

8 Appendices

8.1 Appendix A – Site Plan

dp
originator

checked
db

IMPORTANT
Do not scale from this drawing, except for planning purposes. Use figured dimensions only. If in doubt ask Douglas Briggs Partnership 01243 576611 or architecture@douglasbriggspartnership.co.uk

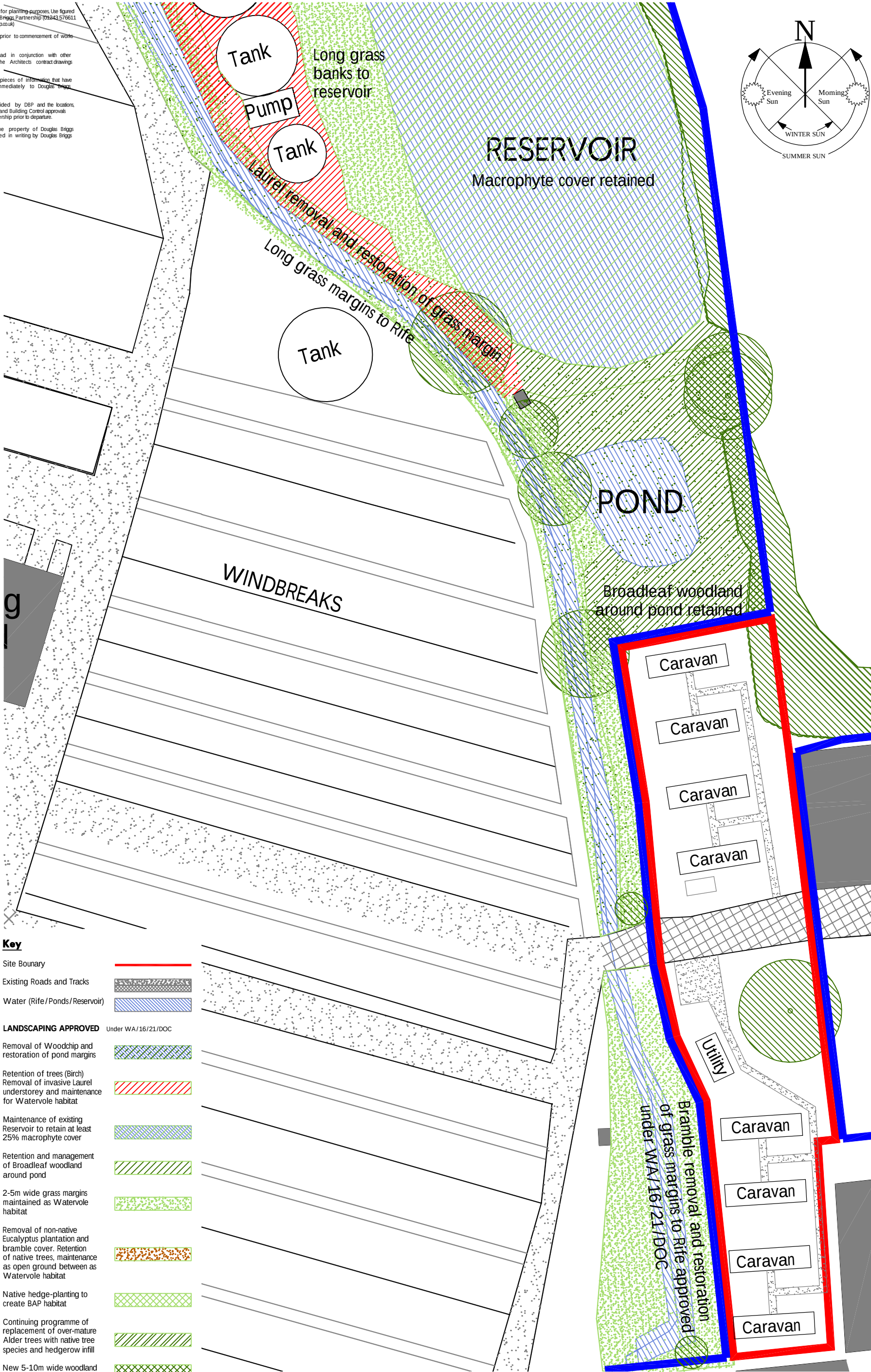
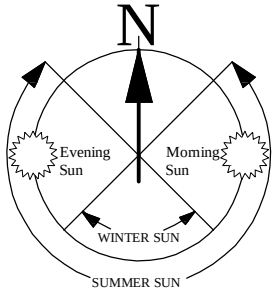
All dimension must be checked on site prior to commencement of works and fabrication.

This drawing/document is to be read in conjunction with other consultants'/suppliers information and the Architects' contract drawings and specifications etc.

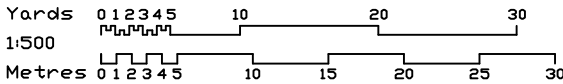
Any discrepancies between different pieces of information that have been supplied are to be notified immediately to Douglas Briggs Partnership.

Any departure from dimensions provided by DBP and the locations, positions or dimensions given in Planning and Building Control approvals shall be notified to Douglas Briggs Partnership prior to departure.

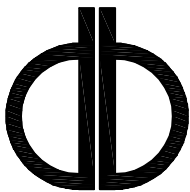
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Fleurie Lake Lane Barnham



PROPOSED
Site Plan
3323- 002
September 2023
1500 @A3



**DOUGLAS BRIGGS
PARTNERSHIP**

**INTEGRATED
ARCHITECTURE
AND
TOWN PLANNING**

Douglas Briggs Partnership
Flint Barns
Ham Farm
Bosham
West Sussex PO18 8EH
T: 01243 576611 F: 01243 574816

8.2 Appendix B – Borehole Log

Ref: C2904 – Fleurie Lake Lane, Barnham
17 December 2024

Arun District Council
The Arun Civic Centre
Maltravers Road
Littlehampton
West Sussex BN17 5LF

**Re: DECISION NOTICE - APPLICATION REF; Y/26/24/PL – FLEURIE NURSERY LAKE LANE, YAPTON, PO22 0AL – PLANNING
CONDITION NO.4**

Dear Sirs

I refer to the decision notice ref; Y/26/24/PL planning conditions no 4,5 and 6, and provide additional information relating to the onsite findings and the proposed drainage design.

Planning condition no 4 states that:

Within 12 months of the date of this permission, full details of the proposed surface water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority. The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, and the recommendations of the SuDS Manual produced by CIRIA. Design considerations must take full account of the 'Supplementary Requirements for Surface Water Drainage Proposals' produced by Arun District Council and are an overriding factor in terms of requirements. Winter groundwater monitoring to establish highest annual ground water levels and winter percolation testing to BRE 365, or similar approved, will be required to support the design of any infiltration drainage. The approved details shall be implemented within 3 months of their approval.

Planning condition no 5 states that:

Within 12 months of the date of this permission details shall be submitted to and approved in writing by the Local Planning Authority for any proposals: to discharge flows to watercourses; or for the culverting, diversion, infilling, or obstruction of any watercourse on or adjacent to the site. Any discharge to a watercourse must be at a rate no greater than the pre-development run-off values and in accordance with current policies. No construction is permitted, which will restrict current and future landowners from undertaking their riparian maintenance responsibilities in respect to any watercourse or culvert on or adjacent to the site. The approved details shall be implemented within 3 months following the date of the discharge of condition decision.

Planning condition no 6 states that:

Within 12 months of the date of this permission, full details of the maintenance and management of the surface water drainage system shall be set out in a site-specific maintenance manual and submitted to, and approved in writing, by the Local Planning Authority. The manual is to include details of financial management and arrangements for the replacement of major components at PLDNSTD (ODB) 2018 Arun District Council Y/26/24/PL 2 of 7 the end of the manufacturer's recommended design life. Upon completed construction of the surface water drainage system, the owner or management company shall strictly adhere to and implement the recommendations contained within the manual.

We have been informed by the client that a deep excavation was carried out for a specific tank installation approximately 100 meters east of the caravan site. The excavation reached a depth of 1.5m BGL, revealing running sand at 0.7m BGL, with groundwater seepage observed at 1.1m BGL.

Additionally, new gas main installation works were undertaken approximately 20m south of the proposed development site. This work reached a depth of 0.8m BGL and identified sandy clay soils with groundwater seepage at the base.

Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW
Tel: 01243 933253 E: mail@cgs civils.co.uk W: www.cgs civils.co.uk
Registered in England No. 8546902 | VAT Registration No.169950851



Figure 1. Gas Main Excavation Location



Photo 1. Gas Main Trench – Indicating groundwater seepage at 0.8mBGL and heavy clay soil.



Photo 2. Septic Tank Excavation indicating running Sand and high groundwater level

An onsite preliminary infiltration test conducted to a depth of 0.9m below ground level indicated low infiltration potential due to negligible water level drop observed during the 4.5-hour test period.



Photo 3. Preliminary BRE365 infiltration test – indicating clay soils

Based on the information provided by the Client and the onsite infiltration test results, it is confirmed that infiltration is not a feasible method for managing surface water runoff.

As a result, surface water runoff will be collected, attenuated, and discharged into the adjacent watercourse at a restricted rate of 1l/s, as specified in the approved drainage strategy drawings.

Given the high groundwater level, the proposed attenuation tank will be constructed with a concrete slab to mitigate potential flotation caused by groundwater pressure.

The information outlined above has been reviewed in consultation with the Council Drainage Engineer. Based on the data provided, infiltration has been ruled out as a feasible option. It was confirmed that the proposed attenuation tank should be designed with consideration of the groundwater level at the surface.

The updated drainage plan, construction details, drainage calculations, Ordinary Watercourse Consent (OWC) drawings, and the maintenance and management plan for the surface water drainage system are included at the end of this statement.

SU 90 SE 28

9726 0449

Todhurst Farm

Surface level +11.0 m
Water struck at +9.1 m
August 1981

Block G

Overburden 1.9 m
Mineral 3.5 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Brickearth	Clay, silty, mottled brown and greyish brown, with peat particles and a few small subangular white flint pebbles	1.7	1.9
Raised Beach Deposits (younger)	a 'Clayey' sand with a few pebbles of flint and sandstone Sand: fine, with traces of medium and coarse; quartz Fines: silt and clay, brown	3.0	4.9
	b Sandy gravel Gravel: coarse with fine, angular to well rounded; flint (some white and porous), chalk and traces of other rock fragments Sand: fine with coarse and medium Fines: silt, brown	0.5	5.4
London Clay	Clay, very silty, olive grey, with some fine sand and mica	1.0+	6.4

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						- $\frac{1}{4}$	+- $\frac{1}{4}$	+-1	+1-4	+4-16	+16-64
a	16	82	2	1.9-2.9	25	65	2	3	1	4	0
				2.9-3.9	12	87	1	0	0	0	0
				3.9-4.9	11	83	3	2	1	0	0
				Mean	16	78	2	2	1	1	0
b	4	51	45	4.9-5.4	4	32	9	10	18	27	0
a+b	14	78	8	1.9-5.4	14	72	3	3	3	5	0



**NGRC
BOREHOLE RECORDS
ADJUSTMENT FORM**

QUARTER SHEET SU 90 SE

BH REGISTRATION NUMBER 46-52

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)



British
Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

INFORMATION MANAGEMENT PROGRAMME

SU90 / 2

SU90 SE47.

LICENCE NO 10/41/412006

A SITE DETAILS

Borehole drilled for:	WELL
Location:	TODMURST NURSERY (NOW WALKERTON NURSERIES)
NGR (8 figures):	SU 976 069
Ground Level (if known):	Please attach site plan
Drilling Company:	
Date of Drilling: Commenced	/ / Completed / /

B CONSTRUCTION DETAILS

Borehole Datum (if not ground level)	above	WELL 12' DEEP
	m below GL	6" DIAMETER.
(point from which all measurements of depth are taken e.g. flange, edge of chamber, etc.)		
Borehole drilled diameter	mm from	to m/depth
	mm from	to m/depth
	mm from	to m/depth
Casing material diameter	mm from	to m/depth
and type (e.g. if plain steel, plastic slotted)		
Casing material diameter	mm from	to m/depth
Casing material diameter	mm from	to m/depth
Casing material diameter	mm from	to m/depth
Grouting details		
Water struck at	m (depth below datum - mbd)	
	m (depth below datum - mbd)	
Rest water level on completion	mbd	

C TEST PUMPING SUMMARY (Please supply full details on Forms WR-39)

Test Pumping Datum (if different from borehole datum)	m	above
		below borehole datum (mbd)
Pump Suction depth	mbd	
Water Level (Start of Test)	mbd	
Water Level (End of Test)	mbd	
Pumping rate	m ³ /d:1/s	
for	days/hours	
Recovery to (from end of pumping)	mbd in	mins: hrs: days
Date(s) of measurements		
Please supply chemical Analysis if available		

Geological Classification (BGS only)	Description of strata	Thickness	Depth
		m	m
	(continue on separate page if necessary)		
	Other comments (e.g. gas encountered, saline water intercepted, etc.) NOT USED FOR MANY YEARS. NO OTHER INFORMATION AVAILABLE (DETAILS FROM EA)		

FOR OFFICIAL USE ONLY

FILE	CONSENT NO	NGS REF NO:
LIC NO:	PURPOSE:	EA REF NO:
DATE REC:	COPY TO:	ENTERED BY:

84999

WR38: Borehole record form

Borehole record

**Nicholls
Boreholes**



Water Resources Act 1991 (as amended by the Water Act 2003)

A Site details

Borehole drilled for L:

Location Lake Ben Maypass Lane, Napton, BN18 0DR

NGR (ten digits) SU97741 04359 Please attach site plan

Ground level (if known) _____ metres Above Ordnance Datum

Drilling company Nicholls Boreholes

Date drilling commenced 19/2/2020 (DD/MM/YYYY) Completed 21/2/2020 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level) _____ metres (m). Please tick if this is above ☐ or below ☐ ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter 203 mm from 0 to 2.2 m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

_____ mm from _____ to _____ m/depth

Casing material Solid uPVC inner diameter 113 mm from 0 to 10 m/depth
and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material Slotted uPVC inner diameter 113 mm from 10 to 16 m/depth

Casing material Solid uPVC inner diameter 113 mm from 16 to 19 m/depth
(Sump with screen on end cap)

Casing material _____ diameter _____ mm from _____ to _____ m/depth

Grouting details 53 bags of washed shingle & 7 bags of Mikal
(FM Seal to Surface)

Water struck at 1. _____ m (depth below datum - mbd) 2. _____ m (mbd)

3. _____ m (mbd) 4. _____ m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum _____ m. Please tick if this is above ☐ or below ☐ ground level.
(if different from borehole datum)

Pump suction depth _____ mbd

Water level (start of test) _____ mbd

Water level (end of test) _____ mbd

Type of test (for example, bailer, step, constant rate)

Pumping rate _____ m³/hour or litres/second. Please tick as appropriate.

for _____ days, _____ hours, _____ mins

Recovery to _____ mbd in _____ days, _____ hours, _____ mins
(from end of pumping)

Date(s) of measurements Pump started (DD/MM/YYYY)

Pump stopped _____ (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box ☐

WR38: Borehole record form

D Strata log

Geological classification (BGS only)	Description of strata	Thickness m	Depth (to base of strata) m
	- Sandy topsoil - Sand - Clay, chalk and flint - Chalk and flint	1.5 0.5 3 17	1.5 2 5 22
	(continue on separate page if necessary)		
	Other comments (for example, gas encountered, saline water intercepted)		

E Completing this form

How long did it take you to fill in this form? _____

For Official use only

Date received (DD/MM/YYYY)	File	Consent number	BGS reference number
Accession number	Wellmaster number	SOBI number	NGR
LIC NO	Purpose	EA reference number	
Copy number	Entered by		

8.3 Appendix C – Greenfield Runoff Calculations, Proposed Contributing Area Plan, Proposed Drainage Strategy, Typical Construction Details, Hydraulic Calculations and Floatation Calculations

Calculated by:	Tom Zajac
Site name:	C2904
Site location:	PO22 0AL

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.83291° N
Longitude:	0.61319° W
Reference:	1865643596
Date:	Mar 10 2025 10:57

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.1
-----------------------	-----

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	2	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.53

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	756	756
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Q _{BAR} (l/s):	0.2	0.69
1 in 1 year (l/s):	0.17	0.58
1 in 30 years (l/s):	0.46	1.58
1 in 100 year (l/s):	0.64	2.19
1 in 200 years (l/s):	0.75	2.56

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



- STANDARD DRAINAGE NOTES
- DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
 - ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
 - ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
 - BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
 - ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
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 - ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA.
 - ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911:PART 1.
 - ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
 - ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
 - ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
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 - NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
 - ALL EXISTING MANHOLE COVER'S, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
 - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
 - UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
 - MANHOLE AND CHAMBER COVER GRADES:

- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD

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R = RECORD	Record of actual completed work

P1	11.12.24	PRELIMINARY ISSUE - FOR PLANNING APPROVAL	KCK	TZ	CS
P-	12.12.23	PRELIMINARY ISSUE	KCK	TZ	CS
REV	DATE	DESCRIPTION	BY	CHK	APP

Consulting Civil Engineers

CLIENT
FLEURIE NURSERY LTD

ARCHITECT
DOUGLAS BRIGGS PARTNERSHIP

JOB TITLE
FLEURIE LAKE LANE,
BARNHAM, PO22 0AL

DRAWING TITLE
PROPOSED CONTRIBUTING
AREA

DRAWN KCK	ENGINEER TZ	CHECKED CS	APPROVED CS
DATE DECEMBER 2023	SCALE @ A1 1:200		
JOB No. C2904	STATUS P	DRAWING No. 201	REV. P1

CONTRIBUTING AREA PLAN (1:200)

Proposed roof drainage area: **0.0282 ha**

Existing driveway and car parking area drained as existing (excluded from drainage calculations)

Proposed discharge rate to be restricted to: **1l/s**

Proposed permeable private footpath areas

PRELIMINARY



ALL DOWNPIPES ARE TO BE INSTALLED WITH LEAF
SEPARATOR FOR GUTTERS.
ORIFICE CHAMBER IS TO BE INSTALLED WITH ORIFICE FILTER
SCREEN TO PREVENT BLOCKAGES

DRAINAGE LEGEND

EXISTING FEATURES

- Existing gas main
- Existing water main
- Proposed Features
 - FWD
 - Foul Drainage
 - Foul Rising Main
 - SWD
 - Surface Water Drainage
 - WB
 - Proposed 1000 litres Water Butt
 - Storm water access chamber (3000)
 - Rainwater pipe (assumed to be confirmed by the Architect)
 - Storm water inspection chamber (4500)
 - Storm water catchpit chamber (4500)
 - Storm water rodding eye
 - Storm water orifice flow control chamber (5000)
 - Foul water access chamber (3000)
 - Foul water inspection chamber (4500)
 - Soil stack (assumed to be confirmed by the Architect)
 - Extent of permeable paving with porous sub-base
 - Existing watercourse 3m Easement, 3m as calculated from the top of the existing watercourse banking line.
 - Finished floor level (as confirmed by the Client)
 - Proposed surface level (as confirmed by the Client)
 - Pipe info - diameter, length, gradient, bedding type

ABBREVIATIONS

- MH - MANHOLE
- IC - INSPECTION CHAMBER
- AC - ACCESS CHAMBER
- CP - CATCHPIT
- BC - BRAKE CHAMBER
- RE - RODDING EYE
- IL - INVERT LEVEL
- SL - SUMP LEVEL
- RA - RESTRICTED ACCESS COVER
- CL - COVER LEVEL
- TL - TOP OF CELLULAR SA
- BL - BASE OF CELLULAR SA
- FL - FORMATION LEVEL

Existing trees (as taken from Douglas Briggs Partnership, 'Proposed Site Plan', drawing no: 3323-002, date September 2023.)

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P4	11.03.25	UPDATED TO LLFA COMMENTS	TZ	CS	CS
P3	11.12.24	PRELIMINARY ISSUE - FOR PLANNING APPROVAL	KCK	TZ	CS
P2	14.03.24	UPDATED TO CLIENT'S COMMENTS	KCK	TZ	CS
P1	01.02.24	UPDATED TO OWC ENGINEER'S COMMENTS	KCK	TZ	CS
P	12.12.23	PRELIMINARY ISSUE	KCK	TZ	CS
REV	DATE	DESCRIPTION	BY	CHK	APP



CLIENT
FLEURIE NURSERY LTD

ARCHITECT
DOUGLAS BRIGGS PARTNERSHIP

JOB TITLE
FLEURIE LAKE LANE,
BARNHAM, PO22 0AL

DRAWING TITLE
PROPOSED DRAINAGE
STRATEGY

DRAWN	KCK	ENGINEER	TZ	CHECKED	CS	APPROVED	CS
DATE	DECEMBER 2023	SCALE @ A1	1:200				
JOB No.	C2904	STATUS	P	DRAWING No.	101	REV.	P4

PRELIMINARY

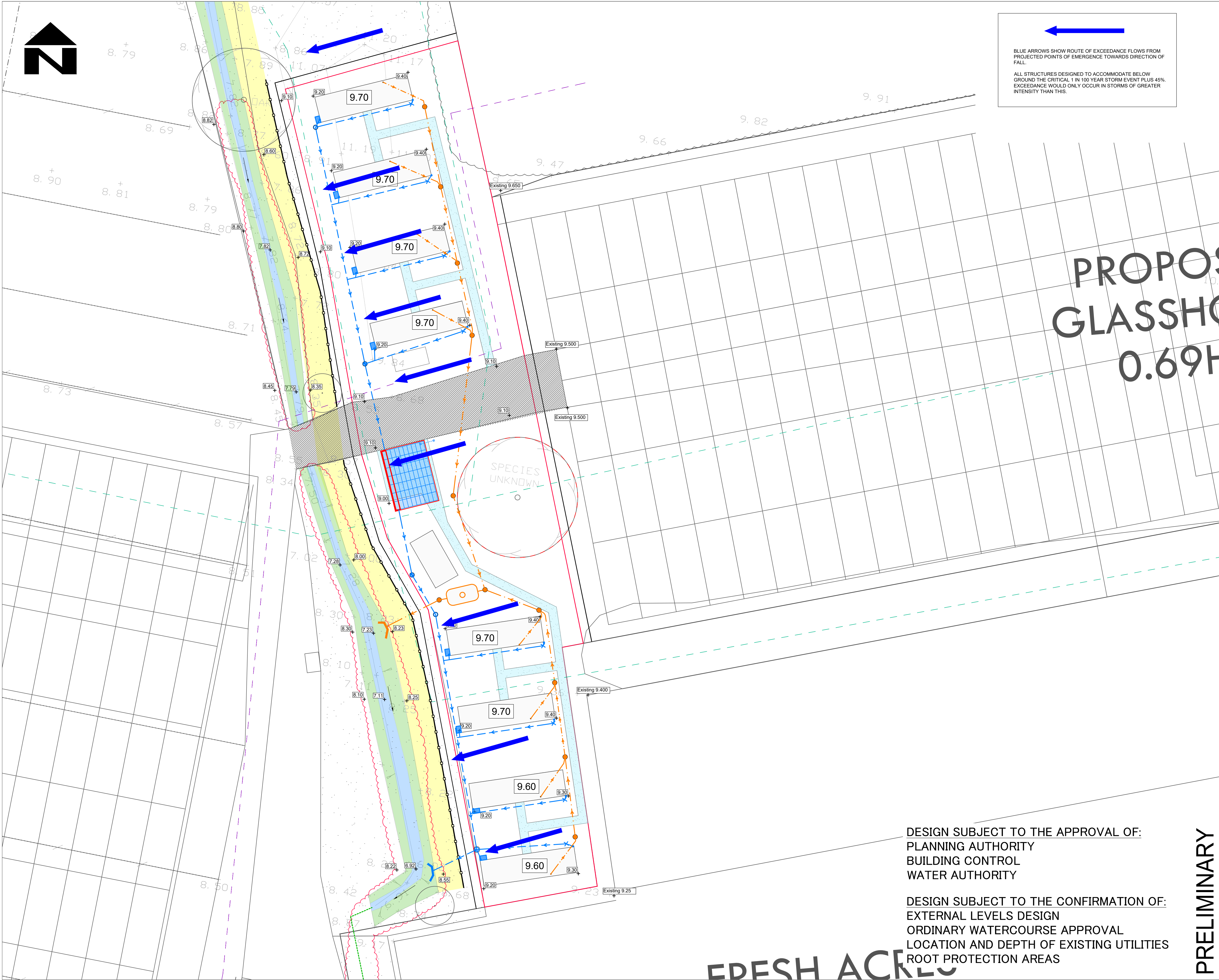
DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL
WATER AUTHORITY

DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
ORDINARY WATERCOURSE APPROVAL
LOCATION AND DEPTH OF EXISTING UTILITIES
ROOT PROTECTION AREAS

Site Specific Notes

- Proposed SW drainage designed based on desktop study available BGS Historical Borehole Logs.
- Surface water runoff to be attenuated and discharged into the existing watercourse at restricted rate of 1/l/s.
- Surface water drainage has been designed to cater for the Critical 1 in 100 year + 45% climate change event.
- A site walkover and onsite excavation works identified a high groundwater level and very low infiltration potential (Thick Clay soils)

EDFRESH ALKES



BLUE ARROWS SHOW ROUTE OF EXCEEDANCE FLOWS FROM PROJECTED POINTS OF EMERGENCE TOWARDS DIRECTION OF FALL.

ALL STRUCTURES DESIGNED TO ACCOMMODATE BELOW GROUND THE CRITICAL 1 IN 100 YEAR STORM EVENT PLUS 45%. EXCEEDANCE WOULD ONLY OCCUR IN STORMS OF GREATER INTENSITY THAN THIS.

- STANDARD DRAINAGE NOTES
- DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
 - ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
 - ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
 - BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
 - ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER, IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
 - COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
 - ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA.
 - ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS. TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911-PART 1.
 - ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
 - ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
 - ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
 - THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
 - STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
 - IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
 - NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
 - ALL EXISTING MANHOLE COVER'S, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
 - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
 - UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
 - MANHOLE AND CHAMBER COVER GRADES:

- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD

Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the only drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

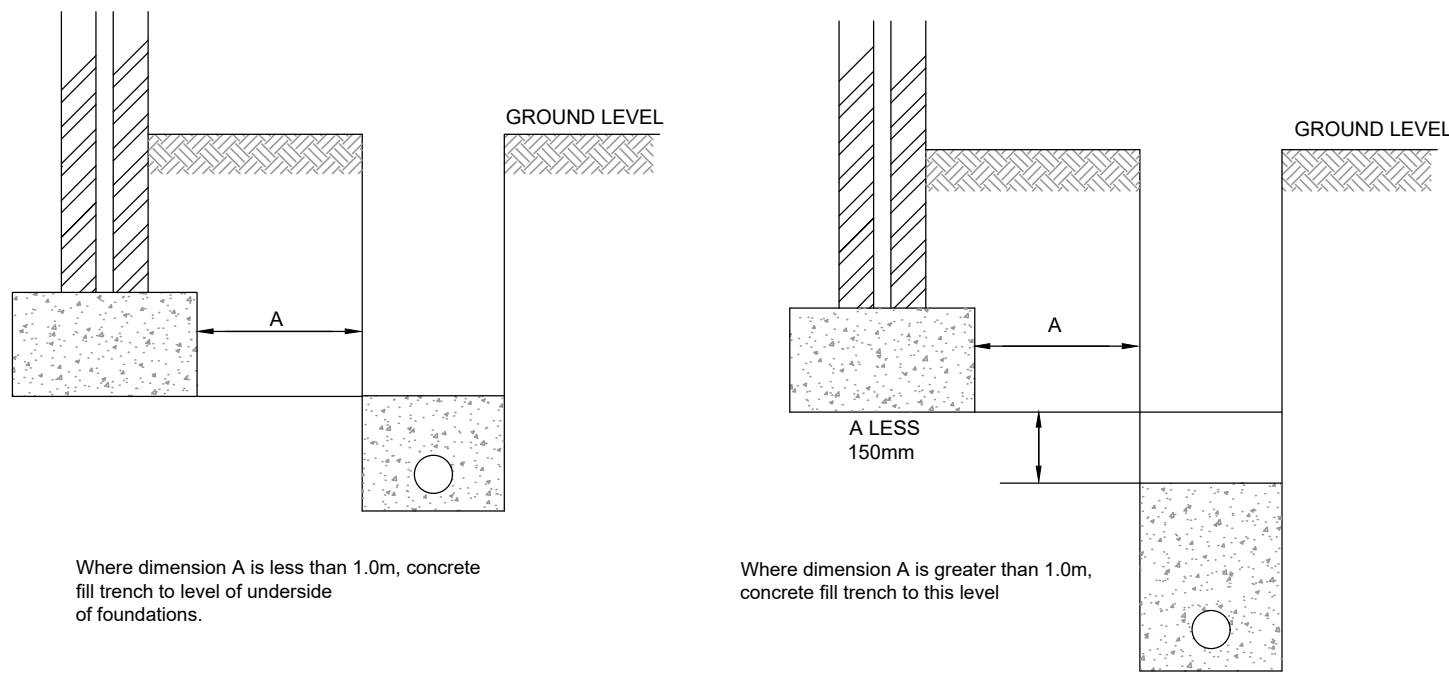
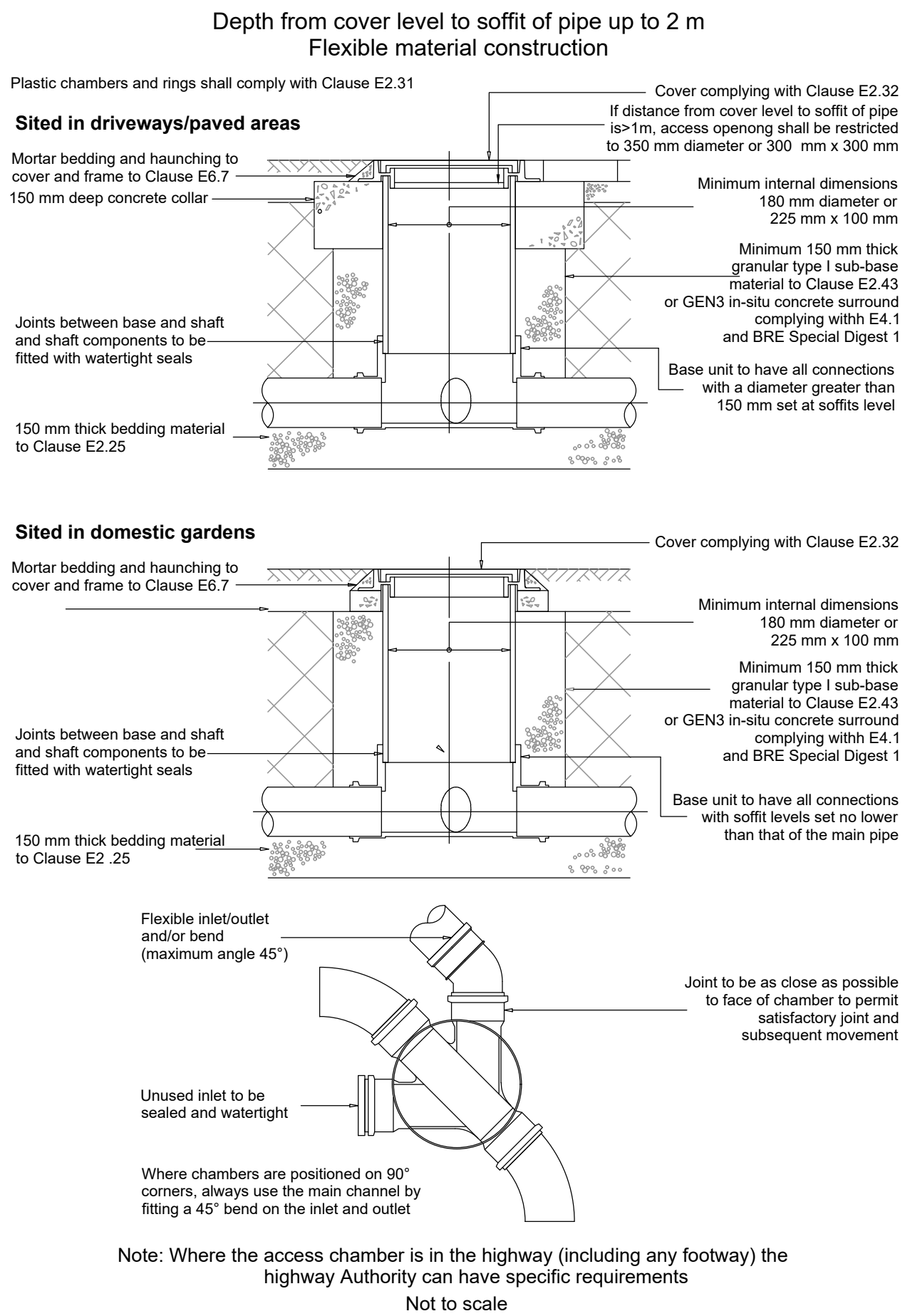
DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL
WATER AUTHORITY

DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
ORDINARY WATERCOURSE APPROVAL
LOCATION AND DEPTH OF EXISTING UTILITIES
ROOT PROTECTION AREAS

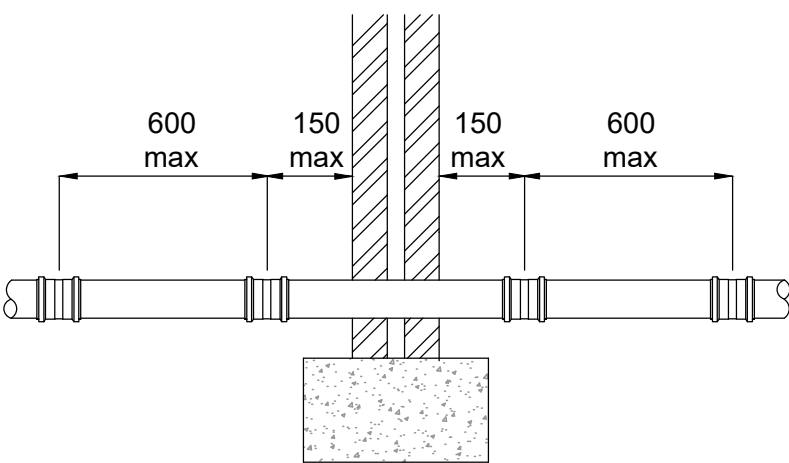
PRELIMINARY

P-	10.03.25	PRELIMINARY ISSUE	KCK	TZ	CS
REV	DATE	DESCRIPTION	BY	CHK	APP
 Consulting Civil Engineers					
CLIENT		FLEURIE NURSERY LTD			
ARCHITECT		DOUGLAS BRIGGS PARTNERSHIP			
JOB TITLE		FLEURIE LAKE LANE, BARNHAM, PO22 0AL			
DRAWING TITLE		EXCEEDANCE FLOW ROUTE			
DRAWN	ENGINEER	CHECKED	APPROVED		
KCK	TZ	CS	CS		
DATE	MARCH 2025		SCALE @ A1	1:200	
JOB No.	STATUS	DRAWING No.	REV.		
C2904	P	401	P-		

FIGURE B 23
TYPICAL INSPECTION CHAMBER DETAIL - TYPE E



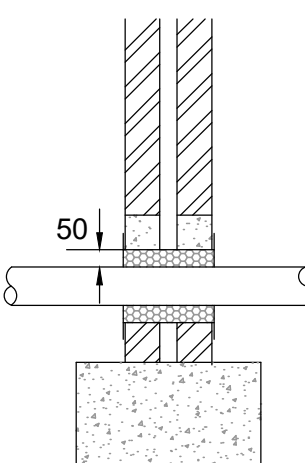
Pipes near buildings



Pipes through wall detail

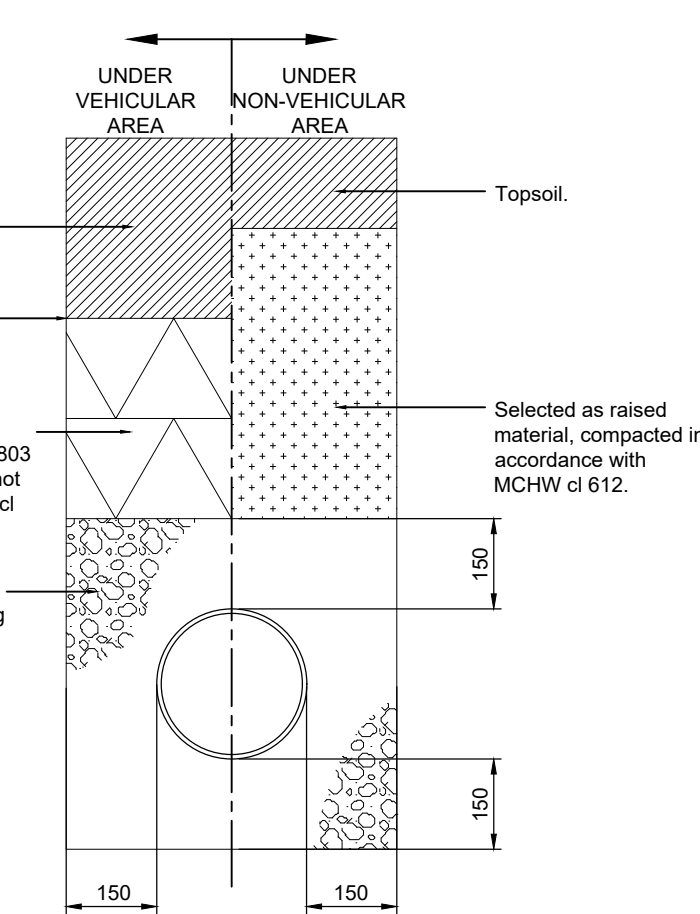
NTS

Pipes near buildings



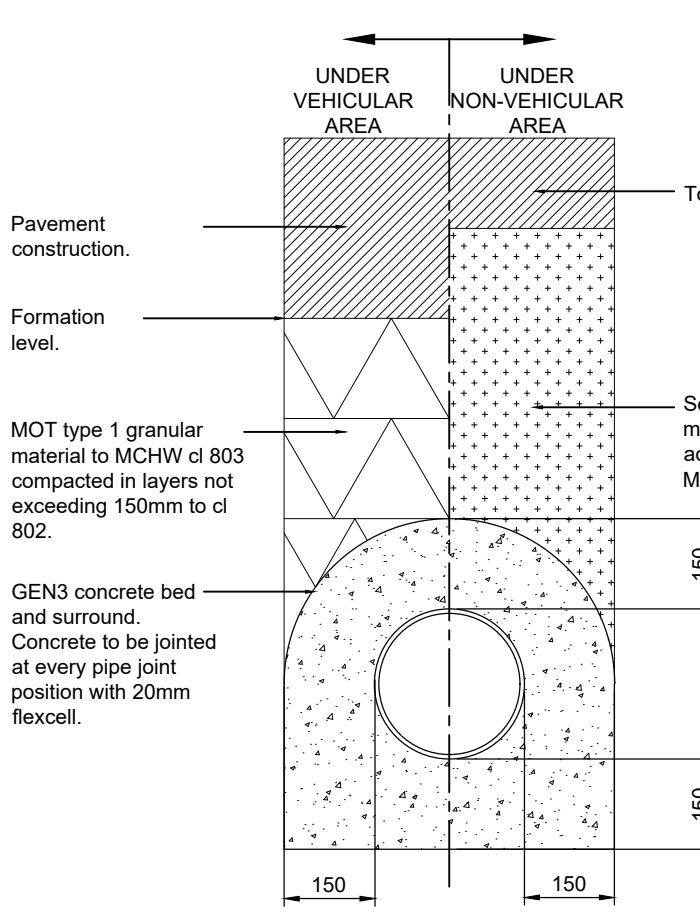
Pipes through wall with lintel detail

NTS



Class S granular pipe bed and surround

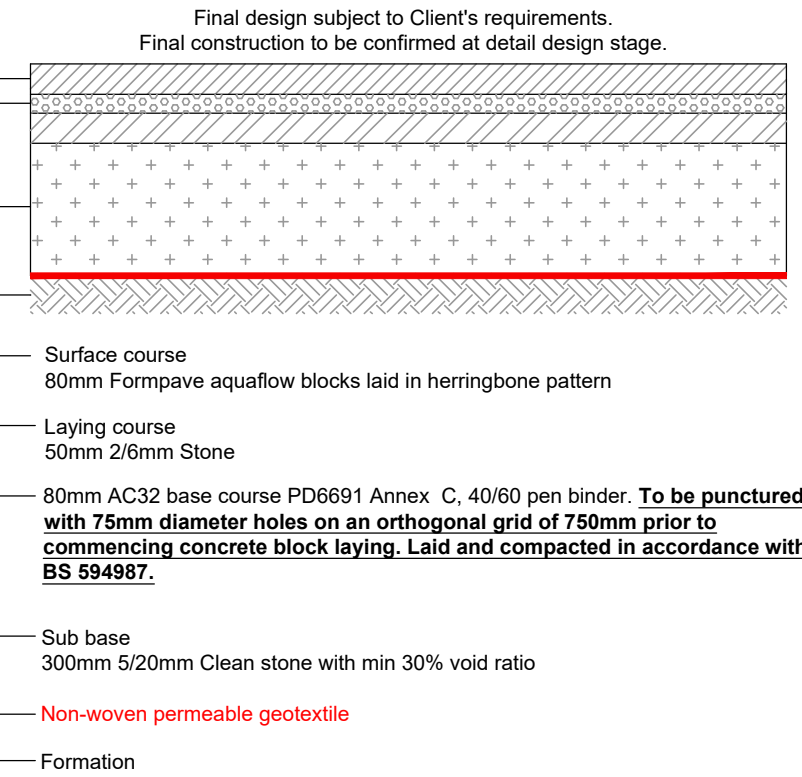
To be used for plastic, vitrified and concrete pipework where cover to crown is greater than 900mm.



Class Z concrete pipe bed and surround

To be used for plastic, vitrified and concrete pipework where cover to crown is less than 900mm.

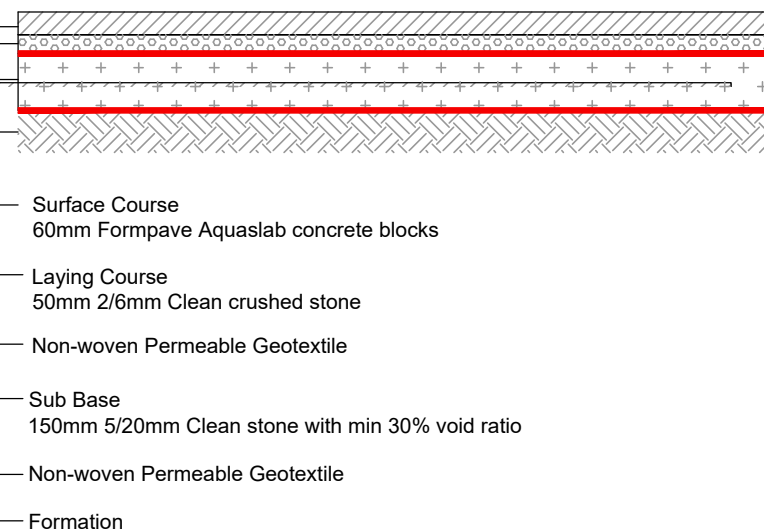
Pipe Bedding Details



Typical permeable block paving construction

To be read in accordance with Formpave details and specification

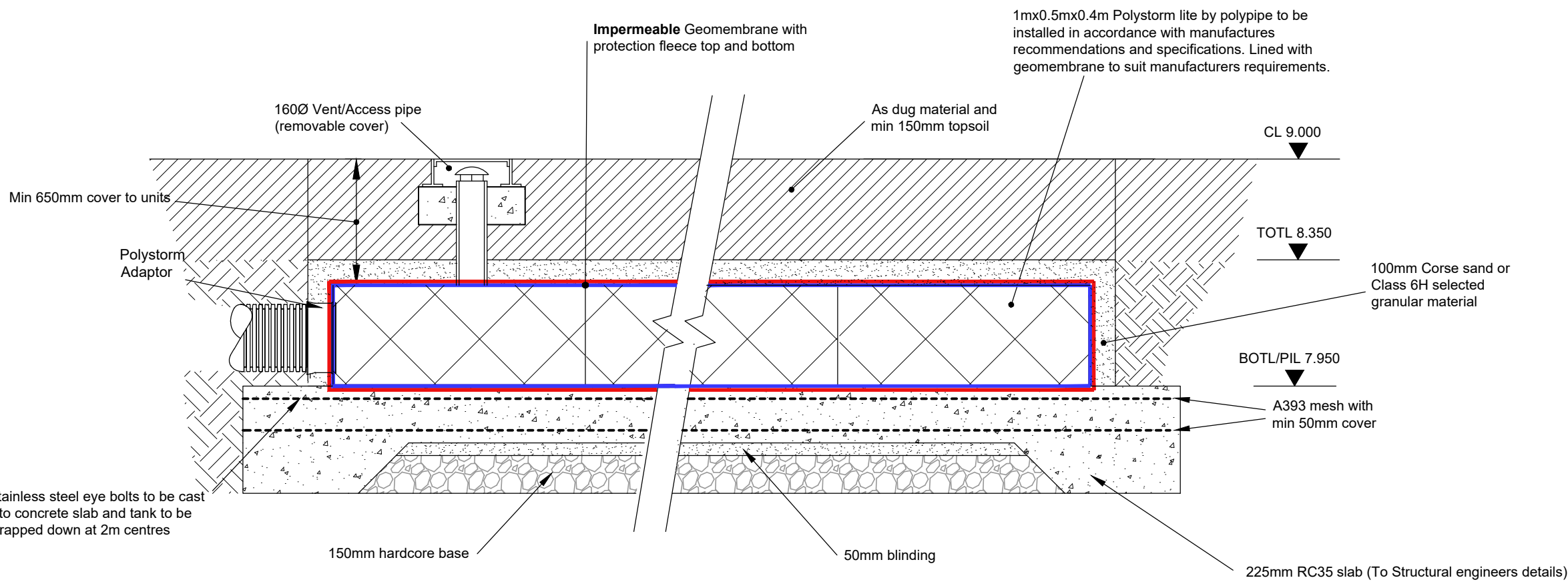
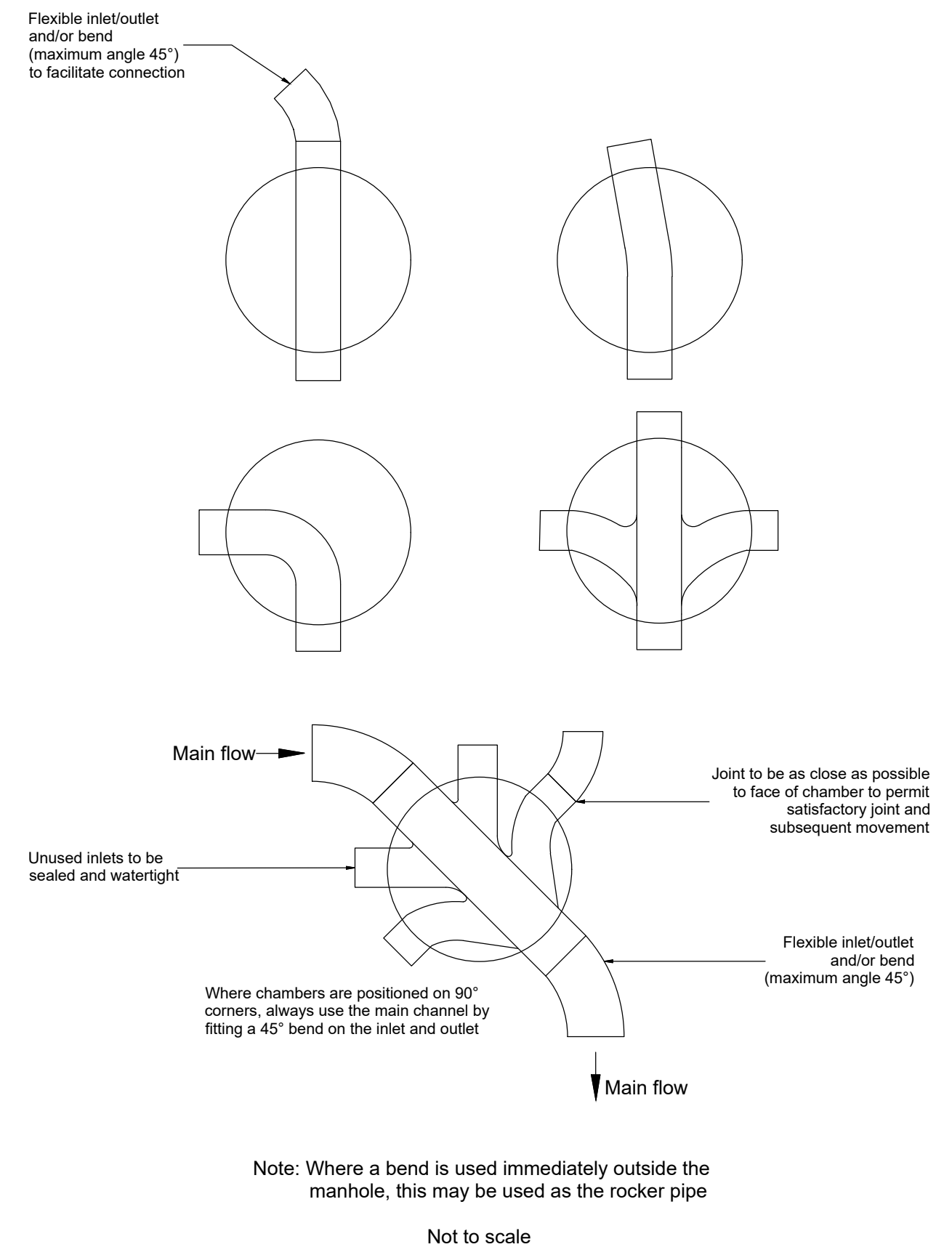
Option II: Permeable block paving constructions for access road and footpaths to be replaced with self draining gravel.



Typical Permeable Slabs footpath construction

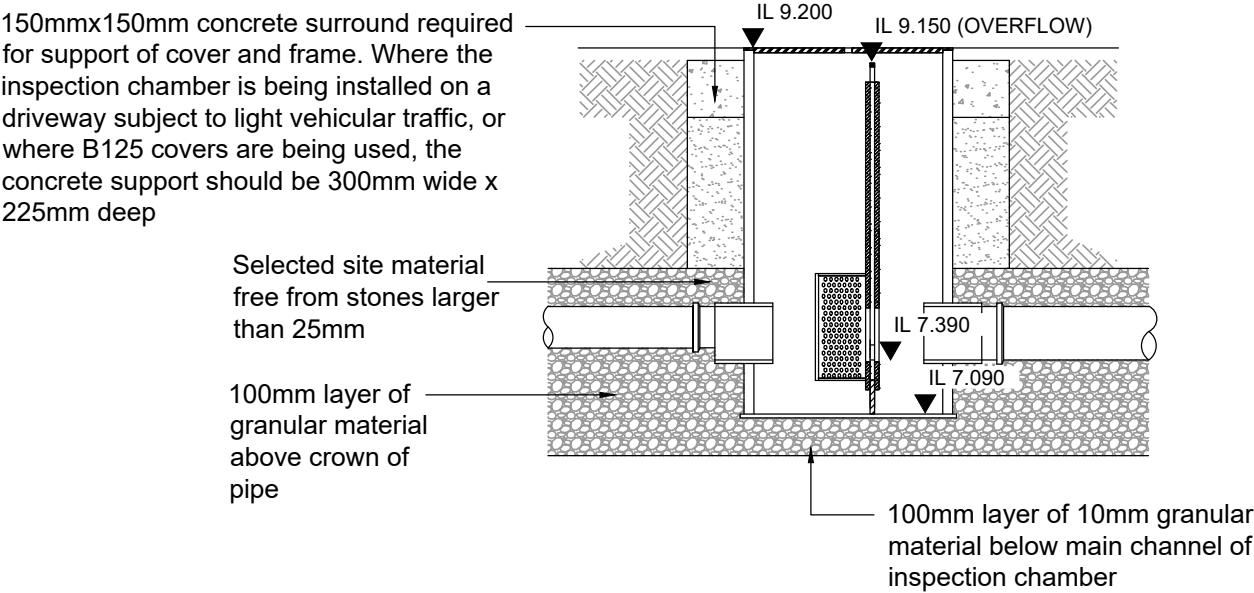
To be read in accordance with Formpave details and specification

FIGURE B 22
TYPICAL BASE LAYOUTS FOR TYPE D CHAMBERS



Attenuation (AT1) tank using polystorm geomodular units landscaped areas only

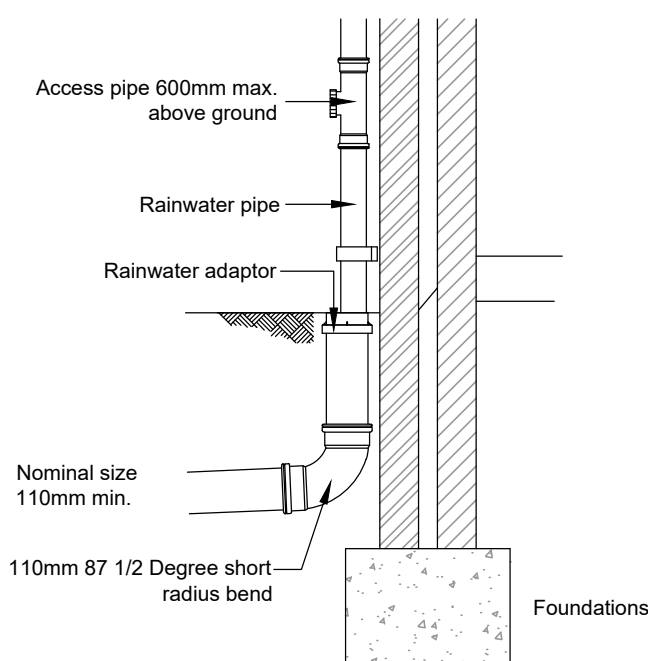
All storage tank drainage works shall be carried out in accordance with the specifications, method statements and recommendations of polypipe



Sel Controflow 600-900Ø Orifice Chamber

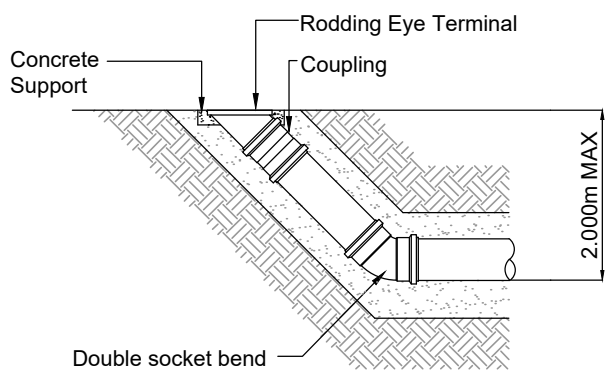
SEL Environmental LTD
Phone: 01254 589987
Email: sales@selenvironmental.com

(scale 1:20)

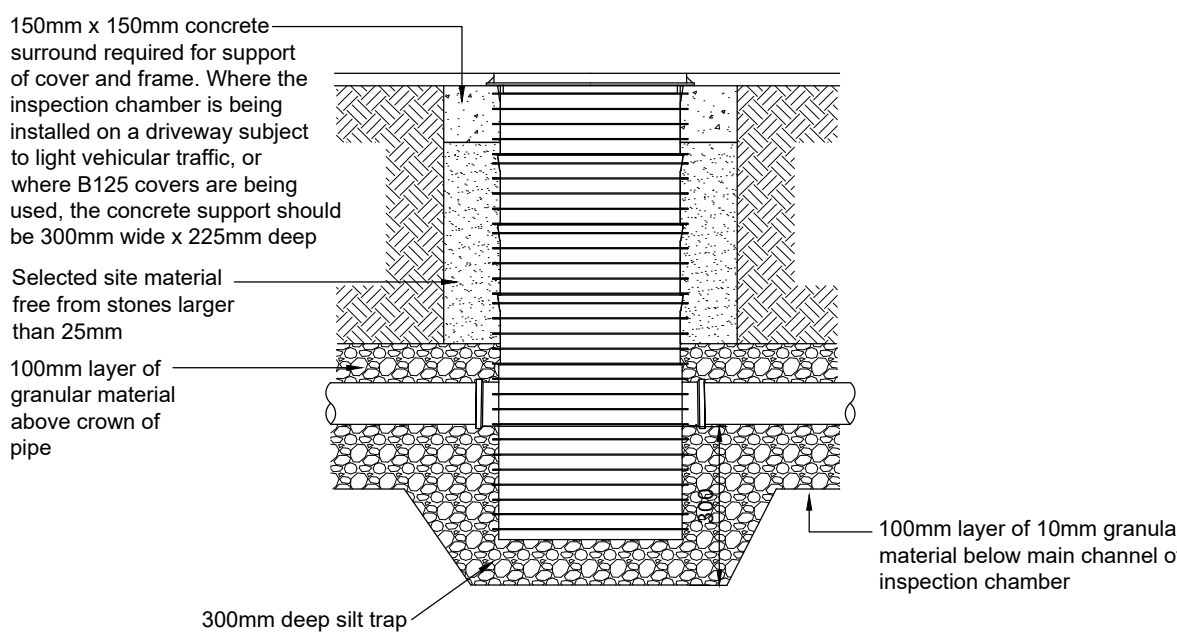


External Rainwater Pipe to Drain

1:20



Rodding eye detail



460mmØ Polypipe basic silt trap detail

SCALE 1:20

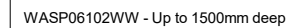
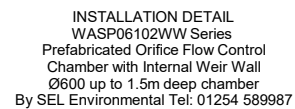
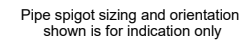
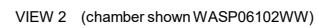
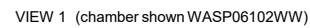
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P2	11.03.25	UPDATED TO LLFA COMMENTS	TZ	CS
P1	11.12.24	PRELIMINARY ISSUE - FOR PLANNING APPROVAL	KCK	TZ
P-	12.12.23	PRELIMINARY ISSUE	KCK	TZ
REV	DATE	DESCRIPTION	BY	CHK APP

PRELIMINARY

CLIENT	FLEURIE NURSERY LTD			
ARCHITECT	DOUGLAS BRIGGS PARTNERSHIP			
JOB TITLE	FLEURIE LAKE LANE, BARNHAM, PO22 0AL			
DRAWING TITLE	PROPOSED TYPICAL CONTSTRUCTION DETAILS			
DRAWN	KCK	ENGINEER	TZ	CHECKED
DATE	DWCEMBER 2023	SCALE @ A1	AS SHOWN	APPROVED
JOB No.	C2904	STATUS	P	DRAWING No.
501				P2



Object Force

Cover type and depth above the tank

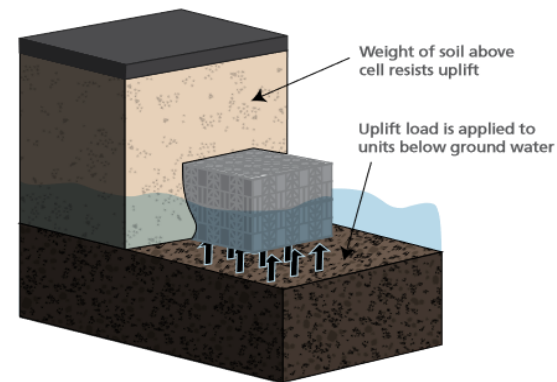
Gravel Surface mLaying Course mSub-base mSubgrade / Topsoil m

(soil/sand surround between access road and top of tank)

Tank size: m²Crates weight: kgNo. of crates: Total tank weight: kgBlock Paving total weight: kgLaying Course total weight: kgSub-base total weight: kgSubgrade total weight: kgTank Weight: kgTotal weight above tank: kg = N = kN

Type

Soil weight

 kg/m³ kg/m³ kg/m³ kg/m³ 



Buoyancy Force

Groundwater:

Groundwater levels: 0.01 mBGL

Tank volume:

Tank size: 35 m2

Tank depth under GWL: 0.4 m

Tank volume: 13.3 m3

Water weight 1000 kg/m3

Buoyancy: 130473 N = 130.473 KN

Factor of safety 1.5min.

405.8397 > 130.473 3.110526 TRUE

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	x
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.002	4.00	9.200	450	497711.829	104681.718	0.600
S2	0.010	4.00	9.200	450	497717.552	104654.293	0.906
S3	0.002	4.00	9.200	450	497723.010	104629.830	1.480
S4	0.003	4.00	9.200	450	497725.736	104625.249	1.533
S5	0.003	4.00	9.200	600	497730.512	104598.027	1.809
ATT			9.000	450	497720.442	104641.507	1.050
RE1	0.001	4.00	9.400	150	497722.948	104684.432	0.500
RE2	0.001	4.00	9.400	450	497724.835	104675.465	0.500
RE3	0.001	4.00	9.400	450	497726.749	104666.824	0.500
RE4	0.001	4.00	9.400	450	497728.965	104658.091	0.500
RE5	0.001	4.00	9.400	150	497738.204	104621.620	0.650
RE6	0.001	4.00	9.400	150	497739.410	104612.639	0.650
RE7	0.001	4.00	9.300	150	497740.710	104603.779	0.600
RE8	0.001	4.00	9.300	150	497740.898	104598.666	0.600
1			9.200		497713.581	104672.994	0.700
2			9.200		497715.435	104664.401	0.795
3			9.200		497726.647	104619.715	1.589
4			9.200		497728.124	104610.955	1.678
5			9.200		497729.804	104602.194	1.767
Existing Ditch 1			8.550		497719.972	104596.151	1.630
Existing Ditch 2			8.550		497720.162	104593.990	1.652

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)
1.001	S1	1	8.898	0.600	8.600	8.504	0.096	93.0	100	4.34	50.0
1.004	S2	ATT	10.300	0.600	8.294	8.191	0.103	100.0	100	4.96	50.0
1.005	ATT	S3	7.700	0.600	7.950	7.873	0.077	100.0	100	5.13	50.0
1.006	S3	S4	5.331	0.600	7.720	7.667	0.053	100.0	100	5.24	50.0
1.007	S4	3	5.608	0.600	7.667	7.611	0.056	100.0	100	5.37	50.0
1.000	RE1	S1	11.445	0.600	8.900	8.600	0.300	38.2	100	4.15	50.0

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)
1.001	0.798	6.3	0.5	0.500	0.596	0.003	0.0	20	0.485
1.004	0.769	6.0	2.9	0.806	0.709	0.016	0.0	49	0.761
1.005	0.769	6.0	2.9	0.950	1.227	0.016	0.0	49	0.761
1.006	0.769	6.0	3.3	1.380	1.433	0.018	0.0	52	0.781
1.007	0.769	6.0	3.8	1.433	1.489	0.021	0.0	57	0.812
1.000	1.252	9.8	0.2	0.400	0.500	0.001	0.0	10	0.481

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)
2.000	RE2	1	11.522	0.600	8.900	8.500	0.400	28.8	100	4.13	50.0
3.000	RE3	2	11.571	0.600	8.900	8.405	0.495	23.4	100	4.12	50.0
4.000	RE4	S2	12.028	0.600	8.900	8.294	0.606	19.8	100	4.12	50.0
8.000	RE8	S5	10.406	0.600	8.700	7.391	1.309	7.9	100	4.06	50.0
5.000	RE5	3	11.713	0.600	8.750	7.611	1.139	10.3	100	4.08	50.0
6.000	RE6	4	11.411	0.600	8.750	7.522	1.228	9.3	100	4.07	50.0
7.000	RE7	5	11.021	0.600	8.700	7.433	1.267	8.7	100	4.07	50.0
1.011	S5	Existing Ditch 1	5.700	0.600	7.391	7.330	0.061	93.4	150	5.93	50.0
1.012	Existing Ditch 1	Existing Ditch 2	2.169	0.030	6.920	6.898	0.022	98.6	1300	5.95	50.0
1.002	1	2	8.791	0.600	8.500	8.405	0.095	93.0	100	4.52	50.0
1.003	2	S2	10.327	0.600	8.405	8.294	0.111	93.0	100	4.74	50.0
1.008	3	4	8.884	0.600	7.611	7.522	0.089	100.0	100	5.56	50.0
1.009	4	5	8.921	0.600	7.522	7.433	0.089	100.0	100	5.75	50.0
1.010	5	S5	4.227	0.600	7.433	7.391	0.042	100.0	100	5.84	50.0

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)
2.000	1.443	11.3	0.2	0.400	0.600	0.001	0.0	9	0.525
3.000	1.603	12.6	0.2	0.400	0.695	0.001	0.0	8	0.549
4.000	1.741	13.7	0.2	0.400	0.806	0.001	0.0	8	0.596
8.000	2.758	21.7	0.2	0.500	1.709	0.001	0.0	7	0.820
5.000	2.424	19.0	0.2	0.550	1.489	0.001	0.0	7	0.719
6.000	2.550	20.0	0.2	0.550	1.578	0.001	0.0	7	0.757
7.000	2.636	20.7	0.2	0.500	1.667	0.001	0.0	7	0.783
1.011	1.040	18.4	5.1	1.659	1.070	0.028	0.0	54	0.888
1.012	2.488	10028.6	5.1	0.330	0.352	0.028	0.0	30	0.299
1.002	0.798	6.3	0.7	0.600	0.695	0.004	0.0	23	0.530
1.003	0.798	6.3	0.9	0.695	0.806	0.005	0.0	25	0.562
1.008	0.769	6.0	4.0	1.489	1.578	0.022	0.0	59	0.819
1.009	0.769	6.0	4.2	1.578	1.667	0.023	0.0	61	0.830
1.010	0.769	6.0	4.3	1.667	1.709	0.024	0.0	63	0.837

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)
1.001	8.898	93.0	100	Circular	9.200	8.600	0.500	9.200	8.504	0.596
1.004	10.300	100.0	100	Circular	9.200	8.294	0.806	9.000	8.191	0.709
1.005	7.700	100.0	100	Circular	9.000	7.950	0.950	9.200	7.873	1.227
1.006	5.331	100.0	100	Circular	9.200	7.720	1.380	9.200	7.667	1.433
1.007	5.608	100.0	100	Circular	9.200	7.667	1.433	9.200	7.611	1.489
1.000	11.445	38.2	100	Circular	9.400	8.900	0.400	9.200	8.600	0.500

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	S1	450	Manhole	Adoptable	1		Junction	
1.004	S2	450	Manhole	Adoptable	ATT	450	Manhole	Adoptable
1.005	ATT	450	Manhole	Adoptable	S3	450	Manhole	Adoptable
1.006	S3	450	Manhole	Adoptable	S4	450	Manhole	Adoptable
1.007	S4	450	Manhole	Adoptable	3		Junction	
1.000	RE1	150	Manhole	Adoptable	S1	450	Manhole	Adoptable

Pipeline Schedule

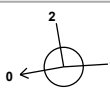
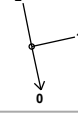
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.000	11.522	28.8	100	Circular	9.400	8.900	0.400	9.200	8.500	0.600
3.000	11.571	23.4	100	Circular	9.400	8.900	0.400	9.200	8.405	0.695
4.000	12.028	19.8	100	Circular	9.400	8.900	0.400	9.200	8.294	0.806
8.000	10.406	7.9	100	Circular	9.300	8.700	0.500	9.200	7.391	1.709
5.000	11.713	10.3	100	Circular	9.400	8.750	0.550	9.200	7.611	1.489
6.000	11.411	9.3	100	Circular	9.400	8.750	0.550	9.200	7.522	1.578
7.000	11.021	8.7	100	Circular	9.300	8.700	0.500	9.200	7.433	1.667
1.011	5.700	93.4	150	Circular	9.200	7.391	1.659	8.550	7.330	1.070
1.012	2.169	98.6	1300	Swale	8.550	6.920	0.330	8.550	6.898	0.352
1.002	8.791	93.0	100	Circular	9.200	8.500	0.600	9.200	8.405	0.695
1.003	10.327	93.0	100	Circular	9.200	8.405	0.695	9.200	8.294	0.806
1.008	8.884	100.0	100	Circular	9.200	7.611	1.489	9.200	7.522	1.578
1.009	8.921	100.0	100	Circular	9.200	7.522	1.578	9.200	7.433	1.667
1.010	4.227	100.0	100	Circular	9.200	7.433	1.667	9.200	7.391	1.709

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	RE2	450	Manhole	Adoptable	1		Junction	
3.000	RE3	450	Manhole	Adoptable	2		Junction	
4.000	RE4	450	Manhole	Adoptable	S2	450	Manhole	Adoptable
8.000	RE8	150	Manhole	Adoptable	S5	600	Manhole	Adoptable
5.000	RE5	150	Manhole	Adoptable	3		Junction	
6.000	RE6	150	Manhole	Adoptable	4		Junction	
7.000	RE7	150	Manhole	Adoptable	5		Junction	
1.011	S5	600	Manhole	Adoptable	Existing Ditch 1		Junction	
1.012	Existing Ditch 1		Junction		Existing Ditch 2		Junction	
1.002	1		Junction		2		Junction	
1.003	2		Junction		S2	450	Manhole	Adoptable
1.008	3		Junction		4		Junction	
1.009	4		Junction		5		Junction	
1.010	5		Junction		S5	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	497711.829	104681.718	9.200	0.600	450	 1 0	1.000	8.600	100
S2	497717.552	104654.293	9.200	0.906	450	 2 1 0	4.000 1.003	8.294 8.294	100 100
S3	497723.010	104629.830	9.200	1.480	450	 1 0	1.005	7.873	100
S4	497725.736	104625.249	9.200	1.533	450	 1 0	1.006	7.720	100
						 1 0	1.007	7.667	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S5	497730.512	104598.027	9.200	1.809	600		1	8.000	7.391	100
							2	1.010	7.391	100
							0	1.011	7.391	150
ATT	497720.442	104641.507	9.000	1.050	450		1	1.004	8.191	100
0	1.005	7.950	100							
RE1	497722.948	104684.432	9.400	0.500	150		0	1.000	8.900	100
RE2	497724.835	104675.465	9.400	0.500	450			0	2.000	8.900
RE3	497726.749	104666.824	9.400	0.500	450			0	3.000	8.900
RE4	497728.965	104658.091	9.400	0.500	450			0	4.000	8.900
RE5	497738.204	104621.620	9.400	0.650	150			0	5.000	8.750
RE6	497739.410	104612.639	9.400	0.650	150			0	6.000	8.750
RE7	497740.710	104603.779	9.300	0.600	150			0	7.000	8.700
RE8	497740.898	104598.666	9.300	0.600	150			0	8.000	8.700
1	497713.581	104672.994	9.200	0.700				1	2.000	8.500
							2	1.001	8.504	100
2	497715.435	104664.401	9.200	0.795			0	1.002	8.500	100
							1	3.000	8.405	100
							2	1.002	8.405	100
3	497726.647	104619.715	9.200	1.589			0	1.003	8.405	100
							1	5.000	7.611	100
							2	1.007	7.611	100
							0	1.008	7.611	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
4	497728.124	104610.955	9.200	1.678		1	6.000	7.522	100
						2	1.008	7.522	100
						0	1.009	7.522	100
						0	1.009	7.522	100
5	497729.804	104602.194	9.200	1.767		1	7.000	7.433	100
						2	1.009	7.433	100
						0	1.010	7.433	100
						0	1.010	7.433	100
Existing Ditch 1	497719.972	104596.151	8.550	1.630		1	1.011	7.330	150
						0	1.012	6.920	1300
Existing Ditch 2	497720.162	104593.990	8.550	1.652		1	1.012	6.898	1300
						0	1.012	6.898	1300

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

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 %)
10	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	0	0

Node Existing Ditch 1 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.300	30	1.300	60	1.300	90	1.300	120	1.300
10	1.300	40	1.300	70	1.300	100	1.300		
20	1.300	50	1.300	80	1.300	110	1.300		

Node Existing Ditch 2 Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		

Applies to All storms

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.300	30	1.300	60	1.300	90	1.300	120	1.300
10	1.300	40	1.300	70	1.300	100	1.300		
20	1.300	50	1.300	80	1.300	110	1.300		

Node S5 Online Orifice Control

Flap Valve	✓	Design Depth (m)	1.000	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	7.391	Diameter (m)	0.020		

Node ATT Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	7.950	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	180	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	7.000	Number Required	1
Porosity	0.95	Pit Length (m)	5.000		

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	8.630	0.030	1.2	0.0047	0.0000	OK
15 minute summer	S2	11	8.382	0.088	6.3	0.0140	0.0000	OK
180 minute winter	S3	132	8.027	0.307	1.7	0.0488	0.0000	SURCHARGED
180 minute winter	S4	132	8.026	0.359	1.6	0.0572	0.0000	SURCHARGED
180 minute winter	S5	132	8.024	0.633	0.9	0.1791	0.0000	SURCHARGED
180 minute winter	ATT	132	8.027	0.077	1.5	2.5764	0.0000	OK
15 minute winter	RE1	10	8.914	0.014	0.4	0.0002	0.0000	OK
15 minute winter	RE2	10	8.913	0.013	0.4	0.0020	0.0000	OK
15 minute winter	RE3	10	8.912	0.012	0.4	0.0020	0.0000	OK
15 minute winter	RE4	10	8.912	0.012	0.4	0.0019	0.0000	OK
15 minute winter	RE5	10	8.760	0.010	0.4	0.0002	0.0000	OK
15 minute summer	RE6	10	8.760	0.010	0.4	0.0002	0.0000	OK
15 minute winter	RE7	10	8.710	0.010	0.4	0.0002	0.0000	OK
15 minute winter	RE8	10	8.710	0.010	0.4	0.0002	0.0000	OK
15 minute summer	1	10	8.533	0.033	1.6	0.0000	0.0000	OK
15 minute summer	2	11	8.443	0.038	1.9	0.0000	0.0000	OK
180 minute winter	3	132	8.026	0.415	1.4	0.0000	0.0000	SURCHARGED
180 minute winter	4	132	8.025	0.503	1.1	0.0000	0.0000	SURCHARGED
180 minute winter	5	132	8.024	0.591	1.0	0.0000	0.0000	SURCHARGED
180 minute winter	Existing Ditch 1	132	6.931	0.011	0.7	0.0000	0.0000	OK
180 minute winter	Existing Ditch 2	132	6.903	0.005	0.7	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 summer	S1	1.001	1	1.2	0.607	0.187	0.0172	
15 minute summer	S2	1.004	ATT	5.9	0.849	0.980	0.0716	
180 minute winter	S3	1.006	S4	1.3	0.516	0.212	0.0417	
180 minute winter	S4	1.007	3	1.3	0.542	0.215	0.0439	
180 minute winter	S5	Orifice	Existing Ditch 1	0.7				
180 minute winter	ATT	1.005	S3	1.5	0.601	0.243	0.0551	
15 minute winter	RE1	1.000	S1	0.4	0.331	0.040	0.0142	
15 minute winter	RE2	2.000	1	0.4	0.306	0.035	0.0159	
15 minute winter	RE3	3.000	2	0.4	0.577	0.032	0.0177	
15 minute winter	RE4	4.000	S2	0.4	0.125	0.029	0.0432	
15 minute winter	RE5	5.000	3	0.4	0.240	0.021	0.0475	
15 minute summer	RE6	6.000	4	0.4	0.566	0.020	0.0466	
15 minute winter	RE7	7.000	5	0.4	0.859	0.019	0.0453	
15 minute winter	RE8	8.000	S5	0.4	0.132	0.018	0.0427	
15 minute summer	1	1.002	2	1.5	0.622	0.241	0.0218	
15 minute summer	2	1.003	S2	1.9	0.388	0.301	0.0515	
180 minute winter	3	1.008	4	1.0	0.501	0.171	0.0695	
180 minute winter	4	1.009	5	0.9	0.355	0.142	0.0698	
180 minute winter	5	1.010	S5	0.6	0.143	0.107	0.0331	
180 minute winter	Existing Ditch 1	1.012	Existing Ditch 2	0.7	0.152	0.000	0.0094	9.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	8.635	0.035	1.6	0.0055	0.0000	OK
15 minute summer	S2	11	8.443	0.149	8.2	0.0236	0.0000	SURCHARGED
120 minute summer	S3	100	8.068	0.348	3.1	0.0554	0.0000	SURCHARGED
120 minute summer	S4	100	8.068	0.401	3.0	0.0637	0.0000	SURCHARGED
120 minute summer	S5	100	8.065	0.674	1.4	0.1907	0.0000	SURCHARGED
120 minute summer	ATT	100	8.069	0.119	3.8	3.9660	0.0000	SURCHARGED
15 minute winter	RE1	10	8.915	0.015	0.5	0.0003	0.0000	OK
15 minute winter	RE2	10	8.914	0.014	0.5	0.0023	0.0000	OK
15 minute winter	RE3	10	8.914	0.014	0.5	0.0022	0.0000	OK
15 minute summer	RE4	10	8.913	0.013	0.5	0.0021	0.0000	OK
15 minute winter	RE5	10	8.761	0.011	0.5	0.0002	0.0000	OK
15 minute winter	RE6	10	8.761	0.011	0.5	0.0002	0.0000	OK
15 minute winter	RE7	10	8.711	0.011	0.5	0.0002	0.0000	OK
15 minute winter	RE8	10	8.711	0.011	0.5	0.0002	0.0000	OK
15 minute summer	1	10	8.539	0.039	2.1	0.0000	0.0000	OK
15 minute summer	2	11	8.456	0.051	2.5	0.0000	0.0000	OK
120 minute summer	3	100	8.067	0.456	2.5	0.0000	0.0000	SURCHARGED
120 minute summer	4	100	8.066	0.544	1.9	0.0000	0.0000	SURCHARGED
120 minute summer	5	100	8.065	0.632	1.3	0.0000	0.0000	SURCHARGED
120 minute summer	Existing Ditch 1	100	6.931	0.011	0.7	0.0000	0.0000	OK
120 minute summer	Existing Ditch 2	100	6.904	0.006	0.7	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 summer	S1	1.001	1	1.6	0.653	0.253	0.0216	
15 minute summer	S2	1.004	ATT	7.3	0.933	1.203	0.0772	
120 minute summer	S3	1.006	S4	2.4	0.539	0.393	0.0417	
120 minute summer	S4	1.007	3	2.3	0.590	0.383	0.0439	
120 minute summer	S5	Orifice	Existing Ditch 1	0.7				
120 minute summer	ATT	1.005	S3	2.7	0.694	0.449	0.0602	
15 minute winter	RE1	1.000	S1	0.5	0.348	0.051	0.0169	
15 minute winter	RE2	2.000	1	0.5	0.396	0.044	0.0191	
15 minute winter	RE3	3.000	2	0.5	0.633	0.040	0.0213	
15 minute summer	RE4	4.000	S2	0.5	0.132	0.036	0.0507	
15 minute winter	RE5	5.000	3	0.5	0.319	0.026	0.0483	
15 minute winter	RE6	6.000	4	0.5	0.770	0.025	0.0473	
15 minute winter	RE7	7.000	5	0.5	0.875	0.024	0.0456	
15 minute winter	RE8	8.000	S5	0.5	0.152	0.023	0.0430	
15 minute summer	1	1.002	2	2.0	0.671	0.322	0.0298	
15 minute summer	2	1.003	S2	2.4	0.381	0.380	0.0612	
120 minute summer	3	1.008	4	1.7	0.508	0.281	0.0695	
120 minute summer	4	1.009	5	1.1	0.365	0.186	0.0698	
120 minute summer	5	1.010	S5	0.7	0.148	0.109	0.0331	
120 minute summer	Existing Ditch 1	1.012	Existing Ditch 2	0.7	0.154	0.000	0.0096	11.0

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	8.641	0.041	2.2	0.0066	0.0000	OK
15 minute summer	S2	11	8.545	0.251	10.1	0.0400	0.0000	SURCHARGED
120 minute winter	S3	112	8.182	0.462	2.5	0.0734	0.0000	SURCHARGED
120 minute winter	S4	112	8.181	0.514	2.6	0.0817	0.0000	SURCHARGED
120 minute winter	S5	114	8.178	0.787	1.3	0.2226	0.0000	SURCHARGED
120 minute winter	ATT	112	8.182	0.232	4.2	7.7540	0.0000	SURCHARGED
15 minute winter	RE1	10	8.918	0.018	0.7	0.0003	0.0000	OK
15 minute winter	RE2	10	8.917	0.017	0.7	0.0027	0.0000	OK
15 minute summer	RE3	10	8.916	0.016	0.7	0.0026	0.0000	OK
15 minute winter	RE4	10	8.915	0.015	0.7	0.0025	0.0000	OK
15 minute winter	RE5	10	8.763	0.013	0.7	0.0002	0.0000	OK
15 minute winter	RE6	10	8.763	0.013	0.7	0.0002	0.0000	OK
15 minute winter	RE7	10	8.713	0.013	0.7	0.0002	0.0000	OK
15 minute winter	RE8	10	8.712	0.012	0.7	0.0002	0.0000	OK
15 minute summer	1	12	8.571	0.071	2.9	0.0000	0.0000	OK
15 minute summer	2	11	8.560	0.155	3.5	0.0000	0.0000	SURCHARGED
120 minute winter	3	114	8.180	0.569	2.3	0.0000	0.0000	SURCHARGED
120 minute winter	4	114	8.179	0.657	1.7	0.0000	0.0000	SURCHARGED
120 minute winter	5	114	8.178	0.745	1.2	0.0000	0.0000	SURCHARGED
120 minute winter	Existing Ditch 1	114	6.932	0.012	0.7	0.0000	0.0000	OK
120 minute winter	Existing Ditch 2	114	6.904	0.006	0.7	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 summer	S1	1.001	1	2.2	0.697	0.350	0.0357	
15 minute summer	S2	1.004	ATT	8.9	1.138	1.475	0.0792	
120 minute winter	S3	1.006	S4	2.0	0.540	0.338	0.0417	
120 minute winter	S4	1.007	3	2.1	0.577	0.346	0.0439	
120 minute winter	S5	Orifice	Existing Ditch 1	0.7				
120 minute winter	ATT	1.005	S3	2.1	0.648	0.341	0.0602	
15 minute winter	RE1	1.000	S1	0.7	0.377	0.071	0.0218	
15 minute winter	RE2	2.000	1	0.7	0.501	0.062	0.0261	
15 minute summer	RE3	3.000	2	0.7	0.645	0.056	0.0500	
15 minute winter	RE4	4.000	S2	0.7	0.135	0.051	0.0517	
15 minute winter	RE5	5.000	3	0.7	0.436	0.037	0.0494	
15 minute winter	RE6	6.000	4	0.7	0.823	0.035	0.0480	
15 minute winter	RE7	7.000	5	0.7	0.877	0.034	0.0463	
15 minute winter	RE8	8.000	S5	0.7	0.167	0.032	0.0436	
15 minute summer	1	1.002	2	2.8	0.645	0.452	0.0604	
15 minute summer	2	1.003	S2	4.1	0.526	0.656	0.0808	
120 minute winter	3	1.008	4	1.5	0.504	0.256	0.0695	
120 minute winter	4	1.009	5	1.0	0.425	0.169	0.0698	
120 minute winter	5	1.010	S5	0.7	0.150	0.118	0.0331	
120 minute winter	Existing Ditch 1	1.012	Existing Ditch 2	0.7	0.159	0.000	0.0100	16.2

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

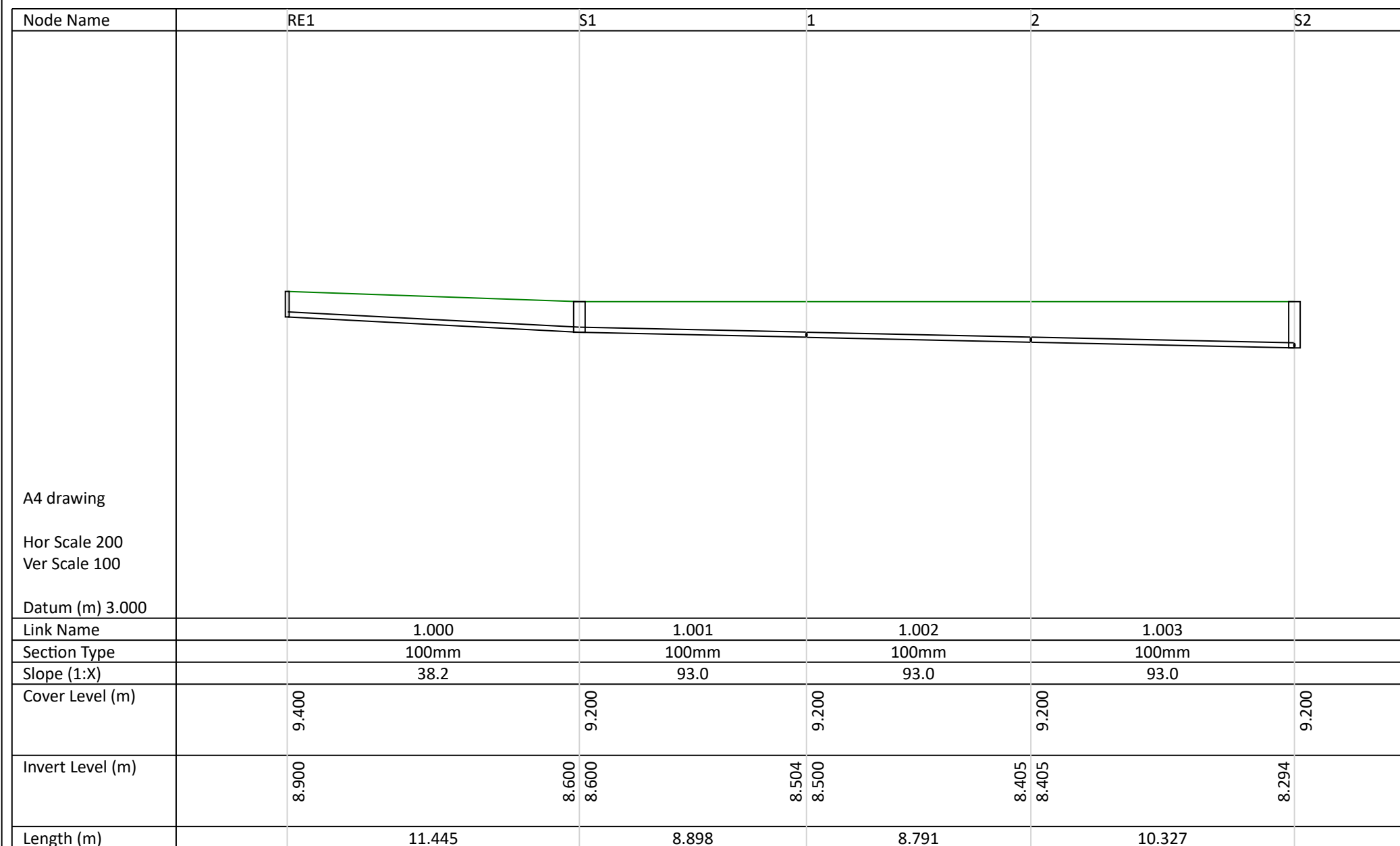
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	10	8.639	0.039	2.0	0.0062	0.0000	OK
15 minute summer	S2	11	8.508	0.214	9.5	0.0340	0.0000	SURCHARGED
120 minute winter	S3	104	8.139	0.419	2.7	0.0667	0.0000	SURCHARGED
120 minute winter	S4	104	8.139	0.472	2.5	0.0750	0.0000	SURCHARGED
120 minute winter	S5	102	8.136	0.745	1.2	0.2107	0.0000	SURCHARGED
120 minute winter	ATT	104	8.140	0.190	4.2	6.3402	0.0000	SURCHARGED
15 minute summer	RE1	10	8.918	0.018	0.7	0.0003	0.0000	OK
15 minute summer	RE2	10	8.917	0.017	0.7	0.0027	0.0000	OK
15 minute summer	RE3	10	8.916	0.016	0.7	0.0026	0.0000	OK
15 minute summer	RE4	10	8.915	0.015	0.7	0.0025	0.0000	OK
15 minute summer	RE5	10	8.763	0.013	0.7	0.0002	0.0000	OK
15 minute summer	RE6	10	8.763	0.013	0.7	0.0002	0.0000	OK
15 minute summer	RE7	10	8.713	0.013	0.7	0.0002	0.0000	OK
15 minute summer	RE8	10	8.712	0.012	0.7	0.0002	0.0000	OK
15 minute summer	1	10	8.545	0.045	2.7	0.0000	0.0000	OK
15 minute summer	2	11	8.532	0.127	3.3	0.0000	0.0000	SURCHARGED
120 minute winter	3	104	8.138	0.527	2.1	0.0000	0.0000	SURCHARGED
120 minute winter	4	102	8.137	0.615	1.6	0.0000	0.0000	SURCHARGED
120 minute winter	5	102	8.136	0.703	1.2	0.0000	0.0000	SURCHARGED
120 minute winter	Existing Ditch 1	104	6.932	0.012	0.7	0.0000	0.0000	OK
120 minute winter	Existing Ditch 2	104	6.904	0.006	0.7	0.0000	0.0000	OK

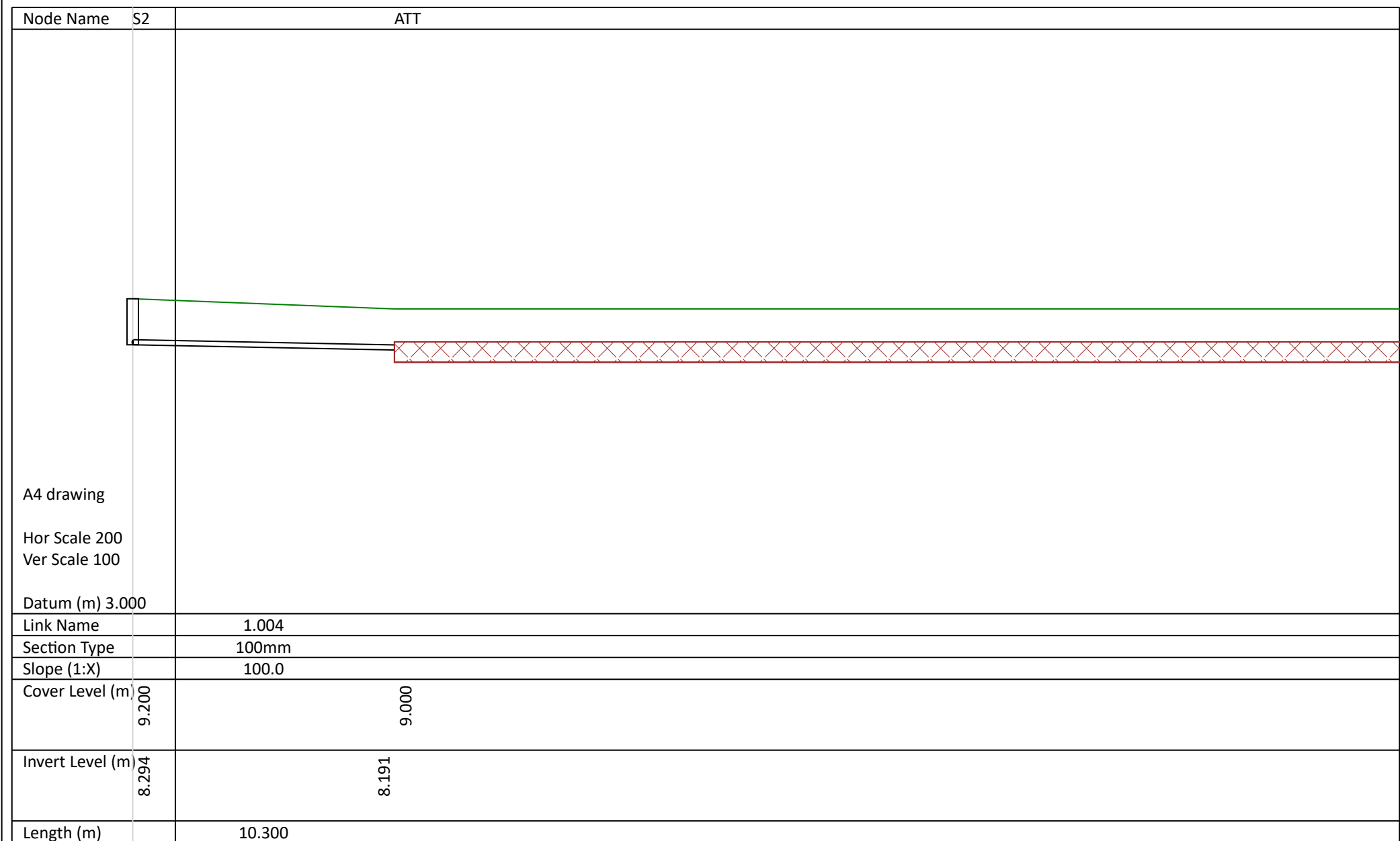
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.001	1	2.0	0.678	0.317	0.0261	
15 minute summer	S2	1.004	ATT	8.4	1.070	1.385	0.0786	
120 minute winter	S3	1.006	S4	2.0	0.539	0.323	0.0417	
120 minute winter	S4	1.007	3	1.9	0.576	0.315	0.0439	
120 minute winter	S5	Orifice	Existing Ditch 1	0.7				
120 minute winter	ATT	1.005	S3	2.3	0.662	0.375	0.0602	
15 minute summer	RE1	1.000	S1	0.7	0.377	0.071	0.0218	
15 minute summer	RE2	2.000	1	0.7	0.501	0.062	0.0246	
15 minute summer	RE3	3.000	2	0.7	0.649	0.055	0.0493	
15 minute summer	RE4	4.000	S2	0.7	0.135	0.051	0.0517	
15 minute summer	RE5	5.000	3	0.7	0.464	0.037	0.0494	
15 minute summer	RE6	6.000	4	0.7	0.827	0.035	0.0480	
15 minute summer	RE7	7.000	5	0.7	0.877	0.034	0.0463	
15 minute summer	RE8	8.000	S5	0.7	0.189	0.032	0.0436	
15 minute summer	1	1.002	2	2.6	0.691	0.416	0.0489	
15 minute summer	2	1.003	S2	3.8	0.521	0.605	0.0808	
120 minute winter	3	1.008	4	1.4	0.502	0.237	0.0695	
120 minute winter	4	1.009	5	1.0	0.425	0.163	0.0698	
120 minute winter	5	1.010	S5	0.7	0.150	0.115	0.0331	
120 minute winter	Existing Ditch 1	1.012	Existing Ditch 2	0.7	0.157	0.000	0.0098	14.4

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	12	8.698	0.098	2.9	0.0156	0.0000	OK
15 minute summer	S2	11	8.656	0.362	12.3	0.0576	0.0000	SURCHARGED
180 minute winter	S3	160	8.300	0.580	2.0	0.0922	0.0000	SURCHARGED
180 minute winter	S4	160	8.299	0.632	1.9	0.1005	0.0000	SURCHARGED
180 minute winter	S5	164	8.295	0.904	1.0	0.2558	0.0000	SURCHARGED
180 minute winter	ATT	160	8.300	0.350	4.0	11.7061	0.0000	SURCHARGED
15 minute summer	RE1	10	8.922	0.022	1.0	0.0004	0.0000	OK
15 minute summer	RE2	10	8.920	0.020	1.0	0.0032	0.0000	OK
15 minute summer	RE3	10	8.919	0.019	1.0	0.0030	0.0000	OK
15 minute summer	RE4	10	8.918	0.018	1.0	0.0029	0.0000	OK
15 minute summer	RE5	10	8.766	0.016	1.0	0.0003	0.0000	OK
15 minute summer	RE6	10	8.765	0.015	1.0	0.0003	0.0000	OK
15 minute summer	RE7	10	8.715	0.015	1.0	0.0003	0.0000	OK
15 minute summer	RE8	10	8.715	0.015	1.0	0.0003	0.0000	OK
15 minute summer	1	12	8.689	0.189	3.9	0.0000	0.0000	SURCHARGED
15 minute summer	2	12	8.670	0.265	3.9	0.0000	0.0000	SURCHARGED
180 minute winter	3	160	8.298	0.687	1.6	0.0000	0.0000	SURCHARGED
180 minute winter	4	160	8.297	0.775	1.3	0.0000	0.0000	SURCHARGED
180 minute winter	5	164	8.296	0.863	0.9	0.0000	0.0000	SURCHARGED
180 minute winter	Existing Ditch 1	164	6.932	0.012	0.8	0.0000	0.0000	OK
180 minute winter	Existing Ditch 2	164	6.904	0.006	0.8	0.0000	0.0000	OK

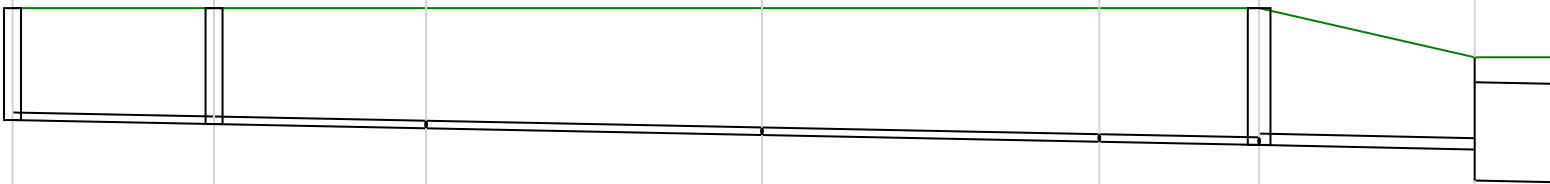
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S1	1.001	1	2.9	0.731	0.461	0.0695	
15 minute summer	S2	1.004	ATT	10.6	1.350	1.750	0.0798	
180 minute winter	S3	1.006	S4	1.5	0.493	0.245	0.0417	
180 minute winter	S4	1.007	3	1.5	0.520	0.253	0.0439	
180 minute winter	S5	Orifice	Existing Ditch 1	0.8				
180 minute winter	ATT	1.005	S3	1.7	0.610	0.278	0.0602	
15 minute summer	RE1	1.000	S1	1.0	0.415	0.102	0.0495	
15 minute summer	RE2	2.000	1	1.0	0.448	0.088	0.0515	
15 minute summer	RE3	3.000	2	1.0	0.645	0.079	0.0513	
15 minute summer	RE4	4.000	S2	1.0	0.188	0.073	0.0530	
15 minute summer	RE5	5.000	3	1.0	0.387	0.053	0.0504	
15 minute summer	RE6	6.000	4	1.0	0.812	0.050	0.0489	
15 minute summer	RE7	7.000	5	1.0	0.877	0.048	0.0472	
15 minute summer	RE8	8.000	S5	1.0	0.195	0.046	0.0444	
15 minute summer	1	1.002	2	3.6	0.701	0.574	0.0688	
15 minute summer	2	1.003	S2	5.0	0.633	0.790	0.0808	
180 minute winter	3	1.008	4	1.2	0.478	0.196	0.0695	
180 minute winter	4	1.009	5	0.8	0.372	0.139	0.0698	
180 minute winter	5	1.010	S5	0.8	0.137	0.126	0.0331	
180 minute winter	Existing Ditch 1	1.012	Existing Ditch 2	0.8	0.164	0.000	0.0104	23.3

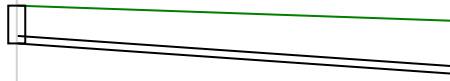


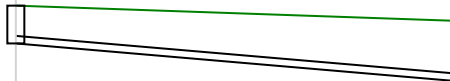


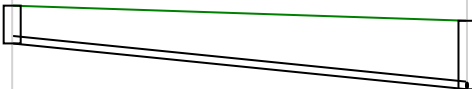


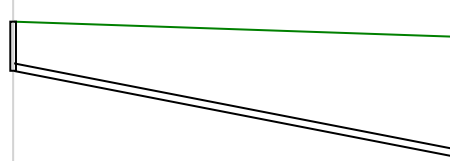
Node Name	ATT	
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000		
Link Name	1.005	
Section Type	100mm	
Slope (1:X)	100.0	
Cover Level (m)	9.000	
Invert Level (m)	7.950	
Length (m)	7.700	

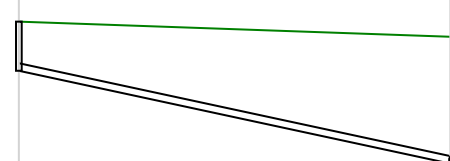
Node Name	S3	S4	3	4	5	S5	Existing	Existing Ditch
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 2.000								
	1.006	1.007	1.008	1.009	1.010	1.011	1.012	
	100mm	100mm	100mm	100mm	100mm	150mm	150mm	150mm
	100.0	100.0	100.0	100.0	100.0	93.4	98.6	98.6
	9.200	9.200	9.200	9.200	9.200	9.200	8.550	8.550
Invert Level (m)	7.720	7.667	7.611	7.522	7.433	7.391	7.330	6.920
Length (m)	5.331	5.608	8.884	8.921	4.227	5.700	2.169	

Node Name	RE2	1
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000		
	2.000	
	100mm	
	28.8	
Cover Level (m)	9.400	9.200
Invert Level (m)	8.900	8.500
Length (m)	11.522	

Node Name	RE3	2
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000		
Link Name	3.000	
Section Type	100mm	
Slope (1:X)	23.4	
Cover Level (m)	9.400	9.200
Invert Level (m)	8.900	8.405
Length (m)	11.571	

Node Name	RE4	S2
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000		
	4.000	
	100mm	
	19.8	
	9.400	9.200
Invert Level (m)	8.900	8.294
Length (m)	12.028	

Node Name	RE5	3
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000 		
Link Name	5.000	
Section Type	100mm	
Slope (1:X)	10.3	
Cover Level (m)	9.400	9.200
Invert Level (m)	8.750	7.611
Length (m)	11.713	

Node Name	RE6	4
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000		
Link Name	6.000	
Section Type	100mm	
Slope (1:X)	9.3	
Cover Level (m)	9.400	9.200
Invert Level (m)	8.750	7.522
Length (m)	11.411	

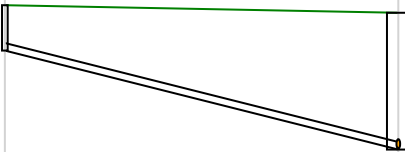


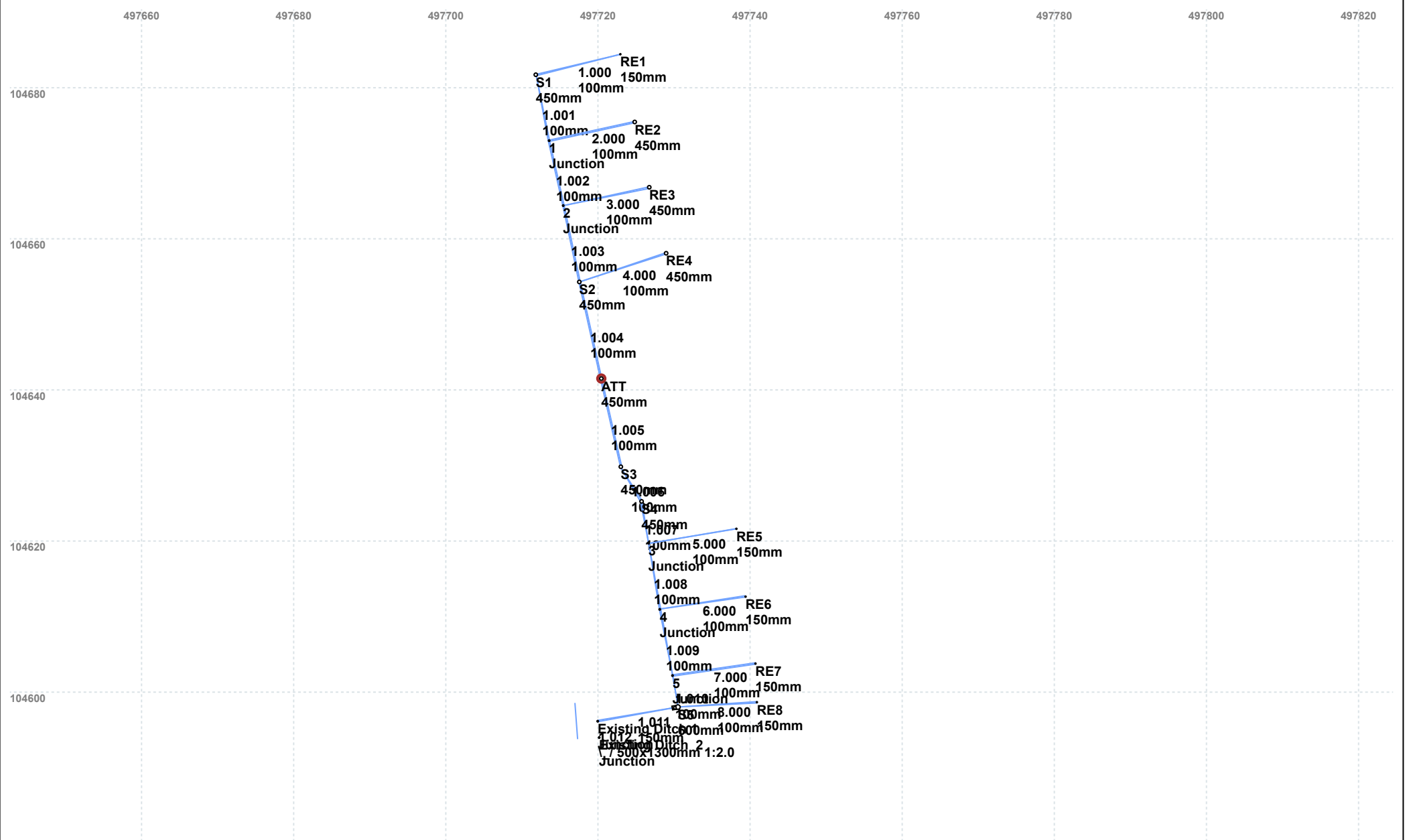
CGS Civils Ltd
Richard Cobden House
Lion Street
Chichester, PO19 1LW

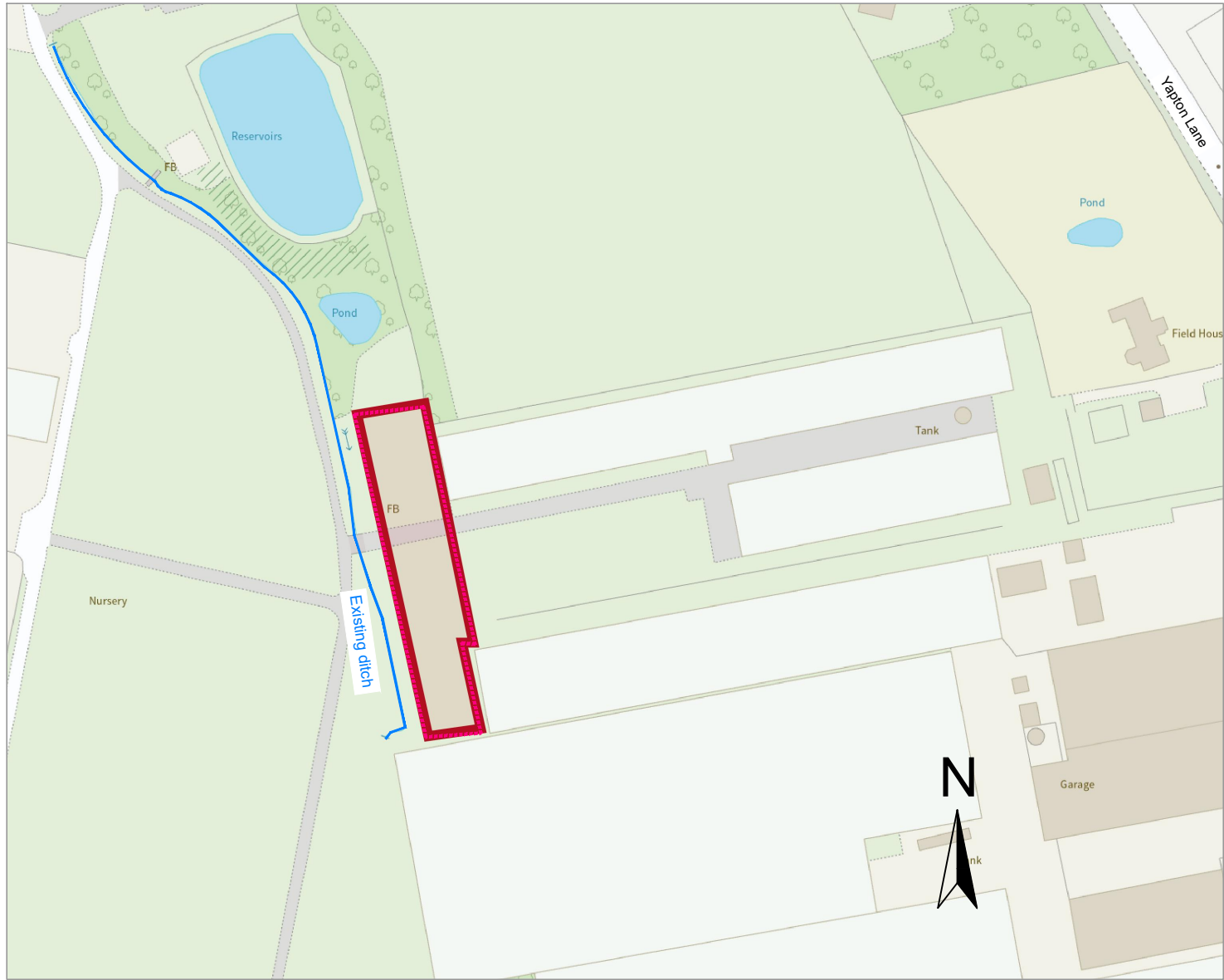
File: Attenuation_1l.pfd
Network: Storm Network
07.03.2025

Page 10
Fleurie Lake Lane,
Barnham
1l/s

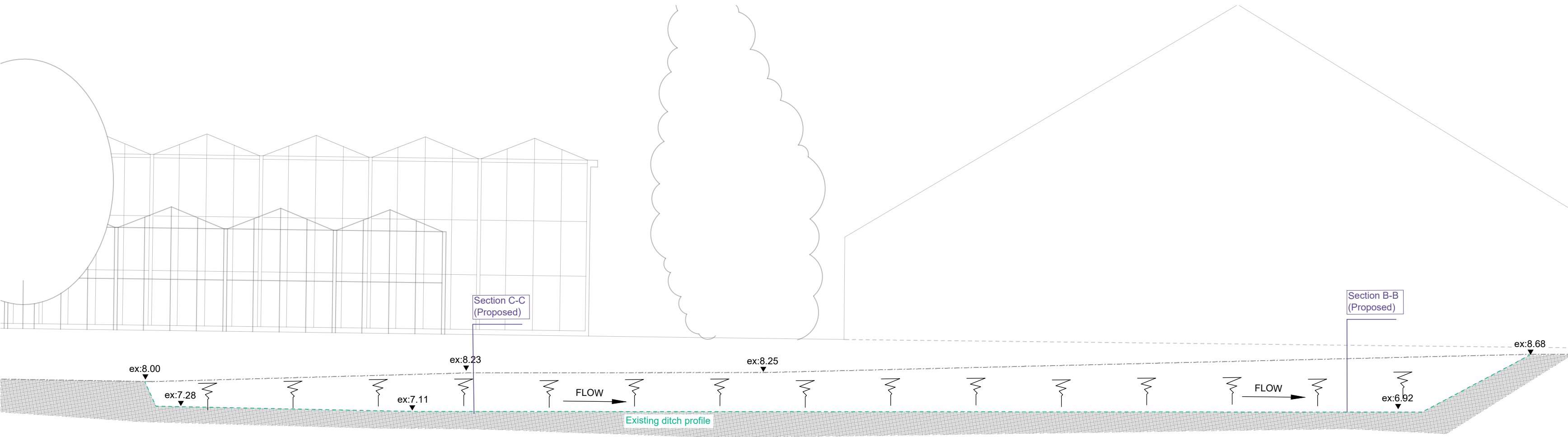
Node Name	RE7		5
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000			
	Link Name		
	Section Type		
	Slope (1:X)		
	Cover Level (m)		
Invert Level (m)	8.700	7.433	
Length (m)	11.021		

Node Name	RE8	S5
A4 drawing Hor Scale 200 Ver Scale 100 Datum (m) 3.000 		
Link Name	8.000	
Section Type	100mm	
Slope (1:X)	7.9	
Cover Level (m)	9.300	9.200
Invert Level (m)	8.700	7.391
Length (m)	10.406	

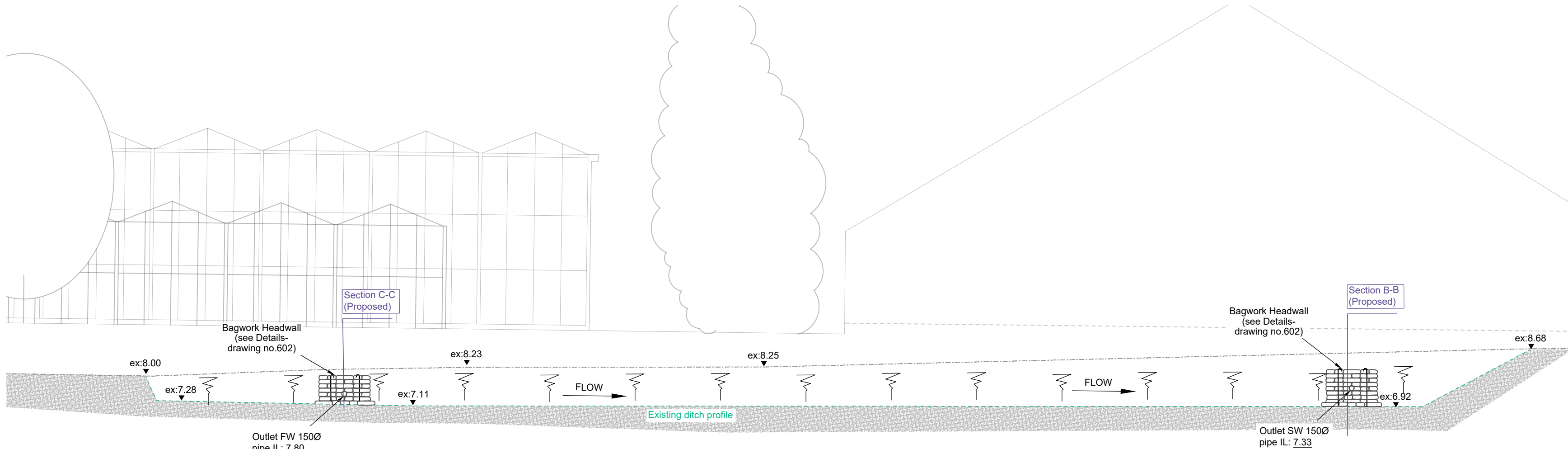




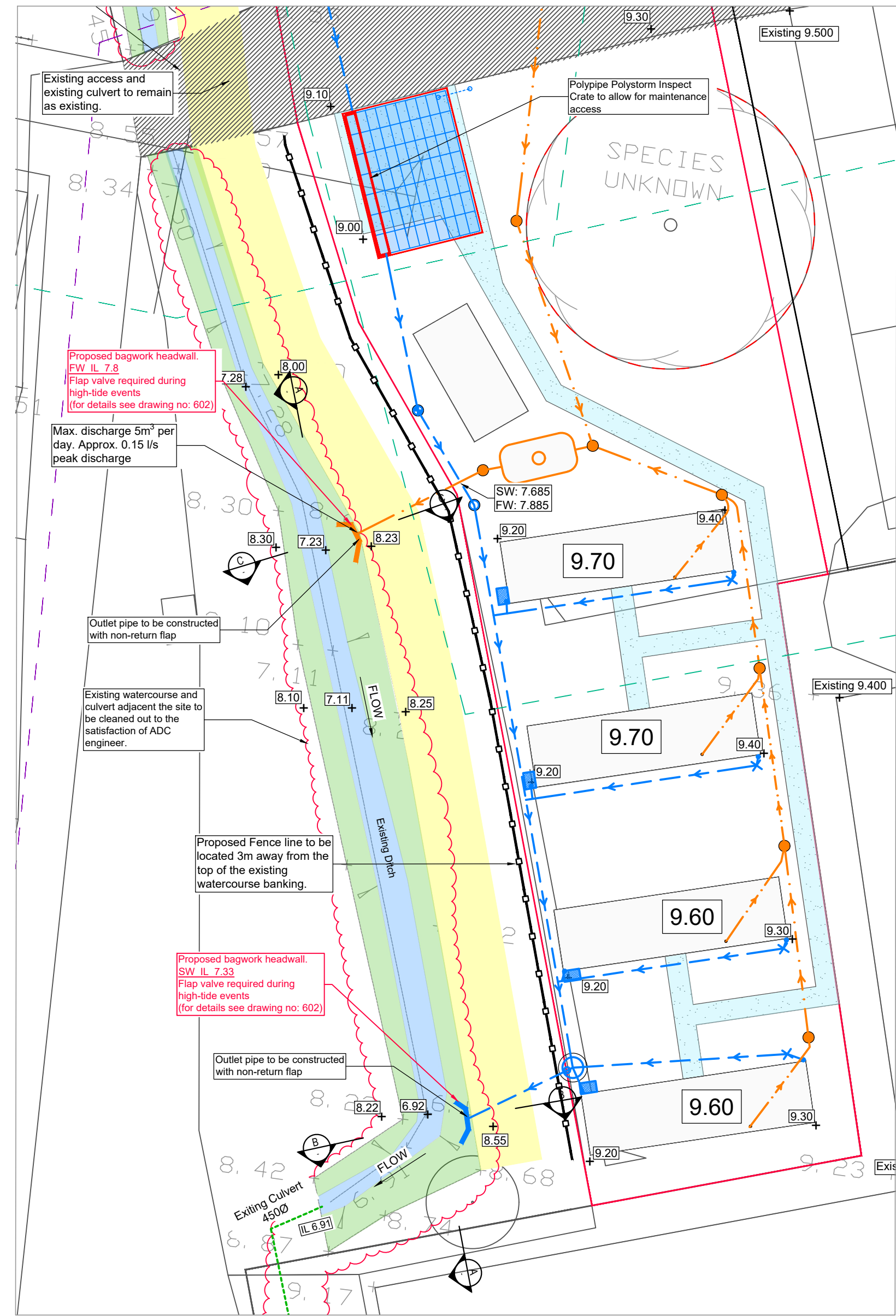
LOCATION PLAN
(scale 1:2500)



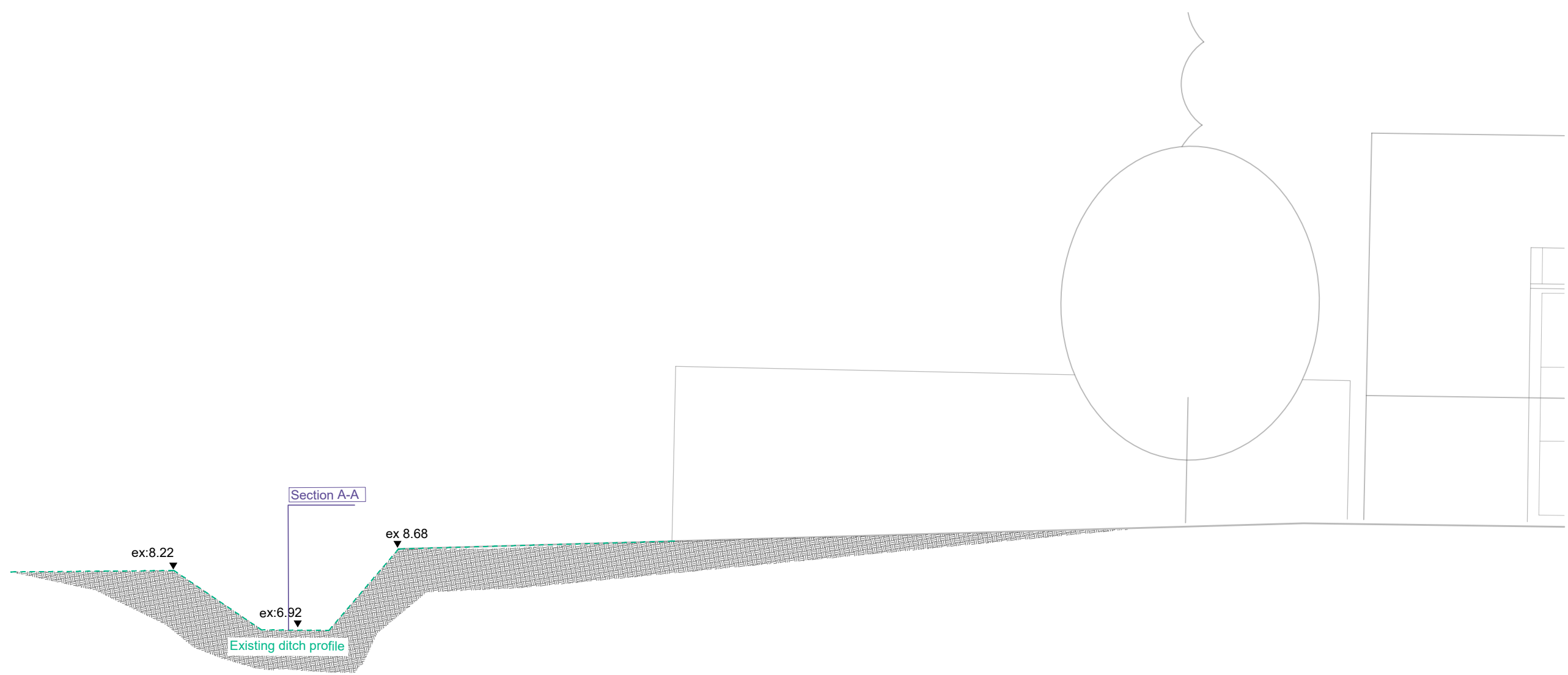
EXISTING DITCH LONGITUDINAL SECTION (A-A)
(scale 1:100)



PROPOSED DITCH LONGITUDINAL SECTION (A-A)
(scale 1:100)



PROPOSED SITE PLAN
(scale 1:200)



EXISTING DITCH SECTION (B-B)
(scale 1:100)

- STANDARD DRAINAGE NOTES
- DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
 - ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
 - THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
 - ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
 - BEFORE COMMENCING CONSTRUCTION THE CONTRACTOR MUST CHECK THE INVERT LEVELS OF EXISTING SEWERS TO WHICH CONNECTIONS ARE MADE. IN ADDITION THE CONTRACTOR MUST LOCATE AND DETERMINE INVERT LEVELS OF THE EXISTING SPURS TO WHICH CONNECTIONS ARE PROPOSED. ANY DISCREPANCIES ARE TO BE NOTIFIED TO THE ENGINEER IMMEDIATELY, PRIOR TO CONSTRUCTION.
 - ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT. THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY.
 - COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
 - ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA.
 - ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911-PART 1.
 - ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
 - ALL ADOPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
 - ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
 - THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
 - STUB CONNECTIONS TO ADOPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
 - IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. SUB SOIL DRAINS ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER.
 - NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
 - ALL EXISTING MANHOLE COVER'S, GULLIES, ETC. ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
 - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT.
 - UPON COMPLETION BUT PRIOR TO HANDOVER, CONTRACTOR TO CARRY OUT FULL CCTV SURVEY OF DRAINAGE SYSTEM WHICH IS TO BE REVIEWED BY ENGINEER TO ENSURE SATISFACTORY INSTALLATION.
 - MANHOLE AND CHAMBER COVER GRADES:

- 'A15' IN ALL LANDSCAPED AREAS AND ON FOOTPATHS
- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD

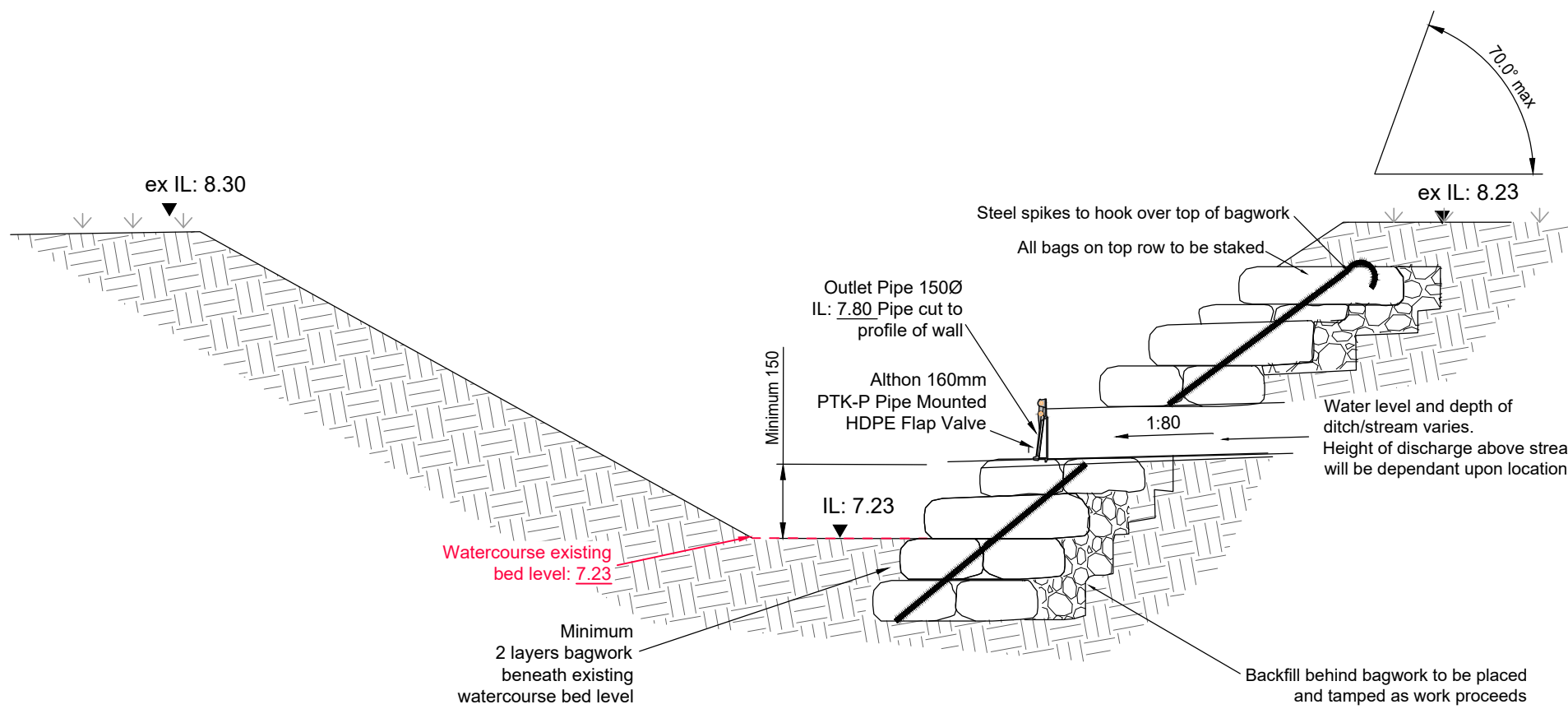
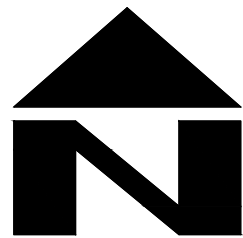
Prefixed to drawing numbers shall signify the following:-

PL = PLANNING	Shall not be used for contract or construction purposes
P = PRELIMINARY	Shall not be used for contract or construction purposes
T = TENDER	Shall not be used for construction purposes
C = CONSTRUCTION	These are the <u>only</u> drawings that shall be used for construction purposes
R = RECORD	Record of actual completed work

P1	13.03.25	UPDATED TO OWC ENGINEER'S COMMENTS	KCK	TZ	CS
P-	12.12.23	PRELIMINARY ISSUE	KCK	TZ	CS
REV	DATE	DESCRIPTION	BY	CHK	APP

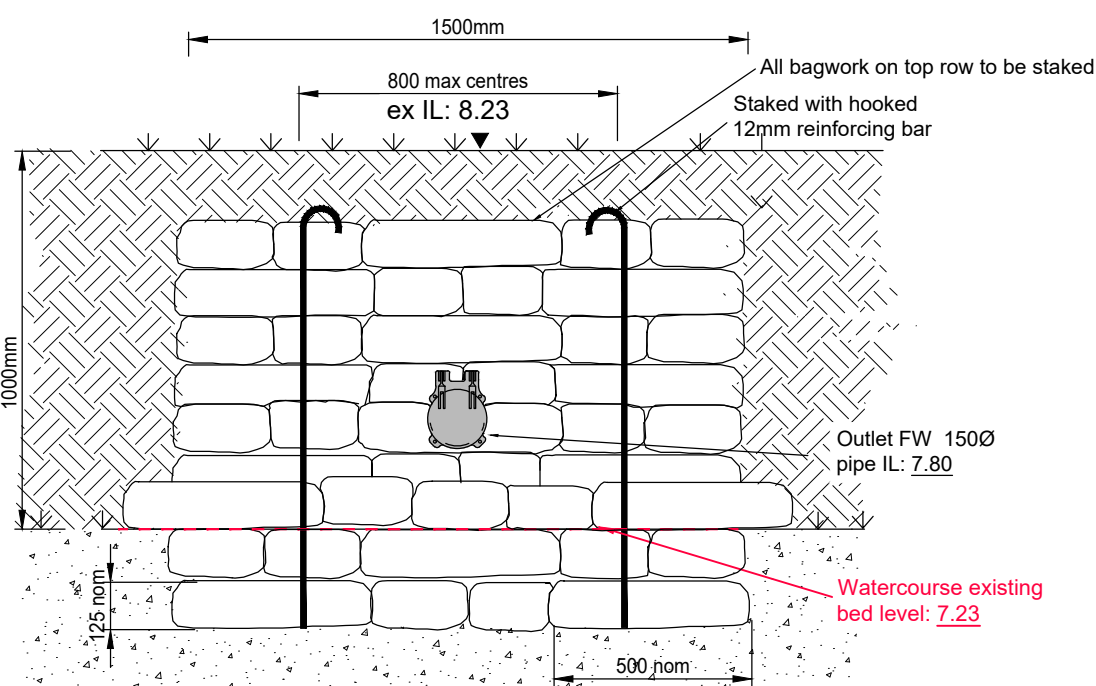
 cgs civils Consulting Civil Engineers				
CLIENT FLEURIE NURSERY LTD				
ARCHITECT DOUGLAS BRIGGS PARTNERSHIP				
JOB TITLE FLEURIE LAKE LANE, BARNHAM, PO22 0AL				
DRAWING TITLE OWC APPLICATION SHEET 1				
DRAWN KCK	ENGINEER TZ	CHECKED CS	APPROVED CS	
DATE DECEMBER 2023		SCALE @ A1 AS SHOWN		
JOB No. C2904	STATUS P	DRAWING No. 601		REV. P1

PRELIMINARY



Headwall section
Outfall to side of ditch

SCALE 1:20

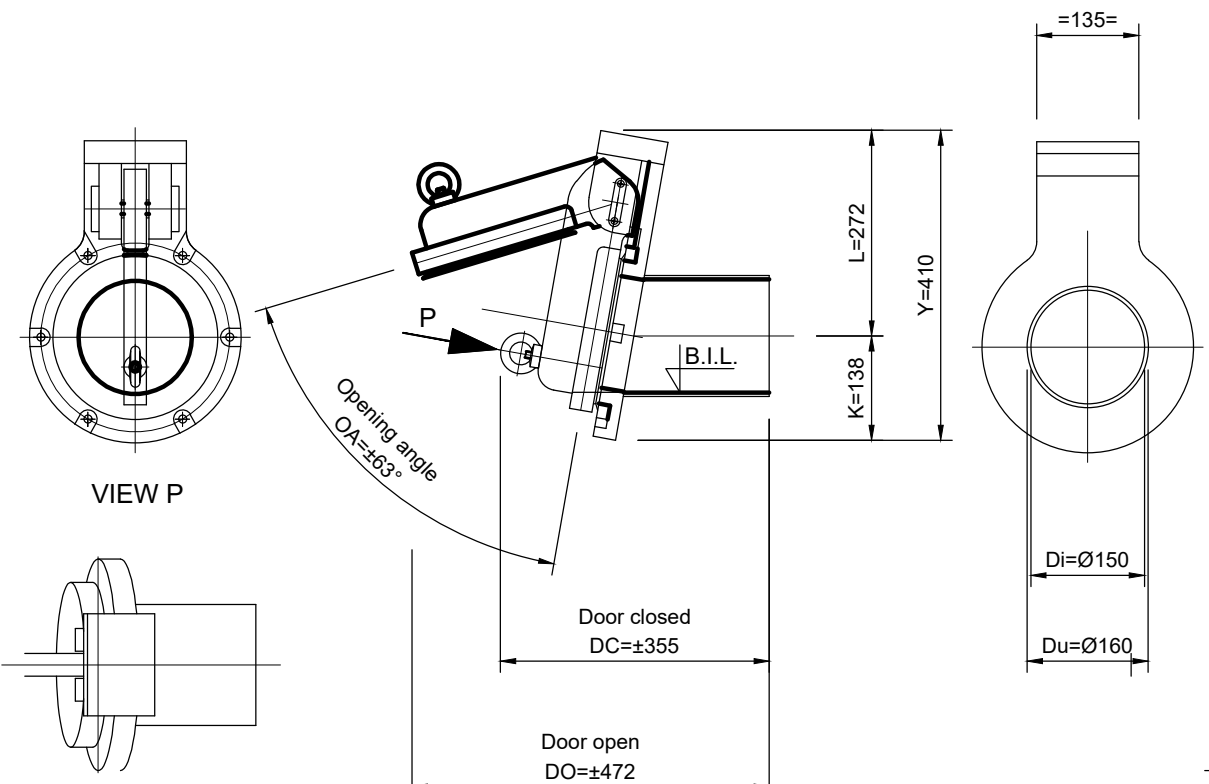


Elevation of headwall
Outfall to pond / side of ditch

SCALE 1:20

OWC Notes

1. Bags shall be of hessian and shall be of size to provide a wall thickness of 500mm.
2. Concrete bagwork shall be to Clause 519 and be three quarter filled with 25mm slump ST4 concrete immediately prior to placing with the ends sewn.
3. The bags shall be placed in a modified fernish bond so as to 'break joint' with the mouths away from the surface and be tamped into position to form a rectangular block.
4. Extent of outlet protection to be the greater of 1500mm or pipe diameter + 1200mm spanning the outlet pipe.
5. Headwall design may need to be adjust to on site conditions following approval from ADC engineer.
6. Ditch to be regraded as requested.
7. All exposed pipework to be certified UV stable.
8. Pipe details to be as specified on supporting drawings.
9. All bags on top rows to be steel spiked.
10. True bed level is established in agreement with the local authority engineer and needs to take account of existing upstream and culvert inverts levels, and hard bed levels of the watercourse.
11. No part of headwall structure to encroach into the profile of the watercourse.



Althon 160mm PTK-P Pipe Mounted Flap Valve

Product: Althon HDPE Flap valve type PTK-P
Application: non-return flap valve suitable for permanent under water use suitable to connect to PVC tube Ø 150mm
Passage: Working Pressure: 1 meter water column permanent from top of opening, 5 meter water column short duration (72 hours) from bottom of opening

All dimensions shown in mm.

Non Return Valve

(not to scale)

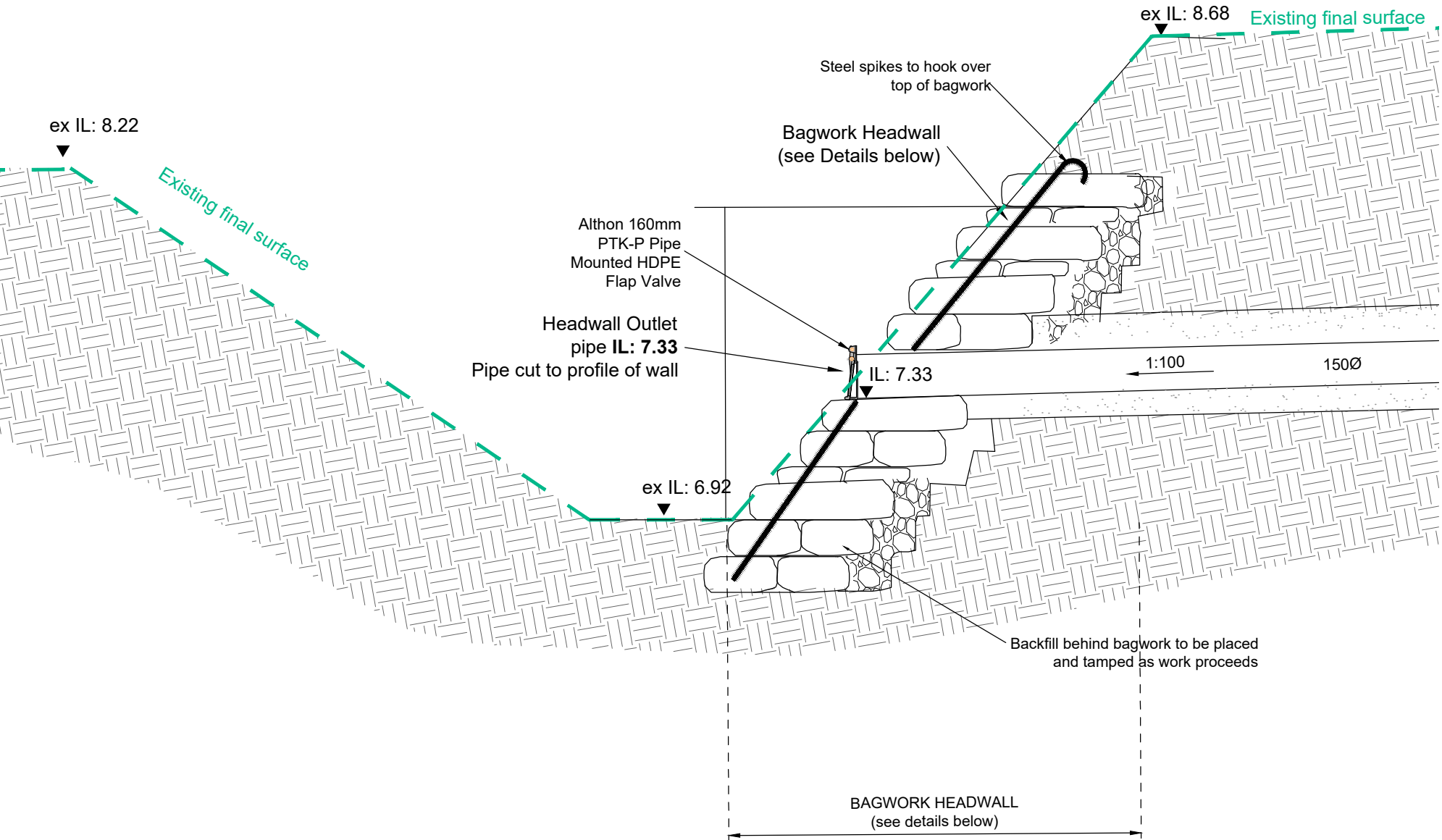
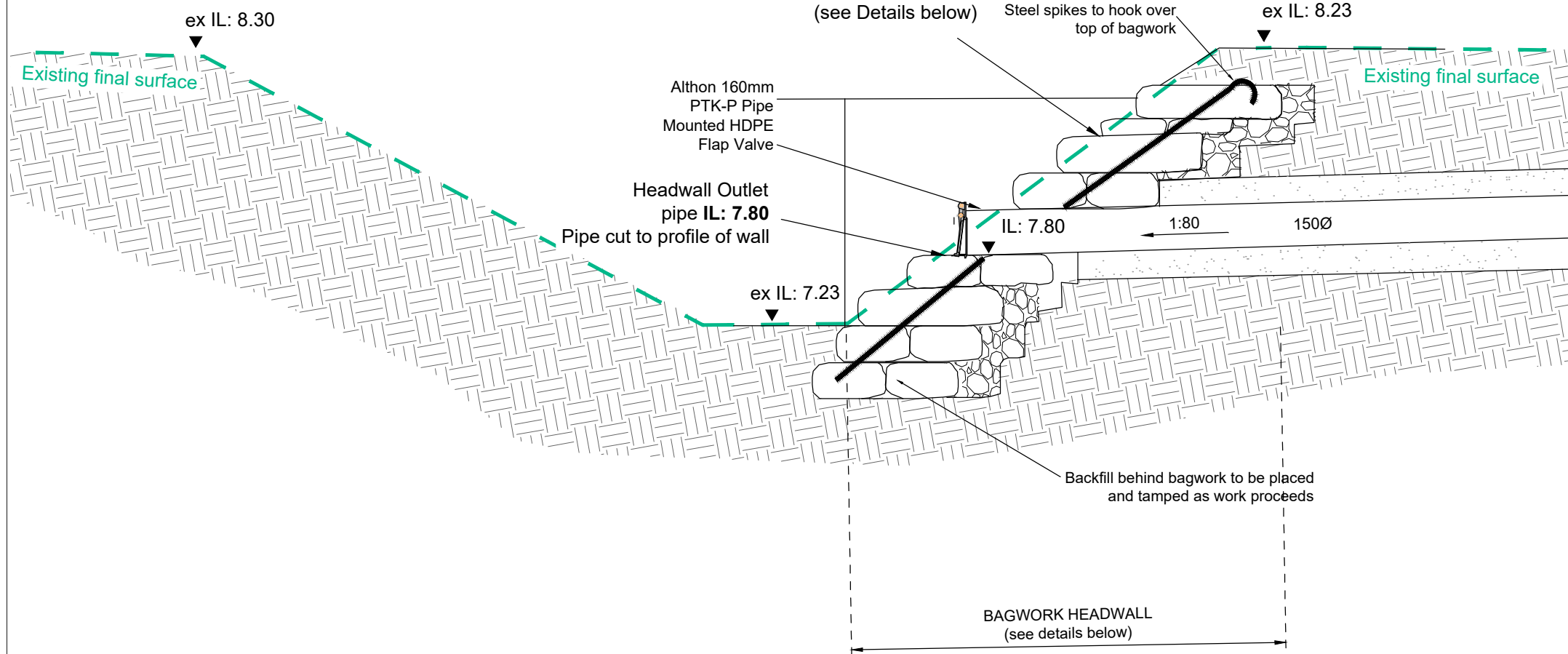
STANDARD DRAINAGE NOTES

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2. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
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7. COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
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9. ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, TO BE VITRIFIED CLAY TO BS EN 295 AND BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 AND BS5911-PART 1.
10. ROAD GULLY OUTLET PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATINGS AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
11. ALL ADAPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS AND SPECIFICATION LAID DOWN DOWN IN 'SEWERS FOR ADOPTION' 6th EDITION, WITH A VIEW TO ADOPTION UPON COMPLETION OF WORKS.
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- 'B125' IN ALL DRIVEWAYS
- 'C250' IN PRIVATE PARKING AREAS
- 'D400' IN CARRIAGEWAY/ACCESS ROAD

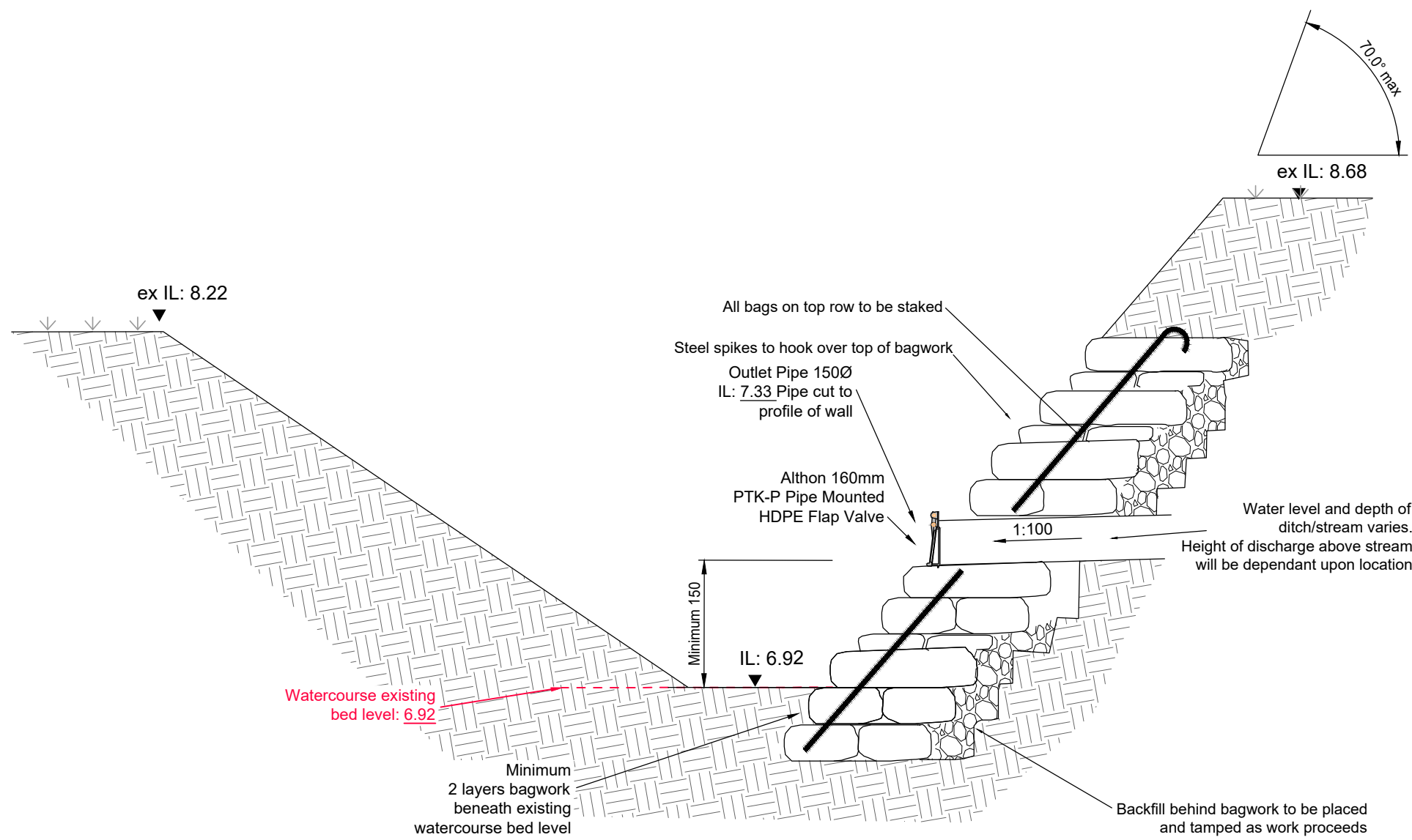
PROPOSED BAGWORK HEADWALL FOR FW DRAINAGE

(scale 1:20)



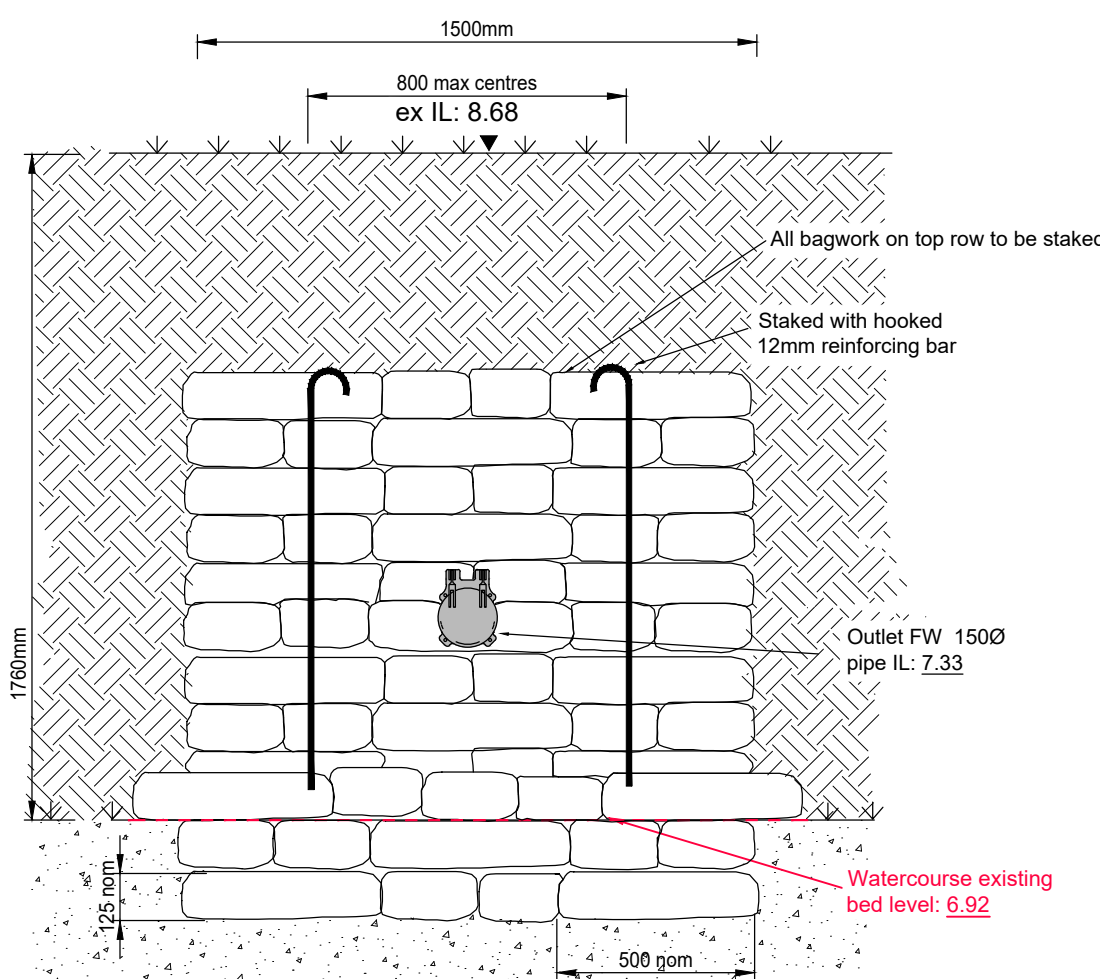
PROPOSED BAGWORK HEADWALL FOR SW DRAINAGE

(scale 1:20)



Headwall section
Outfall to side of ditch

SCALE 1:20



Elevation of headwall
Outfall to pond / side of ditch

SCALE 1:20

Prefixed to drawing numbers shall signify the following:-					
PL = PLANNING	Shall not be used for contract or construction purposes				
P = PRELIMINARY	Shall not be used for contract or construction purposes				
T = TENDER	Shall not be used for construction purposes				
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R = RECORD	Record of actual completed work				

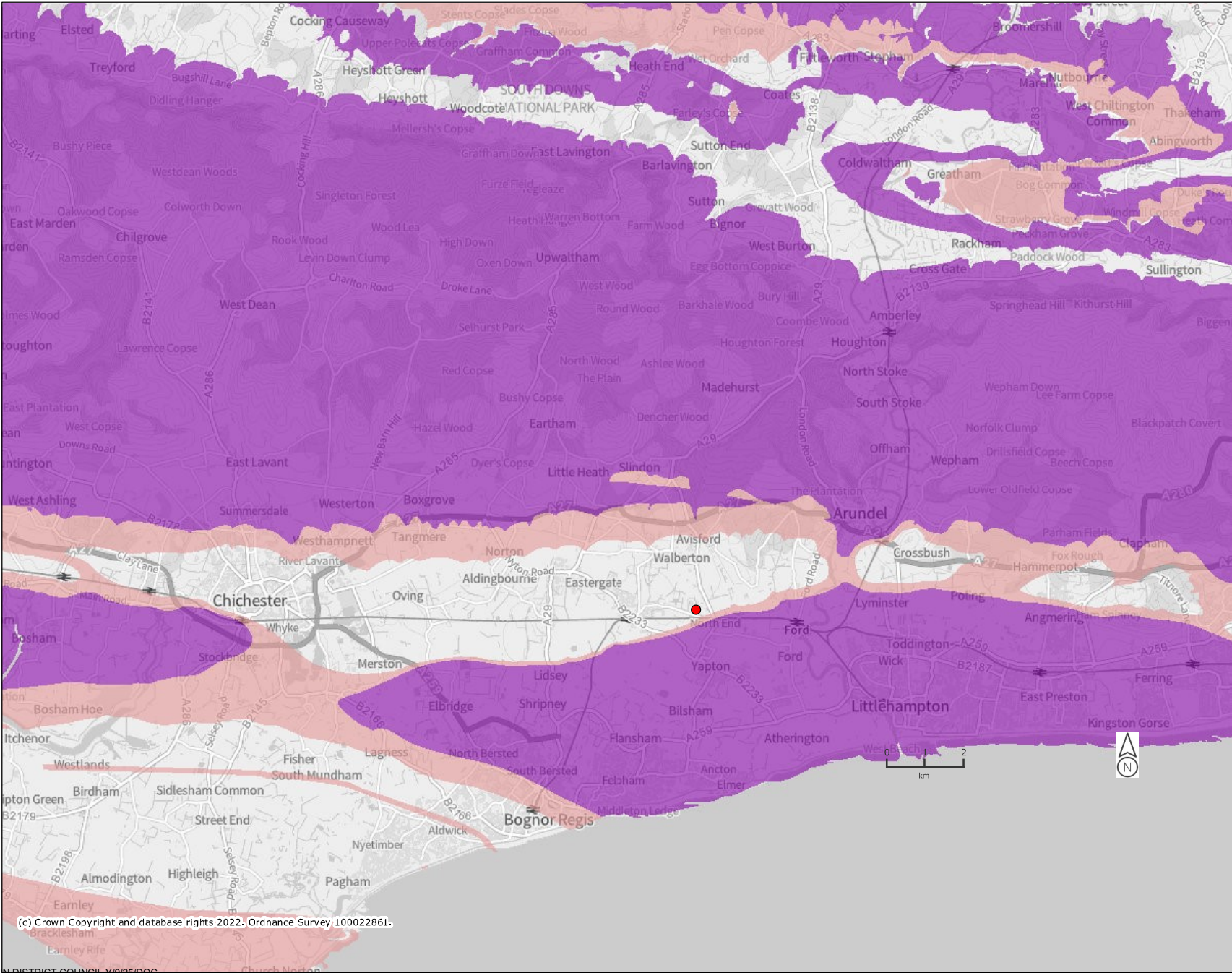
P1	13.03.25	UPDATED TO OWC ENGINEER'S COMMENTS	KCK	TZ	CS
P-	12.12.23	PRELIMINARY ISSUE	KCK	TZ	CS
REV	DATE	DESCRIPTION	BY	CHK	APP

 Consulting Civil Engineers					
CLIENT FLEURIE NURSERY LTD					
ARCHITECT DOUGLAS BRIGGS PARTNERSHIP					
JOB TITLE FLEURIE LAKE LANE, BARNHAM, PO22 0AL					
DRAWING TITLE OWC APPLICATION SHEET 2					
DRAWN	KCK	ENGINEER	TZ	CHECKED	CS
APPROVED					CS
DATE	DECEMBER 2023		SCALE @ A1	AS SHOWN	
JOB No.	C2904	STATUS	P	DRAWING No.	602
REV.					P1

PRELIMINARY

8.4 **Appendix D – Magic Map and EA Flood Map from Environment Agency**

Aquifer Designation Map (Bedrock)



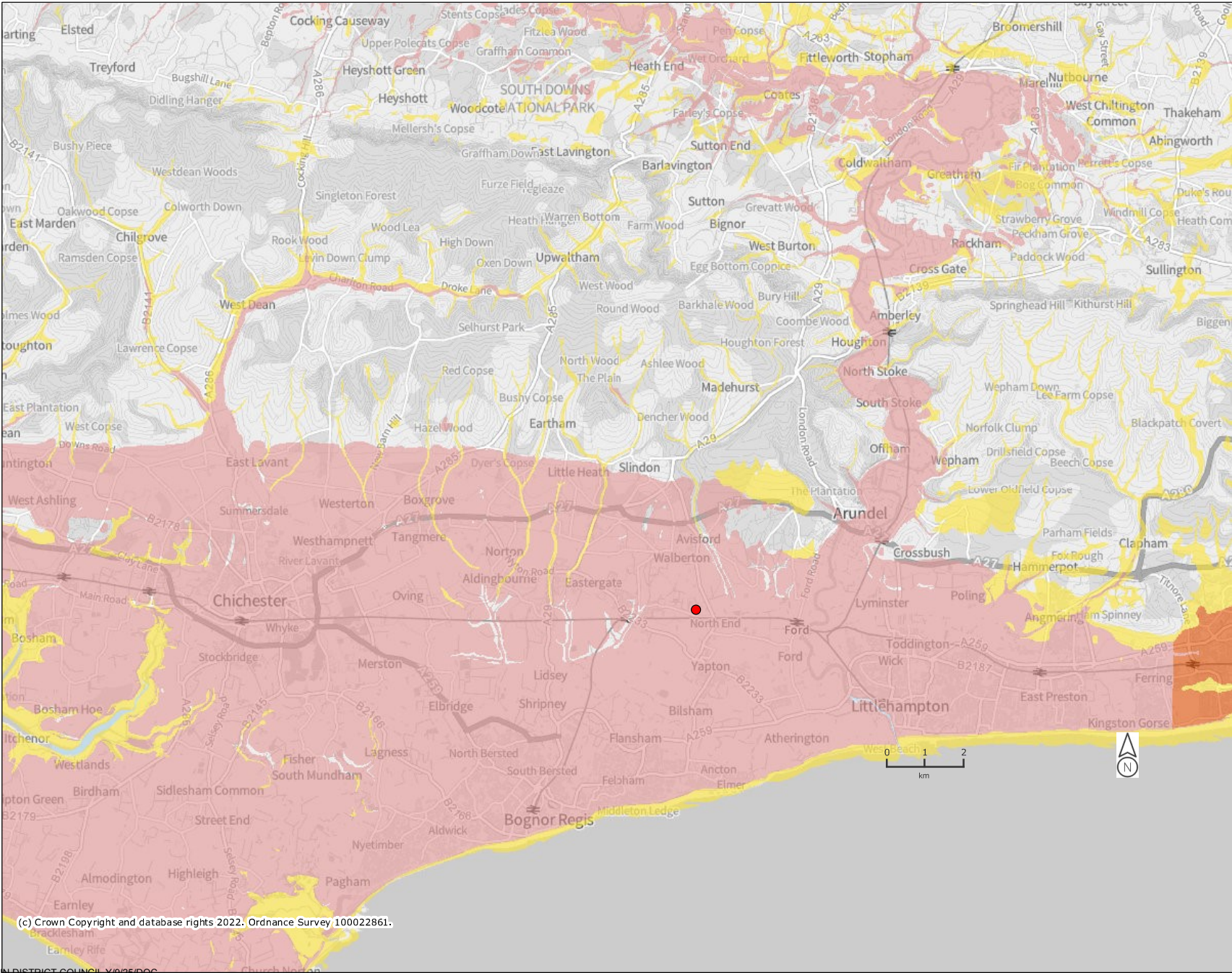
(c) Crown Copyright and database rights 2022. Ordnance Survey 100022861.

Legend
Aquifer Designation
Map (Bedrock)
(England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive

Projection = OSGB36
xmin = 470200
ymin = 95230
xmax = 521000
ymax = 120300
Map produced by MAGIC on 8 November, 2023.
Copyright resides with the data suppliers and the map must not be reproduced without their permission. Some information in MAGIC is a snapshot of the information that is being maintained or continually updated by the originating organisation. Please refer to the metadata for details as information may be illustrative or representative rather than definitive at this stage.

Aquifer Designation Map (Superficial Drift)



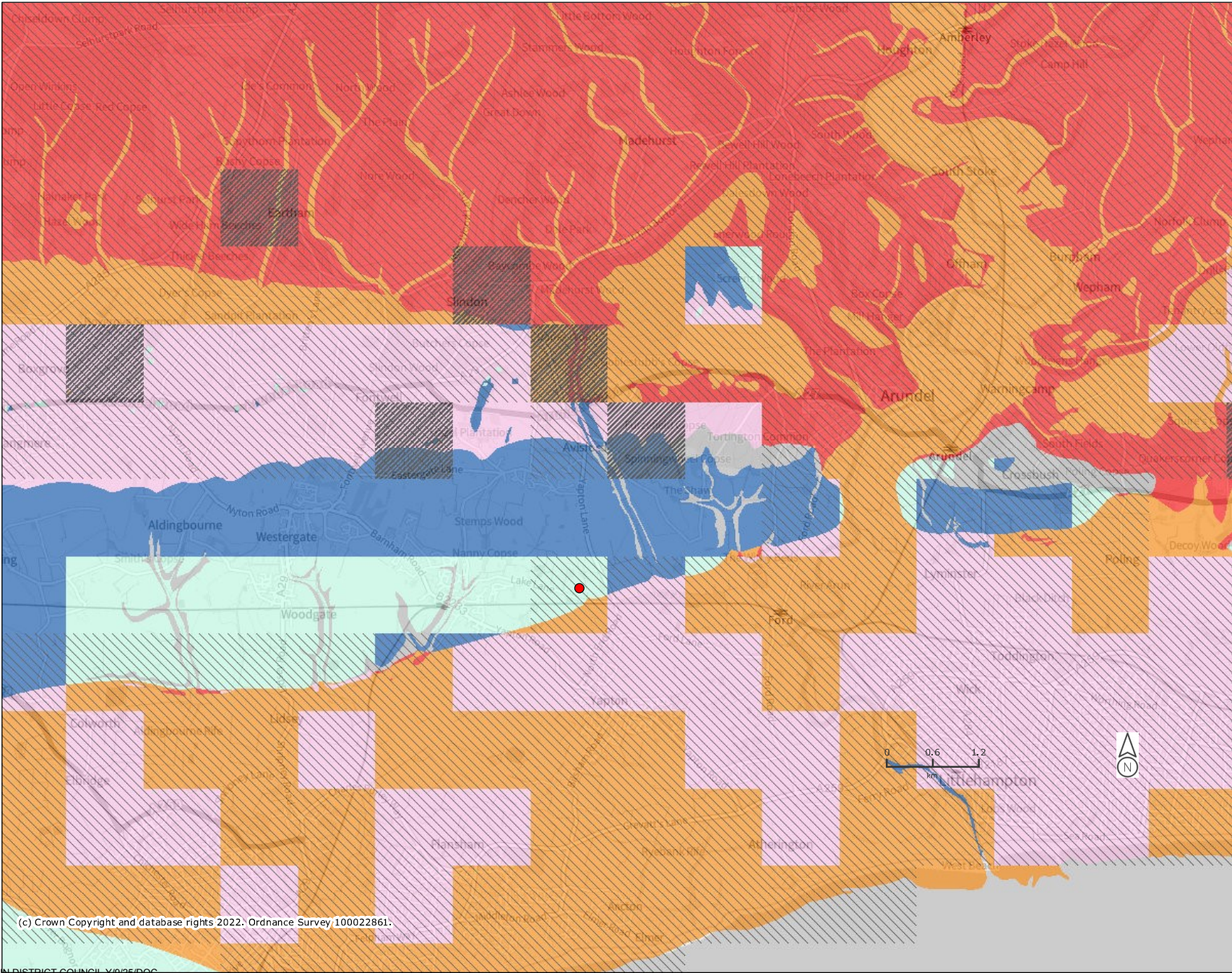
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Legend
Aquifer Designation
Map (Superficial
Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive

Projection = OSGB36
xmin = 470200
ymin = 95230
xmax = 521000
ymax = 120300
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Groundwater Vulnerability Map



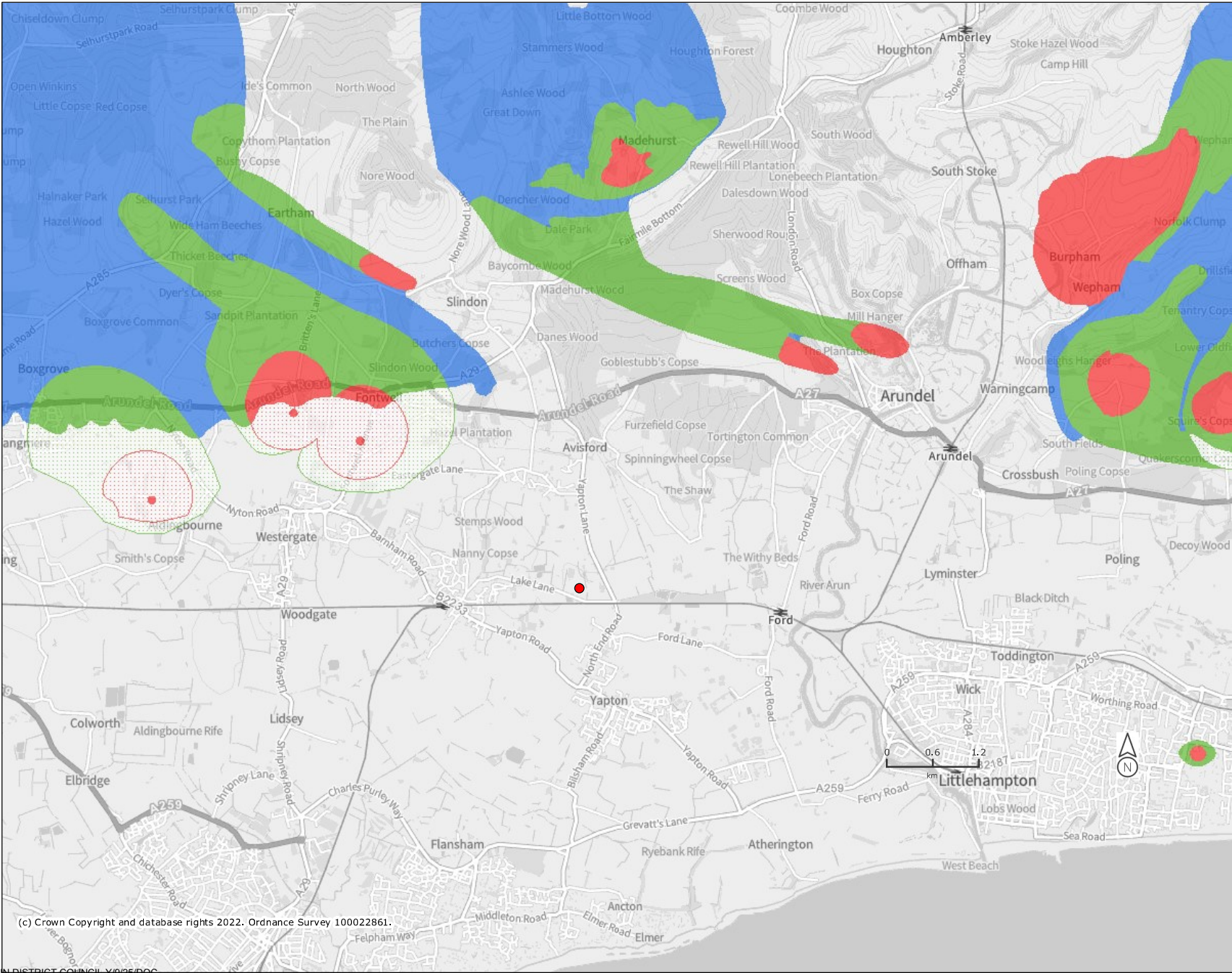
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Legend
Groundwater
Vulnerability Map
(England)

- Local Information
- Soluble Rock Risk
- High
- Medium - High
- Medium
- Medium - Low
- Low
- Unproductive

Projection = OSGB36
xmin = 485400
ymin = 99620
xmax = 510800
ymax = 112100
Map produced by MAGIC on 8 November, 2023.
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Source Protection Zones merged



Legend

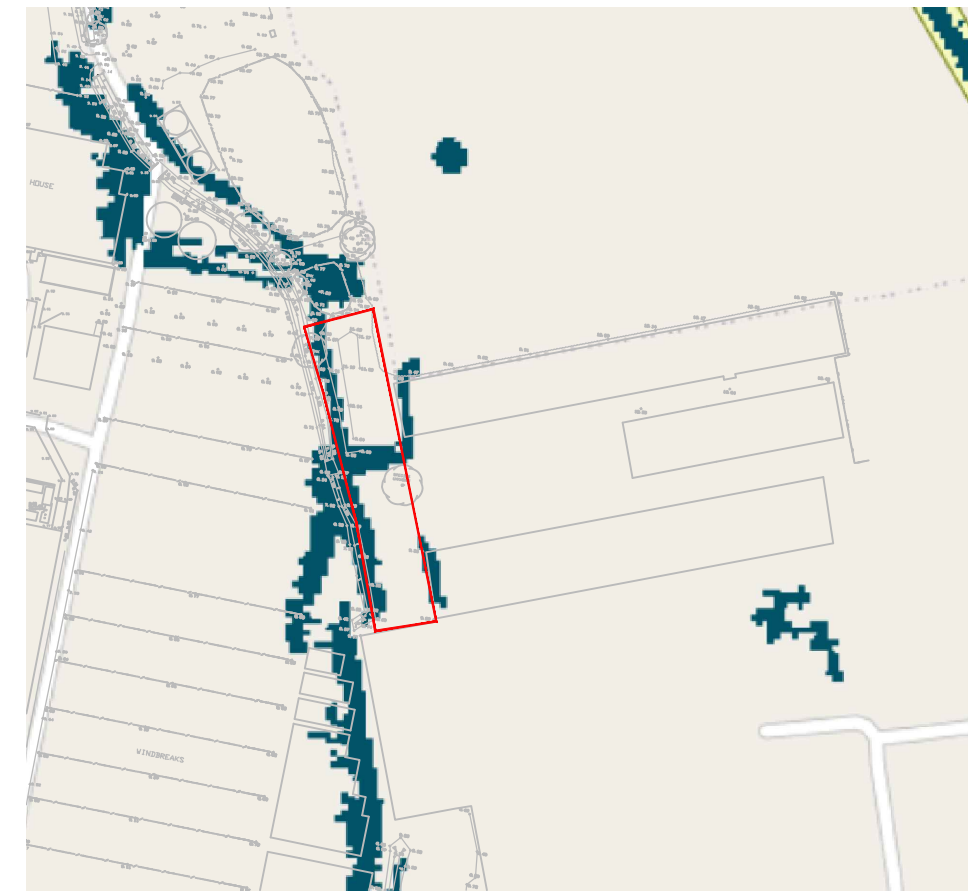
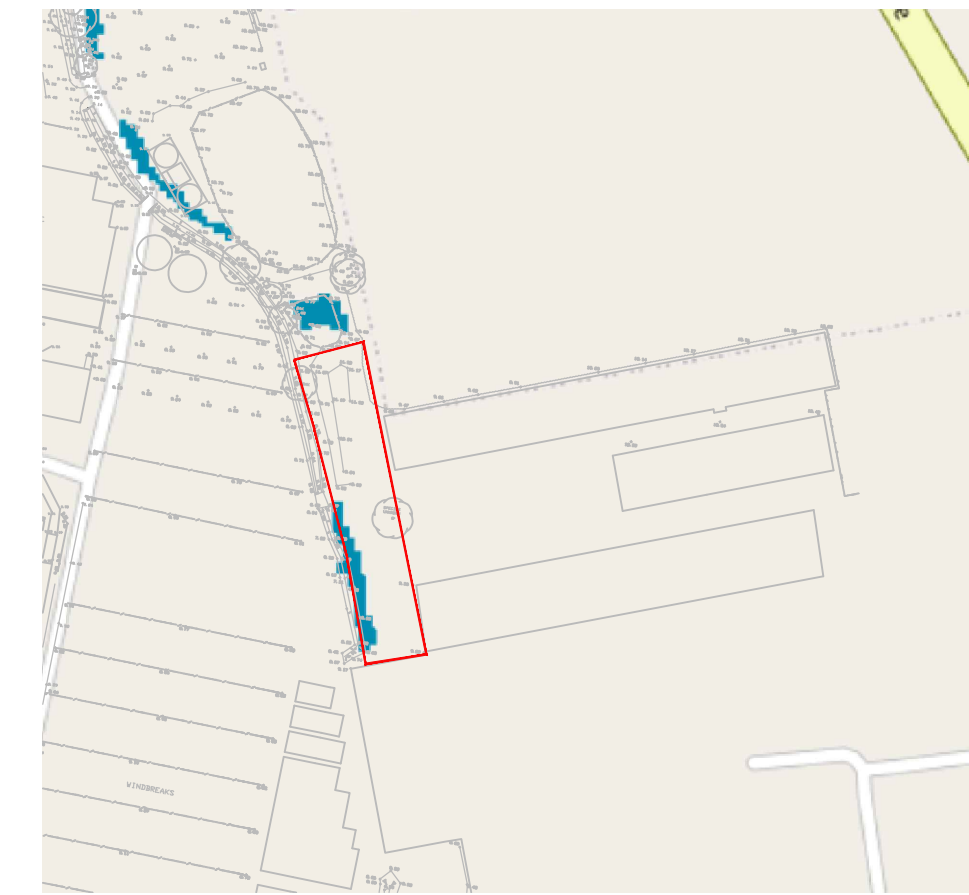
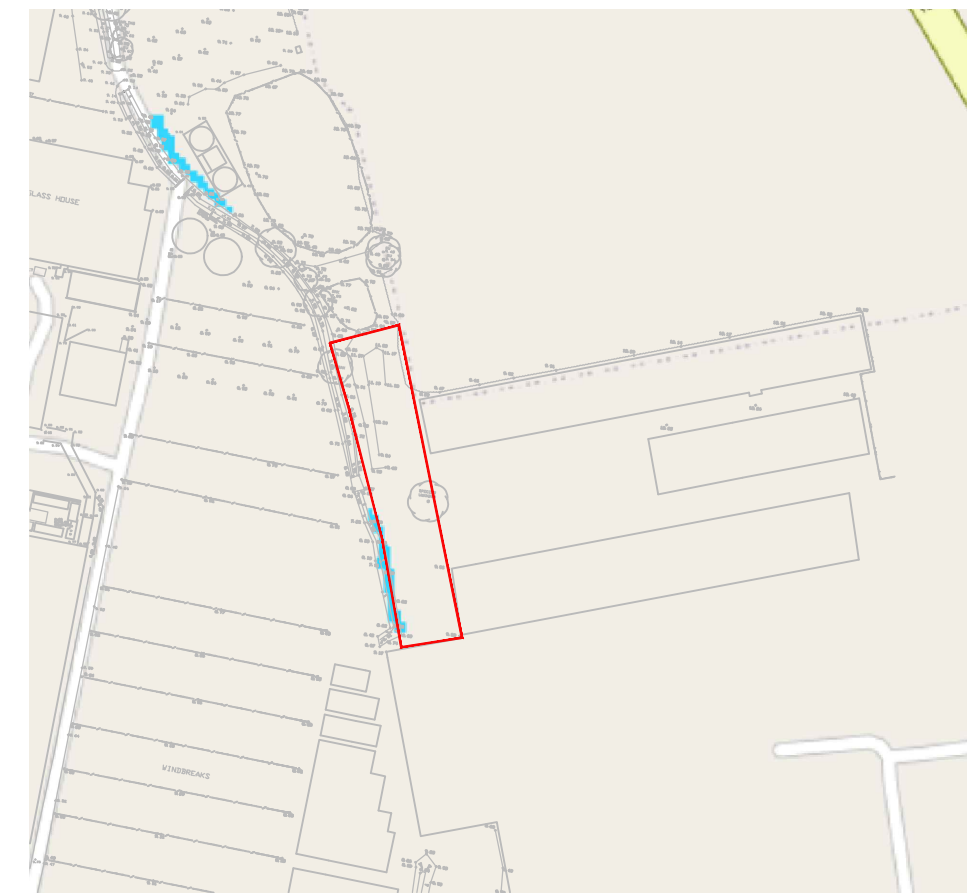
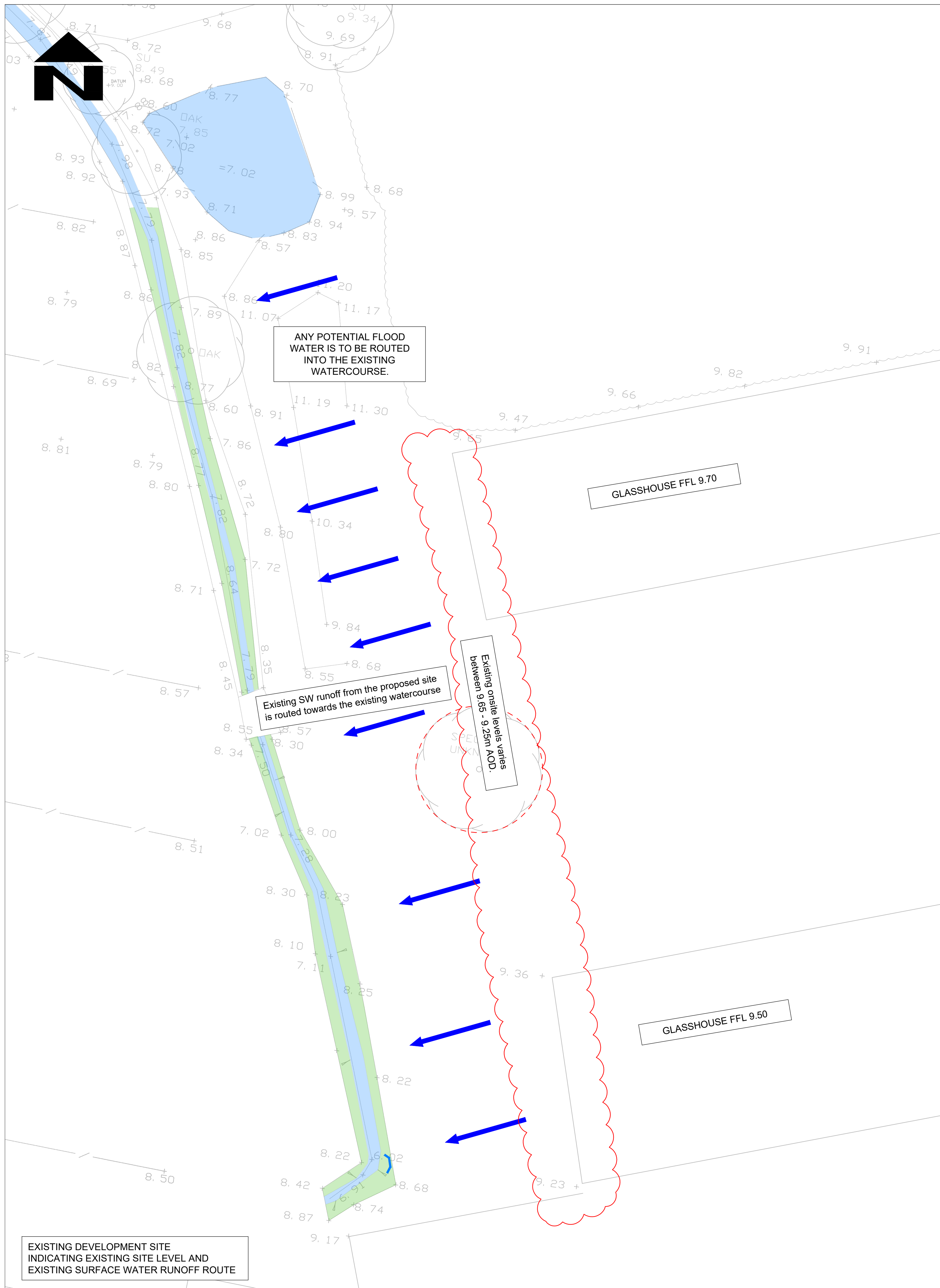
Source Protection Zones merged (England)

- Zone I - Inner Protection Zone
- Zone I - Subsurface Activity
- Zone II - Outer Protection Zone
- Zone II - Subsurface Activity
- Zone III - Total Catchment
- Zone III - Subsurface Activity
- Zone of Special Interest

Projection = OSGB36
xmin = 485400
ymin = 99620
xmax = 510800
ymax = 112100

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8.5 **Appendix E – Existing Site Runoff and Flood Maps**



EA Flood map indicated the existing access being affected by the 1:1000 years flooding only. The existing access road is graded towards to the west into the existing watercourse. The proposed access road level rise will not affect the flood water route as it will still be graded towards the existing watercourse following the existing site topography.

- STANDARD DRAINAGE NOTES
1. DO NOT SCALE FROM THIS DRAWING. REFER TO FIGURED DIMENSIONS ONLY. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
 2. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS ARE IN METERS UNLESS NOTED OTHERWISE.
 3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
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 10. ROAD GULLY OUTLET PIPES ARE TO 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL GULLIES SHALL BE FITTED WITH GRADE D400 GRATING AND FRAMES TO BS EN124, UNLESS OTHERWISE STATED.
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P-	10.03.25	PRELIMINARY ISSUE	KCK	TZ	CS
REV	DATE	DESCRIPTION	BY	CHK	APP



CLIENT **FLEURIE NURSERY LTD**

ARCHITECT
DOUGLAS BRIGGS PARTNERSHIP

JOB TITLE

FLEURIE LAKE LANE,
BARNHAM, PO22 0AL

DRAWING TITLE

EXISTING SITE SURFACE WATER
RUNOFF ROUTE

DRAWN KCK		ENGINEER TZ		CHECKED CS	APPROVED CS
DATE MARCH 2025		SCALE @ A1		1:200	
JOB No. C2904		STATUS P	DRAWING No. 301		REV. P-

PRELIMINARY

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
497724/104638

Created
10 Mar 2025 7:55

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

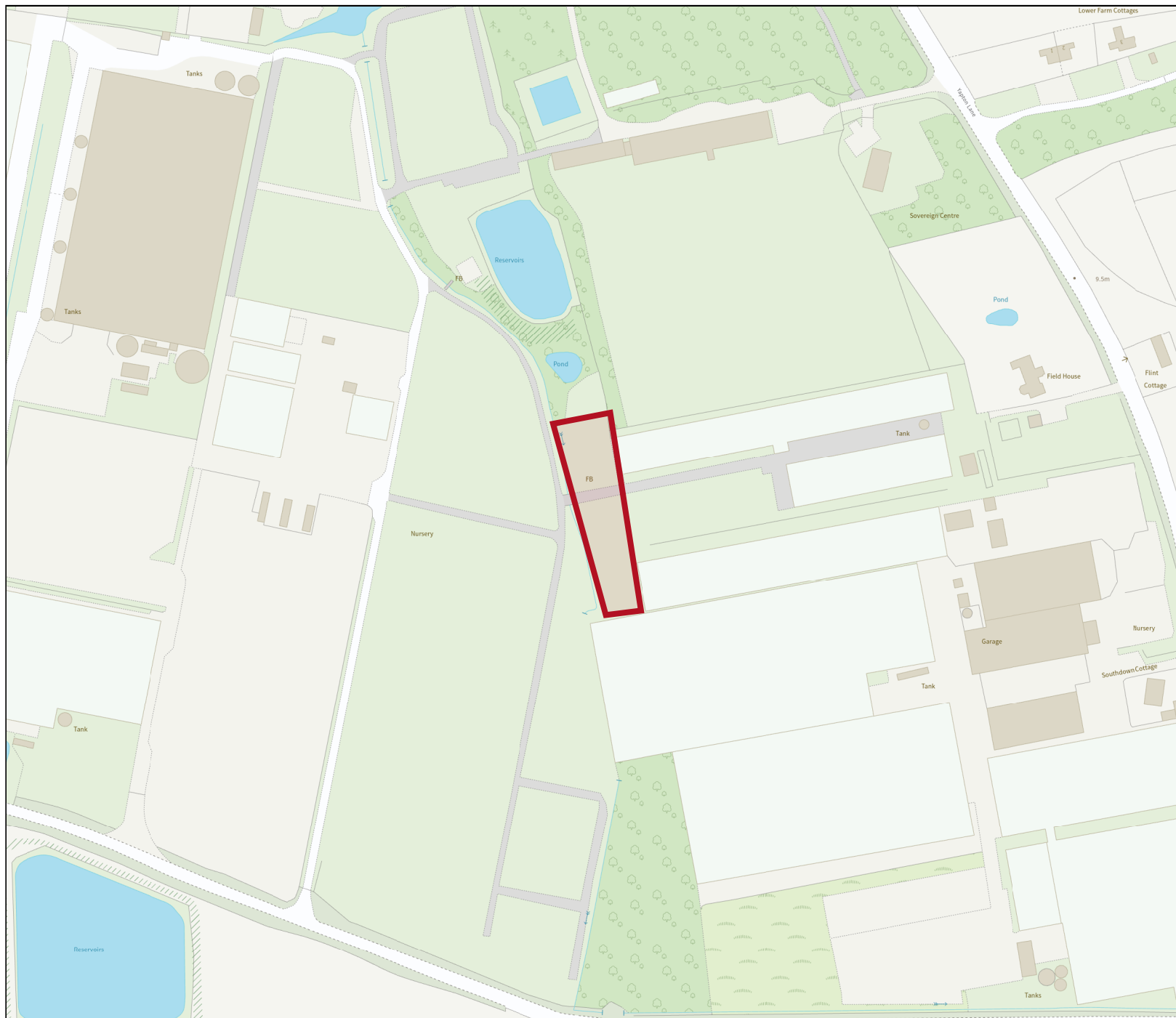
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
497724/104638

Scale
1:2500

Created
10 Mar 2025 7:55

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m

Page 2 of 2

8.6 **Appendix F – Maintenance Statement and SuDS Manual Inspection Checklist**

Maintenance Schedule

Fleurie Lake Lane, Barnham

For

Fleurie Nursery Ltd

Rev – P2

Reference **MS_C2904**

Date **17th April 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	17/04/2024	Initial Issue	TZ	CS
P1	17/12/2024	Updated for Planning Condition Discharge	TZ	CS
P2	10/03/2025	Updated to LLFA Comments	TZ	CS

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2.2	CULVERT AND HEADWALLS.....	11
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5	FOUL TREATMENT PLANT MAINTENANCE	15

1 SuDS Maintenance

1.1 Introduction

- 1.1.1 During construction, the Contractor will be responsible for maintaining the drainage and SuDS (Sustainable Drainage Systems). Upon handover, the developer will take on the responsibility of these duties as laid out in this report.
- 1.1.2 Once appointed the Contractor will prepare a site-specific method statement which will include methods for the control of silt and other pollutants during construction. CIRIA Report C5332, Control of water pollution from construction site, provides further guidance on this. This is also further discussed in this statement below.
- 1.1.3 Once the proposed drainage system has been constructed it will be maintained and operated by the contractor until the handing over of the site and subsequently passed on to the Developer /owner.
- 1.1.4 The whole proposed surface water and foul drainage network including access road drainage system will be monitored and maintained (including repairs and replacement) in accordance with the maintenance schedule in perpetuity by Fleurie Nursery Ltd.
- 1.1.5 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

1.2 SuDS at Land at Fleurie Lake Lane, Barnham.

- 1.2.1 As listed above, in section 5.1.2, the SuDS features used on site will be **Permeable Paving and Attenuation Tank**.
- 1.2.2 The SuDS features have been designed for easy maintenance and comprise:
 - Regular Day-to-Day care – litter collection, regular gardening to control vegetation growth and checking inlets where water enters the SuDS features
 - Occasional tasks – checking the SuDS features and removing any silt that builds up in the SuDS feature
 - Remedial work – repairing damage where necessary

1.3 SuDS Drainage Maintenance Specification

1.3.1 Attenuation Tank

In order to maintain the functioning of the attenuation tanks, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for attenuation storage tanks		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from per-treatment structures and/or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents, and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

1.3.2 Permeable Paving

In order to maintain the functioning of the permeable paving, the following maintenance requirements should be adhered to:

Table 21.3 Operation and maintenance requirements for permeable paving		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to 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 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rate and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

1.4 Management of Accidental Spillage of Pollutants on Site

In the event of an accidental spillage of pollutants on site, immediate and effective action must be taken to prevent harm to the environment, human health, and property. The following procedures should be implemented:

1.4.1 Identification and Containment of Spill:

- Immediately Assess the Spill: Identify the nature of the pollutant (e.g., oil, chemicals, fuel) to determine the best course of action.
- Isolate the Area: Restrict access to the affected area to prevent exposure to personnel or the general public.
- Contain the Spill: Use appropriate containment materials such as spill barriers, sandbags, or absorbent booms to limit the spread of the spillage. Ensure that the pollutant does not enter drains, watercourses, or sensitive environmental areas.

1.4.2 Spill Response Equipment:

- Ensure that suitable spill response kits are readily available at key locations on site. These kits should contain absorbents, personal protective equipment (PPE), neutralizing agents (if applicable), and disposal containers.
- For liquid spills, use absorbent pads, granules, or blankets to soak up the spill and prevent further spread.

1.4.3 Notification and Reporting:

- Alert Relevant Authorities: Notify the appropriate authorities, such as the Environmental Agency (EA), local environmental protection body, or the emergency services, if the spill is significant or poses a risk to the environment.
- Report the Spill: Complete a detailed report outlining the circumstances of the spill, the materials involved, the containment measures taken, and any corrective actions carried out. Keep this record for future reference.

1.4.4 Clean-up and Disposal:

- Carefully remove any contaminated materials, including absorbents and impacted soil or surface materials. These materials must be disposed of following the regulations for hazardous waste disposal.
- Clean affected surfaces and areas thoroughly, using appropriate cleaning agents and procedures to remove any residual pollutants.
- If Necessary, for larger or more complex spills, consider hiring professional environmental contractors to manage the clean-up and ensure that all necessary actions are taken.

1.4.5 Review and Prevention:

- Investigate the cause of the spill to understand how it occurred and to determine if there were any procedural or equipment failures.
- Based on the findings, update the site's spill prevention plan, providing additional safeguards and training to prevent future incidents.
- Ensure all personnel are trained in spill response protocols, the use of spill kits, and safe handling practices for hazardous materials.

1.4.6 Environmental Monitoring:

- After the spill has been cleaned up, monitor surrounding soil, water, and air quality to ensure that no contaminants have been left behind. If necessary, conduct environmental testing to verify that there is no long-term impact.

1.5 General Drainage Maintenance Specification

1.5.1 Inlet Structures and Inspection Chambers

- Inlet structures such as rainwater downpipes, road gullies and channel drains should be free from obstruction at all times to all free flow through the SuDS
- Inspection Chambers and Rodding Eyes are used on bends or where pipes come together. They allow access and cleaning to the system if necessary.

Inlet Structures and Inspection Chambers	
Regular Maintenance	Frequency
Inlet Structures	Monthly
Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.	
Trim vegetation 1m min surround to structures and keep area free from silt and debris	
Inspections Chambers and below ground control chambers.	Annually
Remove cover and inspect, ensuring that the water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	
Undertake inspection after leaf fall in Autumn	
Occasional Maintenance	As necessary
Check topsoil levels are 20mm above edges of chambers to avoid mower damage.	
Remedial Work	As required
Repair physical damage if necessary	

1.5.2 Below ground drainage pipes

- Below ground drainage pipes convey water to the SuDS system. They should always be free from obstruction to allow free flow.

Below Ground Drainage Pipes	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks.	Monthly or as required
Remedial Work	As required
Repair physical damage if necessary	
Monitoring	Annually
Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.	
Survey inside of pipe runs for sediment build up and remove if necessary.	
	Every 5 years or as required

1.6 Arisings Storage & Disposal Arrangements

- Maintenance Access
 - Designated access routes will be established to facilitate safe and efficient maintenance activities.
 - Access points will be positioned to minimize disruption to site operations and ensure safety.
 - Maintenance personnel will follow established safety protocols, including the use of appropriate PPE.
- Arisings Storage & Disposal
 - Any green waste, organic sediment, or debris removed during maintenance will be stored in designated areas away from the watercourse.
 - Green waste and organic material may be spread across crops where appropriate to promote natural decomposition.
 - Non-biodegradable waste, such as plastics or construction debris, will be collected separately and disposed of site in accordance with environmental regulations.
 - Hazardous materials, if encountered, will be stored in sealed containers and disposed of following regulatory guidelines.
- Environmental Protection Measures
 - Regular inspections will be conducted to ensure waste is managed correctly and does not pose a risk of contamination.
 - Spill response procedures will be in place to address any accidental leakage or discharge.
 - Maintenance records will be kept to track waste disposal and ensure compliance with regulations.

1.7 Health and Safety Risks of Maintenance Activities:

The following outlines common health and safety risks associated with maintenance activities, along with recommended actions for managing these risks:

1.7.1 Physical Injuries:

- Risks:
 - Slips, trips, and falls due to wet surfaces or uneven ground.
 - Being struck by falling objects, tools, or equipment.
 - Cuts, burns, or abrasions from using tools or machinery.
 - Injury from handling heavy or awkward items.
- Mitigation:
 - Ensure that walkways and working areas are clear of obstacles, dry, and well-maintained.
 - Use appropriate personal protective equipment (PPE), such as hard hats, gloves, and safety footwear.
 - Train workers on safe lifting techniques and the proper handling of materials and tools.
 - Secure tools and equipment to prevent them from falling.

1.7.2 Exposure to Hazardous Substances:

- Risks:
 - Exposure to chemicals, solvents, and asbestos (if present) during maintenance work.
 - Dust, fumes, or vapors from machinery, paints, or cleaning agents.
- Mitigation:
 - Ensure workers are provided with the correct PPE, including respirators or face masks when necessary.
 - Conduct air monitoring to detect hazardous levels of fumes or dust.
 - Implement ventilation systems in enclosed spaces to reduce the concentration of harmful substances.

- Provide training on the proper handling, storage, and disposal of hazardous materials.
- Use safer alternatives to hazardous chemicals wherever possible.

1.7.3 **Confined Space Work:**

- Risks:
 - Workers entering confined spaces (e.g., tanks, pits, ducts) may face risks of asphyxiation, drowning, or exposure to toxic gases.
- Mitigation:
 - Implement a confined space entry program, including air quality testing, ventilation, and continuous monitoring of oxygen levels.
 - Provide workers with proper training and ensure they have rescue equipment readily available.
 - Ensure that a permit-to-work system is in place to control and monitor confined space activities.
 - Maintain communication at all times with workers inside confined spaces.

1.7.4 **Electrical Hazards:**

- Risks:
 - Risk of electrocution or electrical burns when maintaining electrical systems or equipment.
 - Contact with exposed wires or malfunctioning electrical tools.
- Mitigation:
 - Ensure all electrical systems are properly locked out and tagged out before maintenance begins.
 - Only qualified personnel should perform electrical work.
 - Inspect tools and equipment regularly for defects and repair or replace as necessary.
 - Provide PPE, such as rubber gloves and insulated tools, for electrical work.

1.7.5 **Equipment and Machinery Hazards:**

- Risks:
 - Injury from moving parts, entanglement, or accidental start-up of machinery during maintenance.
- Mitigation:
 - Implement lock-out/tag-out (LOTO) procedures to ensure machinery cannot be accidentally started during maintenance.
 - Provide proper training on the safe use and maintenance of machinery.
 - Perform regular inspections and maintenance on tools and equipment to ensure they are in good working order.

1.7.6 **Working at Heights:**

- Risks:
 - Falls from ladders, scaffolds, or roofs during maintenance work.
 - Falling tools or equipment that could injure workers below.
- Mitigation:
 - Use fall protection systems such as guardrails, safety nets, or personal fall arrest systems.
 - Ensure scaffolds and ladders are properly installed and maintained.
 - Train workers on working at height safety protocols.
 - Use tool lanyards to prevent tools from falling and causing injury.

1.7.7 **Manual Handling Risks:**

- Risks:
 - Back injuries, strains, and sprains from lifting heavy or awkward objects.
- Mitigation:
 - Train workers in proper lifting techniques to avoid injury.
 - Use mechanical aids such as cranes, hoists, or forklifts to handle heavy materials.
 - Limit manual lifting to tasks that can be performed safely without assistance.

1.7.8 **Noise and Vibration:**

- Risks:
 - Prolonged exposure to high noise levels can lead to hearing loss.
 - Vibration from power tools and machinery can cause hand-arm vibration syndrome (HAVS) or musculoskeletal disorders.
- Mitigation:
 - Use noise-dampening equipment and hearing protection (earplugs, earmuffs) in high-noise areas.
 - Implement regular hearing checks for workers exposed to high noise levels.
 - Provide vibration-reducing gloves and limit workers' exposure to vibrating tools.

1.7.9 **Weather-Related Risks:**

- Risks:
 - Adverse weather conditions (e.g., high winds, heavy rain, extreme heat or cold) can increase the risk of accidents.
 - Heat stress or hypothermia from prolonged exposure to extreme temperatures.
- Mitigation:
 - Monitor weather conditions regularly and reschedule maintenance activities if necessary to avoid hazardous conditions.
 - Ensure adequate hydration for workers during hot weather and provide protective clothing during cold conditions.
 - Implement shelter or shade for workers in extreme weather and limit exposure to hazardous weather.

1.7.10 **Fire and Explosion Risks:**

- Risks:
 - Sparks from machinery or electrical work could ignite flammable materials, leading to fires or explosions.
- Mitigation:
 - Ensure that fire extinguishers, fire blankets, and other emergency firefighting equipment are available on-site.
 - Conduct regular fire drills and ensure workers know how to respond in the event of a fire.
 - Use non-sparking tools and maintain safe distances from flammable materials during maintenance work.

2 Existing Watercourse Maintenance Regime

2.1 Drainage Ditch

Watercourses and drainage ditches require correct maintenance in order to allow surface water to flow freely, this will also reduce the risks of flooding. Correctly maintained watercourses can also create an excellent habitat for wildlife. There are specific maintenance procedures that should be followed in order to correctly maintain the ditch.

In order to maintain the functioning of a drainage ditch, the following requirements should be adhered to:

Watercourse and Drainage Ditches	
Regular Maintenance	Frequency
Keep Watercourse Free of Debris Remove any physical obstructions such as large rocks, rubble, fallen trees and branches and other waste materials (litter, grass cuttings etc) so that water can flow freely. All non-organic waste should be completely removed off site and disposed of in an appropriate manner. Any green waste resulting from the maintenance of ditches can be left a safe distance from the bank for a few days to allow any organisms to move back into the watercourse, after which the green waste should be removed so it doesn't wash back into the watercourse. Ensure that any disturbed debris does not end up flowing downstream and causing problems for other landowners. Do not store anything alongside the watercourse which may interfere with maintenance, affect the stability of the bank or get washed into the channel.	Monthly
Keep growth of vegetation under control When trimming vegetation, it is important to consider any impact on biodiversity. Mowing of banks around ditches should be minimised during the animal spawning season of March to mid-July. Some trees may have tree protection orders (TPOs) on them, so if in doubt check with local planning authority. It is recommended to cut only up to just above the water level on one side of the watercourse, leaving the fringe of the bank uncut, thereby maintaining some habitat as well as enabling a free flow of water in the ditch. Cuttings from any clearance work should be removed from the channel to avoid it causing blockages downstream. Putting removed material too close to the top of the bank can lead to it falling back in during times of flooding.	As Required
Remove excess Silt Silt should be removed along the length of the ditch to ensure it flows properly in the right direction. If there are any pipes into or out of the ditch you should remove silt to the same level or below the bottom of the pipe(s). Where possible, try to maintain the original slope and cross section of the ditch when de-silting. If the slope of the ditch is altered it can change the flow pattern, cause erosion or increase flood risk either upstream or downstream. As long as the silt is non-hazardous you can put it on the bank of the watercourse. Depositing silt on top of the banks of the watercourse allows for any organisms to move back into the ditch. However; It is essential that this material does not then block any other ditches or nearby roads, or stop water draining into the ditch if it would normally do so.	As required.

- The silts must be as close as possible to where it was dredged from either: on the bank of the waters from where it was taken or on land directly next to the watercourse.

If you think a material may be hazardous. Contact the Environment Agency for advice.

2.2 Culvert and Headwalls

- Culverts allow the drainage ditch to flow freely under the access road. They should always be free from obstruction to allow free flow.
- Headwalls are used as an outlet to the drainage ditch from the surface water network; they are also used as an inlet and outlet for the culvert.

Culvert and Headwalls	
Regular Maintenance	Frequency
Inspect and identify any areas that are not operating correctly. If required take remedial action.	Monthly for 3 months then annually
Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Remove sediment from pre-treatment inlet structures and inspection chambers.	Annually or as required
Maintain vegetation to designed limits within the vicinity of below ground drainage pipes and tanks to avoid	Monthly or as required
Remedial Work	
Repair physical damage if necessary	As required
Monitoring	
Inspect all inlets, outlets and vents to ensure that they are in good conditions and operating as designed.	Annually
Survey inside of pipe runs for sediment build up and remove if necessary.	Every 5 years or as required

3 Periodic Evaluation of the Maintenance Regime

To ensure the continued effectiveness of the maintenance activities and to identify and address potential risks, a periodic evaluation of the maintenance regime will be scheduled and carried out. This evaluation is crucial to ensure that all maintenance procedures remain aligned with industry best practices, regulatory requirements, and the operational goals of the project. The following outlines the process and key considerations for the periodic evaluation:

3.1.1 Frequency of Evaluation:

- The maintenance regime will be evaluated at regular intervals, as determined by the nature of the work and the criticality of the system being maintained. Typically, evaluations will occur:
 - **Quarterly:** For high-risk or complex systems that require frequent oversight.
 - **Annually:** For less critical systems or where long-term monitoring and adjustments are needed.
 - **Post-Maintenance Inspections:** After the completion of significant maintenance tasks or changes to the site or infrastructure.

3.1.2 Review of Maintenance Activities:

- The evaluation will involve reviewing all performed maintenance activities to ensure they have been carried out in accordance with the prescribed procedures. This includes:
 - Assessing whether the planned maintenance tasks have been executed on time and as per the schedule.
 - Checking for any missed or delayed maintenance actions that could potentially lead to risks or failures.
 - Evaluating the effectiveness of the maintenance performed, including whether it successfully addressed identified issues.
 - Reviewing records of inspections, repairs, and replacements.

3.1.3 Performance Monitoring:

- Key performance indicators (KPIs) will be established to track the success and impact of maintenance activities. These may include:
 - Equipment uptime and downtime.
 - Frequency of breakdowns or failures.
 - Cost of maintenance versus budget.
 - Response times to critical issues or failures.
 - Compliance with safety regulations and risk assessments.
 - Efficiency and sustainability of maintenance procedures.

3.1.4 Inspection and Testing:

- Regular inspections and testing of systems and equipment will be incorporated into the evaluation process. This includes:
 - Physical inspections of infrastructure and equipment to check for wear, tear, or any degradation.
 - Functional testing to verify that systems operate correctly after maintenance.
 - Stress testing or simulated fault conditions to assess the robustness of maintenance measures.

3.1.5 Feedback from Staff and Stakeholders:

- Feedback from maintenance personnel, site supervisors, and other stakeholders will be collected to understand any operational challenges or improvements needed. This includes:
 - Gathering input from workers who perform the maintenance activities to identify any difficulties or inefficiencies encountered.
 - Discussing safety concerns and suggestions for improving safety practices during maintenance activities.
 - Reviewing any customer or client feedback related to the maintenance process.

3.1.6 Identification of Improvements and Updates:

- Based on the evaluation findings, the maintenance regime will be updated and adjusted as necessary. This may include:
 - Revising maintenance schedules based on performance trends or new technology developments.
 - Incorporating new safety measures or updated safety protocols.
 - Introducing more efficient or cost-effective methods and tools.
 - Addressing any areas of non-compliance or failure to meet quality standards.

3.1.7 Documentation and Reporting:

- All evaluations, findings, and adjustments to the maintenance regime will be documented comprehensively. Key reports will include:
 - Evaluation summary with identified issues and corrective actions.
 - Updated maintenance schedules, procedures, and protocols.
 - Record of actions taken to address any performance deficiencies or safety issues.
 - Recommendations for further improvements and the timeline for implementing them.

The evaluation process will be part of a continuous improvement cycle, ensuring that maintenance activities evolve to meet changing conditions, new challenges, and advancements in technology or best practices.

The periodic evaluation will also include ensuring that all maintenance activities are compliant with relevant industry regulations, local authorities' requirements, and any contractual obligations.

4 Formal Procedure for Changes to the Maintenance Regime Following Evaluation:

To ensure the ongoing effectiveness and adaptability of the maintenance regime, a formal procedure will be in place to allow for changes and improvements based on the findings of the periodic evaluations. This procedure ensures that any modifications are properly managed, documented, and implemented in a structured manner, aligning with operational goals, safety standards, and regulatory requirements. The key steps in this process are outlined below:

Identification of Need for Change:

- Following each evaluation, any areas where the maintenance regime may need adjustment will be identified. This could be due to:
 - If performance indicators, such as equipment failures or downtime, show that current maintenance practices are insufficient.
 - If new safety risks or hazards are identified during the evaluation that require changes to protocols.
 - Introduction of new technology or maintenance methods that could improve efficiency or effectiveness.
 - Updates to industry standards or regulatory requirements that mandate changes in maintenance practices.
 - Input from those directly involved in maintenance activities may highlight areas for improvement.

Documentation of Proposed Changes:

- Once the need for change has been identified, a proposal for changes to the maintenance regime will be documented. This includes:
 - A clear description of the proposed change(s).
 - The rationale for the change, including any issues or findings from the evaluation that support the change.
 - Expected outcomes and benefits, such as improved efficiency, reduced downtime, or enhanced safety.
 - An assessment of any associated costs, resource requirements, or scheduling implications.
 - Compliance considerations to ensure that any proposed changes adhere to regulatory requirements

Review and Approval:

- The proposed changes will be reviewed by relevant stakeholders to ensure they align with the broader operational objectives and regulatory standards. This step includes:
 - The maintenance team, site managers, and relevant technical experts will assess the proposed changes for feasibility, practicality, and safety.
 - Depending on the scope of the change, approval may be required from the client, regulatory bodies, or other key stakeholders.
 - A risk assessment may be conducted to evaluate any potential risks associated with the change and identify mitigation strategies.

Update of Maintenance Procedures:

- Once the changes have been approved, the maintenance procedures will be updated to reflect the new approach. This will include:
 - Detailed updates to maintenance schedules, tasks, and responsibilities.
 - Updating manuals, checklists, and procedural documents to incorporate the new practices.
 - If the changes involve new equipment, methods, or safety procedures, training sessions will be organised for all relevant personnel to ensure they are equipped to implement the updated regime.

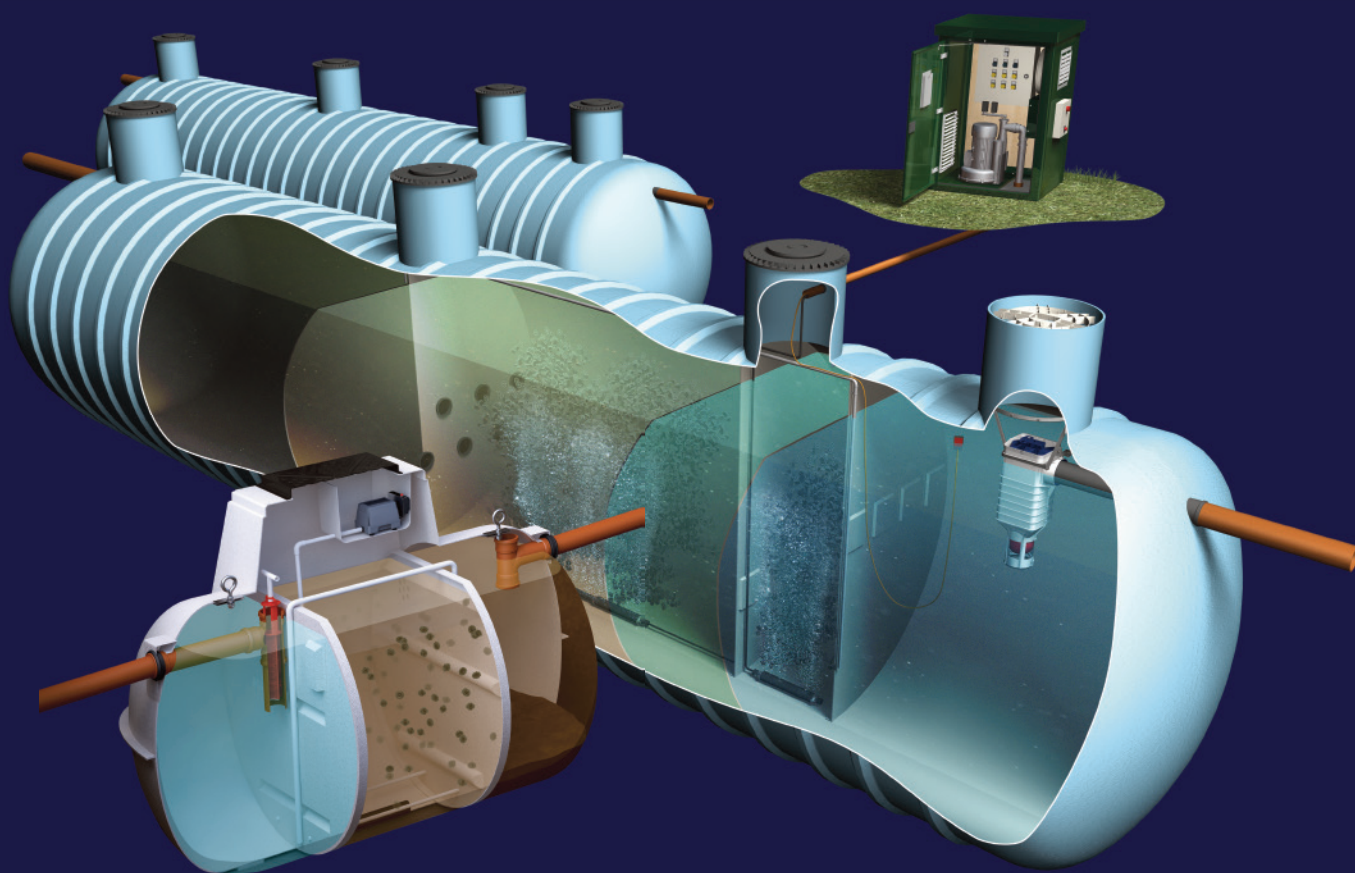
Communication and Implementation:

- Clear communication will be provided to all stakeholders regarding the updated maintenance regime. This includes:
 - Ensuring that the maintenance team and other staff members are fully informed of the changes and their role in the updated procedures.
 - If the changes impact external contractors or partners, they will be informed promptly and provided with any necessary instructions or guidelines.
- The implementation of the changes will be carried out according to the updated maintenance schedule, with monitoring to ensure smooth execution.

5 Foul Treatment Plant Maintenance

Package sewage treatment plants

Installation and operation manual



www.marshindustries.co.uk



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Based in Northamptonshire and with extended facilities in Bridgwater, Somerset, Marsh Industries is a leading manufacturer of sewage treatment plant, off-mains drainage products and rainwater harvesting systems for both UK and overseas markets.

Marsh supplies sewage treatment plant and off-mains drainage products for domestic, commercial and industrial applications as well as offering engineering design and technical support.

With one of the largest merchant distributor networks available in Europe, clients ask for Marsh products and services because they know the company delivers from a solid foundation of knowledge, customer support, product quality and proven performance.

Architects, specifiers and installers within the construction sectors seek alliances and partnership with Marsh because its core products and services bring further added value to their own brands.

COVID-19 NOTICE

Start up information for sewage treatment plants after prolonged periods of inactivity

When returning to or reopening your place of business, please follow the instructions below to enable a smooth start-up and to minimise the risk of pollution when restarting your sewage treatment plant.

Firstly, make sure the area is secure and cordoned off to prevent people or animals on site from falling into the sewage treatment plant. Where possible a qualified British Water accredited engineer should be employed to carry out these procedures. This process should be undertaken by two people while observing HM Government Social Distancing (Covid-19). PPE must be worn and handwashing/sanitizing must be carried out.

When first opening the tank chambers please ensure the area is well ventilated and engineers are wearing protective face masks. Sewer gases can accumulate in sewage treatment plants, particularly Hydrogen Sulphide, which can be very dangerous even at low levels. (Sewer gas is a complex mixture of toxic and nontoxic gases produced by the decomposition of organic household or industrial components of sewage.)

- ✓ When your treatment plant is turned on, make sure the compressor/air blower is operational.
- ✓ Inspect the air filters on the top of the compressor and remove any debris impeding the flow of air.
- ✓ Check whether air is reaching the treatment zone of your sewage treatment plant. This can be done by checking for a mild jacuzzi effect in the middle chamber of the plant.
- ✓ Make sure the media (golf ball sized pieces of plastic) are freely circulating in the aeration chamber within the treatment plant. These must not be accumulating at one side of the chamber or the other.
- ✓ Ensure that the treatment plant is vented locally and that air is allowed unhindered access to the plant with no air admittance valves located on the vent.
- ✓ Be aware that when restarting your plant after prolonged periods of inactivity, smell and odour may be generated in the initial weeks while the biomass - 'good bacteria' - starts to grow again on the media (Activated carbon vents are available for purchase from Marsh Industries if this is an issue).
- ✓ Existing recirculation pipes from the final chamber to the primary chamber assist and speed up the sewage treatment process, however a temporary submersible pump with a flow of less than 10 litres a minute can be fitted into the final humus chamber to further enhance the process. The pump must be 1m below the waterline and should discharge to the primary chamber with the hose being under the waterline to minimise the agitation of solids. The pump can be operated for 20mins in every hour for 6 hours per day for the first 4 days of start up. After this period, the pump should be removed, cleaned and stored.

If you have concerns about restarting your sewage treatment plant, please contact the Marsh HQ on 01933 654582.

Note: Marsh Industries accepts no liability for any damage or loss, including consequential loss caused by the failure of any drainage equipment or any failure caused by gross solids or fats entering the sewage treatment plant.

It is the responsibility of the installer/contractor to undertake installation of the sewage treatment plant as per the manufacturer instructions.

Marsh Industries believe that the information printed in this manual is accurate, and published for information only. No warranties, express or implied, are contained therein, nor does any legal liability attach to Marsh Industries for any reason whatsoever. The company's policy is one of continuous product improvement and we reserve the right to make alterations to our range and specification without prior notice.



1 Pre-installation checklist

Prior to installation please check or take note of the following:

- ✓ Ensure that the information contained in this manual is adhered to at all times.
- ✓ When the sewage treatment plant arrives on site it is recommended to fully inspect for damage (ie, fractures to the shell or ribs, delamination, scratches or abrasions deeper than 1.5mm, stress cracks or star crazing). If any damage is seen or suspected please notify Marsh Industries immediately as problems cannot be rectified easily after installation.
- ✓ It is the responsibility of the installer/contractor to undertake installation of the sewage treatment plant as per Marsh Industries' instructions.
- ✓ All electrical work must be undertaken by fully qualified personnel under the guidance of The Health & Safety at Work Act.
- ✓ Ensure the plant is properly ventilated.
- ✓ The end-user of the plant is responsible for the operation and maintenance of the system and its discharge either direct to a watercourse or through a percolation area.
- ✓ It is important that the product is operated under the conditions for which it is designed. Any variation in these conditions could prevent the unit from performing to its full potential and the effluent discharge may not meet required standards.
- ✓ Maintain the system in accordance with this handbook.
- ✓ Any service contract offered by Marsh is mechanical only and does not include desludging (emptying of the system). The end-user must desludge the system in accordance with the guidelines provided in this handbook.
- ✓ Drainage fields, drains and desludging of the plant remains the responsibility of the end-user. Any damage to the installation due to the influx of surface water or the backing up of drainage fields or drains is not covered by service agreements.
- ✓ Contact Marsh Industries if you have any technical queries regarding the installation, maintenance or servicing of the system.

To maintain optimum system performance the end-user must be aware of certain precautions, including the following:

- ✗ Do not open the plant cover without firstly isolating the mains power.
- ✗ Do not alter in any way, any part of the system or internal parts supplied with the system.
- ✗ The design loading of the plant should not be exceeded.
- ✗ High volume discharges such as those from swimming pools and Jacuzzi's must never enter the system.
- ✗ Surface water must not enter the system.
- ✗ Heavy duty toilet paper, sanitary towels or incontinence pads must not enter the sewage treatment plant. This could cause severe blockages and can adversely affect organic biomass growth.
- ✗ If the plant is installed in a care home or medical facility, spent medication must not enter the sewage treatment plant as this can adversely affect organic biomass growth.
- ✗ Do not allow large quantities of chemicals to enter the system including:
 - *Water softener regenerate*
 - *Disinfectants or high concentrate bleaches*
 - *Strong acids and alkalis*
 - *Oil or grease*
 - *Pesticides*
 - *Photographic chemicals*



2 Site location (For guidance only)

Minimum distances for locating sewage treatment plant is set out below. These are minimum distances only – the unit should be located as far away as is practically possible. However, when locating the plant, consideration should be given to allow adequate access for a desludging tanker.

	Any dwelling	Watercourse or stream	Spring or well	Lake/moat	Site boundary	Road	Slope, break or cuts
Plant	7m	10m	50m	50m	3m	4m	4m
Percolation area	15m	10m	50m	50m	3m	4m	4m

3 Tank installation

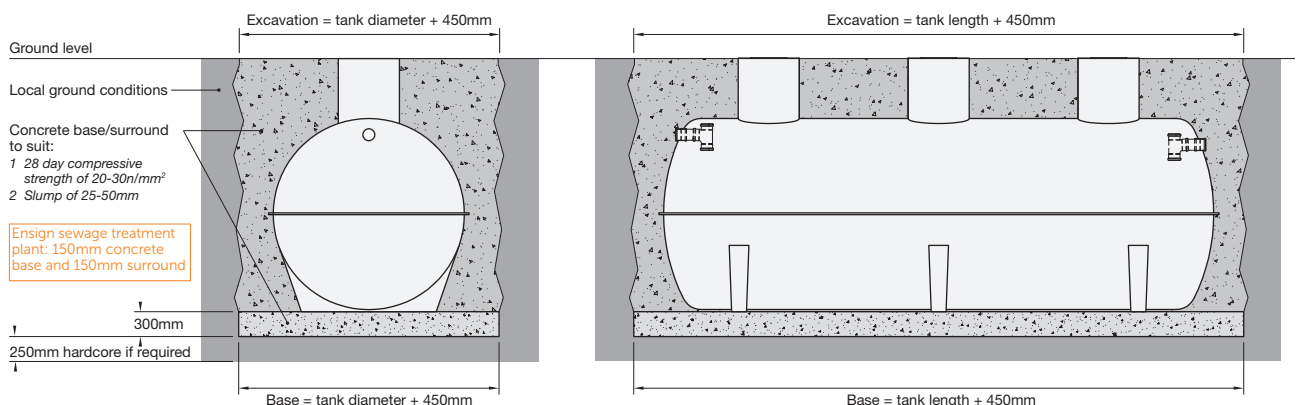
Site inspection

- Ensure site location ground is flat, even and free from rocks.
- If the plant is to be installed in a high traffic area, a qualified civil engineer should design a separate load bearing slab and reinforced base of hard core with metal grid support and concrete.

Movement of the sewage treatment plant

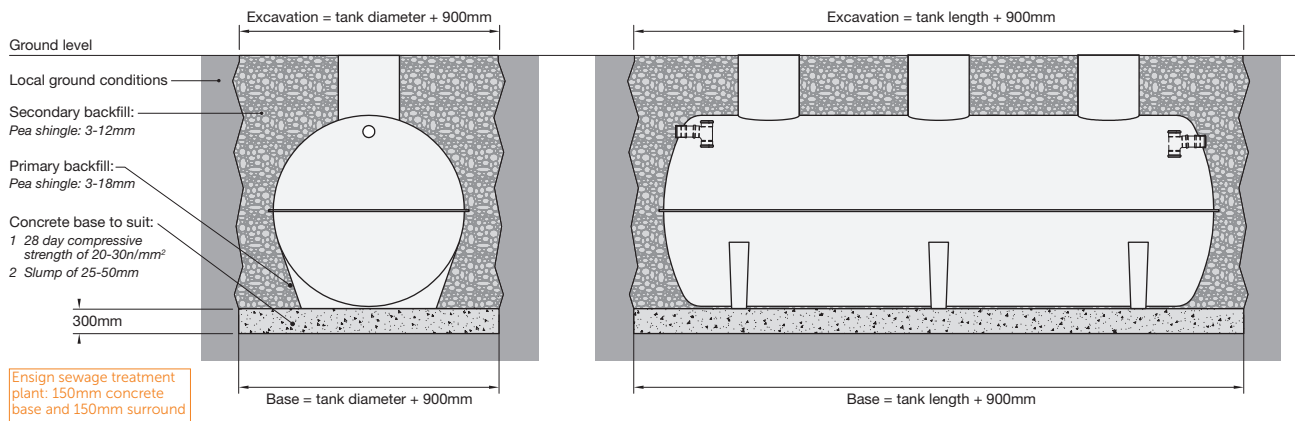
- The weight of the tank is not evenly distributed along its length, so time needs to be taken to ensure the straps are distributed to prevent movement or slippage.
- Use only web straps to lift the tank - do not allow chains, cables or wire ropes to make contact with the tank.
- **Note: Lifting eyes (rated to 350kgs) used during the manufacture of Ensign units can be used for on-site handling**
- A lifting beam is to be used for tanks over 8m long.
- The tank must be fully lifted off the ground for clear movement – do not drag the tank along the ground.
- The unit needs to be chocked to prevent movement or rolling when sitting on the ground.

Concrete base and surround (Recommended)



- Essential for wet sites where the water table can rise above the base of the system (Installation in a wet site may be precluded by site considerations in relation to effluent disposal).
- Groundwater must be controlled and prevented during the installation, even when the tank has been strapped or anchored. Failure to do so will damage the shell and invalidate all warranties.
- The excavation must be kept as dry as possible. Excess water should be evacuated using a site pump/sump, hole/suction hose arrangement. Dewatering should be continued for as long as necessary or at least until the concrete base has set.
- Ensure the excavation is safe with sloped surrounds and shuttering to safeguard the installation.
- The grade and thickness of the concrete base should be designed to suit site conditions - a minimum thickness of 300mm (Ensign sewage treatment plant: 150mm concrete base) and for high water table/wet sites a 250mm hardcore sub-base should be laid, compacted and levelled.
- *The choice of concrete is the responsibility of the installer and should be chosen to suit local ground conditions. In normal conditions with non-aggressive soils, a concrete with a 28 day compressive strength of 20 to 30N/mm² with a 25 to 50mm slump – this must adhere to the relevant BS EN standards. If in doubt seek specialist advice prior to installation.*
- *When pouring concrete around the sewage treatment plant, please ensure the maximum pressure of 15kN/m² around the plant is not exceeded. The concrete should never be poured directly on to the tank.*
- *Do not use vibrating poker.*
- Lower the sewage treatment plant onto the concrete base ensuring the tank is level at all laterals.
- Connect up the pipework - the system is plumbed for 160mm UPVC pipe (Ensign sewage treatment plant up to 16pe: 110mm UPVC pipe). A short length of pipe with flexible joints should be used immediately before and after the sewage treatment plant to allow for movement between the tank and the pipe work.
- The excavation should be backfilled with concrete of minimum 225mm pour width to approximately 300mm below the ground level (full surround to top of tank, around turrets and inlet/outlet points).
- In a multiple tank arrangement, there must be a minimum of 500mm distance between the tanks. This 500mm void must be filled with concrete during the pouring.
- Evenly fill each chamber of the tank with clean water to a depth of 700mm. Continually check the pipework levels and connections visually.
- Backfill evenly around the tank with concrete ensuring no voids are present, especially around the bottom of the tank shell and ribs.
- Continue filling the tank chambers with water whilst evenly backfilling and pouring concrete around the tank ensuring that the water level is no more than 300mm above the concrete level.
- Ensure all turrets and access covers are sealed to prevent concrete entering the plant. Use framework around the turrets to prevent distortion and damage to the tank.
- We recommend that normally the depth from ground level to inlet invert of the sewage treatment plant should be no more than 1.5m. This could change due to groundwater conditions. Deeper inverts with heavier duty shells and ribs are available from Marsh Industries.

Granular surround (For free draining sites)



Primary backfill

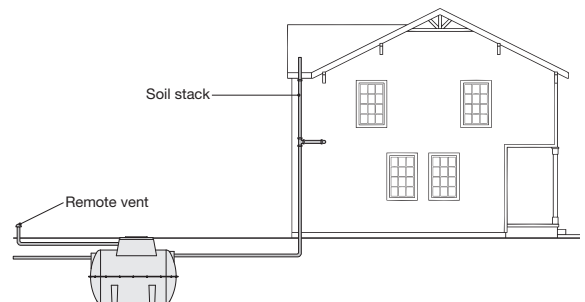
- Primary granular backfill is pea shingle between 3-18mm in size. It should be washed, have no sharp edges and contain no boulders. In winter, check to ensure there are no clumps of ice in the materials as this can create voids causing long term damage.
- Tanks must be installed with primary backfill only within the region immediately surrounding the tanks - the pour width should be 450mm. During the pour, check to make sure that no voids are created and that the pour is evenly distributed.
- The pour should be evenly to the top of the turrets and access points. Care needs to be taken to avoid distortion.

Secondary backfill

- Secondary backfill is pea shingle between 3-12mm or coarse sand. This once again is judged to be clean, free flowing with no voids whilst pouring.
- If crushed stone is used as the secondary backfill, ensure that it is at least 450mm from the tank walls and dome ends.
- Be careful as dug material needs to be carefully selected and sifted to ensure no roots, clay or boulders are present.
- Take care when compacting the backfill material not to distort the turrets or access chambers.

Ventilation

- It is important that a specific air venting point is provided by the installer to allow the system to freely vent and disperse gas, and also ensure air supply to the compressor if this is integral to the tank.
- For all sewage treatment plants it is recommended that a remote vent stack should be installed. This should be connected into the (marked) vent position on the tank using the 110mm grommet supplied, and terminate at a suitable distance and height from any surrounding dwellings to allow dispersal of air from the system. Consideration should be given to the prevailing wind and any local site geography that may inhibit air dispersion or allow any odours to return towards the dwellings.
- Marsh recommend external compressors (in housing supplied) to ensure a constant supply of clean, dry air. If the compressor is supplied integral to the unit (in 'basin' under manway lid) it is recommended to fit a vent local to the tank to improve air supply and quality.
- If in any doubt as to the installation of an appropriate vent, please contact Marsh Industries.



4 Electrical guidelines

NOTE: If the plant is not due to be commissioned for at least two weeks it is advisable to remove the compressor.

- Connection must be performed by a suitably qualified and experienced electrical contractor.
- The electrical requirement of the unit will be either Single Phase or Three Phase. Please check the specification that has been supplied to you about your system.
- The compressor is either linear or side channel and will come with wiring instructions.
- A GRP kiosk or above ground housing may be supplied/required dependent on the size of the plant. Please check your system specification in advance so that you are able to prepare the site for your kiosk.

Standard gravity system with air blower (Conforms to European Standards)

- A 230V, 16amp waterproof plug and socket connector will be supplied with the unit, one for each compressor required. Please check your system specification about the quantity and type of compressor(s). On larger units, connection details can be bespoke, please check prior to installation.

It is the end-user's responsibility for the provision of:

- A single run of 1.5mm (or greater dependent on distance/voltage drop considerations) 3 core SWA cable from the end-user's distribution cabinet to the tank unit socket, or to the pre-wired distribution box fitted inside the GRP kiosk. The cable armour must be properly bonded to the main earth at the premises
- Cable protection via 10amp MCB/RCD or RCBO, rated 230V AC and tripping current 30mA.
- The unit will come with power failure alarm as standard. Other alarms are available, depending on your application, please check the specification supplied to you about your alarm options.
- The air pump/compressors and electric power must never be switched off. It is imperative they run 24 hours a day, every day, to ensure a constant supply of oxygen to the bacteria in the biozone.

Alarm options

Various alarm systems are available to suit different standards and system specifications. Please contact Marsh Industries for full details.

5 Service checklist and maintenance

The plant must be switched off and isolated before checking the electrical components and supply.

General

- Check to ensure the levels in the tank are even across all chambers.
- Regularly check to see if the primary chamber requires desludging (See section 7).

Compressor

- Check to ensure all compressors are working and air hose connections are secure.
- Annually clean the filter on the top of the compressor.
- Annually check the diaphragms and replace if required.
- Check the loss of pressure alarm on compressors.
- If the compressors are housed, either in a kiosk or housing, check to ensure ventilation is adequate.



Media (Within aeration chamber)

- Ensure media is moving around the aeration chamber freely by the diffuser/diffusers.
- Visually check to ensure adequate bio-mass growth on the media surface area.

Polylok Filter (Tertiary filtration)

- If a Polylok Filter is fitted to the plant at the outlet end (normally only on plants over 50PE) carefully lift the filter out of the casket and wash down before returning it back into the casket securely. This should be done normally once a month.
- A high level alarm should be fitted to alert the site owner of when the filter needs cleaning.

High level alarm

- If a high level alarm is fitted, check to ensure the high level alarm float switch is secure and working by lifting of the float switch by approximately 200mm.

Structural

- Check to ensure the baffles are not damaged.
- Check that all manhole cover and frames are secure and all locking nuts are in place.

Electrical

- Check supply current and amps.
- Check wiring condition and IP plugs.

6 Drainage fields

For development proposals in sewered areas it is usually a legal requirement to connect to the public sewer, either by gravity or pumping, as the sewage is conveyed to a municipal sewage treatment works. However, if it can be demonstrated that the proposed sewage disposal system offers a more sustainable solution to the overall water management of the site, then the regulators will consider the installation of a 'private' system.

For any such proposal you should:

- Check with your regulating body to confirm current status with regard to Registration/Consent, quality and volume limits, etc.
- Take account of the requirements of Building Regulations and discuss with the local planning authority at an early stage - well before any planning application is made.

Drainage fields

- If you have access to a suitable area of land, discharge from your septic tank or treatment plant to a properly designed and sized drainage field is the best environmental option as the treated effluent recharges groundwater, nutrients are retained in the soil, and nutrient loads on surface waters are reduced.
- The most common form of drainage field is a subsurface percolation area comprising perforated infiltration pipes laid in shingle filled trenches – normally within 1m of ground level to allow the micro-organisms in the soil to break down the organic matter, and at least 1.2m above the winter water table.
- The drainage field has two principal purposes:
 - To allow percolation of partially treated/treated effluent to ground at a controlled rate.
 - To allow further treatment of partially treated effluent before it reaches the groundwater level.

- Before you can dispose of effluent via a drainage field you first need to assess whether such a route is appropriate, ie, you have a good depth of well-drained, well-aerated soil away from watercourses, wells/boreholes, dwellings, and avoiding sloping sites and areas prone to waterlogging.

Trial hole and percolation test method (See figure 1)

- To calculate the exact area of land required for effective disposal an 'assessment' is required, usually by performing a percolation/water table test as outlined in BS6297 (Code of Practice for the Design and Installation of Drainage Fields for use in Wastewater Treatment) and the latest version of Building Regulations: H2.
- A trial hole should be dug to determine the position of the standing groundwater table a minimum of 1m² in area and 2m deep, or a minimum of 1.5m below the invert of the proposed drainage field pipework.
- The groundwater table should not rise to within 1m of the invert level of the proposed effluent distribution pipes. If the test is carried out in summer, the likely winter groundwater levels should be considered.
- A percolation test should then be carried out to assess the further suitability of the proposed area. A hole 300mm square should be excavated to a depth 300mm below the proposed invert level of the effluent distribution pipe. Where deep drains are necessary the hole should conform to this shape at the bottom, but may be enlarged above the 300mm level to enable safe excavation to be carried out.
- Fill the 300mm square section of the hole to a depth of at least 300mm with water and allow it to seep away overnight.
- Next day, refill the test section with water to a depth of at least 300mm and observe the time, in seconds, for the water to seep away from 75% full to 25% full level (ie, a depth of 150mm). Divide this time by 150. The answer gives the average time in seconds (Vp) required for the water to drop 1mm.
- The test should be carried out at least three times with at least two trial holes and the average figure from the tests should be taken. The test should not be carried out during abnormal weather conditions such as heavy rain, severe frost or drought.

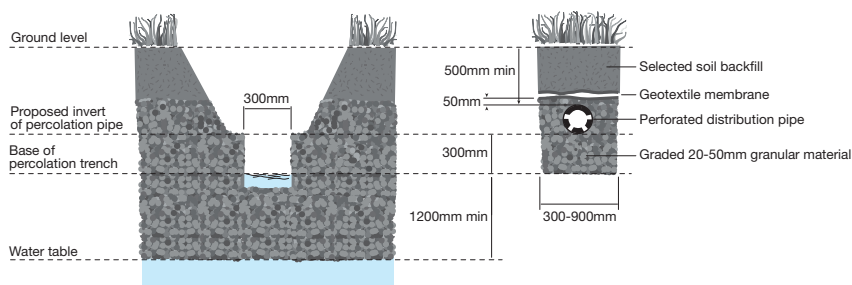


Figure 1 - Percolation/water table test

- Drainage field disposal should only be used when percolation tests indicate average values of Vp of between 12 and 100. This minimum value ensures that untreated effluent cannot percolate too rapidly into groundwater. Where Vp is outside these limits effective treatment is unlikely to take place in a drainage field.

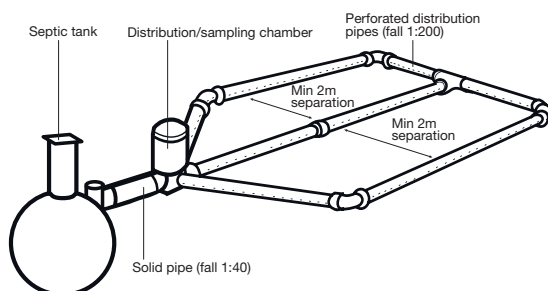


Figure 2 - Typical drainage field construction

Drainage field construction (See figures 1 and 2)

- Drainage fields should be designed and constructed to ensure aerobic contact between the liquid effluent and the subsoil using perforated pipe laid in trenches.
- Pipes should be laid on a 300mm layer of clean shingle or broken stone (graded between 20mm and 50mm) at a minimum depth of 500mm and a uniform gradient not steeper than 1:200.
- Trenches should be filled to a level 50mm above the pipe and covered with a layer of geotextile to prevent the entry of silt. The remainder of the trench can be filled with soil.
- Trenches should be from 300mm to 900mm wide with areas of undisturbed ground 2m wide being maintained between parallel trenches.
- An inspection chamber should be installed between the septic tank and the drainage field.
- Drainage fields should be set out as a continuous loop fed from the inspection chamber.
- To calculate the floor area of the drainage field (A_t in m^2), the following formulas should be used:
 - For septic tanks: $A_t = p \times V_p \times 0.25$
 - For treatment plant: $A_t = p \times V_p \times 0.20$

Where p is the number of persons served by the tank and V_p is the percolation value (secs/mm) obtained.

7 Desludging

The sewage treatment plant will require desludging and maintenance as follows:

- 6PE-35PE – Annually or as required
- 40PE-100PE – Six monthly or as required
- 100PE-300PE – As advised

The desludging of the plant is the responsibility of the site owner. Desludging should be carried out according to the size of the plant and dependent on usage.

It is the site owner's responsibility to provide access for the vacuum tanker, to desludge the plant. Vehicles should never drive over the system. Keep at least 4 metres away from the covers on the plant.

NOTE: If effluent samples are to be taken they should be taken from the sample chamber or, alternatively, from the discharge pipe. Sampling should only be taken by approved test centres.

Desludging procedure

- Desludging should normally be carried out by a vacuum sludge tanker.
- Licensed tankers are available commercially and the service is also provided by some local authorities.
- The sludge should be disposed of in accordance with local authority instructions or in a manner which will not cause pollution.
- The tank should be deslugged before the onset of winter if conditions do not allow a tanker on site.
- The sludge in the primary chamber (s) should not be removed completely, but approximately 75mm should be kept in the bottom of the tank to re-seed the new sludge, which will be formed when the tank is put into use again.

The depth of sludge can be checked using the following technique:

- Use a pole that can touch the bottom of the tank and wrap the bottom 1.4m with a white rag.
- Lower the pole to the bottom of the tank and hold for several minutes to allow the sludge layer to penetrate the rag.
- Remove the pole and note the sludge line, which will be darker than the colouration caused by the liquid waste.

(Typically a dark sludge line approximately 2/3rd from the bottom of the pole means you should desludge).

- On every alternative desludge, dead humus/scum should be skimmed from the final settlement tank(s). Ensure the tee pieces in all chambers are clear.

- Care must be taken not to damage the treatment plant with the hose of the vacuum tanker.

Please note:

- The sewage treatment plant should be clearly marked and vacuum tanker should never come closer than the depth of the excavation for the system unless the appropriate precautions have been taken. Never drive over the sewage treatment plant.
- Desludging should never be carried out alone due to potential dangers.
- The access cover should never be left off while the unit is unattended.
- The continued performance of the plant will depend on regular maintenance and cleaning. It is the end-user's responsibility to desludge the unit and keep the vents clear.

Further safety precautions

- Naked flames should not be used in vicinity of the tank due to the danger of explosion.
- Never enter a tank unless a safety line is attached to the person entering the tank and a second person is above ground to help if the entrant is overcome by gasses or foul air. Personnel entering the tank must have suitable breathing equipment and be fully trained in man entry techniques.
- As safety and security is of vital importance in sewage treatment systems, the following aspects are critical:
 - *Protective clothing/gloves/breathing apparatus, should be worn at all times.*
 - *Always remove contaminated clothing and protective equipment after working with sewage treatment Systems.*
 - *Wash hands and face prior to eating, drinking or smoking.*
 - *Adequate first aid boxes should be present.*
 - *When working with machinery/electrical equipment, proximity of water should be noted. All tools and electrical equipment should be kept dry.*
 - *A second person should be present when carrying out non-routine maintenance.*
- Disused or abandoned tanks should be demolished, filled in or sealed so that accidental entry is impossible.

8 Warranty information

Marsh Industries offers an initial 12-month warranty on every plant installed provided that it is installed, commissioned (if required) and maintained in accordance with the manufacturer's instructions and also provided that the unit has not been subject to damage or abuse. This warranty covers all of the GRP components and any other additional installed components against malfunction.

Marsh Industries

Marsh Industries delivers world-class water/wastewater treatment products and solutions to the domestic, commercial and agricultural sectors from its UK manufacturing plants in Kettering and Bridgwater.

The company is recognised as a collaborative and trusted partner to its customers, with a reputation for providing quality products that really do add value:

- *Sewage treatment plants 4-500+ PE*
- *Pump stations 234-20,000+ litres*
- *Septic tanks and cesspools 2800-20,000+ litres*
- *Septic conversion units 4-60+ PE*
- *Grease traps 234-20,000+ litres*
- *Trash/debris barriers*
- *Agri-silage tanks up to 100,000 litres*
- *Stormwater attenuation up to 130,000 litres*
- *Rainwater harvesting systems 1500-20,000+ litres*
- *Oil separators, wash-down separators and silt traps*

All products are fully type-tested and certified to ensure compliance with relevant environmental permitting programmes and building regulations.

In addition, the company's state-of-the art computer software, GAIA, can generate precise, bespoke commercial sewage treatment plants and pump chamber systems to the finest specification.

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Appendix B: Maintenance inspection checklist



Table B.25 SuDS maintenance inspection checklist			
General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date								
	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date Completed
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

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Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?)								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								

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Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current Increase maintenance Decrease maintenance								
Next inspection								
Proposed date for next inspection								