

Drainage Strategy Report (DSR) For:
Proposed Commercial Units Development,
Plot E, Felindre Meadows,
Pencoed Technology Park, Pencoed

Prepared for:

FABCO Holdings Ltd

REF: 14908 – DSR – R03

Document Control

Project	Proposed Commercial Units Development: Plot E, Felindre Meadows, Pencoed Technology Park, Pencoed
Client	FABCO Holdings Ltd
Vale Consultancy Ref:	14908 – Drainage Strategy Report

Document Checking:

Prepared By: R Melvin

Signed:



Checked By: P Graham

Signed:

Verified By: S Hardacre

Signed:



Issue	Date	Status
01	08.09.2023	First issue
02	30.01.2024	Second issue
03	05.02.2024	Third issue

CONTENTS

1	INTRODUCTION	4
1.1	Site Location	4
1.2	Proposed Development	5
1.3	Topography	5
1.4	Existing Geology	5
1.5	Flood Risk	5
2.0	DRAINAGE SYSTEMS ASSESSMENT	6
2.1	Existing Drainage Systems	6
2.2	Sustainable Drainage Systems (SuDS) Compliance	6
3.0	PROPOSED DRAINAGE – SURFACE WATER	7
3.1	Sustainable Surface Water Drainage	7
3.2	S1: SuDS hierarchy of surface water discharge locations	7
3.2.1	Priority Level 1 - Surface water collected for reuse:	7
3.2.2	Priority Level 2 – Discharge via infiltration:	7
3.3	S2: Surface water runoff hydraulic control	8
3.3.1	Hydraulic Design Calculations	8
3.3.2	Exceedance Flows	8
3.4	S3: Water Quality	9
3.5	S4: Amenity	10
3.6	S5: Biodiversity	10
3.7	S6: Operation and Maintenance Requirements	11
4	CONCLUSIONS	12
	APPENDIX A: Site Location and Survey Plan	13
	APPENDIX B: Proposed Development Plans	14
	APPENDIX C: NRW Flood Maps	15
	APPENDIX D: DCWW Apparatus Record Plans	16
	APPENDIX E: Infiltration Testing Results	17
	APPENDIX F: Hydraulic Design Calculations and Proposed Catchments Plan	18
	APPENDIX G: Proposed Surface Water Drainage Layout and Details	19
	APPENDIX H: Exceedance Flows Plan	20
	APPENDIX I: SuDS Planting Schedule and Landscaping Drawing	21
	APPENDIX J: SuDS Maintenance Plan	22

Limitations

The DSR is prepared as the basis of the SAB application and in support of a planning application, and is for the exclusive benefit of *The Client*. It may not be assigned to or relied upon by third party without the agreement of Vale Consultancy in writing. Vale Consultancy retains all copyright and other intellectual property rights in the document and its contents unless transferred by written agreement between Vale Consultancy and *The Client*.

All comments and proposals contained in this report, including any conclusions, are based on information available to Vale Consultancy during investigations. The conclusions drawn by could therefore differ if the information is found to be inaccurate or misleading. Vale Consultancy accepts no liability should this be the case, nor if additional information exists or becomes available with respect to this scheme.

The date on which this assessment was undertaken, and the date on which the final report is delivered.

All the Natural Resources Wales (NRW) mapping data used is under special licence. Data is current as of **September 2023** and is subject to change.

Purpose of the Report

The purpose of the report is to describe the proposed strategies for the discharge of surface water emanating from the development proposals; in support of a full SuDS Approval Body (SAB) application for Monmouthshire County Council. Flow rates for surface water will be quantified, and a SuDS approval body (SAB) full application will be submitted in support of planning application. The SAB consent legislation came into effect on 7th January 2019, when the Welsh Government introduced Schedule 3 of the Flood and Water Management Act 2010.

1.0 INTRODUCTION

1.1 Site Location

Vale Consultancy has been instructed by FABCO Holdings Ltd, 'The Client' to undertake a drainage strategy report (DSR) for the proposed commercial units at Plot E, Felindre Court, Pencoed Technology Park, Pencoed, (296951E, 180653N).

Refer to Figure 1 below.

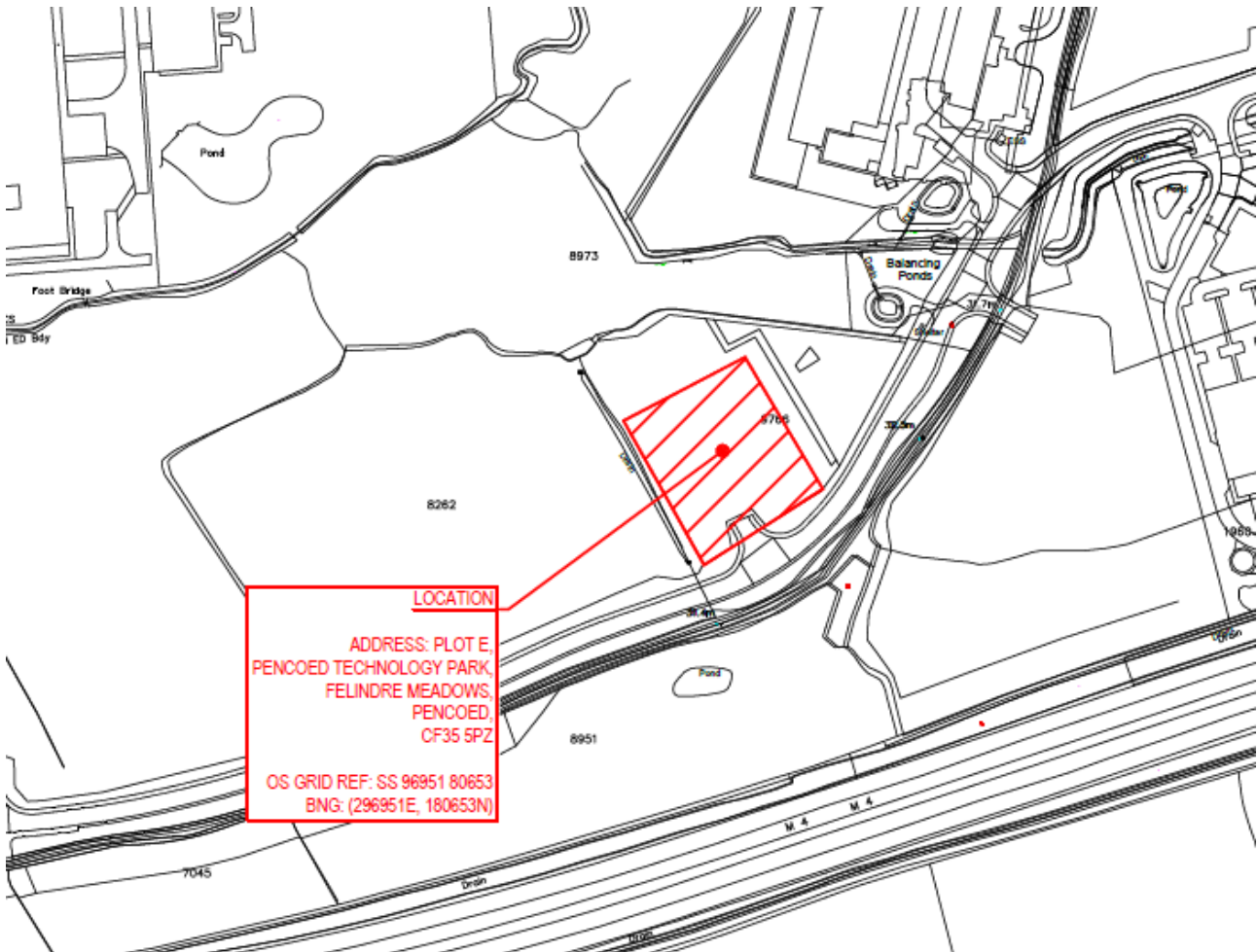


Figure 1 - Site Location Plan

The development site has a total site area of **6505 m² (0.6505 ha)** of undeveloped land, which has been prepared for development as part of the wider Pencoed Technology Park Scheme, with infrastructure (including foul drainage) installed to site entrance highway spur, off Felindre Meadows. The site is situated to the east of Pencoed, circa 780m east of M4 junction 35.

Refer Site Location Plan: Appendix A.

The site is *Undeveloped Land* and is therefore considered to be *Greenfield*.

The drainage strategy assesses the proposals for the management of the surface water discharge from the proposed development, within the context of the expectations of the planning proposals, and also within the constraints of the site layout, environmental conditions.

1.2 Proposed Development

The proposed development consists of three blocks of commercial starter units, totalling 16 units with associated car parking areas, set around a central vehicle access road with a turning area forming a 'T' shape at its end, which is accessed off the existing highway spur from Felindre Meadows.

The development will be sited at existing ground level, with some cut and fill as required to realise the scheme.

Although the overall site area is **0.6505 ha**, the actual developed area of buildings and hard landscaped areas totals **5031 m² (0.503 ha)**.

In conjunction with our design and assessment as civil engineers, information from the other appointed consultants including 360AD Ltd (Project Architect), have been used to produce the DSR and SAB submission.

Refer to Site Proposed: Appendix B.

1.3 Topography

A site topographic survey has been undertaken which includes site and boundary features and site levels. The site has been prepared for development, and is currently open grassland. Ground levels across the site reduce gradually from the south-east to north-west from 32.70m to 31.0m. There is an existing pond situated to the north, adjacent to the site.

Refer Site Survey: Appendix A.

1.4 Existing Geology

A number of site investigation reports were produced for an adjacent site, Plot F, including two reports undertaken by Ove Arup and Partners for the wide Pencoed Technology Park, which at the time were undertaken for the Welsh Development Agency (WDA). These site investigations are to be used as guidance for this site, with further site and ground investigations planned for this site (Plot E) for a more specific indication of the ground conditions at the site. Infiltration testing has recently been carried out at the site by GJ Francis and determined rates between 4.01×10^{-4} m/s (1.4436m/hr) and 7.55×10^{-4} m/s (2.7180 m/hr) across two trial pits. The lower rate has been used for the hydraulic calculation.

The British Geological Survey records show the bedrock geology as Oxwich Head Limestone Formation comprising of sedimentary bedrock formed between 337 million and 329 million years ago during the carboniferous period. There are superficial deposits recorded at the site, consisting of Devensian Till – sedimentary superficial deposits formed between 116 and 11.8 thousand years ago during the Quaternary period.

Refer to FABCO Holdings Plot F Site Investigation Report – Ref: F210610 (which incorporates previous reports)

1.5 Flood Risk

The Natural Resources Wales Flood Map For Planning (FMFP) indicates that the site is not located within any flood risk zones and is '*considered to be at little or no risk flooding due to surface water, groundwater, tidal, rivers or reservoirs*'. This also indicates that the justification test is not applicable and there is no need to consider flood risk further.

Refer NRW FMFP: Appendix C.

2.0 DRAINAGE SYSTEMS ASSESSMENT

2.1 Existing Drainage Systems

There are no recorded surface water drainage assets, either private, local authority or Dwr Cymru Welsh Water recorded within the curtilage of the proposed development site. The site has been prepared for development as part of the wider Pencoed Technology Park scheme, with infrastructure (including foul drainage) installed to the site boundary at highway entrance spur off Felindre Meadows. The Dwr Cymru Welsh Water DCWW apparatus record plans shown an adopted combined chamber within the site access highway spur (Ref: SS 96809601), with 525mm diameter downstream sewer.

Refer DCWW Apparatus Plans: Appendix D

2.2 Sustainable Drainage Systems (SuDS) Compliance

The Flood and Water Management Act 2010 (Schedule 3), requires new developments to include SuDS features that comply with national standards. The Welsh Governments published statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (2018), which became mandatory as of 7th January 2019, and determines the most effective way of embedding SuDS principles in new developments. The statutory national standards are accepted by local authorities that they have taken account of the Welsh Government planning advice on Development and Flood Risk, and the impact of surface water runoff from the development, which is based on limiting the peak runoff rate and runoff volume for extreme events for the 1 in 100-year return period *plus* climate change. In aiming to replicate ‘*greenfield*’ runoff rates for extreme events, this will help to ensure that flood risk is not increased by the development proposals.

This surface water drainage strategy will comply with the Statutory National Standards for Sustainable Drainage Systems (SuDS) for Wales including the Standard Principles and itemised *Standards 1 to 6* as outlined in Sections **3.2 – 3.7**.

3.0 PROPOSED DRAINAGE – SURFACE WATER

3.1 Sustainable Surface Water Drainage

The proposed surface water drainage layout illustrates how surface water runoff from developed hard landscaped areas will be managed. The hard landscaped areas within the development include roof, vehicle circulation space and parking areas

For the purposes of the surface water drainage strategy the site is considered to be categorised as *Greenfield* or *Undeveloped*.

3.2 S1: SuDS hierarchy of surface water discharge locations

The following receptors have been considered for surface water runoff on site, in order of SuDS preference. The aim of SuDS Standards is to ensure that the most effective drainage scheme is delivered with the most preferred levels of surface water destination, where the design can move to the next means of discharge only under exception criteria.

1. Surface Water collection for reuse.
2. Discharge by infiltration into ground.
3. Discharge into open surface water body.
4. Discharge into surface water sewer, highway drain, or other drainage system.
5. Discharge into combined sewer.

3.2.1 Priority Level 1 - Surface water collected for reuse:

The site development of 16 commercial starter units is not expected to require any significant non-potable water demand. As such, there is not a proposal to provide any water butts or rainwater harvesting systems within the development.

It is noted that, although rainwater harvesting systems provide environmental benefits, they do not provide mechanism to manage surface water runoff, either by means of reducing discharge rates or discharge volumes.

No solution, move to next Priority Level

3.2.2 Priority Level 2 – Discharge via infiltration:

Infiltration testing was recently carried out by G J Francis in September 2023 within the site boundary. Two trial pits were dug and three tests carried out at each pit in accordance with BRE365.

The soakaway tests revealed the following results:

TP1	Test 1	4.20x10 ⁻⁴ m/s
	Test 2	4.01x10 ⁻⁴ m/s
	Test 3	4.09x10 ⁻⁴ m/s
TP2	Test 1	7.55x10 ⁻⁴ m/s
	Test 2	6.02x10 ⁻⁴ m/s
	Test 3	6.08x10 ⁻⁴ m/s

Refer Plot E Soakaway Test Result Report by G J Francis: Appendix E

The site infiltration rates recorded are considered an effective rate at which to manage surface water runoff by means of infiltration methods.

From the above test results, an infiltration rate of 4.01×10^{-4} m/s (1.4436 m/h), will be applied to all scheme infiltration system calculations. It is proposed that the existing pond will be re-purposed as an infiltration basin for the final point of surface water discharge.

Proposed discharge of surface water via infiltration achieved. Priority levels 3-5 are less desirable, and therefore not considered.

3.3 S2: Surface water runoff hydraulic control

From the section above, it has been shown that the principle of managing surface water run off by means of infiltration is viable for the scheme. Surface water run-off from the development will primarily be managed via infiltration basin. The existing basin to the North of the development area will be utilised for the surface water attenuation and discharge destination. ACO channel drains and filter strips will be used to collect surface water from rainwater pipes and car parking and pedestrian access areas.

Bin store areas will be managed by traditional road gullies which will discharge into the foul sewer system due to the potential for contaminated surface water run off to pollute SuDs features and groundwater.

3.3.1 Hydraulic Design Calculations

The surface water runoff and management have been calculated and designed using Micro Drainage Source Control Module. The designs use FEH rainfall data for all standard storm durations for events up to and including the 1 in 100 year plus 40% climate change. Infiltration test results have identified that the ground underlying the site is suitable for infiltration as a method of managing the site surface water runoff from hard landscape areas via infiltration systems.

The infiltration test showed consistent characteristics, with a design infiltration rate of 4.01×10^{-4} m/s (1.4436m/hr) applied in all calculations.

Refer Hydraulic Design Calculations: Appendix F.
Refer Drainage Strategy and Details: Appendix G

The calculations demonstrate that, based on the site soakaway test results, the proposed amendments to the existing infiltration basin will ensure that the basin will have sufficient capacity to manage surface water runoff from post development hard landscaped areas, with surface water managed effectively with the site boundary.

3.3.2 Exceedance Flows

Exceedance flow occur during rainfall events which exceed the capacity of the drainage system, due to either rainfall events beyond standard design considerations or issues with the maintenance and performance of the surface water drainage systems. The topography of the site reduces in level gradually towards the north-east of the site. Exceedance flows will be directed onto the access road, and will flow towards the turning area at the northern side of the access road. The water will then be directed to the north-west corner of the site due to its topography where it will naturally infiltrate into the ground or flow into the existing pond to the rear of

block 6. The infiltration basin is to be constructed with a 300mm freeboard which will attenuate the first of the exceedance flows.

Refer to the Flow Exceedance Route Plan, Appendix H.

3.4 S3: Water Quality

There are no existing site surface drainage systems, as the site is greenfield site. Post development surface water runoff will be generated by hard landscaped areas comprising: roofs, access road and parking areas. Surface water runoff final destination will be infiltration via an infiltration basin.

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015) definitions, commercial roofs have a 'low' pollution hazard level, with commercial access roads and parking areas also having a 'low' pollution hazard level. Table 1 shows the pollution hazard indices for each land use. To deliver adequate water quality treatment the total SuDS mitigation index must be more than the pollution hazard index for each contaminant type. The pollution hazard and mitigation indices have been taken from tables 26.2 and 26.3 of the CIRIA SuDS Manual 2015.

The proposed design will ensure that surface water runoff from roof and hard landscaped areas will discharge to infiltration basins which will provide primary treatment, with either direct runoff flows, or via filter drains and linear drainage channels and stone lined rills. The final surface water destination is infiltration to the ground.

The SuDS components will separate the smaller particles and chemicals from the surface water discharge, as it filters through providing sufficient water quality treatment to water discharging to ground.

Table 1 – Summary of pollution Hazard and relevant SuDS Mitigation Indices

Water quality - Simple Index Approach									
		Pollution hazard index				Mitigation Index			
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons	SuDS Components for land use	Total Suspended Solids (TSS)	Metals	Hydro-carbons	Mitigation hazard index > Pollution hazard index (for each contaminant type)
Parking areas	Low	0.5	0.4	0.4	Infiltration Basin	0.7	0.7	0.5	Yes
Access Road (low traffic road)	Low	0.5	0.4	0.4	Infiltration Basin	0.7	0.7	0.5	Yes
Roof areas	Low	0.3	0.2	0.05	Infiltration Basin	0.7	0.7	0.5	Yes

The proposed SuDS components will be sufficient in removing contaminants and pollutants for the proposed site and will have a positive impact on the receiving water quality for the runoff source.

3.5 S4: Amenity

The proposed SuDS features will enhance and soften the impact of the built environment, and will provide an aesthetically pleasing aspect to the development. The raingardens will be planted with native wildflower species which will improve the appearance and add colour to the commercial/industrial setting.

The SuDS features provided with the development will enhance the overall environmental setting of the proposed development.

Refer Drainage Engineering Layout – 14908_C500: Appendix G.

3.6 S5: Biodiversity

The development site is set in a semi-rural location on the eastern side of Pencoed. When established, the planted SuDs features will provide a habitat for invertebrates, attracting insects and subsequently birds and also contributing towards local biodiversity. These features will also link with the repurposed pond to the rear of block 6, further contributing towards the biodiversity of the area.

Refer Landscaping Plan: Appendix I

3.7 S6: Operation and Maintenance Requirements

To ensure SuDS components continue to operate reliably, regular inspection and maintenance should be carried out. In most cases, appropriate information should be provided by the relevant manufacturer on what has been installed, how it works, when to inspect it and whether maintenance will be required. CIRIA C753 The SuDS Manual also provides information on the operation and maintenance requirements for various SuDS components.

Conventional surface water drainage features such as gullies, channels, silt traps and manholes should be inspected as an absolute minimum annually, and where practicable after intense storm events, with silt removal.

Maintenance of the guttering and RWP's is key to effectively managing surface water runoff, particularly due to the proximity of the large established trees in this semi-rural setting.

The raingardens and the infiltration basin should be inspected for litter, which should be disposed of offsite. Any weak or dying plants should be replaced, and the basin weeds sprayed and removed when dead during the following inspection.

The maintenance plan 60-year life cycle costings for the SuDS components are included in **Appendix J**.

The construction programme will be developed by the appointed contractor, and be coordinated with the construction of the non-SuDS feature development on site, i.e. building foundations and super structure, foul drainage and services.

4 CONCLUSIONS

The proposed development consists of three blocks of commercial starter units, totalling 16 units, set along a central access road with parking zones situated to the front of the units, which is accessed off the existing highway spur from Felindre Meadows.

Infiltration testing has recently been carried out at the site by GJ Francis and determined rates between 4.01×10^{-4} m/s (1.4436m/hr) and 7.55×10^{-4} m/s (2.7180 m/hr) across two trial pits. The lower rate has been used for the hydraulic calculation. As such, there will not be an offsite surface water discharge from the development.

Surface water run-off from the development will primarily be managed via infiltration basin. The existing basin to the North of the development area will be utilised for the surface water attenuation and discharge destination. ACO channel drains and filter strips will be used to collect surface water from rainwater pipes and car parking and pedestrian access areas.

Exceedance flows will also be contained within the site where possible, within the 300mm freeboard of the infiltration basin, or discharging to the north-west corner of the site.

The scheme seeks to be cost effective, easily maintainable, improve amenity and biodiversity where possible, and improve surface water runoff from the area.

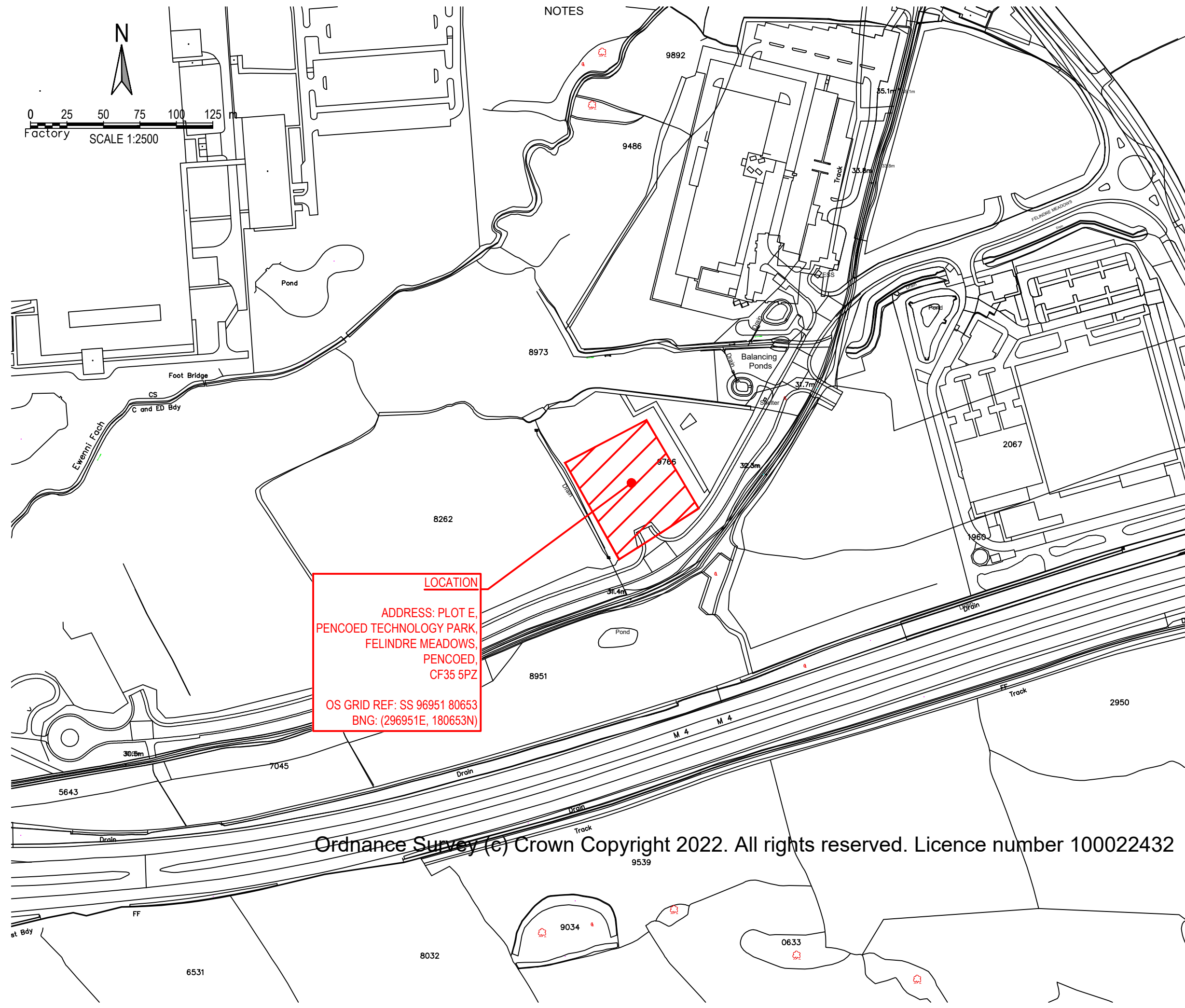
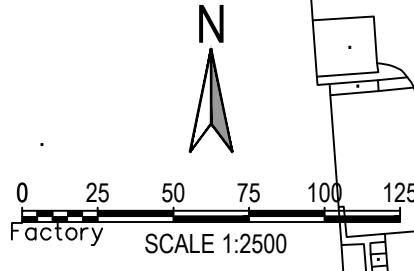
It is concluded that this DSR and full SAB application complies with the SAB consent legislation came into effect on 7th January 2019, when the Welsh Government introduced Schedule 3 of the Flood and Water Management Act 2010.

APPENDIX A: Site Location and Survey Plan

NOTES

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.



LOCATION
ADDRESS: PLOT E,
PENCOED TECHNOLOGY PARK,
FELINDRE MEADOWS,
PENCOED,
CF35 5PZ

OS GRID REF: SS 96951 80653
BNG: (296951E, 180653N)

01	RM	PG	SH	24.07.23	PRELIMINARY
rev.	drawn	chkd.	apprvd.	date	description

Client
FABCO

Project
PLOT E PENCOED TECHNOLOGY PARK
BRIDGEND
CF35 5PZ

Title
LOCATION PLAN

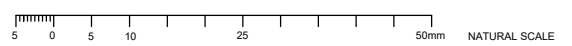


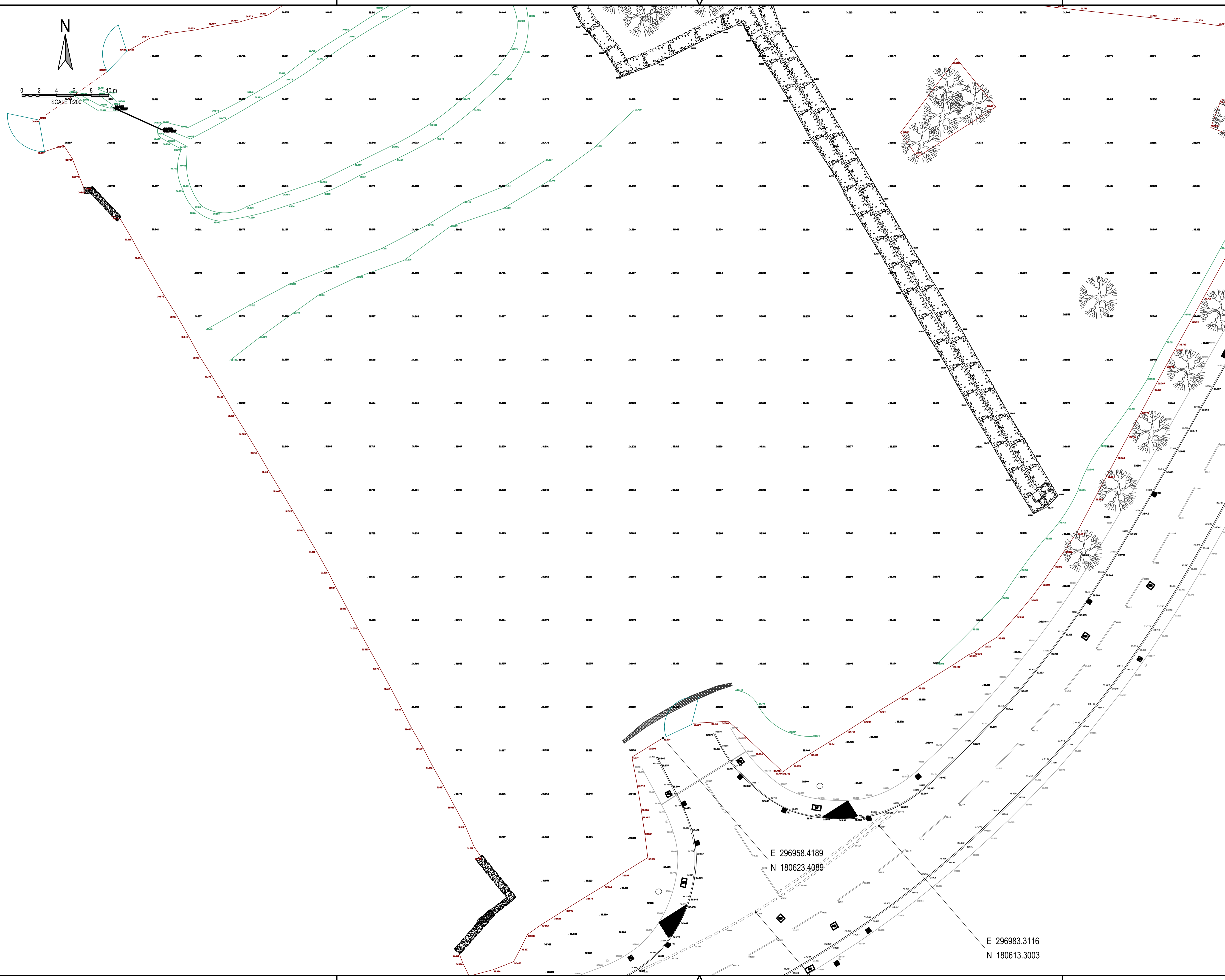
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
 Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked	approved
24.07.23	RM	PG	SH
scale @ A3	project no.		
1:2500	14908		

status	drg. no.	rev.
P	14908/C100	01

Ordnance Survey (c) Crown Copyright 2022. All rights reserved. Licence number 100022432

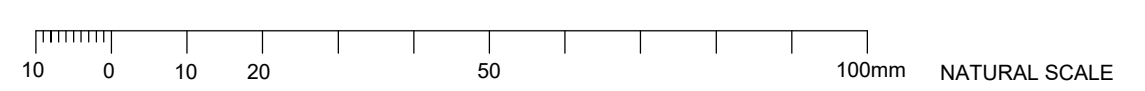




- GENERAL NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
 3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
 4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
 5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
 6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.
 7. TEMPORARY WORKS DESIGN BY OTHERS.
 8. DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

PRELIMINARY

01	RM	PG	SH	25.07.23	PRELIMINARY
rev.	drawn	chkd.	appvd.	date	description
Client FABCO					
Project PLOT E PENCOED TECHNOLOGY PARK BRIDGEND CF35 5PZ					
Title TOPOGRAPHICAL SURVEY					
<p>Vale Consultancy CONSULTING CIVIL & STRUCTURAL ENGINEERS 29 Bocam Park, Old Field Road, Pencoed, Bridgend, CF35 5LJ. Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk</p>					
date	drawn	checked	approved		
25.07.23	RM	PG	SH	25.07.23	25.07.23
scale @ A1 1:200		project no. 14908			
status	drg. no.				rev.
P	14908/C101				01



APPENDIX B: Proposed Development Plans



0 2 4 6 8 10 m
SCALE 1:200



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.
7. TEMPORARY WORKS DESIGN BY OTHERS.
8. DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

PRELIMINARY

01	RM	PG	SH	25.07.23	PRELIMINARY
rev.	drawn	chd.	appd.	date	description

Client
FABCO

Project
**PLOT E PENCOED TECHNOLOGY PARK
BRIDGEND
CF35 5PZ**

Title
PROPOSED SITE LAYOUT

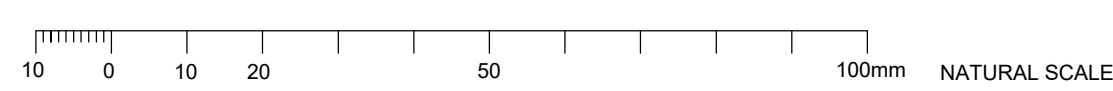


date	drawn	checked	approved
25.07.23	RM	PG 25.07.23	SH 25.07.23
scale @ A1	project no.		
1:200	14908		

**PROPOSED SITE LAYOUT DESIGN
BY 360AD (PROJECT ARCHITECT)
AND IS SUBJECT TO CHANGE**

status	drg. no.	rev.
P	14908/C200	01



















DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender

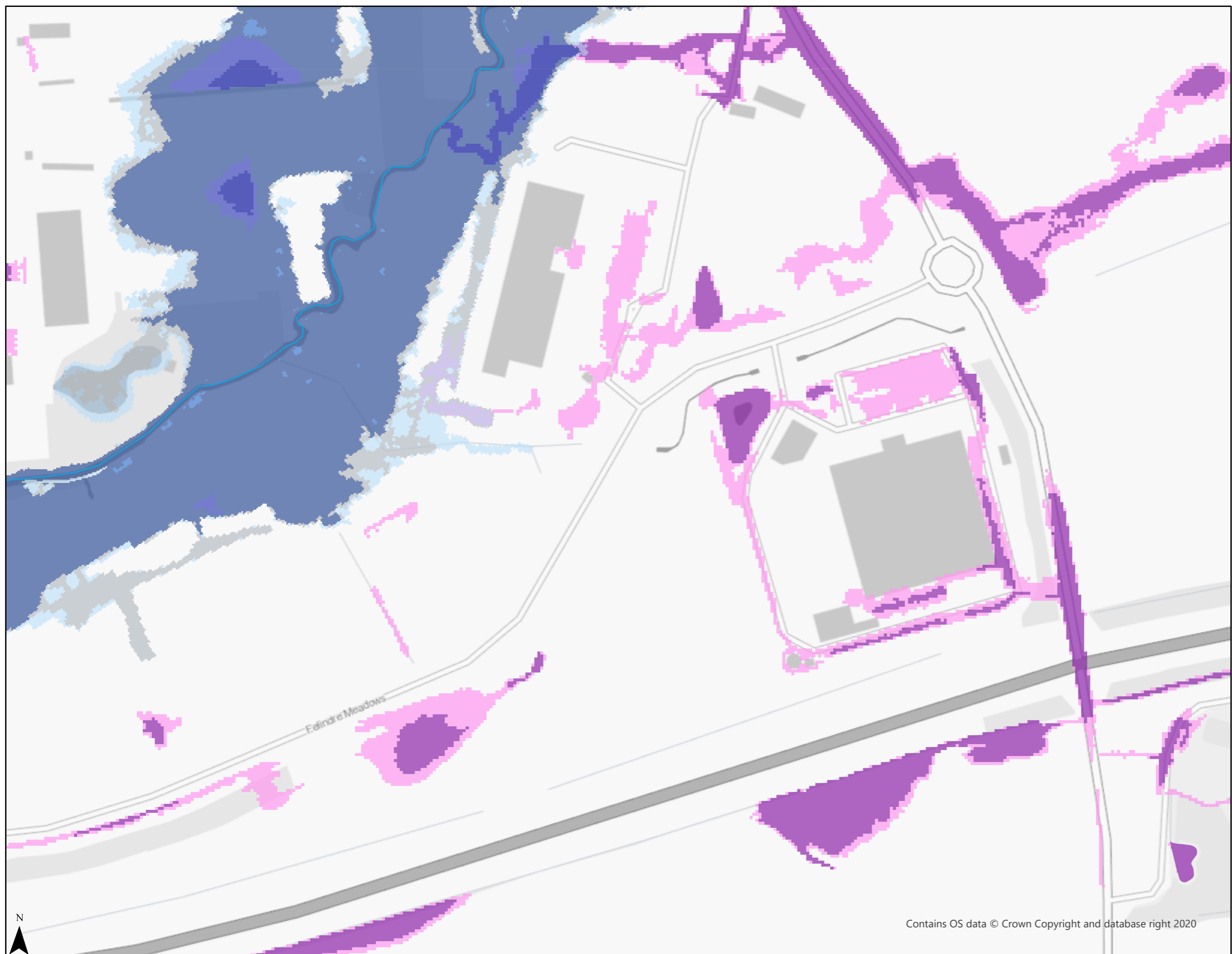


APPENDIX C: NRW Flood Maps

**Flood Map for Planning - Detail
Plot F Pencoed Technology Park**

Legend

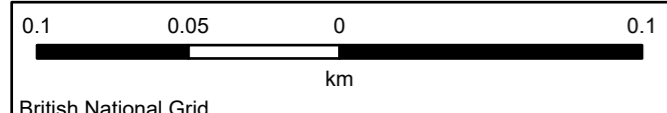
-  Flood Defence Locations
- TAN15 Defended Zones
-  Rivers
-  Sea
-  Rivers and Sea
- Rivers
-  Flood Zone 3
-  Flood Zone 2
- Sea
-  Flood Zone 3
-  Flood Zone 2
- Surface Water and Small Watercourses
-  Flood Zone 3
-  Flood Zone 2
-  Recorded Flood Extents
-  Shoreline Management Plan policies
- Coastal Erosion Risk with No Active Intervention scenario
-  Short-term (2005-2025)
-  Medium-term (2005-2055)
-  Long-term (2005-2105)
-  Flood Risk from Reservoirs
-  Main Rivers
-  NRW Local Model Manager



Contains OS data © Crown Copyright and database right 2020

Scale at A3: 1:2,500

Date: 24/07/2023



Disclaimer
<https://naturalresources.wales/flooding/disclaimer-for-our-flood-and-coastal-erosion-risk-maps/?lang=en>

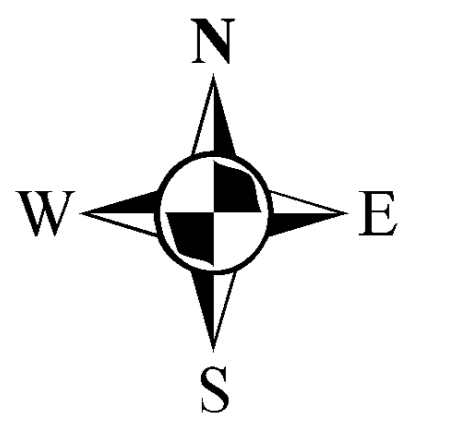
© NRW/CNC. Some information derived from © UK Centre for Ecology & Hydrology © UKCEH, the Environment Agency © EA and Getmapping Plc and Bluesky International Limited, Defra, © Met Office and DARD Rivers Agency, © Cranfield University, © James Hutton Institute, © Ordnance Survey, © Land & Property Services. All rights reserved.

APPENDIX D: DCWW Apparatus Record Plans



Dŵr Cymru
Welsh Water

Plot E, Pencoed Technology Park Bridgend
CF35 5PZ



LEGEND (Representative of most common features)

- Waste network:**
- Foul chamber
 - Surface water chamber
 - Combined sewer overflow
 - Special purpose chamber
 - Treatment works
 - Pumping station
 - Outfall
 - Lamp hole
 - Storm Overflow
 - Rising main
 - Gravity sewer
 - Private sewer
 - Private sewer subject to Sect. 124 adoption agreement
 - Private Sewer Transfer
 - Lateral Drain
 - Inspection Chamber
- NB:** Sewer symbol colour indicates the type:
 RED - Combined
 GREEN - Surface Water
 BROWN - Foul
 Purple - Normal S24 sewers (for indicative purposes only)

Notes:

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 (AC) or Pitch Fibre (PF)) 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.

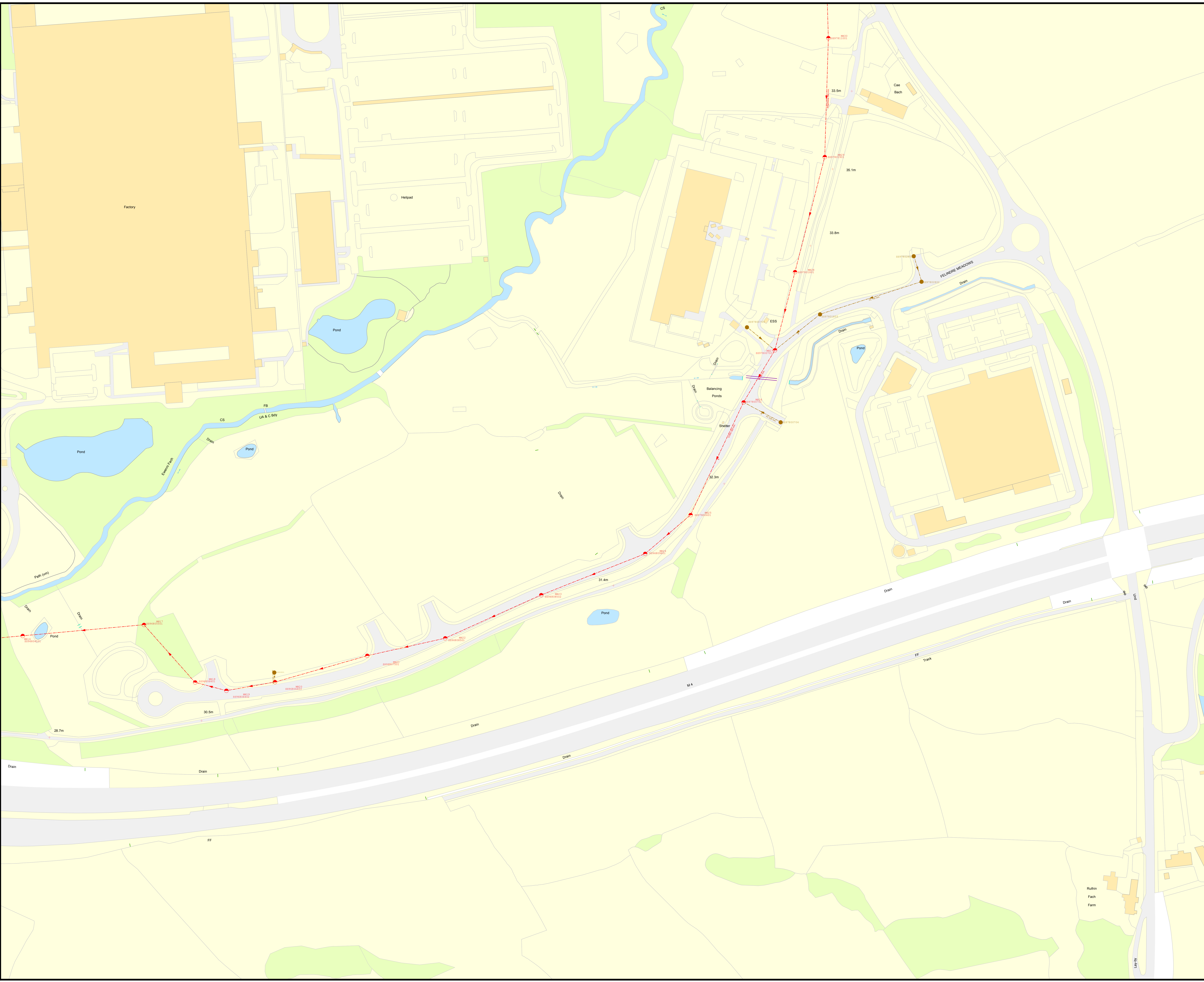
Dŵr Cymru Cymdeithas (the Company) gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and to warrant as to its correctness in these cases in the event of excavations or other works made in the vicinity of the Company's apparatus. The user of locating apparatus before carrying out any excavations reads entirely on their own. The information which is supplied by the Company 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 provisions 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.

Reproduced by permission of the Ordnance Survey on behalf of HMRS. © Crown copyright and database right 2017. All rights reserved. Ordnance Survey Licence Number: 100019294

Map Ref: 296946,180654
Map scale: 1:1000
Printed by: Zara Howells
Printed on: 24 Jul 2023



APPENDIX E: Infiltration Testing Results

Infiltration Test Report

Location: Plot E, Felindre Meadows Pencoed

Client: Fabco Phi 1 Ltd

Date:

12th September 2023

Weather:

Dry

Ground water table level:

Not encountered

Soil Conditions:

0.6m BGL - Medium dense reddish brown silty fine to coarse sand with occasional rounded cobbles of sandstone.

Comments:

All excavations carried out using JCB 3CX and 1500ltr water bowser.

Testing was carried out over a two day period to allow for saturation of each test hole.

Soakaway Test Results - BRE 365 Digest standards

Site: Plot E, Felindre Meadows, Pencoed
 Client: Fabco Phi 1 Ltd

Test Pit 1		Date:	12/09/2023
		Performed by:	M Watkins
Dimensions	(m)	Weather:	Dry. Overcast
Width	1	Topsoil:	n/e 150mm
Length	2	Superficial soil:	N/A
Effective storage depth	0.4	Comments:	
Total depth of hole	1.32		

Test No.	Time (min)	Depth (m)		
1	0	0.86	Vp75-25 = 0.27 m As50 = 2.04 m ² tp75-25 = 4140 s f = 4.20E-04 m/s	
	5	0.75		
	8	0.7		
	15	0.53		
	32	0.5		
	55	0.32		
	74	0.25		
2	0	0.86	Vp75-25 = 0.27 m Ap50 = 2.04 m ² tp75-25 = 4560 s f = 4.01E-04 m/s	
	8	0.75		
	21	0.71		
	44	0.56		
	59	0.52		
	71	0.34		
	84	0.25		
3	0	0.86	Vp75-25 = 0.27 m Ap50 = 2.04 m ² tp75-25 = 5220 s f = 4.09E-04 m/s	
	10	0.75		
	28	0.71		
	46	0.57		
	62	0.53		
	79	0.37		
	97	0.25		

Soakaway Test Results - BRE 365 Digest standards

Site: Plot E, Felindre Meadows, Pencoed
Client: Fabco Phi 1 Ltd

Trial Pit 2		Date:	12/09/2023
		Performed by:	M Watkins
Dimensions	(m)	Weather:	Dry. Overcast
Width	1	Topsoil:	n/e 150mm
Length	2	Superficial soil:	N/A
Effective storage depth	0.4	Comments:	
Total depth of hole	1.2		

Test No.	Time (min)	Depth (m)			
1	0	0.98			
	12	0.75	Vp75-25 =	0.27	m
	28	0.69	As50 =	2.04	m ²
	49	0.42	tp75-25 =	5400	S
	102	0.25	f =	7.55E-04	m/s
2	0	0.98			
	18	0.75	Vp75-25 =	0.27	m
	22	0.7	Ap50 =	2.04	m ²
	58	0.45	tp75-25 =	5880	s
	71	0.35			
	116	0.25	f =	6.02E-04	m/s
3	0	0.98			
	20	0.75	Vp75-25 =	0.27	m
	32	0.71	Ap50 =	2.04	m ²
	77	0.46	tp75-25 =	11580	s
	95	0.36			
	121	0.25	f =	6.08E-04	m/s

APPENDIX F: Hydraulic Design Calculations and Proposed Catchments Plan

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 10 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
15 min Summer	30.311	0.211	98.8	84.1	O K
30 min Summer	30.366	0.266	105.6	107.9	O K
60 min Summer	30.378	0.278	107.0	113.2	O K
120 min Summer	30.305	0.205	98.1	81.3	O K
180 min Summer	30.247	0.147	91.1	57.1	O K
240 min Summer	30.203	0.103	85.8	39.4	O K
360 min Summer	30.152	0.052	79.8	19.5	O K
480 min Summer	30.142	0.042	66.8	15.8	O K
600 min Summer	30.136	0.036	57.0	13.6	O K
720 min Summer	30.132	0.032	50.6	11.9	O K
960 min Summer	30.126	0.026	41.0	9.7	O K
1440 min Summer	30.119	0.019	29.9	7.0	O K
2160 min Summer	30.114	0.014	22.0	5.2	O K
2880 min Summer	30.112	0.012	18.1	4.3	O K
4320 min Summer	30.109	0.009	13.5	3.2	O K
5760 min Summer	30.107	0.007	11.2	2.8	O K
7200 min Summer	30.107	0.007	10.4	2.5	O K
8640 min Summer	30.106	0.006	8.8	2.3	O K
10080 min Summer	30.106	0.006	8.8	2.1	O K
15 min Winter	30.308	0.208	98.5	82.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
15 min Summer	131.422	0.0	20
30 min Summer	92.743	0.0	28
60 min Summer	62.609	0.0	44
120 min Summer	36.577	0.0	76
180 min Summer	26.822	0.0	106
240 min Summer	21.536	0.0	136
360 min Summer	15.781	0.0	190
480 min Summer	12.657	0.0	250
600 min Summer	10.666	0.0	310
720 min Summer	9.274	0.0	368
960 min Summer	7.435	0.0	490
1440 min Summer	5.457	0.0	736
2160 min Summer	4.018	0.0	1076
2880 min Summer	3.252	0.0	1448
4320 min Summer	2.448	0.0	2140
5760 min Summer	2.028	0.0	2904
7200 min Summer	1.775	0.0	3648
8640 min Summer	1.605	0.0	4336
10080 min Summer	1.483	0.0	4992
15 min Winter	131.422	0.0	20

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	30.358	0.258	104.6	104.5	O K
60 min Winter	30.354	0.254	104.0	102.4	O K
120 min Winter	30.247	0.147	91.1	57.3	O K
180 min Winter	30.175	0.075	82.5	28.3	O K
240 min Winter	30.147	0.047	74.2	17.6	O K
360 min Winter	30.135	0.035	55.4	13.1	O K
480 min Winter	30.128	0.028	44.2	10.6	O K
600 min Winter	30.124	0.024	37.8	8.9	O K
720 min Winter	30.121	0.021	33.1	7.8	O K
960 min Winter	30.117	0.017	26.8	6.3	O K
1440 min Winter	30.113	0.013	19.7	4.6	O K
2160 min Winter	30.109	0.009	14.3	3.4	O K
2880 min Winter	30.108	0.008	11.9	2.8	O K
4320 min Winter	30.106	0.006	8.8	2.1	O K
5760 min Winter	30.105	0.005	7.3	1.8	O K
7200 min Winter	30.104	0.004	6.5	1.6	O K
8640 min Winter	30.104	0.004	5.8	1.5	O K
10080 min Winter	30.104	0.004	5.8	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	92.743	0.0	29
60 min Winter	62.609	0.0	46
120 min Winter	36.577	0.0	78
180 min Winter	26.822	0.0	106
240 min Winter	21.536	0.0	130
360 min Winter	15.781	0.0	188
480 min Winter	12.657	0.0	252
600 min Winter	10.666	0.0	310
720 min Winter	9.274	0.0	370
960 min Winter	7.435	0.0	488
1440 min Winter	5.457	0.0	722
2160 min Winter	4.018	0.0	1088
2880 min Winter	3.252	0.0	1504
4320 min Winter	2.448	0.0	2200
5760 min Winter	2.028	0.0	2848
7200 min Winter	1.775	0.0	3656
8640 min Winter	1.605	0.0	4400
10080 min Winter	1.483	0.0	5344

29 Bocam Park
 Old Field Road, Pencoed
 Bridgend, Glamorgan, CF35 5LJ



Date 05/02/2024 14:58
 File 14908_INFILTRATION BASI...

Designed by rhys.melvin
 Checked by

Innovyze Source Control 2020.1

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 296949 180653 SS 96949 80653
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.503

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0	4 0.168	4	8 0.168	8	12 0.168

29 Bocam Park
 Old Field Road, Pencoed
 Bridgend, Glamorgan, CF35 5LJ



Date 05/02/2024 14:58
 File 14908_INFILTRATION BASI...

Designed by rhys.melvin
 Checked by

Innovyze Source Control 2020.1

Model Details

Storage is Online Cover Level (m) 30.700

Infiltration Basin Structure

Invert Level (m) 30.100 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 1.44360 Porosity 1.00
 Infiltration Coefficient Side (m/hr) 1.44360

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	367.2	0.300	455.9	0.301	486.6



0 2 4 6 8 10 m
SCALE 1:200



- GENERAL NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 - ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
 - DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
 - ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
 - EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.
 - TEMPORARY WORKS DESIGN BY OTHERS.
 - DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

LEGEND

- CATCHMENT 1
= 1063m²
 - CATCHMENT 2
= 1321m²
 - CATCHMENT 3
= 1418m²
 - CATCHMENT 4
= 1229m²
- TOTAL IMPERMEABLE AREA
= 5031m²
- SITE AREA
= 6505m²

PRELIMINARY

rev.	drawn	chkd.	appvd.	date	description
01	RM	PG	SH	13.07.23	PRELIMINARY

Client
FABCO

Project
**PLOT E PENCOED TECHNOLOGY PARK
BRIDGEND
CF35 5PZ**

Title
**PROPOSED DRAINAGE
CATCHMENTS PLAN**

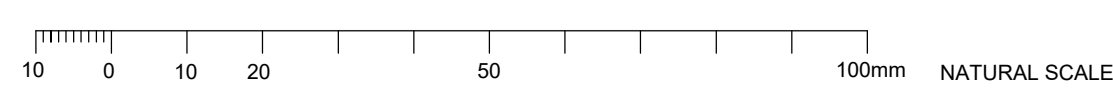


date	drawn	checked	approved
13.07.23	RM	PG 13.07.23	SH 13.07.23

scale @ A1: 1:200
project no.: 14908

status	drg. no.	rev.
P	14908/C502	01

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender



APPENDIX G: Proposed Surface Water Drainage Layout and Details



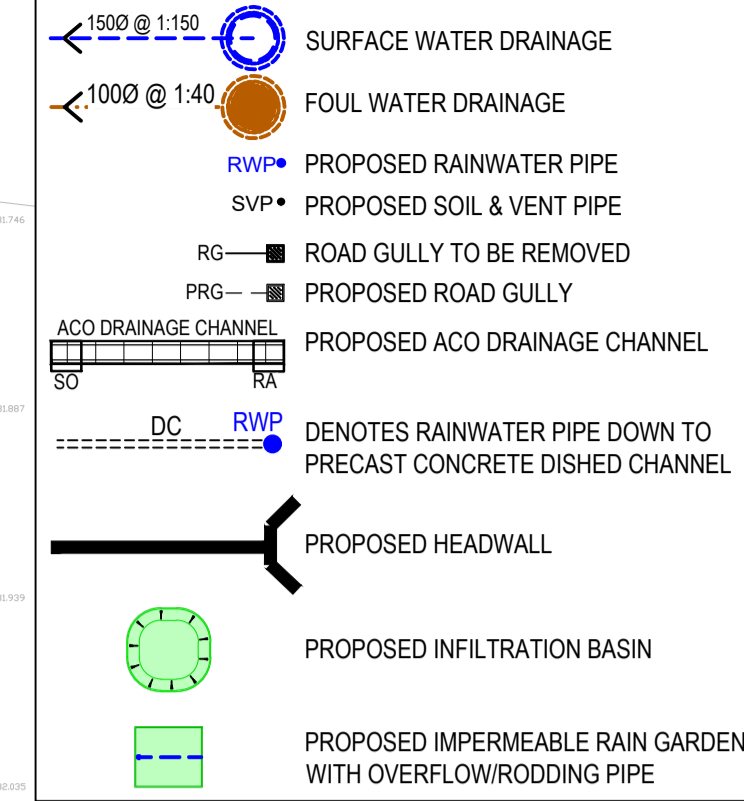
SCALE 1:200
0 2 4 6 8 10 m

INFILTRATION BASIN
INFILTRATION RATE = $4.01 \times 10^{-4} \text{ m/s}$
MAX STORAGE VOLUME = 123.3 m^3
STORAGE DEPTH = 0.3 m
FREEBOARD = 0.3 m

REQUIRED EARTHWORKS FOR INFILTRATION BASIN



DRAINAGE LEGEND



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.
7. TEMPORARY WORKS DESIGN BY OTHERS.
8. DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

PRELIMINARY

rev.	drawn	chd.	appd.	date	description
04	RM	RM	PG	21.07.23	EXISTING INFILTRATION BASIN TO BE USED AND PROPOSED BASIN OMITTED
03	RM	RM	PG	30.01.24	ATTENUATION BASIN AMENDED FOLLOWING RECEIPT OF INFILTRATION TEST RESULTS
02	RM	RM	SH	30.01.24	PERMEABLE PAVING REMOVED. DRAINAGE AMENDED TO SUIT
01	RM	RM	SH	21.07.23	PRELIMINARY

Client
FABCO

Project
PLOT E, PENCOED TECHNOLOGY PARK BRIDGEND CF35 5PZ

Title
DRAINAGE CONCEPT



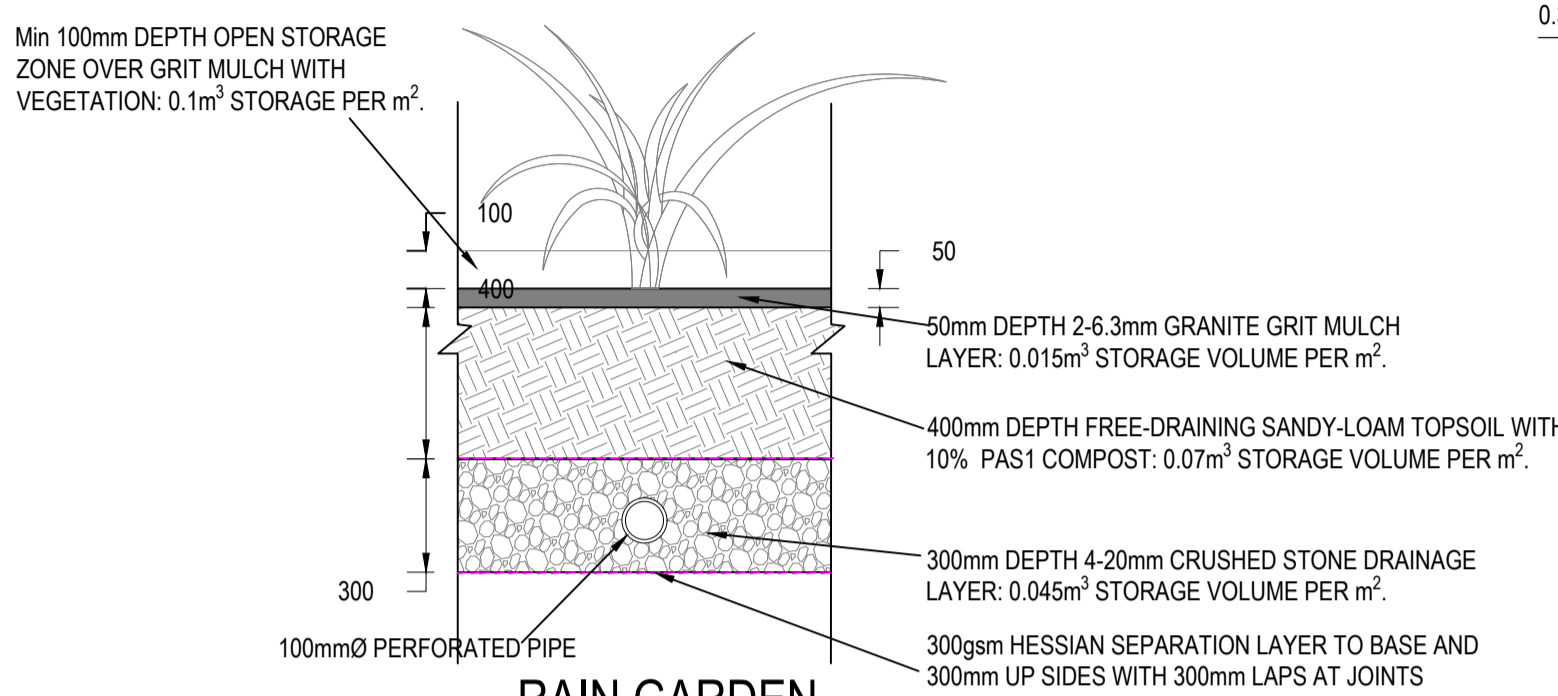
date	drawn	checked	approved
21.07.23	RM	PG	SH

scale @ A1
1:200

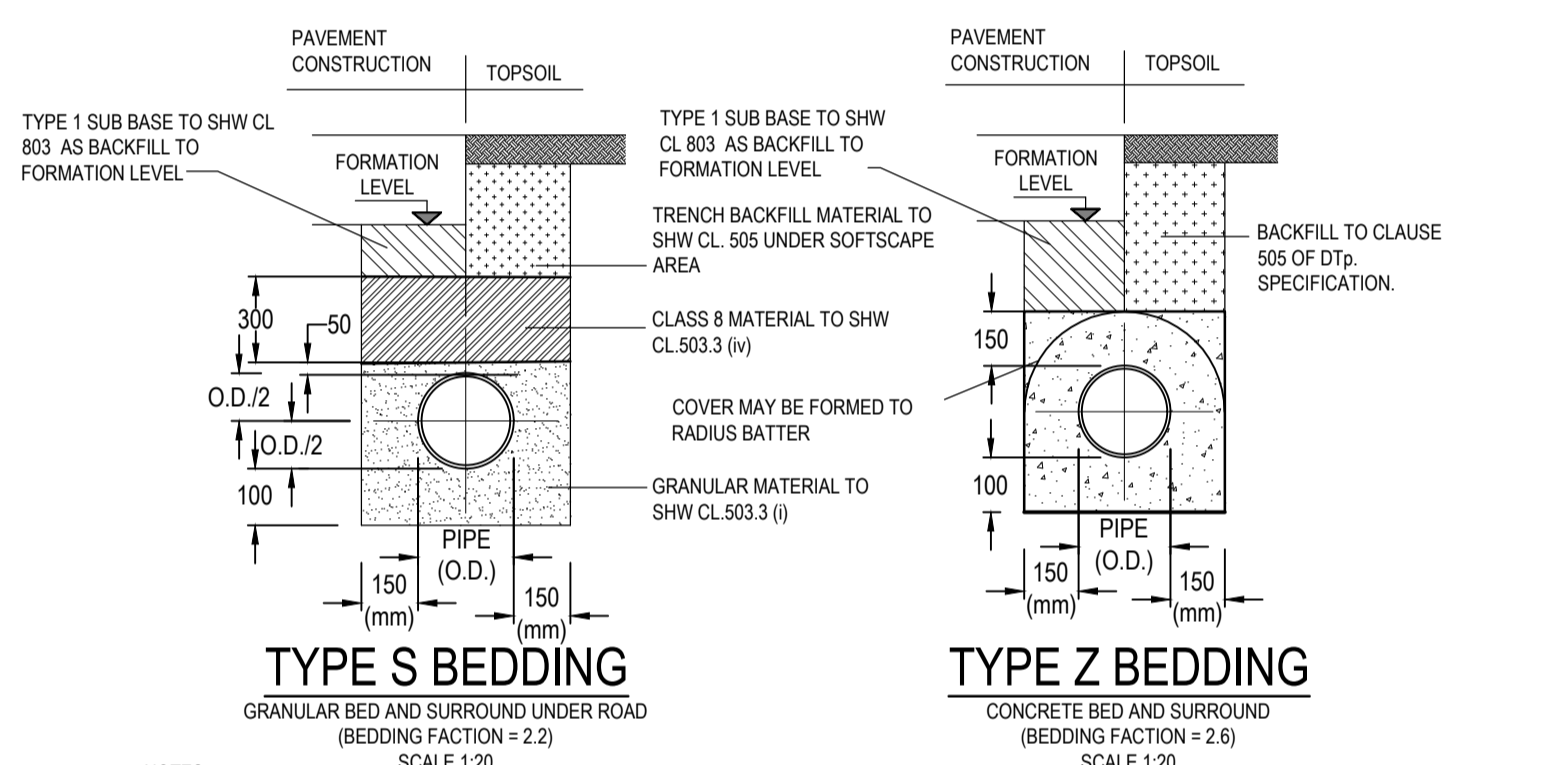
project no.
14908

status	dr. no.	rev.
P	14908/C500	04

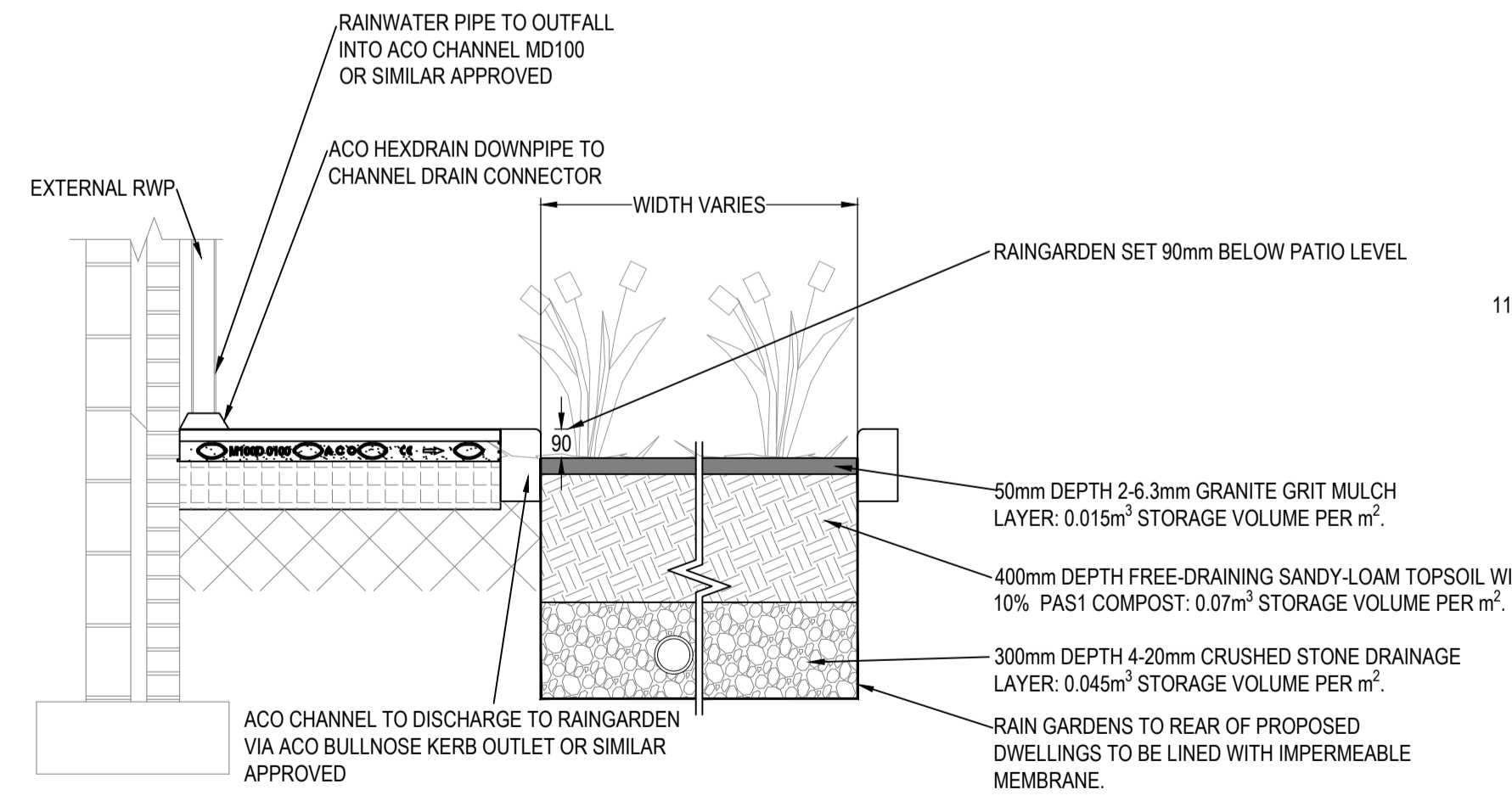
DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender



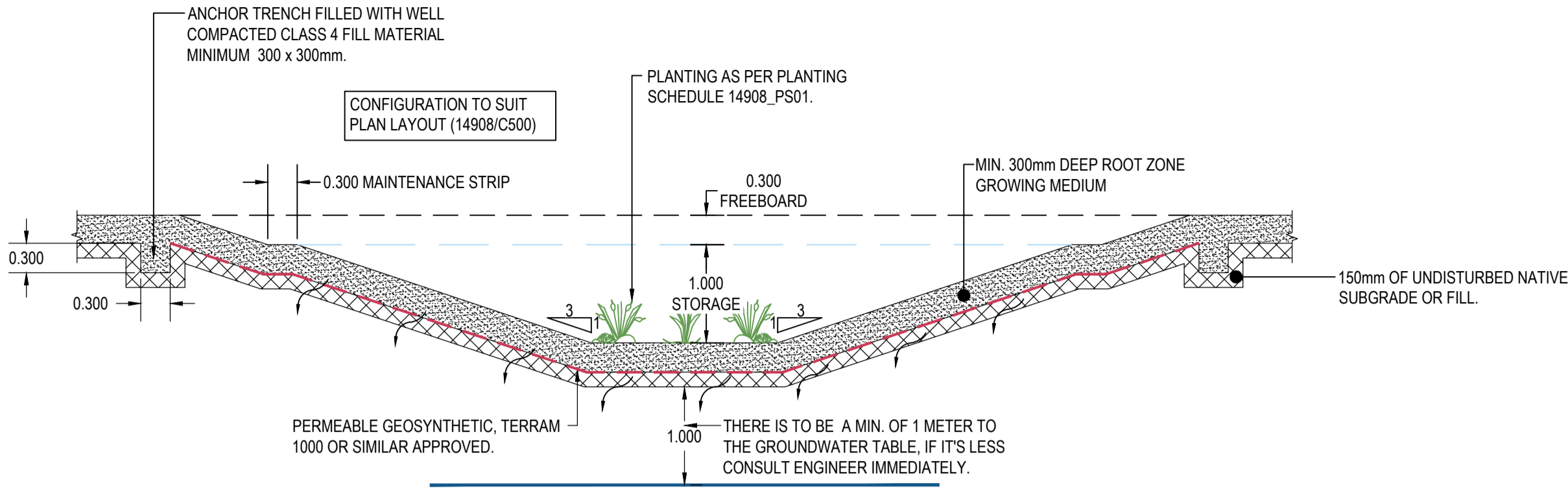
RAIN GARDEN CONSTRUCTION DETAIL
SCALE 1:20



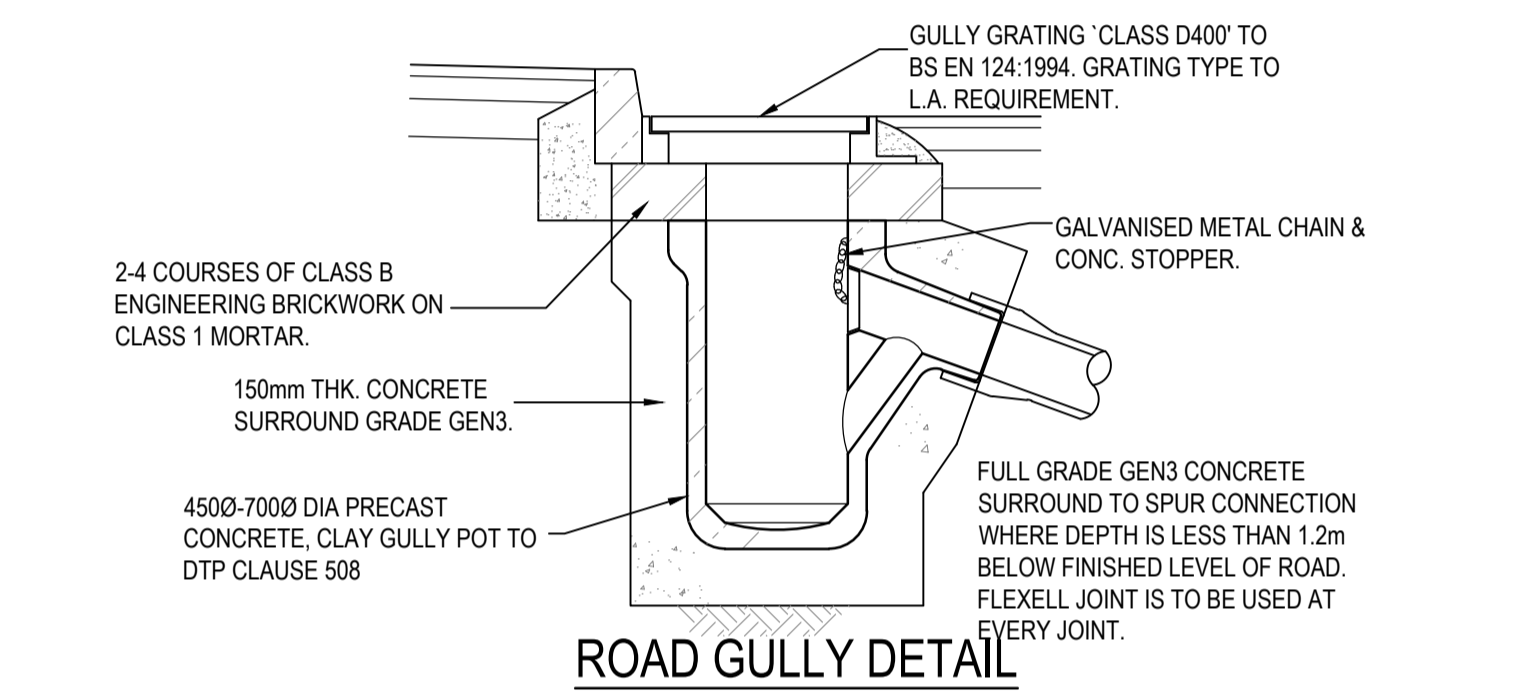
BEDDING DETAILS



RWP TO RAINGARDEN VIA ACO BULLNOSE KERB OUTLET DETAIL
SCALE 1:20



TYPICAL SECTION THROUGH RETENTION BASIN
SCALE 1:50



ROAD GULLY DETAIL
SCALE 1:20

GULLY TOP SHALL COMPLY WITH BS EN 124:1994 FOR INSTALLATION WITHIN AREAS SUBJECT TO PEDESTRIAN AND/OR VEHICULAR TRAFFIC.

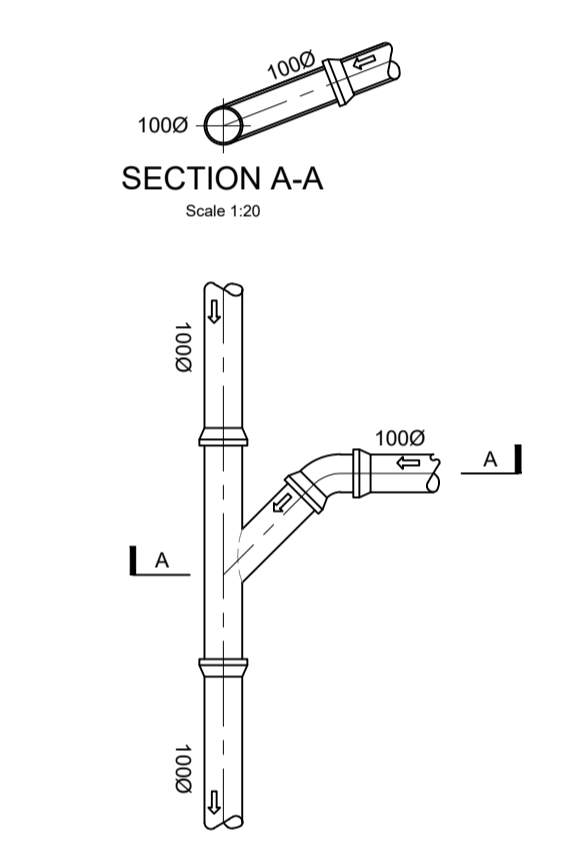
WITH THE ADDITIONAL PROVISION THAT ALL GULLY TOPS LOCATED IN AREAS WHERE VEHICLES CAN ACCESS (VERGES ETC) SHALL BE CLASS D400 MINIMUM. ALL GULLY TOPS SHALL BE SINGLE PIECE, CAPTIVE HINGED, NON-ROCKING AND FREE FROM DEFECTS WHICH MAY IMPAIR THEIR FITNESS FOR USE. THE SLOT DIMENSIONS IN THE GULLY GRATING SHALL BE SELECTED HAVING REGARD OF THE HYDRAULIC CAPACITY AND SHALL BE EVENLY DISTRIBUTED OVER THE CLEAR AREA. THE WATER CLEAR AREA AS GIVEN IN THE MANUFACTURER'S CATALOGUE. NORMAL WIDTH OF GULLY GRATING SHALL BE 450mm MINIMUM AREA OF WATERWAY SHALL BE 1000cm CLEANSING ACCESS - THE OPENED UNIT SHALL PROVIDE A RECTANGULAR CLEAR OPENING 400mm x 250mm.

IF SLOT ORIENTATION TO DIRECTION OF TRAFFIC IS BETWEEN 00 & 450 & 1350 TO 1800, THE MAX LENGTH OF SLOT IS WIDER THAN 16mm.

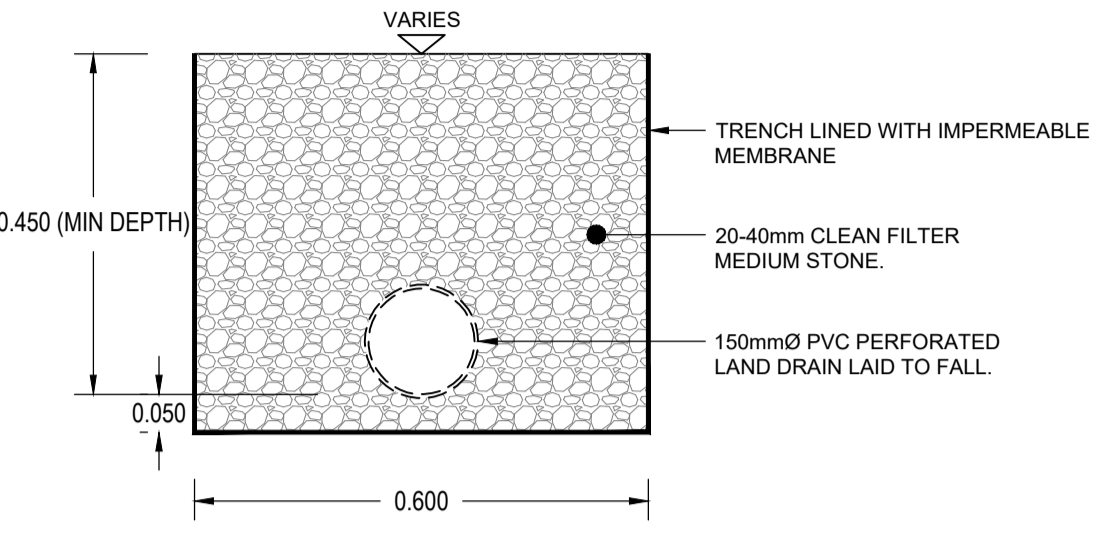
ALL COVERS, GRATINGS AND FRAMES SHALL BEAR APPROPRIATE MARKINGS TO COMPLY WITH CLAUSE 9: BS EN 124:1994 AND SHALL BE CERTIFIED BY CERTIFICATION BODIES APPROVED BY THE AUTHORITY AND SHALL BE BEDDED ON CLASS B ENGINEERING BRICK TO BS 3921 (CLASS 1 MORTAR 12MM THICK) - 2 COURSE MIN - 4 COURSE MAX. BRICKWORK TO BE 225mm THICK ENGLISH BOND.

WITHOUT EXCEPTION, GULLY POT SHALL BE PRECAST CONCRETE CONSTRUCTION TO BS 5911: PART 230: 1994, TABLE 2 WITH 150mm DIAMETER TRAPPED OUTLET, HAVING A GALVANISED METAL CHAIN AND CONCRETE STOPPER.

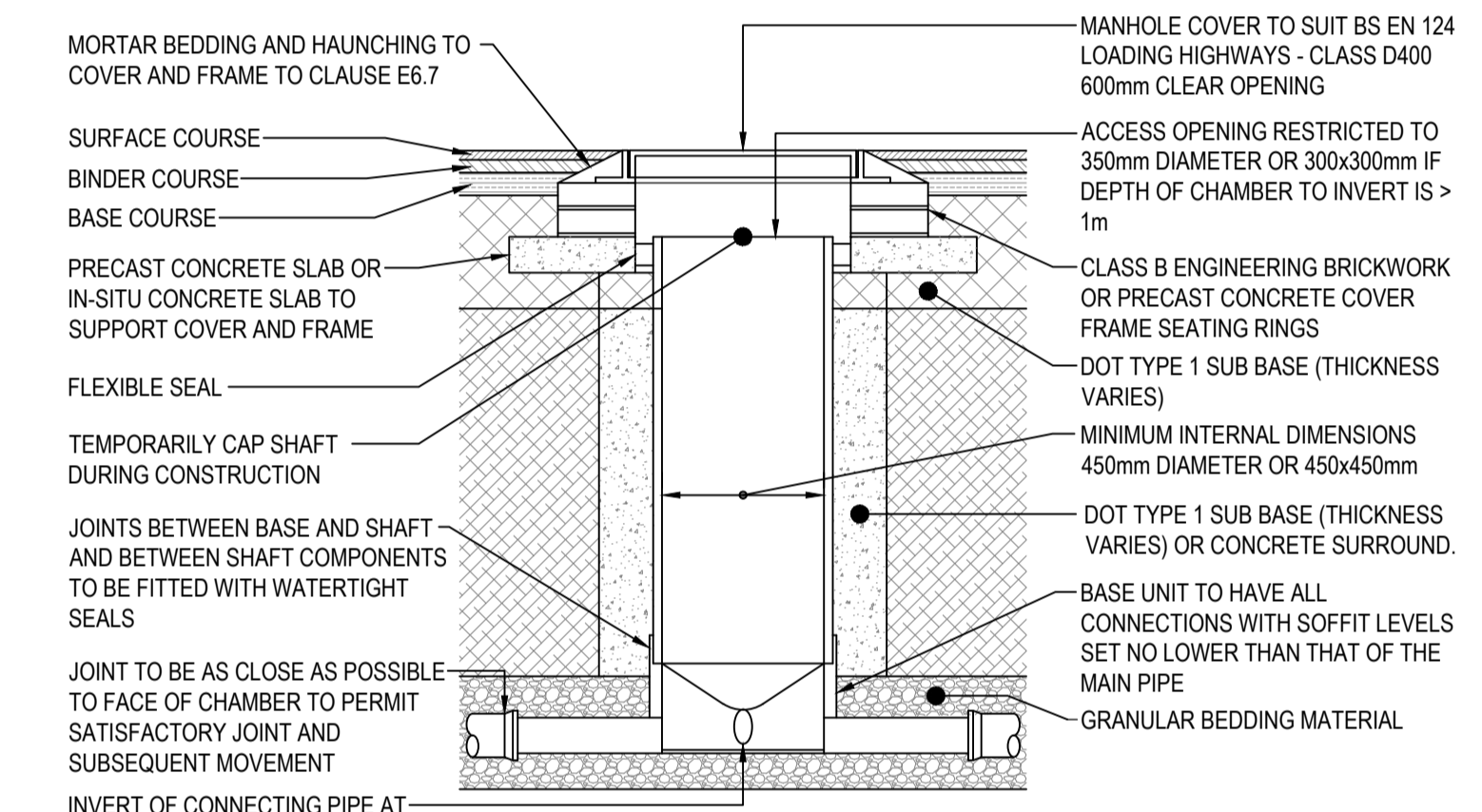
GULLY POT TO BE BEDDED AND SURROUNDED WITH 150mm CONCRETE CLASS 20/25. DIMENSION 'A' TO BE 750mm MINIMUM BELOW CARRIAGEWAY TO ALLOW FOR SERVICES TO CLEAR GULLY CONNECTIONS AND REDUCE THE RISK OF DAMAGE TO PIPES USE TO SETTLEMENT WHERE DEPTH OF RUN IS BELOW 1.2M BELOW FINISHED C/WAY LEVEL A FLEXCELL JOINT IS TO BE USED AT EVERY JOINT.



PREFORMED 'Y' BRANCH CONNECTION
SCALE 1:20



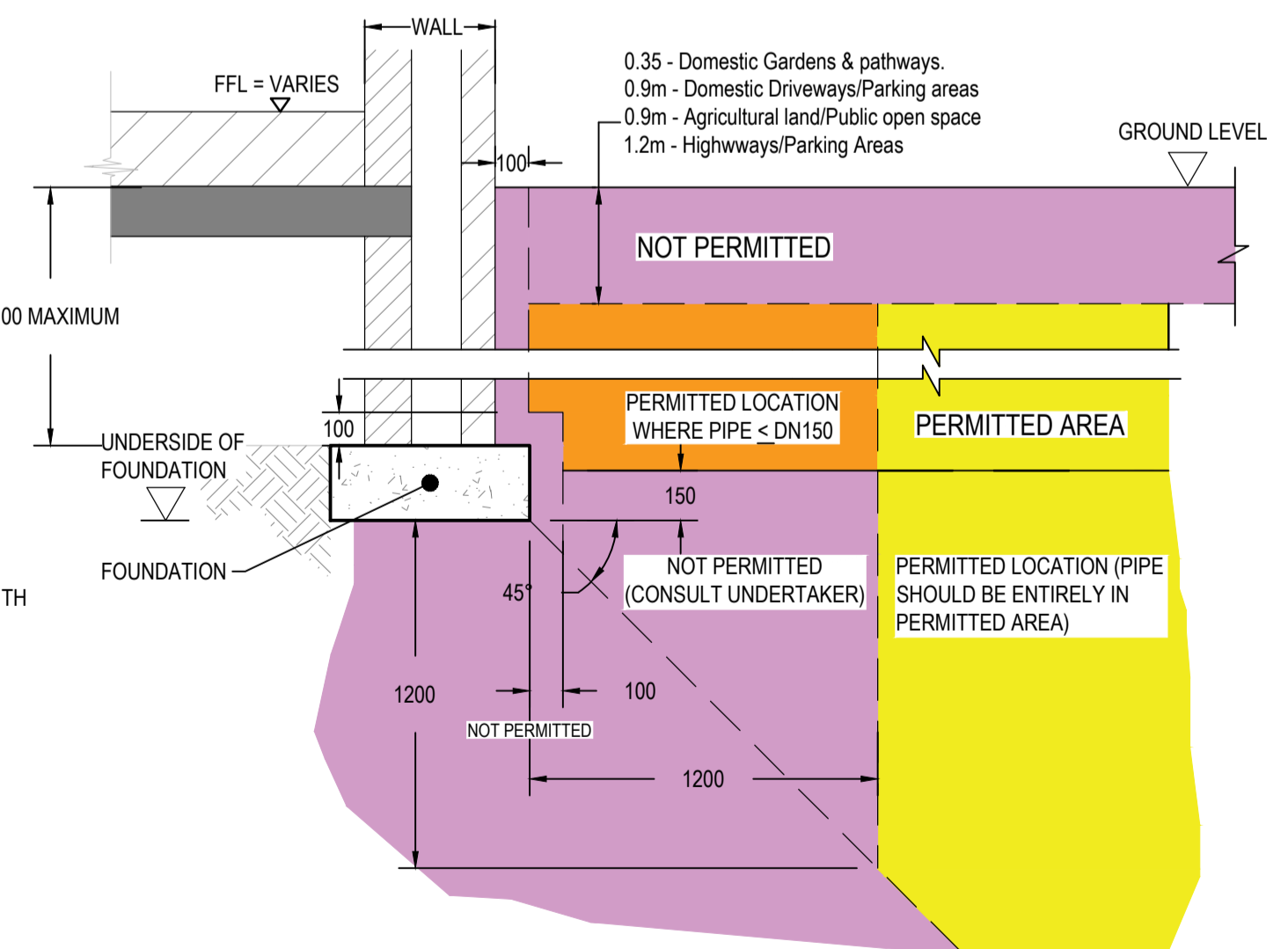
FILTER DRAIN STANDARD DETAIL
SCALE 1:10



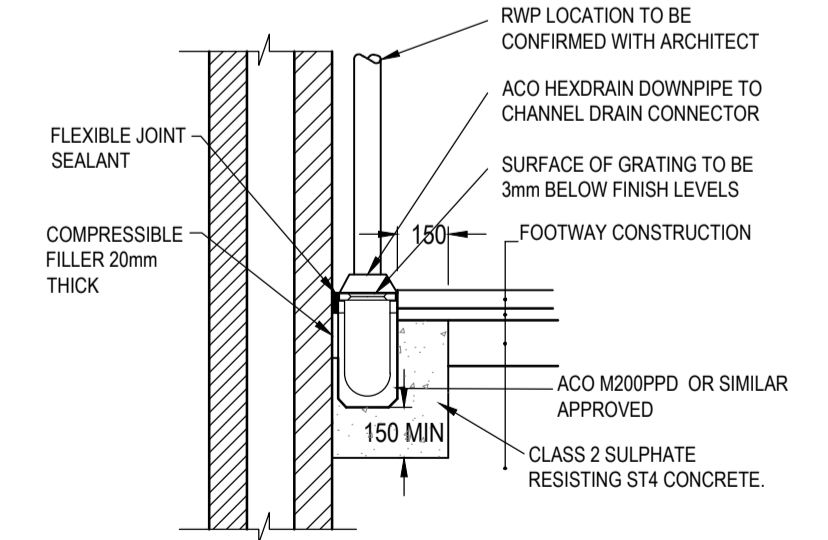
TYPICAL INSPECTION CHAMBER DETAIL - TYPE 3
(REFER TO FIG. B.16 OF SEWERS FOR ADOPTION 7th ED) (DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3m) (FLEXIBLE MATERIAL DETAIL)

PIPE DIA.	ROCKER PIPE LENGTH
100 - 600	0.60m
675 - 750	1.00m
OVER 750	1.25m

ROCKER PIPE DETAILS



DRAINAGE DETAIL IN CLOSE PROXIMITY OF FOUNDATIONS (DETAIL IN ACCORDANCE WITH SFA FIGURE B1)



NOTES:

- DRAINAGE CHANNELS TO BE ACO M200PPD OR SIMILAR APPROVED
- FOUNDATION FOR CHANNELS TO BE LAID ON A ROLLED SUB-BASE OF 150mm MINIMUM THICKNESS.
- GRATING LOAD CLASSIFICATION TO BE C250/D400
- RWPS TO HAVE ACO HEXDRAIN CONNECTORS TO CHANNEL GRATINGS - REFER TO MANUFACTURERS GUIDELINES

RAINWATER PIPE/DRAINAGE CHANNEL CONNECTION DETAIL
SCALE 1:20

- GENERAL NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 - ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
 - DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
 - ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
 - EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.
 - TEMPORARY WORKS DESIGN BY OTHERS.
 - DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

PRELIMINARY

rev.	drawn	checked	approved	description
02	RM	PG	SH	INFILTRATION BASIN AND GRAVEL FILTER DRAIN DETAILS ADDED
01	RM	PG	SH	PRELIMINARY

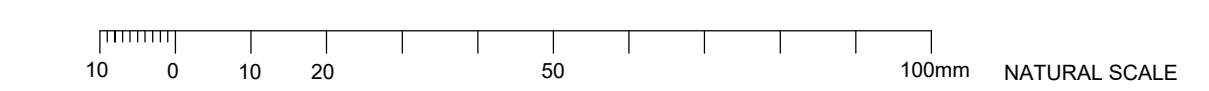
Client
FABCO

Project
PLOT E PENCOED TECHNOLOGY PARK BRIDGEND CF35 5PZ

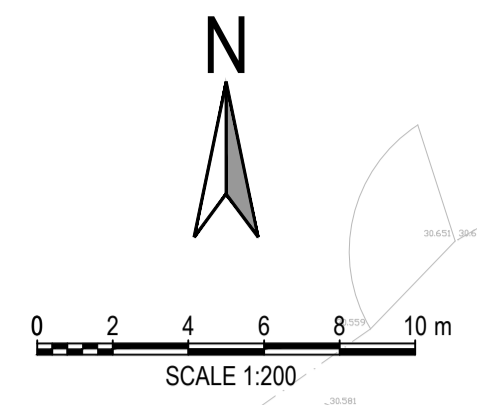
Title
DRAINAGE DETAILS

Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked	approved
25.07.23	RM	PG	SH
scale @ A1		project no.	
AS SHOWN		14908	
status	drg. no.	rev.	
P	14908/C501	02	



APPENDIX H: Exceedance Flows Plan



- GENERAL NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
 2. ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
 3. DO NOT SCALE FROM THE DRAWING. USE FIGURED DIMENSIONS ONLY.
 4. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
 5. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
 6. EXISTING SERVICES HAVE NOT BEEN SHOWN BUT ARE PRESENT - THE CONTRACTOR IS TO LIAISE WITH ALL STATUTORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORKS.
 7. TEMPORARY WORKS DESIGN BY OTHERS.
 8. DESIGN RISK ASSESSMENTS AND METHOD STATEMENTS ARE TO BE PROVIDED TO THE PRINCIPLE CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.



PRELIMINARY

01	RM	PG	SH	25.07.23	PRELIMINARY
rev.	drawn	chd.	appd.	date	description

Client
FABCO

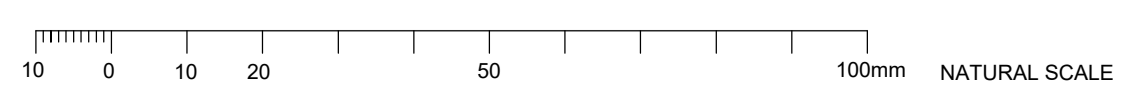
Project
**PLOT F PENCOED TECHNOLOGY PARK
BRIDGEND
CF35 5PZ**

Title
EXCEEDANCE FLOWS PLAN

Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS
29 Bocam Park, Old Field Road, Pencoed, Bridgend CF35 5LJ.
Phone: 01656 863794 Email: enquiries@vale-consultancy.co.uk

date	drawn	checked	approved
25.07.23	RM	PG 25.07.23	SH 25.07.23
scale @ A1	project no.		
1:200	14908		
status	drg. no.	rev.	
P	14908/C503	01	

DRAWING STATUS
A - Approval, AB - As-Built, C - Construction, D - Draft, P - Preliminary, T - Tender



APPENDIX I: SuDS Planting Schedule and Landscaping Drawing

SuDS Planting Schedule for:

Proposed Commercial Units Development,
Plot E, Felindre Meadows,
Pencoed Technology Park, Pencoed

Prepared for:

Adra Housing Association

REF: 14908-PS01 R01



Vale Consultancy
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Document Control

Project	Proposed Commercial Units Development: Plot E, Felindre Meadows, Pencoed Technology Park, Pencoed
Client	FABCO Holdings Ltd
Vale Consultancy Ref:	14908 – PS01

Document Checking:

Prepared By: R Melvin

Signed:



Checked By: P Graham

Signed:

Verified By: S Hardacre

Signed:



Issue	Date	Status
01	25/01/2023	First issue
02		
03		

1.0 Introduction

2.0 Planting Schedule

2.1 Evergreen Plants

2.2 Flowering Ornamental Plants

Appendix A – South and West Wales Wildlife Trust – Rain Garden Guide

1.0 Introduction

This document has been prepared by Vale Consultancy. on behalf of the client; Mr Chris White. The following list of native species plants have been selected as appropriate for use within the scheme rain gardens because of their resilience within the intended environment, ease of maintenance, and which will also contribute towards local biodiversity.

The planting schedule is based on the South and West Wales Wildlife Trust rain garden guidance document. **Ref: Appendix A.**

2.0 Planting Schedule

The use of planting native species within bioretention areas can help to provide a new quality habitat for wildlife, having a positive contribution to biodiversity in the area. Bioretention areas primarily manage surface water runoff water quality and provide runoff interception for small rainfall events. The use of planted native species can support local biodiversity by providing habitat and food for invertebrates and birds.

The planting schedule has been separated into two sections. Firstly, hardy ever green plants that form the mainstay of the planting regime, and secondary, flowering ornamental plants that provide added colour and diversity to the rain gardens.

The following list of plants have been selected as appropriate for use within the proposed rain garden areas.

2.1 Evergreen Plants

The following native species evergreen plants have been selected to form the mainstay of the planting regime:

Water Mint (*mentha aquatica*)

Soft Rush (*Juncus effuses*)

Royal fern (*Osmunda regalis*)

Bugle (*Ajuga Reptans*)

2.2 Flowering Ornamental Plants

The flowering native species flowering ornamental plants have been selected to provide added colour and diversity to the rain garden environment.

Yellow Flag Iris (*Iris pseudocorus*)

Purple Loosestrife (*Lythrum salicaria*)

Chives (*Allium schoenoprasum*)

APPENDIX A

South and West Wales Wildlife Trust Rain Garden Guide

Rain Gardens

How to create your own Rain Garden planter

Our rivers are under a huge amount of stress in the UK, with increased urbanisation changing the natural flow of water, leading to increased water pollution and flooding.

But there is something you can do to help.

There are a number of features you can add to your garden, known as Sustainable Drainage Systems (SuDS), which mimic the countryside in our towns and cities and help improve your local area for wildlife.

Rain Gardens are one of these features. They come in many shapes and sizes, but all have a common goal; to capture water in a beautiful and wildlife-friendly way!

Read on to find out how you can create a Rain Garden Planter in your own garden.

Rain gardens are usually depressions in the ground or raised planters into which a downpipe from the guttering is directed, thereby capturing water during storms that would otherwise have gone straight down the drain, helping to prevent flooding and pollution.



Some Recommended Native Plants

- Yellow Flag Iris (*Iris pseudocorus*)
- Pendulous Sedge (*Carex pendula*)
- Purple Loosestrife (*Lythrum salicaria*)
- Water Mint (*Mentha aquatica*)
- Hemp agrimony (*Eupatorium cannabinum*)
- Ragged Robin (*Lychnis flos-cuculi*)
- Marsh Woundwort (*Stachys palustris*)
- Soft Rush (*Juncus effusus*)
- Royal Fern (*Osmunda regalis*)
- Bugle (*Ajuga reptans*)
- Chives (*Allium schoenoprasum*)



Rain Gardens can be planted with wildlife-friendly plants, such as Yellow Flag Iris, which look beautiful in the garden whilst also supporting pollinators such as Bumblebees and Butterflies.

Make sure they are hardy enough to withstand wet and drought conditions.

Rain Gardens can be a welcome green space in concreted areas such as school yards.



More information:

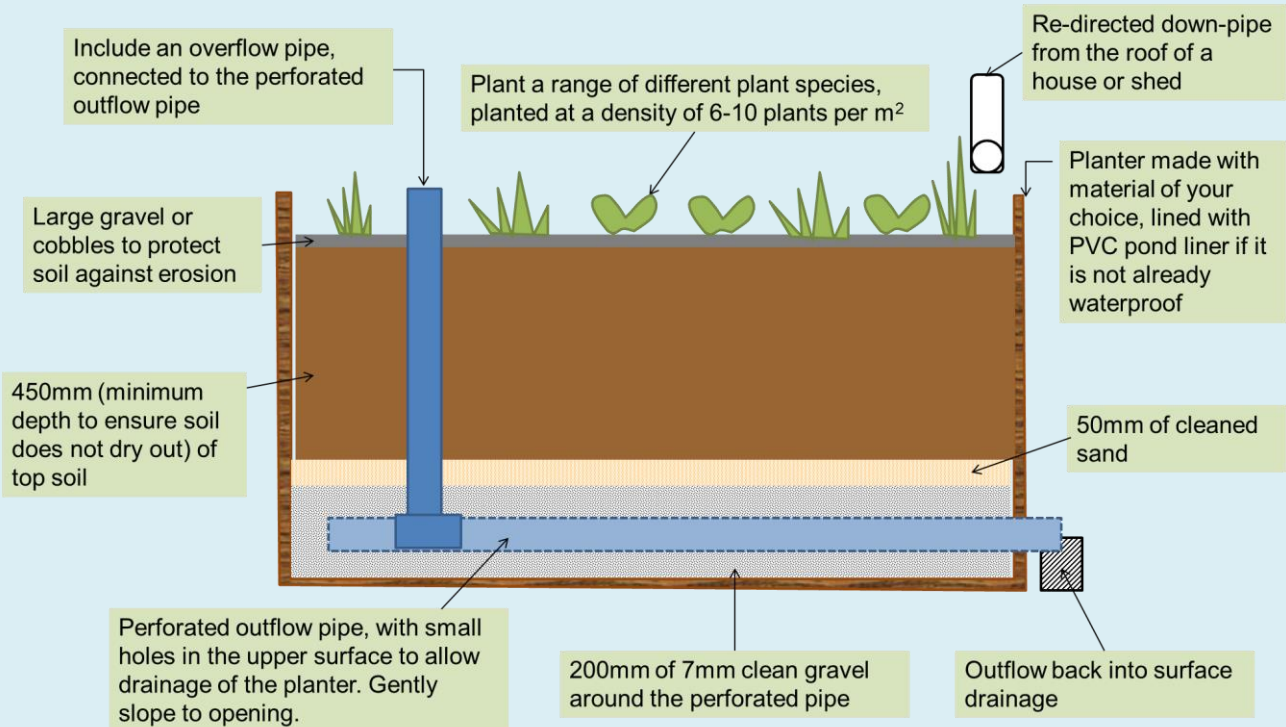
Read more about Rain Gardens at:

- www.welshwildlife.org
- www.raingardens.info



Creating your own Rain Garden Planter

1. The first step is to identify the drain that your planter will empty in to.
2. You will then need to work out how much water your Rain Garden Planter may need to hold in litres. Do this by multiplying the average rainfall of your area (mm) (find via an internet search) by the area of the roof it will be fed by in m². [1].
3. Decide how big you want the planter to be based on amount of water it will receive in high rainfall, and your own personal preference. It is recommended that the minimum planter depth is 45cm to provide adequate water storage. [2]
4. Build a planter with the following structure:



5. Re-direct the chosen downpipe into the planter. If you have any worries about the drainage, consult with your local plumber.
6. Sit back and enjoy your Rain Garden. Watch how it collects water when it rains.

[1] The Rain Garden Guide. Access www.raingardens.info

[2] City of Portland Environmental Services. 2004. Stormwater Management Manual.

[3] Melbourne Water. 2013. Building a Planter Box Raingarden.

The Wildlife Trust of South and West Wales
The Nature Centre
Fountain Road
Tondu
Bridgend
CF32 0EH

01656 724100 / info@welshwildlife.org

Registered Charity no. 1091562

Become a Member

Joining your local Wildlife Trust really is the best way of supporting your local wild places and the wildlife that lives on them. We manage over 90 nature reserves across south and west Wales, each one supporting a diverse array of flora and fauna.

Joining us will enable us to continue to manage these habitats for people and wildlife. It is quick and easy to join, pick up the phone and speak to Nic, Jane or Jon on 01656724100 or go to <http://www.welshwildlife.org/join-us/become-a-member/>



APPENDIX J: SuDS Maintenance Plan

**Management and Maintenance Plan for
Sustainable Drainage (SuDS):**
Proposed Commercial Units Development,
Plot E, Felindre Meadows,
Pencoed Technology Park, Pencoed

Prepared for:


FABCO Holdings Ltd

REF: 14908 – DSR – R01

Document Control

Project	Plot E, Felindre Meadows, Pencoed Technology Park, Pencoed
Client	Adra Housing Association
Vale Consultancy Ref:	14908 – MP01

Document Checking:

Prepared By: R Melvin **Signed:** 

Checked By: P Graham **Signed:**

Verified By: S Hardacre **Signed:** 

Issue	Date	Status
1	25/07/2023	First issue
2	08/09/2023	Permeable paving removed

Contents

1.	INTRODUCTION.....	4
2.	MANAGEMENT RESPONSIBILITIES.....	4
3.	MANAGEMENT OBJECTIVES	4
4	INSPECTION AND MAINTENANCE ACCESS.....	4
5	MAINTENANCE VISITS OR INSPECTIONS	5
6	GENERAL	5
7	ORNAMENTAL PLANTING.....	5
8	LITTER COLLECTION.....	6
9	FENCING/WALLS/RAILING.....	6
10	TRADITIONAL DRAINAGE	6
11	SUMMARY OF INSPECTION AND MAINTENANCE	6
12	LIFETIME MANAGEMENT AND MAINTENANCE COSTS	8

1. INTRODUCTION

- 1.1. This SuDS Management and Maintenance Plan has been prepared by Vale Consultancy on behalf of the client; Fabco Holdings Ltd, in support of a SuDS scheme for the proposed development at Plot E Pencoed Technology Park, Bridgend, CF35 5PZ.
- 1.2. The proposed development consists of the construction of three blocks of commercial units.
- 1.3. The scheme incorporates a sustainable drainage system for surface water runoff, which consists of permeable tarmac and raingardens.
- 1.4. The purpose of this document is to set out the overall management and maintenance objectives for the proposed SuDS components and to describe the long-term maintenance required to allow the system to continue operating as is it intended.
- 1.5. All references to SuDS components are based on the SAB submission drawings:
 - ***14908_C500: Drainage Layout***
 - ***14908_C501: Drainage Details Sheet***
 - ***14908_C502: Proposed Catchment Area Plan***
 - ***14908_C503: Flow Exceedance Plan***

2. MANAGEMENT RESPONSIBILITIES

- 2.1. The site owner and appointed contractor shall be responsible for the implementation of the Management and Maintenance Plan, as part of the overall maintenance of the existing wider site. If deemed necessary, all maintenance operations shall be undertaken by suitable and qualified contractor appointed by the site owner, for the design life of the development.
- 2.2. All inspections and maintenance work must be recorded. This allows for future assessment of the maintenance activities and their response to the system. It can also provide protection against legal claims should the system be exceeded in a storm event leading to flooding elsewhere.

3. MANAGEMENT OBJECTIVES

- 3.1 The site shall be managed and maintained as an attractive, tidy, and safe finish to all landscape elements.
- 3.2 The site owner shall ensure establishment and long-term health of all landscape elements for the benefit of the tenants and visual amenity of the area.
- 3.3 Best Health & Safety practices shall always be understood and followed.
- 3.4 To monitor standards and make amendments where required, it is expected that the site owner will review the management work (with reference to this document) at least quarterly for the first year and annually thereafter.

4 INSPECTION AND MAINTENANCE ACCESS

- 4.1 Access for inspection and maintenance can be gained from the car park and garden accesses, with all SuDS features maintainable from within the site boundary. Maintenance vehicles will be able to park on the proposed car park with direct access to the SuDS features within the car park. Drainage features within the proposed dwelling's rear gardens will accessible via garden access to the sides of the properties.

5 MAINTENANCE VISITS OR INSPECTIONS

- 5.1 Site owner appointed maintenance contractor shall carry out a minimum of 2 maintenance visits (Spring and Autumn) or inspections per year to check drainage SuDS components. Additional visits may be needed to deal with extreme weather conditions or specific horticultural requirements.

6 GENERAL

- 6.1 All materials and workmanship are to be to the highest possible standards and shall be in accordance with relevant British Standards, good horticultural and arboricultural practices, and the landscape specification.
- 6.2 Site owner shall employ suitably qualified staff for all work and when using sprays and mechanical equipment.
- 6.3 Site owner and their appointed contractors shall comply with all relevant Health and Safety regulations and good working practices.
- 6.4 Site owner shall take care when work is beside any structure or paved area and will, at their own cost, be responsible for making good any damage caused.
- 6.5 Weeds, pruning's, leaves, rubbish and other arisings shall be removed from site for composting, where possible. No material shall be left on site, and the area shall be left in a neat and tidy condition after each visit.

7 ORNAMENTAL PLANTING

7.1 Specific objectives:

- To ensure early establishment and healthy growth
- To maintain a dense canopy cover
- To maintain year-round appearance and visual interest

7.2 Maintenance Operations:

- 7.2.1 All planting in the raingarden areas shall be maintained substantially free of weeds. Work shall be done either manually or with appropriate selective weed killer in accordance with manufacturer's recommendations. If weed killer is used, the dead weeds shall be removed at the next maintenance visit. Care must be taken to avoid damage to adjacent planting and grass and replaced immediately if affected by weed killer.
- 7.1.2 Once established, shrubs shall be selectively thinned or reduced in height as appropriate by removal or pruning to allow room for growth and avoid overcrowding/overshadowing and create a natural form rather than cube or cloud shapes. Care shall be taken to avoid over pruning and so creating obvious gaps in the shrub beds.
- 7.1.3 Ground cover plants shall be clipped or pruned, if necessary, to give a neat and tidy finish and contained within the planting bed. Work to remove dead vegetation shall be carried out during the winter months.
- 7.1.4 Pruning of herbaceous planting:
In spring cut stems close to the 'crown' or 'dormant' top of the plant, avoiding the removal of new

shoots.

- Tidy up the base of the plant, removing dead foliage and debris
- Remove all material from site
- Apply a 50mm layer of fine horticultural mulch. This will help moisture retention in the soil, contribute to weed suppression and allow delicate stems to grow
- Leave dried flower head over winter for relevant species e.g., ornamental grasses

7.1.5 Fertilising:

- One application, just before or at the time of spring growth
- A balanced fertiliser is required, one high in Phosphorus (which encourages blooming as well as strong roots and disease resistance). Fertilisers high in nitrogen should not be used as nitrogen promotes excess foliage at the expense of flowers and roots which can result in weak stems

8 LITTER COLLECTION

- 8.1 All hard surfacing shall be swept as necessary, and all rubbish removed from site.
- 8.2 Litter picking/clearance shall take place during each maintenance visit and all waste shall be removed from site.
- 8.3 During autumn maintenance visits all fallen leaves shall be collected and removed from site.

9 FENCING/WALLS/RAILING

- 9.1 All fencing, walls and railings shall be checked for damage/wear and when necessary, shall be replaced/repaired/ re-stained or painted as appropriate.

10 TRADITIONAL DRAINAGE

- 10.1 A monthly site inspection should be carried out, checking for any areas that are not operating correctly and collecting/removing litter and debris
- 10.2 All rainwater pipes, linear drains, catch pits and inspection chambers should be inspected biannually, typically spring and autumn
- 10.3 Any excessive sediment build-up in rainwater pipes, linear drains, gullies or inspection chambers causing blockage or poor performance shall be cleared and cleaned as required

11 SUMMARY OF INSPECTION AND MAINTENANCE

- 11.1 The following briefly summarises the type of inspections and maintenance required for the SuDS components and drainage system used in this scheme:

11.2 General

- General inspections of SuDS areas (Rain gardens, conveyance pipes, and, inlets and outlets) and shall include litter collection
- Biannual check of traditional drainage including rainwater pipes, linear drains, kerb outlets, and inspection chambers

11.3 Rain Gardens

TABLE 18.3 Operation and maintenance requirements for bioretention systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

11.4 Gravel Filter Drains

The below extract from the CIRIA SuDs Manual shows the recommended operation and maintenance schedule for gravel filter drain:

TABLE 16.1 Operation and maintenance requirements for filter drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

11.5 Infiltration basin

The below extract from the CIRIA SuDs Manual shows the recommended operation and maintenance schedule for infiltration basins:

TABLE 13.2 Operation and maintenance requirements for infiltration basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter, debris and trash	Monthly
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass – meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

12 LIFETIME MANAGEMENT AND MAINTENANCE COSTS

12.1 The costs associated with the management and maintenance of the SuDS system over the 60-year design life of the scheme has been estimated based on the inspection and maintenance activities in Section 12, as follows:

12.2 General

- General monthly inspection (incl. litter removal) – included in general maintenance undertaken
- Biannual check of traditional drainage including rainwater pipes, linear drains, gullies and inspection chambers
- Maintenance costs are based on a 60-year design life of the development and SuDS

12.3 Rain Gardens

- Annual Weeding = £100 x 60 yr = £6,000
- Replacement planting annually £100 x 60 yr = £6,000

- Annual Fertiliser /feeding $\text{£}75 \times 60 \text{ yr} = \text{£}4,500$
- Litter picking 2/year $\text{£}35 \times 60 \text{ yr} = \text{£}2,100$

12.4 Infiltration Basin

- Annual Weeding = $\text{£}100 \times 60 \text{ yr} = \text{£}6,000$
- Replacement planting annually $\text{£}100 \times 60 \text{ yr} = \text{£}6,000$
- Litter picking 2/year $\text{£}35 \times 60 \text{ yr} = \text{£}2,100$

12.5 Gravel Filter Drain

- Litter picking monthly $\text{£}20 \times 60 \text{ yr} = \text{£}1,200$

12.6 The total sum of management and maintenance costs for the proposed SuDS over a 60-year design life: **£33,900.00** and **£565 a year (average)**.