Consulting Civil Engineers

Foul and Surface Water Drainage Report

Frithknowle, Picts Lane, Cowfold, West Sussex

Planning Ref: DC/23/1758

For

Mr & Mrs O'Farrell

Rev – **P1**

Reference **C2795**

Date **30th August 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	21/02/2024	Initial Issue	LH	CS
P1	30/08/2024	Revised	LH	CS

Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW
Tel: 01243 933253 E: mail@cgscivils.co.uk W: www.cgscivils.co.uk

Contents

1 INTRODUCTION 3

2 EXECUTIVE SUMMARY: 4

3 SITE GEOLOGY 4

4 EXISTING DRAINAGE 4

5 PROPOSED DRAINAGE STRATEGY 5

6 SUMMARY AND CONCLUSIONS 6

7 APPENDICES 7

1 Introduction

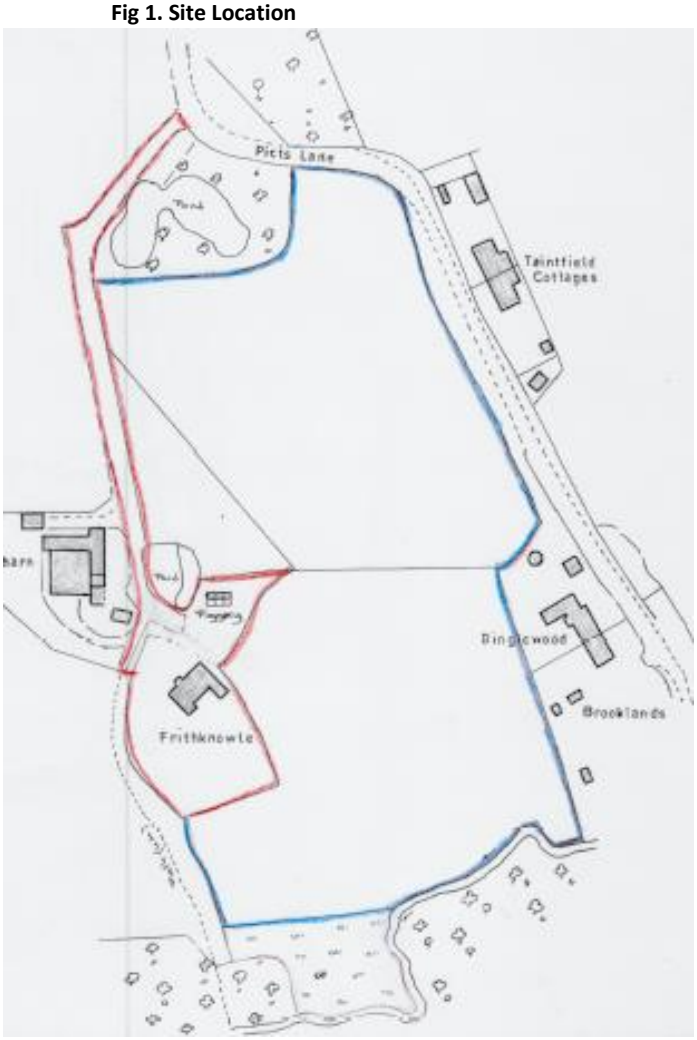
1.1.1 CGS Civils Ltd has been appointed to undertake a drainage strategy report for a proposed development at Frithknowle, Picts Lane in Cowfold, West Sussex.

1.1.2 The purpose of this drainage strategy is to demonstrate how the development area can be satisfactorily drained without increasing flood risk onsite and elsewhere in order to clear Condition 3. The condition is in place on Decision Notice from **15th November 2023**, with the planning reference: **DC/23/1758.** The condition states:

'No development shall commence until a drainage strategy detailing the proposed means of foul and surface water disposal has been submitted to an approved in writing by the Local Planning Authority'

1.1.3 The proposed development will consist of the conversion of an existing piggery to form a 1-bedroom annexe to the existing listed house. The proposed development is located as OS Grid Reference TQ 21885 23986 and has the post code RH13 8AN

Fig 1. Site Location



2 Executive Summary:

2.1.1 The Surface Water will discharge to an existing drainage ditch located to the north of the annexe at a restricted rate of 1.0l/s. The proposed discharge is subject to OWC approval with Horsham DC.

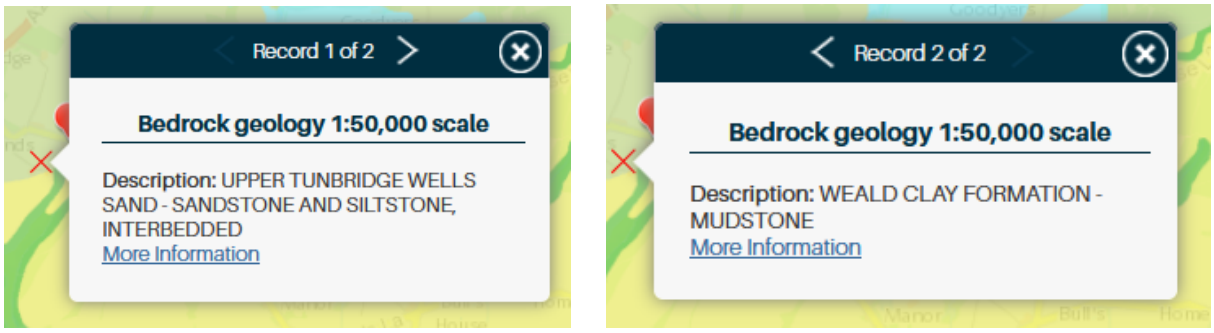
2.1.2 The Foul water will discharge into the existing foul water drainage that serves Frithknowle and into a septic tank. The size of the septic tank is to be confirmed prior to construction to ensure there is sufficient capacity. If it is determined that there is insufficient capacity within the existing septic tank, then an alternative means of foul water discharge should be sought. The proposed alternative option would be to utilise a package treatment plant for the foul waste prior to discharging all treated effluent into the adjacent watercourse.

3 Site Geology

3.1 British Geological Survey information

3.1.1 The British Geological Survey confirms the bedrock geology to be made up Upper Tunbridge Wells Sand and Weald Clay Foprmation, which are comprised of Sandstone, Siltstone and Mudstone. At the time of writing the British Geological Survey website does not have any recorded information of the Superfical deposits on site.

Fig 2. British Geological Survey



3.2 Geological Assessment

3.2.1 An infiltration test to BRE365 was carried out on site by the client which failed to drain at all resulting in a failure. The ground water noted to be thick clay.

4 Existing Drainage

4.1.1 The existing piggery building does not have any existing drainage.

5 Proposed Drainage Strategy

5.1 SuDS Hierarchy

5.1.1 All options for the destination of run-off generated on site have been assessed in line with the SuDS hierarchy as set out in Building Regulations Part H document and DEFRA's Draft National Standards for SuDS.

Table 1. SuDS Hierarchy

Discharge Destination	
Rainwater Harvesting	Yes – 1500l rainwater harvesting tank proposed
Discharge to Ground	No – Infiltration test to BRE365 failed on site
Discharge to Watercourse	Yes – Discharge to adjacent drainage ditch at restricted rate of 1.0l/s.
Discharge to Surface Water Sewer	N/A due to above
Discharge to Other Sewer	N/A due to above

5.2 Proposed Hydraulic Calculation Specifications:

Table 2. SuDS Hierarchy

Hydraulic Calculations Settings:	
Rainfall Methodology	**FEH-22**
Volumetric Run-off Coefficient Cv	**0.75**
CV Winter and Summer	**0.75 / 0.84**
Additional Storage (m^3 / ha)	**0.0**
Flow Control	**0.57m Head @ 1l/s discharge**

5.3 Surface Water Drainage

5.3.1 Due to the failure of the infiltration test, which was carried out on site by the client, it is proposed that all surface water runoff is discharged into an adjacent drainage ditch located along the northern boundary of the site. All surface water runoff from roof areas are to be collected into a positive drainage network before discharing into the existing drainage ditch at a restricted rate of 1.0l/s. There is sufficient capacity within the network to cater for the 1 in 100-year +45% storm.

5.3.2 Hydraulic calculations have been carried out which can be found at Appendix C.

5.4 Foul water drainage

5.4.1 The foul water will discharge into the existing foul water drainage which serves Frithknowle. This drainage network is discharged into a septic tank on site. The size of the septic tank is to be confirmed prior to construction to ensure there is sufficient capacity for the proposed annexe.

5.4.2 If it is determined that there is insufficient capacity within the existing septic tank, then an alternative means of foul water discharge should be sought. The proposed alternative option would be to utilise a package treatment plant for the foul waste prior to discharging all treated effluent into the adjacent watercourse.

6 Summary and Conclusions

6.1.1 CGS Civils has been instructed by to produce a Drainage statement under National Planning Policy Framework (NPPF) to support the Planning Application for the conversion of an existing piggery into a 1-bedroom annexe.

6.1.2 The Surface Water will discharge to an existing drainage ditch located to the north of the annexe at a restricted rate of 1.0l/s.

6.1.3 The Foul water will discharge into the existing foul water drainage that serves Frithknowle and into a septic tank. The size of the septic tank is to be confirmed prior to construction to ensure there is sufficient capacity. If it is determined that there is insufficient capacity within the existing septic tank, then an alternative means of foul water discharge should be sought. The proposed alternative option would be to utilise a package treatment plant for the foul waste prior to discharging all treated effluent into the adjacent watercourse.

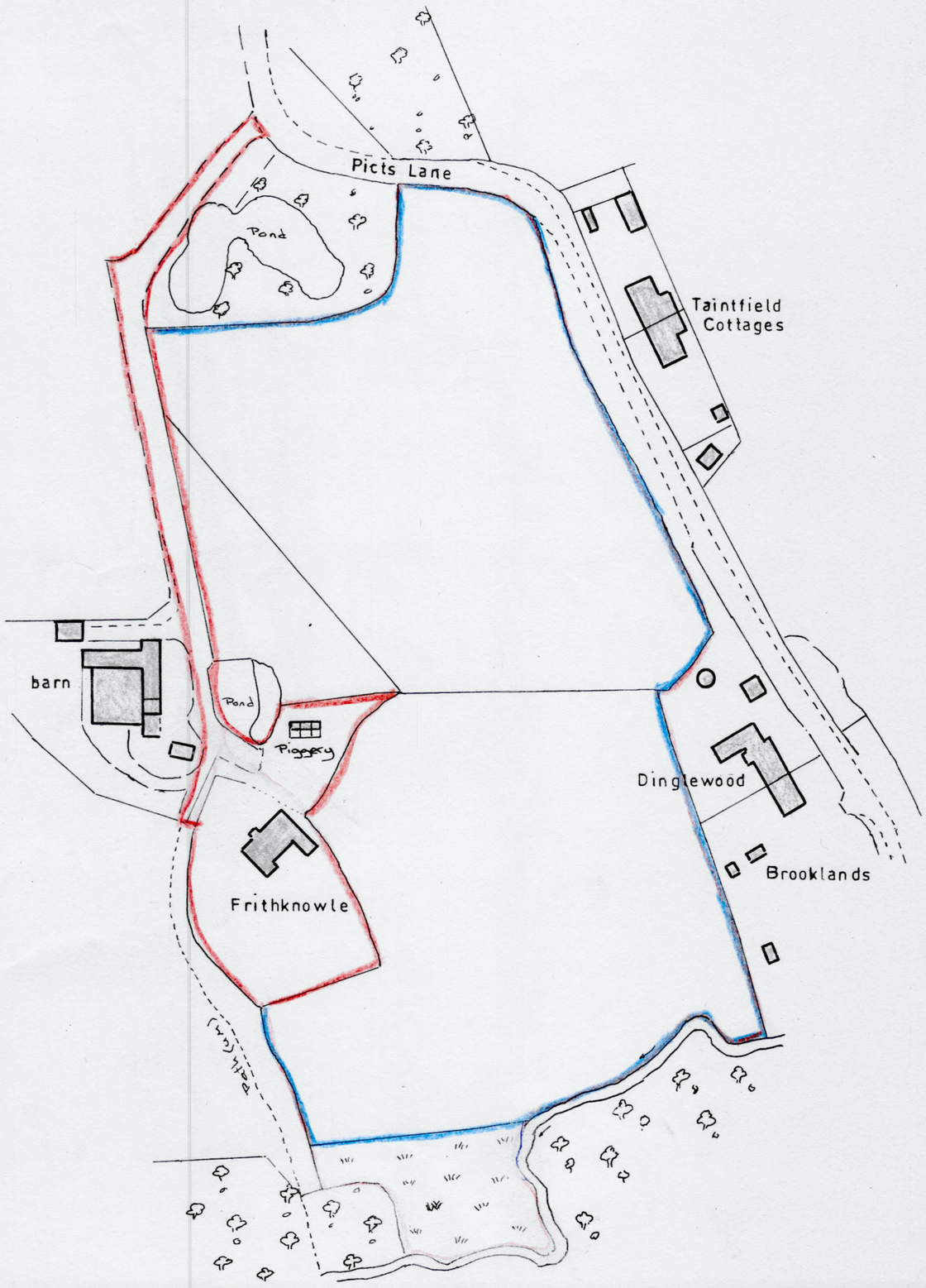
6.1.4 The report has demonstrated that the proposed drainage measures ensure that suitable means of surface water and foul drainage can be achieved for the proposed development.

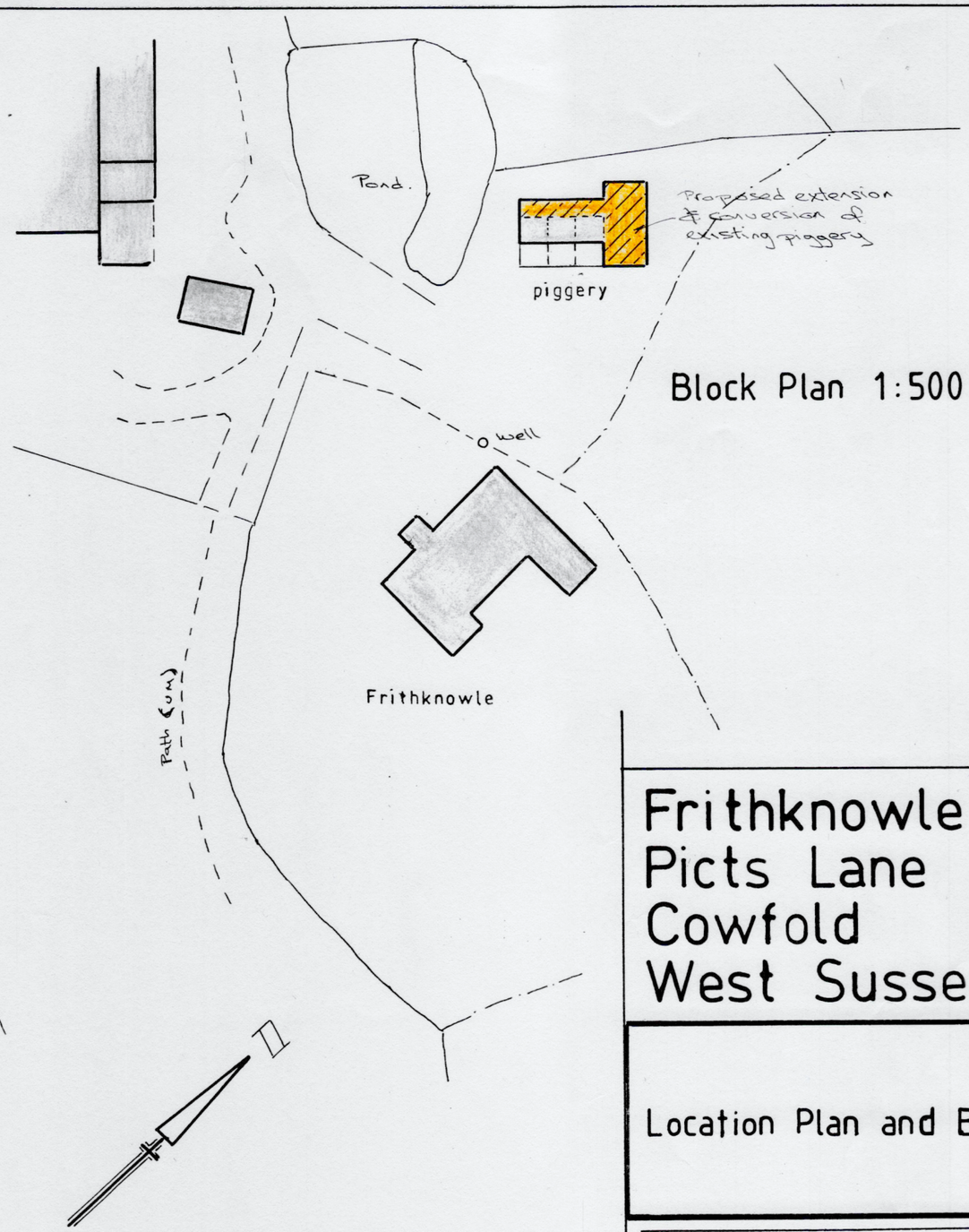
7 Appendices

7.1 Appendix A – Site Plan

A3

Location Plan 1:1250





Block Plan 1:500

1:500 0 10m 20 m

1:1250 0 25 m 50 m

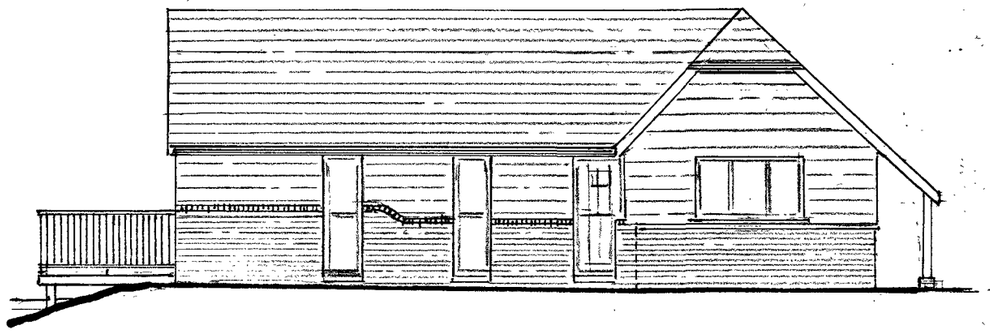
Frithknowle
Picts Lane
Cowfold
West Sussex

Location Plan and Block Plan

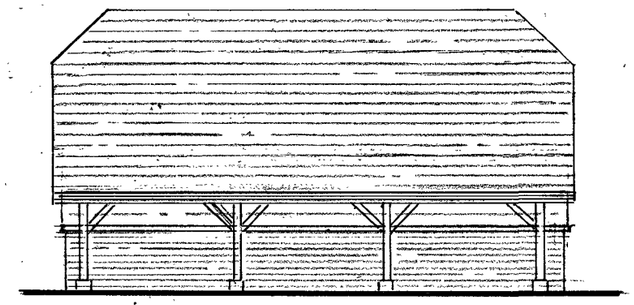
A.D. WALSH DEVELOPMENTS
Architectural Consultants
Alescroft,
Lewes Road, Scaynes Hill,
West Sussex RH17 7PG
tel: (01444) 831777

Scale: 1:1250 & 1:500 @ A3	Drawing No: 123/761/3
Date: January 2023	
Drawn: Alison D Walsh	

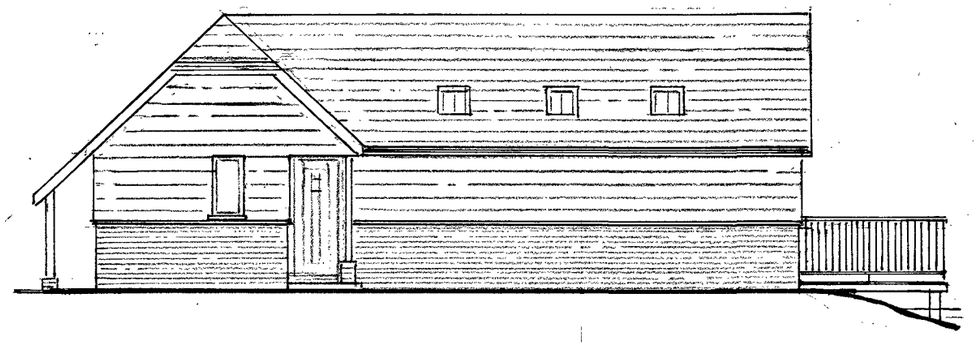
A3



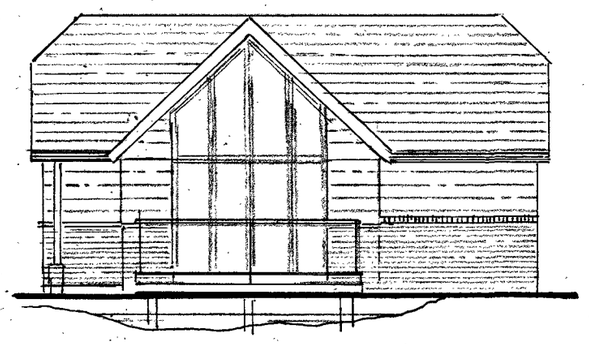
South East Elevation



North East Elevation



North West Elevation



South West Elevation

Facing Materials

ROOF:- Plain clay roof tiles, colour & type to match existing dwelling.

WALLS:- Reclaimed face brick to match existing.

Red face brick corble to match existing coping brick of piggery

Black stained shiplap weather boarding.

RW.GOODS:- Black pvc gutters & downpipes with black stained timber fascia

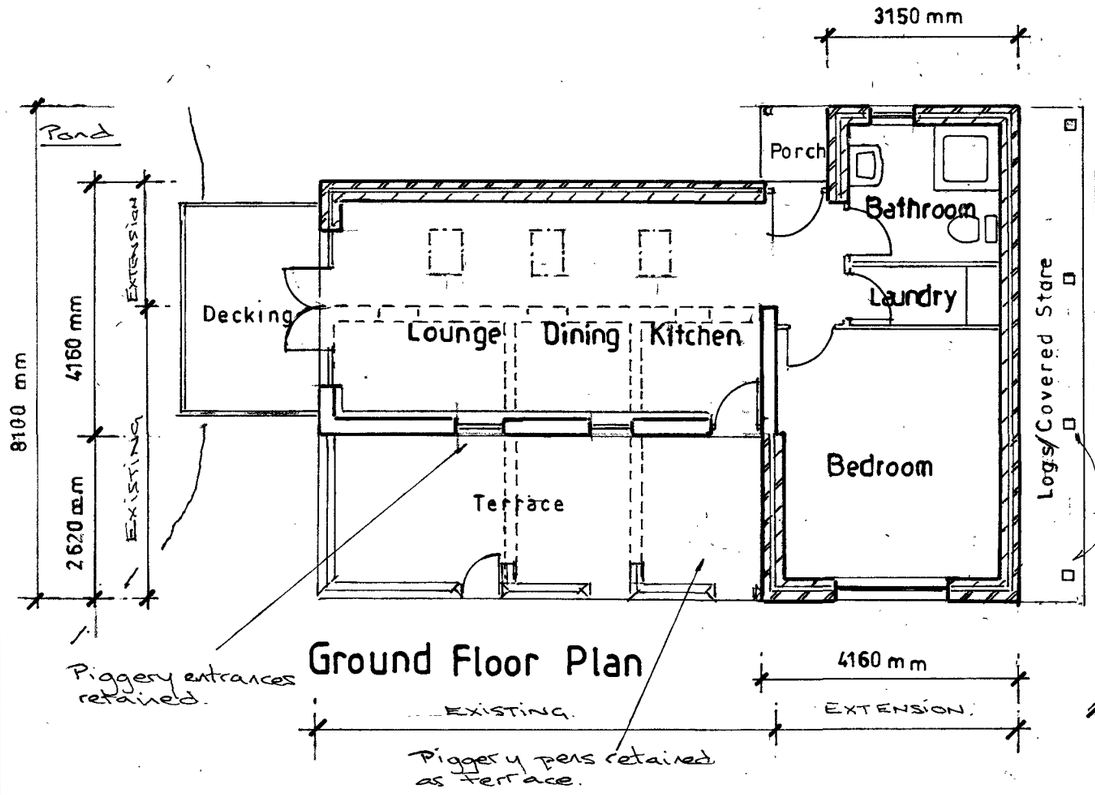
WINDOWS:- Black powder coated aluminium double glazed slim frame windows

DOORS:- Black powder coated door frames + black woodgrain effect doors

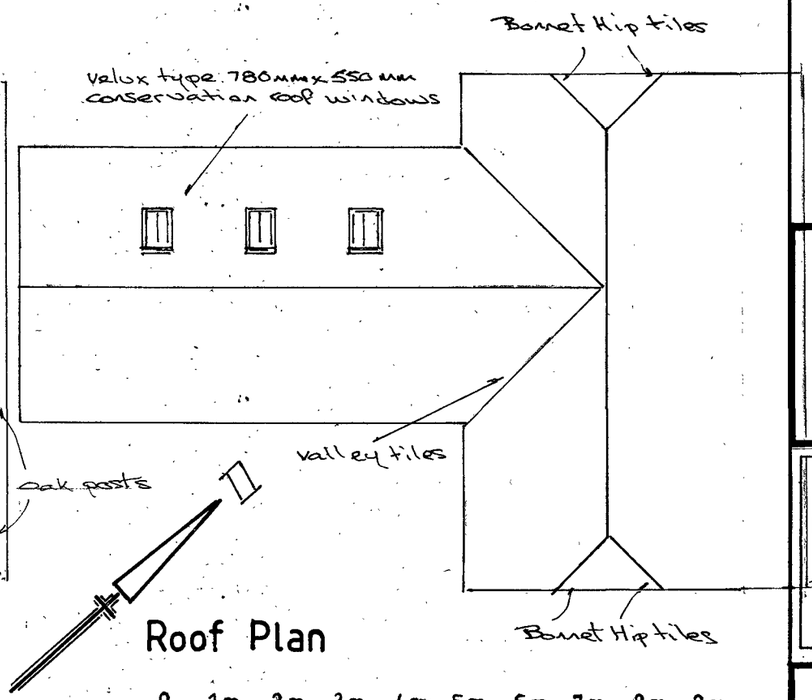
DECKING:- Timber decking & balustrade.

Revisions

'A' Roof pitch details amended to 42.5 degrees + incorporation of covered log store + window material change all to request of Planning/Conservation officer. May 2023.



Ground Floor Plan



Roof Plan

1:100 0 1m 2m 3m 4m 5m 6m 7m 8m 9m

Frithknowle Picts Lane Cowfold West Sussex

Plans and Elevations for Proposed Extension/Conversion of Existing Piggery

A.D. WALSH DEVELOPMENTS
Architectural Consultants
Alescroft,
Lewes Road, Scaynes Hill,
West Sussex RH17 7PG
tel: (01444) 831777

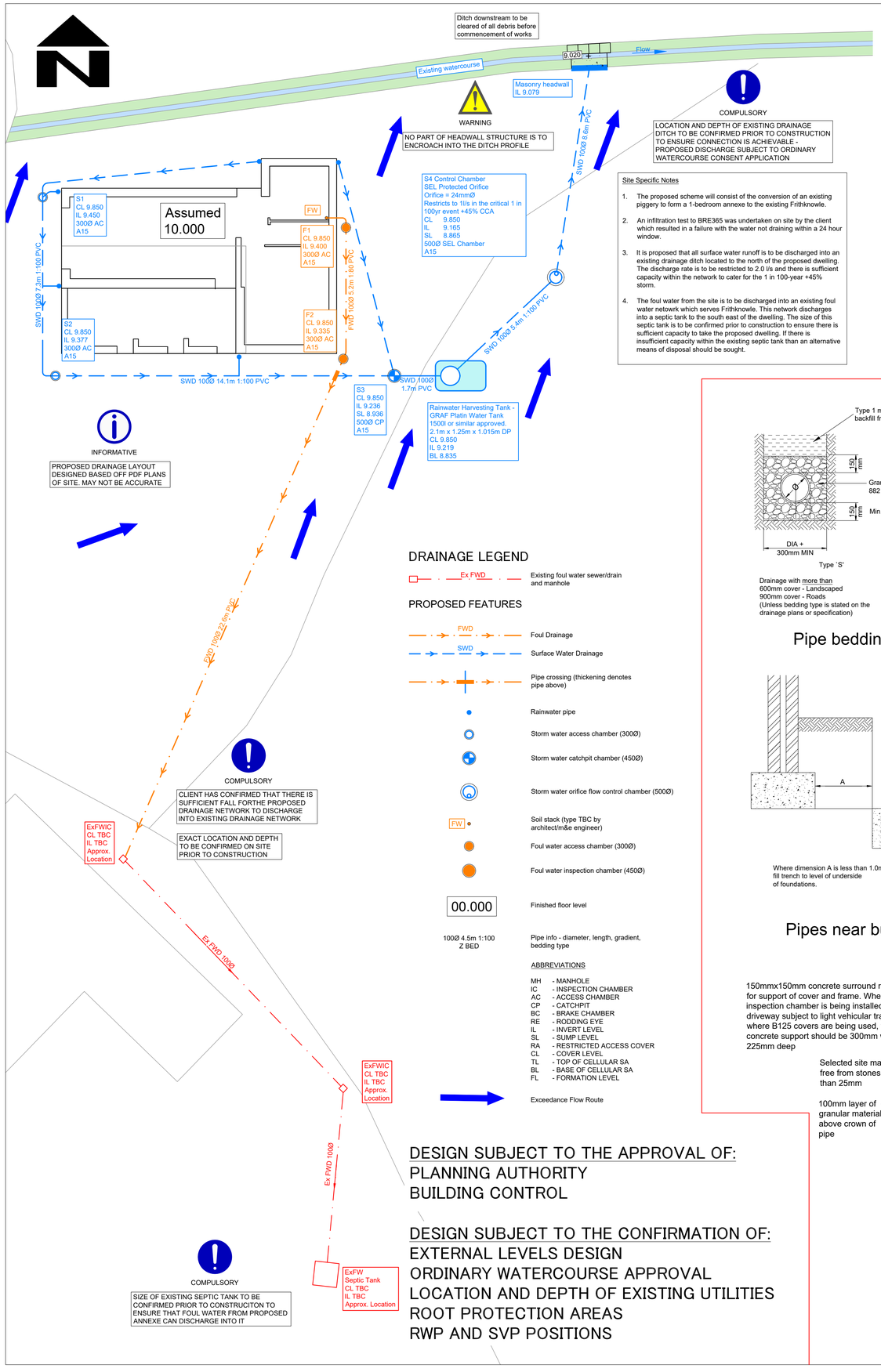
Scale: 1:100 @ A3

Date: January 2023

Drawn

Drawing No: 123/761/2 A

7.2 Appendix B – Drainage Layout



Site Specific Notes

1. The proposed scheme will consist of the conversion of an existing piggery to form a 1-bedroom annexe to the existing Frithknowle.
2. An infiltration test to BRE365 was undertaken on site by the client which resulted in a failure with the water not draining within a 24 hour window.
3. It is proposed that all surface water runoff is to be discharged into an existing drainage ditch located to the north of the proposed dwelling. The discharge rate is to be restricted to 2.0 l/s and there is sufficient capacity within the network to cater for the 1 in 100-year +45% storm.
4. The foul water from the site is to be discharged into an existing foul water netowrk which serves Frithknowle. This network discharges into a septic tank to the south east of the dwelling. The size of this septic tank is to be confirmed prior to construction to ensure there is sufficient capacity to take the proposed dwelling. If there is insufficient capacity within the existing septic tank than an alternative means of disposal should be sought.

DRAINAGE LEGEND

Ex FWD — Existing foul water sewer/drain and manhole

PROPOSED FEATURES

FWD — Foul Drainage

SWD — Surface Water Drainage

Pipe crossing (thickening denotes pipe above)

Rainwater pipe

Storm water access chamber (300Ø)

Storm water catchpit chamber (450Ø)

Storm water orifice flow control chamber (500Ø)

FW — Soil stack (type TBC by architect/m&e engineer)

Foul water access chamber (300Ø)

Foul water inspection chamber (450Ø)

00.000 — Finished floor level

100Ø 4.5m 1:100 Z BED — Pipe info - diameter, length, gradient, bedding type

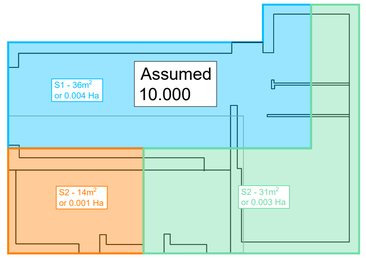
ABBREVIATIONS

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

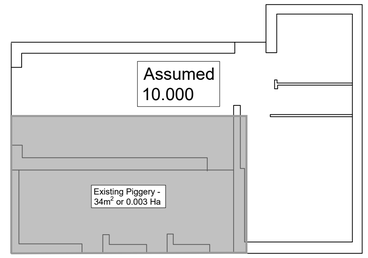
Exceedance Flow Route

DESIGN SUBJECT TO THE APPROVAL OF:
PLANNING AUTHORITY
BUILDING CONTROL

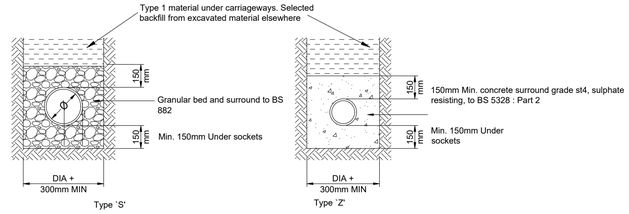
DESIGN SUBJECT TO THE CONFIRMATION OF:
EXTERNAL LEVELS DESIGN
ORDINARY WATERCOURSE APPROVAL
LOCATION AND DEPTH OF EXISTING UTILITIES
ROOT PROTECTION AREAS
RWP AND SVP POSITIONS



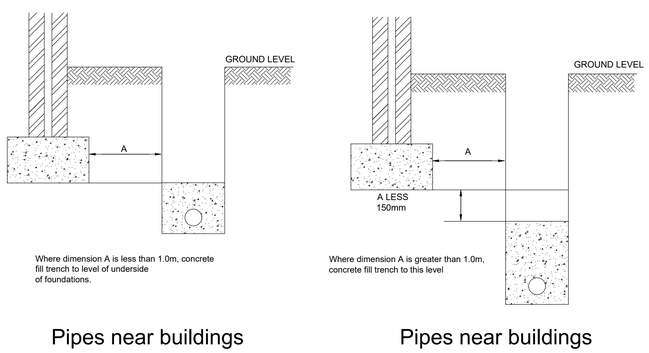
PROPOSED IMPERMEABLE AREAS − 1:100



EXISTING IMPERMEABLE AREAS − 1:100

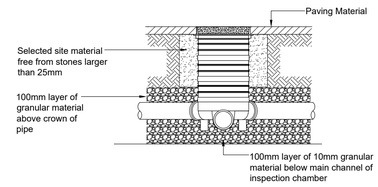


Pipe bedding details in private Areas

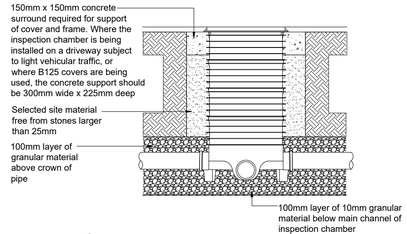


Pipes near buildings

Pipes near buildings



300mmØ SHALLOW INSPECTION CHAMBER DETAIL



1. In all installations, the main channel of the inspection chamber should always be used. Where the chamber is being used as a change of direction for the drainage system, short radius bends of 11¼°, 15°, 30° and 45° can be used in the inlet and outlet to achieve the required angle.
2. Side inlet branch connections enter the inspection chamber approx. 55mm above the invert of the main channel
3. 320mm dia. chambers are supplied with 2no. blanking plugs for the side inlets and 460mm dia. chambers are supplied with 3no. blanking plugs.

460mmØ INSPECTION CHAMBER DETAIL

150mmx150mm concrete surround required for support of cover and frame. Where the inspection chamber is being installed on a driveway subject to light vehicular traffic, or where B125 covers are being used, the concrete support should be 300mm wide x 225mm deep

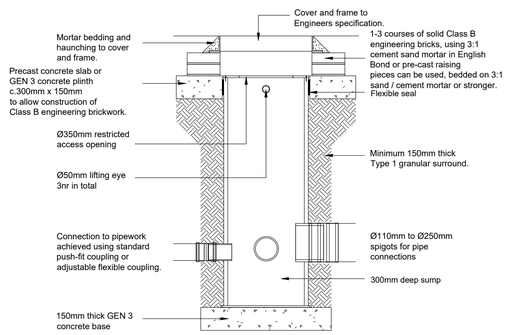
Selected site material free from stones larger than 25mm

100mm layer of granular material above crown of pipe

100mm layer of 10mm granular material below main channel of inspection chamber

SEL CONTROFLOW 500 ORIFICE CHAMBER

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



SEL WASP05050 500Ø Inspection Chamber

CONSTRUCTION DETAILS − 1:20

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.
4. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.
5. 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.
6. 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.
7. COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
8. ALL UN-REFERENCED PIPES ARE TO BE 100mm DIA
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 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.
12. ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT PART-H, AND TO THE SATISFACTION OF THE BUILDING CONTROL INSPECTOR.
13. 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.
14. 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.
15. 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.
16. NO PRIVATE AREAS ARE TO DRAIN ONTO ADOPTABLE AREAS AND VICE VERSA.
17. ALL EXISTING MANHOLE COVER'S, GULLIES, ETC, ARE TO BE RAISED/LOWERED TO SUIT NEW LEVELS.
18. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE LOCATION AND DEPTH OF ALL EXISTING SERVICES AND UTILITIES THAT MAY BE PRESENT
19. 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
20. 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

FOR PLANNING ONLY

REV	DATE	DESCRIPTION	BY	CHK	APP
PL1	30.08.24	REVISED TO SUIT COUNCIL COMMENTS	LH	CS	CS
P-	21.02.24	PRELIMINARY ISSUE	LH	CS	CS

cgs civils
Consulting Civil Engineers

CLIENT: MR & MRS O'FARREL
ARCHITECT: A.D.WALSH DEVELOPMENTS
JOB TITLE: FRITHKNOWLE, PICTS LANE COWFOLD
DRAWING TITLE: DRAINAGE LAYOUT

DRAWN	ENGINEER	CHECKED	APPROVED
LH	C SLADE	CS	CS

DATE: FEBRUARY 2024 — SCALE @ A1: 1:100

JOB No.	STATUS	DRAWING No.	REV.
C2795	PL	101	PL1

7.3 Appendix C – Surface Water Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	10	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.350
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.004	5.00	9.850	Manhole	Adoptable	300	1253.694	-7.377	0.400
S2	0.001	5.00	9.850	Manhole	Adoptable	300	1254.225	-14.816	0.473
S3	0.003	5.00	9.850	Manhole	Adoptable	500	1268.344	-14.816	0.614
S4			9.850	Manhole	Adoptable	500	1275.067	-10.712	0.685
OUTFALL			9.850	Manhole	Adoptable	150	1284.871	-1.552	0.771

Links (Input)

Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S1	S2	7.458	9.450	9.377	0.073	102.2	100
1.001	S2	S3	14.119	9.377	9.236	0.141	100.1	100
1.002	S3	S4	7.877	9.236	9.165	0.071	110.9	100
1.003	S4	OUTFALL	13.417	9.165	9.079	0.086	156.0	100

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	30 year (l/s)	0.1
Summer CV	0.750	Additional Storage (m³/ha)	0.0	100 year (l/s)	0.1
Winter CV	0.840	Check Discharge Rate(s)	✓	Check Discharge Volume	x
Analysis Speed	Normal	2 year (l/s)	0.0		
Skip Steady State	x	10 year (l/s)	0.1		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	45	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	7
Greenfield Method	IH124	Growth Factor 2 year	0.88
Positively Drained Area (ha)	0.008	Growth Factor 10 year	1.62
SAAR (mm)	792	Growth Factor 30 year	2.40
Soil Index	4	Growth Factor 100 year	3.19
SPR	0.47	Betterment (%)	0

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Pre-development Discharge Rate

QBar	0.0	Q 30 year (l/s)	0.1
Q 2 year (l/s)	0.0	Q 100 year (l/s)	0.1
Q 10 year (l/s)	0.1		

Node S4 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.570	Discharge Coefficient	0.650
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	9.165	Diameter (m)	0.024		

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 2 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 winter	S1	10	9.471	0.021	0.6	0.0015	0.0000	OK
15 minute winter	S2	11	9.399	0.022	0.7	0.0016	0.0000	OK
30 minute winter	S3	24	9.297	0.061	0.8	0.0119	0.0000	OK
30 minute winter	S4	24	9.296	0.131	0.8	0.0257	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	9.079	0.000	0.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	0.6	0.460	0.093	0.0091	
15 minute winter	S2	1.001	S3	0.7	0.414	0.108	0.0359	
30 minute winter	S3	1.002	S4	0.8	0.374	0.137	0.0503	
30 minute winter	S4	Orifice	OUTFALL	0.4				0.7

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

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 winter	S1	10	9.479	0.029	1.1	0.0021	0.0000	OK
30 minute winter	S2	24	9.428	0.051	1.1	0.0036	0.0000	OK
30 minute winter	S3	24	9.428	0.192	1.7	0.0376	0.0000	SURCHARGED
30 minute winter	S4	24	9.427	0.262	1.0	0.0513	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	9.079	0.000	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	1.1	0.527	0.179	0.0155	
30 minute winter	S2	1.001	S3	1.1	0.413	0.180	0.0835	
30 minute winter	S3	1.002	S4	1.0	0.356	0.183	0.0616	
30 minute winter	S4	Orifice	OUTFALL	0.7				1.3

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 30 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
30 minute winter	S1	26	9.645	0.195	1.6	0.0139	0.0000	FLOOD RISK
30 minute winter	S2	26	9.645	0.268	2.0	0.0190	0.0000	FLOOD RISK
30 minute winter	S3	26	9.643	0.407	2.6	0.0799	0.0000	FLOOD RISK
30 minute winter	S4	26	9.641	0.476	1.5	0.0934	0.0000	FLOOD RISK
15 minute summer	OUTFALL	1	9.079	0.000	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)
30 minute winter	S1	1.000	S2	1.6	0.570	0.270	0.0584	
30 minute winter	S2	1.001	S3	1.6	0.383	0.258	0.1105	
30 minute winter	S3	1.002	S4	1.5	0.406	0.258	0.0616	
30 minute winter	S4	Orifice	OUTFALL	0.9				2.6

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

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
60 minute winter	S1	45	9.788	0.338	1.4	0.0240	0.0000	FLOOD RISK
60 minute winter	S2	45	9.787	0.410	1.5	0.0291	0.0000	FLOOD RISK
60 minute winter	S3	45	9.786	0.550	1.9	0.1078	0.0000	FLOOD RISK
60 minute winter	S4	45	9.783	0.618	1.3	0.1211	0.0000	FLOOD RISK
15 minute summer	OUTFALL	1	9.079	0.000	0.9	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)
60 minute winter	S1	1.000	S2	1.2	0.505	0.196	0.0584	
60 minute winter	S2	1.001	S3	1.0	0.369	0.169	0.1105	
60 minute winter	S3	1.002	S4	1.3	0.393	0.236	0.0616	
60 minute winter	S4	Orifice	OUTFALL	1.0				4.2

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	10	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.350
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.004	5.00	9.850	Manhole	Adoptable	300	1253.694	-7.377	0.400
S2	0.001	5.00	9.850	Manhole	Adoptable	300	1254.225	-14.816	0.473
S3	0.003	5.00	9.850	Manhole	Adoptable	500	1268.344	-14.816	0.614
S4			9.850	Manhole	Adoptable	500	1275.067	-10.712	0.685
OUTFALL			9.850	Manhole	Adoptable	150	1284.871	-1.552	0.771

Links (Input)

Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	S1	S2	7.458	9.450	9.377	0.073	102.2	100
1.001	S2	S3	14.119	9.377	9.236	0.141	100.1	100
1.002	S3	S4	7.877	9.236	9.165	0.071	110.9	100
1.003	S4	OUTFALL	13.417	9.165	9.079	0.086	156.0	100

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	30 year (l/s)	0.1
Summer CV	0.750	Additional Storage (m³/ha)	0.0	100 year (l/s)	0.1
Winter CV	0.840	Check Discharge Rate(s)	✓	Check Discharge Volume	x
Analysis Speed	Normal	2 year (l/s)	0.0		
Skip Steady State	x	10 year (l/s)	0.1		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	45	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	7
Greenfield Method	IH124	Growth Factor 2 year	0.88
Positively Drained Area (ha)	0.008	Growth Factor 10 year	1.62
SAAR (mm)	792	Growth Factor 30 year	2.40
Soil Index	4	Growth Factor 100 year	3.19
SPR	0.47	Betterment (%)	0

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Pre-development Discharge Rate

QBar	0.0	Q 30 year (l/s)	0.1
Q 2 year (l/s)	0.0	Q 100 year (l/s)	0.1
Q 10 year (l/s)	0.1		

Node S4 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.570	Discharge Coefficient	0.650
Replaces Downstream Link	✓	Design Flow (l/s)	1.0		
Invert Level (m)	9.165	Diameter (m)	0.024		

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 2 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 winter	S1	10	9.471	0.021	0.6	0.0015	0.0000	OK
15 minute winter	S2	11	9.399	0.022	0.7	0.0016	0.0000	OK
30 minute winter	S3	24	9.297	0.061	0.8	0.0119	0.0000	OK
30 minute winter	S4	24	9.296	0.131	0.8	0.0257	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	9.079	0.000	0.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	0.6	0.460	0.093	0.0091	
15 minute winter	S2	1.001	S3	0.7	0.414	0.108	0.0359	
30 minute winter	S3	1.002	S4	0.8	0.374	0.137	0.0503	
30 minute winter	S4	Orifice	OUTFALL	0.4				0.7

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

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 winter	S1	10	9.479	0.029	1.1	0.0021	0.0000	OK
30 minute winter	S2	24	9.428	0.051	1.1	0.0036	0.0000	OK
30 minute winter	S3	24	9.428	0.192	1.7	0.0376	0.0000	SURCHARGED
30 minute winter	S4	24	9.427	0.262	1.0	0.0513	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	9.079	0.000	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	1.1	0.527	0.179	0.0155	
30 minute winter	S2	1.001	S3	1.1	0.413	0.180	0.0835	
30 minute winter	S3	1.002	S4	1.0	0.356	0.183	0.0616	
30 minute winter	S4	Orifice	OUTFALL	0.7				1.3

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 30 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
30 minute winter	S1	26	9.645	0.195	1.6	0.0139	0.0000	FLOOD RISK
30 minute winter	S2	26	9.645	0.268	2.0	0.0190	0.0000	FLOOD RISK
30 minute winter	S3	26	9.643	0.407	2.6	0.0799	0.0000	FLOOD RISK
30 minute winter	S4	26	9.641	0.476	1.5	0.0934	0.0000	FLOOD RISK
15 minute summer	OUTFALL	1	9.079	0.000	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)
30 minute winter	S1	1.000	S2	1.6	0.570	0.270	0.0584	
30 minute winter	S2	1.001	S3	1.6	0.383	0.258	0.1105	
30 minute winter	S3	1.002	S4	1.5	0.406	0.258	0.0616	
30 minute winter	S4	Orifice	OUTFALL	0.9				2.6

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

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
60 minute winter	S1	45	9.788	0.338	1.4	0.0240	0.0000	FLOOD RISK
60 minute winter	S2	45	9.787	0.410	1.5	0.0291	0.0000	FLOOD RISK
60 minute winter	S3	45	9.786	0.550	1.9	0.1078	0.0000	FLOOD RISK
60 minute winter	S4	45	9.783	0.618	1.3	0.1211	0.0000	FLOOD RISK
15 minute summer	OUTFALL	1	9.079	0.000	0.9	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)
60 minute winter	S1	1.000	S2	1.2	0.505	0.196	0.0584	
60 minute winter	S2	1.001	S3	1.0	0.369	0.169	0.1105	
60 minute winter	S3	1.002	S4	1.3	0.393	0.236	0.0616	
60 minute winter	S4	Orifice	OUTFALL	1.0				4.2

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

7.4 Appendix D – Soakaway test

Step 1 – pictures of trial hole









Annex at
Frithknowle
Picts Lane
Cowfold
W Sussex
RH13 8AN

Step 2 – hole filled with water







Annex at
Frithknowle
Picts Lane
Cowfold
W Sussex
RH13 8AN

7.5 Appendix E – Maintenance Schedule

Consulting Civil Engineers

Maintenance Schedule

Frithknowle, Picts Lane, Cowfold, West Sussex

Planning Ref: DC/23/1758

For

Mr & Mrs O'Farrell

Rev - **P**

Reference **C2795**

Date **21st February 2024**

Revision	Date of Issue	Comments	Prepared By	Checked By
P	21/02/2024	Initial Issue	LH	CS

Contents

1 MAINTENANCE 3

1 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 occupier will take on the responsibility of these duties as laid out in this report.

1.1.2 The maintenance schedule for the proposed development will be split down into two separate categories; SuDS features and regular private drainage.

1.2 General Drainage Maintenance Specification

1.2.1 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 **Inspect rainwater downpipes, channel drains and road gullies, removing obstructions and silt as necessary. Check that there is no physical damage.** **Strim vegetation 1m min surround to structures and keep area free from silt and debris**	Monthly
Inspections Chambers and below ground control chambers. **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**	Annually
Occasional Maintenance **Check topsoil levels are 20mm above edges of chambers to avoid mower damage.**	As necessary
Remedial Work **Repair physical damage if necessary**	As required

1.2.2 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 **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