

Survey of Ffridd yr Allt-lwyd

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The Team:

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1) Introduction

Ffridd yr Allt-lwyd (Hill 3404, Section 30D, OS 1:50000 Map 124, OS 1:25000 Maps 23E, Grid Ref. SH797296) is situated to the North East of Coed y Brenin Forest and about 8km West of LLanuwllyn. It is listed as having a height of 500m and a drop of 46m so on height just qualifies for Michael Dewey's list of 500m hills.

The purpose of this survey was to locate the position of the summit and measure its height accurately in order to determine if Ffridd yr Allt-lwyd should retain its Dewey classification.

2) Equipment used and Conditions for Survey

A ground survey to determine the position of the summit was carried out using a Leica NA730 Professional Automatic level (X30 telescopic system)/tripod system and a "1m" E-staff extendable to 5m.

Absolute heights were measured using a Leica Geosystems Viva GS15 Professional receiver. This is a dual-frequency, 24-channel instrument, which means it can lock on to a maximum of 12 satellites and receive two signals (at different frequencies) from each of these satellites. The latter feature reduces inaccuracies that result from atmospheric degradation of the satellite signal. As a stand-alone instrument it is capable of giving position and height to an accuracy of about two metres and five metres respectively. Note that a hand-held GPS receiver can only receive up to 12 satellites and each at a single frequency and therefore it has a poorer positional accuracy of +/-5m and a height accuracy of no better than 10 metres. Despite the on-board features of the Viva GS15 receiver, there are still sources that create residual errors. To obtain accurate positions and heights, corrections were made to the GPS data via imported RINEX data from the Ordnance Survey which was post-processed using Leica Geo Office v7.01 software.

Conditions for the survey, which took place between 11.45hr and 14.00hr, were satisfactory. Although chilly on the summit, 8 degrees Celsius, the wind was light. Conditions were clear and therefore visibility was good.

2.1) Character of Hill

Ffridd yr Allt-lwyd is in a very rural part of Wales to the East of the popular and well established Mountain Biking centre of Coed y Brenin. It is an isolated hill that effectively can only be reached from a minor road which joins the main A470 road several kilometres to the West. This minor road, for its final 2km, runs parallel to and on the South side of the Afon Mawddach before finally crossing a bridge to the farm at Cwm-hasgen. An unsurfaced but drivable (just!) track continues to the deserted farm of Dol-cyn-afon. At both of these farms it is possible to go North across the Afon Mawddach and gain access to Frith yr Allt-lwyd on good tracks.

The South side of the hill is quite steep and has two very pronounced gulleys which more resemble Scottish terrain. The hillside is otherwise covered with short grass and no bracken nor heather.

However the summit is a contrast. It is quite flat, boggy and covered with tussock grass. There are grassy mounds that have to be traversed or bypassed on any approach before the insignificant summit is reached. However, this summit is an excellent viewpoint in this very remote and wild part of Wales.

2.2) Summary of Survey Method

The survey commenced on the summit plateau with the objective of identifying which of the grassy mounds was the highest point. Having set up the Leica level on the tripod at the same height as one of the visually highest grassy mounds, a 360 degree scan showed that a grassy mound to our West was clearly the highest point. We then set up the level on this grassy mound and took staff readings to ascertain the highest point of the hill. There was no feature at this point. The Leica GS15 was set up over the summit position on a tripod using a Leica proprietary tribrach and optical plummet system, and its height above the ground measured. Data were collected for 1 hour with an epoch time of 15 seconds.

2.3) The Summit

See photos in Appendix.

The ten-figure Grid References recorded for the summit were:-

Montana 600	SH 79723 29616	Accuracy 2m Height = 503m
Garmin Map60CSx	SH 79724 29615	Accuracy 2m Height = 493m
Garmin Venture	SH 79724 29615	Accuracy 2m Height = 508m
Magellan Explorist 100	SH 79726 29617	Accuracy 2m Height = 504m
Etrex	SH 79725 29615	Accuracy 4m Height = 503m
Garmin Oregon 450	SH 79726 29618	Accuracy 3m Height = 508m

The Leica GS15 vertical offset used for the antenna mounted on the “Short Tripod” was measured by the integral tape to be 0.571m in addition to the 0.255m vertical offset associated with the tribrach/hook and clamp system. The position and height data for the summit that were recorded by the Leica Viva GS15 and post-processed with Leica GeoOffice 7.01 using imported OS RINEX data from the eight nearest OS base stations were:-

System	Easting	error(1SD)	Northing	error(1SD)	Height(m)	error(1SD)
GS15	279721.410	0.001	329610.753	0.002	500.420	0.010

As the GPS was mounted directly over the summit the height of Ffridd yr Allt-lwyd is 500.42m. This is in good accordance with the 1642ft (500.49m) levelled height that appears on the Ordnance Survey 1901 Pre WW11 1:10,560 map, whilst Harvey maps spot height the area of the summit as 502m. The Database of British and Irish Hills also identifies a slightly lower mound 75m SW at Grid Reference SH 79665 29570. Staff measurements showed this to be 1.76m lower. About 9m away from the summit there is an embedded cairn. Most of the rocks in it were easily moved but there was a larger rock there that appeared to be more permanent. This was measured to be 0.05m lower than the summit position.

3) **Discussion of Results**

From the nature of the grassy terrain at the summit we estimate that it was located with an uncertainty in height of $\pm 0.05\text{m}$. We estimate the uncertainty associated with the GPS measurement for 1 hour of data collection to be $\pm 0.06\text{m}$ and the overall uncertainty in the height measurement therefore is $\pm 0.08\text{m}$. The height of Ffridd yr Allt-lwyd is $500.42 \pm 0.08\text{m}$ and the hill retains its classification as a Dewey.

4) **Summary and Conclusions**

The **summit** of **Ffrith yr Allt-lwyd** is at grid reference * SH 79725 29616 and is the unfeatured top of a grassy mound. Its height is **$500.42 \pm 0.08\text{m}$** .

As the height exceeds 500m, **Ffrith yr Allt-lwyd retains its Dewey classification.**

* NB average hand-held Garmin/Magellan GPS grid references are quoted in the summary.

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Appendix

Leica Viva GS15 set up on the summit of Ffrith yr Allt-lwyd



Leica GS15 set up showing vertical offset (0.571m) at the summit of Ffrith yr Allt-lwyd

