MORGAN SINDALL
ENGINEERING SOLUTIONS

Garnswllt WWTW

Garnswllt Water Features Survey

01/07/202125

300392-DEL-XXX-RP-00001 P01

Morgan Sindall Engineering Solutions Limited
Corporation Street Rugby Warwickshire, CV21 2DW

Contents

MORGAN SINDALL
ENGINEERING SOLUTIONS

Document control

Revision History

Rev	Date	Purpose / Status	Preparer	Checker	Approver	Comments
P01	01/07/2021	First Issue	N Hill	C Holt	P Trafford	None

Prepared by:

Name: N Hill
Position: Design Engineer

Reviewed by:

Name: C Holt
Position: Senior Design Engineer

Approved by:

Name: P Trafford
Position: Head of Engineering

1 Introduction

1.1 General

The Water Features Survey is a baseline study that identifies key water features that may be affected by the proposed scheme for ground dewatering to protect two settlement tanks from ground heave during maintenance works. The format of the Water Features Survey comprises a schedule and a plan. The schedule (Section 6) lists key information about each feature in Drawings (300392-DEL-XXX-DR-00001 P01). This information is used to inform the Hydrological Impact Assessment HIA and Abstraction applications.

This Desk Study is concerned with well point dewatering around the planned maintenance of two settlement tanks at Garnswllt Waste Water Treatment Works (Garnswllt WWTW). It has been prepared for use by Welsh Water Capital Delivery Alliance with respect to the specific project in question. The report provides guidance on the Water Features Survey based on the sources of information listed in Section 2 which are fully referenced in Section 0.

A site visit as part of this Desk Study was conducted on 16/06/2021.

1.2 Limitations

Morgan Sindall Engineering Solutions takes no responsibility over the accuracy or completeness of the third-party published information and third-party ground investigation data used in this desk study report.

2 Sources of information

The following sources were consulted to prepare this Desk Study. The full reference to each source is provided in Section 0.

- Dŵr Cymru Welsh Water Drawing: Garnswllt WWTW Site Plan - Unnumbered (Appendix A)
- Dŵr Cymru Welsh Water Drawing: Garnswllt WWTW Site Plan and inflows/outflows - Unnumbered (Appendix A)
- Historical OS Maps (1:10,000 and 1:2,500), National Library of Scotland Map Images Database (https://maps.nls.uk/)
- Online borehole information and Geological maps from the British Geological Survey (BGS) (www.bgs.ac.uk)
- Magic maps (https://magic.defra.gov.uk/MagicMap.aspx)
- Google Earth, (earth.google.com/web/)
- Natural Resources Wales Interactive Map Viewer https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer210/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/External_Ma

p_Browser/viewers/EMB_Address/virtualdirectory/Resources/Config/Default&locale=en-gb

- BGS Geology of Britain Viewer (http://mapapps.bgs.ac.uk/geologyofbritain/home.html))
- BGS GeoIndex Onshore database (http://mapapps2.bgs.ac.uk/geoindex/home.html).

No other sources of information were consulted during the preparation of this Desk Study.Report 106289 – Factual Report on Ground Investigation at Amman Valley CSO Strategy Ammanford September 2001. Report No 10629

- 300392-DEL-GRN01-CA-00002 C01, Garnswllt De-watering Preliminary Assessment.

3 Site location and proposed development

3.1 Site location

The site is located between the banks of Afon LLwchwr / River Loughor and the Llanelly & Llandilo Railway line as depicted in the Dwr Cymru Welsh Water Drawing Garnswllt WWTW. Coordinates of the area to be dewatered are provided in Table 1.

Location information	Western side	Eastern side
Grid Reference	SN 62112 09855 (E & N 262112 , 209855) SN 62110 09827 (E & N 262110 , 209827)	SN 62167 09822 (E & N 262168 , 209850) SN 62168 09850 (E & N 262167 , 209822)
Address (near) :	Lonyfelin, Garage, Lon y Felin, Garnswllt, Ammonford, SA18 2RH	Lonyfelin, Garage, Lon y Felin, Garnswllt, Ammonford, SA18 2RH

Table 1 Location information

3.2 Proposed Works

The tanks in question are indicated in Figure 1 below.

Figure 1. Location of tanks in question

Site have requested that the groundwater is to be modelled at ground level (16.764mAOD) and reduced to the top of the base slab for the tank (13.259m). The required drawdown would be 3.505m.

Based on the Ground Information (Report 106289), the De-watering Preliminary Assessment (Report 300392-DEL-GRN01-CA-00002 C01), processes required by CIRIA C750 Groundwater Control, and the ground water levels identified (Figure 2 and Figure 3)

The approximate volume of water to be removed from the ground to achieve the required water level is based on:

- Based on the Ground Information (Report 106289),
- De-watering Preliminary Assessment (Report 300392-DEL-GRN01-CA-00002 C01), processes - CIRIA C750 Groundwater Control,
- Ground water levels identified (Figure 2 and Figure 3)

The preliminary volume of ground water extraction estimated is shown in table 1

Figure 2 below shows the locations of the tanks and boreholes

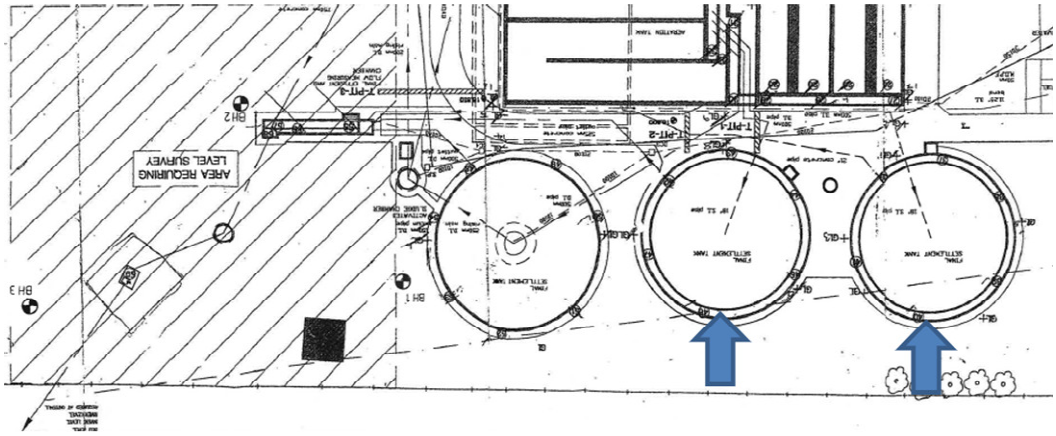


Figure 2. Tank and boreholes

The long section in figure 3 below shows the geology of all three boreholes. Borehole logs have been included in the appendix.

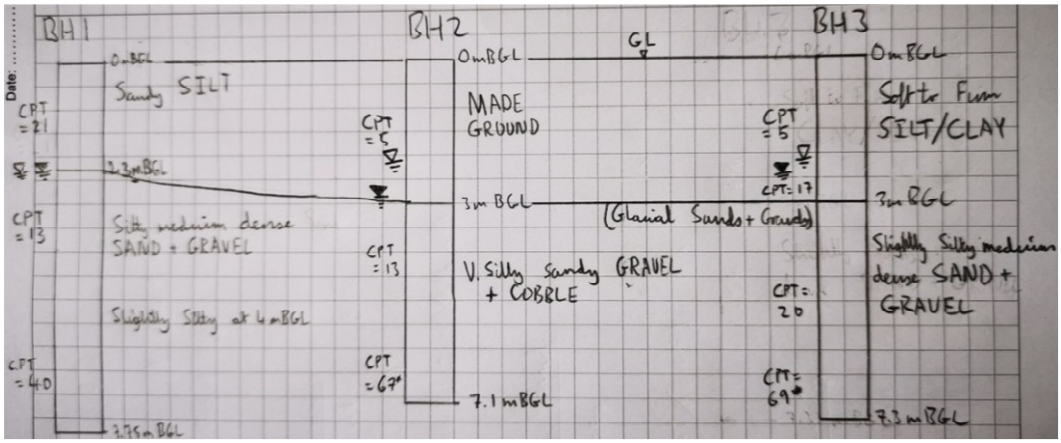


Figure 3. Long Section showing BH1, BH2 and BH3

Assumptions made in the assessment include

Groundwater level – 16.764mAOD

Drawdown level – 13.259mAOD

Base of aquifer – 9.014mAOD, As the base of the aquifer is unknown it has been taken as the base of the borehole (7.75mBGL).

Permeability of k = 10^{-5}m/s to 10^{-4} m/s on the basis of particle size distribution.

Findings of this preliminary assessment are

- For 3.5m of drawdown of the water table assuming it is acting at ground level, a single stage wellpoint system will be required to be installed around the two FST.
- Estimated Discharge calculated to be approximately 2 l/s – 8.5 l/s

- Ground permeability estimated from soil descriptions only.
- Wellpoints expected to be installed to approximately 6m depth at 1.5m spacings at a minimum distance of 1.5m from the tanks.

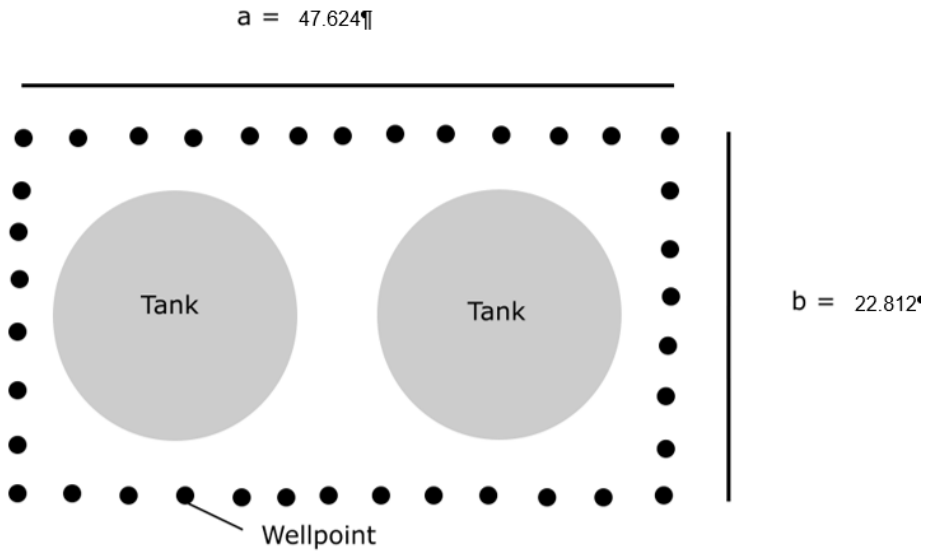


Figure 4. Plan view of excavation showing approximate well arrangement

Alternative well point arrangements may be used, however the estimated discharge will not change as that is dependent on the target areas for dewatering and permeability of the ground.

Quantities expected to be abstracted for dewatering purposes are as follows:

Abstraction period (state 'all year' or give months)	T = 2 months
Peak abstraction rate (litres per second)	r_{pk} = 8.5 l/s
Number of hours of abstraction per day tank works	hr_{abs} = 24 hr per day during dry
Maximum hourly abstraction volume (cubic metres)	$Vol_{hr} = r_{pk}$ = **30.6** m^3/hr
Maximum daily abstraction volume (cubic metres) m^3/day	$Vol_d = Vol_{hr} \times 24hr/1day$ = **734**

Maximum volume for abstraction period (cubic metres)

$$Vol = Vol_d \times (365day/12) \times T = \mathbf{44676}\ m^3$$

3.3 Topography and Geography of the local area

The area comprises flat bottomed valley floor with alluvium and River Terrace Deposits, and surrounding hills with glacial tills overlying bedrock.

3.4 Sensitive land uses, Statutory designations and sites of special interest

Environmental and cultural heritage constraints such as SPA, SAC, WSSSI, NNR have not been identified within 1000m of the proposed scheme based on the information reviewed.

3.5 Hydrology & flood risk

River Lougher forms the main south flowing water course located adjacent to and west of the Garnswllt WWTS site with the tributary River Cathan located to the north. The river has undergone extensive alteration during the 20th Century with most alterations completed by publication of the 1960-1962 1:2,500 OS Plan

Natural Resources Wales flood risk maps indicate the site has a low flood risk from rivers, with medium risk to the south and west of the Garnswllt WWTS.

River Cathan also has a medium flood risk, however this risk is confined to the east side of the railway line.

There is no flood risk from surface water and small watercourses to the Garnswllt WWTW site.

The aquifer designation of the area comprises the following.

- Bedrock is classified as Secondary A Aquifers
- The Superficial Alluvium and River Terrace Deposits on the valley floor are classified as Secondary A Aquifers
- The Superficial Glacial Tills on the hill sides are classified as Secondary (undifferentiated)

3.5.1 Abstraction licences

Historic boreholes that are abstracting water have been identified from the BGS online database. Historic wells have been identified from current and historic OS maps. Section 6 gives further details of the holes based on their location compared to the proposed dewatering.

The site visit on 16/06/2021 identified the farm at Herdsman's Cottage is taking water from a local spring in the hillside. This spring is estimated to be about 340m from the dewatering area.

4 Approach and Methods

4.1 Study Area

The Guidance Note for the FORM WRC consent is to investigate a ground water source requires a water feature survey to cover a minimum radius from the site of abstraction. Therefore, for a proposed daily abstraction of 740m^3 the guidance requires a 1000m-wide radial zone. This distance will be taken from the centre of the zone of dewatering as defined by the well distribution in Figure 4

Water features in the study area have been identified based upon the following data.

- Hydrological features shown on 1:10,000 Ordnance Survey (OS) map,
- Hydrological features identified on in historic 1:10,560 and 1:2,500 OS County Series maps.

Water features searched for in the study area based on the Natural Resources Wales FORM C Section 14 Water Features. These features include the following: borehole, well, pond, spring, adit, seepage, wetland, lake, watercourse, or other.

All key water features within this study area that were identified, categorised and individually labelled as: major watercourse, minor watercourse, pond, abstractions (historic and active wells) and boreholes.

The study area is shown in the Water Features Plan, Drawing 300392-DEL-XXX-DR-00001 P01, Appendix A. No watercourses are identified to cross the site, therefore full catchment areas are not required to be considered.

All water features identified will be assessed for potential for impact from the proposed dewatering

4.2 Reference numbering

Watercourses were classified as 'Major' or 'Minor' using the following criteria:

- Major Watercourse: Shown on OS 1:50,000 scale maps
- Minor Watercourse: Shown on OS 1:10,000 scale maps

Minor watercourses include field drainage and existing road earthwork drains which have been identified from topographical surveys

Each water feature has been given a unique label reference number. They have been assigned using letters referring to the feature type and a number. The letters used for each type of feature and the methods of identification are shown in Table 2.

Table 2. Water feature reference labels

Water Feature	Reference number	Source of information
Major Watercourse	MW	OS Maps 1:50,000 SEPA Flood Maps
Minor Watercourse	W	OS Maps 1:10,000

Pond	P	OS Maps, Aerial Photographs/satellite photos
Abstraction (Historic and active wells)	ABS	BGS online borehole database and OS Maps
Boreholes	BH	BGS online borehole database.

4.3 Watercourse – Key Information

For each of the watercourses the following was noted; flood risk associated with the watercourse, water quality status, and national/ international designations.

4.4 Groundwater

The water quality status for groundwater bodies is based on available groundwater vulnerability data

4.5 Baseline Conditions

Watercourse

- water quality,
- hydromorphology,
- hydrology and flood risk

5 Site Reconnaissance

5.1 Findings of site visit

The site visit confirms the local geology to be Alluvium overlying River Terrace Deposits. The water level in the river is estimated from GPS levels to be about 4m below the ground level adjacent to the Garnswllt WWTW settlement tanks.

The Settlement tanks have about 3 “dewatering holes” located at the circumference of the tanks themselves. Measurement of the ground water level indicates the ground water was at 1.75m bgl at the Eastern Tank and 1.41m at the Western tank. The pond located on site has a water level at about 0.5m below the site ground level. The observed ground water levels suggest there is a hydraulic gradient towards the pond.

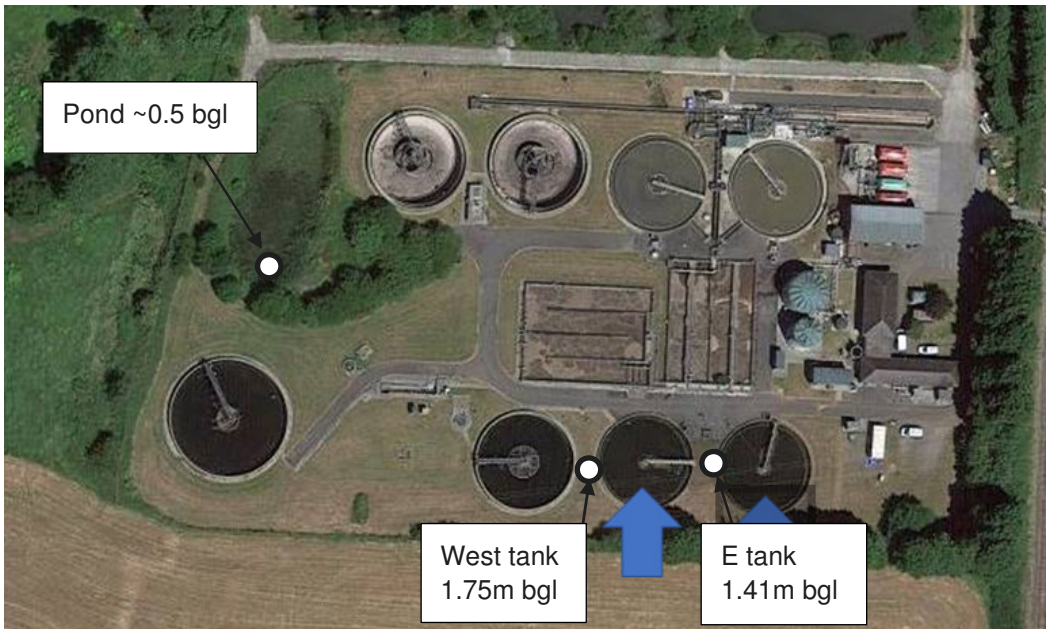


Figure 5. Ground water and pond levels 16/06/2021

The eastern tank is currently not operating, and the depth of the base slab is an estimation as there are no detailed drawings available.

The western tank is currently working at about 50%. The western tank has a history of maintenance and was emptied about 10 years ago with the base slab weighted down with gravel ballast. On completion of the remedial works at the time the gravel ballast was removed prior to the tank being filled again, unfortunately the upward pressure of the ground water cracked the base slab. Therefore the base slab is likely already weakened and highlights the importance of the need for controlled dewatering to protect the structure.

In terms of remedial works, only one tank at a time will be emptied as Garnswllt WWTW does not have enough capacity to empty two tanks at a time

The surrounding farmland to the east and south is part of a single farm at Herdsman's Cottage . The farmer on 16/06/2021 confirmed that they do not have any wells and take their water from a spring in the hillside above the River Terrace deposits. The Spring line can be seen on aerial photos at a level about 10m above the level of the River Terrace Deposits at Herdsman's Cottage. Therefore, it is unlikely the farm will be affected by dewatering at Garnswllt WWTW.

5.2 Site access

There are no limitations to site access, although there are overhead powerlines that will need to be considered for boring the dewatering holes.

6 Water Features Schedule

The water feature schedule lists the waterbodies identified within the project study area and provides their assigned reference number, NGR location.

The schedule also outlines key environmental information relating to the waterbodies including RBMP status (where applicable) and specific designations (e.g. SSSI, SAC, SPA, Drinking Water Protected Area (DWPA)). Justification for scoping-out water features from the environmental assessment is provided and for those subject to the assessment process, sensitivity values are given for the parameters: water quality (surface and groundwater), hydrology and flood risk, and hydromorphology.

As the River Loughor and River Cathan will act as a hydrological barrier, it is unlikely the proposed scheme will have an impact on water features beyond the opposite banks of these rivers (i.e. right bank looking downstream).

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
ABS01	N/A	Unknown well. First noted on 1965 OS Series maps	Well	261293	209800	817	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	High	High	-
ABS02	N/A	Unknown	Well	261384	209962	736	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	High	High	-
ABS03	N/A	Likely drinking water, disused since 1906, Source: OS County Series: Glamorganshire (partial) 1901-1907 1:10,560	Well	261248	210333	987	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	-
ABS04	N/A	Likely drinking water. Source: OS County Series: Glamorganshire (partial) 1901-1907 1:10,560. Disused by OS Plan (partial) 1977 1:2,500	Well	261298	210356	956	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	-
ABS05	N/A	Disused by OS Plan 1960-1962 1:2,500	Well	261452	210613	1005	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	-
ABS06	N/A	Disused by OS Plan 1960-1962 1:2,500	Well	261479	210701	1057	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	-
ABS07	N/A	Agriculture, still in use	Well	261877	210632	812	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	-

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
ABS08	N/A	Drinking possibly, Source: OS County Series: Glamorganshire (partial) 1901-1907 1:10,560. Disused by 1906 1:2,500 OS County Series: Carmarthenshire	Well	262035	211043	1190	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Medium	Medium	-
ABS09	N/A	Drinking possibly, Source: OS County Series: Carmarthenshire 1906 1:2,500. disused by OS Plan 1960-1962 1:2,500	Well	262030	211046	1194	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Medium	Medium	-
ABS10	N/A	Cooper's Well, use unknown, OS County Series: Carmarthenshire 1907-1908 1:10,560. Disused by OS Plan 1960-1962 1:2,500	Well	262579	210434	714	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	-
ABS11	N/A	Herdsman's Cottage Spring: Findings from site visit 16/06/2021. Location assumed near the toe of the slope behind the cottage or similar location.	Well	262497	209740	340	N/A	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	-
BH01	N/A	Reference: SN60NW2/A Name: PENYGARN O/C 1	Borehole	261200	209800	910	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH02	N/A	Reference: SN60NW2 Name: PENYGORN O/C SITE RECORD	Borehole	261220	209860	891	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH03	N/A	Reference: SN61SW31 Name: DECLIVITY SLANT, TY CROES ADDIT	Borehole	261290	210630	1130	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH04	N/A	Reference: SN61SW26 Name: BALANCE PIT, PANTYFFYNON OLD COLLIERY	Borehole	262000	210960	1111	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
BH05	N/A	Reference: SN61SW7 Name: COOPERS WELL O/C SITE 544	Borehole	262900	210700	1122	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH06	N/A	Reference: SN61SW53 Name: BETWS, NO.7	Borehole	262920	210650	1098	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH07	N/A	Reference: SN61SW25 Name: YRISTOWLOG	Borehole	262600	210110	504	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH08	N/A	Reference: SN61SW35 Name: CATTRAN COLLIERY	Borehole	263000	210100	869	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH09	N/A	Reference: SN60NW7 Name: BETWS 8 TAN Y GARN	Borehole	262900	209760	736	N/A	N	Y	Not Impacted by Scheme	-	-	N/A	N/A	N/A
BH10	N/A	Reference: SN60NW11 Name: PLAS UCHAF, TY CROES Water wells Reference: SN60/17 Location: PLAS UCHAF, TY CROES, CARMARTHANSHIRE Depth (m): 55.000000 Year: 2004 Geology: Yes Construction: Yes Chemical: No Hydrogeological: Yes Aquifer: PENNANT SANDSTONE FORMATION	Borehole	261000	209300	1229	N/A	N	Y	Not Impacted by Scheme	-	-	High	High	N/A
MW01	N/A	River Loughor	Major Water course	261965	209953	177	Y	N	N	May be hydraulically connected to strata targeted for dewatering	-	-	Medium	Medium	High

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
MW02	N/A	Nant y Fforest	Major Water course	261749	209825	361	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	High
MW03	N/A	Fferrws Brook	Major Water course	262094	210940	1085	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	High
MW04	N/A	River Amman	Major Water course	262269	210580	737	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	High
MW05	N/A	Unnamed water course	Major Water course	262345	210486	660	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Cathan	-	-	Medium	Medium	High
MW06	N/A	Unnamed water course	Major Water course	262530	210521	762	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Cathan	-	-	Medium	Medium	None
MW07	N/A	Major watercourse River Cathan	Major Water course	262213	210266	418	Y	N	N	May be hydraulically connected to strata targeted for dewatering	-	-	Medium	Medium	High
P01	N/A	Small (<0.002km2) waterbody west of River Loughor	Pond	261535	208923	1071	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Medium	Medium	High

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
P02	N/A	Small (~0.005km2) ephemeral water body/wetland west of River Lougher	Pond	261648	209057	898	y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	High	High	High
P03	N/A	Small (<0.0001km2) historic pond. disused/filled in. Source: 1898 1_2,500 OS	Pond	261881	209159	706	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	High	High	High
P04	N/A	Small (<0.001km2) historic pond. disused/filled in. Source: 1898 1_2,500 OS	Pond	261970	209107	733	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Medium	Medium	High
P05	N/A	Small (~0.004km2) ephemeral water body/wetland west of River Lougher	Pond	261636	209298	710	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	High	High	Medium
P06	N/A	Small (<0.002km2) ephemeral water body west of River Lougher. Agriculture, disused. Source: 1878-1879 1-2500 OS	Pond	261865	209989	281	y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	High
P07	N/A	Small (~0.001km2) ephemeral water body west of River Lougher. Agriculture, disused. Source: 1878-1879 1-2500 OS	Pond	261913	210044	274	y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	High
P08	N/A	Small (size obscured by trees on aerial photo) water body west of River Lougher. Source: 1878-1879 1-2500 OS	Pond	261901	210166	376	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	High

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
P09	N/A	Small (~0.0004km2) water body west of River Lougher	Pond	261831	210368	585	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	None
P10	N/A	Small (~0.004km2) water body west of River Lougher	Pond	261948	210382	552	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	High
P11	N/A	Small (size obscured by trees on aerial photo) water body west of River Lougher. Marked as reservoir. OS County Series: Carmarthenshire 1916-1918 1:2,500	Pond	261901	210169	378	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Low	Low	None
P12	N/A	Small (<0.001km2) water body east of River Lougher	Pond	262045	209904	83	Y	N	N	Likely impacted by the scheme, Inside the dewatering drawdown zone of influence	-	-	Medium	Medium	Low
P13	N/A	Agriculture, Small <100m2. Reservoir first noted on OS Plan 1960-1962 1:2,500, disused and possibly filled in since 1988 OS Map publication.	Pond	261880	210887	1058	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	Medium	Medium	None
P14	N/A	Small pond <100m2	Pond	263089	210629	1206	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Cathan	-	-	Medium	Medium	None
P15	N/A	Small pond <400m2	Pond	263028	209778	862	N	N	Y	Not Impacted by Scheme,	-	-	Medium	Medium	None

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
P16	N/A	Small pond <200m2	Pond	263052	209772	886	N	N	Y	Not Impacted by Scheme,	-	-	Medium	Medium	None
P17	N/A	Small pond <200m2	Pond	263078	209762	913	N	N	Y	Not Impacted by Scheme,	-	-	Medium	Medium	None
P18	N/A	Small pond <200m2	Pond	263104	209754	939	N	N	Y	Not Impacted by Scheme,	-	-	Medium	Medium	None
P19	N/A	Small pond <300m2	Pond	263131	209731	968	N	N	Y	Not Impacted by Scheme,	-	-	Medium	Medium	None
P20	N/A	Water body (~0.008km2) Agriculture, disused and possibly filled in since 1988 OS Map publication.	Pond	261969	208903	935	Y	N	Y	Not Impacted by Scheme,	-	-	High	High	Medium
P21	N/A	v small pond, size obscured by tress on aerial photo. First noted on OS Plan 1960-1962 1:2,500	Pond	261293	209799	817	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Lougher	-	-	High	High	None
P22	N/A	Small constructed tank/pond (~0.003km2) condition appears overgrown in aerial photos.	Pond	262094	209937	84	N	N	N	May be impacted, depends on condition of the surrounding structure	-	-	Medium	Medium	None
P23	N/A	Small constructed tank/pond (~0.003km2) condition appears overgrown in aerial photos.	Pond	262130	209935	82	N	N	N	May be impacted, depends on condition of the surrounding structure	-	-	Medium	Medium	None
P24	N/A	Small constructed tank/pond (~0.003km2) condition appears overgrown in aerial photos.	Pond	262171	209932	82	N	N	N	May be impacted, depends on condition of the surrounding structure	-	-	Medium	Medium	None

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
PN	N/A	Small ephemeral pond. size indeterminable on grid reference finder aerial photography and appears dry	Pond	262171	209932	82	Y	N	N	May be impacted, depends on condition of the surrounding structure	-	-	Medium	Medium	High
PS01	N/A	Potential ground contamination from an aggregate cement works.	Constructed Feature	262282	210240	406	Y	N	N	Potential source of contamination plum for long duration	-	-	Medium	Medium	High
PS02	N/A	Potential ground contamination from railway.	Constructed Feature	262215	209838	49	Y	N	N	Potential source of contamination plum for long duration	-	-	Medium	Medium	High
PS03	N/A	Potential ground contamination from headsman's Cottage buildings area.	Constructed Feature	262395	209784	231	Y	N	N	Potential source of contamination plum for long duration	-	-	Medium	Medium	Low
W01	N/A	Small Channel on 1:10,000 flowing south	Minor	261479	209076	981	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	High
W01.1	N/A	Small Channel on 1:10,000 joins W01. Marked as issuing from drainage	Minor	261536	209246	817	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	None
W01.2	N/A	Small Channel on 1:10,000 joins W01. Marked as issuing from drainage, possibly issue from historic well ABS01	Minor	261582	209320	732	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	None
W01.3	N/A	Small Channel on 1:10,000 joins W01. Possibly issuing from a spring.	Minor	261631	209398	643	y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	None

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
W02.1	N/A	Small Channel on 1:10,000 joins MW02. Possibly issuing from a spring	Minor	261418	209875	694	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	High
W02.2	N/A	Small Channel on 1:10,000 joins MW02. Possibly issuing from a spring/ABS03	Minor	261366	209919	749	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	High
W03	N/A	Small Channel on 1:10,000 joins MW01.	Minor	261765	209855	346	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	High
W03.1	N/A	Drainage ditch on 1:10,000 joins W03.	Minor	261762	209939	360	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	None
W03.2	N/A	Drainage ditch on 1:10,000 joins W03.1	Minor	261683	209968	444	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	None
W03.3	N/A	Drainage ditch on 1:10,000 joins W03.1	Minor	261593	210021	545	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	High	High	None
W04	N/A	Drainage ditch on 1:10,000	Minor	261501	210446	850	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	None

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
W05	N/A	Drainage ditch on 1:10,000	Minor	261458	210494	914	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	None
W06	N/A	Drainage ditch/small channel on 1:10,000	Minor	261905	210628	800	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	None
W07	N/A	small channel on 1:10,000. Joins MW01	Minor	262213	210613	764	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	High
W07.1	N/A	small channel on 1:10,000, Joins W07	Minor	261597	210736	1020	Y	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	High
W08	N/A	Ditch/small channel on 1:10,000. Joins MW03	Minor	262031	211080	1228	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	None
W08.1	N/A	Ditch/small channel on 1:10,000, Joins W08	Minor	261980	211035	1187	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	Medium
W08.2	N/A	Ditch/small channel on 1:10,000, Joins W08	Minor	261966	211029	1183	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	High

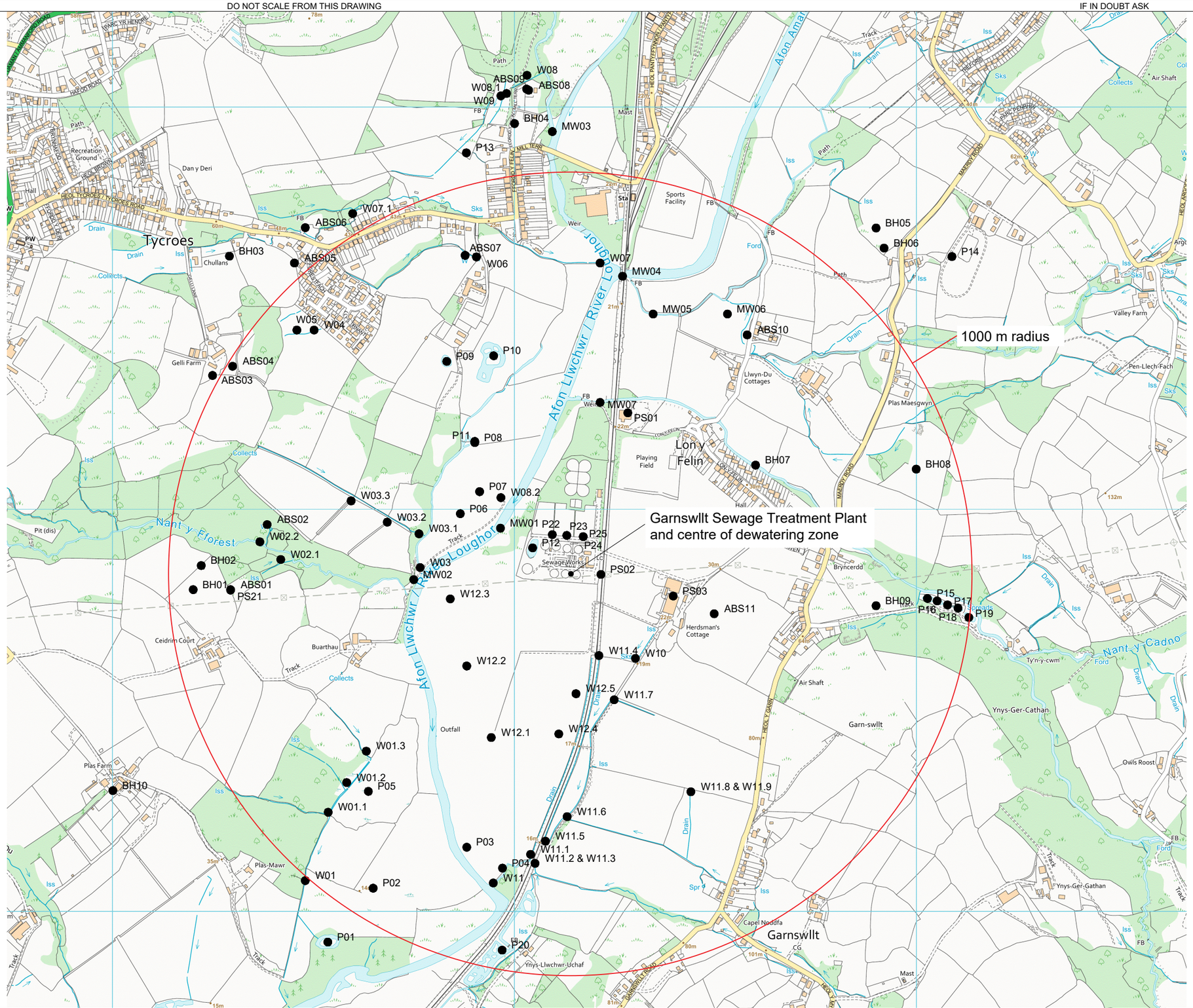
Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
W09	N/A	small channel marked as drain on 1:10,000, Joins MW06	Minor	261966	211029	1183	N	N	Y	Not Impacted by Scheme, hydrologically isolated by River Loughor	-	-	Medium	Medium	High
W10	N/A	small drain marked as issuing from a subsurface drain and terminates in a soakaway.	Minor	262301	209629	235	N	N	N	May be impacted by the scheme, outside, but upslope from the drawdown influence	-	-	Medium	Medium	Low
W11	N/A	small channel joins MW01.	Minor	261947	209070	774	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	High
W11.1	N/A	drainage ditch adjacent to the railway line, joins W11. Outflow from P20	Minor	262040	209141	690	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	High
W11.2	N/A	drainage ditch/small channel adjacent to the railway line, joins W11. Outflow from P21	Minor	262051	209119	710	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	High
W11.3	N/A	small drainage along fence line, joins 11.2	Minor	262051	209119	710	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	High
W11.4	N/A	drainage ditch adjacent to the railway line, joins W11.1.	Minor	262210	209636	191	Y	N	N	May be impacted by the scheme, outside, but upslope from the drawdown influence	-	-	Medium	Medium	Medium
W11.5	N/A	slope toe drainage ditch W11.4.	Minor	262077	209174	654	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	High
W11.6	N/A	drainage ditch along fence line, joins W11.5.	Minor	262131	209235	588	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	Low
W11.7	N/A	drainage ditch along fence line, joins W11.5.	Minor	262248	209526	307	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	None

Water Feature									Scoped Out of Environmental Assessment		Sensitivity				
Water Feature Ref	Relevant Hydro ID	Name / Description	Category	NGR Easting	NGR Northing	Distance from source	Flooding in 200 Year	Located within any designated boundaries	Y/N	Justification	Water Quality (Surface Water)		Aquifer vulnerability		Hydrology & Flood Risk
											Water Quality	Biodiversity	Bedrock	Superficial	
W11.8	N/A	drainage ditch	Minor	262439	209297	591	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	None
W11.9	N/A	drainage ditch	Minor	262439	209297	591	Y	N	Y	Not Impacted by Scheme	-	-	Medium	Medium	None
W12.1	N/A	Ephemeral ponding in abandoned river channel >0.002km2. Identified from field visit and aerial photography	Minor	261942	209432	429	Y	N	Y	Unlikely to be impacted by Scheme due to proximity to River Loughor and distance down stream	-	-	High	High	High
W12.2	N/A	Ephemeral ponding in abandoned river channel <0.002km2. Identified from field visit and aerial photography	Minor	261881	209610	315	Y	N	Y	Unlikely to be impacted by Scheme due to proximity to River Loughor and distance down stream	-	-	High	High	High
W12.3	N/A	Ephemeral ponding in abandoned river channel <0.002km2. Identified from field visit and aerial photography	Minor	261840	209777	275	Y	N	Y	Unlikely to be impacted by Scheme due to proximity to River Loughor and distance down stream	-	-	Medium	Medium	High
W12.4	N/A	Ephemeral ponding in abandoned river channel <0.002km2. Identified from field visit and aerial photography	Minor	262110	209441	385	Y	N	Y	Unlikely to be impacted by Scheme due to proximity to River Loughor and distance down stream	-	-	Medium	Medium	High
W12.5	N/A	Ephemeral ponding in abandoned river channel ~0.003km2. Identified from field visit and aerial photography	Minor	262153	209541	281	Y	N	Y	Unlikely to be impacted by Scheme due to proximity to River Loughor	-	-	High	High	High

Appendix A Water Features plan

DO NOT SCALE FROM THIS DRAWING

IF IN DOUBT ASK



Notes

1. Drawing has been prepared as supplementary information for the Water Features Survey required for the Garnswllt Dewatering Application
2. Map scale is 1:10,000
3. Search area for the water features survey is 1000 m radius from the dewatering zone
4. Drawing to be read in conjunction with Report No. 300392-DEL-XXX-RP-00001
5. Centre of dewatering zone;
   Grid Reference: SB62139 09839
   Grid Reference (6 figure): SN621098
   X (Easting): 262139
   Y (Northing): 209839

Revision	Description	Designed	Drawn	Checked	Approved	Date
P01	First Issue	NH	SMM	CH	PT	02/07/2021

Client

Originator

MORGAN SINDALL ENGINEERING SOLUTIONS

Morgan Sindall Engineering Solutions
Corporation Street Rugby Warwickshire CV21 2DW
T 01788 538731 morgansindall.com

Drawing Title: Water Features Survey

Drawing Number: 300392-DEL-XXX-DR-00001

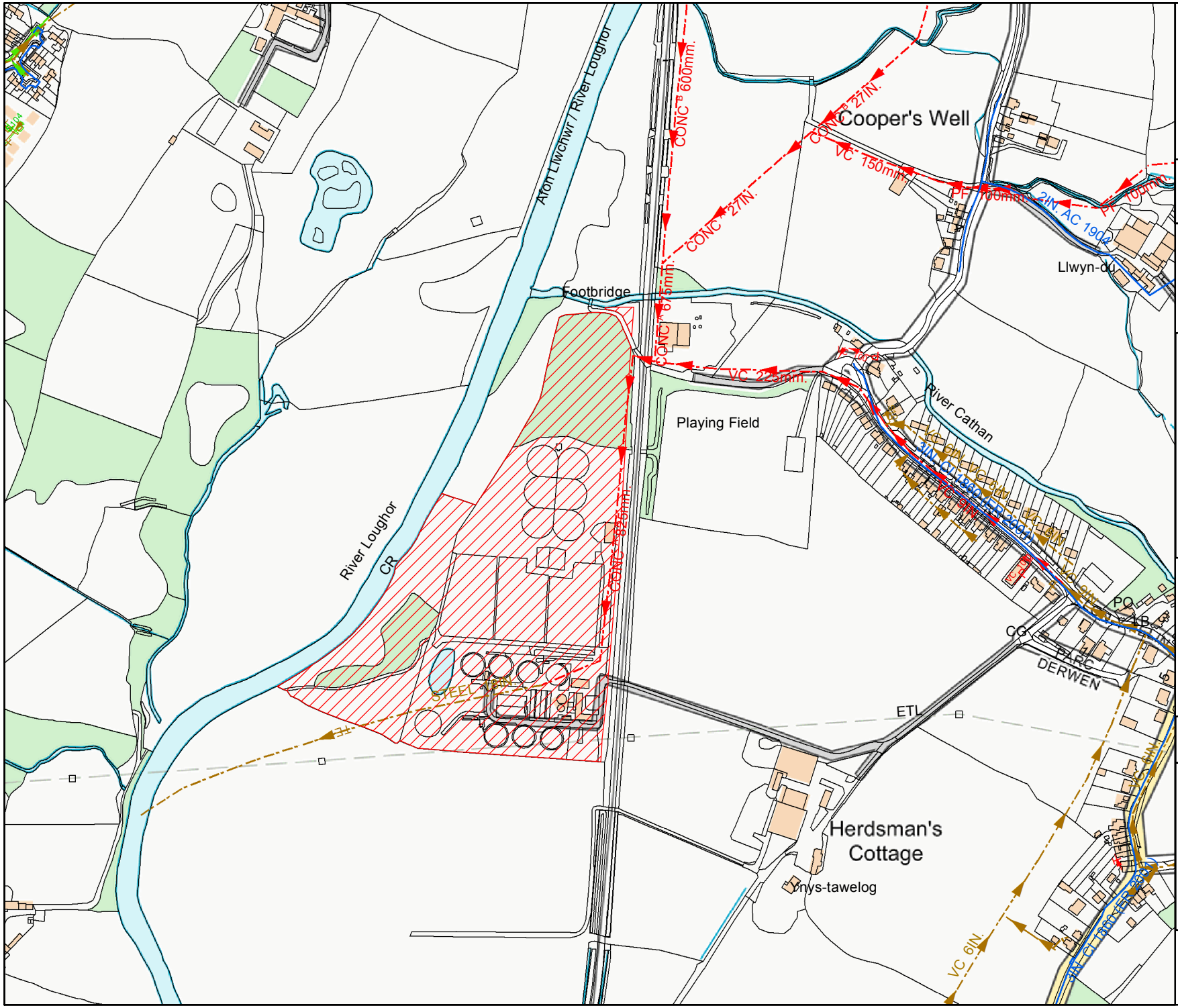
Revision: P01

Scale: N.T.S

Original Size: A3

Drawing Status: Preliminary

Project: Garnswllt



Dŵr Cymru
Welsh Water

Garnswllt WWTW

N
W E
S

LEGEND

- Sluice Valve
- Air Valve SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- Bulk Meter
- Fire Hydrant
- Cap
- Non Dwr Cymru
- Existing Distribution Main
- Gravity Sewer
- Rising Main
- Outfall
- Pumping Station
- Lamphole
- Combined Sewer Overflow
- Special Purpose Chamber
- Treatment Works
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the sewer type.
RED - Combined
GREEN - Surface Water
BROWN - Foul

Notes:

--- Type notes here ---
--- Remembering to manually add line breaks ---

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	262,192, 210,068
Map scale:	1:5,000
Printed by:	sgrey
Printed on:	18/03/2021

Dŵr Cymru
Welsh Water

Garnswllt WWTW

N
W E
S

LEGEND

- Sluice Valve
- Air Valve SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- Bulk Meter
- Fire Hydrant (FH)
- Cap
- Non Dwr Cymru
- Existing Distribution Main
- Gravity Sewer
- Rising Main
- Outfall
- Pumping Station
- Lamphole (LH)
- Combined Sewer Overflow (CO)
- Special Purpose Chamber (SPC)
- Treatment Works
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the sewer type.
RED - Combined
GREEN - Surface Water
BROWN - Foul

Notes:

--- Type notes here ---
--- Remembering to manually add line breaks ---

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	262,192, 210,068
Map scale:	1:5,000
Printed by:	sgrey
Printed on:	18/03/2021