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Proposed Water Transfer Pipeline, Dolbenmaen to Cwmystradllyn

Archaeological Assessment

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Proposed Water Transfer Pipeline, Dolbenmaen to Cwmystradllyn

Archaeological Assessment

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SUMMARY

An archaeological assessment has been completed by Gwynedd Archaeological Trust (GAT) along the route of a proposed new transfer main between Dolbenmaen Water Treatment Works and Cwmystradllyn Water Treatment Works (WTW), Gwynedd. The transfer main will include a 450mm raw water main that will run between the two treatment works, a 50mm branch pipeline that runs from the Dolbenmaen WTW to Dolbenmaen village and several pipeline cross-connections that will run from the proposed transfer main to existing smaller diameter branch pipes. To accommodate the scheme groundworks a 21.8m wide easement is proposed along the transfer main route along with three site compounds at strategic locations. The compounds will be located just outside the easement corridor. The transfer main will be laid within a trench up to 3.8m in width.

The assessment identified a study area within a varied archaeological landscape that passes close to a number of sites of known archaeological significance including two Scheduled Ancient Monuments. Recent discoveries during the archaeological mitigation for the Dolbenmaen water treatment works have confirmed the existence of prehistoric ritual activity at this location, as well as domestic prehistoric activity with the identification of burnt mounds nearby. These point to potentially more activity within the environs and along the easement. At the opposite end of the scheme, the prehistoric standing stone east of the Cwmystradllyn water treatment works points to further potential ritual and/or domestic prehistoric activity.

The proposed water main follows a similar alignment to an existing 18-inch main between the two WTWs, and is about 5.42km in length. The western part of the study area roughly follows the course of the Afon Dwyfor while to the eastern part follows the Afon Henwy. The landscape alters significantly along the proposed route; Dolbenmaen WTW sits at approximately 95m OD while Cwmystradllyn WTW sits at approximately 195m OD and crosses a mixture of improved floodplain pasture, rough grazing and boggy ground. The study area is considered to have medium to high potential for the survival of buried archaeological remains of various periods, particularly at the western and eastern ends of the proposed route, whilst seventeen sites were identified within 50m of the pipeline route. The transfer main will cross the A487(T) road c.1.5km from the scheme start point at Dolbenmaen water treatment works; the section of the A487(T) road that runs through the assessment area is postulated to form part of the Segontium-Pen Llystyn-Tomen y Mur Roman Road system. An alternative route for the Roman Road is postulated to run along the same alignment as the Dolbenmaen village road; the branch pipeline will follow part of this route and will also cross the A487(T) road 500m from the scheme start point.

A programme of strategic mitigation is recommended to be actioned in sequence during the scheme works. This will include a basic record of all affected field boundaries along the easement; a watching brief during the easement enabling works along the entire scheme, with specific focus on the haul road groundworks; targeted archaeological controlled strips near to the Dolbenmaen water treatment works easement start point and near possible burnt mound activity of the 3.8m wide pipe trench in Section 1 (initial 150m), followed by a watching brief during pipe trenching for the remainder of the scheme in the wetland and upland zones.

An archaeological watching brief will be completed for the branch pipeline along its entire length and will incorporate two open fields west of the Dolbenmaen Water Treatment Works, a crossing point at the A487(T) road and the remainder of the branch pipeline where it runs through Dolbenmaen village via the local road.

Watching briefs are recommended for the 3No compounds alongside the easement as well as the reconnections and the cross connections proposed along the route.

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by *Caulmert Ltd* to complete an archaeological assessment of the route of a proposed transfer pipeline between Dolbenmaen Water Treatment Works (**NGR SH49864926**) and Cwmystradllyn Water Treatment Works (**NGR SH54714286**), Gwynedd. The study area is outlined on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B** (reproduced as Figure 01) and **174357-20-9101 Rev A**, and covers a linear distance of *c*.5.42km.

The proposed transfer main will replace an existing main that follows a similar alignment between the respective water treatment works. The existing main will be capped and decommissioned. The existing main and proposed transfer main are detailed on *Black and Veatch* Drawing Nos. **174357-20-0404 Rev C** and **174357-20-0405 Rev C**.

The scheme route starts at the Dolbenmaen water treatment works (WTW) and runs eastwards for 300.0m across an open field before turning south for 80m crossing Afon Dwyfor and then running southwestwards for 560.0m, to then run parallel to the south side of the A487(T) road for 190.0m to then cross the A487(T) road, following the route of a local road for 550.0m and then crossing a series of irregular fields to the east for a distance of 720.0m and then southeast for 780.0m, before continuing northeast for 1.87km, crossing the local road again and the Afon Ddu shortly after, to terminate at the Cwmystradllyn WTW.

Based on information within *Black and Veatch* Drawing No. **174357-20-9101 Rev A**, the transfer pipeline scheme will be completed within a fenced easement 21.8m wide (reproduced as Figure 13). The easement will include the following:

- a 3.8m wide pipe trench up to 1.5m deep;
- a 5.0m wide haul road;
- a 3.0m wide material stockpile zone;
- a 1.0m pedestrian footpath with a pedestrian fence;
- a 3.0m wide excavated material temporary stockpile;
- a 5.0m wide topsoil stockpile

Black and Veatch Drawing No.**174357-20-9100 Rev B** locates three compounds alongside the route:

- Contractor Compound Number 1 – located next to a minor road 1.13km from scheme start point at NGR SH25123425
- Contractor Compound Number 2 - located at NGR SH25123425, 2.40km from scheme point
- Contractor Compound Number 3 - located at NGR SH25393424, 3.18km from scheme start point

Note: the three compounds are alongside but outside the easement route.

In addition to the proposed transfer main, there will also be the following:

- a 50mm branch pipeline that will run from from Dolbenmaen WTW to Dolbenmaen village that crosses the A487(T) c.500m from the scheme start point and then continues along the local road into Dolbenmaen village, where it terminates (as detailed on *Black and Veatch* Drawing Nos. **174357-20-0404 Rev C** and **174357-20-0405 Rev C**; reproduced as Figures 14 and 15 respectively).

- 5No pipeline cross connections that will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18" main. These cross connections will be of small diameter (50 to 200 mm) and of short length, as indicated on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B**.

- Reconnections to all properties or cattle troughs that are currently supplied directly off the treated water main. The locations and quantities of these are not recorded by DCWW but it is expected that these will be very small diameter connections and the works will be normally carried out within the notified construction easements.

Black and Veatch has completed a ground investigation (GI) programme along the scheme corridor. The GI programme was completed by *Ground Investigation (Wales) Limited between* July and October 2012 for *Black and Veatch* (document ref.: 174357-20-2718-A, June 2013). The GI programme was completed as two phases of work: Phase 1 comprised 34 trial pits that were excavated along the proposed route; Phase 2 comprised 4 boreholes sunk at strategic positions along the route of the proposed Afon Dwyfor crossing point and 2 boreholes located on the banks of the Afon Ddu. The results are summarised and discussed in para. 4.4 below.

No mitigation brief has been prepared for this scheme by Gwynedd Archaeological Planning Services (GAPS) or the Snowdownia National Park Authority (SNPA): *the content of this report and all subsequent designs and reports must be approved by both GAPS and SNPA*.

This report also conforms to the guidelines specified in *Standard and Guidance for Archaeological Desk-based Assessment* (Institute for Archaeologists, 1994, rev. 2001, 2009, 2011 and 2012).

*This report deals specifically with the proposed transfer pipeline. GAT has completed archaeological assessment reports for the proposed improvements to the Dolbenmaen WTW (GAT Report **1092**) and the Cwmystradllyn WTW (GAT Report **1027**). It is recommended that these reports are reviewed in tandem with this report.*

1.1 Acknowledgements

The staffs at Caernarfon Archives and the National Library of Wales are thanked for their help with providing archive material.

2 SPECIFICATION

This report conforms to the guidelines specified in *Standard and Guidance for Archaeological Desk-based Assessment* (Institute for Archaeologists, 2008).

A desk-based assessment is defined as 'a programme of assessment of the known or potential archaeological resource within a specified area or site on land, inter-tidal zone or underwater. It consists of a collation of existing written, graphic, photographic and electronic information in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in a local, regional, national or international context as appropriate'. *(Standard and Guidance for Archaeological Desk-based Assessment,* IFA 2008, 2).
The aims of the assessment as given in the specification are:

- to identify and record the cultural heritage within the defined study area;
- to evaluate the importance of what has been identified;
- to recommend ways in which impact upon the cultural heritage can be avoided or minimised.

To comply fully with the aims expressed above it can be necessary to undertake a programme of Field Evaluation following the Desktop study and Field Visit. This is because some sites cannot be assessed by desktop or field visit alone, and additional fieldwork is therefore required. This typically takes the form of geophysical survey or trial excavation, although measured survey is also a possible option. A full programme of assessment and evaluation may therefore consist of:

- Desktop study
- Field walkover
- Initial report
- Field evaluation
- Draft report
- Final report

This phase of the project concerns the first three phases, and recommendations are made concerning further archaeological evaluation or mitigation.

3 METHODS AND TECHNIQUES

3.1 Desk top study

The desktop study comprised the consultation of maps, documents, computer records, written records and reference works, which form part of the Historic Environment Record (HER), located at Gwynedd Archaeological Trust (GAT), Bangor. Information about listed buildings was consulted by means of the CARN (Core Archaeological Index), which is the online index of the Royal Commission on Ancient and Historic Monuments, Wales. Relevant aerial photographs from the collection at RCAHM, Wales were examined.

Sites, buildings and find spots listed in the GAT HER were identified, with PRN referring to the unique Primary Record Number given to each individual site (Appendix I).

3.2 Field Search

The field search was undertaken on 12th April 2013, when the length of the transfer pipeline route was examined. Notes were taken, sketches and measurements were taken of sites of potential archaeological interest and a photographic record was made.

3.3 Report

The available information was synthesised to give a summary of the archaeological and historic background and of the assessment and recommendations, as set out below. The separate features, if any, their evaluation and recommendations are listed separately, and a summary of the overall assessment of the area is given at the end.

The criteria used for assessing the value of features was based upon those used by the Secretary of State for Wales when considering sites for protection as scheduled ancient monuments, as set out in the Welsh Office circular 60/96. The definitions of categories used for impact, field evaluation and mitigation are set out in Appendix II.

For the purposes of the assessment, GAT has divided the scheme into four sections (cf. Figure 01):

- Section 1 - Dolbenmaen WTW to Contractor Compound Number 1
  (NGR **SH25003431** to **SH25123425**)
  Length: 1.37km (main route) & *c.*500m (local main running to Dolbenmaen)

- Section 2 - Contractor Compound Number 1 to Contractor Compound Number 2
  (NGR **SH25123425** to **SH25243425**)
  Length: 1.4km

- Section 3 - Contractor Compound Number 2 to Contractor Compound Number 3
  (NGR **SH25243425** to **SH25393424**)
  Length: 1.75km

- Section 4 - Contractor Compound Number 3 to Cwmystradllyn Water Treatment Works
  Length: 0.9km
  (NGR **SH25393424** to **SH25473428**)

These four sections reflect general topographical changes along the scheme route:

- Section 1 is characterised by the northern slope of a river valley leading onto an alluvial plain
- Sections 2 and 3 are characterised by a change from the northern slope of a river valley to semi-improved wetland leading to improved pasture
- Section 4 transitions from improved pasture to upland pasture.

Specific archaeological mitigation will be recommended for the four sections (cf. para. 6) as well as the features identified within or within proximity to the route (cf. para. 6.2).

4 ARCHAEOLOGICAL RESULTS

4.1 Topographic description

The western part of the study area roughly follows the course of the Afon Dwyfor and the A487(T) in a generally south easterly direction, the road stands at approximately 95m OD adjacent to the WTW. The surrounding fields are characteristically floodplain pasture land, generally clawdd enclosed. This terrain continues largely unaltered, with only minor changes in the quality of pasture until the route turns to the east at the junction of the A 487 towards Golan. This part of the proposed route follows the Afon Henwy and is boggy in character with no good pasture, the area, however is still enclosed with cloddiau. To the south of the road, the ground improves, once again becoming enclosed pasture, although showing signs of being poorly drained and waterlogged in places. This mixed landscape of pasture and wet ground continues until the proposed route reaches the hamlet of Ynys Pandy and turns east-north east. Beyond Ynys Pandy the proposed route begins to climb and becomes enclosed upland pasture. The location of the proposed Cwmystradllyn WTW sits at approximately 195m OD.

The floodplain of the Afon Dwyfor (to the west of the proposed route) cuts through an area of primarily Ordovician rocks (Bassett & Davies, 1977). To the east underlying geology consists of basalt, dolerite & diabase (Geological Survey, England & Wales, Sheets 9 & 10). There are likely to be other isolated deposits and the potential for peaty deposits within the more waterlogged areas and alluvial river terraces.

4.2 Archaeological and historical background

Note: a general archaeological and historical background is produced below, along with a discussion of recent archaeological work at the Dolbenmaen WTW completed by GAT.

The proposed route of the water main lies within a rich archaeological landscape with extensive archaeological evidence from many periods. Following the route from west to east, evidence of prehistoric activity and settlement occurs along the length of the proposed route. Approximately 700m west-south west of the Dolbenmaen WTW stands the probable Bronze-Age standing stone of Beudy Cil-Haul (PRN 192 SH 5078 4240). The stone is described as an elongated glacial boulder approximately 1.8m high and 0.8m square, secured with packing stones. Further evidence of prehistoric activity can be found to the north west of the WTW, a prehistoric burnt-mound known as Glan-Dwyfach (PRN 154 SH 4815 4400) is located on the eastern bank of the Afon Dwyfor, approximately 1.3km from the proposed works.

Other prehistoric sites include a stone-built prehistoric hut circle (PRN 145 SH 4994 4345). Further to the north east, approximately 560m north of the A487 (T) is a prehistoric stone-built rectangular hut platform (PRN 188 SH 5023 4360). The platform is orientated east-north-east by west-south-west and despite some stones existing within the wall face, the majority of the feature has been robbed. Again to the north and approximately 800m from the WTW, close to the modern St. David's church of Garndolbenmaen, are the remains of a prehistoric hut circle (PRN 150 SH 4999 4387). The hut is cut into the slope to the north and terraced out to the south.

To the south of the WTW on the southern bank of the Afon Dwyfor is an undated hut circle (PRN 160 SH 4981 4234) which may also be prehistoric in date, known as Ystumcegid-uchaf round hut. Approximately 800m to the southeast of the WTW, again on the southern bank of the Dwyfor is the Craig-y-Tyddyn hut group (PRN 164SH 5059 4272), identified by the Gwynedd HER as a hillfort.

The nearest confirmed prehistoric site is a Bronze Age standing stone (PRN 2, 360, SH 5495 4297) at Meini Hirion, approximately 190m southeast of the Cwmystradllyn WTW (cf. Figure 5).

Following the route from west to east, the nearest to the Dolbenmaen WTW is the enclosed hut group of Tyn Caeau (NPRN 145 SH 4994 4345) located approximately 300m north of the WTW, and comprising a rectangular stone building heavily robbed to the northeast, and two hollows representing round huts. Again to the north east of the WTW is the stone-built hut circle of Craig y Llan (PRN 172 SH 5041 4351), the walls of which have collapsed to approximately 2.0m in width, with the entrance being located either to the north-north-east or south-south-west.

To the south east of the WTW, on the southern bank of the Dwyfor are two hut groups, the closest being two heavily robbed circular huts (PRN 170 SH 5019 4276), measuring 3.3m and 5.0m in diameter. Further to the southeast lies the enclosed Romano-British hut group of Craig-y-Tyddyn (PRN 165 SH 5052 4280). The site includes the slight remains of an enclosure wall measuring 30.0m in diameter, enclosing two roundhouses measuring 8.3m and 4.0m in diameter.

The current archaeological mitigation programme at the Dolbenmaen WTW (discussed in further detail in para. 4.2.2 below) has so far indicated the presence of a significant prehistoric ritual complex that includes a ring ditch a line of equidistant stones along with evidence of Bronze Age burnt mound. Further understanding and information will become apparent during the course of the mitigation programme as well as the post-excavation programme.

A Roman copper cake has been found at Clenenney (PRN 2, 357 SH 5320 4246), approximately 320m north of the proposed route, near the confluence of the Dwyfor and Henwy. A number of such cakes have been found throughout Gwynedd. The final site of known Romano-British origin are again Hut Circles at Cil Drygwr (PRN 166, SH 5359 4301), approximately 1.2km to the west of the Cwmystradllyn WTW.

The current A487 (T) may follow the line of the Segontium – Pen Llystyn – Tomen y Mur Roman Road (general PRN 17553), incorporating sections PRN 17558 (NGR SH48324359), PRN17559 (NGR SH52553973) and PRN 17821(SH59233829). This route is discussed in detail in GAT Report 572 (Hopewell, D. 2005 *Roman Roads in North-West Wales*) as a route connecting Segontium with the fort at Pen Llystyn and a bathhouse at Tremadog (*ibid.* 12). Within the assessment area, Roman Road Section PRN 17558 is postulated to run along the route of the current A487 from the northwest as far as the junction with the local road to Garndolbenmaen (Figure 02); Section PRN 17559 is postulated to run from the north via the local road through Garndolbenmaen and then the local road through Dolbenmaen to then continue southeast along the A487(T) (Figures 02 and 03); Section PRN 17821 is postulated to run across open fields to the northwest as far as the junction with the local road to Dolbenmaen, where it then continues along the current A487(T) route to the southeast, on the same alignment as section PRN 17559 (Figures 02 and 03). There are currently no traces of Roman road construction along any of these sections. Based on the current proposed scheme route detailed in *Black and Veatch* Drawing No.**174357-20-9100 Rev B**, the transfer main will cross the A487(T) road *c.*1.55km from the scheme start point, across sections PRN 17559 and PRN 17821; the proposed local main running from the Dolbenmaen WTW to Dolbenmaen village will run along section PRN 17559 where it is postulated to run on the alignment of the village road. It is currently understood that open cutting will be used for the new transfer main where it crosses the A487(T) and for the local main connection through Dolbenmaen village.

The westernmost part of the proposed route lies within the medieval cantref of Dolbenmaen in the commote of Eifionydd, and formed part of the medieval township of Dolbenmaen (PRN 7,341 SH 5060 4300). The current village core is to the east of the WTW. The proposed route passes a number of significant archaeological remains from the medieval period. Again following the route from west to east, these include the site of a medieval long hut at Ty Newydd (PRN 188 SH 5021 4359). A second hut platform is located nearby at Craig y Llan (PRN 184 SH 5042 4353).

Dolbenmaen motte (PRN 161 (SAM. CN063) SH 5065 4307) is located to the south of the Dolbenmaen The castle mound and ditch stand on a low ridge running parallel to the river Dwyfor at a fordable crossing point on an important route way. The motte's early history is unclear and it may either be Welsh or Norman built. . The possible site of a bailey, if one existed, is now covered by farm buildings and Plas Dolbenmaen (PRN 5, 257 SH 5068 4307) which itself dates to the 16th to 18th centuries but may be the location of the royal Llys, later a manor. Tax returns from 1662 shows it to be one of only two houses in the district with two hearths. The first edition Ordnance Survey records the buildings as the Dolbenmaen Castle public house. The building itself is an early 18th century L-plan building of stone rubble walls under a slate roof framed by tall gable end chimney stacks. The principal elevation is to the north east and is a two storey four bay front. There are a range of associated outbuildings including a stable, a byre and a washhouse. Approximately 450m north of the motte is another hut platform at Craig y Llan (PRN 187 SH 5089 4345).

Progressing eastwards along the proposed route, approximately 450m north of the hamlet of Ynys Pandy is the Clenennau house and barn (PRN 158 SH 5316 4246). The house is believed to be medieval in date. Further upstream on the Afon Henwy there are medieval hut platforms at Cil Drygwr (PRN 182 SH 5370 4294), approximately 550m north of the proposed alignment. Approximately 850m east of Ynys Pandy is the medieval settlement remains at Gesail Gyfarch (PRN 181 SH 5415 41 92 (centre)). The settlement contains at least six long houses and associated agricultural remains.

4.2.1 Historic Mapping

The route is contained within the historic parishes of Dolbenmaen and Penmorfa, whose tithe maps were produced in 1840 and 1838 respectively (cf. Figures 10 and 12). The tithe map of Penmorfa was produced to a high standard, and shows the properties and property boundaries in detail (Figure 12). This shows that most of the current field boundaries were present by that date. The Dolbenmaen tithe map is more schematic but again most of the current field boundaries can be shown to be present. These features included post-medieval drainage ditches, gullies and field boundaries all of which appear to pre-date the production of the Tithe Map of 1838. The 1st, 2nd and 3rd editions of the Ordnance Survey maps of the area (Caernarvonshire County Series sheets XL.2 and XL.6; 1889, 1900 and 1916 respectively) from 1889 onwards show a landscape pattern which has changed little to the present day other than work to improve the quality of the land.

A 400m long mill race is identified on all three editions of the Ordnance Survey maps north of Pen-y-Cafn farm. The mill race is sourced from the Afon Henwy and runs parallel to the Golan road to feed the water wheel at Brynkir Flannel Mill (NPRN **91665**; **SH52864234**; cf. Figure 8 for a reproduction of the 1st edition map of the area). Neither the Mill nor the mill race are within the easement corridor.

4.2.2 Recent archaeological work at Dolbenmaen WTW

GAT has recently completed a staged programme of archaeological works for the proposed extension to the existing Dolbenmaen WTW, located at the transfer pipeline start point. The staged programme of works included an archaeological assessment (Smith, S. 2012 GAT

Report **1092**), an archaeological watching brief during geotechnical investigation works (Smith, S. 2012 GAT Report **1098**), a geophysical survey of the proposed WTW zone (*Stratascan* 2013, **J3297**) and a series of archaeological trial trenches targeting anomalies identified during the geophysical survey (McNicol, D. 2013, GAT Report **1123**). The assessment identified a study area within a rich archaeological landscape with thirty known sites of archaeological significance within a 500m radial zone. A large rock outcrop was identified in the field to the immediate west of the transfer pipeline start point which appears from a combination of place name evidence and historic literature to have been used as an early medieval assembly mound. Pen Bryn yr Orsedd translates as 'The Seat on top of the Hill', and assembly mounds which have similar characteristics are known from England, Scotland, Ireland and the Isle of Man (GAT Report **1092**: 09). An assembly mound near Llangollen is currently subject to a programme of archaeological work as part of 'Project Eliseg'. In the case of 'Project Eliseg', the mound is topped by the remains of a stone cross, and academic work on the social context for the mound and the cross has recently been published (GAT Report **1092**: 09). The place name 'Dol Pen Maen' is mentioned in the medieval story of 'Math and Mathonwy' as a point where hostages were exchanged between two high – status families (GAT Report **1092**: 09). Dolbenmaen / Dol Pen Maen translates as 'The Meadow with the Rock at the Head', and the rock in this instance may be Pen Bryn yr Orsedd.

A total of 12No geotechnical trial pits were monitored by GAT (Smith, S. 2012. GAT Report **1098**) and revealed a clay silt topsoil, more humic in character in TPD02, TPD04, TPD08, TPD11 and TPD12 and varying in depth between 0.10m (TPD03 and TPD06) and 0.30m (TPD09). *TPD02, cut into the southern side of Pen Bryn yr Orsedd revealed that this side of the mound had not been modified and was entirely natural, composed of a grey silt over a very clean orange brown sandy clay*. TPD01, TPD05, TPD07 and TPD11 revealed river gravel below their respective sub-soils of sandy clay (TPD01); orange-brown till derived material (TPD05); grey-brown through red-orange clay (TPD07) and orange-brown clay-silt (TPD11). TPD03, TPD04, TPD05, TPD08, TPD09 and TPD10 came down immediately below the topsoil onto a till or till derived material Individual unabraded sherds of Post-Medieval pottery were recovered from the topsoil of TPD06 and TPD09.

GAT commissioned *Stratascan* to undertake a geophysical survey (magnetometer) of an 8.4ha area incorporating the main WTW area within the central field and the two ancillary zones. The survey was completed in late February 2013 and concluded that features interpreted as former field boundaries were evident throughout the site and anomalies possibly indicative of prehistoric farmstead activity were noted in the central region of the proposed scheme. These results were used for locating 14No GAT evaluation trenches, which targeted specific anomalies (McNicol, D. 2013, **1123**). Seven of the trenches revealed no evidence of any archaeological activity. Five liner boundary ditches relating to earlier field systems in the area were uncovered along with a probable roundhouse ditch, a possible pit, and two possible platforms. These features suggest there was at least small scale settlement in the area, however the extent and date of this settlement was not revealed during the evaluation.

At the time of writing (July 2013), archaeological mitigation programme ahead of the main scheme works is currently underway. The archaeological mitigation programme is located within three areas:

- the main WTW area within the central field (39,110m^2)
- Zone A (6,890m^2) - main site compound;
- Zone B (6,055m^2) - main soil storage area.

The mitigation comprises a watching brief during all topsoil stripping with all three areas, followed by a controlled strip of the main WTW area and Zone B. Zone A did not require a

controlled strip due to the shallow impact of the compound groundworks and the existence of two DCWW pipes beneath the area.

The controlled strip has so far indicated the presence of a significant prehistoric ritual complex that includes a ring ditch a line of equidistant stones, with the western end of the main WTW area. In addition to this evidence of Bronze Age burnt mound activity has been suggested at the southern end of the main WTW area. There is less activity of note at the eastern end of the main WTW area or Zone B. Further understanding and information on the ritual complex, as well as all other features identified will become apparent during the course of the mitigation programme as well as the post-excavation programme, but these results currently indicate a more extensive prehistoric landscape within this area than was previously understood.

4.3 Statutory and non-statutory designations

There are known Scheduled Ancient Monuments along the proposed route and others within the vicinity of the proposed route. These include the motte at Dolbenmaen (Cn063) and the Craig y Tyddyn hillfort which both lie within 250m of the pipeline route (SH 50554275; Cn046). There are a number of listed buildings also within 250m of the proposed route, the closest being the milestone at SH 51614247 (Ref: LB 21539).

The route lies partly within the Snowdonia National Park (SNP). It does not lie within a designated Landscape of Outstanding or Special Historic Interest (Cadw/ICOMOS 1998).

4.4 Black and Veatch ground investigation programme results

Black and Veatch has completed a ground investigation (GI) programme along the scheme corridor. The GI programme was completed by *Ground Investigation (Wales) Limited* between July and October 2012 for *Black and Veatch* (document ref.: 174357-20-2718-A, June 2013). The GI programme was completed as two phases of work: Phase 1 comprised 34 trial pits that were excavated along the proposed route; Phase 2 comprised 4 boreholes sunk at strategic positions along the route of the proposed Afon Dwyfor crossing point and 2 boreholes located on the banks of the Afon Ddu.

For the trial pitting programme, the scheme was divided into three sections:

- The eastern third of the pipeline route, which ran from the Cwmystradllyn WTW southwestwards to the local Golan road and included Trial Pits TP11 to TP19, starting with TP11 near the Cwmystradllyn WTW;
- The central third of pipeline route, which ran generally east to west along the easement route where it ran parallel to the local Gloan road and included Trial Pits TP20 to TP31;
- The western third of the pipeline route, which ran generally parallel to the northern side of the A487(T) road to Dolbenmaen village and included Trial Pits TP32 to TP38; and an additional series of Trial Pits (TP43 to TP52), which were located along the current proposed easement route, from the crossing point over the A487(T) and then west Dolbenmaen WTW.

The eastern third of the pipeline route comprised elevated field enclosures that led down to more level ground near the Golan road. Trial Pits TP11 to TP14 targeted the elevated field enclosures and included topsoil that varied between 0.11m and 0.25m in thickness, followed by subsoil that varied between 0.10 and 0.28m thick. In the case of TP11 and TP13, this was followed by glacial till. Trial Pits TP12 and TP14 were characterised by colluvial deposits that were 0.30m and 0.90m in respective thickness (followed by glacial till). Trial Pit 15 was

located at the base of the elevated section and comprised 0.17m of topsoil that led onto 0.88m of colluvium, followed by bedrock (siltstone) at 1.05m below ground level. Trial Pit 16 was located 260m west of proposed site compound 3 and comprised 0.16m of topsoil, followed by 0.20m of subsoil leading onto glacial till. Trial Pits TP17 and TP18 recorded 0.40m and 0.21m of topsoil respectively that led onto river alluvials associated with Afon Ddu (which will be crossed by the easement route). Trial Pit 19, where the easement crossed the Golan road, comprised 0.21m of topsoil leading onto glacial till. Water inflow was recorded from 0.17m in Trial Pit 17.

The central section, which ran parallel to the Golan Road as far as the A487(T) crossing point, included Trial Pits TP20 to TP31. On the surface, this section was characterised by semi-improved pasture. The wetland nature of this area was typified by the identification of peat deposits in Trial Pits TP20, TP21, TP29 and TP31. The peat varied in thickness between 0.50m (TP20) and 1.00m (TP31) leading onto clay-rich glacial till. The remaining trial pits along this section (TP22 to TP28), which ran from north of Ynys Pandy Farm, as far west as Drws Duegoed Farm, comprised topsoil/subsoil horizons that varied in thickness from 0.35m (TP24) to 0.57m (TP25), leading in all cases onto glacial till. Shallow water inflow was recorded from 0.15m in Trial Pits TP20 and TP21.

The western section was completed in two stages: a series of trial pits north of the A487(T) road (Trial Pits TP32 to TP41), following an alternate route and a series of trial pits following the proposed route (Trial pits TP42, TP43 and TP45 to TP52). Trial Pit 42 was located within the Dolbenmaen WTW environs and confirmed what has been identified during the archaeological mitigation programme on that scheme: that the area is characterised by shallow topsoil and subsoil (combined depth of 0.29m). Trial Pit 43 was located near the western junction of Golan road and the A487(T) road, near to where a suspected burnt mound has been identified during the assessment report walkover (Feature 2; cf. para. 4.5.1). The trial pit comprised 0.52m of peat deposits leading onto glacial till; shallow water inflow was recorded from 0.30m in the trial pit. Trial Pit 45 was located where the easement route crosses from the north side of the A487(T) road onto the southern side (where it continues westwards to terminate at the Dolbenmaen WTW). This trial pit was characterised by shallow topsoil (0.07m thick) and subsoil (0.25m thick), leading onto glacial till. Trial Pits TP46 to TP52 were all located in the large irregular field south of the Afon Dwyfor. These trial pits comprised topsoil/subsoil horizons that varied from 0.19m thick (TP47) to 0.38m thick (TP46), followed in all cases by river alluvials and river terrace material. A cemented/oxidised ironstone horizon was identified in both Trial Pits TP46 and TP47 at the eastern end of the field. Shallow water infill was recorded from 0.50m below ground level in Trial Pits TP46, TP47 and TP51 (note: the depth of the pipe trench will be 1.50m).

4.5 The Archaeological Survey

The recommendations reflect the information currently provided by Caulmert Ltd. and assume impact only within the defined proposed development area (as outlined on Figures 01 to 05). Any change to the boundary of the proposed development area will require the recommendations below to be changed also.

An existing Dŵr Cymru 18-inch water main runs from the current Dolbenamen WTW to the Cwmystradllyn WTW. The exact alignment is currently un-determined, but it is thought to be on a general alignment similar to the proposed main. The geophysical survey of the proposed Dolbenmaen WTW extension (*Stratascan* 2013, **J3297**), located the western end of the existing main to the north of the current WTW, running parallel to the southern boundary of the A487(T) road (*Stratascan* 2013, **J3297**: Figure A).

4.5.1 Sites identified within 50m of the pipeline route

The following sites have been identified which may lie within 50m of the easement strip, through both the walk over survey and background research. Where a 'C' is noted after the grid reference this indicates the centre point of a feature that may extend over a wider area. For the location of identified features cf. Figures 02 to 05.

For the purposes of the assessment the scheme route is divided into four sections:

- Section 1 - Dolbenmaen WTW to Contractor Compound Number 1
  (NGR **SH25003431** to **SH25123425**)
  Length: 1.37km (main route) & *c.*500m (local main running to Dolbenmaen)

- Section 2 - Contractor Compound Number 1 to Contractor Compound Number 2
  (NGR **SH25123425** to **SH25243425**)
  Length: 1.4km

- Section 3 - Contractor Compound Number 2 to Contractor Compound Number 3
  (NGR **SH25243425** to **SH25393424**)
  Length: 1.75km

- Section 4 - Contractor Compound Number 3 to Cwmystradllyn Water Treatment Works
  Length: 0.9km
  (NGR **SH25393424** to **SH25473428**)

These four sections reflect general topographical changes along the scheme route:

- Section 1 is characterised by the northern slope of a river valley leading onto an alluvial plain
- Sections 2 and 3 are characterised by a change from the northern slope of a river valley to semi-improved wetland leading to improved pasture
- Section 4 transitions from improved pasture to upland pasture/elevated enclosures.

Specific archaeological mitigation will be recommended for the four sections (cf. para. 6) as well as the features identified within or within proximity to the route (cf. para. 6.2).

SECTION 1 - DOLBENMAEN WTW TO COMPOUND 1

Feature 3 Motte at Dolbenmaen (SAM Cn063) PRN 37114
SH 50654307
Period: Medieval
Category: A Impact: None
The motte is a scheduled ancient monument (SAM) and is extant as mound on a low ridge running east-west parallel to the river, and forming a natural approach to the river crossing. The ridge ends in a tongue occupied by a house and farm buildings which may cover the site of a bailey. The mound is 6.6m high. The east half has been mutilated and the lower slopes are cut into by farm buildings. The ditch, 1.3m deep, remains on the west side. The summit, 14.6m by 12.6m, is hollowed and surrounded by a low bank. Loose stones suggest that masonry buildings may once have occupied the top.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance is essential as this is a Scheduled Ancient Monument. The local main groundworks will be completed in close proximity to the SAM (c.25.0m to the north of the SAM), following the route of the local road through Dolbenmaen village. The groundworks for the local main will be mitigated via an archaeological watching brief.*

Feature 4 Dolbenmaen Medieval Township PRN 7341
SH 50604300 C
Period: Medieval
Category: E Impact: Likely
The possible site of the medieval township of Dolbenmaen is located south of the river and may be adjacent to the pipeline route. This gives a heightened potential for the discovery of archaeological remains in this area
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Archaeological watching brief of the Section 1 area during easement strip and a Controlled Strip of the pipeline route in advance of the pipeline main works.*

Feature 5 Pont Dolbenmaen (LB Grade II; Ref; 4213) PRN 11689
SH 50754297
Period: Post-medieval
Category: A Impact: None
A reference occurs in the county records in July 1634 to spending £40 'for edifying and makinge up of Dolbenmen bridge', and Ogilby's atlas of the late 17th century shows a bridge here. The present bridge is roughly contemporary with the creation of the turnpike road in 1810. It is a wide single segmental arch with radiating voussoirs and an extrados arch ring above. The deck of the bridge is marked by a horizontal string course, and the parapet above is of different masonry, perhaps later.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 12 Field Boundaries
Period: Various
Category: B-C Impact: Likely
A significant number of drystone walls *cloddau* and other field boundaries are likely to be breached by the pipeline. This is particularly the case between Corsoer and Ynys Pandy, where the walls appear, by their regular parcelling up of the land to be mainly 19th century in date, and surround the farms. These are probably associated with improved fields, with field boundaries to the east, enclosing more irregular fields, being of unknown date, although they are likely to be 19th century around Cefn Coch Uchaf and Cefn Coch Isaf.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Basic Recording in advance of breaches, followed by recording of sections through the walls*

Feature 13 Beudy Tai Duon, a Stone Built Agricultural Building, probably a former Cowshed PRN 62612

SH50084307
Period: Post-medieval
Category: B Impact: None
A gabled but now roofless stone agricultural building constructed of squared local masonry, which is likely to be post-medieval, and close to the eastern edge of the Dolbenmaen WTW area. The building indicates the importance of the cattle based economy in the area which preceded the current sheep based one. The structure lies close to the easement strip, but will be avoided.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 14 Segontium – Pen Llystyn – Tomen y Mur Roman Road PRN 17558

SH48324359
Period: Roman
Category: B Impact: None
A 3.55km long postulated section of Roman Road that is part of the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* (PRN 17553). This section runs from the Roman Fort site at Penllystyn, Bryncir (PRN 144), along the route of the current A487(T) to the junction with the local road to Garndolbenmaen. There is no visible evidence for the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* within the assessment area.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *This section is not within the transfer main corridor, but mitigation is proposed for sections PRN 17559 and 17821 (alternative postulated routes for Segontium – Pen Llystyn – Tomen y Mur Roman Road), where the transfer main crosses the A487.*

Feature 15 Segontium – Pen Llystyn – Tomen y Mur Roman Road PRN 17559

SH52553973
Period: Roman
Category: B Impact: Unknown
A 6.12km long postulated section of Roman Road that is part of the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* (PRN 17553). This section runs from the local road to Garndolbenmaen to Penmorfa via the village road through Dolbenmaen and part of the A487(T) and is partly on the same alignment as section PRN 17821 (an alternative postulated route for the *Segontium – Pen Llystyn – Tomen y Mur Roman Road*). There is no visible evidence for the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* within the assessment area.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *The transfer main crosses the A487(T)* c.*1.55km from the transfer main start point at the Dolbenmaen WTW. The pipeline will cross the road via open cutting; therefore a watching brief is recommended for the duration of the transfer main groundworks across the A487.*

The transfer main scheme will also include a new Branch Pipeline connection from Dolbenmaen WTW to Dolbenmaen village that crosses the A487(T) c.*500m from the scheme start point and then continues along the local road into Dolbenmaen village, where it terminates. The local main groundworks will involve open cutting both for the road crossing and the local road: a watching brief is recommended for the duration of the transfer main groundworks*

Feature 16 Segontium – Pen Llystyn – Tomen y Mur Roman Road PRN 17821

SH59233829
Period: Roman
Category: B Impact: Unknown
A 27.71km long postulated section of Roman Road that is part of the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* (PRN 17553). This section runs from the Roman Fort site at Penllystyn, Bryncir (PRN 144), across open fields and then along part of the route of the current A487(T), before continuing across more open fields and the Porthmadog cob area, before terminating west of the Tomen y Mur fort complex. Within the assessment area, this section is partly on the same alignment as section PRN 17559 (an alternative postulated route for the *Segontium – Pen Llystyn – Tomen y Mur Roman Road*). There is no visible evidence for the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* within the assessment area.

Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *The transfer main crosses the A487(T)* c.*1.55km from the transfer main start point at the Dolbenmaen WTW. The pipeline will cross the road via open cutting; therefore a watching brief is recommended for the duration of the transfer main groundworks across the A487.*

SECTION 2 - COMPOUND 1 TO COMPOUND 2

Feature 6 Slate Quarry, Ysgubor Cerrig, Dolbenmaen PRN 20204
SH51004270
Category: C Impact: Unlikley
Period: Post-medieval
The site of a slate quarry is noted at this location on the The 1st, 2nd and 3rd editions of the Ordnance Survey maps from 1889 onwards (Caernarvonshire County Series sheets XXXIV.01-03). The feature is not visible at present but the location as indicated in the Historic Environment Record PRN reference will be avoided by the easement.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 2 Possible Burnt Mound at Corsoer (Plate 14) PRN 62613
SH 51304267
Period: Prehistoric
Category: E Impact: None
A circular, or horseshoe-shaped earthwork, approximately 1.5m to 2m diameter within a pasture field adjacent to residential property known as Corsoer (Figure 03 & Plate 14). The exact origin of this earthwork is unclear but may represent a burnt mound. A second similar looking earthwork was observed approximately 40m-50m to the north, beyond the proposed route. The current easement route design avoids this feature.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 9 Milestone (LB Grade II; 21539) PRN 62614
SH51614247
Period: Post-medieval
Category: B Impact: None
A milestone is located on the north side of the old road from Porthmadog to Caernarfon on the west side of the track leading to Tyddyn Madryn.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 12 Field Boundaries
Period: Various
Category: B-C Impact: Likely
A significant number of drystone walls *cloddau* and other field boundaries are likely to be breached by the pipeline. This is particularly the case between Corsoer and Ynys Pandy, where the walls appear, by their regular parcelling up of the land to be mainly 19th century in date, and surround the farms. These are probably associated with improved fields, with field boundaries to the east, enclosing more irregular fields, being of unknown date, although they are likely to be 19th century around Cefn Coch Uchaf and Cefn Coch Isaf.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Basic Recording in advance of breaches, followed by recording of sections through the walls*

SECTION 3 - COMPOUND 2 TO COMPOUND 3

Feature 1 Remains of a building at Pen-y-Cafn (Plate 13) PRN 62615
SH 52854229
Period: Post-medieval
Category: B Impact: None
A stone building, which is likely to be post-medieval, and close to Brynkir Woollen Mill, is located south of the road. The building is not present on the Ynyscynhaearn tithe map but is present on the 1st to 3rd Edition Ordnance Survey maps of the area (cf. Figure 08 for a reproduction of the 2nd Edition map and Figure 11 for a reproduction of the Ynyscynhaearn tithe map). The ruins lie to the north of the easement route.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance.*

Feature 7 Ynys Pandy Carved Stone PRN 36573
SH52804230
Period: Post-Medieval
Category: C Impact: None
A carved stone of post-medieval date.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 8 Clwt y Ffolt, Dolbenmaen PRN 5260

Period: Post-medieval
Category: B Impact: None
The ruins of a possible mid 18th century cottage, with a projecting chimney breast are situated north of the river. There is a small field system associated with this former house. It is thought that this site will be easily avoided.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance*

Feature 12 Field Boundaries
Period: Various
Category: B-C Impact: Likely
A significant number of drystone walls *cloddau* and other field boundaries are likely to be breached by the pipeline. This is particularly the case between Corsoer and Ynys Pandy, where the walls appear, by their regular parcelling up of the land to be mainly 19th century in date, and surround the farms. These are probably associated with improved fields, with field boundaries to the east, enclosing more irregular fields, being of unknown date, although they are likely to be 19th century around Cefn Coch Uchaf and Cefn Coch Isaf.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Basic Recording in advance of breaches, followed by recording of sections through the walls*

Feature 17 Brynkir Mill Race PRN 62616
SH53064215
Period: Post Medieval
Category: C Impact: None
A 400m long mill race is identified on all three editions of the Ordnance Survey maps north of Pen-y-Cafn farm (still visible). The mill race is sourced from the Afon Henwy and runs parallel to the Golan road to feed the water wheel at Brynkir Flannel Mill (NPRN **91665**; **SH52864234**; cf. Figure 8 for a reproduction of the 1st edition map of the area). The mill race is 30m north of the easement corridor and neither the Mill or the mill race are within the easement corridor. ***Recommendations for further assessment:*** *None*
Recommendations for mitigatory measures: *None: will be avoided*

SECTION 4 - COMPOUND 3 TO CWMYSTRADLLYN WATER TREATMENT WORKS

Feature 10 Stone built agricultural building west-south-west of Cefn-Coch Isaf PRN 62617
SH 53984244
Period: Post-medieval
Category: B Impact: None
A stone agricultural building constructed of squared local masonry, which is likely to be post-medieval, and close to Cefn-Coch Isaf, is located north of the road (Figure 5; Plates 09 and 10). It forms an outbuilding as part of the Cefn-Coch Isaf farmstead. The structure lies very close to the easement strip and is within the location of compound 3 (Figure 5). A building is noted at this location on the Penmorfa tithe map (Figure 12) and all subsequent historic mapping (cf. Figure 09), but the schematic nature of the drawing makes it difficult to discern if it represent one or both of the current buildings.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance.*

Feature 11 Sheepfold PRN 5260
SH 54374275
Period: Post-medieval
Category: C Impact: None
A sheepfold is located within a large irregular shaped between Cefn-Coch Isaf Farm and the Cwmystradllyn Water Treatment Works (cf. Figure 05). The sheepfold is extant on the Penmorfa tithe map (Figure 12) and all subsequent historic mapping (cf. Figure 09). Based on the current proposed easement route (Figure 01 and Figure 05), the sheepfold is to the immediate south of the route and can be avoided.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Avoidance. The easement route will be fenced, prohibiting direct access to the feature during scheme works.*

Feature 12 Field Boundaries
Period: Various
Category: B-C Impact: Likely
A significant number of drystone walls *cloddau* and other field boundaries are likely to be breached by the pipeline. This is particularly the case between Corsoer and Ynys Pandy, where the walls appear, by their regular parcelling up of the land to be mainly 19th century in date, and surround the farms. These are probably associated with improved fields, with field boundaries to the east, enclosing more irregular fields, being of unknown date, although they are likely to be 19th century around Cefn Coch Uchaf and Cefn Coch Isaf.
Recommendations for further assessment: *None*
Recommendations for mitigatory measures: *Basic Recording in advance of breaches, followed by recording of sections through the walls*

4.5 Aerial Photographs

The following aerial photographs covering the pipeline route were examined:-

- RAF 106 G UK 1469 Frame 4268 Enlarged 4th May 1946
- Ordnance Survey 73/020 Frame 207 Enlarged 21st March 1973

Little additional detail was observed from the aerial photographs, although alterations to the A487(T) road in the 1970s were noted, including the by-pass of the settlement at Dolbenmaen itself, and the construction of a new bridge across the river. No new archaeological sites were identified along the route, although many known archaeological sites were clearly visible.

5. SUMMARY OF ARCHAEOLOGICAL POTENTIAL

5.1 Location Summary

The proposed development area lies within a rich archaeological landscape with known sites of archaeological significance dating from the prehistoric through to the modern period recorded on the Gwynedd HER. The route measures about 5.42km in length, starting at the Dolbenmaen WTW, running eastwards for 300m across an open field before turning south for 80m, crossing the Afon Dwyfor and then running south-west for 560m to then run parallel to the south side of the A487(T) road for 190m to then cross it. It follows the route of a local road for 550m and then crossing a series of irregular fields to the east for a distance of 720m and then south-east for 780m, before continuing north-east for 1.87km to terminate at the Cwmystradllyn WTW. The proposed route mainly follows the Afon Dwyfor and Afon Henwy and climbs from approximately 95m OD in the west to approximately 195m OD. The landscape changes from floodplain pasture, characterised by small enclosed fields, to poor upland grazing and boggy ground.

5.2 Environmental Remains and Soil Morphology

The proposed route is almost exclusively agricultural in nature with only very limited areas of highway verges and a very short stretch within the highway itself. Mapping confirms that the proposed route has remained largely unaltered throughout the modern period. There is no evidence of deep ploughing or cultivation, it is likely therefore that archaeological remains, if any, would survive at relatively shallow depths. The walkover survey did record an earthwork of possible archaeological origin, confirming this. The extent of truncation caused by the existing main has so far been difficult to ascertain. It was been clearly identified as a standing earthwork along some of the proposed route. Some aerial photographs also suggest that the projected route of the existing pipe may not be accurate as a linear vegetation mark can be traced on a different alignment in some areas, especially to the north west of the hamlet of Ynys-y-Pandy where the proposed route crosses the Afon Ddu.

5.3 Artefactual Potential

There is **high** potential for the survival of medieval artefacts close to Dolbenmaen motte and probable township (Features 3 and 4), as it was a high status medieval *llys* with a probable associated *maerdref*, which might indicate settlement. It is possible that prehistoric artefacts could be identified in the vicinity of the probable prehistoric Burnt Mound at Corsoer (Feature 2). Post medieval artefacts are likely in the vicinity of the farms along the route.

There is **moderate** potential for the survival of artefacts of all periods along the length of the pipeline route.

6. SUMMARY OF RECOMMENDATIONS

6.1 General Recommendations

There is a **medium** to **high** possibility that archaeological remains may be encountered along the length of the proposed route, and the route lies within a landscape of known archaeological sites. The recent discovery of prehistoric ritual activity at the Dolbenmaen WTW has further enhanced the diversity and complexity of archaeological activity within the local landscape.

At this stage it is unclear what impact the existing main has had upon potential archaeological remains along the proposed route, however, the archaeological mitigation at the Dolbenmaen WTW noted that the existing pipeline infrastructure had truncated archaeological activity, whilst other activity had survived in close proximity.

All recommendations are based on current knowledge of the archaeological resource as well as the scheme proposals in *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B** and **174357-20-9101 Rev A**. Based on *Black and Veatch* Drawing No. and **174357-20-9101 Rev A**, which provides details on the scheme easement, it is understood that an area encompassing the pipe trench and haul road will be stripped after the easement route is defined; this stripped area is expected to measure *c.*10m in width. The drawing indicates a shallow unspecified depth for the haul road and a 3.8m width and 1.50m depth for the pipe trench. The sequence of events are expected to be:

- Fencing of easement and pedestrian route/breaching of field boundaries;
- Haul road strip/stockpiling;
- Surface laying of pipe;
- Excavation of pipe trench/further stockpiling
- Laying of pipe

Recommendations are sub-divided into the relevant scheme sections (as defined in para. 1.0) and the expected sequence of events. Separate recommendations are made for the compounds. Consideration has been given to the results of the *Black and Veatch* ground investigation programme (discussed in para. 4.4) and applicability of an archaeological evaluation programme and these are discussed below.

Feature specific mitigation recommendations are listed in para. 6.2

The general recommendations currently envisage an archaeological mitigation programme that will run in tandem with the proposed scheme. Consideration has been given to the viability of an archaeological evaluation programme in advance of the scheme works. For a linear scheme that traverses a varied landscape of medium to high potential such as this, the evaluation programme could have included a geophysical survey along the length and width of the easement, followed by targeted trial trenching of suspected anomalies. However, examining the ground investigation data and the route of the existing main it is recommended that the scheme active mitigation programme will provide the most informed and proactive response to the potential archaeological resource.

The ground investigation (GI) results suggest that Section 1, which runs from the Dolbenmaen WTW to Compound 1 and incorporates the river valley of the Afon Dwyfor, will comprise mostly river alluvials beneath the topsoil/subsoil horizon (cf. Figure 01). The GI results also identified cemented/oxidised ironstone at the eastern end of this section. It is possible the alluvial deposits and the ironstone could limit the effectiveness of a geophysical

survey at this location. The initial length of the easement running from the Dolbenmaen WTW, before it turns southeast to cross the Afon Dwyfor, runs in close proximity to the existing 18” main, which is located between 10m and 20m to the north. Based on the geophysical survey completed by GAT in advance of the Dolbenmaen WTW mitigation, the existing main creates an anomaly signature “bloom” over 10m either side of the existing main, which could limit the effectiveness of a geophysical survey along the easement corridor, where it runs in close proximity to the existing main. This reasoning would apply to Section 2 also, which runs from Compound 1 to Compound 2, traversing mainly semi-improved agricultural land. As *Black and Veatch* Drawing **174357-20-0404 Rev C** indicates, the existing main and the proposed easement run almost parallel and in close proximity; the easement also crosses the existing main at two points where it runs north of the Golan road. Section 3, which runs from Compound 2 to Compound 3, also runs in close proximity to the existing main, as well as crossing the main at two points along the route. Section 4, which runs upland from Compound 3 to the Cwmystradllyn WTW, crosses the existing main and also runs parallel to the existing main in the final field leading to the water treatment works. The GI results also suggested colluvial deposits up to 0.90m thick in two trial pits, whilst bedrock was encountered at the start of this section. These factors could also limit the effectiveness of a geophysical survey at this location.

The proposed mitigation for each of the four easement sections are discussed below.

SECTION 1 - DOLBENMAEN WTW TO COMPOUND 1

Transfer Main Easement Corridor

Section 1 is mainly characterised by improved pasture. The following mitigation sequence is recommended for the transfer main:

- A basic record of all field boundaries prior to and during breaching of the easement. This would include a photographic and descriptive record of their form, function and phasing.

- An archaeological watching brief during the easement enabling works, specifically the excavation of the haul road. This section is characterised by shallow topsoil/subsoil horizons that increase the risk of archaeological activity beneath these horizons being disturbed by vehicle traffic along the easement corridor, especially as the haul road will not be surfaced but will comprise a dirt highway with turf overburden removed. Due consideration should be given to the use of vehicles with limited ground pressure (including tracked dumpers), where practical. The alluvial deposits and high water table that characterise most of this section could be easily disturbed by heavy traffic. The watching brief will monitor the risk to these horizons beneath the subsoil.

- A subsequent archaeological controlled strip of the 3.8m wide pipe trench, to the glacial horizon for an initial length of 150.0m leading from the Dolbenmaen WTW to the location where the branch line starts and where the easement route detours southeast to cross the Afon Dwyfor. The recent discoveries during the Dolbenmaen WTW controlled strip mitigation have so far indicated the presence of a significant prehistoric ritual complex that includes a ring ditch a line of equidistant stones along with evidence of Bronze Age burnt mound activity. This suggests the potential for more extensive archaeological activity within the local landscape and the controlled strip would allow a detailed examination of the pipe trench prior to the start of the pipe laying activities. The controlled strip would involve the GAT archaeologist working with the site plant operator and banksman to strip the footprint of the pipe trench to the glacial horizon and mitigate any archaeological activity identified within the footprint. Any areas of archaeological potential will be cleaned by hand. Where complex archaeological deposits are identified during stripping, these will be identified at an early stage in order to formulate a defined area of work and to allow a suitable archaeological mitigation strategy. *Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width within the easement in the vicinity of the archaeological features to fully expose them and locate any related features*
- Based on the results of the ground investigation programme it has been interpreted that the portion of the easement route that crosses the Afon Dwyfor and runs close to the river bank is characterised by alluvial deposits beneath the topsoil/subsoil horizon and a high water table. For this portion it is recommended that an archaeological watching brief is undertaken during the excavation of the pipe trench where the easement route detours southeast to cross the Afon Dwyfor and runs to the Compound 1 location.

Branch Pipeline through Dolbenmaen Village

- A new branch pipeline is proposed as part of the transfer main works,. The branch pipeline will run from the Dolbenmaen WTW to Dolbenmaen village, crossing the A487(T) c.500m from the scheme start point and then along the local road into

Dolbenmaen village, where it terminates. The branch pipeline will measure *c.*50 mm in diameter and the groundworks will be completed using a narrow open cut trench. The branch line will not require a large easement or haul road where it runs across two open fields and the groundworks in Dolbenmaen village will be restricted to the existing road corridor.

- The branch pipeline will affect the postulated route of the **Segontium – Pen Llystyn – Tomen y Mur Roman Road** at two locations: when the groundworks cross the A487(T) **(Feature 16)** and when the branch pipeline continues through Dolbenmaen village along the local road **(Feature 15)**. Both Features 15 and 16 are alternative routes for the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* and there is currently no visible evidence for the Roman Road at these locations. Due to the potential for activity associated with these features, a watching brief is recommended during the excavation stage of the branch pipeline groundworks. The watching brief will include the two open fields where the branch pipeline runs from the Dolbenmaen WTW to the A487(T) crossing point. The current information indicates that the branch pipeline will run parallel to and in close proximity to the existing 18" main. It is possible the branch pipeline will therefore be excavated through disturbed ground associated with the existing main; the watching brief will determine this during the course of the groundworks.

Compound 1

Compound 1 is located within a large field west of Beudy Cil Haul Farm and will be south of the main easement (cf. Figure 01). The compound will be accessed via the track to Beudy Cil Farm. It is recommended that the compound is mitigated via an intensive watching brief, based on the current assumption that the groundworks will involve a topsoil strip followed by a temporary surface. It is recommended that the compound avoids intrusive sewerage and service facilities and that any such facilities are kept above ground. Should the initial groundworks for the compound expose any archaeological activity it is recommended that the watching brief is superseded by a controlled strip to allow the archaeological mitigation team suitable opportunity to expose the full extent of the archaeological activity. Moreover, if the controlled strip at the start of Section 2 identify archaeological activity in close proximity to Compound 2 then consideration should also be given to replacing the compound watching brief with a controlled strip (based on the current assumption that the controlled strip in Section 2 will precede the activation of the compound). It is also recommended that reinstatement of the compound on completion of the scheme is monitored as an archaeological watching brief to confirm that no additional disturbance will be caused by the removal of the compound infrastructure.

SECTION 2 - COMPOUND 1 TO COMPOUND 2

Transfer Main Easement Corridor

Section 2 is mainly characterised by semi-improved wetland pasture, with further improved pasture in the vicinity of Ty'n Rhos farm. The potential for medieval activity is thought to be lower here, but there may be potential for scattered prehistoric activity, as indicated by **Feature 2 (Possible Burnt Mound at Corsoer)**. The following mitigation sequence is recommended:

- **Possible Burnt Mound at Corsoer (Feature 2**/NGR **SH51304267)**: currently, the easement route avoids this feature, but it is in close proximity (cf. Figure 01). The fencing of the main easement should avoid peripheral impact. *It is recommended that the fencing team is advised of the feature location*.

- A basic record of all field boundaries prior to and during breaching of the easement. This would include a photographic and descriptive record of their form, function and phasing.

- An archaeological watching brief during the easement enabling works, monitoring all groundworks and specifically the haul road. This section is characterised by generally thicker topsoil/subsoil horizons than Section 1, however the portion north of the A487(T) road and parallel to the Golan road includes peat deposits and a very shallow water table that increase the risk of archaeological activity beneath these horizons being disturbed by vehicle traffic along the easement corridor, especially as the haul road will not be surfaced but will comprise a dirt highway with turf overburden removed. There is a high possibility that the burnt mound feature outside the easement may indicate a more extensive spread of similar activity across the local area. Due consideration should be given to the use of vehicles with limited ground pressure (including tracked dumpers), where practical and for surface "bog matting" to avoid the removal of turf to accommodate the haul road.

- A controlled strip is recommend for the initial 510.0m portion of the route that runs from Compound 1 to the A487(T) crossing point and across the road before the route turns eastwards into the wetland zone. This initial length towards the base of a south to north slope that continues into the wetland zone differs from the majority of the section. There is potential for the burnt mound activity identified to the north (Feature 2) to continue across the local landscape. The controlled strip would involve the GAT archaeologist working with the site plant operator and banksman to strip the footprint of the pipe trench to the glacial horizon and mitigate any archaeological activity identified within the footprint. Any areas of archaeological potential will be cleaned by hand. Where complex archaeological deposits are identified during stripping, these will be identified at an early stage in order to formulate a defined area of work and to allow a suitable archaeological mitigation strategy. *Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width within the easement in the vicinity of the archaeological features to fully expose them and locate any related features*

- An archaeological watching brief during the excavation of the 3.8m wide and 1.5m deep pipe trench for the remainder of this section for the portion of the route that runs east of the controlled strip, across the wetland area to Compound 2. *Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width within the easement in the*

vicinity of the archaeological features to fully expose them and locate any related features.

- **Feature 15 Segontium – Pen Llystyn – Tomen y Mur Roman Road (Section PRN 17559/**SH52553973) and **Feature 16 Segontium – Pen Llystyn – Tomen y Mur Roman Road (Section PRN 17821/** SH59233829): the route of the *Segontium – Pen Llystyn – Tomen y Mur Roman Road* is postulated to be on the same alignment as the current A487(T) road within the area of the transfer main. The transfer main crosses the A487(T) road *c.*1.55km from the scheme start point in Section 1 (Dolbenmaen WTW). The crossing point will be completed via open cutting for the width of the pipe trench (currently understood to be 2.8m). A watching brief is recommended for the duration of the groundworks at the crossing point to monitor for any evidence associated with Features 15 and 16.

Pipeline cross connections

There are 3No pipeline cross connections indicated on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B** for this section. These cross connections will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18" main. These cross connections will be of small diameter (50 to 200 mm) and of short length and it is recommended that a watching brief is maintained throughout any groundworks associated with these.

Compound 2

- Compound 2 is located at the end of the section, within a semi-improved field east of *Clawdd Rhos* property and north of the easement (Figure 01). It is recommended that the compound is mitigated via an intensive watching brief, based on the current assumption that the groundworks will involve a topsoil strip followed by a temporary surface. It is recommended that the compound avoids intrusive sewerage and service facilities and that any such facilities are kept above ground. Compound 2 is indicated on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B** as being located over the existing 18" main. It is also recommended that reinstatement of the compound on completion of the scheme is monitored as an archaeological watching brief to confirm that no additional disturbance will be caused by the removal of the compound infrastructure.

SECTION 3 - COMPOUND 2 TO COMPOUND 3

Transfer Main Easement Corridor

This area is of similar nature to Section 2, but with more extensive wetland areas. The following mitigation sequence is recommended:

- A basic record of all field boundaries prior to and during breaching of the easement. This would include a photographic and descriptive record of their form, function and phasing.

- An archaeological watching brief during the easement enabling works, monitoring all groundworks and specifically the haul road. This section is characterised by generally thicker topsoil/subsoil horizons than Section 1, however this section includes peat deposits and a very shallow water table that increase the risk of archaeological activity beneath these horizons being disturbed by vehicle traffic along the easement corridor, especially as the haul road will not be surfaced but will comprise a dirt highway with turf overburden removed. There is a high possibility that the burnt mound feature outside the easement may indicate a more extensive spread of similar activity across the local area. Due consideration should be given to the use of vehicles with limited ground pressure (including tracked dumpers), where practical and for surface “bog matting” to avoid the removal of turf to accommodate the haul road.

- An archaeological watching brief during the excavation of the 3.8m wide and 1.5m deep pipe trench for the remainder of this section for the portion of the route that runs east of the controlled strip, across the wetland area to Compound 2. *Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width within the easement in the vicinity of the archaeological features to fully expose them and locate any related features.*

Pipeline cross connections

- There are 2No pipeline cross connections indicated on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B** for this section. These cross connections will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18” main. These cross connections will be of small diameter (50 to 200 mm) and of short length and it is recommended that a watching brief is maintained throughout any groundworks associated with these.

Compound 3

- Compound 3 is located at the end of the section, next to **Feature 10 - Stone built agricultural building west-south-west of Cefn-Coch Isaf** (Figure 01). It is currently understood that the compound will be positioned on existing hardstanding. It is recommended that the compound avoids intrusive sewerage and service facilities and that any such facilities are kept above ground. It is also recommended that reinstatement of the compound on completion of the scheme is monitored as an archaeological watching brief to confirm that no additional disturbance will be caused by the removal of the compound infrastructure.

There is potential for the survival of palaeoenvironmental remains within the more waterlogged areas of the scheme route, particularly in Sections 2 and 3. It is recommended

that advice is sought from a suitable specialist as to the appropriateness of a palaeoenvironmental assessment strategy, prior to the start of works. This could include a visual assessment of the type and character of the wet areas, some depth and composition augerings in order to assess the potential, followed by any further recommendations. A reactive palaeoenvironmental sampling strategy should also be considered during the main scheme mitigaiton if any deposits are identified and suitable specialist advice sought on an appropriate sampling methodology.

SECTION 4 - COMPOUND 3 TO CWMYSTRADLLYN WATER TREATMENT WORKS

Section 4 is mainly characterised by improved upland pasture. Whilst no features were identified within the easement corridor for this section, this section should be viewed in light of the Meini Hirion standing stone, 290.0m to the east of the easement end point at Cwmystradllyn WTW and the potential this indicates for a wider prehisroic landscape, particularly of a ritual nature. A geophysical survey of the Meini Hirion site (Hopewell, D. & Smith, G. , 2007 , Prehistoric Funerary and Ritual Monument Survey: Assessments of Monuments at Risk in an Agricultural Landscape - Ceremonial Monuments), failed to find any obvious signs of the former stone circle. If the stones have been removed from their original positions, as opposed to being buried, and the field has been ploughed, the only remaining features would be relatively shallow holes that may not be detectable by the gradiometer. There is still, therefore, the potential for sub-surface features within this general area. The GI results are suggesting that there is potential for colluvial deposits along this section too that could have buried potential activityunder thicker deposits.

The following mitigation is recommended for this section:

- A basic record of all field boundaries prior to and during breaching of the easement. This would include a photographic and descriptive record of their form, function and phasing.

- An archaeological watching brief during the easement enabling works, monitoring all groundworks and specifically the haul road. Despite the presence of colluvium within this section, there is still the risk of vehicle rutting on the haul road and due consideration should be given to the use of vehicles with limited ground pressure (including tracked dumpers), where practical.

- An archaeological watching brief during the excavation of the 3.8m wide and 1.5m deep pipe trench for this section. *Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width within the easement in the vicinity of the archaeological features to fully expose them and locate any related features.*

Reconnections to all properties or cattle troughs that are currently supplied directly off the treated water main are proposed. The locations and quantities of these are not recorded by DCWW but it is expected that these will be very small diameter connections and the works will be normally carried out within the notified construction easements. It is recommended that a watching brief is maintained throughout the groundworks for these reconnections.

6.2 Specific Recommendations

The specific recommendations for known/suspected archaeological features are produced below.

Nos	Name	Importance	Impact	Recommendations for further Evaluation	Mitigation Recommendations	Section
1	Remains of a building at Pen-y-Cafn	B	None	None	Avoidance	3
2	Possible Burnt Mound at Corsoer	E	None	Avoidance	Avoidance	2
3	Motte at Dolbenmaen	A	None	None	Avoidance	1
4	Dolbenmaen Medieval Township	E	Likely	None	Controlled Strip	1
5	Pont Dolbenmaen	A	None	None	Avoidance	1
6	Slate Quarry, Ysgubor Cerrig, Dolbenmaen	C	Unlikely	None	Proximity area will be mitigated via an archaeological watching brief	2
7	Ynys Pandy Carved Stone	C	None	None	Avoidance	3
8	Clwt y Ffolt, Dolbenmaen	B	None	None	Avoidance	3
9	Milestone	B	None	None	Avoidance	2
10	Stone building west-south-west of Cefn Coed Isaf	B	None	None	Avoidance	4
11	Sheepfold	C	None	None	Avoidance	4
12	Field Boundaries	B-C	Likely	None	Basic Recording	1-4
13	Beudy Tai Duon	B	None	None	Avoidance	1
14	**Segontium – Pen Llystyn – Tomen y Mur Roman Road**	B	Unknown	None	None	n/a
15	**Segontium – Pen Llystyn – Tomen y Mur Roman Road**	B	Unknown	None	Watching Brief at A487(T) Road crossing point for the transfer main (1.55km from scheme start point) and the branch pipeline through Dolbenmaen Village	1&2
16	**Segontium – Pen Llystyn –**	B	Unknown	None	Watching Brief at A487(T) Road crossing	1&2

	Tomen y Mur Roman Road				point (1.55km form scheme start point) for the transfer main and the branch pipeline (500m from scheme start point)	
17	**Brynkir Mill Race**	C	None	None	Will be avoided	n/a (north of Section 3)

7 CONCLUSIONS

The archaeological assessment carried out along the proposed route of the Garndolbenmaen to Cwmystradllyn water main has shown that the route crosses a rich archaeological landscape with known sites dating from the prehistoric era through to the 19th century. The landscape along the proposed route appears to have undergone only limited development during the modern era. The area is considered to have **medium to high** potential for the survival of buried archaeological remains from prehistoric through to post-medieval times, with particular emphasis on the more improved land characterised by Sections 1 and 4. Both the recent identification of ritual prehistoric activity at the Dolbenmaen water treatment works within close proximity to the start of the easement route and the existence of the Meini Hirion standing stone east of the easement end point suggest the existence of wider ritual landscapes. The Dolbenmaen water treatment works have also identified prehistoric burnt mound activity and the identification of a possible burnt mound just outside the easement route near Corsoer Farm, suggest similar activity could exist in the river valley and wetland areas that characterise the western and central portion of the routes.

The transfer main crosses the postulated route of the Segontium-Pen Llystyn-Tomen y Mur Roman Road *c.*1.5km from the scheme start point; whilst a proposed branch pipeline associated with the transfer main will cross the same postulated route *c.*500m from the scheme start point. The branch pipeline also runs along part of the postulated route where the alignment of the Roman Road is thought to match the current village road that runs through Dolbenmaen village.

A programme of strategic mitigation is recommended to be actioned in sequence during the scheme works. This will include a basic record of all affected field boundaries across all four sections; a watching brief during the easement enabling works across all four sections, with specific focus on the haul road groundworks; an archaeological controlled strip of the 3.8m wide pipe trench in Section 1 (initial 150m), followed by a watching brief of the remainder of the pipe trench in that section; in Section 2 an archaeological controlled strip of the 3.8m wide pipe trench from compound 1 eastwards as far as the easement south of Feature 2, followed by a watching brief of the remainder of the pipe trench in Section 2 and a watching brief for the pipe trenches in Sections 3 and 4.

An archaeological watching brief will be completed for the branch pipeline along its entire length and will incorporate two open fields west of the Dolbenmaen Water Treatment Works, a crossing point at the A487(T) road and the remainder of the branch pipeline where it runs through Dolbenmaen village via the local road. The branch pipeline will have a nominal width of 50mm and will not require the same easement infrastructure as the transfer main.

Watching briefs are recommended for the 3No compounds alongside the easement. In all three cases, recommendations are given for non-intrusive compound infrastructure as well as a watching brief during the compound reinstatement.

Archaeological watching briefs are also recommended for the reconnections and the cross connections, which are all currently understood to involve limited groundworks.

A palaeoenvironmental sampling strategy should be considered for the scheme as a whole and specifically for the semi-improved fields characteristic of Sections 2 and 3. This could be considered in advance of the groundworks or in response to any deposits identified during the course of the mitigation programme. The ground investigation programme for the easement completed by Black and Veatch has confirmed the existence of peat deposits in the wetland areas and has also confirmed the presence of thick alluvial deposits at the western end of the easement and colluvial deposits at the eastern end.

8 ARCHIVE

The archive consists of historic maps, plans and aerial photographs, along with notes and digital images taken on the field visit. The archive is currently held by GAT under project code **G2231**.

A bound report (or copies as required) will be sent to the SNPA archaeologist and GAPS, and a copy sent to the Historic Environment Record (HER), Gwynedd Archaeological Trust, Bangor, for deposition in the Regional HER. A copy of the report will be provided to the National Monument Record at the Royal Commission on the Ancient and Historic Monuments of Wales, Aberystwyth.

9 REFERENCES AND OTHER SOURCES CONSULTED

9.1 Primary Sources

Aerial Photographs

- Welsh Assembly Government RAF 106 G UK 1469 Frame 4268 Enlarged 4th May 1946
- Welsh Assembly Government Ordnance Survey 73/020 Frame 207 Enlarged 21st March 1973

Maps

- Tithe Maps of the parishes of Penmorfa 1838, and Dolbenmaen 1840
- Ordnance Survey 25 inch 1st to 3rd edition Caernarvonshire County Series sheets XXXIV.01-03, 06-07 (1889, 1900 and 1916)

9.2 Secondary Sources

Baker, M. 2013 Personal Communication regarding research on Plas Brynkir for PhD thesis '*The Impact and Development of the Welsh Country House'*

Black and Veatch Drawing Nos.

- **174357-20-9100 Rev B**
- **174357-20-9101 Rev A**
- **174357-20-0404 Rev C**
- **174357-20-0405 Rev C**
- **174357-20-0404 Rev C**
- **174357-20-0405 Rev C**

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The Dry Stone Walling Association. 2004 *Dry Stone Walling Techniques & Traditions Cumbria*

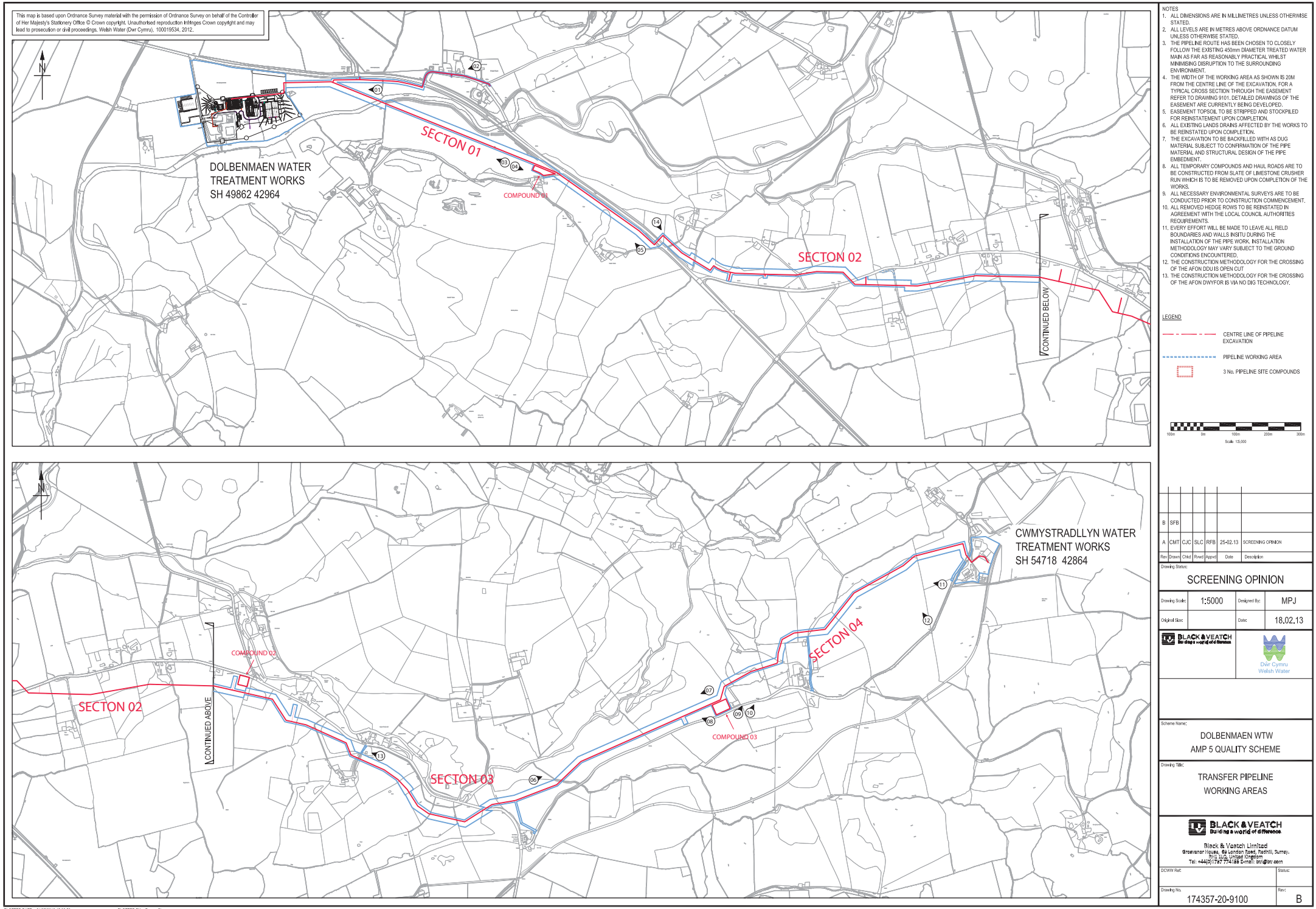


Figure 01: Reproduction of Black & Veatch DWG No. 174357 - 20 - 9100 with Gwynedd Archaeological Trust amendments denoting sections 01 to 04 discussed in text and compounds 01 to 03. The pipeline route is in red and the easement outline in blue. The location and direction of report plates are also indicated.

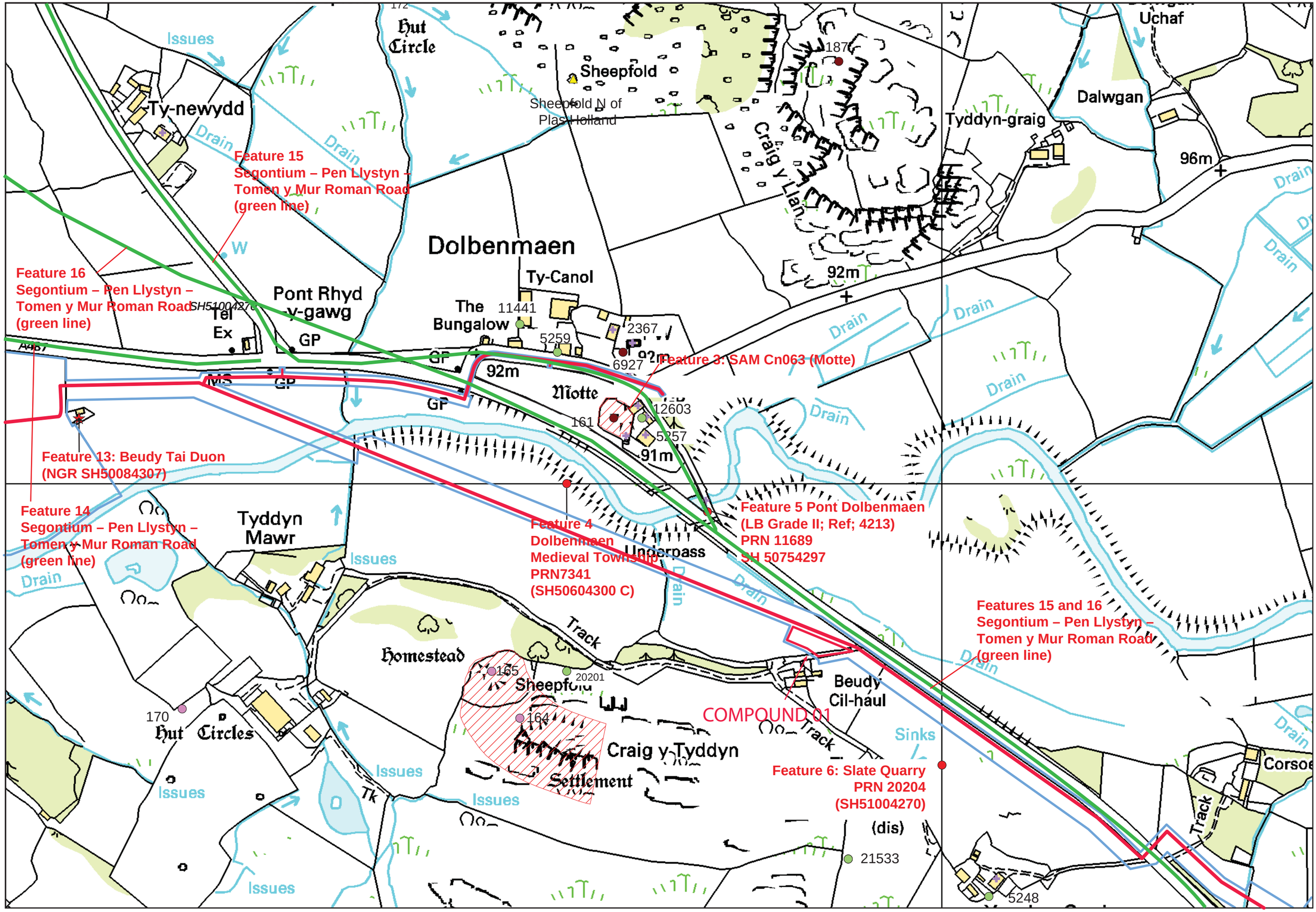


Figure 02: section 1 - location of known and suspected archaeological features (scale 1:3500@A3). The pipeline route is in red; the easement outline in blue.

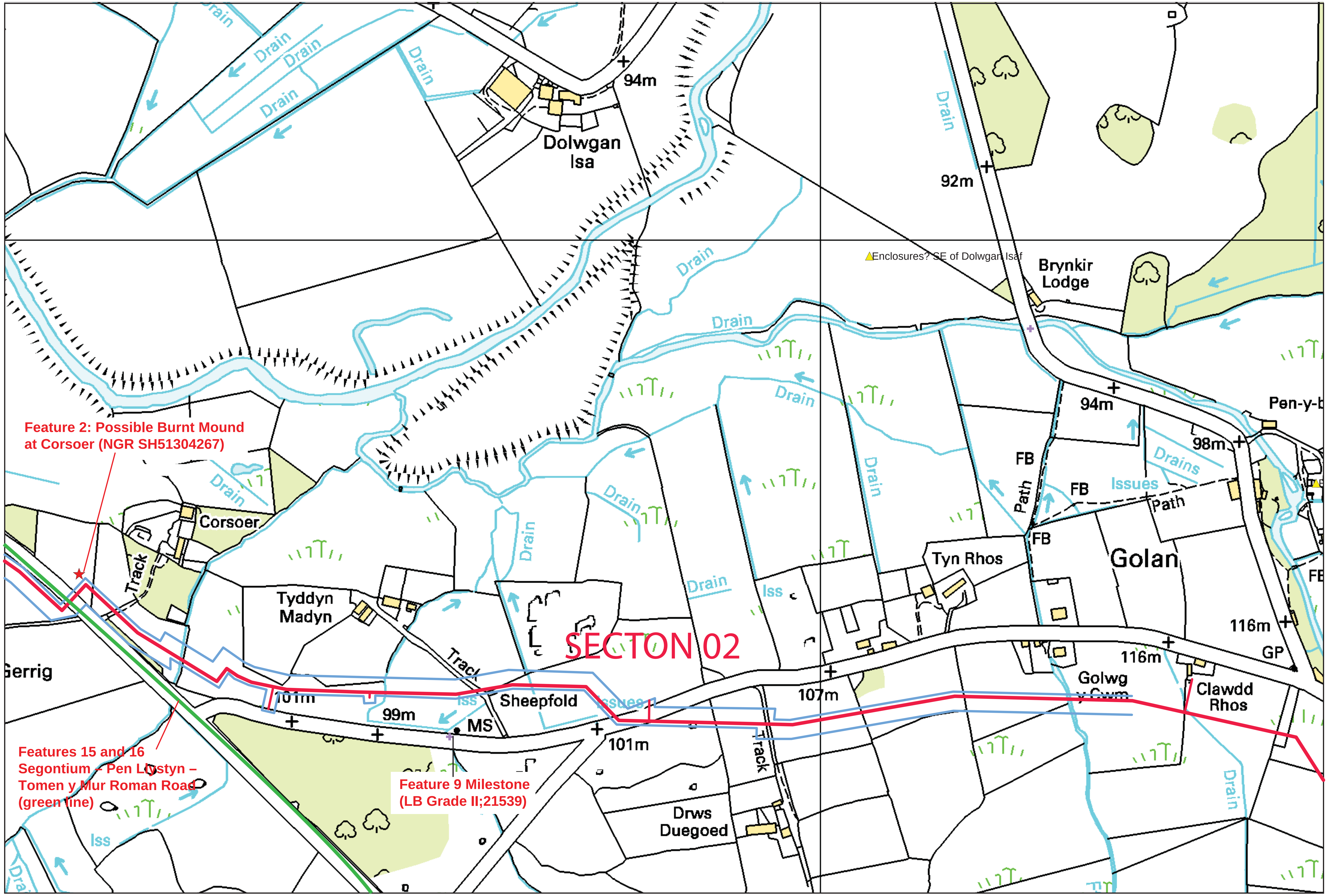


Figure 03: section 2 - location of known and suspected archaeological features (scale 1:3500@A3). The pipeline route is in red; the easement outline in blue.

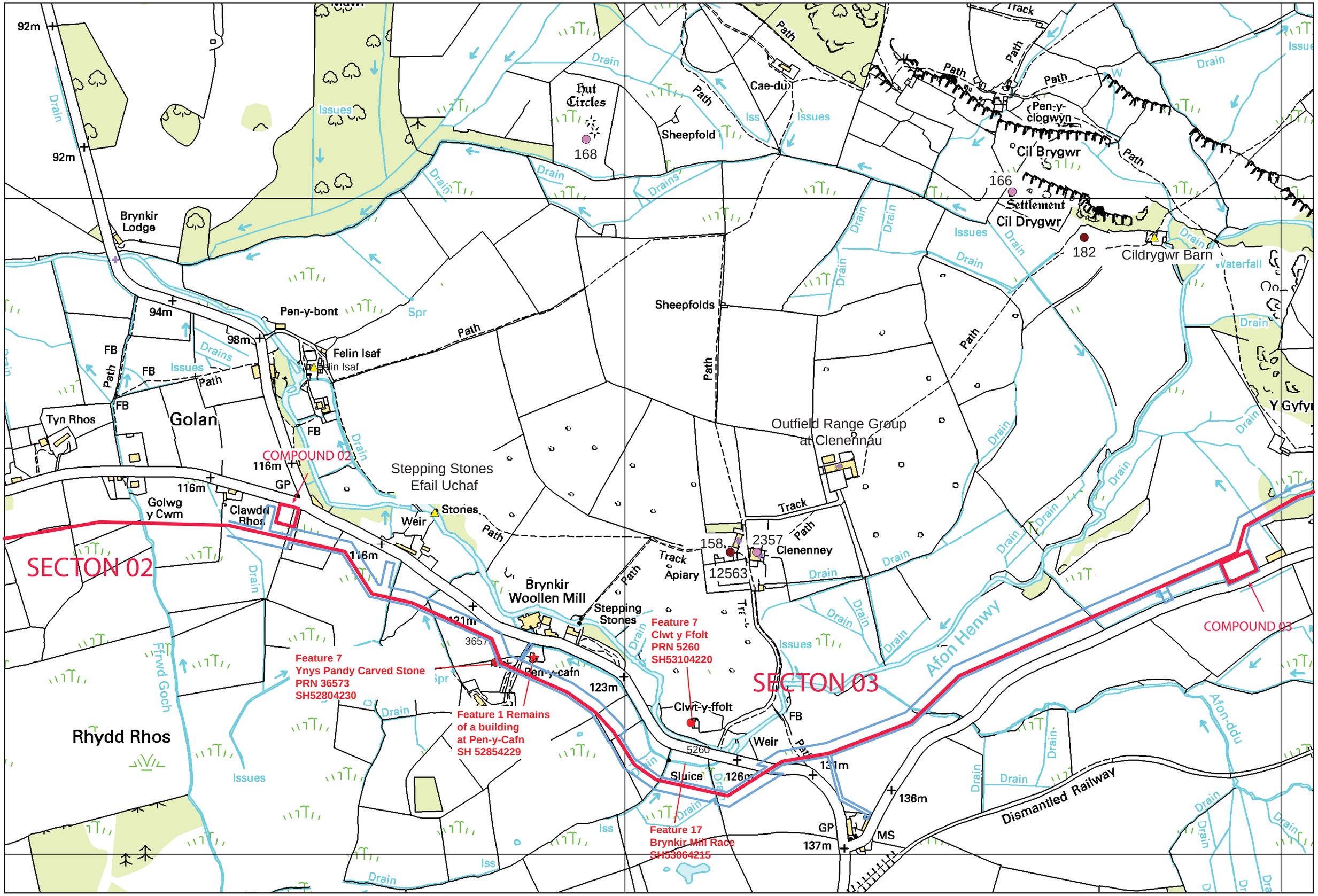


Figure 04: section 3 - location of known and suspected archaeological features (scale 1:5000@A3). The pipeline route is in red and the easement route is outlined in blue.

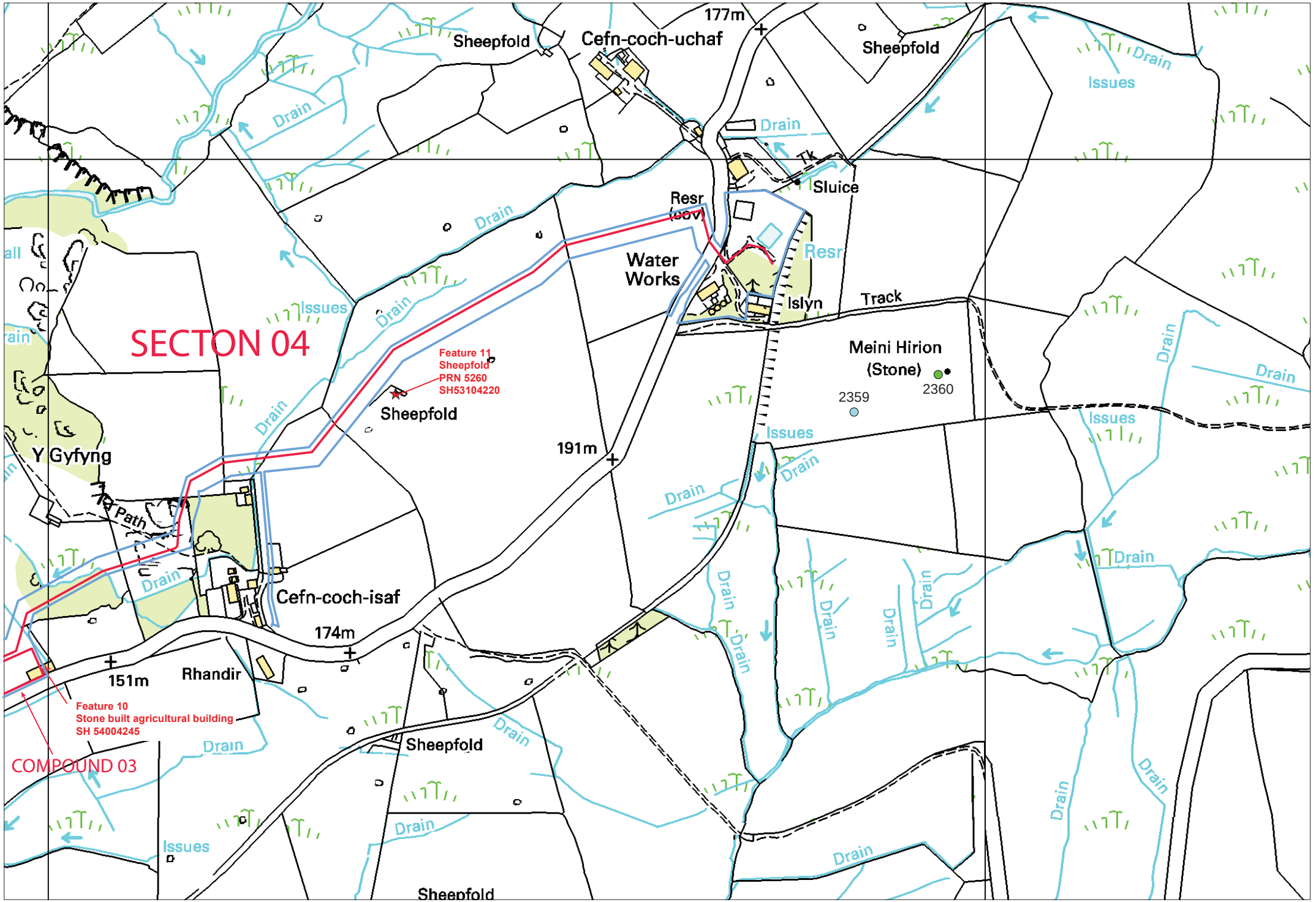


Figure 05: section 4 - location of known and suspected archaeological features (scale 1:3500@A3). The pipeline route is in red and the easement route is outlined in blue.

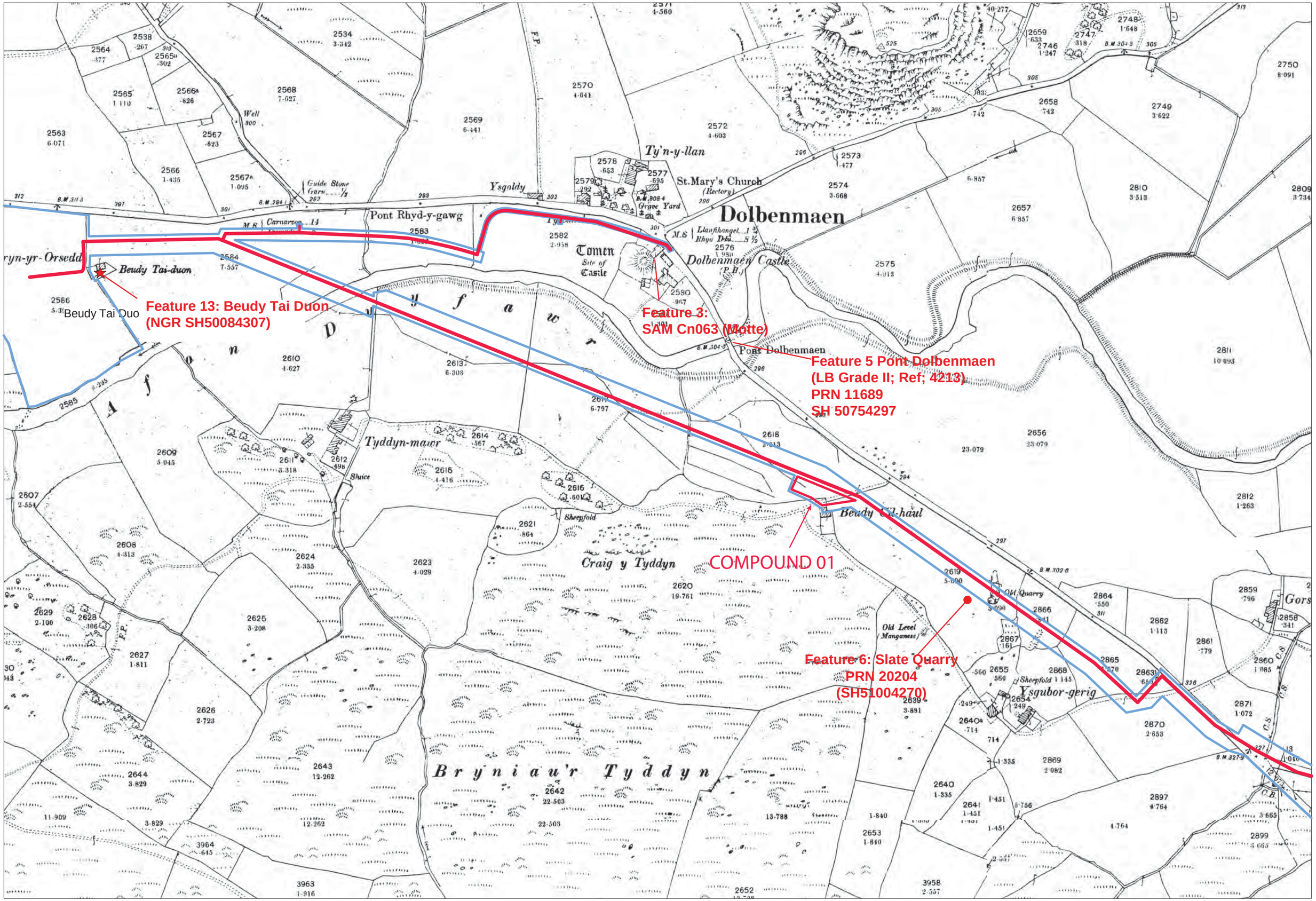


Figure 06: Section 01 - Reproduction of 1" to 25 mile Ordnance Survey County Series (Caernarfonshire) 2nd Edition 1900 - Sheet XL.2 & XL.6 **The pipeline route is in red and the easement route is outlined in blue.**.

SECTON 02

Feature 9 Milestone
(LB Grade II;21539)

Figure 07: Section 02 - Reproduction of 1" to 25 mile Ordnance Survey County Series (Caernarfonshire) 2nd Edition 1900 - Sheet XL.2 & XL.6. **The pipeline route is in red and the easement route is outlined in blue.**

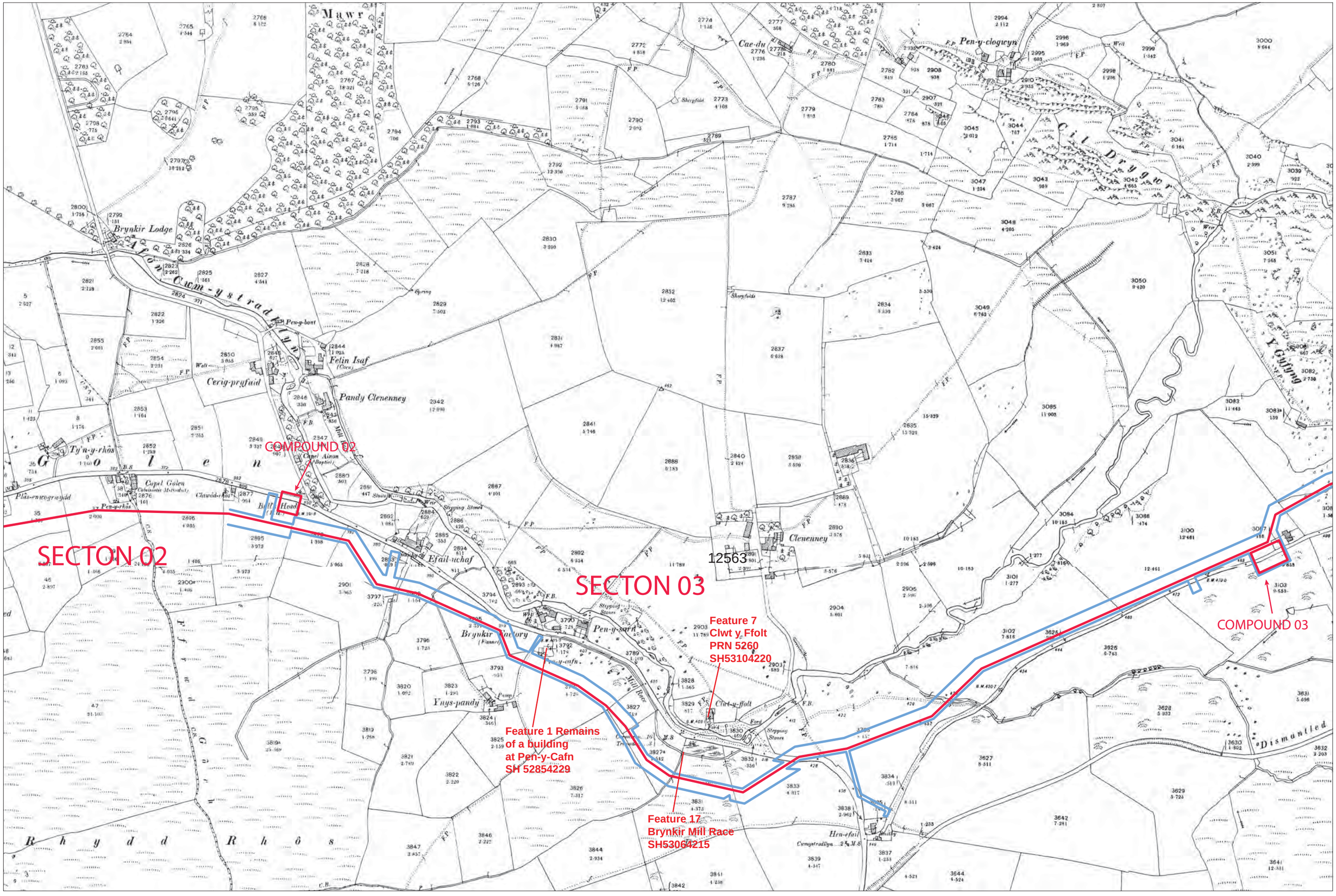


Figure 08: Section 03 - Reproduction of 1" to 25 mile Ordnance Survey County Series (Caernarfonshire) 2nd Edition 1900 - Sheet XL.2 & XL.6. **The pipeline route is in red and the easement route is outlined in blue.**

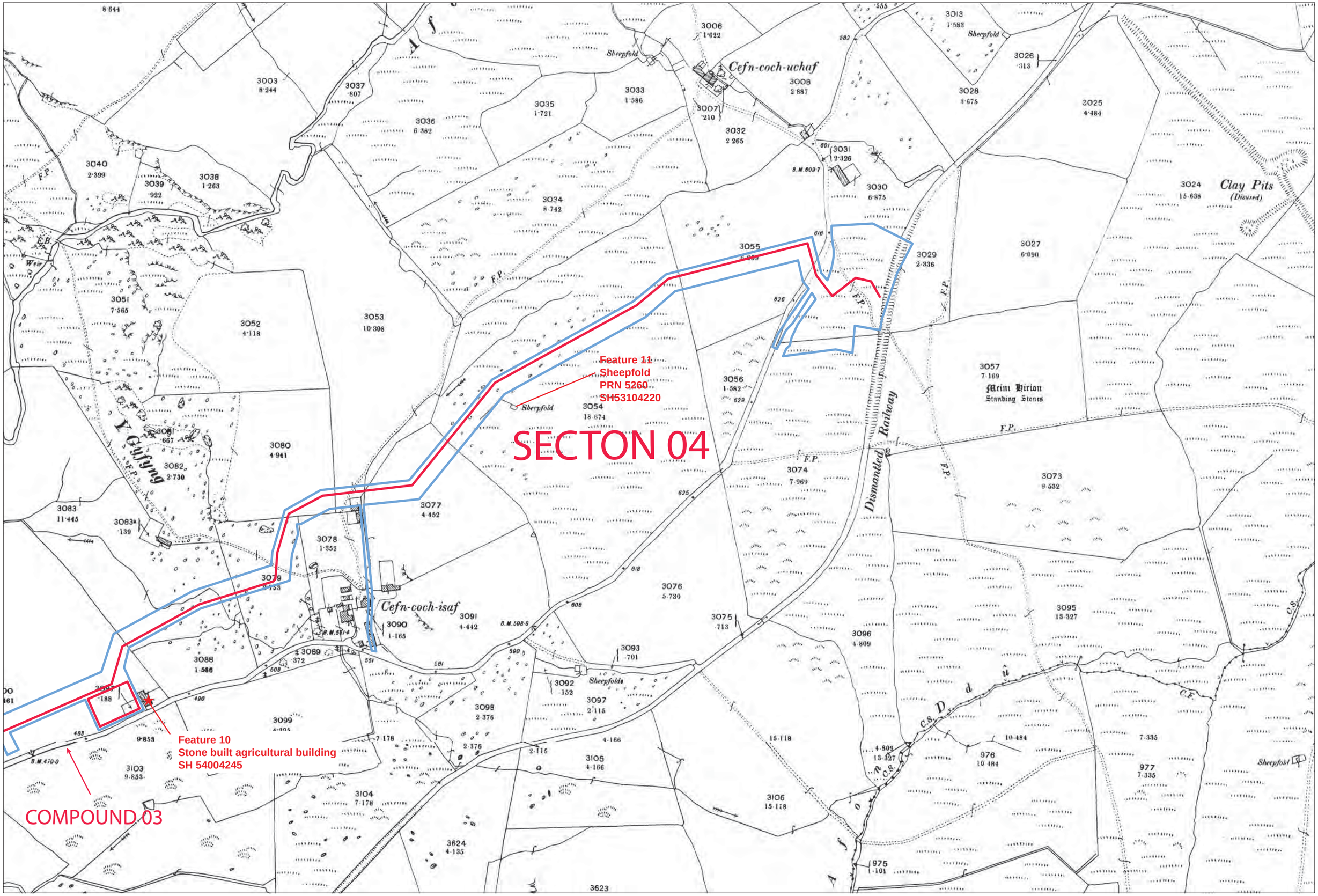


Figure 09: Section 04 - Reproduction of 1" to 25 mile Ordnance Survey County Series (Caernarfonshire) 2nd Edition 1900 - Sheet XL.2 & XL.6. **The pipeline route is in red and the easement route is outlined in blue.**

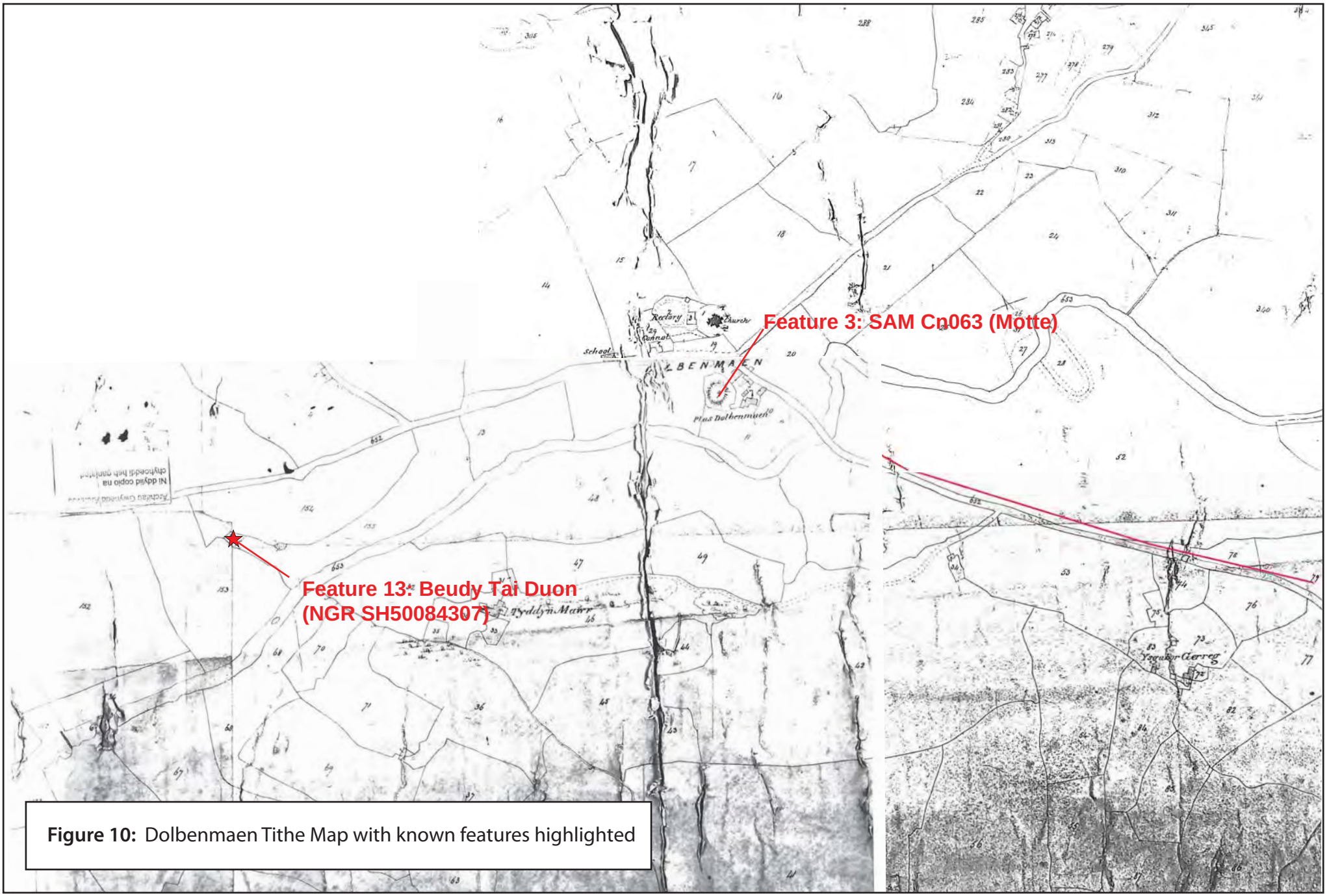


Figure 10: Dolbenmaen Tithe Map with known features highlighted

Figure 11: Ynyscynhaearn Tithe Map

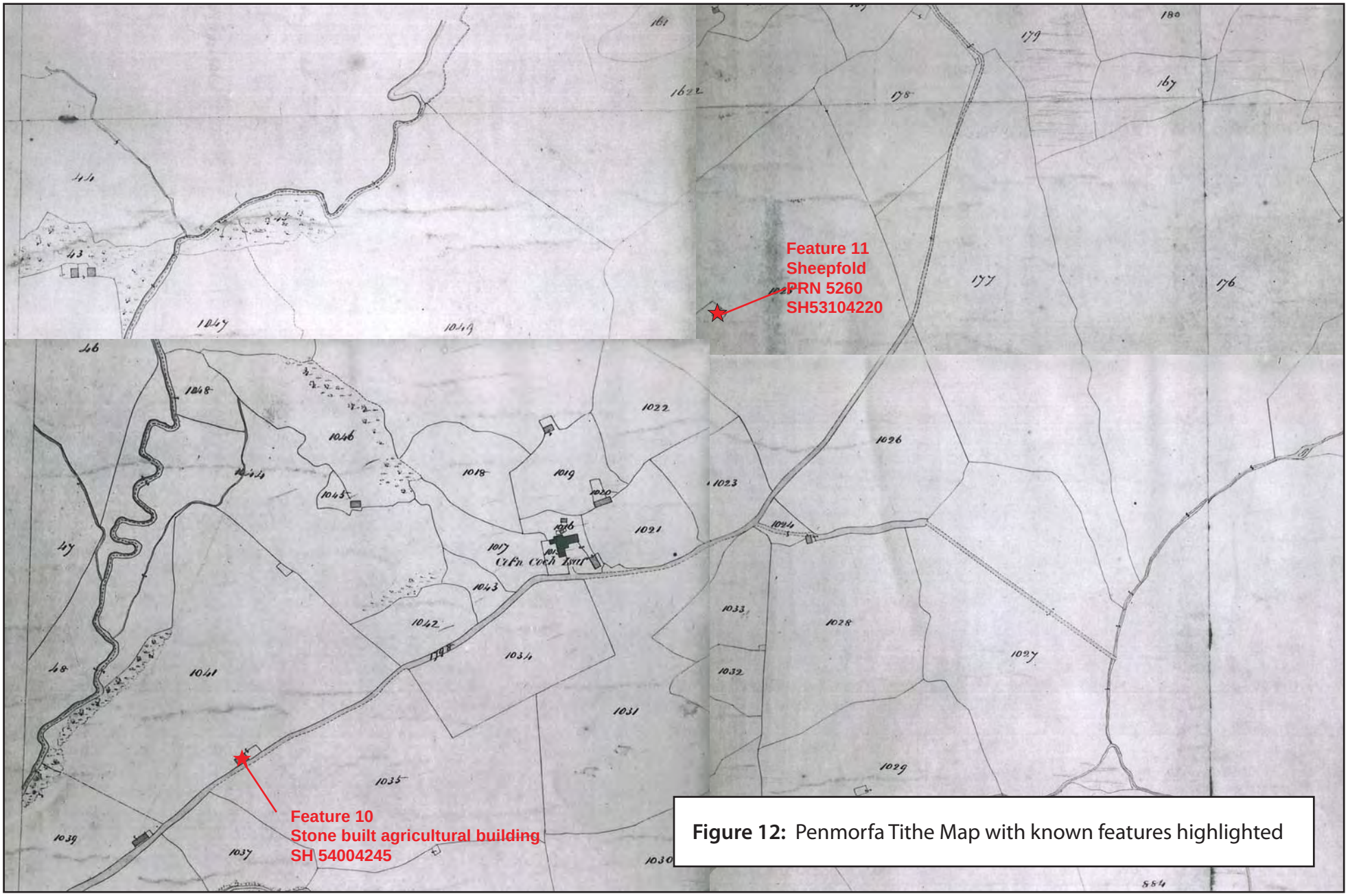
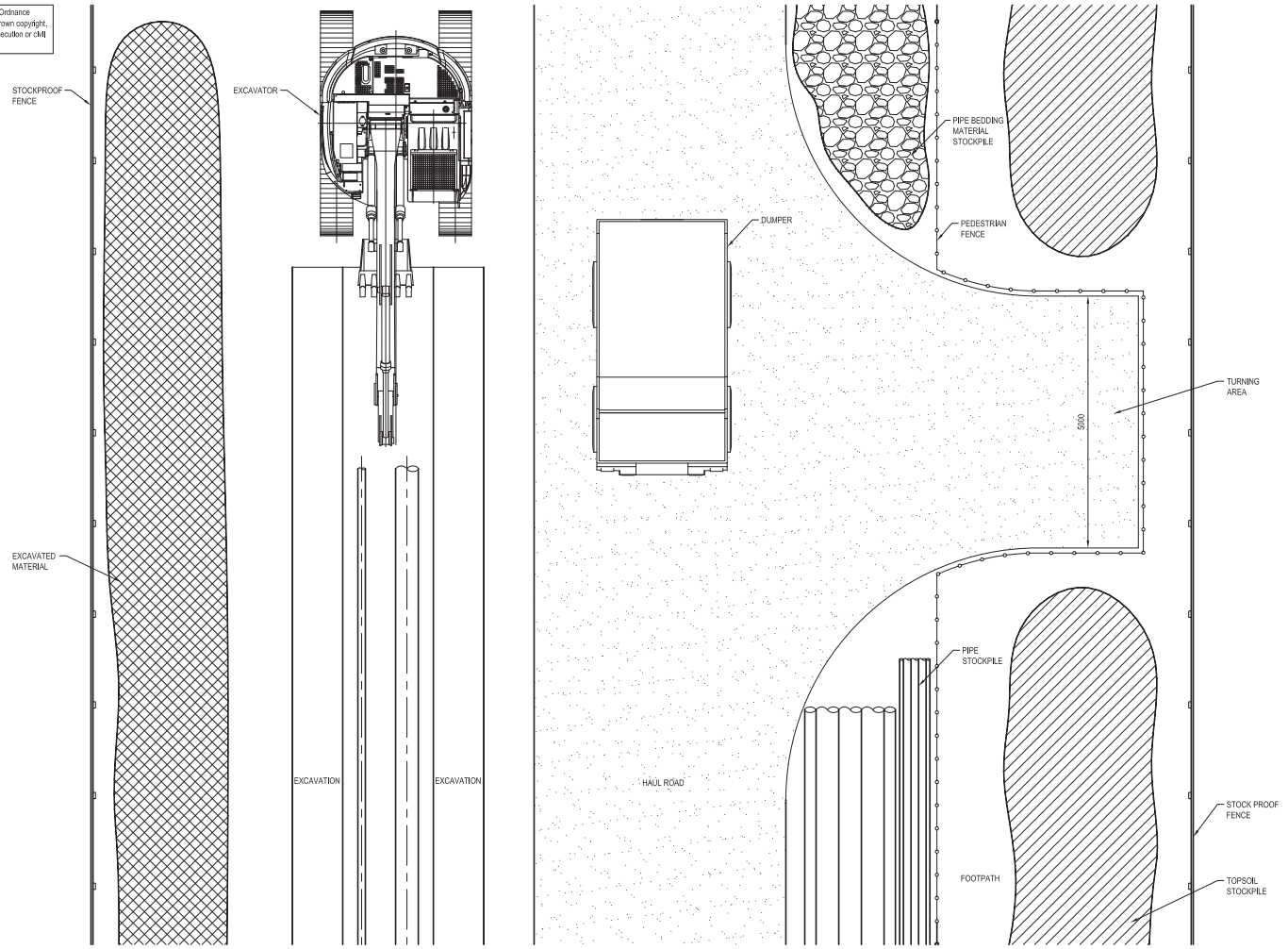
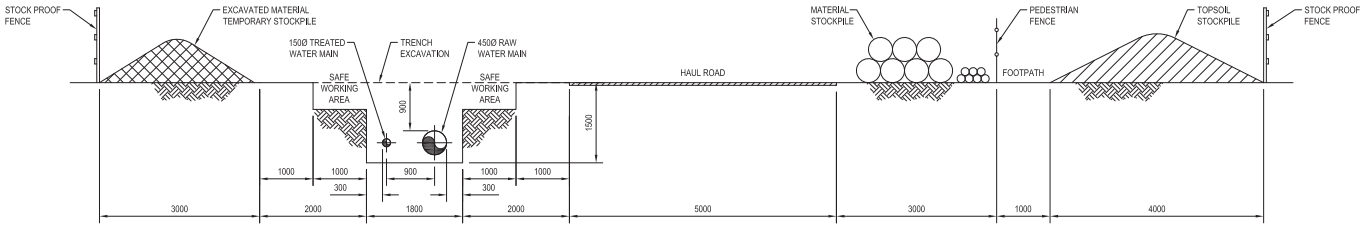


Figure 12: Penmorfa Tithe Map with known features highlighted

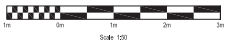


PLAN ON PIPELINE EASEMENT



TYPICAL SECTION THROUGH PIPELINE EASEMENT

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
3. THE PIPELINE ROUTE HAS BEEN CHOSEN TO CLOSELY FOLLOW THE EXISTING 450mm DIAMETER TREATED WATER MAIN AS FAR AS REASONABLY PRACTICAL WHILST MINIMISING DISRUPTION TO THE SURROUNDING ENVIRONMENT.
4. EASEMENT TOPSOIL TO BE STRIPPED AND STOCKPILED FOR REINSTATEMENT UPON COMPLETION.
5. ALL EXISTING LANDS DRAINS AFFECTED BY THE WORKS TO BE REINSTATED UPON COMPLETION.
6. THE EXCAVATION TO BE BACKFILLED WITH AS DUG MATERIAL SUBJECT TO CONFIRMATION OF THE PIPE MATERIAL AND STRUCTURAL DESIGN OF THE PIPE EMBEDMENT.
7. ALL TEMPORARY COMPOUNDS AND HAUL ROADS ARE TO BE CONSTRUCTED FROM SLATE OF LIMESTONE CRUSHER RUN WHICH IS TO BE REMOVED UPON COMPLETION OF THE WORKS.
8. ALL NECESSARY ENVIRONMENTAL SURVEYS ARE TO BE CONDUCTED PRIOR TO CONSTRUCTION COMMENCEMENT.
9. ALL REMOVED HEDGE ROWS TO REINSTATED IN AGREEMENT WITH THE LOCAL COUNCIL AUTHORITIES REQUIREMENTS.
10. EVERY EFFORT WILL BE MADE TO LEAVE ALL FIELD BOUNDARIES AND WALLS INSITU DURING THE INSTALLATION OF THE PIPE WORK. INSTALLATION METHODOLOGY MAY VARY SUBJECT TO THE GROUND CONDITIONS ENCOUNTERED.
11. THE CONSTRUCTION METHODOLOGY FOR THE CROSSING OF THE AFON DDU IS OPEN CUT.
12. THE CONSTRUCTION METHODOLOGY FOR THE CROSSING OF THE AFON DWYFOR IS VIA NO DIG TECHNOLOGY.



Rev	Drawn	Chkd	Rvwd	Appvd	Date	Description
A	CMT	CJC	SLC	RFB	25.02.13	SCREENING OPINION

Drawing Status: SCREENING OPINION

Drawing Scale:	1:50	Designed By:	MPJ
Original Size:	A1	Date:	18.02.13

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Dŵr Cymru Welsh Water

Scheme Name: DOLBENMAEN WTW AMP 5 QUALITY SCHEME

Drawing Title: TRANSFER PIPELINE TYPICAL WORKING AREAS

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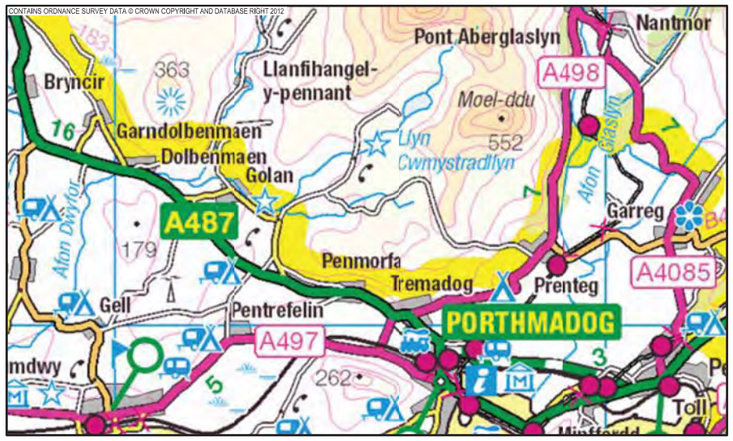
DCWW Ref: | Status:

Drawing No.: 174357-20-9101 | Rev: A

PLOTTED DATE 25/02/2013 15:48:44 PLOTTED BY Thompson, Colin (C)

Figure 13: Reproduction of Black & Veatch DWG 174357-20-9101 detailing easement methodology



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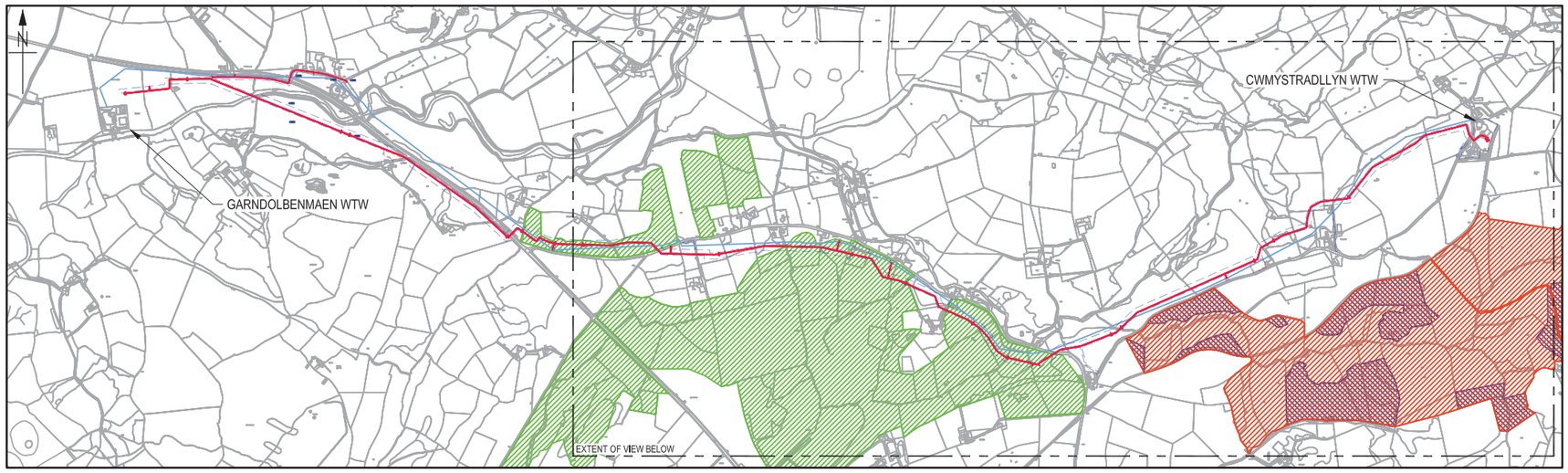

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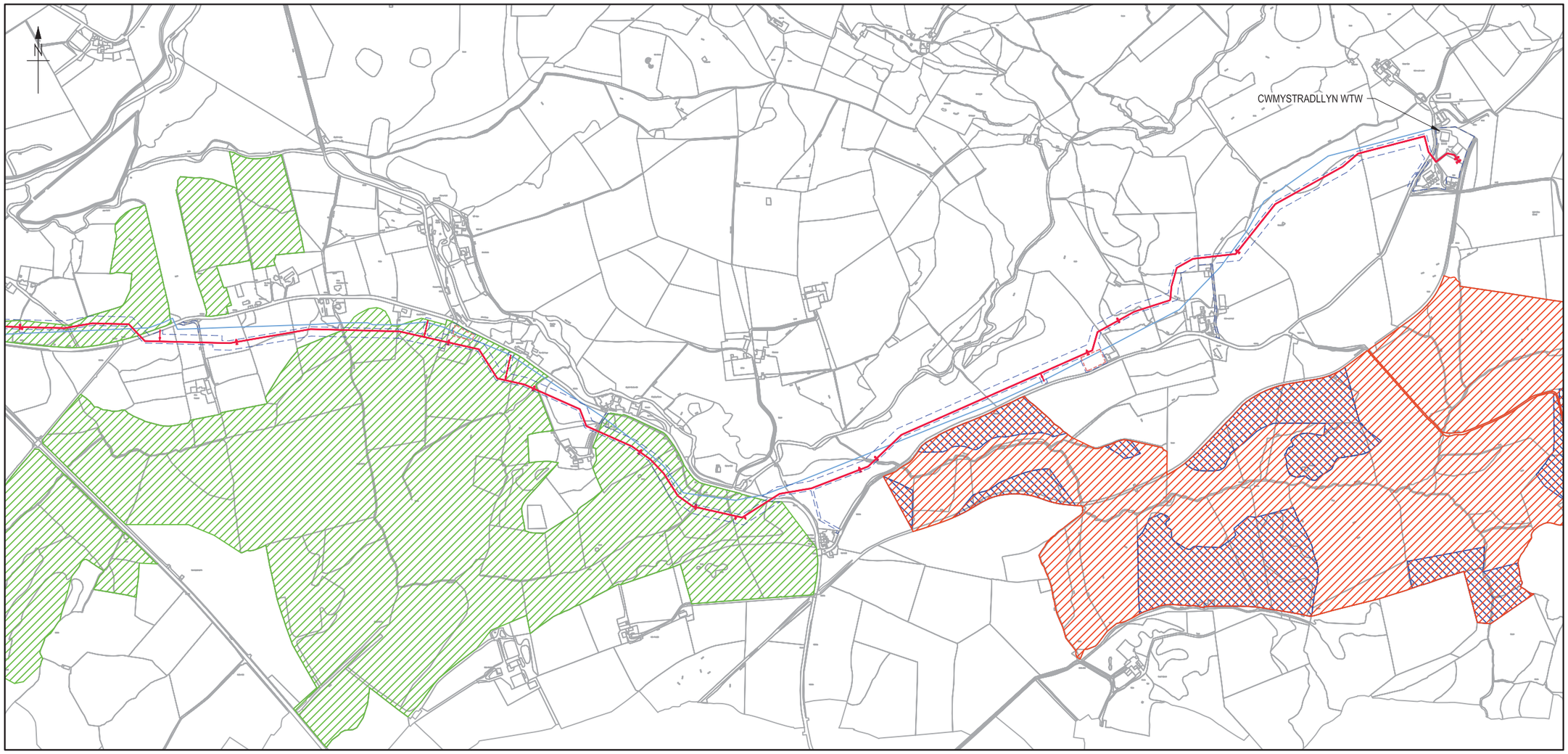

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LEGEND

- AFON DDU SITE OF SPECIAL SCIENTIFIC INTEREST
- AREAS OF DENOTIFICATION
- CANDIDATE WILDLIFE SITES
- NEW PIPE ROUTE
- EXISTING PIPE ROUTE
- PIPELINE WORKING AREA
- PIPELINE SITE COMPOUNDS

100m 0m 100m 200m 300m
Scale 1:5000

100m 0m 200m 400m 600m
Scale 1:10000

Rev	Drawn	Chkd	Rvwd	Appvd	Date	Description
C	PAB	MPJ				PIPELINE ROUTE UPDATED EXISTING PIPELINE ADDED
B	IMN	JP	DW	RB	12.12.12	FOR PLANNING
A	SS	SMc	SMc	RB	13.13.12	FIRST ISSUE

Drawing Status: FOR PLANNING

Drawing Scale:	AS SHOWN	Designed By:	SS
Original Size:	A1	Date:	13.03.12

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Dŵr Cymru Welsh Water

Scheme Name:
DOLBENMAEN WTW
AMP 5 QUALITY SCHEME

Drawing Title:
NATURE COSERVATION DESIGNATIONS
SHEET 2 OF 2

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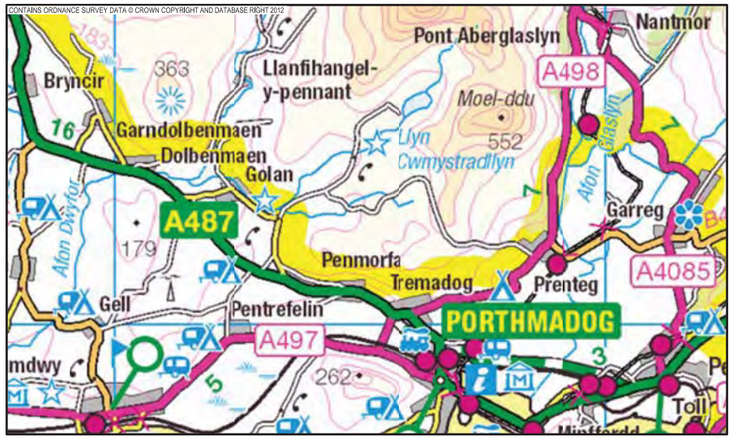
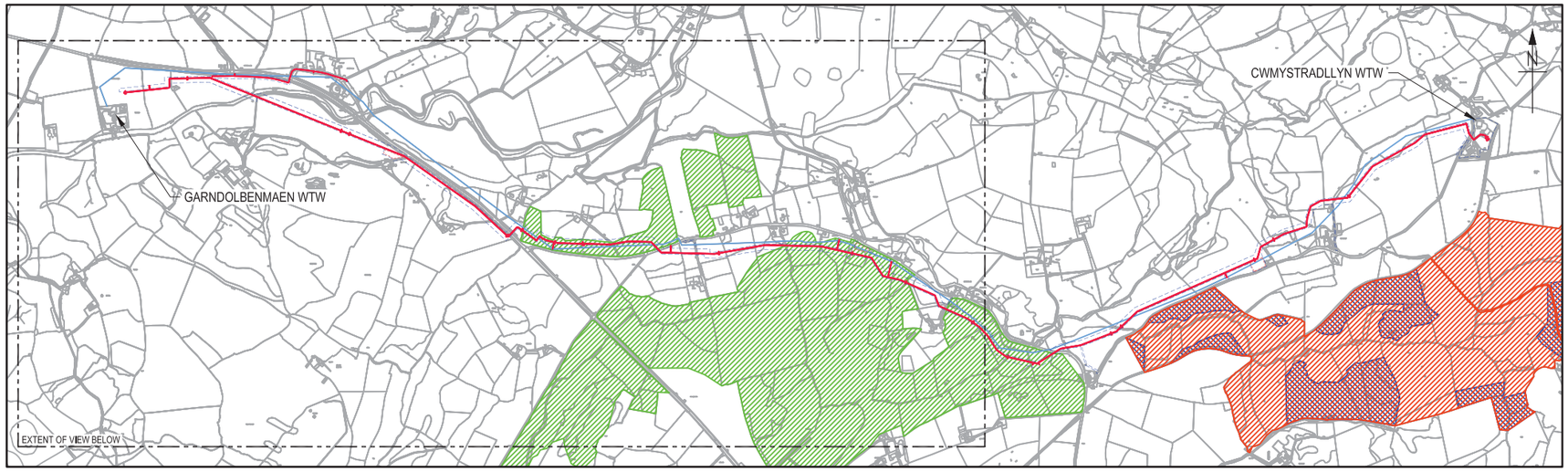
DCWW Ref: Status:

Drawing No. 174357-20-0405 Rev: C

Figure 15: Reproduction of Black & Veatch DWG No. 174357 - 20 - 0405 denoting the existing 18-inch main and the proposed easement. The proposed pipeline route is in red and the easement outline in blue. Wetland zones are highlighted green



LOCATION MAP
N.T.S.



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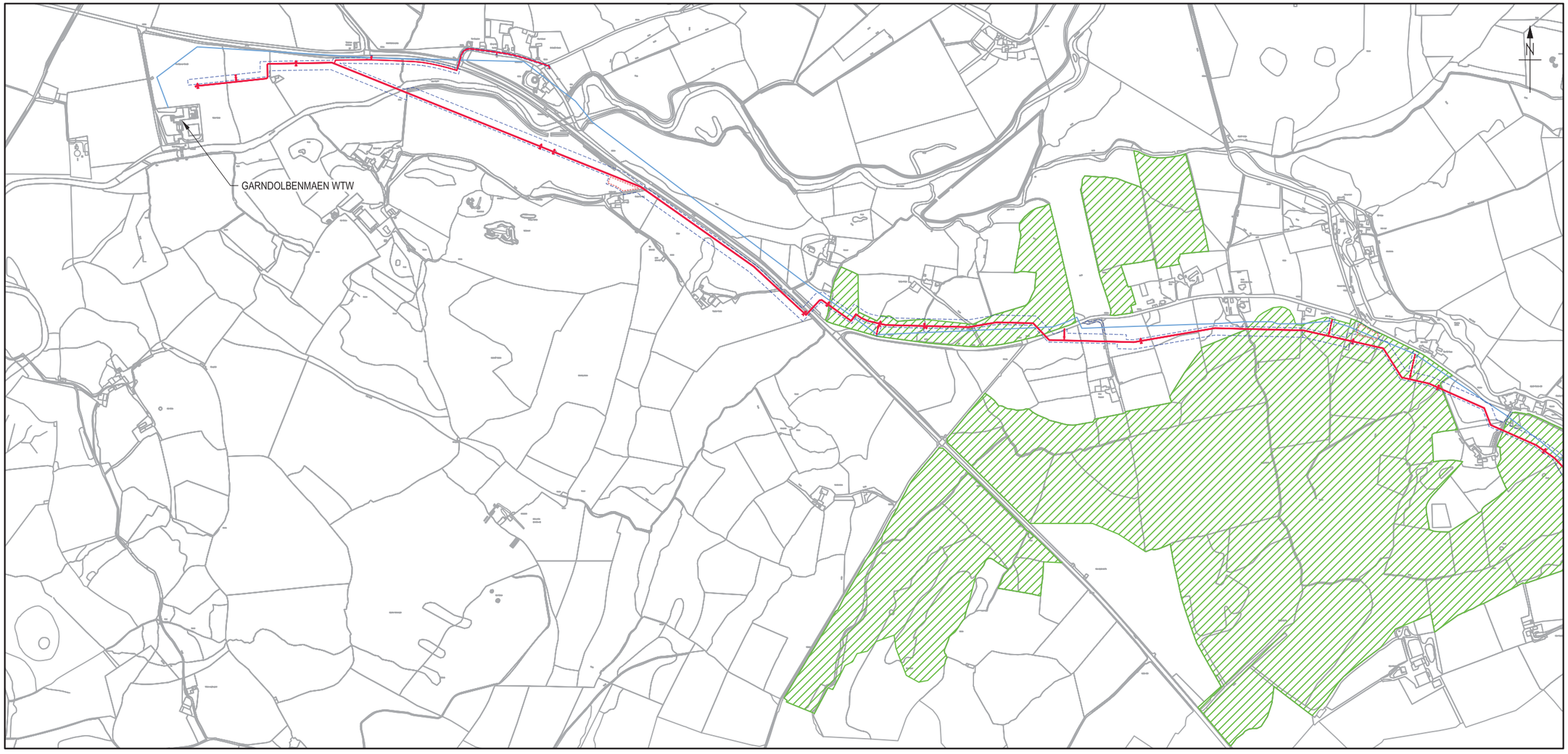

PLAN
SCALE 1:5000

LEGEND

- AFON DDU SITE OF SPECIAL SCIENTIFIC INTEREST
- AREAS OF DENOTIFICATION
- CANDIDATE WILDLIFE SITES
- NEW PIPE ROUTE
- EXISTING PIPE ROUTE
- PIPELINE WORKING AREA
- PIPELINE SITE COMPOUNDS

100m 0m 100m 200m 300m
Scale 1:5000

100m 0m 200m 400m 600m
Scale 1:10000

Rev	Drawn	Chkd	Rvwd	Appvd	Date	Description
C	PAB	MPJ				PIPELINE ROUTE UPDATED EXISTING PIPELINE ADDED
B	IMN	JP	DW	RB	17.12.12	FOR PLANNING
A	SS	SMc	SMc	RB	13.13.12	FIRST ISSUE

Drawing Status: FOR PLANNING

Drawing Scale:	AS SHOWN	Designed By:	SS
Original Size:	A1	Date:	13.03.12

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Dŵr Cymru Welsh Water

Scheme Name: DOLBENMAEN WTW AMP 5 QUALITY SCHEME

Drawing Title: NATURE COSERVATION DESIGNATIONS SHEET 1 OF 2

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DCWW Ref: Status:

Drawing No.: 174357-20-0404 Rev: C

Figure 14: Reproduction of Black & Veatch DWG No. 174357 - 20 - 0404 denoting the existing 18-inch main and the proposed easement. The proposed pipeline route is in red and the easement outline in blue. Wetland zones are highlighted green

Plate 01 - SECTION 1: View wesst of section 1 spur looking towards the existing Dolnbenmaen Water Treatment Works.

Plate 02 - SECTION 1: View southwest of section 1 spur looking from the local road junction. The spur will run across the field on the left of the image and cross the road at the junction point.

Plate 03 - SECTION 1: View west of proposed route near the Afon Dwyfor crossing point. Section 1 is mainly characterised by improved pasture.

Plate 04 - SECTION 2: View east of proposed route. The proposed route runs parallel to the A487 road, close to the boundary on the left of the image. The proposed location of Compound 1 is in the field in the foreground.

Plate 05 - SECTION 2: View east along proposed route from the strating point of Section 2 denoting the semi-improved wetland pasture characteristic of this section.

Plate 06 - SECTION 3: View notheast from centre of route denoting the semi-improved wetland pasture characteristic of this section.

Plate 07 - SECTION 3: View southwest of proposed route of section 3. The proposed route will run parallel to the local road.

Plate 08 - SECTION 3: View northeast of the proposed location for Compound 3 within yard associated with Cefn coh isaf Farm.

Plate 09 - SECTION 4/Compound 3: Detail of GAT Feature 10 (Stone built agricultural building west-south-west of Cefn Coch Isaf). The compound will be to the left of the image (cf. Plate 08).

Plate 10 - SECTION 4/Compound 3: Detail of GAT Feature 10 (Stone built agricultural building west-south-west of Cefn Coch Isaf), showing the active building next to the disused structure.

Plate 11 - SECTION 4: View west of proposed route deatiling field next to Cwmysrtradllyn water treatment works.

Plate 12 - SECTION 4: View west of proposed route deatiling large open field near Cwmysrtradllyn water treatment works.

Plate 13 - SECTION 3: View west of Feature 01 - Remains of a building at Pen-y-Cafn. The remains are currently avoided by the proposed easement route (cf. Figure 04). .

Plate 14 - SECTION 2: Detailed view of Feature 02 - Possible Burnt Mound at Corsoer. This feature is currently avoided by the proposed easement route (cf. Figure 03),

APPENDIX I

Sites on the Gwynedd HER database and Scheduled Ancient Monuments (SAM), within 500m of the study area

Sites on the Gwynedd HER

PRN	Name	Form	Site Type	NGR	Period	Description	Status
192	Beudy Cil Haul Standing Stone	Standing Stone	Site of	SH50784240	Bronze Age	Location	HER
154	Glan-Dwyfach Burnt Mound	Burnt Mound	Earthwork	SH4815440	Prehistoric	Location	HER
145	Hut Group	Remains	Stonework	SH49944345	Prehistoric	Location	HER
188	Hut Platform	Earthwork	Site of	SH50234360	Prehistoric	Location	HER
150	Hut Circle	Remains	Site of	SH4994387	Prehistoric	Location	HER
160	Ystumcegid-Uchaf Round Hut	Remains	Site of	SH49824233	Prehistoric	Location	HER
164	Craig-y-Tyddyn Hut Group	Earthwork	Site of	SH50594272	Prehistoric	Location	HER
2,360	Meini Hirion Standing Stone	Standing Stone	Site of	SH54954297	Prehistoric	Location	HER
145	Tyn Caeau Hut Group	Remains	Site of	SH49944345	Roman	Location	HER
172	Hut Circle	Remains	Site of	SH50414351	Roman	Location	HER
170	Hut Group	Remains	Site of	SH50194276	Roman	Location	HER
165	Craig-y-Tyddyn Roman Hut Group	Remains	Site of	SH50524280	Roman	Location	HER
2,357	Copper Cake	Findspot		SH53204246	Roman	Location	HER
166	Cil Drygwr Hut Circles	Earthwork	Site of	SH53594301	Roman	Location	HER
7,341	Dolbenmaen Village	Settlement	Site of	SH50604300	Med	Location	HER
188	Ty Newydd Long Hut	Earthwork	Site of	SH50214359	Med	Location	HER
184	Craig y Llan Hut Platform	Earthwork	Site of	SH50424353	Med	Location	HER

PRN	Name	Form	Site Type	NGR	Period	Description	Status
6,927	St Marys	Standing Building	Site of	SH5066431 4	Med/Post Med	Standing Building	LB
161	Dolbenmean Castle	Earthwork	Site of	SH5065430 7	Med	Standing Earthwwor k	SAM
5,257	Plas Dolbenmean	Standing Building	Site of	SH5068430 7	Med/Post Med	Standing Building	LB
5,257	Outbuildings-Plas Dolbenmaen	Standing Buildings	Site of	SH5068434 5	Med/Post Med	Standing Buildings	LB
187	Craig y Llan Hut Platform	Earthwork	Site of	SH5089434 5	Med	Location	HER
158	Clenennau House & Barn	Standing Building	Site of	SH5316424 6	Med	Standing Building	LB
182	Cil Drygwr Hut Platforms	Earthworks	Site of	SH5370429 4	Med	Location	HER
181	Gesail Gyfarch	Abandoned Settlement	Site of	SH5415419 2	Med	Location	HER
26,404	Dolbenmaen Cottage		Site of	SH5043	Post Med	Location	HER
16,802	Rhwngyddwyr yd Farm	Farmstead	Site of	SH4953435 2	Post Med	Location	HER
6,814	Jerwsalem Chapel	Standing Building	Site	SH4957437 2	Post Med	Location	HER
16,936	Tyddyn Mawr Farm	Farmstead	Site of	SH503429	Post Med	Location	HER
11,441	Plas Holland	Standing Building	Site of	SH5055431 7	Post Med	Location	HER
5,259	Vicarage	Standing Building	Site of	SH5059431 4	Post Med	Location	LB
11,689	Pont Dolbenmaen	Bridge	Site of	SH5075429 7	Post Med	Location	HER
20,201	Tyddyn Mawr Slate Quarry	Workings	Site of	SH5060428 0	Post Med	Location	HER
20,204	Ysgubor Gerrig Slate Quarry	Workings	Site of	SH5100427 0	Post Med	Location	HER
20,511	Beudy Cil Haul Manganese mine	Workings	Site of	SH5090426 0	Post Med	Location	HER
5,248	Ysgubor Gerrig Farm	Farmstead	Site of	SH5105425 6	Post Med	Location	HER
6,815	Golan Calvinistic Methodist Chapel	Standing Building	Site of	SH5225425 6	Post Med	Location	HER
6,810	Ainon Baptist	Standing	Site of	SH5244427	Post Med	Location	HER

PRN	Name	Form	Site Type	NGR	Period	Description	Status
	Chapel	Building		2			
32,555	Felin Isaf	Standing Building	Site of	SH52524274	Post Med	Location	HER
411,632	Pandy Clenenny	Standing Building	Site of	SH52544267	Post Med	Location	HER
32,566	Efail Uchaf Stepping Stones	Stones/River Crossing	Site of	SH52704252	Post Med	Location	HER
91,665	Brynkir Woollen Mill	Standing Building	Site of	SH52864234	Post Med	Location	HER
5,260	Clwt y Ffolt	Ruins	Site of	SH53104220	Post Med	Location	HER
23,498	Clwt y Ffolt Footbridge	Footbridge	Site of	SH53234221	Post Med	Location	HER
23,497	Clwt y Ffolt Stepping Stones	Stones/River Crossing	Site of	SH53164216	Post Med	Location	HER
28,005	Gorseddau Railway	Trackbed	Alignment	SH53194178	Post Med	Location	HER
220	Ynys y Pandy Slate Mill	Standing Building	Site of	SH55004330	Post Med	Location	HER
411,631	Cefn-Coch-Uchaf Waterwheel		Site of	SH54604309	Post Med	Location	HER
31,358	Cildrygwr Barn & Hendy	Standing Building	Site of	SH53804295	Post Med	Location	HER

APPENDIX II

Definitions of terms used within the report

Categories of importance

The following categories were used to define the importance of the archaeological resource.

Category A - Sites of National Importance.

Scheduled Ancient Monuments, Listed Buildings of grade II* and above, as well as those that would meet the requirements for scheduling (ancient monuments) or listing (buildings) or both.

Sites that are scheduled or listed have legal protection, and it is recommended that all Category A sites remain preserved and protected *in situ*.

Category B - Sites of regional or county importance.

Grade II listed buildings and sites which would not fulfil the criteria for scheduling or listing, but which are nevertheless of particular importance within the region.

Preservation *in situ* is the preferred option for Category B sites, but if damage or destruction cannot be avoided, appropriate detailed recording might be an acceptable alternative.

Category C - Sites of district or local importance.

Sites which are not of sufficient importance to justify a recommendation for preservation if threatened.

Category C sites nevertheless merit adequate recording in advance of damage or destruction.

Category D - Minor and damaged sites.

Sites that are of minor importance or are so badly damaged that too little remains to justify their inclusion in a higher category.

For Category D sites, rapid recording, either in advance of or during destruction, should be sufficient.

Category E - Sites needing further investigation.

Sites, the importance of which is as yet undetermined and which will require further work before they can be allocated to categories A - D are temporarily placed in this category, with specific recommendations for further evaluation. By the end of the assessment there should usually be no sites remaining in this category. In this case several areas of unknown potential have been allocated to this category.

Definition of Impact

The impact of the proposed development on each feature was estimated. The impact is defined as *none, slight, unlikely, likely, significant, considerable or unknown* as follows:

None:
There is no construction impact on this particular site.

Slight:
This has generally been used where the impact is marginal and would not by the nature of the site cause irreversible damage to the remainder of the feature, *e.g.* part of a trackway or field bank.

Unlikely:
This category indicates sites that fall within the band of interest but are unlikely to be directly affected. This includes sites such as standing and occupied buildings at the margins of the band of interest.

Likely:
Sites towards the edges of the study area, which may not be directly affected, but are likely to be damaged in some way by the construction activity.

Significant:
The partial removal of a site affecting its overall integrity. Sites falling into this category may be linear features such as roads or tramways where the removal of part of the feature could make overall interpretation problematic.

Considerable:
The total removal of a feature or its partial removal which would effectively destroy the remainder of the site.

Unknown:
This is used when the location of the site is unknown, but thought to be in the vicinity of the proposed works.

Definition of field evaluation techniques

Field evaluation is necessary to fully understand and assess most class E sites and to allow the evaluation of areas of land where there are no visible features but for which there is potential for sites to exist. Two principal techniques can be used for carrying out the evaluation: geophysical survey and trial trenching. Topographic survey may also be employed where sites are thought to survive as earthworks.

Geophysical survey most often involves the use of a magnetometer, which allows detection of some underground features, depending on their composition and the nature of the subsoil. Other forms of geophysical survey, including resistivity survey and ground penetrating radar might also be of use.

Trial trenching allows a representative sample of the development area to be investigated at depth. Trenches of appropriate size can also be excavated to evaluate category E sites. Trenching is typically carried out with trenches of between 20 to 30m length and 2m width. The topsoil is removed by machine and the resulting surface is cleaned by hand, recording features. Depending on the stratigraphy encountered the machine may be used to remove stratigraphy to deeper levels.

Definition of Mitigatory Recommendations

Below are the measures that may be recommended to mitigate the impact of the development on the archaeology.

None:
No impact so no requirement for mitigatory measures.

Detailed recording:
This requires a full photographic record and measured survey prior to commencement of works.

Archaeological excavation may also be required depending on the particular feature and the extent and effect of the impact.

Basic recording:
Requiring a photographic record and full description prior to commencement of works.

Strip, Map and Sample:
The technique of Strip, Map and Sample involves the examination of machine-stripped surfaces to identify archaeological remains. The stripping is undertaken under the supervision of an archaeologist. Stripping and removal of the overburden is undertaken in such as manner as to ensure damage does not take place to surfaces that have already been stripped, nor to archaeological surfaces that have not yet been revealed.

Stripping is undertaken in as careful a manner as possible, to allow for good identification of archaeological features. A small team of archaeologists will be responsible for subsequently further cleaning defined areas where necessary. Complex sites which cannot be avoided will need to be fully excavated.

Watching brief:
This is a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons. This will be within a specified area or site on land, inter-tidal zone or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

Avoidance:
Features, which may be affected directly by the scheme, or during the construction, should be avoided. Occasionally a minor change to the proposed plan is recommended, but more usually it refers to the need for care to be taken during construction to avoid accidental damage to a feature. This is often best achieved by clearly marking features prior to the start of work.

Reinstatement:
The feature should be re-instated with archaeological advice and supervision.

Gwynedd Archaeological Trust
Ymddiriedolaeth Archaeolegol Gwynedd

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