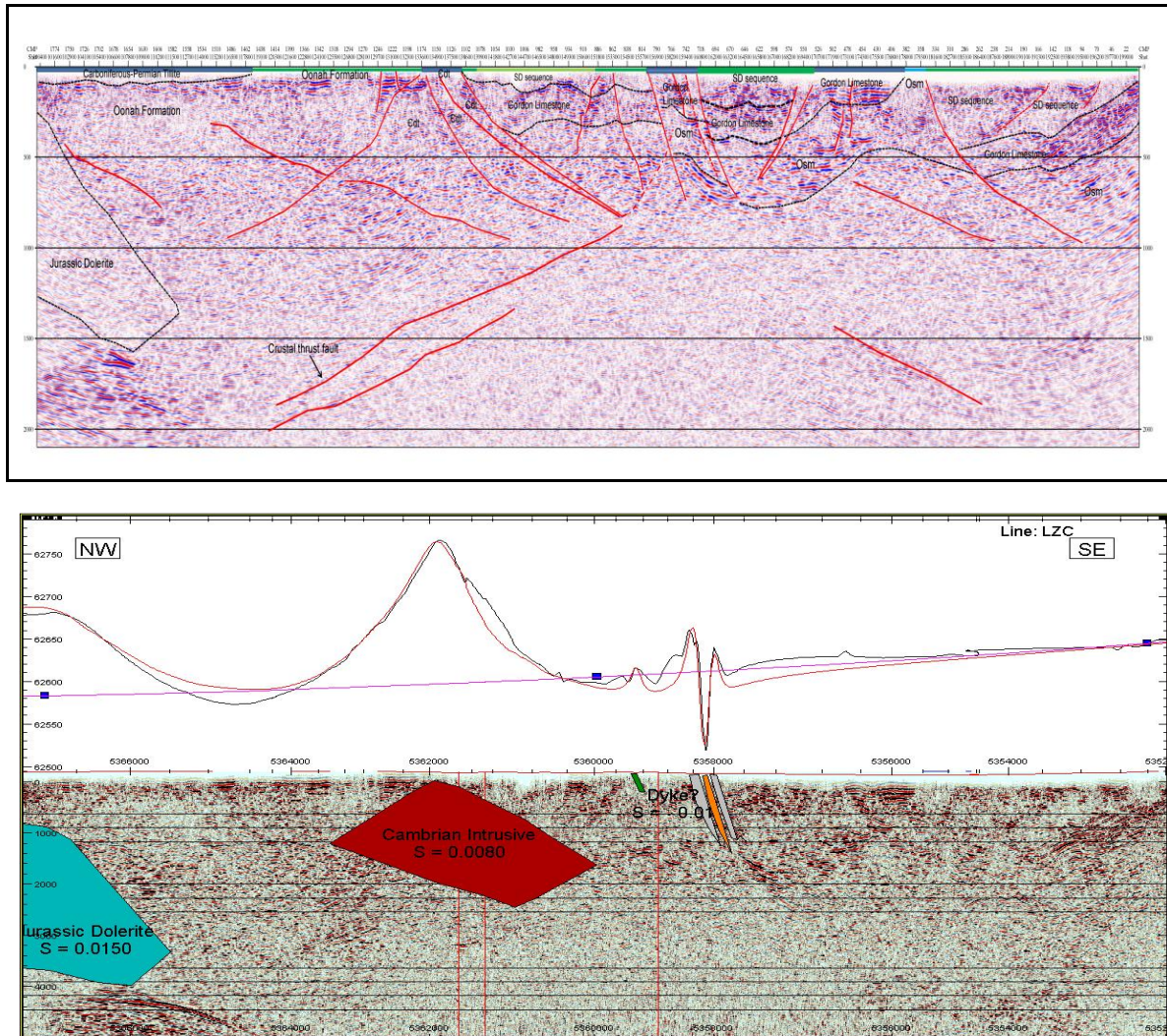


Figure 4-20: The seismic line TB02B_ZC superimposed on the geological map and its magnetic model
(See Appendix for enlarged seismic section)

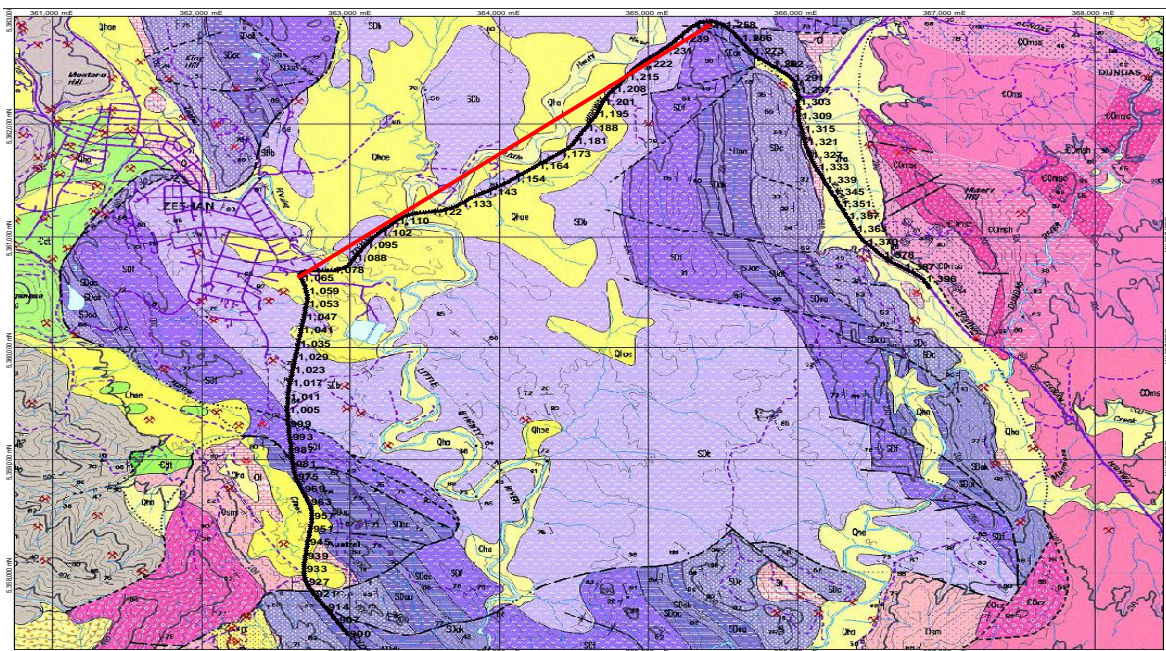
- Overall, the line commences within the centre of a magnetic high, indicating a buried Jurassic Dolerite within the Oonah Formation. The dolerite has a weak seismic feature.
- Between shot point 1325 and 1400, the line crosses a relatively high magnetic anomaly. This part of the line overlaps with the reprocessed seismic line TB02B_ZF, which shows strong reflectors, indicating that the high magnetic anomaly may be a Cambrian mafic unit.
- On the residual gravity image, the line commences within a broad gravity low and terminates in a gravity high, indicating a deeper crustal compositional change along the seismic line.
- In the Zeehan area, the geological map shows that the Oonah Formation overthrusts Cambrian rocks to the northwest of Zeehan. The seismic line crosses the thrust fault separating the Oonah Formation from the Cambrian unit, and indicates that it dips shallowly to the north.
- From shot point 1336, to the end of the seismic line, the section displays a northward over-thrust feature. The thrust faults dip shallowly to south, consistent with magnetic modelling of the fault.
- A thrust dipping to north, between 1 -2 second twt at depth can be readily recognised, the thrust is the same observed on the seismic section TB02B_ZF and forms a potential mineralisation fluid pathway for Devonian Heemskirk Granite related fluids.
- The Gordon Limestone at the end of the seismic section is inferred to be extended under the SD sequence.

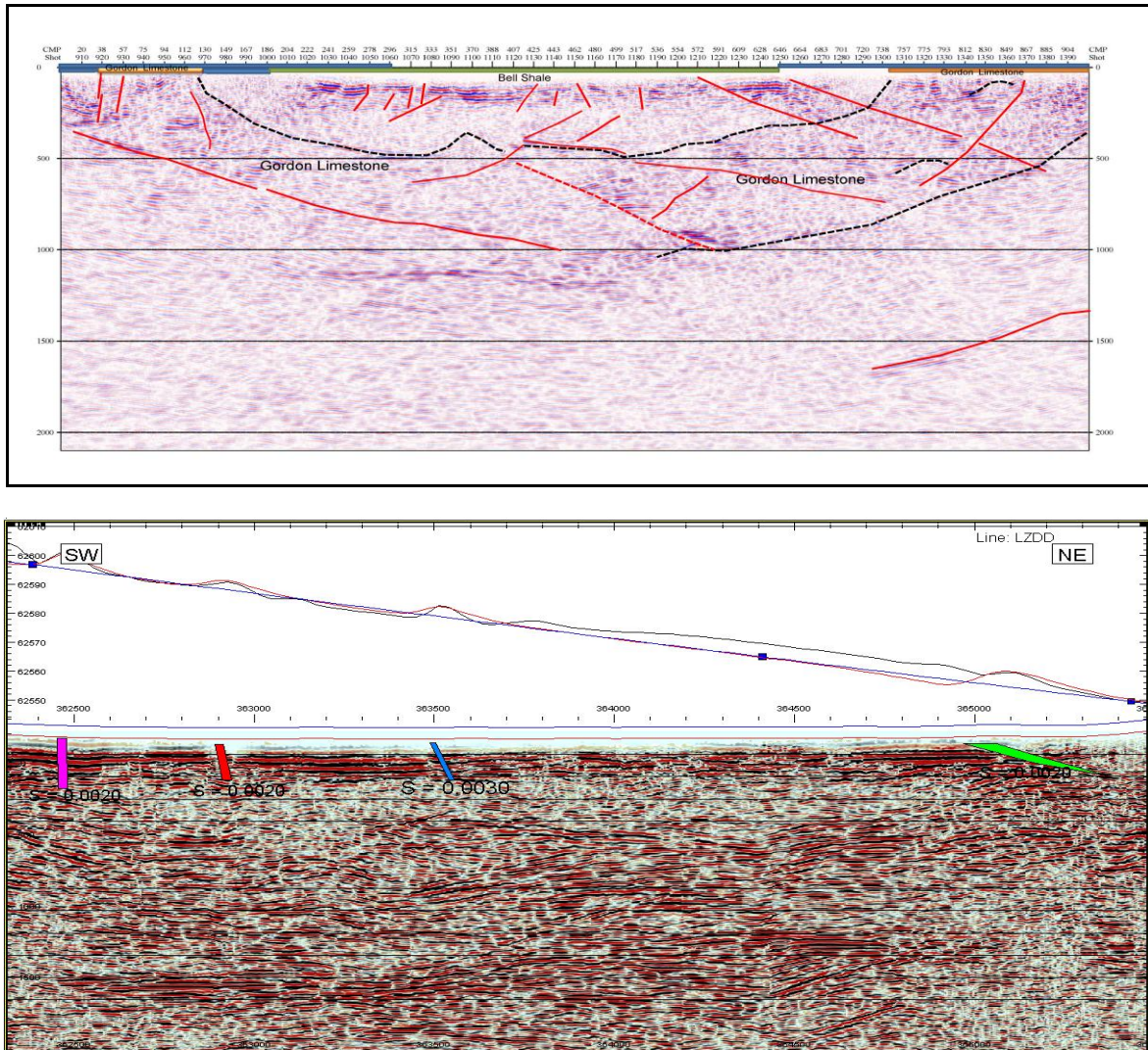
4.4.5 Seismic Interpretation and Magnetic Model along line ZD

The seismic line TB02B-ZD crosses the SE-trending syncline in the Eldon group with the Bell Shale forming the synclinal core and the Gordon Limestone occupying the limbs. The western and eastern part of the profile parallel the overall strike of the units.

Magnetic modelling has only been applied to the central part of the seismic section as both ends of the line, were modelled along the seismic lines TB02B-ZC and TB02B-ZA.

- Overall, no significant magnetic and gravity sources were observed along the profile. The observed magnetic anomalies are fault-related consistent with the seismic observations.
- At shot point 920, the interpreted fault, separating the SD sequence from the Gordon Limestone, dips steeply to south.
- Seismic reflectors between 1.5s and 2s display a syncline feature which is consistent with the mapped geology.
- The central part of the seismic section, (between 0.5 second twt and 1second twt), displays a change in texture of the seismic reflectors at depth that, may indicate the presence of the Gordon Limestone. beneath the overlying sedimentary sequence.
- There are no significant magnetic variations. Small magnetic anomalies observed along the seismic line are probably related to faults.





**Figure 4-21 The seismic line TB02B_ZD superimposed on the geological map and its magnetic model
(See Appendix for enlarged seismic section)**

5 Conclusions and Recommendations

The study utilised both seismic data and potential field data, providing a better understanding of the subsurface structural geology of the Zeehan area, in conjunction with the Zeehan 1:50 000 quadrangle geological maps.

Magnetic modelling along seismic line TB02B-ZF, shows that outcropping Cambrian ultramafic and mafic complex rocks possibly extend beneath the Oonah Formation to the east and south. Ni-Cu mineralisation targets are considered to be related to this Cambrian ultramafic and mafic complex.

The Heemskirt Granite has moderate magnetic responses and a low gravity anomaly. It can be mapped at shallow depths by the magnetic data, with gravity data indicating the granite plunges farther to the north-east at depth.

Jurassic dolerite, cropping out in the northwest of the map area, has a high amplitude in both magnetic and gravity data. It extends south-westwards in the subsurface. Gravity data shows that it also extends north-eastwards at depth.

Reprocessing of seismic line TB02B-ZF considerably enhanced seismic reflectors improving resolution and definition of features. A prominent west-dipping feature probably reflects a major crustal-scale thrust. Smaller back-thrusts are present in the allochthon.

Overall the structure of the Zeehan region is dominated by north-westward thin-skinned thrusts.

Recommendations

We recommend:

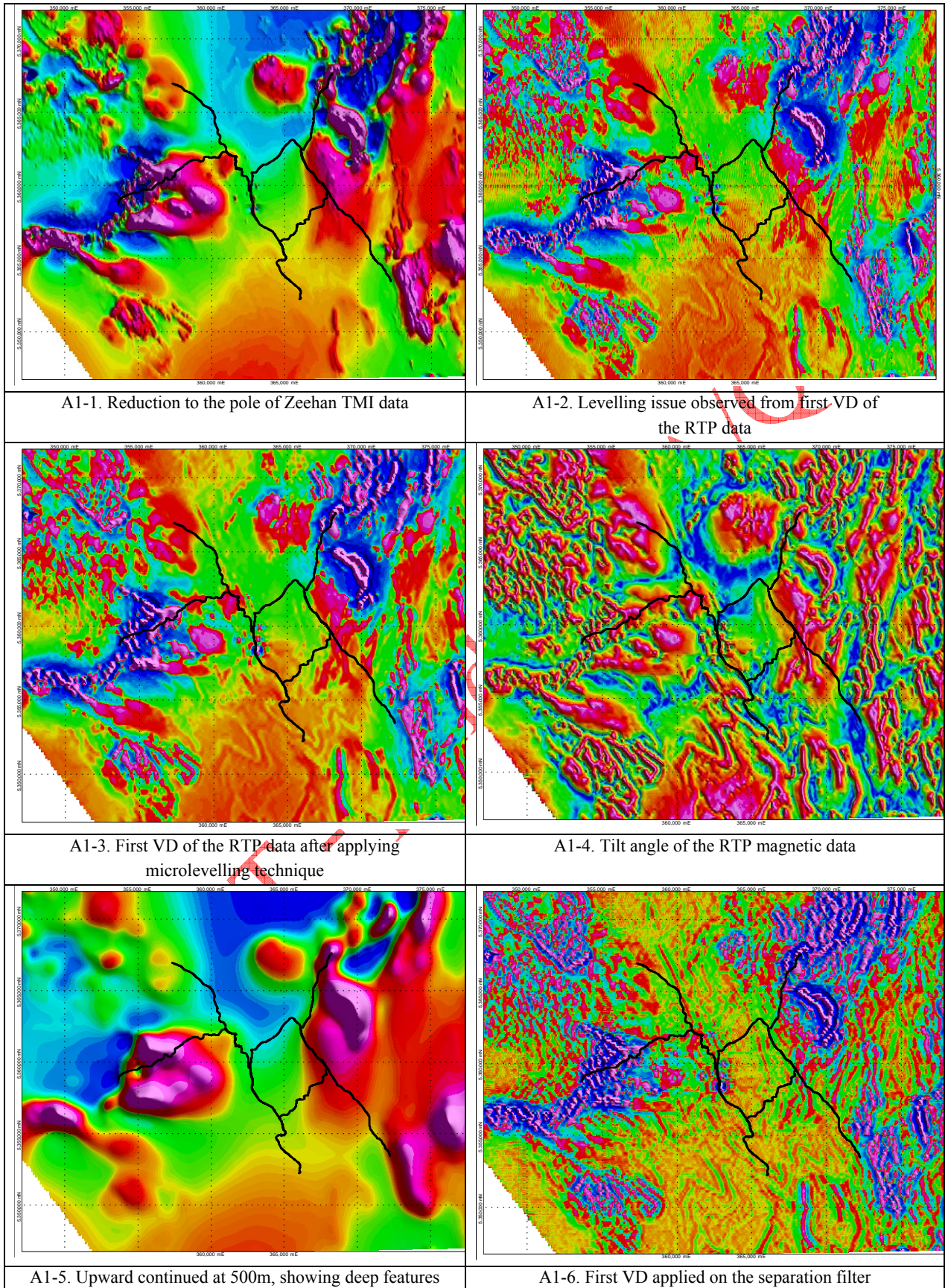
- Reprocessing of the remaining four seismic lines: TB02b-ZA, TB02b-ZB, TB02b-ZC, TB02b-ZD using the processing parameters applied to seismic line TB02b-ZF to improve the seismic interpretation.
- Running a 3D magnetic inversion of the whole study area to evaluate/confirm the seismic interpretation and magnetic modelling results.
- Conducting a detailed magnetic and gravity structural interpretation in the Zeehan area.
- Conducting a petrophysical study on the selected drillholes to assist magnetic and gravity modelling.
- That mineralisation targets areas identified by this study be reviewed and evaluated using detailed 3D magnetic inversion models and structural interpretation to provide targets for drilling and further investigation.

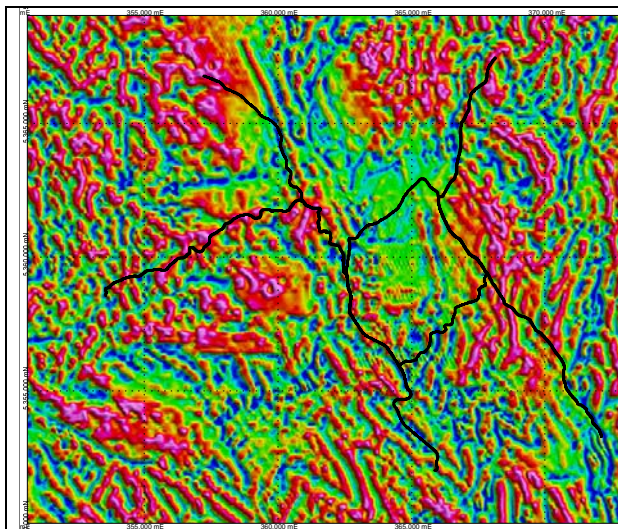
6 References

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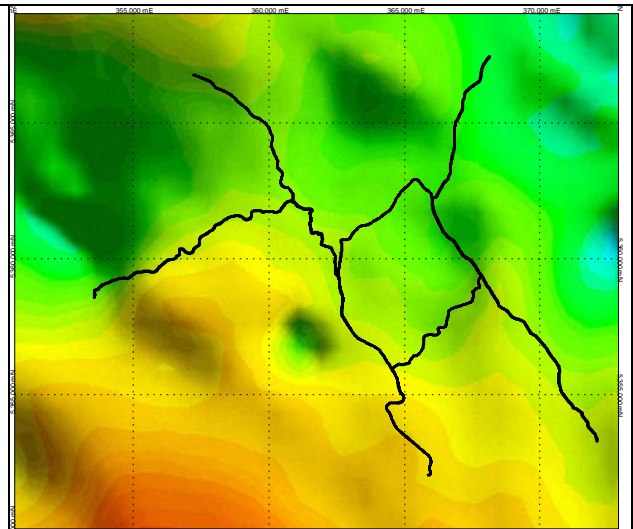
Appendices

Appendix 1: Magnetic and Gravity Enhancements

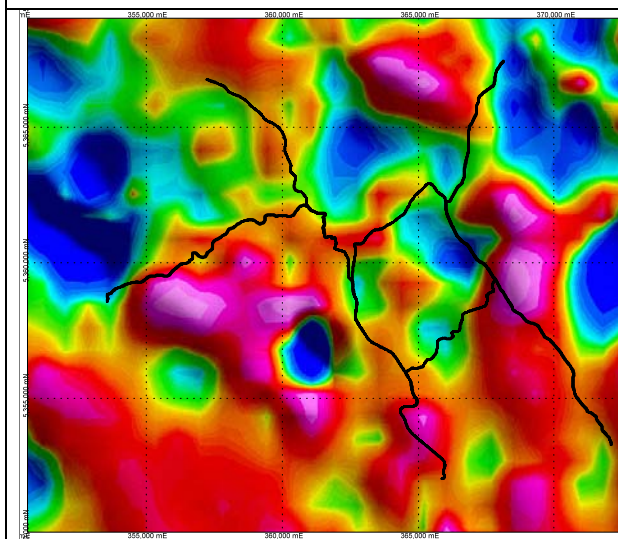




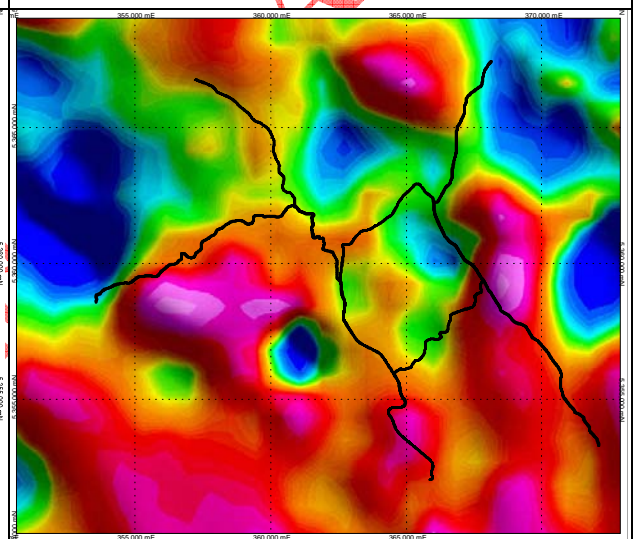
A1-7. Auto Gain Control applied to tilt filter of RTP



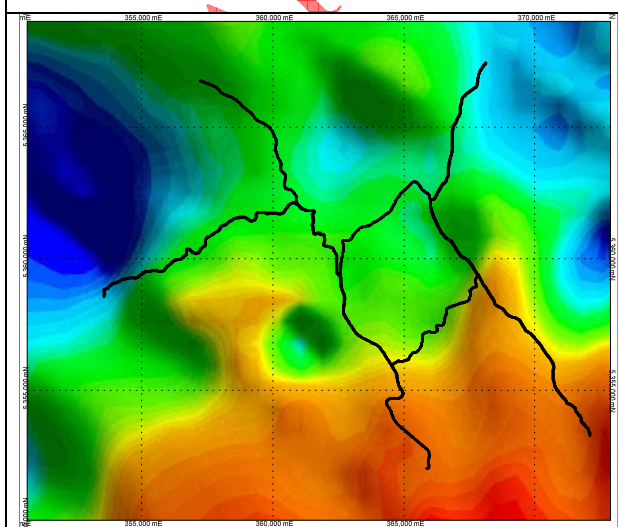
A1-8. Bouguer Gravity



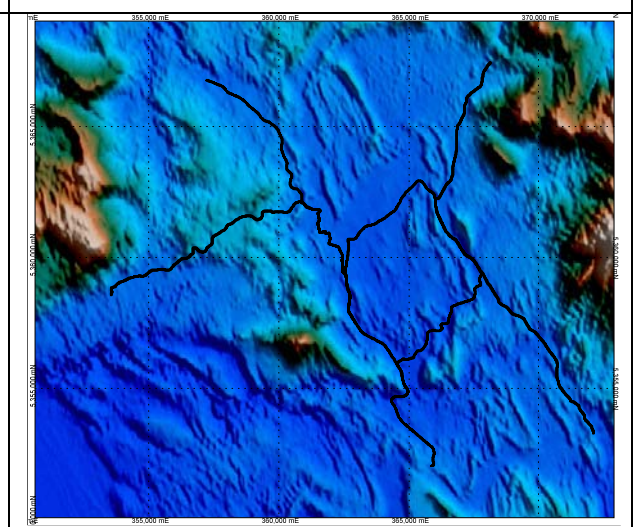
A1-9. First vertical derivative applied to Bouguer gravity



A1-10. Bouguer gravity separation filter, bouguer gravity subtracted by Bouguer gravity upward continued at 1 km



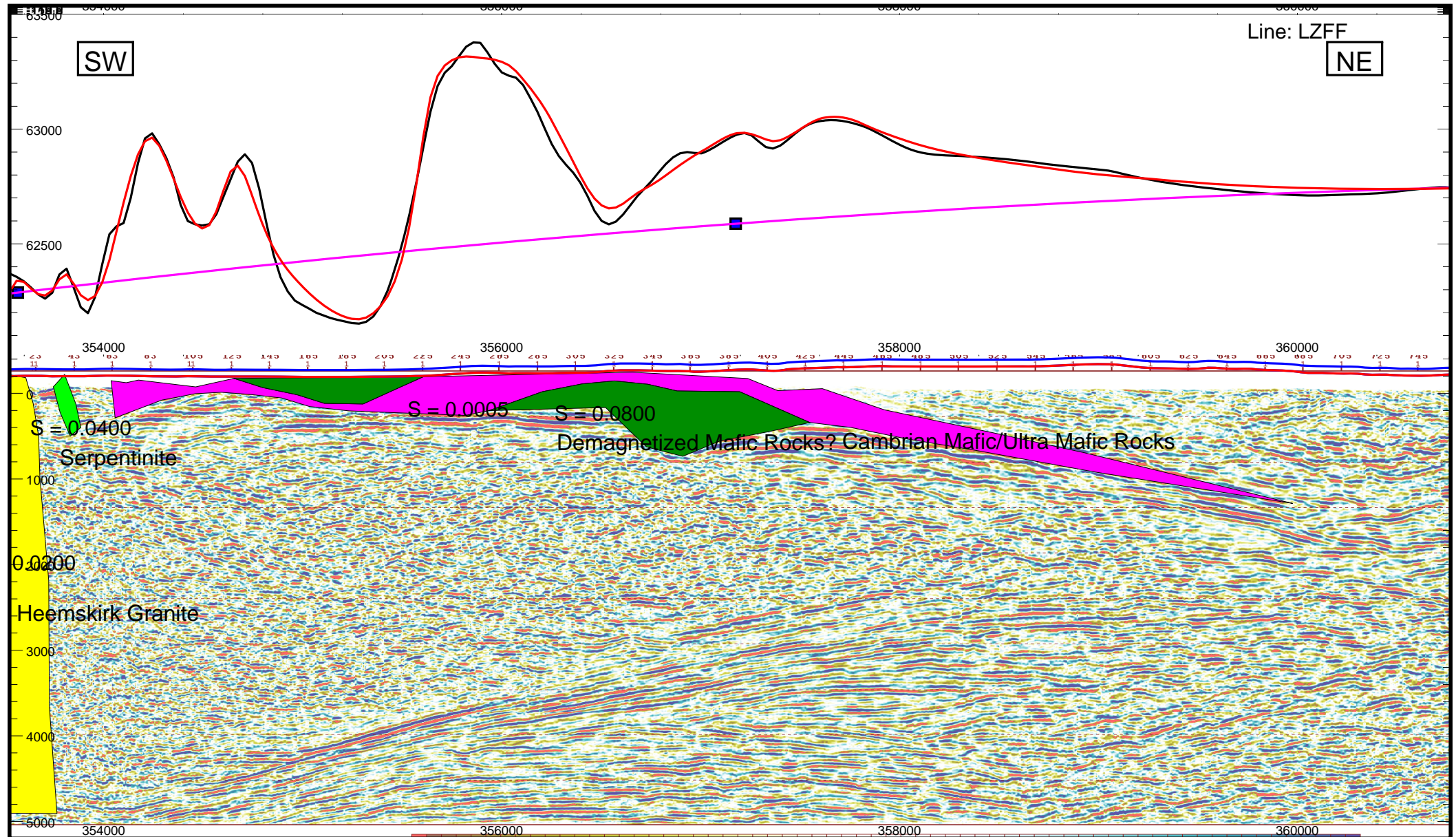
A1-11 Bouguer Gravity second order trend removed



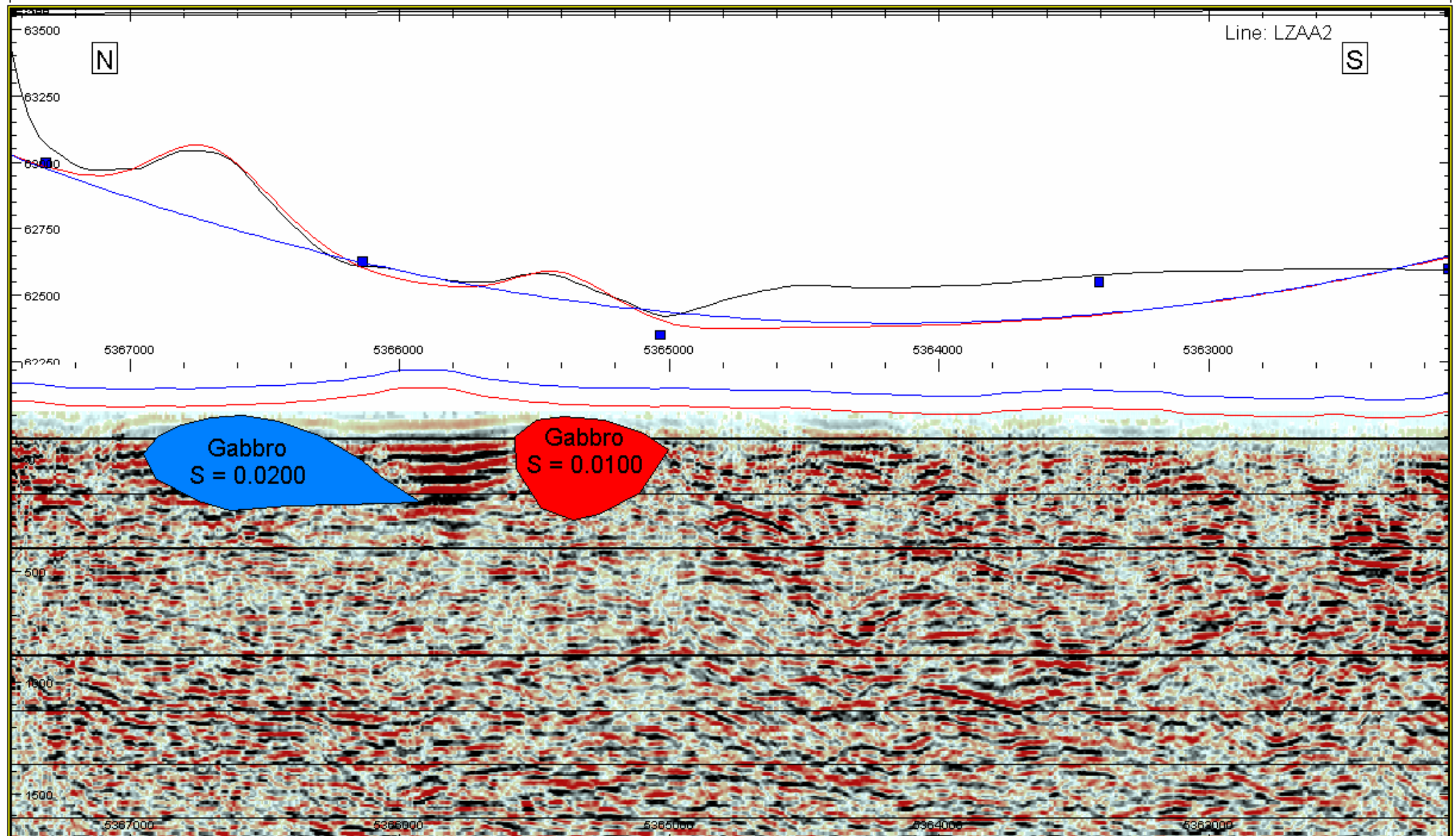
A1-12. Digital Elevation Model

Appendix 2: Magnetic Models

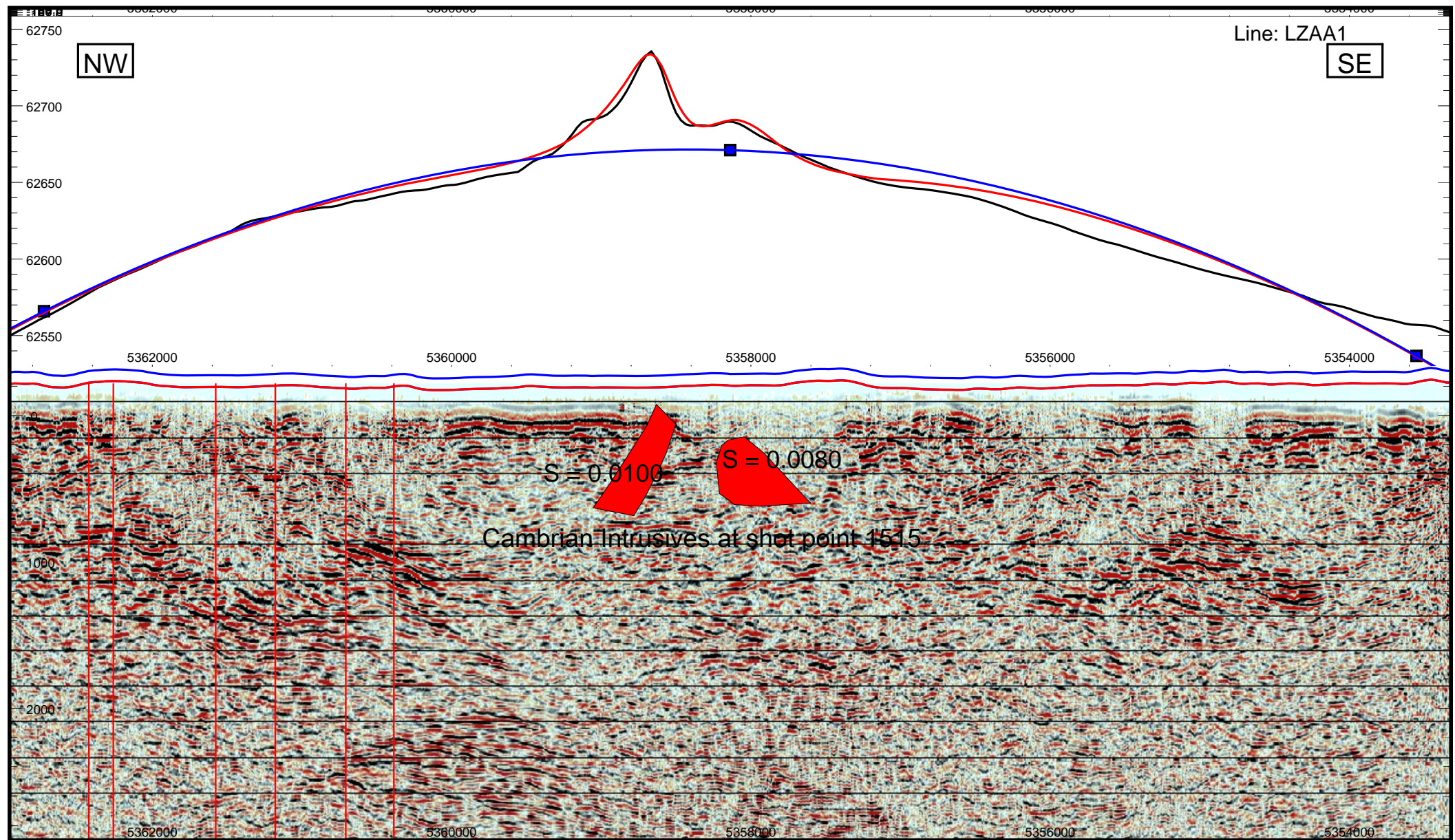
Magnetic Modelling along seismic line TB02B-ZF



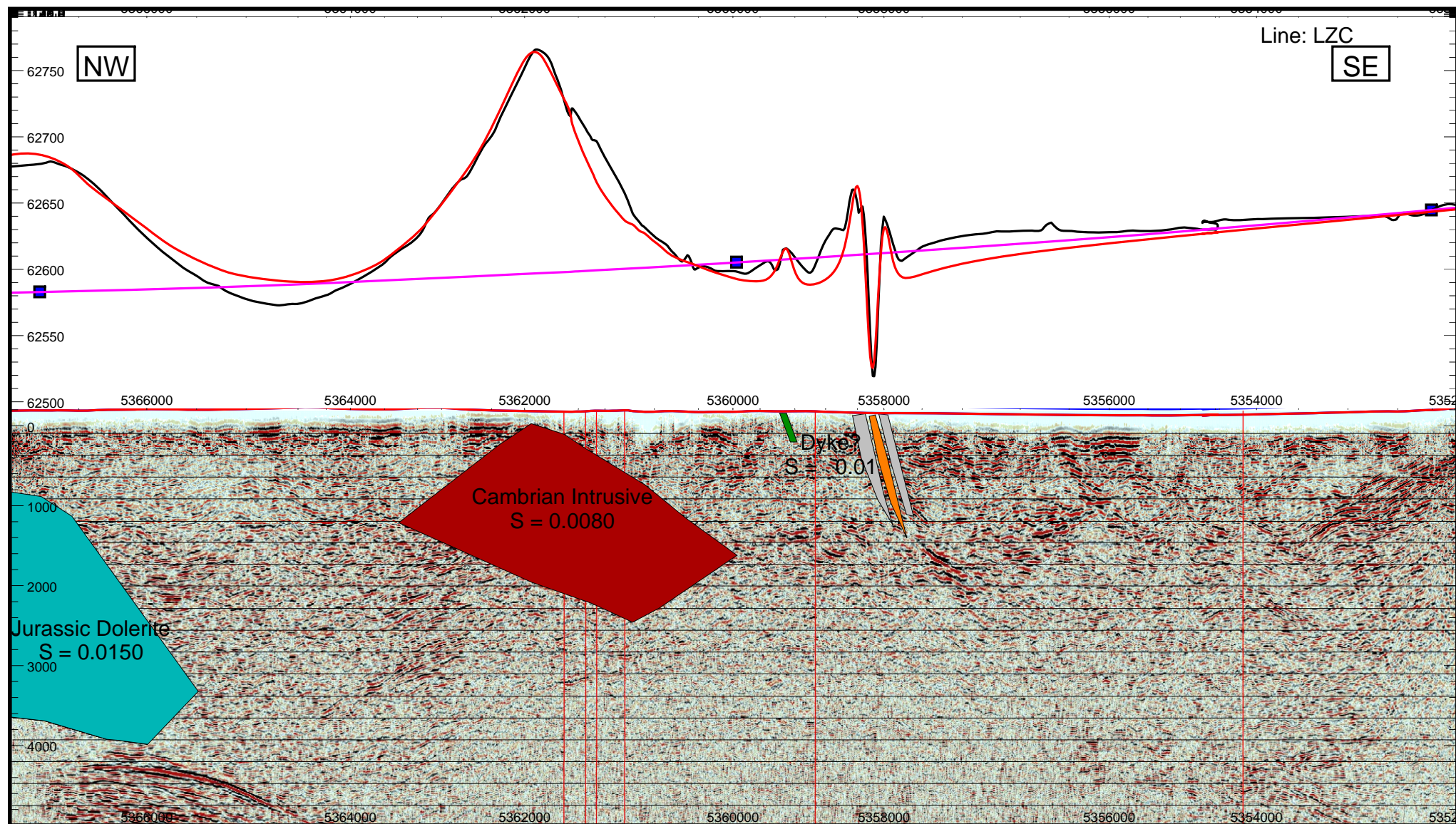
Magnetic Modelling along seismic line TB02B-ZA



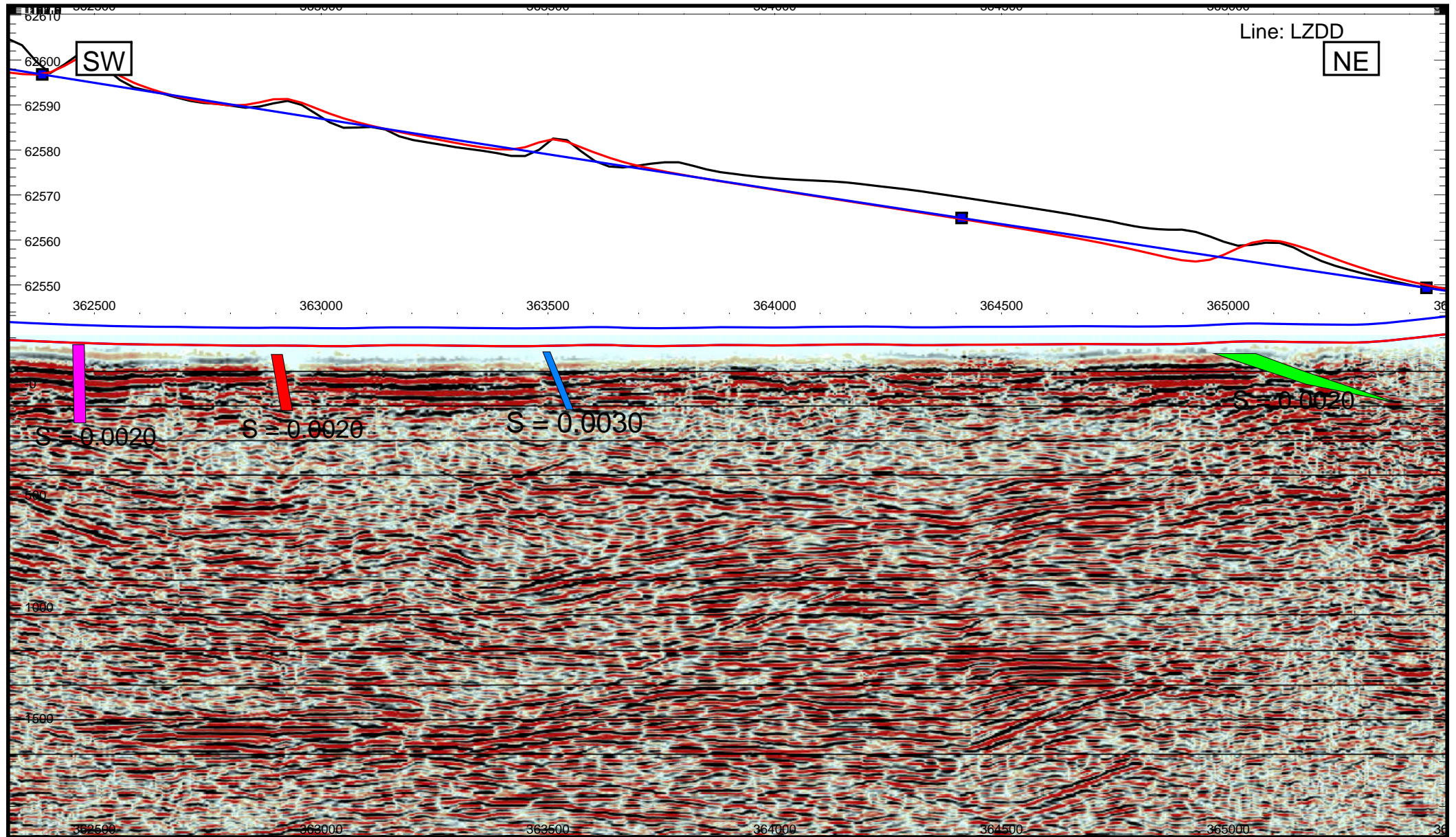
Magnetic Modelling along seismic line TB02B-ZA



Magnetic Modelling along seismic line TB02B-ZC

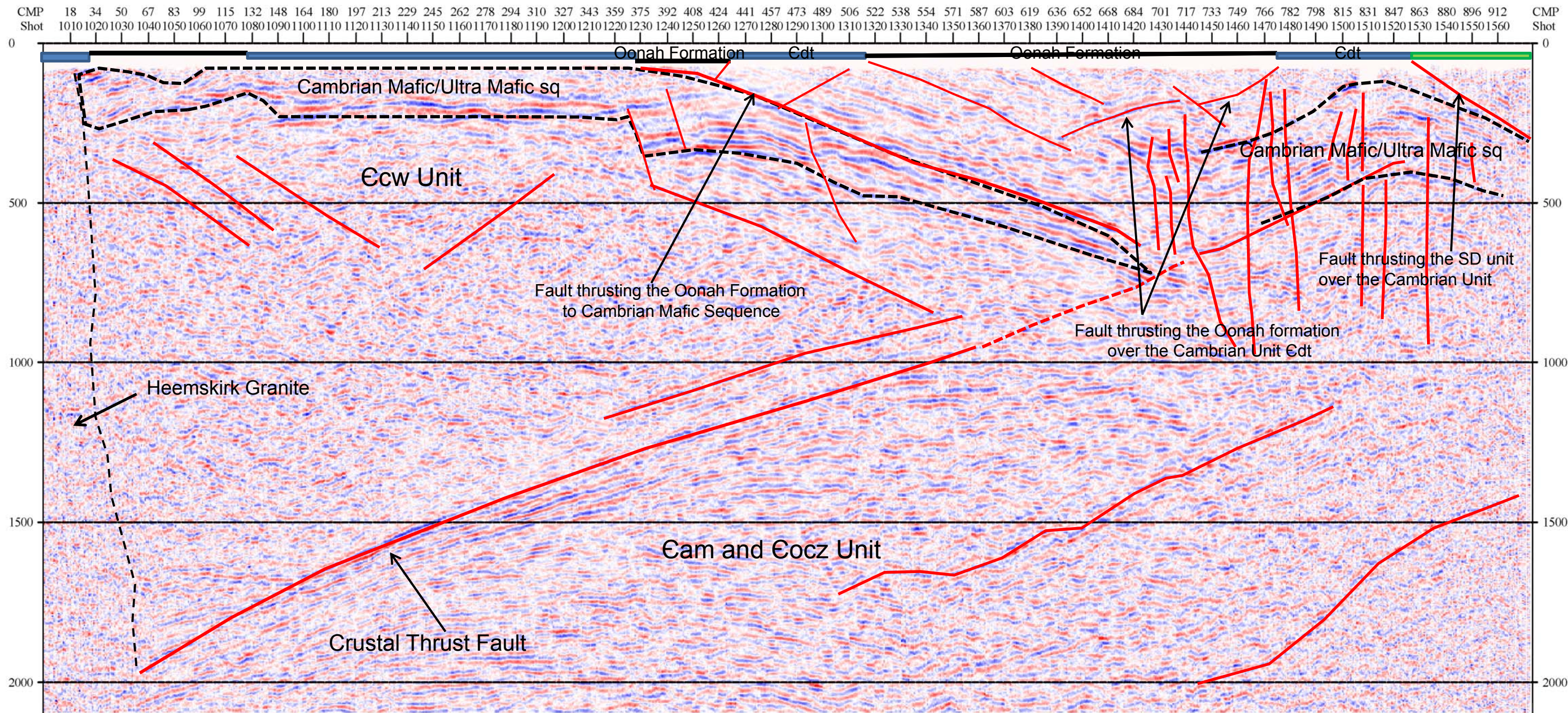


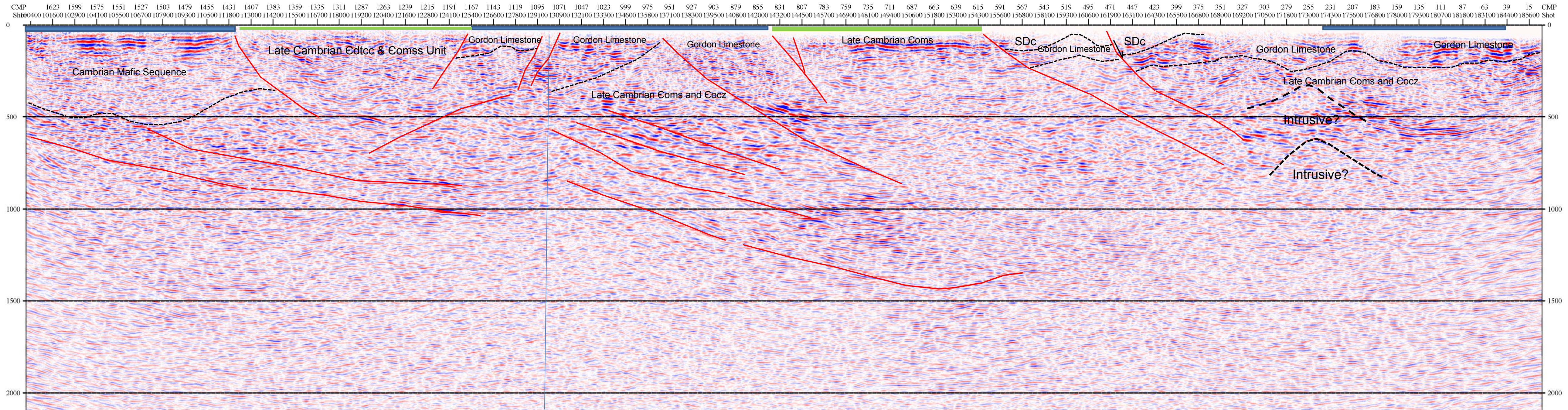
Magnetic Modelling along seismic line TB02B-ZD

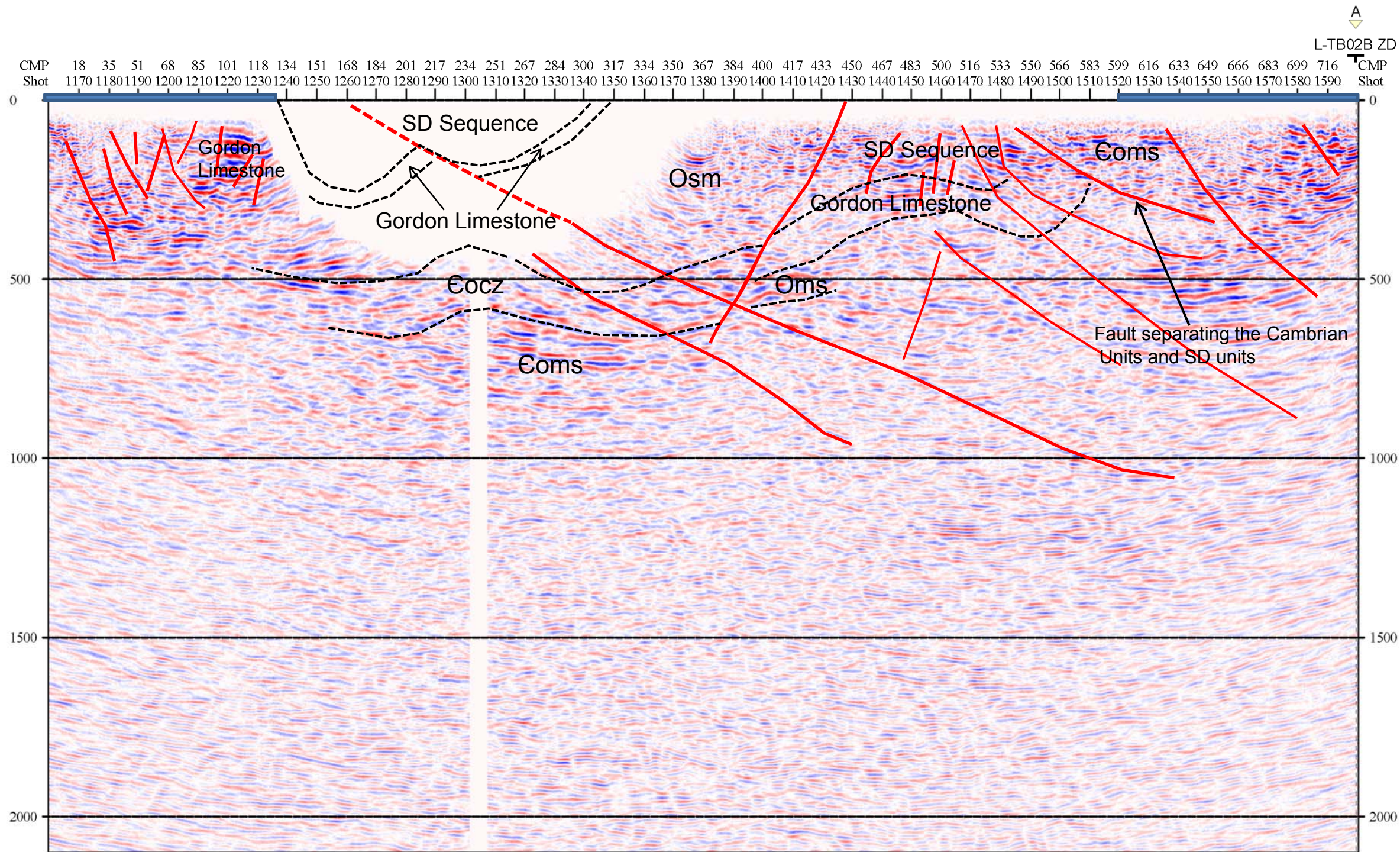


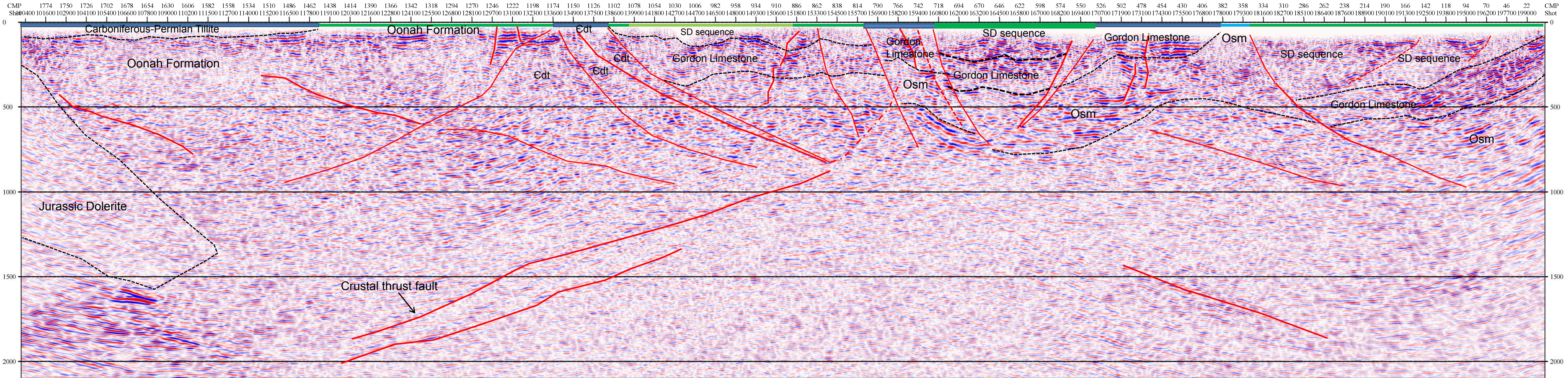
Appendix 3: Interpreted Seismic Sections

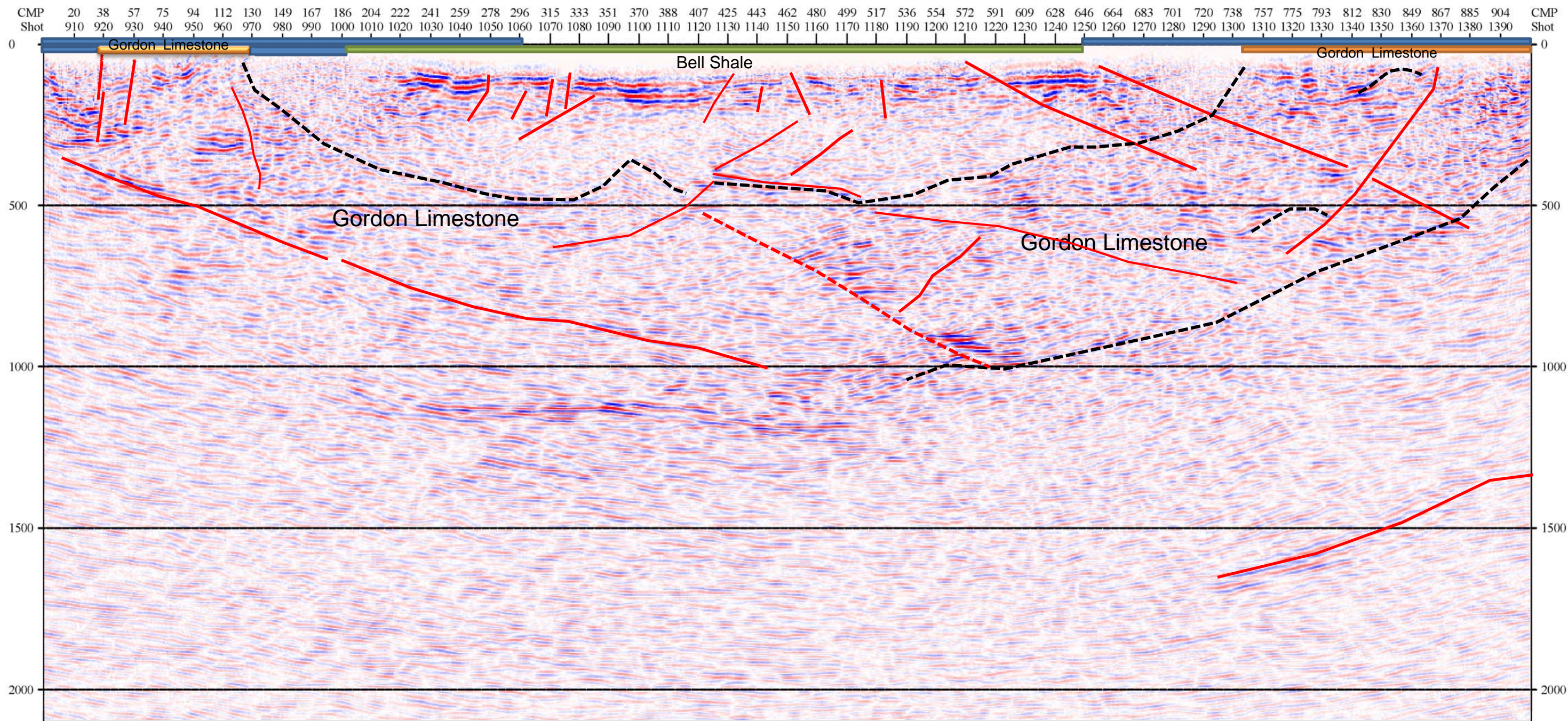
TB02B_ZF; TB02B_ZA; TB02B_ZB; TB02B_ZC; TB02B_ZD











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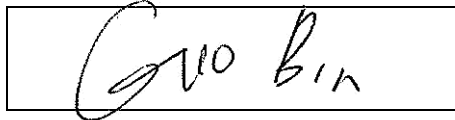
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31 August 2009

Name/Title	Company	Copy #
Veska, Laurie	Zeehan Zinc Limited	1

Approval Signature:



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Rev No.	Date	Revised By	Revision Details
0	31/08/2009	Bin Guo	Report issued to client.