

# Survey of Hoove

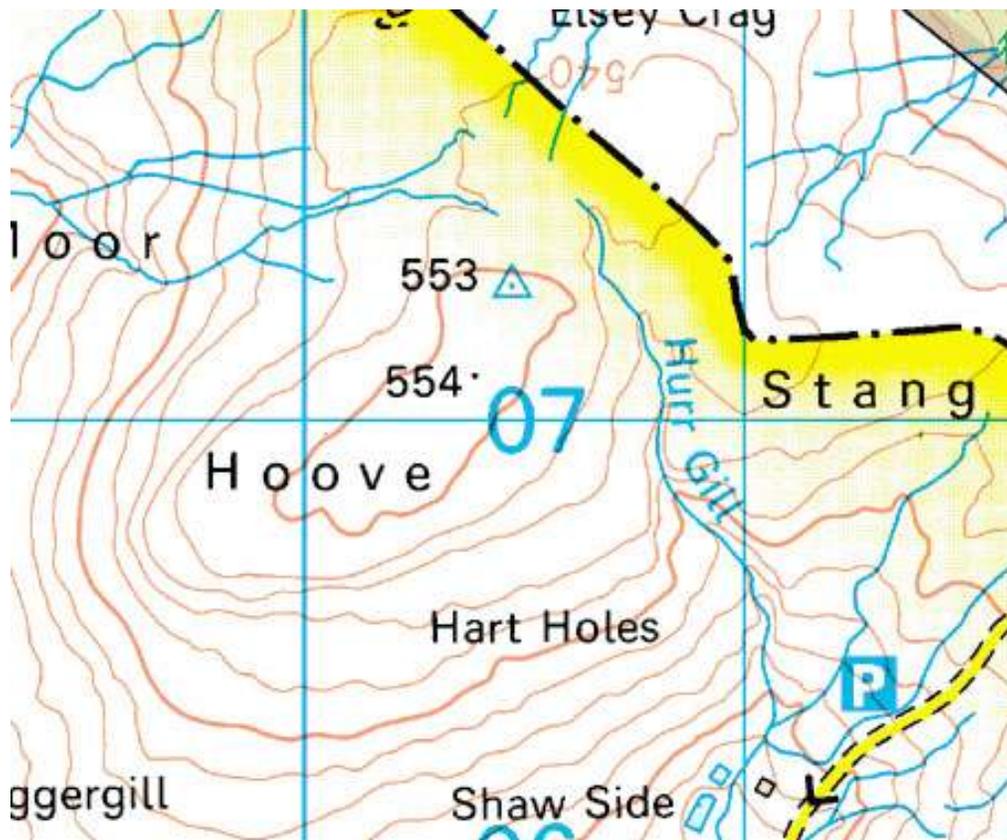
06 February 2014

The Team:

John Barnard, Jim Bloomer, Chris Crocker, Simon Edwardes, George Gradwell and Graham Jackson

## 1) Introduction

Hoove (Hill 2773, Section 35A, OS 1:50000 Map 92, OS 1:25000 Map 30N, current Grid Ref NZ003070) is listed as one of Michael Dewey's 500m hills and as a Marilyn. The OS 1:50k map, shown below, gives a spot height of 554m about 200m South West of a trig point with a height of 553m. The summit area is extensive and a number of those who have climbed this hill have commented that the position of the summit is not clear. It also has not been possible to identify its position with an Abney Level but some observations have suggested that the highest point may be further to the South West. The purpose of this survey is to locate the summit position and then measure its height relative to the Flush Bracket on the trig pillar.



## **2) Equipment used and Conditions for Survey**

The 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.

Conditions for the survey, which took place between 10.30hr and 13.00hr, were poor. Visibility through the level was reduced on occasions by the general greyness and showers of rain. It was quite cold, about 5 degrees Celsius, and the wind chill in the light breeze and general dampness in the air, made it feel colder. However the conditions did not prevent the survey from being carried out.

## **3) The Survey**

### **3.1) Character of Hill**

Hoove lies in the North East corner of the Yorkshire Dales National Park and is about 10km South South West of the small town of Barnard Castle. This area is dominated by grouse moors and most of the hills have wide tracks that lead to lines of shooting butts. Access to Hoove is easily obtained from the minor road that passes the hill on its eastern side. A car park is marked on the OS map and a track leads from there up the East side of Hurr Gill to the summit plateau. This whole area is covered with heather and tussock grass. It is also quite boggy, particularly with the current very wet winter, and during the survey drainage ditches were being constructed on the Northern side of the summit plateau. The trig pillar is the only significant feature in this uninteresting flat terrain.

### **3.2) Summit Survey**

The summit survey commenced near the trig point. The automatic level was set up on a tripod on lower ground and its height adjusted until it was level with the base of the trig point. A 360 degree visual scan through the level showed that ground to the South West was higher. The survey was continued by relocating the automatic level to a point about 150m to the South West of the trig pillar and taking systematic staff readings to find the highest point. The survey continued to the South West where the terrain was measured to be increasing slightly in height. The highest point, on featureless ground, was eventually located about 500m South West from the trig pillar.

A line survey was then carried out to measure the relative heights of the summit and Flush Bracket on the trig pillar. In addition a staff reading was taken on the point we had identified as corresponding to near the 554m spot height marked on the map so that its height could be measured relative to the Flush Bracket.

The line survey was carried using the standard procedure for this technique. The staff was held vertically at the summit position and the level set up in a convenient position towards the trig pillar. Once a reading had been taken (Backsights BS) the staff was then moved to the opposite side of the level, but the level not moved apart from a rotation through 180 degrees to take another reading (Foresights FS). This process of alternately moving the staff and level was repeated three times until the final reading was taken with the staff on the Flush Bracket position. Readings were only taken from the horizontal line and not the lower and upper stadia lines, as ultimate accuracy was not deemed necessary. The measurements are tabulated in Appendix 1.

The following ten-figure grid references were taken:-

**Summit:-**

Garmin Montana 600	NZ 00182 06914	Height = 555m
Garmin Etrex 20	NZ 00181 06914	Height = 558m
Garmin Oregon 450	NZ 00179 06912	Height = 561m

**Trig Pillar:-**

Garmin Montana 600	NZ 00455 07308	Height = 555m
Garmin Etrex 20	NZ 00455 07304	Height = 555m
Garmin Oregon 450	NZ 00456 07305	Height = 555m

**554m Spot Height:-**

Garmin GPSMap CSX	NZ 00405 07137
-------------------	----------------

The OS database lists the Order 2 (Orders 1 and 2 are the most accurate) Flush Bracket height on the trig pillar as 553.516m

Using the Flush Bracket height as the datum the following heights were calculated:-

Summit height = 553.516 + 1.055 = 554.571 = 554.6m

Height of “554m spot height” = 554.571 – 0.800 = 553.771 = 553.8m

**4) Discussion of Results**

The largest error associated with the height of the summit is related to local uncertainty in the heather/tussock grass terrain and we would estimate this to be +/-0.15m. No absolute height measurements were made with GNSS receiver, but from our experience where we have measured the heights of Order 1 or 2 Flush Brackets on trig pillars, we would expect the accuracy of this height to be +/-0.05m. Therefore the overall measurement uncertainty in the height for the hill is +/-0.16m.

**5) Summary and Conclusions**

The **summit** of **Hoove** is at grid reference \* **NZ 00181 06913** and has no feature. It is approximately 500m SW of the trig pillar and its height is **554.6+/-0.16m**.

- NB average hand-held Garmin GNSS grids are quoted in the summary.

John Barnard and Graham Jackson 08 February 2014.

## Appendix 1

**Title:- Hoove**

**Date: 06 Feb 2014**

**Instrument:- Leica NA730**

Point Number	Horizontal Line		Height Difference metres
	Backsight R metres	Foresight F metres	
Summit Position to Flag 1	0.515	1.715	-1.200
Flag1 to Flag 2	0.992	1.383	-0.391
Flag 2 to Flush Bracket on trig pillar	0.992	0.456	0.536
			<b>-1.055</b>
Summit Position to Flag 1	0.515	1.715	-1.200
Flag 1 to "554m Spot height"	0.992	0.592	0.400
			<b>-0.800</b>