PROPOSED DEVELOPMENT

DRAINAGE STRATEGY REPORT & FLOOD STATEMENT

PLOT 14 - CARDIFF GATE INTERNATIONAL BUSINESS PARK
LAND NORTH OF MALTHOUSE AVENUE
PONTPRENNAU
CARDIFF
CF23 8BA

OCTOBER 2021
20033-D101

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Issue	Prepared by	Checked by	Date
D101	TDJ	DKK	01/10/2021

1.0 Introduction

Shear Design Ltd has been instructed to prepare a sustainable drainage strategy report in respect of a potential mixed development at:

Plot 14 – Cardiff Gate Business Park
Land South of Malthouse Avenue
Pontprennau
Cardiff
CF23 8BA

This report has been prepared on behalf of Cardiff Gate Business Park Ltd and is intended to accompany a planning for the development of 2no. mixed residential & commercial unit/s on the site and all associated infrastructure.

Schedule 3 to the Flood and Water Management Act 2010 & The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018 require all proposed developments greater than 100m^2 or more than one unit to be approved by the local SuDS Approving Body (SAB) prior to construction. This report is also intended to supplement the formal SAB approval application for SABs officers, planning officers and other consultees to review.

This report will also consider the flood risk to the site in accordance with the requirements of Technical Advice Note 15 (TAN 15).

The site is located at National Grid Reference ST 21086 82930. A site location plan is included in Appendix A.

2.0 Site Description & Topography

The development site is situated off Malthouse Avenue in an area of Cardiff International Business Park, adjacent to Junction 30 of the M4 motorway. The site is bounded by Malthouse Avenue to the South, Woodsy Close to the East, Parkwall Road to the North and an existing carpark to the West. The site is highest in the north-western corner atop the existing bund with a level of approximately 83.1mAOD, with the sites low point of 66.9mAOD 180m away in the south-eastern corner.

A topographical survey is included in Appendix B.

Historical mapping for the site has been reviewed from 1885 to 1953; the site is continuously a rural, non-developed setting with no buildings noted. The adjacent area was developed in the 1980's & 1990's providing both housing to the south as well as multiple office buildings & car dealerships, the latter, known as Cardiff Gate Business Park, opened circa 1998.

There are 2no. high pressure gas mains within the development site, parallel to the eastern boundary. Suggested easements are noted on proposed layouts and to be confirmed with Wales & West Utilities. Dŵr Cymru Welsh Water (DCWW) asset records show public sewers immediately east of the site boundary, with water mains running parallel to gas mains within the site boundary.

The total site area is approximately 1.45ha hectares of which circa 0.72ha is to be developed.

The proposed development will comprise of a new access formed of Malthouse Avenue, with proposed 740m^2 and 650m^2 commercial units and associated access road and car parking areas.

Refer to Appendix C for an illustrative architectural layout Plan.

3.0 Flood Risk

The site is identified by NRW (Natural Resources Wales) within their development advice mapping as being entirely with Flood Zone A, an area not known to have flooded in the past and *'considered to be at little or no risk of fluvial or tidal/coastal flooding'*. A copy of the development advice map is included within **Appendix D.** More detail mapping regarding specific flood sources has also been reviewed. No segments of surface water flooding have been identified.

3.1 Flood and Water Management Act (2010) and Flood Risk Regulations (2009)

The Flood and Water Management Act of 2010 sets out what should be included in the National flood and coastal erosion risk management strategies for England and Wales as well as local flood risk management strategies. It responds to recent pressure to introduce legislation to address the threat of flooding and water scarcity, both of which are predicted to increase with climate change. The Flood Risk Regulations of 2009 set out the duties regarding producing preliminary flood risk assessments, flood hazard maps and flood risk maps and flood risk management plans. Both Act and Regulation place responsibility on the local authority as Lead Local Flood Authority (LLFA) to manage and lead local flooding issues.

3.2 Schedule 3 to the Flood and Water Management Act 2010 & The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018

As part of the advancement in Sustainable Drainage Systems (SuDS) design, legislature was implemented on 7th January 2019 in Wales to enforce Schedule 3 of the Flood and Water Management Act 2010. This led to the establishment of SuDS Approval Bodies (SABs) for each LLFA. In the case of this development and under requirements of the above legislature, Cardiff Council would look to review and approve any surface water drainage design proposed for the development. Any SuDS proposed would need to conform to CIRA C753, 'The SuDS Manual' and any additional guidance or information provided by the LLFA. Any drainage design previously proposed to connect to a surface water Dŵr Cymru Welsh Water or Highway asset would now be subject to a detailed application & formal approval process, prior to construction and/or communication of drainage flows from the development.

3.3 Technical Advice Note (TAN) 15

Planning Policy Wales sets out the land use planning policies of the Welsh Government and is supplemented by a series of Technical Advice Notes. Technical Advice Note (TAN) 15: Development and Flood Risk (2004) advises on development and flood risk, providing a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location can be assessed. TAN 15 provides an indicative guidance as to what the frequency threshold could be for different types of development described in terms of annual probability of occurrence:

Table 1: Indicative Guidance of TAN15 Section A1.14 *(Targets for no flooding)*

Type of Development	**Threshold Frequency (Years)**	
	Fluvial	**Tide**
Residential	1%	0.5%
Commercial/Retail	1%	0.5%

3.4 Flood Mitigation Measures

Though the proposed site may not be inundated during a flood event, access to the property via local roads could be restricted. All future occupants of the property are recommended to follow all guidance provided by both NRW and the Environment Agency (EA). During extreme flood events the wider area surrounding the site may be affected by flooding. The flood water will rise at a relatively slow rate, and it is considered that the predicted flood scenario and peak flood conditions can be appropriately manged by the implementation of a number of mitigation measures which are identified as follows:

- Met Office Flood Warnings
- Residents/occupiers of the property are to sign up to Floodline (tel: 03459881188) and complete a NRW Personal Flood Plan (refer to Appendix F)
- With the time afforded by advance warning, an evacuation of the property to a safe egress point and the removal any valuables from the building can be implemented
- The predicted depths, rise, speed of inundation and velocities are likely to satisfy the TAN 15 suggested tolerable conditions for more extreme events.
- However, a well-walked means of safe access and egress from the site is likely to be afforded at all times prior to even partial flooding of the surrounding areas. It is crucial to that all occupants of the site be aware of this inherent risk, and the planned egress route.

3.5 Flood Warnings

Though the site is not predicted to be impacted by flooding the occupiers of the site are encouraged to sign up to the 'Floodline Warnings Direct' scheme so that they receive advanced warning of potential flooding and possible travel / access implications for the site. This can be done by telephoning the NRW/EA on 0845 988 1188. Current flood warnings enforced can also be viewed online on NRW's home page at https://naturalresources.wales/. Current Flood Warnings enforced by the EA can also be viewed on the EA web site (https://flood-warning-information.service.gov.uk/warnings). Both NRW & EA issue flood warnings using a four-stage system:-

1. Flood Alert
2. Flood Warning
3. Severe Flood Warning
4. Warnings No Longer in Force

Current meanings of these warnings refer to NRW online advice at https://naturalresources.wales/flooding/flood-codes/?lang=en (Ref **Appendix F**).

4.0 Drainage Strategy

4.1 Existing Foul Drainage

Whilst there are no known adopted Dŵr Cymru Welsh Water (DCWW) sewer records indicate that there is a public foul sewer running north-south outside of the site's eastern boundary, along Woodsy Close; a copy of the DCWW sewer record is included in Appendix D.

4.2 Proposed Foul Drainage

Depending on final architectural layouts, it is assumed that a single foul connection to FMH18A, ST21821901 be constructed for the whole development site, under a Section 106 of the Water Industry Act 1991 (WIA 1991) submitted to DCWW. Similarly depending on final quantity and size of dwelling units, the peak flow rates will be calculated allowing for a suitable sized and designed gravity fed foul water drainage system (to be adopted under a Section 104 Agreement of WIA 1991) to be constructed.

4.3 Existing Surface Water Drainage

There are no surface water sewers shown on DCWW's records within the site's redline planning boundary, but the watercourse of Nant Pontprennau is clearly shown and identified within the topographical survey provided and headwalls providing surface water drainage from other areas of Cardiff Gate are shown. Following a review of historic map tiles for the area, the watercourse appears to have been moved eastwards by approx. 100m and artificially straightened. Near to the south east corner of the site at a confluence point with another stream, the watercourse becomes culverted for approximately 75m before outfalling and continuing on as open watercourse south of Old St Mellon's Road.

4.4 Proposed Surface Water Drainage

In line with Statutory standards for SuDS Wales, 2018 discharging of surface water runoff should conform to the following hierarchy as detailed in Standard 1 (S1):

Priority Level 1: *Surface water runoff is collected for use*

Priority Level 2: *Surface water runoff is infiltrated to ground*

Priority Level 3: *Surface water runoff is discharged to a surface water body*

Priority Level 4: *Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system*

Priority Level 5: *Surface water runoff is discharged to a combined sewer*

4.4.1 Assessment of Proposed Discharge Location:

Priority Level 1: Surface water runoff is collected for use; Due to the small roof areas proposed for residential dwellings, the reuse of water through rain water harvesting as a potable source (flushing of toilets etc) is not deemed appropriate. However, elements regarding the possible use of SuDS planters and/or water butts will allow for the reuse of rainwater and should enable natural irrigation of green landscaping.

Priority Level 2: Surface water runoff is infiltrated to ground; Based upon previous ground investigation works and local area knowledge, it is anticipated that the soils within the site will not be accepting of infiltration flows. The adjacent watercourse also indicates a possible high-water table. Testing to BRE Digest 365 is recommended to confirm the assumption that the site is impervious.

Priority Level 3: Surface water runoff is discharged to a surface water body; No main rivers or known watercourses have been identified within the red line boundary.

Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system; It is proposed that the surface water sewer located with in Woodsy Close be used as the site's connection point to the wider DCWW network.

Priority Level 5: Surface water runoff is discharged to a combined sewer; No combined water sewers are known to exist within the development site.

4.4.2 Proposed Surface Water Strategy

It is proposed that surface water runoff from proposed carriageways and footways is to be collected and conveyed by permeable paving and conventional gullies to proposed rain gardens along the eastern boundary. It is intended that this will discharge into a geocellular attenuation tank to the rear and eastern side of Building A, providing the majority of attenuation for the site. The adoption of the rain-gardens to the back of footways/parking areas is to be discussed with Cardiff Council. Surface water discharge will be restricted to 3.1/s (based upon the agreed rate of 4.31 l/s/ha with Cardiff Council on another Cardiff Gate development site) via a vortex flow control for all critical storm events up to (and including) the 1 in 100 year + 40% climate change provision. A drawing illustrating our proposal is included in Appendix E which will be presented to Cardiff Council under a SABS pre-application process and will be suitable amended following any future discussions or receipt of formal comments. Under Cardiff Council's role as SAB and LLFA, additional SuDS features may be offered for adoption and future maintenance completed by Cardiff Council.

4.5 Pollution Prevention

4.5.1 Water Quality Management Criteria

The surface water drainage network serving the proposed development consists of various SuDS features to ensure that where possible, all impermeable catchments are drained via SuDS features that improve the water quality of the run-off and mitigate the risk of polluting the downstream network. The criteria noted in this technical note is based on the requirements set out in Chapter 4 and 26 of CIRIA Report 753, *The SuDS Manual.*

Table 1 below sets out the minimum water quality management requirements for discharges to receiving surface waters.

Table 1: Minimum water quality management

Land Use	Pollution Hazard Levels	Requirements for discharge to surface waters
Other roofs (typically commercial/industrial roofs)	Low	Simple index approach
Individual driveway, cul de sacs & access road	Low	Simple index approach

Based on the site-specific land use noted in Table 1, Table 2 sets out the pollution hazard indices for the different land uses. The indices range from 0 (no pollution hazard for this contaminant type) to 1 (high pollution hazard for this contaminant type).

Table 2: Pollution hazard indices for different land use classifications

Land Use	Pollution Hazard Levels	Total suspended solids (TSS)	Metals	Hydrocarbons
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05
Individual driveway, cul de sacs & access road	Low	0.5	0.4	0.4

4.5.2 Water Quality Treatment Strategy

The water quality treatment strategy is based on the simple index approach noted in The SuDS Manual. To ensure that the SuDS features deliver adequate treatment, features should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for that contaminant type. The site-specific SuDS features for this development include:

- Permeable Paving
- Rain garden (Bio-retention system)

Table 3: Mitigation indices for each SuDS feature against the pollution hazard indices.

Commercial Development				
Other roofs (typically commercial/industrial roofs):	**Pollution Hazard Indices (minimum)**	**Mitigation indices**		**Total Index**
		Permeable Paving	**Rain-garden (bio-retention system)**	
Total suspended solids (TSS)	0.5	N/A	0.8	**0.80**
Metals	0.4	N/A	0.8	**0.80**
Hydrocarbons	0.4	N/A	0.8	**0.80**
Individual property driveways, cul de sacs & general access roads:				***= $x_1 + 0.5(x_2)$***
Total suspended solids (TSS)	0.3	0.7	0.5	**0.95**
Metals	0.2	0.6	0.6	**0.90**
Hydrocarbons	0.05	0.7	0.6	**1.00**

The indices in Table 3 above illustrate that the proposed SuDS features exceed the minimum requirements noted in Table 2 to improve the water quality of the run-off and to mitigate the risk of polluting the downstream network.

4.5.3 Surface Water & SuDS Operation and Maintenance Strategy

4.5.3.1 Drainage Features

Drainage Feature	Purpose and function	Maintenance
Private drains	Convey run-off	Inspection via CCTV survey to check for blockages
Linear drainage and gullies	Convey run-off and intercept run-off	Inspection of sump sediment level via grating
Permeable paving	Convey run-off and intercept run-off	Surface level inspection for silt build-up in joints and regular brushing/vacuuming if required
Geocellular Attenuation Tank i. Storage Crates ii. Catchpit & inlet iii. Vent pipe iv. Overflow pipe Outlet (see Flow Control Chamber below)	Storage of peak flows (where discharge rates are restricted) during a critical storm event	1. Inspection for blockages/debris 2. Inspection for build-up of sediments and debris around inlets, outlets vents and overflows to ensure that they are in good condition and operating as designed 3. Removal of debris from the catchment surface 4. Removal of silt & debris from catchpit sump 5. Survey of inside of tank for sediment build-up and remove if necessary.
Flow control chamber	Restrict the peak surface water discharge to a managed rate	Visual inspection of inlet sump for sediment build-up, flow control device (keep bypass gate closed) and opening clear, downstream pipework clear.
Bio-retention system (including rain gardens)	Convey and intercept run-off from roofs and paved areas	Inspection for litter/sediment build-up, adequate infiltration, vegetation condition and inlet/outlet pipe blockages.

In addition to the ongoing maintenance of the drainage features, structural inspection will also be required to monitor the structural integrity of the chambers, whilst also ensuring that, where used, any step irons and safety features are firmly fixed.

4.5.3.2 Operation and Maintenance Strategy for the drainage network and associated features

The following table sets out the maintenance schedule, actions and frequency for the maintenance of the drainage features noted in Section 4.5.3.1.

Maintenance Schedule	Action Required	Frequency (typical)
Regular inspections & monitoring	Inspect bioretention system infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine maintenance is necessary.	Quarterly
	Check operation of underdrains on bioretention systems by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect bioretention system inlets and outlets for blockage	Quarterly
	Inspect/check all inlets, outlet, pipes, and vents to ensure that they are in good condition and operating as designed	As required
	Carry out remote survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
	Inspect silt accumulation rates and establish appropriate maintenance frequencies	Annually
	Monitor inspection chambers, manholes and catchpits	Annually
Regular Maintenance	Remove litter, debris and weeds from catchment surface	Monthly
	Cleaning – Brush regularly and remove sweepings from hard surfaces and permeable paving	Monthly
	Inspect inlet catchpits and assess general condition and possible build-up of silt, litter or debris and remove where required	Monthly for 3 months, then annually
	Check mechanical devices (flow control device and non-return valve)	Half yearly
	Removal of silt, litter or debris from catchpit sump and flow control chamber	Annually, or as required
	Removal of silt, litter or debris build-up from bioretention system inlets or forebays	Quarterly to biannually
	Check and clear sediments from reverse action interceptor via rodding arm.	Annually, or as required
	Replace any plants to maintain planting density in bioretention system	As required
Occasional Maintenance	Stabilise and mow contributing and adjacent areas to permeable paving	As required
	Infill any holes or scour in bioretention system filter medium, improve erosion protection if required	As required

Occasional Maintenance	Repair minor accumulations of silt in bioretention system by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
	Permeable pavements – brush and vacuum surface	Annually
Remedial actions	Repair/jet/rehabilitate inlet, outlets, overflows, reverse action interceptor, flow control chamber and vents	As required
	Remove and replace bioretention system filter medium and vegetation above	As required but likely to be > 20 years

Maintenance and inspection of all drainage apparatus should be conducted in accordance with the manufacturer's guidance. On completion of the construction phase, the relevant operation and maintenance information should be provided in the relevant Health and Safety File and Operation and Maintenance manual. Operation, maintenance and inspections should be carried out by suitably qualified operatives.

5.0 Summary

The proposed developed site is in Flood Zone A and is considered to be at low risk of flooding from tidal and fluvial sources. Based upon a review of flooding from other source the site will not be adversely at risk of flooding and the development could proceed in full compliance with the requirements of TAN 15.

Proposed foul water is proposed to connect to the foul sewer directly adjacent to the development site, with peak flows and capacity to be confirmed and agreed with DCWW following finalising of architectural concept plans.

Historic surface water infiltration information and results shown poor acceptance and it is recommended that site testing to BRE digest 365 be undertaken to confirm this. On site, the design includes use of rain-gardens, permeable paving and a geocellular attenuation tank to ensure the surface water design standards meet the SAB requirements for water re-use, water discharge control, interception for retention and water quality requirements in line with CIRIA Report 753, *The SUDS Manual* and Welsh Government Statutory Standards for Sustainable Drainage Design. Total site surface water discharge to the existing DCWW surface water sewer will be restricted to an agreed rate with Cardiff Council SAB as well as any works to the existing culverted watercourse; subject to Ordinary Watercourse Land Drainage Consent.

Report prepared by: -
ON BEHALF OF SHEAR DESIGN LTD

THOMAS JAYNE
CIVIL ENGINEER

Approved by: -
ON BEHALF OF SHEAR DESIGN LTD

D Kilgour

DAMEON KILGOUR
ASSOCIATE
CIVIL ENGINEER

APPENDIX

A) SITE LOCATION PLAN

The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
A - Site boundary updated	11.05.20	GR	GR

Site Boundary

Plot 8b: Full proposal for a car showroom.

Plot 12: Outline proposal for residential development. Approximately 150 dwellings.

Plot 14: Full proposal for a Welsh Ambulance Service Facility (pink area); and Outline proposal for mixed-use development.

Full proposal for a bus, pedestrian, and cycle connection.

Full proposal for bus egress through Becks Court.

Plot 3b: Rationalisation of unmanaged wood-land area to enable development and secure landscape management

Bus route connecting proposed new accesses

PROJECT
Cardiff Gate

DRAWING TITLE
Site Plan

DATE	SCALE	DRAWN BY	CHECK BY
30.04.20	1:1250@A1	GR	GR

PROJECT NO	DRAWING NO	REVISION
21674	9020	A

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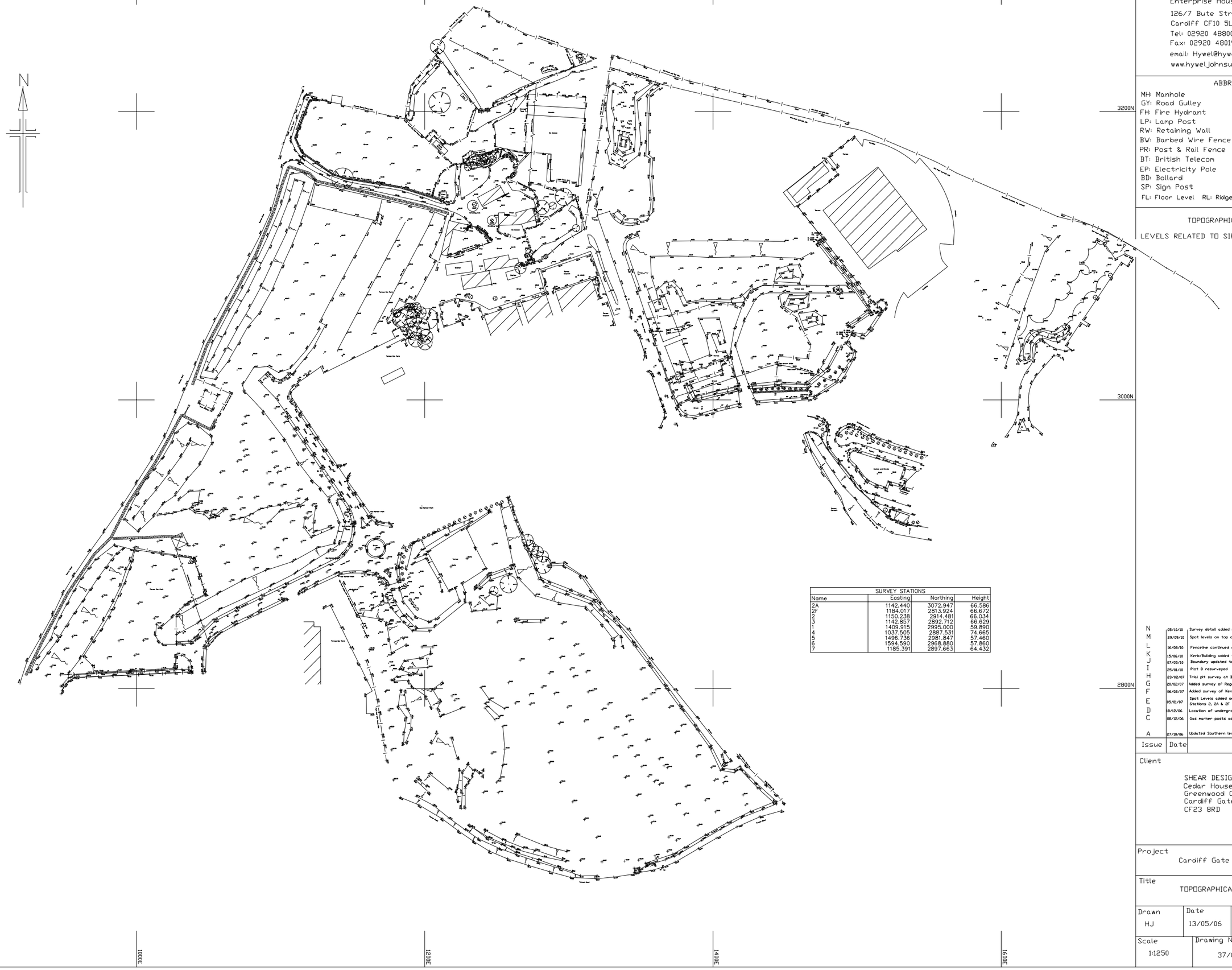
APPENDIX

B) TOPOGRAPHICAL SURVEY



SURVEY STATIONS			
Name	Easting	Northing	Height
2A	1142.440	3072.947	66.586
2F	1184.017	2813.924	66.672
2	1150.238	2914.481	66.034
3	1142.857	2892.712	66.629
1	1409.915	2995.000	59.890
4	1037.505	2887.531	74.665
5	1496.736	2981.847	57.460
6	1594.590	2968.880	57.860
7	1185.391	2897.663	64.432

Survey by:

Hywel John Surveys
Enterprise House
126/7 Bute Street
Cardiff CF10 5LE
Tel: 02920 488006
Fax: 02920 480195
email: Hywel@hyweljohnsurveys.co.uk
www.hyweljohnsurveys.co.uk

ABBREVIATIONS

MH: Manhole	IC: Inspection Cover
GY: Road Gulley	ST: Stop Tap
FH: Fire Hydrant	TP:Telephone Pole
LP: Lamp Post	SV: Stop Valve
RW: Retaining Wall	PW: Post & Wire Fence
BW: Barbed Wire Fence	MR: Marker
PR: Post & Rail Fence	LF: Lap Fence
BT: British Telecom	WM: Water Meter
EP: Electricity Pole	GV: Gas Valve
BD: Bollard	RS: Road Sign
SP: Sign Post	IR: Iron Railings

FL: Floor Level RL: Ridge Level EL: Eaves Level

TOPOGRAPHICAL SURVEY

LEVELS RELATED TO SIR ROBERT MCALPINE SURV

Issue	Date	Remarks	Checked
N	05/10/10	Survey detail added next to KBDS site	
M	29/09/10	Spot levels on top of heap next to Mercedes	
L	16/08/10	Fenceline continued around Lloyds Building	
K	15/06/10	Kerb/Building added to AUDI site	JRV
J	07/05/10	Boundary updated to North	JRV
I	25/01/10	Plot 8 resurveyed	JRV
H	23/02/07	Trial pit survey at Boyes Rees office	JRV
G	20/02/07	Added survey of Regents House to East	JRV
F	06/02/07	Added survey of Kennels to North	JRV
E	05/01/07	Spot Levels added on Plot 12 using Stations 2, 2A & 2F	JRV
D	18/12/06	Location of underground gas pipe	JRV
C	08/12/06	Gas marker posts added	JRV
A	27/10/06	Updated Southern levels	JRV

Client

SHEAR DESIGN
Cedar House
Greenwood Close
Cardiff Gate
CF23 8RD

Project

Cardiff Gate Business Park

Title

TOPOGRAPHICAL SURVEY

Drawn	Date	Checked	Date
HJ	13/05/06		

Scale	Drawing Number
1:1250	37/06/HJ

APPENDIX

C) PROPOSED SITE LAYOUT

The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
B - Areas Update	09/06/21	GR	-

N

- Site Boundary
- Mixed Area = ~0.71ha
- Commercial Area = ~0.12ha
- Residential Area = ~2.36ha

Project
Cardiff Gate

Drawing Title
Plot-12 Plot-14 Concept Plan

Date	Scale	Drawn by	Check by
05.06.20	1:2000@A3	GR	-

Project No	Drawing No	Revision
21047	9300	B

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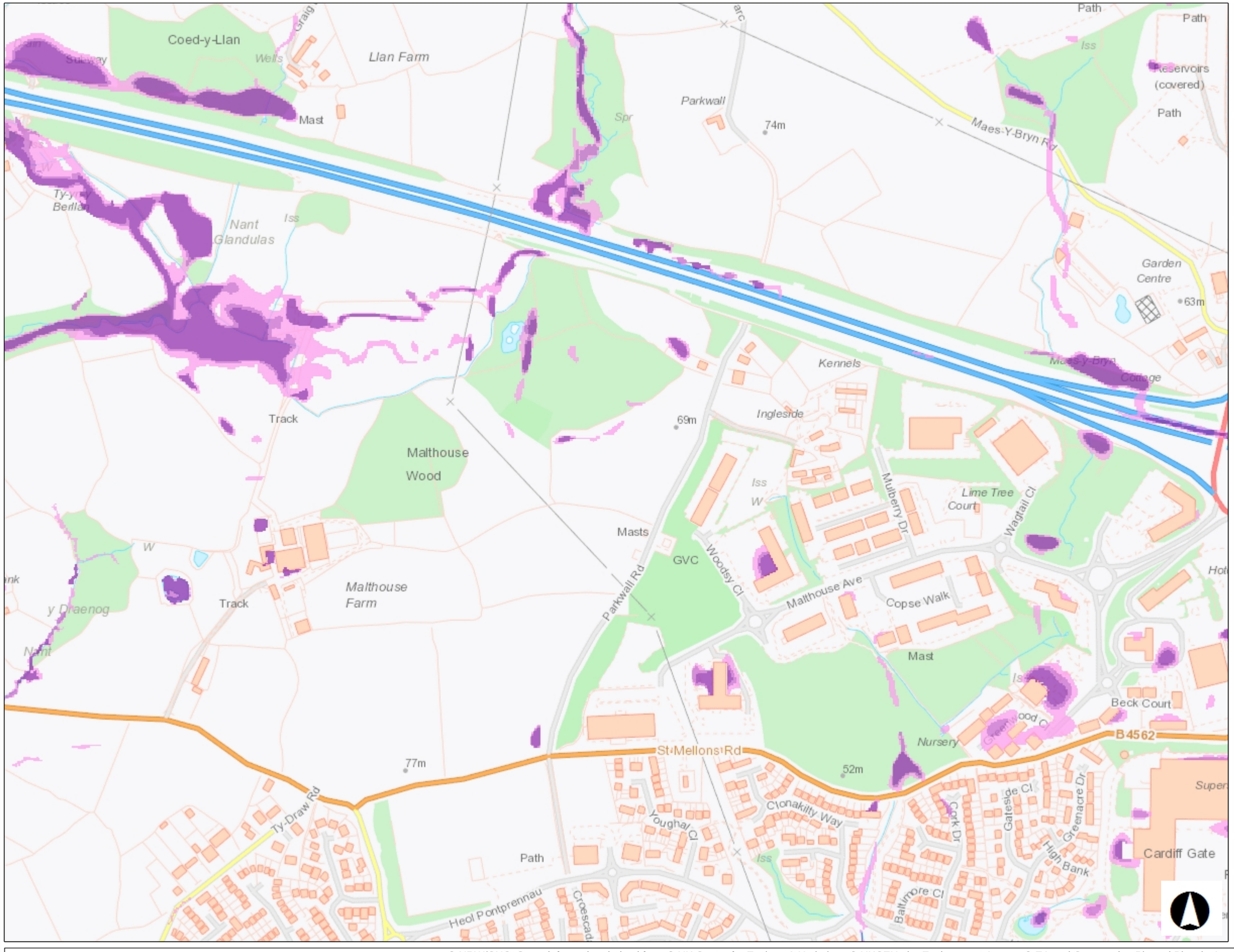
J:\21000\21047 - Cardiff Gate\A4 - Dwgs & Registers\M Planning\21047 9300 Concept Plan Plot-12 Plot-14 Rev B.dwg - A3

APPENDIX

D) NRW FLOOD MAPPING AND DCWW SEWER RECORDS



0.3 0 0.13 0.3

British_National_Grid Kilometers

Cyfoeth Naturiol Cymru
Natural Resources Wales

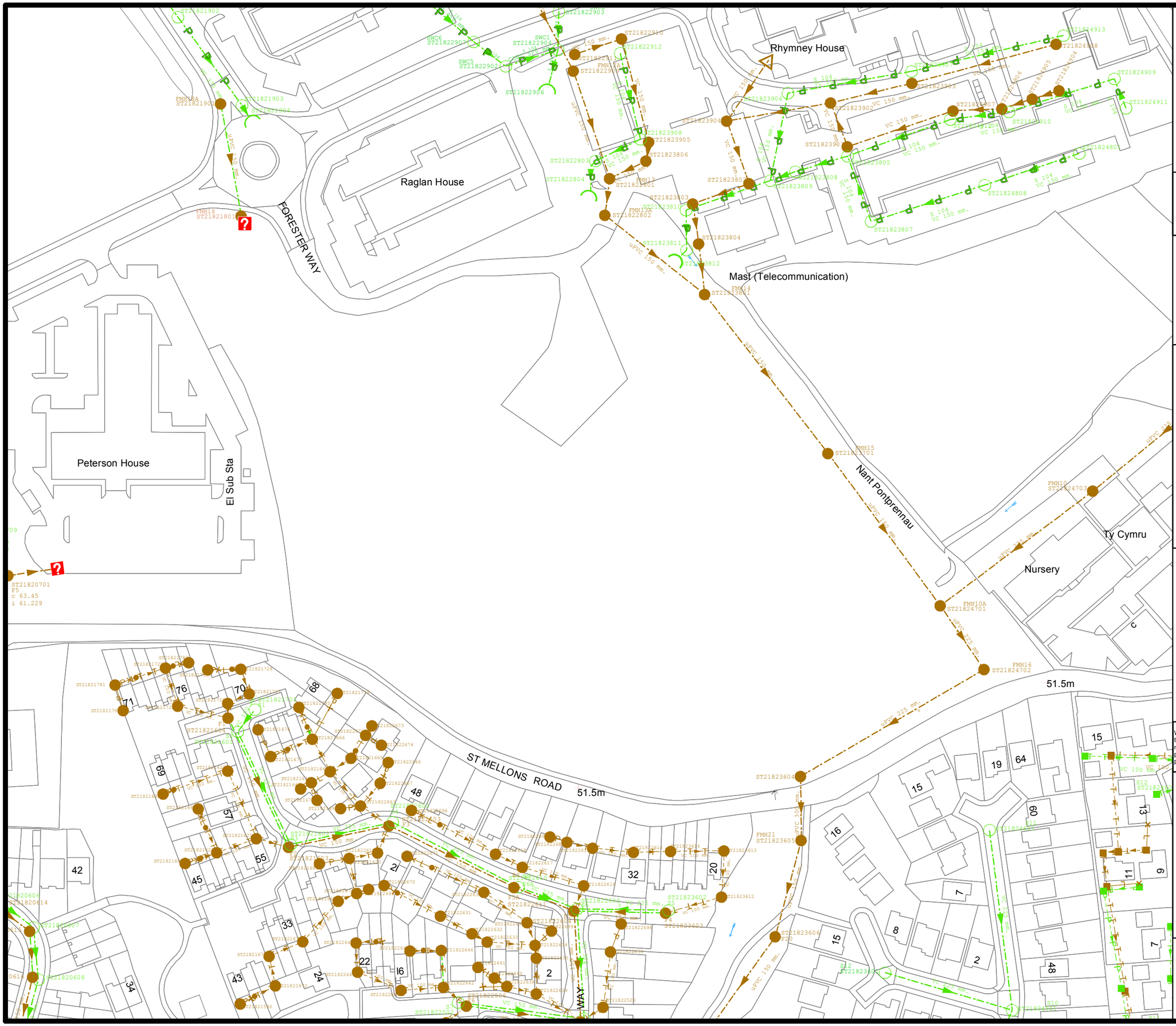
Map Perygl Llifogydd / Flood Risk Map - Plot 14 - Cardiff Gate Business Park

Allwedd / Map Key

- Risk Level Under Review
- Flood Risk from Rivers - Extent
  - High
  - Medium
  - Low
- Flood Risk from the Sea
  - High
  - Medium
  - Low
- Flood Risk from Surface Water & Small Watercourses - Extent
  - High
  - Medium
  - Low

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
04/10/2021



Dŵr Cymru
Welsh Water

PPA0000870

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

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

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only 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 and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of 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:	321283 182771
Map scale:	1:1,250
Printed by:	bg
Printed on:	12th March 2015

APPENDIX

E) ILLUSTRATIVE DRAINAGE LAYOUT AND CALCULATIONS

PROPOSED CAR PARKING AREA SHOWN IN LIGHT GREY. POSSIBLE INCLUSION OF PERMEABLE PAVEMENT (LINED WITH GAUGE 2000 DPM, VISQUEEN 2000 O.S.A.) TO AID TREATMENT OF RUNOFF (TO BE DISCUSSED WITH SABs OFFICER WITH RELATION TO PROPOSED SITE GRADIENTS)

SITE LAYOUT AND BOUNDARIES DICTATED BY ADJACENT EASEMENTS, UTILITIES AND OH CABLES/PYLONS

PROPOSED COMMERCIAL BUILDING

INCLUSION OF GREEN ROOF (TREATMENT) AND BLUE ROOF (TREATMENT & STORAGE) TO BE EXPLORED AND POSSIBLE MAINTENANCE RESTRICTIONS FROM OH CABLES REVIEWED.

INDICATIVE LOCATION OF POTENTIAL RAIN GARDENS. AREA 286m², BASED ON 4% OF IMPERMEABLE SITE AREA (7151m²)

GEOCELLULAR ATTENAUTION TANK (WAVIN AQUA CELL CORE-R O.S.A.)

BASED ON 0.715HA IMPERMEABLE AREA, MIN ATTENUATION VOLUME FOR ALL CRITICAL STORM EVENTS INCL. 1IN100YR+40%CC = 700M³ X 1.2M DEPTH

TANK LOCATED GREATER DISTANCE OF OH CABLES/PYLONS TO ENSURE ACCESS FOR FUTURE MAINTENANCE

INCLUSION OF GREEN ROOF (TREATMENT) AND BLUE ROOF (TREATMENT & STORAGE) TO BE EXPLORED AND POSSIBLE MAINTENANCE RESTRICTIONS FROM OH CABLES REVIEWED.

PROPOSED COMMERCIAL BUILDING

PROPOSED NEW VEHICULAR ACCESS OFF MALTHOUSE AVENUE

VORTEX FLOW CONTROL (HYDROBRAKE O.S.A.) WITHIN MH CHAMBER LIMITING DISCHARGE FROM THE DEVELOPMENT TO 3.1 L/s (BASED ON AGREED RATE OF 4.31 L/s/ha)

CONNECTION TO SuDS DRAINAGE SYSTEM OF PLOT 12 OR ADJACENT SW SEWER IF VIABLE;
REFER TO DRG 20033-SK500

NOTES

GENERAL

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS RELATE TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THIS 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, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
6. THIS DRAWING IS COPYRIGHT © PROPERTY OF SHEAR DESIGN LIMITED.

- High pressure gas main with 15m easement exclusion zone either side of line of pipe in residential areas
- High pressure gas main with 6m easement exclusion zone either side of line of pipe in commercial areas
- Foul sewer with 3m easement either side of line of pipe
- Water main with 3m easement either side of line of pipe
- Overhead cable easement
- Development boundary
- Proposed surface water geocellular attenuation tank
- Proposed rain garden

REV	DATE	DESCRIPTION	BY	CHK
AMENDMENTS				

CLIENT:

PROJECT: CARDIFF GATE BUSINESS PARK

TITLE: PLOT 14, CONCEPT SuDS DRAINAGE PLAN

SHEAR design
Consulting Civil and Structural Engineers
7 Ashtree Court – Woodsy Close – Cardiff Gate Business Park – Cardiff – CF23 8RW
Tel: 029 2054 7000 – Fax: 029 2054 7001 – www.shear-design.com – enquiries@shear-design.com

DRAWN:	CHECKED:	DATE:	SCALE:
TDJ	DK	AUG 2021	1:500 @ A1

STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT T = TENDER C = CONSTRUCTION AB = AS-BUILT

STATUS:	DRAWING NUMBER:	REVISION:
P	20033-SK550	--

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

Half Drain Time : 2309 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	65.400	0.300	0.0	3.1	3.1	199.2	O K
30 min Summer	65.520	0.420	0.0	3.1	3.1	279.4	O K
60 min Summer	65.662	0.562	0.0	3.1	3.1	374.0	O K
120 min Summer	65.820	0.720	0.0	3.1	3.1	479.0	O K
180 min Summer	65.911	0.811	0.0	3.1	3.1	539.1	O K
240 min Summer	65.973	0.873	0.0	3.1	3.1	580.7	O K
360 min Summer	66.064	0.964	0.0	3.1	3.1	640.9	O K
480 min Summer	66.125	1.025	0.0	3.1	3.1	681.9	O K
600 min Summer	66.170	1.070	0.0	3.1	3.1	711.6	O K
720 min Summer	66.203	1.103	0.0	3.1	3.1	733.8	O K
960 min Summer	66.247	1.147	0.0	3.2	3.2	763.1	O K
1440 min Summer	66.284	1.184	0.0	3.2	3.2	787.0	O K
2160 min Summer	66.276	1.176	0.0	3.2	3.2	782.1	O K
2880 min Summer	66.253	1.153	0.0	3.2	3.2	767.0	O K
4320 min Summer	66.216	1.116	0.0	3.1	3.1	742.0	O K
5760 min Summer	66.182	1.082	0.0	3.1	3.1	719.3	O K
7200 min Summer	66.147	1.047	0.0	3.1	3.1	696.5	O K
8640 min Summer	66.113	1.013	0.0	3.1	3.1	673.6	O K
10080 min Summer	66.079	0.979	0.0	3.1	3.1	650.9	O K
15 min Winter	65.400	0.300	0.0	3.1	3.1	199.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	113.212	0.0	202.1	19
30 min Summer	79.743	0.0	256.8	34
60 min Summer	53.779	0.0	384.2	64
120 min Summer	34.885	0.0	487.8	124
180 min Summer	26.524	0.0	485.5	184
240 min Summer	21.706	0.0	481.4	244
360 min Summer	16.359	0.0	476.6	362
480 min Summer	13.354	0.0	475.8	482
600 min Summer	11.395	0.0	477.5	602
720 min Summer	10.002	0.0	481.2	722
960 min Summer	8.130	0.0	492.8	962
1440 min Summer	6.053	0.0	506.5	1440
2160 min Summer	4.491	0.0	989.3	2008
2880 min Summer	3.628	0.0	975.5	2360
4320 min Summer	2.693	0.0	944.2	3116
5760 min Summer	2.181	0.0	1497.2	3976
7200 min Summer	1.853	0.0	1589.5	4824
8640 min Summer	1.624	0.0	1671.6	5624
10080 min Summer	1.453	0.0	1633.1	6456
15 min Winter	113.212	0.0	202.1	19

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	65.520	0.420	0.0	3.1	3.1	279.4	O K
60 min Winter	65.662	0.562	0.0	3.1	3.1	374.0	O K
120 min Winter	65.820	0.720	0.0	3.1	3.1	479.1	O K
180 min Winter	65.911	0.811	0.0	3.1	3.1	539.4	O K
240 min Winter	65.974	0.874	0.0	3.1	3.1	581.3	O K
360 min Winter	66.065	0.965	0.0	3.1	3.1	642.0	O K
480 min Winter	66.128	1.028	0.0	3.1	3.1	683.5	O K
600 min Winter	66.173	1.073	0.0	3.1	3.1	713.9	O K
720 min Winter	66.208	1.108	0.0	3.1	3.1	736.6	O K
960 min Winter	66.254	1.154	0.0	3.2	3.2	767.4	O K
1440 min Winter	66.296	1.196	0.0	3.2	3.2	795.0	O K
2160 min Winter	66.296	1.196	0.0	3.2	3.2	795.4	O K
2880 min Winter	66.265	1.165	0.0	3.2	3.2	775.0	O K
4320 min Winter	66.211	1.111	0.0	3.1	3.1	738.6	O K
5760 min Winter	66.157	1.057	0.0	3.1	3.1	703.0	O K
7200 min Winter	66.100	1.000	0.0	3.1	3.1	665.1	O K
8640 min Winter	66.041	0.941	0.0	3.1	3.1	626.0	O K
10080 min Winter	65.982	0.882	0.0	3.1	3.1	586.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	79.743	0.0	256.8	33
60 min Winter	53.779	0.0	384.2	64
120 min Winter	34.885	0.0	487.9	122
180 min Winter	26.524	0.0	485.4	182
240 min Winter	21.706	0.0	481.2	240
360 min Winter	16.359	0.0	476.2	358
480 min Winter	13.354	0.0	475.1	476
600 min Winter	11.395	0.0	476.5	592
720 min Winter	10.002	0.0	480.0	708
960 min Winter	8.130	0.0	491.2	940
1440 min Winter	6.053	0.0	503.6	1396
2160 min Winter	4.491	0.0	984.3	2052
2880 min Winter	3.628	0.0	969.8	2596
4320 min Winter	2.693	0.0	944.3	3288
5760 min Winter	2.181	0.0	1496.2	4216
7200 min Winter	1.853	0.0	1589.4	5184
8640 min Winter	1.624	0.0	1670.9	6056
10080 min Winter	1.453	0.0	1655.3	6960

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.266	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.715

Time (mins) From:	To:	Area (ha)
0	4	0.715

Model Details

Storage is Online Cover Level (m) 67.500

Cellular Storage Structure

Invert Level (m) 65.100 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	0.0	1.201	0.0	0.0
1.200	700.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0081-3100-1200-3100
Design Head (m)	1.200
Design Flow (l/s)	3.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	81
Invert Level (m)	65.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	3.1
Flush-Flo™	0.356	3.1
Kick-Flo®	0.723	2.5
Mean Flow over Head Range	-	2.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	1.200	3.1	3.000	4.7	7.000	7.1
0.200	2.9	1.400	3.3	3.500	5.1	7.500	7.3
0.300	3.0	1.600	3.5	4.000	5.4	8.000	7.5
0.400	3.0	1.800	3.7	4.500	5.7	8.500	7.7
0.500	3.0	2.000	3.9	5.000	6.0	9.000	7.9
0.600	2.8	2.200	4.1	5.500	6.3	9.500	8.2
0.800	2.6	2.400	4.3	6.000	6.6		
1.000	2.8	2.600	4.4	6.500	6.8		

APPENDIX

F) NRW PERSONAL FLOOD PLAN & FLOOD WARNING DEFINITIONS

FLOOD ALERT

What it means

- Flooding is possible. Be prepared.

When is it used?

- Between two hours and two days in advance of flooding.

What to do

- Be prepared to act on your flood plan.
- Prepare a flood kit of essential items.
- Monitor local water levels and the flood forecast on our website.

FLOOD WARNING

What it means

- Flooding is expected. Immediate action required.

When is it used?

- Between half an hour and one day in advance of flooding.

What to do

- Move family, pets and valuables to a safe place.
- Turn off gas, electricity and water supplies if it is safe to do so.
- Put flood protection equipment in place.

SEVERE FLOOD WARNING

What it means

- Severe flooding. Danger to life.

When is it used?

- When flooding poses a significant threat to life.

What to do

- Stay in a safe place with a means of escape.
- Be ready to leave your home.
- Cooperate with the emergency services.
- Call 999 if you are in immediate danger.

Cyfoeth Naturiol Cymru
Natural Resources Wales

Personal Flood Plan

Name:

Useful numbers:

General contact list	Company name	Contact name	Telephone
Floodline	Natural Resources Wales		0345 988 1188
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company & policy number			
Local council			
Local radio station			
Travel / weather info			

Key locations:

Service cut-off	Description of location
Electricity	
Gas	
Water	

Who can help / who can you help?

Relationship	Name	Contact details	How can they / you help?
Relative			
Friend or neighbour			

What can you do if a flood is expected in your area?

Actions	Location
Home Move furniture and electrical items to safety	
Put flood boards, polythene and sandbags in place	
Make a list now of what you can move away from the risk	
Turn off electricity, water and gas supplies	
Roll up carpets and rugs	
Unless you have time to remove them hang curtains over the rods	
Move sentimental items to safety	
Put important documents in polythene bags and move to safety	
Garden and outside Move your car out of the flood risk area	
Move any large or loose items or weigh them down	
Business Move important documents, computers and stock	
Alert staff and request their help	
Farmers move animals and livestock to safety	
Evacuation – prepare a flood kit in advance Inform your family or friends that you may need to leave your home	
Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons	

What can I do now?

Put important documents out of flood risk and protect in polythene	☐	Look at the best way of stopping floodwater entering your property	☐
Check your insurance covers you for flooding	☐	Make a flood plan and prepare a flood kit	☐
Find out where you can get sandbags	☐	Identify what you would need to take with you if you had to leave your home	☐
Identify who can help you / who you can help	☐	Understand the flood warning codes	☐

Are you signed up to receive flood warnings?

☐ If not call Floodline on **0345 988 1188** to see if your area receives free flood warnings.

Let us know when you've completed your flood plan by calling Floodline on **0345 988 1188.**
This will help us learn more about how people are preparing for flooding.

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at **www.bluepages.org.uk**