

SURFACE WATER DRAINAGE SCHEME AND POLLUTION PREVENTION

For

PROPOSED ECO LODGES AT EAVES HALL, MOOR LANE, WEST BRADFORD, CLITHEROE, BB7 3JG

For

BOWLAND INNS & HOTELS

Project No.: 10855				
Issue Date	Revision	Status	Issued By	Checked By
06.09.2021	-----	For Approval	R E Ford	S J Reid
17.06.2026	A	For Approval	L S Reed	S J Reid

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INTRODUCTION

- 1.1 This report provides an update to a drainage strategy that was initially drafted to discharge Condition 14 of the previously approved planning application from Ribble Valley Borough Council (Reference 3/2020/0544). It also sets out the measures proposed for the management of surface water and pollution prevention during the construction phase, in order to discharge Condition 15.
- 1.2 The report has been prepared on behalf of Bowland Inns & Hotels with the objective of providing sufficient information to pre-empt the need for drainage related pre-commencement conditions.
- 1.3 The scheme comprises construction of 15No. eco lodges and associated infrastructure at Eaves Hall, Moor Lane, West Bradford, Clitheroe, BB7 3JG. A location plan is included within Appendix A.
- 1.4 Condition 14 of the previous permission stated the following:
No development shall commence until final details of the design and implementation of an appropriate surface water drainage scheme have been submitted to and approved in writing by the local planning authority. Those details shall include:
 - a) *A final surface water drainage layout plan; appropriately labelled to include all pipe / structure references, dimensions, design levels, finished floor levels and external ground levels (in AOD);*
 - b) *A full set of flow calculations for the surface water drainage network. The calculations must show the full network design criteria, pipeline schedules and simulation outputs for the 1 in 1 year, 1 in 30 year and 1 in 100-year return period, plus an appropriate allowance for climate change and urban creep. The calculations must demonstrate that surface water runoff from the application site will not exceed existing pre-development surface water runoff rates and volumes for the corresponding rainfall intensity.*
 - c) *A final site plan showing all on-site surface water catchment areas, i.e. areas that will contribute to the proposed surface water drainage network.*

- d) *Confirmation of how surface water will be managed within any non-drained areas of the site, i.e. verges, gardens and public open space.*
- e) *A final site plan showing all overland flow routes and flood water exceedance routes, both on and off site;*
- f) *Details of any measures taken to prevent flooding and pollution of the receiving groundwater and / or surface waters, including watercourses; and*
- g) *Details of how the surface water drainage network will be managed and maintained over the lifetime of the development.*

The scheme shall be implemented in accordance with the approved details prior to first occupation or completion of the development, whichever is the sooner. Thereafter the drainage system shall be retained, managed and maintained in accordance with the approved details.

- 1.5 This drainage scheme is to discharge Condition 14 of the planning approval. It describes the existing site conditions and proposed development. It assesses the potential impact of proposals on existing drainage and includes a proposed scheme for the provision of new drainage to serve the proposed development.

- 1.6 Condition 15 of the previous permission stated the following:
No development shall commence until details of how surface water and pollution prevention will be managed during each construction phase has been submitted to and approved in writing by the local planning authority.

Reasons: To ensure that the construction phase(s) of development does not pose an undue flood risk on site or elsewhere; to ensure that any pollution arising from the development as a result of the construction works does not adversely impact on existing or proposed ecological or geomorphic condition of water bodies.

2. BASE INFORMATION

Existing site

- 2.1 The proposal relates to a piece of land within the Eaves Hall estate, approx. 150m to the north of Eaves Hall. Moor Lane lies along the site's eastern boundary. The site is approx. 1.8 hectare in size.
- 2.2 The majority of the land currently comprises grassland with mature trees along the line of the watercourse that lies within the site along its western boundary. A smaller watercourse lies along the eastern boundary with Moor Lane.
- 2.3 Access to the site is from Moor Lane through a gate at its south-eastern corner via a compacted gravel track that loops round towards Eaves Hall to the south.
- 2.4 The site falls towards the south, a level of approx. 134.5m AOD along its northern boundary and a level approx. 121.3m AOD along its southern boundary.

Site geology

- 2.5 The online Soilscales Viewer has identified the site lying in a region characterised by slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage that are not conducive to infiltration techniques.
- 2.6 The Flood Risk Assessment and Outline Drainage Strategy accompanying the planning application stated that infiltration methods such as soakaways are unlikely to be feasible on the account of deep deposits of silty clay and boulder clay expected below the site.

Understanding of existing drainage local to the site

- 2.7 The site is drained by the watercourses that lie along the site's western and eastern boundaries.
- 2.8 The watercourse within the western site boundary is Greg Sike, flowing southeast, discharging into the River Ribble over 1.4km away. The watercourse running adjacent to Moor Lane along the eastern boundary of the site flows towards West Bradford Brook to the east and ultimately the River Ribble.
- 2.9 United Utilities sewer records identify a public combined sewer running south eastwards along the line of the public right of way that lies within the land immediately to the east of Moor Lane opposite the site. The sewer enters Moor Lane at the sites southeastern corner and continues to run to the southeast along Moor Lane. The sewer records are included within Appendix B.

Proposed development

- 2.10 The proposal is for a small-scale tourism development of 15 self-catering eco-lodges on the site to provide additional accommodation for Eaves Hall.
- 2.11 Pedestrian access will be via gravel pathways and a car park on the south side will provide 20 parking spaces including two disabled spaces.

3. PROPOSED SURFACE WATER DRAINAGE SCHEME

- 3.1 The proposed surface water drainage plan is included within Appendix C.
- 3.2 In accordance with the National Standards for Sustainable Drainage, the drainage scheme should incorporate the use of Sustainable Drainage (SUDS) where possible. The approach promotes the use of infiltration features in the first instance. If drainage cannot be achieved solely through infiltration due to site conditions or contamination risks, the preferred options are (in order of preference):
- (i) a controlled discharge to a local waterbody or watercourse, or
 - (ii) a controlled discharge into the public sewer network (depending on availability and capacity).
- 3.3 The rate and volume of discharge should strive to provide betterment and be restricted to the pre-development values as far as practicable.
- 3.4 The site has been identified as lying in a region characterised by slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage that are not conducive to infiltration techniques due to the deep deposits of silty clay and boulder clay expected below the site.
- 3.5 The watercourse Greg Sike lies within the western site boundary and flows southeast to discharge into the River Ribble over 1.4km away.
- 3.6 The majority of the site comprises grassland and has a fall to the south. The layout of the site locates the eco-lodges to the north of the site access and car parking area that lie adjacent to the site's southern boundary.
- 3.7 At the completion of the development the area of the site where the lodges are located will remain grassland as the lodges will be sited over the existing ground, pedestrian access to the lodges will be via gravel pathways and no positive surface water drainage will be provided within the area of the site where the lodges are to be sited, enabling rainwater falling onto the lodges and pathways to runoff to adjacent ground. There will be an element of infiltration into the ground and water will be held up by the grass and landscaped areas.

- 3.8 Swale basins, french drains and an attenuation pond have been incorporated into the site design.
- 3.9 A swale basin and a series of french drains have been positioned alongside the car parking areas and access road to collect any surface water runoff.
- 3.10 An additional swale basin has been positioned within the areas of grassland at the bottom of the lodges to store any surface water runoff from this area of the development site that does not infiltrate or evaporate.
- 3.11 Surface water will be controlled to 2.2l/s prior to a discharge being made into the Greg Sike watercourse via an attenuation pond that is to run along the western part of the site's southern boundary. A maximum of 127m³ of storage will be required to cater for the 100-year storm event plus 50% added for climate change and is contained within the attenuation pond.
- 3.12 A surface water drainage design has been carried out for the 100-year critical rainstorm plus 50% on stored volumes. The design is included within Appendix D.

4. PROPOSED SURFACE WATER AND POLLUTION PREVENTION

- 4.1 The construction work comprises the excavation and casting of concrete foundation bases for the pre-fabricated Eco Lodges, excavation for and laying of drains, drainage features and services, and the construction of a site access road and car park. The site will be landscaped on completion of this work.
- 4.2 During the main construction phase, the following pollution prevention measures will be implemented:
- a) Excavations will be de-watered if necessary by pumping and discharging of the pumped water to grassed areas remote from the Brook or any other watercourse.
 - b) Vegetation removal will be minimised to prevent a reduction in area available for disposal of silt-laden water.
 - c) Stockpiles will be covered to prevent migration of fine material to grassed areas.
 - d) Wheel-washing of plant will be carried out remove from any watercourse, with the run-off collected in a sump and fine material disposed of over grassed areas.
 - e) No site-washing of concrete delivery lorries will be permitted.
 - f) Diesel-powered plant will be refuelled from mobile bunded bowsers. No on-site fuel storage will be allowed.
 - g) Re-fuelling will be carried out on an impermeable area and a fuel spill kit will be kept on site.
 - h) Waste materials will be removed from the site and disposed of at an appropriate re-cycling facility.

5. MANAGEMENT AND MAINTENANCE PLAN

- 5.1 The maintenance responsibilities for the various drainage features of the scheme will be with the site operator.
- 5.2 The table below lists the various drainage features utilised within the proposed drainage design along with the maintenance regime that should be followed.

<u>SURFACE WATER DRAINAGE FOR THE ACCESS ROAD AND CAR PARKING AREA</u>	
Regular maintenance	Frequency
Manhole covers are securely in place. Specialist operatives with current confined spaces training to lift covers and visually inspect manholes to ensure they are kept clear of leaves, debris, silt, etc. Check drainage pipes are operating as expected.	Annually or when notified.
Occasional tasks	Frequency
Specialist operatives with current confined spaces training to remove debris and silt from the manholes to ensure outlets are kept clear of debris to ensure adequate drainage.	As required from regular maintenance inspection to trigger works.
Remedial work	Frequency
The specialist operatives are to advise the management company of any repair works necessary to the manholes. Drains heavily blocked or damaged to be jetted / repaired.	As required from regular maintenance inspection to trigger works.
<u>WATERCOURSE / SWALES</u>	
Regular maintenance	Frequency
Visually inspect watercourse and swales to ensure they are kept reasonably clear of leaves and debris etc. at surface. Inspection of inlet and outlet structures.	Annually. No triggers other than maintenance to be taken on regular schedule.
Cutting of vegetation along length of open watercourse sections and swales so that the watercourse and swales don't become	Frequency varies, vegetation will require cutting more often in summer / spring months than autumn / winter months. To be cut as required.

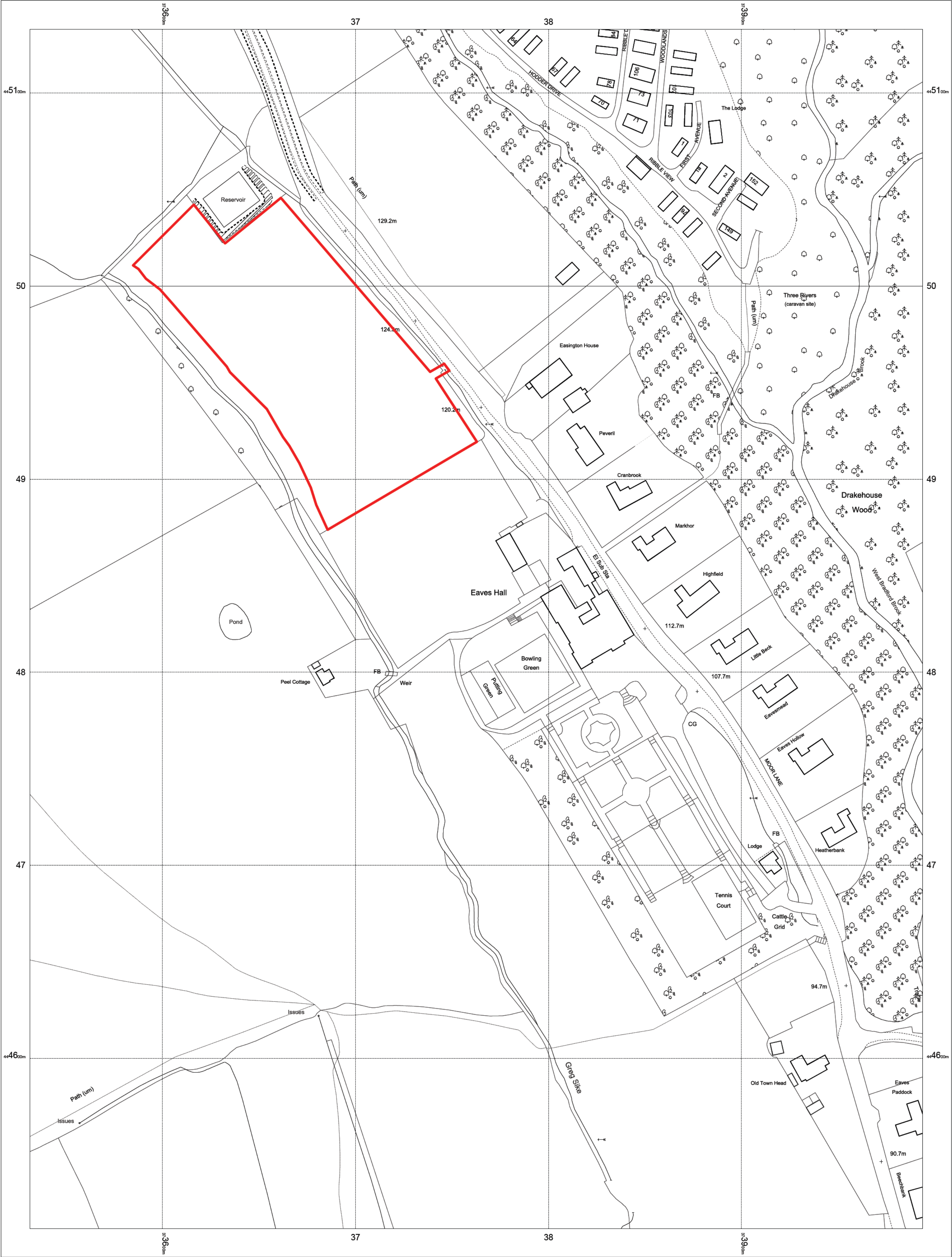
overgrown.	No triggers other than maintenance to be taken on regular schedule.
Remedial work	Frequency
Maintenance of watercourse and swales profile should scour or erosion or build-up of silt occur. Repair of inlets and outlets.	As required. Indicator of problem / trigger for maintenance when significant watercourse or swale scour and erosion or build-up of silt has occurred.

6. SUMMARY AND CONCLUSIONS

- 6.1 This report provides an update to a drainage strategy that was initially drafted to discharge Condition 14 of the previously approved planning application from Ribble Valley Borough Council (Reference 3/2020/0544). It also sets out the measures proposed for the management of surface water and pollution prevention during the construction phase, in order to discharge Condition 15.
- 6.2 A swale basin and a series of french drains have been positioned alongside the car parking areas and access road to collect any surface water runoff. An additional swale basin has been positioned within the areas of grassland at the bottom of the lodges to store any surface water runoff from this area of the development site that does not infiltrate or evaporate.
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Appendix A

LOCATION PLAN



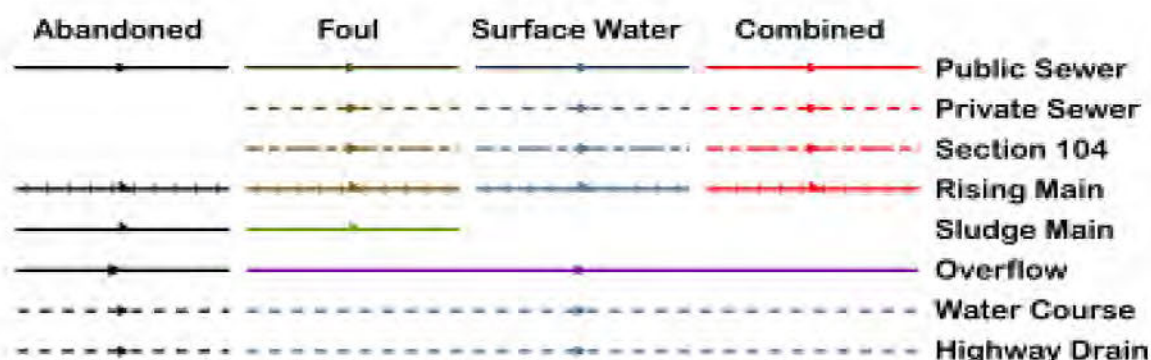
Eaves Hall
Eaves Hall Lane
Clitheroe
Lancashire
BB7 3JG

OS Mastermap
28 November 2012, ID: MDP-00192997
www.mapdataportal.co.uk
1:1250 scale print at A2, Centre: 373762 E, 444823 N
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Appendix B

UNITED UTILITIES SEWER RECORDS

Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	



Scale: 1:4432
Date: 07/10/2020

SEWER RECORDS



Water for the North West

Address or Site Reference: EAVES HALL EAVES HALL LANE, WEST
BRADFORD, CLITHEROE, BB7 3JG

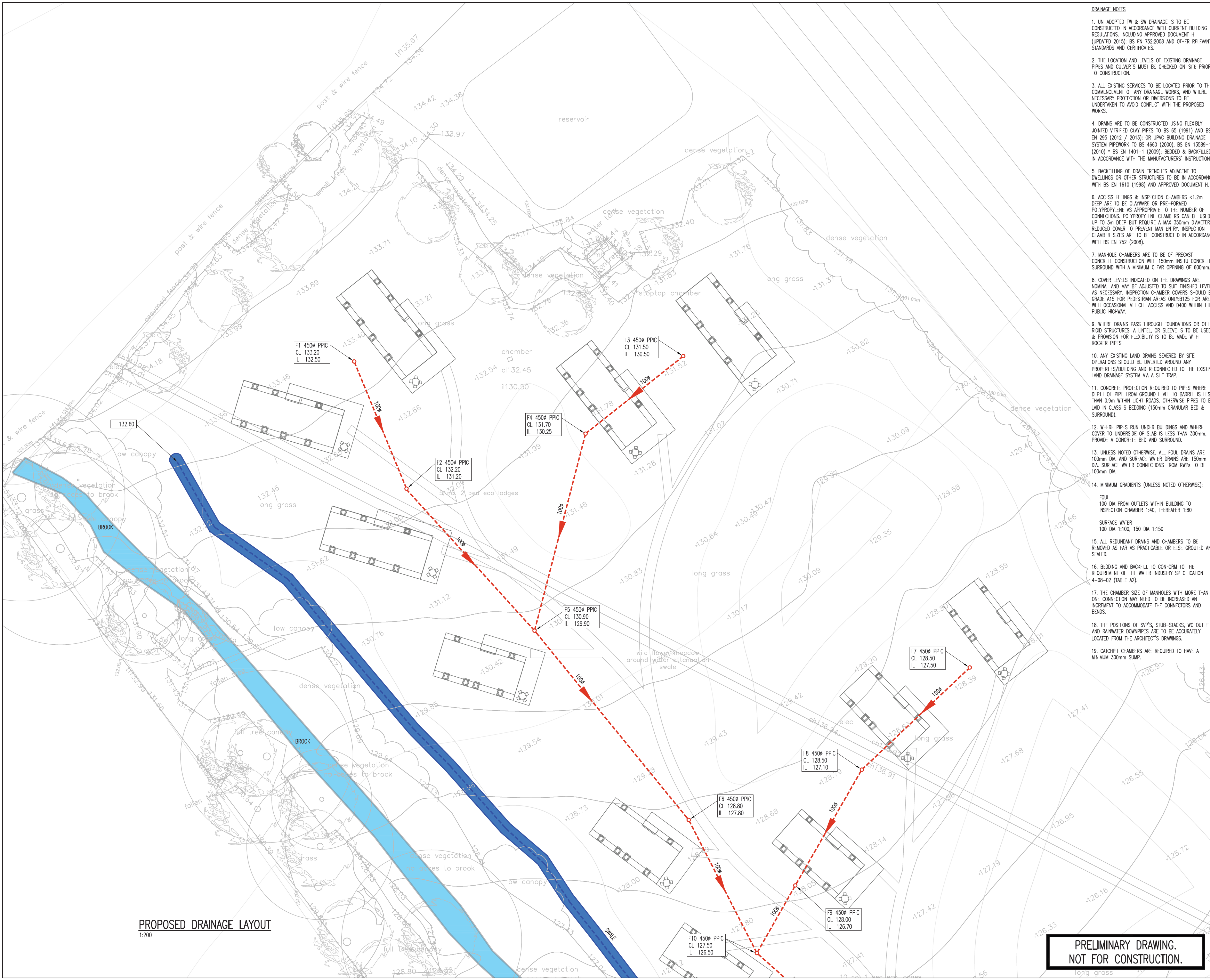
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The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Appendix C

**PROPOSED SURFACE WATER DRAINAGE
LAYOUT AND DETAILS**



PROPOSED DRAINAGE LAYOUT
1:200

DRAINAGE NOTES

1. UN-ADOPTED FW & SW DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH CURRENT BUILDING REGULATIONS, INCLUDING APPROVED DOCUMENT H (UPDATED 2015); BS EN 752:2008 AND OTHER RELEVANT STANDARDS AND CERTIFICATES.
2. THE LOCATION AND LEVELS OF EXISTING DRAINAGE PIPES AND CULVERTS MUST BE CHECKED ON-SITE PRIOR TO CONSTRUCTION.
3. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO THE COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORKS.
4. DRAINS ARE TO BE CONSTRUCTED USING FLEXIBLY JOINTED VITRIFIED CLAY PIPES TO BS 65 (1991) AND BS EN 295 (2012 / 2013); OR UPVC BUILDING DRAINAGE SYSTEM PIPEWORK TO BS 4660 (2000), BS EN 13589-1 (2010) * BS EN 1401-1 (2009); BEDDED & BACKFILLED IN ACCORDANCE WITH THE MANUFACTURERS' INSTRUCTIONS.
5. BACKFILLING OF DRAIN TRENCHES ADJACENT TO DWELLINGS OR OTHER STRUCTURES TO BE IN ACCORDANCE WITH BS EN 1610 (1998) AND APPROVED DOCUMENT H.
6. ACCESS FITTINGS & INSPECTION CHAMBERS <1.2m DEEP ARE TO BE CLAYWARE OR PRE-FORMED POLYPROPYLENE AS APPROPRIATE TO THE NUMBER OF CONNECTIONS. POLYPROPYLENE CHAMBERS CAN BE USED UP TO 3m DEEP BUT REQUIRE A MAX 350mm DIAMETER REDUCED COVER TO PREVENT MAN ENTRY. INSPECTION CHAMBER SIZES ARE TO BE CONSTRUCTED IN ACCORDANCE WITH BS EN 752 (2008).
7. MANHOLE CHAMBERS ARE TO BE OF PRECAST CONCRETE CONSTRUCTION WITH 150mm INSTU CONCRETE SURROUND WITH A MINIMUM CLEAR OPENING OF 600mm.
8. COVER LEVELS INDICATED ON THE DRAWINGS ARE NOMINAL AND MAY BE ADJUSTED TO SUIT FINISHED LEVELS AS NECESSARY. INSPECTION CHAMBER COVERS SHOULD BE GRADE A15 FOR PEDESTRIAN AREAS ONLY B125 FOR AREAS WITH OCCASIONAL VEHICLE ACCESS AND D400 WITHIN THE PUBLIC HIGHWAY.
9. WHERE DRAINS PASS THROUGH FOUNDATIONS OR OTHER RIGID STRUCTURES, A LINTEL OR SLEEVE IS TO BE USED & PROVISION FOR FLEXIBILITY IS TO BE MADE WITH ROCKER PIPES.
10. ANY EXISTING LAND DRAINS SEVERED BY SITE OPERATIONS SHOULD BE DIVERTED AROUND ANY PROPERTIES/BUILDING AND RECONNECTED TO THE EXISTING LAND DRAINAGE SYSTEM VIA A SILT TRAP.
11. CONCRETE PROTECTION REQUIRED TO PIPES WHERE DEPTH OF PIPE FROM GROUND LEVEL TO BARREL IS LESS THAN 0.9m WITHIN LIGHT ROADS. OTHERWISE PIPES TO BE LAID IN CLASS S BEDDING (150mm GRANULAR BED & SURROUND).
12. WHERE PIPES RUN UNDER BUILDINGS AND WHERE COVER TO UNDERSIDE OF SLAB IS LESS THAN 300mm, PROVIDE A CONCRETE BED AND SURROUND.
13. UNLESS NOTED OTHERWISE, ALL FOUL DRAINS ARE 100mm DIA. AND SURFACE WATER DRAINS ARE 150mm DIA. SURFACE WATER CONNECTIONS FROM RWPs TO BE 100mm DIA.
14. MINIMUM GRADIENTS (UNLESS NOTED OTHERWISE):
FOUL
100 DIA FROM OUTLETS WITHIN BUILDING TO INSPECTION CHAMBER 1:40, THEREAFTER 1:80
SURFACE WATER
100 DIA 1:100, 150 DIA 1:150
15. ALL REDUNDANT DRAINS AND CHAMBERS TO BE REMOVED AS FAR AS PRACTICABLE OR ELSE GROUTED AND SEALED.
16. BEDDING AND BACKFILL TO CONFORM TO THE REQUIREMENT OF THE WATER INDUSTRY SPECIFICATION 4-08-02 (TABLE A2).
17. THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTORS AND BENDS.
18. THE POSITIONS OF SVP'S, STUB-STACKS, WC OUTLETS AND RAINWATER DOWNPIPES ARE TO BE ACCURATELY LOCATED FROM THE ARCHITECT'S DRAWINGS.
19. CATCHPIT CHAMBERS ARE REQUIRED TO HAVE A MINIMUM 300mm SUMP.

LEGEND

- PROPOSED FOUL DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED PERFORATED PIPE FRENCH DRAIN
- PPIC PROPOSED POLYPROPYLENE INSPECTION CHAMBER
- PCC CC PROPOSED PRE-CAST CONCRETE CATCHPIT CHAMBER
- MH EXISTING MANHOLE

FOR DRAINAGE NOTES, SEE RJP DRAWING 10855-101

P1	ISSUED FOR APPROVAL	LR	SUR	17.08.26
A	ISSUED FOR CONSTRUCTION	LR	SUR	02.12.21
Rev	Details	Drawn By	Chk/App By	Date

Client:

BOWLAND INNS
AND HOTELS

Project:
EAVES HALL
ECO PODS

Title:
PROPOSED
DRAINAGE LAYOUT
SHEET 1 OF 2

Issued For:

APPROVAL

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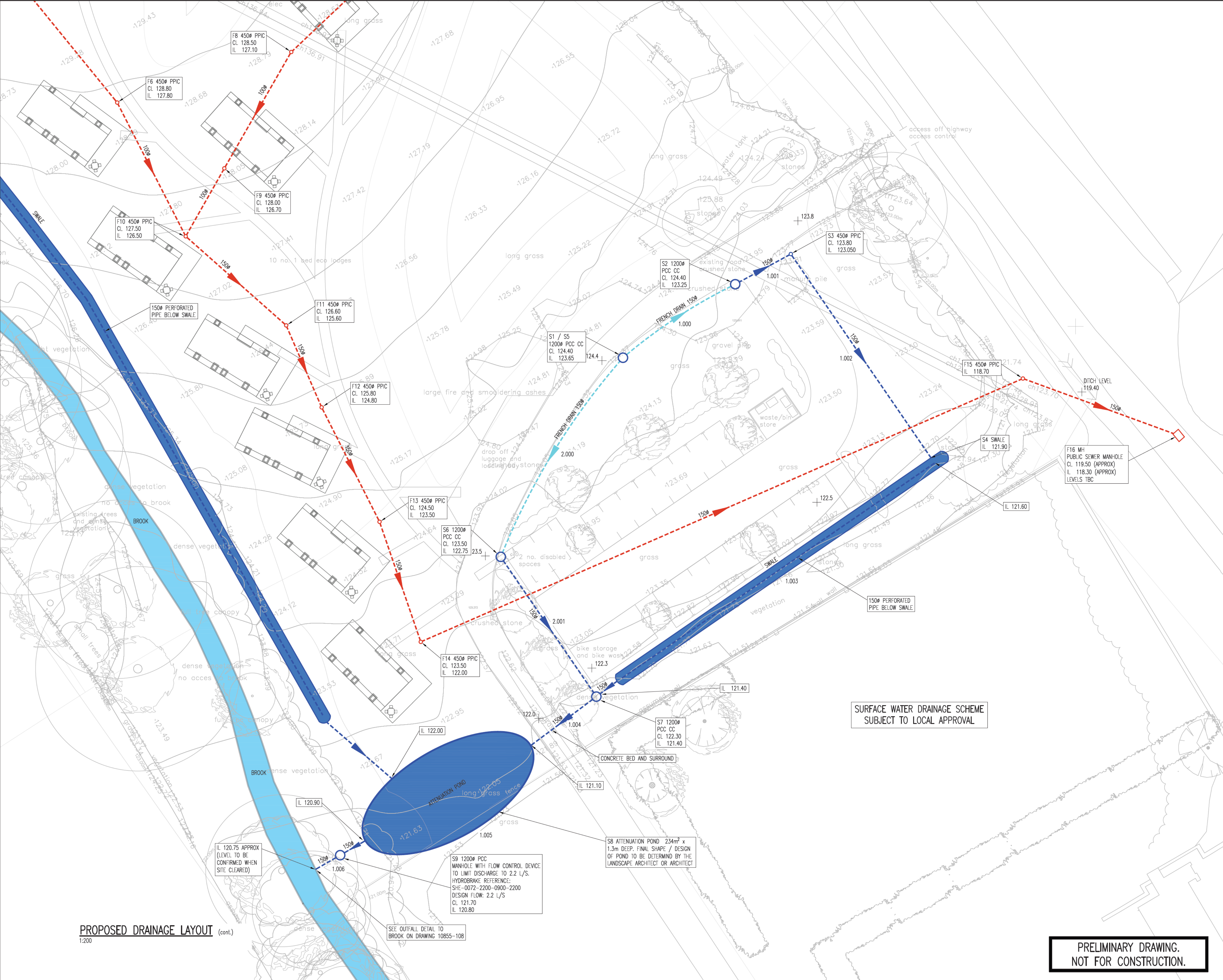
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10855	101	P1

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LEGEND

- PROPOSED FOUL DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED PERFORATED PIPE FRENCH DRAIN
- PPIC PROPOSED POLYPROPYLENE INSPECTION CHAMBER
- PCC CC PROPOSED PRE-CAST CONCRETE CATCH-PIT CHAMBER
- MH EXISTING MANHOLE

FOR DRAINAGE NOTES, SEE RJP DRAWING 10855-101

Rev	Details	Drawn By	Chk/App By	Date
P2	ISSUED FOR APPROVAL	LR	SJR	17.06.26
A	ISSUED FOR CONSTRUCTION	LR	SJR	02.12.21
P1	ISSUED FOR INFORMATION	LR	BF	06.09.21

Client:

BOWLAND INNS AND HOTELS

Project:

EAVES HALL ECO PODS

Title:

PROPOSED DRAINAGE LAYOUT SHEET 2 OF 2

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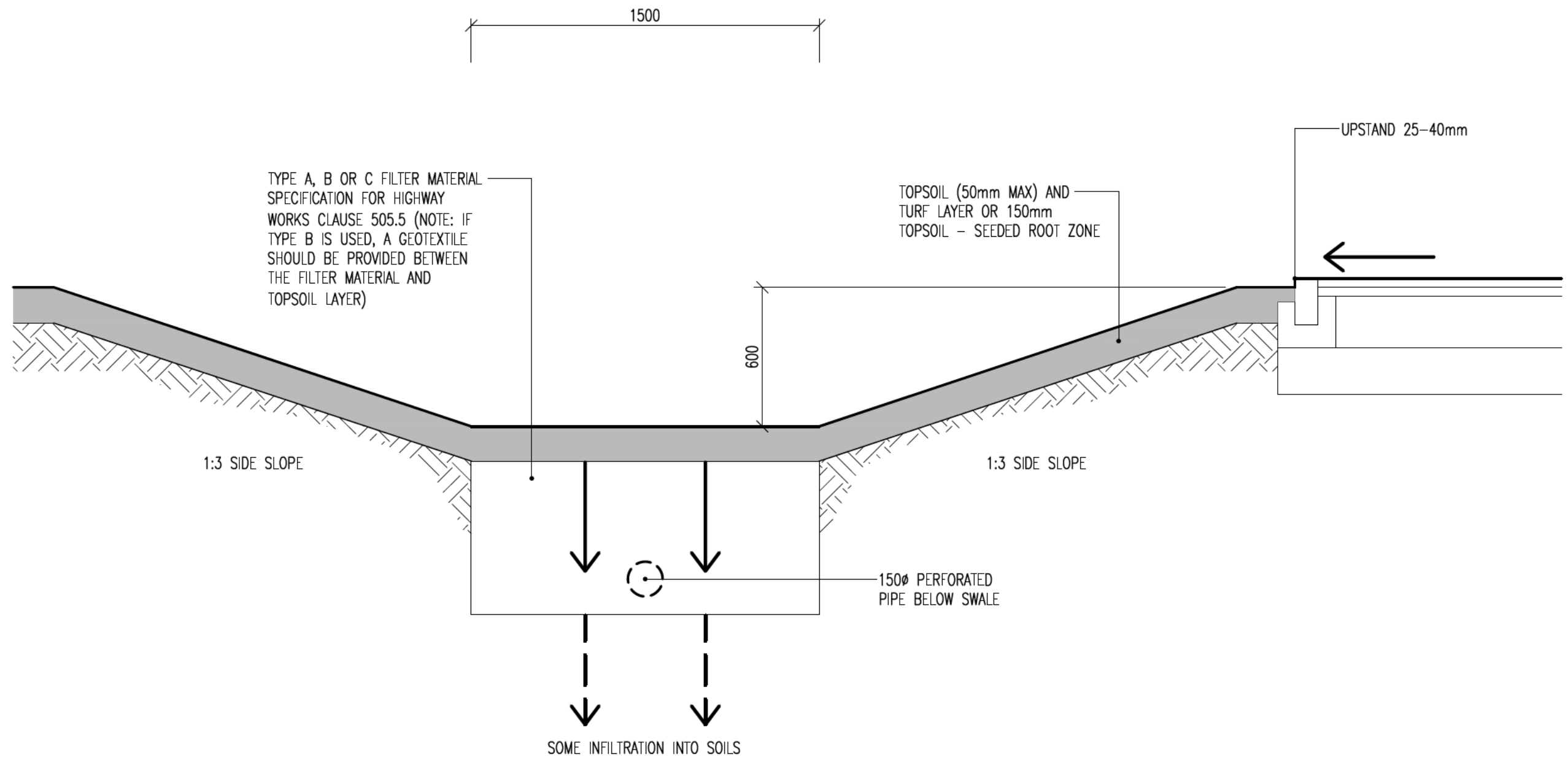
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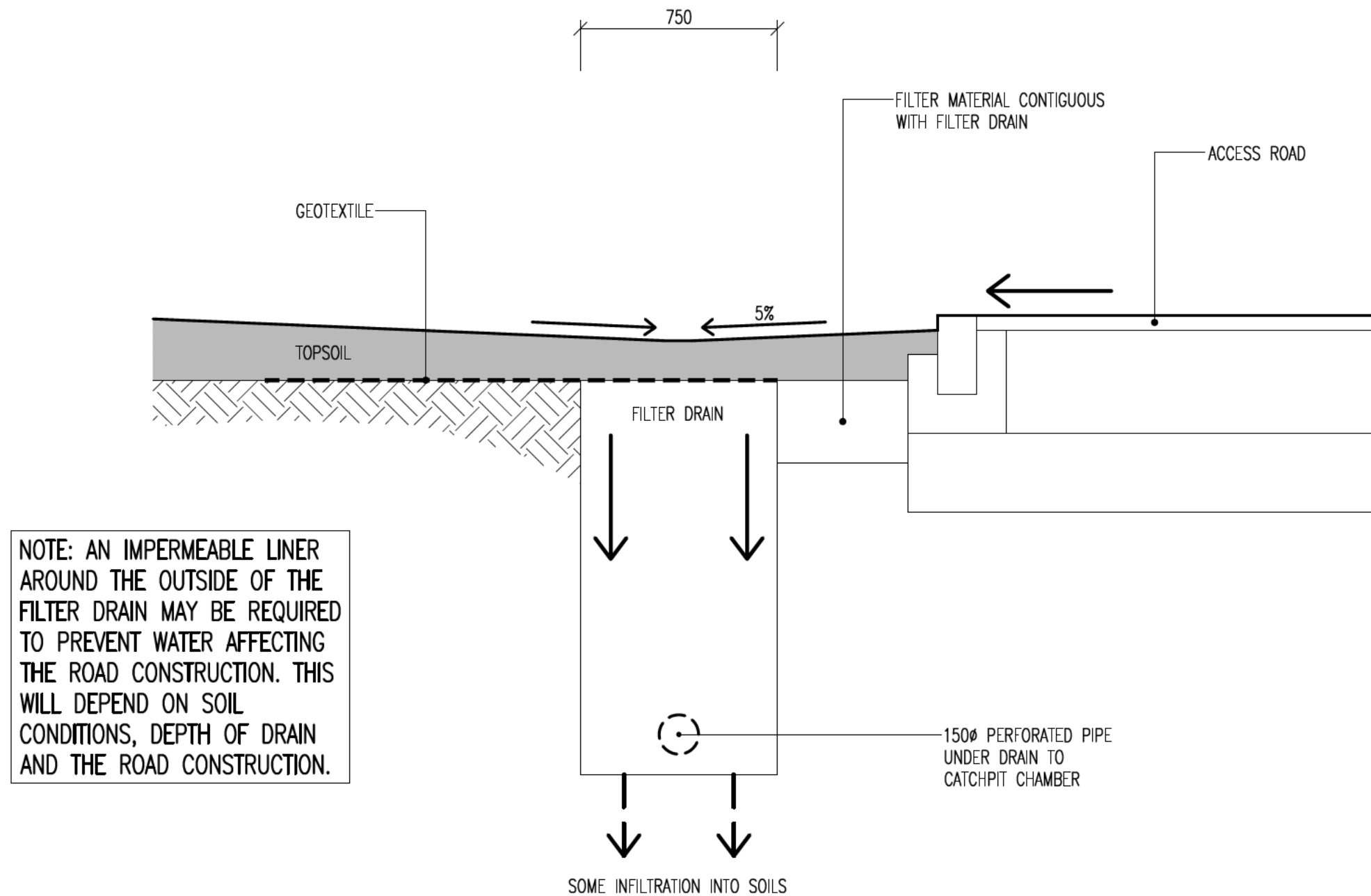
PROPOSED DRAINAGE LAYOUT (cont.)
1:200



SWALE DETAIL
1:20

**PRELIMINARY DRAWING.
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Reid Jones partnership Consulting Civil & Structural Engineers 3 Cross Street, Preston, PR1 3LT 9 Orrell Road, Orrell, Wigan WN5 8EY Tel 01772 498007 Tel 01942 216006 E-mail enq@reidjonespartnership.co.uk Web www.reidjonespartnership.co.uk	Client:	Project:	Title:	Rev	Details	Drawn By	Ckd/App By	Date	Issued For: APPROVAL		
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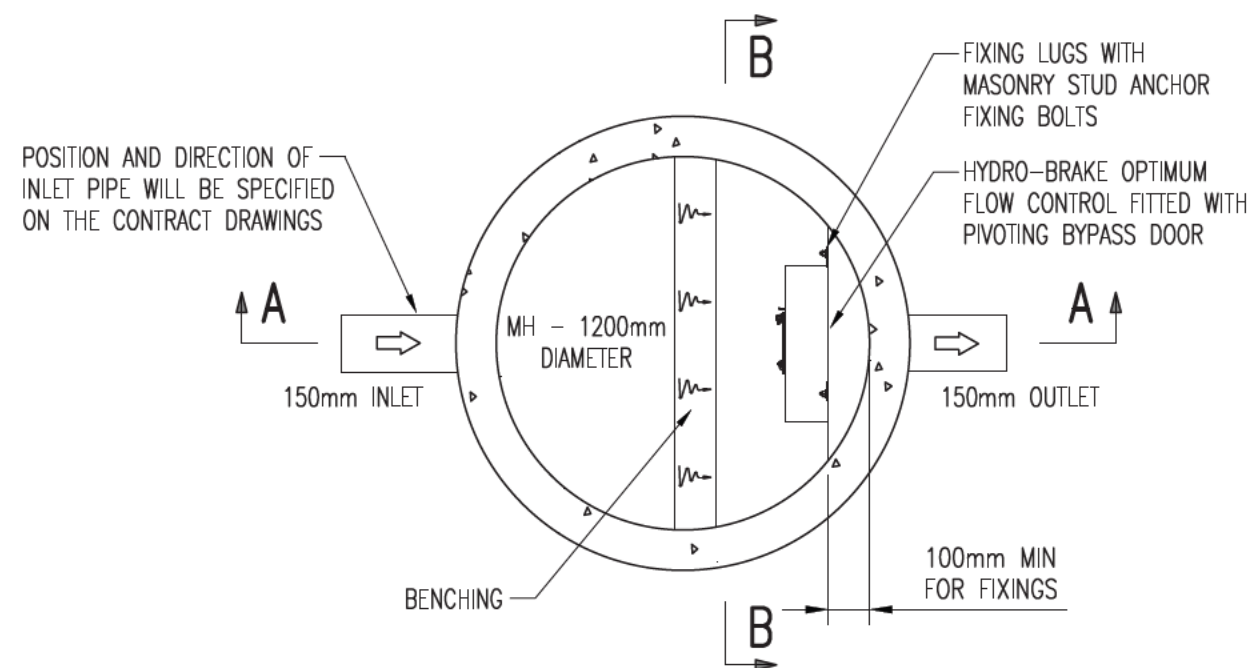


FILTER DRAIN DETAILS – COMBINED SURFACE WATER AND GROUNDWATER DRAINAGE

1:20

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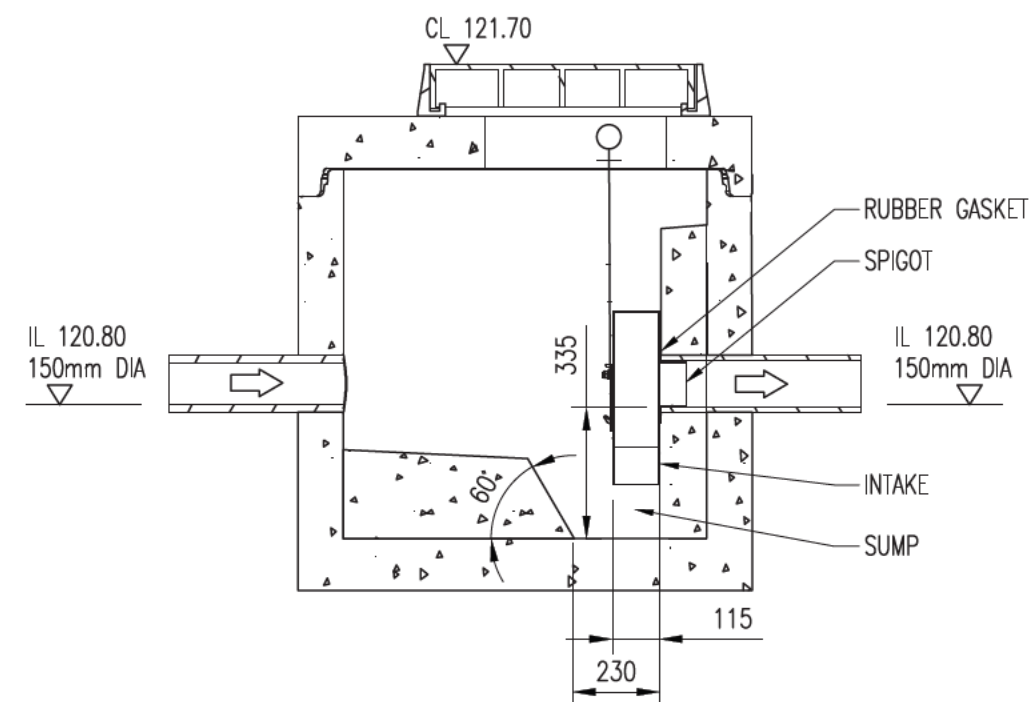
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				LR LR LR	SJR SJR BF	17.06.26 02.12.21 06.09.21	Drawing No: 104
				Drawn By	Ckd/App By	Date	Issue: P2



**HYDROBRAKE
DETAIL ON PLAN**

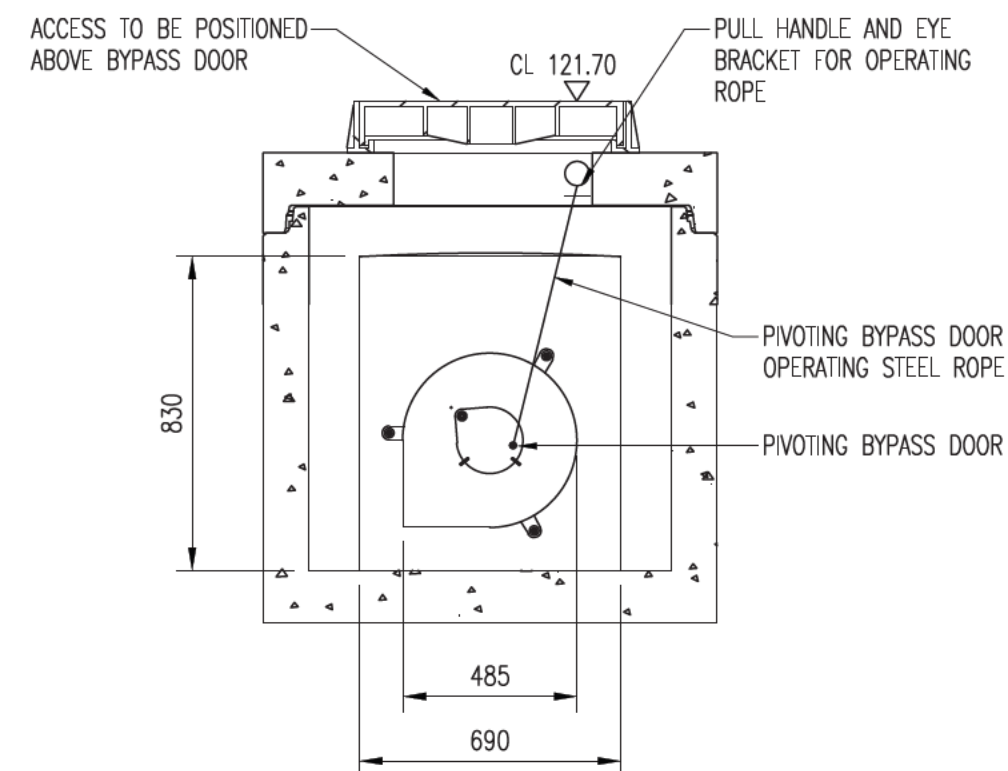
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HYDROBRAKE REFERENCE:
CTL-SHE-0072-2200-0900-2200



SECTION A-A

1:20



SECTION B-B

1:20

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Client:

**BOWLAND INNS
AND HOTELS**

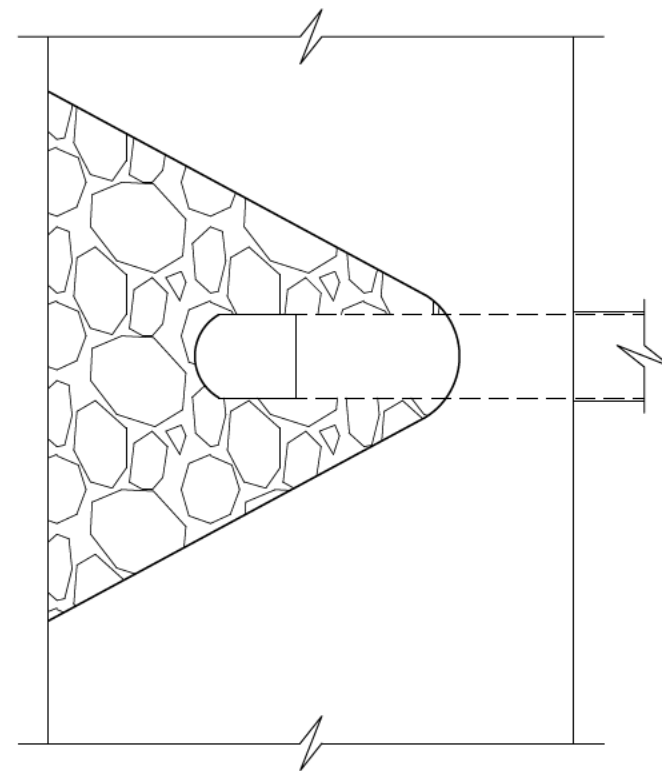
Project:

**EAVES HALL
ECO PODS**

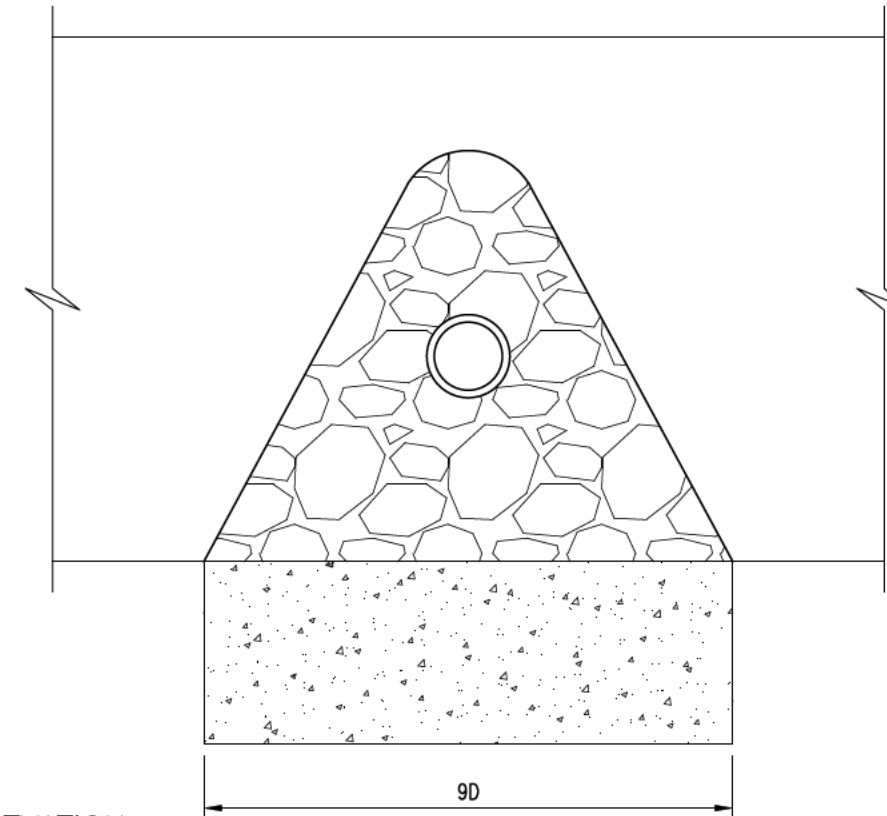
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HYDROBRAKE DETAIL

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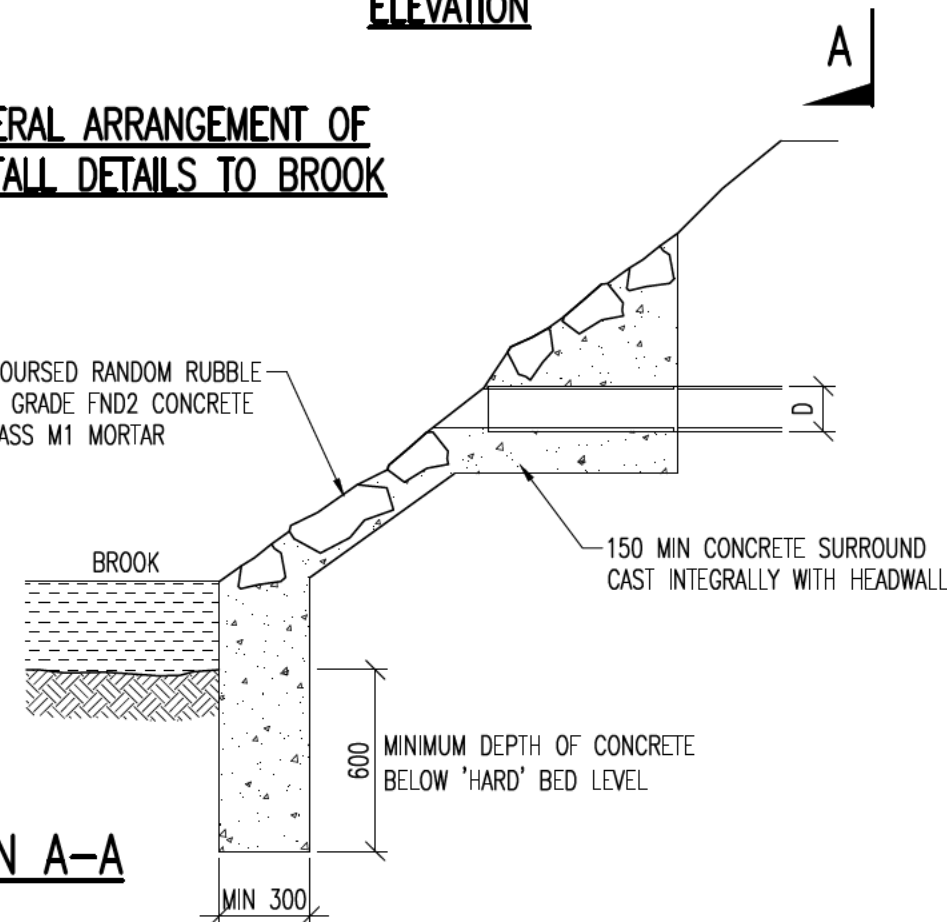
PLAN



ELEVATION

**GENERAL ARRANGEMENT OF
OUTFALL DETAILS TO BROOK**

225 TO 300 THK UNCOURSED RANDOM RUBBLE
PITCHING ON 100 THK GRADE FND2 CONCRETE
AND POINTED WITH CLASS M1 MORTAR



SECTION A-A

**PRELIMINARY DRAWING.
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Consulting Civil &
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Client:

**BOWLAND INNS
AND HOTELS**

Project:

**EAVES HALL
ECO PODS**

Title:

**GENERAL ARRANGEMENT
OF OUTFALL DETAILS
TO BROOK**

P1
A

ISSUED FOR APPROVAL
ISSUED FOR CONSTRUCTION

LR
LR

SJR
SJR

17.06.26
02.12.21

Issued For:

APPROVAL

Scale: NTS @ A3

Project No:

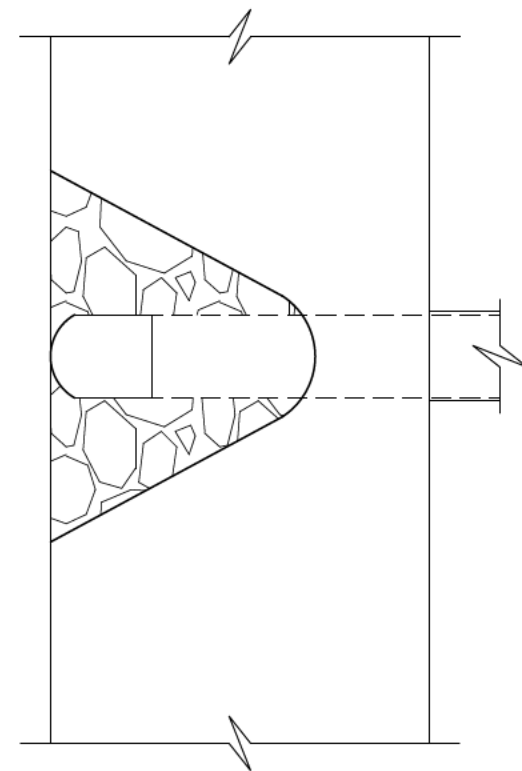
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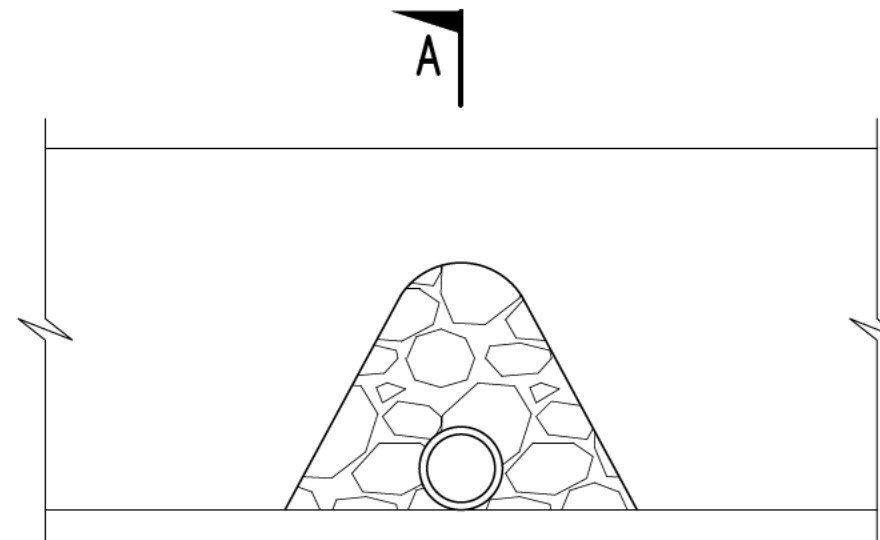
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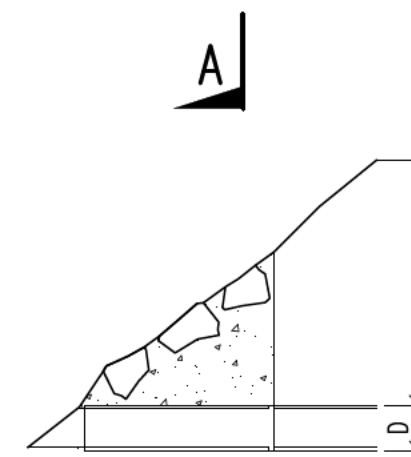
P1



PLAN



ELEVATION



SECTION A-A

GENERAL ARRANGEMENT OF
OUTFALL DETAILS TO SWALE

**PRELIMINARY DRAWING.
NOT FOR CONSTRUCTION.**

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ECO PODS**

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**GENERAL ARRANGEMENT
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TO SWALE**

P1
A

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ISSUED FOR CONSTRUCTION

LR
LR

SJR
SJR

17.06.26
22.12.21

Issued For:

APPROVAL

Scale: NTS @ A3

Project No:

10855

Drawing No:

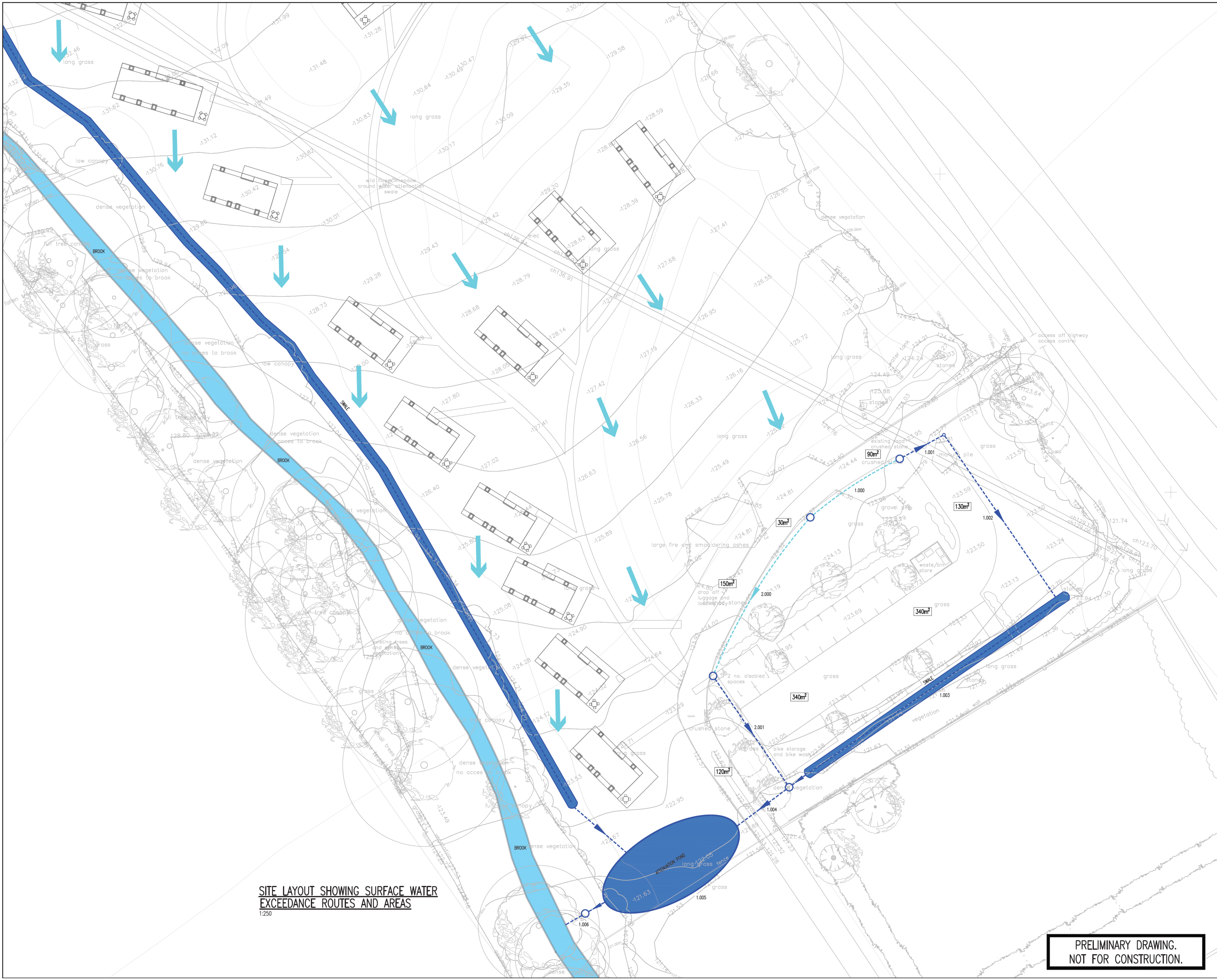
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Issue:

P1

Appendix D

EXCEEDANCE FLOW ROUTES AND AREAS



LEGEND
- - - PROPOSED SURFACE WATER DRAIN
- - - PROPOSED PERFORATED PIPE FRENCH DRAIN
➡ EXCEEDANCE ROUTE
FOR DRAINAGE NOTES, SEE RJP DRAWING 10855-101

P1	ISSUED FOR APPROVAL	LR	SJR	17.08.26
Rev	Details	Drawn By	Chk/App By	Date

Client:
BOWLAND INNS AND HOTELS

Project:
EAVES HALL ECO PODS

Title:
SURFACE WATER DRAINAGE EXCEEDANCE ROUTES AND CONTRIBUTING AREAS

Issued For:
APPROVAL

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Scale: **AS INDICATED** @ (A1)

Project No:	Drawing No:	Issue:
10855	111	P1

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PRELIMINARY DRAWING. NOT FOR CONSTRUCTION.

QMS
ISO 9001:2015
REGISTERED
QUALITY MANAGEMENT

Appendix E

SURFACE WATER DRAINAGE DESIGN

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	75.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.900	Minimum Backdrop Height (m)	0.200
Ratio-R	0.250	Preferred Cover Depth (m)	0.600
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)	Depth (m)
S1	0.016	5.00	124.400	1200	0.750
S2			124.400	1200	1.150
S3	0.047	5.00	123.800	450	0.750
S4	0.030	5.00	122.700		1.100
S5		5.00	124.400	1200	0.750
S6	0.034	5.00	123.500	1200	0.750
S7			122.300	1200	0.900
S8 Pond	0.038	5.00	122.050		0.950
S9 Hydrobrake			121.700	1200	0.900
Brook Outfall			121.600		0.850

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	S1	S2	16.000	0.600	123.650	123.250	0.400	40.0	150	5.17	54.2
1.001	S2	S3	7.000	0.600	123.250	123.050	0.200	35.0	150	5.24	54.0
1.002	S3	S4	30.000	0.600	123.050	121.900	1.150	26.1	150	5.49	53.1
1.003	S4	S7	50.000	0.320	121.600	121.400	0.200	250.0	600	13.61	35.8
1.004	S7	S8 Pond	9.500	0.320	121.400	121.100	0.300	31.7	150	14.79	34.4
1.005	S8 Pond	S9 Hydrobrake	20.000	0.320	121.100	120.900	0.200	100.0	150	19.18	30.2
1.006	S9 Hydrobrake	Brook Outfall	5.000	0.320	120.800	120.750	0.050	100.0	150	20.28	29.3
2.000	S5	S6	28.000	0.600	123.650	122.750	0.900	31.1	150	5.26	53.9
2.001	S6	S7	20.000	0.600	122.750	121.400	1.350	14.8	150	5.38	53.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.596	28.2	2.4	0.600	1.000	0.016	0.0
1.001	1.707	30.2	2.3	1.000	0.600	0.016	0.0
1.002	1.979	35.0	9.1	0.600	0.650	0.063	0.0
1.003	0.103	203.1	9.0	0.500	0.300	0.093	0.0
1.004	0.135	39.4	11.8	0.750	0.800	0.127	0.0
1.005	0.076	22.2	13.5	0.800	0.650	0.165	0.0
1.006	0.076	22.2	13.1	0.750	0.700	0.165	0.0
2.000	1.811	32.0	0.0	0.600	0.600	0.000	0.0
2.001	2.630	46.5	4.9	0.600	0.750	0.034	0.0

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	16.000	40.0	150	Circular	124.400	123.650	0.600	124.400	123.250	1.000
1.001	7.000	35.0	150	Circular	124.400	123.250	1.000	123.800	123.050	0.600
1.002	30.000	26.1	150	Circular	123.800	123.050	0.600	122.700	121.900	0.650
1.003	50.000	250.0	600	swale	122.700	121.600	0.500	122.300	121.400	0.300
1.004	9.500	31.7	150	swale	122.300	121.400	0.750	122.050	121.100	0.800
1.005	20.000	100.0	150	swale	122.050	121.100	0.800	121.700	120.900	0.650
1.006	5.000	100.0	150	swale	121.700	120.800	0.750	121.600	120.750	0.700
2.000	28.000	31.1	150	Circular	124.400	123.650	0.600	123.500	122.750	0.600
2.001	20.000	14.8	150	Circular	123.500	122.750	0.600	122.300	121.400	0.750

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1200	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	450	Manhole	Adoptable
1.002	S3	450	Manhole	Adoptable	S4		Junction	
1.003	S4		Junction		S7	1200	Junction	
1.004	S7	1200	Junction		S8 Pond		Manhole	Adoptable
1.005	S8 Pond		Manhole	Adoptable	S9 Hydrobrake	1200	Manhole	Adoptable
1.006	S9 Hydrobrake	1200	Manhole	Adoptable	Brook Outfall		Manhole	Adoptable
2.000	S5	1200	Manhole	Adoptable	S6	1200	Manhole	Adoptable
2.001	S6	1200	Manhole	Adoptable	S7	1200	Junction	

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	124.400	0.750	1200				
				0	1.000	123.650	150
S2	124.400	1.150	1200				
				0	1.001	123.250	150
S3	123.800	0.750	450				
				0	1.002	123.050	150
S4	122.700	1.100					
				0	1.003	121.600	600
S5	124.400	0.750	1200				
				0	2.000	123.650	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S6	123.500	0.750	1200		1	2.000	122.750 150
					0	2.001	122.750 150
S7	122.300	0.900	1200		1	2.001	121.400 150
					2	1.003	121.400 600
					0	1.004	121.400 150
S8 Pond	122.050	0.950			1	1.004	121.100 150
					0	1.005	121.100 150
S9 Hydrobrake	121.700	0.900	1200		1	1.005	120.900 150
					0	1.006	120.800 150
Brook Outfall	121.600	0.850			1	1.006	120.750 150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	19.900	Drain Down Time (mins)	240
Ratio-R	0.250	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	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	50	0	0

Node S9 Hydrobrake Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	120.800	Product Number	CTL-SHE-0072-2200-0900-2200
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.2	Min Node Diameter (mm)	1200

Node S8 Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	121.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	225



Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	234.0	0.0	1.300	234.0	0.0	1.301	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	123.677	0.027	1.9	0.0419	0.0000	OK
15 minute winter	S2	11	123.275	0.025	1.9	0.0286	0.0000	OK
15 minute winter	S3	10	123.097	0.047	7.4	0.0663	0.0000	OK
60 minute summer	S4	38	121.695	0.095	8.3	0.0519	0.0000	OK
15 minute summer	S5	1	123.650	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S6	10	122.783	0.033	4.1	0.0676	0.0000	OK
60 minute winter	S7	44	121.471	0.071	6.8	0.0000	0.0000	OK
240 minute winter	S8 Pond	172	121.166	0.066	5.4	15.5376	0.0000	OK
480 minute winter	S9 Hydrobrake	328	121.151	0.351	4.8	0.3966	0.0000	SURCHARGED
15 minute summer	Brook Outfall	1	120.750	0.000	0.3	0.0000	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 winter	S1	1.000	S2	1.9	0.918	0.066	0.0327	
15 minute winter	S2	1.001	S3	1.9	0.572	0.061	0.0233	
15 minute winter	S3	1.002	S4	7.3	1.559	0.208	0.1402	
60 minute summer	S4	1.003	S7	4.9	0.036	0.024	6.8844	
15 minute summer	S5	2.000	S6	0.0	0.000	0.000	0.0400	
15 minute winter	S6	2.001	S7	4.1	2.227	0.088	0.0544	
60 minute winter	S7	1.004	S8 Pond	6.1	0.075	0.154	0.7851	
240 minute winter	S8 Pond	1.005	S9 Hydrobrake	5.1	0.043	0.228	6.2262	
480 minute winter	S9 Hydrobrake	Hydro-Brake®	Brook Outfall	2.2				38.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	123.693	0.043	4.7	0.0664	0.0000	OK
15 minute winter	S2	10	123.290	0.040	4.6	0.0448	0.0000	OK
15 minute winter	S3	10	123.128	0.078	18.4	0.1100	0.0000	OK
30 minute winter	S4	22	121.773	0.173	22.7	0.0944	0.0000	OK
15 minute summer	S5	1	123.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S6	9	122.799	0.049	9.5	0.0994	0.0000	OK
30 minute winter	S7	25	121.525	0.125	20.5	0.0000	0.0000	OK
480 minute winter	S8 Pond	376	121.259	0.159	7.6	37.3612	0.0000	SURCHARGED
480 minute winter	S9 Hydrobrake	376	121.259	0.459	6.3	0.5190	0.0000	SURCHARGED
15 minute summer	Brook Outfall	1	120.750	0.000	1.6	0.0000	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 winter	S1	1.000	S2	4.6	1.186	0.165	0.0626	
15 minute winter	S2	1.001	S3	4.6	0.719	0.152	0.0453	
15 minute winter	S3	1.002	S4	18.1	1.980	0.517	0.2738	
30 minute winter	S4	1.003	S7	15.0	0.053	0.074	14.2426	
15 minute summer	S5	2.000	S6	0.0	0.000	0.000	0.0695	
15 minute summer	S6	2.001	S7	9.6	2.557	0.207	0.1317	
30 minute winter	S7	1.004	S8 Pond	16.9	0.110	0.430	1.5031	
480 minute winter	S8 Pond	1.005	S9 Hydrobrake	6.3	0.044	0.285	12.3949	
480 minute winter	S9 Hydrobrake	Hydro-Brake®	Brook Outfall	2.2				70.1

Results for 100 year Critical Storm Duration. Lowest mass balance: 97.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	123.699	0.049	6.1	0.0764	0.0000	OK
15 minute winter	S2	10	123.295	0.045	6.0	0.0512	0.0000	OK
15 minute winter	S3	10	123.142	0.092	23.7	0.1295	0.0000	OK
30 minute winter	S4	22	121.803	0.203	29.5	0.1106	0.0000	OK
15 minute summer	S5	1	123.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S6	9	122.805	0.055	12.3	0.1117	0.0000	OK
30 minute winter	S7	24	121.550	0.150	28.2	0.0000	0.0000	OK
480 minute winter	S8 Pond	408	121.324	0.224	9.7	52.5842	0.0000	SURCHARGED
480 minute winter	S9 Hydrobrake	408	121.324	0.524	6.6	0.5925	0.0000	SURCHARGED
15 minute summer	Brook Outfall	1	120.750	0.000	2.2	0.0000	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 winter	S1	1.000	S2	6.0	1.273	0.214	0.0758	
15 minute winter	S2	1.001	S3	6.0	0.761	0.197	0.0551	
15 minute winter	S3	1.002	S4	23.4	2.099	0.668	0.3338	
30 minute winter	S4	1.003	S7	20.6	0.059	0.102	17.6322	
15 minute summer	S5	2.000	S6	0.0	0.000	0.000	0.0815	
15 minute summer	S6	2.001	S7	12.4	2.633	0.268	0.1646	
30 minute winter	S7	1.004	S8 Pond	24.3	0.125	0.617	1.9006	
480 minute winter	S8 Pond	1.005	S9 Hydrobrake	6.6	0.049	0.298	16.6136	
480 minute winter	S9 Hydrobrake	Hydro-Brake®	Brook Outfall	2.2				69.5

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 97.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	123.711	0.061	9.1	0.0953	0.0000	OK
15 minute winter	S2	10	123.306	0.056	9.0	0.0633	0.0000	OK
15 minute winter	S3	10	123.174	0.124	35.6	0.1751	0.0000	OK
30 minute winter	S4	21	121.857	0.257	44.3	0.1400	0.0000	OK
15 minute summer	S5	1	123.650	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S6	10	122.817	0.067	19.3	0.1368	0.0000	OK
30 minute winter	S7	23	121.593	0.193	45.6	0.0000	0.0000	SURCHARGED
600 minute winter	S8 Pond	570	121.479	0.379	12.5	88.9424	0.0000	SURCHARGED
600 minute winter	S9 Hydrobrake	570	121.479	0.679	5.9	0.7677	0.0000	FLOOD RISK
15 minute summer	Brook Outfall	1	120.750	0.000	2.2	0.0000	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 winter	S1	1.000	S2	9.0	1.415	0.320	0.1019	
15 minute winter	S2	1.001	S3	8.9	0.818	0.296	0.0755	
15 minute winter	S3	1.002	S4	35.2	2.210	1.005	0.4975	
30 minute winter	S4	1.003	S7	33.1	0.069	0.163	24.2925	
15 minute summer	S5	2.000	S6	0.0	0.000	0.000	0.1051	
15 minute winter	S6	2.001	S7	19.1	2.672	0.411	0.2320	
30 minute winter	S7	1.004	S8 Pond	41.9	0.150	1.064	2.7222	
600 minute winter	S8 Pond	1.005	S9 Hydrobrake	5.9	0.044	0.266	28.7213	
600 minute winter	S9 Hydrobrake	Hydro-Brake®	Brook Outfall	2.2				80.6