



# Zevon 2D seismic test line

## 2D seismic interpretation report

Exploration License: EP115

License Holder: Frontier Oil & Gas Pty Ltd

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1:100k Map sheets: Cleland (5050), Mount Murray (5049)

1:250k Map sheets: Mount Liebig (SF5216), Lake Amadeus (SG5204)

Datum/Zone: GDA94 MGA Zone 52

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### **Report and Interest Holder Identification**

This Processing Report for the Zevon 2D seismic test line acquired within Exploration Permit 115 (EP115) in November 2023 is submitted to the Northern Territory Government in accordance with the Petroleum Act 1984 (Act) and Petroleum Regulations 2020 by Central Petroleum which operates EP115 on behalf of Frontier Oil & Gas.

Version	Date	Author	Changes made
1.1	23rd November 2024	Lawrence Leader	First Version

Acronyms	Full form
Act	Petroleum Act 1984
AGC	Automatic Gain Control
CMP	Common Mid-Point
FFT	Fast Fourier Transform
FWC	Full Waveform Correction
LSNS	Land Seismic Noise Specialists
m/s	metres per second
m	Metres
msec	Milliseconds
NMO	Normal Moveout
PSDM	Pre-stack Depth Migration
PSTM	Pre-stack Time Migration
QC	Quality Control
RMO	Residual Moveout

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## **1. Executive Summary**

The Zevon seismic test line was acquired over the Zevon prospect in the central southern area of EP115 by Oceania Geo in November 2023.

After acquisition of the seismic data Land Seismic Noise Specialists began the data processing in December 2023 and provided Central the last of the project deliverables in March 2024, although follow-up revisions continued into May 2024.

Following on from the processing the seismic line has been interpreted with the interpretation being tied to the Wells Anticline survey acquired in 2008.

The Zevon test line does not intersect any other seismic surveys so that there are uncertainties in the correlation of stratigraphic to seismic horizons.

As such interpretative maps have not been generated because such maps would be of limited value given the high degree of uncertainties.

The structural interpretation of the seismic test line incorporates contractional features of salt tectonics and is consistent with structures observed elsewhere in the Amadeus Basin.

Additional seismic over the Zevon feature that ties into existing seismic surveys will improve the interpretation and assist in a more robust depth conversion process.

## **2. Introduction**

The Zevon seismic test line was acquired in the central southern area of EP115 approximately 300 km west of Alice Springs and 60 km west of Central Petroleum's facilities at Mereenie (Figure 1 and Figure 2). The seismic test line is located within land held by Haast Bluff Aboriginal Land Trust which is administered through the CLC. Access to the southern and northern ends of the seismic test line was via an existing track from Central Petroleum's facilities at Mereenie (Figure 2).

The seismic test line traversed the Zevon prospect which is interpreted to be a large elevated sub-salt structure that hosts the Neoproterozoic Heavitree - Gillen Petroleum System in the northwestern Amadeus Basin. The expected reservoir fluid is gaseous hydrocarbons with the overlying salt also potentially creating a seal for associated helium and hydrogen as has been proven elsewhere in the basin.

In November 2023, with the assistance of a Geophysics and Drilling Collaborations Grant awarded by the Northern Territory Government, Central engaged Oceania Geo to acquire a seismic test line over the Zevon prospect. After acquisition of the seismic data Land Seismic Noise Specialists (LSNS) began the data processing on 4 December 2023 and provided Central the last of the project deliverables on 1 March 2024, although follow-up revisions continued into May 2024.

Following on from the processing the seismic line has been interpreted with the interpretation being tied to the Wells Anticline survey acquired in 2008.

# EP115 Zevon 2D seismic test line interpretation report

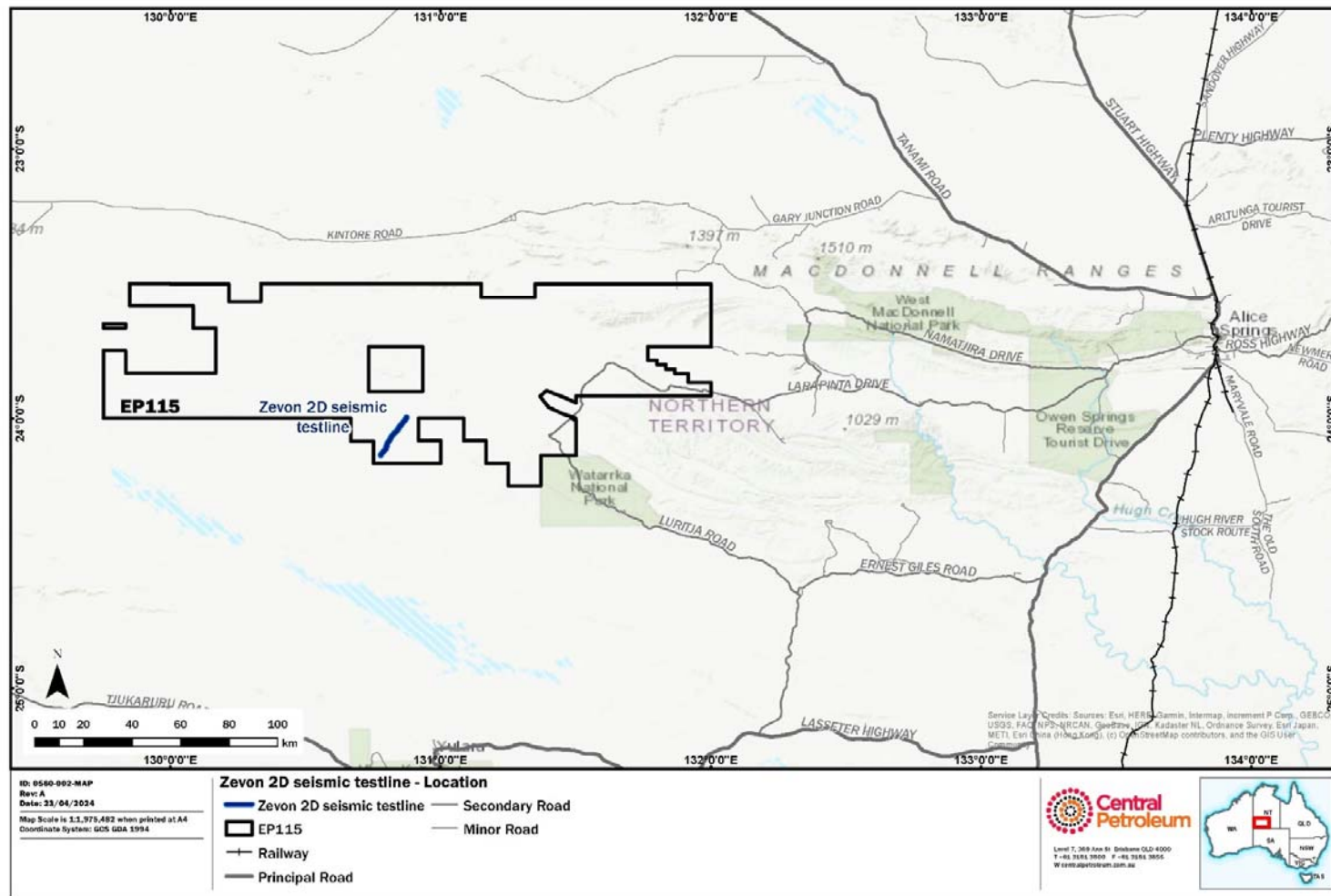


Figure 1: Location map of EP115 and the Zevon 2D seismic test line.

## EP115 Zevon 2D seismic test line interpretation report

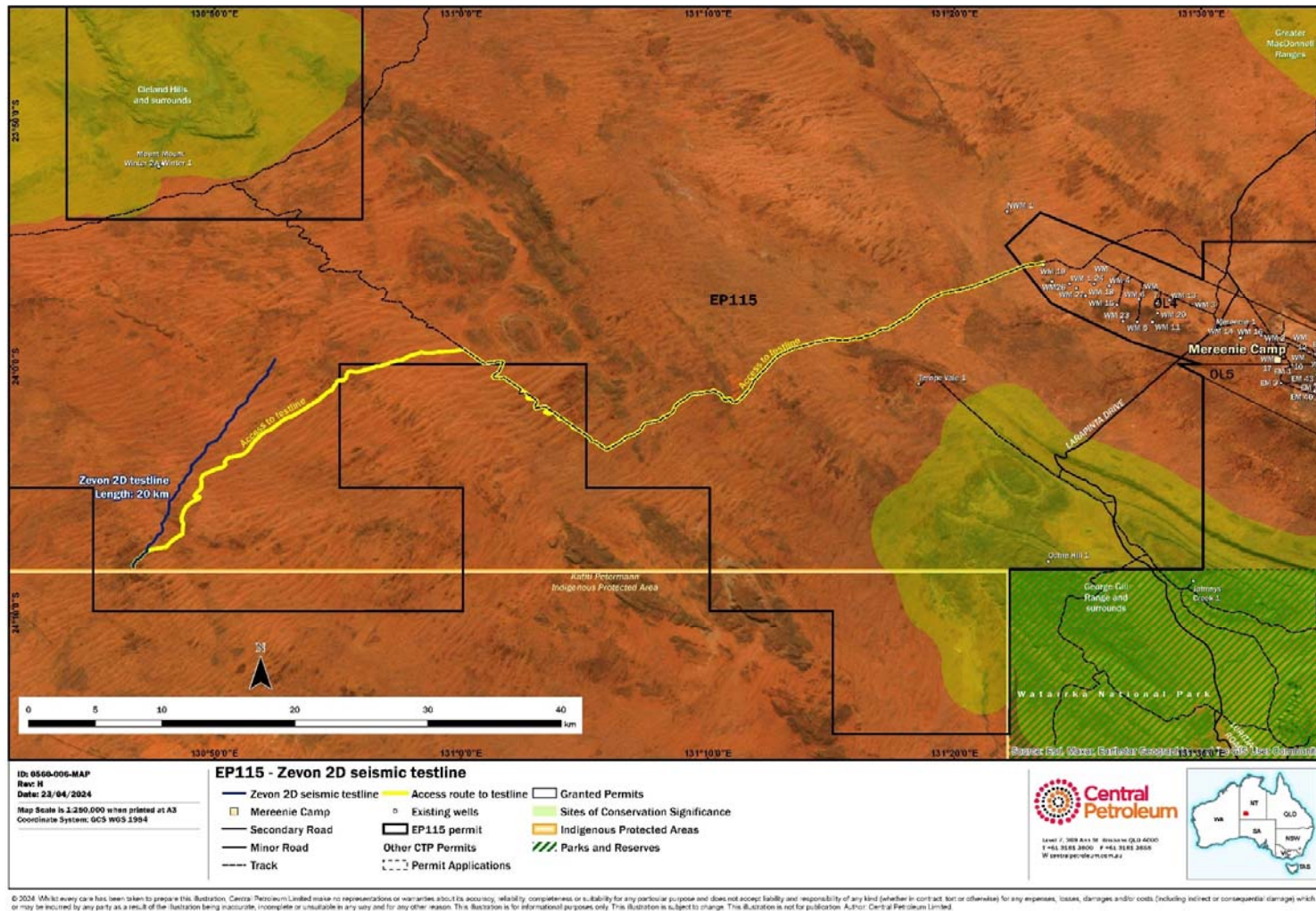


Figure 2: Zevon test line access from Central Petroleum's Mereenie Facilities.

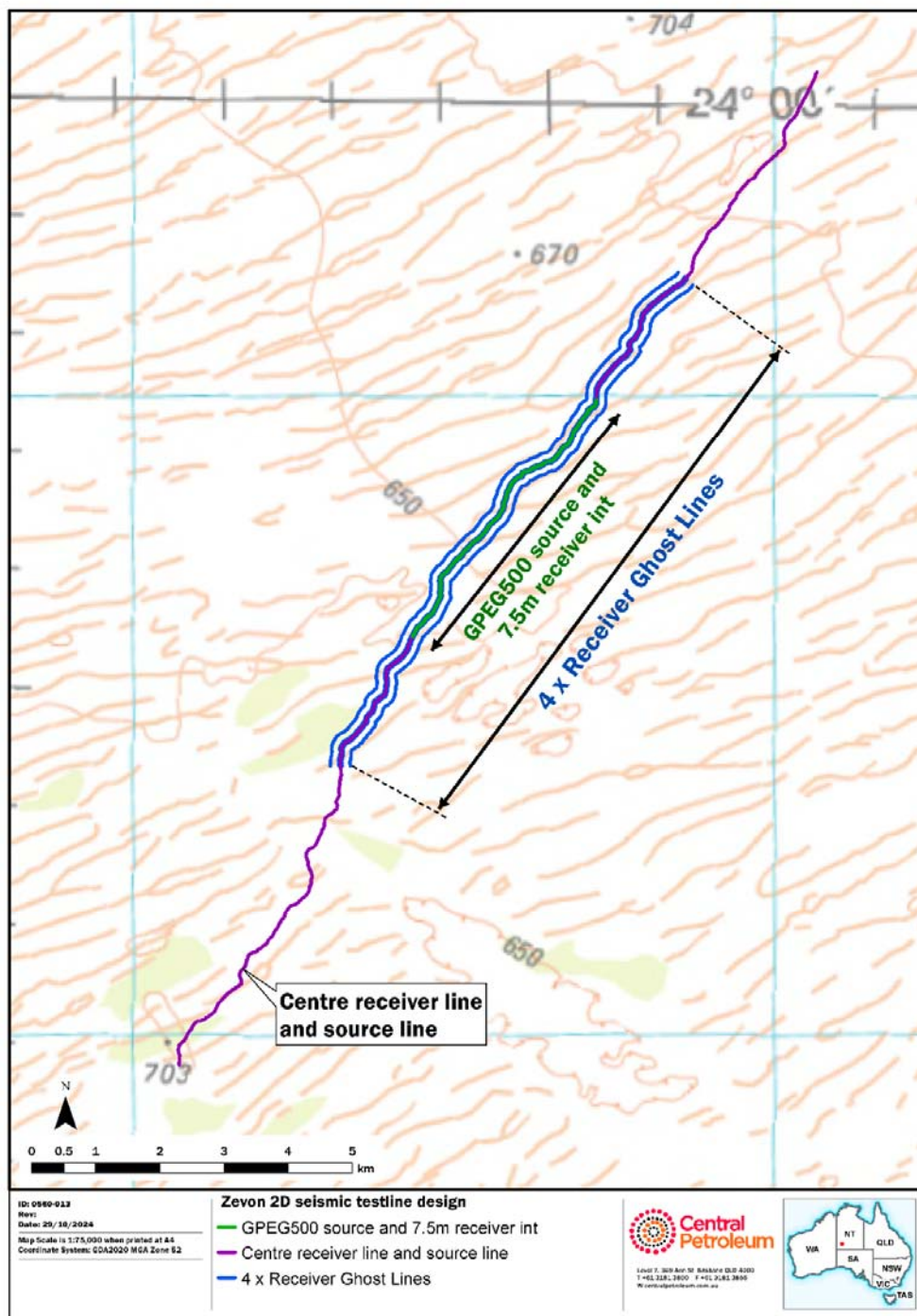
### 3. Survey Details

The survey layout (Figure 3 with specifics detailed in Table 1) primarily consisted of 5 receiver lines; a central main line (CZ23-03); and four ghost lines (CZ23- 01, CZ23-02, CZ23-04 & CZ23-05). CZ23-03 was 20 km in length and comprised receiver nodes at 15 m intervals interleaved with source stations at 15 m intervals. The seismic source used for the full length of CZ23-03 was a 1,400 kg weight drop (WD1400 / heavy source). A 5 km section of CZ23-03 was acquired as a 'dense section' with receivers at 7.5 m intervals and a second set of source stations at 15 m intervals but interleaved with the source stations of the 1,400 kg weight drop to provide a source station spacing of 7.5 m. The seismic source for the second set of source stations was a 500 kg weight drop (GPEG500 / light source). The ghost lines were acquired parallel to CZ23-03 at 25 m and 125 m to the northwest and consisted of receiver nodes only at 15 m intervals. No source stations were run along the ghost lines.

2023 Central Petroleum Zevon 2D Seismic Survey	
Total Length / Number of lines	20km / 5 lines + 2 receiver grids
Total Source Points – WD1400	1258
Total Source Points – GPEG500	334
Total Receiver Points	4758
Source Point Interval	15m
Receiver Point Interval	15m / 7.5m (5km central dense section of line)
Drops per point	3
Live spread	4323 2D / 225 3D (x 2)
Max Offset	8000m
Source Type	WD1400: 1400kg gravity based weight drop. Drop height = 2.5m GPEG500: 500kg gravity based weight drop. Drop height = 1m
Receiver Type / Array	Stryde Nimble Node: Single piezo electric accelerometer node onshore. 0.8 Nyquist filter.
Record Length	5sec @ 2ms
Recording Polarity	SEG (SEG Negative)
Data format	SEGD - ACCELERATION

**Table 1 – Seismic survey acquisition parameters.**

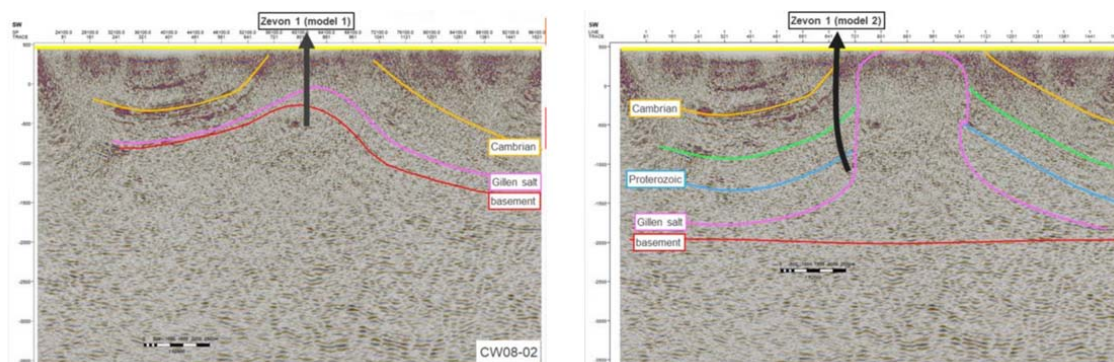




**Figure 3 - Zevon test line components. Test line consists of a 20 km central main line with a 5 km 'dense' section flanked by four 10 km ghost lines.**

## 4. Objectives

The objective of the Zevon 2D seismic test line was to image the Heavitree / basement over the Zevon prospect which was interpreted to be either a large elevated sub-salt structure or a benign sub-horizontal feature that hosts the Neoproterozoic Heavitree - Gillen Petroleum System in the northwestern Amadeus Basin.



*Figure 4 – Vintage seismic section of line CW08-02 showing two alternate interpretations.*

## 5. Seismic Survey Mapping

### 5.1 Interpretation Methodology

The interpretation of the Zevon 2D seismic test line was undertaken by Central personnel using Schlumberger's Petrel software. Since the test line does not intersect any other survey, the key seismic events were mapped to the test line by way of a jump correlation from a seismic line of the 2008 Wells survey approximately 9 km to the northwest. As such there are uncertainties in the correlation of stratigraphic horizons to seismic horizons, however there are some broad constraints provided by the limited outcrop data and potential field data.

### 5.2 Surfaces Interpreted

The surfaces that have been interpreted are top basement, Heavitree Quartzite, top Bitter Springs Group, the Pertatataka Formation, and the Tempe Formation. The position of each of these surfaces within the stratigraphy of the Amadeus is illustrated in the stratigraphic column of Figure 5. The Heavitree and basement were mapped because they constitute the target horizons. The top Bitter Springs was interpreted because it defines the broad geometry of the salt across the top of the target horizons. The Pertatataka Formation was interpreted because it is delineated by a prominent and contiguous reflector. The Tempe Formation was mapped because it is part of the Cambrian sequence which can be broadly correlated with the limited outcrop.

The interpretation shows the structure that the seismic test line transects is characterised by a stratigraphic sequence that has accommodated shortening by thrusting. However, due to the presence of the salt there is a partial decoupling between the basement / Heavitree and the Pertatataka. This means that a fault that takes up shortening in the basement / Heavitree is not necessarily coincident with a fault that takes up shortening in the Neoproterozoic – Cambrian sediments overlying the interbedded salt and carbonates package. This structural model is consistent with the observation of partially coupled shortening in the southern Amadeus at Mount Kitty (Figure 7).

### **5.3 Synthetic Seismograms & Depth Conversion**

There is not a well on the Zevon line or the Wells survey so that the relation of the Zevon line to a depth reference by way of a seismic well tie has not been established. Instead, the interpreted seismic horizons have been converted to depth using a constant velocity of  $4,700 \text{ ms}^{-1}$  which is approximates the average regional velocity of the Ordovician – Cambrian – Neoproterozoic sequence in the western Amadeus. As a result of the depth conversion the Heavitree and basement targets are at a depth of approximately 3,600 m and 4,000 m respectively.

### **5.4 Interpretative Maps**

Given that the Zevon seismic survey consisted of one line that is not tied to another survey interpretative maps have not been generated because the high degree of uncertainty in the jump correlation and depth conversion would mean that any generated maps would be of little value.

## **6. Conclusions**

The Zevon test line does not intersect any other seismic surveys so that the seismic horizons have been interpreted by way of a jump correlation from an adjacent seismic survey. As such there are uncertainties in the correlation of stratigraphic to seismic horizons. The structural interpretation of the seismic test line incorporates contractional features of salt tectonics and is consistent with structures observed elsewhere in the Amadeus Basin. Additional seismic over the Zevon feature that ties into existing seismic surveys will improve the interpretation and assist in a more robust depth conversion process.

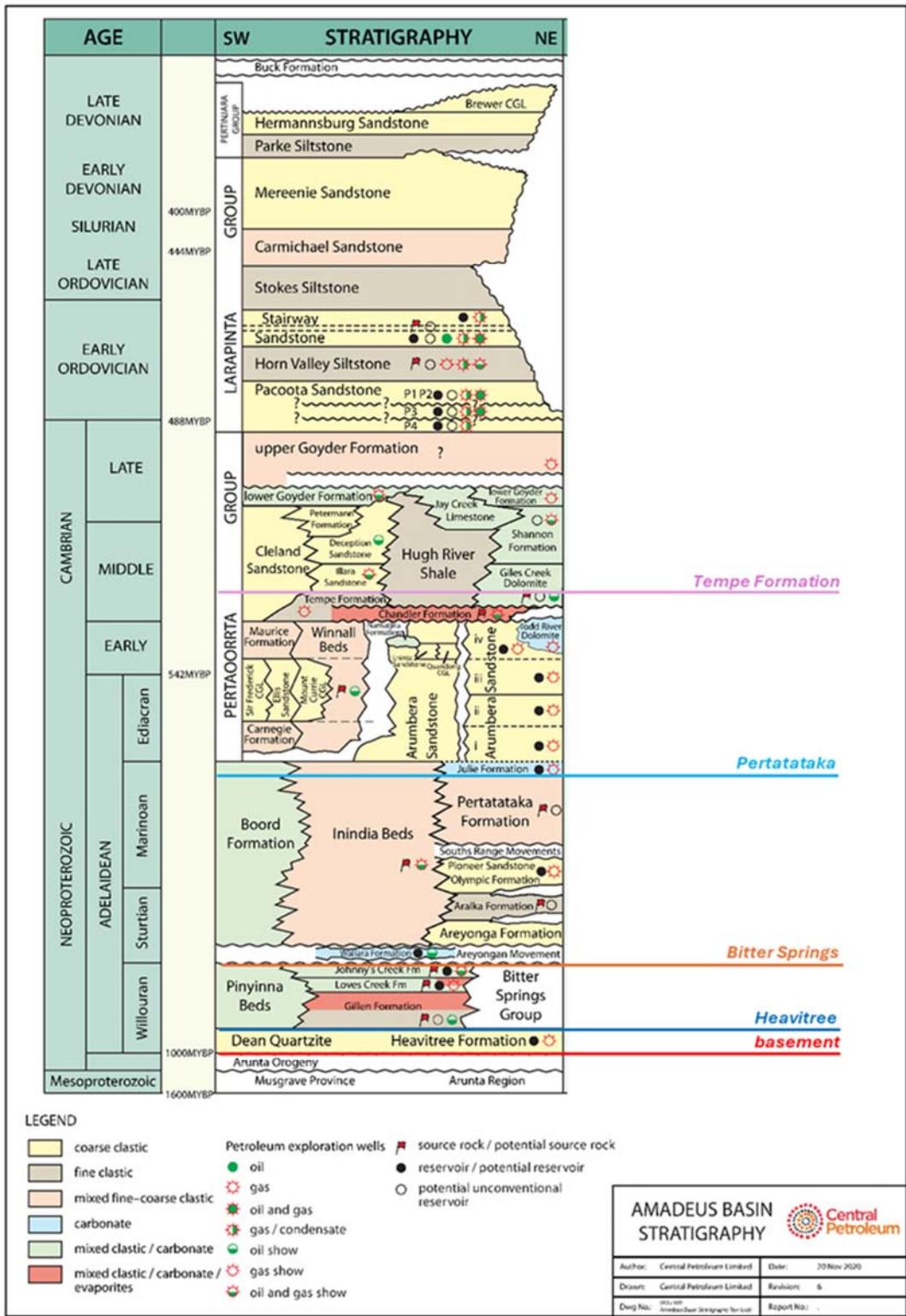
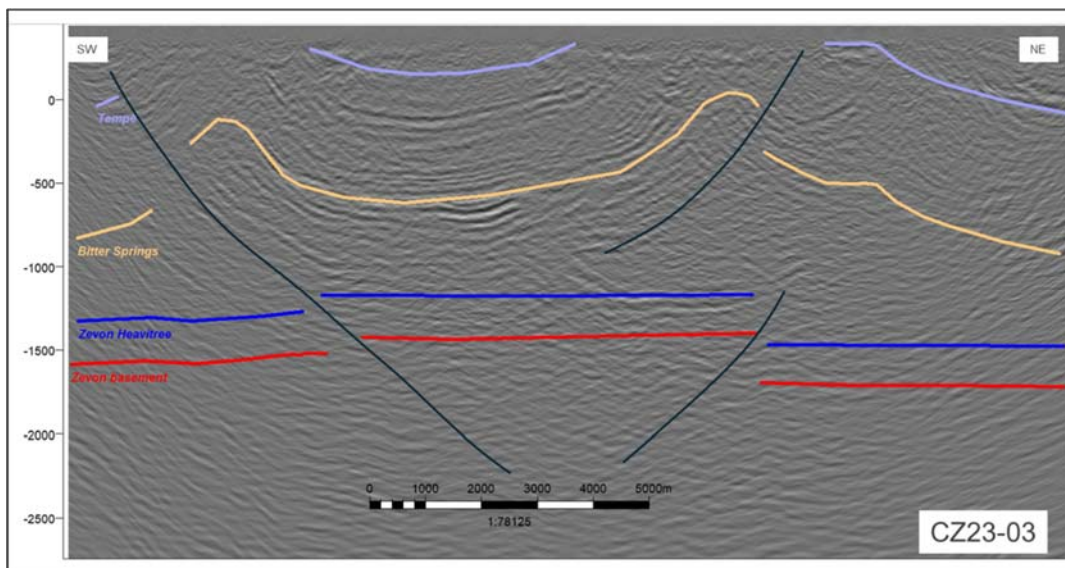
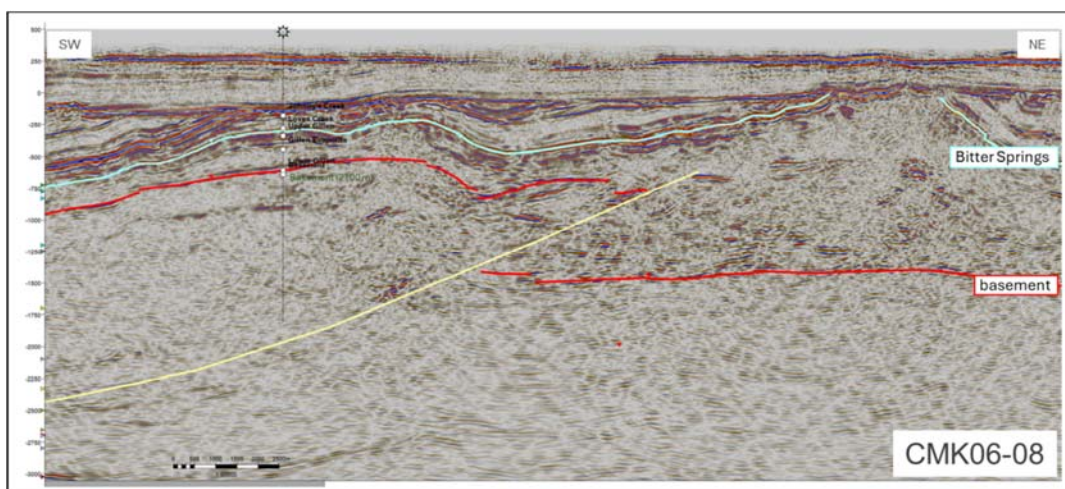


Figure 5 - Amadeus Basin stratigraphic column.





**Figure 6 - Interpretation of Zevon seismic test line illustrating partial coupling of deformation above and below the Bitter Springs Group due to the salt and interbedded carbonates.**



**Figure 7 - Interpretation of seismic over Mount Kitty shows partial decoupling of deformation above and below the Gillen Formation of the Bitter Springs Group.**