

Clyne Valley Shaft Mounds SAMGm455, Swansea

Archaeological Landscape Monument Survey



Prepared
For

City & County of Swansea

By



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Summary

Comisiynwyd Archaeoleg Mynydd Du Cyf gan Ddinas a Sit Abertawe i gwblhau arolwg archeolegol o'r difrod a achosir i'r Cofeb Hynafol Rhestredig Twmpathau Siafft Cwm Clyne (SAMGm455) gan selogion beic mynydd (BM) gan greu rhwydwaith o draciau i lawr allt, rampiau a neidiau y tu mewn i'r ardal a drefnwyd.

Cynhaliwyd hediadau drôn lluosog gan ddefnyddio camerâu RGB, thermol ac aml-olwg safonol i gynhyrchu cofnod ffotogrammetrig manwl o ardal yr arolwg. Nodwyd cyfanswm o ddeg pwll cloch ynghyd â thair twmpath rwbel mawr ar aliniad N-S yn fras a hyd at o leiaf naw twmpath llai neu ardal rwbel hanesyddol ond cafodd y nodweddion rhedyn eu rhwystro rhag adnabod y nodweddion hyn. Roedd defnyddio ystod amrywiol o ddal data, RGB, aml-olygfaol a thermol, yn hanfodol wrth ddatgelu'r traciau a'r cloddiadau MTB hynny a guddiwyd gan lystyfiant.

Mae'r adroddiad presennol yn nodi canlyniadau'r arolwg archeolegol yn unol â'r Ceisiadau Ffotogrammetrig ar gyfer Canllawiau Treftadaeth Ddiwylliannol ar gyfer Arfer Da gan Lloegr Hanesyddol (cyhoeddwyd 2017) a Deall Archeoleg Tirweddau Canllaw i Arfer Cofnodi Da (cyhoeddwyd 2017). Mae'r holl waith wedi'i wneud yn unol â safonau proffesiynol y Sefydliad Siartredig Archeolegydd (SSA).

Black Mountains Archaeology Ltd were commissioned by City and County of Swansea to carry out an archaeological survey of damage caused to the Scheduled Ancient Monument of Clyne Valley Shaft Mounds (SAMGm455) by mountain bike (MTB) enthusiasts creating a network of downhill tracks, ramps and jumps inside the scheduled area.

Multiple drone flights using standard RGB, thermal and multispectral cameras were carried out to produce a detailed photogrammetric record of the survey area. A total of ten bell pits were identified together with three large spoil mounds on broadly a N-S alignment and up to at least another nine smaller mounds or historic spoil areas but identification of these features was hampered by the bracken cover. A total of eleven full or partial downhill MTB tracks were recorded, many obscured by vegetation cover. The use of a diverse range of data capture, RGB, multispectral and thermal, was critical in revealing those MTB tracks and excavations hidden by vegetation. The bell pits and spoil mounds appear to be largely intact, but some evidence of unlawful excavations on the site. These are mainly shallow tracks with embanked corners that utilise the large bell pit spoil mounds as ramps and jumps.

The present report sets out the results of the archaeological survey in accordance with the Historic England's Photogrammetric Applications for Cultural Heritage Guidance for Good Practice (Published 2017) and Understanding the Archaeology of Landscapes A Guide to Good Recording Practice (Published 2017). All work has been carried out in accordance with the professional standards of the Chartered Institute for Archaeologist (CIfA).

Acknowledgements and Copyright

The project was managed by Richard Lewis BA MCIfA. The survey was carried out by Richard Lewis and Ross Cook BA (ArchaeoDomus). The report, 3D photogrammetric modelling and illustrations were prepared by Richard Lewis. Ross Cook (ArchaeoDomus) provided the thermal photogrammetric modelling (Figures 11-13). Welsh summary translation was

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Archaeological Landscape Monument Survey

1 Introduction

- 1.1.1 Black Mountains Archaeology Ltd/Archaeoleg Mynydd Du Cyf were commissioned by City and County of Swansea to carry out an archaeological survey of damage caused to the Scheduled Ancient Monument of Clyne Valley Shaft Mounds (SAMGm455) by mountain bike (MTB) enthusiasts creating a network of downhill tracks, ramps and jumps inside the scheduled area.
- 1.1.2 In accordance with Scheduled Monument Consent (SMC) granted on 28th August 2020 (qA1394237 X.C32.AMO) Cadw required a programme of work in the form of "...an earthwork survey by GPS referenced total station and drone, to produce a survey report including interpretation, diagrams, maps, photographs, 3D terrain plan and to produce recommendations for remedial measures and associated archaeological recording to inform remedial works, in order to preserve it for the future and allow safe public access to the area...".
- 1.1.3 The present report sets out the results of the archaeological survey in accordance with the Historic England's *Photogrammetric Applications for Cultural Heritage Guidance for Good Practice* (Published 2017) and *Understanding the Archaeology of Landscapes A Guide to Good Recording Practice* (Published 2017). All work has been carried out in accordance with the professional standards of the *Chartered Institute for Archaeologist* (CIfA).

2 Background

- 2.1.1 The survey area is located within Clyne Country Park, around 700 acres of parkland and woodland formally belonging to Clyne Castle. The castle and grounds are a Registered Historic Park and Garden (PGW Gm 47) and the survey area lies within the essential setting of the parkland. Clyne Castle is a two storey castellated mansion dating to around 1800 with gothic alterations made in 1819-20. The earliest house on the site was called Woodlands, a plain three gabled two storey house built for Richard Phillips in 1791. By 1800 Woodlands was substantially extended and altered by Col. George Warde from Kent. The Clyne Castle and estate was briefly owned by Sir Benjamin Hall of Llanover, famed for overseeing the construction of 'Big Ben' in the Elizabeth Tower, Westminster, who gave the castle and estate to his sister Charlotte Berrington. The castle and estate then passed to the Vivian family in 1860 with William Graham Vivian refurbishing and extending the house into an opulent mansion. By 1870 he had changed the name to Clyne Castle and by 1954 the Vivian family had sold the estate to Swansea Council (Cadw and ICOMOS 2000, 158-164; Newman 1995, 486-489).
- 2.1.2 Clyne Woods is a managed mixed deciduous woodland dating to at least middle of the 12th century when woodland here is inferred by de Newburgh's charter to Swansea in 1158-84 granting of the *boscus* (woodland) surrounding the borough (Leighton 1997, 140). Although, woodland here probably existed since the Mesolithic Period 6,000-10,000 years ago. By 1306 the De-Breos's charter of liberties to the lordship of Gower notes the woodland of Clyne to be made into parkland, probably as a hunting park, although no (deer) park boundary earthwork is known. Felling and hauling of timbers from Clyne Forest for the repairs works to the Swansea Castle are recorded in Hugh de Waterton's accounts of 1401-02 (Jones 1992) and a Parliamentary Survey from

1650 notes the 'Forrest of Clyn and Clyn Moor (as) a parcel of rough woody ground' as consisting of 400 acres (Leighton 1997, 135-159). Clyne Farm first appears in record in 1760, a plan attached to a lease held by the Duke of Beaufort (Badminton archives) and it is likely that enclosure of the common to the west of Clyne Woods was underway at this time. Although, there is some evidence of earlier 16th century illicit land occupation with parts of what is now Clyne Woods being enclosed. The Earl of Worcester made complaints in 1590 regarding illegal encroachment between 1549 and 1589 (Robinson 1968, 357-88; Leighton 1997, 145). In 1729 the Beaufort estate lands in Glamorgan listed timber valued at £4,500 of which two-thirds came from Clyne Wood (Leighton 1997, 151). The tithe map and apportionment (Plan of Oystermouth in the County of Glamorgan 1845) show Clyne Wood still owned by the Duke of Beaufort and Leighton (1997, 150-153) suggests a mixed regime of woodland management there at that time (cordage, tanning bark, coppicing and timber). The change of landowner to the Vivians in the 1860s marked a change in woodland management, with timber still important for mining and the planting of conifers both in Clyne Wood and on Clyne Farm. During the later 19th and 20th centuries large scale forestry work and felling was undertaken. Aerial photographs held by Air Photos Wales from 1946 through to the 1990s show with many areas of Clyne Woods deforested and then slowly reforested to the extent of woodland visible today.

- 2.1.3 Industrial activity in the Clyne Valley has left a legacy of remains from the later medieval period to the 20th century. The valley boasts five scheduled ancient monuments (Clyne Valley Shaft Mounds Gm455, Ynys Pit and Leat Gm461, Clyne Wood Coal Level Gm464, Clyne Arsenic and Copperworks Gm475 and Clyne Wood Colliery Steam Winding Machine Gm469) and many other non-designated industrial sites.
- 2.1.4 The earliest industrial remains in the Clyne Valley are those concerned with the present investigations, the Clyne Valley Shaft Mounds (Gm455). The 1306 De-Breos's charter mentioned above notes the earliest record of coal mining in the Swansea area with 'sea coal' being worked (*Et mineria corbonum maris juxta la lun*). Williams (1958, 18) notes this was likely outcrop workings for domestic purposes and it is not until the 17th century when large scale coal exploitation begins with a grant in 1642 to Richard Seys "for digging of coals in Clyn Fforest...". The coal was likely carried by packhorse down to Blackpill where Richard Seys had acquired a lease for a coaling place at Mill Dock (Swansea Common Hall Book 1658). Williams also notes a chart of Swansea Bay in 1795 showing a quay located opposite Blackpill where coal was loaded to ships of 'fairly large draught'.
- 2.1.5 Williams (1958, 18-19) recorded extensive early and later industrial remains in the Clyne Valley area in the mid-20th century. At the time he noted 255 early workings or 'bell pits' together with ten large collieries of 19th and 20th century date and twelve smaller collieries and slants/levels (Plate 2). The 255 early 'bell pits' workings were then classified into six zones. Zone 1 on Fairwood Common, Zone 2 at Three Crosses, Zone 3 at Wern Fawr Farm, Zone 4 in Hen Parc Wood, and Zones 5 and 6 the north and south areas respectively of Clyne Wood. Williams recorded 24 bell pits in Zone 5 and 30 bell pits in Zone 6. These tended to follow a 'more or less' straight line down the valley side to the valley bottom. The bell pits ranged in size from 10 feet (3m) in diameter and 10 feet (3m) in depth to 6 feet (1.8m) in diameter and 6 feet (1.8m) in depth. Williams (1958, 18) suggests that the earliest bell pits are those identified in

Zone 5, which encompasses the present investigation area, as these are one of two sets of bell pits referred to in the grant in 1642 to Richard Seys in Clyne Woods and of the two groups (Zones 5 and 6) are the most weathered.

- 2.1.6 Industrial activity accelerated in the 19th century, made possible by new communication routes into the valley. In 1804 the Oystermouth Tramway (Swansea and Mumbles Railway) was constructed, together with a branch at Black Pill serving quarries within the Clyne Valley and later (1855) the Clyne Wood Colliery (HER01433w; SAMGm469), Rhydydefaid Colliery (HER06565w) and Boat Level (HER02269.0w), and the Ynys Pit (HER02881w; SAMGm461) (Barrie 1994, 214). The Llanelli to Swansea line through the Clyne Valley was completed in 1867 and became part of the LNWR main line from Swansea to Pontarddulais in 1873, the single track extended to double tracks by 1892. The line was closed in 1964 and incorporated into a cycle track in the later 20th century (Barrie 1994, 210-213).
- 2.1.7 Numerous large collieries and smaller levels were exploited in the 19th century, aided by the transport links provided by the Oystermouth Tramway and later LNWR main line. Ynys Pit and Leat (HER02881w; SAMGm461) is located on southwest facing valley side and was developed by Sir John Morris between 1804-1807, with the colliery sunk in the 1840s and out of use by 1877. Towards to lower end of the valley on the northeast facing valley side is the Clyne Wood Coal Level (HER01550w; SAMGm464), a rock-cut, stone lined coal level dating to around 1840 and connected to the Clyne Wood Canal (HER02828.0w). The latter dating to 1799-1803 as a mill leat for the corn mill in Black Pill but seems also to have been used for industrial transport. Located not far from the Clyne Wood Canal to the south of the Clyne Wood Coal Level is the Clyne Arsenic and Copperworks (HER01215w; SAMGm475), a well-preserved non-ferrous smelting works. Built between 1825 by and closed in 1841 but later reopened by Henry Kingscote until final closure in 1860. The buildings, which represent a rare survival of an intact production plant of the period, were later used as hay sheds (Newman 1995, 488-489; Hughes and Reynolds 1989, 15).
- 2.1.8 To the north of the Clyne Valley a cluster of industrial sites is located on either side of the river and former railway. The Clyne Wood Colliery (HER01433w; SAMGm469) was established in 1867 and had a small twin cylinder horizontal steam winding engine (SAMGm469), the remains of which lies *in-situ*. Goldsmith (2012, 29) quotes a Cambrian Newspaper article for the Clyne Wood Colliery Company detailing the auction of the colliery, including the winding engine and boilers: *"All the new and valuable plant & materials, lately used by the Clyne Wood Colliery Company, comprising one horizontal steam engine, 14 in cylinder, 34 in stroke, egg end boiler about 27 ft by 4 ft 6 in diameter, both made by Waddle, of Llanelly, of the best material and workmanship, has only been used a short time, and equal to new; drum and winding gear, wire rope; lift of 7 in pumps complete with pump rods, V bob, stays and iron standards; several tons of colliery rails, 16 lbs to the yard; points and crossings; small lot flange rails, 72 lbs to the yard, lever points and crossings; two wood erections used as engine house and forge; tipping stage; quantity of sleepers. The colliery is situated between Killay and Mumbles Road Station on the Llanelly Railway"*.
- 2.1.9 Rhydydefaid Colliery (HER06565w) and Boat Level (HER02269.0w) are located opposite Clyne Wood Colliery and adjacent to the Clyne Valley Brick and Tile Works (HER02109w). Goldsmith (2012, 29) notes that the Duke of Beaufort let the

Rhydydefaid Boat Level (HER02269.0w) to John Morris II in 1836, which was then later acquired and closed by the Rhydydefaid Colliery Company in 1856. The level brought coal out by means of an underground canal. The adjacent brickworks began trading in the 1870s and by 1959 went into liquidation and finally closed in 1960 (HER02109w).

3 Location, Topography and Geology

- 3.1.1 The landscape monument survey area is positioned on the northeast facing valley side of Clyne Woods, in the Clyne Valley Country Park, Swansea (centred on NGR SS 260733.610,192026.374, Figure 1). The survey area is located in the Gower Area of Outstanding Natural Beauty, the first AONB designated in the UK, and the Historic Landscape of Gower (HLW (Gt) 1), specifically within the historic landscape character area of Clyne Castle (HLCA078). This area also forms the essential setting for Clyne Castle Registered Historic Park and Garden (PGW Gm 47). The survey area is almost wholly within Clyne Valley Shaft Mounds Scheduled Ancient Monument (SAMGm455).
- 3.1.2 The northeast facing valley is largely covered in deciduous woodland and bordered to the northeast by the River Clyne and the National Cycle Network Route 4. The ground rises the southwest from 15mOD at the valley bottom to 120mOD at Clyne Farm. The landscape here is a small regular agricultural fieldscape giving way to open moorland on Clyne Common to the southwest.
- 3.1.3 The geology of the survey area is the South Wales Lower Coal Measures Formation, these are sedimentary mudstones and siltstones formed approximately 318 to 319 million years ago in the Carboniferous Period (BGS 2020). Superficial lithology includes Quaternary glacial sedimentary deposits of clay and silt. Soils belong to Brickfield 2 group (soil association 713f), consisting of slowly permeable and seasonally waterlogged fine loamy soils (Mackney *et al* 1983).

4 Objectives

- 4.1.1 The archaeological landscape survey work has been undertaken at Level II to Historic England's *Understanding the Archaeology of Landscapes A Guide to Good Recording Practice* (Published 2017), a nationally (UK) recognised landscape recording standard, to provide a basic descriptive and interpretive record of an archaeological monument or landscape, as a result of field investigation. The survey is intended to be both metrically accurate and analytical, depicting the real landscape context of the archaeological features. The archaeological landscape monument survey will have considered the development and use of the site and the record will include the conclusions reached, but may not discuss in detail the evidence on which this analysis is based. The presentation of these observations in a written report, taking account of related documentary and historical evidence. The preparation of an archive of digital data recovered and records made as a result of the project, and the deposition of this archive in a suitable receiving museum or similar institution.

5 Legislative Framework

- 5.1.1 Any works affecting an ancient monument and its setting are protected through implementation of the *Ancient Monument and Archaeological Areas Act 1979*. In Wales the *1979 Act* has been strengthened by *The Historic Environment (Wales) Act 2016*. The *2016 Act* makes important improvements for the protection and management of the Welsh historic environment. It also stands at the centre of an

integrated package of secondary legislation (Annexes 1-6), new and updated planning policy and advice, and best-practice guidance on a wide range of topics (*TAN 24 Historic Environment*). Taken together, these support and promote the careful management of change in the historic environment in accordance with current conservation philosophy and practice.

- 5.1.2 The *Ancient Monument and Archaeological Areas Act 1979* and *The Historic Environment (Wales) Act 2016* sets out a presumption in favour of preservation *in-situ* concerning sites and monuments of national importance (scheduled/listed), and there exists in the current *Planning Policy Wales (Chapter 6)* a presumption in favour of preservation *in-situ* of all types of heritage assets.

6 Methodology

- 6.1.1 The investigations consisted of an archaeological survey of damage caused to the Scheduled Ancient Monument of Clyne Valley Shaft Mounds (SAMGm455) by mountain bike (MTB) enthusiasts creating a network of downhill tracks, ramps and jumps inside the scheduled area. Multiple drone flights using standard RGB, thermal and multispectral cameras were carried out to produce a detailed photogrammetric record of the survey area. The aerial survey was carried out with three UAVs (drones) equipped with a Hasselblad 35mm equivalent 20mp, 1" sensor, 4k UHD camera; a multispectral camera with six 1/2.9" sensors, including one RGB sensor for visible light imaging and five monochrome sensors (with Blue (B): 450 nm \pm 16 nm; Green (G): 560 nm \pm 16 nm; Red (R): 650 nm \pm 16 nm; Red edge (RE): 730 nm \pm 16 nm; Near-infrared (NIR): 840 nm \pm 26 nm filters); and a thermal dual camera with a 35mm equivalent 12mp 1/2.3" sensor and a Flir uncooled VOx microbolometer.
- 6.1.2 The ground investigations and aerial survey were tied into the Ordnance Survey National Grid and Datum using an EMLID Reach GN55/ Glonass (GPS) Receiver and data logger with a <10mm tolerance. All 3D models were produced using proprietary photogrammetry software and aligned using known ground control points (GCPs). Dimensional control was then applied to each model and then reprocessed using the new parameters and optimised cameras. The Hasselblad 35mm RGB camera capture created a dense point cloud of over 140 million points and high face count meshes with a mean RMS error of 0.013m. The model was then exported to OBJ format. Six GCPs were used with a sub-10mm error margin to OSGB36 (National Grid) and a Ground Sampling Distance (GSD) of 0.79cm/pixel. The 3D model is hosted by us and can be viewed here <https://p3d.in/Hs34M>. The multispectral camera capture created a dense point cloud of over 1.5 million points and radiometrically corrected reflectance maps using NDVI indices. Six GCPs were used with a sub-10mm error margin to OSGB36 (National Grid) and a Ground Sampling Distance (GSD) of 4.04cm/pixel. The thermal camera capture created a dense point cloud of over 1.5 million points with a mean RMS error of 0.01121m. Six GCPs were used with a sub-10mm error margin to OSGB36 (National Grid) and a Ground Sampling Distance (GSD) of 4.04cm/pixel. High resolution orthographic renders (orthomosaics, DTM and DSM) were exported and scaled in georeferenced raster (TIFF and JPEG) format.
- 6.1.3 The capture, processing and output of 3D models conformed to professional industry standard and best practice guidelines as set out by Historic England's *Photogrammetric Applications for Cultural Heritage Guidance for Good Practice* (Published 2017) and *Understanding the Archaeology of Landscapes A Guide to Good*

Recording Practice (Published 2017). All work has been carried out in accordance with the professional standards of the *Chartered Institute for Archaeologist* (CIfA).

- 6.1.4 A copy of the report and digital archive will be supplied to the client and their agents, the regional HER (GGAT) and the Royal Commission on the Ancient and Historical Monuments of Wales. Submission of photogrammetric images acquired by drone to the RCAHMW will follow *RCAHMW Unmanned Aerial Vehicle (UAV) Policy*. All data has been digitally stored in appropriate formats (SHP, DXF, TIFF, RAW, JPEG, PDF etc) with the archive destination in mind. All data will be submitted to the relevant archives in accordance with the RCAHMW's *Guidelines for Digital Archaeological Archives* (2015) and the regional HER's *Guidance for the Submission of Data to the Welsh Historic Environmental Records (HERs)* (published 2018).

7 Results

- 7.1.1 The investigations consisted of an archaeological survey of damage caused to the Scheduled Ancient Monument of Clyne Valley Shaft Mounds (SAMGm455) by mountain bike (MTB) enthusiasts creating a network of downhill tracks, ramps and jumps inside the scheduled area. Multiple drone flights using standard RGB, thermal and multispectral cameras were carried out to produce a detailed photogrammetric and topographic record of the survey area. The area was also extensively walked, where vegetation allowed, to further identify archaeological features or MTB damage to the scheduled ancient monument.
- 7.1.2 The survey area (Figures 1 and 2; Plate 1) is an open area of scrub covered largely by bracken fern. The former LNWR, now National Cycle Network Route 4, runs along the NE boundary. To the SE is established deciduous woodland, to the NW recovering deciduous woodland and scrub. To the SW is more established woodland rising to 120mOD towards Clyne Farm. At least three clearly visible MTB tracks were observed aligned NE/SW through the bracken. The latter obscuring several more. It was assumed at the commencement of the survey that this area of the scheduled ancient monument had been extensively excavated by MTB enthusiasts to create the sweeping tracks, ramps and jumps visible in the bracken. Some excavation was noted exposed along the sides of the MTB tracks and discrete areas used to quarry clay for the ramps and corner bunds (Plate 4). A large hole had been excavated part way down the far eastern MTB track to create a bund for an adjoining corner. Ironically, a broken bicycle had been dumped into the quarried area (Plate 5).
- 7.1.3 Three large mounds were located in the centre of the survey area in broadly a N-S alignment (Plates 6-7). From N-S measuring 9m, 7m and 8m in diameter respectively. These mounds had been incorporated into one of the more established MTB tracks. There were also at least another nine smaller mounds or historic spoil areas but identification of these features was hampered by the bracken cover. Four bell pits were visible (Plates 6-7, 9 and 10), although one (Bell Pit 2) to the NW of the survey area may be a scrape from MTB activity (Plate 8), with a further two bell pits partially obscured by bracken (Plates 9). Review of historic aerial photographs identified a further four bell pits, which compared well with the depressions noted in the contour survey. Bell Pits 1 and 9 being one in the same (Plate 10).
- 7.1.4 The UAV RGB camera was used to produce a measured and highly detailed 3D model (<https://p3d.in/Hs34M>) of the survey area, including a digital surface model (DSM), topographical contour plan at 10cm intervals and orthomosaic (Figures 2-5). The high

resolution and centimetre accurate (GSD 0.79cm/pixel) orthomosaic was then imported into GIS and the MTB tracks recorded in detail. At this stage three MTB tracks were identifiable with several more obscured by vegetation. The DSM was then used to create a hill shade relief and topographical contour plans (Figures 6-7). This enabled the MTB tracks to be further refined together with providing greater detail of the form of the surviving historic bell pits and associated spoil mounds. However, the presence of more MTB tracks hidden by bracken cover was suspected so UAV multispectral and thermal cameras were deployed to reveal those light bands outside of the range (RGB) of human sight (Figures 8-13). Essentially unveiling the vegetation obscuring the suspected MTB tracks. Analysis of these images identified a further eight full or partial lengths of MTB track. All interconnected and commencing from the top of the hill to the SW and exiting to the NE or NW onto the cycle track. The use of multispectral images, particularly vegetation indices (Normalized Difference Vegetation Index NDVI), helped to identify which groups of plants (bracken) were more sparsely distributed or were shown to be unhealthy absorbing more near-infrared light. The healthier plants being located on or near overgrown MTB tracks, even though to the naked eye there was almost complete vegetation cover. Similarly the thermal images helped to identify which areas had a higher ambient temperature, the MTB tracks with no vegetation cover producing warmer signatures than the surrounding bracken. This almost certainly is partly due to the whole area being former bell pit spoil mounds. Colliery spoil tips are generally known to create microclimates as they heat up faster than surrounding soils. Unhealthy or stunted vegetation produced cooler signatures, which again allowed the warmer ground of the MTB tracks to become visible.

- 7.1.5 Aerial and historic mapping was studied in detail together with coal authority information and the excellent study by Michael Williams (1958; Plate 2) to correlate the known bell pits and spoil mounds with those identified during the survey. By far the most useful source was Michael Williams Gower entry (1958) and the aerial mapping, particularly the RAF 1946 aerial photographs (Plate 3) that showed the survey area devoid of trees and the bell pits and spoil mounds in great detail (Figures 14-18). The historic images were georeferenced and the bell pits and spoil mounds digitised. These were shown to correlate well with the topographic contour survey (Figures 6, 16-18) indicating the bell pits and in particular the spoil mounds have survived particularly well, despite the recent MTB activity. Later aerial mapping showed gradual reforestation of the wider area but the survey area remaining largely free of trees. By 2006 three large spoil mounds are still visible in a straight N-S alignment (Plate 11) but it is not until 2008 when the first evidence of MTB activity is evident (Plate 12). At this time, around three significant downhill tracks are visible, one track along the line of the spoil mounds together with a number of smaller interconnecting tracks.
- 7.1.6 A trackway was noted at the far south of the site which married well with forestry track visible on the 1946 aerial photograph (Plate 3). Further bell pits were visible as water filled depressions from the edge of and outside the survey area in the woodland

to the south and southeast. However, due to the dense bramble cover it was not possible to survey these in detail.

8 Conclusions

- 8.1.1 The investigations consisted of an archaeological survey of damage caused to the Scheduled Ancient Monument of Clyne Valley Shaft Mounds (SAMGm455) by mountain bike (MTB) enthusiasts creating a network of downhill tracks, ramps and jumps inside the scheduled area. Multiple drone flights using standard RGB, thermal and multispectral cameras were carried out to produce a detailed photogrammetric record of the survey area. A total of ten bell pits were identified (including one duplicate Bell Pit 1/9) together with three large spoil mounds on broadly a N-S alignment and up to at least another nine smaller mounds or historic spoil areas but identification of these features was hampered by the bracken cover. The topographic contour survey and historic aerial images of the bell pits and spoil mounds married well. A total of eleven full or partial downhill MTB tracks were recorded, many obscured by vegetation cover. The use of a diverse range of data capture, RGB, multispectral and thermal, was critical in revealing those MTB tracks and excavations hidden by vegetation.
- 8.1.2 The bell pits and spoil mounds appear to be largely intact, but with some evidence of unlawful excavations on the site. These are mainly shallow tracks that utilise the large bell pit spoil mounds as ramps and jumps. Excavation has occurred on almost all MTB track corners to create sweeping corner gradients, presumably to increase track speed. However, these excavations or quarries tend to use very small quantities of clay from the immediate area of the corner or track. However, Plate 5 shows some very substantial excavations (3m wide by over 2m deep) to create a high corner on the far easterly track. It is not clear if this was the location of a former bell pit or simply a very large excavation by MTB enthusiasts. Likewise Bell Pit 2 (Plate 8) could be historic mining activity but may also simply be surface quarrying by MTB enthusiasts. It was interesting to note a large colony of mason bees had made hundreds of nests in the exposed clay here.
- 8.1.3 The spoil mounds and bell pit entrances appropriated into the MTB tracks and ramps would appear to date to the 1640s, with early workings known from at least the early 14th century. The bell pit and spoil mounds here are potentially some of the earliest in the Clyne Valley. The spoil mounds visible during the survey had survived remarkably well, despite the attentions of the MTB enthusiasts. If possible, MTB enthusiasts should be encouraged to use alternate tracks in the Clyne Valley away from the Scheduled Ancient Monument. There is an opportunity here to engagement with the MTB group(s) and work with them to create a new set of challenging downhill tracks that avoid damaging historic features. Education of the presence of the historic features and collaborative working with the MTB group(s) will help to foster a sense of place and convey value to the archaeological features to prevent further damage in the future.
- 8.1.4 Some remediation work would be beneficial to restore the monument and remove the evidence of MTB excavations and banking. The tops of the three larger spoil heaps have shallow scoups excavated into the tops and together with the MTB track corners these could be restored. The larger excavated areas (Plates 5 and 8) may need archaeological intervention before being back-filled so that we fully understand the

extent of the MTB damage to the Scheduled Ancient Monument. The whole survey area would benefit from bracken removal and further survey work to establish the full extent of surviving industrial remains. Likewise, the many bell pits located in the adjacent woodland would also benefit from more detailed survey in line with the Upland Survey methodology (essentially walking in 20-30 transects through the woodland and recording the bell pits (and any other archaeology) using GPS, hand measurements and photographs). This activity could be carried out as a community archaeology project led by professional archaeologists.

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Other Sources

BGS <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> accessed 23-08-20

10 Appendix I – Figures

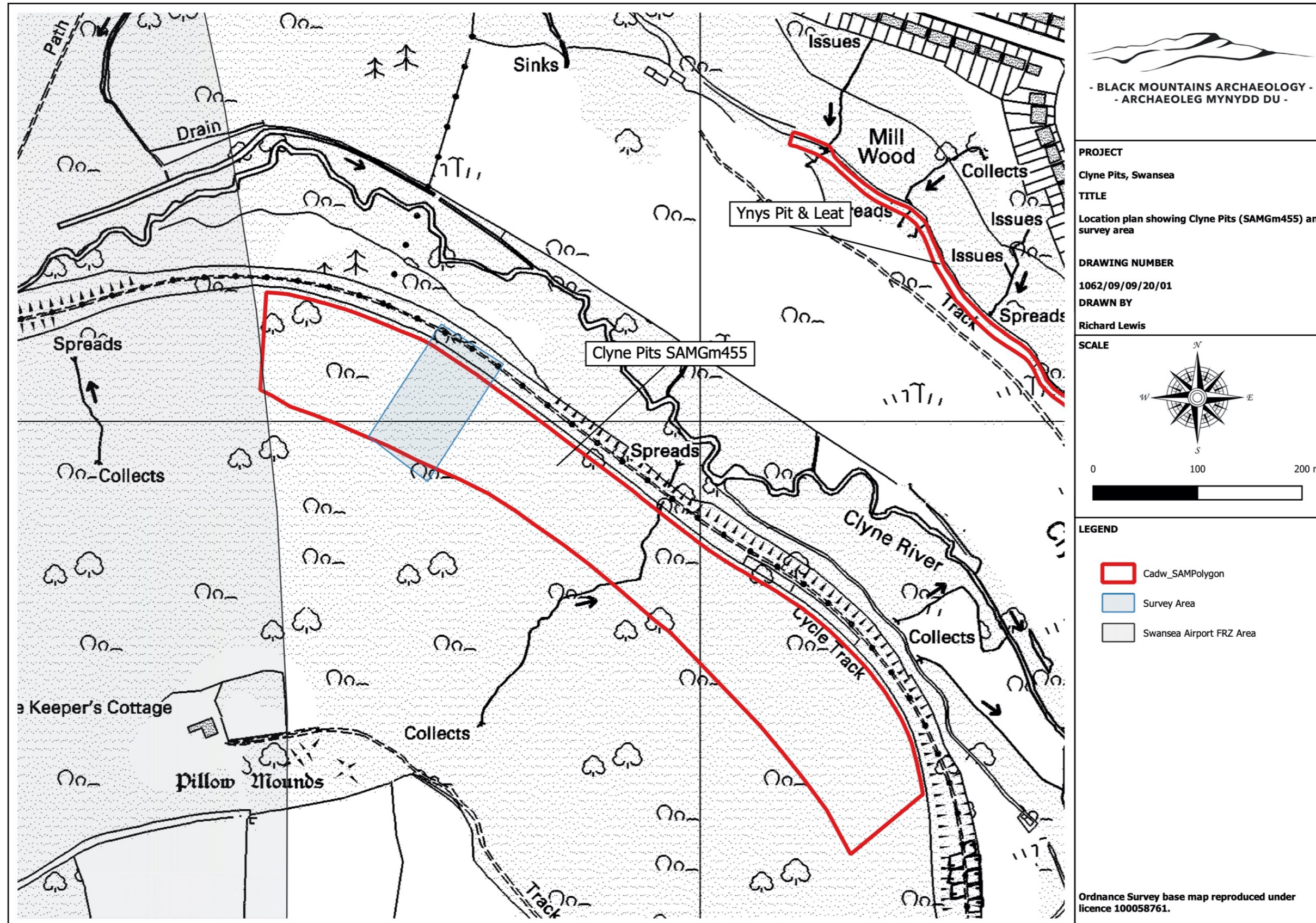


Figure 1. Location plan showing mountain bike tracks through Clyne Valley Shaft Mounds SAMGm455 and survey area.

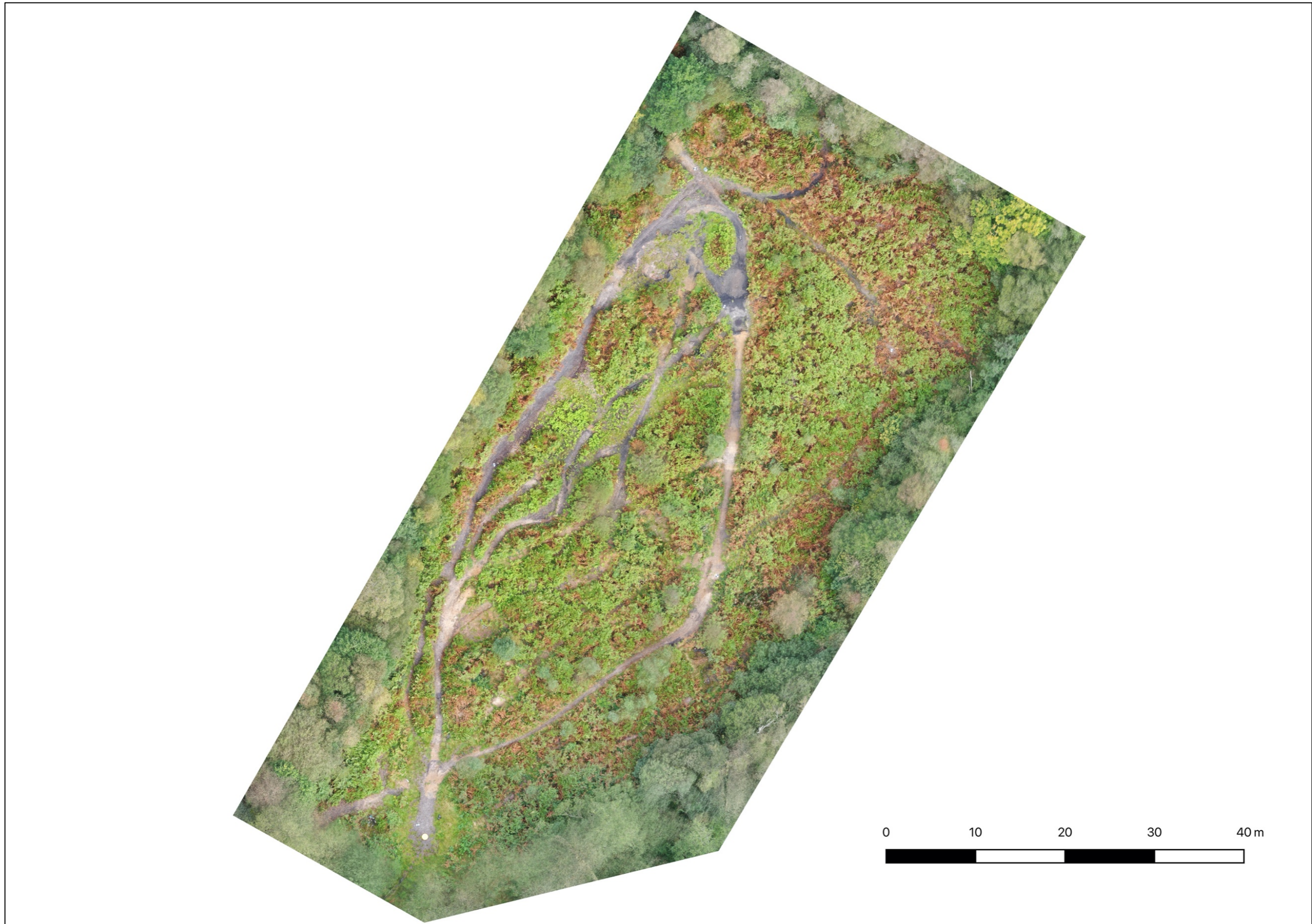


Figure 2. Photogrammetric orthomosaic of survey area showing MTB tracks. Nadir view.

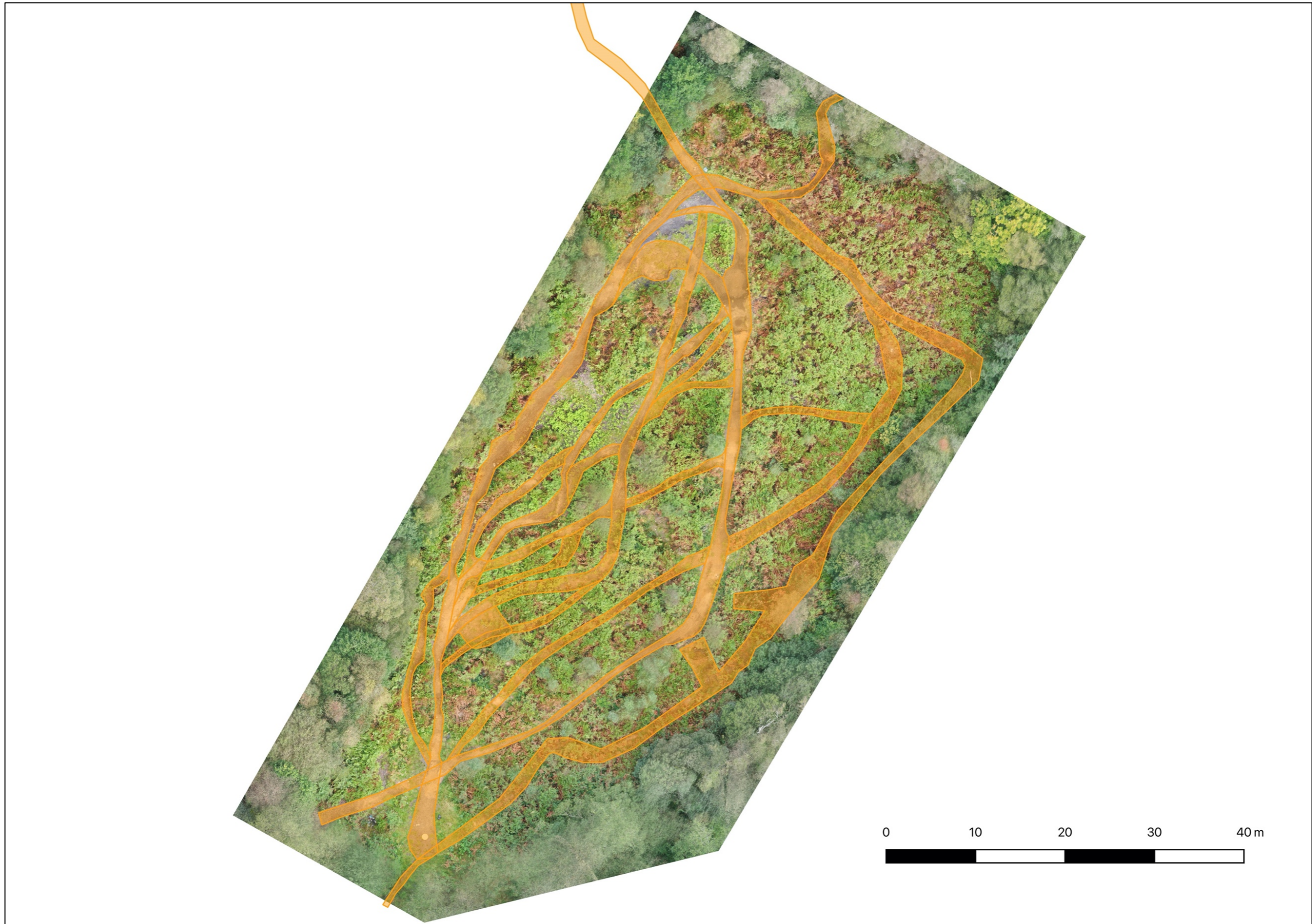


Figure 3. Photogrammetric orthomosaic of survey area showing mapped MTB tracks. Nadir view.

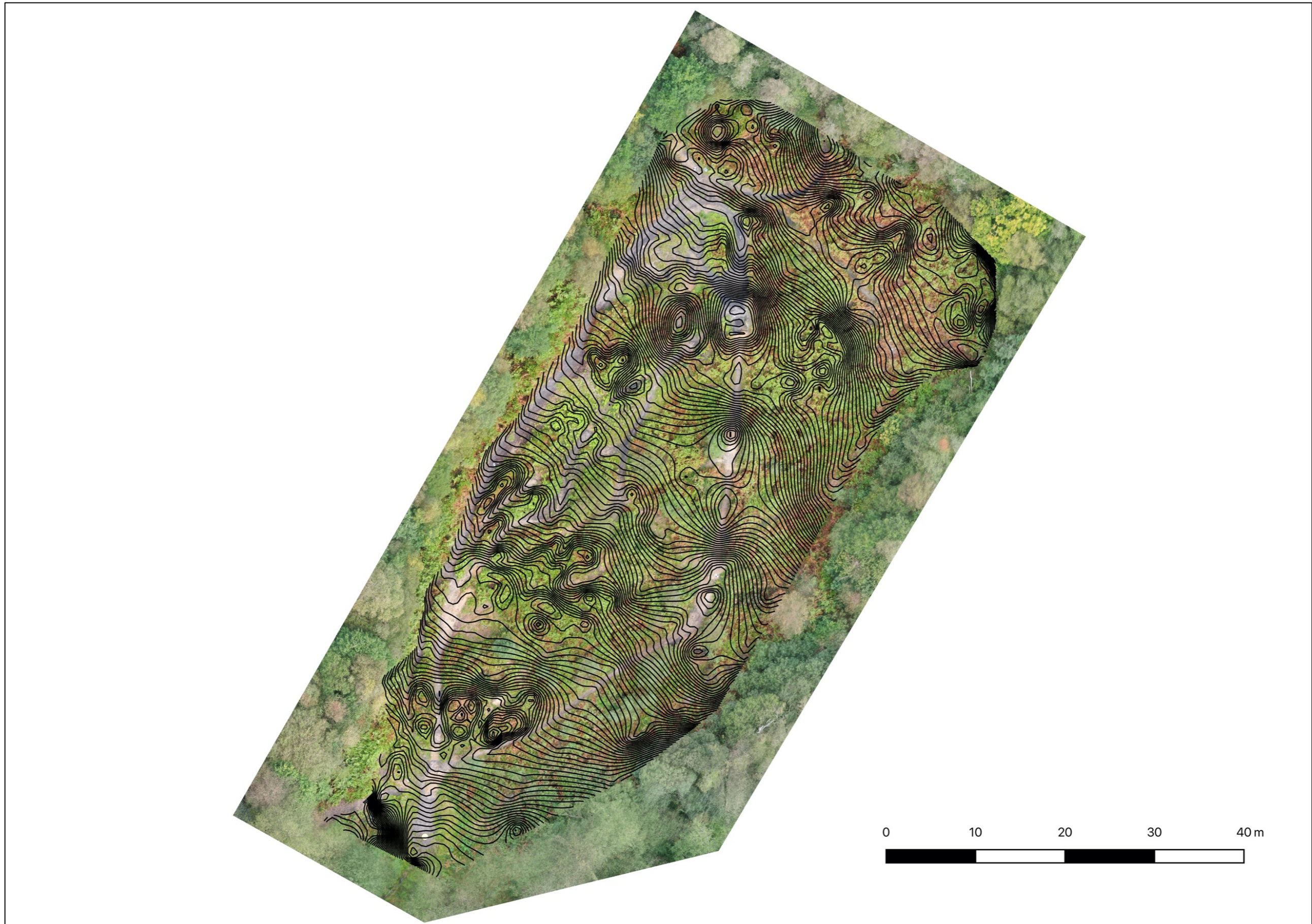


Figure 4. Photogrammetric orthomosaic of survey area with topographic contour survey overlay generated from digital surface model (DSM). Nadir view.

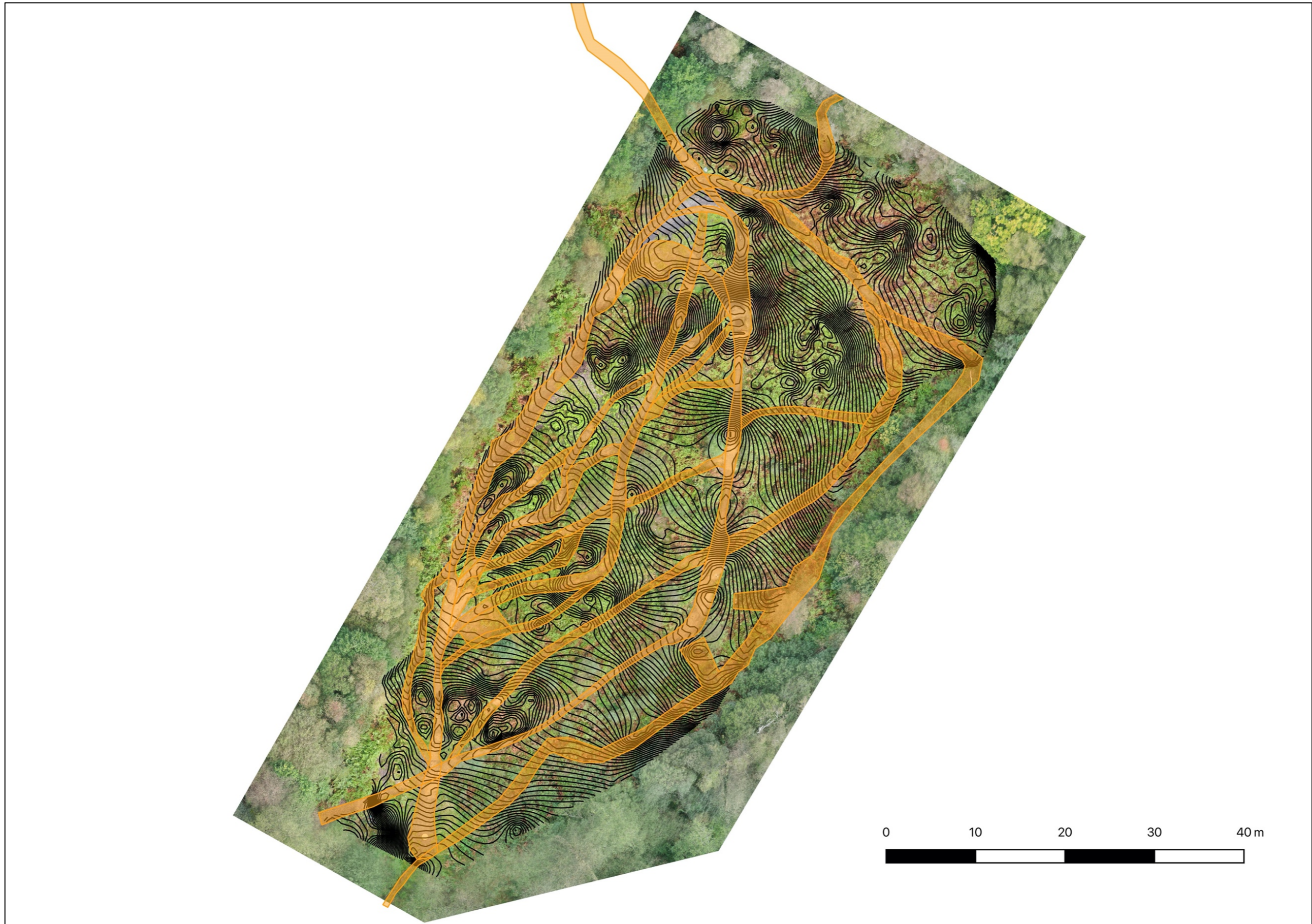


Figure 5. Photogrammetric orthomosaic of survey area with topographic contour survey (DSM) overlay and mapped MTB tracks. Nadir view.

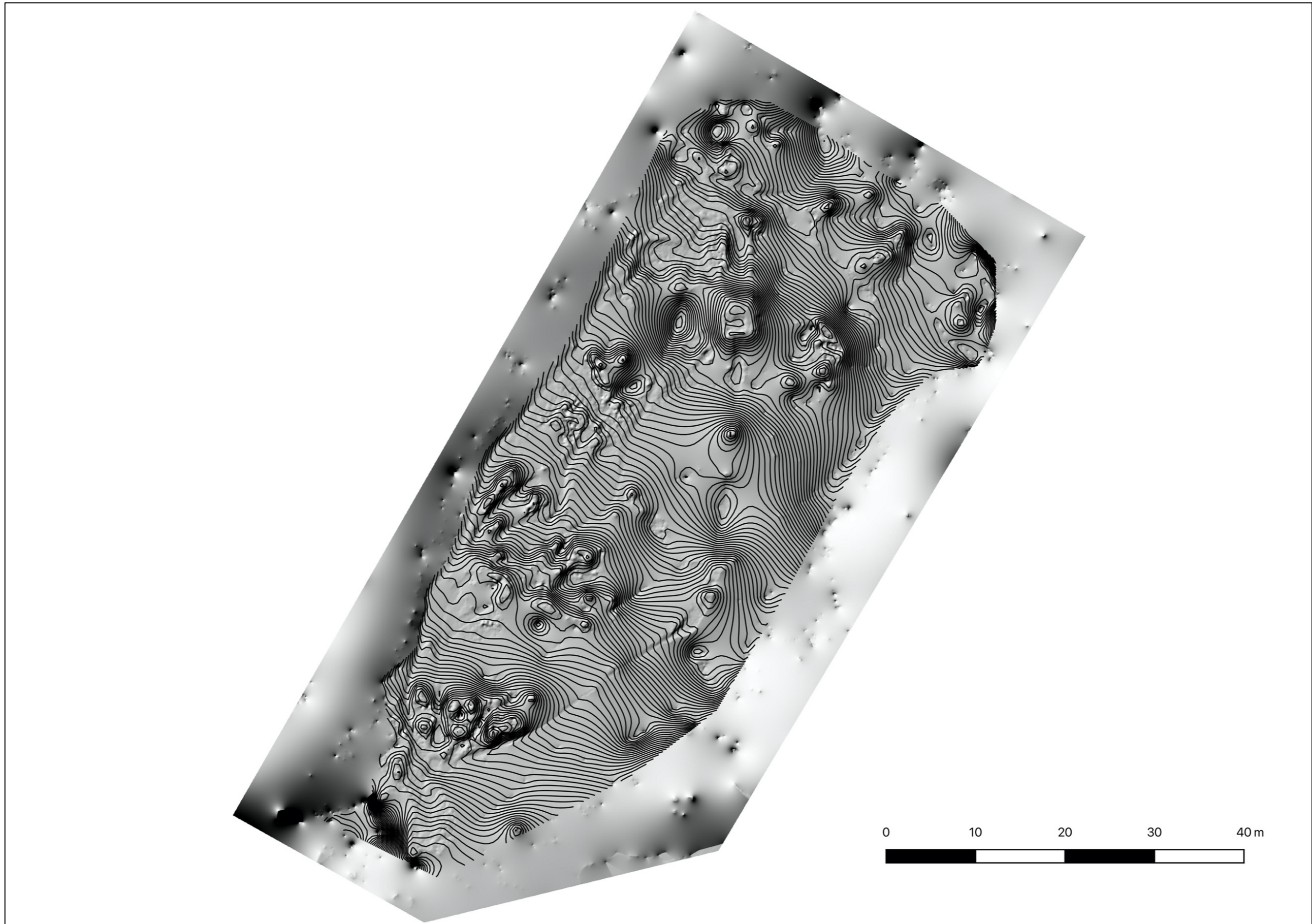


Figure 6. Digital surface model (DSM) with topographic contour survey overlay. Nadir view.

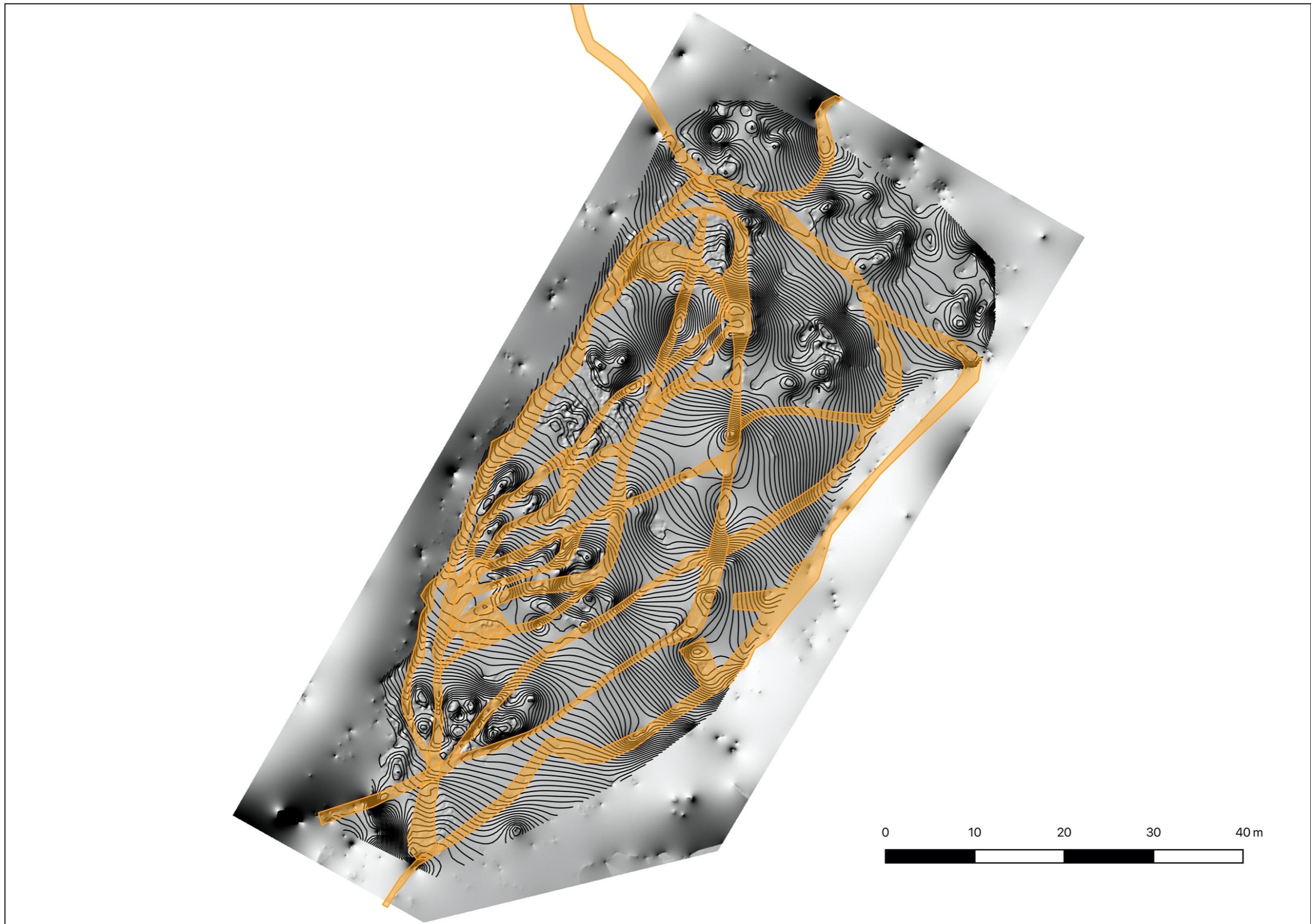


Figure 7. Digital surface model (DSM) with topographic contour survey and mapped MTB tracks overlay. Nadir view

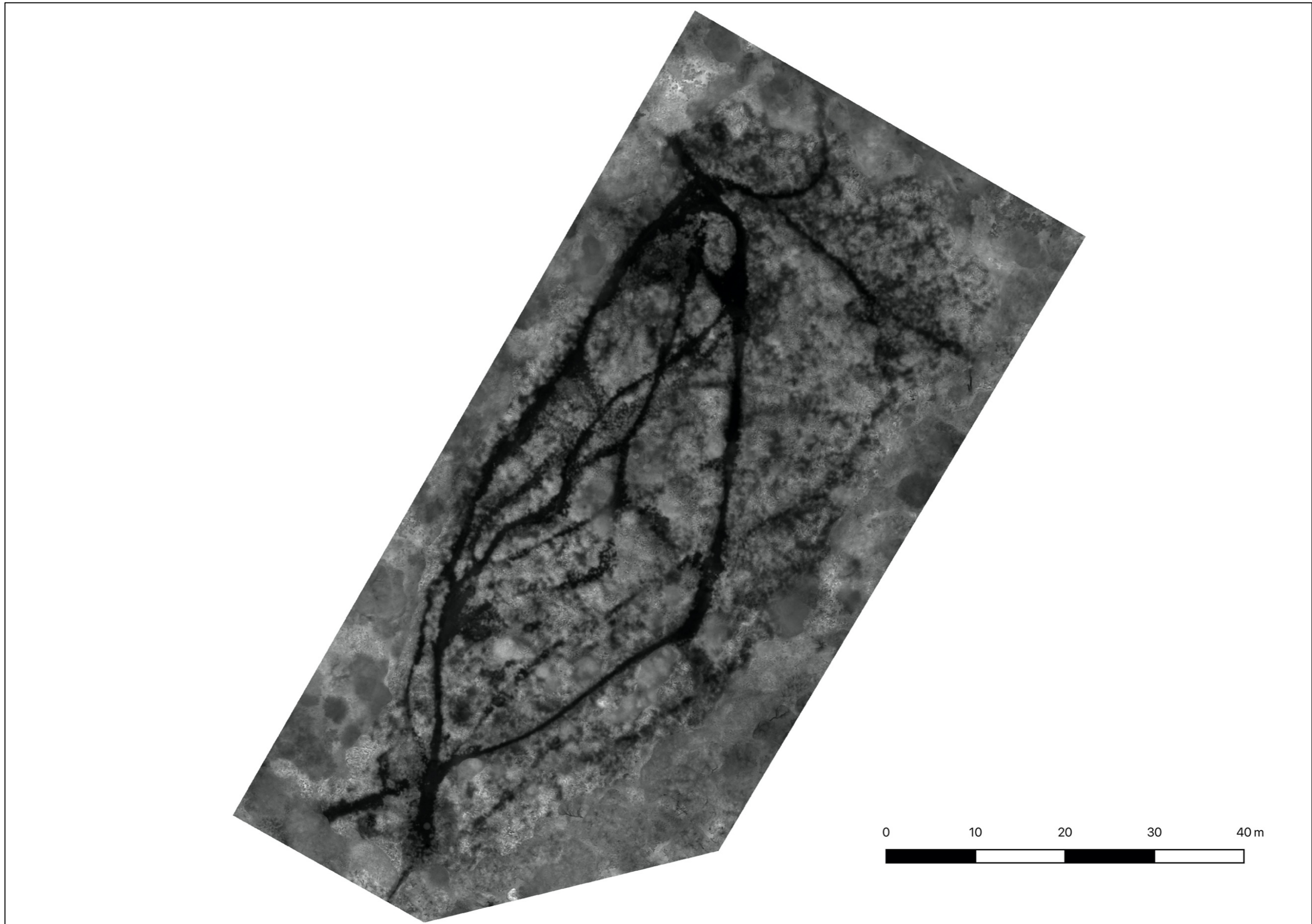


Figure 8. Multispectral photogrammetric orthomosaic showing MTB tracks otherwise hidden by vegetation. Nadir view.

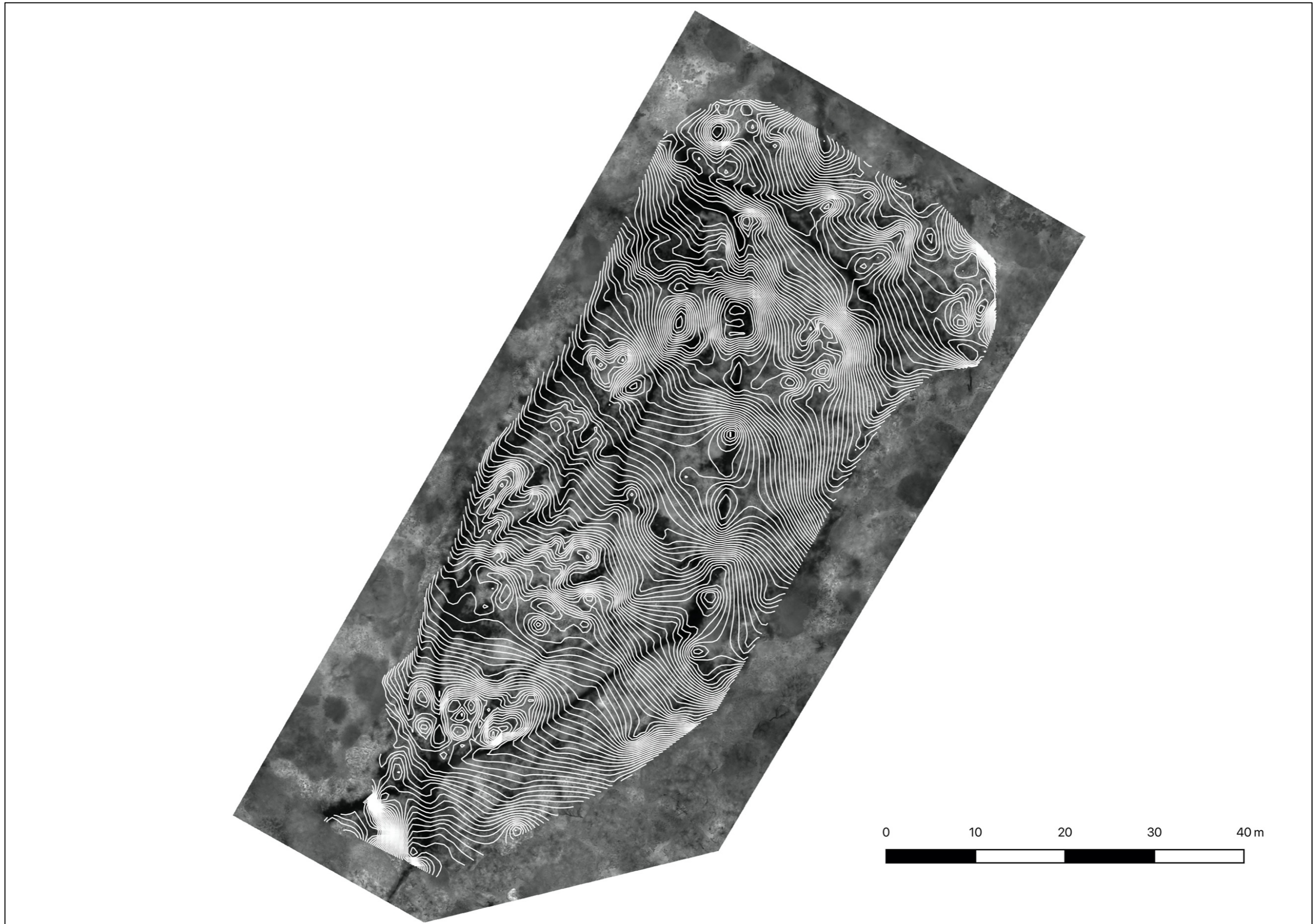


Figure 9. Multispectral photogrammetric orthomosaic with topographic contour survey showing MTB tracks otherwise hidden by vegetation. Nadir view.

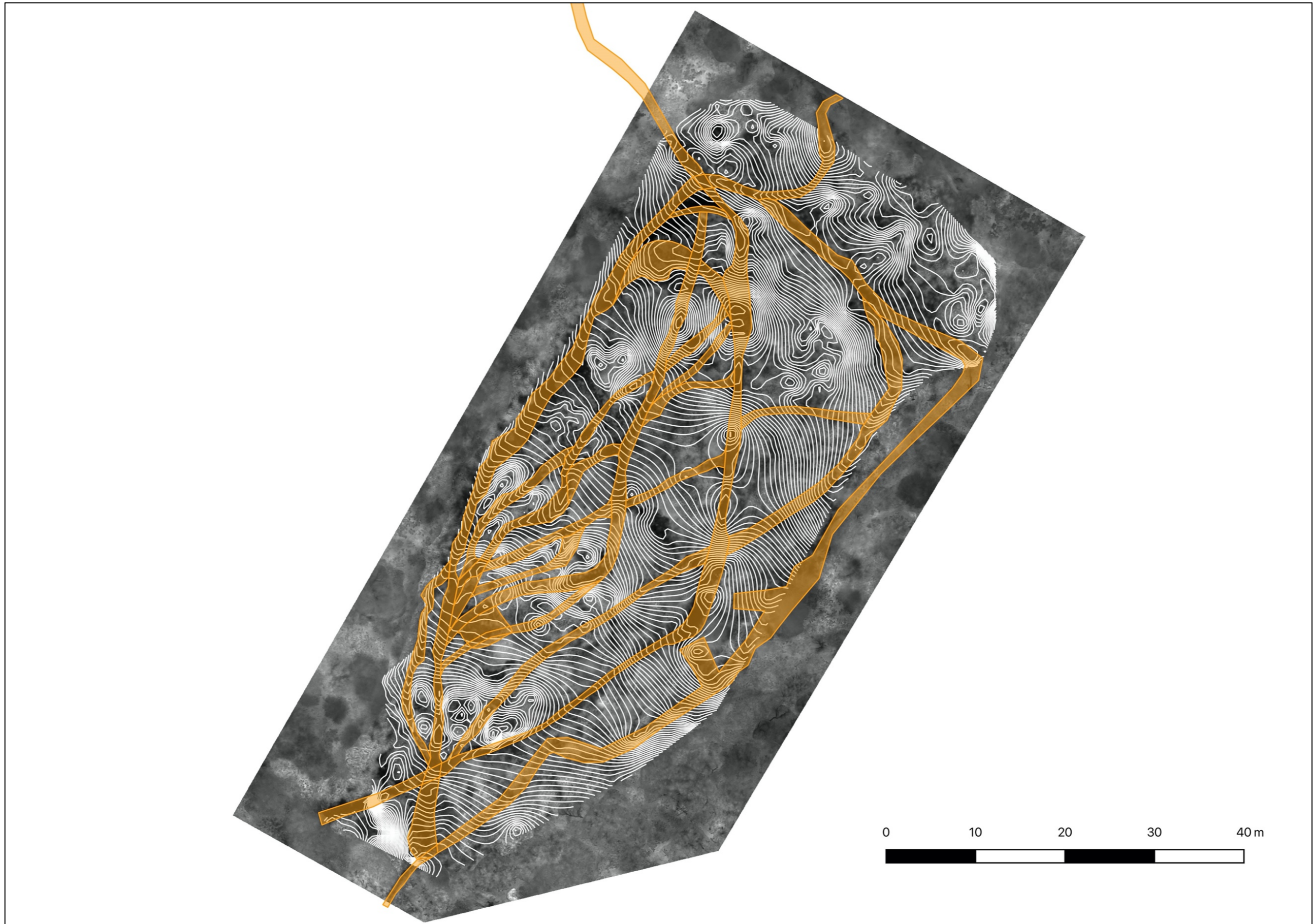


Figure 10. Multispectral photogrammetric orthomosaic with topographic contour survey and mapped MTB tracks. Nadir view.

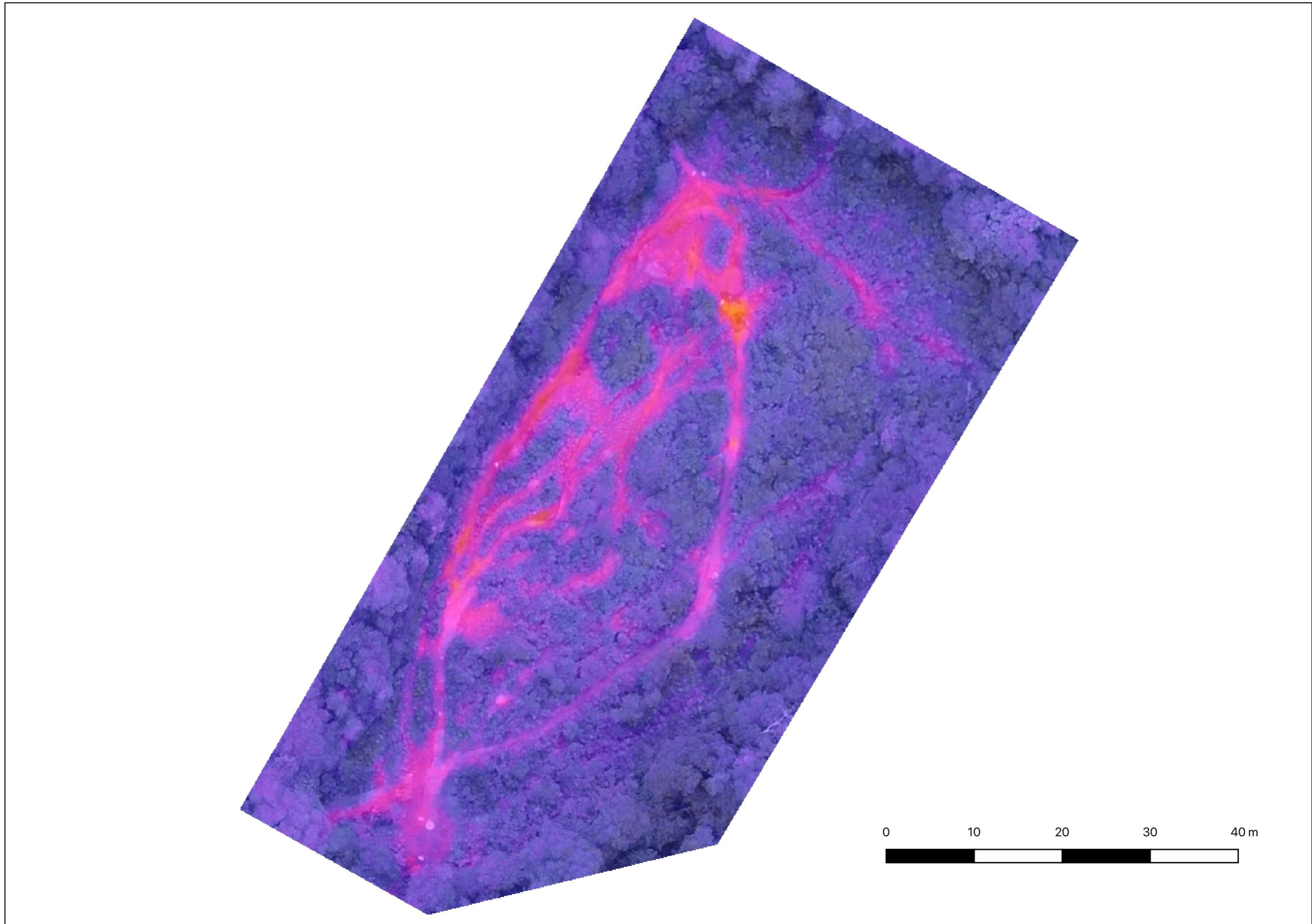


Figure 11. Thermal photogrammetric orthomosaic of survey area showing MTB tracks otherwise hidden by vegetation. Nadir view. Image © ArchaeoDomus.

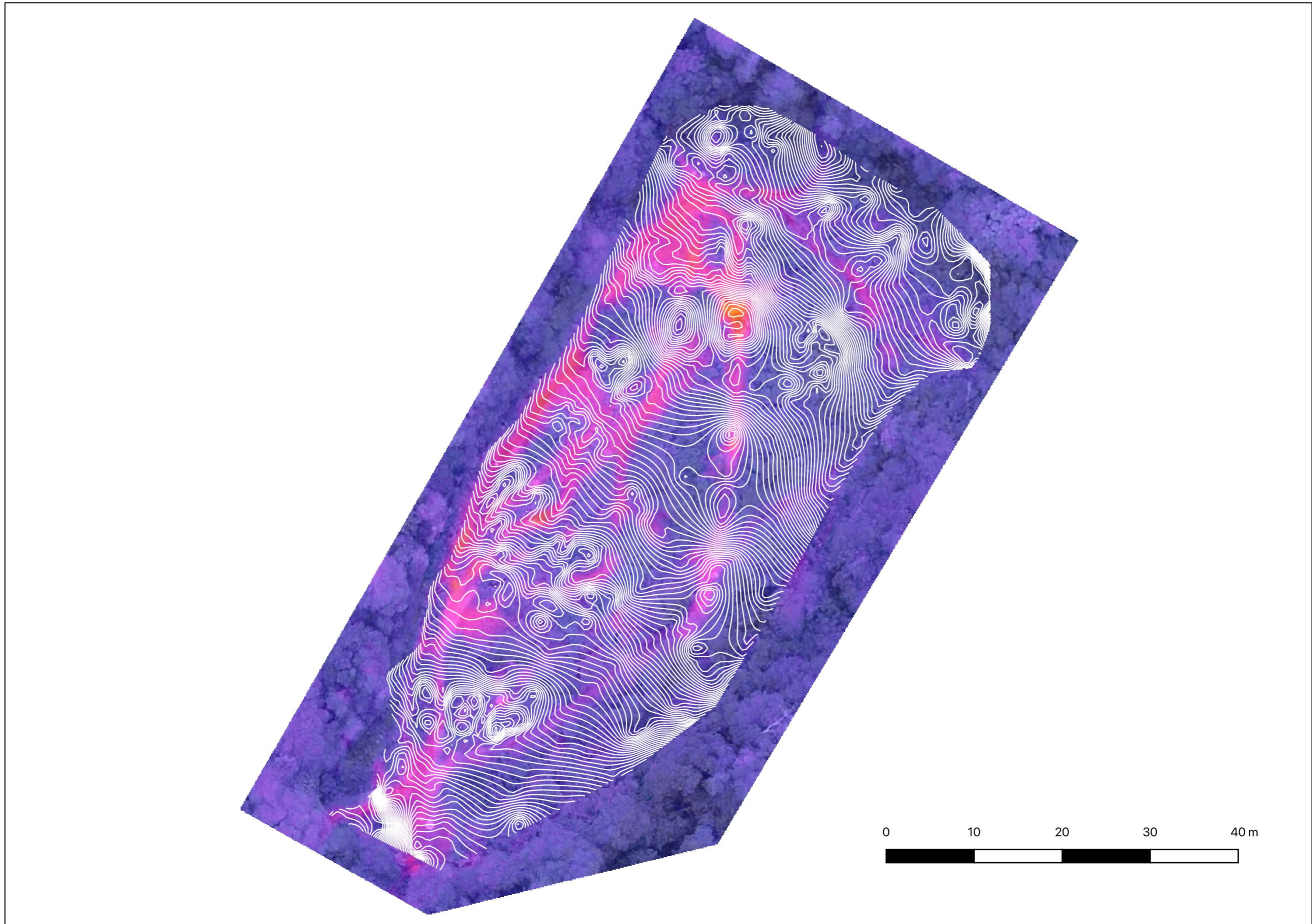


Figure 12. Thermal photogrammetric orthomosaic of survey area with topographic contour survey showing MTB tracks otherwise hidden by vegetation. Nadir view. Image © ArchaeoDomus.

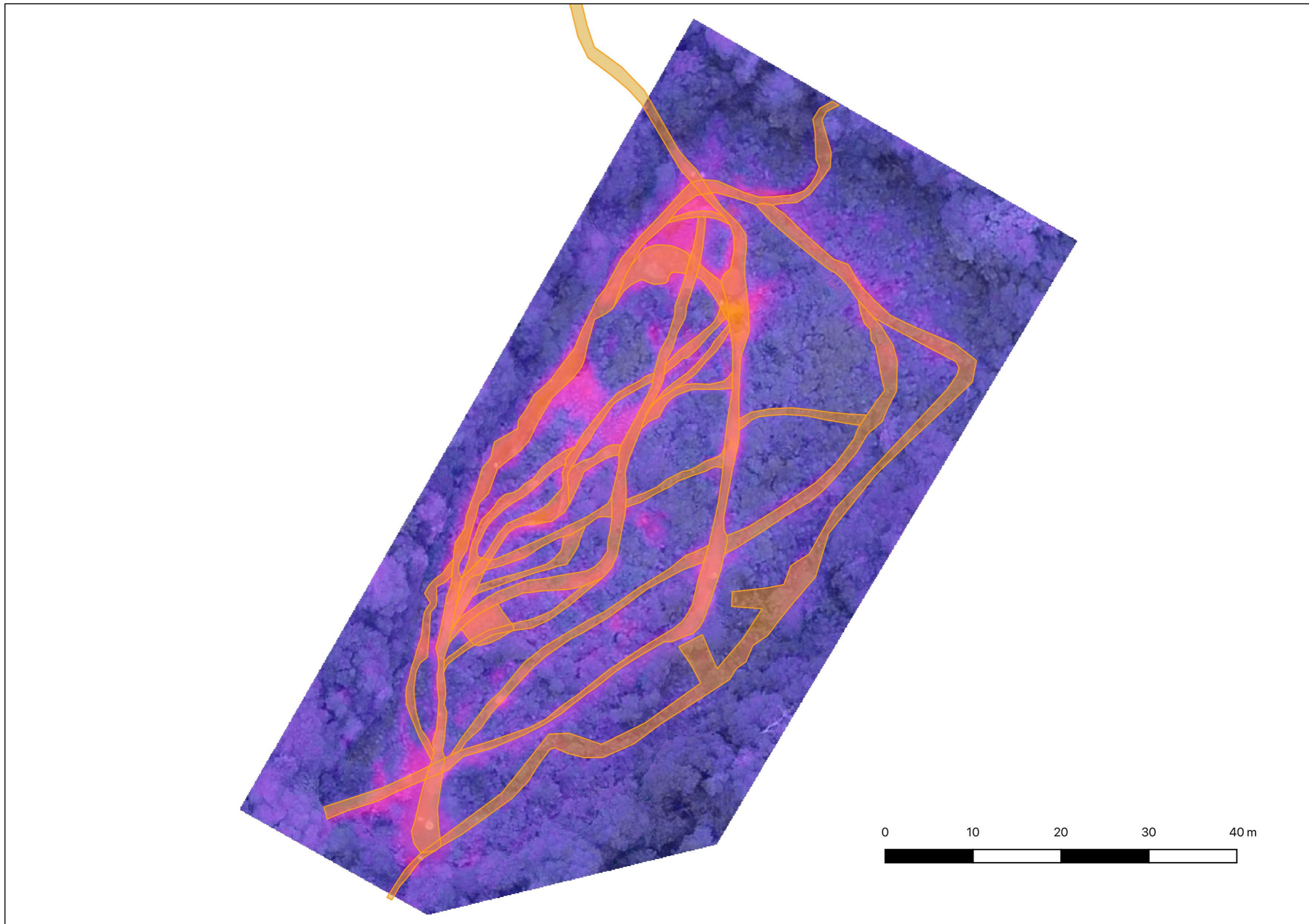


Figure 13. Thermal photogrammetric orthomosaic of survey area with topographic contour survey showing MTB tracks otherwise hidden by vegetation. Nadir view. Image © ArchaeoDomus.

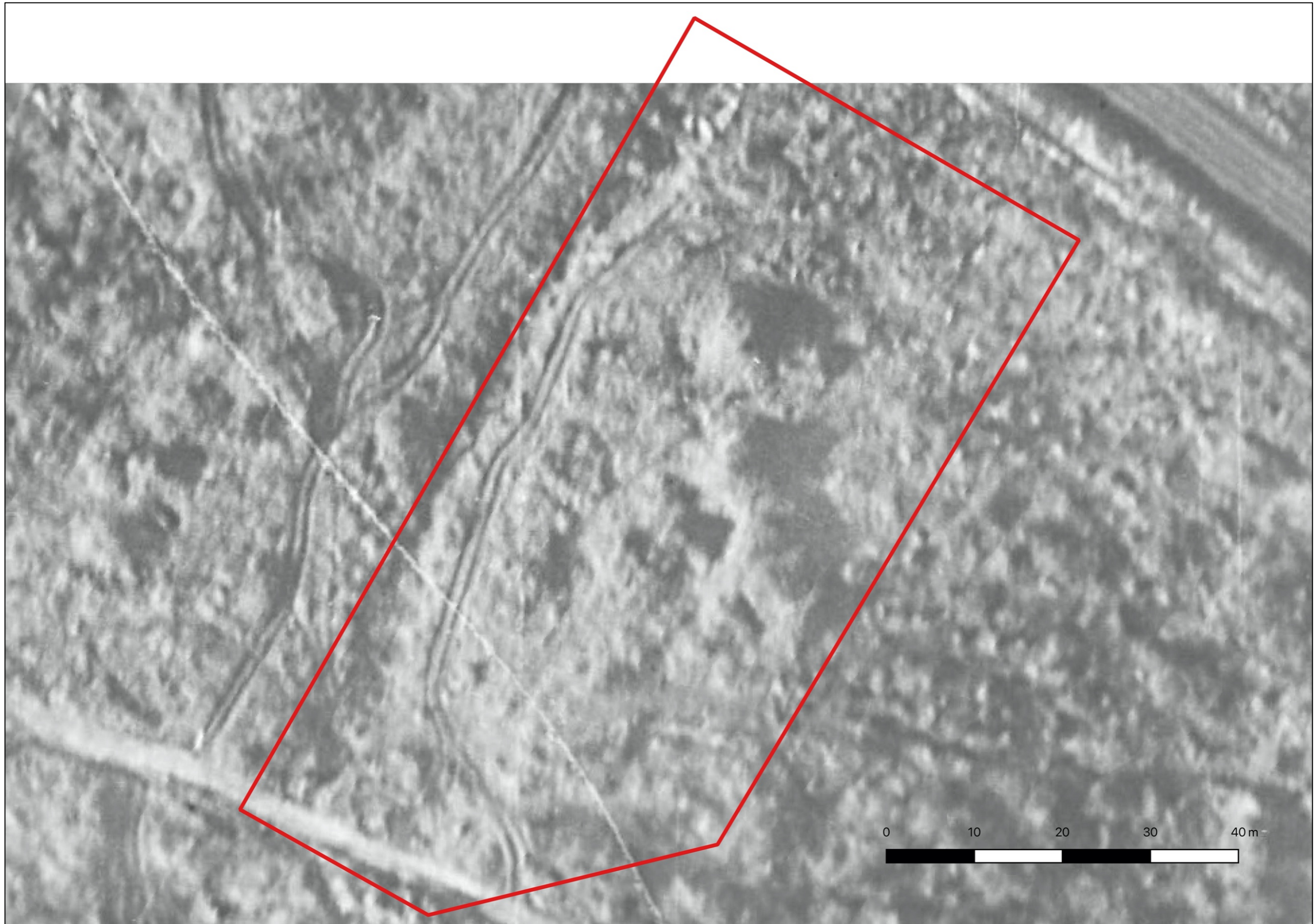


Figure 14. RAF 1946 aerial photograph showing bell pits and spoil mounds (1946 4646 RAF106GUK_1294 6069). Nadir view. © Air Photo Wales.

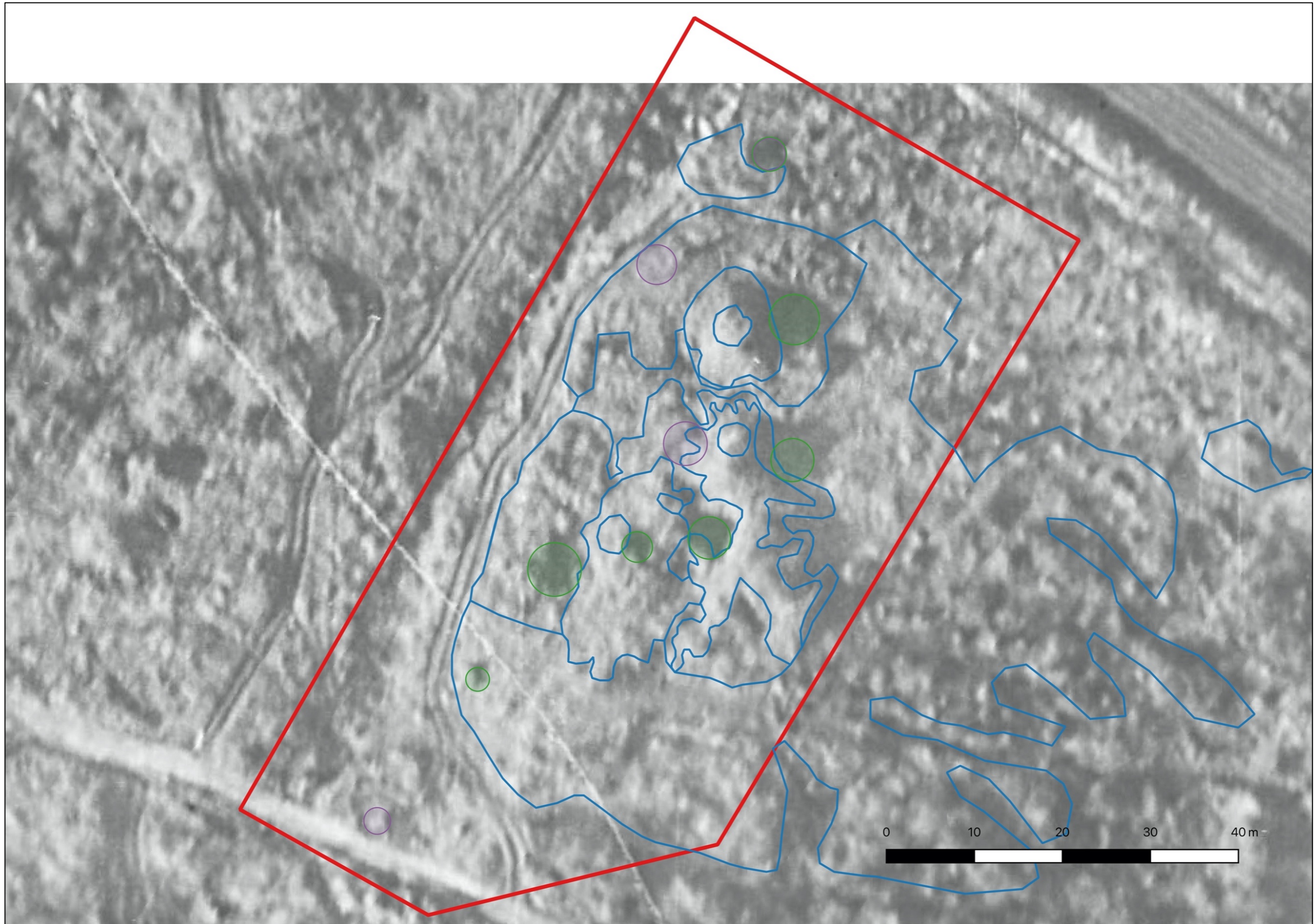


Figure 15. RAF 1946 aerial photograph showing mapped bell pits (green circles) and spoil mounds (blue polygons) (1946 4646 RAF106GUK_1294 6069). Bell pits noted during survey shown as purple circles. Nadir view. © Air Photo Wales.

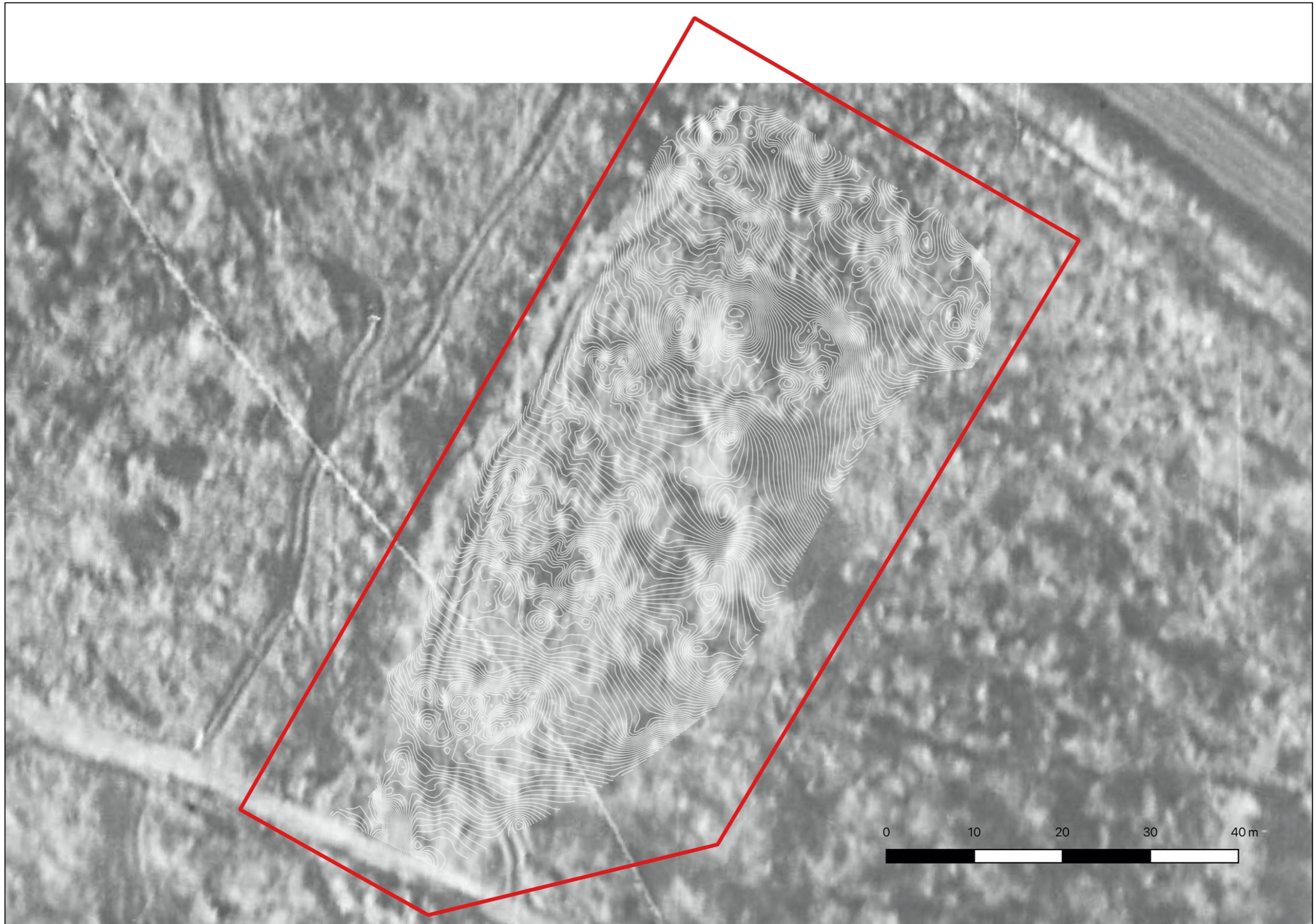


Figure 16. RAF 1946 aerial photograph showing bell pits and spoil mounds with topographic contour survey overlay (1946 4646 RAF106GUK_1294 6069). Nadir view. © Air Photo Wales.

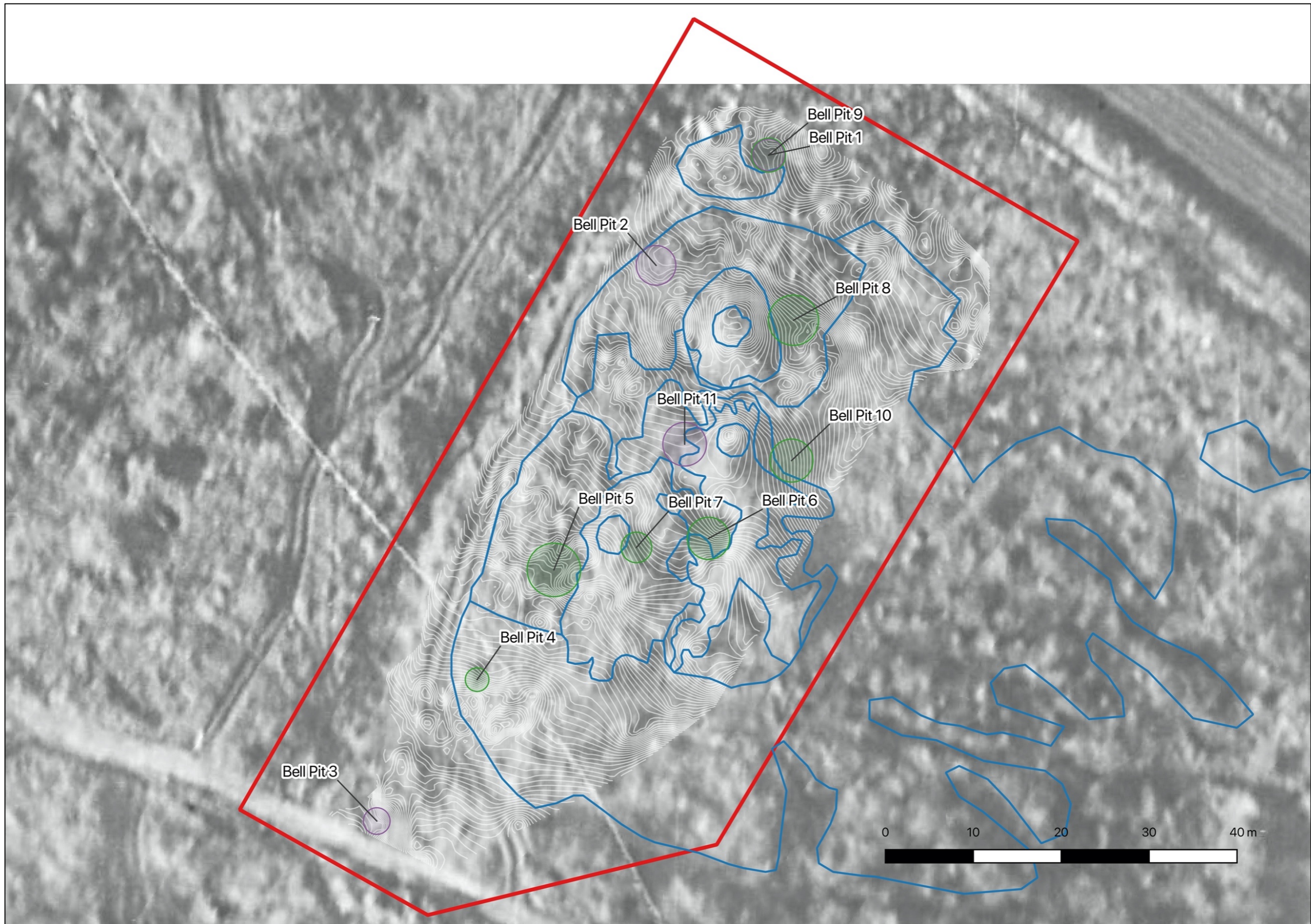


Figure 17. RAF 1946 aerial photograph showing mapped bell pits (purple and green circles) and spoil mounds (blue polygons) with topographic contour survey overlay (1946 4646 RAF106GUK_1294 6069). Nadir view. © Air Photo Wales.

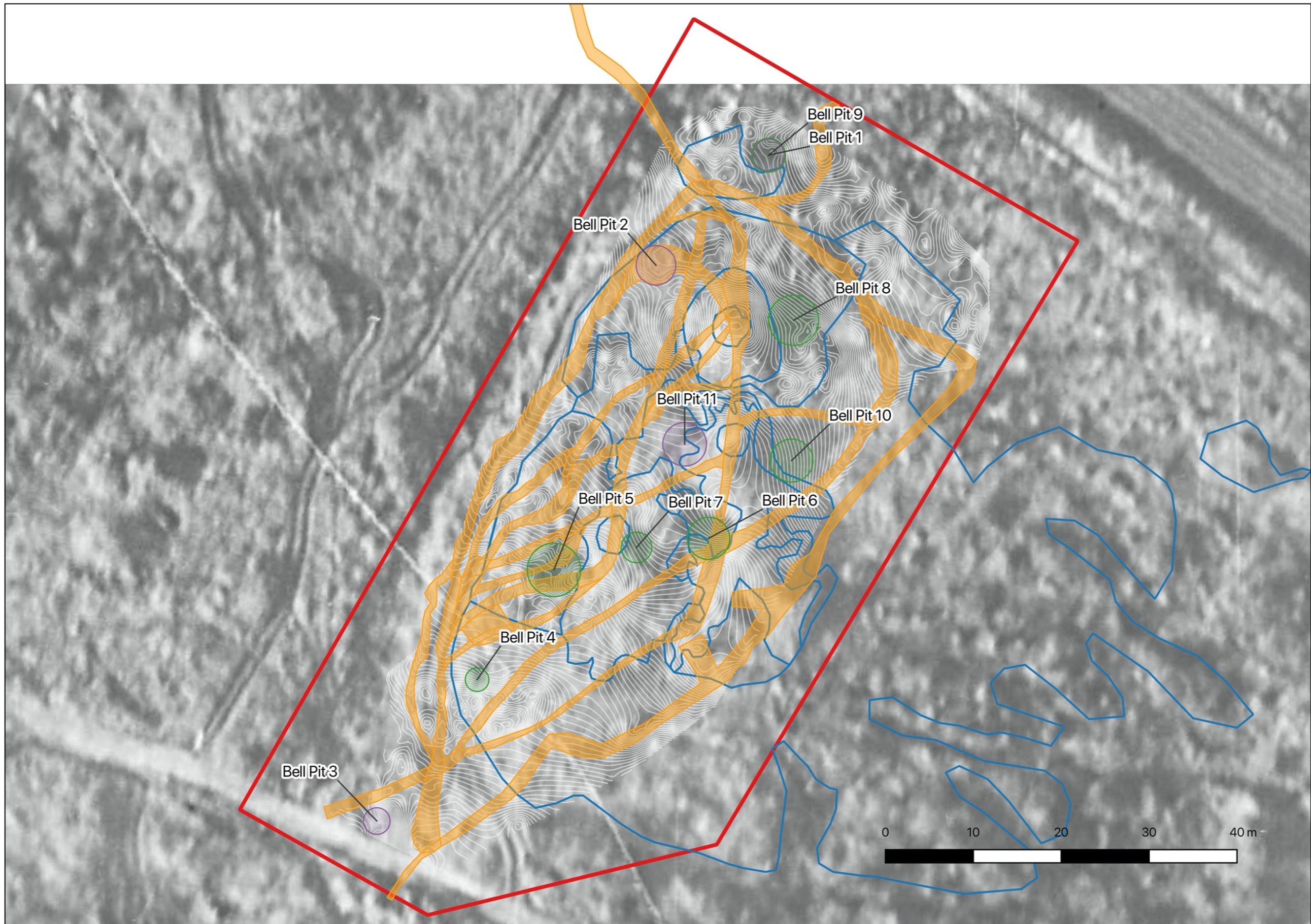


Figure 18. RAF 1946 aerial photograph showing mapped bell pits (purple and green circles) and spoil mounds (blue polygons) with topographic contour survey and MTB tracks overlay (1946 4646 RAF106GUK_1294 6069). Nadir view. © Air Photo Wales.

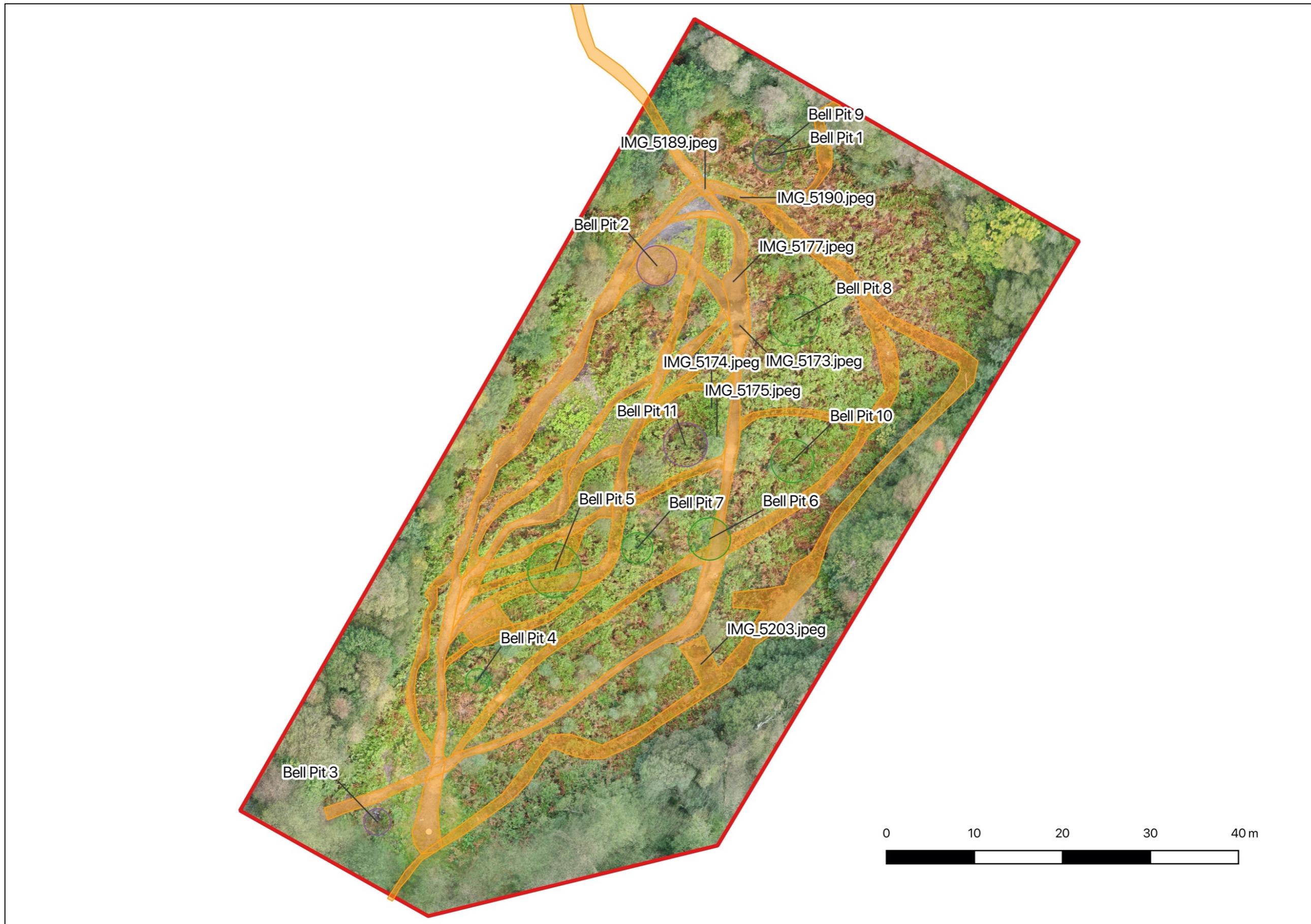


Figure 19. Location of photographs reproduced in Appendix II.

11 Appendix II – Plates



Plate 1 – Aerial view of the mountain bike tracks through Clyne Valley Shaft Mounds SAMGm455.

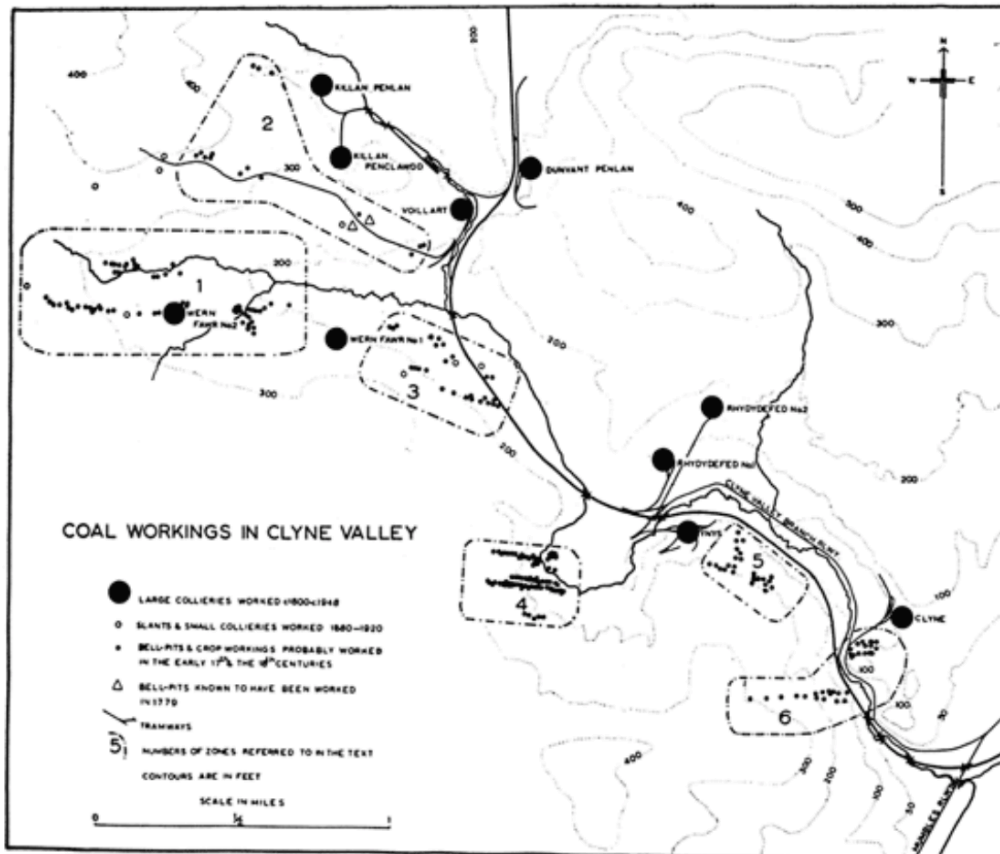


Plate 2 – Coal Workings in the Clyne Valley. Reproduced from Michael Williams (1958) Early Coal Working in the Clyne Valley, Gower 11, p19.



Plate 3 – RAF 1946 aerial photograph showing bell pits and spoil mounds (1946 4646 RAF106GUK_1294 6069). © Welsh Government1.



Plate 4 – (IMG5177) View to NW of MTB earthwork corner (right) and track leading NW to cycle track.



Plate 5 – (IMG5203) View of possible bell pit quarried for clay to build corner bund of far E MTB track.



Plate 6 – (IMG5175) View N of largest bell pit mound (centre) and Bell Pit 6 (centre bottom).



Plate 7 – (IMG5173) View S from large N bell pit mound.



Plate 8 – (IMG5189) View SW of Bell Pit 2 or MTB quarry.



Plate 9 – (IMG5174) View SW of Bell Pit 11 hidden in the bracken.



Plate 10 – (IMG5190) View N of Bell Pit 1/9.



Plate 11 – 2006 aerial image showing no MTB tracks © Map data 2020 Google.



Plate 12 – 2008 aerial image showing MTB tracks © Map data 2020 Google.



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