# GDC Co-funding
# 2D Seismic Reflection Survey
# of the Angela Deposit

**Resourcing the Territory**

**GDC Co-funding**

Exploration Grant: Round 15 – Brownfields Targeting

File Ref: 36:DITT2022/00099

**Elevate Uranium Ltd**

EL8 Brownfields Targeting

**Tenement EL25758**

Authors:

| | | |
|---|---|---|
| Elevate Uranium (Title Holder): | Asha Rao | Asha.Rao@elevateuranium.com.au |
| | Jason Triffitt | Jason.Triffitt@elevateuranium.com.au |
| HiSeis (Contractor): | Nik Sykiotis | n.sykiotis@hiseis.com |
| | Greg Turner | g.turner@hiseis.com |


30 April 2023

NT Mapsheet 1:250 000: Alice Springs SF5314

NT Mapsheet 1:100 000: Alice Springs 5650

Zone 53

# Copyright statement

**Disclaimer statement: HiSeis**

The opinions expressed in this Report are based on information supplied to HiSeis Pty Ltd (HiSeis) by Elevate Uranium Ltd (EL8). The opinions in this Report are provided in response to a specific request from EL8 to do so. HiSeis has exercised due care in reviewing the supplied information. Whilst HiSeis has compared key supplied data with expected values, the accuracy of the results and conclusions arising from that data within this review are entirely reliant on the accuracy and completeness of the supplied data. HiSeis 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. Opinions presented in this Report apply to the site conditions and features as they existed at the time of HiSeis' investigations. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which HiSeis had no prior knowledge nor had the opportunity to evaluate. HiSeis shall have no liability to any third party in relation to the opinions expressed in this Report.

# Abstract

Reflection seismic surveying has not been widely applied in minerals exploration owing to perceived high cost, and problems with resolving steeply dipping stratigraphy. Furthermore, traditional methods of acquiring seismic data can involve ground disturbance. In this case, however, the stratigraphy is gently dipping and well suited for the seismic technique. Elevate Uranium proposes partnering with HiSeis to acquire new affordable seismic data at Angela. HiSeis uses highly specialised acquisition technology that causes minimal surface disturbance (*i.e.*, does not constitute "substantial disturbance" under section 35 of the Mining Management Act, 2001).

The Angela Deposit is a "roll-front" type, sandstone-hosted, uranium deposit ((current resource 31 Mlb $eU_3O_8$), located approximately 25km south of Alice Springs, Northern Territory. Hosted within sandstones and conglomerates of the Undandita Member in the Amadeus Basin sediments.

In December 2022, Elevate Uranium contracted HiSeis to undertake a small 2D seismic program over the Angela Deposit. This comprised 3 seismic lines for a total 16.7-line km with 10m source spacing, 5m receiver spacing and a 20 second sweep. Data acquisition was completed in December 2022 with the final data processing and interpretation completed in April 2023.

The objectives of the survey were:

- Firstly, to facilitate the construction of a 3D geological model to increase current understanding of the mineralisation setting. This implies that the seismic will enhance the ability to correlate lithologies between drillholes.
- Secondly, to identify correlations between seismic reflectors, oxidation boundaries and areas of known mineralisation. It is proposed that these correlations might then be extrapolated into untested areas of potential extension to the current resource.
- Third, the identification of any faults present is crucial for optimum mine design (much of Angela is likely to be mined underground) and could also result in modifications to the current mineral systems model (which does not assign any importance to fault structures).

The 2D seismic program at Elevate Uranium's Angela project confirmed that seismic is an effective method to image the subsurface. The results and interpretation of the seismic data provide insight into potential uranium deposition and provide potential upside for future exploration.

To further enhance subsurface imaging and the subsequent value that can be added to future exploration and mining activities, HiSeis has recommended the following activities at Angela:

- The acquisition of downhole logging (FWS and VSP) together with specific gravity measurements to better characterize the seismic response of key geology. These should be strategically placed in relation to the 2D or future 3D surveys to maximize their contribution to improving the processing and overall geologic understanding of the area.
- A 3D seismic survey to better delineate events in a 3D space and add confidence in their spatial position for potential drill testing.

# Table of Contents

# 1. Introduction

Elevate Uranium ("Elevate") is a uranium exploration company with significant resources in Namibia and Australia (NT and WA).

The Angela uranium deposit, within EL25758, is 100% owned by Elevate Uranium and is located on Owen Springs Station and situated approximately 25km south of Alice Springs in the Northern Territory of Australia (see Figure 1). The tenement is accessed approximately 24 km south along the Old South RD for Alice Springs. The seismic survey area is then access via station tracks.

The project area is generally flat topography with small areas of outcropping sandstone. Figure 1 includes photographs of the indicative landscape.

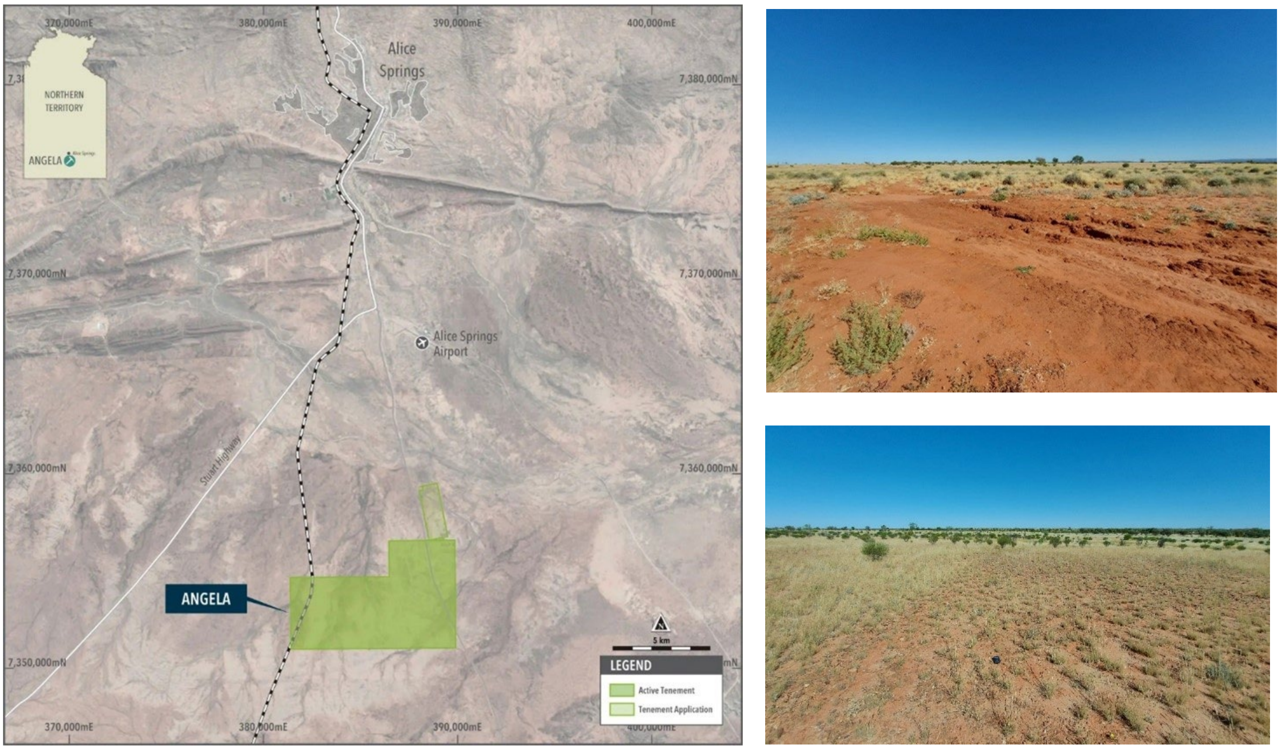


Figure 1: Angela project location and lease holding (ref: www.elevateuranium.com.au/australia/angela) and photos of the area.

As part of the Northern Territory Government initiative "Resourcing the Territory", Elevate Uranium applied for and was awarded a grant under Round 15 (2022) Geophysics and Drilling Collaborations program – Brownfields targeting to undertake 2D seismic work over the Angela deposit.

HiSeis was contracted to undertake the acquisition, processing and interpretation of the seismic program.

This report outlines the work carried out and findings as contribution to the co-funded Round 15 project.

# 2. Regional context

## 2.1 Regional Geology

The Angela and Pamela deposits are hosted within the Undandita Sandstone Member of the late-Devonian to early Carboniferous Brewer Conglomerate. The Brewer Conglomerate is the youngest geological unit within the Amadeus Basin and was deposited as a wedge-shaped, molasse deposit in a foreland basin setting in response to southwards thrusting of the Arunta Block (to the north) over the Amadeus Basin.

Continued deformation during the latter stages of the Alice Springs Orogeny subsequently deformed the Brewer Conglomerate, producing a series of broad, east-west trending, doubly plunging synclines within the Amadeus Basin.

Uplift occurred along the northern margin of the Amadeus Basin and progressed from west to east through the later stages of the Alice Springs Orogeny. The lower part of the Undandita Sandstone Member was derived from Upper Proterozoic to Lower Palaeozoic sediments of the basin. With increasing uplift in the Alice Springs Orogeny, the Lower Proterozoic granitic and gneissic Arunta Complex to the north became exposed and contributed increasingly to the upper parts of the Undandita Sandstone Member, providing an intrastratal source for uranium.

The Brewer Conglomerate was deposited as a series of coalescing alluvial fans developed on the southern flanks of the proto-MacDonnell Ranges by southwards draining, braided fluvial channels fed into a large-scale, generally east-west trending, longitudinal drainage system. Depositional environments are interpreted to be environments including braided fluvial channel, abandoned channel, to overbank and possibly lacustrine settings.

Stream gradient decreases away from the ranges (southwards) and the Brewer Conglomerate inter-fingers with, and passes laterally into, the finer-grained, more distal Undandita Sandstone Member. The Brewer Conglomerate reaches a maximum thickness of 3,000 m within the Missionary Syncline, 15 km southeast of Alice Springs where the largely oxidised Undandita Sandstone Member contains a wedge of reduced sediment between regionally planar upper and lower redox boundaries. Uranium mineralisation is concentrated at these redox boundaries.

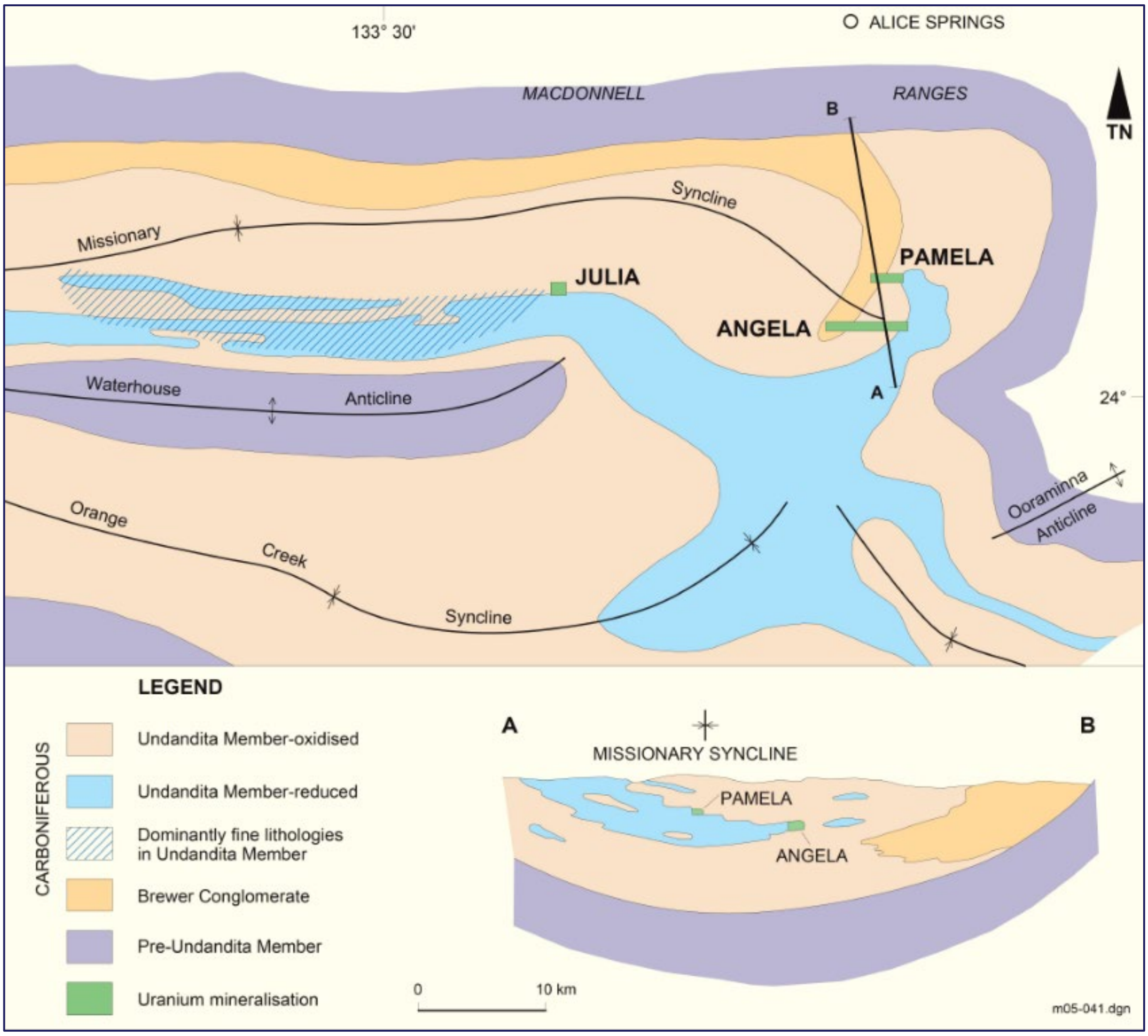


Figure 2: Local Geology

## 2.2 Project Geology

Uranium mineralisation at the Angela and Pamela deposits is hosted within the Undandita Sandstone Member which ranges from fine to coarse grained lithic arenite, and from medium to coarse grained lithic arkose, intermixed with subordinate conglomerate and pebbly sandstone horizons, and thin, poorly developed limestone and mudstone units deposited under waning flow conditions and within abandoned channels. Most of the mineralisation is hosted by medium to coarse grained feldspathic lithic arenites, which although finer, are better sorted.

Mineralisation is considered to have been emplaced during the early-Carboniferous (during diagenesis) and has been preserved by extensive calcite cementation of the host rock. Structural deformation during the Alice Springs Orogeny has subsequently folded and exposed the mineralisation at surface. The main Angela I mineralisation crops out near the eastern margin of the licence, close to the Old South Road, and dips ~9° to the west. Mineralisation is known to extend westwards for at least 5 km to depths of ~900 m.

The target in the area is sandstone hosted uranium mineralisation formed at geochemical (redox) boundaries by deposition of uranium from groundwater. Redox boundaries in the upper part of this reduced zone typically show uranium accumulations. The major accumulations are located in irregularities or steps, mainly on the upper regional redox boundary in the Missionary Syncline. These accumulations were previously identified in the Angela area (Borshoff & Faris, 1990).

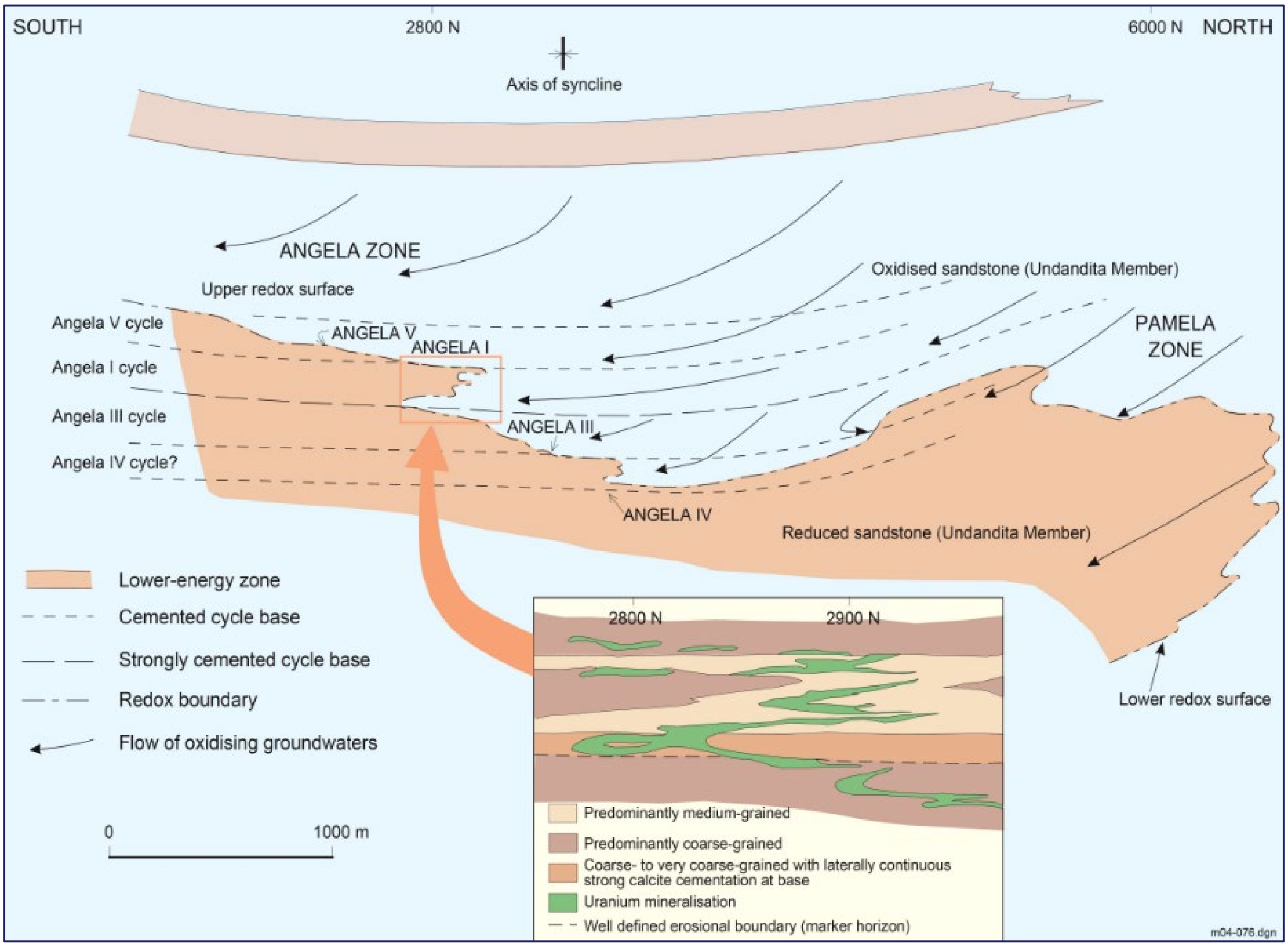


Figure 3: Deposit Schematic Cross Section

# 3. Previous exploration

## 3.1 Historical Exploration

Uranerz explored the Alice Springs Project (which extended across the current EL25758) for over 10 years from 1972 to 1983 and the tenements were held until 1990. The following summary is adapted from Uranerz reports as detailed in the Bibliography.

A detailed airborne radiometric survey over the tenements was carried out in 1973 and airborne spectrometry located three anomalies. Trenching and drilling of these anomalies in 1973-1974 led to the recognition of the Angela and Pamela prospects. In 1974, shallow vacuum drilling on a regional grid, together with reconnaissance mapping indicated that these prospects were regionally located along the boundary between oxidised and reduced sandstones.

From 1974 onwards exploration was divided into two broad phases; the first involved diamond/percussion drilling of the known mineralised bodies to test size, grade and establish mineralisation controls; the second involved regional exploration along the reduced zone and its margins. Detailed drilling at the Angela and Pamela prospects in 1974-1975 defined the main outline of the mineralisation. Ore resources for the part of the Angela I deposit that was drilled amounted to about 15,00 t $U_3O_8$. From 1975 to 1977 percussion drilling was carried out along strike of the upper or northern margin of the reduced zone to test the potential of mineralisation at depth in the zone between the Pamela and Angela prospects. The redox boundary was tested by holes drilled approximately 500 m apart to a maximum depth of 150 m. Drilling was continued southwest from the Angela I deposit.

In 1978 recalculation of ore resources based on results of the latest investigations confirmed a resource of 1,500 t $U_3O_8$ using a cut-off of 500 ppm over 2 m for the Angela I deposit, and it was also concluded that considerable resources could occur further down-dip and in separate zones immediately north and south of the Angela I deposit. Detailed drilling of the Angela I deposit in 1979 indicated a 30-40 m change in the stratigraphic level of the redox boundary with which the mineralisation is associated. This “step” marks a complex zone of stacked oxidised and reduced lobes and tongues. In plan, this multi-lobed zone plots as a distinct east-west trend.

Drilling between the Angela I deposit, and the Pamela prospect delineated a group of spatially and genetically related step zones containing inter-digitated mineralisation. These are referred to as Angela II, Angela III and IV prospects. Close-spaced drilling at 10 m intervals on the 800W section over the Angela I deposit provided detailed lithology, but hole-to-hole lithological correlations could not be demonstrated.

In 1980, the Angela I deposit was confirmed over a 4,900 m strike length and remained open to the west at depth. Infill percussion and diamond drilling upgraded the integrity of defined resources. Angela II-IV satellite prospects were defined as thinner ore zones with similarities to the Angela I deposit. The Angela V satellite prospect was delineated as a new ore zone south of Angela I, similar to the Angela II and III prospects.

All prospects have good potential down-dip to the west. Exploration in 1981 concentrated on establishing the style, continuity and potential of the Angela prospects, flanking the Angela I deposit. A data review was carried out, which included recalculation of all gamma log $eU_3O_8$ values using the high-resolution deconvolution methodology. Regional sedimentological studies established a sedimentary history for the basin, which led to improved genetic concepts for redox processes and allowed a better evaluation of prospectively.

Investigations in 1982 were confined to re-logging drill core and data studies of prospects in the East Missionary Syncline. Detailed re-logging allowed more meaningful sedimentological profiles to be constructed. Correlation of sedimentary features was achieved using downhole resistivity logs. Ore distribution profiles from deconvolved down-hole gamma logging were compiled.

Data studies showed individual lenses of ore are related to a regionally continuous 30 m stratigraphic sandstone package with a prominent coarse-grained basal unit.

In 1983, Uranerz completed a pre-feasibility study that indicated the Alice Springs Project, comprising the Angela and Pamela deposits, would not be economically viable at the prevailing and predicted short to mid-term uranium price and the project was placed on care and maintenance. In 1990, Uranerz, applied to the Northern Territory Government to have the project area converted to a Reservation from Occupation (RO) to protect the resource.

## 3.2 Previous Exploration

<u>2009</u>

Work conducted on EL25758 during the year ended 2009 included a drilling program comprising 103 diamond holes for 10,333 m with 16,684 m of RC pre-collars and 8 geotechnical holes. All holes were probed for gamma and resistivity. A total of 1,924 samples were sent for assay.

<u>2010 – 2011</u>

During the 2010 reporting year a total of 59 percussion pre-collared diamond holes were drilled for 5,683 m with downhole gamma and resistivity probing conducted on all holes. Geochemical analysis was conducted on a total of 1,948 samples.

Activities on the project were scaled back during the 2010 – 2011 reporting period following NT Government's announcement that it would not support the development of a mine at Angela. Work included drilling of 3 rotary mud holes for 690 m and baseline environmental studies.

<u>2011 – 2012</u>

Work conducted during the 2011 – 2012 reporting period was restricted to completion of the baseline studies, environmental management and rehabilitation monitoring.

<u>2012 – 2013</u>

Work completed during the 2012 – 2013 reporting year was limited to completion of the proposed rehabilitation program in order to obtain a Certificate of Closure in respect of Authorisation No. 0493/01. All holes from the 2009, 2010 and 2011 programs were rehabilitated, and a report was submitted to the Department of Minerals and Energy in October 2013.

<u>2013 – 2014</u>

During the 2013 – 2014 reporting year work completed included an audit of all drill core, completion of a comprehensive review of all technical work, re-logging of selected core, thin section preparation, creation of an updated 3D geological model and completion of rehabilitation, including work under previous tenure as requested by Mining Compliance Division.

2014 – 2015

Activities undertaken during the 2014 – 2015 tenement year were limited to off-ground studies including investigation into geochemical signatures and mineral mapping at Angela, compilation of historical optical microscopy and XRD analysis of 26 samples.

2015 – 2016

During 2015 – 2016 work included hyperspectral analysis and subsequent interpretation of 740 laboratory pulps.

2016 – 2019

Following acquisition of EL25758 by Optimal Mining in 2016 work was limited to off-ground validation of existing data until it was acquired by Elevate Uranium Ltd, formerly Marenica Energy, in 2019.

2020 – 2021

The acid consumption, based on previous work undertaken by the Cameco-Paladin Joint Venture, in the uranium leach stage for the Angela resource was expected to be about 100 to 120 kg/t (as $H_2SO_4$). At the current acid price of $400/t ($0.40/kg) delivered to site, this equates to a high operating cost for acid.

This high acid cost has historically been a serious impediment to development of the Angela project. Elevate Uranium sought to reduce the acid consumption through application of its ***U-pgrade***™ process.

A proof of concept metallurgical program was initiated on a drill core sample used in a prior radiometric sorting testwork program managed by Paladin. Mineralogical reports suggest that the acid consuming mineral was calcite. The scope was to confirm the acid consuming mineral was indeed calcite and then establish whether the bulk of the calcite could be removed prior to leaching, thus reducing the leach acid consumption and thereby the project operating costs.

The metallurgical testwork program was completed at the Australian Nuclear Science and Technology Organisation ("ANSTO"), renowned for its uranium knowledge and experience, having run testwork programs on nearly all uranium projects around the world.

The sample used in the ANSTO program included a total of 240 by one metre half NQ diamond drill core intervals obtained from 32 drill holes sourced from the locations shown in Figure 4 below. The total sample mass of 600 kg was stage crushed to generate a 20 kg sample for the ***U-pgrade***™ testwork program.

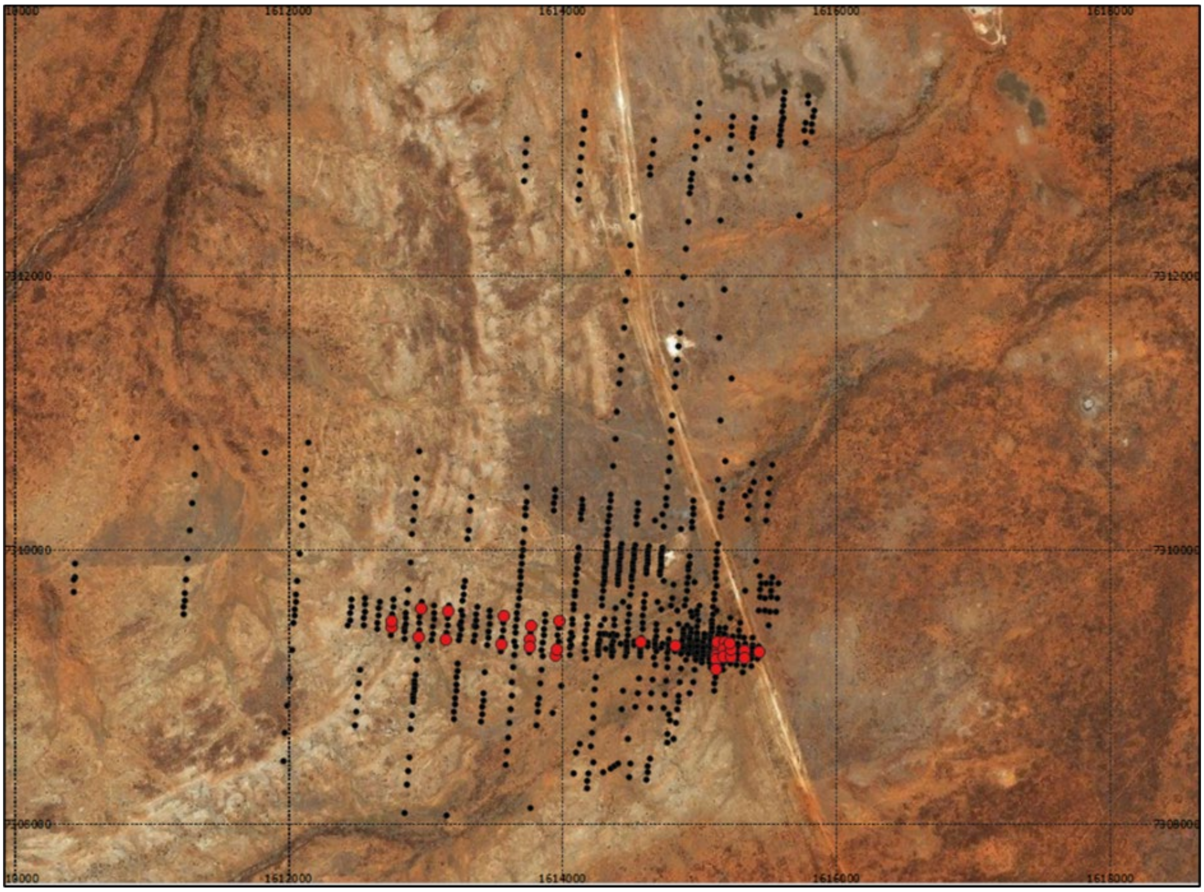

Figure 4: Location of Drill Holes Used in Testwork Program

The sample used had an acid consumption of 104 kg/t, similar to that obtained during previous testwork undertaken by Paladin on the Angela resource. The sample uranium grade (459 ppm $U_3O_8$) is lower than the average Mineral Resource grade due to the inclusion of waste material from the sorting testwork, but in the context of this scope of work the uranium grade was not considered critical to proving the concept of calcite removal.

Mineralogical work on this sample confirmed the acid consuming mineral was calcite, which was predominantly liberated from other minerals and hence, removal by physical beneficiation was potentially possible.

Removal of the calcite mineral was successful from the first metallurgical test. Minor changes were made to subsequent test conditions to generate sufficient product mass to complete acid leach tests on samples pre and post calcite removal, in order to confirm the expected reduction in acid consumption. The bulk of the calcite (84% of the total present in the sample) was recovered into a reject fraction grading 92% calcite and containing 9% of the feed mass, resulting in 91% of the mass and 16% of the calcite reporting to the leach stage.

A standard set of leach conditions were applied to:

i) the pre-calcite removal sample, and

ii) the post-calcite removal sample,

to determine the expected reduction in acid consumption.

The results summarised in Table 1 below show that the removal of calcite reduced the acid consumption from 104 kg/t to 24 kg/t, i.e., a difference of 80 kg/t. The estimated delivered cost of sulphuric acid to the Angela site has been assumed, based on indicative quotes obtained for these calculations, to be A$400/t or $0.40/kg.

Table 1: Metallurgical Testwork Results

| Sample | Mass (%) | Acid Consumption (kg/t of sample) | Acid Consumption (kg/t of feed) | $U_3O_8$ Extraction from Sample (%) |
|---|---|---|---|---|
| Pre calcite removal - feed | 100 | 104 | 104 | 93.0 |
| Post calcite removal | 91 | 26 | 24 | 95.8 |
| **Nett Difference** | | | **80** | **2.8** |

Uranium extraction from the sample subjected to the ***U-pgrade***™ process increased by 2.8% after removal of the calcite compared to the untreated sample. While various mechanisms for this could be proposed, whatever the reason, removal of most of the calcite prior to acid leaching had a positive effect on the uranium extraction, in this case increasing by 2.8%.

Inevitably, when a uranium sample is beneficiated, some uranium is lost in the reject fraction. This occurred during the calcite removal stage where the post calcite removal sample was 91% of the original mass with a grade of 463 ppm. However, the increased leach uranium extraction rate partially offset this loss. On the sample tested, the net loss of uranium from the ***U-pgrade***™ calcite removal stage and subsequent leach was 23 ppm $U_3O_8$ more than the whole of ore leach.

There is also a significant environmental benefit from removal of the calcite, since the calcite stream could be used to neutralise the acid in the leach tailings prior to disposal. This would result in the leach residue being rendered inert as a result of all acid being destroyed and all soluble metals precipitated. This consequential benefit is a significant potential environmental result that will be assessed in future testwork programs and study phases.

This proof of concept program concluded that:

- removal of the bulk of the acid consuming calcite mineral could be achieved with minimal uranium losses,
- uranium extraction in the leach could be increased by removal of calcite, and
- the calcite reject could be used to render the leach tailings inert, providing significant potential environmental benefit for the project.

These results have been achieved from a limited proof of concept testwork program. Although the sample used in this program has a similar calcite content to the Angela resource, the uranium grade is lower, and although the uranium grade is not critical to the removal of calcite, it is possible that the uranium losses from a higher grade sample could vary from what has been reported from this testwork program.

# 4. Exploration concept

Angela is a sandstone-hosted roll-front type deposit within Devonian to Carboniferous sediments of the Amadeus Basin. The interfingering Undandita sandstone member and the overlying Brewer Conglomerate host the uranium mineralisation. A higher-grade core of 20.2 Mlb $U_3O_8$ is found within the mineralised zone.

To date, approximately 670m of diamond drilling was completed prior to Elevate acquiring the tenure. There is a current Inferred Resource of approximately 30.8 Mlb $U_3O_8$ at 1,310ppm $U_3O_8$.

Uranium mineralisation is concentrated in the oxidised zone immediately above the redox boundary and is reported to have been precipitated from fertile oxidizing groundwater which percolated through sediments that contained leachable uranium (Ref: Uranerz_UAL_Report.pdf)

The sandstones of the Undandita Member that typically host mineralisation are medium to coarse feldspathic lithic arenite with calcite cement. They are known to have permeability contrasts between the different layers and there is minimal visual distinction between the sandstone boundaries.

This led Elevate Uranium to undertake a small seismic program to investigate whether this method would support correlation between drillholes.

# 5. Details of the collaborative program

On 2 September 2022, Elevate Uranium contracted HiSeis to undertake a small 2D seismic program over the Angela Deposit. This comprised 3 seismic lines for a total of approximately 16.7 km. The scope of work included survey design, acquisition, processing and interpretation of the seismic data. More details of the program components are outlined below.

The key objective of the program was to obtain a better understanding the geological environment at the Angela project.

More specifically, Elevate was interested in using seismic to determine the whether the seismic method could:

- Correlate lithology between (and beyond) drillholes;
- Identify structural features;
- Identify alteration.

## 5.1 Survey Design

The design of the seismic program was completed in collaboration by Elevate and HiSeis. Budget and land access constraints were taken into consideration, and as a result, three 2D seismic lines were agreed to be surveyed along existing tracks with minimal line preparation required (Table 2).

Figure 5 shows the location of the final line locations relative to the Angela project and lease outline. Minor grading of an existing track was done on the eastern end of Line 2 to accommodate the seismic source equipment. No new land clearing was undertaken.

Table 2: Survey design parameters and target objective.

| Line No. | Line length (km) | Approximate Orientation | Coordinates | Target objective |
|---|---|---|---|---|
| Line 1 | 6.05 | North-west, south-east | X: 87959.8 - 390106<br>Y: 7356325.8 - 7350754.2<br>Elevation: 540.1 – 550.2 | Image along strike of the near surface portion of the Angela deposit extending north toward Pamela prospect. |
| Line 2 | 5.34 | West - East | X: 384282.8 - 389301.6<br>Y: 7352742.1 - 7352562.7<br>Elevation: 559.3 - 545.4 | Image along the plunge direction of the Angela ore body. |
| Line 3 | 5.3 | South-west, north-east | X: 383677.5 - 386280.1<br>Y: 7350986.7 - 7355413.5<br>Elevation: 564.9 – 552 | Image along strike of the deeper portion of the Angela deposit. |

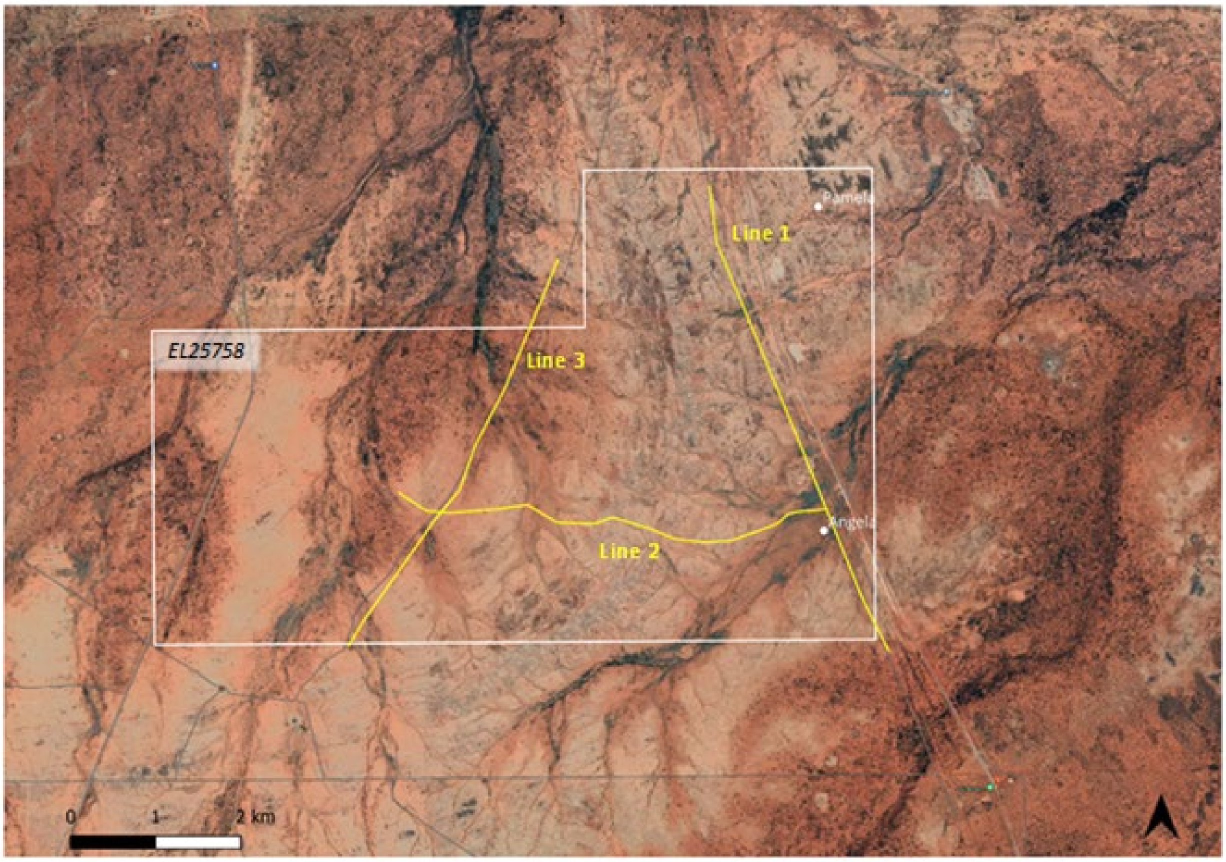


Figure 5: 2D seismic line locations (yellow) and Elevate Uranium lease EL25758 outline (white).

## 5.2 Acquisition

Seismic data acquisition was conducted by HiSeis between 18/12/2022 and 20/12/2022.

The acquisition was carried out with a receiver interval (Ri) of 5 m and a source interval (Si) of 10 m utilising a single, 60 000 lb vibrator delivering one, 20-second sweep through a frequency range of 3 – 120 Hz. The receivers were 5 Hz Quantum nodes. Table 3 provides further detail on the technical survey specifications for the seismic program, whilst Table 4 provides further details of each of the 2D survey lines. The image in Figure 6 shows the 2D lines with receiver station numbers shown.

There were no safety incidents or equipment breakdowns during the seismic acquisition.

Table 3: Acquisition technical survey specifications.

System: MGA
GDA: 2020
Zone: 53

| Equipment Line lengths | 16.7 km |
|---|---|
| Total number of source points | 1657 – Skips |
| Number of Receiver Stns | 3311 - skips |
| Sample Interval | 2 ms |
| Record Length | 3 s |
| Nominal Fold | All line live |
| Format | SEG-D to USB hard drive in field and **RECORD SEG D (or SEG Y)** |
| Source | INOVA AHV-IV (60000 lb) |
| Source Array | 1 x AHV IV in a single fleet |
| Source Number | 1 |
| **Recording Filters:** | |
| Low-cut | 3 Hz |
| Hi-cut | 0.8 Nyquist set to 205 Hz |
| Notch | Out |
| Diversity Stack | Yes |
| **Source Parameters:** | |
| Source Spacing | 10 m |
| Sweep Frequency | 3 – 120 Hz |
| Sweep Number | 1 |
| Sweep Length | 20 secs |
| Sweep Type - | Linear |
| Source Array | 1 vibe |
| Start Taper | 1500 ms |
| End Taper | 500 ms |
| Maximum Source Gaps | As required for safety/access |
| **Receiver Parameters: QUANTUM** | |
| Group Spacing | 5 m |
| Geophone Type | Quantum 5Hz (PS-5GR) |
| Case | land |
| Frequency | 5 Hz |
| Geophones per Group | One (1) |

Table 4: Details of each of the 2D survey lines.

| 2D line number | Line length (CDP) | Number of source points | Number of receiver stations | Start station | End station |
|---|---|---|---|---|---|
| Line 1 | 6.05 km | 602 | 1203 | 11001 | 12203 |
| Line 2 | 5.34 km | 531 | 1060 | 21002 | 22061 |
| Line 3 | 5.3 km | 524 | 1047 | 31001 | 32047 |

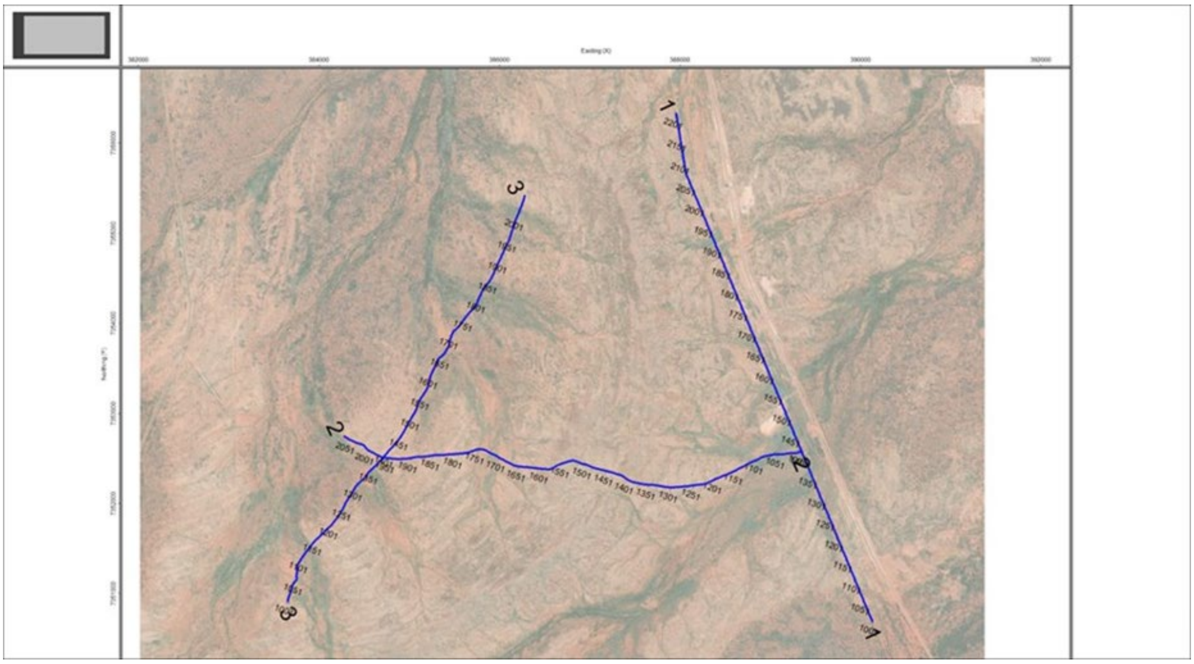

Figure 6: Acquisition map showing the receiver station locations.

## 5.3 Processing

Seismic data processing was conducted in Perth by HiSeis in 2023. The 2D lines were processed using a conventional hard rock processing flow adapted for the acquisition parameters, survey objectives and geology known to exist. Pre-stack time migrated (PreSTM) outputs were provided for the 2D datasets. Various attributes were also produced to aid in the identification of more subtle features to support interpretation, including Cosine Phase and Amplitude Envelope.

The delivered seismic data was output to a final datum of 580m above sea level. All coordinates were recorded in GDA2020, MGA Zone 53.

The seismic data processing of the Angela dataset encountered no significant issues and multiple products were supplied to assist with the geological interpretation of the area. Significant reflectivity was observed within the seismic data indicating that the area is conducive towards the seismic reflection technique. Given the 3D nature of the known geology, there is likely to be out-of-plane reflectivity affecting the 2D seismic. It is advised that this is considered when interpreting the seismic sections.

### 5.3.1 Data Preparation

The data preparation phase consisted of several steps required to ensure the raw data has been checked and prepared for processing. Digital raw data, observer logs and survey information were provided, and data import and geometry assignment were straight forward.

Shot and receiver peg coordinates and positional information were cross-checked against provided observer logs. Geometry was verified by overlaying a theoretical airwave on the raw data and ensuring the actual and theoretical airwave correlate for every shot record. During this time, each shot record's data quality (particularly shot signal to ambient noise ratio) was also analysed to ensure the data quality was satisfactory.

#### First Breaks

At the completion of preliminary data quality control, a rigorous first break picking process was followed. This involved the manual picking of every record's first break while at the same time removing bad traces that may contaminate the shot record. First breaks were picked to an offset of 1500 meters.

### 5.3.2 Processing workflow

Following first break picking two main processing streams were followed:

- Refraction Tomography (TOP-ROCK) and
- Reflection processing culminating in pre-stack time migration (Pre-STM)
-

**1. Refraction Tomography (TOP-ROCK)**

HiSeis Top-Rock processing workflow which use the first-break picking and high-resolution refraction tomography was used to generate a velocity model, ray-path model and extract iso-velocity surfaces. These attributes provide near-surface geological information and typically can be used to determine the depth to the top of fresh rock as well as identify any features that may imprint on this contact.

**2. Reflection processing culminating in pre-stack time migration (Pre-STM)**

The raw 2D seismic data was put through the seismic processing workflow summarised in Table 5 which was designed to enhance signal, attenuate noise and recover lost frequencies.

A Kirchoff Pre-STM was applied using an output Common Mid Point (CMP) spacing of 2.5 m and offset binning 25m-3125m x 50m. A 5km half-aperture was used with a 75 degree dip limit.

The final 2D PreSTM was depth converted using smoothed refraction tomography velocities at shallow depth merged with smoothed RMS velocities converted to interval velocities from the PreSTM.

Table 5: Seismic processing flow.

| |
|---|
| 1. Import of raw data from SGY files, data verification and trace edit. |
| 2. Geometry assignment using a bin size of 2.5 metres. |
| 3. First break picking over 1.5 km of offset. |
| 4. Refraction tomography and calculation of statics, 580m final datum, 3500 m/s replacement velocity |
| 5. Quality control of statics solution on shot records. |
| 6. Deconvolution – zero phase spike, 0.1% white noise. |
| 7. Bandpass filter 4 – 16– 90 – 120 Hz. |
| 8. Surface wave noise attenuation (5 – 80 Hz . up to 2.0 km/s velocity). |
| 9. Air-blast attenuation. |
| 10. Amplitude recovery using automatic gain control (AGC), 500ms window. |
| 11. CVS analysis for velocity guide function. |
| 12. Application of NMO using guide function – stretch mute 60% and creation of a brute stack. |
| 13. Data conditioning and time gate picked for residual static calculation. |
| 14. 1$^{ST}$ pass Interactive velocity analysis confirms velocities 3000-6500m/s |
| 15. Computation of surface consistent residual reflection statics (delay time based) and application of residual statics. |
| 16. Pre-stack time migration, dip 75, 5 km aperture , bandpass filter 10-20-90-150Hz. |
| 17. Stacking |
| 18. Post stack enhancement. |
| 19. Time Depth conversion |
| 20. Generation of attributes. |
| 21. SGY files exported to specifications. |

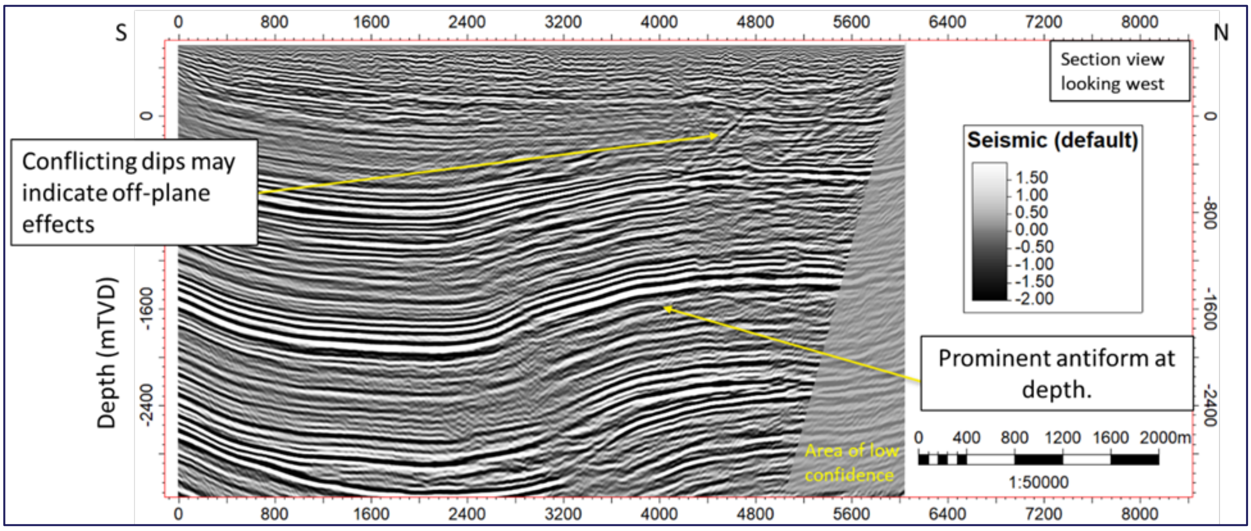


Figure 7: PreSTM section Angela 2D seismic Line 1.

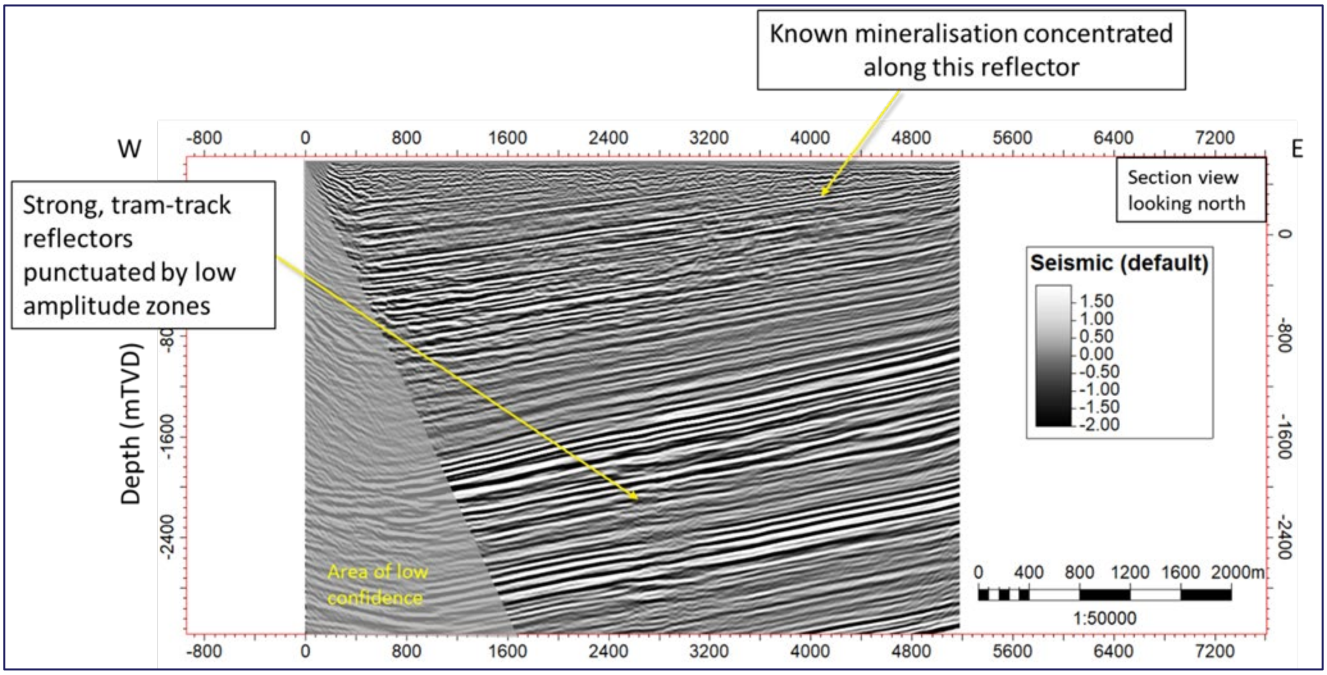


Figure 8: PreSTM section Angela 2D seismic Line 2.

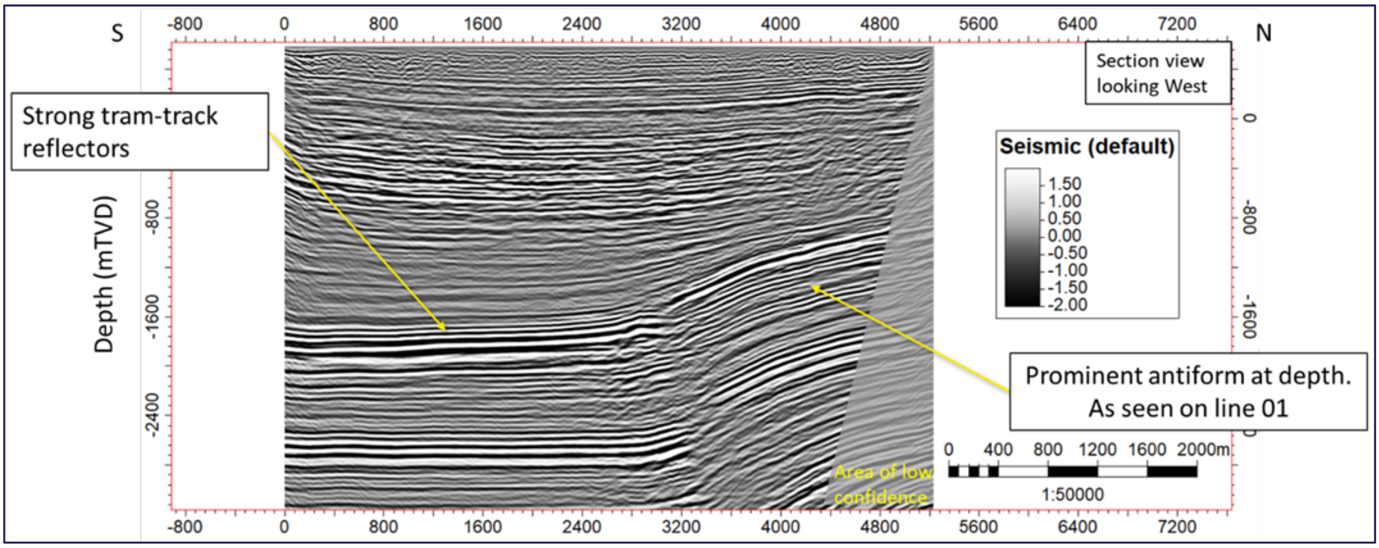


Figure 9: PreSTM section Angela 2D seismic Line 3.

# 6. Results and interpretations

Geological interpretation of the 2D seismic data included identification of several key stratigraphic reflectors, and a domain of reduced reflector continuity below approximately 1km depth that interrupts the more continuous reflectors on each line (refer to Figure 16). The tying of stratigraphic layers between Line 1 and Line 2 is quite uncertain, because there is a data gap between them and no other lines cross line 1. Several key drillholes (AP017, AP112, EW43, EW309, EW371) ameliorate this to some degree. 3D seismic would reduce the uncertainty.

To support the interpretation, different seismic attributes (data filters) were applied to the reflectivity data to produce enhanced outputs. These include:

1. Cosine Phase: Highlights broad scale trends of reflectors.
2. Amplitude Envelope: Removes the wavelet overprint, enhances amplitude variations which may represent changes in lithology, alteration etc.

*Note: When interpreting 2D seismic data it is important to note that reflective objects may not be directly beneath the acquisition line as seismic energy radiates out and is reflected in 3D. The 2D seismic image records the echo time (which is proportional to the distance to the object) regardless of whether the object is directly below the line or not. Reflective objects that are not directly below the seismic line may still be imaged by the seismic survey, generating additional complexity to be considered during interpretation. These reflections are known as "off-plane events". This effect is negated by a 3D seismic survey as all reflections will be resolved back to their true location.*

Key observations and outcomes of the seismic program, including exploration implications are summarised below.

- Uranium is concentrated on a particular stratigraphic layer(s) and this layer is largely undisturbed by significant structural offsets.
- The main mineralisation coincides very closely to one of the picked reflectors ("Base Reflector-Peak") and is also identifiable on the Seismic Envelope Attribute. Most of the drill-holes stop at this dipping reflector.
- Increases in seismic amplitude along this reflector correlate with where uranium mineralization is known (see Figure 7 and Figure 10). This is broadly consistent with the observed change in seismic impedance at the boundary between reduced and non-reduced rocks as seen in core measurements completed by Elevate.

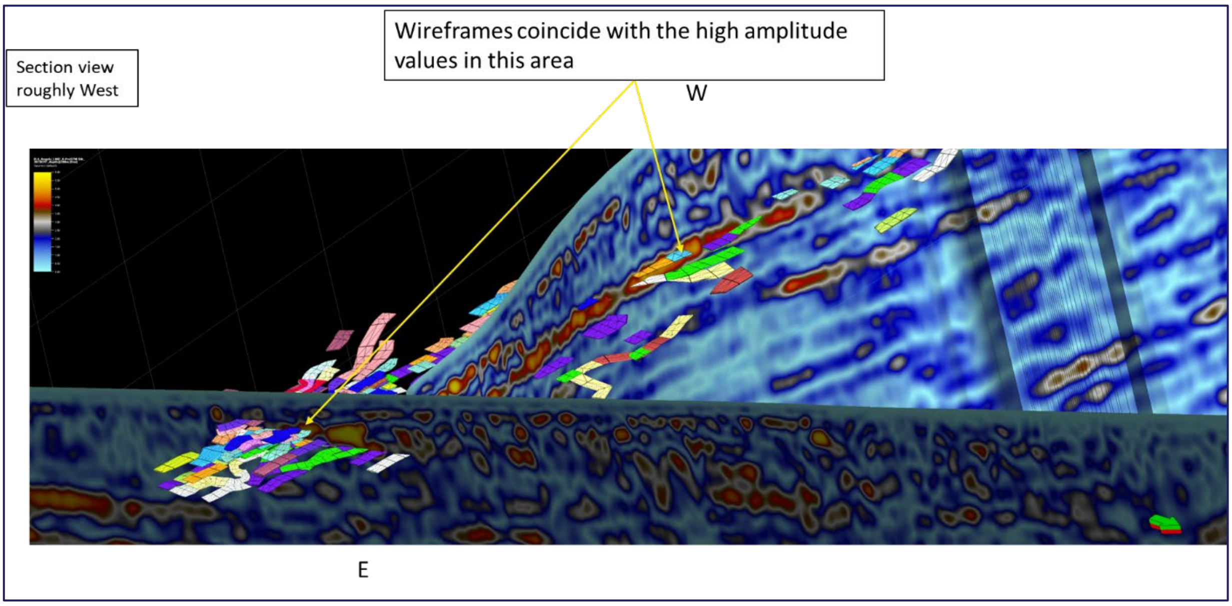


Figure 10: Amplitude Envelope attribute image showing legacy wireframes of known mineralisation.

- High amplitude regions exist just below the known mineralisation, indicating these positions may be prospective for additional uranium mineralization.
- On Line 2, the seismic envelope attribute shows a correlation between high seismic amplitudes and high $U_3O_8$.
- The seismic shows deeper structures which may have influenced the emplacement of the mineralization and deeper zones of reduced reflectivity. There is a zone of reduced reflector continuity that punctuates continuous reflectors on all 3 lines. This could be evidence of a deeper hydrothermal system that sourced the oxidized, uranium rich fluid for the shallower orebody. Alternatively, a deeper hydrocarbon system could have sourced the reduced fluids that interacted with the shallower oxidised fluids to precipitate the uranium (see Jin et al).
- Whilst historical interpretations indicate significant structural offsets, no large fault offsets were detected in the top 1km (within seismic resolution).

A key exploration opportunity identified from the seismic imaging is an anomalous area below known mineralisation, which may represent deeper uranium enrichment. This area is untested with drilling.

In addition, the results and interpretation of the seismic data support two potential hypothesis for uranium deposition. It is also possible that uranium deposition could have resulted from a combination of both.

Hypothesis 1: Oxidized fluids sourced from above (e.g., meteoric water) could penetrate the stratigraphy through the unconformity, percolate down onto the identified seismic reflector (aquitard?) and react with the reduced country rock to precipitate out the uranium.

Hypothesis 2: Oxidised (reduced) fluids could be sourced from below and react with overlying reduced (oxidized) fluids. Visible discontinuities in the seismic imaging could be evidence of alteration fluid pathways or hydrocarbons. The seismic discontinuities could also be due to the presence of salt, lateral facies change or other reasons, so care must be taken in interpreting these features without having drilled them.

The following images provide a summary of the seismic results for each 2D seismic line.

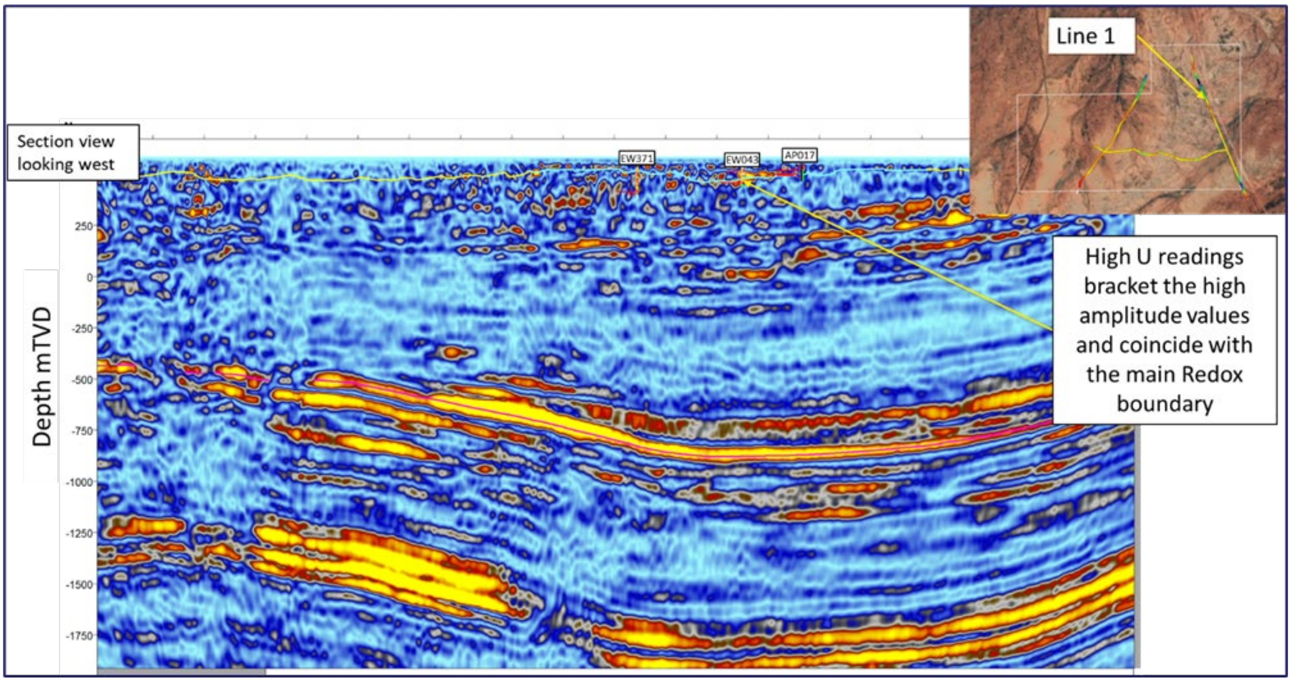


Figure 11: Line 1: Amplitude Envelope attribute image showing high amplitudes in yellow.

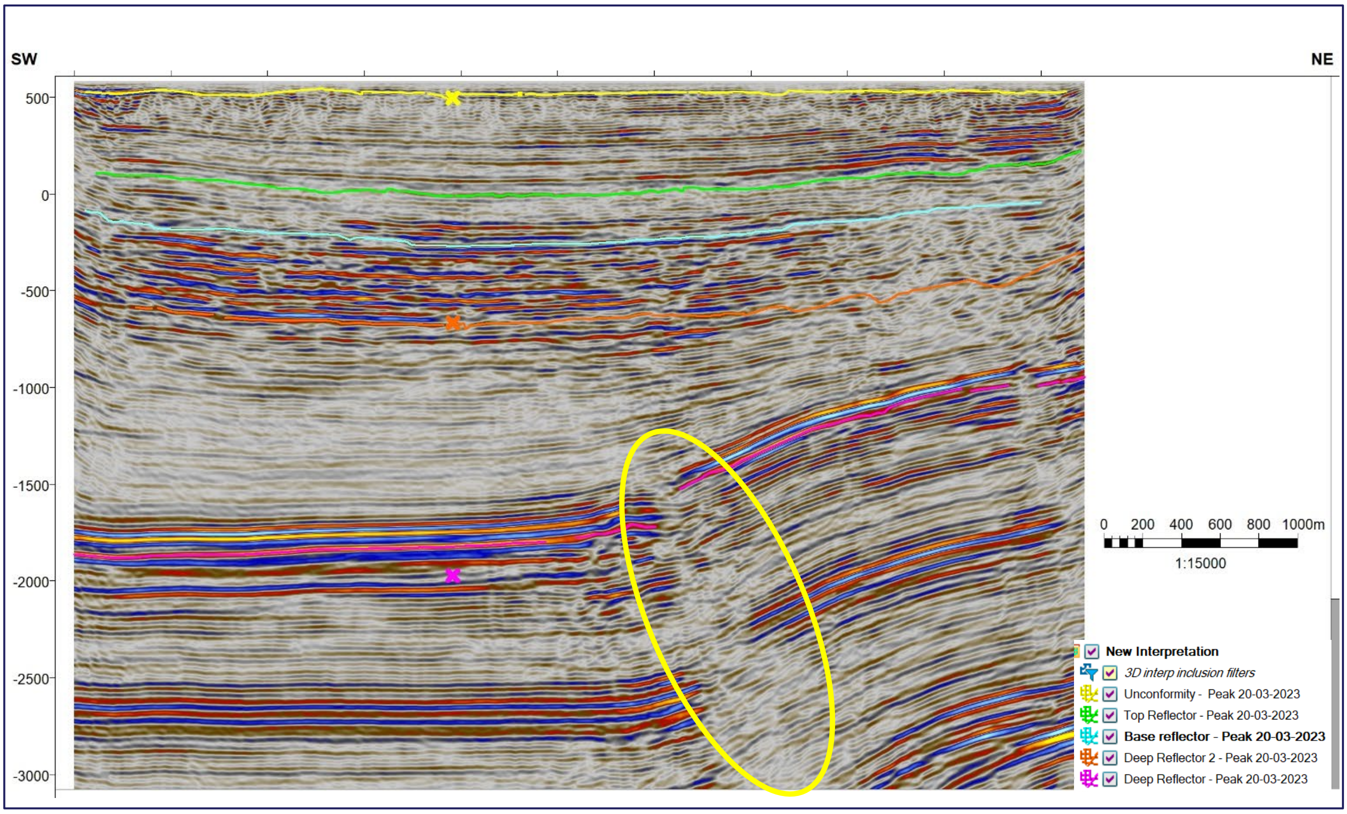


Figure 12: Line 1: Seismic image showing linework for trends of reflectors and the zone of seismic discontinuity (yellow oval).

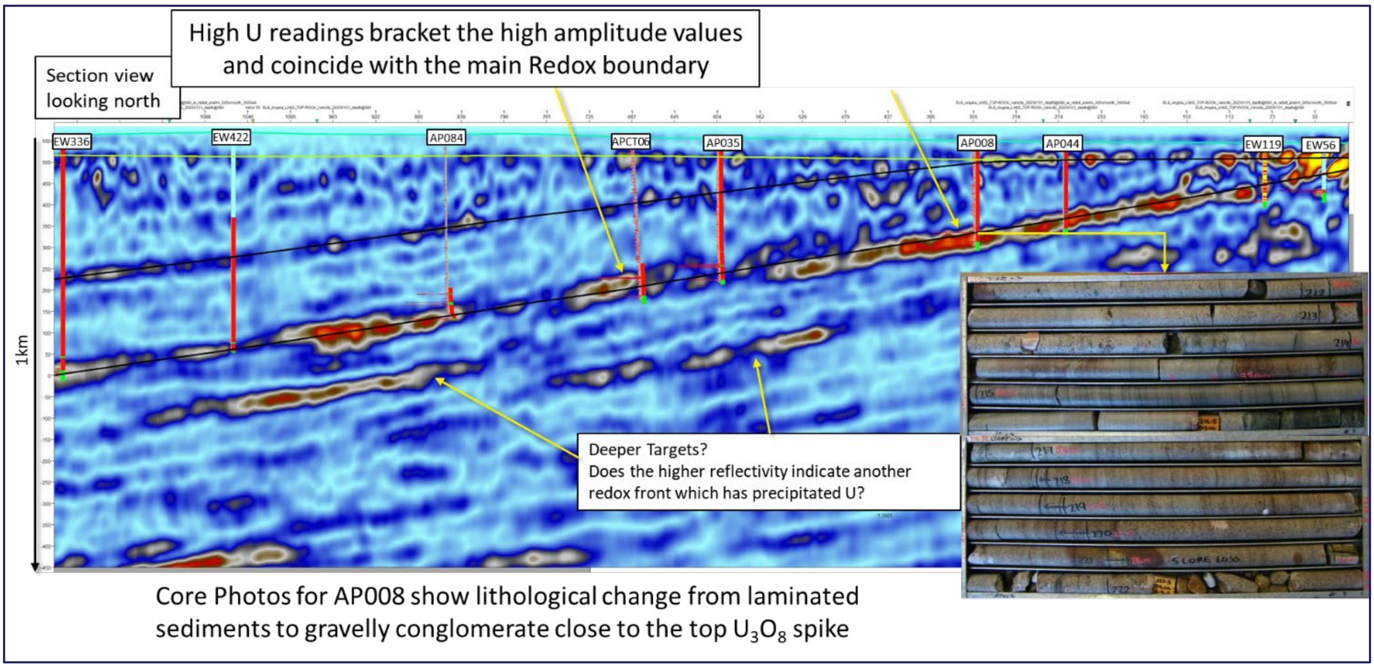


Figure 13: Line 2: Amplitude Envelope attribute image showing high amplitudes coinciding with main Redox boundary.

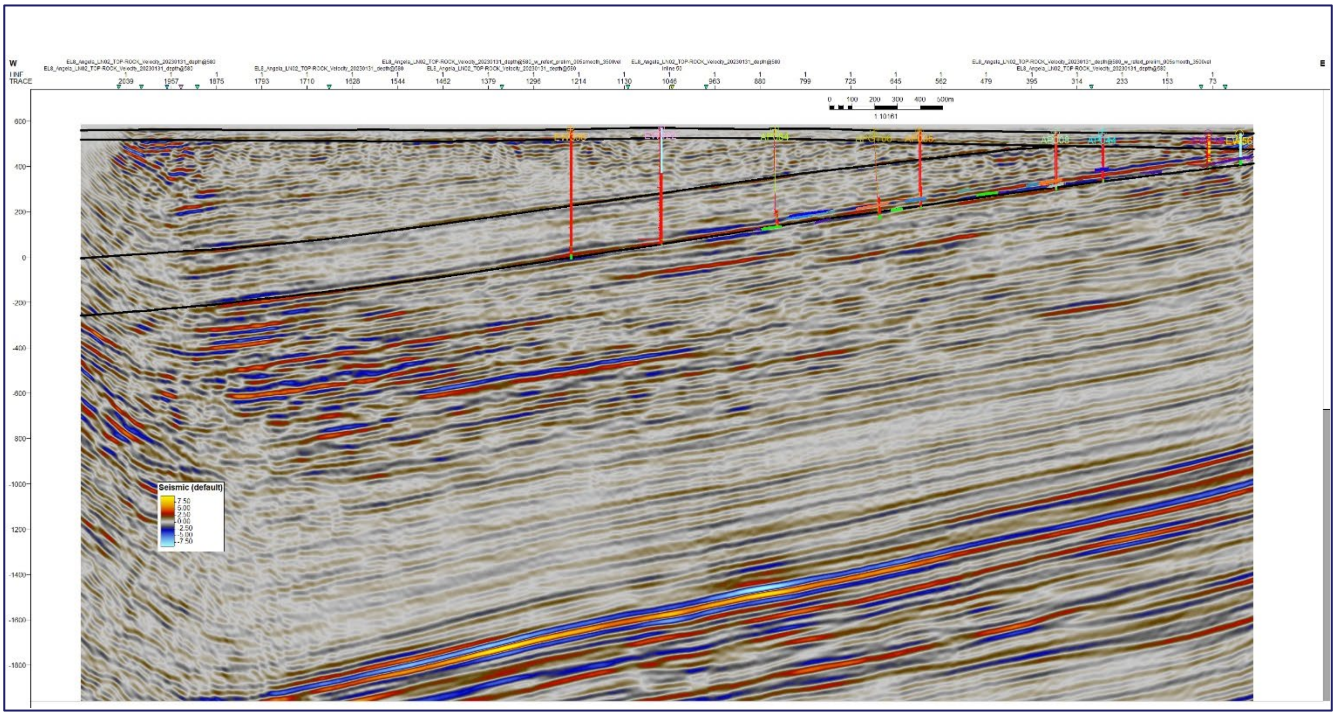

Figure 14: Line 2: Seismic image showing existing drillholes close to the line.

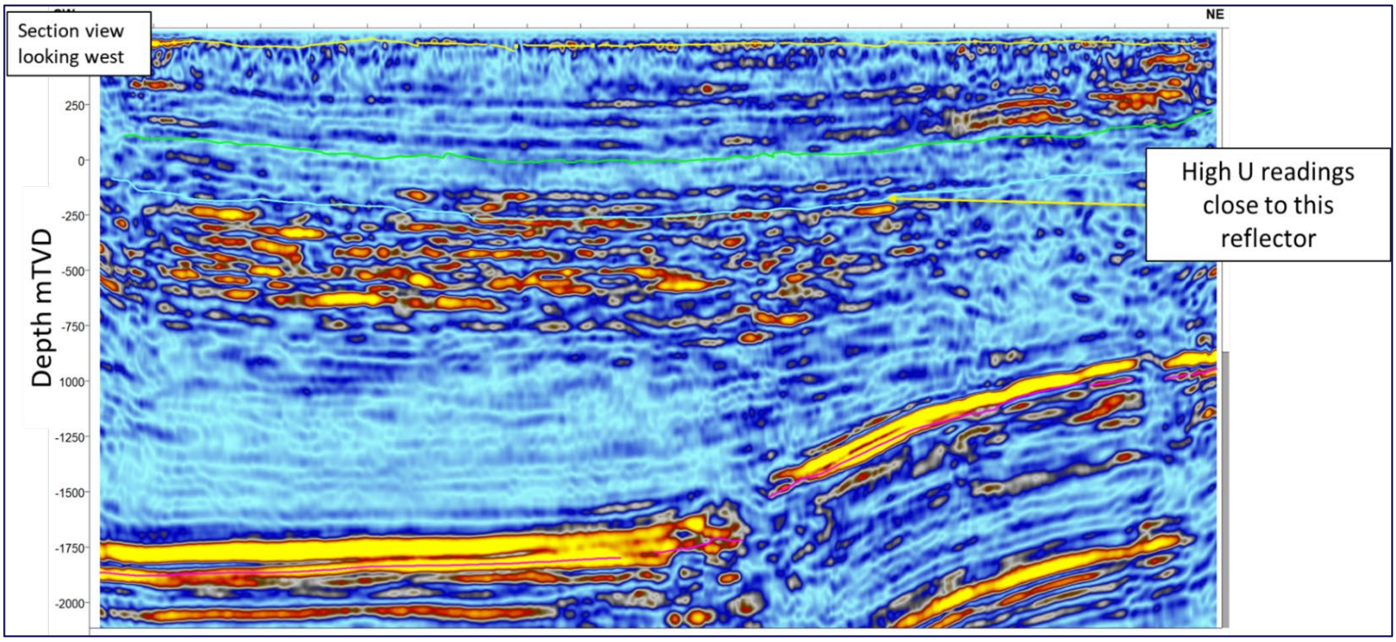


Figure 15: Line 3: Amplitude Envelope attribute image showing high amplitudes in yellow.

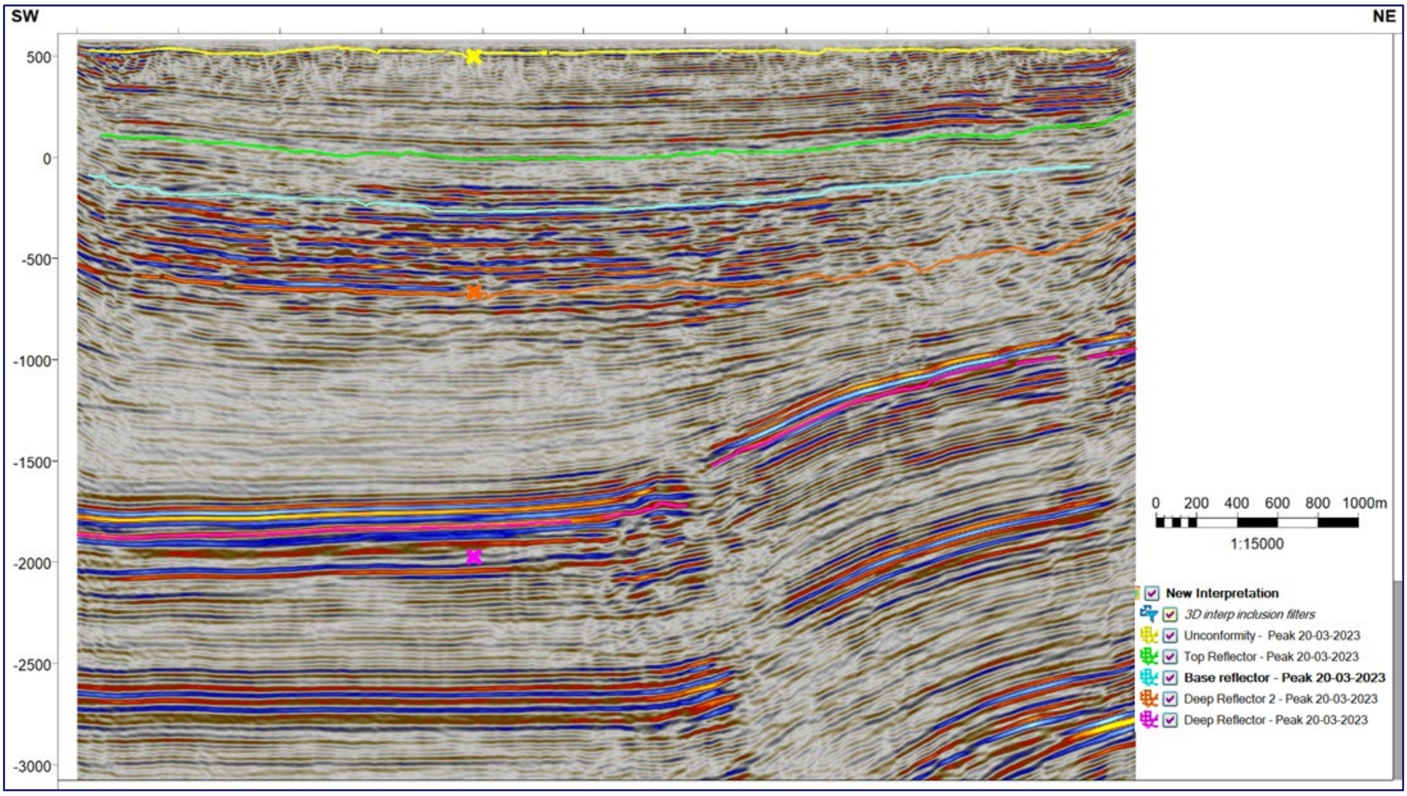


Figure 16: Line 3: Seismic image showing linework for trends of reflectors.

# 7. Conclusion & recommendations

The 2D seismic program at Elevate Uranium's Angela project confirmed that seismic is an effective method to image the subsurface. The results and interpretation of the seismic data provide insight into potential uranium deposition and provide potential upside for future exploration.

To further enhance subsurface imaging and the subsequent value that can be added to future exploration and mining activities, HiSeis recommends the following activities at Angela:

- The acquisition of downhole logging (FWS and VSP) together with specific gravity measurements to better characterize the seismic response of key geology. These should be strategically placed in relation to the 2D or future 3D surveys to maximize their contribution to improving the processing and overall geologic understanding of the area.
- A 3D seismic survey to better delineate events in a 3D space and add confidence in their spatial position for potential drill testing.

# 8. References

Jin, Ruoshi & Teng, Xueming & Li, Xiaoguang & Si, Qinghong & Wang, Wei. (2019). Genesis of sandstone-type uranium deposits along the northern margin of the Ordos Basin, China. Geoscience Frontiers. 11. 10.1016/j.gsf.2019.07.005.

UAL Report TR 230-9, https://geoscience.nt.gov.au/gemis/ntgsjspui/handle/1/74037

Alice Springs. 1983. SF53-14 1:250K Raster Geology Data. Northern Territory Geological Survey, Minerals and Energy Division, Department of Regional Development, Primary Industry, Fisheries and Resources.

Aquaterra Consulting Pty Ltd (2011). Angela Uranium Project – Surface Water and Groundwater Baseline Monitoring – Final Report.

Battey G.1984. Summary of Discussion with Uranerz Australia Pty Ltd on Methods Used to Process Borehole Gamma Ray Logs From the Angela Deposit (NT)

Borshoff J. & Faris I. 1990. Angela and Pamela uranium deposits. In: Geology of the Mineral deposits of Australia and Papua New Guinea (editor Hughes F.E.). The Australasian Institute of Mining & Metallurgy, Melbourne; p1139.1142.

Chea Y. Chew W., Zhang G. 1998. A Novel Array Laterolog Method, The Log Analyst.

Ferguson, K.M. 1975. UAL report 54: Exploration 1975 on the Ewaninga Prospect surrounding areas. Alice Springs, NT. Uranerz (Australia) Pty Ltd internal Report. NTGS Open File Report 9112-EXP-0003-V1.

Kellogg Brown & Root Pty Ltd (KBR) (2011). Summary of Baseline Data Acquisition – 2010. Radiation and meteorology at the Angela Deposit (2011). Prepared for Cameco Australia Pty Ltd

Morete S. 1983. Supplementary Information for the Bureau of Mineral Resources on the Angela I Deposit and Angela II-V Prospects, Alice Springs, Northern Territory, UEL Report TR230-29.

Paladin, 2012; Inaugural Annual Water Report Angela Project, Circa 2008 to June 2012, October 2012

Scott. 1980. Pitfalls in Determining the Dead Time of Nuclear Well-Logging Probes, SLWLA Twenty-First Annual Logging Symposium, July 8-11.

UAL Report No. 62. Exploration 1976 on the Ewaninga Prospect and surrounding areas, Alice Springs, N.T. Compiled by Dr. G. Ott. Edited by D.O. Zimmerman and S. Morete. March, 1977.