Mitre Geophysics Pty Ltd
Mineral Exploration and Engineering Consultants

To:	**Josh Denholm, Emma Haley Avebury Metals Ltd**
Date:	**17/04/2023**
Copy:	
From:	**Kate Hine, Nick Direen & Bismah Akhtar, Mitre Geophysics**
Subject:	**MF116 DHEM results**

Summary

Khumsup Geophysics conducted a DHEM survey on a single, PVC–cased surface exploration diamond hole, MF116, targeting massive Ni sulphide (pentlandite–pyrrhotite–chalcopyrite) mineralisation within altered gabbroic rocks in the Melba Flat exploration tenement RL5/2009, Tasmania. The survey was conducted in March 2023 for Avebury Nickel Mine. MF116 targeted fault offset extension of the Nickel Reward mineralisation.

The DHEM survey shows no anomalies typical of a significant confined conductor. There are minor high frequency, short wavelength responses from 270 to 310m, presumably related to the disseminated pyrrhotite and pyrite (up to 2%) intersected between 277–283m, and 298–306m. These also produce strong magnetic responses up to 2000nT and we recommended comparing with the best available magnetics to see if the magnetic anomaly can be mapped out by the airborne data. The EM character, however, suggests only localised sources.

EM is highly effective for the NiS mineralisation at Avebury. The results from the DHEM (or lack thereof) suggest that there are no significant massive NiS within 100m of MF116. Disseminated NiS will not have been imaged by this survey. Future drilling should test outside of this envelope.

1.1 Background

MF116 is located at the Nickel Reward prospect which is on the Dundas 1:25000 geological sheet (Seymour and McClenaghan, 2003), some 6km NE of the township of Zeehan. The area was accessed via logging road off the Murchison Hwy, ~500m NE of Nevada Creek.

The survey used a single, ~300x300m, collar loop. The northernmost point of the loop was ~100m south of the Emu Bay railway line. Surveying was undertaken in mid–late March 2023.

The target mineralisation was believed to be a fault offset extension of the Nickel Reward mineralisation. Nickel Reward is a Cambrian gabbro hosted NiS prospect located about 500m northeast of MF116. This mineralisation has been described as high sulphidation NiS, based on the massive pentlandite $(Ni,Fe)_9S_8$ – pyrrhotite–chalcopyrite association. However, other nickel ore lenses in this camp also contain the assemblage millerite (NiS)–chalcopyrite–pyrite (Bottrill, 2014). Both styles are expected to be significant conductors.

The ideal target size was a significant lens (~5m thick x 100's of metres strike: see Bottrill, 2014) of NiS (*sensu lato)* hosted in altered gabbro. DHEM was successfully used to define conductive sulphide lenses at the Avebury deposit in 1998 (Asten, 1999), although the latter are more serpentinised and skarned units of the Cambrian Mafic–Ultramafic Complex.

A more conservative target size is a 100m strike length x 100m plunge length, with dip to the southeast (the same as the Nickel Reward mineralisation), with an indicative conductance of 5000S, based on analogue orebodies (Gilgallon et al., 2019). The survey design was based on this size target at 250m below surface.

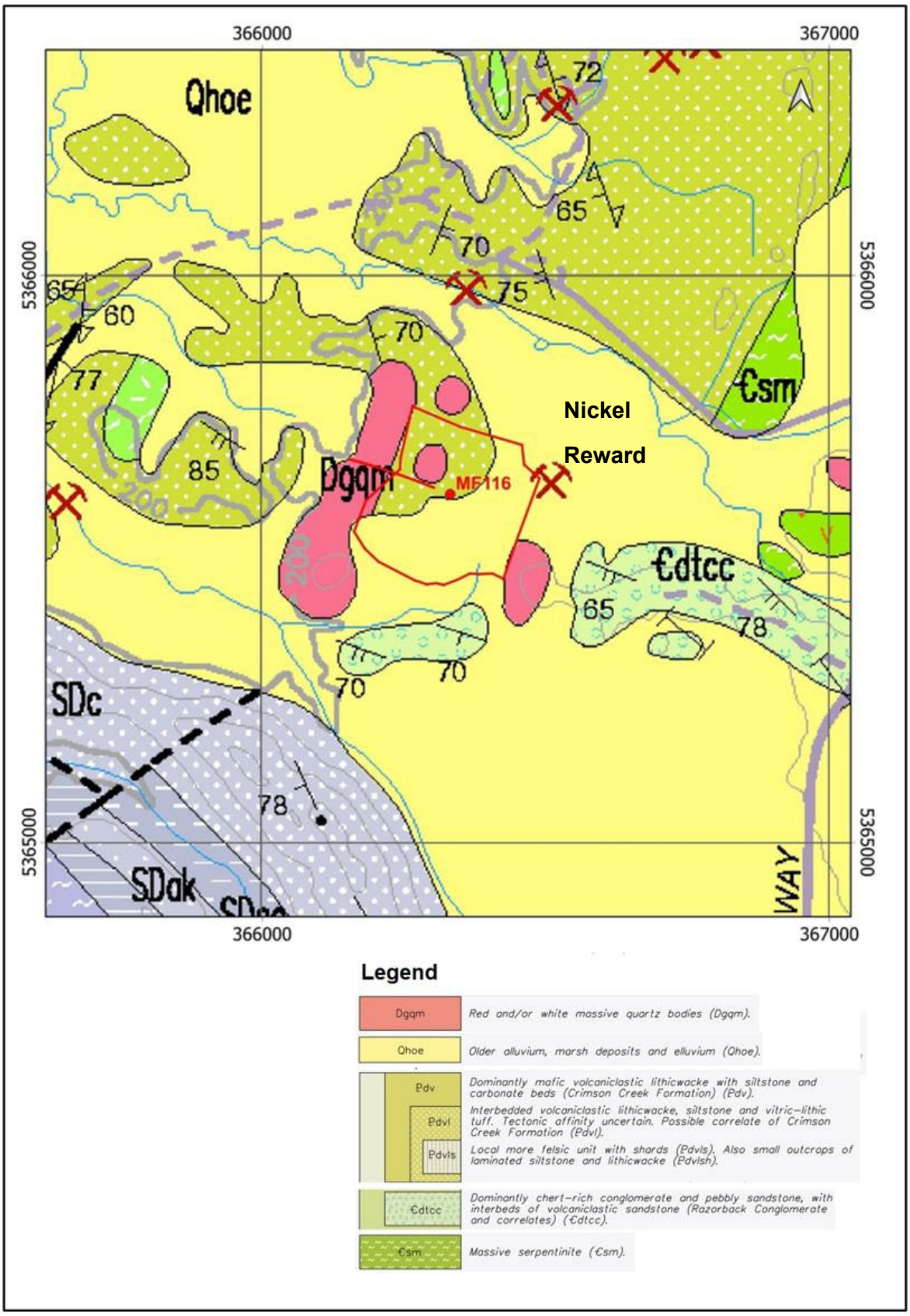


Figure 1: Local geology with drillhole and DHEM loop location.

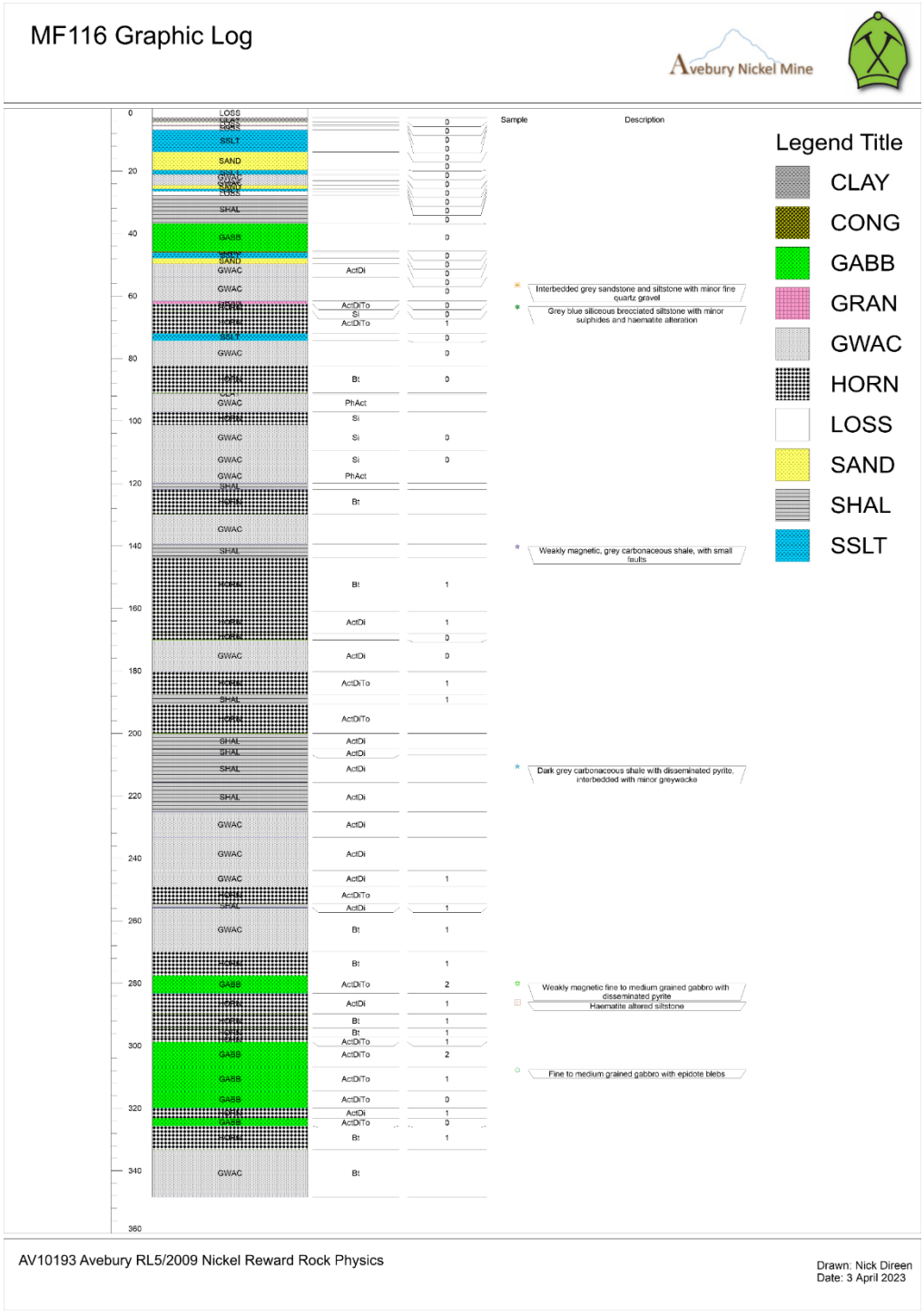


Figure 2: Drillhole log for MF116. There were reportedly disseminated sulphides (pyrrhotite and pyrite) associated with gabbros from 277.5m –283.2m (2% po–py), and at 298.8–306.8m (2% po–py) (E Haley pers. Comm, 2023). It is unclear whether these intersections are stringers to more continuous massive lenses.

1.2 MF116 DHEM survey details

Date: 30th March 2023

Contractor: Khumsup Geophysics

Collar Location: 366331mE, 5365614mN; 200mASL

Projection system: GDA 94 MGA Zone 55

Hole Azimuth, Dip, Depth: 292.5°, 60°, 348.4m

Tx Current: 80A

Components: A,U and V

Frequency: 2.0833Hz

Surveyed Interval: 60–348.4m

Stacks: 64 and 128

Units: pT/A

Transmitter: Khumsup TD TX

Receiver: DigiAtlantis

Probe No.: 193

Channels: 33 channels over the interval 0.087msec to 114.067msec

Loop: MF116, 300x300m (Figure X)

Loop Corner Coordinates: 366425mE 5365465mN 215mASL; 366406mE 5365474mN 210mASL; 366383mE 5365473mN 210mASL; 366366mE 5365474mN 210mASL; 366344mE 5365463mN 210mASL; 366320mE 5365454mN 210mASL; 366307mE 5365457mN 210mASL; 366290mE 5365455mN 210mASL; 366269mE 5365462mN 210mASL; 366205mE 5365495mN 210mASL; 366181mE 5365518mN 210mASL; 366162mE 5365548mN 211mASL; 366183mE 5365603mN 210mASL; 366243mE 5365658mN 210mASL; 366244mE 5365678mN 210mASL; 366265mE 5365769mN 209mASL; 366349mE 5365733mN 210mASL; 366458mE 5365701mN 210mASL; 366462mE 5365666mN 210mASL; 366489mE 5365642mN 210mASL; 366452mE 5365542mN 217mASL; 366425mE 5365464mN 215mASL

Figure 3: Khumsup survey crew in action dummying the hole, and several shorts of the equipment

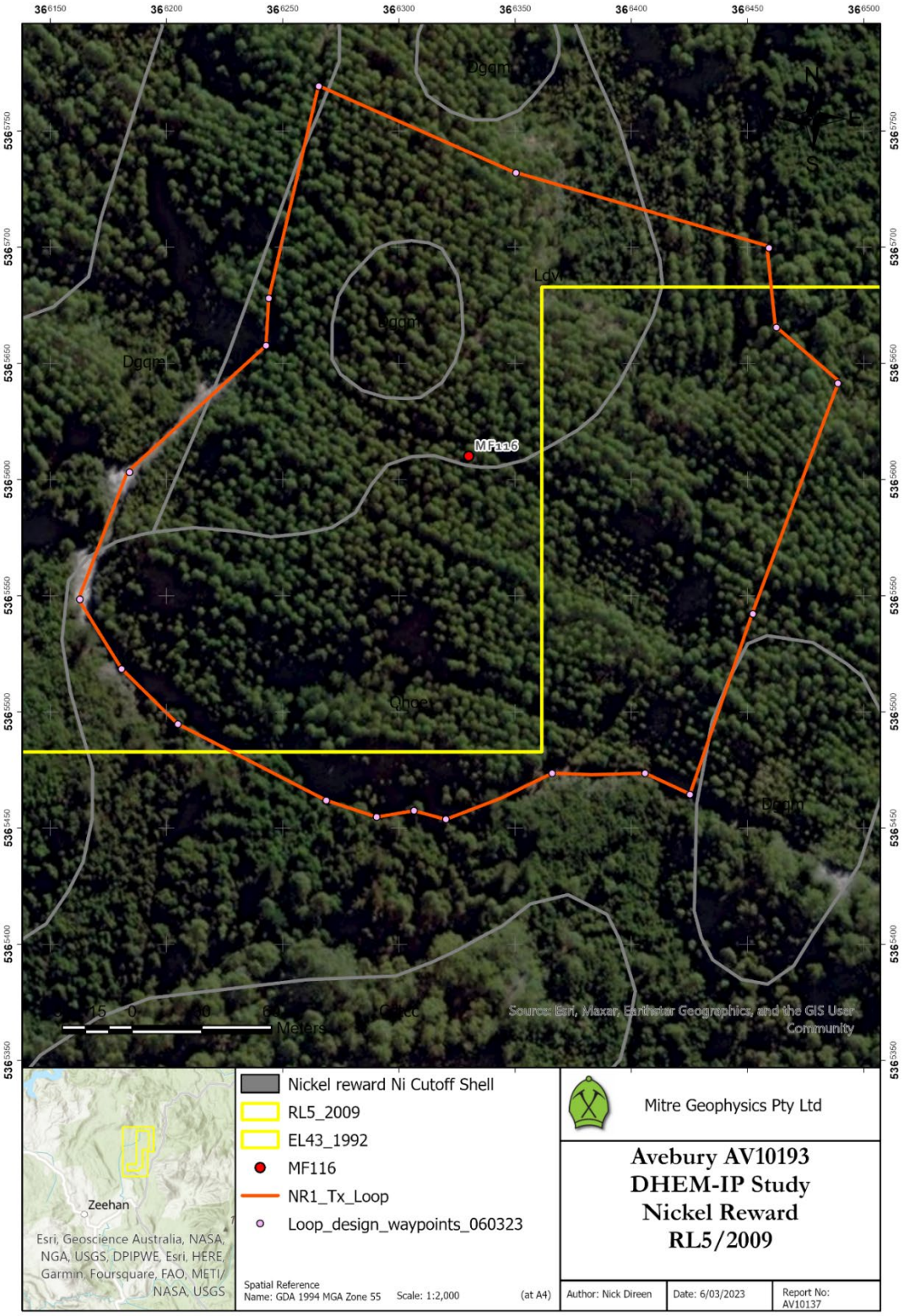


Figure 4: Final position of ground loop (red), adjusted to fit with track locations and to avoid swampy areas for ease of logistics, based on ground inspection by J. Denholm. Grey outlines are geological unit boundaries from Dundas 1:25000 geological atlas (Seymour & McClenaghan, 2003).

1.3 Results

The first ~55m of the DHEM shows that there is clearly still some steel casing in the hole, so we removed the data over this interval. The loop wire also generates an apparent off hole response, mostly in the axial component, from 60–120m, mostly apparent in the A component. This is not an exploration target.

The profiles show weak high frequency 'wobbles' from 270 to 310m downhole, coinciding with strong (up to 2000nT) spikes in the downhole magnetic profile. These 'EM wobbles' are too short wavelength to suggest a large accumulation of sulphides, however they do show that even 1–2% po is enough to significantly increase the local conductivity. In a different environment, the correlation between with the strong magnetic anomaly would mean that it may be possible to trace this zone in the aerial magnetics; however the magnetic data at Melba Flat is dominated by a high gradient effect due to a thick and areally extensive magnetic sheet of Cambrian Mafic–Ultramafic Complex (€bb – boninitic lavas; €spg – serpentinised peridotite; €sm – massive serpentinite) just to the east of the Murchison Highway – which completely swamps any subtle details in the Melba Flat area that might be due to the magnetic shale unit. It may be possible to remove this gradient with judicious high pass filtering.

The most interesting aspect of the DHEM profile is a *temporal* anomaly. That is, instead of the EM fields decaying to zero, the entire profile shows an elevated background signal. This could be due to calibration errors in the digiAtlantis probe; however, it may also be an exceptionally large, very distant, highly conductive zone far beyond the end of the hole. We consider this interpretation to be *very unlikely*.

It is also worthwhile noting that the grey carbonaceous shales logged at 140m and 210m do not appear to be conductive, which suggests that the carbon content is too low to be problematic.

Overall, the DHEM data are quite noisy. This is largely a function of the lack of signal, since neither the host rock nor the overburden are particularly conductive. However, at least part of the noise may be due to Khumsup's apparent lack of experience with DHEM.

The DHEM profiles are shown in Appendix 1.

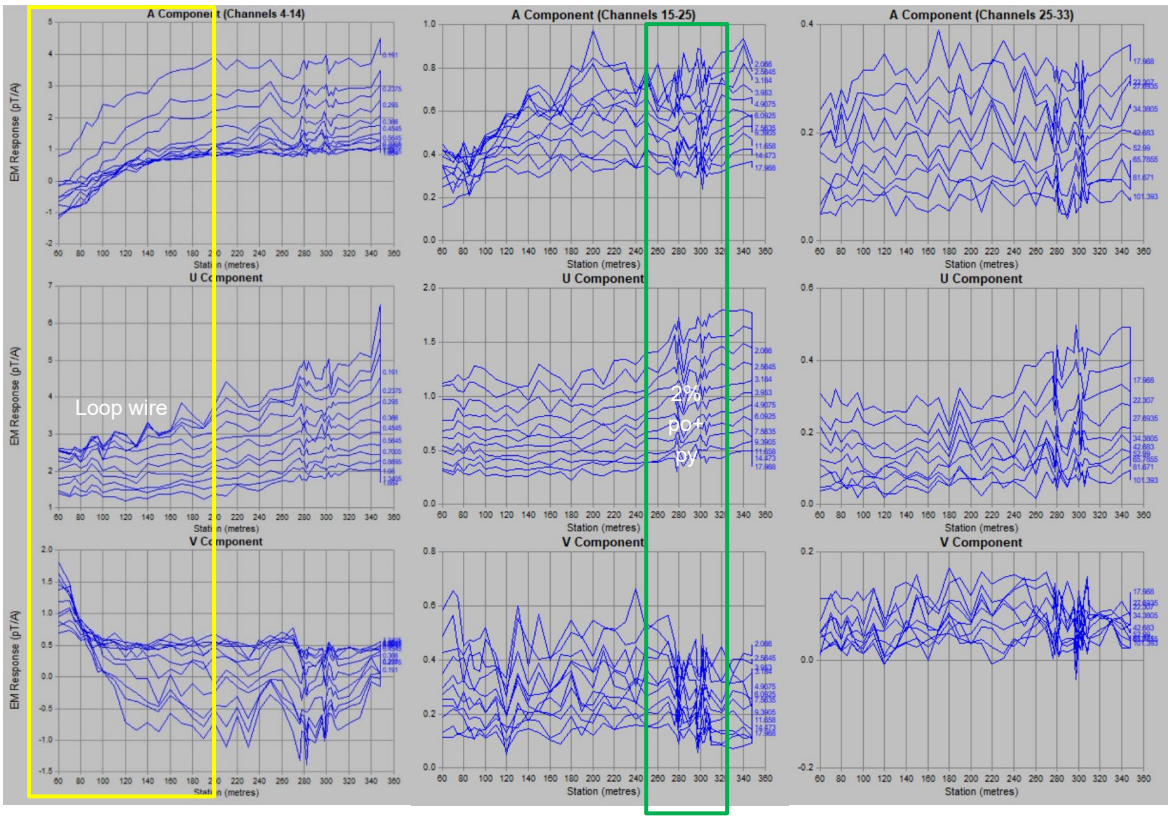


Figure 5: DHEM profiles for MF116.

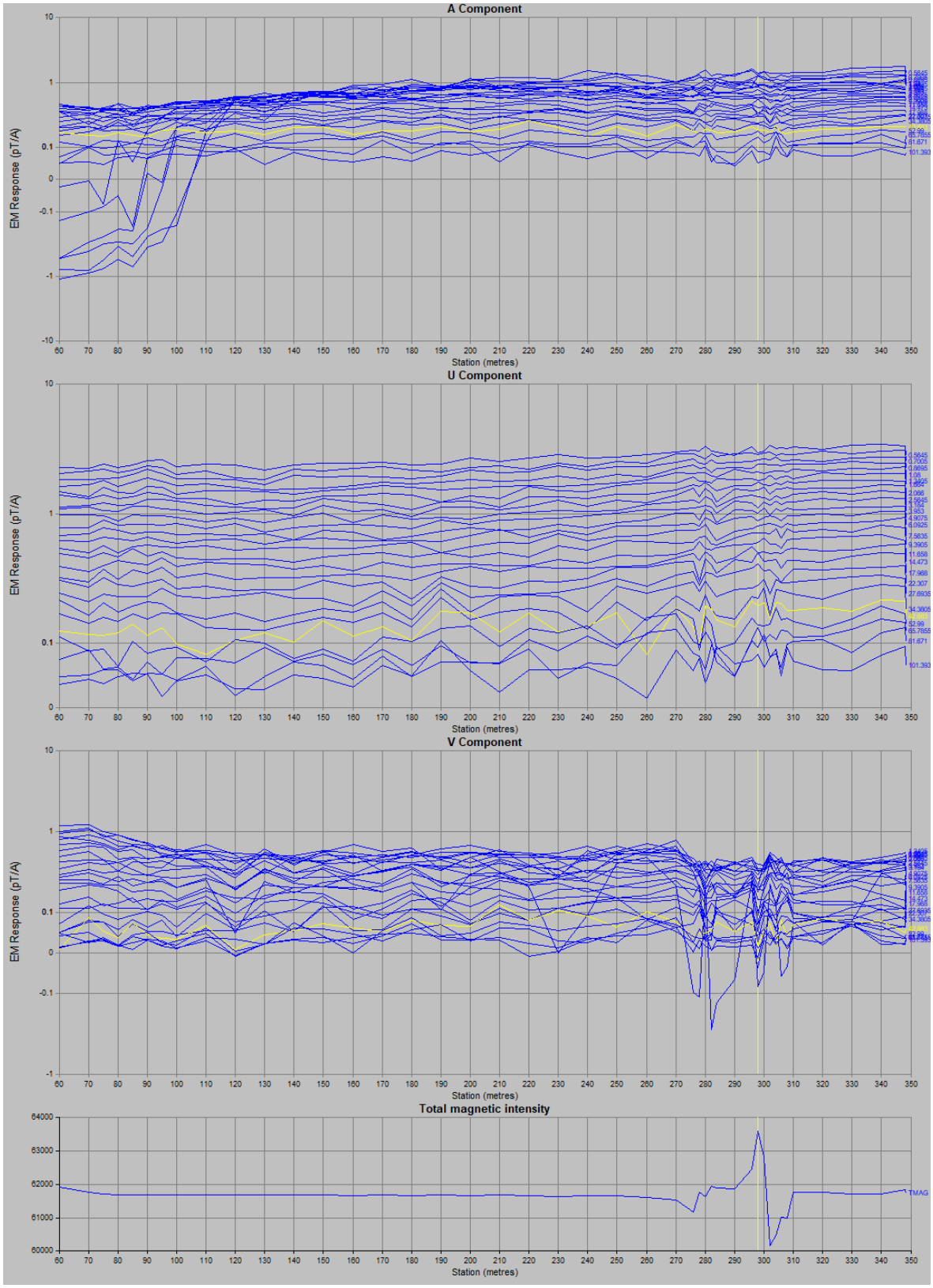


Figure 6: Log–line profile for all 3 components plus the total magnetic intensity log (also acquired by the DHEM probe).

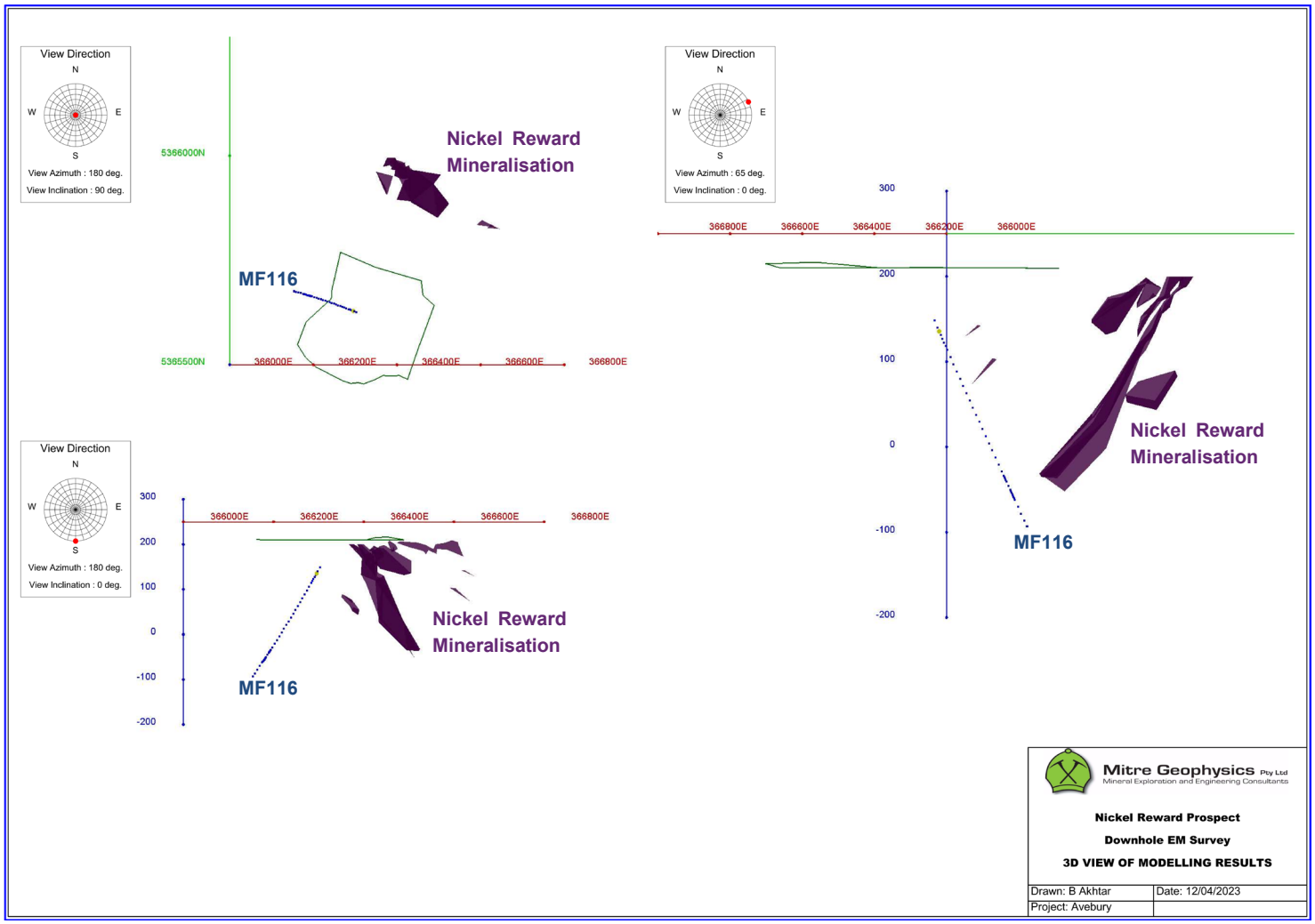


Figure 7: Sectional view showing MF116 and existing Nickel Reward mineralisation.

1.4 Conclusions and recommendations

- The DHEM from MF116 shows no anomalies indicative of a confined basement conductor.
- The estimate range of investigation/sterilisation is, conservatively, 100m, but for a much larger or NiS zone it could be up to 200m.
- The logged carbonaceous shales do not appear to be conductive.
- The weak sulphides (po+py) intersected between 270m and 310m appear to generate a strong magnetic field and thus may be traceable on an appropriately filtered version of the aerial magnetics that removes the gradient effect of the serpentinite sheet to the east.
- There is no conductive overburden, so the depth of investigation of EM method in general should be particularly good.
- The EM profiles do not decay to zero. This may be a calibration error with the DHEM equipment of the half–space response, but it may also be an exceptionally large, highly conductive zone far away.

1.5 References

Asten, M.W., 1999. Report for Allegiance Mining NL. AVEBURY PROSPECT, ZEEHAN, TASMANIA. Results of Surface and Borehole EM survey, April 1999, Flagstaff GeoConsultants Pty Ltd.

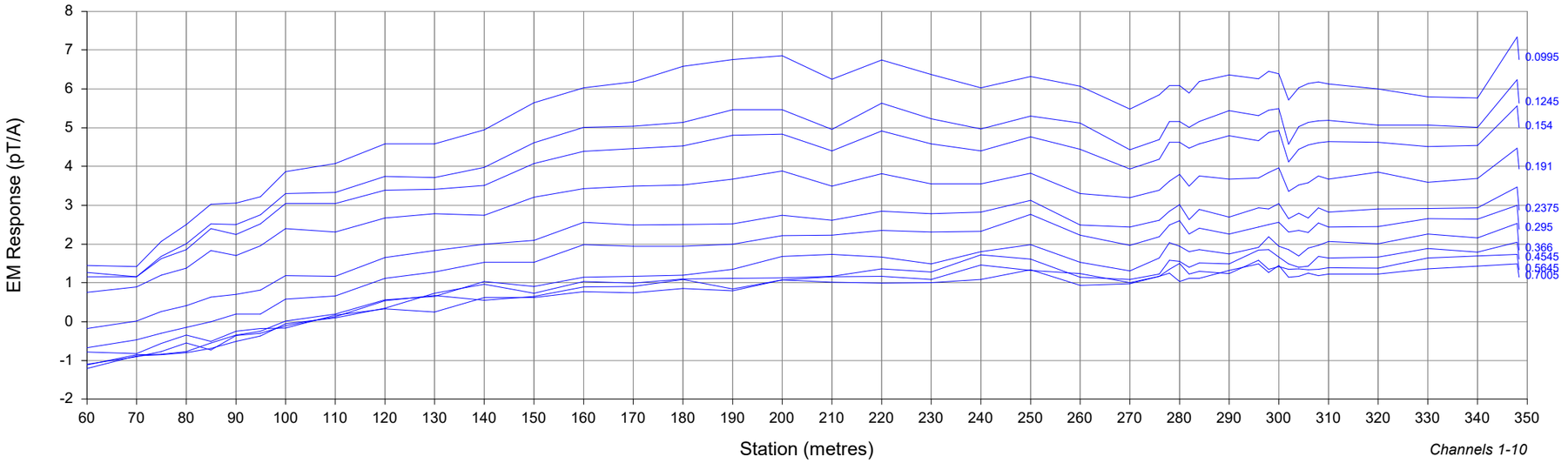
Bottrill, R.S., 2014. 4.4.7 Mineral deposits associated with the mafic–ultramafic complexes. In: K.D. Corbett, P.G. Quilty and C.R. Calver (Editors), Geological Evolution of Tasmania. Geological Society of Tasmania Special Publication 24. Geological Society of Tasmania (Tasmania Division), Hobart, pp. 141–145.

Gilgallon, K., Tomlinson, A. and Mortimer, R., 2019. The Forrestania and Nepean electromagnetic test ranges, Western Australia–a comparison of airborne systems. ASEG Extended Abstracts, 2019(1): 1–4.

Seymour, D.B. and McClenaghan, M.P., 2003. Digital Geological Atlas 1:25 000 Scale Series. Sheet 3636. Dundas. Mineral Resources Tasmania.

Appendix: Profiles

A Component



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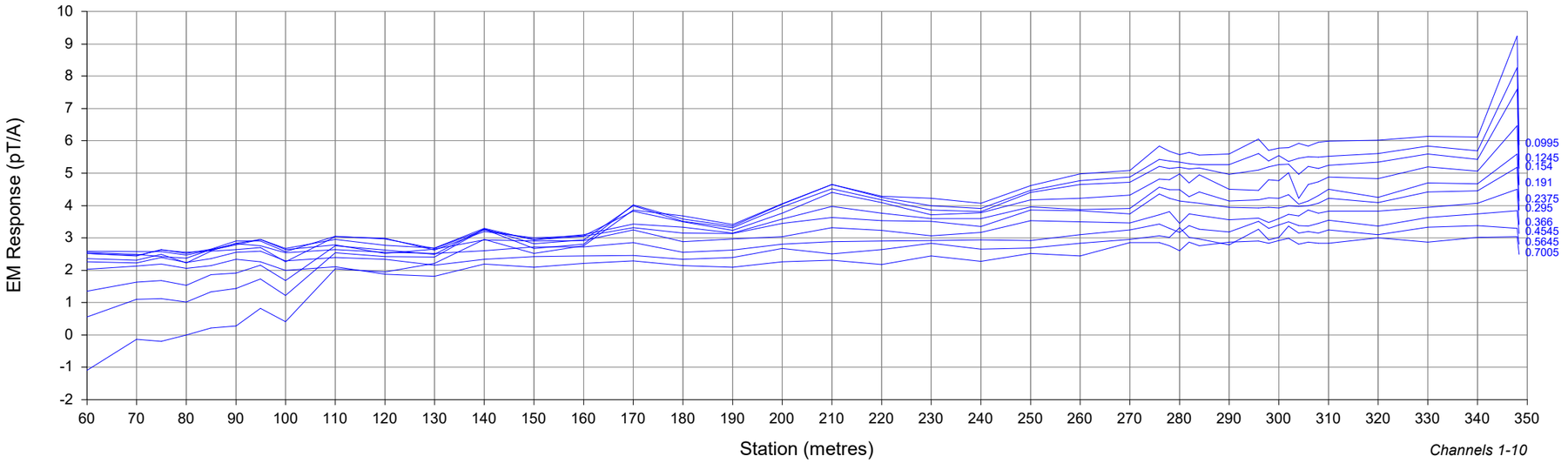

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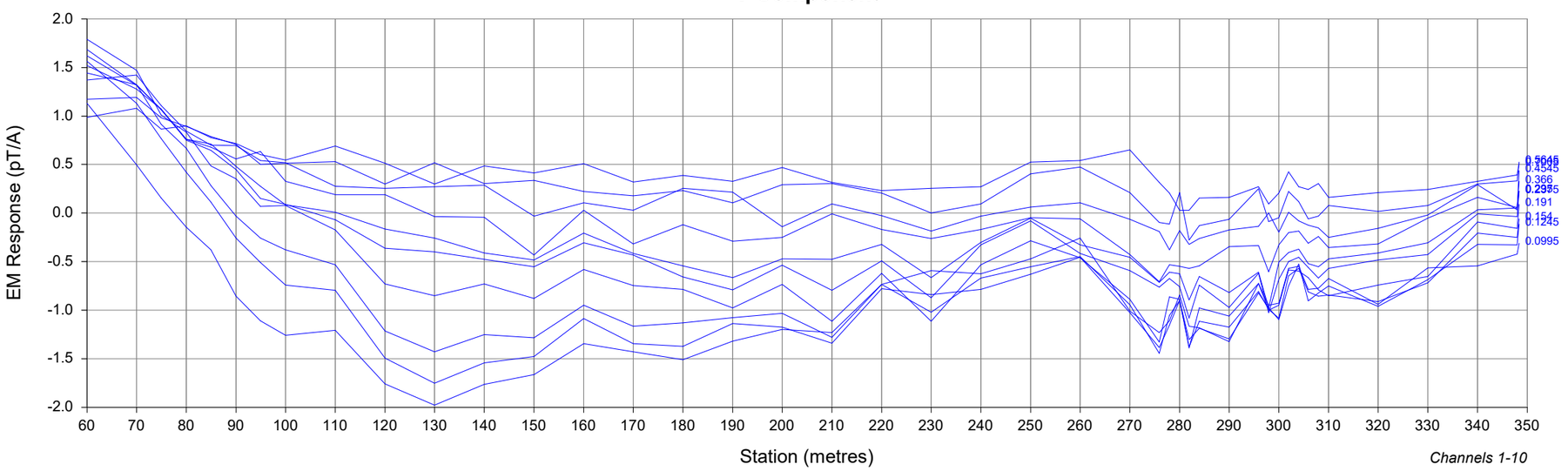

WINDOW TIMES (ms): Centre
From the end of the turn off (120.852 ms)

1	: 0.0995	18	: 3.953
2	: 0.1245	19	: 4.908
3	: 0.1540	20	: 6.093
4	: 0.1910	21	: 7.564
5	: 0.2375	22	: 9.390
6	: 0.2950	23	: 11.66
7	: 0.3660	24	: 14.47
8	: 0.4545	25	: 17.97
9	: 0.5645	26	: 22.31
10	: 0.7005	27	: 27.69
11	: 0.8695	28	: 34.38
12	: 1.080	29	: 42.68
13	: 1.341	30	: 52.99
14	: 1.664	31	: 65.79
15	: 2.066	32	: 81.67
16	: 2.565	33	: 101.4
17	: 3.184		

SURVEY PARAMETERS

Configuration	: Downhole
Station Spacing	: 0-10 m

RECEIVER

Receiver	: DigiAtlantis
Frequency	: 2.0833 Hz
Component	: AUV
Probe no.	: 193

TRANSMITTER

Transmitter	: Zonge
Loop	: MF116
Tx Loop Side	: 300 m
Tx Current	: 80 A
Turn Off	: 0.850 ms

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Nickel Reward Prospect
Downhole EM Survey
PROFILES OF EM RESPONSE
Line MF116

Drawn: B Akhtar	Date: 12/04/2023
Project: Avebury	

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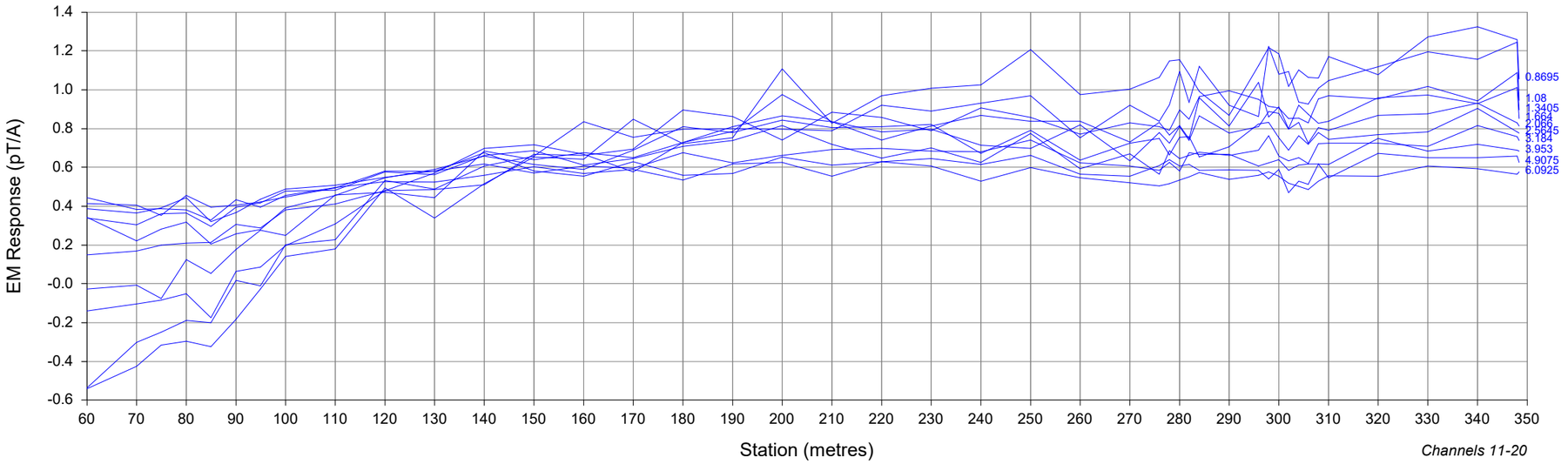

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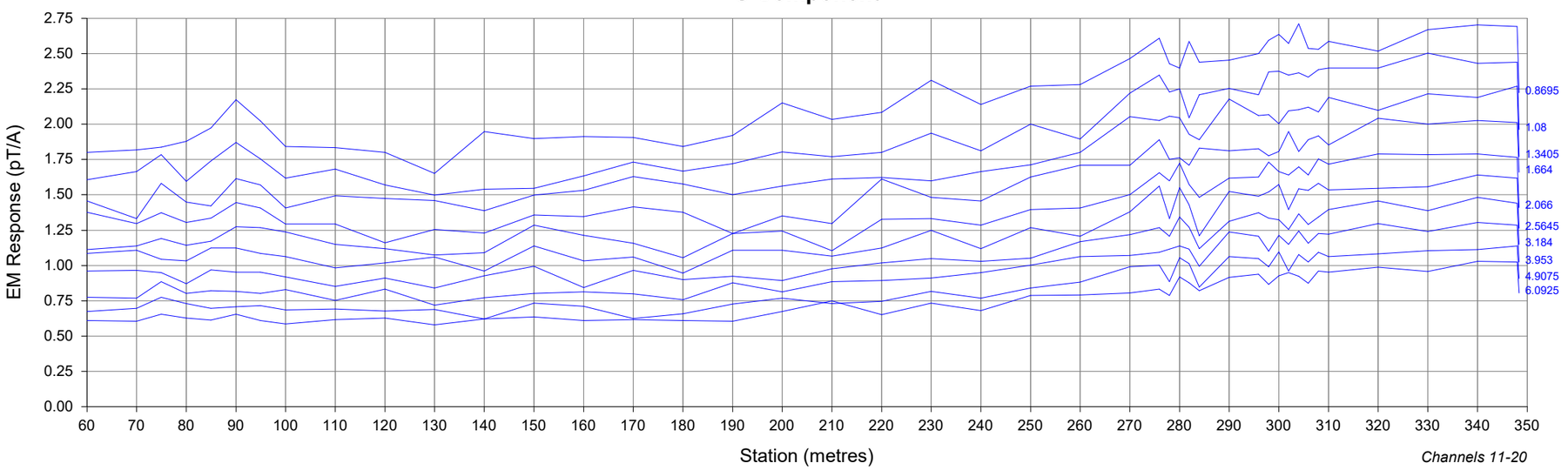

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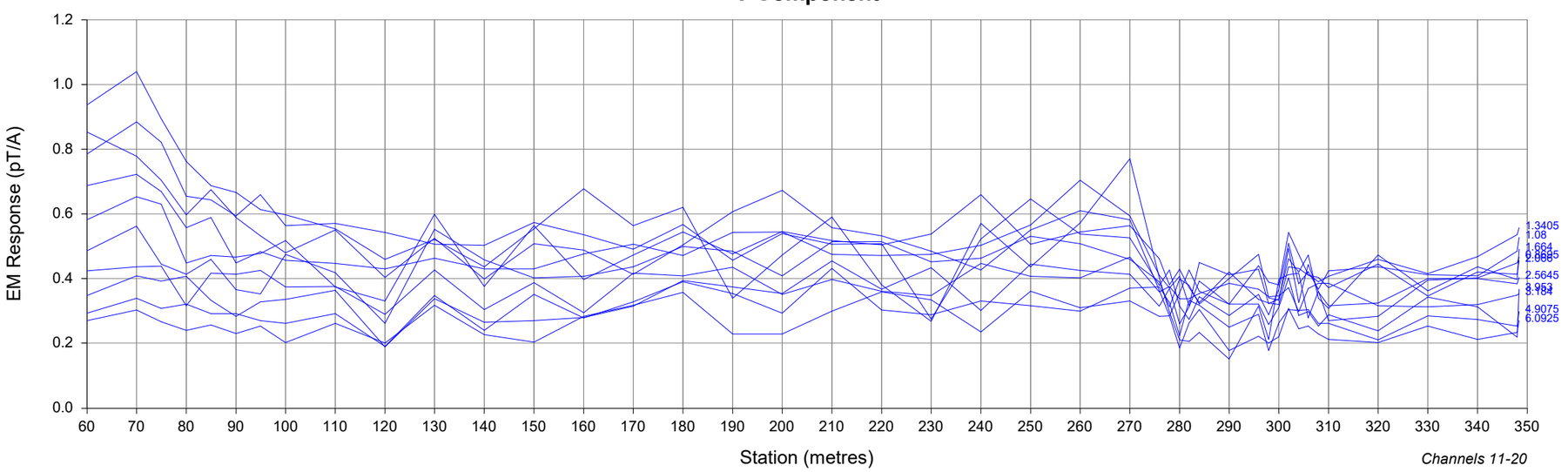

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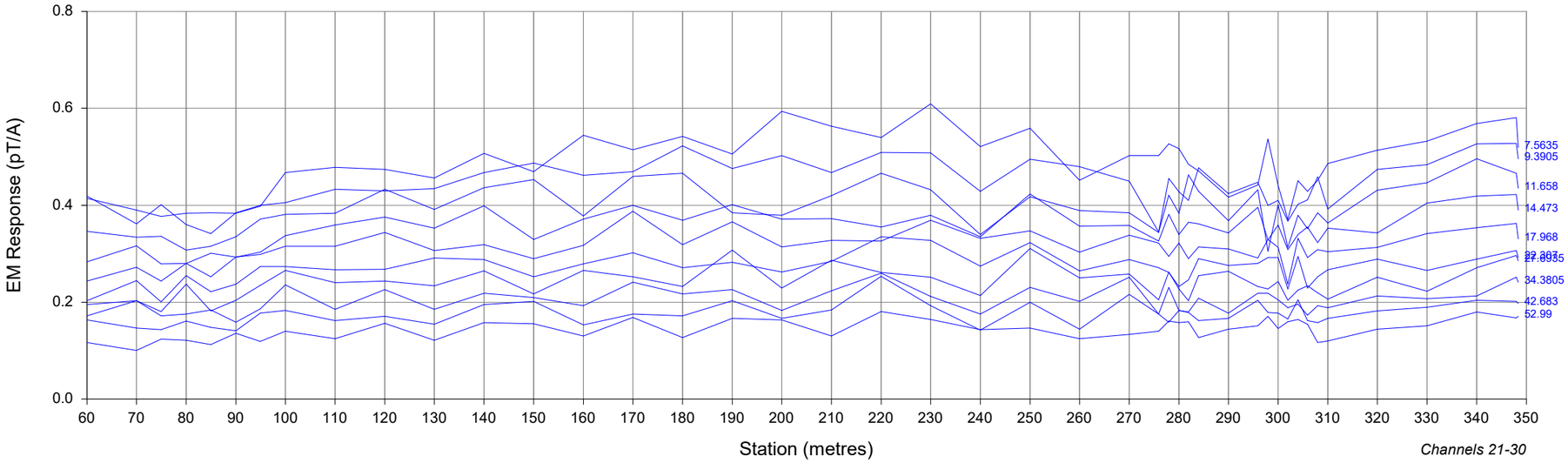

Channels 21-30

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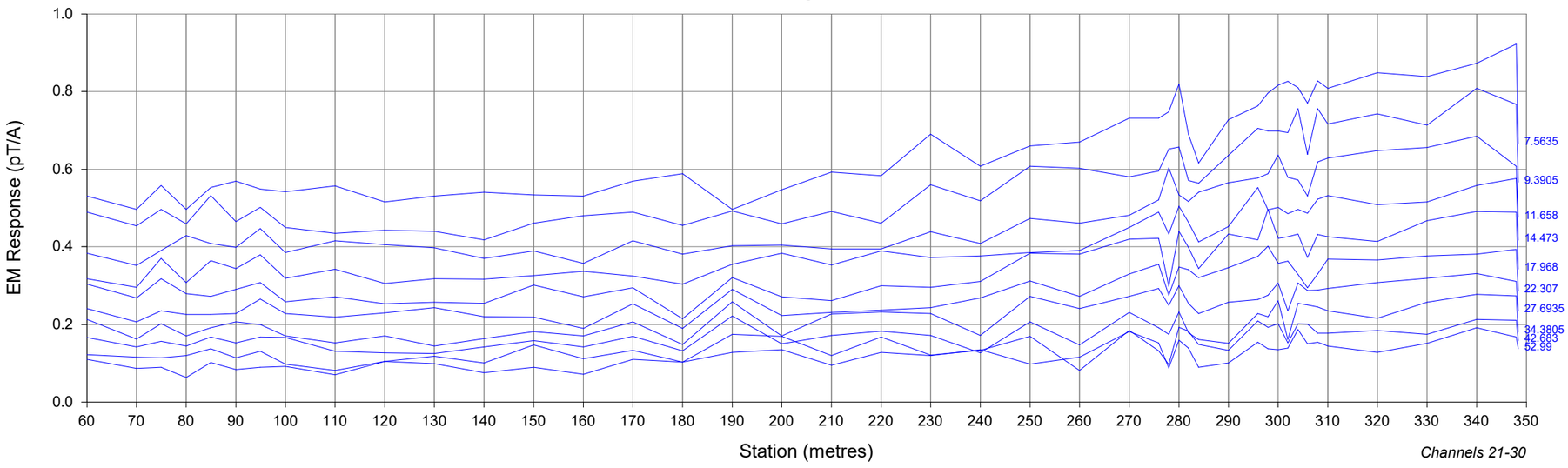

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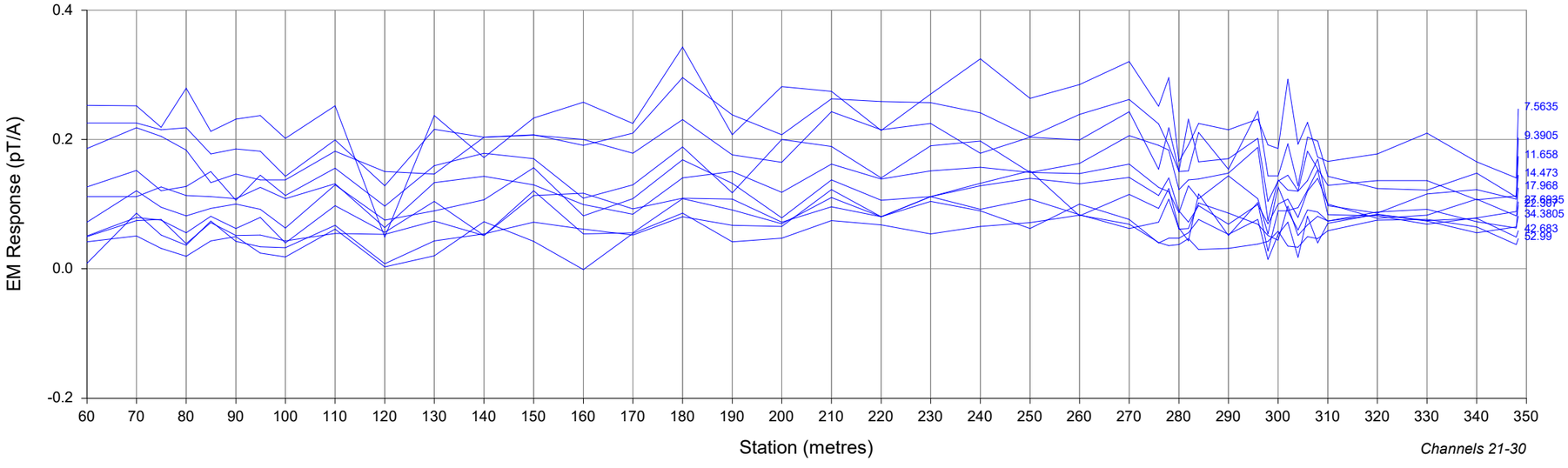

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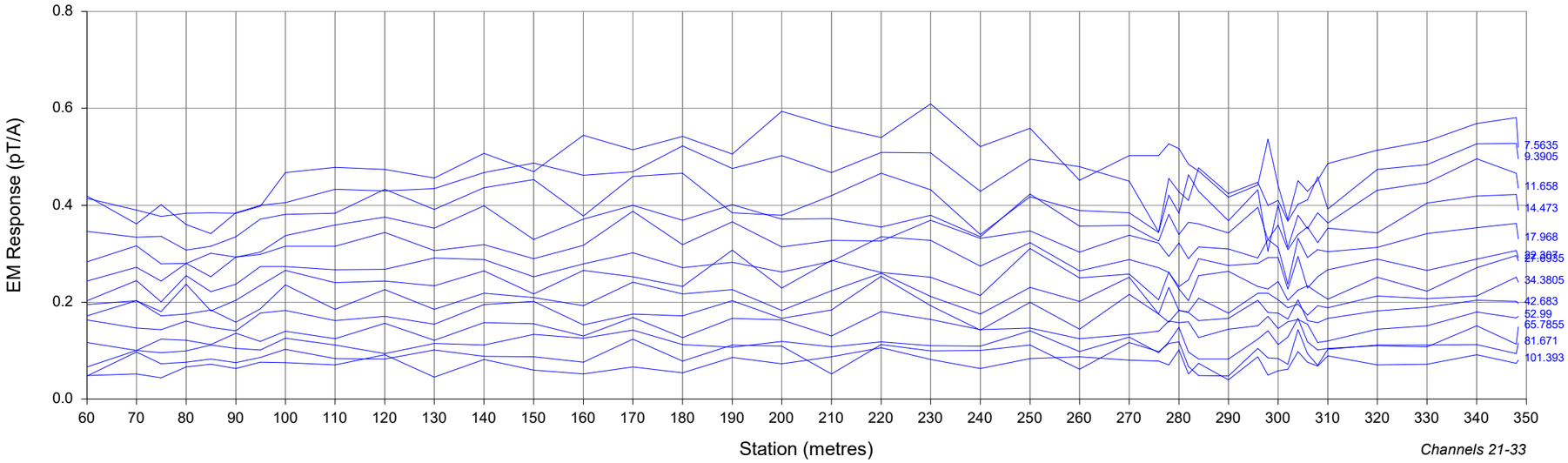

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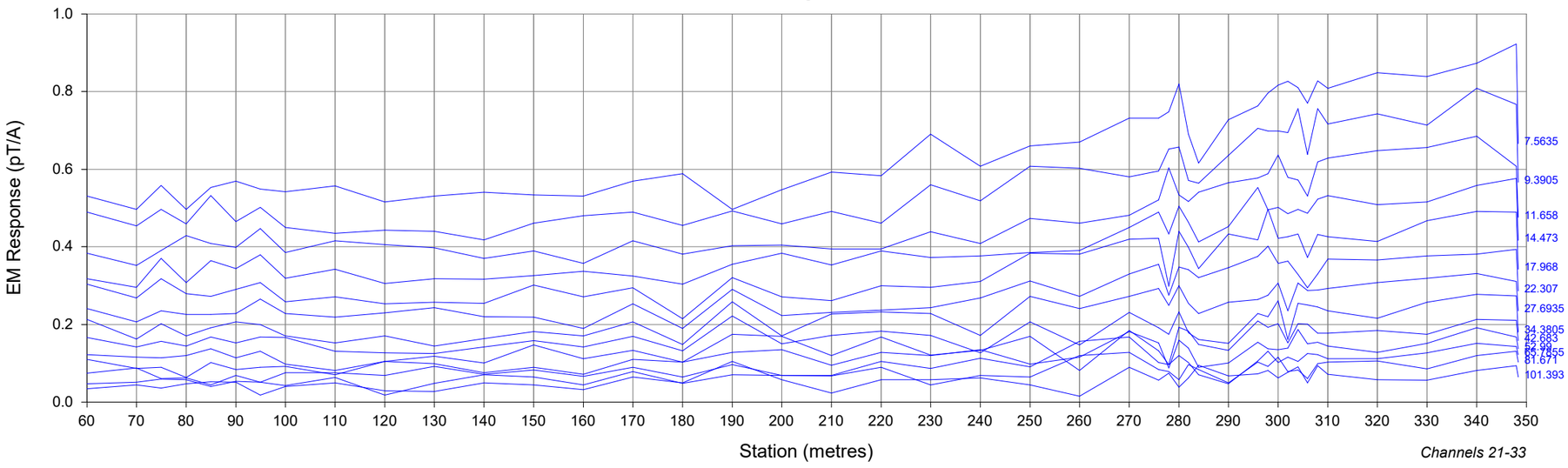

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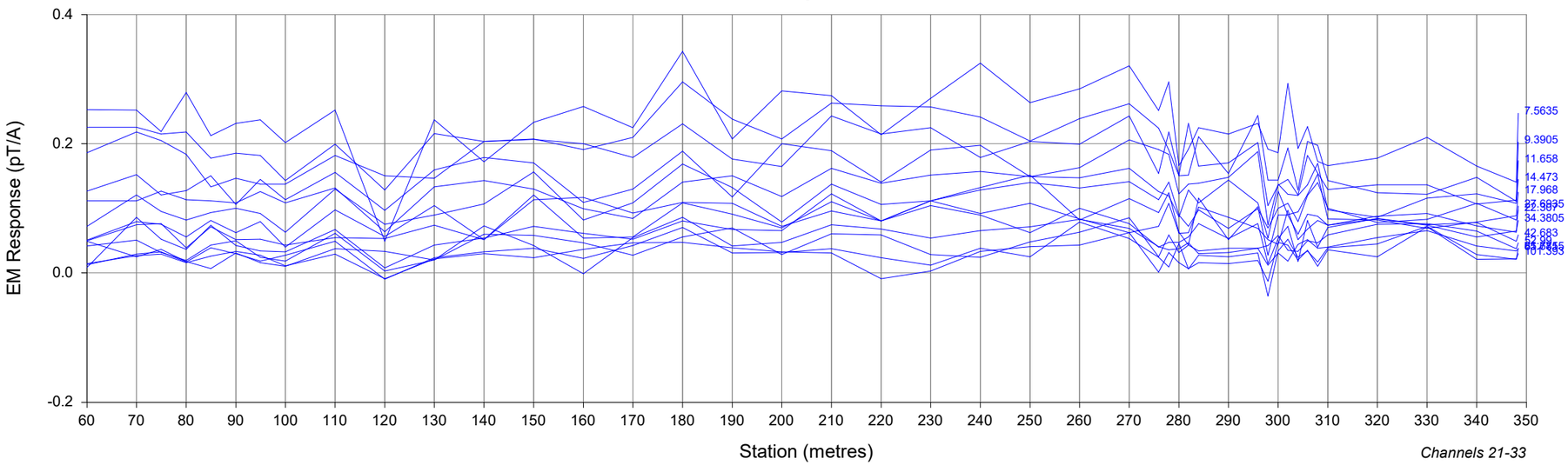

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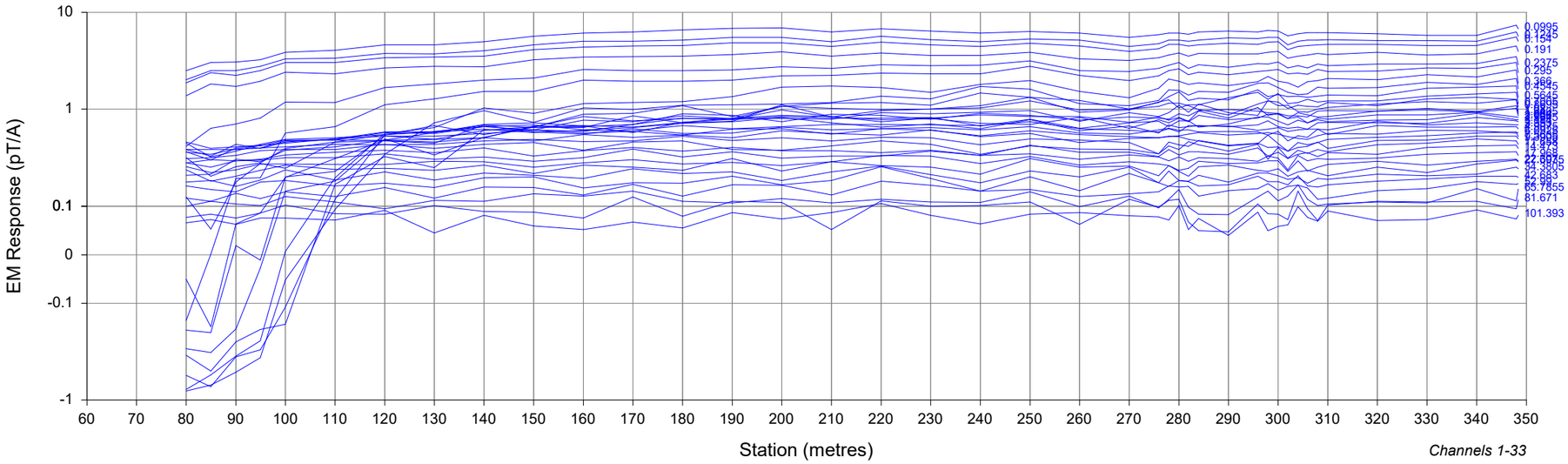

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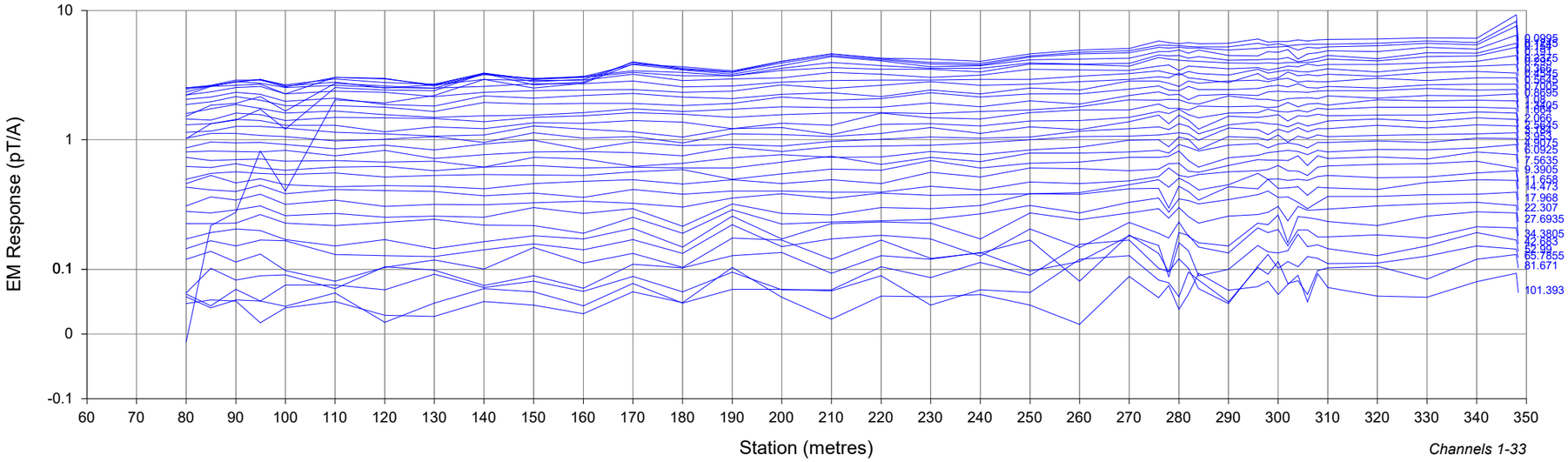

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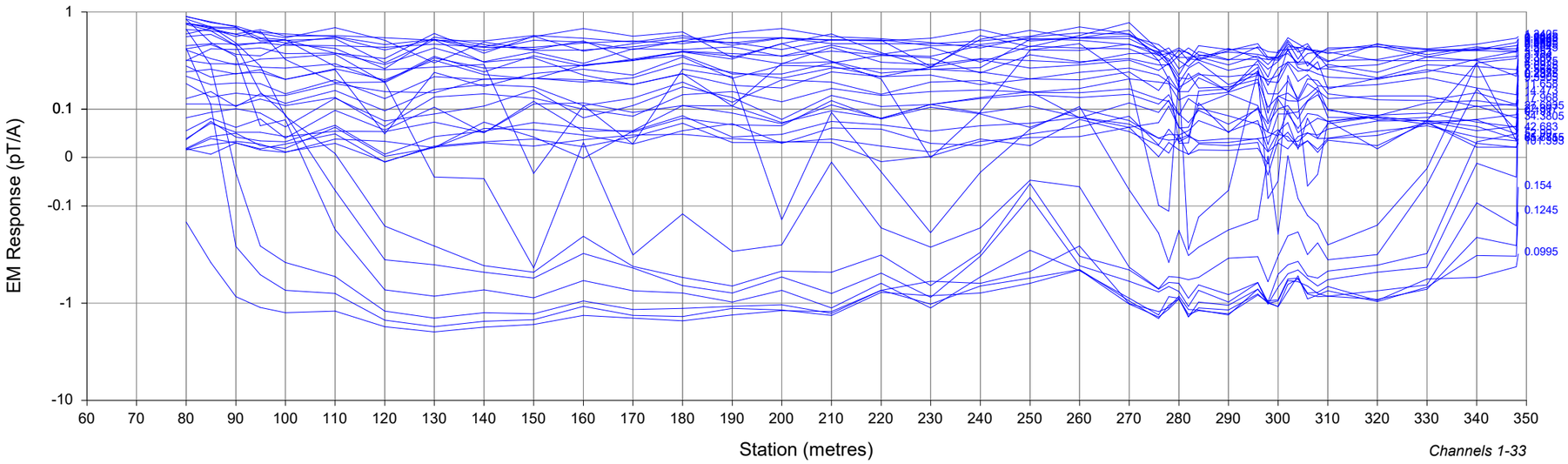

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