

Maes y Droell Quarry: Hydrogeological Impact Assessment

HIA Report

Silica Sand Mold Ltd

11 August 2026

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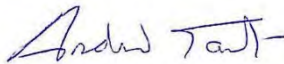
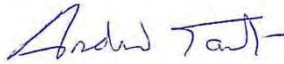
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Appendix B	Borehole Geological Logs
Appendix C	GI Borehole Log
Appendix D	Impact Assessment Methodology

1 Introduction

Silica Sand Mold Ltd (SSML) is submitting a planning application for the reopening and deepening of the existing (dormant) Maes y Droell Quarry (the Site), located approximately 7.6 km south of Mold, Denbighshire. The Site has previously targeted the sands of the Cefn y Fedw Formation, and an increased demand and improvements in processing techniques has initiated SSML to reopen the Site.

SSML proposes to rework the southern part of the existing Site, not going deeper than the existing ~294 m AOD lowest elevation. The northern part of the existing Site will be deepened by 15 m to ~315 m AOD (refer to Appendix A for detailed development plans). Phase 4 will work a north-western extension area to a depth of 326 m AOD, ~30 m deeper than the existing land surface. No dewatering is proposed, with excavations to remain above the water table. This limits the potential hydrogeological related impacts from the proposed development significantly.

Following operations, the Site will be restored to accommodate various natural habitats including rhos & upland woodland scrub with heath and wetland mosaic. Figure 1 shows the Site location and surrounding area, with proposed development plans and restoration plans presented in Appendix A.

Envireau Water has been engaged by Stephen Halliday on behalf of SSML to prepare a Hydrogeological Impact Assessment (HIA) to support the planning application. Envireau Water has also prepared a Flood Consequences Assessment and Outline Drainage Strategy (FCA), provided as a separate report (Envireau Water, 2026).

1.1 Scope of Work

This report assesses the potential hydrological and hydrogeological impacts of the proposed development. The scope of work undertaken for this report includes the following:

- Review of the baseline hydrogeology and hydrology (Section 2);
- Identification of potential receptors (Section 3);
- Development of the hydrogeological conceptual model (Section 4);
- Outline of proposed development in addition to environmental and water management (Section 5); and
- An assessment of the potential impacts of the proposed development and recommendations for appropriate monitoring and mitigation measures (as appropriate) (Section 6).

1.2 Data Sources

The information and assessments in this report are based on:

- Proposed development and restoration plans provided by Stephen Halliday;
- Geological and hydrogeological data from previous site investigations;
- Geology, Hydrology & Water Quality chapter of an Environmental Statement undertaken in 2011 by Hafren reports (Hafren Water, 2011);
- British Geological Survey (BGS) mapping;

- Ordnance Survey mapping;
- Site visits undertaken by Envireau Water on 3 March 2025;
- Data on designated sites from Natural Resources Wales (NRW), and
- Data from the NRW including abstraction licences and discharge activity permits.

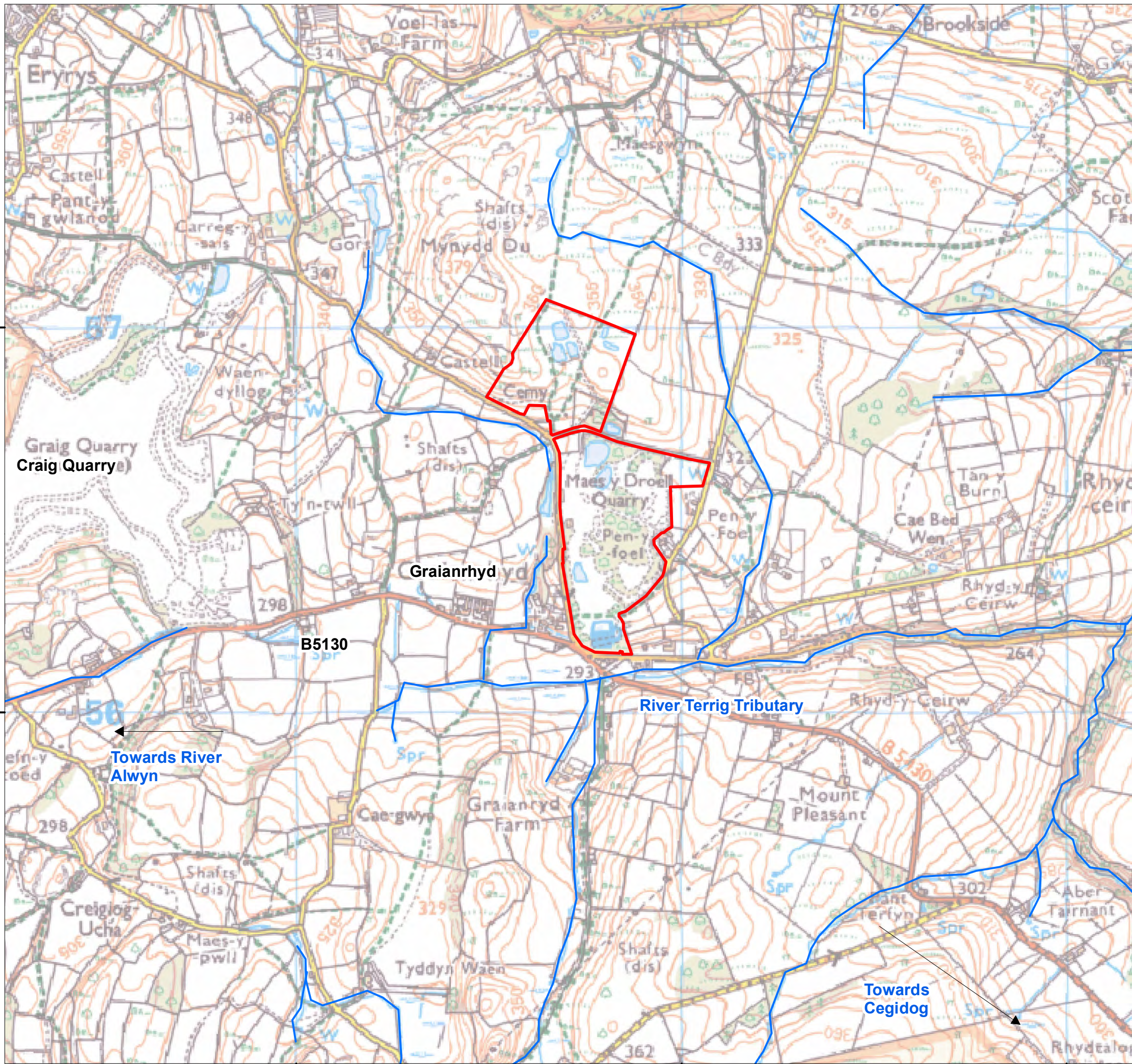


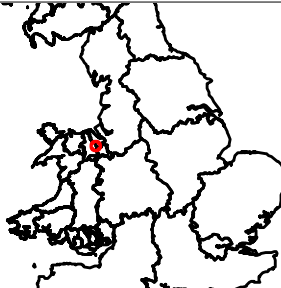
Figure 1: Site Setting

Maes y Droell, Mold

-  Site Boundary
-  Stream/River

Notes:

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0 100 200 300 400 500 Meters
Scale: 1:10,000 at A3

23 January 2026
NGR: 321,707 E / 356,464 N

Project No. 3491083
Client: Maes y Droell
Drawn by: CA
Ref: Site Setting



2 BASELINE CONDITIONS

2.1 Site Setting

Maes y Droell Quarry (the Site) is located approximately 400 m north of Graianrhyd and is approximately 7.6 km south of Mold in North Wales Figure 1. The economic mineral to be extracted is the Cefn-y-Fedw Sandstone Formation of the Millstone Grit Group. Extraction operations at the Site began in 1880 and reached an excavation depth of ~300 m AOD in the early 2000's.

The Site is in a rural area primarily characterised by agricultural land and forestry. Graig Quarry, operated by Tarmac Trading Ltd, is located 830 m west of the Site. The Nercwys Forest is located 1.2 km north of the Site and forms part of the Clwydian Range and Dee Valley Area of Outstanding Natural Beauty (AONB).

Today the Site is dormant with previously worked piles of material and five surface water ponds. The north-west extension area (the 'Extension Area') is separated from the current site by a bridleway and is situated on land rising from approximately 330 m AOD to 355 m AOD towards the north of the Site.

To the north and northwest of the Site, topography reaches 368mAOD at Mynydd Du and falls to the south to approximately 293mAOD at the River Terrig (Figure 1).

The Site is accessed from the Eryrys road off the B5430 which links to the A5104, 1.6 km east, and the A494, 4.3 km to the west.

2.2 Geology

2.2.1 Superficial Geology

There is no superficial cover mapped on Site, apart from a small area of lacustrine deposits located on the north-east of the Site within the extension area (Figure 2). Onsite borehole logs show the presence of glacial deposits.

In the surrounding area, there is sporadic superficial cover including glacial till (diamicton) and head deposits. Both of these units are heterogenous deposits composed of clay, silt, sand and gravel with occasional cobbles. Based on BGS local borehole logs (including SJ25NW55 located towards the north-east), the total superficial thickness can reach up to 15 meters, although it is anticipated to be thinner across most of the area.

Peat is also present in the surrounding area, having been deposited sporadically in valleys. Alluvium is present along the southern boundary of the Site having been deposited along the tributaries of the River Terrig.

2.2.2 Bedrock Geology

Figure 3 shows the bedrock geology in the local area, and the stratigraphic sequence is summarised in Table 1. Bedrock units have not been fully intercepted in local borehole logs, therefore most thicknesses presented in Table 1 are based on BGS reporting (BGS, 2020).

The local geology consists of transgressive shallow marine deposits (Carboniferous period), with a gradually coarsening upwards sequence. The Millstone Grit Group records coarsening upwards sequences of sandstones, conglomerates, siltstones and mudstone, with the Cefn-y-Fedw Sandstone Formation, the oldest unit outcropping at the Site (BGS, 2020). The Cefn-y-Fedw Sandstone Formation comprises quartzose sandstones and thin quartz conglomerates, interbedded with mudstones, siltstones, cherty mudstones, and glassy cherts.

The Millstone Grit Group is underlain by the Clwyd Limestone Group, which is dominated by limestones with sandstone and conglomeratic intervals; and outcrops 500 m west of the Site.

The Site sits in a structurally complex area as deposition has occurred within a faulted basin. Faults to the west of the Site generally have a north-east to a south-west trend, and the Site itself lies between two extensional faults with a northern downthrow and 500 m offset. To the east, faulting density decreases and faults have a north-south trend with varying offsets from 170 – 760 m. On the Site's fault block, rock units are dipping moderately (approximately 22 degrees) south-east.

Along with faulting, the area has also undergone extensive folding which has created a complex sequence of faulted syncline and anticline structures.

2.2.3 Local Geology

Strata Surveys Ltd drilled a total of five boreholes in 2010, the majority focused on the southern end of the Site (BH1, BH3, BH4 and BH5) with one towards the north (BH2) (Figure 4). Borehole BH1, BH2 and BH4, located around the perimeter of the Site, record the presence of sand, clay and silt layers to a maximum thickness of 9.7 m (Appendix B). It is interpreted that these deposits are of glacial origin despite no superficial deposits having been mapped by the BGS. BH3 and BH5 record made ground that ranges from 1.3 to 1.9 m in thickness.

A total of 10 boreholes were drilled in 2020 that primarily intercept the Cefn-y-Fedw Sandstone with varying thicknesses of made ground up to a maximum thickness of 16.5 m. It is noted that BH20-5 shows alternating beds of mudstone and sand/silt down to a depth of 36 m bgl. The only other borehole to note mudstone was BH20-4 at a depth of 19 m bgl. Both of these boreholes are located to the east of the fault that divides the extension area.

At the Site, the Cefn-y-Fedw Sandstone has been proven to at least 71 m in thickness from an investigation borehole ('GI Borehole' on Figure 4) drilled in September 2025 that is located towards the north-west of the Site. The drilling intercepted 'brown mudstone' from 24.9 to 26.2 m bgl (300.1 to 298.8 m AOD), believed to be part of the Holywell Shales Formation that is commonly interbedded within the Cefn-y-

Fedw Sandstone Formation. The geological borehole log is attached in Appendix C. The total thickness of the Cefn-y-Fedw Sandstone at the Site is not known.

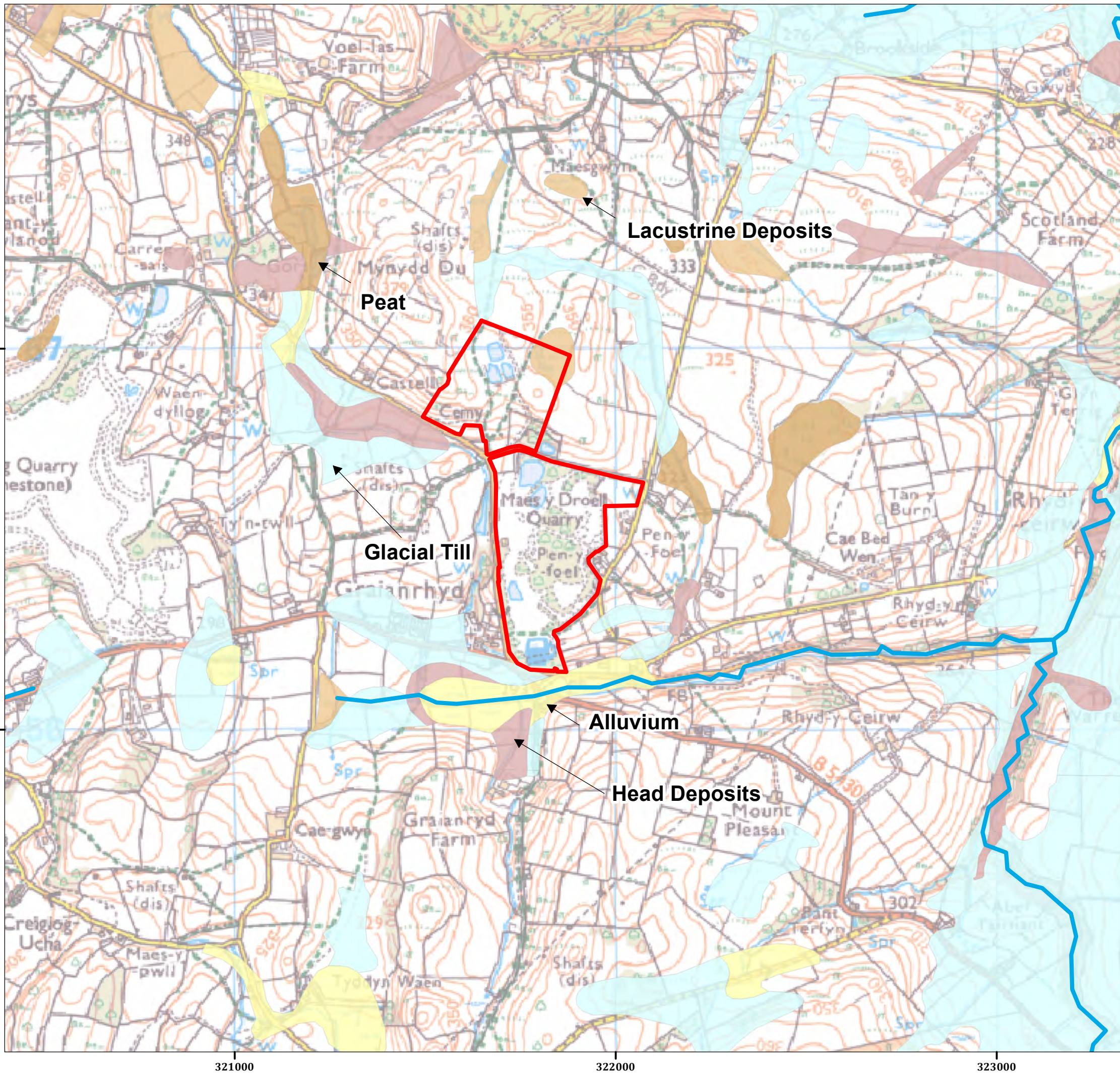


Figure 2: Superficial Deposits

Maes y Droell, Mold

- Site Boundary
- Watercourses
- Superficial Deposits**
 - Head Deposits
 - Alluvium
 - Lacustrine deposits - clay and silt
 - Peat
 - Glacial Till (Diamicton)

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06 January 2026

NGR: 321,860 E / 356,529 N

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Client: Maes y Droell

Drawn by: CA

Ref: Superficial Geology

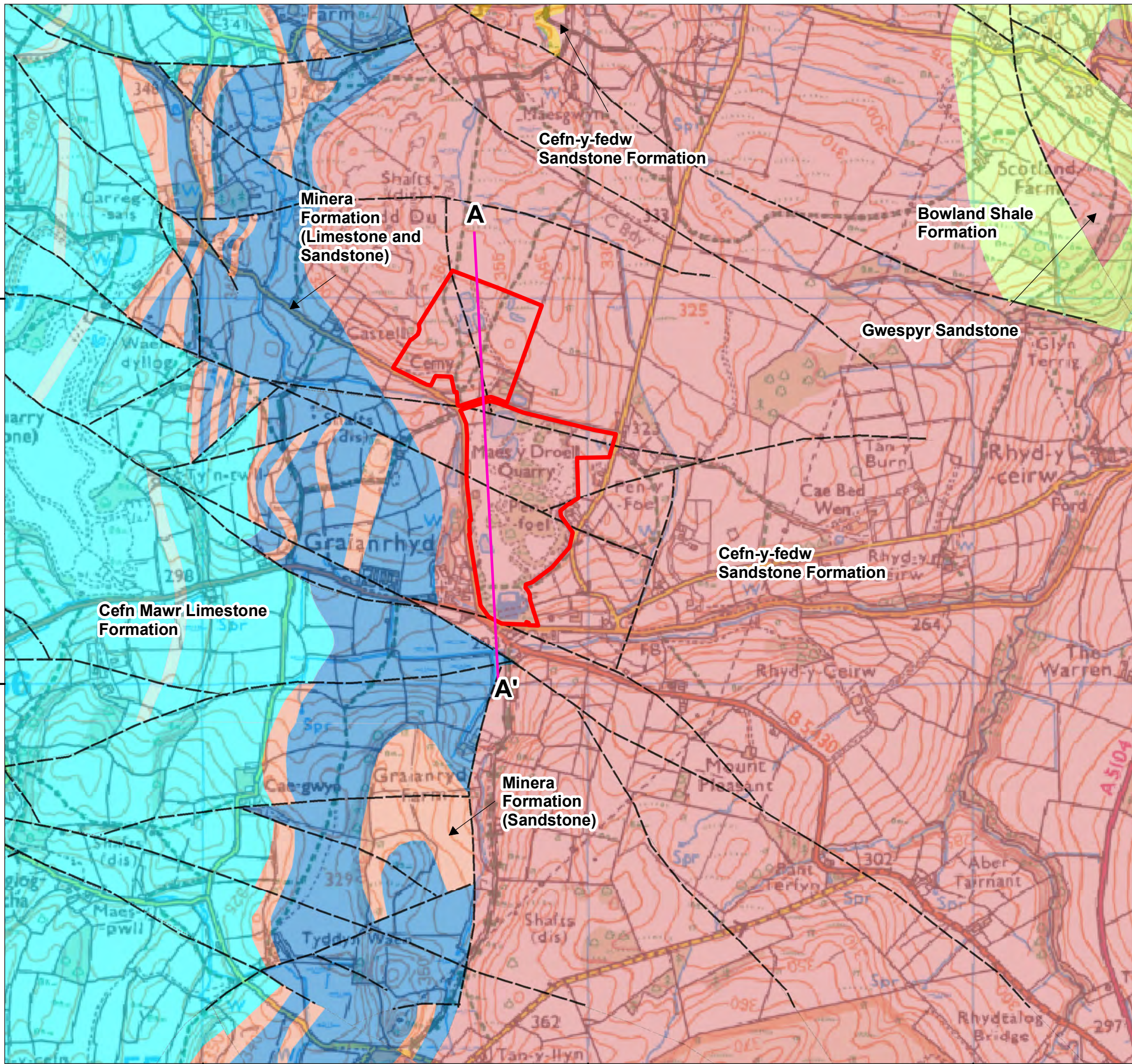


Figure 3: Bedrock Geology

Maes y Droell, Mold

Site Boundary

Cross Section

Bedrock Geology

Gwespyr Sandstone

Bowland Shale Formation

Cern y Fedw Sandstone Formation - Chert

Cefn y Fedw Sandstone Formation

Minera Formation - Sandstone

Minera Formation - Limestone and Sandstone

Cefn Mawr Limestone Formation

Faults

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Client: Maes y Droell

Drawn by: CA

Ref: Bedrock Geology

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Table 1 Geological Summary

Stratigraphic Age	Group	Formation	Description	Thickness on site
Quaternary	Fluvial Deposits	Alluvium	Clay, silt, sand and gravel, generally sorted to semi-sorted	Up to 3.7 m
	Mass Movement Deposits	Head	Poorly sorted, poorly stratified, angular rock debris comprised of gravel, sand and clay with silt, clay or peat lenses	
	Till	Glacial till (diamicton)	Unsorted and unstratified and heterogenous mixture of clay, sand, gravel and boulders	
Carboniferous	Millstone Grit Group	Gwespyr Sandstone	Fine grained feldspathic and micaceous sandstones, with conglomerate, siltstone and mudstone beds locally	Up to 260 m*
		Bowland Shales	Commonly interbedded within the Fern-y-Fedw Sandstone. Grey fissiled and blocky mudstone, subordinate sequences of interbedded limestone and sandstone	120 – 620 m*
		Cefn-y-Fedw Sandstone Formation	Comprises of lower, middle and upper units. The lower section is coarse to fine quartzitic sandstone, transitioning into pebbly sandstones and then fine grained quartzitic sandstone in its upper sections	Up to 250 - 300 m * (proven to 49 m on site)
	Clwyd Limestone Group	Minera Formation	Interbedded dark, argillaceous limestones and massive limestones	50 – 180 m*
		Cefn Mawr Limestone Formation	Dark argillaceous limestones and mudstones interbedded with massive limestones and mudstone	40 – 272 m *

2.3 Hydrology

2.3.1 Rainfall

The Standard Annual Average Rainfall (SAAR) for the Site is 989 mm/year (HR Wallingford, 2025). This is slightly higher than at Mold and land to the east due to the Site's higher elevation, however, is comparable to land to the west in the Clwydian Range where elevations and SAAR's increase to > 400 m AOD and > 1000 mm/yr respectively.

2.3.2 Surface Water Features

The Site is located in the River Terrig Catchment, and the local watercourses to Site are the River Terrig, River Alyn and River Cegidog (Figure 1). The Alyn catchment lies approximately 500 m east of Site, while the Cegidog catchment sits approximately 1000 m south-east. The River Terrig is sourced from a series of springs approximately 1 km south-east from the Site and joins the River Alyn approximately 7 km north-east of the Site. The River Alyn then discharges to the River Dee approximately 18 km east of the Site.

2.4 Hydrogeology

2.4.1 Aquifer Characteristics

Boreholes drilled onsite show that superficial deposits at the Site are largely high in clay and silts, with some sands, and are not laterally extensive. Due to this, the superficial deposits have a low storage capacity and permeability. It is noted no superficial deposits have been mapped by the BGS.

The bedrock aquifer underlying the Site is the Cefn-y-Fedw Sandstone Formation of the Millstone Grit Group which is categorised as a Secondary A aquifer. Stratigraphically, the unit is overlain by the Coal Measures and underlain by the Carboniferous Limestones (Clwyd Limestone Group). Due to the unit's deposition within a faulted basin these units are offset and can be present adjacent to one another in some areas, impacting regional flow pathways and potentially creating areas of enhanced flow.

The Millstone Grit Group is comprised of a variety of coarse sandstones with interbedded siltstones and clay units which creates a multi-layered aquifer with local perched water tables. The sandstones within the group are generally well cemented with low intergranular permeability and so flow mainly occurs along fractures, bedding planes and coarser sandstone layers. Porosity has been measured at around 14% and mean permeability is 4×10^{-2} m/d in Northern England (British Geological Society, 2005). In 2010, Hafren Water carried out slug tests on BH1 and recorded transmissivities of 33 – 65 m/d (Hafren Water, 2011). Storage capacity is expected to be moderate - low and will be dictated by fracture apertures, and coarse sandstone layer thickness and lateral continuousness.

Hydraulic testing was also conducted on borehole BH4 on 3 March 2025 showing a permeability ranging from 10.8 m/day to 21.7 m/day which is broadly consistent with previous testing at the site. It is noted that this is three orders of magnitude higher than literature values.

Across the majority of the surrounding area, the sandstone outcrops at the surface which enables direct recharge from rainfall. Vertical and horizontal recharge within the unit will be variable due to the multi layered nature of the

aquifer and will be controlled by local fracture and fault systems. Due to the limited superficial cover, the sandstone will be hydraulically connected to the surface water environment.

Locally, BGS records suggest only small yields (<100 m³/day) are available. It is also noted that springs can arise at the base of the unit and can be used for small scale supplies (British Geological Society, 2005).

The Clwyd Limestone Group beneath the Cefn-y-Fedw Sandstone is categorised by NRW as a principal aquifer. Where the unit is considered a major aquifer, it is reliant on secondary porosity and permeability created by karstic hydrogeological behaviour which can create significant and complex flow pathways. It has a variable composition and is recorded to have low porosity and permeability where karstic environments are not present. Reported bulk aquifer properties include porosity at 0.18 % and intergranular hydraulic conductivity at 0.001 – 0.01 m/d (Allen et al, 1997). Due to the aquifer's variability, there is uncertainty in the yields which can be achieved; however they are generally considered low yielding; with boreholes in the unit being rare and water supply uses being generally small-scale spring supplies (Allen et al, 1997).

An investigation borehole was drilled by Rotadrill in September 2025 to a total depth of 75 m and cased off to 60 m bgl ("G1 borehole" in Appendix C). Groundwater level was measured at 30.28 m bgl (294.7 m AOD) on 9 October 2025. Groundwater strikes were recorded at both ~32 m bgl and ~60 m bgl suggesting a multilayered aquifer system separated by low permeability mudstones. A 24-hour constant rate pumping test was conducted at 5 l/s with a total drawdown of ~11.7 m. The measured water level in this borehole is below the deepest part of the Sites current and proposed excavations.

2.4.2 Groundwater Levels and flows

Investigation boreholes drilled by Hafren Water in 2010 record groundwater elevations (Appendix B) which indicates south-eastern groundwater flow, at a steep hydraulic gradient, towards the River Terrig.

the locations of the groundwater levels measurements.

Despite the multi-layered nature of the aquifer, the recorded groundwater levels in Table 2 do not give an indication of perched groundwater being present locally, although this may be in part due to the long screen intervals. The extent of seasonal variation is not fully understood as groundwater levels have not been recorded regularly; however, it is anticipated that groundwater levels and rainfall will show a strong relationship due to the reasonably high permeability of the sandstone and large areas of outcrops across Site.

Table 2 Recorded Groundwater Levels

Location	Groundwater Elevations (m AOD)		Screened Interval (m AOD)	Screened Geology
BH1	Not provided	n/a ^{2,3}	290.4 – 282	Clay/Sandstone
BH2	303.1 ¹	n/a ^{2,3}	329 – 282	Sandstone
BH3	291.7 ¹	295.4 ²	308 – 282	Sandstone
BH4	286.7 ¹	289.8 ²	291 – 279	Clay/Sandstone
BH5	Dry ¹	Dry ²	318 – 280	Sandstone
Mine shaft	324 ¹	-	-	
GI Borehole ⁴	-	294.7		Sandstone
Notes: 1. Groundwater levels from 7 January 2010. 2. Groundwater levels from 3 March 2025. 3. Boreholes could not be located on-site. 4. Borehole drilled in September 2025 and groundwater level recorded on 9 October 2025.				

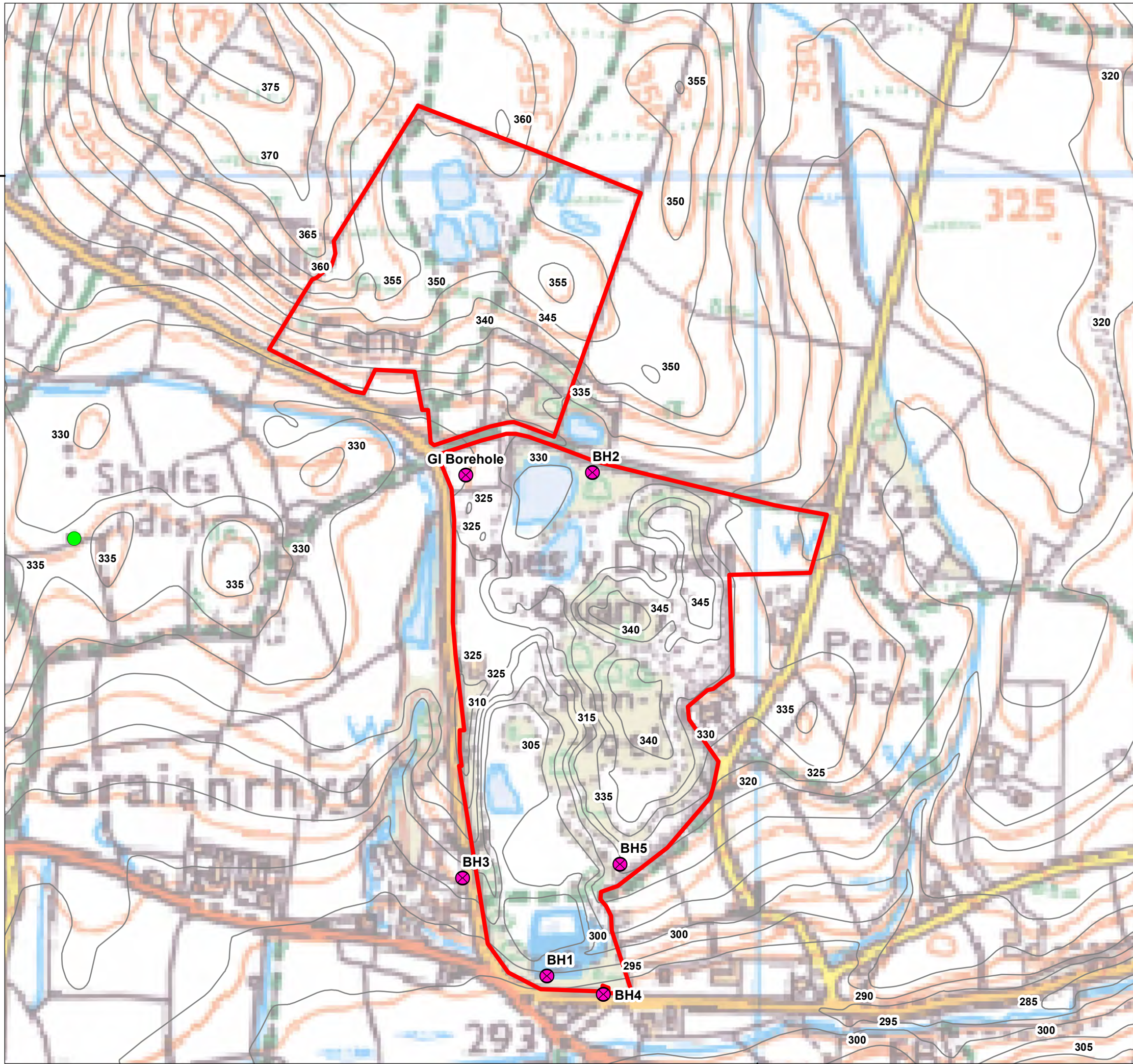


Figure 4: Groundwater Levels

Maes y Droell, Mold

Site Boundary

Groundwater Level Boreholes

Mine Shaft

Contours

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0 50 100 150 200 Meters
Scale: 1:4,000 at A3

06 January 2026
NGR: 321,805 E / 356,629 N

Project No. 3491083
Client: Maes y Droell
Drawn by: CA
Ref: Groundwater Levels

3 Environmental Setting

3.1 Search Area

Water dependent receptors within 1.5 km of the Site have been reviewed, and the findings set out in this section. The radius of 1.5 km has been chosen to be conservative and is based on experience of appropriate zones of influence for similar quarry developments. Significant receptors (e.g., Special Areas of Conservation (SACs)) outside this distance have also been considered. The search area and identified receptors are presented on Figure 5.

3.2 Surface Water Features - Lakes/Ponds

A total of 17 lakes/ponds are located within 1.5 km of the Site boundary that are a mixture of manmade and natural. Further details are summarised in Table 3. The majority of these features are relatively small with the exception of Cyfynwy Lake located ~1.3 km to the south of the Site.

Table 3 Pond/Lake Details

Map Ref.	Easting	Northing	Distance (m)
SWF1	321819	356738	5 (E)
SWF2	321646	356556	20 (W)
SWF3	321699	357472	380 (N)
SWF4	321224	357229	430 (NW)
SWF5	321194	357316	480 (NW)
SWF6	322652	356372	630 (E)
SWF7	321880	357691	660 (N)
SWF8	321618	357762	690 (N)
SWF9	320974	356204	710 (SW)
SWF10	320801	357124	740 (NW)
SWF11	320741	356888	750 (W)
SWF12	320717	356890	780 (W)
SWF13	322783	357091	800 (E)
SWF14	320929	357485	820 (NW)
SWF15	320993	355407	1,070 (SW)
SWF16	321492	358348	1,270 (N)
SWF17	321725	354671	1,300 (S)

3.3 Surface Water Features – Streams/Rivers

The Site is located within the Terrig Catchment with numerous drains and streams in the near vicinity that ultimately discharge into the River Terrig. The closest stream is located on the western side of Eryrys road, approximately 20 m from Site at its closest point. This stream originates from ponds 450 m north-west and flows in a south-easterly direction close to the Sites western boundary.

The largest stream in the area, flowing to the east, is located 20 m south of the Site into which many local drains/streams discharge into. This tributary confluences with the River Terrig ~1.2. km to the east of the Site.

A drain originating from a pond (SWF3) to the north of the Site flows southwards, located approximately 100 m east of the Site boundary, before discharging into an eastward-flowing stream situated within the local topographical low.

There is one surface water body that is part of the Alyn Catchment, flowing to the west, located ~980 m to the west of Site.

3.4 Registered Private Water Supply

An information request was sent to Denbighshire County Council in November 2025 for Private Water Supplies (PWS) within 1.5 km of the Site. Locations are summarised in Figure 5 and further detailed in Table 4. No information is available on the borehole associated with PWS1, but the geological map indicates the borehole could be targeting the Minera Formation – interbedded limestones and calcareous sandstones.

Table 4 Private Water Supply Summary

Map Ref.	Easting	Northing	Type	Distance (m)
PWS1	321008	357521	Borehole	785
PWS2	321067	357614	Spring	800
PWS3	322625	355499	Spring	1,000

3.5 Abstraction Licences

Online available data from NRW (Nov 2025) confirms there are no abstraction licences within 1.5 km of Site.

3.6 OS Map Features

A total of 24 OS Map features were identified within 1.5 km of the Site with locations presented in Figure 5 and further details summarised in Table 5.

Table 5 OS Map Features Survey

Map Ref.	Easting	Northing	Type	Distance (m)	Target Unit/Comment ¹
OS1	322046	356619	Well	0	Cefn-y-Fedw Sandstone Formation
OS2	321599	356414	Well	100	Minera Formation
OS3	322161	356390	Well	200	Cefn-y-Fedw Sandstone Formation
OS4	321054	356780	Well	450	Minera Formation
OS5	322419	356244	Well	490	Cefn-y-Fedw Sandstone Formation
OS6	321911	357527	Well	520	Cefn-y-Fedw Sandstone Formation
OS7	321257	355918	Spring	540	Minera Formation
OS8	322257	357442	Spring	600	Cefn-y-Fedw Sandstone Formation
OS9	321072	356149	Spring	650	Cefn Mawr Limestone (Fault)
OS10	322235	355574	Spring	680	Contact between Cefn-y-Fedw Sandstone Formation and till
OS11	320970	357276	Well	690	Minera Formation
OS12	321916	357809	Well	790	Cefn-y-Fedw Sandstone Formation
OS13	322329	357754	Well	900	Cefn-y-Fedw Sandstone Formation
OS14	322975	356355	Well	950	Cefn-y-Fedw Sandstone Formation
OS15	322700	355445	Spring	1,090	Fault in Cefn-y-Fedw Sandstone Formation
OS16	320819	357865	Well	1,150	Cefn Mawr Limestone
OS17	321081	355161	Well	1,220	Cefn Mawr Limestone
OS18	322908	355450	Spring	1,250	Fault in Cefn-y-Fedw Sandstone Formation
OS19	321214	355029	Well	1,260	Minera Formation
OS20	321662	354894	Spring	1,270	From Lake Cyfynwy through Cefn-y-Fedw Sandstone Formation (potentially)
OS21	322765	355220	Spring	1,290	Cefn-y-Fedw Sandstone Formation
OS22	320265	357303	Well	1,320	Cefn Mawr Limestone
OS23	320576	357906	Well	1,360	Cefn Mawr Limestone
OS24	320659	358068	Well	1,410	Cefn Mawr Limestone
Notes:					
Target units for boreholes assumed based off BGS 1:50k geological map					

3.7 BGS Water Wells

There are two water wells on the BGS database within 1.5 km of the Site Centre. Locations are presented in Figure 5 and details summarised in Table 6.

Table 6 BGS Borehole Summary

Map Ref.	Name	Easting	Northing	BGS Ref	Distance (m)	Depth (m)	Target Unit
BGS1	Maes y Droell	321271	356788	SJ25/14	230	24	Cefn Mawr Limestone
BGS2	CARREG-Y-SAIS	320900	357198	SJ25/11	720	4.6	

3.8 Designated Sites

Designated environmental sites within 1,500 m of Site are provided in Figure 5. The Sites of Special Scientific Interest (SSSI) and Special Conservation Area (SAC) are classified based on the grasslands and heath present. The west of the Site is also dominated by the Clwydian Range and Dee Valley, which is protected as an Area of Outstanding Natural Beauty (AONB).

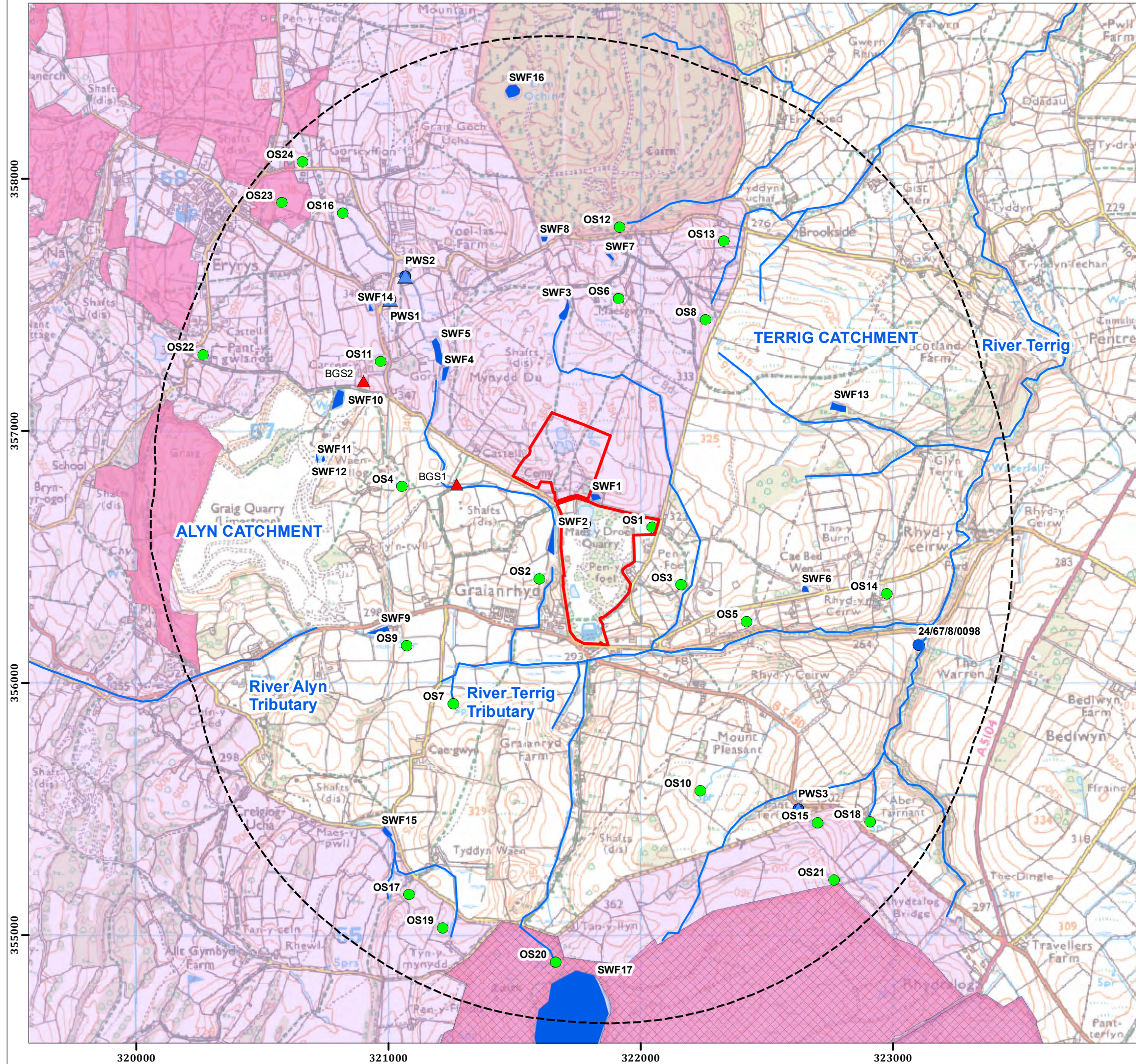
Table 7 Designated Sites

Site	Designation	Designation Category	Distance (m)
Clwydian Range and Dee Valley	AONB	Character/beauty /Heritage	On Site
Llandegla Moor	SSSI	Biological	1,150 km (south)
Berwyn and South Clwyd mountains	SAC	Biological	1,150km (south)
Graig Llanarmon-yn-Ial	SSSI	Biological	1,160 km (west)
Glaswelltiroedd Eryrys (Eryrys Grasslands)	SSSI	Biological	1,240 km (north-west)
Bryn Alyn	SSSI	Biological	1,420 km (north-west)

Figure 5: Environmental Setting

Maes y Droell, Mold

- Site Boundary
- Search Radius (1.5 km)
- SSSI
- SAC
- AONB
- Surface Water Feature
- Stream/River
- Private Water Supplies
- NRW Licenced Abstractions
- BGS Wells
- OS Map Features
- PWS



Notes:

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0 100 200 300 400 500 Meters
Scale: 1:15,000 at A3

23 January 2026
NGR: 321,769 E / 356,634 N

Project No. 3491083
Client: Graianrhyd Maes y Droell
Drawn by: CA
Ref: Environmental Setting

4 HYDROGEOLOGICAL CONCEPTUAL MODEL

This section summarises the conceptual model which is based on available hydrogeological data and the conceptual understanding of the hydrogeology. A conceptual hydrogeological cross section is shown on Figure 6. A cross section of the typical local geological setting is presented in Figure 7 that is located ~2 km north of the Site.

The Site lies within the River Terrig Catchment, positioned on raised ground north of a River Terrig tributary and sloping gently to the south.

Superficial deposits have been recorded onsite through numerous drilling programs, however BGS mapping has noted no superficial onsite. In the wider area, glacial till is present approximately 1 km east and 2 km west of the Site.

The Site is underlain by the Cefn-y-Fedw Sandstone Formation, consisting predominantly of quartzose sandstones and thin quartz conglomerates, interbedded with mudstones, siltstones, cherty mudstones, and glassy cherts. The sandstone can show varying levels of cementation (carbonate cement), with onsite drilling data indicating that the sandstone is generally poorly cemented at this location. The bedrock dips in an easterly direction, forming part of a synclinal structure whose axis lies to the east; the quarry is located on the limb of this syncline.

Primary porosity within the sandstone is intergranular, with groundwater movement occurring mainly through the matrix where cementation is not extensive. The interbedded mudstones create strong vertical anisotropy in hydraulic conductivity, locally acting as aquitards that can perch groundwater above more permeable layers, particularly relevant in the proposed extension area.

Locally groundwater flow is expected to be towards the south-east. Locally, a high density of east-west trending faults may exert a strong control on flow, acting as preferential pathways for groundwater movement.

Boreholes drilled in 2010 indicate the presence of multiple groundwater levels; each perched on mudstone horizons within the sandstone sequence. These mudstones act as local flow boundaries, strongly influencing groundwater movement at the Site scale. A suspected spring to the southwest of the Site situated at ~349 m AOD, near the artificial ponds at the top of the extension area, likely reflects perched groundwater discharge where a mudstone layer outcrops at the surface.

Recharge is expected to occur directly from rainfall where the sandstone outcrops via infiltration and percolation. Previous quarrying at the Site has removed topsoil and any superficial deposits, thereby increasing recharge into the Cefn-y-Fedw Sandstone locally. The River Terrig tributary to the south is likely a losing stream under normal conditions local to the Site, given the relative elevation of the Site and observed groundwater levels, although it may switch to gaining conditions in winter when groundwater levels rise. The tributary is likely primarily fed by surface runoff.

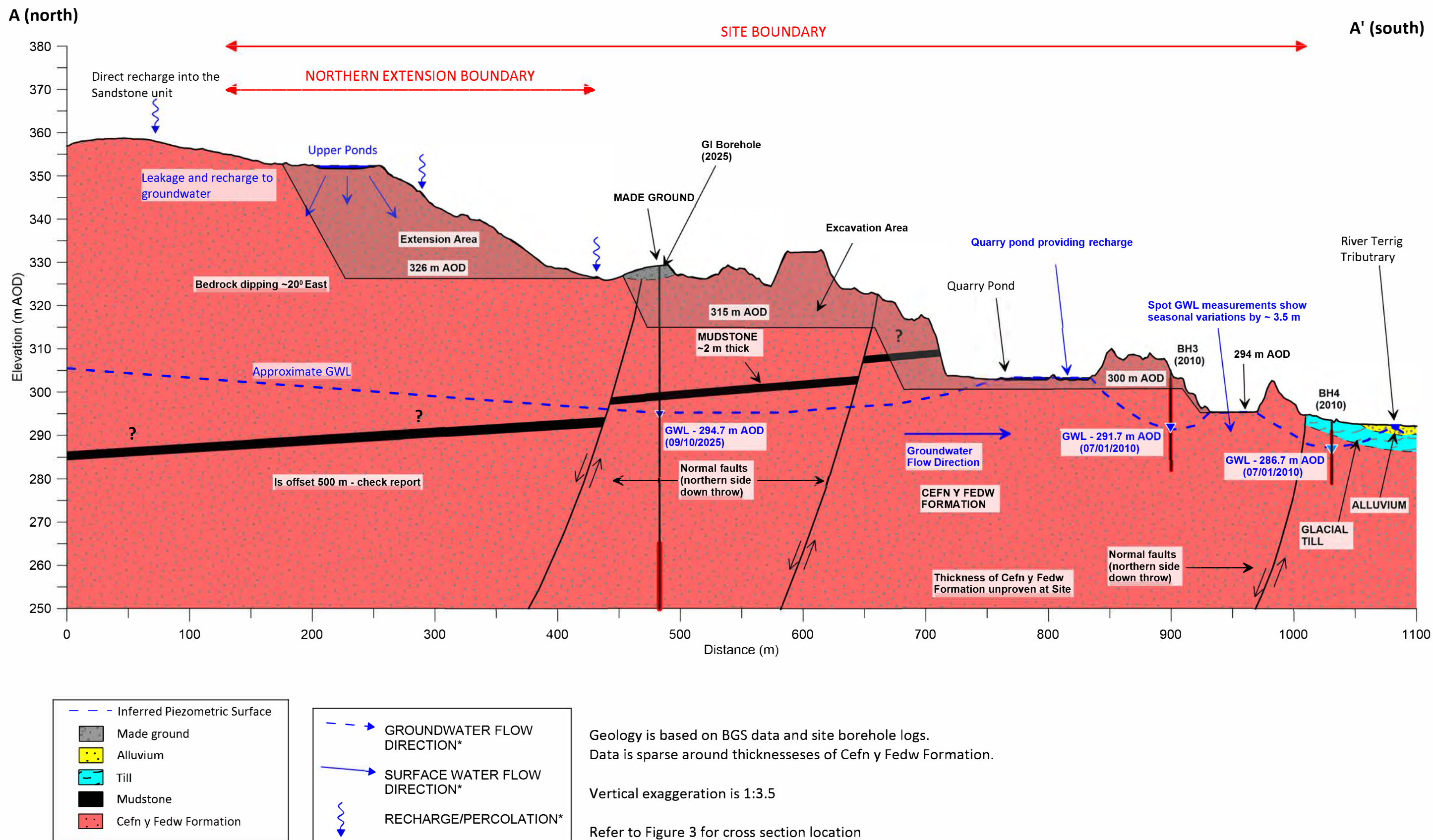
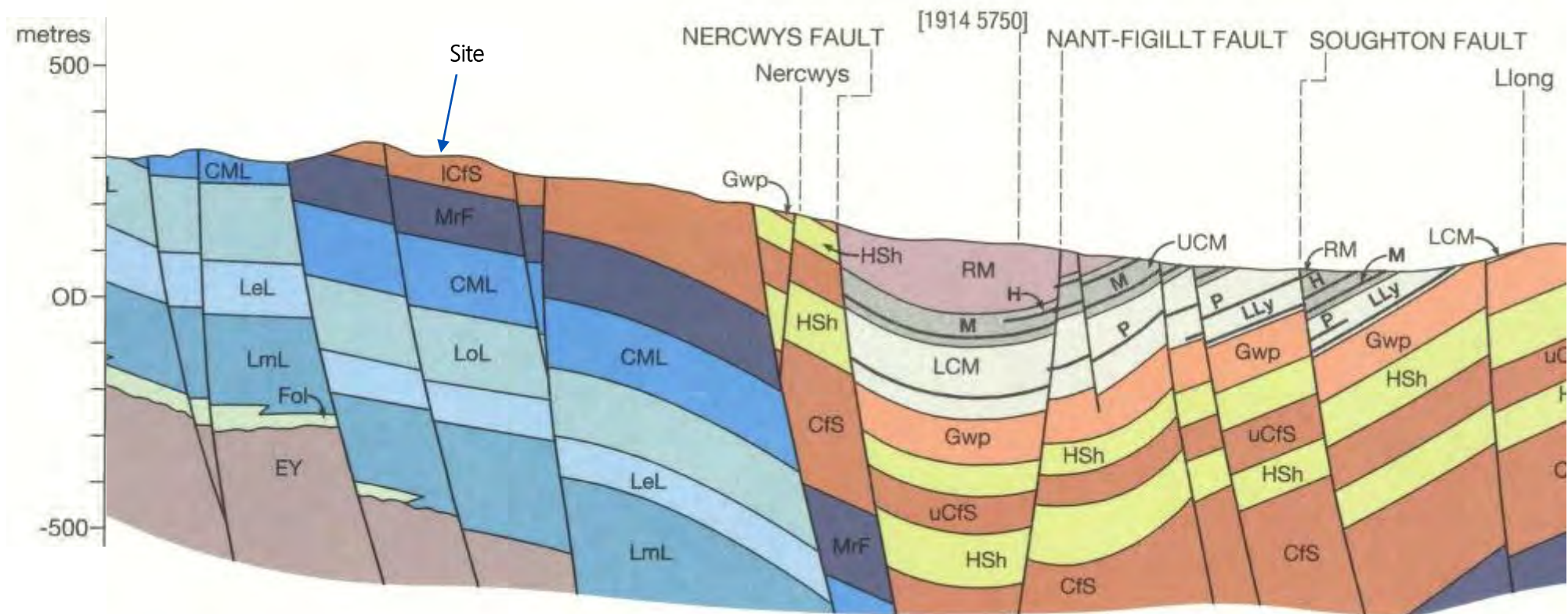


Figure 6: Conceptual Hydrogeological Cross Section (North-South)

Date: 06 November 2025
Project No. 3491236
Client: Silica Sand Mold Ltd
Ref: FIG CSHM N-S
Drawn by: CA



Figure 7 BGS Cross Section



5 PROPOSED DEVELOPMENT

5.1 Operational Phase

5.1.1 Quarry Development

Full details of the proposed development are presented in the accompanying Environmental Impact Assessment Report (EIAR) (Stephenson Halliday, 2025). A summary is presented below, and development plans are shown in Appendix A.

SSML is applying for planning permission to rework the existing Site. Reworking of the existing area comprises an excavation elevation being staggered towards the south from 315 m AOD to 300 m AOD, and finally 294 m AOD. The Northern Extension plans to excavate to a depth of 30 m bgl (~326 m AOD). Figure 6 presents the proposed excavations in cross section.

Existing infrastructure will be demolished with new processing plant being situated towards the north-east of the existing Site.

5.1.2 Surface Water Management

Full details of the proposed surface water management are provided in the accompanying FCA (Envireau Water, 2026). A summary is provided below.

Runoff and direct rainfall will infiltrate and percolate into the underlying Cefn-y-Fedw Sandstone Formation. Where infiltration rates are exceeded, water will be directed to the quarry sump where over time will drain away, with the base of the excavation being above recorded groundwater levels.

5.1.3 Groundwater Dewatering

No groundwater dewatering is proposed, with SSML proposing to excavate the upper sandstone above the groundwater table as indicated by the groundwater monitoring dataset.

The recent investigation borehole drilled in 2005 ("GI borehole" in Figure 4) that was drilled towards the north-west of the existing quarry Site records groundwater levels of 294.7 m AOD. The most north westerly area is approximately 400 m north of this borehole and assuming a groundwater gradient of 0.01, it is expected that groundwater levels in the extension area are to be around 298.7 m AOD. The proposed maximum worked depth in the extension area will be 326 m AOD, thus extraction will not intercept the water table, and dewatering will not be required.

The Cefn-y-Fedw Sandstone is noted to have mudstone layers throughout the sandstone formation. Drilling conducted in 2020 has confirmed the presence of these mudstone layers to the west of the extension area. These mudstone layers provide natural no flow boundaries (minimal flow) vertically and so perched groundwater may be intercepted during the works. It is expected that any perched groundwater would be of low volumes and would naturally recharge to ground at the lowest point of the excavation.

Recharge to the Cefn-y-Fedw Sandstone Formation beyond the extension area elevation would be considered minimal and so once initially drained, further inflows are expected to be minimal.

5.1.4 Environmental Management (Embedded Mitigation)

As excavation works will not extend below the water table, no dewatering activities are anticipated. Consequently, no discharge permit or suspended solids settlement requirements apply.

Storage of Fuels, Oils and Chemical

The Site will operate in accordance with the GES-06 Oil Liquid Fuel and Chemical Storage Standard. This includes the following measures:

- Facilities for the storage of fuels or chemicals will be sited on an impervious base and surrounded by impervious bund walls.
- The volume of the bunded compound will be greater than the tank capacity (at least 110% of the maximum tank capacity).
- Filling points, vents, gauges, and sight glasses will be located within the bund walls.
- The bund drainage system will be sealed with no discharge to any watercourse, land, or underground strata permitted. Associated pipework will be located above ground and protected so as to prevent accidental damage.
- All filling points and tank overflow pipe outlets will discharge downwards into the bund.
- Storage of loose drums of fuel at the Site will not be permitted.

Fuelling and maintenance of vehicles and machinery, and cleaning of tools and plant will be carried out in line with the Guidelines for Pollution Prevention (GPPs). Mobile bowsters will be double skinned with all pumps and hoses contained. Staff involved in refuelling and servicing plant will be trained in safe fuelling procedures. Drip trays will be used while refuelling and regular inspection and maintenance of vehicles, tanks and bunds will be undertaken.

An emergency spill kit (containing absorbent materials and spill socks and pillows, storage receptable/bin bags, ties, and hazard tape) will be maintained in good order and stored in an accessible location in the unlikely event of a spillage of fuel or other chemicals within the Site.

Restoration Proposal

This restoration strategy aims to restore and enhance upland habitats through a combination of targeted active and passive ecological interventions. Central to the scheme is upland restoration, focusing on rewetting degraded areas to improve hydrological function and carbon sequestration. Restoration will be complemented by the re-introduction of native plant species, selected to reflect the site's historical vegetation and support local biodiversity. The proposed restoration plan is included in Appendix A.

All plant and buildings will be removed from the Site. At cessation of operations, low lying areas in the existing Site will be clay lined to retain water and help establish acid wet woodland with heath and wetland scrape mosaic. Native tree species will also be planted.

The extension area will include occasional shallow water body scrapes. The remaining area will be planted and developed to form rhos and upland woodland scrub with heath and wetland mosaic.

6 IMPACT ASSESSMENT

6.1 Assessment Methodology

A hydrogeological impact assessment has been carried out using the Source-Pathway-Receptor (S-P-R) approach described in Green Leaves III, and the guidance provided by the Environment Agency in relation to preparing a hydrogeological impact assessment (EA, 2025). A Tier 1 assessment is appropriate for this Site, as a robust understanding of the hydrogeology and groundwater conditions has been developed and no proximal high-sensitivity receptors have been identified.

The impact assessment has been carried out based on the identified hazards in accordance with the methodology presented at Appendix D.

6.2 Hazard Identification

The hazard associated with the proposed extension is:

- Deterioration in water quality by spills or leaks of chemicals or fuels stored on-site or through accidental loss of fluids from mobile and/or fixed plant equipment.

The risk of this hazard occurring is considered in the following sections.

6.3 Receptor and Pathway Identification

This report has identified receptors that may be impacted by the proposed development. Any pollutants (such as fuel) that reached the ground surface would infiltrate vertically into the sandstone aquifer. If percolating fuel reached any perched water tables this would intercept the pollutants. The identified pathway for all the potential receptors is therefore percolation vertically in the unsaturated zone and groundwater flow within the sandstone aquifer. Given that groundwater flow is inferred to be in a southerly direction towards the tributary of the River Terrig, receptors to the north, east and west have been screened out. The tributary of the River Terrig is considered to be a no flow boundary and receptors to the south have been screened out.

Therefore, conservatively, the potential receptors are:

- Groundwater in the sandstone aquifer
- Tributary of the River Terrig;
- Two OS map wells, OS2 and OS3;

Flood risks are assessed in the FCA (Envireau Water, 2026).

6.4 Impact Assessment

6.4.1 Receptor Sensitivity

The impact assessment has been carried out based on the identified hazards in accordance with the methodology presented in Appendix D.

The impact assessment given in Table 8 shows that the hazards pose a very low risk to the identified receptors. The impact analysis demonstrates that, further mitigation beyond the embedded mitigation outlined in Section 5.1.4 is not required and there will be no significant impacts on the water environment from the proposed development. This assessment is based on the available information to date and ongoing monitoring will be undertaken to confirm this conclusion (see below).

Table 8 Impact Assessment

Hazard	Source	Pathway	Receptor	Receptor Sensitivity	Distance from Site	Magnitude of Impact (without embedded mitigation)		Potential Significance of Effect	Likelihood of Occurrence with Embedded Mitigation		Risk (with embedded mitigation)
						Value	Justification		Value	Justification	
Degradation of groundwater and surface water quality from standard plant operation	Chemical spills from Site	Infiltration through the unsaturated zone. Groundwater flow through the sandstone bedrock	Groundwater in sandstone aquifer	Very High	At Site	High	Contamination could have a high magnitude of impact (without embedded mitigation)	Major	Very Unlikely	Embedded mitigation will ensure that the water environment is protected even in the unlikely event of a spill. The significant unsaturated zone will also act to protect groundwater quality in the sandstone aquifer	Very Low
			Tributary of River Terrig	High	50 (S)	Moderate		Moderate	Very Unlikely		Very Low
			OS2 Well	Medium	1.2 km southwest	Moderate		Moderate	Very Unlikely		Very Low
			OS3 Well	Medium	At Site or < 1 km	Moderate		Moderate	Very Unlikely		Very low

6.5 Proposed Monitoring and Reporting (Mitigation Measures)

6.5.1 Groundwater Level Monitoring

A groundwater monitoring programme will be established prior to the commencement of earthworks. One additional monitoring borehole will be installed within the extension area to record groundwater levels and assess seasonal fluctuations. Monthly monitoring will include manual water level measurements for a period of 12 months, followed by quarterly monitoring. The results of this monitoring will be used to confirm that the quarry floor remains above the water table, with no dewatering to be undertaken.

6.5.2 Groundwater Quality

It is proposed to undertake groundwater quality sampling in boreholes BH2, BH4, Extension BH6 and GI borehole to establish baseline groundwater quality results. A suggested analysis suite is presented Table 9. Sampling in the first year would comprise two samples six months apart, later moving to annual sampling, to quantify any changes in groundwater chemistry that may show early indication of contamination from quarrying activities, with locations summarised in Figure 8.

Table 9 Groundwater Analysis Suite

Category	Analytes
Physicochemical parameters	pH, Electrical Conductivity (EC), Dissolved Oxygen (DO), Hardness, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Hardness.
Major & Minor Ions	Ca, Mg, Na, K, Cl, SO_4^{2-} , NO_3^- , Alkalinity (bicarbonate and carbonate), Al, F.
Heavy/Trace Metals	As, Hg, Mn, Cd, Cr, Cr^{+3} , Cr^{+6} , Fe, Zn, Cu, Pb, Ni
Organic Contaminants	TPH, PAH, Phenols
Notes:	
1. Metals will include totals and dissolved.	

Table 10 Monitoring Locations

Location	Monitoring requirements
GI Borehole	Groundwater level
BH2	Water quality sampling
BH4	
Extension BH6	Groundwater level & water quality sampling

6.5.3 Reporting

After the first year of operation, the groundwater level and quality data will be reviewed independently by a Chartered Hydrogeologist, and an interpretative report will be produced and submitted to NRW to include details as follows:

- Progress of quarrying over the period, including up to date topographic survey;
- Data in a graphical format and description of the trends in groundwater level and quality;
- Assessment of trends within the context of concomitant quarrying activities and ambient climatic conditions to make conclusions regarding the level of effects, if any, from the development;
- Review of the monitoring network, and any recommendations to change it – this may include increasing or decreasing monitoring.

After this, an interpretative analytical report will be completed every 3 years, or as recommended by the previous report.

Should there be a change in the predicted impacts from those set out above, the requirement for additional mitigation will be agreed with NRW.

It is proposed as part of the monitoring plan for the Site that one new monitoring borehole will be installed in the extension area to gain more accurate information on groundwater levels in the extension area. The proposed monitoring borehole locations are presented in Figure 8.

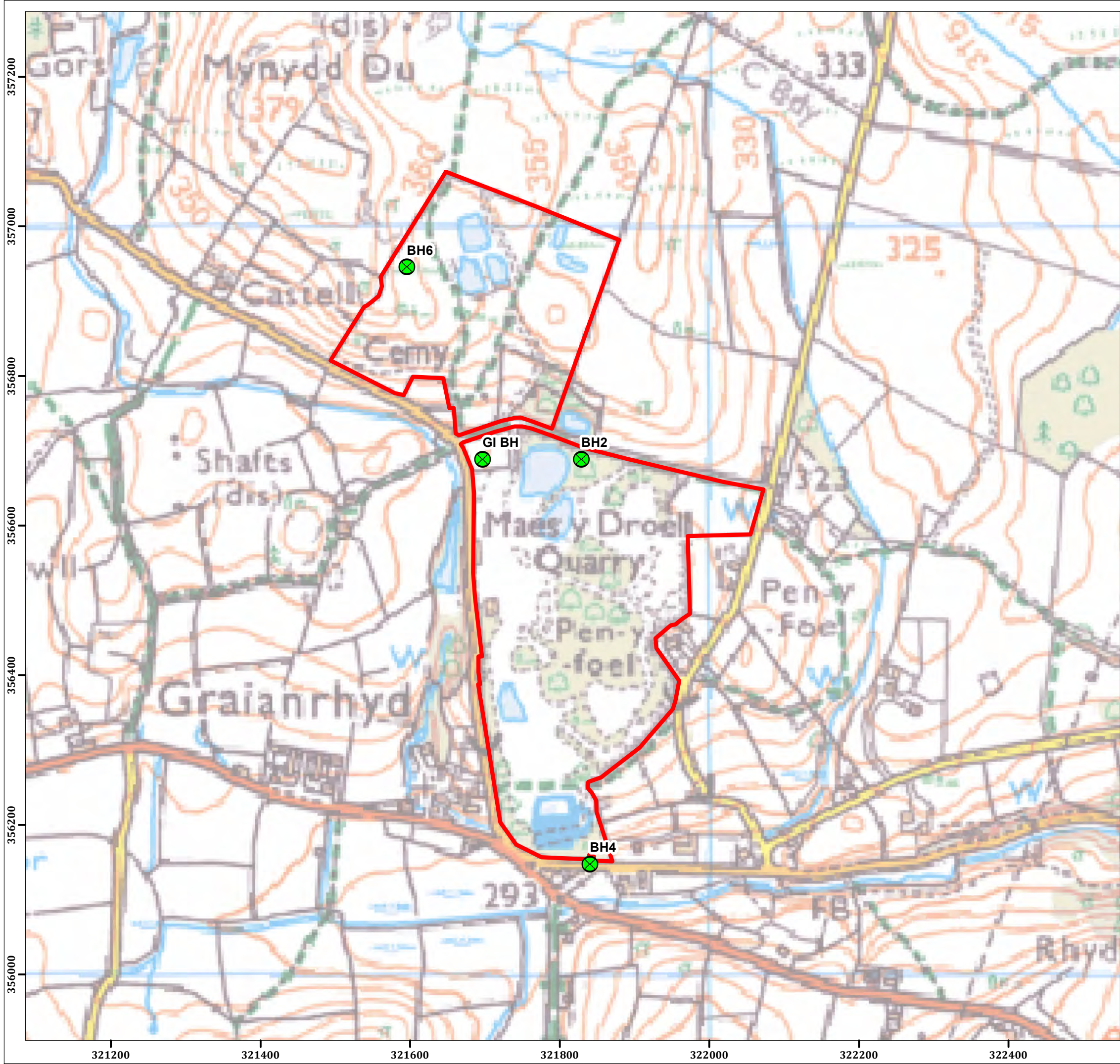
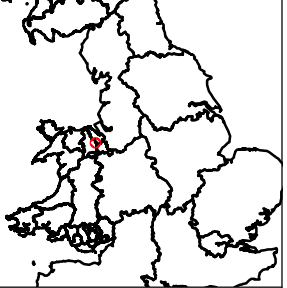


Figure 8: Proposed Monitoring Plan
Maes y Droell, Mold

-  Site Boundary
-  Monitoring Locations

Notes:

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26 January 2026

NGR: 321,817 E / 356,599 N

0 50 100 150 200 Meters

Scale: 1:5,000 at A3

Project No. 3491083

Client: Maes y Droell

Drawn by: CA

Ref: Monitoring Plan



The potential hydrogeological and hydrological impacts have been reviewed from the proposed reworking of the existing Site and proposed extension area at Maes y Droell. Based on this study, the following conclusions have been drawn:

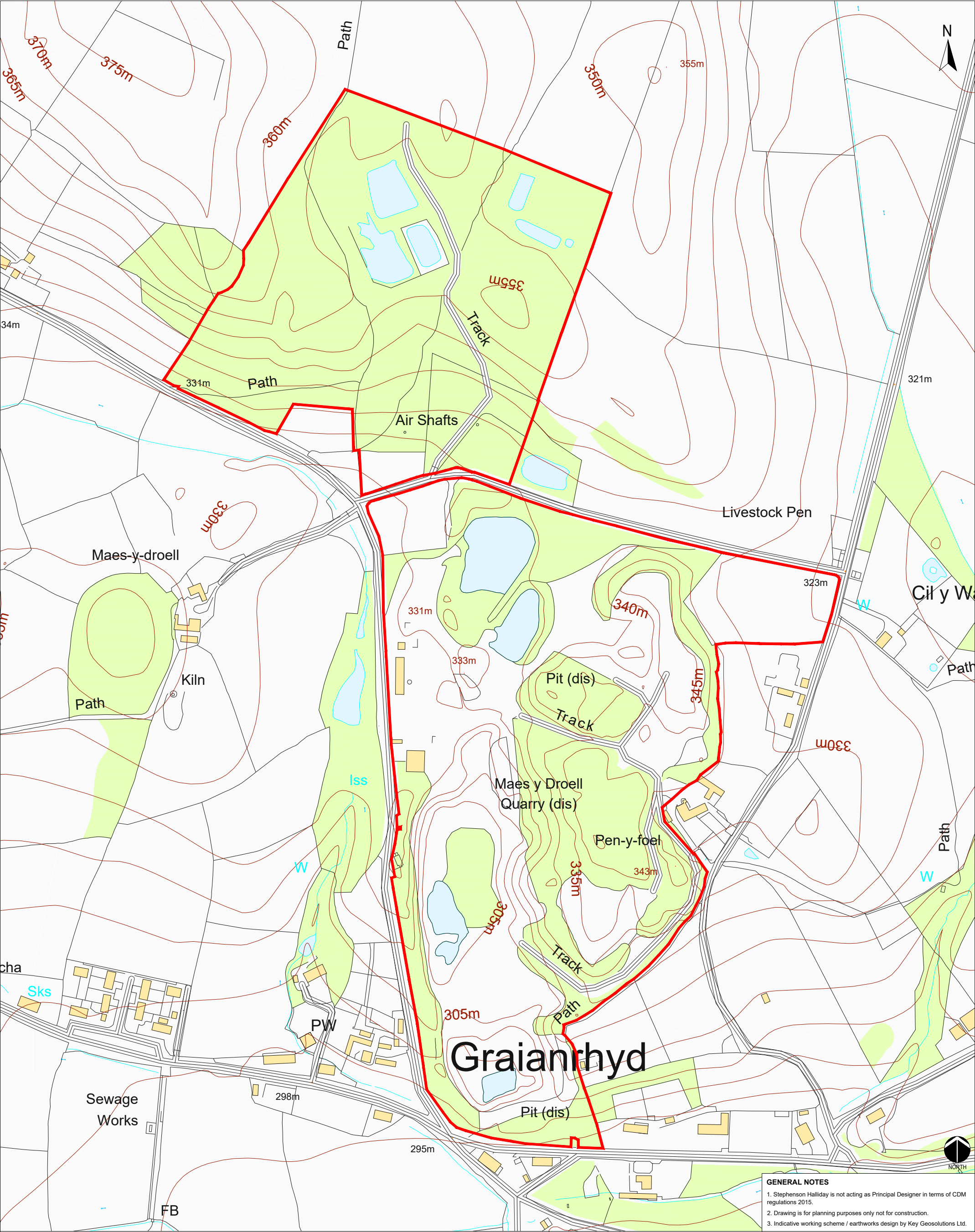
- The worked Cefn-y-Fedw Sandstone is poorly cemented, and groundwater flow is primarily intergranular.
- The sandstone formation has multiple mudstone layers that act as aquitards, retarding vertical groundwater movement and potentially causing perched groundwater to be intercepted.
- Locally groundwater flow is towards the south likely contributing to baseflow in the tributary of the River Terrig.
- No dewatering will be undertaken, with workings remaining above the water table. Any perched groundwater encountered with train to ground at the lowest excavation level.
- Potential receptors to degraded groundwater quality include the sandstone aquifer itself, two wells identified from the OS Map and the tributary of the River Terrig that are situated down gradient of the local groundwater flow and could potentially be impacted from a groundwater quality perspective.
- Effects on groundwater quality is considered to be insignificant as the quarry will be operating in accordance with standard best practice to minimise the impact of refuelling and the storage of fuel, oils, and other chemicals.
- Ongoing groundwater level monitoring and quality sampling is proposed to ensure no negative impacts will occur as a result of the quarrying activities.
- SSML will undertake monitoring and regular reporting to confirm the finding of this assessment.

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Appendices

Appendix A Development Plans



KEY

Application site boundary

Client

Silica Sand Mold Limited

Project Title

Maes y Droell Quarry

Drawing Title

Site Location Plan

File Path

JUNE_26_UPDATE_MDQ-SH-ELS-M2-LS-001_SITE_LOCATION_PLAN.dwg

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Drawn	Date	Checked	Date	Approved	Date
JD	07/2026	EK	07/2026	AP	07/2026
Scale	Orig Size		Status		
1:3,000	A3		PLANNING		

Drawing No.

FIGURE 1

Rev.

-

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KEY

Application site boundary

Client

Silica Sand Mold Limited

Project Title

Maes y Droell Quarry

Drawing Title

Aerial Context Plan

File Path

JUNE_26_UPDATE_MDQ-SH-ELS-M2-LS-002_AERIAL_IMAGE.dwg

GENERAL NOTES

1. Stephenson Halliday is not acting as Principal Designer in terms of CDM regulations 2015.

2. Drawing is for planning purposes only not for construction.

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JD	07/2026	EK	07/2026	AP	07/2026
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FIGURE 2

Rev.

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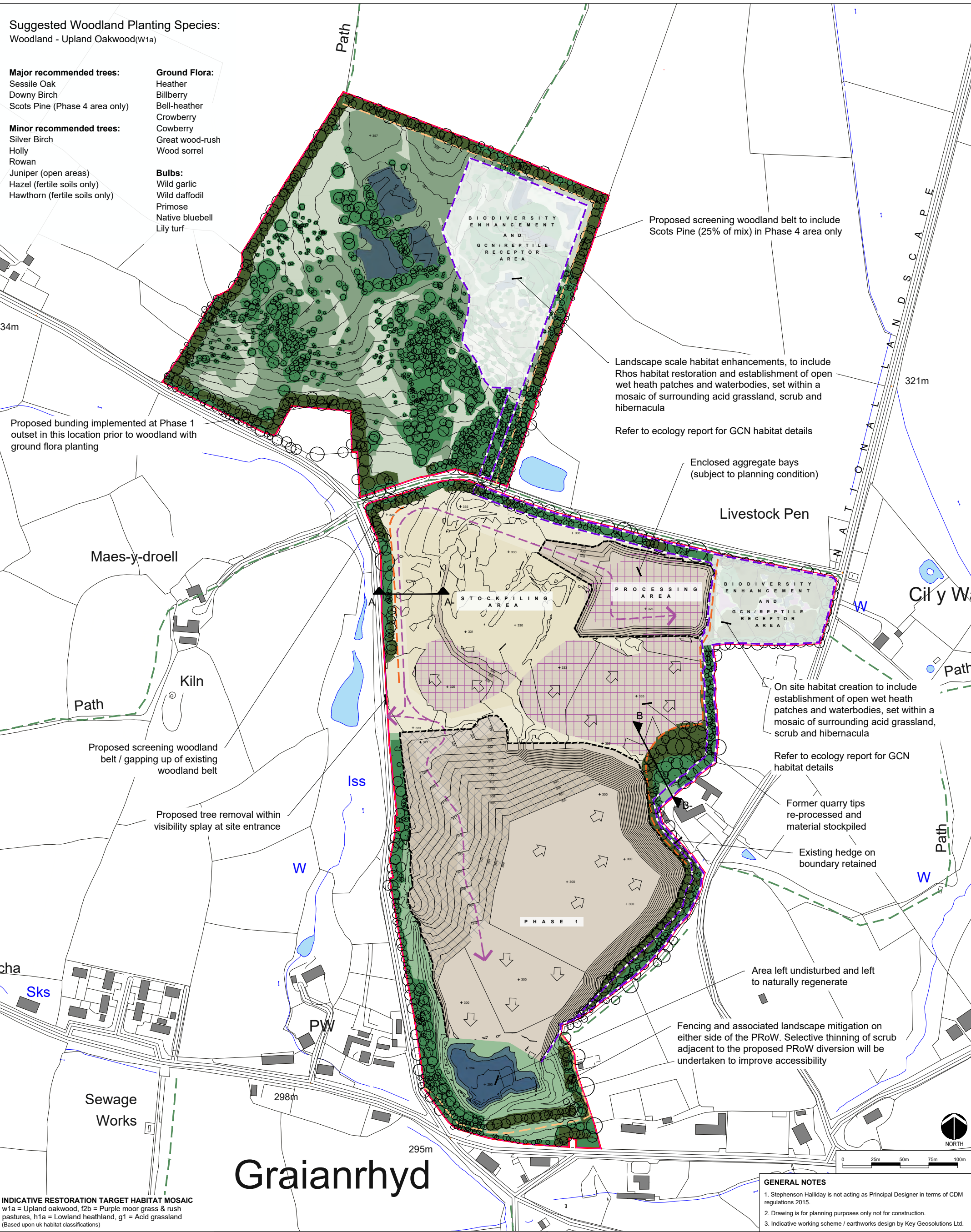
Suggested Woodland Planting Species:
Woodland - Upland Oakwood(w1a)

Major recommended trees:
Sessile Oak
Downy Birch
Scots Pine (Phase 4 area only)

Minor recommended trees:
Silver Birch
Holly
Rowan
Juniper (open areas)
Hazel (fertile soils only)
Hawthorn (fertile soils only)

Ground Flora:
Heather
Billberry
Bell-heather
Crowberry
Cowberry
Great wood-rush
Wood sorrel

Bulbs:
Wild garlic
Wild daffodil
Primrose
Native bluebell
Lily turf



INDICATIVE RESTORATION TARGET HABITAT MOSAIC
w1a = Upland oakwood, f2b = Purple moor grass & rush pastures, h1a = Lowland heathland, g1 = Acid grassland
(Based upon UK habitat classifications)

	Application site boundary		Existing vegetation		GCN / reptile terrestrial habitat connectivity & green infrastructure link (For details refer to ecology report)
	Phase 1 extraction area		Proposed woodland (w1a) with ground flora planting		Biodiversity enhancement areas
	Stockpiles re-worked		Proposed wetland marginal zone (f2b)		PRoW (retained)
	Quarry floor (disturbed)		Proposed heath (h1a) & acid grassland (g1) mosaic		PRoW (indicative diversion)
	Quarry face (disturbed)		Proposed acid grassland (g1)		Indicative access route
	Backfilling area		Indicative 2m contours		Indicative acoustic mitigation
	Disturbed ground				

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Drawn	Date	Checked	Date	Approved	Date
JD	07/2026	EK	07/2026	AP	07/2026
Scale	1:3,000	Orig Size	A3	Status	PLANNING

File Path

APR_26_UPDATE_MDQ-SH-ELS-M2-LS-003_PHASE_1.dwg

Drawing No.

FIGURE 3

Rev.

-

Woodland - Upland Oakwood(W1a)

Sessile Oak
Downy Birch
Scots Pine (Phase 4 area only)

- Silver Birch
- Holly
- Rowan
- Juniper (open areas)
- Hazel (fertile soils only)
- Hawthorn (fertile soils only)

Heather
Billberry
Bell-heather
Crowberry
Cowberry
Great wood-rush
Wood sorrel

Wild garlic
Wild daffodil
Primrose
Native bluebell
Lily turf

- Proposed screening woodland belt to include Scots Pine (25% of mix) in Phase 4 area only

Landscape scale habitat enhancements, to include Rhos habitat restoration and establishment of open wet heath patches and waterbodies, set within a mosaic of surrounding acid grassland, scrub and hibernacula

Refer to ecology report for GCN habitat details

Livestock Pen

On site habitat creation to include establishment of open wet heath patches and waterbodies, set within a mosaic of surrounding acid grassland, scrub and hibernacula

Refer to ecology report for GCN
habitat details

- Existing hedge on boundary retained

- Area left undisturbed and left to naturally regenerate

- Fencing and associated landscape mitigation on either side of the PRoW. Selective thinning of scrub adjacent to the proposed PRoW diversion will be undertaken to improve accessibility

Proposed bunding implemented at Phase 1
outset in this location prior to woodland with
ground flora planting

Maes-y-droell

Kiln

Path

Proposed screening woodland
belt / gapping up of existing
woodland belt

Proposed tree removal within
visibility splay at site entrance

Sewage Works

Graianrhyd

INDICATIVE RESTORATION TARGET HABITAT MOSAIC

w1a = Upland oakwood, f2b = Purple moor grass & rush pastures, h1a = Lowland heathland, g1 = Acid grassland
(Based upon uk habitat classifications)

	Application site boundary
	Phase 2 extraction area
	Quarry floor (disturbed)
	Quarry face (disturbed)
	Backfilling area
	Disturbed ground

	Existing vegetation
	Proposed woodland (w1a) with ground flora planting
	Proposed wetland marginal zone (f2b)
	Proposed heath (h1a) & acid grassland (g1) mosaic
	Proposed acid grassland (g1)
	Indicative 2m contours

-  GCN / reptile terrestrial habitat connectivity & green infrastructure
(For details refer to ecology report)
-  Biodiversity enhancement areas
-  PRoW (retained)
-  PRoW (indicative diversion)
-  Indicative access route
-  Indicative acoustic mitigation

Client	Silica Sand Mold Limited
--------	--------------------------

Project Title

Maes y Droell Quarry

Phase 2
Indicative Quarry
Development Plan

File Path
APR 26 UPDATE MDQ-SH-ELS-M2-LS-004 PHASE 2.dwg

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JD	07/2026	EK	07/2026	AP	07/2026

Scale 1:3 000	Orig Size A3	Status PLANNING
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Drawing No.	Rev.
FIGURE 4	-

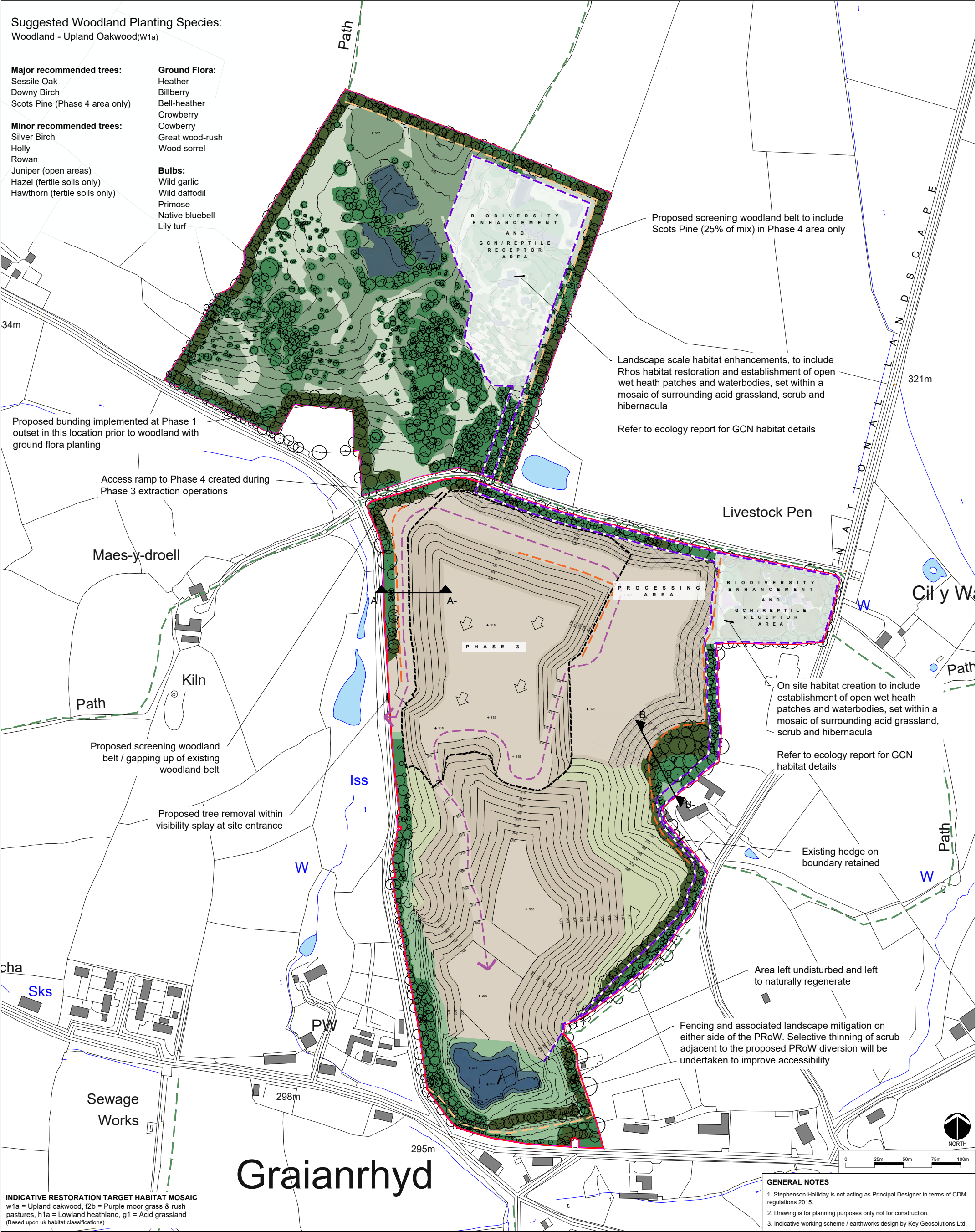
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Woodland - Upland Oakwood(w1a)

Major recommended trees:
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Downy Birch
Scots Pine (Phase 4 area only)

Minor recommended trees:
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Juniper (open areas)
Hazel (fertile soils only)
Hawthorn (fertile soils only)

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Crowberry
Cowberry
Great wood-rush
Wood sorrel

Bulbs:
Wild garlic
Wild daffodil
Primrose
Native bluebell
Lily turf



Graianrhyd

INDICATIVE RESTORATION TARGET HABITAT MOSAIC
w1a = Upland oakwood, f2b = Purple moor grass & rush pastures, h1a = Lowland heathland, g1 = Acid grassland
(Based upon UK habitat classifications)

KEY			
	Application site boundary		Existing vegetation
	Phase 3 extraction area		Proposed woodland (w1a) with ground flora planting
	Quarry floor (disturbed)		Proposed wetland marginal zone (f2b)
	Quarry face (disturbed)		Proposed heath (h1a) & acid grassland (g1) mosaic
	Backfilling area		Proposed acid grassland (g1)
	Assisted natural regeneration of quarry face		Indicative 2m contours
	GCN / reptile terrestrial habitat connectivity & green infrastructure link (For details refer to ecology report)		Biodiversity enhancement areas
	PRoW (retained)		PRoW (indicative diversion)
	Indicative access route		Indicative acoustic mitigation

Client	Silica Sand Mold Limited
Project Title	Maes y Droell Quarry
Drawing Title	Phase 3 Indicative Quarry Development Plan
File Path	APRIL_26_UPDATE_MDQ-SH-ELS-M2-LS-005_PHASE_3.dwg

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 Planning, Landscape & Environment an RSK company			
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Drawn JD	Date 07/2026	Checked EK	Date 07/2026
Scale 1:3,000	Orig Size A3	Approved AP	Date 07/2026
Drawing No. FIGURE 5	Status PLANNING		Rev. -

Suggested Woodland Planting Species:
Woodland - Upland Oakwood (W1a)

Major recommended trees:
Sessile Oak
Downy Birch
Scots Pine (Phase 4 area only)

Minor recommended trees:
Silver Birch
Holly
Rowan
Juniper (open areas)
Hazel (fertile soils only)
Hawthorn (fertile soils only)

Ground Flora:
Heather
Billberry
Bell-heather
Crowberry
Cowberry
Great wood-rush
Wood sorrel

Bulbs:
Wild garlic
Wild daffodil
Primrose
Native bluebell
Lily turf



INDICATIVE RESTORATION TARGET HABITAT MOSAIC
w1a = Upland oakwood, f2b = Purple moor grass & rush pastures, h1a = Lowland heathland, g1 = Acid grassland
(Based upon UK habitat classifications)

KEY			
	Application site boundary		Existing vegetation
	Phase 4 extraction area		Proposed woodland (w1a) with ground flora planting
	Quarry floor (disturbed)		Proposed wetland marginal zone (f2b)
	Quarry face (disturbed)		Proposed heath (h1a) & acid grassland (g1) mosaic
	Backfilling area		Proposed acid grassland (g1)
	Assisted natural regeneration of quarry face		Indicative 2m contours
	GCN / reptile terrestrial habitat connectivity & green infrastructure link (For details refer to ecology report)		Biodiversity enhancement areas
	PRoW (retained)		PRoW (indicative diversion)
	Indicative access route		Indicative acoustic mitigation

GENERAL NOTES

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Drawn	Date	Checked	Date	Approved	Date
JD	07/2026	EK	07/2026	AP	07/2026
Scale	1:3,000	Orig Size	A3	Status	PLANNING

File Path
APRIL_26_UPDATE_MDQ-SH-ELS-M2-LS-006_PHASE_4.dwg

Drawing No.
FIGURE 6

Rev.
-

Suggested Woodland Planting Species:

Woodland - Upland Oakwood(w1a)

Major recommended trees:

Sessile Oak
Downy Birch
Scots Pine (Phase 4 area only)

Minor recommended trees:

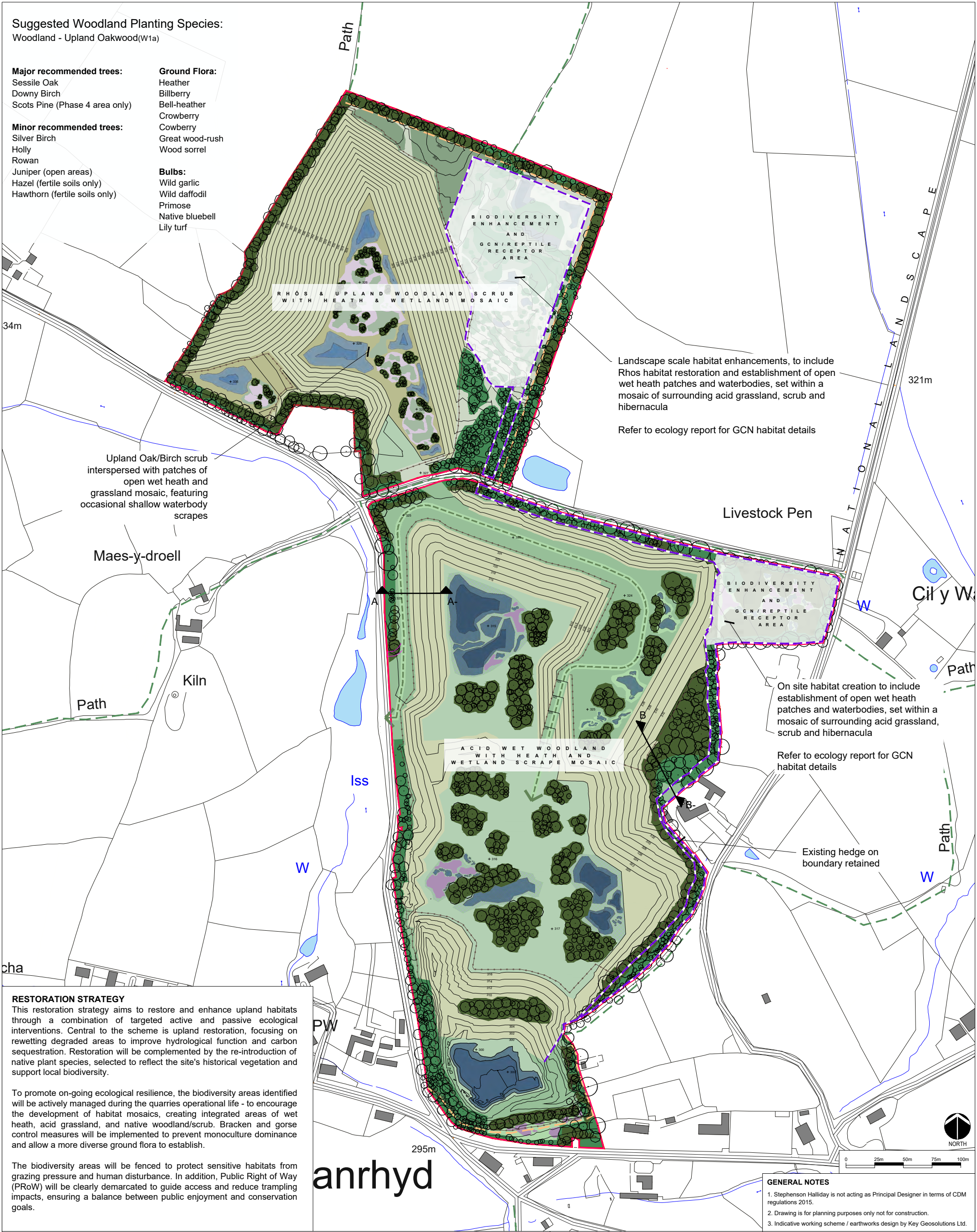
Silver Birch
Holly
Rowan
Juniper (open areas)
Hazel (fertile soils only)
Hawthorn (fertile soils only)

Ground Flora:

Heather
Billberry
Bell-heather
Crowberry
Cowberry
Great wood-rush
Wood sorrel

Bulbs:

Wild garlic
Wild daffodil
Primrose
Native bluebell
Lily turf



RESTORATION STRATEGY

This restoration strategy aims to restore and enhance upland habitats through a combination of targeted active and passive ecological interventions. Central to the scheme is upland restoration, focusing on rewetting degraded areas to improve hydrological function and carbon sequestration. Restoration will be complemented by the re-introduction of native plant species, selected to reflect the site's historical vegetation and support local biodiversity.

To promote on-going ecological resilience, the biodiversity areas identified will be actively managed during the quarries operational life - to encourage the development of habitat mosaics, creating integrated areas of wet heath, acid grassland, and native woodland/scrub. Bracken and gorse control measures will be implemented to prevent monoculture dominance and allow a more diverse ground flora to establish.

The biodiversity areas will be fenced to protect sensitive habitats from grazing pressure and human disturbance. In addition, Public Right of Way (PRoW) will be clearly demarcated to guide access and reduce trampling impacts, ensuring a balance between public enjoyment and conservation goals.

KEY

	Application site boundary		Proposed heath (h1a) & acid grassland (g1) mosaic		PRoW (retained)
	Assisted natural regeneration of quarry face		Proposed Rhôs restoration (f2a8)		PRoW (indicative diversion)
	Indicative 2m contours		Proposed acid grassland (g1)		Indicative access route
	Existing vegetation		GCN / reptile terrestrial habitat connectivity & green infrastructure link (For details refer to ecology report)		Proposed fencing
	Proposed woodland (w1a) with ground flora planting		Biodiversity enhancement areas		
	Proposed wetland marginal zone (f2b)				

INDICATIVE RESTORATION TARGET HABITAT MOSAIC
w1a = Upland oakwood, f2b = Purple moor grass & rush pastures, h1a = Lowland heathland, g1 = Acid grassland (Based upon uk habitat classifications)

GENERAL NOTES

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Client
Silica Sand Mold Limited

Project Title
Maes y Droell Quarry

Drawing Title
Restoration Indicative Quarry Development Plan

File Path
APRIL_26_UPDATE_MDQ-SH-ELS-M2-LS-007_RESTORATION.dwg

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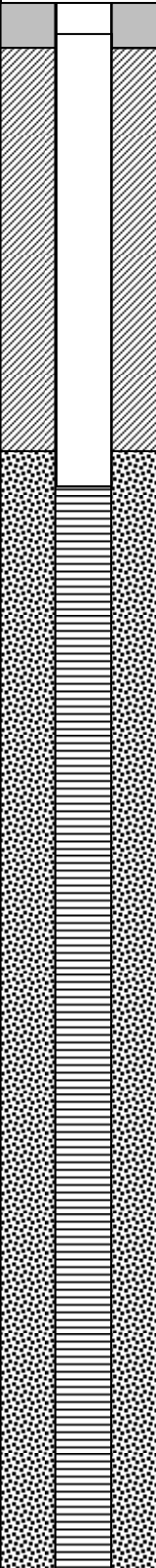
Drawn	Date	Checked	Date	Approved	Date
JD	07/2026	EK	07/2026	AP	07/2026

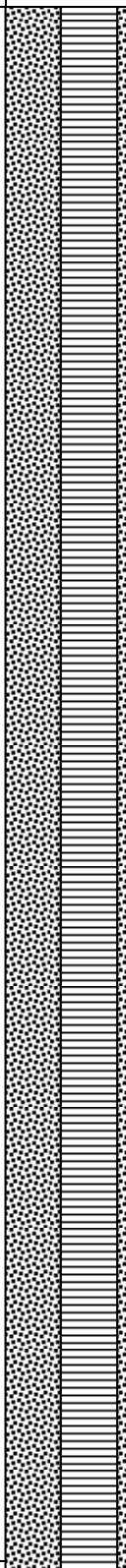
Scale	Orig Size	Status
1:3,000	A3	PLANNING

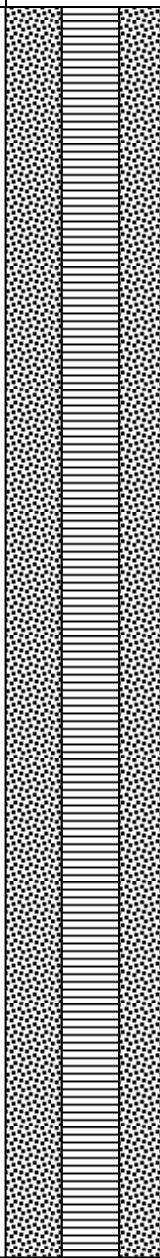
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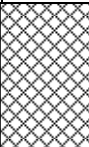
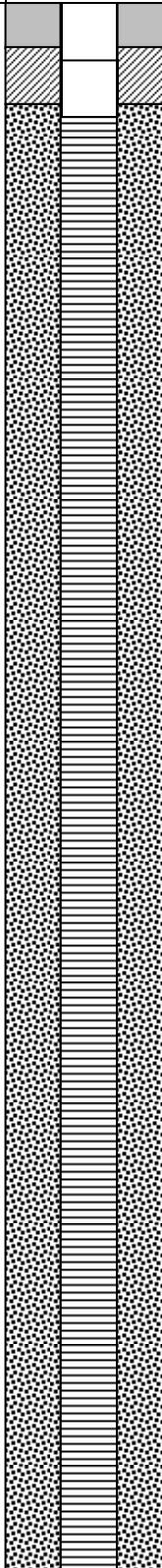
Appendix B Borehole Geological Logs

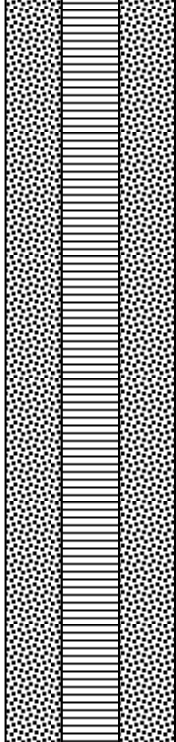
Installation details:	Concrete (0m – 0.5 m)	Gravel pack (2.7 – 15 m)
	Bentonite (0.5 – 2.7 m)	
(all depths given below ground level)	Plain pipe (0.3 agl – 3 m)	
	Slotted pipe (3 – 12 m)	

			Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N ^o 2	
					Client: G & K Edwards Holdings Ltd.		Sheet 1 of 3	
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:			
Drill rig:			GL Elevation: ~335 mAOD		Date started: 26/06/2010			
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 22/07/2010			
Casing:			Direction:		Reference:			
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description		Depth (m)	Level (mAOD)	Sample (m)	Installation
Water strike 11.90 Water Dried out Water strike 16.5 m	(3.70)		SAND / GRAVEL / COBBLES		1	331.30		
	3.70		Cefn-y-Fedw SANDSTONE	2				
				3				
				4				
				5				
				6				
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
Installation details:		Concrete (0m – 0.5 m) Gravel pack (5.5 – 53.0 m) Bentonite (0.5 – 5.5 m) Plain pipe (0.3 – 6.0 m) Slotted pipe (6.0 – 53.0 m)						
(all depths given below ground level)								

		Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N^o 2	
				Client: G & K Edwards Holdings Ltd.		Sheet 2 of 3	
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:		
Drill rig:			GL Elevation: ~335 mAOD		Date started: 26/06/2010		
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 22/07/2010		
Casing:			Direction:		Reference:		
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description	Depth (m)	Level (mAOD)	Sample (m)	Installation
R.W.L  33.22			Cefn-y-Fedw SANDSTONE	20			
				21			
				22			
				23			
				24			
				25			
				26			
				27			
				28			
				29			
				30			
				31			
				32			
				33			
				34			
				35			
				36			
				37			
38							
Installation details:		Concrete (0m – 0.5 m) Gravel pack (5.5 – 53.0 m) Bentonite (0.5 – 5.5 m) Plain pipe (0.3 – 6.0 m) Slotted pipe (6.0 – 53.0 m)					
(all depths given below ground level)							

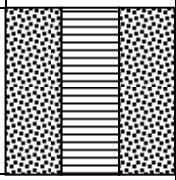
		Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N° 2	
				Client: G & K Edwards Holdings Ltd.		Sheet 3 of 3	
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:		
Drill rig:			GL Elevation: ~335 mAOD		Date started: 26/06/2010		
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 22/07/2010		
Casing:			Direction:		Reference:		
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description	Depth (m)	Level (mAOD)	Sample (m)	Installation
			Cefn-y-Fedw SANDSTONE	39			
				40			
				41			
				42			
				43			
				44			
				45			
				45			
				47			
				48			
				49			
				50			
				51			
				52			
			53				
Installation details:		Concrete (0m – 0.5 m) Gravel pack (5.5 – 53.0 m) Bentonite (0.5 – 5.5 m) Plain pipe (0.3 agl – 6.0 m) Slotted pipe (6.0 – 53.0 m)					

			Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N ^o 3	
					Client: G & K Edwards Holdings Ltd.		Sheet 1 of 2	
Contractor: Strata Surveys Ltd			Coordinates:			Logged by:		
Drill rig:			GL Elevation: ~310 mAOD			Date started: 09/07/2010		
Type of drilling: Rotary (air flush)			Inclination:			Date completed: 10/07/2010		
Casing:			Direction:			Reference:		
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description	Depth (m)	Level (mAOD)	Sample (m)	Installation	
DRY	(1.90)		MADE GROUND / FILL	1	308.10			
	1.90			2				
	(27.60)		Cefn-y-Fedw SANDSTONE	3				
				4				
				5				
				6				
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
Installation details:		Concrete (0m – 0.5 m) Gravel pack (1.3 – 28.0 m) Bentonite (0.5 – 1.3 m) Plain pipe (0.8 – 1.5 m) Slotted pipe (1.5 – 28.0 m)						
(all depths given below ground level)								

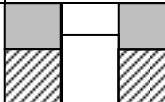
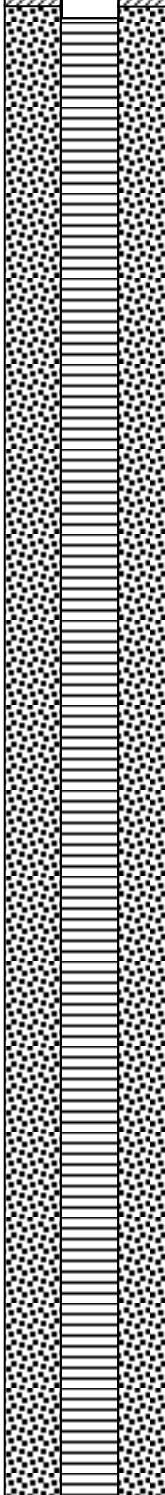
		Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N° 3		
				Client: G & K Edwards Holdings Ltd.		Sheet 2 of 2		
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:			
Drill rig:			GL Elevation: ~310 mAOD		Date started: 09/07/2010			
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 10/07/2010			
Casing:			Direction:		Reference:			
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description		Depth (m)	Level (mAOD)	Sample (m)	Installation
R.W.L 22.5			Cefn-y-Fedw SANDSTONE		20			
					21			
					22			
					23			
					24			
					25			
					26			
					27			
					28			
					Slightly damp base			
Installation details:		Concrete (0m – 0.5 m) Gravel pack (1.3 – 28.0 m) Bentonite (0.5 – 1.3 m) Water flush added at 25.50 m Plain pipe (0.8 – 1.5 m) Slotted pipe (1.5 – 28.0 m)						
(all depths given below ground level)								

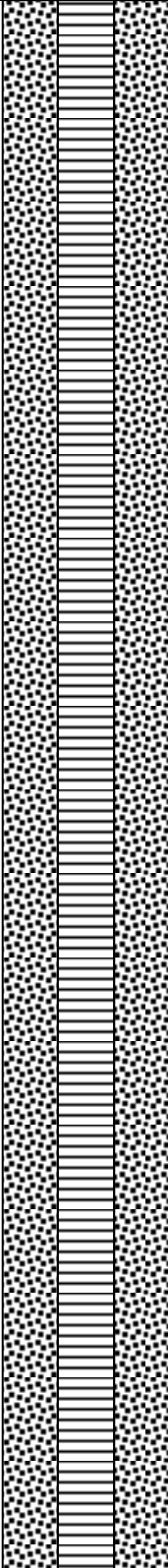
			Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N^o 4	
					Client: G & K Edwards Holdings Ltd.		Sheet 1 of 2	
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:			
Drill rig:			GL Elevation: ~300 mAOD		Date started: 11/07/2010			
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 12/07/2010			
Casing:			Direction:		Reference:			
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description		Depth (m)	Level (mAOD)	Sample (m)	Installation
DRY	(0.40) 0.40		TOPSOIL / STONE FILL			299.60		
			Sandy CLAY		1			
	(3.30)				2			
					3			
	3.70				4	296.30		
	(2.30)		Silty, sandy, gravelly CLAY		5			
	6.00				6	294.00		
	(3.00)		Clayey SILT		7			
					8			
	9.00				9	291.00		
R.W.L 12.40 m	(1.10)		Sandy CLAY		10	289.90		
	10.10				11			
			Cefn-y-Fedw SANDSTONE		12			
					13			
					14			
					15			
					16			
					17			
					18			
					19			
Installation details:			Concrete (0m – 0.5 m) Gravel pack (8.7 – 21 m) Bentonite (0.5 – 8.7 m)					

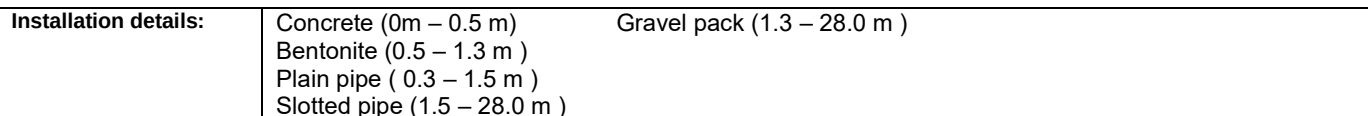
Water strike
15.00 m
Dried out

(all depths given below ground level)		Plain pipe (0.3 agl – 9.2 m) Slotted pipe (9.2 – 21 m)					
		Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N^o 4	
				Client: G & K Edwards Holdings Ltd.		Sheet 2 of 2	
Contractor: Strata Surveys Ltd		Coordinates:		Logged by:			
Drill rig:		GL Elevation: ~300 mAOD		Date started: 11/07/2010			
Type of drilling: Rotary (air flush)		Inclination:		Date completed: 12/07/2010			
Casing:		Direction:		Reference:			
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description	Depth (m)	Level (mAOD)	Sample (m)	Installation
Dry	(10.90)		Cefn-y-Fedw SANDSTONE	20	279.00		
	21.00		End of hole	21			
Installation details:		Concrete (0m – 0.5 m) Gravel pack (8.7 – 21 m) Bentonite (0.5 – 8.7 m)					

(all depths given below ground level)	Plain pipe (0.3 agl – 9.2 m) Slotted pipe (9.2 – 21 m)
--	--

			Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N ^o 5	
					Client: G & K Edwards Holdings Ltd.		Sheet 1 of 3	
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:			
Drill rig:			GL Elevation: ~320 mAOD		Date started: 07/07/2010			
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 09/07/2010			
Casing:			Direction:		Reference:			
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description		Depth (m)	Level (mAOD)	Sample (m)	Installation
DRY	1.30		MADE GROUND / FILL 1.30 m		1	318.70		
	38.70		Cefn-y-Fedw SANDSTONE		2			
					3			
					4			
					5			
					6			
					7			
					8			
					9			
					10			
					11			
					12			
					13			
					14			
					15			
					16			
					17			
					18			
					19			
Installation details:		Concrete (0m – 0.5 m) Gravel pack (1.3 – 28.0 m)						
(all depths given below ground level)		Bentonite (0.5 – 1.3 m)						
		Plain pipe (0.3 – 1.5 m)						
		Slotted pipe (1.5 – 28.0 m)						

		Barkers Chambers, Barker Street, Shrewsbury, Shropshire, SY1 1SB Tel: 01743 355770 Fax: 01743 357771 www.hafrenwater.com		Site: Maes-y-Droell		Borehole N^o 5	
				Client: G & K Edwards Holdings Ltd.		Sheet 2 of 3	
Contractor: Strata Surveys Ltd			Coordinates:		Logged by:		
Drill rig:			GL Elevation: ~320 mAOD		Date started: 07/07/2010		
Type of drilling: Rotary (air flush)			Inclination:		Date completed: 09/07/2010		
Casing:			Direction:		Reference:		
Depth to water (m)	Depth (m) (thickness)	Rock type	Visual description	Depth (m)	Level (mAOD)	Sample (m)	Installation
			Cefn-y-Fedw SANDSTONE	20			
				21			
				22			
				23			
				24			
				25			
				26			
				27			
				28			
				29			
				30			
				31			
				32			
				33			
				34			
				35			
				36			
				37			
			38				
Installation details:		Concrete (0m – 0.5 m) Gravel pack (1.3 – 28.0 m) Bentonite (0.5 – 1.3 m) Water added as flush at 34.0 m Plain pipe (0.3 – 1.5 m) Slotted pipe (1.5 – 28.0 m)					
(all depths given below ground level)							



Appendix C GI Borehole Log

RISING HEAD TEST		Casing and Depth (m)	Water strikes (m)	Samples & Testing			Stratum Description	Borehole Depth (m)
MINUTES	WATER DEPTH			Depth (m)	Type	Results		
1	60m	WATER STRIKE AT 32m ▼	HUGE WATER STRIKE AT 60m ▼				0m - 4m - Brown Sandstone - Made Ground?	1
2	55.8m							2
3	52.3m							3
4	48.9m						4	
5	46.2m						5	
6	42.6m						6	
7	42.6m						7	
8	42m						8	
9	41m						9	
10	41.8m						10	
11							11	
12							12	
13							13	
14							14	
15	40.8m						15	
16							16	
17							17	
18							18	
19							19	
20	40m						20	
21							21	
22							22	
23							23	
24							24	
25	29.5m						25	
26							26	
27							27	
28							28	
29							29	
30	39.1m						30	
31		31						
32		32						
33		33						
34		34						
35	38.6m	35						
36		36						
37		37						
38		38						
39		39						
40	38.1m	40						
41		41						
42		42						
43		43						
44		44						
45	37.9m	45						
46		46						
47		47						
48		48						
49		49						
50	37.6m	50						
51		51						
52		52						
53		53						
54		54						
55		55						
56		56						
57		57						
58		58						
59		59						
60	37.3m	60						
		61						
		62						
		63						
		64						
		65						
		66						
		67						
		68						
		69						
		70						
		71						
		72						
		73						
		74						
		75						

Appendix D Impact Assessment Methodology

HIA METHODOLOGY – TIER 1

1 INTRODUCTION

DEFRA's GL III [Ref. 1] contains generic guidelines for the assessment and management of environmental risks. GL III outlines a staged approach to risk assessment and the document is intended to guide regulatory staff in Government and its agencies, as well as those carrying out assessments, to reach a decision on managing environmental risk.

The hydrogeological risk assessment has been carried out using a Source-Pathway-Receptor (S-P-R) approach following the principles described in GL III [Ref. 1] and the methodology in the Environment Agency's approach to groundwater protection [Ref. 2] and associated technical guidance [Ref. 3]. Where S-P-R linkages have been identified, the sensitivity of the receptor, magnitude of impact and significance of effect has been considered in order to assess potential risks.

Ref. 2 describes a tiered approach to risk assessment, starting at Tier 1 and progressing to Tier 3. Tier 1 is essentially a qualitative approach and Tier 3 is a highly quantitative approach. The choice of approach should be based on how complicated the hydrogeological system is, how sensitive the receptors are, and how easily and fully the risks can be mitigated. As such the selection process is iterative, and in complex systems there may be a mixture of approaches where simple, low risk sub-systems are assessed with a Tier 1 approach and more complex aspects with risks that cannot be fully mitigated may need a complex quantitative approach. The methodology described in this Appendix is for a Tier 1 assessment.

2 RECEPTOR SENSITIVITY

The sensitivity of water dependent receptors is based on their status and in the case of aquifers, their resource value, as described in Table 1.

Table 1 Receptor Sensitivity

Receptor Sensitivity	Description	Examples
Very High	Water resource or receptor with an importance and rarity at an international level with limited potential for substitution.	A water resource making up a vital component of an SAC or SPA. A water body achieving a status of 'High status or potential' under the WFD. Principal aquifer providing potable water to a large population. EC designated Salmonid fishery.
High	Water resource or receptor with a high quality and rarity at a national or regional level and limited potential for substitution.	A water resource designated or directly linked to a SSSI. A water dependent NNR or County Wildlife Site. Principal aquifer providing potable water to a small population. A river designated as being of Good status or with a target of Good status or potential under the WFD. EC designated Cyprinid fishery.

Receptor Sensitivity	Description	Examples
Medium	Water resource with a high quality and rarity at a local scale; or water resource with a medium quality and rarity at a regional or national scale.	Secondary A aquifer providing potable water to a small population. An aquifer providing abstraction water for agricultural or industrial use. A local, undesignated water dependent nature conservation area.
Low	Water resource with a low quality and rarity at a local scale.	An ordinary water course or other water body without significant ecological habitat. A Secondary B or poorly permeable aquifer.

3 MAGNITUDE OF IMPACT

The magnitude of a potential impact on a receptor depends on the nature and extent of the proposed development and is independent of the sensitivity of the water resource, as described in Table 2.

Table 2 Magnitude of Impact

Magnitude of Impact	Description	Examples
High	Results in a major change to attributes.	Loss of EU designated Salmonid fishery. Change in WFD classification of a water body. Compromise employment source. Pollution of potable source of abstraction. Prevents abstraction. Impact on SAC or SPA qualifying criteria.
Medium	Results in impact on integrity of attribute or loss of part of attribute.	Loss / gain in productivity of a fishery. Contribution / reduction of a significant proportion of the effluent in a receiving river, but insufficient to change its WFD classification Impacts on but doesn't prevent abstraction.
Low	Results in minor impact to attributes.	Measurable changes in attribute, but of limited size and/or Proportion.
Very Low	Results in an impact on attribute but of insignificant magnitude to affect use and/or integrity.	Physical impact to a water resource, but no significant reduction/increase in quality, productivity or biodiversity. No significant impact on the economic value of the feature.

4 POTENTIAL SIGNIFICANCE OF EFFECT

The significance of the potential effect is derived by combining the assessments of both the sensitivity of the water resource and the magnitude of the impact in a simple matrix, as presented in Table 3.

Table 3 Significance of Effect

Receptor Sensitivity	Magnitude of Impact			
	High	Medium	Low	Very Low
Very High	Major	Major	Moderate	Moderate
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible

5 LIKELIHOOD OF OCCURANCE

The overall risk analysis is dependent on the likelihood that an event will occur. In the case of a Tier 1 assessment the likelihood is assessed qualitatively. Table 4 describes the categories and provides examples.

Table 4 Qualitative Likelihood of Occurrence

Qualitative Likelihood of Occurrence	Description	Examples
Highly Likely	High probability of occurrence	Spillage at a poorly maintained and operated facility. Uncontrolled activity in or on an aquifer, close to surface water. Uncontrolled known discharge. Predicted or predictable dewatering impact.
Likely	On balance could occur	Controlled but un-mitigated activity. Complex process where failure of a part is likely to lead to release. Large area where 100% sealing cannot reasonably be expected. Predicted dewatering within reasonable confidence limits.
Moderate	Equally likely/unlikely	Unmitigated, low risk controllable activity. Partially contained site.
Unlikely	On balance wouldn't occur	Mitigated higher risk simple, controllable activity. Underlain by poorly permeable strata. Existing contained site. Receptor outside predicted zone of influence of dewatering.
Very Unlikely	Very low probability of occurrence	Essentially no risk due to geological setting. Extreme set of circumstances required to generate low probability. Fully mitigated low or medium risk.

6 QUALITATIVE RISK ANALYSIS

The residual qualitative risk is derived by combining the likelihood of occurrence and the potential significance of effect in a simple matrix, as presented in Table 5. Risks which are assessed to be very high, high or medium are considered to be significant, whilst those that are low, very low or none are not significant.

Table 5 Qualitative Risk Analysis

Qualitative Likelihood of Occurrence	Significance of Effect			
	Major	Moderate	Minor	Negligible
Highly Likely	Very High	High	Medium	Low
Likely	High	Medium	Low	Very Low
Moderate	Medium	Low	Very Low	None
Unlikely	Low	Very Low	None	None
Very Unlikely	Very Low	None	None	None

7 REFERENCES

Ref. 1: Green Leaves III - Guidelines for Environmental Risk Assessment and Management: Green Leaves III. Revised Departmental Guidance Prepared by Defra and the Collaborative Centre of Excellence in Understanding and Managing Natural and Environmental Risks, Cranfield University November, 2011.

Ref. 2: The Environment Agency's approach to groundwater protection. Version 1.2. Environment Agency, February 2018.

Ref. 3: Groundwater risk assessment for your environmental permit. Environment Agency, Updated April 2018. <https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit>.

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