Newbold Farm, Duntisbourne Abbots

Mr and Mrs Scudamore

Technical Note – Drainage Strategy

231064-KTN-RP-01-A

26th November 2023

K-Ten Consulting

The Site
24 Chosen View Road
Cheltenham
GL51 9LT

DOCUMENT CONTROL

Document Status

Revision	Date	Document Author	Status
A	**27.11.23**	**Kris Tovey**	**Final**

Limitations of Liability

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National Standards, regulations and Council policy do change which could affect the validity of this Report. The methodologies adopted and the sources of information used by K-Ten Consulting Ltd in providing its services are outlined within the report. Any information provided by third parties and referred to within the report and appendices has not been checked or verified by K-Ten Consulting Ltd, unless otherwise expressly stated within this Report.

CONTENTS PAGE

APPENDICIES

1.0 INTRODUCTION

1.1 K-Ten Consulting Ltd (K-Ten) provide professional Flood Risk, Infrastructure and Drainage services throughout the UK.

1.2 K-Ten have been commissioned by Mr and Mrs Scudamore (applicant) to prepare technical surface and foul drainage design information to support a planning application at Newbold Farm, Duntisbourne Abbots.

1.3 The project consists of the conversion and extension of an existing barn to provide a residential dwelling with associated external works. Refer to **Appendix A** for proposed site layout.

1.4 This technical note will summarise the below ground drainage requirements on site in accordance with Council water management guidelines and national standards.

2.0 EXISTING SITE DETAILS

Site Location

2.1 The site is located in the north of Duntisbourne Abbots, Cirencester. The approximate site co-ordinates are E 396980, N 208050 and National Grid SO969080, with the nearest post code GL7 7JN.

2.2 Refer to **Appendix B** for site location plan.

2.3 The current site comprises an existing residential building, associated out buildings and surrounding soft landscaping.

Existing Drainage

2.4 Thames Water asset records show no existing public drainage assets within close proximity to the site.

2.5 Refer to **Appendix C** for Thames Water Asset Records.

2.6 The current site buildings discharge foul waste to an existing septic tank.

2.7 Surface Water from the current impermeable areas of hardstanding and roof area discharges naturally to ground and existing soakaways on site.

Existing Hydrology

2.8 The closest watercourse is a spring fed stream running through Duntisbourne Abbots south towards Cirencester.

2.9 Online soil maps indicate the site to be underlain by freely draining shallow lime rich strata over chalk or limestone, which would suggest good natural drainage conditions.

Topography

2.10 A detailed topographical survey was completed in October 2021, a copy of which is included in **Appendix D**.

2.11 Ground levels within the area of proposed development are relatively flat with levels in the region of 195.40m AOD.

2.12 The site rises steeply to the north west via an earth bank and a raised soft landscaped area which continues to rise to the northern boundary.

Site Testing

2.13 Infiltration Testing was completed on 14th November 2023 under the supervision of K-Ten Consulting Ltd and in accordance with BRE365. Refer to **Appendix E** for site records and test calculations.

3.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

3.1 The existing barn roof drainage discharges uncontrolled directly to ground.

3.2 The existing and new roof areas within the proposed development will introduce impermeable areas totalling 440m^2.

3.3 Refer to **Appendix A** for proposed site layout.

3.4 A surface water strategy is proposed to manage and reduce the flood risk and surface water run-off from the development, with consideration to SuDS.

3.5 The SuDS hierarchy dictates that surface water run off should be managed as high up the following list as practically possible:

a) into the ground (via infiltration) and re-use, or then;
b) to a surface water body, or then;
c) to a surface water sewer, highway drain or another drainage system, or then;
d) to a combined sewer.

3.6 Infiltration testing was undertaken on site and concluded infiltration is a viable method of discharge with a design rate of **0.098 m/sec** recorded. Refer to **Appendix E** for infiltration rates.

3.7 All roof run off will be captured within a positive gravity drainage system and discharged to a below ground cellular soakaway offering 95% void ratio. The soakaway will be designed to cater for the 1 in 100 year rainfall event with a 40% allowance for climate change and design factor of safety of 2.0.

3.8 The soakaway will be 3.5m x 7.0m x 1.0m deep with a maximum water level of 987mm and maximum volume of 23.55m^3.

3.9 Refer to **Appendix F** for Drainage Calculations

3.10 Half drain time is less than 24 hours.

3.11 The soakaway will be located a minimum of 5m from any structure with suitable cover for the anticipated loading classification it will receive.

3.12 Inspection chambers will be fitted with silt traps upstream of the soakaway.

3.13 All other development areas will be constructed with permeable surfacing.

3.14 Refer to **Appendix G** for surface water drainage strategy.

3.15 Any exceedance flows above the 100 year event plus climate change will be directed towards the site access and follow natural topography to the south.

3.16 All proposed development run off for the 100 year event plus and allowance for climate change will be contained within the site.

4.0 WATER QUALITY AND POLLUTION

4.1 Water quality has been assessed in accordance with The SuDS Manual (CIRIA C753) which states the design of surface water should consider minimising contaminants within surface water runoff discharged from the site.

4.2 The level of treatment required is dependent on the proposed land use according to the pollution hazard indices (refer to SuDS Manual table 26.2). For this development the contaminant risks come from the *Residential Roofs,* which is classified as very low pollution hazard level.

4.3 As the discharge is directly to ground the mitigation indices against Pollution Hazard indices is not required.

4.4 It is good practice that gullies and chambers have suitable silt traps/catchpits to reduce sediments within the drainage system.

5.0 PROPOSED FOUL DRAINAGE STRATEGY

5.1 Development wastewater will connect to an on site primary and secondary treatment plant with clean water discharge to an effluent field in accordance with Building Regulations H and British Standards BS 6297:2007.

5.2 The anticipated development waste loads have been calculated in accordance with British Loading and Flows Tables 4 – for a 4 Bed dwelling = 6P.

5.3 The wastewater treatment plant will include a visual and audible high level alarm.

5.4 In accordance with Building Regulations H a V_p of 12 sec/mm has been interpolated from the BRE365 site infiltration rates. This rate sites within the 12-100 sec/mm allowable range for effluent field design.

5.5 An effluent field plan area of 6P x Vp12 x 0.2 = 15m^2 will be required.

5.6 The drainage field will be constructed 600mm below ground level and in accordance with Diagram 1 Building Regulations H.

5.7 Refer to **Appendix G** for surface water drainage strategy.

6.0 MAINTENANCE AND MANAGEMENT

6.1 Maintenance of SuDS features is required in order to ensure that the surface water drainage system operates effectively, and the risk of flooding of the site and surrounding areas is reduced.

6.2 A maintenance schedule should be undertaken to ensure that the drainage system remains fully operational for the design lifetime. The below table summarises a maintenance plan for the drainage systems and components within the development.

6.3 The SuDS Manual (CIRIA C753) and specific product suppliers guidelines should also be referred to for further information on maintenance and frequency.

6.4 All on site drainage will be maintained and managed through a private management company.

Drainage Component	Required Action	Typical Frequency
General pipework, manholes, chambers, silt traps and headwalls	Stabilise adjacent areas	As required
	Remove weeds and vegetation	As required
	Clear/Jet any poor performing structures	As required
	Inspect all drainage features for poor operation	3 monthly, 48 hours after large storms in first six months
	Monitor inspection chambers and silt traps. Inspect silt accumulation and determine silt clearance frequencies	Annually
Cellular Soakaways	Inspection of inlets, oulets and silt traps	As required
	Silt removal	Annually
Permeable Paving, if used.	Surface visual inspection for ponding, damaged blocks and build up of silt/detritus	Annually or after major storm events
	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
	Remove litter, weeds and debris	Monthly
	Vacuum sweeping and brush replacement of approved jointing material	Annually
	Replace geotextile and bedding layer	Every 30 year

APPENDIX A

PROPOSED SITE LAYOUT

Site Plan - Roof Level

Site Plan - Ground Level

N

0 2 4 6 8 10m

Notes

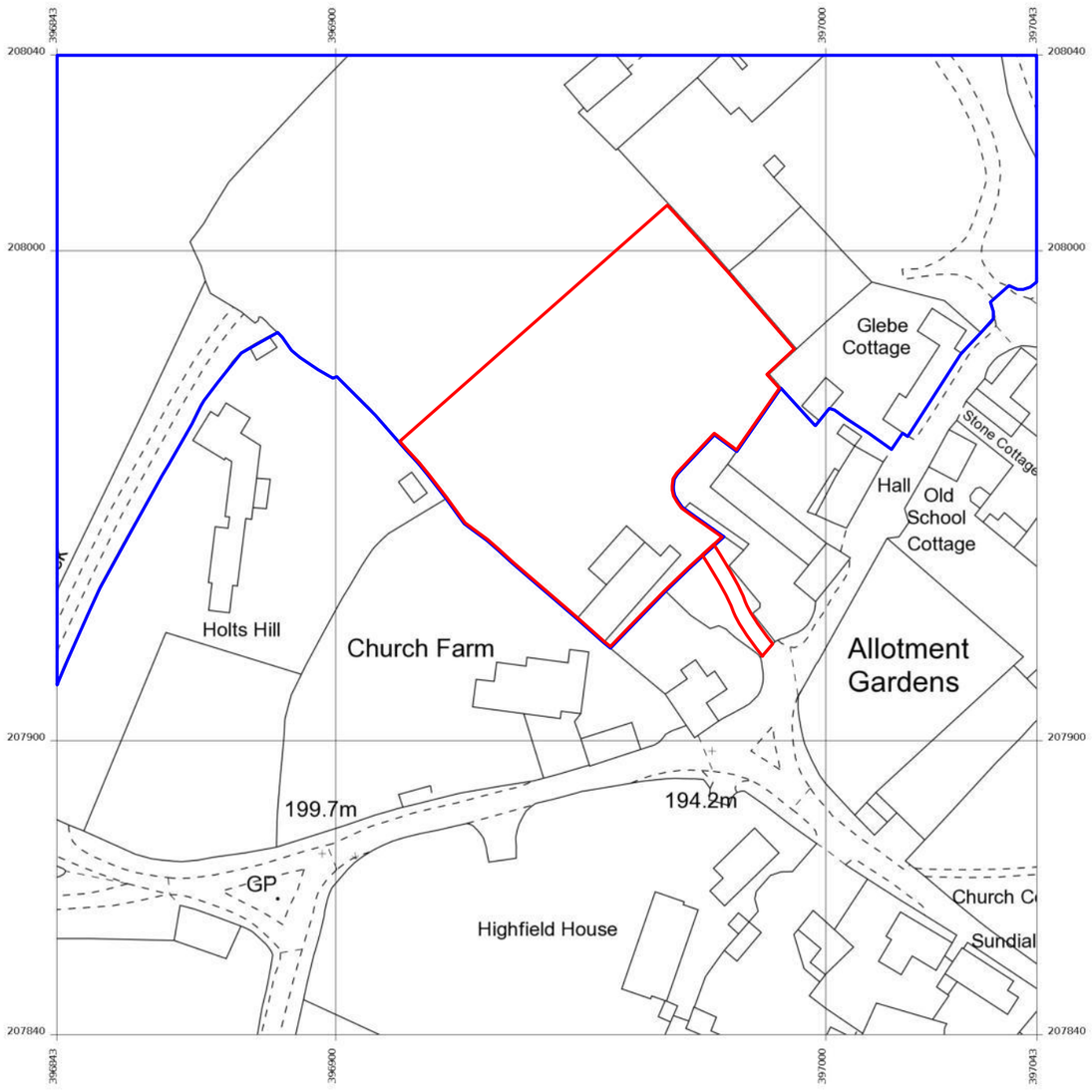
1. This drawing remains copyright of Blake Architects Limited and may not be reproduced or copied without consent in writing.
2. For construction use figured dimensions only.
3. Any discrepancies between site and drawings to be reported to the architect immediately.
4. Read in conjunction with all relevant structural and mechanical & electrical engineers drawings.
5. Survey undertaken by:

REVISIONS	
PROJECT	21.18 Newbold Farm Barn
ADDRESS	Duntisbourne Abbots,Gloucestershire, GL7 7JN
BLAKE ARCHITECTS	Blake Architects Limited 1 Coves Barn, Winstone Gloucestershire, GL7 7JZ [t] 01285 841407 [e] mail@blakearchitects.co.uk www.blakearchitects.co.uk
TITLE	Proposed Site Plan
DRAWING NUMBER	21.18.03.11
STATUS	PLANNING

DRAWN	CHECKED	DATE	SCALE	REVISION
ET	JN	14.11.23	1:250 @ A1	-

APPENDIX B

SITE LOCATION PLAN



Produced 24 Jun 2022 from the Ordnance Survey MasterMap (Topography) Database and incorporating surveyed revision available at this date.

The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

Metres
0 10 20 30 40 50

1:1250

Supplied by: **Stanfords 24 Jun 2022**
Licence: © Crown Copyright and database rights 2022 OS100035409
Order Licence Reference: Ol1547514
Centre coordinates: 396943 207940

Newbold Farm, Duntisbourne Abbots, Duntisbourne Abbots

Notes

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REVISIONS	
PROJECT	21.18 Newbold Farm Barn
ADDRESS	Duntisbourne Abbots,Gloucestershire, GL7 7JN
BLAKE ARCHITECTS	Blake Architects Limited 1 Coves Barn, Winstone Gloucestershire. GL7 7JZ [t] 01285 841407 [e] mail@blakearchitects.co.uk www.blakearchitects.co.uk
TITLE	Location Plan
DRAWING NUMBER	21.18.03.01
STATUS	PLANNING

DRAWN	CHECKED	DATE	SCALE	REVISION
HG	JN	24.06.22	1:1250 @ A3	-

APPENDIX C

THAMES WATER SEWER RECORDS

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2023_4912336

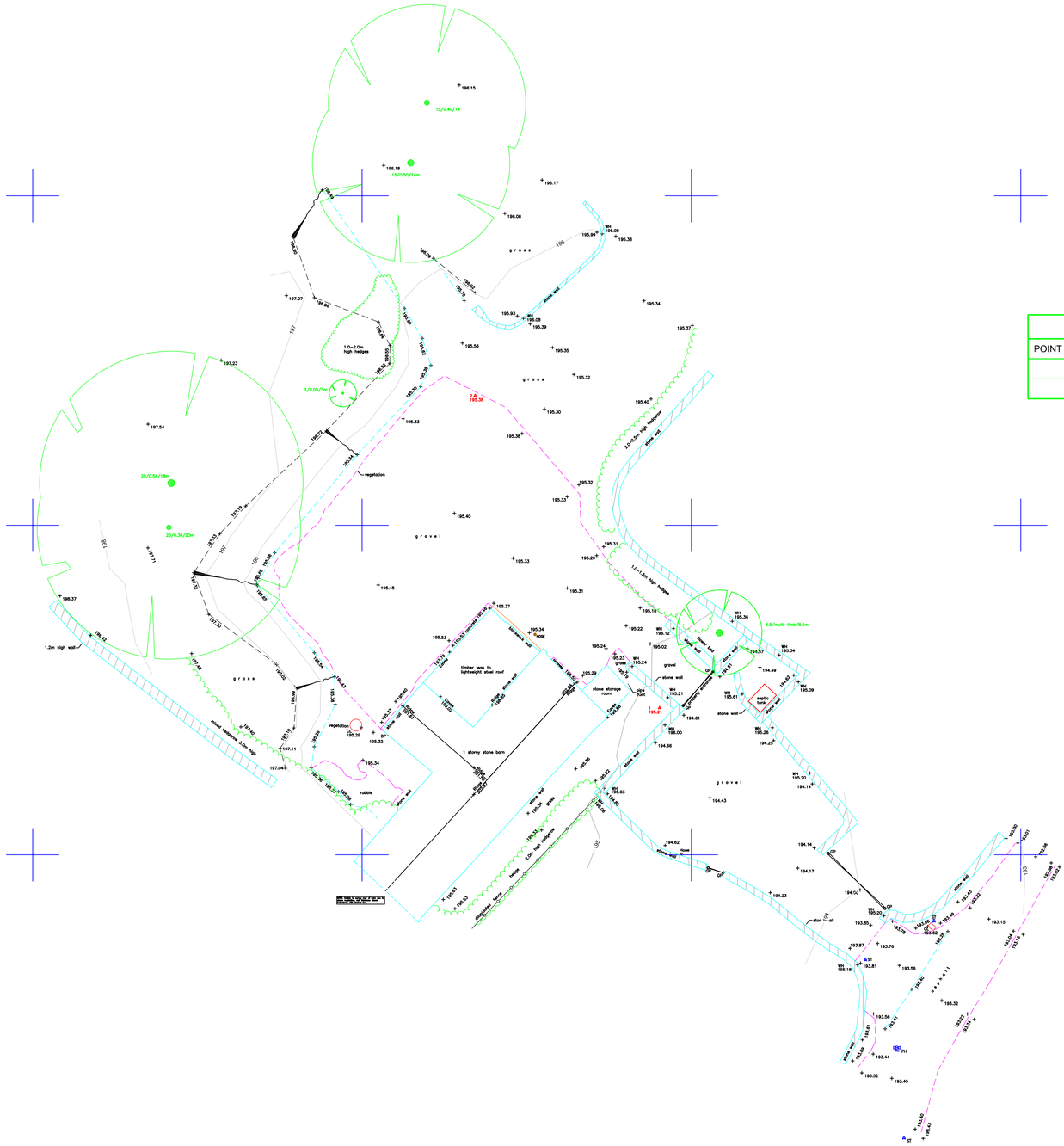
0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	ASuji
Print Date:	16/11/2023
Map Centre:	396953,207960
Grid Reference:	SO9607NE

Comments:

APPENDIX D

TOPOGRAPHICAL SURVEY



POINT DATA				
POINT NUMBER	EASTING	NORTHING	LEVEL	DESCRIPTION
1	396972.588	207936.139	195.207	STN
2	396958.591	207959.832	195.384	STN

0 8 16 Meters

A1

RICS

DO NOT SCALE

NOTES:

1. Levels are related to Ordnance Datum Newlyn
2. Grid is related to Ordnance Datum North
3. Drainage pipe sizes are estimated from the surface
4. Tree sizes are measured 1m from the ground

KEY

AV	AIR VALVE	OL	OUTSIDE LIGHT
BB	BELISHA BEACON	LV	LOW VOLTAGE
BH	BOREHOLE	MH	MANHOLE COVER
BOL	BOLLLARD	MK	MARKER
BM	BENCH MARK	MKE	MARKER ELECTRIC
BS	BUS STOP	MKFH	MARKER FIRE HYDRANT
BT	BRITISH TELECOM COVER	MKSV	MARKER SLUICE VALVE
B–W	BARBED WIRE	MKT	MARKER TELEPHONE
CB	CONTROL BOX	MKW	MARKER WATER
C–B	CLOSE BOARDED	NB	NOTICE BOARD
CL	COVER LEVEL	NP	NAME PLATE
C–L	CHAIN LINK	PO	POST
CP	CATCH PIT	PP	PETROL PUMP
CPS	CONCRETE PAVING SLABS	P&R	POST & RAIL
CTV	CABLE TV COVER	P&W	POST & WIRE
DP	DISTRIBUTION POST	RE	RODDING EYE
EOT	END OF TRACE	RP	REFLECTOR POST
EP	ELECTRIC POLE	RS	ROAD SIGN
ER	EARTH ROD	SP	SIGN POST
FH	FIRE HYDRANT	STP	STAND PIPE
FHT	FENCE HEIGHT	SV	SLUICE VALVE
FW	FOUL WATER	SW	SURFACE WATER
G	GULLY	SY	STAY
GP	GATE POST	TBM	TEMPORARY BENCH MARK
GAS	GAS VALVE	TCB	TELEPHONE CALL BOX
HH	HEDGE HEIGHT	TL	TRAFFIC LIGHT
HV	HIGH VOLTAGE	TM	TICKET MACHINE
IC	INSPECTION COVER	TP	TELEPHONE POLE
I–R	IRON RAILING	UTT	UNABLE TO TRACE
KO	KERB OUTLET	UTL	UNABLE TO LIFT
LP	LAMP POST	WH	WALL HEIGHT
		WM	WATER METER
		WO	WASH OUT
		VT	VENT

LINETYPE MENU

Top Bank
Bottom Bank
Building
Foliage
Hedge
Pipe
Verge
Wall
Kerb
Fence
Overhead Cable
Drop Kerb
Depth Burial 0.56m
High Voltage
Fibre Optics
Cable TV
Telephone
Low Voltage
Water line
Gas line
Ducting
Tree Spread/Dia/Height
Manhole/ Inspection cover
Unknown
General Coms
Foul Water
Surface Water
Grid Cross

Rev	Date	Details Of Issue	Initials

Status

Topo & Building Survey

Geomap
44B Nailsworth Mills Estate
Avening Road
Nailsworth
Glos
GL6 0BS
Tel: 01453 833116
email: info@geomapltd.co.uk
www.geomapltd.co.uk

Client **Blake Architects**

Project **Duntinsbourne Abbots, The Old Rectory Newbold Farm, Survey Drawings**

Title **Topographic Survey 2D**

Drawn	Date:	Scale (at A1)
TC	01/11/21	1:200

Drg no.	Revision No.
DBA-GEO-XX-GF-DR-C-0001	2

APPENDIX E

SITE INFILTRATION RECORDS AND CALCULATIONS

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Soakaway Test Record

Location Newbold Grange — Test Pit Number

Duntisbourne Abbots — Test Number 1 of 3

GL7 7JN — Date 14/11/23

Depth versus time measurements

Depth below datum (mm) START HERE ⇩	Time (minutes)	Depth below datum (mm) CONTINUE HERE ⇩	Time (minutes)
43	5	687	90
86	10	723	95
127	15	759	100
167	20	793	105
205	25	828	110
243	30	862	115
280	35	897	120
319	40	932	125
359	45	967	130
396	50	1000	135
431	55		
467	60		
503	65		
540	70		
576	75		
613	80		
650	85		

K-Ten Consulting

Soakaway Test Record

Location NEWBOLD GRANGE — Test Pit Number

DUNTSBOURNE ABBOTS — Test Number 2 of 3

GL7 7JN — Date 14/11/23

Depth versus time measurements

Depth below datum (mm) START HERE ⇩	Time (minutes)	Depth below datum (mm) CONTINUE HERE ⇩	Time (minutes)
35	5	629	90
69	10	663	95
107	15	695	100
142	20	731	105
176	25	766	110
211	30	801	115
246	35	833	120
282	40	869	125
314	45	904	130
351	50	939	135
384	55	974	140
419	60	1000	142
455	65		
487	70		
523	75		
558	80		
594	85		

K-Ten Consulting

Soakaway Test Record			
Location NEWBOLD CRANCE		Test Pit Number	
DUNTSBOURNE ABBOTS		Test Number 3 of 3	
GL7 7JN		Date 14/11/23	
Depth versus time measurements			
Depth below datum (mm) START HERE ⇩	Time (minutes)	Depth below datum (mm) CONTINUE HERE ⇩	Time (minutes)
34	5	586	90
69	10	619	95
103	15	651	100
137	20	684	105
160	25	716	110
193	30	747	115
226	35	778	120
260	40	820	125
294	45	850	130
327	50	882	135
360	55	912	140
392	60	941	145
425	65	970	150
457	70	1000	155
488	75		
521	80		
554	85		

Infiltration Test Results

in accordance with BRE Digest 365

Project Name	Newbold Farm
Project Number	23-1064
Test Date	14.11.23
Test Pit	01-Jan-00

Pit Dimensions:

Length = 1.000 m
Width = 0.450 m
Depth = 1.500 m

Test Number: 01

Distance from ground to top of water = 0.500 m
Total drop below water level at end of test = 1.000 m

75% of effective depth below datum = 0.250 m — Time, t_{75} = 31 mins
25% of effective depth below datum = 0.750 m — Time, t_{25} = 100 mins

V_{p75-25} = 0.225 m3 — t_{p75-25} = 69 mins
A_{p50} = 1.900 m2

Soil infiltration rate, f = **2.9E-05** m/sec
Soil infiltration rate, f = **0.103** m/hr

Test Number: 02

Distance from ground to top of water = 0.500 m
Total drop below water level at end of test = 1.000 m

75% of effective depth below datum = 0.250 m — Time, t_{75} = 35 mins
25% of effective depth below datum = 0.750 m — Time, t_{25} = 107 mins

V_{p75-25} = 0.225 m3 — t_{p75-25} = 72 mins
A_{p50} = 1.900 m2

Soil infiltration rate, f = **2.7E-05** m/sec
Soil infiltration rate, f = **0.099** m/hr

Test Number: 03

Distance from ground to top of water = 0.500 m
Total drop below water level at end of test = 1.000 m

75% of effective depth below datum = 0.250 m — Time, t_{75} = 38 mins
25% of effective depth below datum = 0.750 m — Time, t_{25} = 115 mins

V_{p75-25} = 0.225 m3 — t_{p75-25} = 77 mins
A_{p50} = 1.900 m2

Soil infiltration rate, f = **2.6E-05** m/sec
Soil infiltration rate, f = **0.092** m/hr

APPENDIX F

DRAINAGE CALCULATIONS

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	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
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)	Easting (m)	Northing (m)	Depth (m)
Soakaway 01	0.044	4.00	195.300	0.000	0.000	1.500

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node Soakaway 01 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.09800	Invert Level (m)	193.800	Depth (m)	1.000
Side Inf Coefficient (m/hr)	0.09800	Time to half empty (mins)	407	Inf Depth (m)	
Safety Factor	2.0	Pit Width (m)	3.500	Number Required	1
Porosity	0.95	Pit Length (m)	7.000		

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
240 minute winter	Soakaway 01	180	193.986	0.185	1.4	4.4253	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Soakaway 01	Infiltration	0.4

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
240 minute winter	Soakaway 01	192	194.156	0.356	2.3	8.4885	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Soakaway 01	Infiltration	0.4

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
240 minute winter	Soakaway 01	224	194.279	0.479	2.9	11.4399	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
240 minute winter	Soakaway 01	Infiltration	0.5

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
480 minute winter	Soakaway 01	368	194.445	0.645	2.2	15.3971	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
480 minute winter	Soakaway 01	Infiltration	0.5

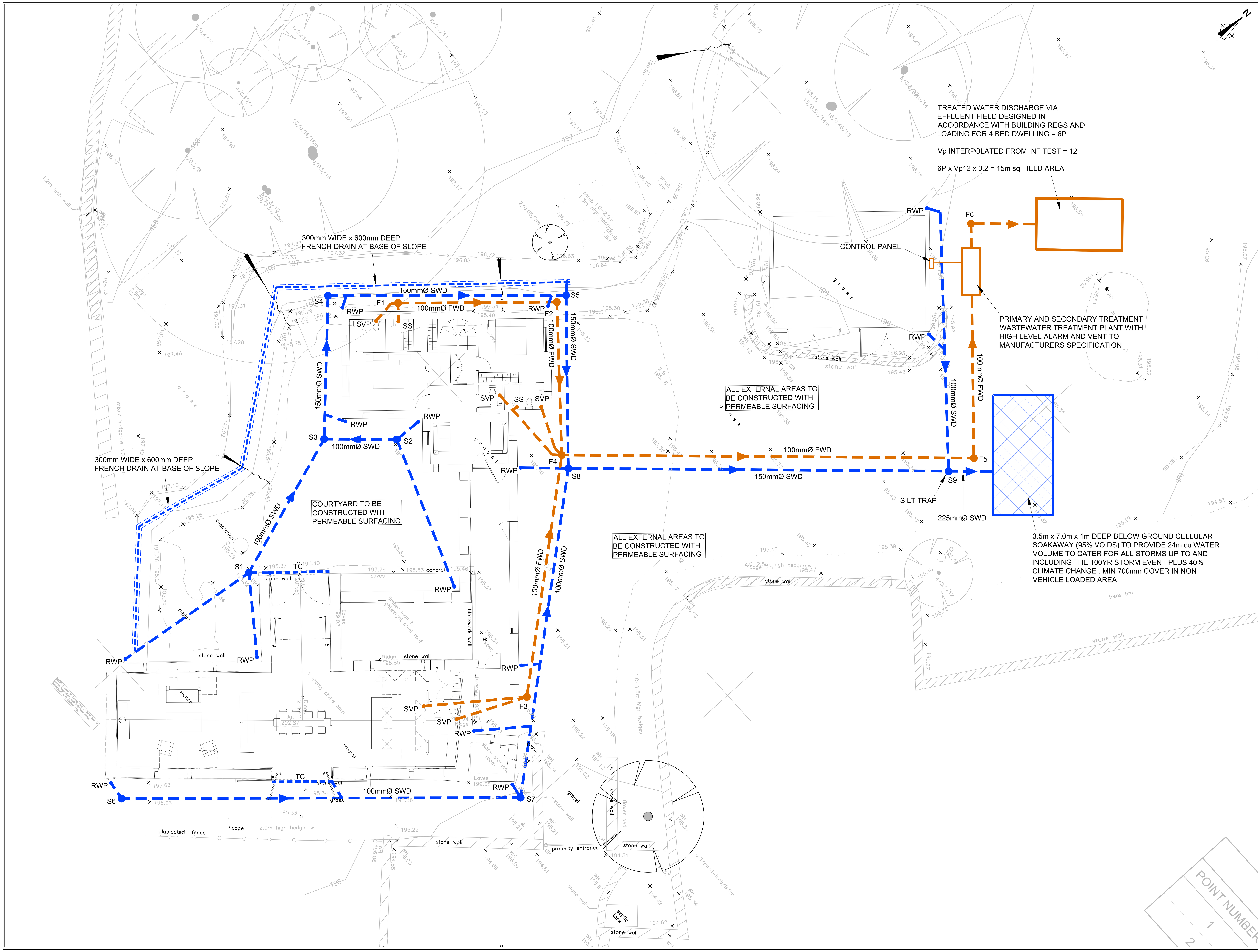
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Soakaway 01	465	194.787	0.987	2.7	23.5524	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)
600 minute winter	Soakaway 01	Infiltration	0.6

APPENDIX G

DRAINAGE STRATEGY



Notes:

1. Do not scale from this drawing. All dimensions are in metres unless noted otherwise.
2. Drawing to be read in conjunction with all other consultants drawings. Any discrepancies are to be reported to the engineer immediately.
3. Position of existing services/statutory undertakers apparatus are to be checked by the contractor prior to starting work.

KEY:

- PROPOSED STORM DRAINAGE
- PROPOSED FOUL DRAINAGE
- FRENCH DRAIN
- RWP — RAINWATER DOWNPIPE
- TC — THRESHOLD CHANNEL
- SVP — SOIL VENT PIPE
- SS — SHOWER OUTLET

Rev	Date	Details	Drawn
B	27.11.23	ISSUED FOR PLANNING	KT
A	21.11.23	DRAFT FOR CLIENT COMMENT	KT

K-Ten Consulting

CLIENT:
MR AND MRS SCUDAMORE

PROJECT:
NEWBOLD FARM DUNTISBOURNE ABBOTS GLOUCESTERSHIRE

TITLE:
DRAINAGE LAYOUT

SCALE @ A1:	DATE:	DRAWN:	STATUS:
1:200	18.11.23	KT	PLANNING

JOB NO:	DRAWING NO:	REVISION:
23-1064	C001	B