

Proposed Residential Development, Main Road, Dyffryn Cellwen, Neath

Flood Risk Assessment inc Drainage Strategy

for

QDTS Properties



Rev	Prepared by	Date
A	P Dwyer	Dec 22
B	P Dwyer	Apr 23
C	P Dwyer	Nov 23

**Proposed Residential Development, Main Road, Dyffryn Cellwen, Neath
Flood Risk Assessment inc. Drainage Strategy**

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1 INTRODUCTION

1.1 This Drainage Strategy for the proposed development of land to the north of Main Road, Neath has been prepared for QDTS Properties.

1.2 The objective of this assessment is to identify any potential risk of flooding to the proposed site and adjacent properties as a result of the development in accordance with the requirements of the current Planning Policy Wales Framework (PPW) and Neath Port Talbot County Borough Council requirements.

1.3 The report will also assess the surface and foul water drainage proposals to ensure the development does not increase the risk of flooding elsewhere and provide options for Sustainable Urban Drainage (SuDS) techniques in line with CIRIA and Neath Port Talbot County Borough Council's current guidance.

1.4 This report is based on information received from Welsh Water together with the review of the Natural Resources Wales online flood maps. A topographical survey has also been provided and a Preliminary Geo-Environmental Assessment & Ground Investigation Report undertaken by Terrafirma has been used for reference regarding underlying ground conditions for the site.

1.5 This report presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the scope of works. In the production of this report, it is considered that the site is to be developed for 6No new residential properties with associated roads, gardens and parking.

1.6 This report has been prepared for the sole use of QDTS Properties and their appointed consultants. No other third party may rely upon or reproduce the contents of this report without written approval.

2 THE SITE

Location and Description

2.1 The site is centred on national grid reference 285075 , 210190 and located in the land north of Main Road, Dyffryn Cellwen, Neath approximately 800m north west of Benwan and 800m south east of Olnwyn. As shown in the below extract.



2.2 The site is currently unoccupied land following the demolition of the former surgery and residential buildings.

2.3 A topographical survey is presented within **Appendix A** and shows levels generally fall to the north east from the south west to a lowest point of approximately 235.93mAOD. The highest level in south west area of the site is around 241.30mAOD around the existing public toilets and substation situated either side of the existing site access.

2.4 A copy of the existing flood flow paths of surface water based on the topographical survey described above can be found in Appendix F.

2.5 The proposed development layout is shown in **Appendix B**. The drawing shows the outline proposals to provide 6 No new residential properties with associated roads, gardens and parking.

3 Hydrology & Existing Drainage

3.1 The nearest watercourse to the site is the Camnant located just 300m to the north east adjacent to the Inter Valley Road, the watercourse flows to the north east for around 700m where it discharges into the Afon Pyrdin.

3.2 Another watercourse is located 700m south of the site, named the Nant Cellwen. The watercourse runs in a north eastern direction where it discharges into the Camnant watercourse after approximately 500m.

3.3 Historical maps show a watercourse located directly to the north east corner of the site running in an eastern direction. It is believed that this watercourse has been culverted as part of the construction of the adjacent residential care scheme.

3.4 Details from the Welsh Water sewer records accompanied with drainage information contained within the topographical survey have confirmed there is a 525mm surface water sewer running along the southern boundary of the site to the east. The sewer then runs north east. From reviewing historical maps, it is believed that this sewer is a culverted watercourse which forms part of the watercourse culverted recently to the north east of the site, described in section 3.3.

3.5 A 100mm foul drain passes through the site from the existing public toilets in the south west, heading to the south west corner where it exits the site.

3.6 A 150mm surface water drain is located within the north east corner of the site, where it exits the site and it believed to run into the 525mm culverted watercourse within the adjacent land.

3.7 The geo-environmental assessment states that no groundwater was encountered in any of the exploratory holes. A copy of the exploratory hole logs can be found in Appendix D.

4 FLOOD MAP ASSESSMENT

Fluvial Flooding

4.1 Online flood maps have been reviewed and show that the site is located outside the mapped areas at risk of fluvial flooding.

4.2 Flooding from the Camnant watercourse located to the north east does not breach the Inter Valley road, located around 300m away from the site.

4.3 It is therefore considered that the site has a very low risk of flooding from this source.

Coastal Flooding

4.4 Online flood maps have been reviewed and show that the site is located outside the mapped areas at risk of coastal flooding.

4.5 The site is considered to have a negligible risk of flooding from this source.

Pluvial Flooding

4.6 Surface water flooding occurs when the amount of rainfall exceeds the drainage or infiltration capacity of the surface it falls upon. Surface water runoff can coalesce into surface water flow pathways, especially in urban areas where there is a large proportion of impermeable ground surface due to development, as it flows towards a drainage system or watercourse. Surface water can also pond within areas with inadequate drainage.

4.7 Surface water flood maps highlight the following risk categories:

- High risk: The area has a chance of flooding of greater than 1 in 30 (3.3%) each year.
- Medium risk: The area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) each year.
- Low risk: The area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%) each year.

- Very low risk: The area has a chance of flooding of less than 1 in 1000 (0.1%) each year.

4.8 Online flood maps have been reviewed and show that the site is at a medium to high risk in the eastern are of the site. This is considered to be likely due to existing low-lying areas without sufficient surface water drainage. As per the proposals in Appendix D, a positive drainage system suitably designed to accommodate all storm events up to the 1in100 year +CC will be provided.

4.9 It is therefore considered the site will have a low risk of flooding from this source.

4.10 The below extract of online flood maps shows the Pluvial and Fluvial flood risk to the site.



Flooding from Artificial Sources

4.11 Online reservoir inundation mapping has been reviewed and shows the site to be located outside the mapped extent of reservoir flooding.

4.12 Therefore, the site is considered as having a negligible risk of flooding from this source.

Ground Water Flooding

4.13 Another potential risk of flooding to be considered is from rising groundwater within the underlying strata.

4.14 No groundwater monitoring has taken place at this time. However, during the ground investigation, groundwater was not encountered in the exploratory holes.

4.15 Any significant groundwater ingress that does occur within excavations should be controlled by localised pumping from sumps within excavations.

5 SURFACE WATER AND FOUL WATER DRAINAGE

Surface Water Drainage Hierarchy

5.1 The proposed surface water drainage scheme should seek to meet the current Planning Policy Wales (PPW) and Neath Port Talbot County Borough Council's current requirements. As per guidance of the discharge of surface water for new developments, the following hierarchy should be adhered to:

- 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.

5.2 Collection of surface water for re-use should be considered as the first choice, due to the nature of the scheme it is proposed that the most appropriate method to do so will be in the form of 2No above ground water butts provided to the rear rainwater pipes of each property. The water butts will have an overflow system linked to the rainwater pipes to allow excess flows to enter the surface water drainage. As such, the water butts are not considered within the hydraulic model of the drainage system.

5.3 Following this, consideration should be given to infiltration techniques (to ground), the ground conditions encountered within the exploratory holes carried out across the site have been described as firm to stiff dark brown sandy very gravelly CLAY with inclusions of brick.

5.4 It is considered that the above ground conditions are unlikely suitable for suitable infiltration to ground. However, soakaway tests have been completed in order to fully discount the option. The results of these test can be found in Appendix D, which show that water did not drain from the test pits and tests were therefore abandoned.

5.5 The nearest open watercourse to the site is the Camnant watercourse located 300m to the east. A route to discharge to this watercourse is considered unfeasible due to its distance from the site and would involve construction in third party land. Discharge to an open watercourse has therefore discounted.

5.6 Historical maps show a watercourse located directly to the north east corner of the site running in an eastern direction. It is believed that this watercourse has been culverted as part of the construction of the adjacent residential care scheme.

5.7 A 150mm surface water drain is located within the north east corner of the site, where it exits the site and it believed to run into the 525mm culverted watercourse within the adjacent land.

5.8 It is therefore proposed that the existing outfall from the site into the culverted watercourse will be utilised. With a new manhole to be constructed online of the drain.

Surface Water Discharge Rate

5.9 The existing 1in1 year greenfield runoff rate for the existing site has been calculated as 3.5l/s, the calculation used to obtain this within Flow modelling software can be found in the extract below. This has been based on a positively drained area of 0.211Ha.

Pre-development discharge

Site Makeup

Brownfield Method

Greenfield Method

Positively Drained Area (ha)

SAAR (mm)

Soil Index

SPR

Region

Betterment (%)

QBar (l/s)

Return Period (years)	Growth Factor	Q (l/s)
1	0.85	3.5
30	1.95	8.0
100	2.48	10.2

5.10 It is therefore proposed to restrict flows to a maximum discharge rate of 3.5l/s whilst attenuating additional volumes within the drainage system. Due to the shallow depth of the existing drain, it is necessary to restrict flows through the use of a package pumping station.

Surface Water Attenuation

5.11 The attenuation required to accommodate a 1 in 100+40% year storm event has been estimated to be around 120m³. The surface water drainage system will be designed to accommodate a 1 in 100-year storm event +40% Climate change within the drainage network below ground. Surface water attenuation is to be provided by cellular storage, filter trenches, raigarden and permeable parking bays. No flooding will occur to any of the proposed buildings or adjacent properties.

5.12 The cellular storage tank proposed will provide 80m³ of attenuation with the remaining storage requirement satisfied within the course graded aggregate subbase of the filter trenches and permeable parking bays as well as the raingarden located adjacent to the access road.

5.13 Details of all proposed storage systems can be found in Appendix G and the cellular storage tank design can be found in Appendix H

Surface Water Treatment

5.14 An assessment has been undertaken in relation to the following areas and the treatment provided within the drainage system to ensure the quality of the discharge from the site in reference to Ciria guidance C753.

5.15 SUDs treatment systems provided within the proposed drainage system include a swale, filter trenches, porous paving, and rain gardens.

Residential Roof Area (Pollution Hazard Level – Very Low)

5.16 Table 26.2 of the SuDS Manual (C753) states the pollution hazard indices for residential roofs and is presented within **Table 1** below.

Table 1: Pollution hazard indices for residential roofs

Pollution Hazard	Total Suspended Solids (TSS)	Metals	Hydro carbons
Low	0.2	0.2	0.05

5.17 The roof water in the development will pass through a series of rain garden systems within the landscaping to the rear of the dwellings, with the remaining areas roof water discharging into filter drains which will provide treatment of the surface water run-off. In line with Table 26.3 of the SuDS manual (C753) this will provide the following mitigation indices and is presented within **Table 2** below.

Table 2: Bioretention System Mitigation Indices

Type of SuDS component	Total Suspended Solids (TSS)	Metals	Hydro carbons
Bioretention System	0.8	0.8	0.8
Filter Drain	0.4	0.4	0.4

5.18 These indices are both greater than the pollution hazard indices and therefore provide sufficient treatment of surface water flows from the roof.

Access Road (Pollution Hazard Level – low)

5.19 The access road has been classified as a low traffic road in accordance with Table 26.2 of the SuDS Manual (C753) shown within **Table 3**. This states the pollution hazard indices as follows:

Table 3: Pollution Hazard Indices from a low traffic road

Pollution Hazard	Total Suspended Solids (TSS)	Metals	Hydro carbons
Medium	0.5	0.4	0.4

5.20 The access road will drain via a raingarden. In line with Table 26.3 of the SuDS manual (C753) shown within **Table 4**, this will provide the following mitigation indices.

Table 4: Bioretention System Mitigation Indices

Type of SuDS component	Total Suspended Solids (TSS)	Metals	Hydro carbons
Bioretention System	0.8	0.8	0.8

5.21 These indices will fully meet the treatment requirements from this area of the site.

Shared Parking Area (Pollution Hazard Level – low)

5.22 The shared parking area has been classified as a low traffic road in accordance with Table 26.2 of the SuDS Manual (C753) shown within **Table 5**. This states the pollution hazard indices as follows:

Table 5: Pollution Hazard Indices from a low traffic road

Pollution Hazard	Total Suspended Solids (TSS)	Metals	Hydro carbons
Medium	0.5	0.4	0.4

5.23 The shared parking area will drain via porous driveways or a raingarden. In line with Table 26.3 of the SuDS manual (C753) shown within **Table 4**, this will provide the following mitigation indices.

Table 6: Swale & Filter Trench Mitigation Indices

Type of SuDS component	Total Suspended Solids (TSS)	Metals	Hydro carbons
Porous Paving	0.7	0.6	0.7
Raingarden	0.8	0.8	0.8

5.24 Both of these indices will fully meet the treatment requirements from this area of the site.

5.25 All private surface water drainage should be designed in accordance with the current Building Regulations. All private drainage will be maintained by the developers appointed maintenance company in accordance with the maintenance plan attached in **Appendix E**.

Surface Water Exceedance Routes

5.26 The surface water drainage system has been designed to accommodate all storm events up to the 1in100 year +40%CC below ground with no flooding occurring to the surface. The drainage calculations contained within Appendix D demonstrate this.

5.27 Despite the above, a proposed flood flow paths drawing has been provided within Appendix F to show where surface water would flow and gather based on the proposed levels in the case of blockage to the system.

5.28 As the site discharges via a pumping station, an exceedance route plan has also been provided for the event of a pumping station failure. The plan is contained within Appendix F, calculations for the pump failure event can be found within Appendix D.

5.29 The calculations show that in this event, around 150m³ of surface water would exceed to system at RE2 within the parking bays in the north east corner of the shared driveway. The water would be retained by the kerbs in this area up to a level of 236.400mAOD where it would start to flow into the rain garden to the north and then further north into the public highway, Heol Gaer.

Foul Water Drainage

5.30 Foul flows will connect into the existing 150mm foul drain diverted through the site. The diversion has been provided to maintain the foul outfall from the public toilets located to the south west of the site.

5.31 All private foul water drainage within the site will be designed in accordance with the current Building Regulation.

5.32 A preliminary drainage layout plan showing foul water drainage is included within **Appendix D**.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 The site has been reviewed in relation to all potential sources of flooding and it is considered that the site is at low to negligible risk of flooding from all sources. The proposed development will not exacerbate flooding elsewhere.

6.2 Surface water flows will be restricted by a package pumping station to a maximum flow rate of 3.5l/s to mimic the 1 in 1 year greenfield runoff rate of the site.

6.3 Surface water flows will be discharged into the culverted watercourse located to the north east of the site utilising an existing 150mm surface water pipe from the site.

6.4 The attenuation required to accommodate a 1 in 100+40% year storm event is in the order of 120m³. Surface water attenuation is to be provided by cellular storage, filter trenches, raingardens and permeable parking bays.

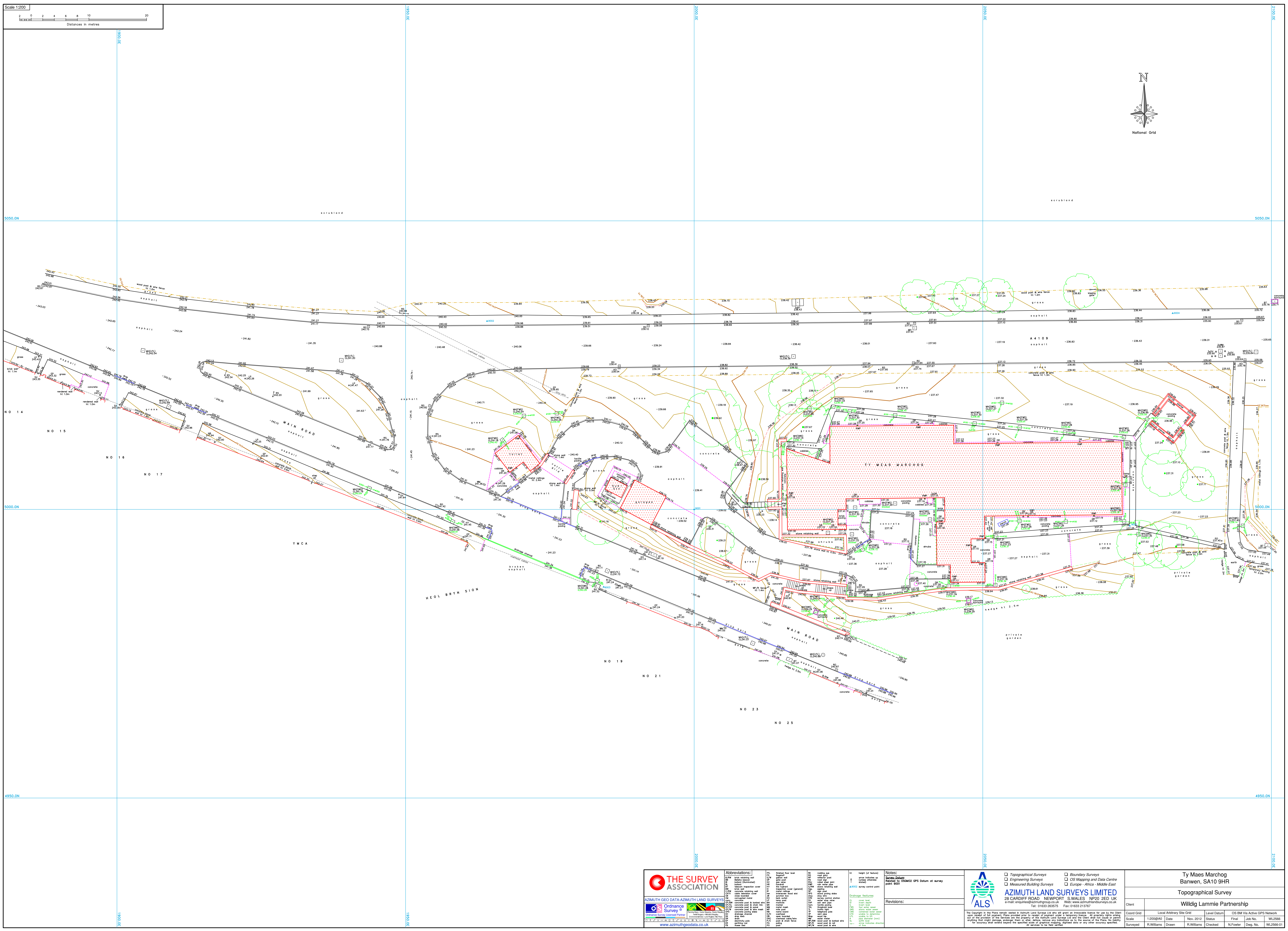
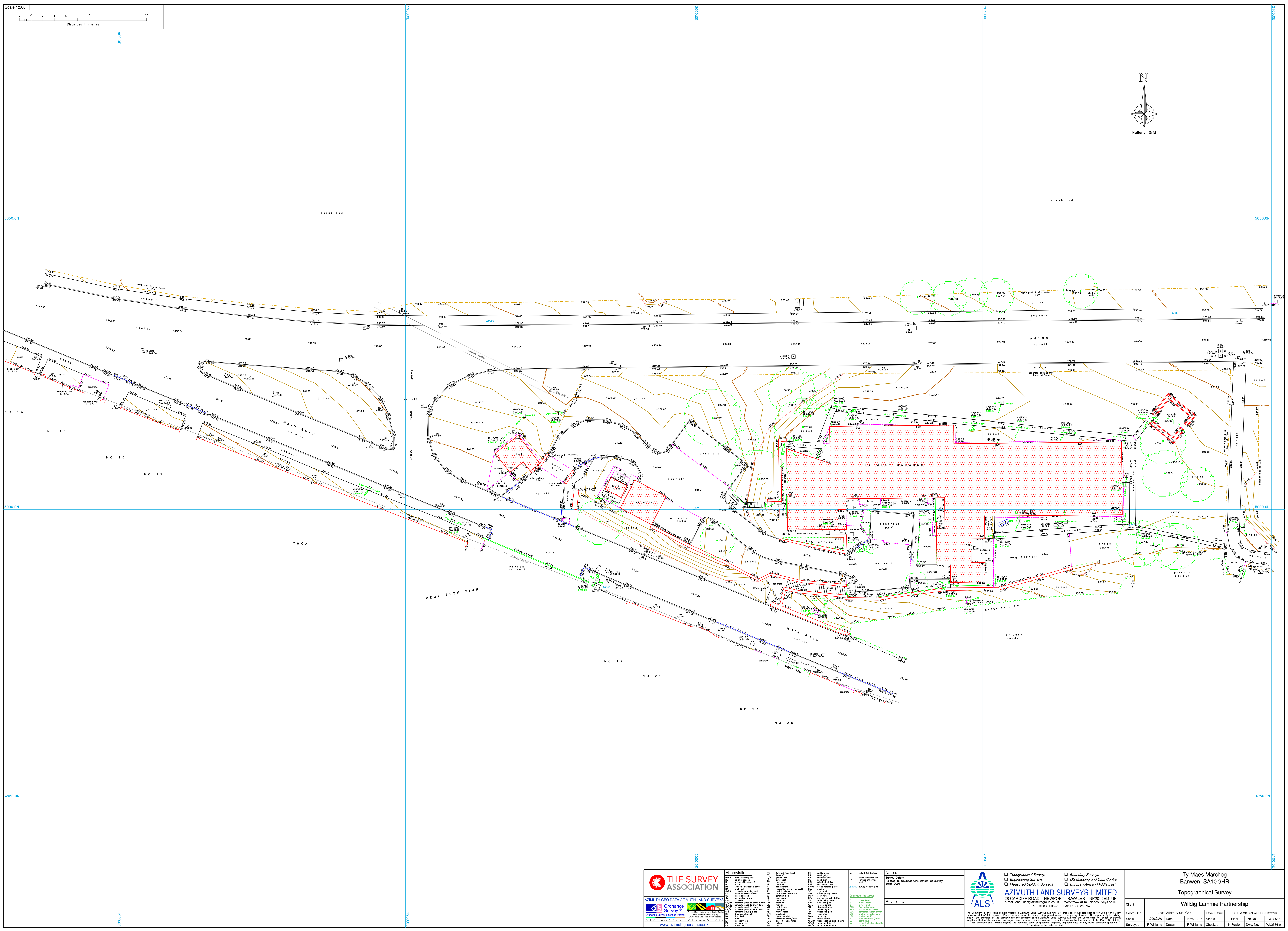
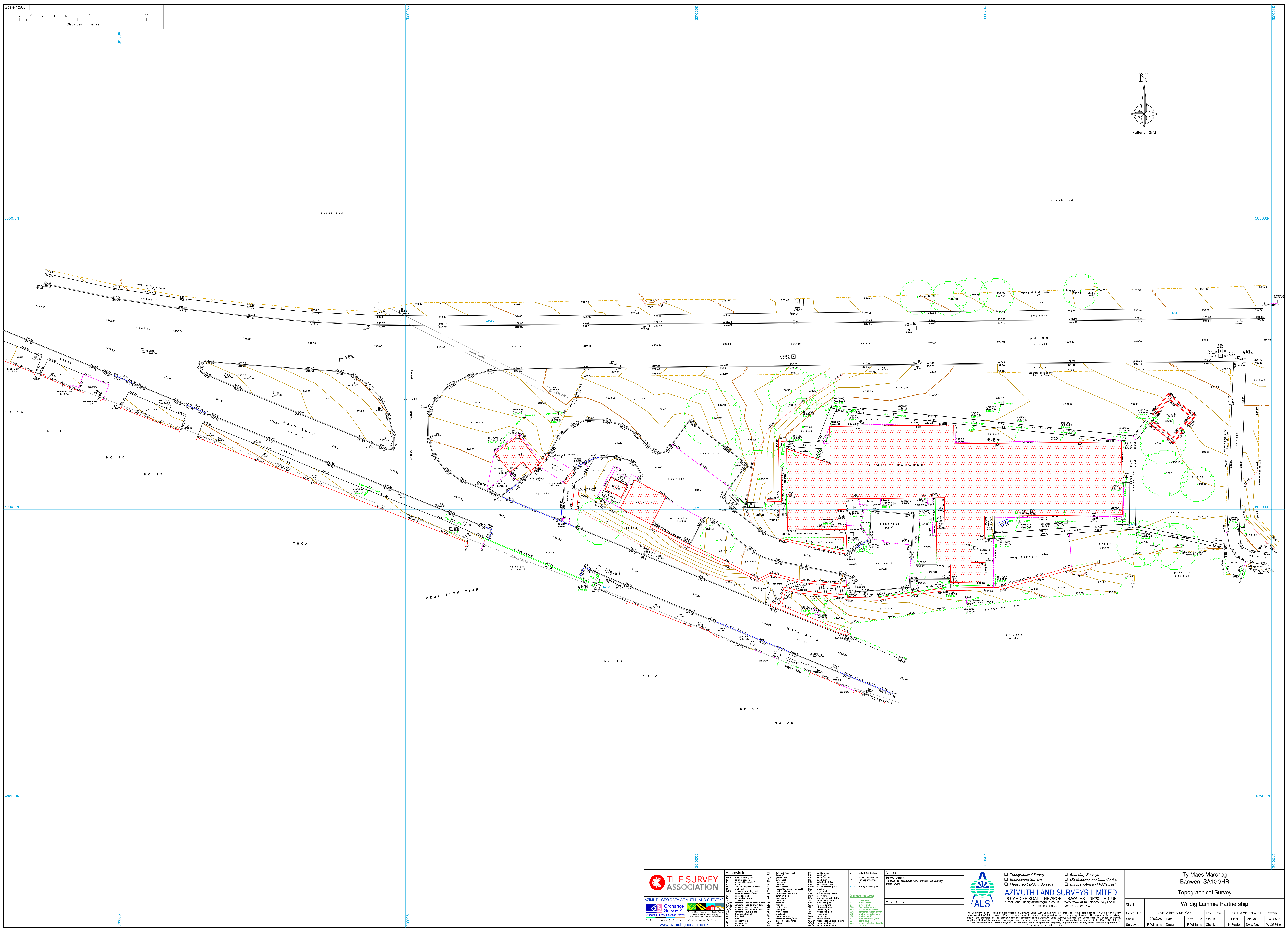
6.5 Water butts will also be provided to all properties to allow roof water to be stored for reuse.

6.6 Surface water flows will be contained within the drainage system for storm events up to and including the 1 in 100 years+40% climate change event.

6.7 Sustainable Urban Drainage techniques have been considered to improve the water quality of the discharge of surface water flows from the development. This will be in the form of a filter trenches, porous paving, and rain gardens. All surface water from the site has been shown to satisfy the require treatment indices of C753 The SUDs Manual.

6.8 Foul flows will connect into the existing 150mm foul drain diverted through the site. The diversion has been provided to maintain the foul outfall from the public toilets located to the south west of the site.

Appendix A Topographical Survey



Appendix B Proposed Site Plan

	FFL	Ridge
Plot 1	+245.52	+253.16
Plot 2	+244.72	+252.80
Plot 3	+244.16	+252.26
Plot 4	+243.62	+251.70
Plot 5	+243.10	+250.97
Plot 6	+242.47	+250.39

Measurements not to be scaled from this drawing. All dimensions to be checked and confirmed prior to commencement of work. Contractors to notify architects of site variations affecting information on this drawing. The information in this drawing is copyright of Hickman & Smith Architects Ltd. Survey Information by others.

Date	Rev	By	Details
21.08.23	/	AC	Issued for comment
21.08.23	A	AC	Issued for planning
07.11.23	B	AC	Revised to match SAB

Location Key



PLANNING

Hickman & Smith Architects
a: 49 Oxford Street, Leicester, LE1 5XY
: +44 (0)116 207 8825
e: info@hickmanandsmith.co.uk

Project	
Neath	

Client

Proposed Site and Landscaping Plan

Date	Scale	Checked
10/08/23	1:200@A1 1:400@A3	DH
Project Ref.	Drawing No.	Revision
0346	PL-100	B



Appendix C GI Logs and Soakaway tests



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5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No:

TP1

Sheet 1 of 1

Project Name: Dyffryn Cellwen

Project No:
14753

Co-ords: -
Level:

Date:
24/05/2018

Location: Dyffryn Cellwen

Dimensions: 1.80
Depth 3.00 0.80

Scale:
1:25
Logged:

Client:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				3.00			MADE GROUND: firm brown gravelly CLAY with inclusions of brick and glass
							End of Pit at 3.000m

Stability: Trial pit stable

Remarks:



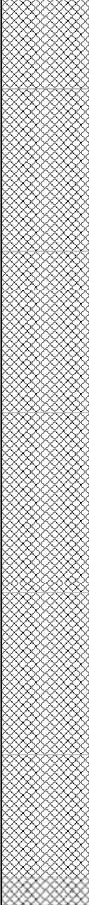
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Pentwyn, Cardiff
CF23 7HA

Trial Pit No:
TP2
Sheet 1 of 1

Project Name: Dyffryn Cellwen	Project No: 14753	Co-ords: - Level:	Date: 24/05/2018
-------------------------------	-------------------	----------------------	------------------

Location: Dyffryn Cellwen	Dimensions: 1.80 Depth 3.00	0.80 	Scale: 1:25 Logged:
---------------------------	--------------------------------	--	------------------------

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				3.00			MADE GROUND: firm brown sandy gravelly CLAY with inclusions of brick and glass
							End of Pit at 3.000m

1

2

3

4

5

Stability: Trial pit stable

Remarks:



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Pentwyn, Cardiff
CF23 7HA

Trial Pit No:

TP3

Sheet 1 of 1

Project Name: Dyffryn Cellwen

Project No:
14753

Co-ords: -
Level:

Date:
24/05/2018

Location: Dyffryn Cellwen

Dimensions: 1.80
Depth 3.00 0.80

Scale:
1:25
Logged:

Client:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				1.20			MADE GROUND: firm brown gravelly CLAY with inclusions of brick and glass	1
							MADE GROUND: firm brown very gravelly CLAY with inclusions of brick and glass	2
				3.00			End of Pit at 3.000m	3
								4
								5

Stability: Trial pit stable

Remarks:



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CF23 7HA

Trial Pit No:

TP4

Sheet 1 of 1

Project Name: Dyffryn Cellwen

Project No:
14753

Co-ords: -
Level:

Date:
24/05/2018

Location: Dyffryn Cellwen

Dimensions: 1.80

Depth
3.00

0.80

Scale:
1:25

Logged:

Client:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				3.00			MADE GROUND: firm brown gravelly CLAY with inclusions of brick and glass
							End of Pit at 3.000m

Stability: Trial pit stable

Remarks:



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Pentwyn, Cardiff
CF23 7HA

Trial Pit No:

TP5

Sheet 1 of 1

Project Name: Dyffryn Cellwen

Project No:
14753

Co-ords: -
Level:

Date:
24/05/2018

Location: Dyffryn Cellwen

Dimensions: 1.80

Depth
3.00

0.80

Scale:
1:25
Logged:

Client:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				3.00			MADE GROUND: firm brown gravelly CLAY with inclusions of brick and glass
							End of Pit at 3.000m

Stability: Trial pit stable

Remarks:



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CF23 7HA

Trial Pit No:

TP6

Sheet 1 of 1

Project Name: Dyffryn Cellwen

Project No:
14753

Co-ords: -
Level:

Date:
24/05/2018

Location: Dyffryn Cellwen

Dimensions: 1.80

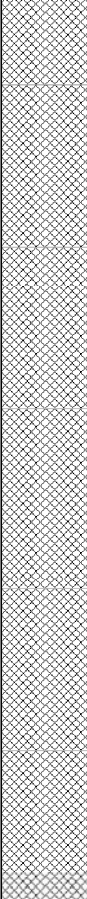
Depth
3.00

0.80

Scale:
1:25

Logged:

Client:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				3.00			MADE GROUND: firm brown gravelly CLAY with inclusions of brick and glass
							End of Pit at 3.000m

Stability: Trial pit stable

Remarks:



PERCOLATIONTESTS.CO.UK

SOAKAWAY ASSESSMENT

Project Number:
PT1342

Site Address:
Land at Main Road, Dyffryn Cellwen, Neath, SA10 9HT

Weather:
Dry

Date Of Testing:
09/11/2022

Client:

Site Location GPS



Site Photo





RESULTS

Percolation Tests In Line With BRE365

Trial Pit:	Length:	Width:	Depth:	Depth of water (at 100%)
A	1000	400	1500	0

Notes:

** Ground water encroached during excavation, soakaways should not be located within 1m of the water table, further testing abandoned **

Ground Water Encroached During Excavation

Depth Of Ground Water

Yes

1.1m BGL

RESULTS

Percolation Tests In Line With BRE365

Trial Pit:	Length:	Width:	Depth:	Depth of water (at 100%)
B	1000	400	1200	0

Notes:

** Ground water encroached during excavation, soakaways should not be located within 1m of the water table, further testing abandoned **

Ground Water Encroached During Excavation

Depth Of Ground Water

Yes

0.8m BGL

RESULTS

Percolation Tests In Line With BRE365

Trial Pit:	Length:	Width:	Depth:	Depth of water (at 100%)
C	1000	400	1200	0

Notes:

** Ground water encroached during excavation, soakaways should not be located within 1m of the water table, further testing abandoned **

Ground Water Encroached During Excavation

Depth Of Ground Water

Yes

1.3m BGL



Site Layout





PERCOLATIONTESTS.CO.UK

PHOTOS

Trial Pit A

Trial Pit B



PERCOLATIONTESTS.CO.UK



Trial Pit C





PERCOLATIONTESTS.CO.UK



Appendix D

Proposed Drainage Layout and Calculations

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HEALTH & SAFETY

1. CONTRACTOR SHOULD BE AWARE OF GENERAL CONSTRUCTION RISKS TO PREVENT SLIPS, TRIPS AND FALLS AND TAKE NECESSARY PRECAUTIONS WITHOUT SPECIAL INSTRUCTION.

ROADS & DRAINAGE

2. CONTRACTOR TO PROVIDE TRENCH SUPPORTS AS APPROPRIATE AND ENSURE THAT ALL TRENCHES ARE AT A SAFE DISTANCE FROM TRENCHES PRIOR TO INSTALLING DRAINAGE

3. THE TIME THAT EXCAVATIONS ARE OPEN ON SITE SHOULD BE KEPT TO A MINIMUM AND ALL TRENCHES SHOULD BE SURROUNDED BY A BARRIER.

4. CONNECTIONS TO EXISTING SEWERS TO BE MADE BY WW APPROVED CONTRACTOR ONLY.

5. CONTRACTOR TO MAKE OPERATIVE AWARE OF ASSOCIATED DANGERS TO THE WORKERS HAS LEFT SIGNPOSTS (W/TH DISEASES) AND RECOMMENDED PRECAUTIONS TO ADEQUATE WELFARE. ALL ACTIVITIES ARE PROTECTIVE COVERAGE TO BE PROVIDED AS REQUIRED.

6. UNFINISHED MANHOLES MUST BE COVERED WITH LOAD BEARING MATERIALS AND SURROUNDED WITH BARRIER.

PIPES & CABLES

7. SERVICE RECORDS TO BE REFERRED TO PRIOR TO WORK COMMENCING. CONTRACTOR TO PROCEED WITH CAUTION AND SERVICES TO BE LOCATED BY HAND DIG AND PROTECTED ACCORDINGLY.

EXCAVATION/FILL

8. CONTRACTOR TO ENSURE RELEVANT MEASURES ARE TAKEN TO KEEP PLANT AND PEOPLE A SAFE DISTANCE FROM STEEP SLOPES DURING THE WORKS.

9. CONTRACTOR TO TAKE PRECAUTIONS TO BE TAKEN TO KEEP PEOPLE A SAFE DISTANCE FROM WORKING PLANT WHERE NECESSARY.

10. CONTRACTOR TO REFER TO GROUND INVESTIGATION REPORT FOR CONTAMINATION RISK AND TO PROVIDE ADEQUATE WELFARE FACILITIES AND PROTECTIVE COVERAGE AS REQUIRED.

Proposed Foul drain and manhole	
Proposed Storm drain and manhole	
Existing Foul sewer and manhole	
Existing Surface Water sewer and manhole	
Existing Combined sewer and manhole	
Private storm rodding eye	
450mm dia. private inspection chamber.	
600mm dia. private inspection chamber.	
Proposed road gully & connecting pipe work. 150ø pipe unless noted otherwise	
Haydon Monotec Channel Drain with sump outlet	
Porous Paving with 450mm Deep clean stone aggregate sub-base to drain to collector pipe	

CONTRACTOR MUST PROVIDE CCTV SURVEY UPON COMPLETION OF ALL DRAINAGE WORKS.

08/11/23	FILTER TRENCH TO NORTH REPLACED WITH RAINGARDEN	PFD	P4
14/10/23	UPDATED TO SUIT COMMENTS	PFD	P3
01/08/23	UPDATED TO SUIT CCTV SURVEY	PFD	P3
04/05/23	UPDATED TO SUIT COMMENTS	PFD	P2
30/11/22	PRELIMINARY ISSUE	PFD	P1
Date	Revisions	Drawn	Rev.

PFDwyer Ltd
Consultant Engineers

PF Dwyer Limited
Rudchester
Hepscott
Morpeth
Northumberland
NE61 6LL

Mob: 07591 913658
www.pfduk.com

Client QDTS PROPERTIES

Project RESIDENTIAL DEVELOPMENT
MAIN ROAD, NEATH

Title	PROPOSED DRAINAGE LAYOUT
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Scale	Drawn	Checked	Date
A1 1:200	PFD	PFD	NOV 2022

Drawing Status Preliminary

Job No.	Drawing No.	Revision
XXXX	C001	P4

30/11/2022

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1	0.000	5.00	239.885	150	1988.734	5009.299	1.085
S1	0.012	5.00	239.200	600	1997.997	5011.308	1.200
S2			239.050	600	2006.874	5011.308	1.310
S3	0.004	5.00	239.100	600	2008.298	4998.791	1.000
S4			239.100	600	2008.298	5005.450	1.050
S5	0.009	5.00	238.700	600	2013.115	5011.308	1.200
S6			238.550	600	2020.988	5011.308	1.350
S7	0.004	5.00	238.650	600	2021.989	4995.868	1.000
S8			238.650	600	2022.125	5004.998	1.070
S9	0.007	5.00	238.150	600	2026.982	5011.308	1.150
S10	0.008	5.00	237.650	600	2045.754	4995.870	1.000
S11			237.650	600	2045.802	5004.081	1.100
S12	0.005	5.00	237.650	600	2050.836	5011.308	1.150
S13	0.004	5.00	237.100	600	2071.599	4998.791	0.500
S14			237.100	600	2071.599	5008.124	0.600
S15	0.012	5.00	237.100	600	2069.298	5013.114	1.750
S16	0.026	5.00	239.100	600	1995.538	5020.353	0.900
HW1	0.021	5.00	238.000	150	2025.617	5020.894	1.050
HW2			237.750	150	2037.100	5020.634	1.000
RE2		5.00	236.300	150	2091.138	5019.492	1.000
S17	0.006	5.00	236.350	600	2085.303	5020.884	1.100
S18	0.045	5.00	236.500	600	2075.183	5020.783	1.350
S19	0.004	5.00	236.400	600	2086.219	5000.609	1.000
S20			236.430	600	2086.219	5010.258	1.130
TANK			236.500	600	2076.506	5017.337	1.600
S21			236.400	1500	2085.846	5017.337	1.570

30/11/2022

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE1	S1	9.478	0.600	238.800	238.000	0.800	11.8	150	5.05	38.4
1.001	S1	S2	8.877	0.600	238.000	237.740	0.260	34.1	150	5.14	38.2
1.002	S2	S5	6.241	0.600	237.740	237.500	0.240	26.0	150	5.19	38.1
2.000	S3	S4	6.659	0.600	238.100	238.050	0.050	133.2	150	5.13	38.2
2.001	S4	S5	7.584	0.600	238.050	237.500	0.550	13.8	150	5.17	38.1
1.003	S5	S6	7.873	0.600	237.500	237.200	0.300	26.2	150	5.26	37.9
1.004	S6	S9	5.994	0.600	237.200	237.000	0.200	30.0	150	5.31	37.8
3.001	S7	S8	9.131	0.600	237.650	237.580	0.070	130.4	150	5.17	38.1
3.002	S8	S9	7.963	0.600	237.580	237.000	0.580	13.7	150	5.22	38.0
1.005	S9	S12	23.854	0.600	237.000	236.500	0.500	47.7	150	5.58	37.1
4.000	S10	S11	8.211	0.600	236.650	236.550	0.100	82.1	150	5.12	38.2
4.001	S11	S12	8.807	0.600	236.550	236.500	0.050	176.1	150	5.32	37.8
1.006	S12	S15	18.550	0.600	236.500	235.760	0.740	25.1	150	5.74	36.8
5.000	S13	S14	9.333	0.600	236.600	236.500	0.100	93.3	150	5.15	38.2
5.001	S14	S15	5.495	0.600	236.500	235.350	1.150	4.8	150	5.17	38.1
1.007	S15	TANK	8.354	0.600	235.350	235.300	0.050	167.1	150	5.92	36.4
6.000	S16	HW1	30.084	0.600	238.200	236.950	1.250	24.1	150	5.24	37.9
6.001	HW1	HW2	11.486	0.600	236.950	236.750	0.200	57.4	150	5.39	37.6
6.002	HW2	S18	38.083	0.600	236.750	235.150	1.600	23.8	150	5.69	36.9
7.000	RE2	S17	5.999	0.600	235.300	235.250	0.050	120.0	150	5.11	38.3
7.001	S17	S18	10.121	0.600	235.250	235.150	0.100	101.2	150	5.28	37.9
6.003	S18	TANK	3.691	0.600	235.150	235.100	0.050	73.8	150	5.75	36.8
8.000	S19	S20	9.649	0.600	235.400	235.300	0.100	96.5	150	5.16	38.2
8.001	S20	TANK	12.019	0.600	235.300	235.200	0.100	120.2	150	5.38	37.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.943	52.0	0.0	0.935	1.050	0.000	0.0	0	0.000
1.001	1.728	30.5	1.2	1.050	1.160	0.012	0.0	21	0.851
1.002	1.982	35.0	1.2	1.160	1.050	0.012	0.0	19	0.924
2.000	0.869	15.4	0.4	0.850	0.900	0.004	0.0	17	0.377
2.001	2.727	48.2	0.4	0.900	1.050	0.004	0.0	10	0.812
1.003	1.973	34.9	2.6	1.050	1.200	0.025	0.0	27	1.150
1.004	1.845	32.6	2.6	1.200	1.000	0.025	0.0	28	1.103
3.001	0.878	15.5	0.4	0.850	0.920	0.004	0.0	17	0.372
3.002	2.733	48.3	0.4	0.920	1.000	0.004	0.0	10	0.814
1.005	1.460	25.8	3.6	1.000	1.000	0.036	0.0	38	1.032
4.000	1.110	19.6	0.8	0.850	0.950	0.008	0.0	21	0.545
4.001	0.754	13.3	0.8	0.950	1.000	0.008	0.0	25	0.419
1.006	2.019	35.7	4.9	1.000	1.190	0.049	0.0	37	1.415
5.000	1.040	18.4	0.4	0.350	0.450	0.004	0.0	16	0.422
5.001	4.642	82.0	0.4	0.450	1.600	0.004	0.0	8	1.209
1.007	0.774	13.7	6.4	1.600	1.050	0.065	0.0	72	0.763
6.000	2.061	36.4	2.7	0.750	0.900	0.026	0.0	27	1.202
6.001	1.330	23.5	4.8	0.900	0.850	0.047	0.0	46	1.048
6.002	2.072	36.6	4.7	0.850	1.200	0.047	0.0	36	1.426
7.000	0.916	16.2	0.0	0.850	0.950	0.000	0.0	0	0.000
7.001	0.999	17.6	0.6	0.950	1.200	0.006	0.0	19	0.462
6.003	1.171	20.7	9.8	1.200	1.250	0.098	0.0	72	1.154
8.000	1.023	18.1	0.4	0.850	0.980	0.004	0.0	16	0.414
8.001	0.915	16.2	0.4	0.980	1.150	0.004	0.0	17	0.388

30/11/2022

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.008	TANK	S21	9.340	0.600	234.900	234.830	0.070	133.4	225	6.06	36.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	1.130	44.9	16.3	1.375	1.345	0.167	0.0	94	1.042

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.478	11.8	150	Circular	239.885	238.800	0.935	239.200	238.000	1.050
1.001	8.877	34.1	150	Circular	239.200	238.000	1.050	239.050	237.740	1.160
1.002	6.241	26.0	150	Circular	239.050	237.740	1.160	238.700	237.500	1.050
2.000	6.659	133.2	150	Circular	239.100	238.100	0.850	239.100	238.050	0.900
2.001	7.584	13.8	150	Circular	239.100	238.050	0.900	238.700	237.500	1.050
1.003	7.873	26.2	150	Circular	238.700	237.500	1.050	238.550	237.200	1.200
1.004	5.994	30.0	150	Circular	238.550	237.200	1.200	238.150	237.000	1.000
3.001	9.131	130.4	150	Circular	238.650	237.650	0.850	238.650	237.580	0.920
3.002	7.963	13.7	150	Circular	238.650	237.580	0.920	238.150	237.000	1.000
1.005	23.854	47.7	150	Circular	238.150	237.000	1.000	237.650	236.500	1.000
4.000	8.211	82.1	150	Circular	237.650	236.650	0.850	237.650	236.550	0.950
4.001	8.807	176.1	150	Circular	237.650	236.550	0.950	237.650	236.500	1.000
1.006	18.550	25.1	150	Circular	237.650	236.500	1.000	237.100	235.760	1.190
5.000	9.333	93.3	150	Circular	237.100	236.600	0.350	237.100	236.500	0.450
5.001	5.495	4.8	150	Circular	237.100	236.500	0.450	237.100	235.350	1.600
1.007	8.354	167.1	150	Circular	237.100	235.350	1.600	236.500	235.300	1.050
6.000	30.084	24.1	150	Circular	239.100	238.200	0.750	238.000	236.950	0.900
6.001	11.486	57.4	150	Circular	238.000	236.950	0.900	237.750	236.750	0.850
6.002	38.083	23.8	150	Circular	237.750	236.750	0.850	236.500	235.150	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	150	Manhole	Adoptable	S1	600	Manhole	Adoptable
1.001	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.002	S2	600	Manhole	Adoptable	S5	600	Manhole	Adoptable
2.000	S3	600	Manhole	Adoptable	S4	600	Manhole	Adoptable
2.001	S4	600	Manhole	Adoptable	S5	600	Manhole	Adoptable
1.003	S5	600	Manhole	Adoptable	S6	600	Manhole	Adoptable
1.004	S6	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
3.001	S7	600	Manhole	Adoptable	S8	600	Manhole	Adoptable
3.002	S8	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
1.005	S9	600	Manhole	Adoptable	S12	600	Manhole	Adoptable
4.000	S10	600	Manhole	Adoptable	S11	600	Manhole	Adoptable
4.001	S11	600	Manhole	Adoptable	S12	600	Manhole	Adoptable
1.006	S12	600	Manhole	Adoptable	S15	600	Manhole	Adoptable
5.000	S13	600	Manhole	Adoptable	S14	600	Manhole	Adoptable
5.001	S14	600	Manhole	Adoptable	S15	600	Manhole	Adoptable
1.007	S15	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
6.000	S16	600	Manhole	Adoptable	HW1	150	Manhole	Adoptable
6.001	HW1	150	Manhole	Adoptable	HW2	150	Manhole	Adoptable
6.002	HW2	150	Manhole	Adoptable	S18	600	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.000	5.999	120.0	150	Circular	236.300	235.300	0.850	236.350	235.250	0.950
7.001	10.121	101.2	150	Circular	236.350	235.250	0.950	236.500	235.150	1.200
6.003	3.691	73.8	150	Circular	236.500	235.150	1.200	236.500	235.100	1.250
8.000	9.649	96.5	150	Circular	236.400	235.400	0.850	236.430	235.300	0.980
8.001	12.019	120.2	150	Circular	236.430	235.300	0.980	236.500	235.200	1.150
1.008	9.340	133.4	225	Circular	236.500	234.900	1.375	236.400	234.830	1.345

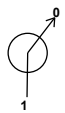
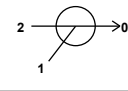
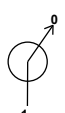
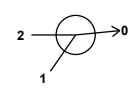
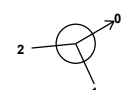
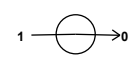
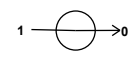
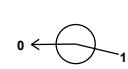
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	RE2	150	Manhole	Adoptable	S17	600	Manhole	Adoptable
7.001	S17	600	Manhole	Adoptable	S18	600	Manhole	Adoptable
6.003	S18	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
8.000	S19	600	Manhole	Adoptable	S20	600	Manhole	Adoptable
8.001	S20	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
1.008	TANK	600	Manhole	Adoptable	S21	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	1988.734	5009.299	239.885	1.085	150				
						0	1.000	238.800	150
S1	1997.997	5011.308	239.200	1.200	600		1	1.000	238.000
						0	1.001	238.000	150
S2	2006.874	5011.308	239.050	1.310	600		1	1.001	237.740
						0	1.002	237.740	150
S3	2008.298	4998.791	239.100	1.000	600				
						0	2.000	238.100	150
S4	2008.298	5005.450	239.100	1.050	600		1	2.000	238.050
						0	2.001	238.050	150
S5	2013.115	5011.308	238.700	1.200	600		1	2.001	237.500
						2	1.002	237.500	150
						0	1.003	237.500	150
S6	2020.988	5011.308	238.550	1.350	600		1	1.003	237.200
						0	1.004	237.200	150
S7	2021.989	4995.868	238.650	1.000	600				
						0	3.001	237.650	150

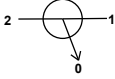
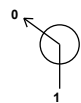
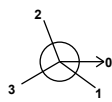
30/11/2022

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S8	2022.125	5004.998	238.650	1.070	600		1 3.001	237.580	150
S9	2026.982	5011.308	238.150	1.150	600		0 3.002	237.580	150
							1 3.002	237.000	150
							2 1.004	237.000	150
S10	2045.754	4995.870	237.650	1.000	600		0 1.005	237.000	150
							0 4.000	236.650	150
S11	2045.802	5004.081	237.650	1.100	600		1 4.000	236.550	150
S12	2050.836	5011.308	237.650	1.150	600		0 4.001	236.550	150
							1 4.001	236.500	150
							2 1.005	236.500	150
S13	2071.599	4998.791	237.100	0.500	600		0 1.006	236.500	150
							0 5.000	236.600	150
S14	2071.599	5008.124	237.100	0.600	600		1 5.000	236.500	150
S15	2069.298	5013.114	237.100	1.750	600		0 5.001	236.500	150
							1 5.001	235.350	150
							2 1.006	235.760	150
S16	1995.538	5020.353	239.100	0.900	600		0 1.007	235.350	150
							0 6.000	238.200	150
HW1	2025.617	5020.894	238.000	1.050	150		1 6.000	236.950	150
							0 6.001	236.950	150
HW2	2037.100	5020.634	237.750	1.000	150		1 6.001	236.750	150
							0 6.002	236.750	150
RE2	2091.138	5019.492	236.300	1.000	150		0 7.000	235.300	150
S17	2085.303	5020.884	236.350	1.100	600		1 7.000	235.250	150
							0 7.001	235.250	150

30/11/2022

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S18	2075.183	5020.783	236.500	1.350	600		1	7.001	235.150
							2	6.002	235.150
							0	6.003	235.150
S19	2086.219	5000.609	236.400	1.000	600		0	8.000	235.400
							1	8.000	235.300
S20	2086.219	5010.258	236.430	1.130	600		0	8.001	235.300
							1	8.001	235.200
TANK	2076.506	5017.337	236.500	1.600	600		2	6.003	235.100
							3	1.007	235.300
							0	1.008	234.900
S21	2085.846	5017.337	236.400	1.570	1500		1	1.008	234.830

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.200	1 year (l/s)	3.5
Summer CV	0.750	30 year (l/s)	8.0
Winter CV	0.840	100 year (l/s)	10.2
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	20	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Growth Factor 1 year	0.85
Brownfield Method	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.211	Betterment (%)	0
SAAR (mm)	1841	QBar	4.1
Soil Index	5	Q 1 year (l/s)	3.5
SPR	0.53	Q 30 year (l/s)	8.0
Region	9	Q 100 year (l/s)	10.2

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Node S21 Online Pump Control

Flap Valve	x	Design Depth (m)	1.300	Switch off depth (m)	0.100
Replaces Downstream Link	✓	Design Flow (l/s)	3.5		
Invert Level (m)	234.830	Switch on depth (m)	0.200		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.500	0.400	3.500	0.700	3.500	1.000	3.500	1.300	3.500
0.200	3.500	0.500	3.500	0.800	3.500	1.100	3.500		
0.300	3.500	0.600	3.500	0.900	3.500	1.200	3.500		

Node TANK Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	234.900	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	1.020
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.96	Length (m)	20.000		

Node S18 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	235.150	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	120	Depth (m)	
Safety Factor	2.0	Width (m)	1.000	Inf Depth (m)	
Porosity	0.30	Length (m)	46.000		

Node S17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	235.740	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	112	Depth (m)	0.560
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

Node HW2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	236.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5.7	0.0	1.000	33.0	0.0	1.001	33.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.022	0.022	1.3	0.0106	0.0000	OK
15 minute winter	S2	11	237.760	0.020	1.3	0.0056	0.0000	OK
15 minute winter	S3	10	238.118	0.018	0.4	0.0065	0.0000	OK
15 minute winter	S4	11	238.060	0.010	0.4	0.0028	0.0000	OK
30 minute summer	S5	18	237.529	0.029	2.7	0.0126	0.0000	OK
30 minute summer	S6	18	237.229	0.029	2.7	0.0083	0.0000	OK
15 minute winter	S7	10	237.668	0.018	0.4	0.0065	0.0000	OK
15 minute winter	S8	12	237.590	0.010	0.4	0.0028	0.0000	OK
30 minute summer	S9	18	237.039	0.039	3.8	0.0159	0.0000	OK
15 minute summer	S10	10	236.672	0.022	0.9	0.0096	0.0000	OK
15 minute winter	S11	11	236.576	0.026	0.9	0.0073	0.0000	OK
15 minute winter	S12	11	236.540	0.040	5.2	0.0146	0.0000	OK
15 minute winter	S13	12	236.617	0.017	0.4	0.0076	0.0000	OK
15 minute winter	S14	12	236.508	0.008	0.4	0.0022	0.0000	OK
15 minute winter	S15	11	235.430	0.080	6.9	0.0337	0.0000	OK
15 minute winter	S16	10	238.229	0.028	2.9	0.0245	0.0000	OK
15 minute winter	HW1	10	237.002	0.052	5.3	0.0216	0.0000	OK
15 minute winter	HW2	11	236.788	0.038	5.1	0.2352	0.0000	OK
15 minute summer	RE2	1	235.300	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S17	10	235.270	0.020	0.7	0.0077	0.0000	OK
15 minute winter	S18	11	235.236	0.086	10.4	0.1236	0.0000	OK
15 minute winter	S19	9	235.416	0.016	0.4	0.0057	0.0000	OK
15 minute winter	S20	12	235.317	0.016	0.4	0.0047	0.0000	OK
240 minute summer	TANK	152	235.113	0.213	8.4	14.8856	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0074	
15 minute winter	S1	1.001	S2	1.3	0.881	0.043	0.0131	
15 minute winter	S2	1.002	S5	1.3	0.708	0.037	0.0117	
15 minute winter	S3	2.000	S4	0.4	0.492	0.026	0.0056	
15 minute winter	S4	2.001	S5	0.4	0.328	0.008	0.0109	
30 minute summer	S5	1.003	S6	2.7	1.125	0.077	0.0189	
30 minute summer	S6	1.004	S9	2.7	0.889	0.082	0.0182	
15 minute winter	S7	3.001	S8	0.4	0.492	0.026	0.0076	
15 minute winter	S8	3.002	S9	0.4	0.225	0.008	0.0166	
30 minute summer	S9	1.005	S12	3.8	1.034	0.146	0.0871	
15 minute summer	S10	4.000	S11	0.9	0.500	0.044	0.0144	
15 minute winter	S11	4.001	S12	0.9	0.302	0.064	0.0251	
15 minute winter	S12	1.006	S15	5.2	1.423	0.146	0.0677	
15 minute winter	S13	5.000	S14	0.4	0.584	0.022	0.0067	
15 minute winter	S14	5.001	S15	0.4	0.121	0.005	0.0273	
15 minute winter	S15	1.007	TANK	6.9	0.748	0.502	0.0767	
15 minute winter	S16	6.000	HW1	2.9	0.758	0.078	0.1155	
15 minute winter	HW1	6.001	HW2	5.1	1.194	0.218	0.0501	
15 minute winter	HW2	6.002	S18	5.1	0.738	0.138	0.2654	
15 minute summer	RE2	7.000	S17	0.0	0.000	0.000	0.0039	
15 minute winter	S17	7.001	S18	0.7	0.128	0.037	0.0598	
15 minute winter	S18	6.003	TANK	10.3	1.074	0.499	0.0355	
15 minute winter	S19	8.000	S20	0.4	0.433	0.022	0.0097	
15 minute winter	S20	8.001	TANK	0.4	0.386	0.025	0.0124	
240 minute summer	TANK	1.008	S21	6.6	0.273	0.147	0.3675	

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	S21	152	235.112	0.282	6.6	0.4990	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute summer	S21	Pump		3.5				29.4

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.035	0.035	3.3	0.0168	0.0000	OK
15 minute winter	S2	10	237.771	0.031	3.3	0.0087	0.0000	OK
15 minute winter	S3	10	238.129	0.029	1.1	0.0105	0.0000	OK
15 minute winter	S4	10	238.065	0.015	1.1	0.0044	0.0000	OK
15 minute winter	S5	10	237.547	0.047	6.8	0.0203	0.0000	OK
15 minute winter	S6	10	237.247	0.047	6.7	0.0134	0.0000	OK
15 minute winter	S7	10	237.679	0.029	1.1	0.0105	0.0000	OK
15 minute winter	S8	11	237.595	0.015	1.1	0.0044	0.0000	OK
15 minute winter	S9	11	237.065	0.065	9.6	0.0262	0.0000	OK
15 minute winter	S10	10	236.684	0.034	2.2	0.0153	0.0000	OK
15 minute winter	S11	11	236.591	0.041	2.2	0.0115	0.0000	OK
15 minute winter	S12	11	236.566	0.066	13.1	0.0243	0.0000	OK
15 minute winter	S13	10	236.628	0.027	1.1	0.0122	0.0000	OK
15 minute winter	S14	10	236.512	0.012	1.1	0.0034	0.0000	OK
15 minute winter	S15	11	235.530	0.180	17.3	0.0757	0.0000	SURCHARGED
15 minute winter	S16	10	238.245	0.045	7.1	0.0385	0.0000	OK
15 minute winter	HW1	10	237.036	0.086	12.7	0.0360	0.0000	OK
15 minute winter	HW2	11	236.810	0.060	12.5	0.3950	0.0000	OK
240 minute winter	RE2	184	235.455	0.155	0.2	0.0028	0.0000	SURCHARGED
240 minute winter	S17	184	235.455	0.205	0.5	0.0802	0.0000	SURCHARGED
240 minute winter	S18	184	235.455	0.305	7.9	0.7344	0.0000	SURCHARGED
240 minute winter	S19	184	235.454	0.054	0.3	0.0196	0.0000	OK
240 minute winter	S20	184	235.454	0.154	0.4	0.0436	0.0000	SURCHARGED
240 minute winter	TANK	184	235.454	0.554	13.1	41.1620	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0140	
15 minute winter	S1	1.001	S2	3.3	1.147	0.107	0.0253	
15 minute winter	S2	1.002	S5	3.2	0.895	0.092	0.0228	
15 minute winter	S3	2.000	S4	1.1	0.664	0.070	0.0110	
15 minute winter	S4	2.001	S5	1.0	0.403	0.022	0.0214	
15 minute winter	S5	1.003	S6	6.7	1.416	0.192	0.0373	
15 minute winter	S6	1.004	S9	6.7	1.109	0.204	0.0361	
15 minute winter	S7	3.001	S8	1.1	0.663	0.069	0.0151	
15 minute winter	S8	3.002	S9	1.0	0.279	0.022	0.0328	
15 minute winter	S9	1.005	S12	9.6	1.311	0.373	0.1752	
15 minute winter	S10	4.000	S11	2.2	0.636	0.111	0.0282	
15 minute winter	S11	4.001	S12	2.1	0.392	0.161	0.0495	
15 minute winter	S12	1.006	S15	13.1	1.824	0.369	0.1337	
15 minute winter	S13	5.000	S14	1.1	0.785	0.058	0.0133	
15 minute winter	S14	5.001	S15	1.1	0.119	0.013	0.0502	
15 minute winter	S15	1.007	TANK	17.3	0.998	1.263	0.1373	
15 minute winter	S16	6.000	HW1	7.0	0.953	0.193	0.2237	
15 minute winter	HW1	6.001	HW2	12.5	1.484	0.533	0.0971	
15 minute winter	HW2	6.002	S18	12.5	0.879	0.341	0.4615	
240 minute winter	RE2	7.000	S17	-0.2	-0.064	-0.011	0.1056	
240 minute winter	S17	7.001	S18	0.5	0.113	0.028	0.1782	
240 minute winter	S18	6.003	TANK	7.7	0.969	0.371	0.0650	
240 minute winter	S19	8.000	S20	0.3	0.373	0.017	0.1125	
240 minute winter	S20	8.001	TANK	0.3	0.354	0.019	0.2116	
240 minute winter	TANK	1.008	S21	6.2	0.280	0.138	0.3715	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S21	184	235.453	0.623	6.2	1.1013	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	S21	Pump		3.5				76.4

30/11/2022

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.040	0.040	4.2	0.0191	0.0000	OK
15 minute winter	S2	10	237.775	0.035	4.2	0.0099	0.0000	OK
30 minute summer	S3	18	238.133	0.033	1.4	0.0119	0.0000	OK
30 minute summer	S4	18	238.068	0.018	1.4	0.0050	0.0000	OK
15 minute winter	S5	10	237.554	0.054	8.7	0.0233	0.0000	OK
30 minute summer	S6	18	237.255	0.055	8.6	0.0156	0.0000	OK
30 minute summer	S7	18	237.683	0.033	1.4	0.0119	0.0000	OK
30 minute summer	S8	18	237.598	0.018	1.4	0.0050	0.0000	OK
30 minute summer	S9	18	237.075	0.075	12.4	0.0305	0.0000	OK
15 minute winter	S10	10	236.689	0.039	2.8	0.0174	0.0000	OK
15 minute winter	S11	11	236.596	0.046	2.8	0.0130	0.0000	OK
15 minute winter	S12	11	236.576	0.076	16.8	0.0282	0.0000	OK
30 minute summer	S13	18	236.631	0.031	1.4	0.0139	0.0000	OK
30 minute summer	S14	18	236.514	0.014	1.4	0.0039	0.0000	OK
240 minute winter	S15	196	235.651	0.301	6.5	0.1264	0.0000	SURCHARGED
15 minute winter	S16	10	238.251	0.051	9.2	0.0441	0.0000	OK
15 minute winter	HW1	10	237.053	0.102	16.5	0.0428	0.0000	OK
15 minute winter	HW2	11	236.820	0.070	16.2	0.4653	0.0000	OK
240 minute winter	RE2	196	235.651	0.351	0.2	0.0063	0.0000	SURCHARGED
240 minute winter	S17	196	235.651	0.401	0.6	0.1572	0.0000	SURCHARGED
240 minute winter	S18	196	235.651	0.501	9.7	1.6468	0.0000	SURCHARGED
240 minute winter	S19	196	235.650	0.250	0.4	0.0908	0.0000	SURCHARGED
240 minute winter	S20	196	235.650	0.350	0.6	0.0991	0.0000	SURCHARGED
240 minute winter	TANK	196	235.650	0.750	15.6	56.2930	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0169	
15 minute winter	S1	1.001	S2	4.2	1.225	0.136	0.0302	
15 minute winter	S2	1.002	S5	4.1	0.953	0.118	0.0274	
30 minute summer	S3	2.000	S4	1.4	0.718	0.091	0.0133	
30 minute summer	S4	2.001	S5	1.4	0.438	0.029	0.0258	
15 minute winter	S5	1.003	S6	8.6	1.497	0.247	0.0453	
30 minute summer	S6	1.004	S9	8.6	1.170	0.264	0.0441	
30 minute summer	S7	3.001	S8	1.4	0.718	0.090	0.0183	
30 minute summer	S8	3.002	S9	1.4	0.301	0.029	0.0399	
30 minute summer	S9	1.005	S12	12.4	1.395	0.479	0.2115	
15 minute winter	S10	4.000	S11	2.8	0.677	0.142	0.0338	
15 minute winter	S11	4.001	S12	2.7	0.414	0.206	0.0597	
15 minute winter	S12	1.006	S15	16.9	1.941	0.474	0.1618	
30 minute summer	S13	5.000	S14	1.4	0.849	0.076	0.0161	
30 minute summer	S14	5.001	S15	1.4	0.128	0.017	0.0505	
240 minute winter	S15	1.007	TANK	6.5	0.739	0.475	0.1471	
15 minute winter	S16	6.000	HW1	9.1	1.003	0.250	0.2726	
15 minute winter	HW1	6.001	HW2	16.2	1.568	0.690	0.1184	
15 minute winter	HW2	6.002	S18	16.2	1.093	0.441	0.4879	
240 minute winter	RE2	7.000	S17	-0.2	-0.050	-0.015	0.1056	
240 minute winter	S17	7.001	S18	0.6	0.116	0.033	0.1782	
240 minute winter	S18	6.003	TANK	9.0	0.988	0.433	0.0650	
240 minute winter	S19	8.000	S20	0.4	0.403	0.022	0.1699	
240 minute winter	S20	8.001	TANK	0.4	0.375	0.025	0.2116	
240 minute winter	TANK	1.008	S21	4.3	0.286	0.096	0.3715	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S21	196	235.650	0.820	4.3	1.4481	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	S21	Pump		3.5				87.8

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Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.044	0.044	5.1	0.0212	0.0000	OK
15 minute winter	S2	10	237.778	0.038	5.0	0.0109	0.0000	OK
15 minute winter	S3	10	238.136	0.036	1.7	0.0130	0.0000	OK
15 minute winter	S4	10	238.069	0.019	1.7	0.0054	0.0000	OK
15 minute winter	S5	10	237.560	0.060	10.5	0.0259	0.0000	OK
15 minute winter	S6	10	237.262	0.062	10.4	0.0175	0.0000	OK
15 minute winter	S7	10	237.686	0.036	1.7	0.0131	0.0000	OK
15 minute winter	S8	10	237.599	0.019	1.7	0.0054	0.0000	OK
15 minute winter	S9	11	237.084	0.084	15.0	0.0341	0.0000	OK
15 minute winter	S10	10	236.694	0.044	3.4	0.0193	0.0000	OK
15 minute winter	S11	10	236.601	0.051	3.4	0.0143	0.0000	OK
15 minute winter	S12	11	236.586	0.086	20.2	0.0317	0.0000	OK
15 minute winter	S13	10	236.634	0.034	1.7	0.0152	0.0000	OK
15 minute winter	S14	10	236.515	0.015	1.7	0.0042	0.0000	OK
360 minute winter	S15	288	235.838	0.488	6.5	0.2050	0.0000	SURCHARGED
15 minute winter	S16	10	238.256	0.056	11.0	0.0485	0.0000	OK
15 minute winter	HW1	10	237.068	0.118	19.8	0.0492	0.0000	OK
15 minute winter	HW2	11	236.828	0.078	19.4	0.5257	0.0000	OK
360 minute winter	RE2	288	235.838	0.538	0.2	0.0097	0.0000	SURCHARGED
360 minute winter	S17	288	235.838	0.588	0.6	0.8401	0.0000	SURCHARGED
360 minute winter	S18	288	235.838	0.688	9.1	2.8385	0.0000	SURCHARGED
360 minute winter	S19	288	235.838	0.438	0.4	0.1588	0.0000	SURCHARGED
360 minute winter	S20	288	235.838	0.538	0.6	0.1521	0.0000	SURCHARGED
360 minute winter	TANK	288	235.838	0.938	14.6	70.7320	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0194	
15 minute winter	S1	1.001	S2	5.0	1.291	0.165	0.0348	
15 minute winter	S2	1.002	S5	5.0	1.002	0.143	0.0315	
15 minute winter	S3	2.000	S4	1.7	0.758	0.109	0.0151	
15 minute winter	S4	2.001	S5	1.7	0.452	0.034	0.0297	
15 minute winter	S5	1.003	S6	10.4	1.555	0.298	0.0526	
15 minute winter	S6	1.004	S9	10.3	1.213	0.316	0.0510	
15 minute winter	S7	3.001	S8	1.7	0.757	0.108	0.0207	
15 minute winter	S8	3.002	S9	1.7	0.307	0.034	0.0458	
15 minute winter	S9	1.005	S12	14.9	1.450	0.579	0.2456	
15 minute winter	S10	4.000	S11	3.4	0.712	0.171	0.0389	
15 minute winter	S11	4.001	S12	3.3	0.431	0.247	0.0687	
15 minute winter	S12	1.006	S15	20.4	2.025	0.571	0.1867	
15 minute winter	S13	5.000	S14	1.7	0.894	0.091	0.0183	
15 minute winter	S14	5.001	S15	1.7	0.151	0.020	0.0508	
360 minute winter	S15	1.007	TANK	6.2	0.718	0.453	0.1471	
15 minute winter	S16	6.000	HW1	10.9	1.028	0.299	0.3140	
15 minute winter	HW1	6.001	HW2	19.4	1.615	0.826	0.1365	
15 minute winter	HW2	6.002	S18	19.4	1.270	0.529	0.5102	
360 minute winter	RE2	7.000	S17	-0.2	-0.036	-0.013	0.1056	
360 minute winter	S17	7.001	S18	0.5	0.107	0.028	0.1782	
360 minute winter	S18	6.003	TANK	8.4	0.954	0.406	0.0650	
360 minute winter	S19	8.000	S20	0.4	0.403	0.022	0.1699	
360 minute winter	S20	8.001	TANK	-0.5	0.354	-0.029	0.2116	
360 minute winter	TANK	1.008	S21	5.6	0.278	0.124	0.3715	

30/11/2022

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S21	288	235.837	1.007	5.6	1.7791	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S21	Pump		3.5				111.7

30/11/2022

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.048	0.047	5.9	0.0229	0.0000	OK
15 minute winter	S2	10	237.781	0.041	5.9	0.0117	0.0000	OK
15 minute winter	S3	10	238.139	0.039	2.0	0.0142	0.0000	OK
15 minute winter	S4	10	238.071	0.021	2.0	0.0059	0.0000	OK
15 minute winter	S5	10	237.565	0.065	12.2	0.0283	0.0000	OK
15 minute winter	S6	10	237.268	0.068	12.1	0.0193	0.0000	OK
15 minute winter	S7	10	237.689	0.039	2.0	0.0142	0.0000	OK
15 minute winter	S8	10	237.601	0.021	2.0	0.0059	0.0000	OK
15 minute winter	S9	10	237.094	0.094	17.5	0.0378	0.0000	OK
15 minute winter	S10	10	236.697	0.047	3.9	0.0208	0.0000	OK
15 minute winter	S11	11	236.606	0.056	3.9	0.0158	0.0000	OK
15 minute winter	S12	11	236.595	0.095	23.5	0.0351	0.0000	OK
15 minute winter	S13	10	236.637	0.037	2.0	0.0165	0.0000	OK
15 minute winter	S14	10	236.516	0.016	2.0	0.0045	0.0000	OK
360 minute winter	S15	296	236.295	0.945	7.1	0.3971	0.0000	SURCHARGED
15 minute winter	S16	10	238.261	0.061	12.8	0.0527	0.0000	OK
15 minute winter	HW1	10	237.088	0.137	23.1	0.0575	0.0000	OK
15 minute winter	HW2	11	236.835	0.085	22.5	0.5856	0.0000	OK
360 minute winter	RE2	296	236.296	0.996	0.2	0.0179	0.0000	FLOOD RISK
360 minute winter	S17	296	236.296	1.046	2.2	4.4342	0.0000	FLOOD RISK
360 minute winter	S18	296	236.296	1.146	10.6	7.0645	0.0000	FLOOD RISK
360 minute winter	S19	296	236.295	0.895	0.4	0.3248	0.0000	FLOOD RISK
360 minute winter	S20	296	236.295	0.995	0.4	0.2815	0.0000	FLOOD RISK
360 minute winter	TANK	296	236.295	1.395	16.6	77.2351	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0218	
15 minute winter	S1	1.001	S2	5.9	1.342	0.192	0.0387	
15 minute winter	S2	1.002	S5	5.8	1.037	0.166	0.0353	
15 minute winter	S3	2.000	S4	2.0	0.796	0.129	0.0170	
15 minute winter	S4	2.001	S5	2.0	0.473	0.041	0.0334	
15 minute winter	S5	1.003	S6	12.1	1.601	0.347	0.0595	
15 minute winter	S6	1.004	S9	12.0	1.246	0.369	0.0579	
15 minute winter	S7	3.001	S8	2.0	0.795	0.127	0.0233	
15 minute winter	S8	3.002	S9	2.0	0.318	0.041	0.0518	
15 minute winter	S9	1.005	S12	17.3	1.496	0.672	0.2770	
15 minute winter	S10	4.000	S11	3.9	0.731	0.197	0.0435	
15 minute winter	S11	4.001	S12	3.8	0.443	0.284	0.0779	
15 minute winter	S12	1.006	S15	23.6	2.089	0.663	0.2100	
15 minute winter	S13	5.000	S14	2.0	0.937	0.107	0.0206	
15 minute winter	S14	5.001	S15	2.0	0.177	0.024	0.0511	
360 minute winter	S15	1.007	TANK	6.9	0.729	0.504	0.1471	
15 minute winter	S16	6.000	HW1	12.7	1.053	0.349	0.3559	
15 minute winter	HW1	6.001	HW2	22.5	1.634	0.957	0.1556	
15 minute winter	HW2	6.002	S18	22.5	1.437	0.616	0.5316	
360 minute winter	RE2	7.000	S17	-0.2	-0.032	-0.015	0.1056	
360 minute winter	S17	7.001	S18	-1.9	0.107	-0.106	0.1782	
360 minute winter	S18	6.003	TANK	9.6	0.957	0.465	0.0650	
360 minute winter	S19	8.000	S20	0.4	0.372	0.022	0.1699	
360 minute winter	S20	8.001	TANK	0.3	0.354	0.019	0.2116	
360 minute winter	TANK	1.008	S21	4.5	0.278	0.099	0.3715	

30/11/2022

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.41%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	S21	296	236.294	1.464	4.5	2.5870	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	S21	Pump		3.5				111.7

24/04/2023

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1	0.000	5.00	239.885	150	1988.734	5009.299	1.085
S1	0.012	5.00	239.200	600	1997.997	5011.308	1.200
S2			239.050	600	2006.874	5011.308	1.310
S3	0.004	5.00	239.100	600	2008.298	4998.791	1.000
S4			239.100	600	2008.298	5005.450	1.050
S5	0.009	5.00	238.700	600	2013.115	5011.308	1.200
S6			238.550	600	2020.988	5011.308	1.350
S7	0.004	5.00	238.650	600	2021.989	4995.868	1.000
S8			238.650	600	2022.125	5004.998	1.070
S9	0.007	5.00	238.150	600	2026.982	5011.308	1.150
S10	0.008	5.00	237.650	600	2045.754	4995.870	1.000
S11			237.650	600	2045.802	5004.081	1.100
S12	0.005	5.00	237.650	600	2050.836	5011.308	1.150
S13	0.004	5.00	237.100	600	2071.599	4998.791	0.500
S14			237.100	600	2071.599	5008.124	0.600
S15	0.012	5.00	237.100	600	2069.298	5013.114	1.750
S16	0.026	5.00	239.100	600	1995.538	5020.353	0.900
HW1	0.021	5.00	238.000	150	2025.617	5020.894	1.050
HW2			237.750	150	2037.100	5020.634	1.000
RE2		5.00	236.300	150	2091.138	5019.492	1.000
S17	0.006	5.00	236.350	600	2085.303	5020.884	1.100
S18	0.045	5.00	236.500	600	2075.183	5020.783	1.350
S19	0.004	5.00	236.400	600	2086.219	5000.609	1.000
S20			236.430	600	2086.219	5010.258	1.130
TANK			236.500	600	2076.506	5017.337	1.600
S21			236.400	1500	2085.846	5017.337	1.570

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE1	S1	9.478	0.600	238.800	238.000	0.800	11.8	150	5.05	38.4
1.001	S1	S2	8.877	0.600	238.000	237.740	0.260	34.1	150	5.14	38.2
1.002	S2	S5	6.241	0.600	237.740	237.500	0.240	26.0	150	5.19	38.1
2.000	S3	S4	6.659	0.600	238.100	238.050	0.050	133.2	150	5.13	38.2
2.001	S4	S5	7.584	0.600	238.050	237.500	0.550	13.8	150	5.17	38.1
1.003	S5	S6	7.873	0.600	237.500	237.200	0.300	26.2	150	5.26	37.9
1.004	S6	S9	5.994	0.600	237.200	237.000	0.200	30.0	150	5.31	37.8
3.001	S7	S8	9.131	0.600	237.650	237.580	0.070	130.4	150	5.17	38.1
3.002	S8	S9	7.963	0.600	237.580	237.000	0.580	13.7	150	5.22	38.0
1.005	S9	S12	23.854	0.600	237.000	236.500	0.500	47.7	150	5.58	37.1
4.000	S10	S11	8.211	0.600	236.650	236.550	0.100	82.1	150	5.12	38.2
4.001	S11	S12	8.807	0.600	236.550	236.500	0.050	176.1	150	5.32	37.8
1.006	S12	S15	18.550	0.600	236.500	235.760	0.740	25.1	150	5.74	36.8
5.000	S13	S14	9.333	0.600	236.600	236.500	0.100	93.3	150	5.15	38.2
5.001	S14	S15	5.495	0.600	236.500	235.350	1.150	4.8	150	5.17	38.1
1.007	S15	TANK	8.354	0.600	235.350	235.300	0.050	167.1	150	5.92	36.4
6.000	S16	HW1	30.084	0.600	238.200	236.950	1.250	24.1	150	5.24	37.9
6.001	HW1	HW2	11.486	0.600	236.950	236.750	0.200	57.4	150	5.39	37.6
6.002	HW2	S18	38.083	0.600	236.750	235.150	1.600	23.8	150	5.69	36.9
7.000	RE2	S17	5.999	0.600	235.300	235.250	0.050	120.0	150	5.11	38.3
7.001	S17	S18	10.121	0.600	235.250	235.150	0.100	101.2	150	5.28	37.9
6.003	S18	TANK	3.691	0.600	235.150	235.100	0.050	73.8	150	5.75	36.8
8.000	S19	S20	9.649	0.600	235.400	235.300	0.100	96.5	150	5.16	38.2
8.001	S20	TANK	12.019	0.600	235.300	235.200	0.100	120.2	150	5.38	37.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.943	52.0	0.0	0.935	1.050	0.000	0.0	0	0.000
1.001	1.728	30.5	1.2	1.050	1.160	0.012	0.0	21	0.851
1.002	1.982	35.0	1.2	1.160	1.050	0.012	0.0	19	0.924
2.000	0.869	15.4	0.4	0.850	0.900	0.004	0.0	17	0.377
2.001	2.727	48.2	0.4	0.900	1.050	0.004	0.0	10	0.812
1.003	1.973	34.9	2.6	1.050	1.200	0.025	0.0	27	1.150
1.004	1.845	32.6	2.6	1.200	1.000	0.025	0.0	28	1.103
3.001	0.878	15.5	0.4	0.850	0.920	0.004	0.0	17	0.372
3.002	2.733	48.3	0.4	0.920	1.000	0.004	0.0	10	0.814
1.005	1.460	25.8	3.6	1.000	1.000	0.036	0.0	38	1.032
4.000	1.110	19.6	0.8	0.850	0.950	0.008	0.0	21	0.545
4.001	0.754	13.3	0.8	0.950	1.000	0.008	0.0	25	0.419
1.006	2.019	35.7	4.9	1.000	1.190	0.049	0.0	37	1.415
5.000	1.040	18.4	0.4	0.350	0.450	0.004	0.0	16	0.422
5.001	4.642	82.0	0.4	0.450	1.600	0.004	0.0	8	1.209
1.007	0.774	13.7	6.4	1.600	1.050	0.065	0.0	72	0.763
6.000	2.061	36.4	2.7	0.750	0.900	0.026	0.0	27	1.202
6.001	1.330	23.5	4.8	0.900	0.850	0.047	0.0	46	1.048
6.002	2.072	36.6	4.7	0.850	1.200	0.047	0.0	36	1.426
7.000	0.916	16.2	0.0	0.850	0.950	0.000	0.0	0	0.000
7.001	0.999	17.6	0.6	0.950	1.200	0.006	0.0	19	0.462
6.003	1.171	20.7	9.8	1.200	1.250	0.098	0.0	72	1.154
8.000	1.023	18.1	0.4	0.850	0.980	0.004	0.0	16	0.414
8.001	0.915	16.2	0.4	0.980	1.150	0.004	0.0	17	0.388

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.008	TANK	S21	9.340	0.600	234.900	234.830	0.070	133.4	225	6.06	36.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.008	1.130	44.9	16.3	1.375	1.345	0.167	0.0	94	1.042

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.478	11.8	150	Circular	239.885	238.800	0.935	239.200	238.000	1.050
1.001	8.877	34.1	150	Circular	239.200	238.000	1.050	239.050	237.740	1.160
1.002	6.241	26.0	150	Circular	239.050	237.740	1.160	238.700	237.500	1.050
2.000	6.659	133.2	150	Circular	239.100	238.100	0.850	239.100	238.050	0.900
2.001	7.584	13.8	150	Circular	239.100	238.050	0.900	238.700	237.500	1.050
1.003	7.873	26.2	150	Circular	238.700	237.500	1.050	238.550	237.200	1.200
1.004	5.994	30.0	150	Circular	238.550	237.200	1.200	238.150	237.000	1.000
3.001	9.131	130.4	150	Circular	238.650	237.650	0.850	238.650	237.580	0.920
3.002	7.963	13.7	150	Circular	238.650	237.580	0.920	238.150	237.000	1.000
1.005	23.854	47.7	150	Circular	238.150	237.000	1.000	237.650	236.500	1.000
4.000	8.211	82.1	150	Circular	237.650	236.650	0.850	237.650	236.550	0.950
4.001	8.807	176.1	150	Circular	237.650	236.550	0.950	237.650	236.500	1.000
1.006	18.550	25.1	150	Circular	237.650	236.500	1.000	237.100	235.760	1.190
5.000	9.333	93.3	150	Circular	237.100	236.600	0.350	237.100	236.500	0.450
5.001	5.495	4.8	150	Circular	237.100	236.500	0.450	237.100	235.350	1.600
1.007	8.354	167.1	150	Circular	237.100	235.350	1.600	236.500	235.300	1.050
6.000	30.084	24.1	150	Circular	239.100	238.200	0.750	238.000	236.950	0.900
6.001	11.486	57.4	150	Circular	238.000	236.950	0.900	237.750	236.750	0.850
6.002	38.083	23.8	150	Circular	237.750	236.750	0.850	236.500	235.150	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	150	Manhole	Adoptable	S1	600	Manhole	Adoptable
1.001	S1	600	Manhole	Adoptable	S2	600	Manhole	Adoptable
1.002	S2	600	Manhole	Adoptable	S5	600	Manhole	Adoptable
2.000	S3	600	Manhole	Adoptable	S4	600	Manhole	Adoptable
2.001	S4	600	Manhole	Adoptable	S5	600	Manhole	Adoptable
1.003	S5	600	Manhole	Adoptable	S6	600	Manhole	Adoptable
1.004	S6	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
3.001	S7	600	Manhole	Adoptable	S8	600	Manhole	Adoptable
3.002	S8	600	Manhole	Adoptable	S9	600	Manhole	Adoptable
1.005	S9	600	Manhole	Adoptable	S12	600	Manhole	Adoptable
4.000	S10	600	Manhole	Adoptable	S11	600	Manhole	Adoptable
4.001	S11	600	Manhole	Adoptable	S12	600	Manhole	Adoptable
1.006	S12	600	Manhole	Adoptable	S15	600	Manhole	Adoptable
5.000	S13	600	Manhole	Adoptable	S14	600	Manhole	Adoptable
5.001	S14	600	Manhole	Adoptable	S15	600	Manhole	Adoptable
1.007	S15	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
6.000	S16	600	Manhole	Adoptable	HW1	150	Manhole	Adoptable
6.001	HW1	150	Manhole	Adoptable	HW2	150	Manhole	Adoptable
6.002	HW2	150	Manhole	Adoptable	S18	600	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.000	5.999	120.0	150	Circular	236.300	235.300	0.850	236.350	235.250	0.950
7.001	10.121	101.2	150	Circular	236.350	235.250	0.950	236.500	235.150	1.200
6.003	3.691	73.8	150	Circular	236.500	235.150	1.200	236.500	235.100	1.250
8.000	9.649	96.5	150	Circular	236.400	235.400	0.850	236.430	235.300	0.980
8.001	12.019	120.2	150	Circular	236.430	235.300	0.980	236.500	235.200	1.150
1.008	9.340	133.4	225	Circular	236.500	234.900	1.375	236.400	234.830	1.345

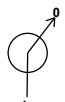
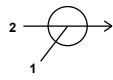
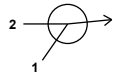
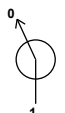
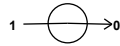
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.000	RE2	150	Manhole	Adoptable	S17	600	Manhole	Adoptable
7.001	S17	600	Manhole	Adoptable	S18	600	Manhole	Adoptable
6.003	S18	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
8.000	S19	600	Manhole	Adoptable	S20	600	Manhole	Adoptable
8.001	S20	600	Manhole	Adoptable	TANK	600	Manhole	Adoptable
1.008	TANK	600	Manhole	Adoptable	S21	1500	Manhole	Adoptable

Manhole Schedule

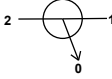
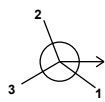
Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
RE1	1988.734	5009.299	239.885	1.085	150					
						0	1.000	238.800	150	
S1	1997.997	5011.308	239.200	1.200	600		1	1.000	238.000	150
						0	1.001	238.000	150	
S2	2006.874	5011.308	239.050	1.310	600		1	1.001	237.740	150
						0	1.002	237.740	150	
S3	2008.298	4998.791	239.100	1.000	600					
						0	2.000	238.100	150	
S4	2008.298	5005.450	239.100	1.050	600		1	2.000	238.050	150
						0	2.001	238.050	150	
S5	2013.115	5011.308	238.700	1.200	600		1	2.001	237.500	150
						2	1.002	237.500	150	
						0	1.003	237.500	150	
S6	2020.988	5011.308	238.550	1.350	600		1	1.003	237.200	150
						0	1.004	237.200	150	
S7	2021.989	4995.868	238.650	1.000	600					
						0	3.001	237.650	150	

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S8	2022.125	5004.998	238.650	1.070	600		1 3.001	237.580	150
S9	2026.982	5011.308	238.150	1.150	600		0 3.002	237.580	150
							1 3.002	237.000	150
							2 1.004	237.000	150
S10	2045.754	4995.870	237.650	1.000	600		0 1.005	237.000	150
							1 4.000	236.650	150
S11	2045.802	5004.081	237.650	1.100	600		1 4.000	236.550	150
S12	2050.836	5011.308	237.650	1.150	600		0 4.001	236.550	150
							1 4.001	236.500	150
							2 1.005	236.500	150
S13	2071.599	4998.791	237.100	0.500	600		0 1.006	236.500	150
							1 5.000	236.600	150
S14	2071.599	5008.124	237.100	0.600	600		1 5.000	236.500	150
S15	2069.298	5013.114	237.100	1.750	600		0 5.001	236.500	150
							1 5.001	235.350	150
							2 1.006	235.760	150
S16	1995.538	5020.353	239.100	0.900	600		0 1.007	235.350	150
							1 6.000	238.200	150
HW1	2025.617	5020.894	238.000	1.050	150		1 6.000	236.950	150
HW2	2037.100	5020.634	237.750	1.000	150		0 6.001	236.950	150
							1 6.001	236.750	150
							0 6.002	236.750	150
RE2	2091.138	5019.492	236.300	1.000	150		1 7.000	235.300	150
S17	2085.303	5020.884	236.350	1.100	600		0 7.001	235.250	150
							1 7.000	235.250	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S18	2075.183	5020.783	236.500	1.350	600		1	7.001	235.150
							2	6.002	235.150
							0	6.003	235.150
S19	2086.219	5000.609	236.400	1.000	600		0	8.000	235.400
							1	8.000	235.300
S20	2086.219	5010.258	236.430	1.130	600		0	8.001	235.300
							1	8.001	235.200
TANK	2076.506	5017.337	236.500	1.600	600		2	6.003	235.100
							3	1.007	235.300
							0	1.008	234.900
S21	2085.846	5017.337	236.400	1.570	1500		1	1.008	234.830
							0	1.008	234.830

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.200	1 year (l/s)	3.5
Summer CV	0.750	30 year (l/s)	8.0
Winter CV	0.840	100 year (l/s)	10.2
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	0	0	0
100	20	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Brownfield	Growth Factor 1 year	0.85
Brownfield Method	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.211	Betterment (%)	0
SAAR (mm)	1841	QBar	4.1
Soil Index	5	Q 1 year (l/s)	3.5
SPR	0.53	Q 30 year (l/s)	8.0
Region	9	Q 100 year (l/s)	10.2

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Node S21 Online Pump Control

Flap Valve	x	Design Depth (m)	1.300	Switch off depth (m)	0.100
Replaces Downstream Link	✓	Design Flow (l/s)	0.1		
Invert Level (m)	234.830	Switch on depth (m)	0.200		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.000	0.400	0.000	0.700	0.000	1.000	0.000	1.300	0.000
0.200	0.000	0.500	0.000	0.800	0.000	1.100	0.000		
0.300	0.000	0.600	0.000	0.900	0.000	1.200	0.000		

Node TANK Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	234.900	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	1.020
Safety Factor	2.0	Width (m)	4.000	Inf Depth (m)	
Porosity	0.96	Length (m)	20.000		

Node S18 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	235.150	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	1.000	Inf Depth (m)	
Porosity	0.30	Length (m)	46.000		

Node S17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	235.740	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.560
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	5.000		

Node HW2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	236.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	5.7	0.0	1.000	33.0	0.0	1.001	33.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.022	0.022	1.3	0.0106	0.0000	OK
15 minute winter	S2	11	237.760	0.020	1.3	0.0056	0.0000	OK
15 minute winter	S3	10	238.118	0.018	0.4	0.0065	0.0000	OK
15 minute winter	S4	11	238.060	0.010	0.4	0.0028	0.0000	OK
30 minute summer	S5	18	237.529	0.029	2.7	0.0126	0.0000	OK
30 minute summer	S6	18	237.229	0.029	2.7	0.0083	0.0000	OK
15 minute winter	S7	10	237.668	0.018	0.4	0.0065	0.0000	OK
15 minute winter	S8	12	237.590	0.010	0.4	0.0028	0.0000	OK
30 minute summer	S9	18	237.039	0.039	3.8	0.0159	0.0000	OK
15 minute summer	S10	10	236.672	0.022	0.9	0.0096	0.0000	OK
15 minute winter	S11	11	236.576	0.026	0.9	0.0073	0.0000	OK
15 minute winter	S12	11	236.540	0.040	5.2	0.0146	0.0000	OK
15 minute winter	S13	12	236.617	0.017	0.4	0.0076	0.0000	OK
15 minute winter	S14	12	236.508	0.008	0.4	0.0022	0.0000	OK
1440 minute winter	S15	1470	235.790	0.440	1.1	0.1849	0.0000	SURCHARGED
15 minute winter	S16	10	238.229	0.028	2.9	0.0245	0.0000	OK
15 minute winter	HW1	10	237.002	0.052	5.3	0.0216	0.0000	OK
15 minute winter	HW2	11	236.788	0.038	5.1	0.2352	0.0000	OK
1440 minute winter	RE2	1530	235.790	0.490	0.1	0.0088	0.0000	SURCHARGED
1440 minute winter	S17	1470	235.790	0.540	0.1	0.4647	0.0000	SURCHARGED
1440 minute winter	S18	1650	235.790	0.640	1.4	2.5027	0.0000	SURCHARGED
1440 minute winter	S19	1560	235.791	0.391	0.1	0.1418	0.0000	SURCHARGED
1440 minute winter	S20	1590	235.791	0.490	0.1	0.1388	0.0000	SURCHARGED
1440 minute winter	TANK	1680	235.790	0.890	2.4	67.0864	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0074	
15 minute winter	S1	1.001	S2	1.3	0.881	0.043	0.0131	
15 minute winter	S2	1.002	S5	1.3	0.708	0.037	0.0117	
15 minute winter	S3	2.000	S4	0.4	0.492	0.026	0.0056	
15 minute winter	S4	2.001	S5	0.4	0.328	0.008	0.0109	
30 minute summer	S5	1.003	S6	2.7	1.125	0.077	0.0189	
30 minute summer	S6	1.004	S9	2.7	0.889	0.082	0.0182	
15 minute winter	S7	3.001	S8	0.4	0.492	0.026	0.0076	
15 minute winter	S8	3.002	S9	0.4	0.225	0.008	0.0166	
30 minute summer	S9	1.005	S12	3.8	1.034	0.146	0.0871	
15 minute summer	S10	4.000	S11	0.9	0.500	0.044	0.0144	
15 minute winter	S11	4.001	S12	0.9	0.302	0.064	0.0251	
15 minute winter	S12	1.006	S15	5.2	1.423	0.146	0.0677	
15 minute winter	S13	5.000	S14	0.4	0.584	0.022	0.0067	
15 minute winter	S14	5.001	S15	0.4	0.121	0.005	0.0273	
1440 minute winter	S15	1.007	TANK	1.1	0.460	0.080	0.1471	
15 minute winter	S16	6.000	HW1	2.9	0.758	0.078	0.1155	
15 minute winter	HW1	6.001	HW2	5.1	1.194	0.218	0.0501	
15 minute winter	HW2	6.002	S18	5.1	0.738	0.138	0.2654	
1440 minute winter	RE2	7.000	S17	-0.1	-0.007	-0.003	0.1056	
1440 minute winter	S17	7.001	S18	0.1	0.105	0.006	0.1782	
1440 minute winter	S18	6.003	TANK	1.4	0.586	0.068	0.0650	
1440 minute winter	S19	8.000	S20	0.1	0.265	0.006	0.1699	
1440 minute winter	S20	8.001	TANK	0.1	0.057	0.006	0.2116	
1440 minute winter	TANK	1.008	S21	0.1	0.087	0.001	0.3715	

Results for 1 year Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S21	1500	235.790	0.960	0.1	1.6968	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S21	Pump		0.0				0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.035	0.035	3.3	0.0168	0.0000	OK
15 minute winter	S2	10	237.771	0.031	3.3	0.0087	0.0000	OK
15 minute winter	S3	10	238.129	0.029	1.1	0.0105	0.0000	OK
15 minute winter	S4	10	238.065	0.015	1.1	0.0044	0.0000	OK
15 minute winter	S5	10	237.547	0.047	6.8	0.0203	0.0000	OK
15 minute winter	S6	10	237.247	0.047	6.7	0.0134	0.0000	OK
15 minute winter	S7	10	237.679	0.029	1.1	0.0105	0.0000	OK
15 minute winter	S8	11	237.595	0.015	1.1	0.0044	0.0000	OK
15 minute winter	S9	11	237.065	0.065	9.6	0.0262	0.0000	OK
15 minute winter	S10	10	236.684	0.034	2.2	0.0153	0.0000	OK
15 minute winter	S11	11	236.591	0.041	2.2	0.0115	0.0000	OK
15 minute winter	S12	11	236.566	0.066	13.1	0.0243	0.0000	OK
15 minute winter	S13	10	236.628	0.027	1.1	0.0122	0.0000	OK
15 minute winter	S14	10	236.512	0.012	1.1	0.0034	0.0000	OK
1440 minute winter	S15	870	236.309	0.959	1.6	0.4027	0.0000	SURCHARGED
15 minute winter	S16	10	238.245	0.045	7.1	0.0385	0.0000	OK
15 minute winter	HW1	10	237.036	0.086	12.7	0.0360	0.0000	OK
15 minute winter	HW2	11	236.810	0.060	12.5	0.3950	0.0000	OK
1440 minute winter	RE2	870	236.300	1.000	3.4	0.0180	42.9412	FLOOD
1440 minute winter	S17	870	236.303	1.053	3.4	4.4738	0.0000	FLOOD RISK
1440 minute winter	S18	870	236.308	1.158	3.2	7.2024	0.0000	FLOOD RISK
1440 minute winter	S19	870	236.308	0.908	0.3	0.3297	0.0000	FLOOD RISK
1440 minute winter	S20	870	236.308	1.008	0.4	0.2853	0.0000	FLOOD RISK
1440 minute winter	TANK	870	236.308	1.408	3.7	77.2389	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0140	
15 minute winter	S1	1.001	S2	3.3	1.147	0.107	0.0253	
15 minute winter	S2	1.002	S5	3.2	0.895	0.092	0.0228	
15 minute winter	S3	2.000	S4	1.1	0.664	0.070	0.0110	
15 minute winter	S4	2.001	S5	1.0	0.403	0.022	0.0214	
15 minute winter	S5	1.003	S6	6.7	1.416	0.192	0.0373	
15 minute winter	S6	1.004	S9	6.7	1.109	0.204	0.0361	
15 minute winter	S7	3.001	S8	1.1	0.663	0.069	0.0151	
15 minute winter	S8	3.002	S9	1.0	0.279	0.022	0.0328	
15 minute winter	S9	1.005	S12	9.6	1.311	0.373	0.1752	
15 minute winter	S10	4.000	S11	2.2	0.636	0.111	0.0282	
15 minute winter	S11	4.001	S12	2.1	0.392	0.161	0.0495	
15 minute winter	S12	1.006	S15	13.1	1.824	0.369	0.1337	
15 minute winter	S13	5.000	S14	1.1	0.785	0.058	0.0133	
15 minute winter	S14	5.001	S15	1.1	0.119	0.013	0.0502	
1440 minute winter	S15	1.007	TANK	1.5	0.471	0.113	0.1471	
15 minute winter	S16	6.000	HW1	7.0	0.953	0.193	0.2237	
15 minute winter	HW1	6.001	HW2	12.5	1.484	0.533	0.0971	
15 minute winter	HW2	6.002	S18	12.5	0.879	0.341	0.4615	
1440 minute winter	RE2	7.000	S17	-3.4	-0.191	-0.207	0.1056	
1440 minute winter	S17	7.001	S18	-3.3	-0.185	-0.185	0.1782	
1440 minute winter	S18	6.003	TANK	2.2	0.555	0.104	0.0650	
1440 minute winter	S19	8.000	S20	-0.2	0.265	-0.013	0.1699	
1440 minute winter	S20	8.001	TANK	-0.4	0.249	-0.027	0.2116	
1440 minute winter	TANK	1.008	S21	0.3	0.091	0.006	0.3715	

Results for 30 year Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S21	870	236.308	1.478	0.3	2.6118	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S21	Pump		0.0				0.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.040	0.040	4.2	0.0191	0.0000	OK
15 minute winter	S2	10	237.775	0.035	4.2	0.0099	0.0000	OK
30 minute summer	S3	18	238.133	0.033	1.4	0.0119	0.0000	OK
30 minute summer	S4	18	238.068	0.018	1.4	0.0050	0.0000	OK
15 minute winter	S5	10	237.554	0.054	8.7	0.0233	0.0000	OK
30 minute summer	S6	18	237.255	0.055	8.6	0.0156	0.0000	OK
30 minute summer	S7	18	237.683	0.033	1.4	0.0119	0.0000	OK
30 minute summer	S8	18	237.598	0.018	1.4	0.0050	0.0000	OK
30 minute summer	S9	18	237.075	0.075	12.4	0.0305	0.0000	OK
15 minute winter	S10	10	236.689	0.039	2.8	0.0174	0.0000	OK
15 minute winter	S11	11	236.596	0.046	2.8	0.0130	0.0000	OK
15 minute winter	S12	11	236.576	0.076	16.8	0.0282	0.0000	OK
30 minute summer	S13	18	236.631	0.031	1.4	0.0139	0.0000	OK
30 minute summer	S14	18	236.514	0.014	1.4	0.0039	0.0000	OK
720 minute winter	S15	435	236.334	0.984	3.4	0.4132	0.0000	SURCHARGED
15 minute winter	S16	10	238.251	0.051	9.2	0.0441	0.0000	OK
15 minute winter	HW1	10	237.053	0.102	16.5	0.0428	0.0000	OK
15 minute winter	HW2	11	236.820	0.070	16.2	0.4653	0.0000	OK
1440 minute winter	RE2	780	236.300	1.000	4.7	0.0180	77.7035	FLOOD
720 minute winter	S17	435	236.312	1.062	6.5	4.4774	0.0000	FLOOD RISK
720 minute winter	S18	435	236.330	1.179	6.4	7.4520	0.0000	FLOOD RISK
720 minute winter	S19	435	236.331	0.931	0.8	0.3380	0.0000	FLOOD RISK
720 minute winter	S20	435	236.331	1.031	1.0	0.2918	0.0000	FLOOD RISK
720 minute winter	TANK	435	236.331	1.431	7.4	77.2454	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0169	
15 minute winter	S1	1.001	S2	4.2	1.225	0.136	0.0302	
15 minute winter	S2	1.002	S5	4.1	0.953	0.118	0.0274	
30 minute summer	S3	2.000	S4	1.4	0.718	0.091	0.0133	
30 minute summer	S4	2.001	S5	1.4	0.438	0.029	0.0258	
15 minute winter	S5	1.003	S6	8.6	1.497	0.247	0.0453	
30 minute summer	S6	1.004	S9	8.6	1.170	0.264	0.0441	
30 minute summer	S7	3.001	S8	1.4	0.718	0.090	0.0183	
30 minute summer	S8	3.002	S9	1.4	0.301	0.029	0.0399	
30 minute summer	S9	1.005	S12	12.4	1.395	0.479	0.2115	
15 minute winter	S10	4.000	S11	2.8	0.677	0.142	0.0338	
15 minute winter	S11	4.001	S12	2.7	0.414	0.206	0.0597	
15 minute winter	S12	1.006	S15	16.9	1.941	0.474	0.1618	
30 minute summer	S13	5.000	S14	1.4	0.849	0.076	0.0161	
30 minute summer	S14	5.001	S15	1.4	0.128	0.017	0.0505	
720 minute winter	S15	1.007	TANK	3.3	0.549	0.241	0.1471	
15 minute winter	S16	6.000	HW1	9.1	1.003	0.250	0.2726	
15 minute winter	HW1	6.001	HW2	16.2	1.568	0.690	0.1184	
15 minute winter	HW2	6.002	S18	16.2	1.093	0.441	0.4879	
1440 minute winter	RE2	7.000	S17	-4.7	-0.264	-0.287	0.1056	
720 minute winter	S17	7.001	S18	-6.3	-0.360	-0.359	0.1782	
720 minute winter	S18	6.003	TANK	4.1	0.656	0.199	0.0650	
720 minute winter	S19	8.000	S20	-0.6	0.268	-0.033	0.1699	
720 minute winter	S20	8.001	TANK	-1.0	0.255	-0.059	0.2116	
720 minute winter	TANK	1.008	S21	0.5	0.130	0.010	0.3715	

Results for 100 year Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	S21	435	236.331	1.501	0.5	2.6526	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	S21	Pump		0.0				0.0

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.044	0.044	5.1	0.0212	0.0000	OK
15 minute winter	S2	10	237.778	0.038	5.0	0.0109	0.0000	OK
15 minute winter	S3	10	238.136	0.036	1.7	0.0130	0.0000	OK
15 minute winter	S4	10	238.069	0.019	1.7	0.0054	0.0000	OK
15 minute winter	S5	10	237.560	0.060	10.5	0.0259	0.0000	OK
15 minute winter	S6	10	237.262	0.062	10.4	0.0175	0.0000	OK
15 minute winter	S7	10	237.686	0.036	1.7	0.0131	0.0000	OK
15 minute winter	S8	10	237.599	0.019	1.7	0.0054	0.0000	OK
15 minute winter	S9	11	237.084	0.084	15.0	0.0341	0.0000	OK
15 minute winter	S10	10	236.694	0.044	3.4	0.0193	0.0000	OK
15 minute winter	S11	10	236.601	0.051	3.4	0.0143	0.0000	OK
15 minute winter	S12	11	236.586	0.086	20.2	0.0317	0.0000	OK
15 minute winter	S13	10	236.634	0.034	1.7	0.0152	0.0000	OK
15 minute winter	S14	10	236.515	0.015	1.7	0.0042	0.0000	OK
480 minute winter	S15	288	236.381	1.031	5.2	0.4329	0.0000	SURCHARGED
15 minute winter	S16	10	238.256	0.056	11.0	0.0485	0.0000	OK
15 minute winter	HW1	10	237.068	0.118	19.8	0.0492	0.0000	OK
15 minute winter	HW2	11	236.828	0.078	19.4	0.5257	0.0000	OK
1440 minute winter	RE2	750	236.300	1.000	6.6	0.0180	107.0650	FLOOD
480 minute winter	S17	288	236.330	1.080	10.3	4.4844	0.0000	FLOOD RISK
480 minute winter	S18	288	236.372	1.222	10.1	7.9509	0.0000	FLOOD RISK
480 minute winter	S19	288	236.375	0.975	0.5	0.3540	0.0000	FLOOD RISK
480 minute winter	S20	288	236.375	1.075	0.8	0.3043	0.0000	FLOOD RISK
480 minute winter	TANK	288	236.375	1.475	11.2	77.2579	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0194	
15 minute winter	S1	1.001	S2	5.0	1.291	0.165	0.0348	
15 minute winter	S2	1.002	S5	5.0	1.002	0.143	0.0315	
15 minute winter	S3	2.000	S4	1.7	0.758	0.109	0.0151	
15 minute winter	S4	2.001	S5	1.7	0.452	0.034	0.0297	
15 minute winter	S5	1.003	S6	10.4	1.555	0.298	0.0526	
15 minute winter	S6	1.004	S9	10.3	1.213	0.316	0.0510	
15 minute winter	S7	3.001	S8	1.7	0.757	0.108	0.0207	
15 minute winter	S8	3.002	S9	1.7	0.307	0.034	0.0458	
15 minute winter	S9	1.005	S12	14.9	1.450	0.579	0.2456	
15 minute winter	S10	4.000	S11	3.4	0.712	0.171	0.0389	
15 minute winter	S11	4.001	S12	3.3	0.431	0.247	0.0687	
15 minute winter	S12	1.006	S15	20.4	2.025	0.571	0.1867	
15 minute winter	S13	5.000	S14	1.7	0.894	0.091	0.0183	
15 minute winter	S14	5.001	S15	1.7	0.151	0.020	0.0508	
480 minute winter	S15	1.007	TANK	5.0	0.610	0.365	0.1471	
15 minute winter	S16	6.000	HW1	10.9	1.028	0.299	0.3140	
15 minute winter	HW1	6.001	HW2	19.4	1.615	0.826	0.1365	
15 minute winter	HW2	6.002	S18	19.4	1.270	0.529	0.5102	
1440 minute winter	RE2	7.000	S17	-6.6	-0.375	-0.408	0.1056	
480 minute winter	S17	7.001	S18	-9.9	-0.561	-0.559	0.1782	
480 minute winter	S18	6.003	TANK	6.3	0.700	0.303	0.0650	
480 minute winter	S19	8.000	S20	0.2	0.329	0.013	0.1699	
480 minute winter	S20	8.001	TANK	-0.8	0.255	-0.048	0.2116	
480 minute winter	TANK	1.008	S21	0.7	0.275	0.017	0.3715	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	S21	288	236.375	1.545	0.7	2.7305	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S21	Pump		0.0				0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	1	238.800	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	238.048	0.047	5.9	0.0229	0.0000	OK
15 minute winter	S2	10	237.781	0.041	5.9	0.0117	0.0000	OK
15 minute winter	S3	10	238.139	0.039	2.0	0.0142	0.0000	OK
15 minute winter	S4	10	238.071	0.021	2.0	0.0059	0.0000	OK
15 minute winter	S5	10	237.565	0.065	12.2	0.0283	0.0000	OK
15 minute winter	S6	10	237.268	0.068	12.1	0.0193	0.0000	OK
15 minute winter	S7	10	237.689	0.039	2.0	0.0142	0.0000	OK
15 minute winter	S8	10	237.601	0.021	2.0	0.0059	0.0000	OK
15 minute winter	S9	10	237.094	0.094	17.5	0.0378	0.0000	OK
15 minute winter	S10	10	236.697	0.047	3.9	0.0208	0.0000	OK
15 minute winter	S11	11	236.606	0.056	3.9	0.0158	0.0000	OK
15 minute winter	S12	11	236.595	0.095	23.5	0.0351	0.0000	OK
15 minute winter	S13	10	236.637	0.037	2.0	0.0165	0.0000	OK
15 minute winter	S14	10	236.516	0.016	2.0	0.0045	0.0000	OK
240 minute winter	S15	152	236.413	1.063	9.4	0.4464	0.0000	SURCHARGED
15 minute winter	S16	10	238.261	0.061	12.8	0.0527	0.0000	OK
15 minute winter	HW1	10	237.088	0.137	23.1	0.0575	0.0000	OK
15 minute winter	HW2	11	236.835	0.085	22.5	0.5856	0.0000	OK
1440 minute winter	RE2	690	236.300	1.000	7.4	0.0180	152.7853	FLOOD
480 minute winter	S17	264	236.342	1.091	12.0	4.4888	0.0000	FLOOD RISK
480 minute winter	S18	264	236.398	1.248	11.4	8.2686	0.0000	FLOOD RISK
480 minute winter	S19	264	236.400	1.000	0.6	0.3630	0.8131	FLOOD
360 minute winter	S20	208	236.400	1.100	0.9	0.3114	0.0000	FLOOD RISK
480 minute winter	TANK	264	236.400	1.500	12.1	77.2650	0.0000	FLOOD RISK

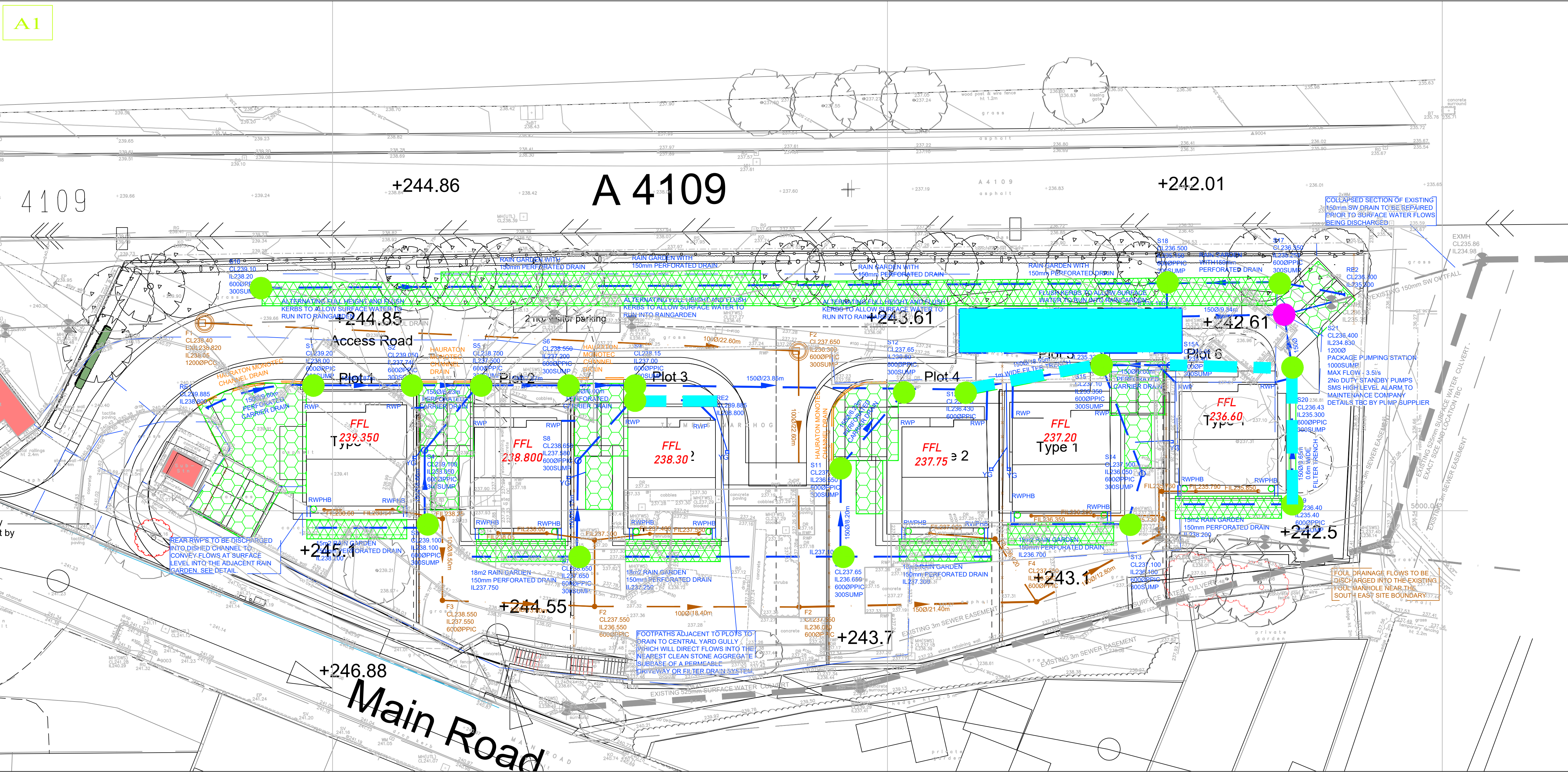
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	0.0	0.000	0.000	0.0218	
15 minute winter	S1	1.001	S2	5.9	1.342	0.192	0.0387	
15 minute winter	S2	1.002	S5	5.8	1.037	0.166	0.0353	
15 minute winter	S3	2.000	S4	2.0	0.796	0.129	0.0170	
15 minute winter	S4	2.001	S5	2.0	0.473	0.041	0.0334	
15 minute winter	S5	1.003	S6	12.1	1.601	0.347	0.0595	
15 minute winter	S6	1.004	S9	12.0	1.246	0.369	0.0579	
15 minute winter	S7	3.001	S8	2.0	0.795	0.127	0.0233	
15 minute winter	S8	3.002	S9	2.0	0.318	0.041	0.0518	
15 minute winter	S9	1.005	S12	17.3	1.496	0.672	0.2770	
15 minute winter	S10	4.000	S11	3.9	0.731	0.197	0.0435	
15 minute winter	S11	4.001	S12	3.8	0.443	0.284	0.0779	
15 minute winter	S12	1.006	S15	23.6	2.089	0.663	0.2100	
15 minute winter	S13	5.000	S14	2.0	0.937	0.107	0.0206	
15 minute winter	S14	5.001	S15	2.0	0.177	0.024	0.0511	
240 minute winter	S15	1.007	TANK	9.1	0.741	0.662	0.1471	
15 minute winter	S16	6.000	HW1	12.7	1.053	0.349	0.3559	
15 minute winter	HW1	6.001	HW2	22.5	1.634	0.957	0.1556	
15 minute winter	HW2	6.002	S18	22.5	1.437	0.616	0.5316	
1440 minute winter	RE2	7.000	S17	-7.4	-0.420	-0.457	0.1056	
480 minute winter	S17	7.001	S18	-11.5	-0.655	-0.653	0.1782	
480 minute winter	S18	6.003	TANK	6.9	0.722	0.333	0.0650	
480 minute winter	S19	8.000	S20	0.3	0.329	0.018	0.1699	
360 minute winter	S20	8.001	TANK	-0.9	0.301	-0.054	0.2116	
480 minute winter	TANK	1.008	S21	2.0	0.291	0.044	0.3715	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	S21	330	236.400	1.570	2.0	2.7742	1.7704	FLOOD
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute summer	S21	Pump		0.0				0.0

Appendix E Drainage Maintenance Plan

A1



.... PDF/DWG issues of this drawing are controlled in the format (e.g. DWG, AutoCAD, PDF, etc.) UN-controlled and are used at your own risk.

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Contractors should refer to the residual risks contained in the CDM Pre Construction Information before carrying out any site operations and should not issue parts of this drawing without including the CDM notes and references. This information will include details of the SIGNIFICANT risks which PFDwyer Ltd have considered beyond that which a competent contractor should be aware.

HEALTH & SAFETY

1. CONTRACTOR SHOULD BE AWARE OF GENERAL CONSTRUCTION RISKS TO PREVENT SLIPS, TRIPS AND FALLS AND TAKE NECESSARY PRECAUTIONS WITHOUT SPECIAL TRAINING.
2. CONTRACTOR TO PROVIDE TRENCH SHAPES AS APPROPRIATE AND ENSURE THAT PLANT REMAINS A SAFE DISTANCE FROM TRENCHES PRIOR TO INSTALLING DRAINAGE. EXCAVATIONS ARE OPEN ON SITE SHOULD BE KEPT TO A MINIMUM AND ALL TRENCHES SHOULD BE SURROUNDED BY A BARRIER.
3. CONNECTIONS TO EXISTING SEWERS TO BE MADE BY SW APPROVED CONTRACTOR
4. CONTRACTOR TO MAKE OPERATES AWARE OF ASSOCIATED DANGERS TO HEALTH SUCH AS LEPTOSPIROSIS (WELLS DISEASE) AND RECOMMENDED PRECAUTIONS. ADEQUATE WEAR FACILITIES AND PROTECTIVE CLOTHING TO BE PROVIDED AS REQUIRED.
5. UNPROCESSED MANURE MUST BE COVERED WITH LOAD BEARING MATERIALS AND SURROUNDED WITH BARRIER.
6. PIPES & CABLES
7. SERVICE RECORDS TO BE REFERRED TO PRIOR TO WORK COMMENCING. CONTRACTOR TO PROCEED WITH CAUTION AND SERVICES TO BE LOCATED BY HAND DIG AND PROTECTED ACCORDINGLY.
8. EXCAVATION/FILL
9. CONTRACTOR TO ENSURE RELEVANT MEASURES ARE TAKEN TO KEEP PLANT AND PEOPLE AT A SAFE DISTANCE FROM STEEP SLOPES DURING THE WORKS.
10. CONTRACTOR TO ENSURE THAT PROCEDURES ARE IN PLACE TO KEEP PEOPLE A SAFE DISTANCE FROM WORKING PLANT WHERE NECESSARY.
11. CONTRACTOR TO REFER TO GROUND INVESTIGATION REPORT FOR CONTAMINATION TESTS AND TO PROVIDE ADEQUATE WEAR FACILITIES AND PROTECTIVE CLOTHING AS REQUIRED.

DETAILS OF APPOINTED MANAGEMENT COMPANY: UKPI Group Ltd
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POROUS PAVING		TO BE MAINTAINED BY APPOINTED MAINTENANCE COMPANY	
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY	
REGULAR MAINTENANCE	BRUSHING AND VACUUMING (STANDARD COSMETIC SWEEP OVER WHOLE AREA)	ONCE A YEAR AFTER AUTUMN LEAF FALL	
OCCASIONAL MAINTENANCE	STABILISE AND MOW CONTRIBUTING AND ADJACENT AREAS.	AS REQUIRED	
	REMOVAL OF WEEDS OR MANAGEMENT USING GLYPHOSATE APPLIED DIRECTLY INTO WEEDS BY AN APPLICATOR RATHER THAN SPRAYING	AS REQUIRED-ONCE PER YEAR ON LESS FREQUENTLY USED PAVEMENT	
REMEDIAL ACTIONS	REMEDiate ANY LANDSCAPING WHICH, THROUGH VEGETATION MAINTENANCE OR SOIL SLIP, HAS BEEN RAISED WITHIN 50mm OF LEVEL OF THE PAVING	AS REQUIRED	
	REMEDIAL WORK TO ANY DEPRESSIONS, RUTTING AND CRACKED OR BROKEN BLOCKS CONSIDERED DETRIMENTAL TO THE STRUCTURAL PERFORMANCE OR A HAZARD TO USERS AND REPLACE LOST JOINTING MATERIAL	AS REQUIRED	
	REHABILITATION OF SURFACE AND UPPER SUBSTRUCTURE BY REMEDIAL SWEEPING	EVERY 10-15 YEARS AS REQUIRED	
MONITORING	INITIAL INSPECTION	MONTHLY OR 3 MONTHS AFTER INSTALLATION	
	INSPECT FOR EVIDENCE OF POOR OPERATION AND OR WEED GROWTH - IF REQUIRED TAKE REMEDIAL ACTION	THREE MONTHLY	
	INSPECT SILT ACCUMULATION RATES AND ESTABLISH APPROPRIATE BRUSHING FREQUENCIES	ANNUALLY	
	MONITOR INSPECTION CHAMBERS	ANNUALLY	

PUMPING STATION		TO BE MAINTAINED BY APPOINTED MANAGEMENT COMPANY	
MAINTENANCE SCHEDULE		REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE		INSPECT AND REMOVE SILT ACCUMULATION ESTABLISH SILT REMOVAL FREQUENCIES	MONTHLY FOR 3 MONTHS THEN ANNUALLY
OCCASIONAL MAINTENANCE		REMOVE SILT WHEN 100MM DEEP IN CHAMBER BASE	EVERY 2 YEARS OR AS REQUIRED
REMEDIAL ACTIONS		REPAIR PHYSICAL DAMAGE IF NECESSARY	AS REQUIRED

CELLULAR STORAGE		TO BE MAINTAINED BY APPOINTED MANAGEMENT COMPANY	
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY	
REGULAR MAINTENANCE	INSPECT AND IDENTIFY ANY AREAS THAT ARE NOT OPERATING CORRECTLY	MONTHLY FOR 3 MONTHS THEN ANNUALLY	
	REMOVE DEBRIS FROM THE CATCHMENT SURFACE (WHERE IT MAY CAUSE RISKS TO PERFORMANCE)	MONTHLY	
	REMOVE SEDIMENT FROM PRETREATMENT CATCH PITS	ANNUALLY OR AS REQUIRED	
REMEDIAL ACTIONS	REPAIR/REHABILITATE INLETS, OUTLETS AND VENTS	AS REQUIRED	
MONITORING	INSPECT/CHECK ALL INLETS, OUTLETS AND VENTS	ANNUALLY	
	SURVEY INSIDE OF TANK FOR SEDIMENT BUILD UP AND REMOVE IF NECESSARY	EVERY 5 YEARS OR AS REQUIRED	

FILTER TRENCH		TO BE MAINTAINED BY APPOINTED MAINTENANCE COMPANY	
REGULAR MAINTENANCE	MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
		INSPECT INLETS STONE SURFACE FOR SEDIMENT AT SURFACE	QUARTERLY / AFTER STORM EVENTS
		INSPECT GEOTEXTILE MEMBRANE FOR SEDIMENT AT SURFACE	
		INSPECT INLETS, OUTLETS FOR SILT ACCUMULATION. ESTABLISH SILT REMOVAL FREQUENCIES	MONTHLY (AT START, THEN AS REQUIRED)
		GRASS CUTTING AT EDGES	
		MANAGE VEGETATION AND REMOVE NUISANCE PLANTS	MONTHLY (AT START, THEN AS REQUIRED)
		REMOVE LITTER AND DEAD LEAVES	MONTHLY
OCCASIONAL MAINTENANCE		REMOVE SEDIMENT FROM STONE SURFACE	1 - 5 YEARS OR AS REQUIRED
		REMOVE SEDIMENT FROM GEOTEXTILE MEMBRANE	1 - 5 YEARS OR AS REQUIRED
REMEDIAL ACTIONS		REPAIR PHYSICAL DAMAGE OF STONE SURFACE AND GEOTEXTILE MEMBRANE	AS REQUIRED

SW DRAINS & MANHOLES	TO BE MAINTAINED BY MANAGEMENT COMPANY	
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE	INSPECT AND IDENTIFY ANY AREAS THAT ARE NOT OPERATING CORRECTLY. IF REQUIRED TAKE REMEDIAL ACTION	MONTHLY FOR 3 MONTHS THEN ANNUALLY
OCCASIONAL MAINTENANCE	SURVEY INSIDE OF OUTLET PIPES TO CHECK FOR SEDIMENT BUILD UP AND REMOVE IF NECESSARY	EVERY 5 YEARS OR AS REQUIRED
REMEDIAL ACTIONS	REPAIR PHYSICAL DAMAGE IF NECESSARY	AS REQUIRED

SW SILT TRAPS		TO BE MAINTAINED BY APPOINTED MANAGEMENT COMPANY
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE	INSPECT ACCESS POINTS FOR SILT ACCUMULATION TO ESTABLISH SILT REMOVAL FREQUENCIES	MONTHLY FOR 3 MONTHS THEN ANNUALLY
OCCASIONAL MAINTENANCE	REMOVE SILT WHEN 100MM DEEP	EVERY 2 YEARS OR AS REQUIRED
REMEDIAL ACTIONS	REPAIR PHYSICAL DAMAGE IF NECESSARY	AS REQUIRED

RAIN GARDEN AREA 	TO BE MAINTAINED BY MANAGEMENT COMPANY	
MAINTENANCE SCHEDULE	REQUIRED ACTION	FREQUENCY
REGULAR MAINTENANCE	INSPECT INLETS AND OUTLETS FOR BLOCKAGES, CLEAR IF REQUIRED	MONTHLY
	REMOVE LITTER AND DEAD LEAVES	MONTHLY (AT START, THEN AS REQUIRED)
	MANAGE OTHER VEGETATION AND REMOVE NUISANCE PLANTS	MONTHLY FOR FIRST YEAR, THEN AS REQUIRED
OCCASIONAL MAINTENANCE	INSPECT INLETS, OUTLETS AND BASIN FOR SILT ACCUMULATION. ESTABLISH SILT REMOVAL FREQUENCIES	MONTHLY FOR FIRST YEAR, THEN AS REQUIRED
	REMOVE SEDIMENT FROM INLETS, OUTLETS AND BASIN WHEN DEPTH EXCEEDS 25MM	EVERY 5 YEARS OR AS REQUIRED
REMEDIAL ACTIONS	RESEED AREA OF POOR VEGETATION GROWTH	ANNUALLY OR AS REQUIRED
	REPAIR EROSION OR OTHER DAMAGE BY RESEEDING	
	REPAIR/REHABILITATION OF INLETS AND OUTLET.	AS REQUIRED
	RE-LEVEL UNEVEN SURFACES AND REINSTATE DESIGN LEVELS	

DO NOT SCALE.

02/11/23	SWALE REMOVED. ADDITIONAL RAINGARDEN AREAS ADDED.	PFD	P2
24/11/22	PRELIMINARY ISSUE	PFD	P1
Date	Revisions	Drawn	Rev.



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Client	QDTS PROPERTIES
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Project RESIDENTIAL DEVELOPMENT
MAIN ROAD, NEATH

Title	PROPOSED DRAINAGE MAINTENANCE PLAN
-------	---------------------------------------

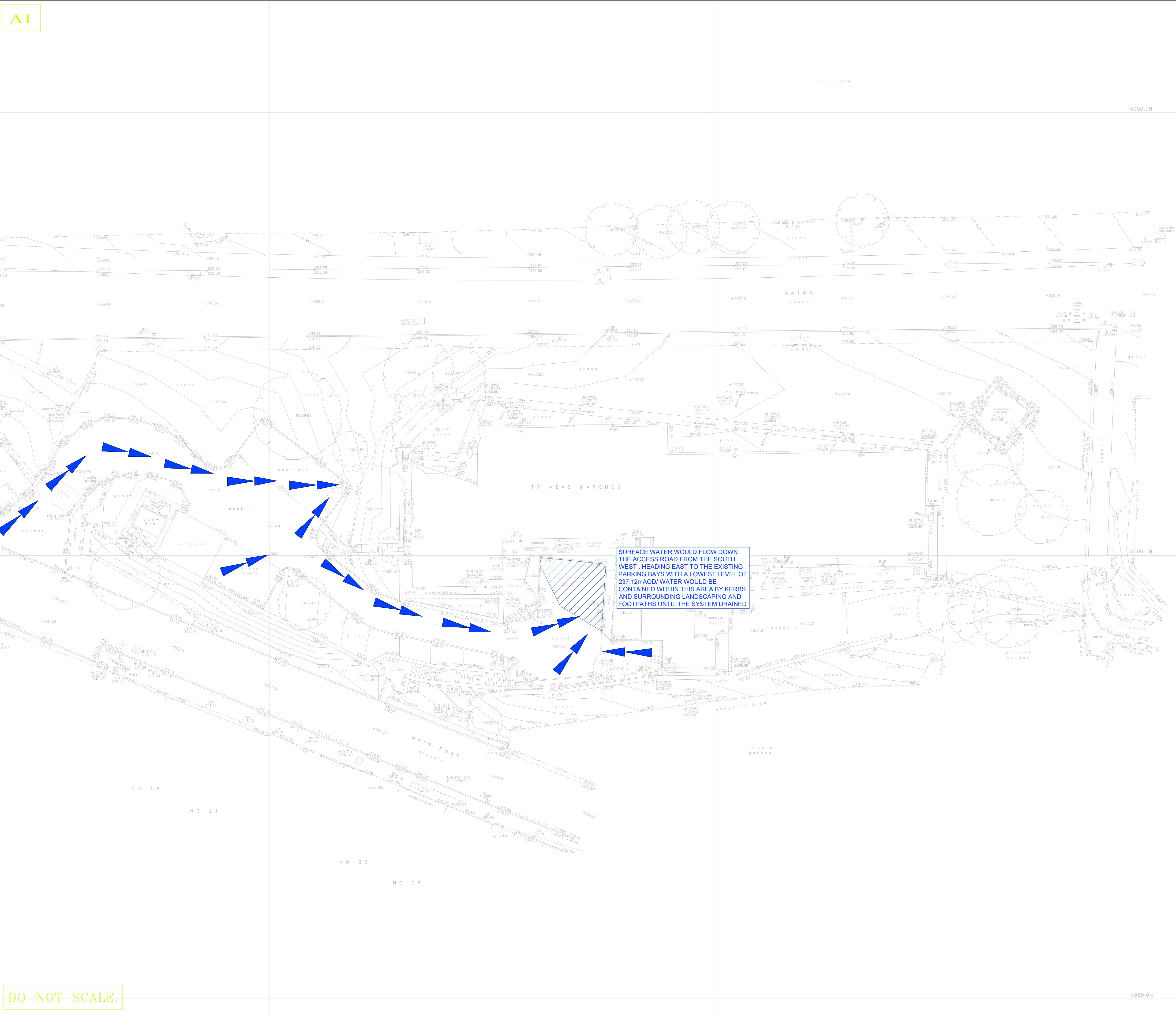
Scale A1 1:200	Drawn PFD	Checked PFD	Date NOV 2022
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Drawing Status	Preliminary
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Job No. XXXX	Drawing No. C012	Revision P2
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Appendix F

Existing & Proposed Flood Flow Paths



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- HEALTH & SAFETY
1. CONTRACTOR SHOULD BE AWARE OF GENERAL CONSTRUCTION RISKS TO PREVENT SLIPS, TRIPS AND FALLS AND TAKE NECESSARY PRECAUTIONS WITHOUT SPECIAL INSTRUCTION.
 2. CONTRACTOR TO PROVIDE TRENCH SUPPORTS AS APPROPRIATE AND ENSURE THAT PLANT REMAINS A SAFE DISTANCE FROM TRENCHES PRIOR TO INSTALLING DRAINAGE.
 3. THE TIME THAT EXCAVATIONS ARE OPEN ON SITE SHOULD BE KEPT TO A MINIMUM AND ALL TRENCHES SHOULD BE SURROUNDED BY A BARRIER.
 4. CONNECTIONS TO EXISTING SEWERS TO BE MADE BY SW APPROVED CONTRACTOR ONLY.
 5. CONTRACTOR TO MAKE OPERATIVES AWARE OF ASSOCIATED DANGERS TO HEALTH SUCH AS LEPTOSPIROSIS (WELLS DISEASE) AND RECOMMENDED PRECAUTIONS. ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING TO BE PROVIDED AS REQUIRED.
 6. UNFINISHED MANHOLES MUST BE COVERED WITH LOAD BEARING MATERIALS AND SURROUNDED WITH BARRIER.
 7. SERVICE RECORDS TO BE REFERRED TO PRIOR TO WORK COMMENCING. CONTRACTOR TO PROCEED WITH CAUTION AND SERVICES TO BE LOCATED BY HAND DIG AND PROTECTED ACCORDINGLY.
 8. CONTRACTOR TO ENSURE RELEVANT MEASURES ARE TAKEN TO KEEP PLANT AND PEOPLE A SAFE DISTANCE FROM STEEP SLOPES DURING THE WORKS.
 9. CONTRACTOR TO ENSURE THAT PROCEDURES ARE IN PLACE TO KEEP PEOPLE A SAFE DISTANCE FROM WORKING PLANT WHERE NECESSARY.
 10. CONTRACTOR TO REFER TO GROUND INVESTIGATION REPORT FOR CONTAMINATION TESTS AND TO PROVIDE ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING AS REQUIRED.

24/1/22	PRELIMINARY ISSUE		PFD	P1
Date	Revisions	Drawn Rev.		



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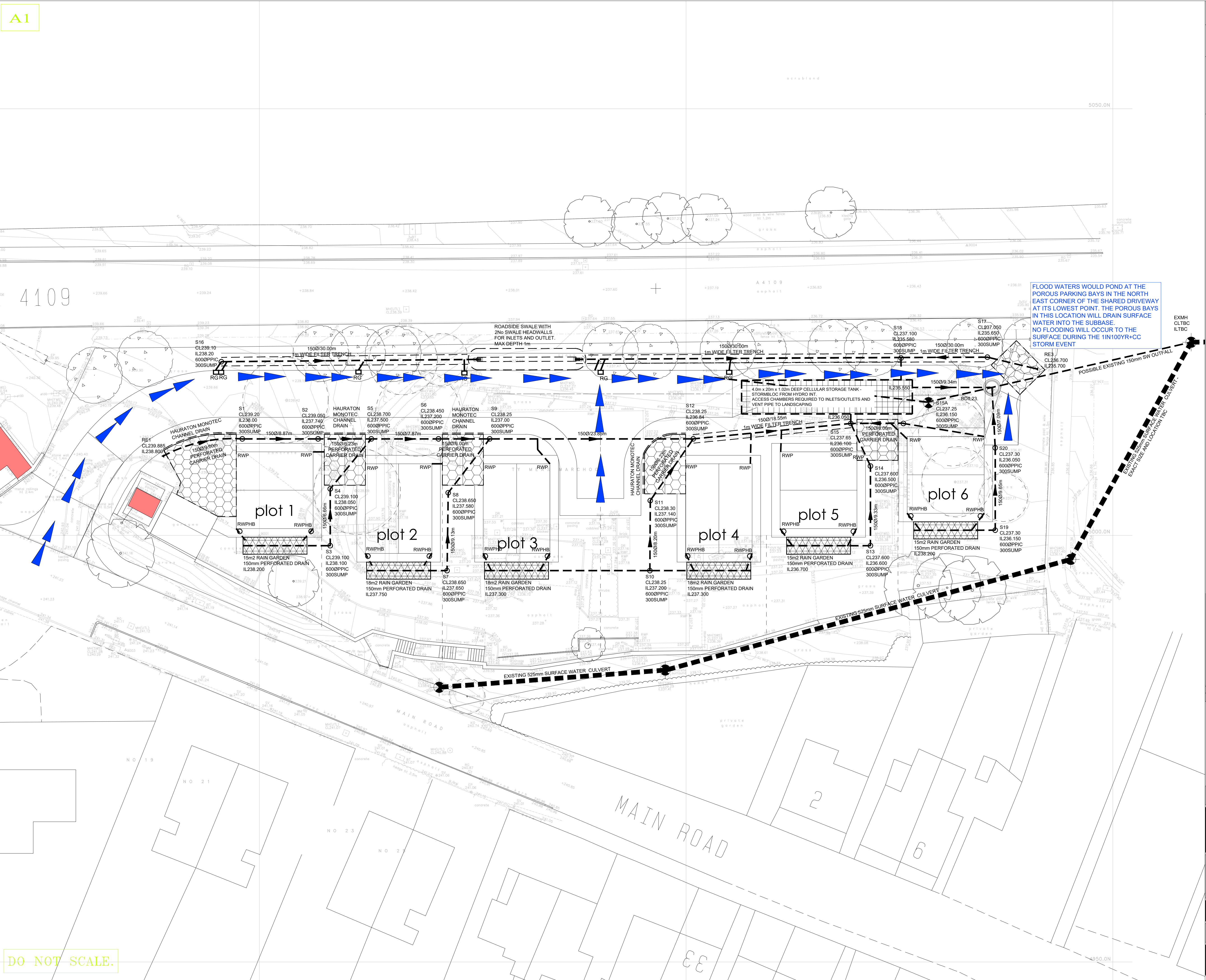
Project RESIDENTIAL DEVELOPMENT
MAIN ROAD, NEATH

Title EXISTING FLOOD FLOW PATHS

Scale	Drawn	Checked	Date
A1 1:200	PFD	PFD	NOV 2022

Drawing Status Preliminary

Job No.	Drawing No.	Revision
XXXX	C010	P1



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30/1/22	PRELIMINARY ISSUE	PFD	P1
Date	Revisions	Drawn	Rev.

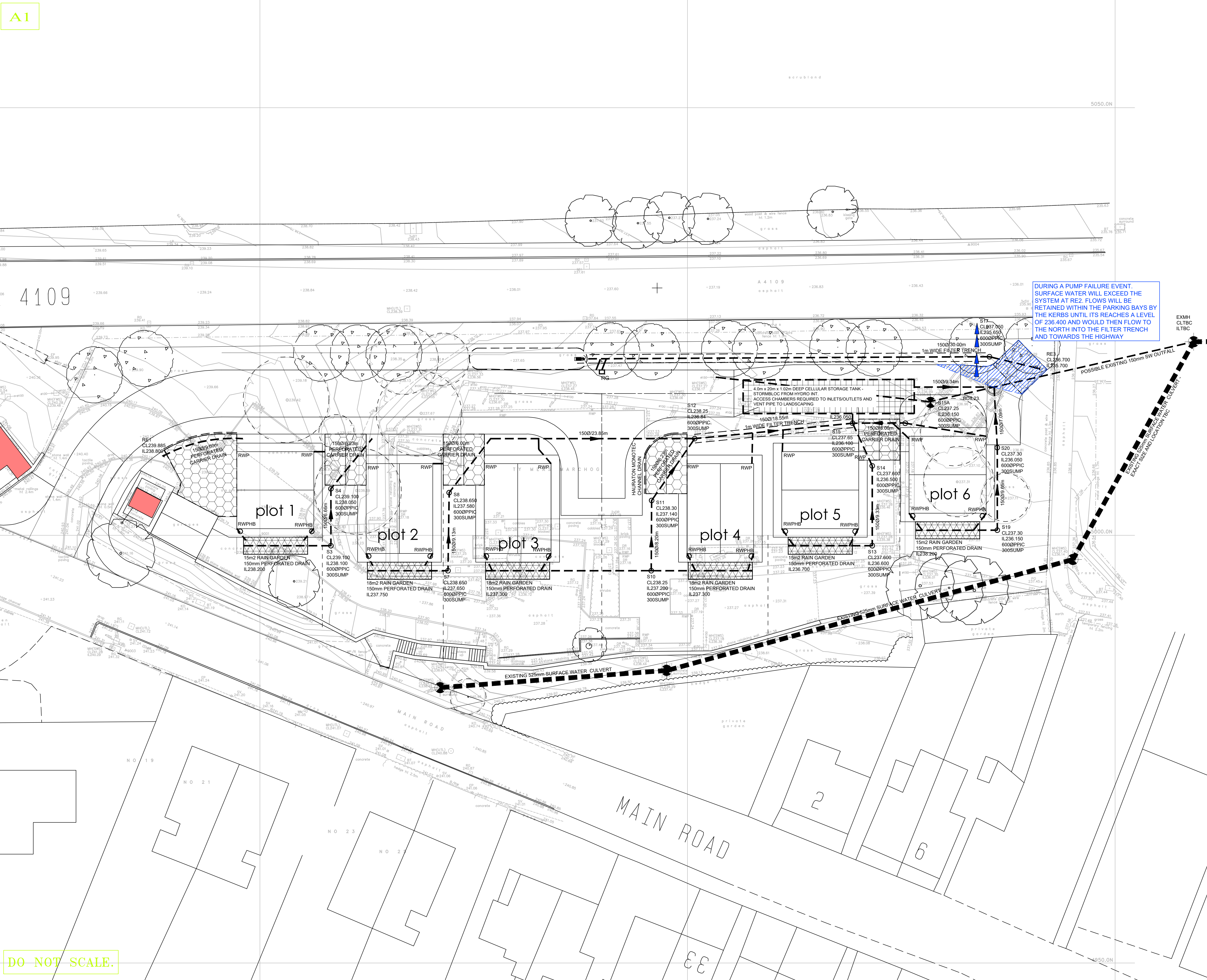


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Client	QDTS PROPERTIES						
Project	RESIDENTIAL DEVELOPMENT MAIN ROAD, NEATH						
Title	PROPOSED FLOOD FLOW PATHS						
Scale	A1 1:200	Drawn	PFD	Checked	PFD	Date	NOV 2022
Drawing Status		Preliminary					
Job No.	XXXX		Drawing No.	C011		Revision	P1



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7. SERVICE RECORDS TO BE REFERRED TO PRIOR TO WORK COMMENCING. CONTRACTOR TO PROCEED WITH CAUTION AND SERVICES TO BE LOCATED BY HAND DIG AND PROTECTED ACCORDINGLY.
8. EXCAVATION/FILL
9. CONTRACTOR TO ENSURE RELEVANT MEASURES ARE TAKEN TO KEEP PLANT AND PEOPLE A SAFE DISTANCE FROM STEEP SLOPES DURING THE WORKS.
10. CONTRACTOR TO ENSURE THAT PROCEDURES ARE IN PLACE TO KEEP PEOPLE A SAFE DISTANCE FROM WORKING PLANT WHERE NECESSARY.
11. CONTRACTOR TO REFER TO GROUND INVESTIGATION REPORT FOR CONTAMINATION TESTS AND TO PROVIDE ADEQUATE WELFARE FACILITIES AND PROTECTIVE CLOTHING AS REQUIRED.

30/1/22	PRELIMINARY ISSUE	PFD	P1
Date	Revisions	Drawn	Rev.

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Client

QDTS PROPERTIES

Project

RESIDENTIAL DEVELOPMENT
MAIN ROAD, NEATH

Title

PROPOSED FLOOD FLOW PATHS
PUMP FAILURE EXCEEDANCE ROUTES

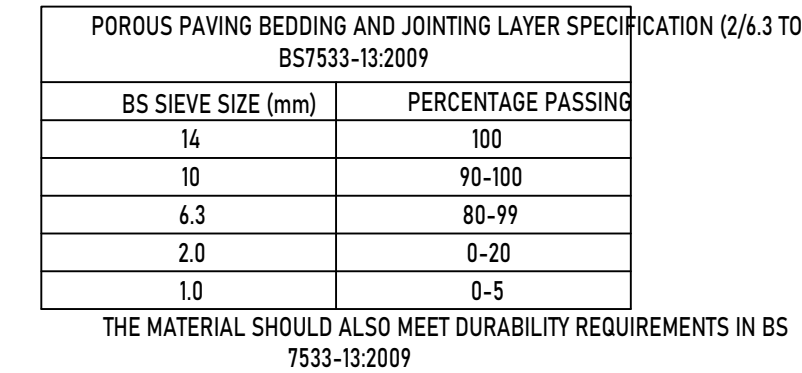
Scale	Drawn	Checked	Date
A1 1:200	PFD	PFD	APR 2023

Drawing Status

Preliminary

Job No.	Drawing No.	Revision
XXXX	C013	P1

Appendix G Drainage Construction Details

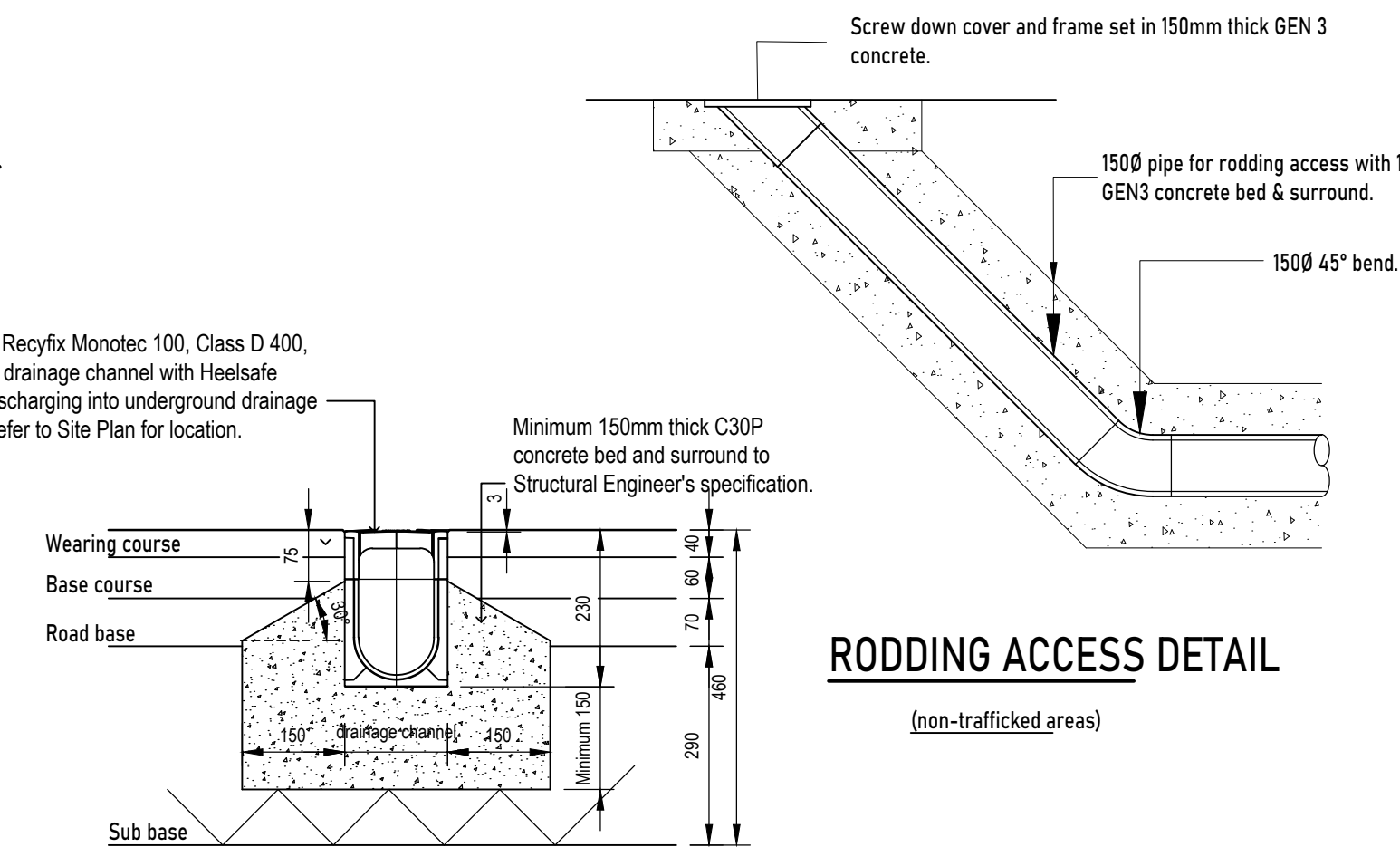


TYPICAL GRADING REQUIREMENTS FOR POROUS PAVING SUB-BASE AGGREGATES (COARSE AGGREGATE 4/20)	
SIEVE SIZE (mm)	PERCENT PASSING
80	-
63	-
40	100
31.5	98-100
20	90-99
10	25-70
4	0-15
2	0-5
1	-

SCALE 1:10

Course graded aggregate sub base should be moistened, laid in 100-150mm layers and compacted to ensure that the maximum density is achieved without crushing the individual aggregate particles. This should be achieved by rolling with little or no compaction. The surface levels should be in range +20mm 50 -15mm

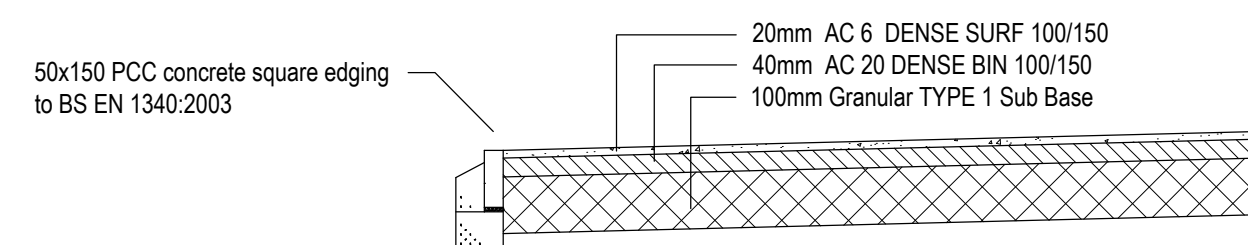
With the exception of plant and equipment needed for installation of the paving units, no other traffic or equipment should be allowed onto the completed layer as the surface is easily damaged and rutted. Care and precautions are also needed to ensure that the surface is not damaged, rutted or clogged with mud and detritus from the plant and equipment whilst installing the next pavement layer. Precautions should be undertaken to avoid runoff from adjacent areas.



(non-trafficked areas)

FILTER TRENCH CROSS SECTION

CHANNEL DRAIN DETAIL



SCALE 1:20

SCALE 1:10

DO NOT SCALE.

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14/10/23	DETAILS UPDATED	PFD	P3
04/05/23	DETAILS UPDATED	PFD	P2
24/11/22	PRELIMINARY ISSUE	PFD	P1
Date	Revisions	Drawn	Rev.



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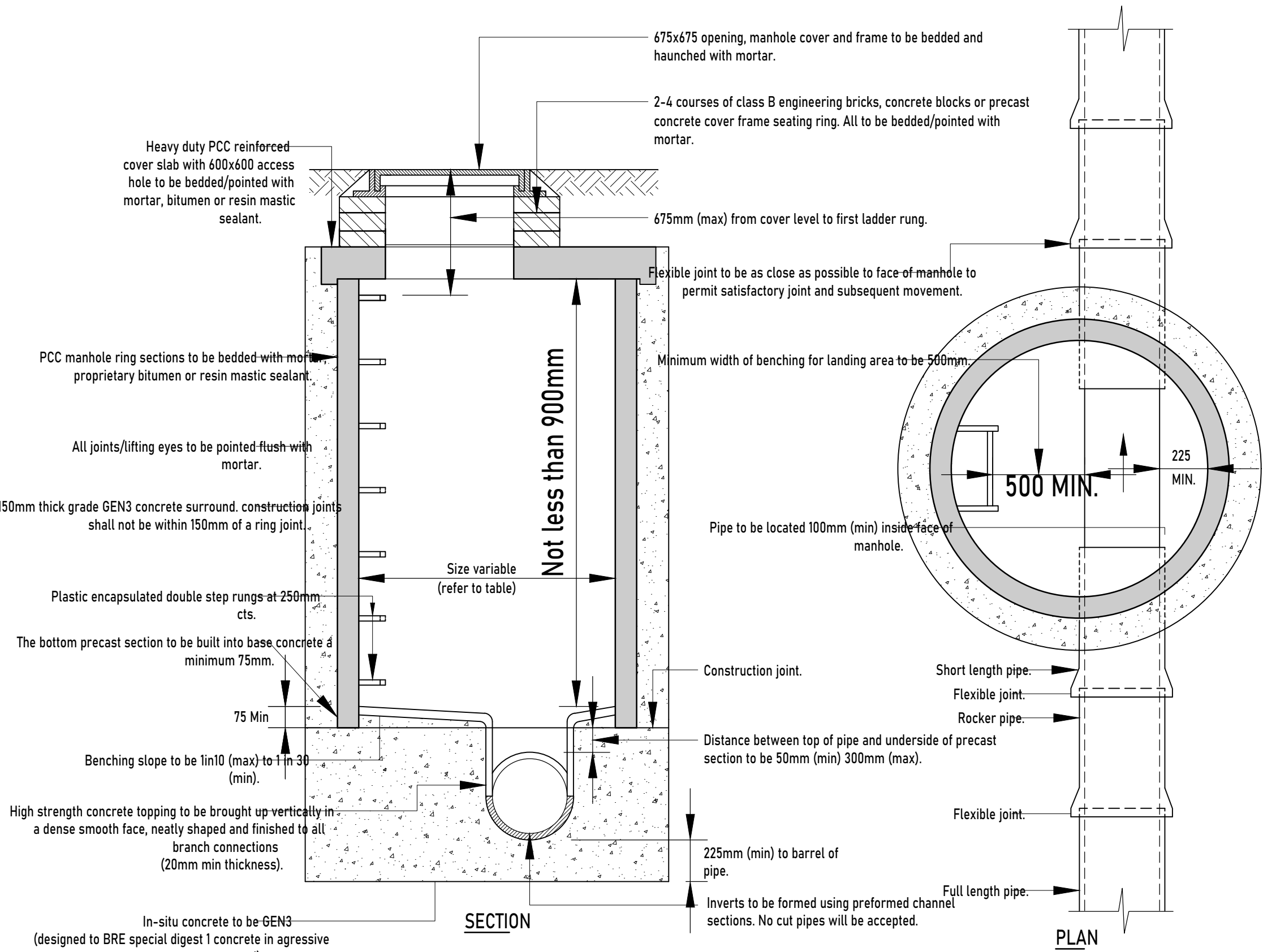
Project	RESIDENTIAL DEVELOPMENT MAIN ROAD, NEATH
---------	---

Title	DRAINAGE CONSTRUCTION DETAILS SHEET 1
-------	--

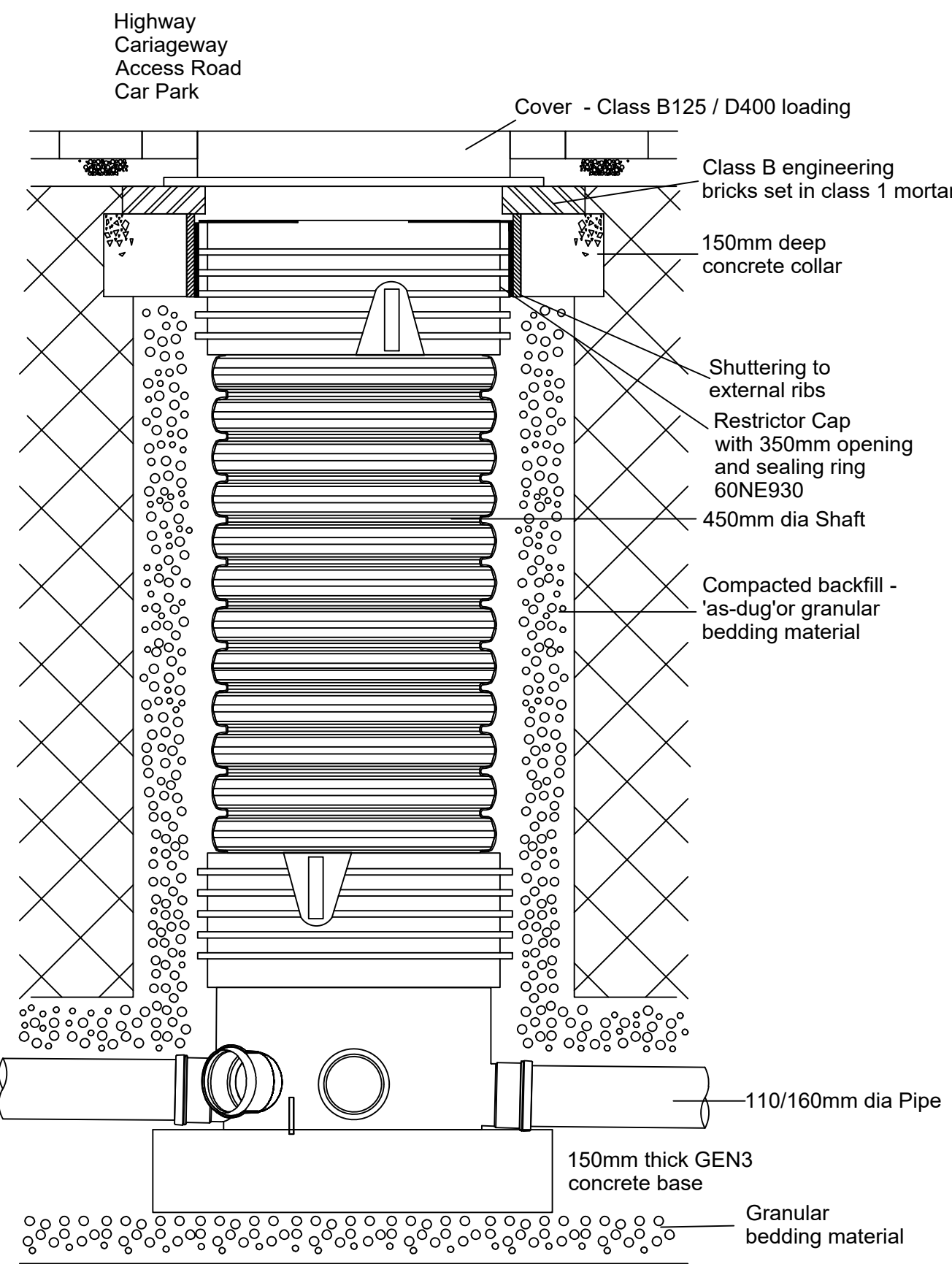
Scale	Drawn	Checked	Date
A1 1:200	PFD	PFD	NOV 2022

Drawing Status Preliminary

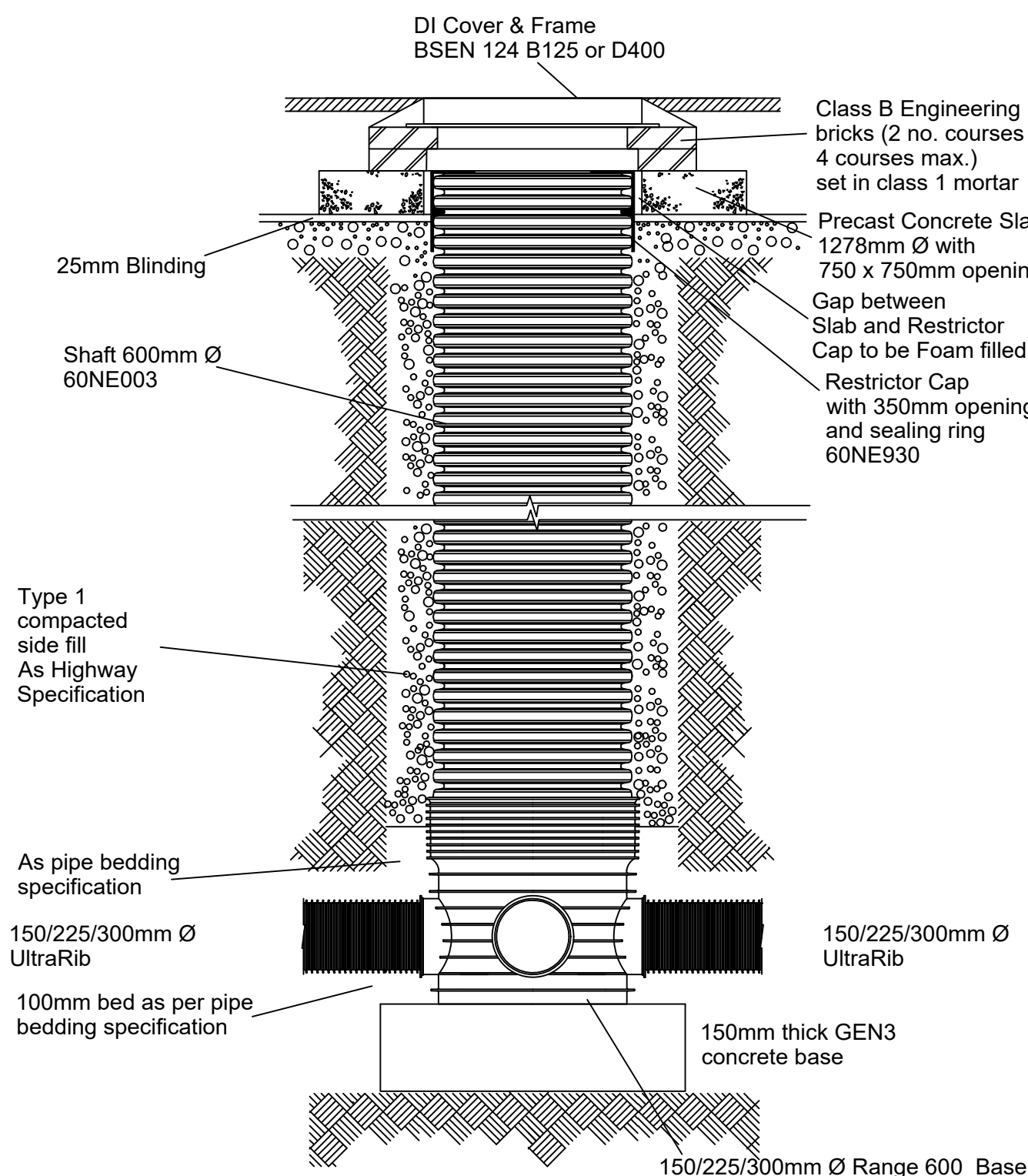
Job No. XXXX	Drawing No. C003	Revision P3
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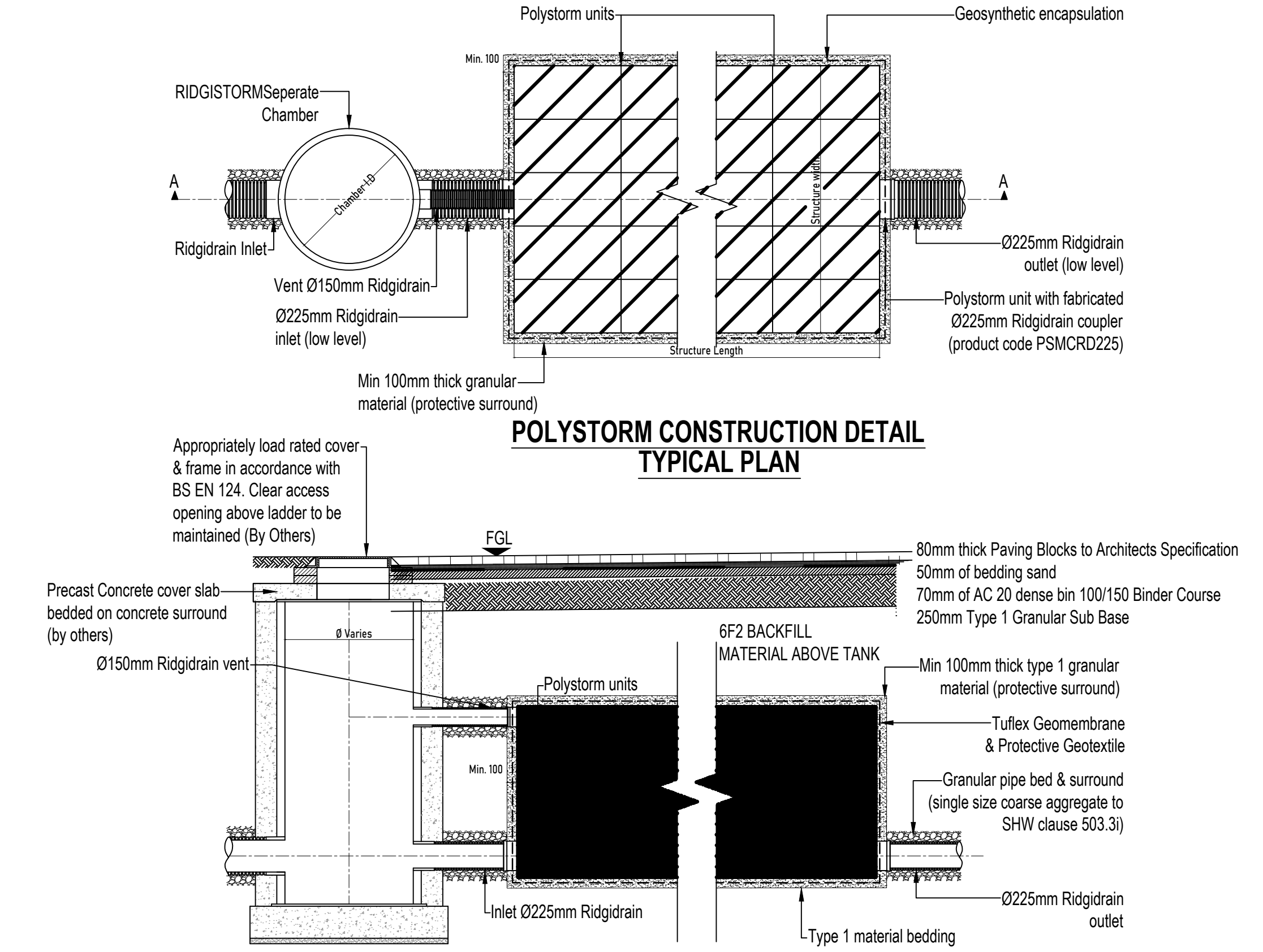
TYPICAL TYPE B P.C.C MANHOLE DETAIL
DEPTH TO SOFFIT OF PIPE 1500mm TO 3000mm



TYPICAL 450mm PPIC DETAIL
MAX DEPTH 3000mm NON ENTRY >1000mm
(note: construction details as standard PCC manhole)

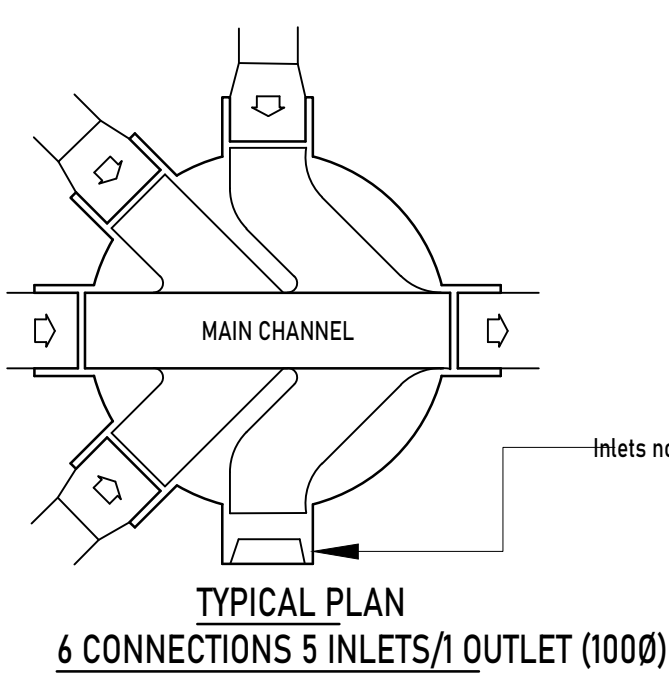


TYPICAL 600mm PPIC DETAIL
MAX DEPTH 3000mm NON ENTRY >1000mm
(note: construction details as standard PCC manhole)

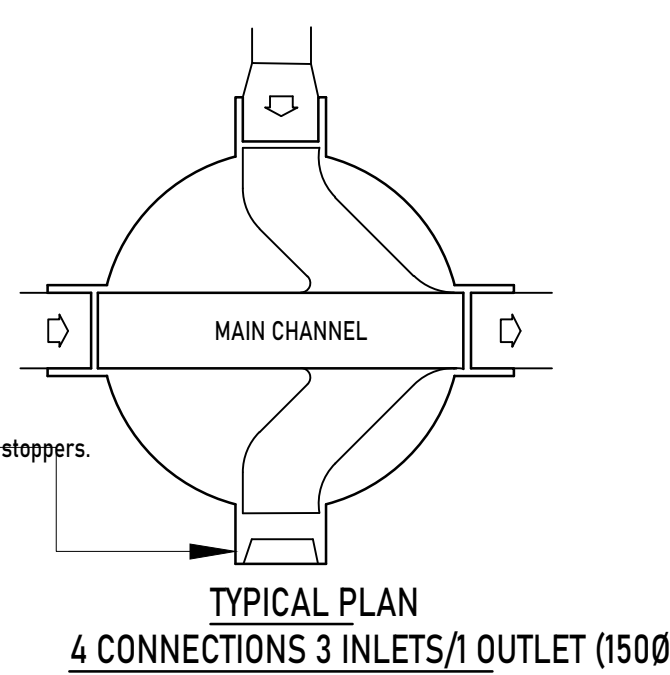


POLYSTORM CONSTRUCTION DETAIL
TYPICAL PLAN

POLYSTORM CONSTRUCTION DETAIL
TYPICAL SECTION



TYPICAL PLAN
6 CONNECTIONS 5 INLETS/1 OUTLET (1000)



TYPICAL PLAN
4 CONNECTIONS 3 INLETS/1 OUTLET (1500)

14/10/23	DETAILS UPDATED	PFD	P3
04/08/23	DETAILS UPDATED	PFD	P2
30/11/22	PRELIMINARY ISSUE	PFD	P1
Date	Revisions	Drawn	Rev.



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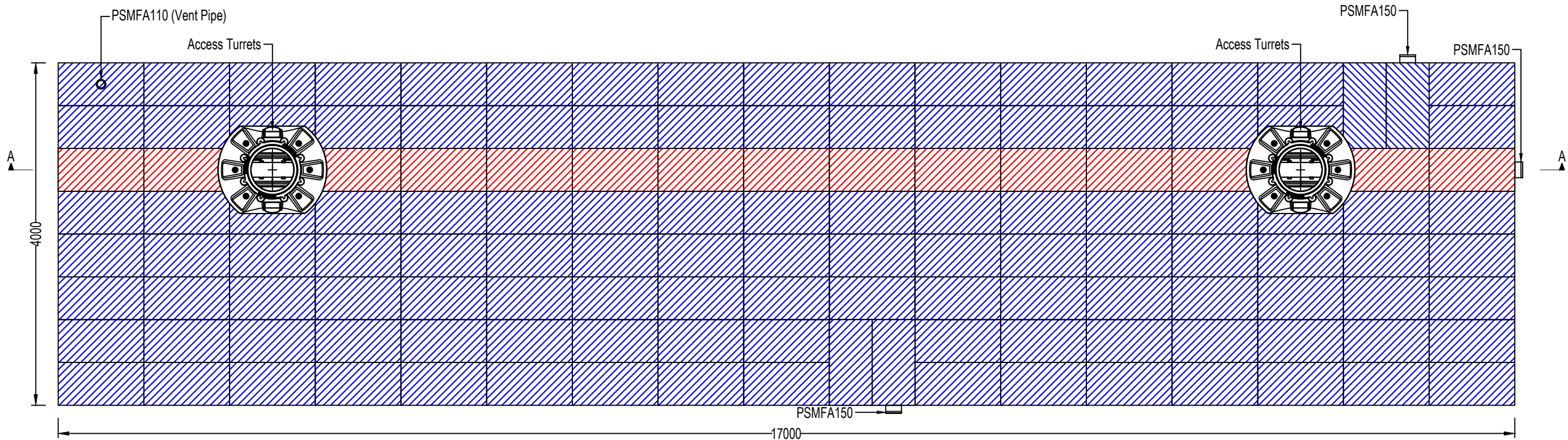
Client	QDTS PROPERTIES							
Project	RESIDENTIAL DEVELOPMENT MAIN ROAD, NEATH							
Title	DRAINAGE CONSTRUCTION DETAILS SHEET 2							
Scale	A1 1:200	Drawn	PFD	Checked	PFD	Date	NOV 2022	
Drawing Status		Preliminary						
Job No.	XXXX		Drawing No.		C004		Revision	P3

Appendix H

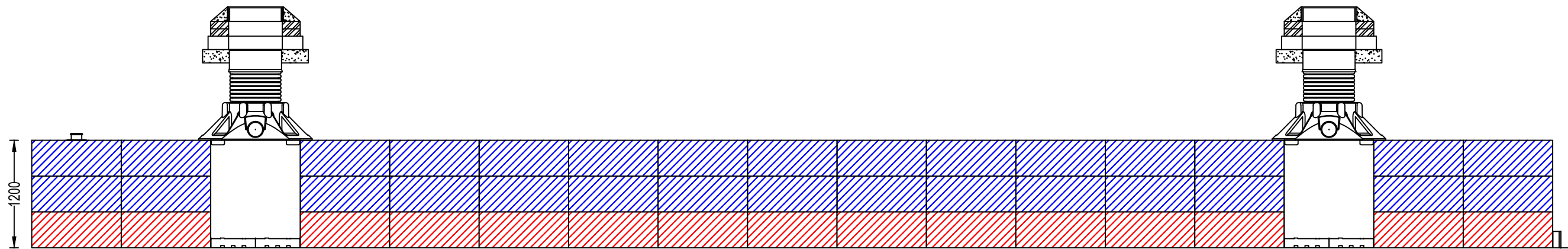
Attenuation Tank Design

LEGEND:	
	Polystorm-R Units (PSM1A)
	Polystorm-Inspect Units (PSM4)

PROPOSED POLYSTORM STRUCTURE	
Plan Area (m²)	68.00
Tank Volume (m³)	81.60
Storage (m³)	77.52
Polystorm-R Units (PSM1A)	387
Polystorm-Inspect Units (PSM4)	15
Access Turret	2



PLAN
Scale (1:50)



SECTION A-A
Scale (1:50)

POLYSTORM NOTES

- This drawing needs to be read in conjunction with all relevant Architects, Engineers and specialist drawings.
- Stormwater Attenuation / Infiltration system shall be Polypipe Civil's Polystorm pre-formed geocellular system, with minimum 94% volumetric void. Units shall be installed using recommended jointing clips to maintain rigidity and minimise deflection.
- Multi-layered Polystorm tank configurations shall be fixed with proprietary shear connectors between each vertical layer to maintain rigidity and minimise lateral displacement.
- Drawings should be read in conjunction with the supportings structural calculations, which are illustrative and should be validated by a suitably qualified Engineer, or similar.
- For Field conditions, backfill should be placed and compacted in layers no greater than 300mm and for trafficked areas, backfill should be placed and compacted in layers no greater than 150mm.
- The installer shall ensure that all expected temporary construction transient loads have been considered as part of the structural design and a minimum of 300mm backfill should be placed prior to initial compaction.
- Polystorm Tanks should be installed in accordance with Polypipe Civils recommendations (refer to technical guidance for further information).

GENERAL TOLERANCES

All dimensions in millimetres, unless otherwise stated

PIPE Ø RANGE	TOLERANCE ±
≤ 300	5
> 300 to 750	10
≥ 750 NON-RXL	20
≥ 750 RXL	+50 / -30

ANGLES	± 1°30'
TYPICAL BENCHING SLOPE	1.9° - 5.7°
EXTERNAL BASE FLANGE	50 ± 20
ALL OTHER DIMENSIONS	+50 / -30

NOTES:

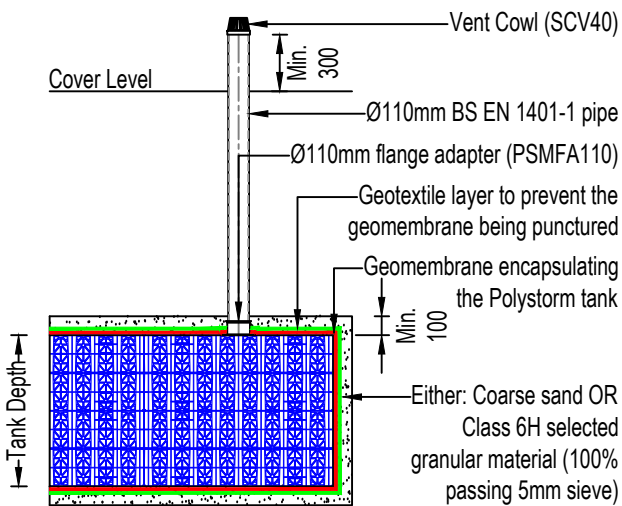
- Standard spigots in accordance with ES23
- All dimensions annotated with * indicate points of intersection
- If applicable, dimensions annotated with KD# are key BIM dimensions
- Remove all burrs and break sharp edges
- Spark test all joints that require leak-tightness
- Team leader inspection points identified by: 1 2 3

GENERAL NOTES

- This drawing details Polypipe Civils proposed offering, reflecting our interpretation of the information provided.
- Polypipe bespoke Ridgistorm-XL chambers are complete pre-formed units.
- Polypipe products to be installed in accordance with Polypipe Civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will take ultimate ownership of the installation.
- Site conditions may require specific installation requirements. The installer should verify that the proposed installation method is acceptable, giving due consideration to the requirements of the relevant approving and adopting authorities, before construction activities commence.
- Advice on any system requirements specific to the proposed Ridgistorm XL system should be sought from Polypipe Civils.
- All PE stub connections will require adaptors (to be supplied by Contractor / Developer).**

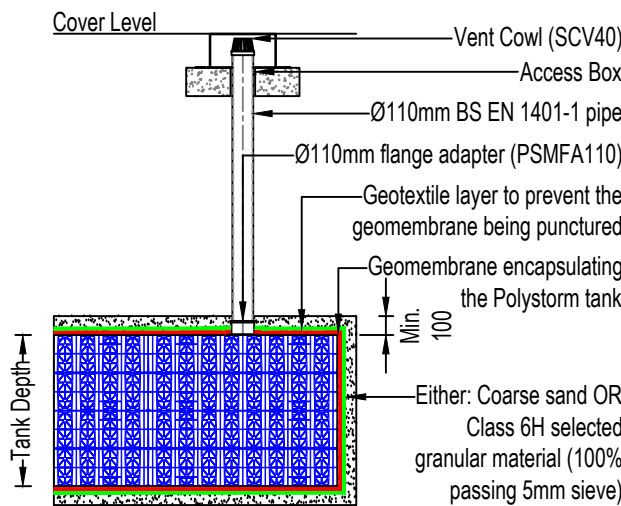
DRAWING NOTES

- Drawings should not be scaled, refer to figured dimensions only.
- All dimensions in millimetres, unless otherwise stated.
- All dimensions are nominal and may vary within manufacturing or construction tolerances.
- All site temporary and enabling works by others.
- This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.



**ATTENUATION TANK VENTILATION
SYSTEM - OPTION 1)**

Scale (1:40)



**ATTENUATION TANK VENTILATION
SYSTEM - OPTION 2)**

Scale (1:40)

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PROJECT NAME		STATUS	
QTDS Properties - Main Road, Dyffryn Cellwen, Neath, West Glamorgan		PRELIMINARY	
PROJECT TYPE	POLYSTORM ATTENUATION TANK GENERAL ARRANGEMENT	SHEET SIZE	SHEET NO.
		A2	1 of 1
		DRAWN BY	
		LH	
		SCALE	
		DATE	
		AS SHOWN	
28/04/23			
DRAWING NO.		REV.	
96484_LH_D1		-	