Survey Commissioned

by

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Fieldwork

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Blaenau Ffestiniog Downhill Cycle Tracks Watching Brief

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NGR

Centred on: SH 70100 47850

Location and Topography (Figures 1 and 2)

The downhill cycle tracks use the height of Cribau, to the north of Blaenau Ffestiniog as a launching area for four downhill cycle tracks. Two of these start on the main peak of Cribau at about 483 m OD, whilst the other two start at a minor peak of slightly to the north at about 470 m OD. All of the routes end in the car park of the Llechwedd Slate Caverns at about 260 m OD. Three of the routes are on the eastern faces of Cribau, whilst one route follows the much steeper southern flanks. Each of these downhill tracks is approximately 1.0 – 1.5 m wide. As part of the construction it was also necessary to build a temporary route from Llechwedd Quarry at SH 69993 47141 to near the dis-used farmstead of Cribau at SH 70032 47323. A second access track was also built along the western side of The Lodge from the Llechwedd car park to the end of one of the downhill tracks at SH 69726 47602.

A short "jumps" track was also constructed within rough ground between the car park for the Llechwedd Slate Quarry and the A470. This was within an area which had already been disturbed by the dumping of slate waste. A Visitors Centre was also constructed in the car park adjacent to the Jumps Track.

A much larger road had to been constructed on the western flanks of Cribau to provide vehicle access to the top of the mountain. This leaves the A 470 at SH 69887 48445, adjacent to "Boot Hill" (PRN 14626). It then crosses the relatively flat, boggy area of Ffridd y Blwch before snaking up the western flanks of Cribau. A small access track was also made linking the two peaks of Cribau, thereby giving access to the start of two of the downhill routes.

Archaeological Background

Engineering Archaeological Services Ltd and Govannon Consultancy were commissioned to carry out a pre-construction assessment (Gwyn *et al* 2009) of the Llechwedd Downhill Scheme and three other routes. This consisted of a desktop study followed by a walkover survey of the routes then proposed. This assessment took place in December 2008 locating 57 features of archaeological interest. The proposed routes, however, bear little resemblance to those which were constructed.

Between 2008 and 2012 all of the routes were re-designed, indeed many of the downhill routes were only finally designed as part of the construction process. Of particular note is the re-design of the up-lift route. Originally this was supposed to follow the western side of Cribau from the near to the road access to the Llechwedd car park, crossing open ground, however the re-route linked to the A470 near to "Boot Hill" providing a much shorter route to the top of the mountain.

SUMMARY

The construction of the Downhill Cycle tracks was carefully planned so that its impact on the archaeological record was as slight as possible. Inevitably, however, some archaeological features were encountered, particularly along the southern side of the development area. The emergency works associated with the up-lift road resulted in the commission of a palaeo-environmental study of the peat deposits on Ffridd y Blwch from which an outline of human activity and environmental development from the Late Mesolithic can be determined.

A chronological summary of the finding of both the environmental and the archaeological studies is shown below.

Period	Date	Summary
Late Mesolithic	4728-4548 BC	Open water surrounded by forests dominated by oak, birch and pine. Ponds fringed by grasses and sedges with willow and alder. The presence of charcoal possible suggests a level of human presence in the area, possibly manipulating the landscape to improve hunting opportunities.
Post Mesolithic Prehistoric		Humanly struck flake of quartz, possibly Late Neolithic/Early Bronze age in date. Possible mound adjacent to Boot Hill
Neolithic to Early Bronze Age	2900–1550 BC	Wooded environment with the development of alder car on in-filled ponds. At about 2866 – 2500 BC significant burnt layer probably initiated by humans to clear the ground for pasture or cultivation. Beginning of acidification of the uplands
Late Bronze Age		Open landscape developing, possibly for pastoralism. Mosaic of grassland and heather with isolated specimens of birch and oak, small patches of alder. Likely that cereal crops being grown in the general area. Acidification of uplands continues, partly because of climate change. Charcoal in the column possibly associated with the burning of heather for grazing. Holly appears in pollen spectrum.
Iron Age/Romano-British		Woodland regeneration, expansion of hazel scrub and heather
?Roman		Roofing slate found, but from hard standing around gate to uplift road probably imported onto the site.
Early Medieval		Resurgence of activity, burning to clear areas. Intensification of pastoral activity
Later medieval/post medieval		Heather/sedge predominates
Later medieval/post medieval		Possible platform at sheepfold site and a platform at SH 70238 47815 possible hafod type activity Possible plough marks
18th/19th centuries		Development of Cribau farmstead and associated agricultural features.
19th century		Waste from quarrying waste sealed by further peat development. Peat cutting took place on regenerated peat.

Period	Date	Summary
19th century/20th century		Tai'r Frest and other structures along southern edge constructed. Hugh Richards, the "oldest Quarryman in Blaenau" lived at Tai'r Frest. Presence of at least three rock cannons. Development of quarrying and underground works. Rock quarrying and possible incline Re-use of iron rails from tramways Drainage on the mountain and peat cutting Field drains in field Garden associated with Plas-y-waenydd
End of Second World War		Boot Hill

Methodology

The works were commissioned by Antur ‘Stiniog with Captia Symonds acting as the consultants for the project. The project was divided into three main contracts, the uplift route, the downhill routes and the construction of a visitor centre within the Llechwedd car park

Uplift Route

The position of the uplift route was finalised after the pre-construction assessment had taken place. It final route bore no similarity to that investigated. It was therefore necessary to walk the proposed route prior to its construction, which resulted in minor re-routing in order to protect two features noted (see below).

A road way, approximately 5 m wide, was constructed by G.H James Cŷf from an existing gateway onto the A470 to the top of Cribau where a turning circle was constructed. The route was stripped with a mechanical excavator using a smooth faced ditching bucket. Originally it was intended that the relatively flat area across Ffridd y Bwlch was only to be stripped for the first 100 m from the gateway, however the ground proved to be soft, so peaty soils removed across the whole of route. By chainage 187m the route started to climb the steeper slopes of Cribau requiring the route to be terraced into the hillside. Even during construction the route of the road was adapted to local conditions, particularly above one of the adits cut into the western slope of Cribau it was necessary to move the route from that planned giving the adit a wider berth.

Severe weather in early December 2012 required emergency works to be carried out to deal with the excessive rain. Two new drains were dug, together with a series of large settling ponds in order to protect the quality of the water supplying Llyn Ffridd-y-bwlch. One of these drains was dug from approximately half way up the north western slope of Cribau towards the north east for approximately 45 m. The north western end of this drain clipped the base of a slate tip, narrowly missing a temporary structure or *gwall*. The second drain crossed Ffridd y Blwlch near to the foot of Cribau. The drain ran for approximately 100 m cutting significant peat deposits. The works for both these drains and the settling ponds was undertaken as emergency works with the archaeologist not informed until after the works had been carried out. As mitigation for the above works Antur ‘Stiniog agreed to fund the palaeoenvironmental investigation of the peat deposits disturbed by the works (See Grant below)

Downhill Routes

The Downhill Routes were constructed by Xtreme Track based on a design by Architrail. Although the basic concept of the routes were planned before construction started, in practice much of the detail design was done on an *ad hoc* basis taking account of local detailed topology. One of the proposed routes was abandoned early in the construction programme, because of practical and archaeological issues, requiring a new section of the route to be designed. A methodology was developed where the routes were pegged by Architrail and then were then walked by archaeologist and any necessary adjustments then made through discussion. Further changes were made as a result of discussions between the contractors and the archaeologist. All of the modifications were subject to archaeological approval. The good working relations, particularly between Xtreme Track (the contractors) and the archaeologist, meant that minor changes could be made to the route during construction, if archaeological features were uncovered, thus in practice much of the final routing was done by discussion between the contractor and the archaeologist.

Four routes were constructed together with two haul roads in order to give access to the routes for stone supplies, a linking route between the two peaks of Cribau, a linking route through

the woodland above Plas-y-waenydd and a jumps practice track within the Llechwedd car park.

Each of the tracks was constructed in a similar manor, a trench was dug down to the subsoil level. If this was on a side slope it was necessary that this trench was terraced into the hillside. The trench was then filled either with crushed stone or more commonly with clayey material dug from a series of temporary pits dug along the line of the routes. These pits were back filled with the material removed from the initial digging of the trench. Where archaeological features were crossed by the proposed route (mainly dry stone walls) no pits were dug closer than 5 m of the feature. The feature was also covered by a layer of semi-permeable geo-textile, before being covered by additional materials. The features were further protected by placing large stone blocks on or around the features on top of track protecting the underlying features from the erosive effects of the cycle tracks.

Survey Results

Both the Uplift and the Downhill routes were subjected to an intermittent watching brief. The first 270 m of the Uplift Route, however, was across the relatively flat ground of Ffridd y Bwlch (Plate 1) and was therefore the subject of a more intensive watching brief with a continuous archaeological presence.

Uplift Route

No anthropogenic deposits or features were locate during the ground works associated with the construction of the Uplift Route. The only artefact recovered was a stone roof tile (Plate 2), however this was within a dump of stone debris in the gateway and is therefore not *in situ*. The character of this roof tile is similar to Roman roof slates found at Tremadog (Jones *pers. comm*.) (http://www.flickr.com/photos/63164772@N05/sets/72157626825044834/)

The initial stages of the uplift route were planned to miss a number of features near to the access gateway. Probably the most important of these was Esgidiau Meirw or “Boot Hill” (PRN 14626), a low mound the top layer of which is characterised by boot fragments consisting of heel plates, eyelets, nails, screws, sole shanks and occasional sole plates (Plate 3). The boots are rejects from a factory that was set up in Blaenau Market Hall to recycle old boots and shoes for the army in the Second World War (Hopewell 2005, 18)

Adjacent to this site at SH 69900 48416 is an elongated earthen mound (Plate 4). Standing up to 2 m high this mound is approximately 16 m long and 13 m wide and whilst it may be natural it has some of the characteristics of a prehistoric burial mound. There are three adits cut into the lower western slopes of Cribau (PRN 30197 and 14781) which were recorded as part of the pre-construction survey (Gwyn *et al* 2009). The uplift route was designed to miss these features by running above them. The most northerly of these adits, however, (PRN 30197) was partly backfilled by spoil tipping over the edge of the uplift route despite the contractors having been warned as to the presence of the adit and requested not to damage the site. It was not possible to remove the quantity of spoil from the adit without causing further significant damage and thus this spoil was left partially filling the entrance passage of the adit (Plate 5)

A marked feature of the uplift route were the peaty soils encountered over much of the route. Over the relatively flat ground of Ffridd y Blwch the depth of peat varied considerably suggesting that there are a series of peat filled basins which occupy this area. The stripping during the construction suggested that the peat varied in thickness between 0.3 and 1.0 m. A common factor was the presence of large plant macro fossils towards the base of the peat representing a series of tree root plates and fallen timber (Plates 6 and 7). Where it was

possible to identify this material it was noted that there was a preponderance of silver birch fragments. The peat appears to be filling a series of shallow hollows along the route of the uplift road. The first of these is centred on SH 69888 48394, reaching a maximum depth of 0.75 m and spreading for approximately 100 m along the route (Figure 3). Although organic rich soil was encountered between this and the next hollow is was only approximately 300 mm thick. The second hollow was centred on SH 69991 48370 reaching a depth of at least 1 m and spreading over a 38 m length of the route. The greater depth and relatively narrow profile might suggest this may be a choked channel rather than a hollow.

These peat filled hollows appear to be on the edge of a much broader spread of peat. The digging of the emergency drain across the base of the slope revealed a peat deposit which is the subject of the palaeoenvironmental study (Grant, this report).

Further deposits of peat were discovered on a slight shelf on the western slopes of Cribau. Between SH 70052 47884 and SH 70048 47828 a deposit of peat up to 1.2 m thick was recorded with it maximum depth at SH 70052 47878 (Plate 8), although it maintained a depth of approximately 0.9 m for at least 57 m of the route. Once again, although the bulk of the peat was fairly amorphous in character, towards its base there were fragments of wood preserved which, where the bark was preserved proved to be of silver birch.

A shallow peat deposit was also noted on the top of Cribau within the turning circle of the Uplift route. This was only between 300 and 400 mm thick. No wood fragments were recorded within this peat.

The emergency works carried out in early December 2011 consisted of two drainage channels dug off the corridor of the Uplift Route and a series of soak away pits designed to control the excessive rain which was encountered and protect Llyn Ffridd-y-bwlch from an influx of dirt water entering this lake which is used as a fishing facility. The drain which ran along the base of the western slopes of Cribau (Plate 9) cut through considerable peat deposits (Plate 10). The drain was approximately 100 m long, 2 – 3 m wide and up to 1 m deep. This drain was dug without notifying the archaeologist, however it would appear that the stratigraphy within the peat consisted of a layer of amorphous peat, approximately 500 mm thick over a layer of clean, grey, clay approximately 300 mm thick which in turn sealed more peat which contained visible plant macrofossils in the form of large fragments of wood. This damage resulted in a mitigation strategy being devised which required the palaeoenvironmental study of these deposits (See Grant below).

A second emergency drain ran about halfway up the western slopes of Cribau and was designed to divert water before it swamped Uplift road into the drainage system which was being built as part of the scheme. It ran for approximately 43 m and was 500 mm wide, varying in depth between 300 and 500 mm. At its northern end, unfortunately it cut through the tail of the spoil heaps associated with the adit (PRN 30198) which had been recorded in the pre-construction phase of the project (Plate 11).

Downhill Routes

The works associated with construction of the downhill routes can be conveniently divided into a number of elements. Two haul road were constructed in order to facilitate the importation of materials to the lower portions of the routes, access to the upper levels was via the uplift route. A linking route was also constructed, joining the lower levels of routes to the Llechwedd car park was also built through the woodland to the north east of Plas-waenydd. One of the proposed routes was abandoned early in the construction phase, however this route was walked in order to define its archaeological potential.

Abandoned Route.

A proposed section of one of the routes (Figure 4) was abandoned early in the construction process, partly because of the number of archaeological issues it generated, but also because of practical problems with the construction of this route. The abandoned section ran, from near the abandoned farmstead of Cribau, down slope before cutting back along the slope towards the field to the north west of Plas-waenydd.

Adjacent to the proposed route at SH 70018 47286 the remains of an abandoned fence line (Plate 12) was recorded. This consisted of a series of upright slate slabs 180 x 700 mm in size between sections of "T" shaped rail standing up to 0.95 m above the ground. It formed an "L" shaped boundary between two natural rocks and may be related to a section of rail lying on an outcrop of rock, only 20m to the NE, at SH 70037 47291 (Plate 13). Each of the corner posts of the fence were iron bars 70 x 30 mm in size standing to a height of 0.8 m

The route then dropped onto a pre-existing path which crossed the hillside (Plate 14). The proposed route followed this path between SH 69970 472887 and SH 69945 47315, a distance of approximately 34 m. The path is up to 1.2 m wide and is partly terraced into the hillside with marked stone revetting on its lower edge. It is cut into the hillside by up to 1 m and has dry stone revetting on its lower side of a similar height. The path is surfaced with slate slabs up to 1 x 0.6 m in size over much of its length (Plate 14), although it has collapsed in places. It passes through a gateway marked by upright iron posts, one of which is a re-used "T" shaped rail and the other an iron bar 70 x 20 mm in section. The path appears on the First Edition Ordnance survey map (Merionethshire IV.5) (Figure 5) where it runs south east from row of cottages called Tai'r Frest. The path is still in use on the 1900 map of the area, however it has been blocked by spoil from an adit (PRN 30214) by 1918. This blocking can be seen at SH 69944 47319 where a dry stone wall supports the tail of the spoil heap (Plate 15). It is possible that this wall was an attempt to maintain the footpath, by restricting the spread of the spoil heap. This proved to be short lived as by 1918 the path was already blocked.

After following the old footpath for approximately 34 m, the route dropped onto the spoil heap for an adit which first appears on the 1900 Ordnance Survey Map (Figure 5). This adit later became the "hidden waterfall" and by 1918 and was used as one of the main drains for the underground workings. The surface of the spoil heap has remains of at least three tramlines (Plate 16) which were used to transport the spoil from the adit to the tip. This spoil heap must have been very short lived as it does not appear on the historic mapping until 1900, however the spoil from the adit (PRN 30214) had already lapped over the top by 1918.

Haul Roads (Figure 6)

Two haul roads were built in order to facilitate the construction of the lower portions of the downhill routes. One of the "roads" ran from an access road to Llechwedd Quarry at SH 69993 47141 to link in with the downhill routes near to the Cribau farm complex at SH 70026 47291. The other linked the western end of the Llechwedd car park at SH 69750 47291 to a footpath running past the Tai'r Frest complex at SH 69796 47501. This second road ran to the west of the walled garden attached to The Lodge before crossing the field to the north of the walled garden. This section through the field was later modified and became part of the downhill routes.

The only archaeological feature recorded on the southern haul road was a dry stone wall at SH 69997 47152. This feature separated the quarry area from the open *ffridd*. Rather tumbled in character (Plate 17) the haul road was placed so that it passed through a section of the wall which was already collapsed. The northern end of this haul road passes between the slate fence and the iron rail on top of a rock outcrop described above. This end of the haul road was

originally intended to take a much straighter route, however this would have crossed the Cribau farm complex, thus a new route was negotiated with the contractor.

The northern haul road followed the existing access road to "The Lodge", before extending this road along the western side of the walled garden. Where the haul road crossed the open field to the north west of the walled garden a number of stone built stone drains were encountered. These will be described below.

Linking Routes (Figure 7)

A linking route was constructed through the woodland to the north of Plas-y-waenydd, whilst no archaeological features or deposits were directly affected, the route passed just to the north east of the walled garden attached to "The Lodge" (Plate 18). It was lucky that part of the garden was cleared at the same time as the downhill cycle tracks were constructed and the removal of some of the trees in the woodland made the walled garden easier to see. The Garden was divided into two areas, an upper level on the northern side and a lower garden to the south. Within the northern area there appears to be the remains of a series of buildings, although these were not further investigated as they were outside the area of the development.

A second linking route was constructed between the two peaks of Cribau linking the turning circle for the up lift road to the beginning of the red and green routes. No archaeology was noted on this route.

Main Routes (Figure 8)

The four downhill routes were constructed, these are shown in Black, Blue, Red and Green on Figure 8. The Black and Blue Routes start on the southern peak of Cribau, whilst the Red and Green Routes start on the northern peak. The recorded archaeology concentrated along the southern side of Cribau between the disused farmstead of Cribau and the row of terraced houses called Tai'r Frest This pattern was noted in the pre-construction reports (Gwyn *et al* 2009) and was confirmed by the construction of the downhill routes. Features were recorded outside this corridor, however there was a marked concentration on the slopes overlooking the Llechwedd complex.

Linear Feature PRN 14688

High on the slopes of Cribau between SH 70158 47863 and SH 70429 47823 a low earthen bank was recorded. This feature was first recorded in 2000 by D. Hopewell as part of the Upland Survey commissioned by the Royal Commission on the Ancient and Historic Monuments of Wales (http://www.cofiadurcahcymru.org.uk/arch/gat/english/gat_ interface.html) where it was given the PRN number 14688. The bank was also record in the pre-construction survey carried out for this project (Gwyn *et al* 2009). The bank was crossed by the Black, Red and Green routes, however, where the lower routes (Red and Green) crossed the bank it was possible to protect the bank by building the tracks over the feature and providing stone blocks on the track surfaces to prevent erosion (Plate 19). The bank generally consists of an earthen bank between 1.75 m and 2.65 m wide and up to 0.5 m high with a crude ditch running along its northern side (Figures 8 and 9). In parts along the western end the northern side of the bank is faced with large stone blocks which act as an informal revetment. Whilst the crossings of the Red and Green Routes were built up that for the Black Route was excavated in order to characterise the bank (Plate 20). The bank at this point is near to its western extent and was somewhat smaller than further down slope. The stratigraphy is shown on Figure 8 and the contexts summarised below:

1 Slightly clayey, humic soil with many roots of grass and coarse reedy vegetation. Rare small, angular stone, mostly slatey material. [Organic rich topsoil developing after the construction of the bank.]

2 Dumped layer of very pale grey and yellow clay mixed with mid brown slightly clayey humic soil. The layer contains the occasional rounded stone and rare fragment of slated material. Stones up to 70 mm in size. [Up cast from the "ditch" (Context 4)].

3 Very dark brown slightly clayey, humic soil with the rotted remains of fine roots. [Peat rich old soil profile from before the bank was built].

4 Marked cut in slight slope of natural forming a slight shelf, approximately 120 mm wide and 150 mm high. Siting on this shelf are a series of large stone boulders up to 50 x 300 x 100 mm in size forming a stone revetting for the bank.

5 Collapsed dump of large stone boulders, up to 250 x 20 x 100 mm in size in a matrix of mid brown slightly humic soil with many fine roots. [Collapse of stone revetting for the northern side of the bank].

6 Very compact, clayey pale grey layer with many very small (less than 10 mm) fragments of stone including local slatey material and pellets of local yellow and pale grey clay. Possibly water laid. [Water laid deposit forming in the base of the ditch].

The bank clearly has a preferred orientation with the revetment and ditch only on the northern side. It is possible that the bank itself is coincidental and that the ditch is the main feature. This would have drained an area of peat which exists to the west of the uplift road. It would also have acted as a major land division. The lower (eastern end) of the bank/ditch mergers with an area of significant erosion with deep cut flashes which eventually run into the Afon Barlwyd.

Possible Plough Marks

Close to point at which both the Red and Green Routes cross the bank (PRN 14688) two rocks were noted with marked grooves in their surfaces which appear to be the result of ploughing (Plates 21 and 22). The grooves on both of the blocks were parallel and between 20 and 35 mm apart. These would suggest that at least the area to the south of the bank was ploughed at some point, although the dating of this event is unknown. Also approximately 75 m WSW of the Red route crossing of the bank a rectangular platform was noted at SH 70238 47815 which appear to be the remains of a rectangular building (Plate 23)

Quartz Flake

A humanly struck quartz flake was found at SH 70015 47740 on the Black route. This is a tertiary flake 39.4 x 31.4 x 10.8 mm in size made on an opaque, white quartz which was probably derived from resources immediately available to the find site (Plate 24). The flake was found near to the western break of slope of the Cribau plateau and would appear to be a stray find as no feature or other artefacts were found in association with this flake. Dating stray lithic items is difficult if they are not associated with typologically distinct artefacts, however the size and form of this flake would suggest a possible post-Mesolithic (after 4400 BC, Lynch *et al* 2000, Fig. 2) date for this artefact.

Sheep Fold PRN 30236

Centred on SH 70263 47579 is a sheep fold previously recorded as PRN 30,236 as part of the preconstruction survey (Gwyn *et al* 2009) (Figure 11, Plate 25). The fold consist of a circular

enclosure, 10.6 m in diameter, which sits on a platform partly cut into the hillside, but largely built up along its south eastern side. Although not entirely clear it is possible that this platform pre-dates the standing stone walls and may be the position of a prehistoric circular platform. The circular enclosure, itself, appears to cut through an earlier, sub-rectangular, enclosure which was attached to a natural rock face to the north west. This enclosure was 12.85 m wide and extended from the rock face by 15.3 m. The Red Route runs alongside the natural rock face at this point crossing the remains of the earlier enclosure. Near to the rock face the remains of the enclosure walls were only one block high, thus it was possible to build the track up sealing the remains of the walls, thereby protecting the remains. The top soiling through this area revealed no new evidence for the use or dating of this feature, however, because of state of the local vegetation a new possible hut platform was located to the south west of the sheepfold. Centre on SH 70253 47563 this feature consisted of a platform 19 m long and 4.2 m wide, cut into the hillside at its north western end and slightly built up at the south eastern end. This feature was not directly affected by the construction process and the area of the possible hut platform was fenced off in order to protect it during construction. The relationship between the hut platform and the sheep fold is uncertain. It would seem unlikely that the circular enclosure is contemporary with the possible hut platform, however is possible that the earlier, sub rectangular enclosure and the hut platform may be contemporary. The platform below the circular enclosure is curious, whilst it might simply be part of the construction of the circular enclosure, the reason for the relatively flat platform for a relatively small, simple sheepfold is not clear. It is possible that a pre-existing platform was used, giving a relatively flat area within which to construct the sheepfold. It is therefore possible that the underlying platform may be a prehistoric circular hut platform.

Bridge

At SH 70166 47422, close to the point where the Red and Green Routes join a small stone bridge over a ditch was recorded (Plates 26 and 27). This consisted of two layers of large stone slabs, approximately 0.8 x 1.4 m in size supported by dry stone walling revetting on both sides of the ditch. The small size of this bridge would suggest that it carried a footpath, possibly related to the farmstead of Cribau which is only 115 m to the south west.

Slate Fence

Although now made of wire, the fence running between SH 70098 47527 and SH 70282 47601 was originally made of slate slabs. This fence line is crossed by both Blue and Red Routes. Near to the circular sheep fold (PRN 30236) a few slate fence slabs were recorded (Plate 28), however adjacent to the point where the Blue Route crosses the fence a dump of slate fence slabs was encountered (Plate 29) at SH 70136 47579. The slab were between 600 and 900 mm long, 70 and 120 mm wide and typically 10 mm thick. Many of the slabs have circular saw marks along their edges which suggest that they were cut after the invention of the Greaves saw in 1850 (W Jones *pers. comm.*). It is not certain whether this was a supply of slab, left on site to repair any damage to the fences line or, probably more likely, the result of replacement of the slate fence with wire.

Cribau area

The Cribau farmstead complex was recognised as an area of potential archaeological conflict during the pre-construction study (Gwyn *et al* 2009). The construction phase allowed for a topographic survey to be carried out of the surviving remains (Figure 12) and a fuller appreciation of the complex and its relationship to other features within the landscape. New features were also located which give further detail of this abandoned farmstead. Two routes pass through the complex (Red and Blue), both of which were to the west of the main building ranges.

The main building range (PRN 30,205), which forms the core of the complex, consists of a central, single storey, house with an extension to the north and a range of probable agricultural buildings to the south (Plate 30). The house was originally 13 x 6.6 m in size with its chimney on the northern gable end (Plate 31) and the only doorway in the eastern wall. It would appear that there were no, stone built internal divisions at this stage, however a dividing wall was added at a later stage dividing this range into two rooms. To this building an extension was added to the north (Plate 32) which was 5.3 x 5.2 m in size and had a well-appointed hearth in the northern gable wall. It also had its only doorway in the western wall. To the south of the original house a range of two buildings were added. It is assumed that these were agricultural in character, and were probably barns. All of the building were cut into the hillside, such that on the western side of the building the ground stood at eaves level. There is some evidence that the roof was deliberately stripped from the house at the end of its useful life with some of the slates (Plate 33) being carefully stacked behind the house.

The historic Ordnance Survey Maps (Figure 5) show that the building were in existence before 1888. Indeed it would appear that the decline of the complex had already started by that date as the First Edition Ordnance Survey map shows the northern section of the barn was already roofless. By 1900 the complex appears to have converted to only the domestic range with both of the barns being roofless and by 1918 the whole complex had lost its roofs

Another group of small buildings occur towards the north western end of the complex. These consist of three, small, buildings in two groups. (PRN 30,227 and PRN 30,226). To the north are two linked buildings (PRN 30,227) with the western building being 4.25 x 3.58 m in size and the eastern 2.80 x 3.95 m. These building would appear to be associated with a range of paddocks separating these animal shed from the house complex to the south west. The paddocks are partly terraced into the hillside and would appear to have an access route to the higher level alongside the wall PRN 30,230. At one point along this wall, where the paddock PRN 30,229 is terraced into the hillside, are three large stone blocks with a series of holes drilled into their surfaces (Figure 13, Plates 35 – 37). These appear to represent the position of a fence line and possible gateway between the paddocks.

The southern animal shed (PRN 30,226) sits on a revetted platform above a canalised, seasonal stream. It is 4.17 x 3.29 m in size with an open face to the south. The canalised stream is part of a system of artificial drainage designed to control the flow of natural drainage within the complex. There are a series of small drains feeding into the large canalised stream which runs from a deliberate gap in the boundary wall of the complex (PRN 30,203) towards the south west, before turning to the south east and passing under a small stone bridge (Plate 38). This bridge carries the extension of the track which passes in front of the main building range. The route of this track beyond the bridge is uncertain, but probably runs towards a gap in the boundary bank (PRN 30,224) to the north and east. There is a major boundary running approximately east – west to the north of the farm complex (PRN 30,203). This is crossed by both the Blue and Red Routes. The Red Route passed through a pre-existing gap where the wall had collapsed. The Blue Route, however, crossed the wall near to the point where it runs into the natural rock exposure, only the base of wall survived as series of large stone slabs 150.0 x 0.60 m x 0.14 m in size adjacent to the vertical rock face. It was also possibly associated to a stone wall incorporated into the rock face, slightly to the north. At the crossing point the wall was only 0.5 m height although elsewhere it reaches a height of 2.1m. Here it was necessary to build the track up so that it sealed the wall (Plates 39 and 40)

Below a slight overhang a “rock cannon” was located. This consists of a large stone block approximately 3.0 m long and 1.2 m wide with 12 holes drilled into its upper surface (Figure 14, Plate 41). The position of this rock cannon may be significant as the overhanging rock face would have acted as a sounding board increasing the effect of the cannon.

It is not certain whether the structure PRN 30216 (Figure 15) to the north and west of the Cribau Farmstead, at SH 70010 47344, was associated with the farm. Shown on the First Edition Ordnance Survey Map of 1888 as a roofed building with a series of attached boundaries, this building is roofless by the time that the 1900 Ordnance Survey map is produced. It proved impossible to move the Red Route to avoid this structure. The lower section of the structure (Plate 43) is largely collapsed except for the section which is revetted into the hillside. This would have been a small (4.3 x 4.0 m) building alongside the track to Cribau. This was cut into the hillside such that there was a platform, possibly a small paddock behind the building. The Red Route crossed this upper area (Plate 44) where the wall had collapsed. Once again an approach was adopted such that the track was built up over the remains of the wall and large stones were incorporated into the structure in order to protect the remains from erosion. Approximately 12.7 m to the north west the Red Route crossed a section of dry stone wall (Plate 45) which is runs parallel to the main structure PRN 30,216. There appears to be a deliberate gap in the wall which presumably marks the gate way into a small paddock between this wall and the main structure. The Red Route was constructed over this gate way, building the track up and over the remains, thereby sealing the wall.

Area below the footpath to Cribau

To the south and west of the track which leads from the A470 to the Cribau Farmstead complex a range of archaeological features were located and recorded. The historic Ordnance Survey maps (Figure 5) show the development of two levels and the changing alignment of two footpaths across this area.

The two footpaths run from the terrace of cottages known as Tai'r Frest to the south and east. The northern path runs directly south east and can be related to the footpath noted on the abandoned route (see above) which was later sealed by the tips from the adit PRN 30,214. Within the area below the track this footpath is well developed, being cut into the hillside and having a dry stone revetment along its southern side for much of its length, retaining its general character noted on the other side of the spoil heaps. This footpath was in existence prior to 1888 and was still complete in 1918, although by this time it crossed the tail of the spoil heaps from the adit PRN 30,214. This footpath was crossed by the Blue Route, however by positioning large boulders it was possible to protect the remains from further damage.

The southern footpath, was also crossed by the Blue Route, however this footpath had a different history. Although appearing on the 1888 Ordnance Survey map (Figure 5) by 1900 it was no longer a significant feature within the landscape. It ran from the terrace of Tai'r Fest to the woodland which formed part of the wider garden associated with Plas Weunydd and presumably formed a link between these two buildings. This footpath was less clear, as only a slight hollow could be followed for part of its length. This was in filled with a layer of geotextile between the hollow and the fill at the point it was crossed by the Red Route (Plate 47), however, where the Blue Route crossed the line of the footpath it was not possible to protect the remains, thus a section was cut and the remains described (Figure 17, Plate 46). The layers encountered are described below:

7 Very dark grey/brown, humic rich soil with many bracken roots. The layer contained many loosely packed stones up to 230 x 80 x 20 mm in size and the occasional fragment of 19th century pottery and handmade brick fragments. This layer merges with Context 9 to the east.

8 Yellow/brown clayey silt with some stones and bracken roots. [Disturbed top of natural].

9 Similar to Context 7, but with fewer stones. This layer merges with Context 7 to the west and seal the probable surface of the track (Context 10)

10 Large flat stone slab 0.66 m wide and 0.15 m thick probably forming the surface of the track.

This footpath was clearly a carefully constructed feature. It is curious that it linked Tai'r Frest directly to the grounds of Plas Weunydd, possibly suggesting a closer relationship between the two properties than would initially be expected. It is possible that servants or other workers employed at Plas Weunydd lived in at least some of the terraced cottages at Tai'r Frest.

Another feature which may be associated with Plas Weunydd is the possible remains of an incline at SH 69923 47374 (Plate 48). Although highly eroded this feature is 2.2 m wide and up to 15.4 m long with relatively randomly packed stones between two dry stone walls. The character of this feature is similar to the construction techniques used to construct inclines within the slate quarries. Given it position it is possible that this feature may have been associated with the construction of Plas Weunydd. There are the remains of quarries above the track to Cribau at SH 69964 473773, which have been for the extraction of stone, that may be the source of building materials and the possible incline could therefore have been used to transport stone down to the building site. Running parallel with the possible incline, approximately 17 m to the north west, is the remains of a dry stone wall. Now only one course high it was possible to miss the surviving remains during construction.

Late within the construction period, the route of the Red Route was redefined so that it crossed the track to Cribau Farmstead on a bridge and then turned back to link in with the Blue Route at SH 69885 47389. This involved passing though the remains of a fence at SH 69846 47439 before passing to the north of a small sheep fold at SH 69847 47422. The fence line was marked by both the remains of wooden posts and holes drilled into the rock outcrop to the west (Plate 49). The sheepfold is a very tumbled structure (Plate 50) approximately 4.5 x 4.75 m in size which appears to have been divided into two cells. It appears as a single cell on the First Edition Ordnance Survey map of 1888 (Figure 5), however by the Second Edition of 1900 this enclosure has been divided into two with the northern cell possibly being roofed. Further modification is shown on the 1918 Edition map where the covered cell is open and the southern cell slightly extended. It is likely that this feature was a rapidly evolving animal enclosure which was being adapted to changes in the local economy. The Red Route avoided this structure and care was taken not to bury any of its features during construction.

The spoil heap associated with adit (PRN 30,214) was crossed by the Blue Route. The originally proposed route was re-directed so that it crossed the spoil heap in the shortest distance, avoiding the steepest slopes. The surface of the tip was covered with geotextile and the track constructed above the level of the tip, thereby protecting the remains (Plate 51). Within the mouth of the adit a possible rock cannon was located (Plate 52 and 53, Figure 18). This consisted of a series of holes drilled into the face of a steeply sloping natural slab forming two curving lines together with a single hole drilled into the side of this slab. The positioning of this possible rock cannon would allow the adit to act as a sound chamber, amplifying the sound when the rock cannon was fired.

Tai'r-Frest Area

On the northern side of the track to Cribau Farmstead is a row of terraced houses together with a series of associated features. Recorded as PRN 30,212 in the pre-construction study (Gwyn *et al* 2009), it is associated with two pig sty complexes (PRN 30,213, 30,207), an enclosure (PRN 30,210), a drain (PRN30,213), a well (PRN 30,208) and its associated path (PRN 30,209). The Red Route was designed to avoid the main building structures, but was forced to run to the north of the row of terraced houses known as Tai'r Frest, cutting the line

of the enclosure and the drain. During construction the route of the Red Route was further modified at very short notice when a rock cannon was discovered during top soiling activities.

Tai'r Frest consist of a row of what was originally five terraced cottages (Plate 54, Figure 19)) each of which were 4.5 m wide and 7m deep sitting on a raised platform above the track (PRN 30,195) from the A470(T) to the Cribau farm complex (PRN 30,205). They stand to a maximum height of 2.7 m. Now in four units with the northwest unit being double size and containing a later sub-division (possibly a sheep pen). Each of the houses within the terrace had a doorway in its south western corner with an adjacent window. There is also a hearth on the dividing walls between each of the houses. There are lean to extensions on the NW and SE ends and three small structure on a slightly lower platform in front of the row of the cottages. These structures each consist a cell, open to the NE with vents/chutes to the SW overlooking the track way. There is some evidence that they were relatively low structures (approximately 1 m with sloping slate slab roofs. These may be pig sties although their interpretation is uncertain.

Two areas with graffiti were noted, one on the dividing wall between the third and fourth (from the south) houses which is a painted slogan reading "English Out" (Plate 55); and the other a carved cartouche reading "ES" (Plate 56) on the stonework facing the track to the Cribau Farmstead. Some development of Tai'r Frest can be seen on the historic Ordnance Survey maps (Figure 5). This can particularly be seen with the structures in front of the terrace, alongside the track to Cribau. These seem to have been developed between 1888 and 1900 replacing an area of woodland, possibly an orchard. The range of buildings then seem to have been simplified by 1918, a pattern which is reflected in the paddock to the rear of the terrace where a sub-division is removed. One of the terraces was the home of a Hugh Richard in 1881 who was described by Herald Gymraeg as the oldest quarryman in Blaenau Ffestiniog. He was reputed to have still been working at the age of 85, having been working for 76 years (http://www.llechicymru.info/iqtoldestquarryman.english.htm)

The construction of the Red Route did not reveal any sign of the sub-division of the paddock behind Tai'r Frest, the remains of the boundary walls of which were protected with added materials. The structure of the drain (PRN 30,211) on the south eastern side of the paddock (PRN 30,210), however, was revealed by the works (Figure 22.3, Plate 57). This had a series of slate slabs up to 800 x 250 x 30 mm in size lining the western side of a channel up to 0.6 m wide and 0.25 m deep. This drain would have protected the rear of Tai'r Frest, draining the water to the south and east of the terrace. Observations made during the construction period would suggest that this drain ran into an underground, stone built, drain with a box like cross-section which probably ran beneath the track, although it is now partly exposed in the cutting for the track.

To the north and west of the terrace three natural boulders were recorded with surface modifications. Two of these had a groove running along their lengths (Plates 58 and 59 and are of unknown function. The third would appear to be a rock cannon (Figure 20, Plates 60 and 61). This was a slab angled to the south with eighteen holes drilled into its surface. The majority of these (14) form a rough triangular shape which probably form the core of the cannon. The top surface of the boulder is flaked suggesting that this cannon had been fired.

The Black and Red Routes crossed the track to Cribau Farmstead by means of a bridge. This require the digging of two small pits to provide footings for the central supports of the bridge at SH 69849 47462. Each pit was approximately 1.5 m square and was largely dug through the surface of the track to Cribau. The somewhat disturbed remains of a possible wall was recorded in the section of the southern pit (Figure 21, Plate 62) which would appear to predate the construction of the track to Cribau. The wall would appear to run approximately east –

west and presumably relates to a land division prior to a point where the track was as wide as it is today. The stratigraphy within this trench is summarised below:

11 Highly disturbed gravelly layer, part of the build-up associated with the track to Cribau

12 Ferruginous gravel with well packed rounded stones up to 50 mm in size and the occasional larger stone up to 150 mm in a yellowish brown slightly clayey sand.

13 Possible stone wall running at a slight angle to the pit. Large, angular, stone boulders forming a possible wall at least 0.5 m wide.

Outside the corridor of the cycle routes; the intermittent rock face between Tai,r Frest and the structure of PRN 30,216, has a series of holes drilled into its surface at a number of points (Plates 63 – 66) these would appear to mark the line of at least one fence line, although why a fence would be require on these near vertical surfaces is unknown.

Lower Field

The work in the field to the north of Plas Weunydd and adjacent to the A470 revealed the presence of a well-built, stone, drain system (Figure 22.1, 22.2, 23). There appears to be a main drain running, diagonally across the field in a NE – SW direction. This was broken into at two places during the construction of the Black Route showing the character of the construction. The Black Route was re-routed in order to reduce the damage to this feature. The main drain (Figure 22.1, Plates 67 – 68) is a well-made structure with a slate slab floor, dry stone wall sides and a cap of large slate slabs. It is approximately 0.48 m wide and 0.38 m tall forming a roughly rectangular tube, although the side walls do tend to corbel in towards the top. At, at least four point, smaller side drains entered the main drain at acute angles. These are typically 0.12 m wide and 0.24 m high and of a similar construction to the main drain, although at some places the side walls consist of a single large stone rather than coursed dry stone walling. The drainage system was still working with water flowing through, presumably draining into the small steam running adjacent to the A470. The investment in such a well-made drainage system is little surprising, particularly given the poor quality of the grazing in this field which contains areas of peat and other soft ground which the drainage system has failed to drain.

Jumps Track

The Jumps Track (Figure 24) was constructed in the eastern portion of the car parks associated with Llechwedd Slate Caverns. No archaeological features were noted during its construction.

Visitors Centre

The new Visitors Centre for the Down Hill Tracks was built adjacent to the Jumps Track (Figure 24). This area was is shown as an open area, possibly a pond, on the Second Edition Ordnance Survey map of 1901 (Figure 25). Subsequent to this map the area has had significant quantities of quarry waste dumped on it which has been flattened to form a car park. None of the footing were deep enough to reach the bottom of the dumped layer.

Assessment of a peat core from Ffridd Y Bwlch, Blaenau Ffestiniog, Gwynedd, North Wales (F.R.Grant)

1. NON-TECHNICAL SUMMARY

A single 3.10m core was extracted from a mire close to the works associated with the construction of an uplift road and drains for the Blaenau downhill cycle tracks, and assessed for palaeoenvironmental value. The core contained palaeoenvironmental evidence dating from the Mesolithic, 5805 ± 35 BP, and suggested an oak-birch-hazel woodland dominated the landscape at this time. Elm and pine were also present, with alder and willow in the wetter areas, and an area of open water at the sampling site. Later, an alder carr developed in this area. Evidence for human activity during the Neolithic is slight, although a burning event is evidenced at 4100 +/- 35 BP. A sample from the Bronze Age, *c.*2650 BP, indicates a substantial change in the environment by this time, with open grassland, evidence for cereal cultivation, burning, and a reduction in tree cover. Woodland and hazel scrub regeneration is evidenced during the Romano-British period, followed by a return to grassland conditions during the Medieval. Heather and sedge moorland dominates the landscape of the early post-Medieval, with some slight evidence for cereal cultivation.

2. INTRODUCTION

In January 2012 the author was invited by Antur 'Stiniog Cyf to provide a specification and quote for an assessment of the peat deposits identified during works to construct the uplift road and associated drainage for the Blaenau downhill cycle tracks.

Accordingly, upon acceptance of the specification and quote, the fieldwork detailed in the specification was carried out.

This report detailing these works was completed in May 2012.

3. LOCATION

The area identified for palaeoenvironmental study centred on the west facing slopes of Ffridd y Bwlch (NGR SH70 48), north of Blaenau Ffestiniog, Gwynedd, upon which the uplift road has been constructed.

4. ARCHAEOLOGICAL BACKGROUND

A full description of the archaeological and historical development of the area is described in the report produced by EAS for the archaeological assessment and scoping study for the cycle tracks (Gwyn, Brooks and Laws, 2009), and as such only a brief summary is given here.

Although the area was undoubtedly exploited, at least marginally, during the Mesolithic and Neolithic periods, archaeological evidence for human activity prior to the Bronze Age is limited. Neolithic activity is confined to the recovery of stray finds such as the stone axe rough-out from the vicinity of Llyn Stwlan (http://jurarcahms.gov.uk/nmw.nmwservlet) *c.*5km to the southwest. Later prehistoric settlement and funerary monuments have all been recorded in the general area, although it would appear that even at this point in time there was not a strong focus of activity here (Smith 2003). A possible robbed Bronze Age cist to the south of Llyn Ystradau has been identified, and several unenclosed and enclosed hut-circles are recorded. These include the hut-circle at Moel Farlwyd (PRN 618) just to the northeast of the palaeoenvironmental study area. More examples are recorded further to the south and southwest. Typically hut-circles are assumed to be broadly Iron Age in date; however, it is

possible that they could range from the Bronze Age to well into the Roman Period (Silvester 2003, 126 – 127).

Although the Roman site of Tomen y Mur lies *c.*5km south of the study area, direct evidence for Roman activity closer to site is lacking. Agriculture, based upon individual farmsteads, appears to be the predominant activity during the Medieval period. Homesteads, various field boundaries such as earthen banks and stone walls, and sheep management structures such as folds, washing areas and shelters have been recorded within the general area. Although predominantly dated to the post-Medieval period, some of these may originate from the earlier period. The term "ffridd" (as in Ffridd y Bwlch) refers to the mountain pastures or sheepwalks.

Although agriculture remained important, from the mid-18th century slate quarrying developed into the major constituent of the economy of the area. Five trial adits with their associated tips are located immediately above the palaeoenvironmental study area.

5. PALAEOENVIRONMENTAL BACKGROUND

Certain areas of Snowdonia have been relatively intensively studied using palaeoenvironmental techniques, and have revealed information on Late-Glacial environments, as well as Post-Glacial environmental development and human activity. However, no previous studies have been carried out from the study area. The closest identified analyses are from the hillfort at Bryn y Castell *c.*7km to the southeast (Mighall and Chambers 1995), Llyn Morwynion, *c.*9km southeast (Caseldine *et al.* 2001) and at Crawcwellt, *c.*15km south (Chambers and Lageard 1993). The Migneint upland region further to the southeast has been studied (Blackford 1990, Blackford and Chambers 1991), and acidification of Llyn Llagi to the west (Battarbee *et al.* 1988). From collating the data from analyses from across Wales, general patterns of vegetation development can be identified, although there is of course some variation geographically, chronologically and in individual behaviour of species.

Following the Late Devensian ice maximum, deglaciation was rapid and climatic amelioration was underway by the beginning of the Late-Glacial Interstadial *c.*15-13 thousand years ago. Pollen evidence suggests a vegetation dominated by Poaceae (grasses), Cyperaceae (sedges), *Rumex* (docks and sorrels) and *Artemisia* (mugworts). This open-habitat was colonised by *Juniperus* (juniper) and later *Betula* (birch). Ince's work (1996) at Clogwynygarreg *c.*20km to the northwest of the study area, typified this pattern. Here a Poaceae-*Rumex* dominated short-herb community *c.*13,000 BP, developed into *Juniperus* scrub with tall herbs such as Apiaceae (Umbelliferae or parsleys) and *Filipendula* (meadowsweet), and isolated stands of *Betula* on favourable slopes. A period of severe climatic deterioration occurred between *c.*12.8 and 11.5 thousand years ago, known as the Younger Dryas, or Loch Lomond Stadial. This period is characterised in Wales by a reduction in woody species and an increase in the pollen of open-habitat and disturbed soil indicators. The climatic regression of the Loch Lomond Stadial is marked at Clogwynygarreg, between 11020+/-150 – 10760+/-140 BP, by the regression in the former plant communities and an increase in those herbs indicative of disturbed ground such as Chenopodiaceae (goosefoots) and Artemisia. Mineragenic sedimentation also occurs at this point.

Patterns of early Holocene vegetational development for Wales, from *c.*10,000 BP, can be seen to depict a re-colonisation by *Juniperus*/Pinus, followed by *Betula* (birch), then an eventual extensive expansion by *Corylus* (hazel). At Nant Ffrancon, northwestern Snowdonia, the expansion in *Corylus* occurred *c.*9300 BP (Hibbert and Switsur 1976). As conditions improved, warmth-loving trees such as *Quercus* (oak) and *Ulmus* (elm) expanded

into Wales, eventually forming an oak-dominated woodland, with Pinus (pine) and *Betula* occupying the higher sites. A rise in alder has generally been dated to 7000 BP although there is evidence for earlier colonisation in places. It is suggested that the early expansion of *Alnus* at Moel y Gerddi, Ardudwy may have been triggered by the burning activities of Mesolithic communities (Chambers *et al.* 1988). *Tilia* (lime) and *Fraxinus* (ash) appear to have become established in Wales by 6000 BP (Birks 1989) but remained most abundant to the east and in lowland areas.

6. METHODS

Mire Characterisation

A walkover survey and probing was carried out to identify the general nature of the mire. The extensive nature of the deposit meant it was not practicable to determine the entire basin morphology. Three cores were extracted using an Eijkelkamp gouge auger, and the basic stratigraphy noted. These included a core taken from an area of peat cutting, in order to identify the depth of peat removed.

Sample Extraction

Sample extraction at the selected site took place on 25.01.12, using a Russian corer. Two adjacent cores were extracted from the deepest part of the mire as identified by auguring. These cores overlapped in order to prevent any end-of-core disruption of the samples. The samples were immediately wrapped in clingfilm, labelled, and covered in black plastic before being transported to cold storage. A photographic record of the area and the process involved was maintained.

The samples were cleaned and a visual stratigraphic description was compiled which allowed description of the botanical composition of the peat, as well as an estimation of the degree of humification. These descriptions were based upon elements of Troels-Smith's (1955) classification and the ten class scale of peat humification (von Post 1924; Aaby 1986). Whilst recognising this as a relatively unrefined method of determining the degree of humification, this technique was considered adequate in this study for the recognition of broad changes in the climatic conditions at the time of peat deposition within the profiles.

Pollen Preparation and Analysis

Eight sub-samples were extracted from the core. This number of sub-samples maximised the efficiency of the pollen preparation (in which 8 samples can be processed at a time), and allowed a useful data set to be achieved which could be utilised for any possible future research. After cleaning of the profile surface, 1 cm sub-sampling was carried out. The upper 0.50m, reflecting the most recent time period, was not sampled (see later). Sub-samples were taken from the following horizons: 0.64m, 1.02m, 1.38m, 1.76m, 2.16m, 2.46, 2.74m and 3.06m. The samples were subjected to standard potassium hydroxide digestion and acetolysis as described in Moore *et al* (1991). After dehydration in ethanol, then tetra-butyl alcohol, the samples were mounted in silicone oil.

Counting and identification was carried out using an Zeiss Axiolab at x400 magnification, and with the aid of the reference collection type slides of the Palaeoecological Research Unit at the University of Manchester, online pollen image databases, and the pollen and spore key in Moore *et al.* (1991). Linear traverses of the slide were carried out at 1mm intervals from one edge to the other, and in one direction only.

A minimum total pollen sum of 400 land pollen grains plus spores and aquatics was attained from each sample. This count value would allow meaningful results to be incorporated within

any possible further research without additional counting being required. The nomenclature used is principally that of Bennett (1984), with additional notes from Moore *et al.* (1991).

Microscopic charcoal particles were counted as they were encountered during the general pollen count. These were then represented as a percentage of the TLP sum.

Radiocarbon Dating

Two samples for radiocarbon dating were extracted from the profile, as specified in the brief. A sample from 3.08-3.10m, close to the base of the organic material, and a fragment of twig from a burnt layer at 2.43m were submitted. The comparison of the two dates should allow a broad estimation of sediment deposition rates (peat accumulation) to be attained; allowing correlation with other investigated sites and provide a guide time-scale for any changes noted in the pollen data.

Samples for radiocarbon dating were wrapped in labelled aluminium foil packages before being bagged in polythene sample bags. The samples were submitted for Accelerator Mass Spectrometry (AMS) at SUERC, University of Glasgow, Scotland. Calibration of the dates was determined using the University of Oxford Radiocarbon Accelerator Unit calibration programme (OxCal3).

A crude sediment deposition curve was created for the profile using the conventional radiocarbon date, and a proxy date identified by the deposition of quarry waste from the mid-nineteenth century AD (see later). A trend line was added to allow inter and extrapolation of the data in order to estimate a date for other levels of the core (Dark 2000, 12). It should be noted that the deposition curve is based on the central age estimate of the radiocarbon dates and should not be taken as a precise date. In addition problems in attempting to create a constant deposition curve based on a limited number of dates are discussed below.

Methodological Considerations

Pollen analysis has a long pedigree in the history of palaeoenvironmental studies, and has proved an invaluable tool provided certain considerations are taken into account. These include methods of dispersion and survival of pollen grains, a recognition of sampling distortion and the concerns of representivity of a single sample from a site, issues of contamination, and statistical problems both in the manipulation and the interpretation of the resulting data. Despite the elements of uncertainty brought in by all of the above considerations, in general terms the value and versatility of pollen analysis as a palaeoenvironmental tool is undisputed. The remarkable degree of consistency from the many studies undertaken underlines the value of pollen analysis.

Similar considerations need to be applied when discussing the results of radiocarbon dating and peat accumulation rates. Radiocarbon dating provides only an age estimate rather than a true date for an object or an event. As such a direct chronological relationship between events suggested in the pollen record and historical events should only be implied, particularly when only one or two radiocarbon dates are acquired, and when dates are achieved by interpolation of individual dates which implies a constant deposition rate for the sediment. For a truly meaningful sediment deposition rate to be ascertained several radiocarbon dates should be acquired in order to mitigate for changes in the accumulation rate over time.

8. RESULTS

Mire Characterisation, Local Topography and Vegetation

The study area lies within an area of relatively gently sloping ground, partly enclosed by the much steeper slopes of Moel Dyrnogydd to the north, Moel Farlwyd to the northeast and Ffridd y Bwlch to the east. It opens to the southwest to Llyn Ffridd-y-Bwlch and the area now occupied by the Ffestiniog Slate quarry. Peat has developed over an extent of approximately 500m^2, within this south-westerly facing ground. The majority of the deposit exists on the eastern side of the A470 road, (the area under study) but a proportion continues to the west. The underlying topography in the study area appears to consist of at least two northeast to southwest aligned ridges separated by deeper areas of basin mire, and clothed, at least partly, in blanket peat. The highest points of these ridges form small "islands" within the boggy ground. The deepest areas of peat were found to lie in the east of this area, below the steeper slopes of well-drained ground, in a basin measuring *c.*112m northeast - southwest x *c.*102m northeast – southwest, where a small stream crossed the mire (Figure 26).

Natural drainage of the area is by means of several streams, generally flowing east to west before entering Llyn Ffridd-y-Bwlch. The predominant mire vegetation consists of *Sphagnum spp.* (bog moss) with *Eriophorum sp.* (cotton grass), *Molinia cearulea* (purple moor grass) and *Erica tetralix* (cross-leaved heath), with fringes of Juncus (rushes) on the soligenous peats at the base of the better drained, grassed slopes.

The slopes of Ffridd y Bwlch have been exploited for slate quarrying in the mid-nineteenth century (Gwyn, *pers. comm.*), with five trial adits and associated spoil heaps lying just above the mire.

Augering took place at three points within this basin, and suggested a maximum depth of peat and soft sediment of *c.*3.20m.

Auger Point A SH69996 48303

Auger Point B SH69982 48286 (peat cutting area)

Auger Point C SH70014 48276

A band of presumed nineteenth-century slate quarrying waste was noted at both point A and C, at *c.*0.40-0.50m depth. This layer was somewhat thinner at point A. Point A lies further to the west and north, further away from the tips of slate debris. It was not visible in the core from point B, where only *c.*1.25m of peat remained. Point A and C both identified a basal layer of clay and slate chip overlain by organic peaty mud. These in turn were overlain by *c.*2-2.2m of wood peat/well-humified peat. Moss and sedge peat lay above the band of quarrying waste. A thin, greyish-brown band of charcoal-rich material was noted at both of these points, at *c.*2.50m depth.

The cores for retaining and analysis were taken from the area of auguring point C, at SH 70014 48276, at *c.*380m OD.

Plate 70: Mire area, with quarry spoil in fore, uplift road and drain cuts, facing northwest.

Profile Stratigraphy

Depth	**Description**
0-0.20m.	Active layer – moss and sedge
0.20-0.35m.	Moss peat Dark blackish-brown. Turfa bryophytica (Sphagni) Humification 6/7
0.35-0.41m.	Silty-clay/slate-waste derived material. Mid brownish-grey. Occasional monocot visible.
0.41-0.52m.	Silt/slate-waste with slate chips <10mm diameter. Light brownish-grey.
0.52-0.74m	Herbaceous peat (monocots) Dark blackish-brown. *Turfa herbacea* Humification 6/7
0.74-0.78m.	Moss / monocot peat. Dark orange-brown. Turfa bryophytica (Sphagni) Humification 5
0.78-1.40m.	Unidentified organic material. Occasional *Betula* twig and flecks of charcoal. Very dark blackish-brown. *Substantia humosa* Humification 8/9.
1.40-1.50m.	Moss peat. Occasional wood and twiggy fragments. Mid blackish-brown. Turfa bryophytica (Sphagni) Humification 7
1.50-1.90m.	Unidentified organic material. Occasional twiggy fragments. Dark blackish-brown.

Depth	Description
	Substantia humosa. Humification 9
1.90-2.07m.	Wood peat. Dark blackish-brown. *Turfa lignosa* Humification 8
2.07-2.15m.	Wood and bark fragments. Occasional fragment of monocot Dark orange-brown. Detritis lignosus.
2.15-2.35m.	Unidentified organic material. Dark blackish-brown. Substantia humosa. Humification 8/9
2.35-2.39m.	Unidentified organic material. Mid blackish-brown. Substantia humosa. Humification 9
2.39-2.44m.	Unidentified?organic material. Greyish-brown. Visible charcoal fragments.
2.44-2.95m.	Unidentified organic material. Occasional wood/twig fragments. Dark blackish-brown. *Substantia humosa*. Humification 8/9.
2.95-3.05m.	Fine detritus mud. Occasional slate fragments <5mm diameter. Dark greyish-brown. Limus humosus.
3.05-3.10m.	Fine detritus mud Very dark blackish-brown. Limus humosus

Fig 27: Profile Stratigraphy

Radiocarbon Dating

The radiocarbon dating information is presented in the table below. These suggest that organic-rich sediment deposition began at this sample site before 5805+/-35BP (measured at 3.08m), and calibrated to 4728 – 4548 cal BC (94.1% probability). The sample from 2.43m provided a radiocarbon date of 4100+/-35BP, calibrated at 95.4% probability to 2866-2500 cal BC.

A layer of slate fragments between 0.36m and 0.52m was interpreted as debris from the trial levels located above the bog. This layer was used as a proxy dating tool as the activity associated with these levels is believed to date to the mid-nineteenth century.

The application of a trendline in order to interpolate dates for such a long timespan using only two radiocarbon dates provides only a crude tool for age estimation of the sediment throughout the core. Caution must be applied when attempting to associate changes in the palaeoenvironmental record with the historical and archaeological record when using this technique. However, with these provisos in mind, such a technique may still provide a useful tool to broadly estimate the chronology of changes within the pollen diagram, particularly when combined with a range of other data sets.

Sample	Laboratory Number	**Radiocarbon** Age BP	Historical Period
2.43m	SUERC-39681 (GU26938)	4100 ± 35	Neolithic (Mid-late)
3.08m	SUERC-39682 (GU26939)	5805 ± 35	Mesolithic (Later)

Fig 28: Radiocarbon dating information

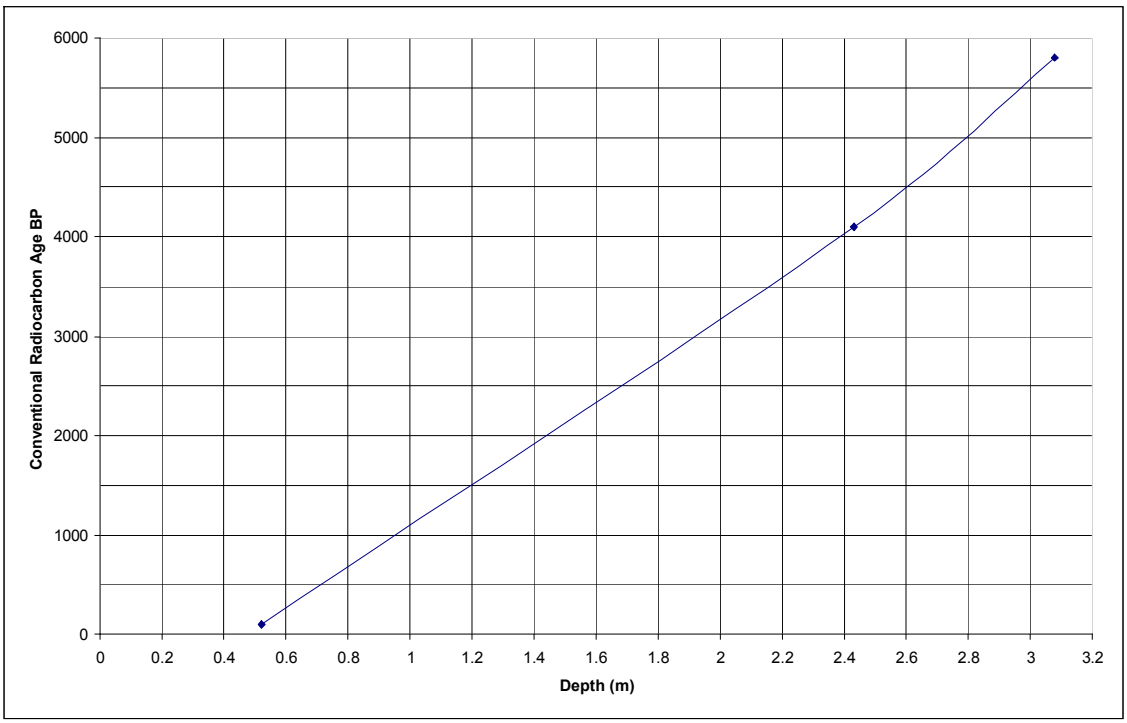

Fig 29: Estimation of peat accumulation using slate debris layer as proxy date

Pollen Analysis

Pollen preservation and concentration was generally good. A full count of 400 TLP (total land pollen) was achieved for each sample.

3.06m

This sample is dominated by the pollen of arboreal species (AP), forming *c.*77% of Total Land Pollen (TLP) The principal tree species is *Quercus* (oak), but there are also relatively high values for *Betula* (birch), *Alnus* (alder), Pinus (pine) and *Ulmus* (elm). Shrubs such as *Corylus* (hazel) and *Salix* (willow) form a further 19% of TLP, with *Salix* demonstrating its maximum value in this sample. Dwarf shrubs (ericas such as heather) were represented by a single grain only. Values for herbaceous species such as Poaceae (grasses) and Cyperaceae (sedges) are low at less than 4% TLP. Aquatic species are represented by *Myriophyllium*

(water milfoil). Relatively high values for fern spores, including Polypodiaceae, were recorded. Microscopic charcoal values are moderately high.

2.74m

Values for AP and shrub pollen remain relatively unchanged in this sample at *c.*74% and 20% TLP respectively. However, the arboreal pollen record is now dominated by *Alnus* which attains *c.*50% TLP. A corresponding sharp decline in the pollen of *Quercus* and *Betula* is particularly noted, although Pinus and *Ulmus* also decrease. Dwarf shrubs have increased slightly to *c.*1.4% TLP, whilst herbs including Poaceae and Cyperaceae remain low. Microscopic charcoal values are low.

2.46m

A very slight shift in the balance between AP and shrub pollen is shown, with arboreal pollen representing *c.*70% and shrubs increasing to *c.*24%. *Alnus* once again dominates the arboreal pollen, with reduced quantities of *Quercus, Betula,* Pinus and *Ulmus*. *Fraxinus* (ash) and *Tilia* (lime) appear, albeit represented by single grains only. Dwarf shrubs remain at low levels (*c.*1.8% TLP), as do all herbaceous species. Fern spores remain relatively high at *c.*20% TLP. Microscopic charcoal values are low.

2.16m

The pollen spectrum continues to be dominated by that of arboreal and shrub species. Alnus remains the dominant tree. Whilst still at relatively low values, *Betula* has doubled its representation to *c.*11% TLP, with *Quercus* also showing a very slight increase to c.8%. Pinus, *Fraxinus* and *Tilia* are absent. Dwarf shrubs have declined again to very low levels. Herbaceous species remain low, with Poaceae at *c.*1.5% TLP and Cyperaceae *c.*2.2%. The appearance of *Potentilla* (tormentil) adds a little more diversity to the herbaceous pollen spectrum. Microscopic charcoal values remain low.

1.76m

This sample marks a distinct change in the vegetational balance at the sampling site. AP declines to *c.*43% TLP, and shrubs (predominantly *Corylus*) to 16%. Much of the decline in AP is due to the decrease in *Alnus* values to *c.*20% TLP. *Quercus* and *Betula* remain low, although both show a very slight increase on their previous level. Pinus remains absent and *Ulmus* also disappears. *Ilex* (holly) appears as a component in the arboreal pollen spectrum, and *Tilia* is represented. Dwarf shrubs show a low peak to *c.*3% TLP, and their increase is accompanied by a dramatic peak in herbaceous species, particularly Poaceae. Increased diversity in the herbaceous flora is depicted with Ranunculus (buttercups), *Potentilla, Artemisia*-type (mugworts), Rubiaceae (bedstraws), *Achillea*-type (yarrow) and *Rumex acetosella* (sheep's sorrel). Cereal-type pollen is noted for the first time. *Pteridium* (bracken) also appears. These changes are accompanied by a peak in microscopic charcoal deposition.

1.38m

Whilst AP remains at *c.*45% TLP, *Corylus* demonstrates a dramatic increase to peak at *c.*40%. Pinaceae and *Ulmus* reappear, albeit at very low levels. *Alnus* represents *c.*22% TLP, *Quercus c.*8% and *Betula c.*14%. Values for dwarf shrubs have decreased again to less than 1%. Cyperaceae has increased slightly to *c.*6%, whilst values for Poaceae have declined steeply to below 7%. Although herbaceous pollen has declined generally, *Plantago lanceolata* (ribwort plantain) was noted, and *Pteridium* was also present. Values for microscopic charcoal deposition have declined dramatically.

1.02m

AP once again increases slightly, dominated by *Betula* at *c.*38% TLP. *Alnus* has undergone a dramatic decline to less than 10%, *Quercus* has also declined slightly, and Pinaceae and *Ulmus* are absent. Values for *Corylus* have declined to *c.*20%. Dwarf shrubs are increasing slightly, but still only represent just over 2% TLP. Poaceae has once again increased dramatically to *c.*20%, but without a notable increase in other herbaceous flora, although *Succisia* (scabious) appears for the first time. Values for Cyperaceae remain relatively low, whilst those for microscopic charcoal begin to increase.

0.64m

This sample demonstrates a dramatic reduction in AP to *c.*17% TLP, accompanied by a significant increase in the pollen of dwarf shrubs (predominantly *Calluna vulgaris* heather) to *c.*33%. The arboreal pollen spectrum contains *Betula* at *c.*10%, *Quercus* less than 2%*, Alnus c.*5%*, Fraxinus, Ulmus,* Pinaceae, and *Sambucus* (elder) all at less than 1%. *Corylus* represents *c.*13% with very low quantities of *Salix.* Cyperaceae has increased to *c.*15%, with Poaceae representing 12%. Further variety in the herbaceous pollen is demonstrated by the appearance of Apiaceae (Umbelliferae or parsleys), accompanied by *Artemisia* and Ranunculus, whilst *Potentilla* and *Succisia* have increased relatively dramatically. Values for microscopic charcoal display a significant increase to peak in this sample.

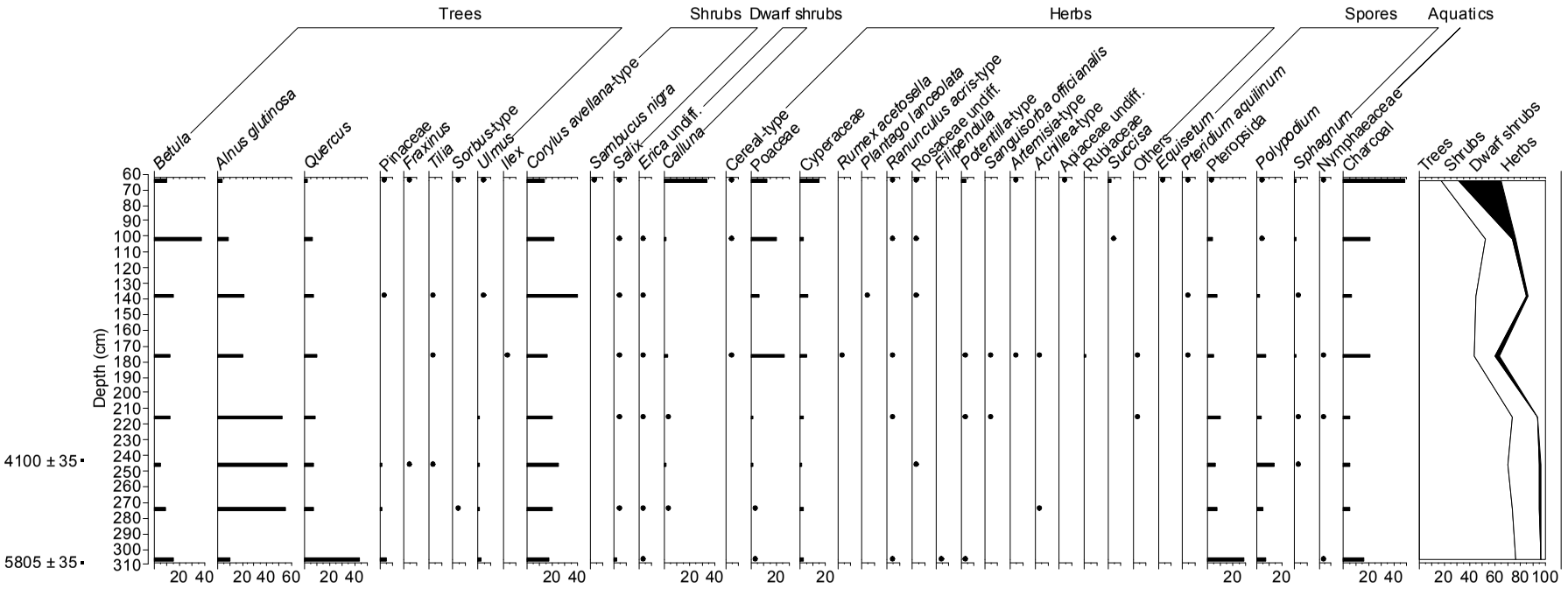

Fig. 30: Bwlch y Ffridd, Blaenau Ffestiniog, Gwynedd, Pollen and Charcoal Diagram (%TLP)

8. DISCUSSION

Vegetational Development and Human Activity

Sampling Interval

The limited sampling interval of this assessment does not allow detailed analysis of the vegetational changes and human activity over time to be identified. Broad patterns of change can be implied, and a snap-shot of the environmental situation at given points in time described. Repeating patterns of clearance, activity, and regeneration, which can only be identified through close interval analysis, undoubtedly occurred and led to the broader changes described below.

Lack of Diversity in the Herbaceous Flora

The herbaceous flora from the samples from this profile is unusually limited in range and quantity. A key indicator of disturbance and associated with grazing is the appearance of *Plantago lanceolata* (ribwort plantain), and this is usually common in pollen assemblages suggestive of extensive grassland, such as those seen at 1.76m. However, it appears only as a trace component of the flora in this profile. Other common ruderals such as *Taraxacum* (dandelion) are absent entirely. Where herbaceous pollen does occur (other than that of Poaceae or Cyperaceae), the values are generally low.

This is possibly a result of relatively limited human activity in the area. The pollen evidence from this core suggests that the dense woodlands of the Atlantic period remained relatively closed and undisturbed, until at least 4100+/-35BP. Significant impacts are not noted until the *c.*2650BP (mid-later Bronze Age). Caution should be shown however, as the wide sampling interval of this analysis precludes detailed assessment of the inter-sample periods. These represent considerable periods of time and undoubtedly contain further evidence of as yet unidentified activity and change. However, a lack of long-term cycles of disturbance, clearance and regeneration may have lead to the limited range of herbaceous flora.

Later Mesolithic

The lowest sample analysed, at 3.06m, depicts the climax forest typical of the Atlantic Period in this region. The radiocarbon dates suggest this sample represents a phase after 5805+/-35BP, during the Later Mesolithic. The dryland forests are dominated by *Quercus,* but *Betula* and Pinus are also important constituents. *Quercus petraea* (sessile oak), is able to colonise higher altitudes, and a *Betula-Quercus-Pinus* woodland may have developed on the upland and hillslope areas (Walker 1982). Recent work near Pen-y-Gwryd, *c.*8km to the north-west has identified stumps of Mesolithic *Alnus* and *Quercus* growing at 350m OD (Fyfe *et al.* forthcoming). *Corylus,* which may have been growing as a canopy tree as well as forming thick scrub or understorey, *Ulmus* and *Quercus,* would dominate the denser lower-lying woodlands. Ferns would grow on the trees in the predominantly wooded landscape, as well as on any exposed rock in the area. Some open water existed at the sampling site, as evidenced by the profile stratigraphy and the presence of aquatic plants. Grass and sedges probably fringed the pools or wetland area, but aside from this, evidence for open areas is limited. *Salix* and *Alnus* could be growing locally close to the water's edge, but also fringing any water courses, pools etc. in the wider area, or as a component of a wet woodland on the valley bottom or in basin mires.

Microscopic charcoal deposition may reflect burning events over a regional or extra-local area, whereas macroscopic charcoal particles within a sample tend to suggest direct, local burning of the mire surface. Higher values for microscopic charcoal deposition in this sample may reflect the nature of the depositional environment within an area of open water, rather

than an episode of burning, as no other indicators for disturbance are present. Burning events may be natural in origin. However, deliberate burning of the vegetation during the Mesolithic period is a well-documented phenomenon (Innes, Blackford and Simmons 2010; Ryan and Blackford 2010; Walker *et al.* 2006). There is a considerable body of evidence to suggest that human-induced burning by hunter-gatherers was probably used to control the movement of herds of large grazing mammals. It should also be considered, however, that some of the charcoal detected may be the result of domestic fires rather than the burning of the vegetation. This may be the case where the pollen evidence does not appear to support the known impacts of clearance activity using fire (Ryan and Blackford 2010, 11).

Neolithic and Earlier Bronze Age c.4850BP – c.3500BP

The following three samples from 2.74m, 2.46m and 2.16m continue to reflect a predominantly wooded environment, albeit with slight changes in the composition of the woodland in each sample. Extrapolation of the radiocarbon data suggest these samples refer to the Neolithic and earlier Bronze Age periods. *Alnus* pollen comes to dominate the profile generally, probably reflecting the development of an alder-carr on the site, as the area of open-water in-fills. Correspondingly the core stratigraphy depicts a change from essentially peaty mud at the base, to well-humified, dark peat containing occasional woody fragments as organic material deposition increases. The variation in the composition of the woodlands depicted in each of the samples probably reflects local changes associated with climatic variations, human activity and natural disturbance. It is not, however, possible to determine the precise nature of these changes owing to the wide sampling interval of this assessment.

Between 2.39m and 2.44m a significant burning event is noted in the core stratigraphy, with a radiocarbon date of 4100+/-35BP suggesting this occurred towards the end of the Neolithic. The change in the stratigraphy and the presence of visible fragments of burnt material imply that burning took place directly upon the mire. Although a natural fire cannot be discounted, it is entirely probable that a human agent was responsible for this burning; particularly taking into account the local wet substrate. As discussed earlier, burning may have been carried out to clear ground for grazing of domestic animals or for cultivation, or as a means to control wild animals for hunting. It is not possible to assess the degree of effect the burning event had upon the local vegetation, but it is suggested that no long-term or dramatic changes occurred. This possibly implies the activity was an isolated event, from communities based outside the local area.

Somewhat later, further diversity in the arboreal pollen, represented by the appearance of *Fraxinus* and *Tilia* at 2.46m probably results from a combination of factors which may also include human activity. *Fraxinus* (ash) in particular is an opportunistic, light-loving species, which can rapidly colonise areas of open ground which have formerly been cleared. An increase in *Corylus* may also reflect the development of hazel scrub over formerly open areas. The appearance of *Tilia* (lime) is interesting. *Tilia* is a thermophilous species, requiring mean August temperatures of 20ºC in order to produce fertile seed, and preferring richer mor soils (Piggott and Huntley 1978; 180). It is also insect-pollinated, and is thus thought to be somewhat underrepresented in pollen diagrams as it produces less pollen per tree than wind-pollinated species. *Tilia* is thought to have become established in Wales by *c.*6000 BP, but was only abundant in eastern lowland sites, with a much more restricted occurrence elsewhere (Caseldine 1990, 34). *Tilia* is a useful fodder crop, and also provides important fibres for cordage from the bast from the inner bark. During historical times *Tilia* has been coppiced in order to actively increase the growth suitable for bast production, and an ancient British coppice at Westonbirt Arboretum in Gloucestershire is thought to be up to 2000 years old (Godwin 1984, 160-164; Mabey 1996, 116-119). However, the trace amounts of both *Fraxinus* and *Tilia* represented in this profile suggest that either these species were present

locally only in relatively small amounts, or that their input is derived from wider, more regional sources.

The slight increase in *Calluna vulgaris* at this point may indicate the gradual onset of acidification on those areas of poorer, thinner soils. Later *Betula* increases, possibly expanding onto areas formerly occupied by heather. An increase in *Potentilla* can suggest increased grazing pressure, as it has been suggested that grazing may be beneficial to the flowering of *Potentilla erecta* (tormentil), (Moore *et al.* 1986). However, no other indicators of disturbance or grazing are present, and values for Poaceae (grass) remain low. Creeping cinquefoil (*Potentilla reptans*) naturally colonises a range of habitats, including rocky places, such as screes, and may be present as a natural component of the flora.

A distinct elm-decline, traditionally dated to *c.*5000 BP, is not clear in these samples, although values for *Ulmus* pollen do decline generally over time. Possibly *Ulmus* was an insignificant component of the woodland in this area, and its presence in the pollen record derives from more distant, regional sources. This distance could cause a "softening" of the signal, making any decline less distinct. Additionally, the wide sampling interval may disguise any inter-sample changes. It is recognised that local differences in the distribution of *Ulmus* may also be responsible for variations in the date of this event from site to site across Wales (see Caseldine 1990, 45). It is not until the following sample at 1.76m that *Ulmus* disappears from the pollen record entirely.

Bronze Age c.2650BP

The sample from 1.76m shows a distinct change from the predominantly wooded environment of preceding phases, to a much more open landscape, with significant evidence for human activity. Extrapolation of the radiocarbon dates suggests that this sample represents the later Bronze Age.

Grassland is extensive with a range of herbs present, such as *Rumex acetosella* and *Potentilla* indicative of pastoralism, and areas of damp grassland dominated by Cyperaceae (sedges) with Ranunculaceae (buttercups), and Rubiaceae (bedstraws). However, cereal cultivation is also implied by the presence of cereal-type pollen in association with herbs indicative of cultivation and disturbance such as *Artemisia*-type. A similar general pattern is reflected in the pollen from Llyn Morwynion (Caseldine *et al.* 2001) to the southeast of Blaenau Ffestiniog. Here a decline in arboreal and shrub species is accompanied by an expansion of grassland and heathland communities after 2930+/-70 BP. Similar patterns are seen at Bryn y Castell *c.*2700 yr BP (Mighall and Chambers 1995) and at Crawcwellt from c.3090+/- BP (Chambers and Lageard 1993, 24).

The increase of Ericaceae during the Bronze Age is a common feature to many pollen diagrams from Wales (Caseldine 1990, 56). As cooler, wetter conditions prevailed, acidification of the vulnerable upland soils increased, encouraging the spread of *Calluna.* Additionally a peak in microscopic charcoal deposition associated with the increase in *Calluna* pollen indicates the probable use of fire for the management of heather grazing. Burning of *Calluna* prevents the maturing of the heather plants, and maintains younger, nutritious growth suitable for grazing. *Calluna* will germinate rapidly after burning, encouraging its spread. The appearance of *Pteridium,* itself favoured by burning, emphasises the presence of open areas, possibly cleared by fire.

The appearance of *Ilex aquifoliaceae* (holly), albeit in trace quantities, is interesting as *Ilex* pollen is generally rare in peat deposits because of poor dispersal characteristics, but more common in mineragenic deposits where soil erosion results from clearance (Moore *et al.* 1986). Its presence was noted in deposits representing later periods from Ynys Ettws (Caseldine 2006) and Moel Rhiwlug (Grant 2007), and raised the question of whether the tree

was a coincidental natural occurrence or evidence of deliberate management. *Ilex* has traditionally been used as a fodder crop, for both cattle and sheep, particularly during winter, and it may thus have been selectively avoided during clearance. That holly was retained as a useful, evergreen boundary marker, to align a plough sight, or as a superstitious belief is well-documented during later historical periods (Mabey 1996, 244).

The upland in the area of the sampling site would now consist of a mosaic of grassland and heather, with isolated specimens or small stands of *Betula* and *Quercus*, and areas of *Corylus* coppice or scrub. These may be limited to the slopes and steeper valley sides. *Alnus* has declined reflecting the transition of the alder-carr to peat bog, as reflected in the core stratigraphy.

Iron Age/Romano-British c.1850BP

The palaeoenvironmental record from this sample suggests that human activity in the area has declined at this time, and woodland regeneration is taking place. The dramatic expansion of *Corylus* probably reflects the colonisation of formerly cleared, grassy areas by hazel scrub, and burning activity appears minimal. Reduced grazing and management of the local uplands would allow *Betula* to recolonise former *Calluna* dominated areas. A lack of archaeological occupation evidence for this period in the immediate vicinity of the sampling site suggests communities were not intensively active here at this time. This contrasts with Bryn y Castell to the southeast, where grassland expansion accompanied declines in *Betula* and *Alnus,* lesser declines in *Corylus* and *Quercus,* and possible cereal cultivation during the period of occupation of the hillfort (Mighall and Chambers 1995, 318-319).

Early Medieval c.1150BP

Some resurgence in activity is once again suggested, with burning utilised to clear areas of *Corylus,* and to manage areas of heather for grazing. Grassland has once again increased, although *Betula*-dominated woodland remains a significant component of the landscape. The continued impoverishment of the upland soils would also favour the expansion of *Betula* over *Corylus* scrub. Intensification of pastoral activity is similarly suggested at Bryn y Castell and at Llyn Morwynion during this period (*ibid.*).

Later medieval/Post-Medieval c.350BP

Heather and sedge moorland predominates in this sample, with burning being utilised to manage the vegetation mainly for sheep grazing, common to the uplands of Wales at this time. Grazing and burning regimes have varied and complex effects on the resultant vegetation. Sedges such as *Eriophorum vaginatum* (cotton grass) can be particularly encouraged by frequent burning and light grazing. However, persistent heavy grazing can cause it to decline, whilst favouring the flowering of *Potentilla* (Caseldine *et al.* 2001, 30). Increases in *Potentilla erecta* (tormentil) also emphasise the leached nature of the upland soils at this time (Ingrouille 1995, 191).

On deeper, drier soils *Pteridium* will be favoured by burning, and can out-compete *Calluna* and inhibit the growth of other plants such as grasses. *Pteridium* may also be encouraged to spread as a result of grazing, particularly by sheep.

Upland cultivation of cereal during the post-medieval period is certainly not without precedent. Tipping (1998) has questioned the role of climatic downturn in upland cultivation patterns on the Anglo-Scottish border, recording cereal cultivation at several sites during this period.

Wooded areas are minimal, and probably consist of small mixed stands in the valley bottoms, or isolated trees of *Betula* or Pinus on the higher ground.

Significance of Nineteenth Century Quarrying

It appears that a significant quantity of waste material, derived from upslope slate quarrying in the mid-nineteenth century, washed down onto the mire surface. This could have had a considerable impact upon areas of the mire in terms of drainage and vegetation, varying in impact according to location and distance from the source. Reduced humification of the overlying peat layers is apparent closer to the source where the band of waste material is thickest. The augured profile from the area of presumed peat-cutting did not contain evidence of this waste material, suggesting that the peat-cutting took place after quarrying had ceased, and the material was removed. Alternatively, it is possible, although less likely, that deposition did not occur at this point in the first place.

Effect of the Drain Cutting associated with the Uplift Road

Two drains and a soak away area were dug across the mire, as part of the construction of the uplift road. These will significantly alter the hydrology and vegetation of the mire, and adversely affect the palaeoenvironmental record held within it. Effects will be complex and vary in intensity across the mire. Some areas will experience increased drainage and relative drying, whereas pooling will occur in others. This will affect the degree and rate of peat humification, and change the vegetation and micro-organism activity. The use of heavy machinery will have physically damaged areas of the mire surface. Mechanical removal of peat has occurred to create the drain channels, and the spoil spread over a significant area of the mire. This will nullify these areas of the mire in terms of palaeoenvironmental significance, as older material now overlies more recent material.

Plate 71: Drain cut and spread of material, facing northeast.

9. CONCLUSIONS

This analysis has successfully demonstrated the survival of a palaeoenvironmental record in the mire at Ffridd y Bwlch, which provides information on landscape development and human activity from at least 5805+/-35BP. The record demonstrates broad themes common to other areas of upland Wales in describing the composition of the climax woodland of the Mesolithic, indicating the relatively intense human activity during the Bronze Age, and highlighting the later development of heather-sedge moorland. However, a relative scarcity of prehistoric archaeological evidence suggesting that the immediate area was not a strong focus for human activity during this time, also appears supported by the palaeoenvironmental evidence. Evidence for Neolithic and earlier activity, aside from a single burning event, is limited, and regeneration appears to occur for some time after the Bronze Age. Caution should be shown however, as the broad sampling range prevents the identification of any detailed inter-sample changes.

The analysis adds to the rather limited palaeoenvironmental record from this area of Snowdonia, and provides a basis for further research into general or more specific themes identified. The mire has demonstrated the capability of the peat deposits in the area to extend our knowledge of human activity and landscape change, and it is possible that still deeper deposits remain to be identified which could extend the palaeoenvironmental record even further back into the Mesolithic. Closer interval sampling with additional radiocarbon dating would allow a more detailed description of change over time to be compiled, and assist in clarifying those events already identified. For example, further information on the burning event dated to 4100+/-35BP, the activity identified during the Bronze Age, and the effect of later human activity such as slate quarrying could all be explored.

9. ACKNOWLEDGEMENTS

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Conclusions

Given the extensive nature of the works undertaken during the construction of the downhill tracks and their associated works, surprisingly little new archaeological features were located. Indeed most of the features recorded concentrated along the southern side Cribau between the farmstead of Cribau and the row of terraced houses known as Tai'r Fest, a pattern recognised in the pre-construction survey undertaken in 2009 (Gwyn *et al*).

Very little physical evidence of prehistoric activity within the study area was recovered except for palaeoenvironmental evidence. This, however, suggested a level of Late Mesolithic activity taking place between 4728 – 4548 BC, possibly including the burning of part of the landscape to improve the hunting potential. Further activity is suggested in period 2900 – 1550 BC with a significant burnt layer within the palaeoenvironmental core, possibly associated with the clearing of ground for cultivation. It is possible that this is a similar time period to that in which the quartz flake was struck, although this was found high on the slopes of Cribau. It is also possible that the mound near to "Boot Hill" may date to this period, although the exact nature of this mound is still to be determined and it is possible that it may be a natural feature. However its form would suggest it may be a burial mound, possibly of Neolithic form.

A marked change to a more pastoral economy is suggested in the Late Bronze Age section of the palaeoenvironmental core with period of woodland regeneration during the Iron Age and Romano-British period. The only other possible Roman activity noted in the study is the recovery of a possible Roman Roof tile near to "Boot Hill". There is some evidence for a resurgence of activity with the burning of areas within the Early Medieval period, possibly as a result of an intensification of pastoral activity. This however, appear to be a relatively short lived phase as by the later Medieval or Early Post-Medieval period heather and sedges dominate the environmental record.

Most of the activity recorded in the study is Post Medieval in date, indeed, most of this is probably eighteenth or nineteenth century in date. Some manipulation of the peat deposits on the hill side was noted. The top of the peats on the Ffridd y Blwch show some evidence for having been cut, also the bank/ditch (PRN 14688) appears to have been at least partly designed to drain the peat deposits on the top of Cribau. The possible plough marks recorded at SH 70325 47829 suggest a level of arable activity not associated with the current agricultural regime was probably carried out at some time in the Late Medieval or Post-Medieval period, possibly associated with the building platform noted outside the area disturbed by the development at SH 70238 47815.

The sheepfold at SH 70263 47579 (PRN 30236) is clearly a site that has developed over time. The circular cell at the heart of the sheepfold appear to sit on an earlier platform of a similar size and shape. One possibility is that this was a prehistoric (possibly Iron Age) platform for a house. Also adjacent to this site is a rectilinear platform running at right angles to the hill slope suggesting the presence of a Late Medieval or Post Medieval building possibly associated with the sheepfold.

A major area of activity was that of the Cribau Farmstead. A string of building were constructed and extended including a house and a range of domestic building along the line of a stream. Also associated with this farm was a series of enclosures defining the paddocks and "in-fields" of the farmstead. The level of manipulation of the local drainage is noticeable with deliberately dug drains concentrating water into the stream which ran in front of some of the agricultural buildings. Although no direct evidence was recorded it is possible that an undershot waterwheel was located adjacent to platform in front of the building PRN30226.

This complex would appear to be in decline by 1888 as the Ordnance Survey map (Figure 5) shows some of the building were already roofless by this date.

It is assumed that the construction of Tai'r Frest is related to the development of the local slate industry, indeed in the 1881 it was the home of Hugh Richard who was described as "the oldest quarryman in Blaenau Ffestiniog" by the Herald Gymraeg (http://www.llechicymru.info/iqtoldestquarryman.english.htm). However it is clear that the occupiers had at least a partially mixed economy. There is a paddock behind the terrace and a series of pig stys and a sheep fold in the immediate area which are assumed to be associated with the terrace.

Perhaps the most curious results of the study is the recording or three previously unknown rock cannons. None of these are large scale features and appear to be essentially on a domestic scale. Rock Cannons are not uncommon in Gwynedd, Jones, in his study of Rock Cannons in Gwynedd, had recorded 235 examples by 2001 (Jones 2002, 1), however the larger, better known examples appear to be associated with major local and national events. They consist of a series of holes drilled in a rock slab filled with black powder which were linked with slow burning fuses. The length of the fuses were timed so that when ignited the "cannon" produced a rhythmic pattern of explosions. The earliest record of rock cannons within North Wales occurs in a survey of the Vaenol Estate in 1777 (Jones 2002, 6), although most would appear to be nineteenth century in date (Jones 2002, 7). Dating of these feature is difficult, although Jones (2002, 3) suggest that rock cannons without fuse channels tend to be earlier. The rock cannons recorded, however, are relatively small and appear to be related to local events, it is probably relevant, in this context, that in the Nantlle Valley that Rock Cannons are also known as "wedding or marriage" stones (Jones 2002, 1). It is noticeable that two of the rock cannons recorded were placed such that they had a "sound box" in order to increase the effect of the cannon. Behind Cribau Farmstead, this consisted of an overhanging natural rock face and at SH 69969 47357 the rock cannon used the mouth of an adit (PRN 30,214).

It is likely that at least some of the materials used in the construction of Plas Weunydd were of local origins. A feature recorded at SH 69923 47374, although rather tumbled, would appear to be the remains of a possible incline. Its orientation would suggest that it linked the stone quarry at SH 69964 473773 to Plas Weunydd which was constructed in 1870 for the Greaves Family (http://www.cofiadurcahcymru.org.uk/arch/gat/english/gat_interface.html). Plas Weunydd was clearly a substantial home incorporating alpine gardens (now largely the car park for the Llechwedd Slate Caverns) and the walled gardens behind The Lodge. It is also possible that the extensive drainage, in the field north west of the walled garden, was constructed at this time in order to improve the lower field.

Perhaps the most important lesson from the project is the requirement for close co-operation between the contractors and the archaeologist. The difference in approach between the construction of the up-lift route and the rest of the tracks was instructive. The up-lift route was much more like a standard construction contract with a prescribed route where the progress could generally be predicted, however, problems were encountered when work was forced on the contractors outside the programme and this work was not notified to the archaeologist. There was also some difficulty with communications both between the archaeologist and the contractors and within the contractor's team. This resulted in a number of mistakes which could have been avoided. For example, although the contractors were warned about an adit below the route being constructed, spoil was dumped into the mouth of the adit, largely because the warning was not passed on from the Foreman to the workers carrying out the work. Also, despite having fenced off "Boot Hill" to protect it during construction, when the reinstatement of this area was undertaken a new drain was dug clipping the foot of the mound. The most damage, however was carried out as a response to the adverse weather encountered in December 2011. The very wet weather required

emergency works to control the amount of run-off and prevent it from contaminating a local fishing lake. Two, unplanned, cut-off drains were dug together with a series of drainage ponds. One of the cut-off drains was 2 – 3 m wide and up to 100 m long cutting through extensive peat deposits and the drainage ponds were similarly through peat deposits at least 1 m deep. Unfortunately the archaeologist was not notified of this work until after these works had been almost completed making the monitoring of this work unsatisfactory. The one advantage of these works was as a result of the mitigation work which were commissioned by Antur 'Stiniog. A palaeoenvironmental study of the peats (see Grant below) was commissioned which gives an indication of the changing local environment from the Late Mesolithic to the post-industrial era.

The construction of the down-hill routes had their own challenges. Although provisional routes were inspected as part of the pre-construction study, there is little correlation between planned routes and those actually constructed. Indeed, much of the detailed design was not carried out until the section of the tracks was under-construction. This has the potential for serious archaeological concern, however with this project the exemplary character of the contractors meant that the archaeologist was involved in the discussions over route selection. Indeed it was possible for the archaeologist to request minor diversions at very short notice which could be carried out in order to any protect archaeological features encountered. Probably the best example of this is that of the rock cannon encountered behind Tai'r Frest. This was found during top-soiling and once recognised a minor re-route was undertaken immediately as a result of a discussion between the contractor and the archaeologist. The construction of the down-hill routes was not without its challenges. Although not mentioned in the provisional method statement provide to the archaeologist a series of borrow pits were dug along the routes in order to provide material for the construction of the tracks. These pits were then re-filled with the top-soil and less suitable material removed from the line of the tracks.

The pre-construction reports (Gwyn *et al* 2009) included a scoping study on the interpretive possibilities of the cycle tracks by E. Carson Mee. It is now possible to add to more focussed suggestions for the heritage interpretation of the downhill route. There are five possible point at which interpretation could take place, the visitors centre, Cribau farmstead, Tai'r Frest, the turning point on top of Cribau and near "Boot Hill". The visitor centre is the obvious place for the majority of the interpretation. It is suggested that this should concentrate on the great time depth recorded in the environmental work and the changes within the environment over time. This could be linked to the changes of farming practice shown in the features recorded during construction. The Cribau farmstead is best place to look at the eighteenth and nineteenth century farming which formed the background to the expansion of the slate industry. Tai'r Frest, however, carries the story forward into the nineteenth century with the construction of the terraced row of houses, the development of Plas Weunydd and the development of the slate industry. This point is also probably the area to feature the "rock cannons" because two of the three examples are within this area. The turning area on the top of Cribau is probably a good point at which to engage the people immediately involved in downhill cycling with a summary of the archaeological features they will encounter on the routes. The final area is near to the access point for the uplift road adjacent to "Boot Hill". Here the some reference should be made to the environmental story as well to "Boot Hill" itself. How the interpretation is delivered will be a matter of the interpretation strategy adopted by Antur 'Stiniog, however a mixture of "traditional" information boards and smart phone technology could be considered. The visitor centre, Cribau farmstead and Tai'r Frest are probably best suited to traditional boards whilst the use of technology may be more appropriate on the top of Cribau.

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Support with the topographic surveys and with advice on all things slate and rock cannons were freely given by Bill Jones

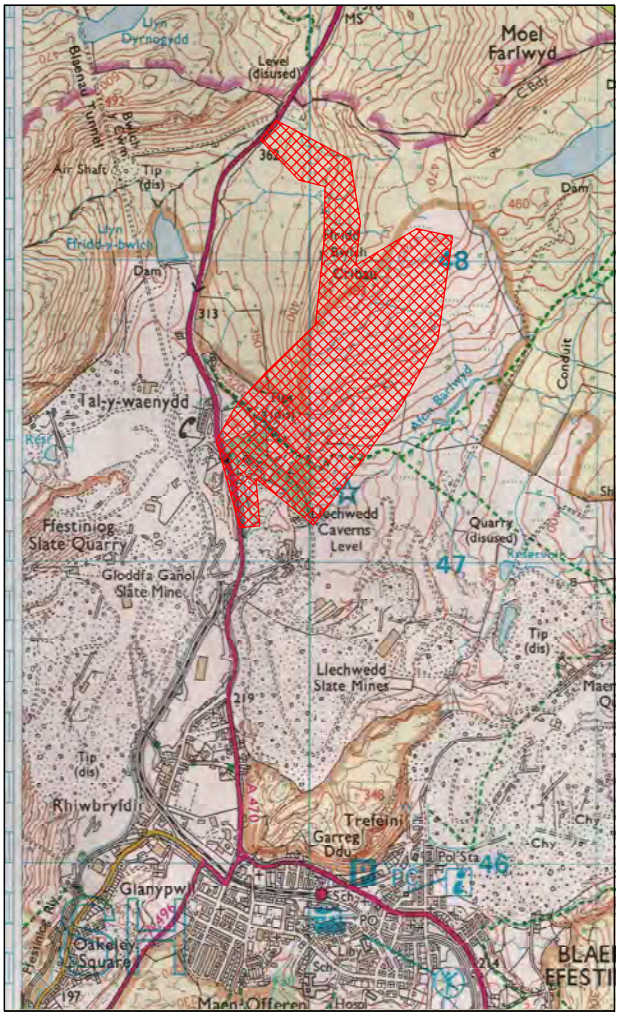

Figure 1: Location
Scale 1:25,000

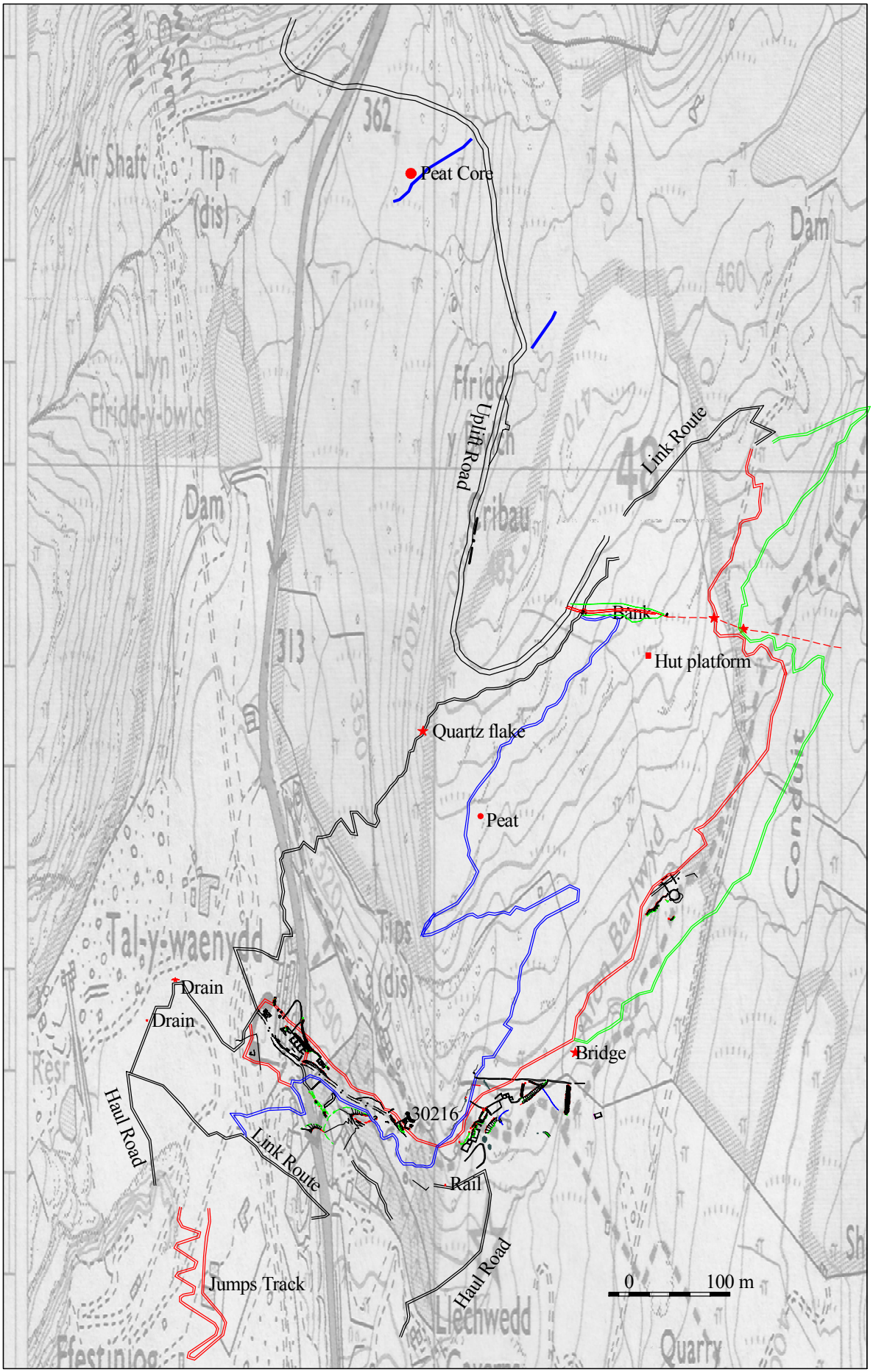

Figure 2: The Routes
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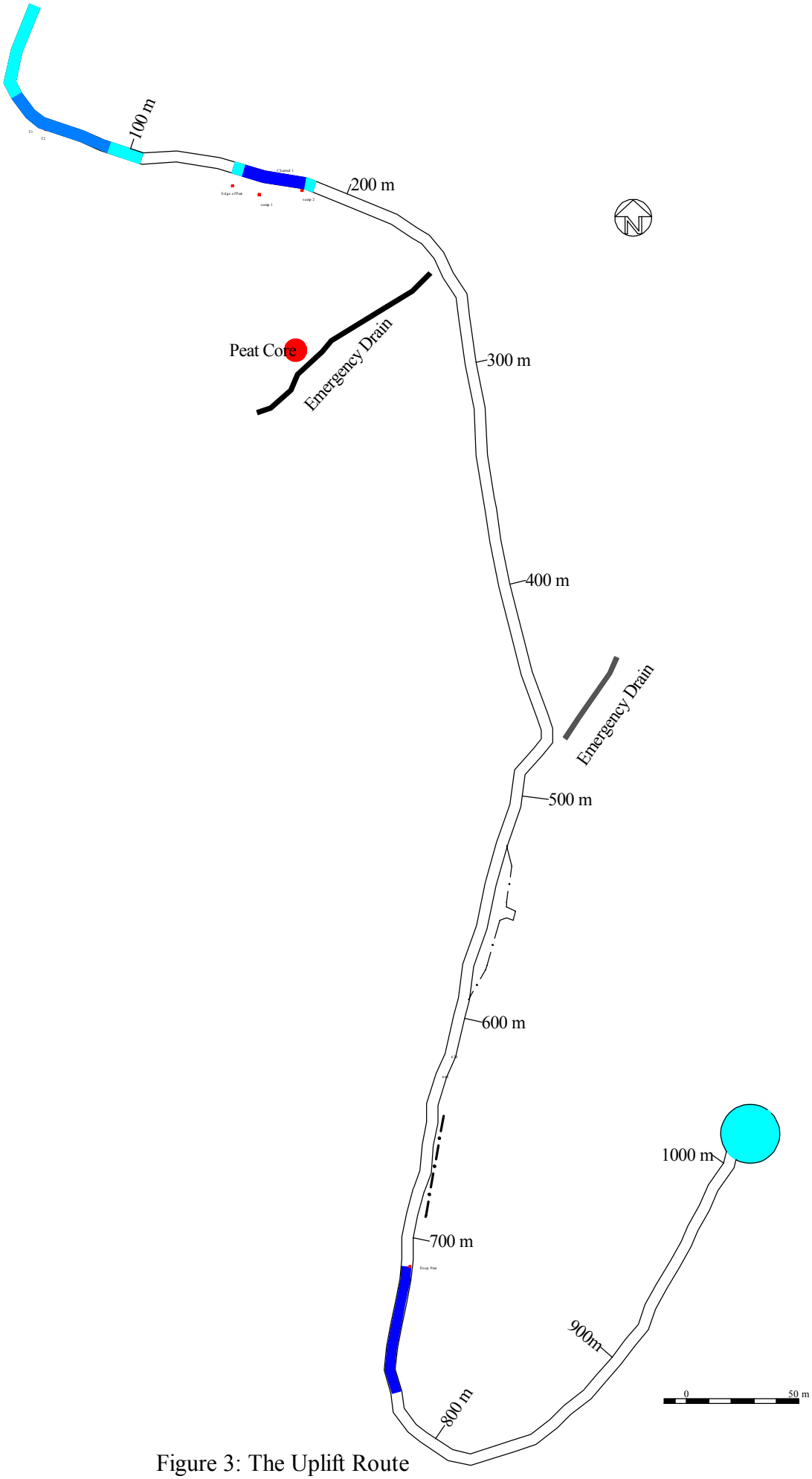


Figure 3: The Uplift Route
Scale 1:2500

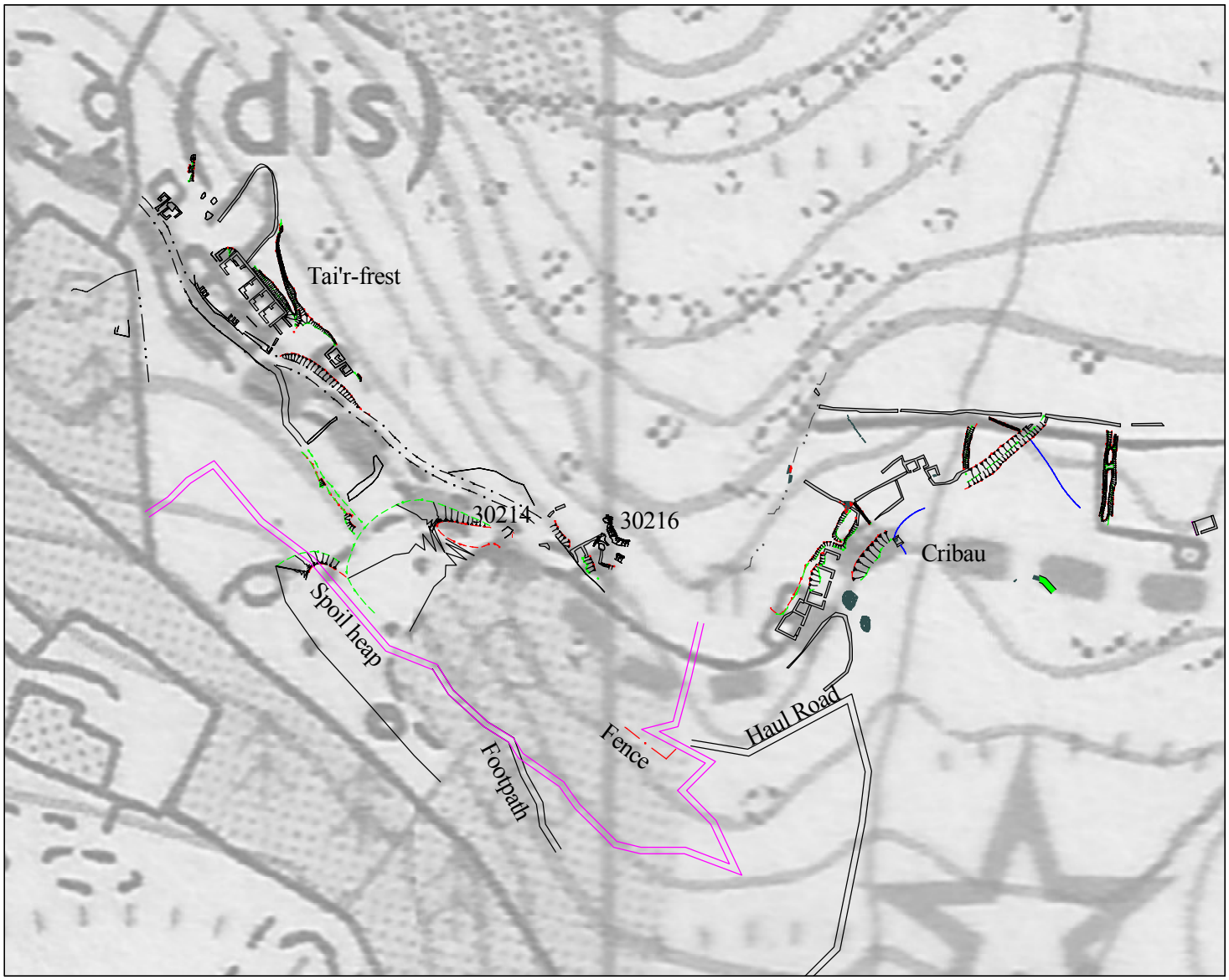


Figure 4: The Abandoned Route
Scale 1:2,000

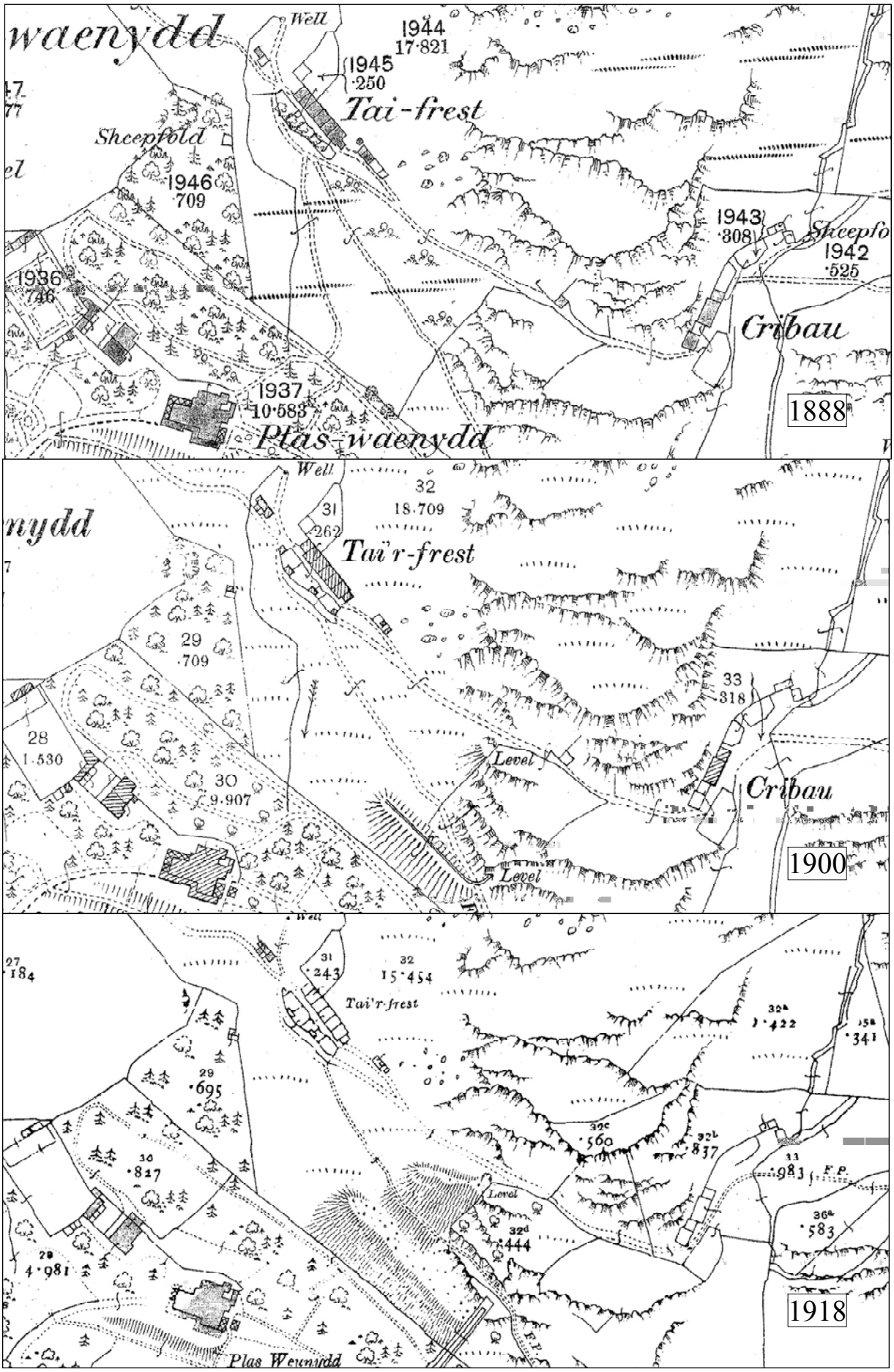


Figure 5: Extracts from the Ordnance Survey Merionethshire IV.5 Maps, Scale 1:2500

Figure 6: The Haul Roads
Scale 1:2000

Figure 7: The Link Route
Scale 1:2000

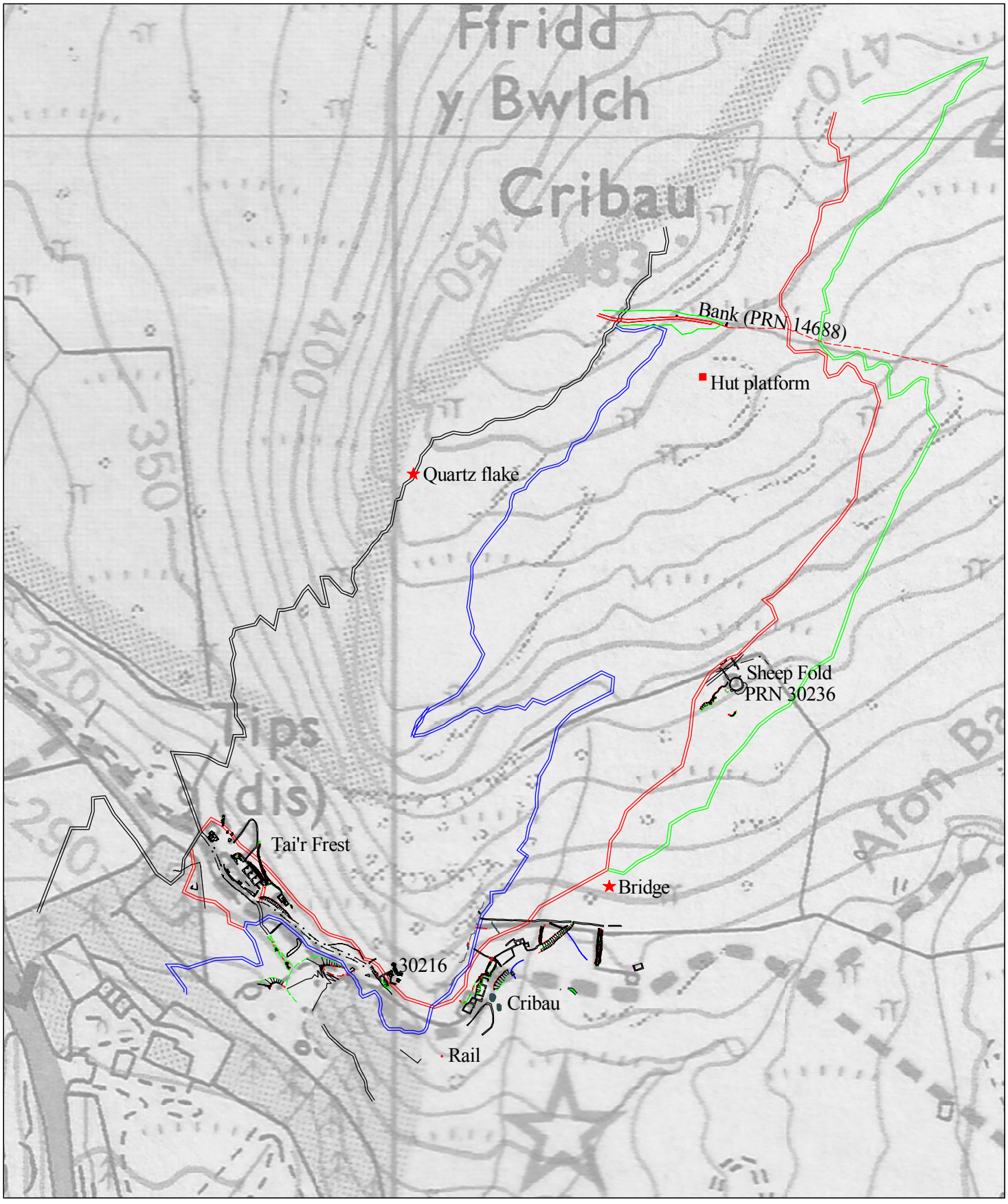


Figure 8: The Downhill Routes
Scale 1:4000

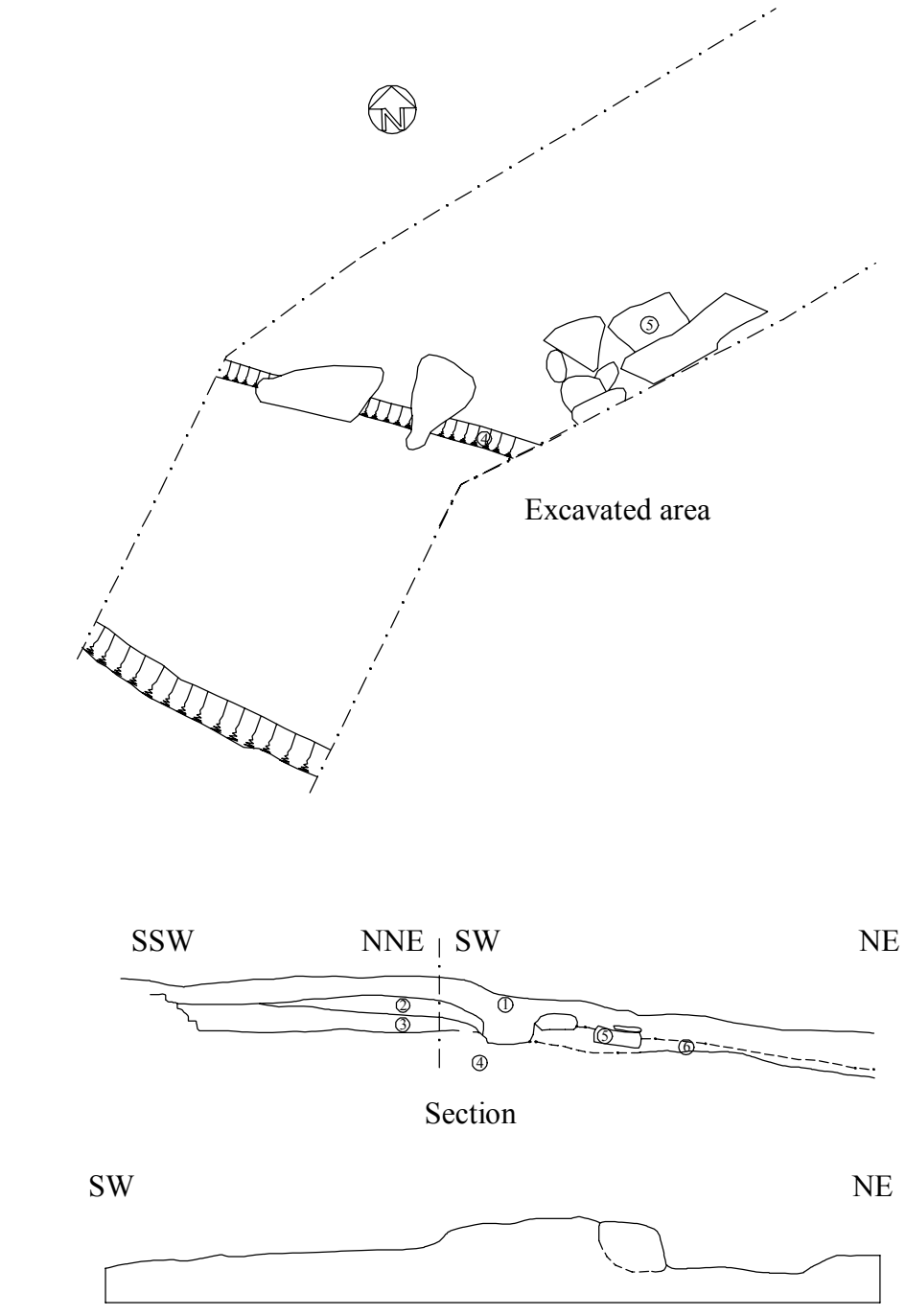
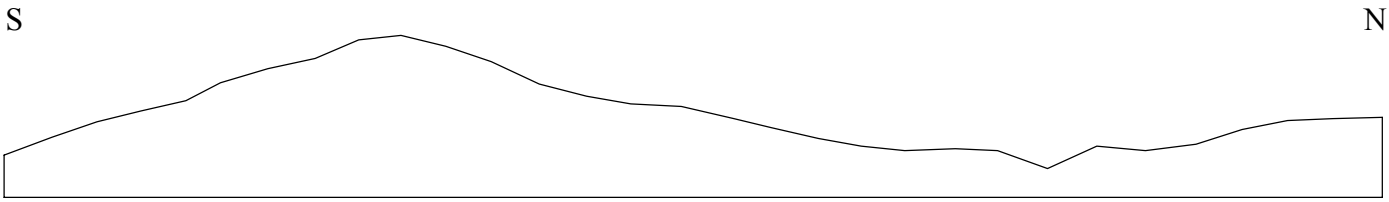


Figure 9: Bank PRN 14688, Plan and Section
Scale 1:50



Profiles of Bank PRN 14688 at Red route crossing

Figure 10: Profile of Bank PRN 14688
Scale 1:50

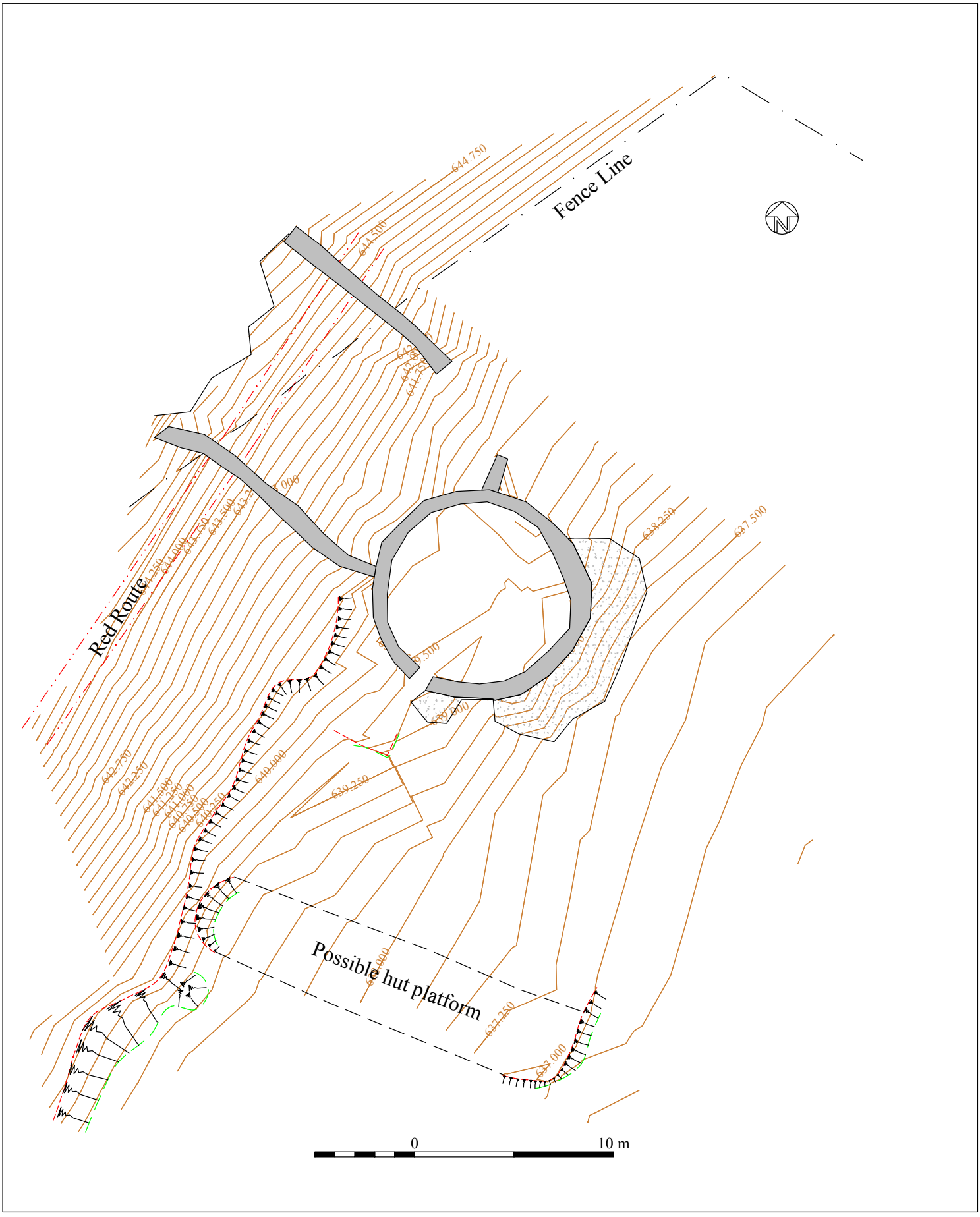


Figure 11: Sheepfold PRN 30236
Scale 1:250

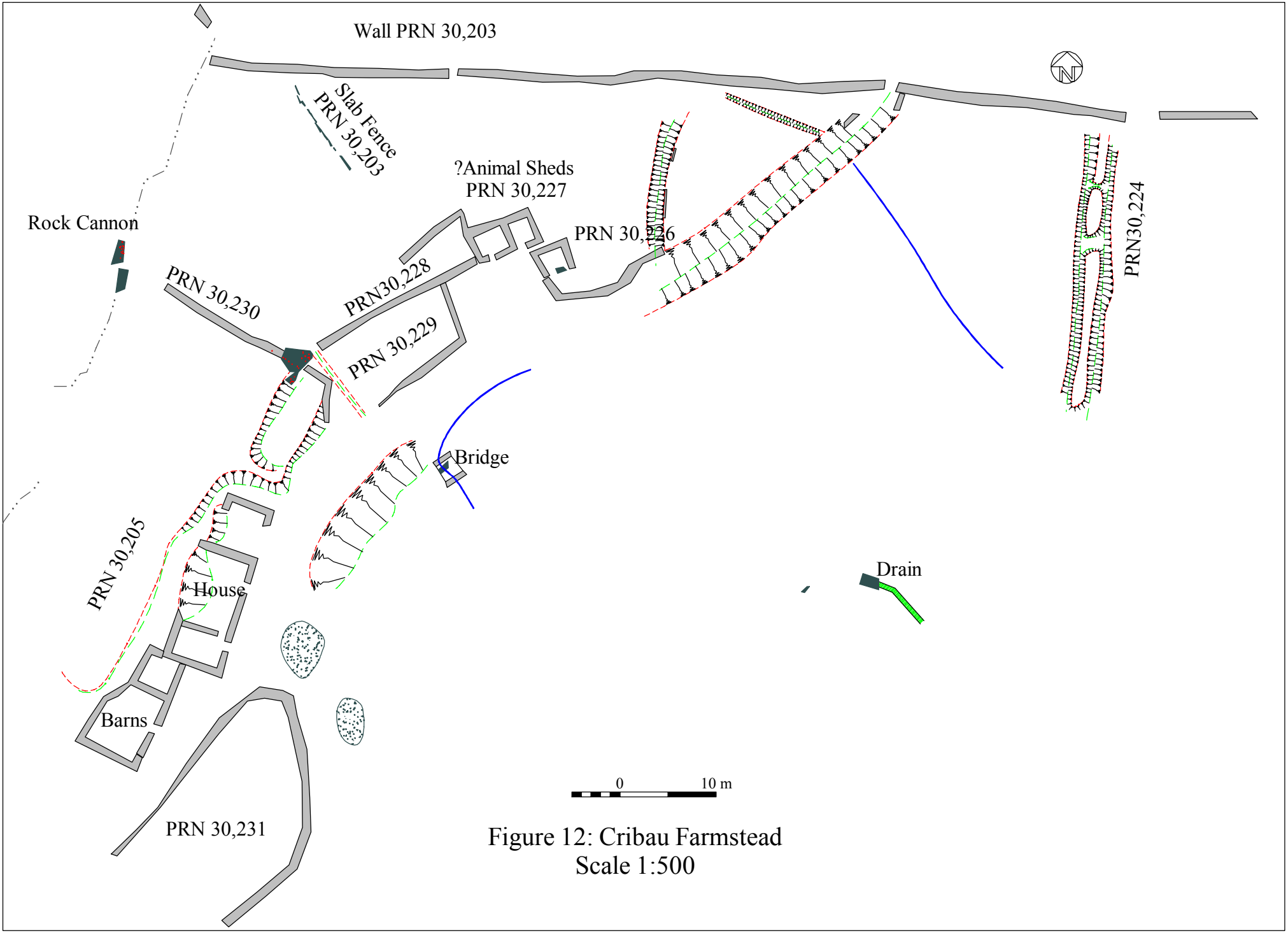


Figure 12: Cribau Farmstead
Scale 1:500

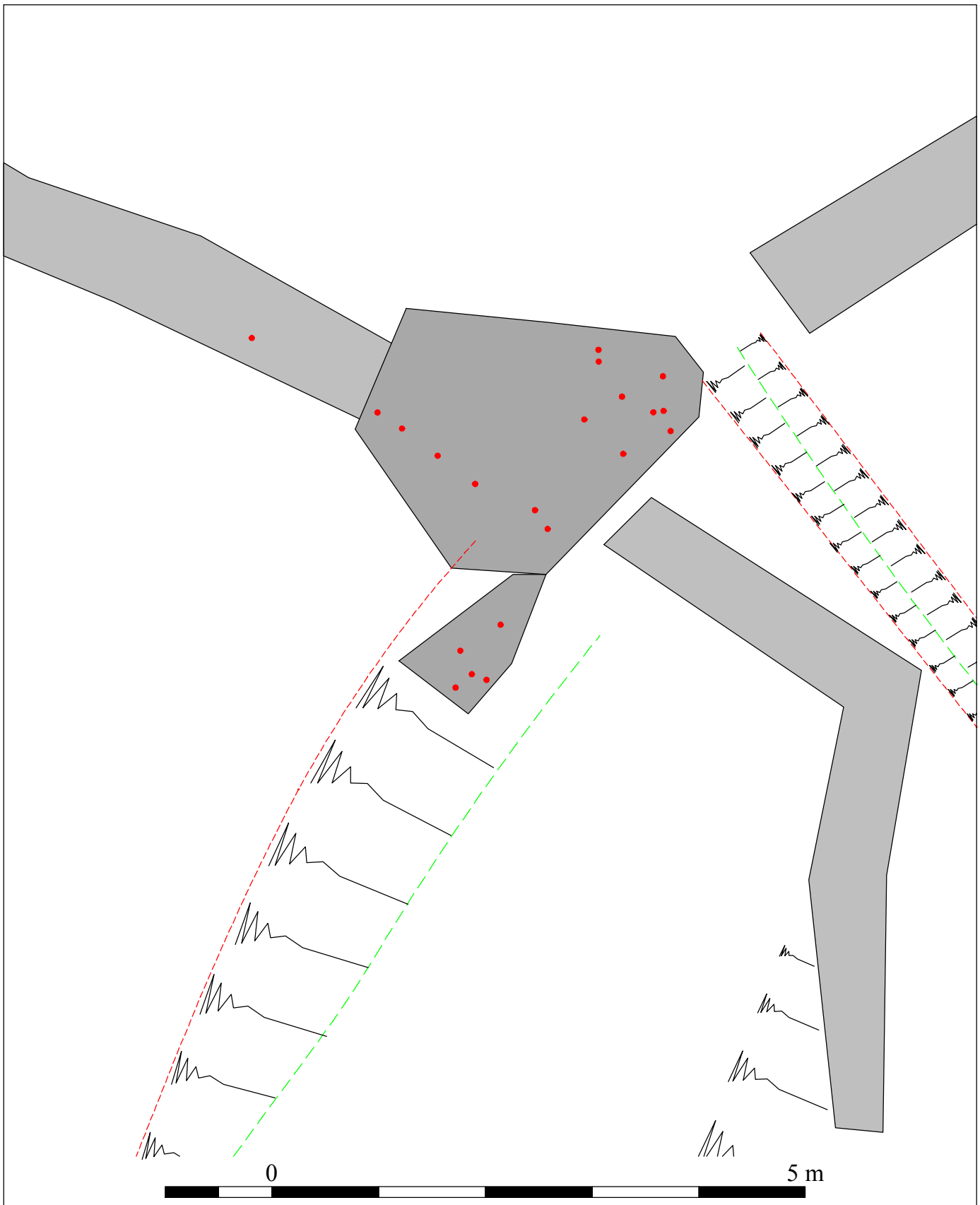


Figure 13: Distribution of drilled holes in PRN 30,230
Scale 1:50

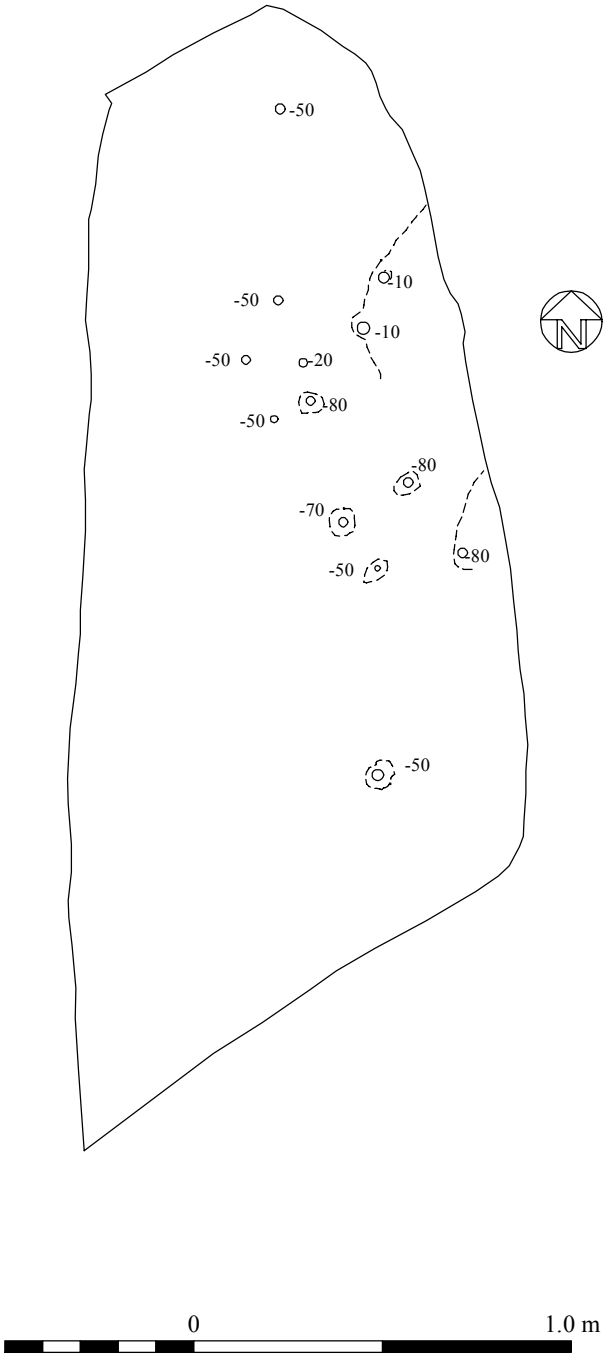


Figure 14: Rock Cannon near Cribau
Scale 1:20
Hole depths shown in millimetres

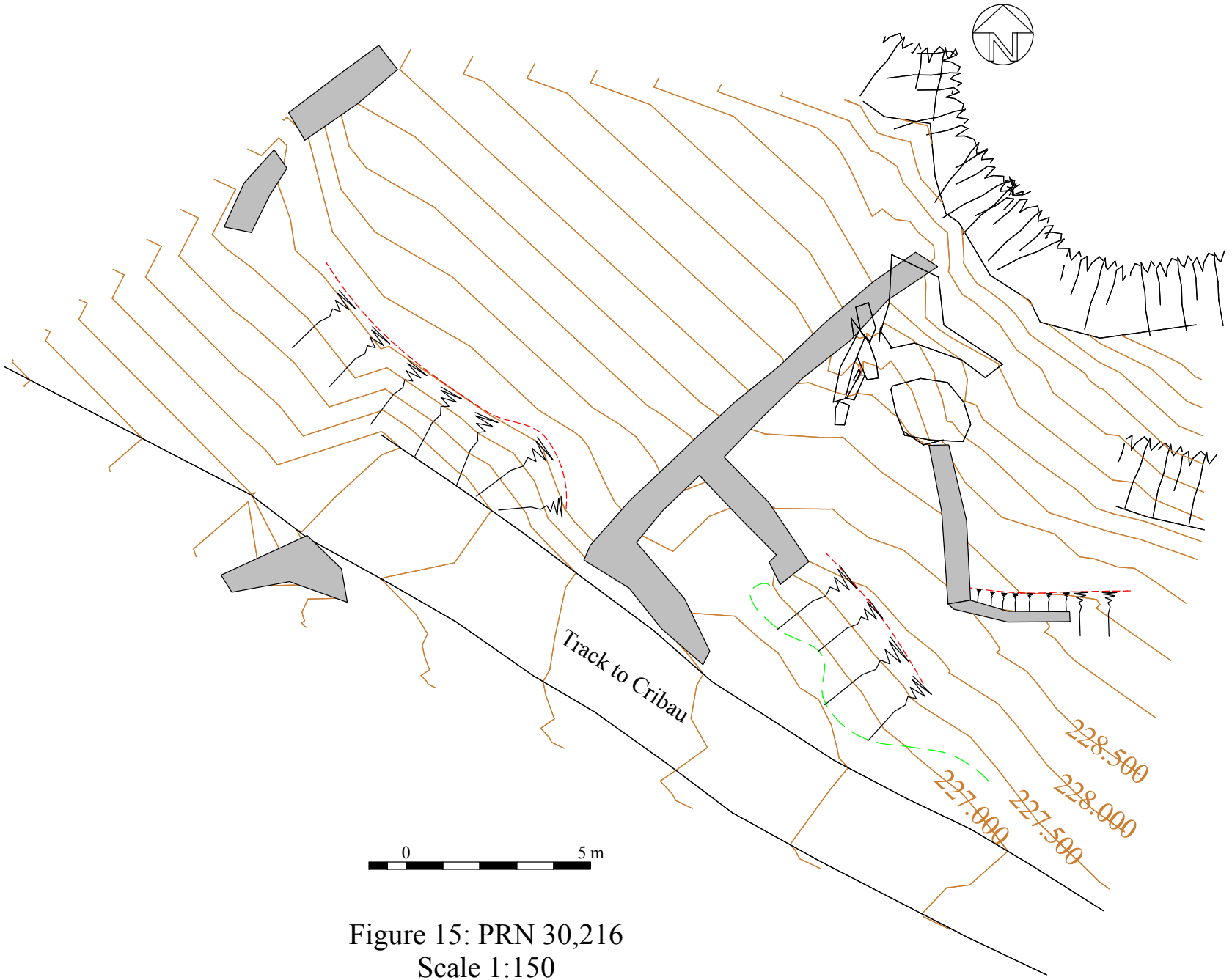


Figure 15: PRN 30,216
Scale 1:150

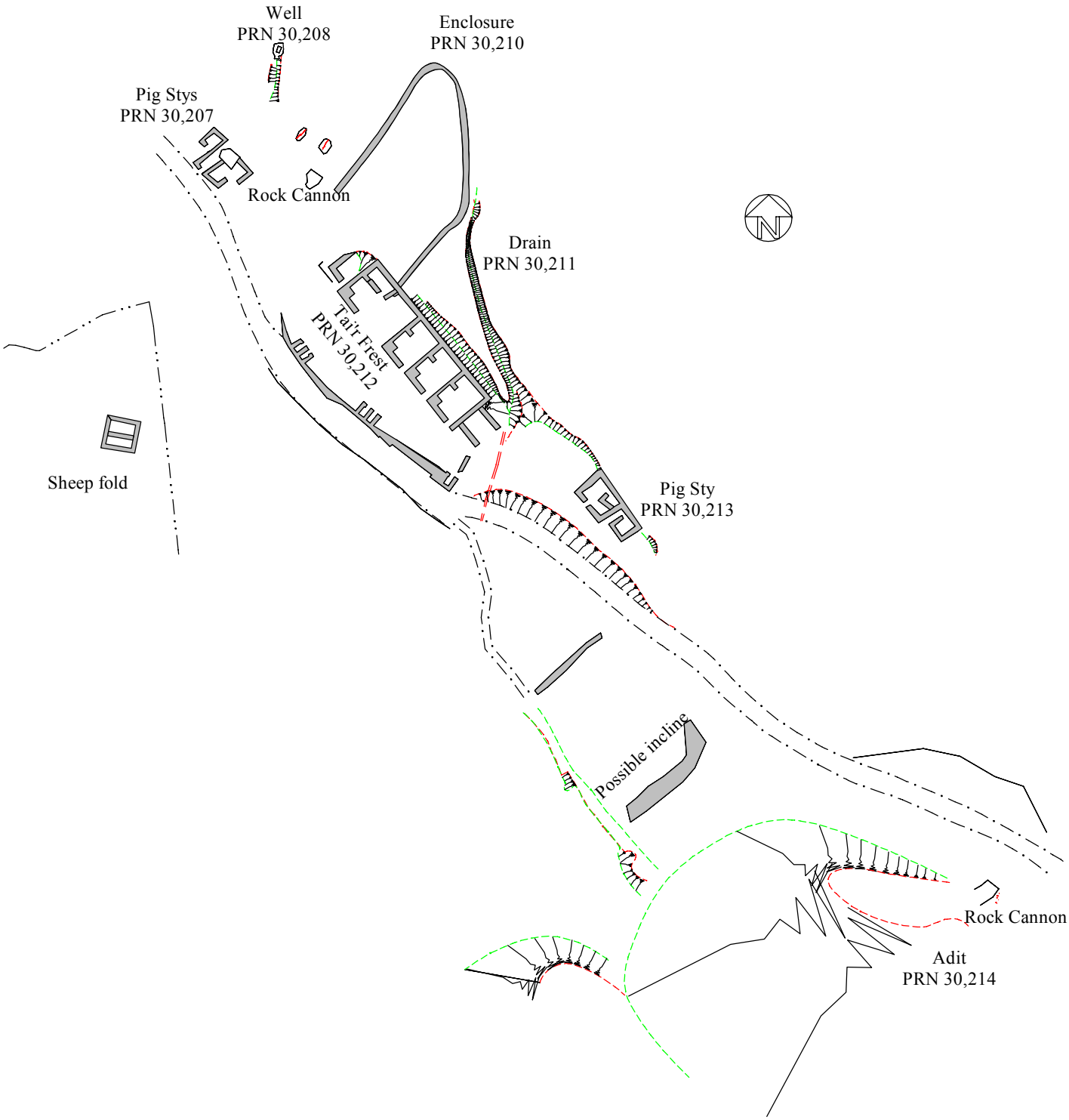


Figure 16: Tai'r Frest Area
Scale 1:800

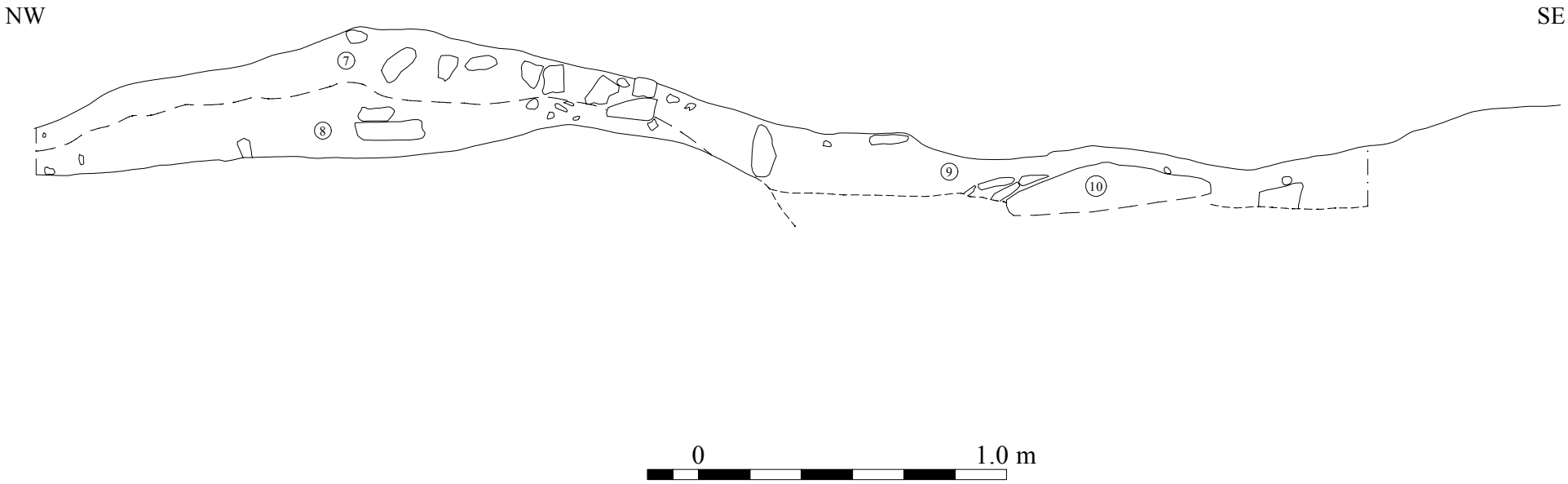


Figure 17: Track Crossing at SH 69890 47363
Scale 1:20

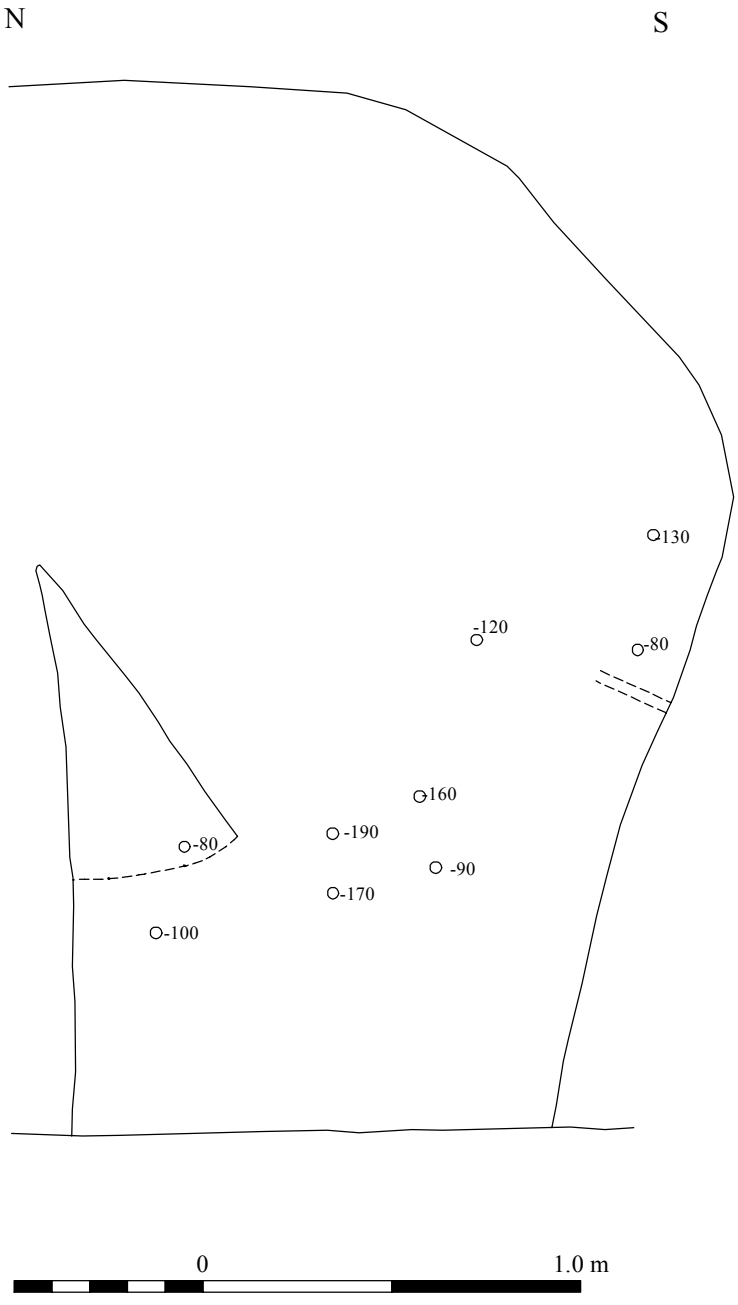


Figure 18: Rock Cannon Associated with Adit PRN 14688
Scale 1:20
Hole depths shown in millimetres

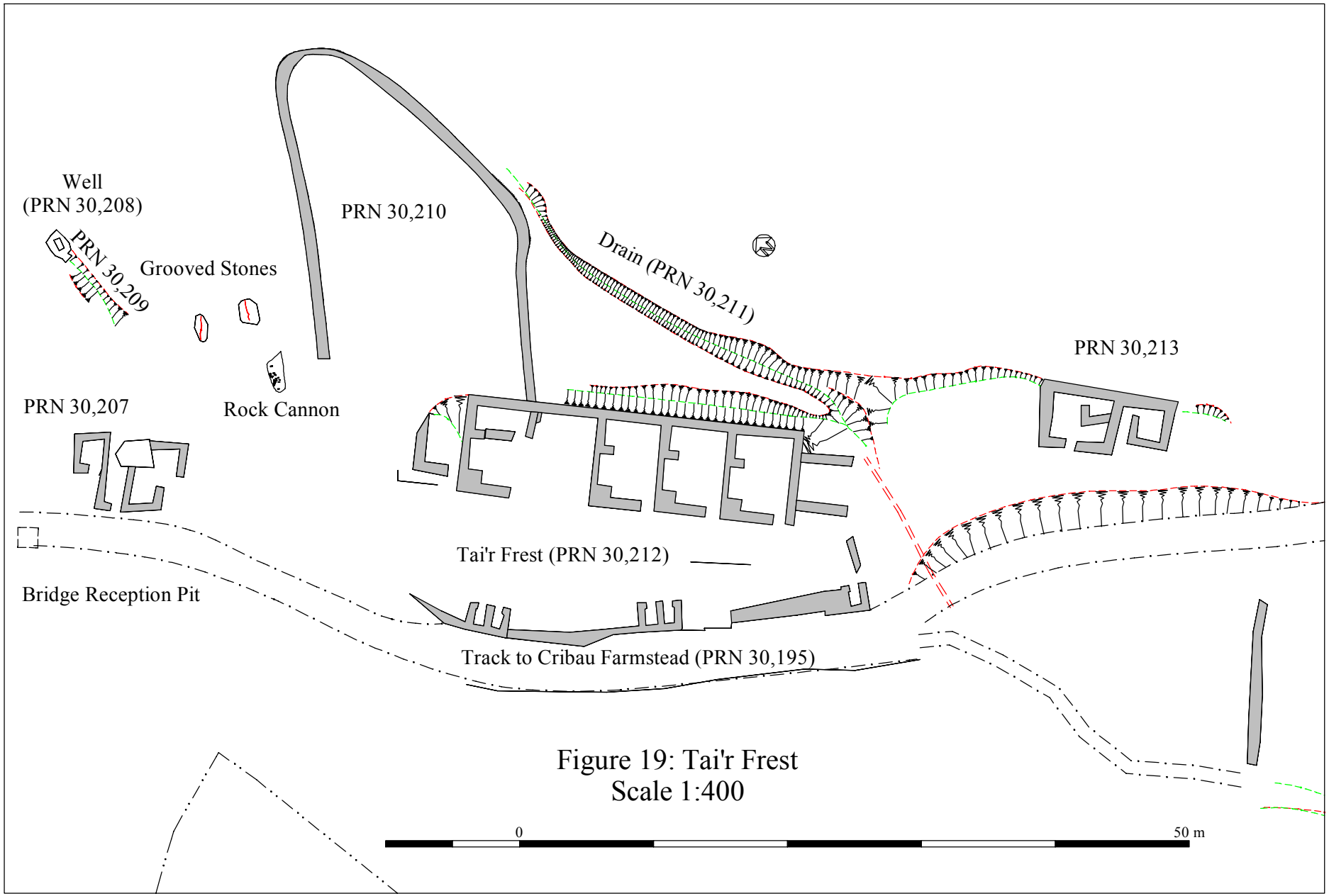


Figure 19: Tai'r Frest
Scale 1:400

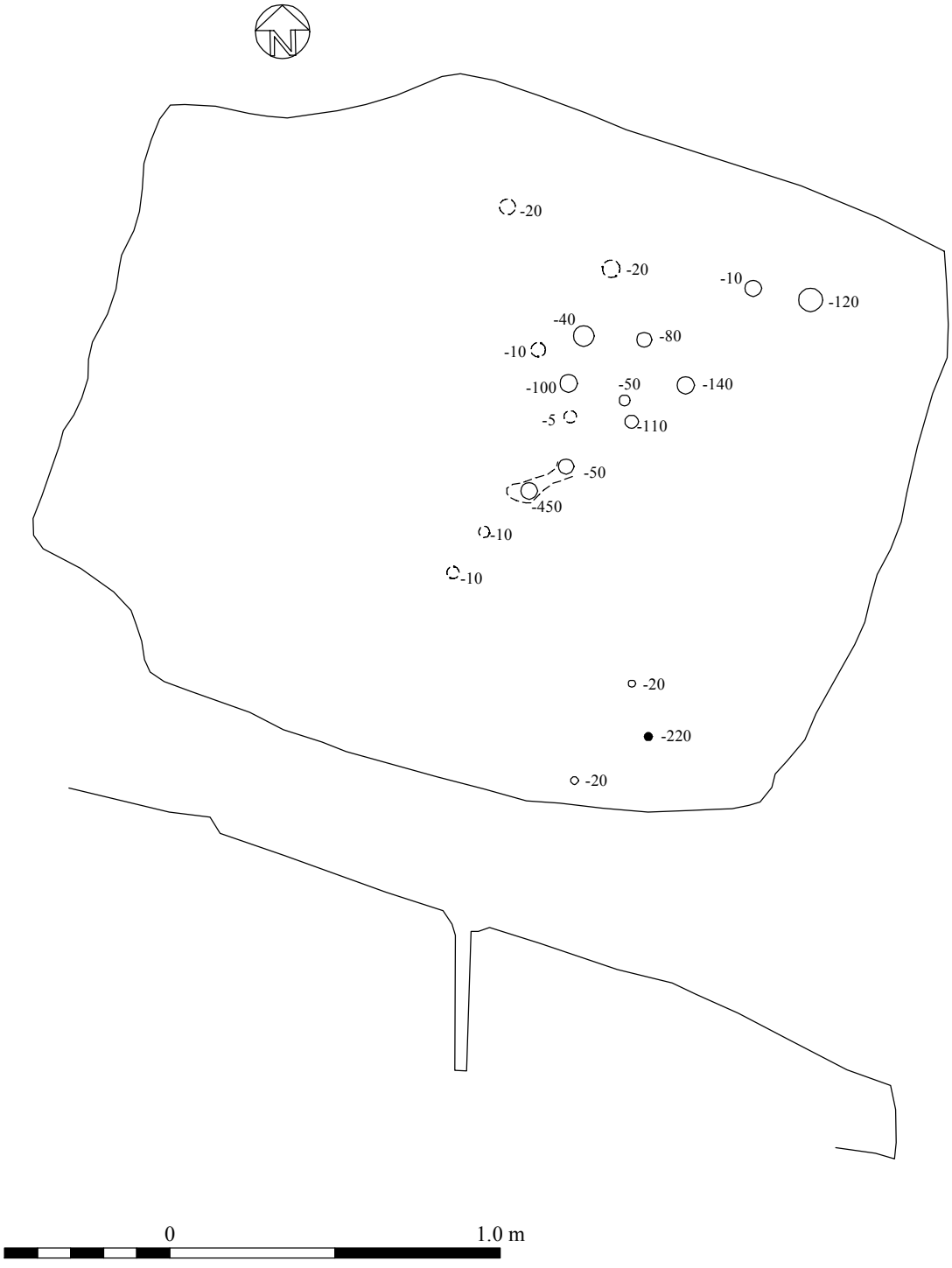


Figure 20: Rock Cannon associated with Tai'r Frest
Scale 1:20
Hole depths shown in millimetres

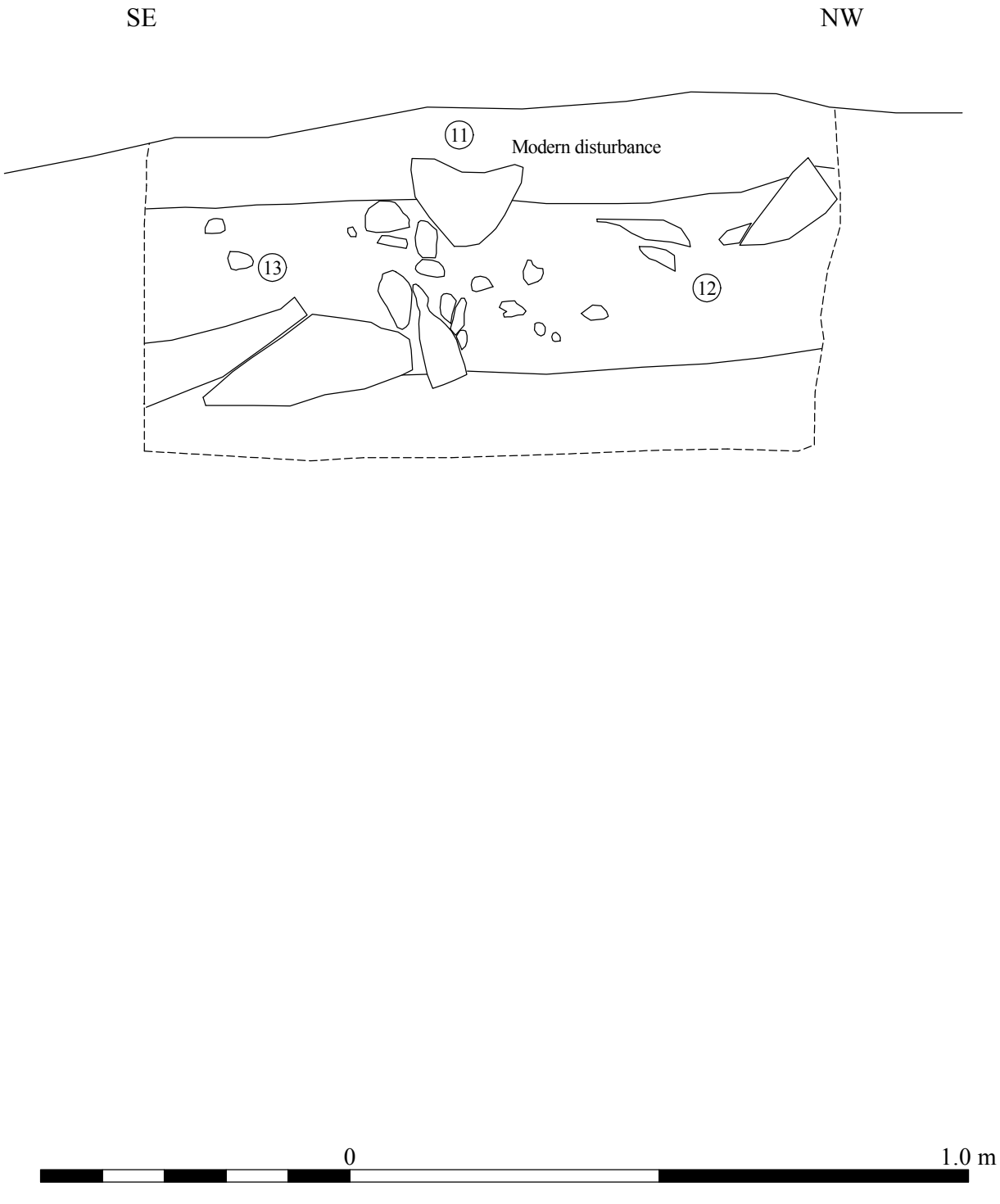


Figure 21: Section of the Bridge Reception Pit
at SH 69849 47462
Scale 1:10

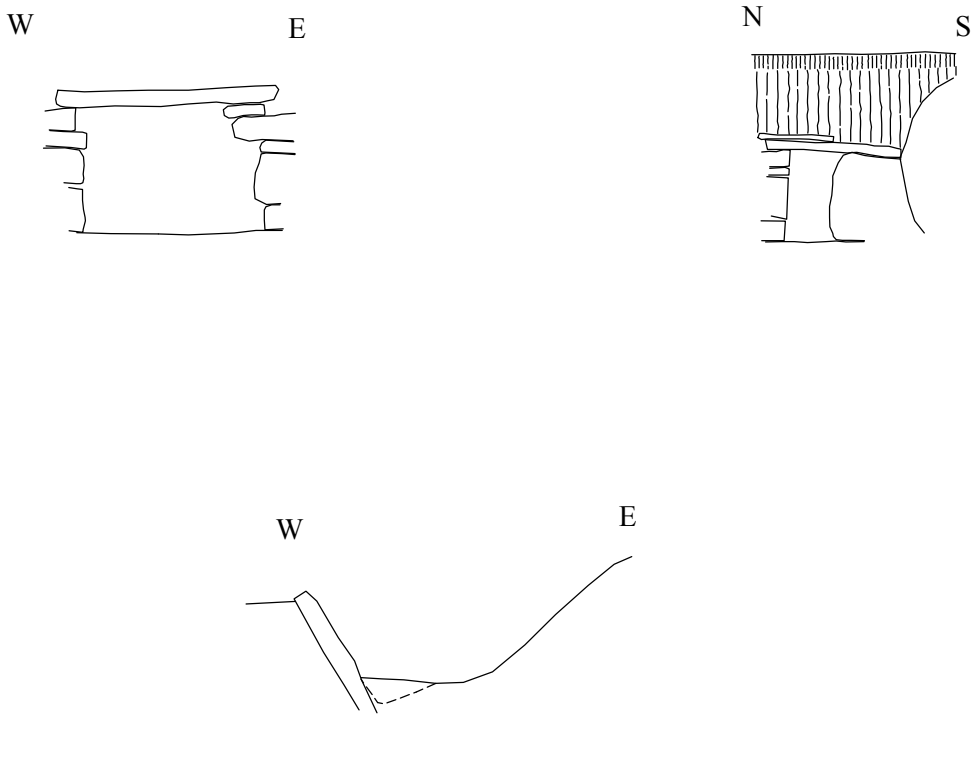


Figure 22: Sections Through Drains
Scale 1:20

Figure 23: Field System
Scale 1:1200

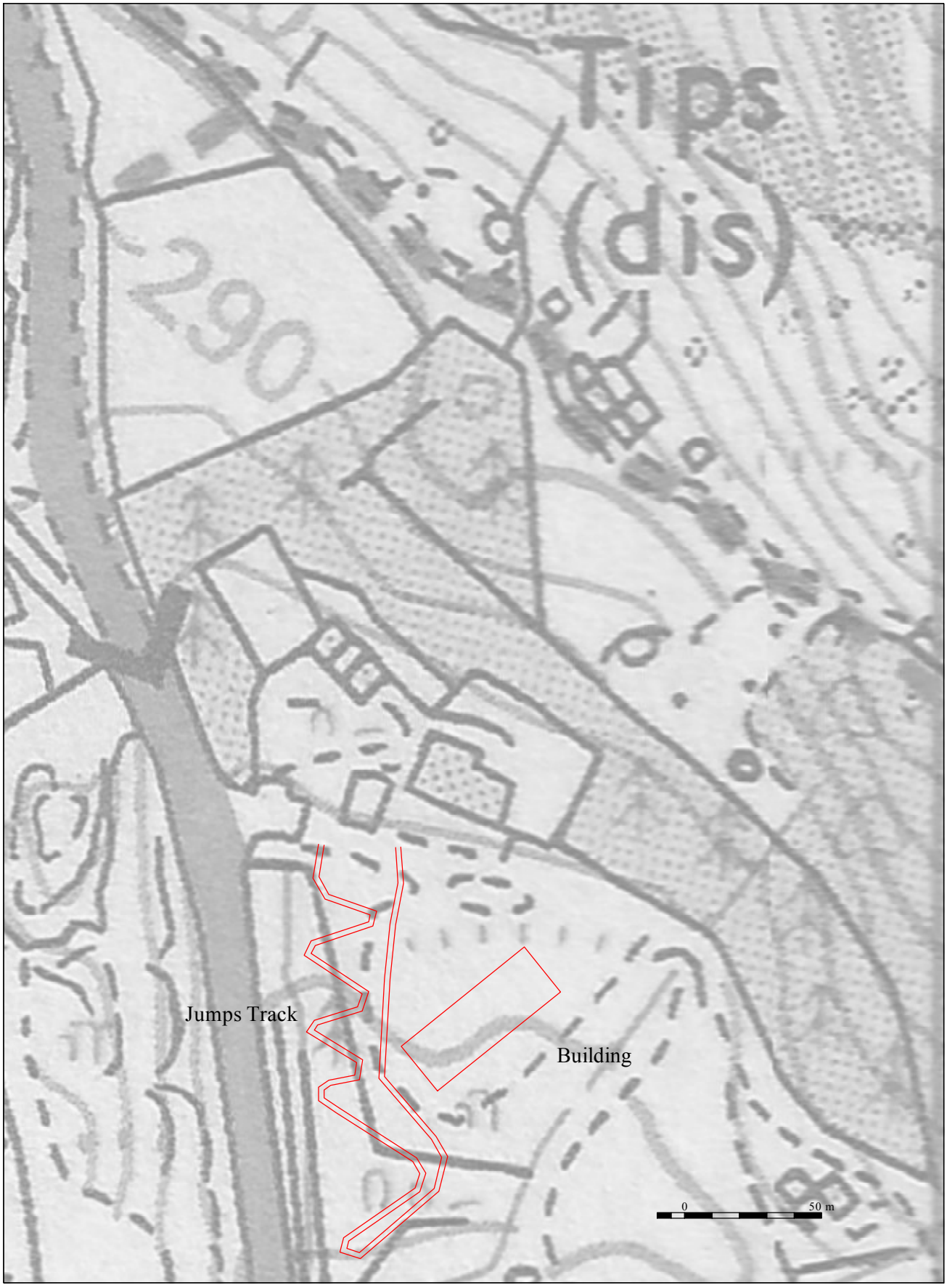


Figure 24: Location of the Jumps track and the Visitor Centre
Scale 1:2000

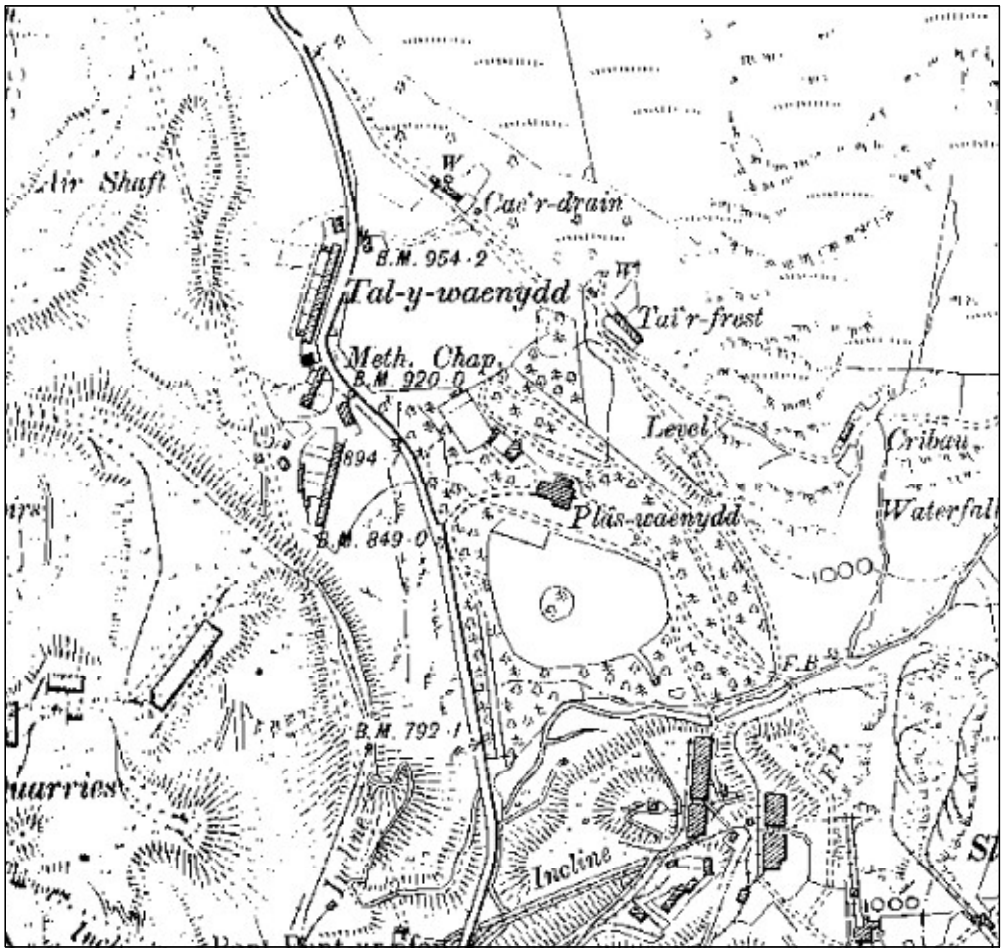


Figure 25: Extract from the 1901,
Second Edition Ordnance Survey Map
Carnarvonshire XXXIX NW
Not to scale

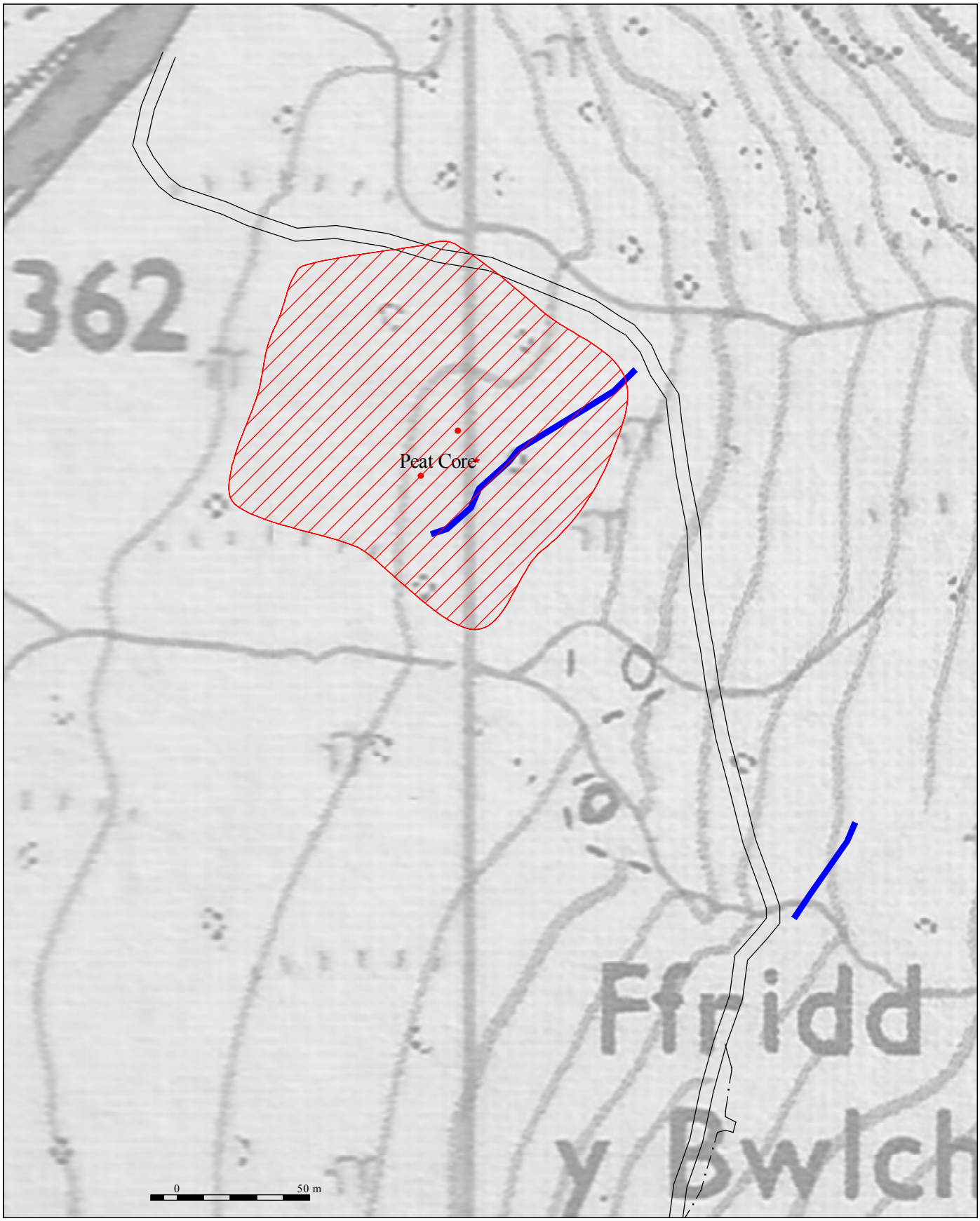


Figure 26: Possible Extent of the Sampled Peat Basin
Scale 1:2000

Plate 1: General view during the construction of the Uplift Route across Ffridd y Bwlch

Plate 2: Stone roof tile

Plate 3: detail of the surface of “Boot Hill”

Plate 4: Low mound at SH 69900 48416

Plate 5: Spoil tipping in to the top of the adit (PRN 30197)

Plate 6: Remains of a tree stump on Ffridd y Blwch

Plate 7: Maximum depth of the peat on Ffridd y Blwch cut by the uplift route

Plate 8: Peat deposit at SH 70052 47878

Plate 9: Emergency drain at base of western slopes of Cribau

Plate 10: Section through peat deposits in the emergency drain at base of western slopes of Cribau

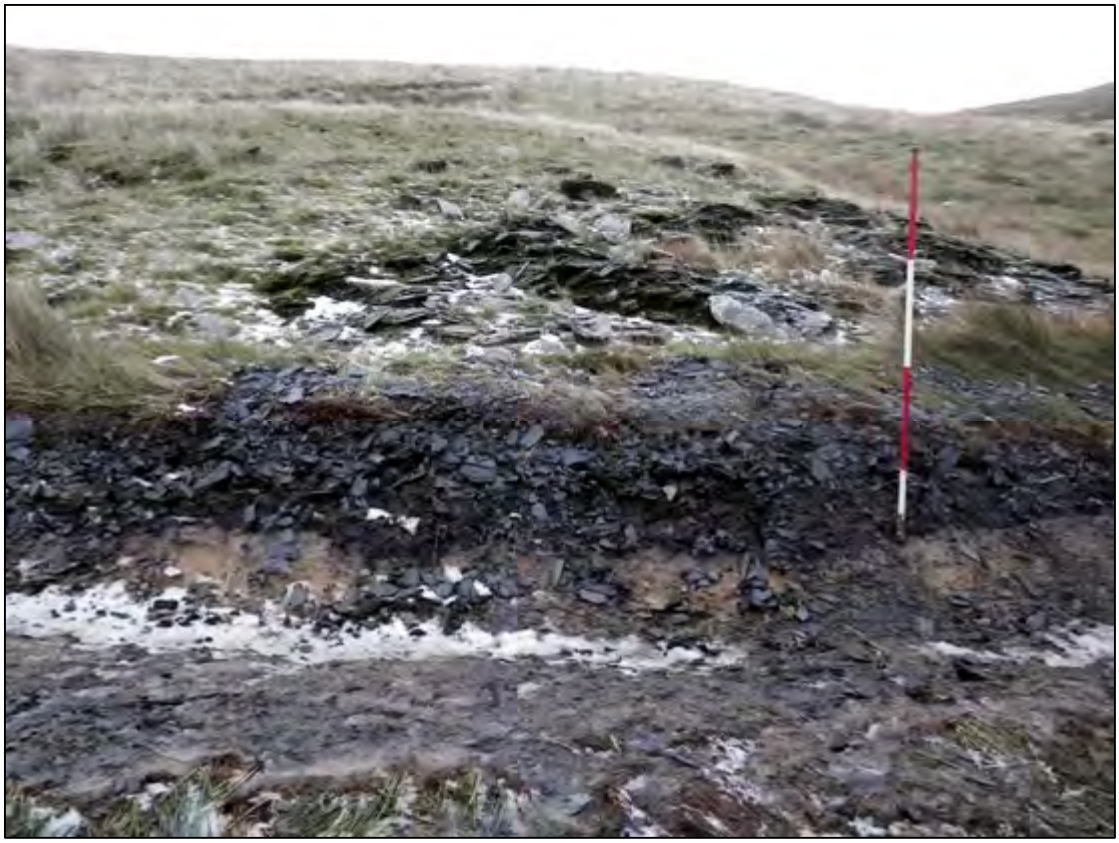


Plate 11: Emergency drain cutting the tail of the spoil heap to adit PRN 30198

Plate 12: Remnant of the slate fence

Plate 13: Iron rail on rock outcrop

Plate 14: The footpath on the abandoned route

Plate 15: Blocking on the footpath on the abandoned route

Plate 16: Spoil heap from the “hidden waterfall”

Plate 17: Dry stone wall cut by the southern haul road

Plate 18: The walled garden

Plate 19: The Red route crossing the bank PRN 14688

Plate 20: The Black route crossing of the bank PRN 14688

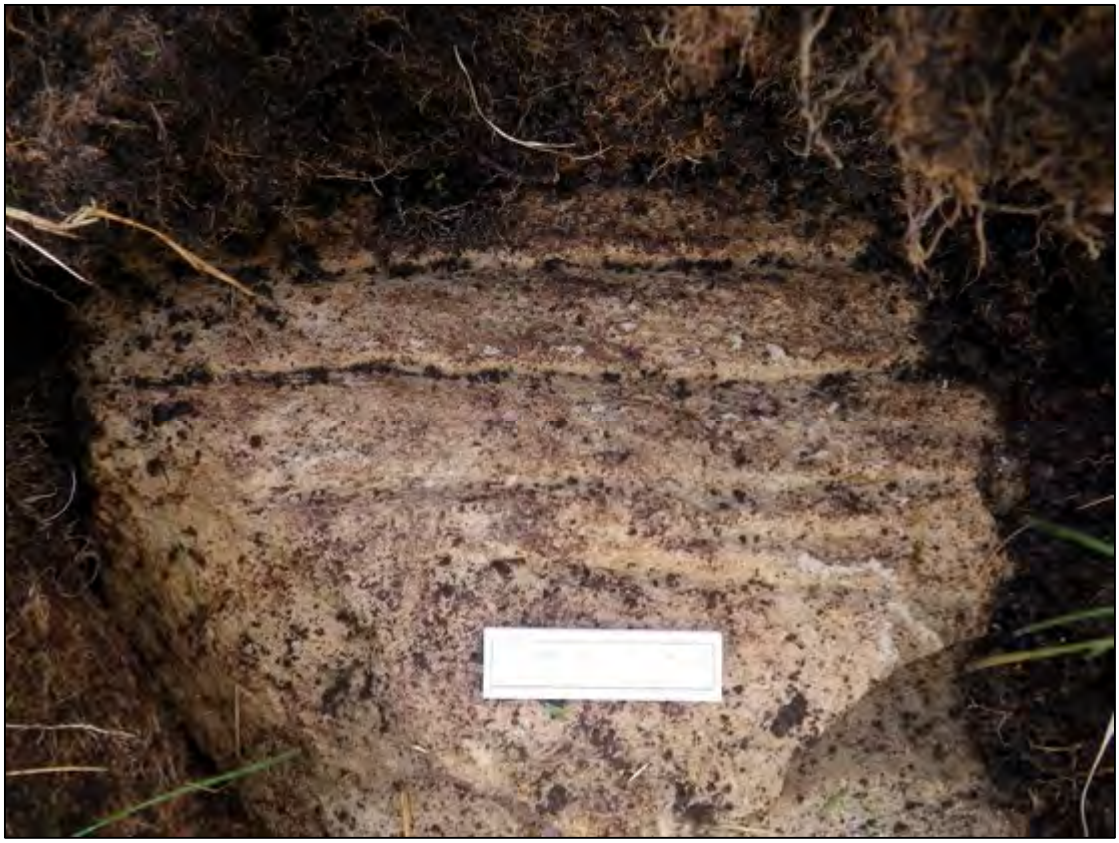


Plate 21: Possible plough marks on a rock near to the Bank PRN 14688

Plate 22: Possible plough marks on a rock near to the Bank PRN 14688

Plate 23: Rectangular platform at SH 70238 47815

Plate 24: Quartzite flake

Plate 25: Sheepfold PRN 30236

Plate 26: Stone bridge at SH 70166 47422

Plate 27: Stone bridge at SH 70166 47422

Plate 28: Slate fence slabs near to sheepfold PRN 30236

Plate 29: Dump of slate fence slabs at SH 70136 47579

Plate 30: Cribau Farmstead, looking SW

Plate 31: Cribau house looking NE

Plate 32: Blocked fireplace in the northern extension of Cribau farmhouse

Plate 33: Roofing slates from Cribau

Plate 34: Animal shed, part of the Cribau Farmstead, looking NE

Plate 35: Stone block with drill holes, part of PRN 30,230

Plate 36: Stone block with drill holes, part of PRN 30,230

Plate 37: Stone block with drill holes, part of PRN 30,230

Plate 38: Stone bridge in the Cribau Farmstead

Plate 39: Point at which the Blue Route crosses PRN 30,203, looking north

Plate 40: Blue Route crossing of PRN 30,203, looking north

Plate 41: Rock Cannon below a natural overhang near Cribau

Plate 42: Detail of the Rock Cannon near Cribau

Plate 43: Lower section of PRN 30,216, looking NE

Plate 44: PRN 30,216 from above

Plate 45: Wall crossing to the north of PRN 30,216, looking SE

Plate 46: Footpath Crossing at SH 69889 47364

Plate 47: Footpath crossing at SH 69881 47391

Plate 48: Possible incline at SH 69923 473774

Plate 49: Drilled holes for a fence at SH 69833 47434

Plate 50: Remains of the sheepfold at SH 69847 47422

Plate 51: Protecting the tip associated with adit PRN 30,214

Plate 52: Location of the possible rock cannon in the mouth of the adit PRN 30,214

Plate 53: Possible rock cannon in the mouth of the adit PRN 30,214

Plate 54: Tai’r Frest, looking NE

Plate 55: Graffiti reading “English Out” on Tai’r Frest

Plate 56: Carved graffiti on Tai’r Frest

Plate 57: Structure of the drain behind Tai'r Frest

Plate 58: Grooved rock near to Tai'r Frest

Plate 59: Grooved rock near Tai’r Frest

Plate 60: Possible rock cannon, near Tai’r Frest

Plate 61: Detail of rock cannon near Tai'r Frest

Plate 62: Possible wall beneath the track to Cribau Farmstead near to Tai'r Frest

Plate 63: Possible fence line between Tai'r Frest and PRN 30,216

Plate 64: Possible fence line between Tai'r Frest and PRN 30,216

Plate 65: Possible fence line between Tai'r Frest and PRN 30,216

Plate 66: Possible fence line between Tai'r Frest and PRN 30,216

Plate 67: Main Drain

Plate 68: Inside the main drain

Plate 69: Side drain