BC Geological Survey
Assessment Report
39657

ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT: GEOPHYSICAL REPORT on Keithley Creek Claims

TOTAL COST: $6,838.10

AUTHOR(S): Nicholas Gust
SIGNATURE(S):

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S):
STATEMENT OF WORK EVENT NUMBER(S)/DATE(S): **5856041**

YEAR OF WORK: 2021

PROPERTY NAME: Keithley Creek

CLAIM NAME(S) (on which work was done):

521262

COMMODITIES SOUGHT: Gold

MINERAL INVENTORY MINFILE NUMBER(S),IF KNOWN:

MINING DIVISION:
NTS / BCGS: 093A073
LATITUDE: ____52____° ___46_____' __17____"
LONGITUDE: __121_____° ___25______' __41_____" (at centre of work)
UTM Zone: 10 EASTING: 606074 NORTHING: 5848056

OWNER(S): Terrence Martinich

MAILING ADDRESS:
1304 STALKER ROAD RR #1
Pender Island, BC
V0N 2M1

OPERATOR(S) [who paid for the work]:

Terrence Martinich

MAILING ADDRESS:
1304 STALKER ROAD RR #1
Pender Island, BC
V0N 2M1

REPORT KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude. **Do not use abbreviations or codes**)

Proterozoic-Paleozoic, Proterozoic-Paleozoic, Snowshoe Group, Snowshoe Group, Metamorphic rocks, Metamorphic rocks, Paleozoic, Paleozoic, Greenstones, Greenstones, Greenschists, Greenschists, Siltstones, Phyllites, Greywackes, Quartzites, Limestones, Gold, Pyrite

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:

ARIS 35110

TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (in metric units)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)			
Ground, mapping			
Photo interpretation			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic	960 meters	521262	$6,838.10
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for …)			
Soil			
Silt			
Rock			
Other			
DRILLING (total metres, number of holes, size, storage location)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling / Assaying			
Petrographic			
Mineralographic			
Metallurgic			
PROSPECTING (scale/area)			
PREPATORY / PHYSICAL			
Line/grid (km)			
Topo/Photogrammetric (scale, area)			
Legal Surveys (scale, area)			
Road, local access (km)/trail			
Trench (number/metres)			
Underground development (metres)			
Other			
		TOTAL COST	$6,838.10

GEOPHYSICAL REPORT
on Keithley Creek Claims

Tenure numbers: 413206, 398654, 396319,

521262, 542577, 595225, 595227, 594878

Cariboo Mining Division

Map 093A

DATE OF REPORT
December 5, 2021

REPORT PREPARED BY
Nicholas Gust

CENTER OF WORK
Lat. 52° 46’ 17” N, Long. 121° 25’ 41” W

Table of Contents

Introduction

From September 4th to 5th, 2021, a geophysical survey was conducted on the Keithley Creek Property.

The purpose of the survey was to map bedrock and subsurface layers to aid in placer exploration. The main goal was to provide evidence for a potential paleo-channels as well to map the bedrock depth and topography.

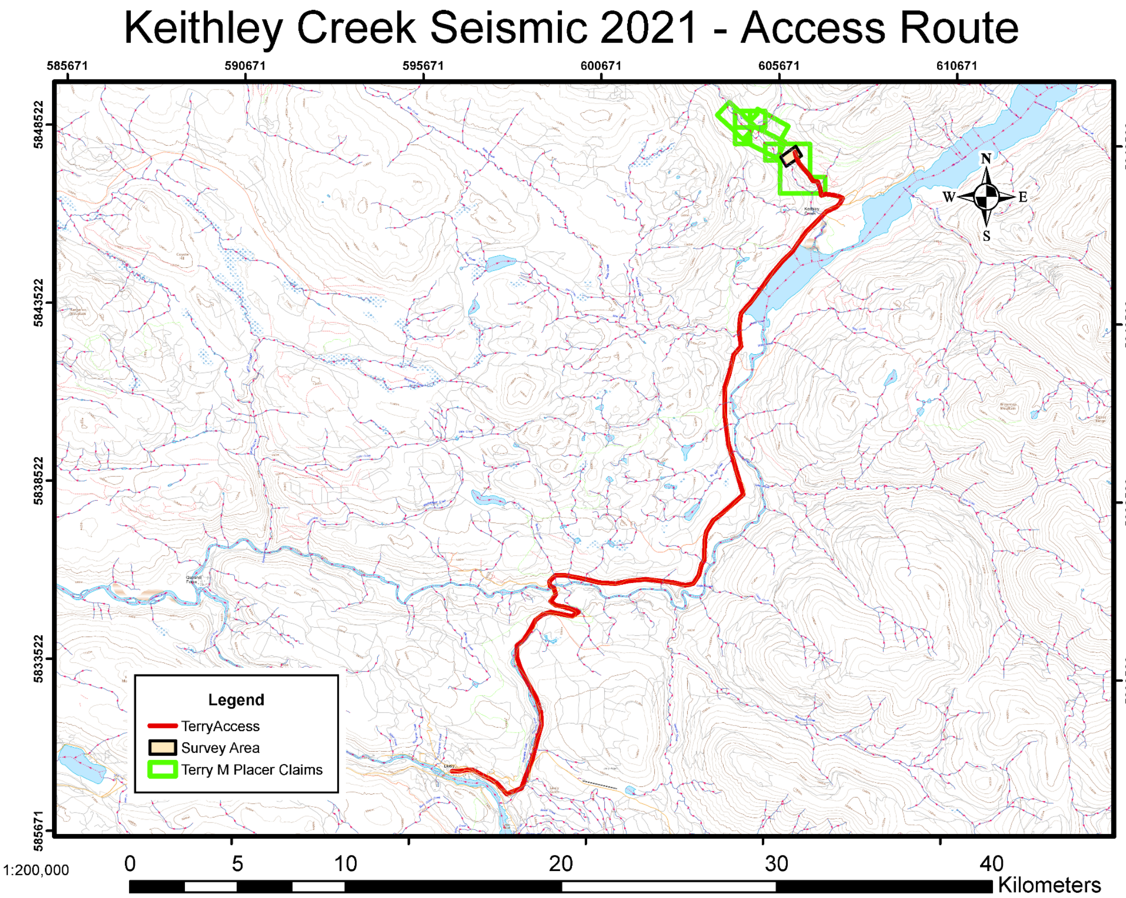
A passive seismic system was utilized in this survey. The instrument that we used records ambient seismic noise and does not require a source. In processing, we used the Horizontal-to-Vertical Spectral Ratio (HVSR) technique to identify bedrock depth over the survey area. The results of the survey provided a map of the bedrock depths and topography and provided new targets for future exploration and mining.

The survey was conducted by West Coast Placer. The crew consisted of a five person team led by Nicholas Gust, who is trained in the application and interpretation of this technique. The HVSR seismic technique is new to placer exploration and part of this program was to assess the effectiveness and value of this technique.

Location and Access

The Keithley Creek placer claims are located in the province of British Columbia, Canada, in the Cariboo regional district.

The Keithley Creek claims are located 40 kilometers by road from the community of Likely, B.C. Keithley Creek Road is the main road Yanks Peak FSR leads up to the claim.



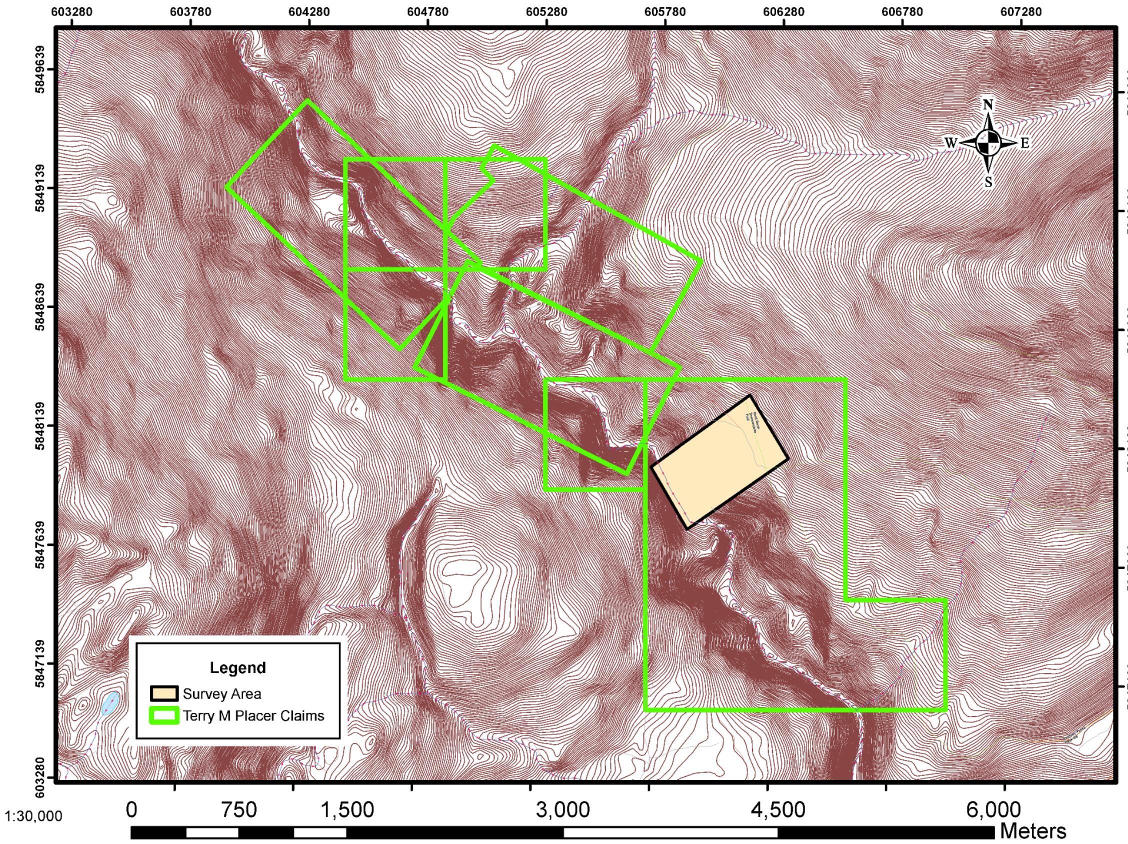
Property Description

The property consists of several placer claims owned by Terrence Martinich. Tenure numbers 413206, 398654, 396319, 521262, 542577, 595225, 595227, 594878. The total workable area is 365 hectares.

The property is situated within the central part of the Quesnel-Shuswap Highland between the eastern edge of the Interior Plateau and the western foothills of the Columbia Mountains. Topography varies from steep along Keithley Creek and Snowshoe Creek to moderate and gentle at higher elevations, up to the Pikes Peak area where steep rugged slopes occur. Elevations on the property range from 800 m in the east part of the property to over 1600 m in the central part of the property.

The vegetation in this area consists of mature stands of spruce, pine, fir, hemlock, and cedar with thick alder in some places.

Keithley Creek Seismic 2021 - Claims Overview



Previous Work

Records of gold mining in the Keithley Creek area date back to the earliest history of placer mining in British Columbia. Placer gold was discovered near the mouth of Keithley Creek in July 1860 by an American lawyer named Willaim Ross “Doc” Keithley and his partner Isaiah P. Diller. A year later the whole creek was staked and placer gold was discovered on Keithley, Snowshoe, Little Snowshoe, and French Snowshoe Creeks around the same time.

By 1861 a town was erected at the mouth of the creek. The mining town known as Keithly Creek boasted three grocery stores, a bakery, a restaurant, a butcher shop, a blacksmith, and several taverns.

In early 1861 “Doc” Keithley and a small prospecting party including George Weaver, John Rose, and Benjamin MacDonald explored north of the creek over the Snowshoe Plateau. As they made their way down they found gold lying exposed at the surface that had begun to oxidize on a small creek that they named Antler Creek. The party called the partially oxidized gold “sun-burned gold”. By the end of 1861 over 1,200 miners were at work on Antler Creek which was the richest deposit discovered in British Columbia up to that point.

The early mining on Keithley Creek was extremely profitable. Hubert Bancroft described the early finds in his 1887 book:
“The early gold found on Keithley Creek in 1860 was described as partly of solid nuggets paving the bedrock within a few feet of the surface. A party of five men, in June 1861, divided one thousand two hundred dollars between them as the product of a single day's labor, and their daily average for some time was said to be a pound weight of gold.

In September 1861 several companies were making from fifty to one hundred dollars a day to the man in the bed of the creek and one hundred dollars in the dry-diggings on the hill side. Flumes were built of enormous size and length and the numerous wheel pumps were set in motion. In 1867 the lead was lost; yet the Chinese on the creek continued to make money, the claim at the mouth of the creek paying from twelve to sixteen dollars a day to the digger. After 1875 the yield fell off.”

It should be noted that the spot gold price in 1860 was about $16. That means the Chinese miners were getting an ounce per day to the man after the “lead was lost”. The miners in 1861 were getting an average of 75 ounces per day to the man!

The area covered by the present Keithley Creek claims owned by Mr. Martinich has seen a lot of exploration in the past. Small-scale placer mining took place on the banks of Keithley Creek in this area as early as 1860. There aren't very good records of the mining activity during this time near the mouth of Keithley Creek. The 1875 annual report to the minister states that there were 11 claims on Keithley Creek that year with a total of 23 white and 54 Chinese workers. By 1880 there were 58 miners on Keithley Creek (14 white and 44 Chinese).

Beginning in 1914 work on placer lease 1460 was commenced by Robert W. Harrison and E. J. Worth to explore a high channel of Keithley Creek. In that year a 24-foot tunnel was run to bedrock which showed good prospects at $3 to the pan.

A second tunnel was constructed 3 feet lower with the hopes of hitting better pay. IN 2015 a ditch was run from Four Mile Creek by a crew of 14 men. Two miles of ditch and 2,500 feet of flume were constructed.
(Annual report 2017)

The Geological Survey of Canada, Summary Report 1918 describes the Kitchener Mine:

"At present, the only mining carried on in this locality is a high channel deposit lying on the east side of the creek, 130 feet above th~ present bed of the stream and 1 mile above its mouth. Here is situated the Kitchener mine owned by Mr. R. W. Harrison and Mr. E. J. Worth. Mr. Harrison, assisted by three men, has driven a tunnel 100 feet through the outer rim rock and has sti·uck a very rich deposit of gravel. Two years ago Messrs. Harrison and Worth worked another part of the same bench a short distance away, which yielded over $18,000 from 10,000 square feet of bedrock surface; but the bench, averaging 40 feet in width, on being traced was found to have been cut away by later erosion and a considerable sum was expended in locating its continuation.

The gold, which was largely coarse, was found to occur in two paystreaks-one, containing the coarser gold, occurred in gravel lying near bedrock, and in some places the gold was found wedged in the crevices of the quartzite schist to a depth of 2 feet; the other, a paystreak carrying somewhat finer gold, was found to be on a layer of silt occurring several feet above bedrock. Exceptionally high values were found beneath some of the large boulders lying on bedrock. Where potholes occurred, values were found around. their rims and in small channels leading from them, but the potholes themselves did not contain sufficient values to make it worthwhile cleaning them out."

In 1924 the Kitchener Mine had reached peak production. In total, the mine processed 1,076,376 cubic yards that year by means of hydraulicking with an undisclosed amount of gold produced (annual report 2024).

Interestingly the mine manager, one King C. Laylander commissioned an early magnetometer survey over the area. They used an instrument referred to as a “combined magnetometer” manufactured by F. J. Berg in Sweden. This is the earliest use of a magnetometer on record for the purpose of mapping paleochannels. Despite the pioneering effort, the magnetometer survey did not successfully extend the known paleochannel.

The Kitchener Mine shut down in 1927 and didn’t really produce much after that.

In 1934 a new company called Placer Engineers Ltd began working ground near the confluence of Four Mile Creek and Keithley Creek, which lies approximately 800 meters upstream from the 2021 survey area. The “engineers” reportedly recovered 160 ounces from 150 square feet of bench in 1934 (Vancouver Sun 1934). The goal of the engineers mine was to mine gold from the intersection of two paleochannels, one ancient channel of Keithley Creek and one of Four Mile Creek. According to a newplarer article in 1934, “A pit 800 feet long, 250 feet deep, and almost 600 feet from rim to rim, has been worked out, with only the first 300 feet on bedrock.” (Vancouver Sun 1934)

The Placer Engineers mine used hydraulic methods and mined until 1939.

Since the closing of the Placer Engineers mine very little work has taken place on the property.

Regional Geology

The geology of the claim area was described very well by Laurence Sookochoff in a previous report in 2014 (ARIS 35110):

“The Cariboo mining district is divided into four tectonically and stratigraphically unique terrains. The rocks of the four terrains range in age from Proterozoic to Jurassic and were deposits into an ocean environment. From east to west, the terrains are Cariboo (continental shelf clastics and carbonates) Barkerville (continental shelf and slope clastics, carbonates and volcaniclastics), Slide Mountain (rift floor pillowed basalt and chert), and Quesnel (island arc volcaniclastics and fine-grained clastics).

The Cariboo Terrain is of Precambrian and Permo Triassic age and is in fault contact with the western margin of Precambrian North American Crater along the Rocky Mountain Trench. It can be divided into two successions, one Cambrian and older and the other Ordovician to Permo-Triassic. The older succession consists of grit, limestone, sandstone, shale and is unconformably overlain by the younger succession of basinal shale, dolostone, wacke, limestone, and basalt.

The Barkerville Terrain consists of Precambrian and Palaeozoic rocks ranging in composition from grit, quartzite, and black pelite to lesser limestone and volcaniclastics rocks. The contact between the Barkerville and Cariboo terrains in the northwest-trending, east-dipping Pleasant Valley Thrust.

The Barkerville and Cariboo terrains are over thrust (Pundata Thrust) by the Slide Mountain Terrain. The Slide Mountain Terrain consists of Mississippian to Permian basalt in part pillowed, and chert pelitic sequences intruded by diorite, gabbro, and minor ultramafic rocks. The Quesnel Terrain lies west of the Slide Mountain Terrains and consists of Upper Triassic and Lower Jurassic black shale and volcaniclastics greenstone.“

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.

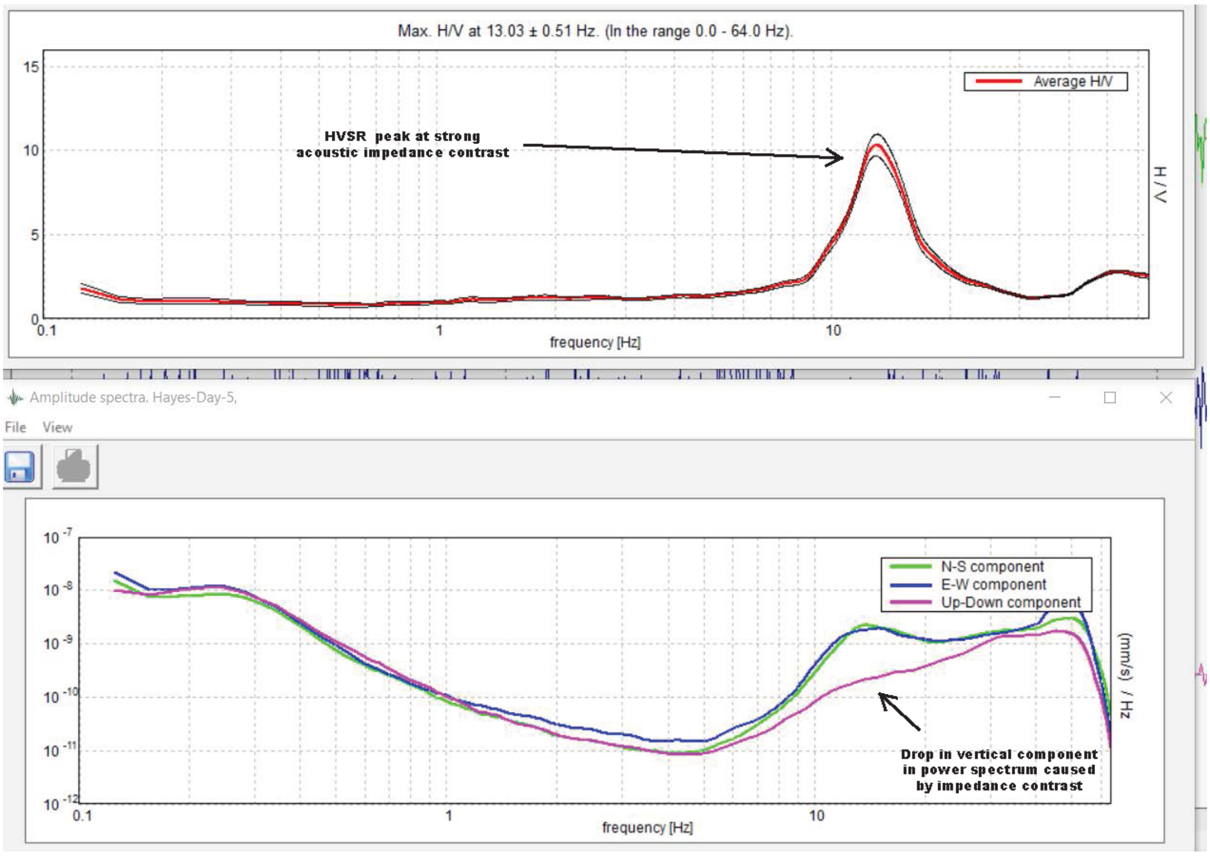
In processing with proprietary software the recorded time-series data (X, Y and Z) is converted to the frequency domain using a Fast Fourier Transform (FFT), and the two components are displayed as a power spectrum.

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 30 meters, a chain 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 an orange pin flag and recorded on the GPS for processing.

Each reading takes 20 minutes, that 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 twice per day to check for data quality. Initial processing was completed in the evening each day.

Processing Technique

Each station is processed independently on-site 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.

With this seismic technique, we don't get a lot of info about the layers that we see. There's not enough velocity information to discern as to what the makeup of each layer is. The bedrock is interpreted as the most prominent impedance contrast but the technique does not provide any information on the makeup of the upper layers. In the cross-sections, we identified several distinct layers and they were labeled as layers 1 through 6.

Interpretation

Line 1 showed thick overburden near the beginning of the line on stations L1S1 to L1S3. That section has the depth and thickness that are typically observed when mapping a paleochannel. The other lines did not show a continuation of that structure.

Lines 2, 3, and 4 all showed shallow bedrock and no clearly defined paleochannels. Line 5 showed deeper bedrock throughout. It's possible that there is a buried channel to the North of the survey grid but we don't have enough data to confirm that.

The northern portion of the grid showed much deeper bedrock on the start of line 1 and throughout line 5. On the bedrock elevation map there apears to be an abrupt change in the slope at the middle of line 1 and line 2. The interpretation map shows that line in the maps below.

Conclusion

The seismic survey has shown interesting characteristics of the bedrock below the surface. There's no clear evidence of a paleochannel in the survey area however the slope change observed could indicate the edge of a hidden paleochannel. More testing would provide evidence for that.

The passive seismic HVSR technique has proven to be a cost-effective and accurate exploration tool for placer exploration. The survey can be done without any impact to the environment at all and requires no dynamite or energy source.

This was a small survey but it was successful in mapping overburden thickness and the bedrock elevation over the survey area. More seismic lines continueing to the to the north-west of the 2021 grid might show evidence for the paleochannel that was mined by Placer Engineers Ltd in the 1930s.

Costs

Personnel	Days/QTY	Rate	Subtotal
Geophysical Technician - Nicholas Gust	2	$900.00	$1,800.00
Equipment Costs	2	$300.00	$600.00
Field Assistant - Mike Nichol	2	$300.00	$600.00
Field Assistant - Gavin Nichol	2	$300.00	$600.00
Field Assistant - Terry Martinich	2	$300.00	$600.00
Field Assistant - Oliver Gust	2	$500.00	$1,000.00
Data Processing and Interpretation	1	$600.00	$600.00
Report Writing	1	$250.00	$250.00
Mob/Demob Costs	1,142	$0.55	$628.10
4x4 Truck (day rate)	2	$100.00	$200.00
Total			$6,838.10

References

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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 and prospecting since 2008.

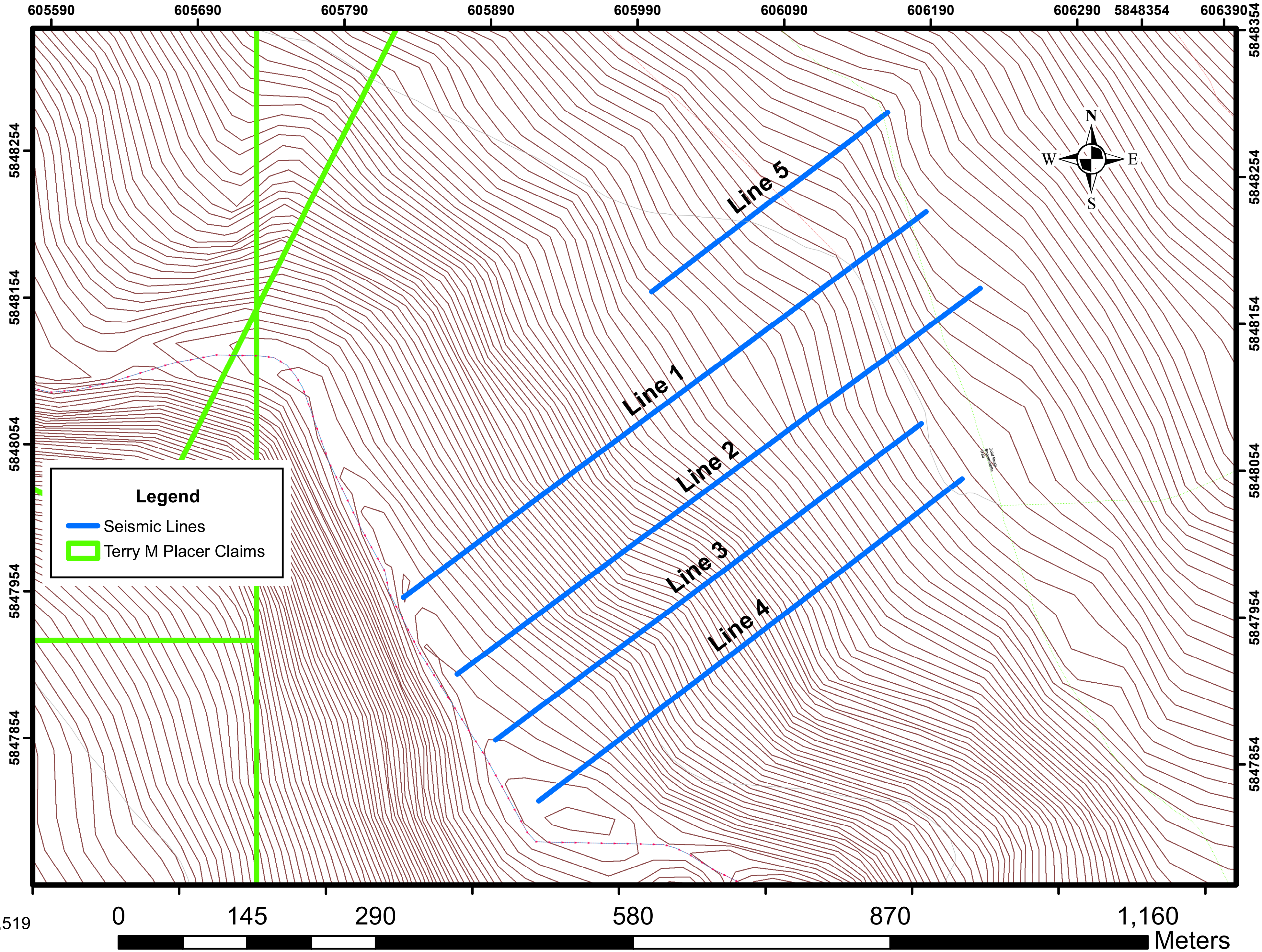
4. This report is compiled and interpreted from data obtained and produced under my supervision and largely by me.

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

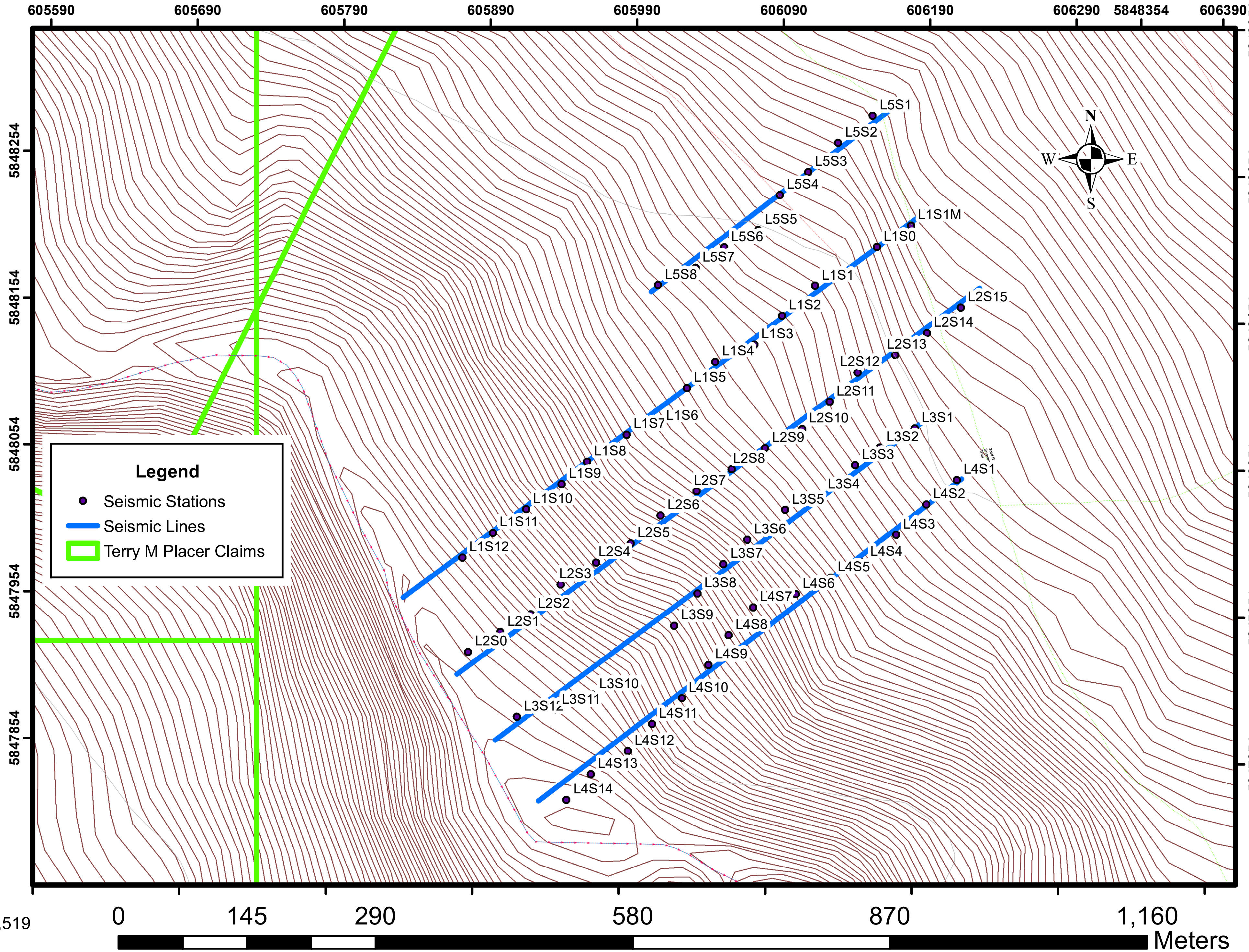
Appendix I:

Maps and Data

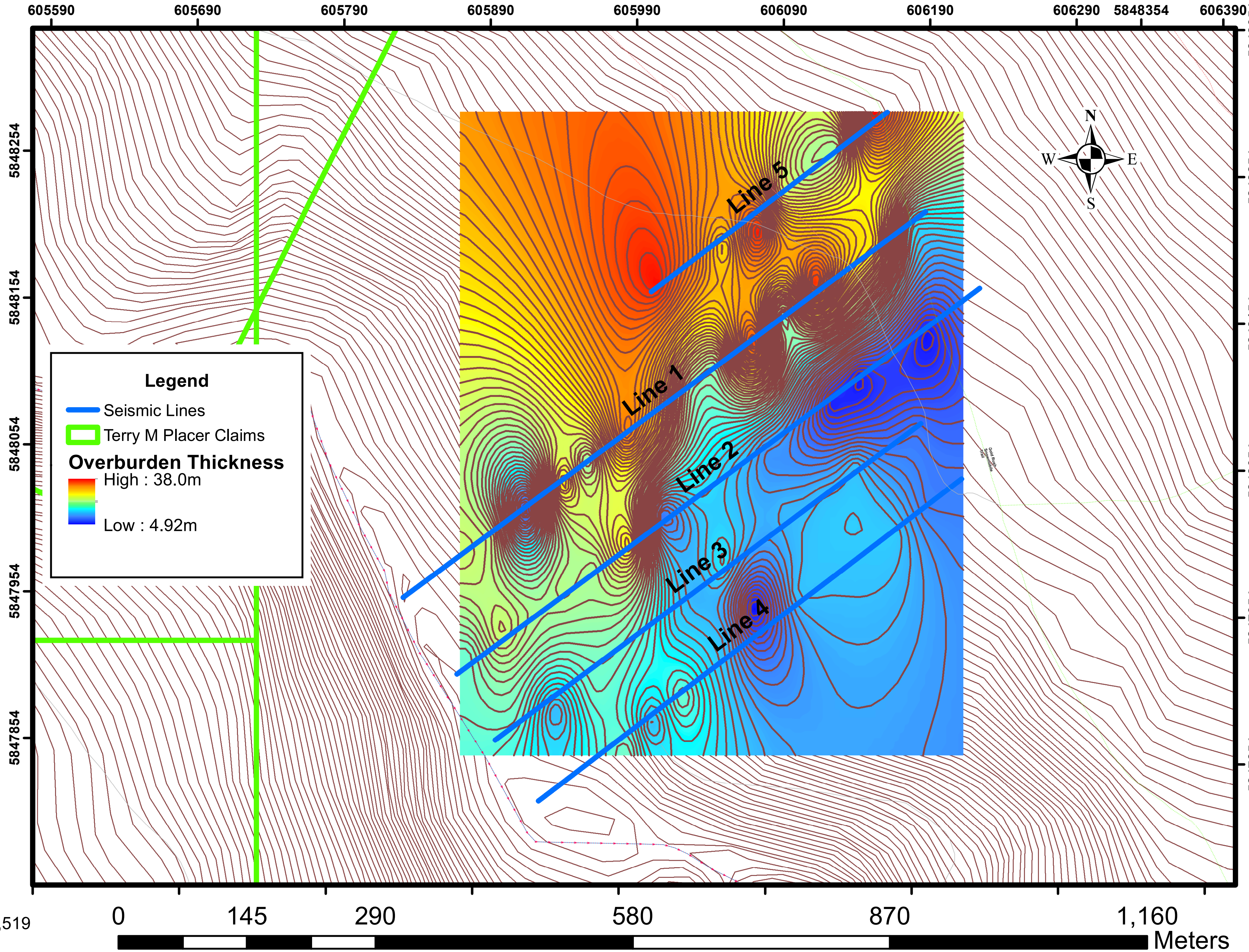
Keithley Creek Seismic 2021 - Seismic Lines



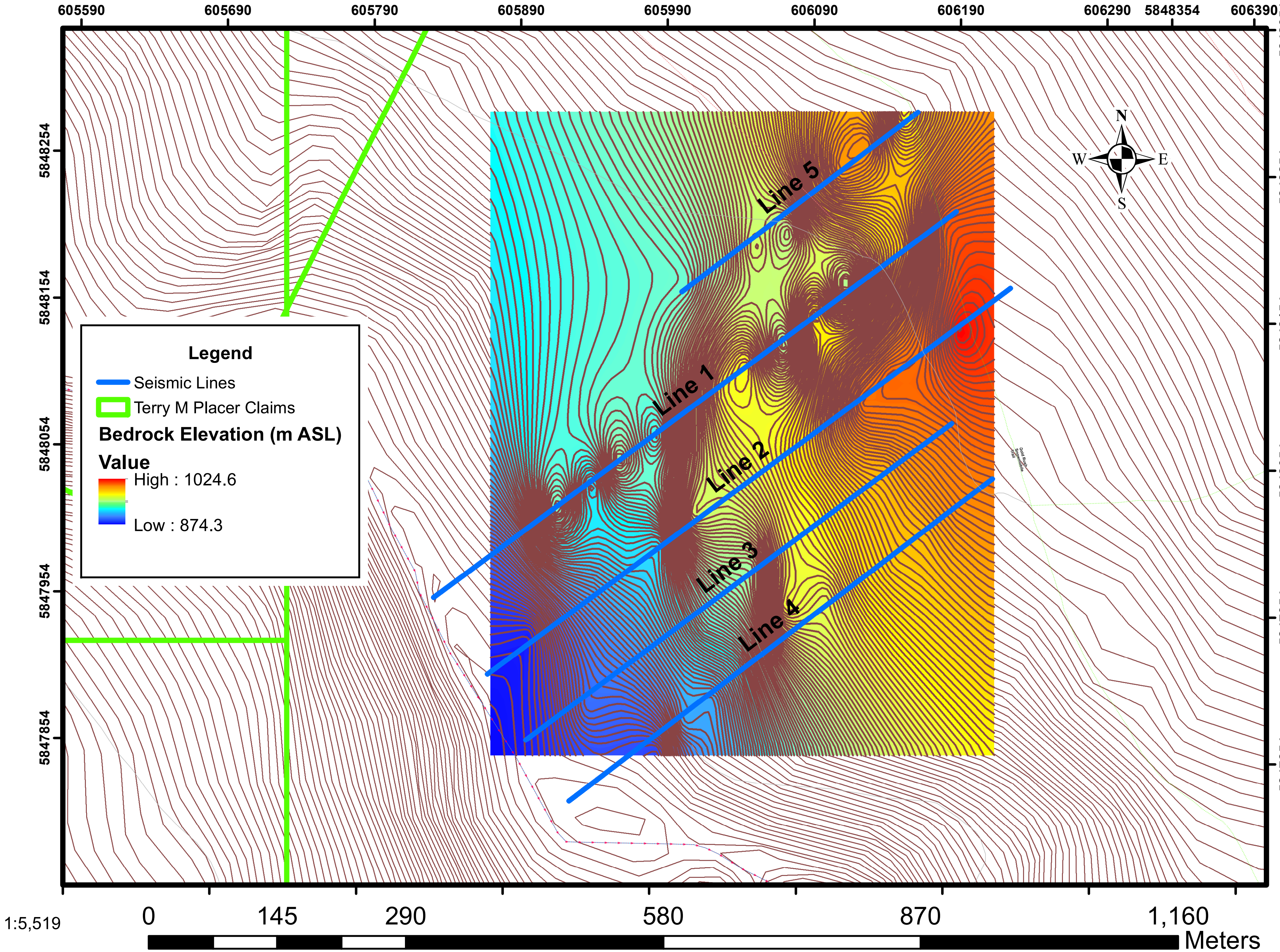
Keithley Creek Seismic 2021 - Seismic Lines



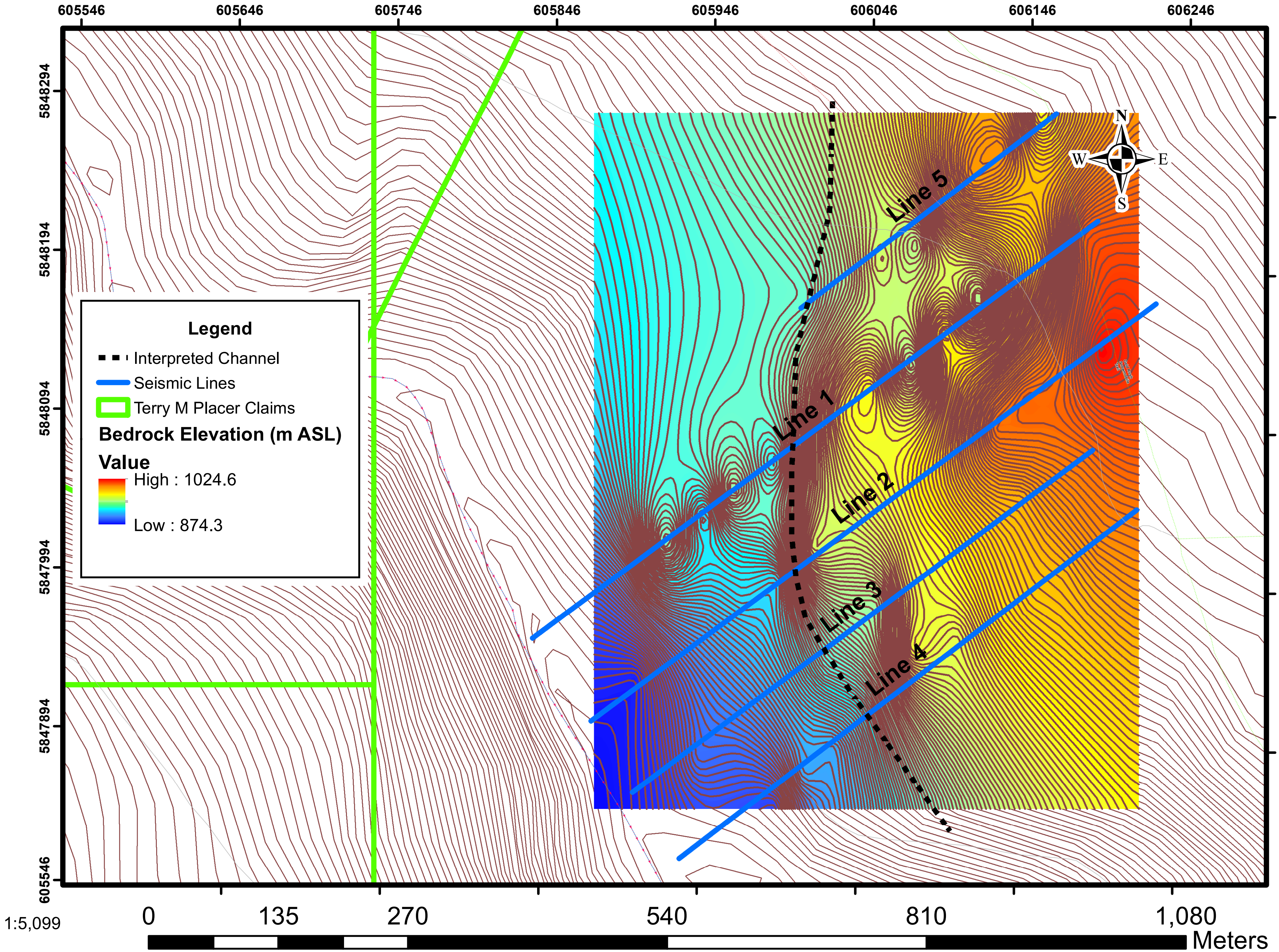
Keithley Creek Seismic 2021 - Overburden Thickness



Keithley Creek Seismic 2021 - Bedrock Elevation



Keithley Creek Seismic 2021 - Interpretation



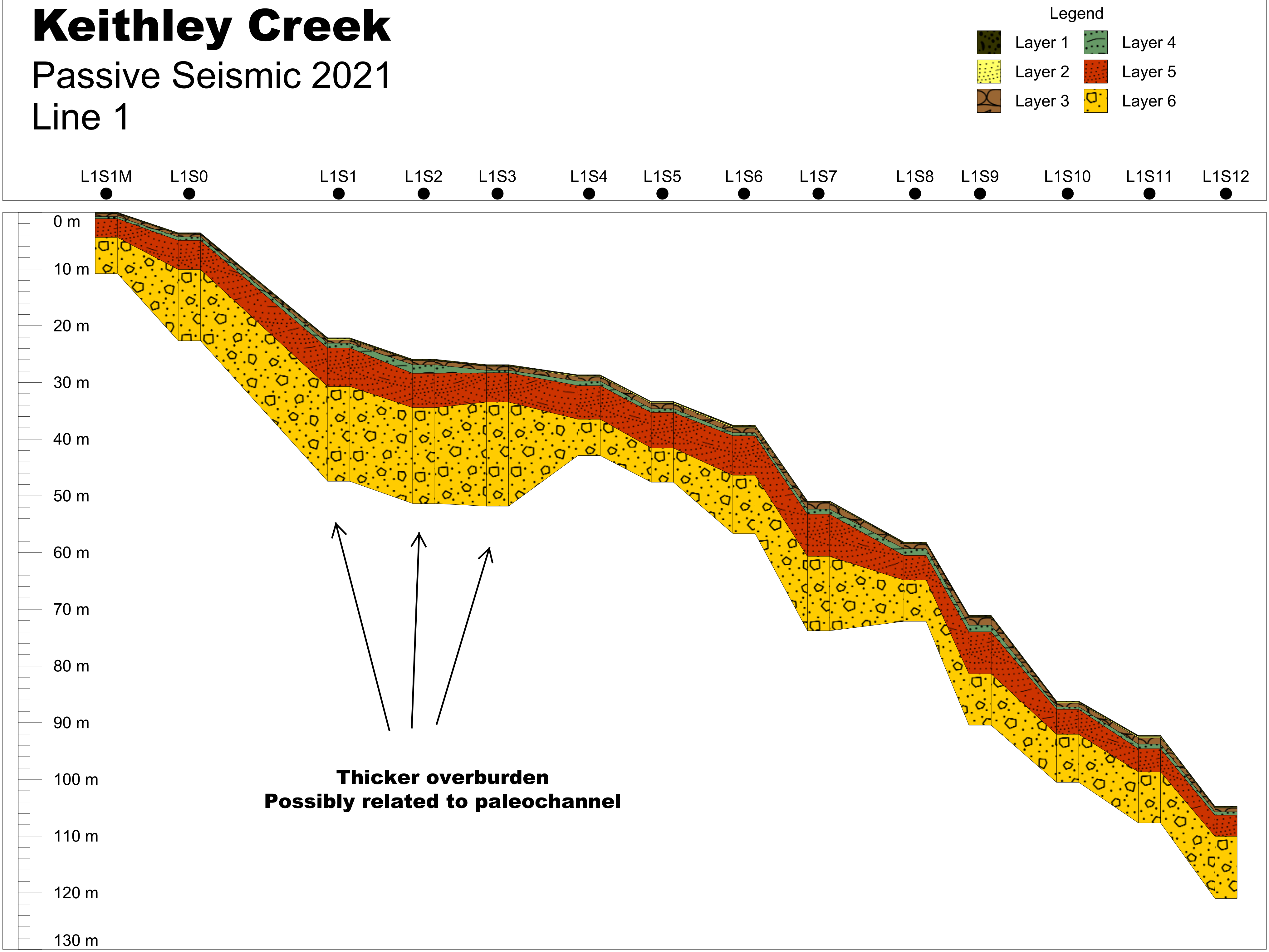
Appendix II:

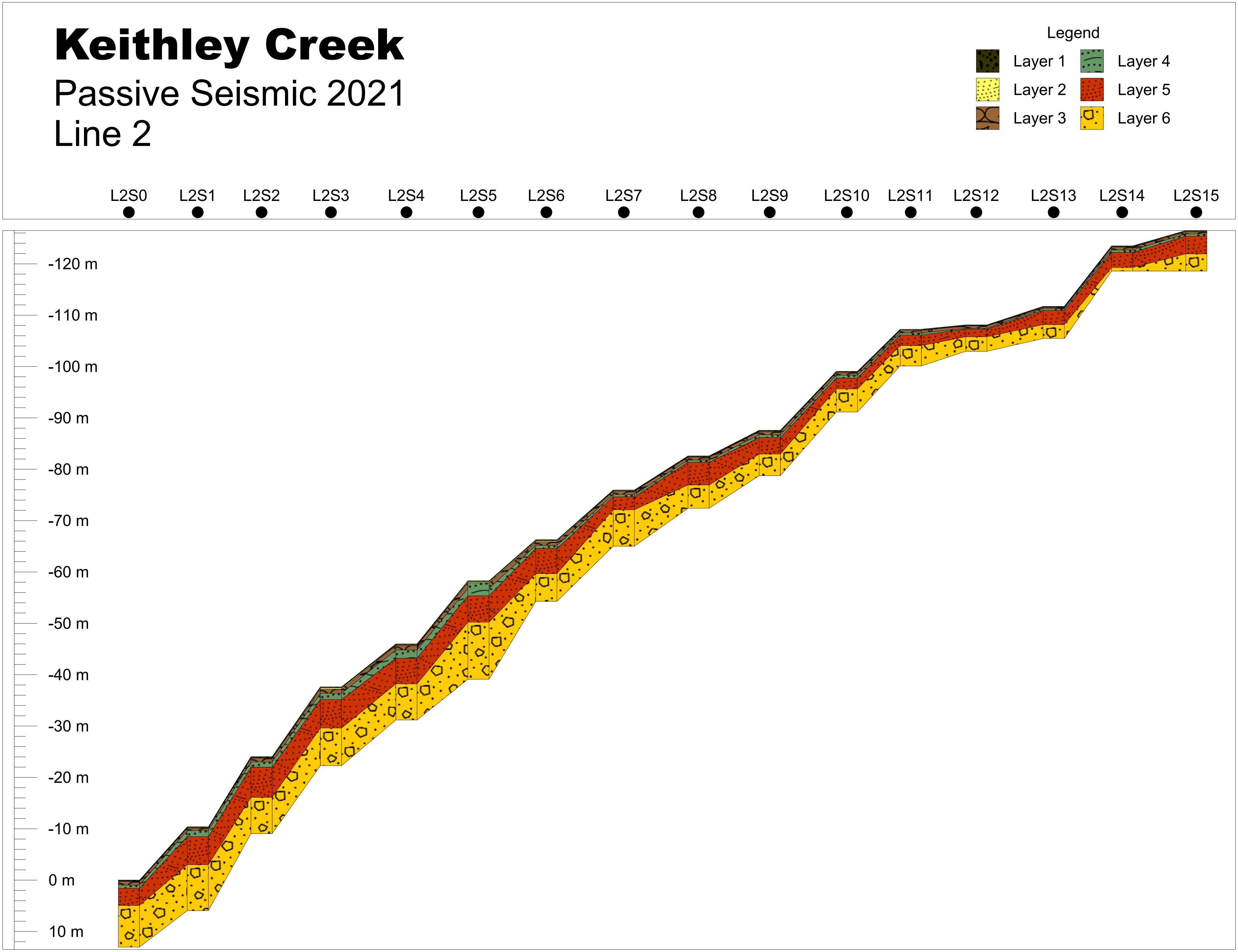
Cross Sections

Keithley Creek

Passive Seismic 2021

Line 1



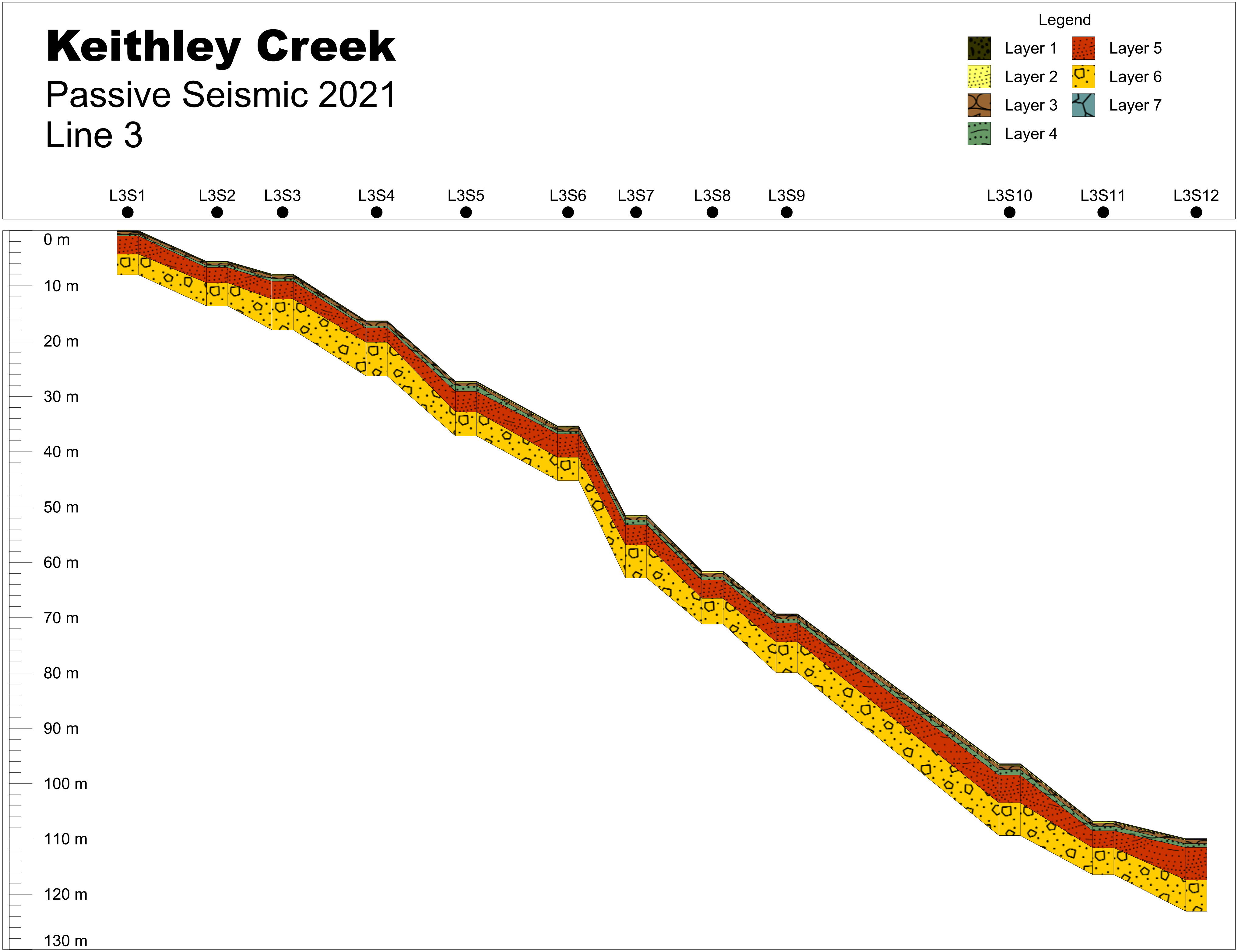


Keithley Creek
Passive Seismic 2021
Line 2
Legend
Layer 1
Layer 2
Layer 3
Layer 4
Layer 5
Layer 6
L2S0
L2S1
L2S2
L2S3
L2S4
L2S5
L2S6
L2S7
L2S8
L2S9
L2S10
L2S11
L2S12
L2S13
L2S14
L2S15
-120 m
-110 m
-100 m
-90 m
-80 m
-70 m
-60 m
-50 m
-40 m
-30 m
-20 m
-10 m
0 m
10 m

Keithley Creek

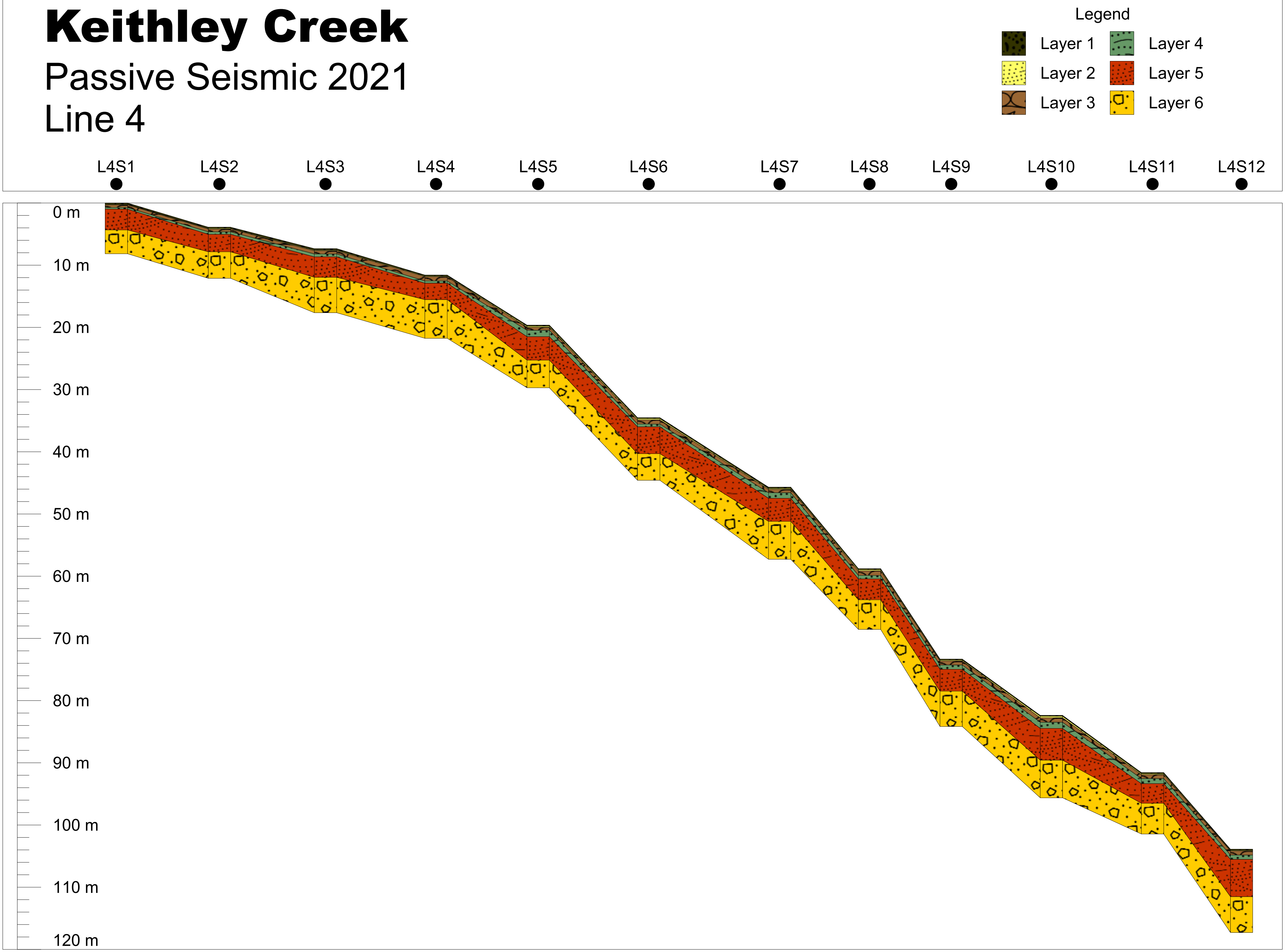
Passive Seismic 2021

Line 3



Keithley Creek

Passive Seismic 2021
Line 4



Keithley Creek

Passive Seismic 2021

Line 5