Survey of Mynydd Dinas

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1) Introduction

Mynydd Dinas (Hill 2301, Section 32C, OS 1:50000 Map 170, OS 1:25000 Map 165, Grid Ref SS761915) is situated in South Wales above Port Talbot. It is listed as having a drop of 152m and therefore is classified as a Marilyn. (A Marilyn is any hill in England, Scotland, Wales, Isle of Man and Ireland with a minimum drop of 150m). The value of drop has been measured from maps with the summit value derived from a spot height and to the bwlch from interpolation of contours. Consequently there is a significant chance that the drop could be less than 150m.

The purpose of this survey was to measure the drop for Mynydd Dinas and thus clarify its status.

2) Equipment used and Conditions for Survey

Ground surveys to determine the positions of the bwlch and summit were 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, multi-channel instrument, which means it can lock on to a maximum of 12 GPS and 8 GLONASS 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 GPS 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. Some recently produced hand held GPS Garmin receivers can also receive signals from GLONASS satellites which greatly improve the speed at which these units can achieve a satellite "fix". 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 8.3 software.

Conditions for the survey, which took place between 14.00hr and 18.00hr, were fair. The weather was overcast with a cloud base of about 400m, well above the summit of Mynydd Dinas. The temperature was 10 degrees Celsius, although it much felt colder in the light wind, and a light shower of rain on the summit did not interrupt the survey.

3) The Survey

3.1) Character of Hill

Mynydd Dinas is only 258m high according to the map, but looks higher than this from the M4 motorway as it rises steeply above the town of Port Talbot. Its northern, western and eastern slopes are covered in conifer forest, while its southern slopes are largely free of trees and comprise rough grass and bracken. The hill is best approached from the North where a forest track leaves the minor road above Baglan, a suburb of Port Talbot, at SS759925. The track passes a farm building and then traverses the bwlch before gently ascending the West slope of the hill. This track bifurcates at SS757916 and the left branch is taken. Just 50m further on the track bifurcates again and this time the right-hand branch is taken for 300m to a gate. Just before the gate a path continues up the hill to the trig point. A previous visit by the authors in 2006 determined the highest point to be ground by a small rock 65m E of the trig point and this ground was estimated to be 30cm higher than the ground upon which the trig point was built. The summit area is quite flat and covered in thick heather which is interspersed with small pine trees and birch saplings.

3.2) Summary of Survey Method

The position of the bwlch was identified as a point on the track. Sightings through the level from this area quickly showed that the ground was ascending in both North and South directions and at the lowest point of the track the ground was wet and marshy on both sides of it. Ground to the North-East was also shown to be higher despite initial suspicion that the bwlch might lay in this area. Ground by a large barn at SS761923 was also quickly shown to be higher than the low point on the track. The marsh to the East of the track appeared to be stagnant but drained to the East down a steep-sided valley. Ground to the West of the track did not have standing water in the immediate vicinity that could be seen, although dense vegetation covered this area. Having identified the position of the bwlch, staff readings were taken of its position on the track, of ground immediately by the track on its West and East sides, and at the set-up position of the GS15 receiver.

The summit of the hill required extensive measurement with level and staff in order to identify the highest point. The survey was hampered by both the depth of the heather and the density of tree cover which was sufficient frequently to block line-of-sight between level and staff. The strategy we adopted was to choose a line running in an approximately East-West direction and take staff readings to the North and South of and on the line to determine the indistinct line of the summit ridge. The highest point along this line was then identified as the summit.

The absolute heights of the summit and the bwlch were measured with the Leica Viva GS15 receiver with data from both GPS and GLONASS satellites being collected. The instrument was set up with tripod support to hold it firmly over the point to be measured and was fixed to the tripod with a clamp and tribrach (the “short tripod” configuration). Its height above the ground was measured with an integral tape measure. Data were collected for 45 minutes with an epoch time of 15 seconds on the summit and for an hour with an epoch time of 15 seconds on the bwlch.

3.3) The Bwlch

The bwlch was surveyed with level and staff as described in Section 3.2 and we are confident this was achieved to within +/-0.1m of height.

The ten-figure Grid References for the bwlch were:-

Garmin Map60CSx	SS 76160 92308	Height = 107m
Garmin Montana 600	SS 76161 92311	Height = 100m
Garmin Etrex 20	SS 76161 92311	Height = 107m
Garmin Oregon 450	SS 76161 92314	Height = 109m

The Leica Viva GS15 was set up about 25m South at a convenient position at the side of the track. The vertical offset from measuring point to the ground was 0.520m (see photograph) plus 0.255m for the tribrach/hook system.

The position and height data that were recorded by the Leica Viva GS15 and post-processed with Leica GeoOffice 8.3 using imported OS RINEX data were:-

System	Easting	error(1SD)	Northing	error(1SD)	Height(m)	error(1SD)
GS15	276158.087	0.003	192281.839	0.003	106.542	0.016

Staff readings to the GS15, the bwlch and positions just off the track to its East and West were:

GS15 set-up position = 0.744m

Bwlch on track = 1.659m

Ground to East side of track = 2.337m

Ground to West side of track = 2.506m

The height of the bwlch on the track is 106.542 - 1.659 + 0.744 = 105.63m

Note that the track runs over the bwlch and is raised by approximately 0.7m above the original bwlch position. This situation is treated in Section 4 (Defining Cols) of the document Summits and Cols which says that the surface of the embankment, in this case the track, is taken as the bwlch position.

3.4) Summit of Mynydd Dinas

The exact position of the summit was established using the level and staff as described in Section 3.2 and is ground 3m NE of a rock. This rock is 65m E of the trig point. This position is only 2m away from our original measurement in 2010.

The ten-figure Grid References for the summit are:-

Garmin Map60CSx	SS 76143 91533	Height = 262m
Garmin Venture	SS 76145 91535	Height = 260m
Garmin Etrex	SS 76144 91533	Height = 262m
Magellan Explorist 100	SS 76144 91535	Height = 258m

These grid references were recorded on our 2010 visit.

The Leica Viva GS15 was set up on the summit position using the "short tripod" configuration described above. The vertical offset from measuring point to the ground was 0.505m (see photograph) plus 0.255m for the tribrach/hook system.

The position and height data for the summit recorded by the Leica Viva GS15 and post-processed with Leica GeoOffice 8.3 using imported OS RINEX data were:-

System	Easting	error(1SD)	Northing	error(1SD)	Height(m)	error(1SD)
GS15	276143.782	0.002	191529.849	0.002	258.103	0.010

From the set-up position of the level, staff readings for the following features were:

Ground 3m NE of rock = 0.933m

Ground by trig point = 1.157m

Flush bracket of trig point = 0.934m

The ground by the trig point is 1.157 - 0.933 = 0.224m lower than the summit

Height of flush bracket = 258.103 - 0.934 + 0.933 = 258.102m

(Ordnance Survey lists the height of the trig point flush bracket as 258.113m and our measurement is in excellent agreement being just 0.01m lower)

4) Discussion of Results

The largest error was associated with the correct location of the summit. Although we located a position just 2m away from that in our previous survey with Abney levels in 2006, nevertheless the ground is very uneven and the depth of heather presents a significant challenge in finding the highest point. We estimate a measurement uncertainty of +/-0.10m in height. We also estimate that the bwlch was located to better than +/-0.05m in height since this lay on the track. The measurement uncertainty associated with the instrument is +/-0.06m for both summit and bwlch. Therefore the overall uncertainty in drop measurement for the hill is no more than +/-0.14m.

The drop measurement is 152.47+/-0.14m and therefore Mynydd Dinas does achieve the 150m required to retain its Marilyn status.

5) Summary and Conclusions

The **summit** of **Mynydd Dinas** is at grid reference * SS 76144 91534 and is ground 3m NE of a small rock 65m East of the trig point. Its height is **258.1m**.

The bwlch for Mynydd Dinas is at grid reference *SS 76161 92311. Its height is **105.6m**.

The **re-ascent** from the **bwlch to the summit is 152.5m** and therefore **Mynydd Dinas retains its Marilyn status.**

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

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Appendix 1

View of GS15 set-up on summit position

Photograph of tape reading at summit set-up position

View of GS15 set up at bwlch

Photograph of tape reading at bwlch set-up position