GEOPHYSICAL REPORT

on the

Kamaha Property

Sella Limba Cheifdom

Sierra Leone

DATE OF REPORT
February 9, 2024

REPORT PREPARED BY
Nicholas Gust

CENTER OF WORK
Lat. 9°32'26.934"N , Long. 12°15'20.566"W

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Introduction

From January 19-22, 2024, a comprehensive geophysical survey was conducted on the claim held by Bright Continent Minerals, situated in the foothills north of Kamakwie, near the village of Kamaha in Sierra Leone's Northern Province. The primary objective of this survey was to map the bedrock contours and analyze the subsurface geological formations, crucial for assessing the claim's potential for gold mining.

Positioned within the Sella Limba chiefdom, the claim lies in a region renowned for its geological diversity and historical mining activities, albeit primarily artisanal in nature. The area is characterized by a mix of dense forests and agricultural fields, punctuated by the rolling hills and valleys typical of Sierra Leone's northern terrain. Access to the site is facilitated through a network of scenic rural dirt roads.

Historically, the region has seen a shift from diamond to gold mining, with the area around Kamakwie becoming a focal point for artisanal miners following the discovery of gold. This transition marks a significant departure from the more widely known diamond mining narrative that has dominated Sierra Leone's mining sector. Despite the historical significance of mining in the area, documentation specific to the claim's immediate vicinity remains scarce, with evidence of artisanal mining activity suggesting a rich, albeit largely untapped, potential.

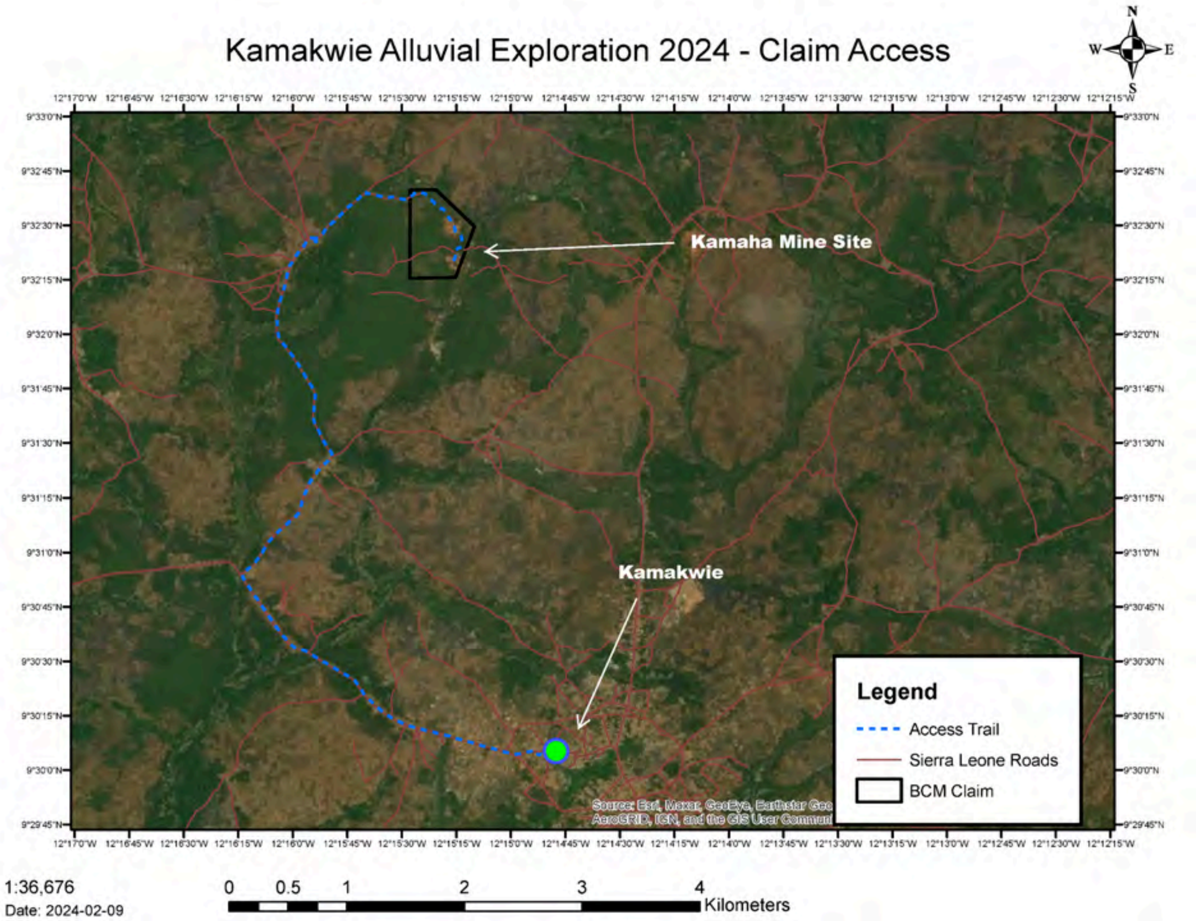
The survey utilized the passive seismic HVSR method to record the earth's natural seismic vibrations, providing an innovative approach to traditional survey techniques that often rely on controlled seismic sources. This methodology is especially suited to delineating subsurface geological features and estimating the thickness of overburden material, critical in placer mining scenarios.

The survey was conducted by a team led by Nicholas Gust, who is trained in the application and interpretation of this technique. Several workers from the Kamaha village were hired to aid in line cutting and preparation for the survey.

Location and Access

The mining claim owned by Bright Continent Minerals is situated approximately 5 kilometers north of Kamakwie, near the village of Kamaha, in the Northern Province of Sierra Leone, within the Bombali District. Kamakwie, serving as the chiefdom headquarters of the Karene Chiefdom, anchors the region's geographical and administrative context for the claim.

To access the claim from Kamakwie, one must navigate a network of unnamed dirt roads that traverse the rural landscape characterized by forests, agricultural fields, and undulating terrain. These roads, typical of the region's rural infrastructure, may present challenges in terms of accessibility, especially during the rainy season when conditions can deteriorate. The claim's location, proximate to Kamaha, situates it within a context of small-scale agricultural and mining activities, reflecting the broader economic and environmental setting of northern Sierra Leone.

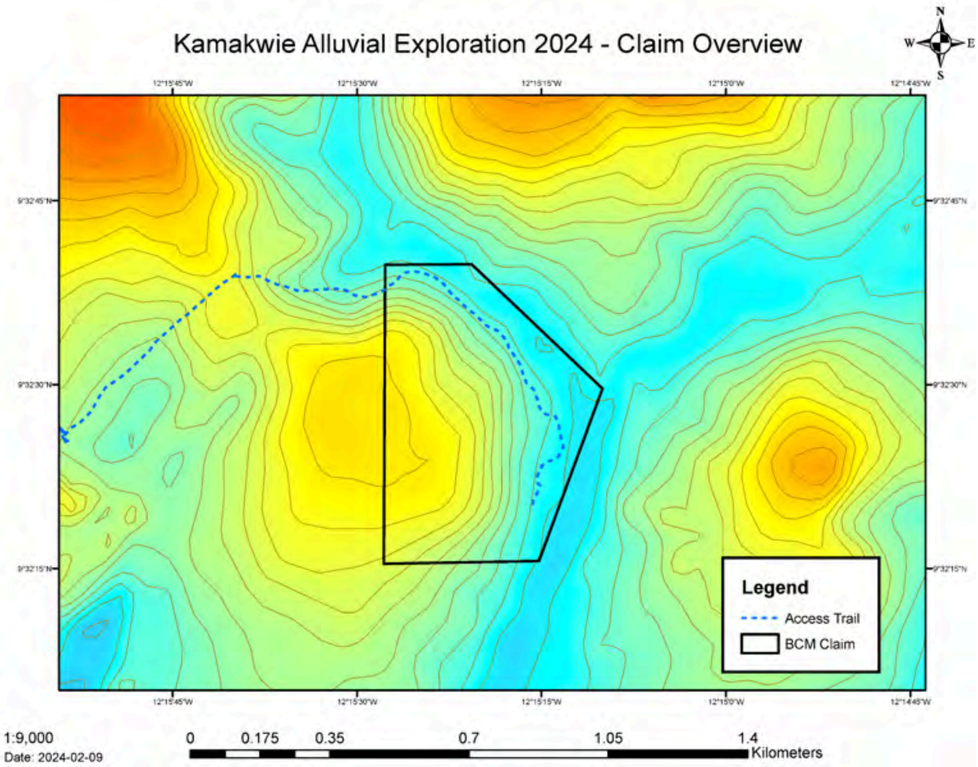


Property Description

The small-scale mining licence SML 15/2022, is a 32-hectare claim owned by Bright Continent Minerals Limited. The claim is located in the Sella Limba chiefdom and was originally staked in 2022.

The region surrounding Kamakwie in the Northern Province of Sierra Leone features a diverse and accessible landscape characterized by gently rolling hills and lowland areas. This varied topography supports a mix of uses, including agriculture, habitation, and mining activities, underpinned by the area's fertile soils and significant water resources from numerous streams and rivers. The presence of both savannah grasslands and patches of forest across the terrain reflects the transitional climatic zone, with these ecological systems providing a habitat for diverse flora and fauna while also supporting local agricultural practices.

The climate in the Kamakwie vicinity is distinctly tropical, marked by a wet season with significant rainfall that influences river levels and access, and a dry season that affects water availability and vegetation. Geologically, the region is part of the mineral-rich West African Craton, making it a point of interest for mining due to its potential for gold, diamonds, and other minerals. This geological diversity, combined with the area's physiographic features, shapes the region's economic activities and environmental dynamics, presenting both opportunities and challenges for sustainable development and resource management.



Previous Work

This report focuses on the mining activities in Northern Sierra Leone, with a particular emphasis on the Kamakwie area, a region characterized by its significant involvement in the artisanal mining sector. The historical backdrop of mining in Sierra Leone is marked by the exploitation of various minerals, most notably diamonds, which have been central to the country's economic narrative. However, in the northern region, and especially around Kamakwie, artisanal gold mining plays a pivotal role in the local economy.

While the national history of mining in Sierra Leone is predominantly defined by diamond extraction, the narrative shifts in the Northern Province, where artisanal gold mining emerges as a key economic activity. The discovery and subsequent exploitation of gold reserves in areas surrounding Kamakwie have led to a burgeoning artisanal mining community. Unlike the diamond-centric mining history that has often been marred by conflict and environmental challenges, gold mining in this region offers a different perspective, showcasing the potential for sustainable livelihoods amidst the challenges.

In the vicinity of Kamakwie, artisanal gold mining is characterized by small-scale operations that rely heavily on manual labor and traditional mining techniques. The workforce comprises local inhabitants who engage in mining to support their families, often in the absence of alternative employment opportunities. These miners employ rudimentary methods to extract gold, a process that, while economically vital, poses significant environmental and health risks due to the lack of formal regulation and oversight.

There is no recorded information available on previous mining in the immediate area of the Bright Continent Minerals claim. There is evidence of localized artisanal mining pits around the area. The claim itself has several old and recent workings that were carried out by local miners. There are two large trenches on the claim itself that were created by local miners prior to the staking of the claim.

The artisanal mining sector in the area around Kamakwie, Northern Sierra Leone, presents a unique set of opportunities and challenges. Unlike the diamond-dominated narratives of the country's mining history, gold mining in this region offers a pathway to economic empowerment for local communities. However, realizing this potential requires concerted efforts to mitigate environmental impacts, improve working conditions, and ensure that the benefits of mining are equitably distributed among all stakeholders involved.

Regional Geology

The country's Precambrian shield is broadly categorized into infracrustal and supracrustal units, alongside basic and ultrabasic igneous intrusions. The infracrustal rocks, consisting of gneisses and granitoids, form the foundational bedrock of Sierra Leone and have undergone significant reworking during two major orogenic (mountain-building) episodes - the Leonean and the Liberian.

> **Leonean Orogenic Episode (≈2950-3200 Ma)**: This older geological event is marked by the intrusion of basic igneous rocks, known as Pre-Leonean Amphibolites, and the formation of greenstone belts, notably represented by the deeply eroded Loko Group. These greenstone belts, formed during this period, are crucial for understanding the distribution and genesis of gold deposits in the region.
>
> **Liberian Orogenic Episode (≈2700 Ma)**: Following the Leonean episode, the Liberian orogeny introduced another phase of geological activity, characterized by the emplacement of metamorphosed basic igneous intrusions, referred to as Pre-Liberian Amphibolites. Unlike their Leonean counterparts, these rocks exhibit a distinct Liberian tectonite fabric, indicative of the complex tectonic processes that have shaped the region's geology. Amphibolites of this age are predominantly found within the Sula Group and along its western and northern margins, contributing to the rich tapestry of Sierra Leone's geological landscape.

The geological landscape around Kamakwie in Sierra Leone is part of the broader West African Craton, an ancient geological formation that provides a stable platform for a variety of mineral deposits, including significant gold reserves. This cratonic region is characterized by Precambrian basement rocks overlain in places by younger Proterozoic formations, such as the Birimian rocks known for their gold-bearing potential. Within this extensive geological framework, the processes of weathering and erosion play pivotal roles in the formation of laterite and saprolite layers, which are integral to the area's alluvial gold deposits.

In the warm and humid tropical climate of Northern Sierra Leone, intense chemical weathering of the underlying rocks leads to the formation of laterite soils, which are rich in iron and aluminum oxides. These soils form a distinctive reddish-brown layer that caps the landscape in many areas, including around Kamakwie. Beneath the laterite, saprolite forms from the in-situ weathering of bedrock, retaining the original rock's structure but becoming softer and more friable. This weathered layer is significant for gold exploration as it may contain disseminated gold particles released from the parent rock.

The weathering processes that create laterite and saprolite layers contribute to the secondary dispersion and concentration of gold. As these weathered materials are eroded and transported by water, denser gold particles settle in alluvial deposits, particularly in areas where water flow slows down, such as river bends and depressions. The presence of laterite and saprolite is thus a crucial indicator in the exploration for alluvial gold, as these layers can point to both secondary placer deposits and potential primary sources of gold in the underlying bedrock.

Survey Method and Theory

The passive seismic HVSR method consists of recording ambient or natural seismic energy vibrations using a seismometer. The seismometer must be able to record ground motion in three axes (XYZ), over a broad range of frequencies (0-128 Hz), and over a long time period (1 min to 60 min, usually 20 min).

Traditional seismic surveys use an energy source such as dynamite, or a dropped weight. The HVSR method is very different in that it utilizes ambient vibrations in the surface of the earth. These are considered noise in traditional surveys but in this case, provides the source vibrations.

The ambient signal consists primarily of surface Rayleigh and Love waves, which are generated from natural sources. Sources of ambient vibration are ongoing crustal microtremors, rain, and wind. In more populated areas sources can come from human activities such as traffic movement, construction and factories.

The ambient seismic energy creates seismic resonance within the near-surface strata and regolith. This resonance is a function of the thickness and the shear-wave velocity of the subsurface layers, and is particularly amplified when layers have a strong and sharp acoustic impedance contrast boundary. Acoustic impedance is a function of the density multiplied by the shear wave velocity of a layer. That impedance is how we can identify different layers and their depth.

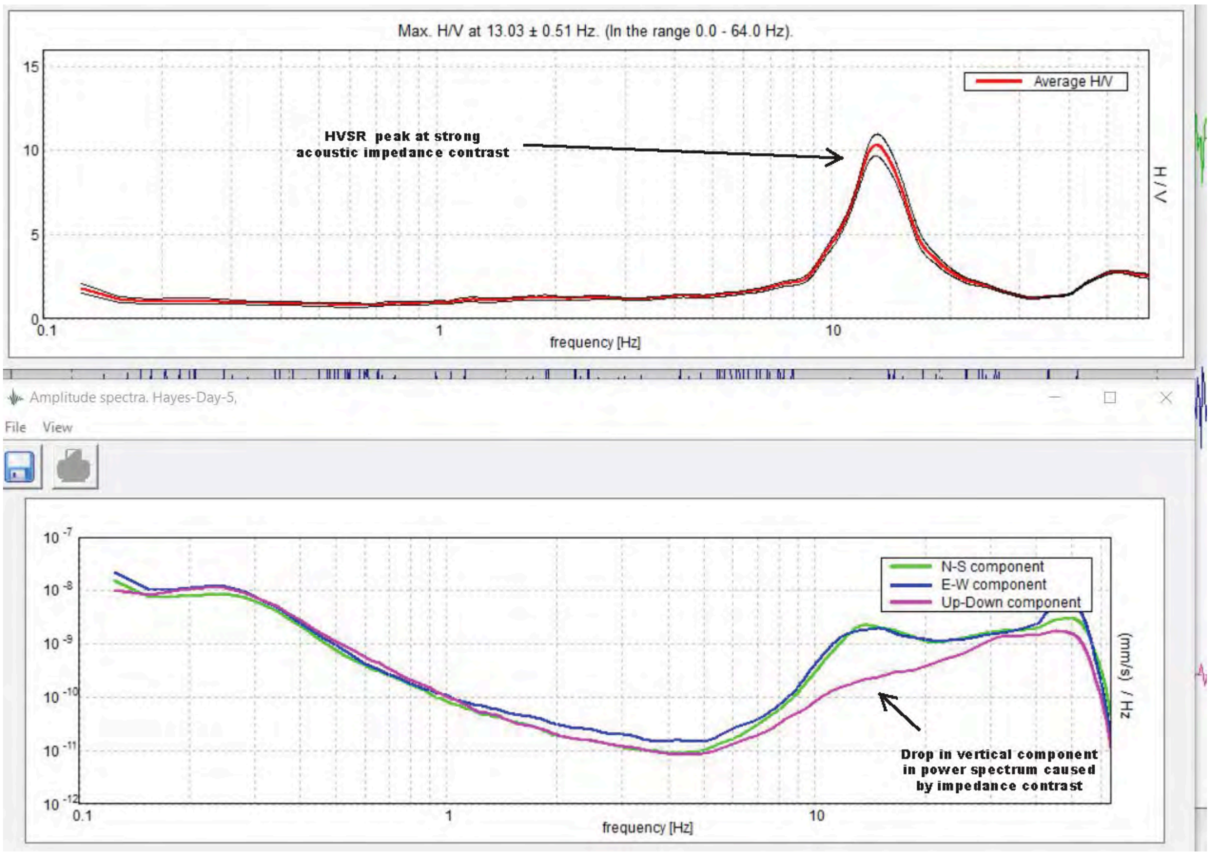
In processing with proprietary software the recorded time-series data (X, Y and Z) is converted to the frequency domain using a Fast Fourier Transform (FFT), and the two components are displayed as a power spectrum.

After the inversion, the horizontal components are usually very similar unless there is strong anisotropy in the near-surface. The Vertical component dips where resonance occurs from trapping by underlying layers. Where the vertical component deviates from the two horizontal components a H/V peak is interpreted. The frequency at which the peak occurs can be used to calculate the depth from surface.

This resonant frequency is related to the thickness and shear wave velocity of the resonant layer by the following equation from Nakamura (2000):

$f_0 = Vs/4h$

where f_0 = peak resonant frequency (Hz), Vs = shear wave velocity (m/s), and h = layer thickness (m). In a two-layered earth model, resonance frequency (f_0) can be used in estimating the overburden thickness (h) using the equation



From processing the data we know the peak resonant frequency but there are still two unknowns. Vs and the thickness (h). In order to accurately calculate the thickness for each location, we need to know the shear wave velocity of the overburden layers. That can be acquired by running a test station at an area of known depth such as a drill hole. Once the velocity is known it is simple to calculate the thickness.

Equipment

The Tromino 3G BLU Seismograph, manufactured by MoHo Science & Technology from Italy was used on this survey. The Tromino works on the HVSR principle, is a very light and portable instrument that records seismic noise in the frequency range of 0.1 to 1024 Hz.

The Tromino is a small (1 dm3, < 1 kg) all-in-one instrument, equipped with:

- 3 velocimetric channels (adjustable dynamic range)
- 3 accelerometric channels
- 1 analog channel
- GPS receiver

The Tromino does not require cables or a source and acts as a standalone geophysical instrument.

A Reach RS2 multi-band RTK GNSS receiver, manufactured by Emlid was used to record spatial information for computer mapping. Some of the specs are here below:

- Dimensions: 126x126x142 mm
- Weight: 950 gram
- Ingress protection: IP67
- Corrections: NTRIP, VRS, RTCM3
- Position output: NMEA, LLH/XYZ
- Positioning kinematic horizontal: 7 mm + 1 ppm
- Positioning kinematic vertical: 14 mm + 1 ppm
- GNSS signals tracked: GPS/QZSS L1C/A, L2C, GLONASS L1OF, L2OF, BeiDou B1I, B2I, Galileo E1-B/C, E5b

Number of channels: 184

Survey Procedure

Station spacing was set at 30m for the survey lines.   A 30m rope was used to layout the survey lines using two people. Line locations were chosen in advance in GIS software and layed out in the field using a handheld GPS. Each station was marked with a pin flag and recorded on the GPS for processing.

Each reading takes 20 minutes, which allows for sufficient data collection to be modeled in the interpretation software. It is important for the seismometer to have good contact with the ground. At most stations, it was necessary to remove the vegetative mat and expose soil/subsoil that the instrument can be planted into.

The seismometer used in this survey is extremely sensitive since it's designed for picking up faint, ambient energy in the earth. The trade-off is that it is also sensitive to sources of noise.

Station data is stored on the device and downloaded each day to check for data quality. Initial processing was completed in the evening each day. To estimate the shear wave velocities seismic data was recorded at several of the drill hole locations that were completed in previous years. Those velocities were used to satisfy the equation above and calculate the layer thicknesses.

Processing and Interpretation

Each station is processed independently using proprietary software that utilizes the HVSR method described above. Each trace is analyzed for quality and if necessary noisy sections can be removed using a windowing technique. There were two stations that had too much noise and had to be repeated but most were below the noise threshold or able to be cleaned up.

The coordinates and calculated bedrock depth are populated into a CSV file to be gridded. Surfer software was used for gridding the data and the resulting vector data can be used in GIS software such as ArcMap. The final data is presented as a topographical map showing the difference between surface and bedrock elevations.

Interpretation

Cross Sections

Line 1 runs in an east to west orientation starting at the valley bottom and heading up the hill to the west. The overburden thickness was fairly consistent throughout the line at around 30 meters. The bedrock was deeper near the valley bottom and rose steeply from stations 7 to 10. The top half of the line had fairly flat bedrock with thick overburden (~33m).

Line 2 also runs in an east to west orientation an is positioned about 200 meters north of line 1. The profile was similar with deeper bedrock at the valley bottom which rises with the hillside. There was a dip in the bedrock at stations 9 and 10. That is an interesting feature that might hold some good gold grades.

Line 3 lies to the north of line 2 with the same orientation. This line had flat bedrock about 25 meters deep from stations 1-5. The bedrock sloped down towards the river from stations 6 to 8.

Line 4 lies to the south of line 1 running east to west. This line showed a deep section at station 2 which exhibits the characteristics of a paleochannel. The deep section had an overburden thickness of 32 meters.   The overburden thickness on the hill slope from stations 7 to 10 was much thinner (18m) and bedrock was rising with the hillside. The section on top of the hill had thicker overburden (~33m) and was generally flat.

Line 5 lies on the southern edge of the claim in the same orientation as the other lines. This line showed a fairly even slope and overburden thickness, averaging about 28 meters thick.

Conclusion

The seismic survey has revealed valuable information about the bedrock depth and potential targets for exploration over this claim. The seismic data reveals that the bedrock is much deeper than expected. Existing excavations only go down about 10 meters from the surface while the bedrock is around 30 meters deep in most places.

Onsite observations have shown that the alluvial material is mainly composed of laterite and saprolite soils with residual source rock. The seismic cross sections show that those clay-rich layers should extend much deeper than can be observed at the surface. Exploration down to bedrock will be essential and very well could show gold grades much higher than have been observed in existing excavations.

The seismic survey also revealed that the existing artisanal workings have only scratched the surface of the alluvial material that lies underneath.

Lines 1 and 4 showed indications of a buried paleochannel that might run adjacent to the current river. This should be a primary target for exploration which will likely require an RC or sonic drill to sample the near bedrock layers.

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Statement of Qualifications

I, Nicholas Gust, of the city of Mission, in the province of British Columbia do hereby certify that:

1. I am a graduate of the University of Calgary with a B.Sc.in Geophysics. I am also a graduate of the Southern Alberta Institute of Technology and hold a diploma in Exploration Technology.

2. I have received training from the manufacturer of the instrument used in this survey in the application of field techniques and interpretation.

3. I have worked in the exploration industry and have been conducting geophysical surveys since 2008.

4. This report is compiled and interpreted from data obtained from a passive seismic survey carried out under my field supervision.

5. I have based the conclusions and recommendations contained in this report on my knowledge of geophysics, my previous experience, and the results of the field work conducted on the property.

Appendix I:
Maps and Data

Kamakwie Alluvial Exploration 2024 - Claim Access

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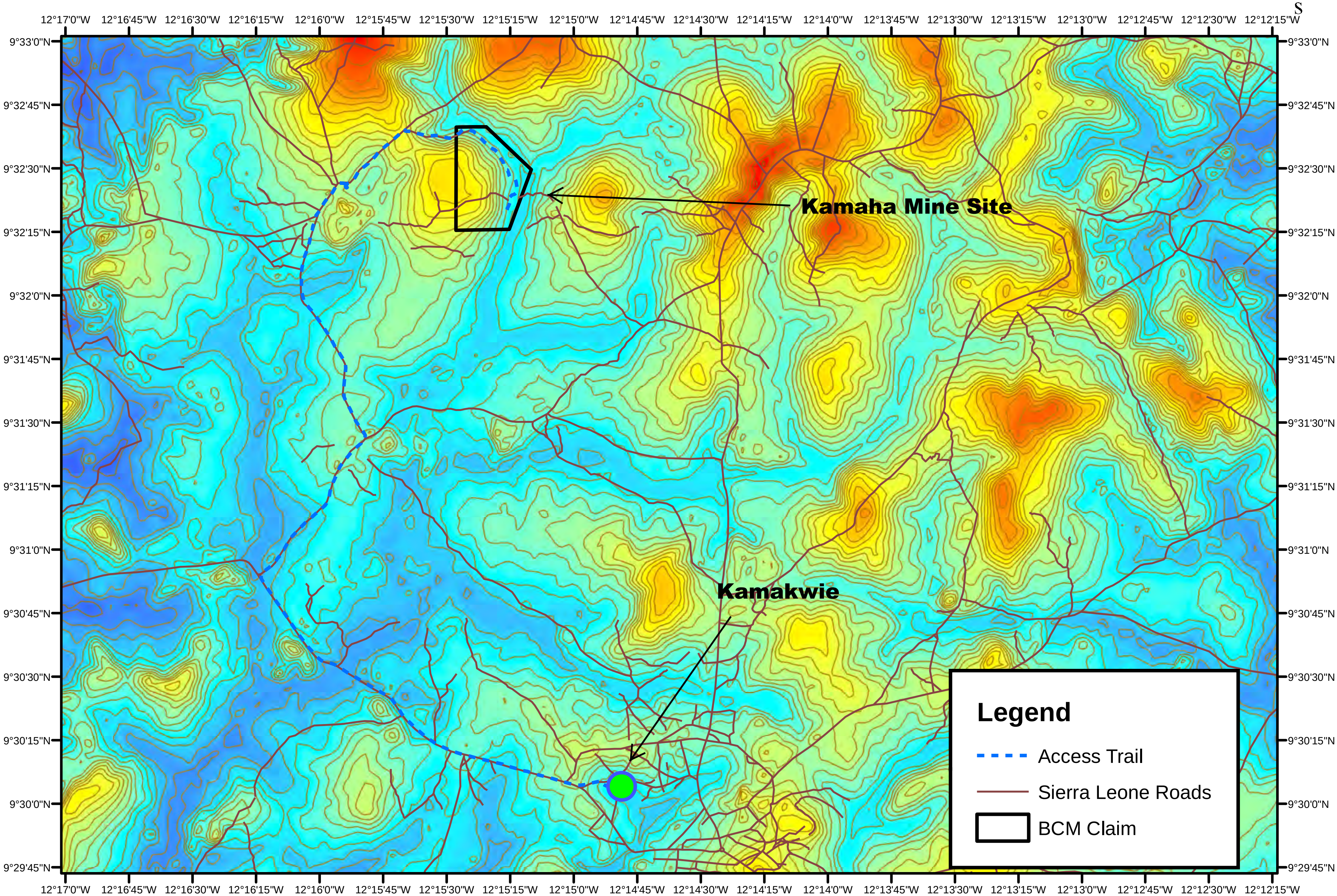

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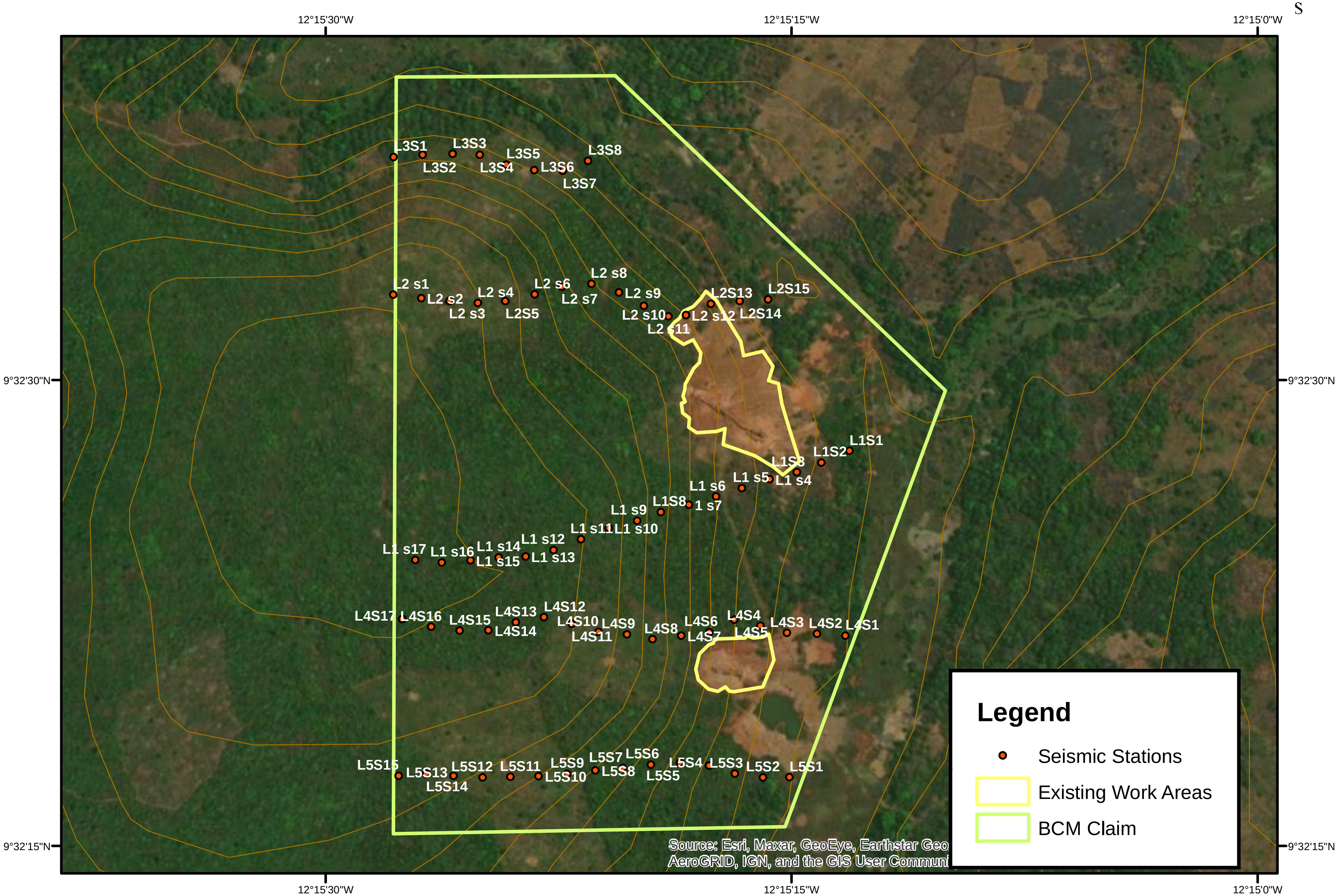
0 0.5 1 2 3 4 Kilometers

Date: 2024-02-09

Kamakwie Alluvial Exploration 2024 - Seismic Stations



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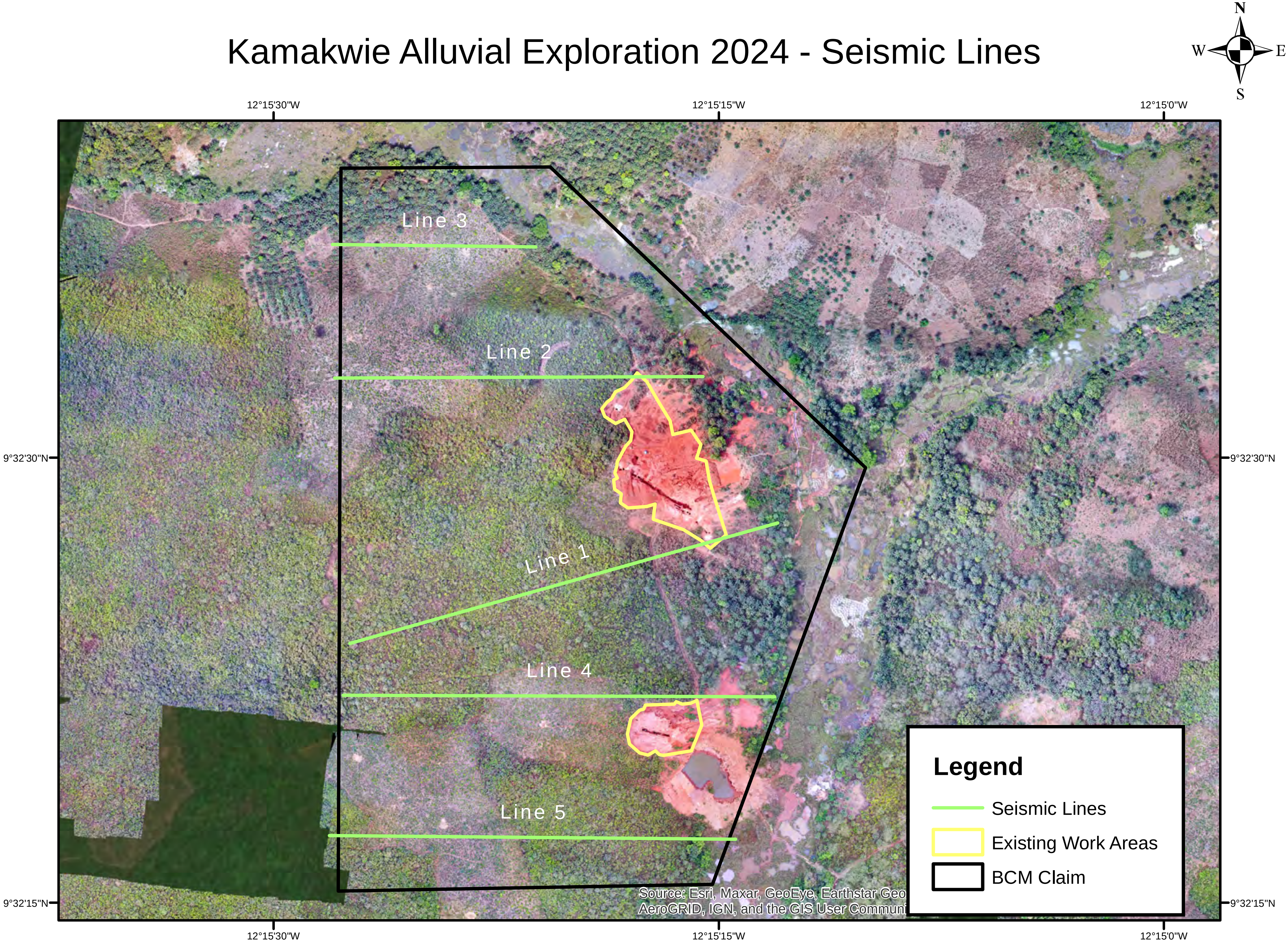
Kamakwie Alluvial Exploration 2024 - Seismic Lines



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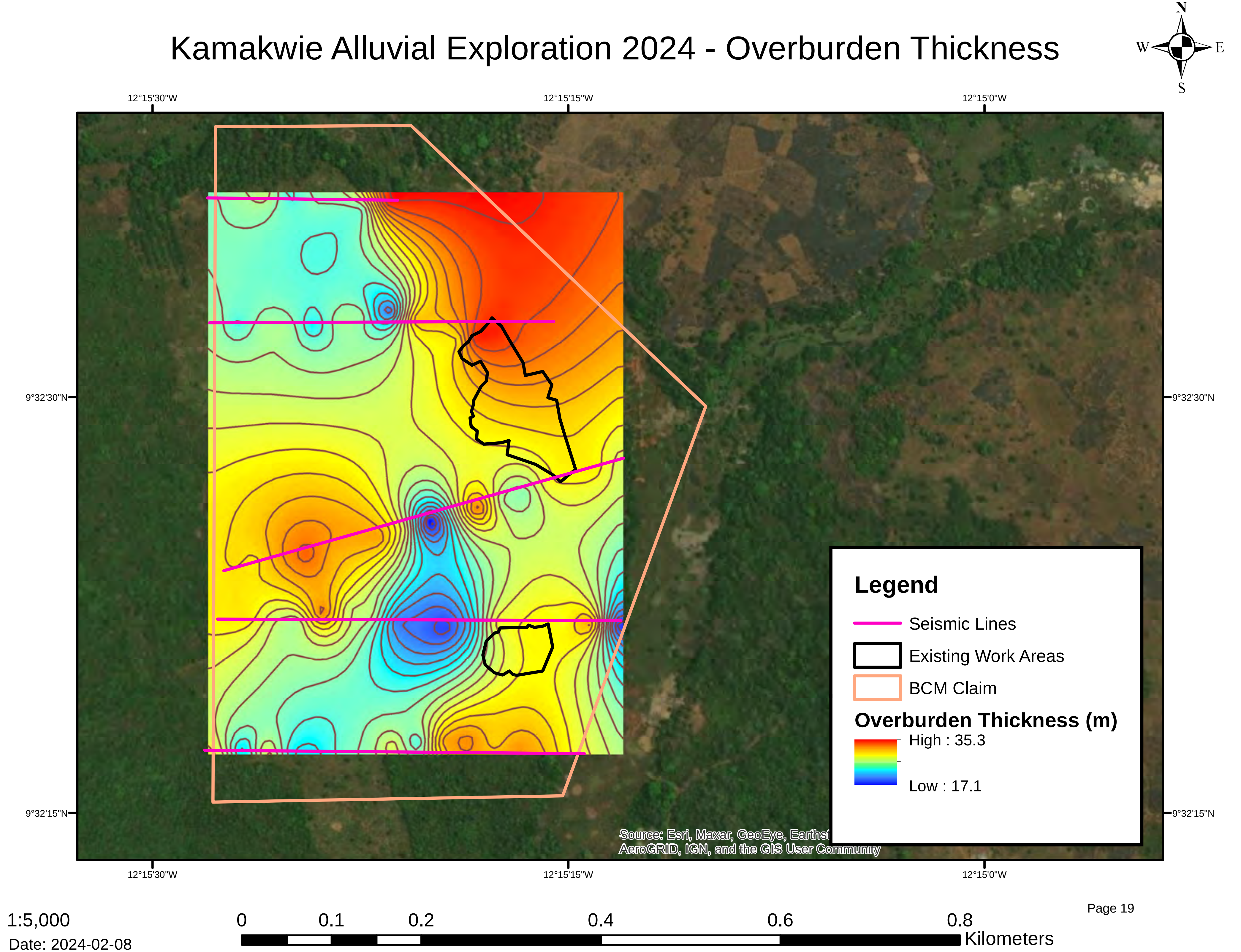
Kamakwie Alluvial Exploration 2024 - Overburden Thickness



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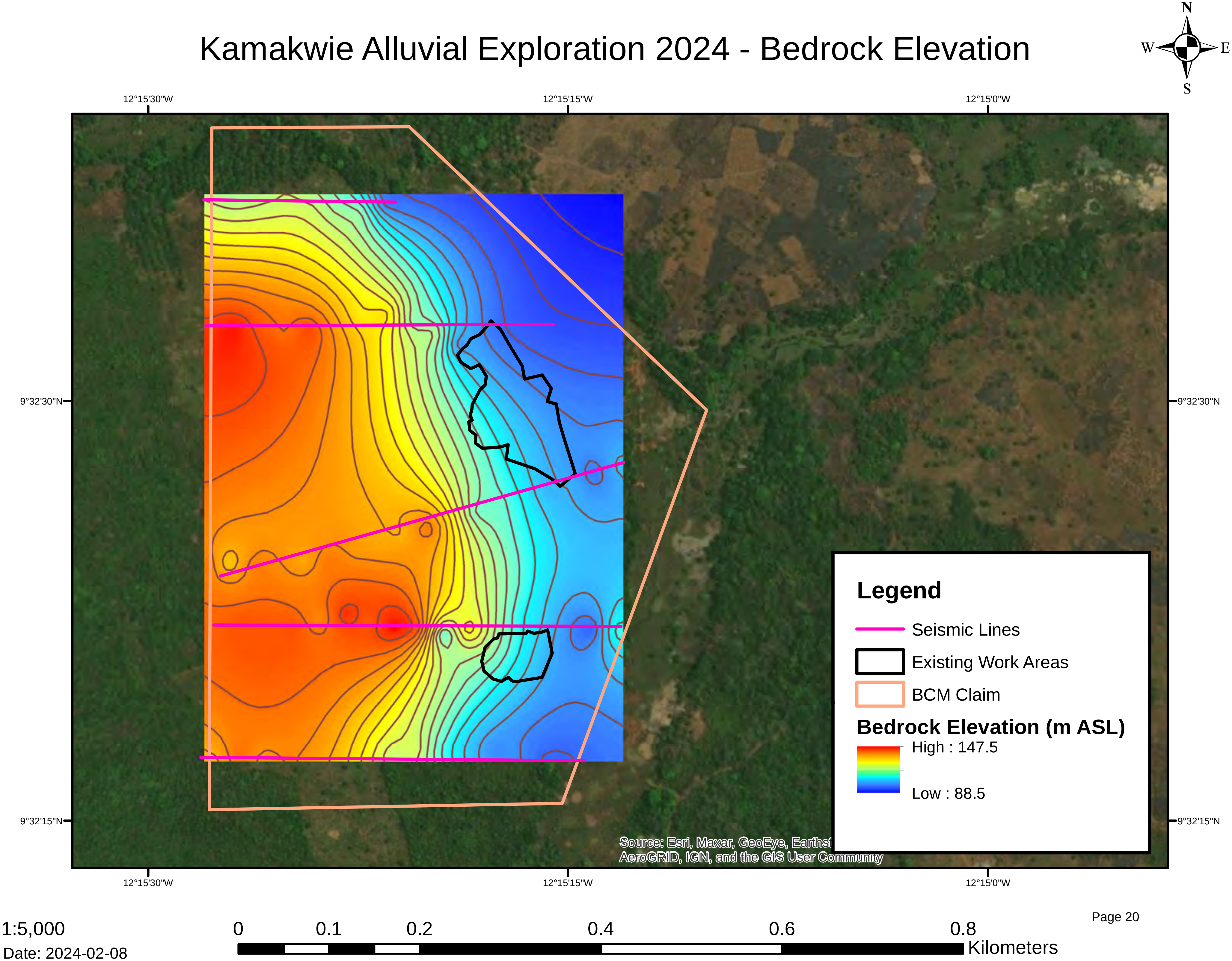
Kamakwie Alluvial Exploration 2024 - Bedrock Elevation



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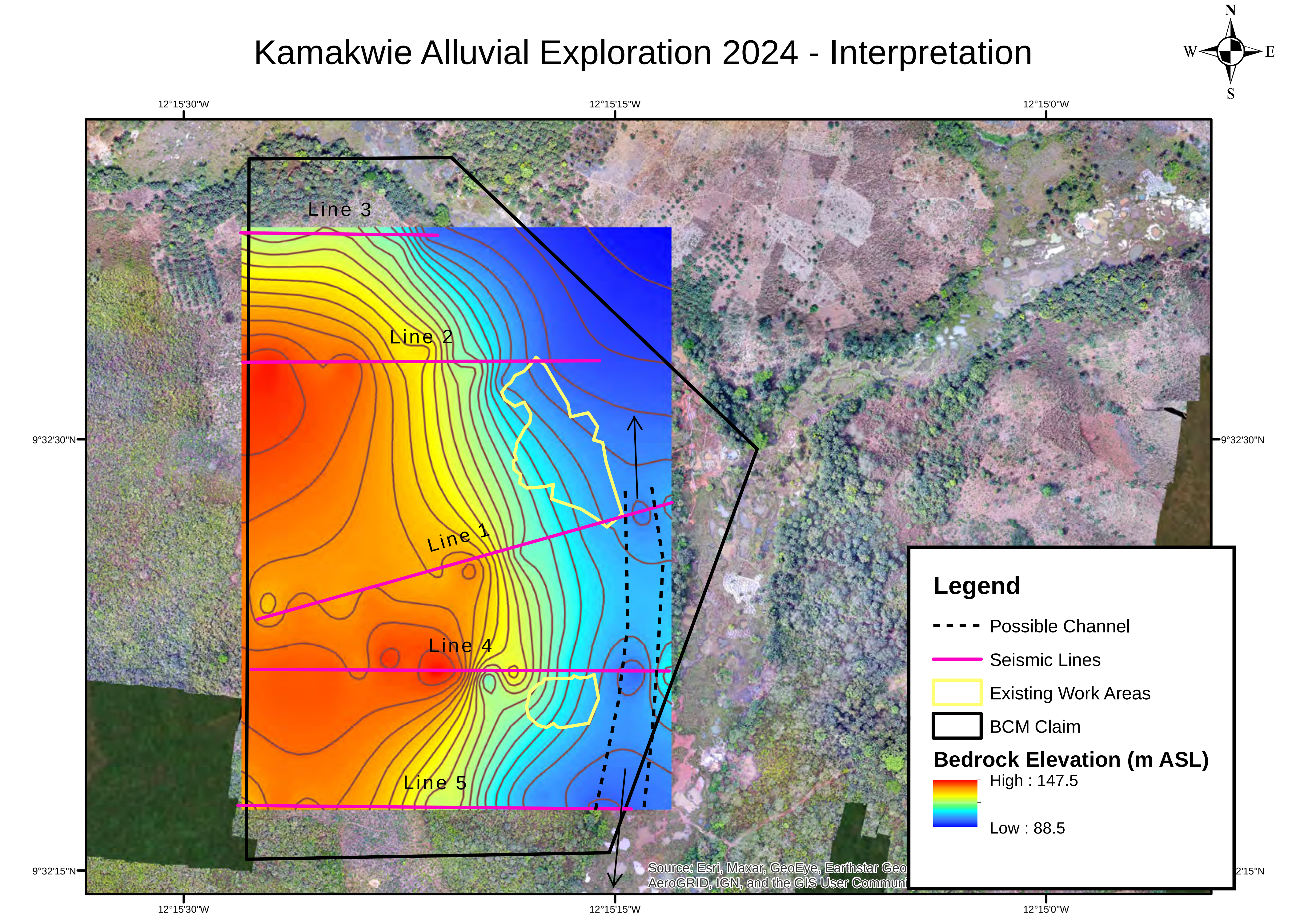
Kamakwie Alluvial Exploration 2024 - Interpretation



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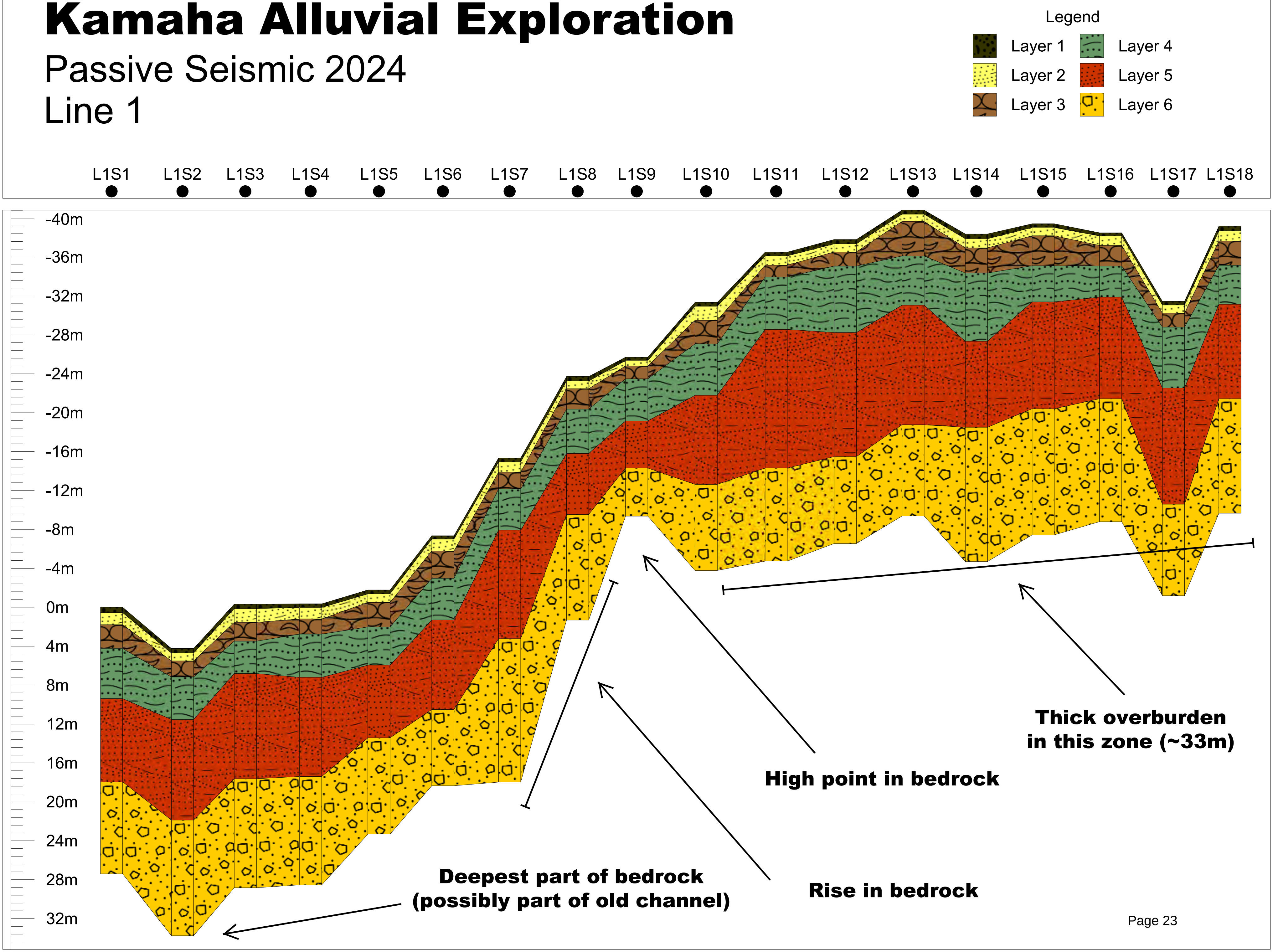
Appendix II:
Cross Sections

Kamaha Alluvial Exploration

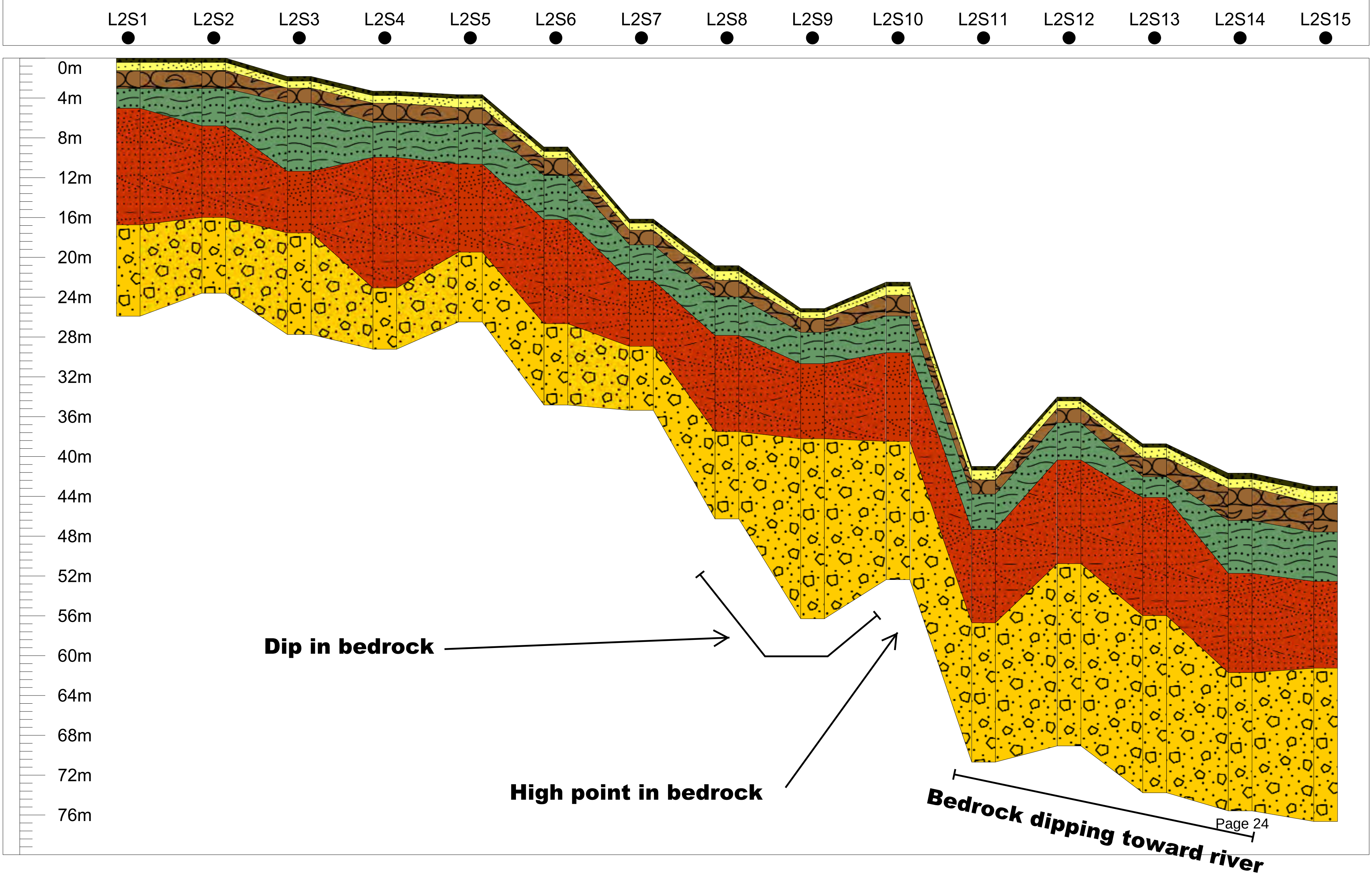
Passive Seismic 2024
Line 1



Kamaha Alluvial Exploration

Passive Seismic 2024
Line 2

Legend
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6



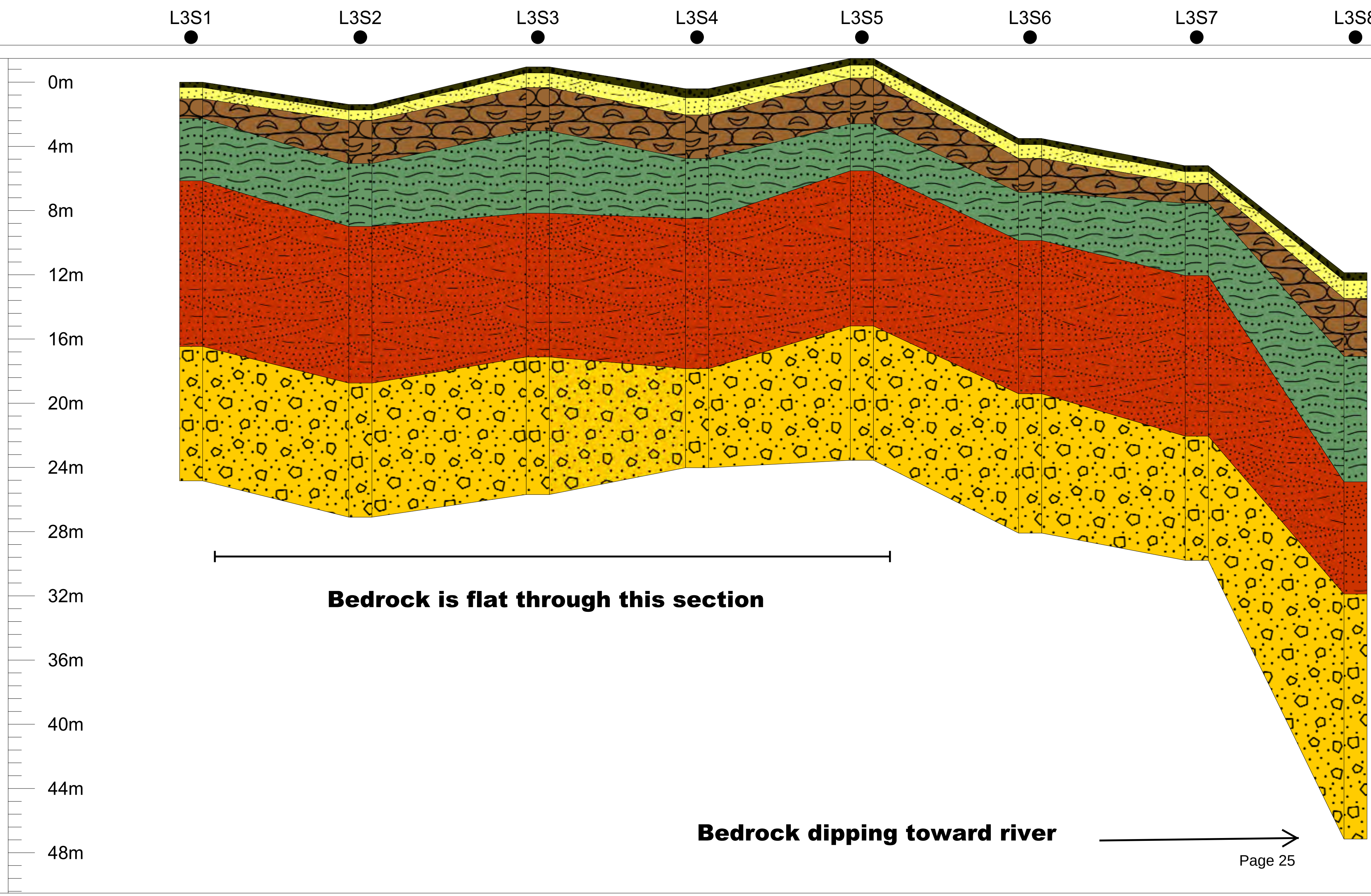
Kamaha Alluvial Exploration

Passive Seismic 2024

Line 3

Legend

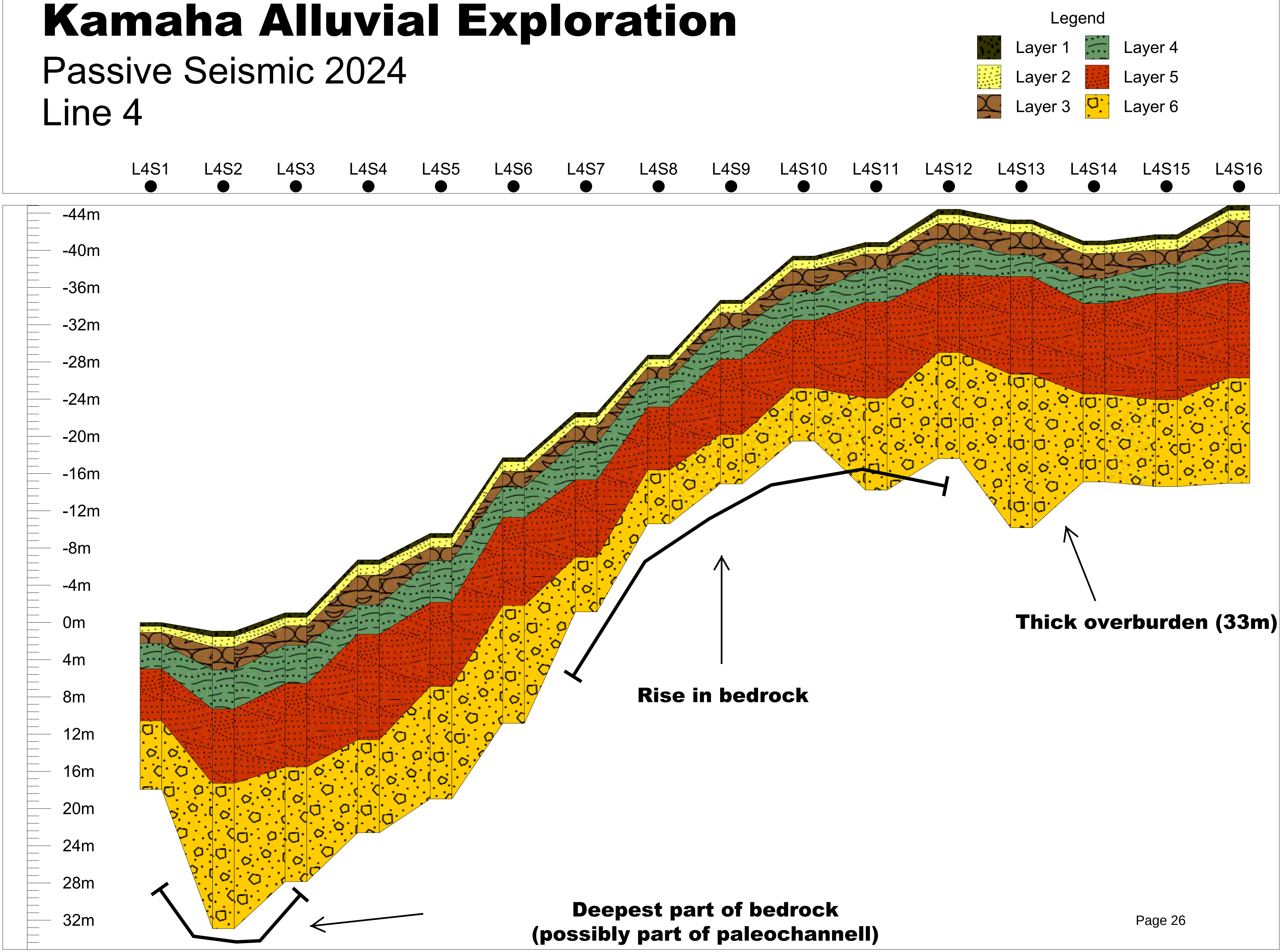
- Layer 1
- Layer 2
- Layer 3
- Layer 4
- Layer 5
- Layer 6



Kamaha Alluvial Exploration

Passive Seismic 2024

Line 4



Kamaha Alluvial Exploration

Passive Seismic 2024
Line 5