



**The Coal  
Authority**

## **Site Inspection Report**

### **Pen y Graig Arw Quarry, Ystalyfera**



**Client: Neath Port Talbot County Borough Council**

**Report prepared by: Darren Bryant**

**Principal Project Manager – The Coal Authority**

**Date: November 2017**

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## **1.0 Introduction**

The Coal Authority was instructed by Neath Port Talbot County Borough Council to undertake an inspection of Pen Y Graig Arw Quarry, Ystalyfera.

The purpose of the inspection was to provide an assessment of stability and to identify safety issues pertaining to the site.

The site was inspected by Darren Bryant and Robert Sullivan of the Coal Authority, accompanied by Paul Ransome and Nick Ellis of Neath Port Talbot County Borough Council on Monday 20<sup>th</sup> November 2017.

Weather conditions at the time of inspection comprised low cloud and heavy rain.

The inspection has taken account of features observable at the time of inspection, and may not characterise all aspects of the site due to restrictions on access for safety reasons and vegetation coverage. It is possible that evidence of ground movement may be present that could not be observed at the time of inspection.

## **2.0 Site Conditions**

The site comprises a disused quarry, within private ownership, located on the western slopes of the Swansea valley, above the village of Ystalyfera at NGR 275872E 208137N. It extends from an elevation of around 175m AOD at the eastern edge of the site to 200m AOD at the crest of the former high wall. The quarry floor is elevated at approximately 185m AOD, with local mounds of spoil rising to 195m AOD. The quarry occupies an area of approximately 200m x 100m. The site location is shown on Figure 1.

The topography includes a near vertical high wall along the north western boundary, with a partially infilled quarry floor. Numerous mounds of quarry spoil are situated within the site boundary.

The majority of the site is well vegetated with dense undergrowth and tree cover.

The eastern perimeter is defined by a near vertical cliff face, at the base of which is the recently failed landslide area at Panteg. Several spoil tips comprising quarry waste are located along the crest of this cliff face.

A drainage system comprising a series of manhole chambers and pipes (Photographs 13 to 18) is located at the approximate locations shown on Figure 10. This system is understood to have been installed during the 1950's / 1960's and is recorded in previous reports as the 'Penygraig System'. The drainage system is understood to collect surface water flows from the quarry area and also to convey minewater from recorded mine adits within the area.

Inspection of the British Geological Survey sheet (Figure 5) for the area indicates the strata at the site to comprise Llynfi Beds sandstones with interbedded siltstones, dipping south at relatively shallow angles. The stratigraphic boundary of this sandstone unit is identified on the geological plan as being approximately at the base

of the cliff to the eastern boundary, at the general outcrop position of the Lower Pinchin coal seam. The strata below the sandstone unit are indicated as comprising un-differentiated sandstone and mudstone units.

The geological plan also indicates the site to be immediately adjacent a large area of landslip deposits.

### **3.0 History**

Inspection of historic Ordnance Survey plans dating from 1877 to present indicates the quarry to have developed from some time prior to 1877, being noted as 'disused' by 1961. The historic plans show the site to have developed to its current position by the early 19<sup>th</sup> Century, with very little obvious changes since.

A drainage system was installed around the perimeter of the quarry in the 1950's / 1960's as described in Section 2 above.

The site is currently utilised for rough grazing.

### **4.0 Observations**

Inspection on the 20<sup>th</sup> November 2017 began at the north-eastern boundary of the site, within the quarry floor, at the foot of the high wall. The inspection then took an anti-clockwise route through and around the quarry, followed by an inspection of the various spoil mounds present. The approximate route is shown on Figure 10.

Access was limited to accessible areas and generally along routes cut through the dense vegetation by NPTCBC staff (Photographs 7 and 8).

The quarry high wall is generally vertical, with the exposed strata comprising moderately weathered thin to thickly bedded sandstone units, with occasional subordinate siltstones (Photographs 1 to 6).

Occasional moderate groundwater seepages were observed from the face, generally at the interface of sandstone / siltstone units and at main joint sets. Several areas of loose overhanging blocks were observed, with occasional small rockfall areas noted (Photograph 6).

The high wall did not appear to have adequate fencing at the crest and no warning notices were present. Areas of fly tipping, comprising gas bottles, corrugated steel sheets and a burnt out car were observed within the quarry floor.

The inspection then followed a previously cleared route along the line of the drainage system. The drainage system appeared to be conveying water flows reasonably well although the chamber and pipes appeared visually to be in poor condition.

The inspection proceeded to the southern eastern perimeter, where a vertical cliff forms the site boundary. The spoil mounds in this area are in close proximity (<1m in places) to the cliff edge.

Numerous mature trees are located along the cliff edge. The root systems of these trees are likely to have penetrated the weathered bedrock and will likely destabilise the cliff edge in the future.

The inspection then viewed the various spoil mounds within the centre of the site. The mounds comprise quarry discard generally comprising flat sandstone within a matrix of finer material (Photographs 9 to 12).

The mounds are generally set at the maximum angle of repose, having been end tipped with little or no compaction. Where the spoil is un-vegetated, the materials appeared relatively loose.

There was no evidence of significant slope failures on any of the spoil mounds, with only localised scour and erosion, probably due to surface water erosion.

Localised areas of standing water were observed within the quarry floor (Photograph 19), suggesting that the drainage system is either not functioning or not present within this area. It is likely that water infiltrating the quarry floor will emerge at the base of the cliff to the eastern boundary, at the interface of the sandstone / mudstone strata and the position of the Lower Pinchin coal seam.

The inspection terminated within grazing fields to the north of the main quarry feature.

## **5.0 Consequences of Failure**

Localised spalling and surface erosion of the quarry waste mound sections adjacent the cliff edge may result in small amounts of spoil escaping over the cliff edge during extreme weather events. There was no visual evidence of significant spalling and erosion reaching the cliff edge, but the potential for this to occur presents a low to moderate risk. It is clear that in the past some quarry waste has spilled over the cliff edge, directly above the most recent (2012) Panteg landslide.

A significant failure of the eastern cliff edge would result in destabilising of the adjacent spoil mounds, leading to collapse and deposition onto the plateau area at the base of the cliff. Such a failure would surcharge the existing landside and would likely cause further downslope movement. Based on a visual assessment this scenario is considered to present a low to medium risk under current conditions. Due to access restrictions and dense vegetation cover, it was not possible to inspect the condition of the interface of the cliff base and head of the Panteg landslide.

## **6.0 Recommendations**

It is recommended that a further inspection is undertaken when additional targeted vegetation clearance has been undertaken, in order to assess any unidentified areas of instability which could affect the quarry site.

The quarry location is in very close proximity to a recorded landslide. Although there is no obvious visual evidence of active landslide activity affecting the site at present, it

is recommended that the site should be inspected on an annual basis to monitor conditions and should also be visited following reports of instability in the general area.

The condition of the surface water drainage system should be investigated. Dye testing could be utilised to determine flow routes and the ultimate discharge location.

Under ideal conditions a CCTV survey of the drainage system should be carried out, however, access restrictions may preclude this exercise.

Loose and missing manhole covers should be replaced.

It is suggested that if the existing drainage system has sufficient capacity, it could be extended to capture areas of ponding within the quarry floor.

The drainage system final discharge location should be located to assess the condition of the ground in the vicinity and to determine whether surface water flows are entering the area at the head of the Panteg landslide.

Selective removal of trees along the cliff edge may reduce the risk of instability along the cliff edge. The opinion of a specialist tree surgeon should be sought as access to the cliff edge presents a significant risk to operatives.

Edge protection fencing and warning signs should be placed along the quarry high wall, and warning signs should be placed at the head of the Panteg landslide to warn the general public of the risk from falling rocks.

# **Appendices**

**Figures**

**Photographs**

Figure 1 – Site Location

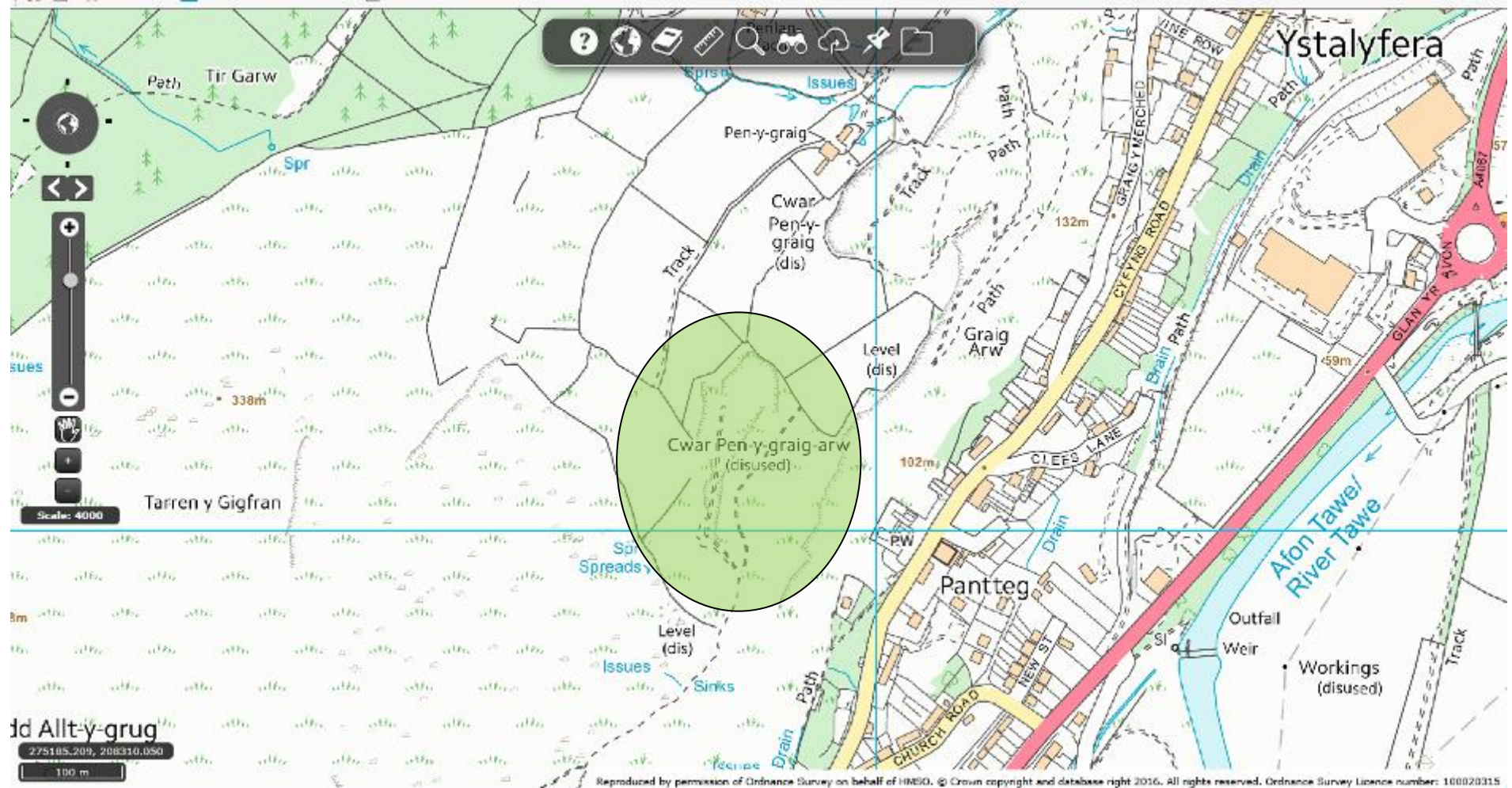




Figure 2 – Google Earth Image



Figure 3 – Contour Plan

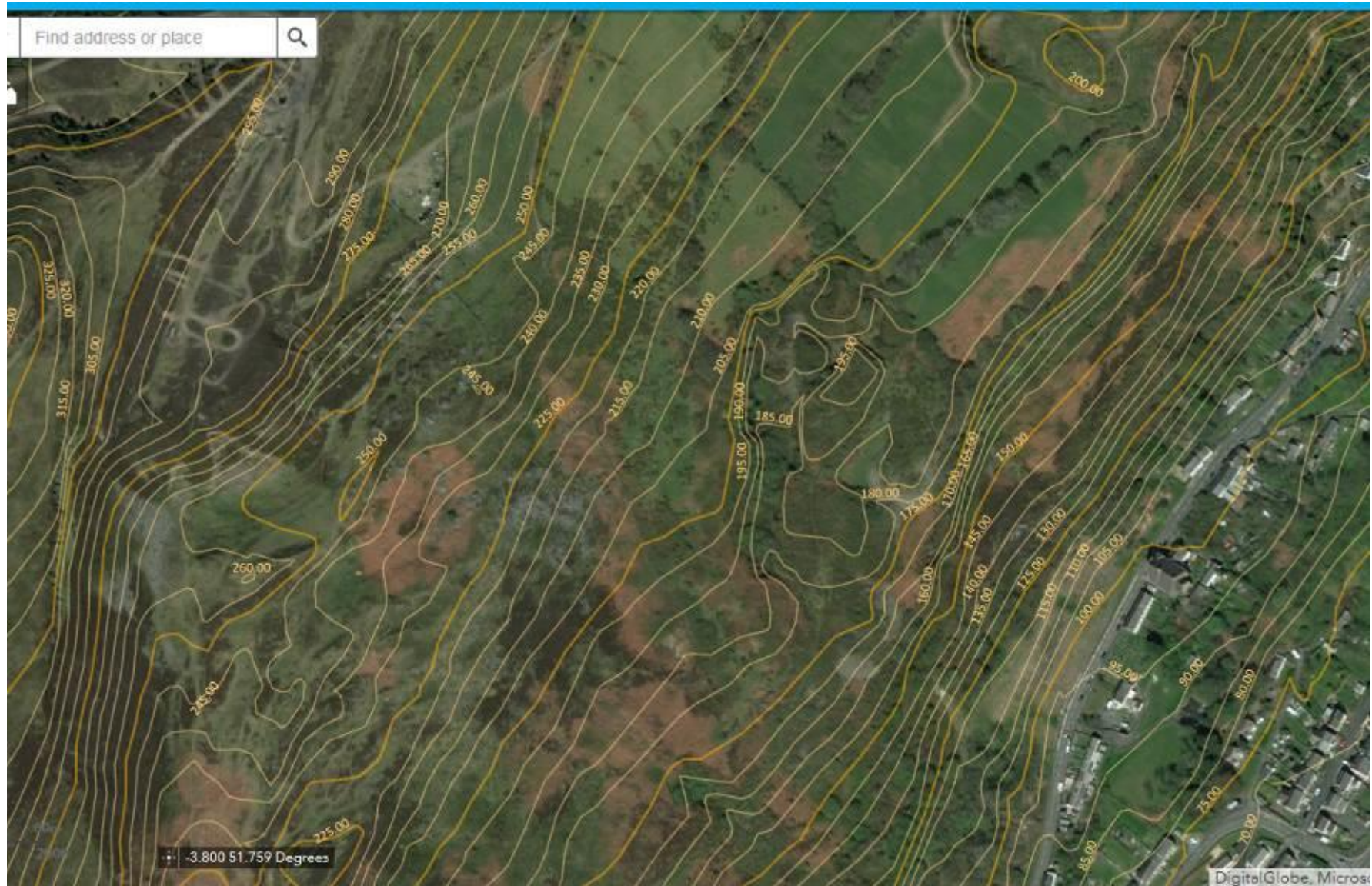
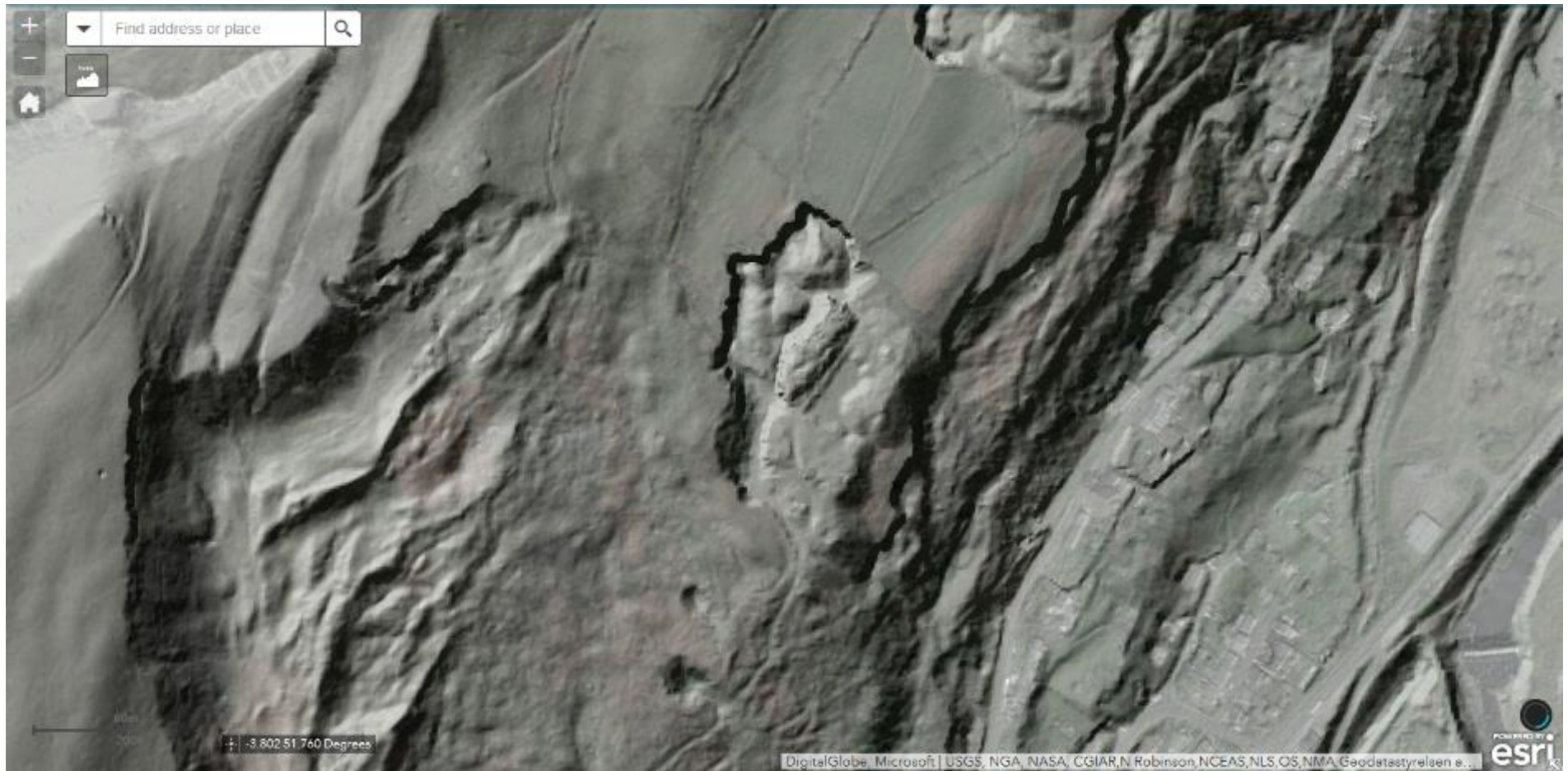


Figure 4 – LIDAR Relief Map



**Figure 5 – Geological Plan**



Figure 6 – 1877 Ordnance Survey (www.old-maps.co.uk)



Figure 7 – 1889 Ordnance Survey (www.old-maps.co.uk)

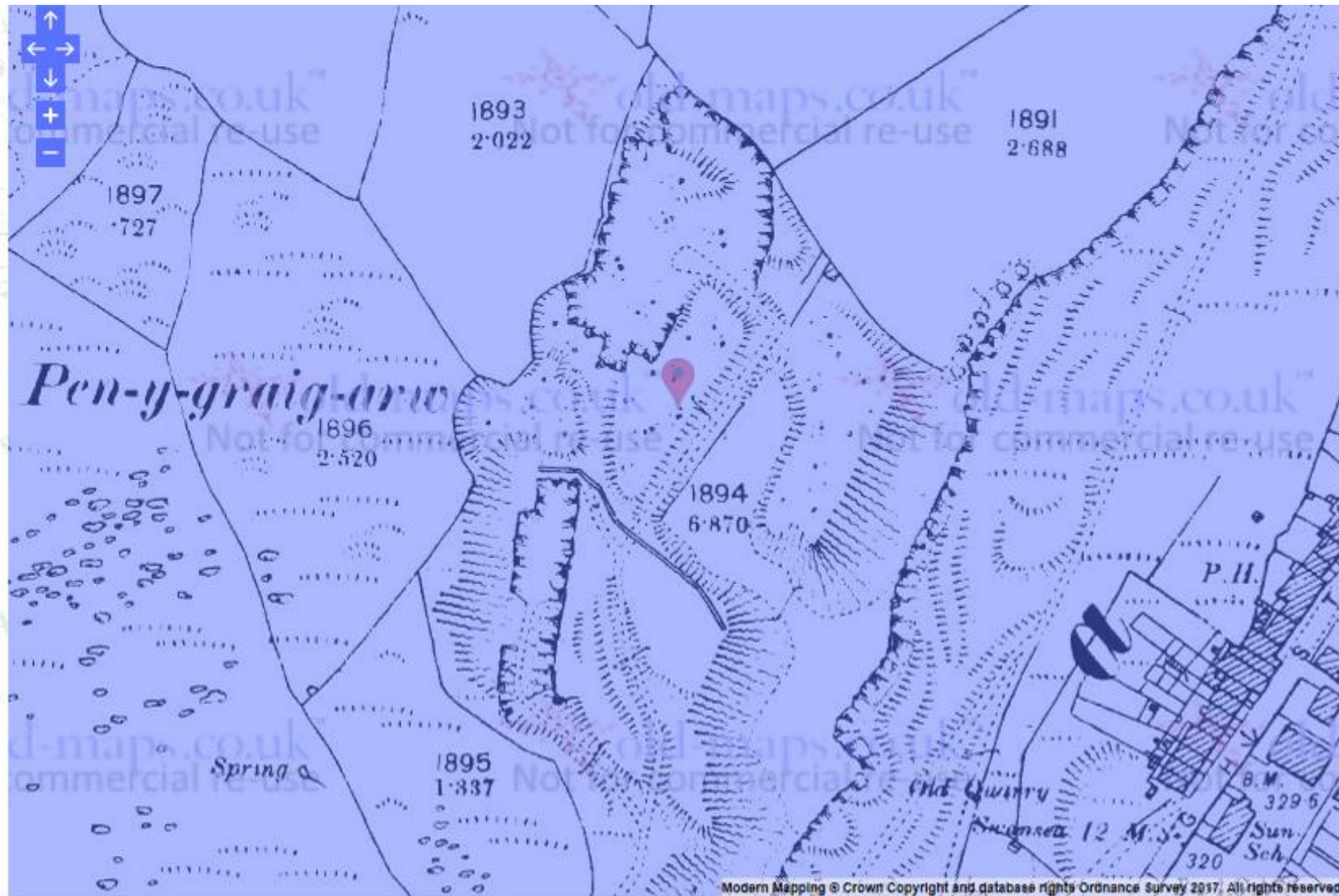


Figure 8 – 1918 Ordnance Survey (partial) ([www.old-maps.co.uk](http://www.old-maps.co.uk))

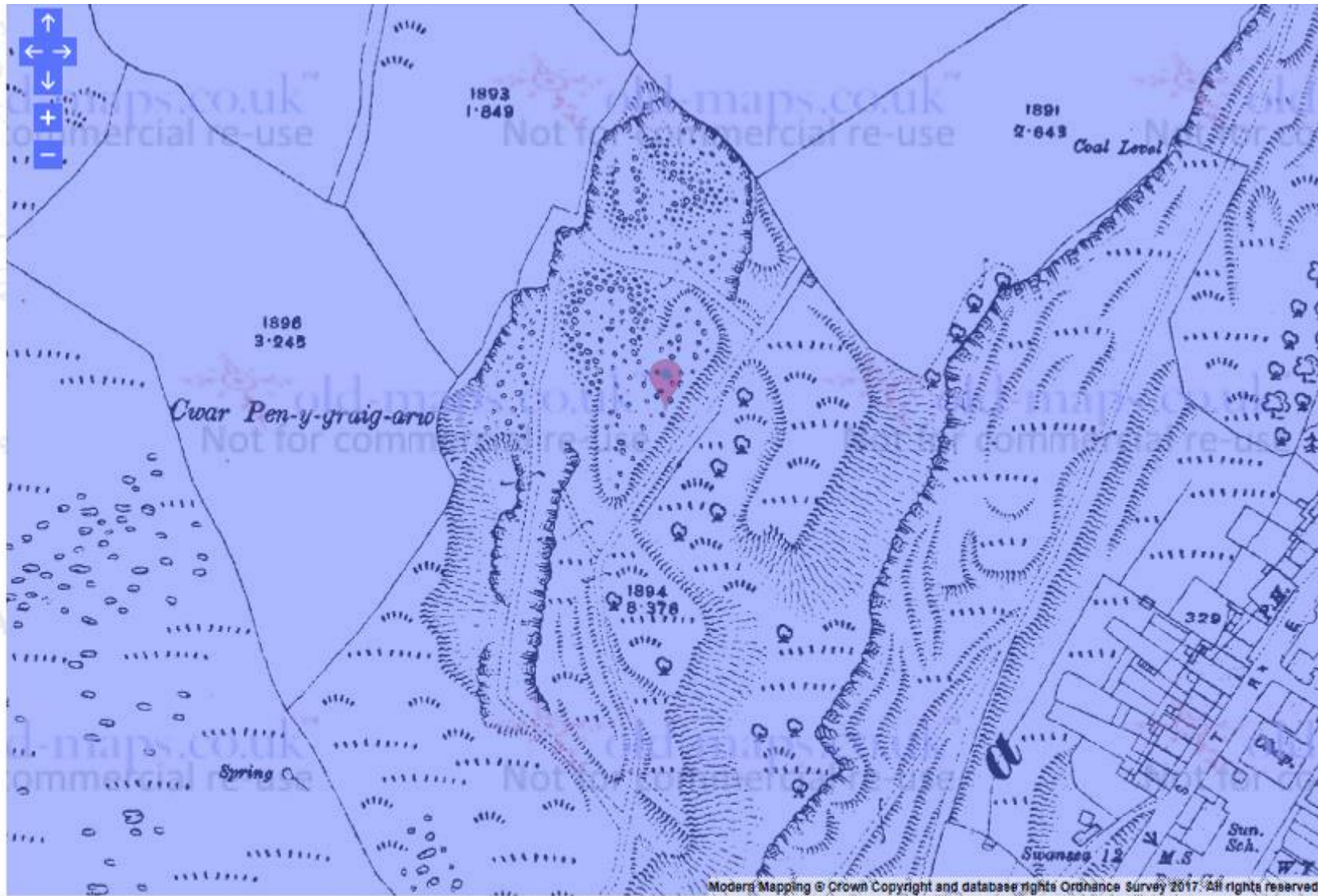


Figure 9 – 1961 Ordnance Survey (www.old-maps.co.uk)

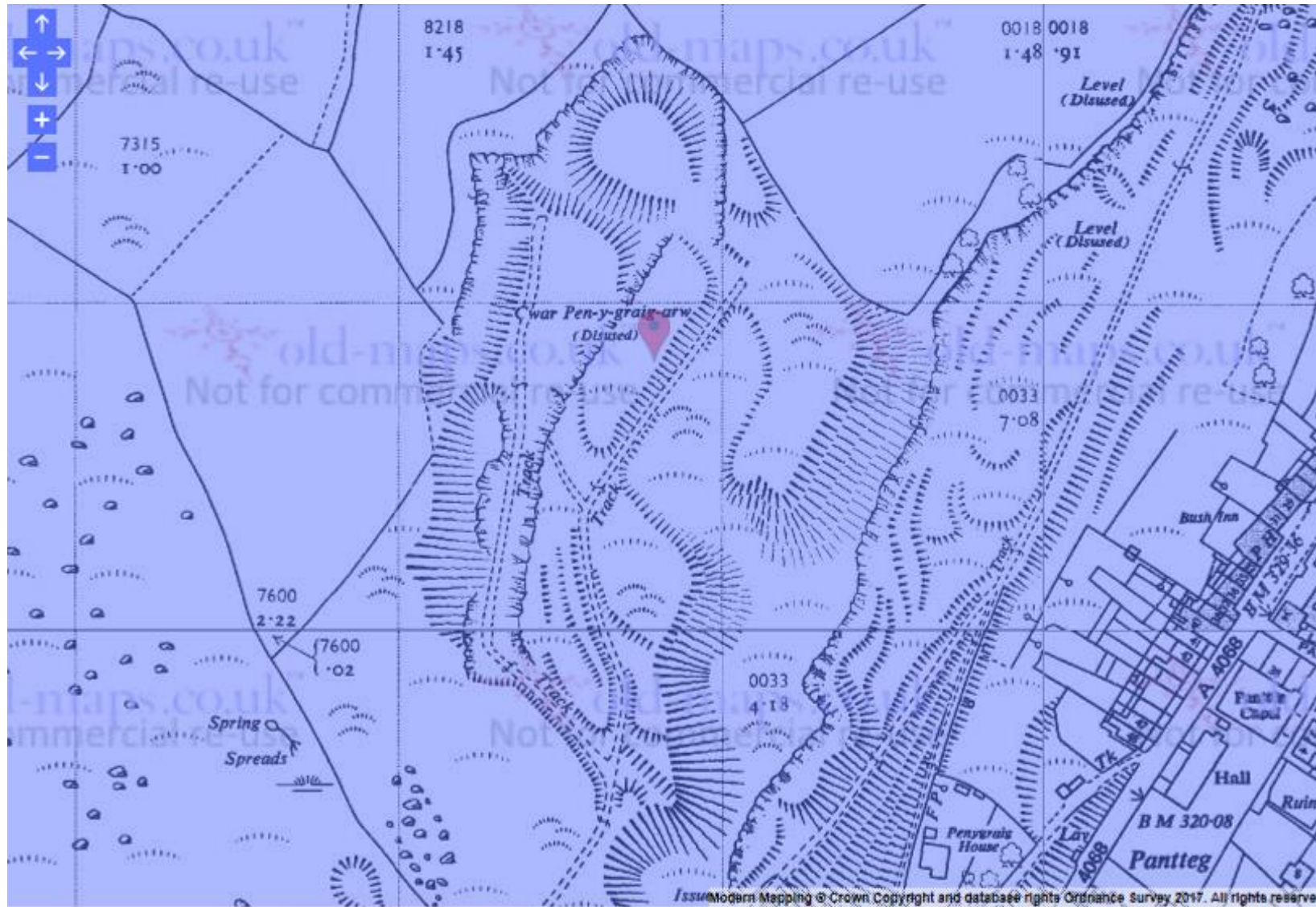
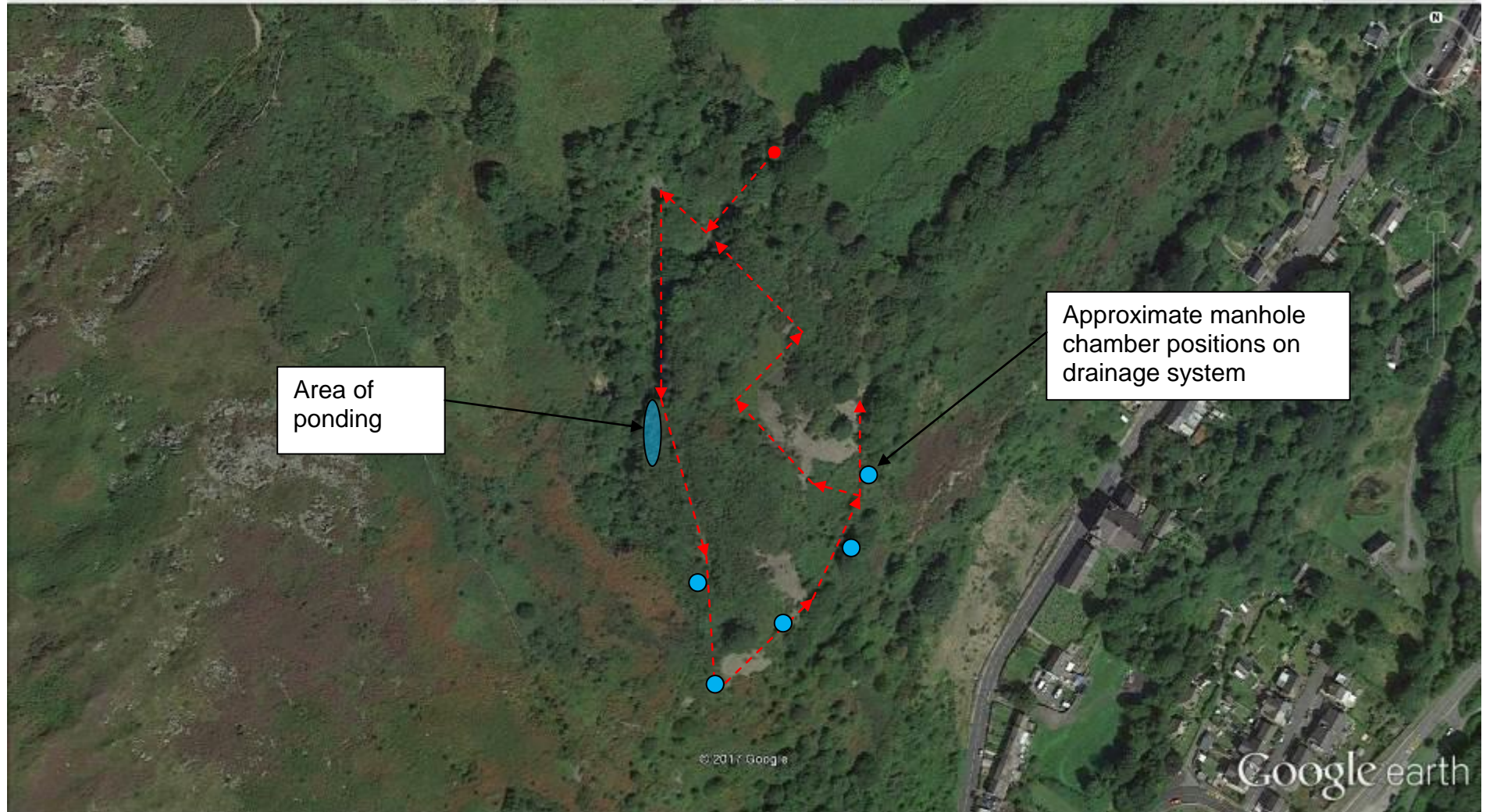




Figure 10 – Inspection Route and Key Locations





**Photograph 1 – Quarry high wall location**



**Photograph 2 – Quarry high wall location**



**Photograph 3 – Quarry high wall location**



**Photograph 4 – Quarry high wall location**



**Photograph 5 – Quarry high wall location**



**Photograph 6 – Quarry high wall showing overhanging block and trees**



**Photograph 7 – Typical view of vegetation cover**



**Photograph 8 – Access tracks cut through vegetation**



**Photograph 9 – Quarry waste tip**



**Photograph 10 – Quarry waste tip**



**Photograph 11 – Quarry waste toe at crest of cliff**



**Photograph 12 – Quarry waste toe at crest of cliff**



**Photograph 13 – Manhole chamber along footpath**



**Photograph 14 – Internal view of manhole chamber**





**Photograph 15 – Manhole chamber along footpath**



**Photograph 16 – Internal view of manhole chamber**



**Photograph 17 – Manhole chamber along footpath**



**Photograph 18 – Internal view of manhole chamber**



**Photograph 19 – Area of ponding within quarry floor**



**Photograph 20 – View of Panteg landslip with quarry beyond crest**