GODSELL • ARNOLD
PARTNERSHIP LTD

Sundown Farm, Martin Drove End

Foul & Surface Water Drainage Strategy

Prepared for

Ms Carol Besant

June 2023

Job No: 23340

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Revision	Amendments	Prepared By	Checked	Status	Date
1	First Issue	MJR	IJW	Planning	26.06.2023
1.1	Drawing Scales updated	MJR		Planning	27.07.23

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APPENDICES

1.0 Introduction

1.1 Project Introduction and Objectives

Boon Brown Architects have prepared a scheme for a new residential Farmhouse associated with the Sundown Farm. Ms Carol Besant (owner) has instructed GAP Ltd to prepare a Drainage Strategy for the new Farmhouse The document can only be transferred and relied upon with the written permission of Ms Carol Besant and GAP Ltd.

1.2 Development Background

The site is accessible from Howgare Road, Martin Drove End, near Fordingbridge. The proposed building is a new Farmhouse associated with Sundown Farm.

(National Grid Reference SU04952 21172).

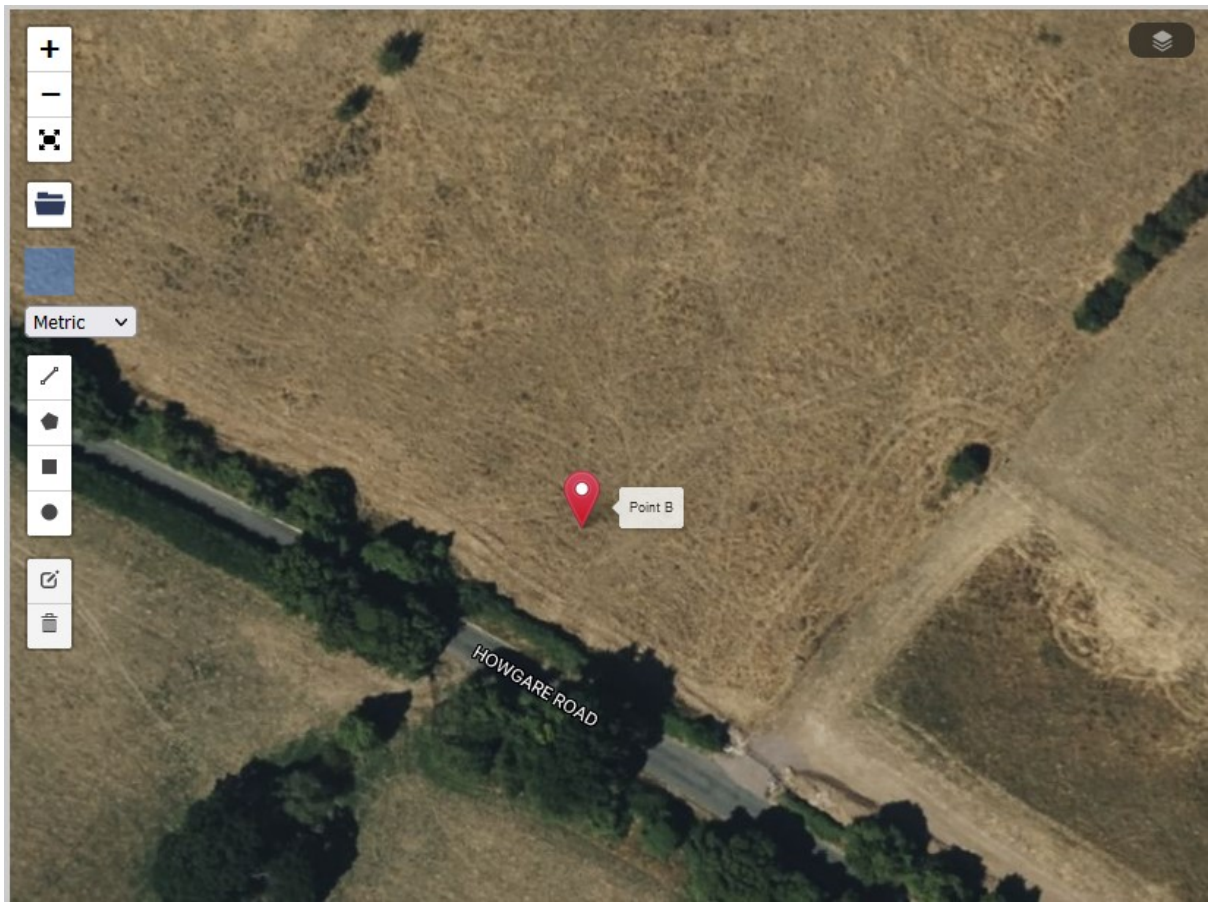

Figure 1: Aerial view of Site (approximate site location noted as Point B)

The current site proposals have been produced by the architect Boon Brown Architects and are shown in Appendix A – Architect's Layout Drawing.

This report summarises the proposed foul and surface water drainage strategy for the site.

1.3 Site Location

The site is situated within approximately 40Ha of land associated with Sundown Farm. The proposed new Farmhouse is positioned on the northern side of Howgare Road. The proposed Farmhouse will be located in close proximity to existing farm buildings, as part of the proposals some of the redundant buildings and existing farm buildings will be removed. The new Farmhouse will be constructed on a levelled area within the land associated with Sundown Farm. The new dwelling and associated ancillary areas, Solar Panel Array, Ground Source Heat Pump and Infiltration field (for Sewage Treatment Plant) will have a total site area of circa 2300m^2. The site benefits from an existing access onto Howgare Road as shown on existing topographic survey, which can be found in Appendix B.

1.4 Flood Zone (UK Government Indicative Flood Mapping)

An extract of the UK Government's Indicative Flood Map for rivers and sea is shown in Figure 2 below. The areas shown as high risk have a chance of river flooding of greater than 3.3% (1 in 30), the areas shown as medium risk have a chance of flooding between 1% and 3.3% (1 in 100 to 1 in 30), the areas shown at low risk have a chance of flooding of between 0.1% and 1% (1 in 1000 to 1 in 100) and the areas shown as very low risk have a chance of flooding of less than 0.1% (1 in 1000). All areas falling outside of the blue shading are not at risk of flooding from rivers or sea.

The site can be identified from Figure 2 as being located outside of the coloured zones that identify the Flood Zones. This site is in Flood Zone 1.

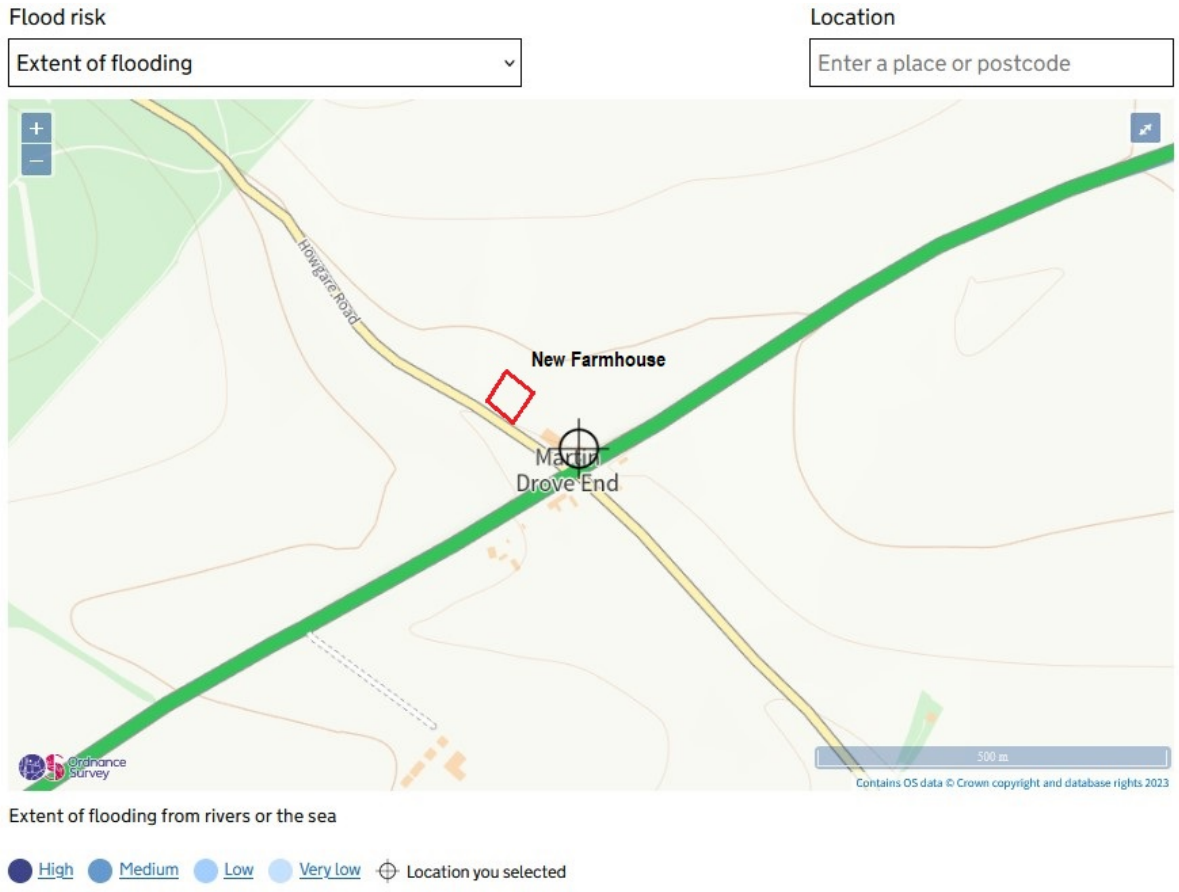

Figure 2: UK Government Indicative Flood mapping from rivers and sea

The Environment Agency, flood risk mapping website has been checked for surface water flooding, there are no associated surface water flood risk areas in the vicinity of the site shown. The closest location of surface water flooding is associated with an existing ditch that runs along Howgare Road on the western side as can be seen in figure 3 below.

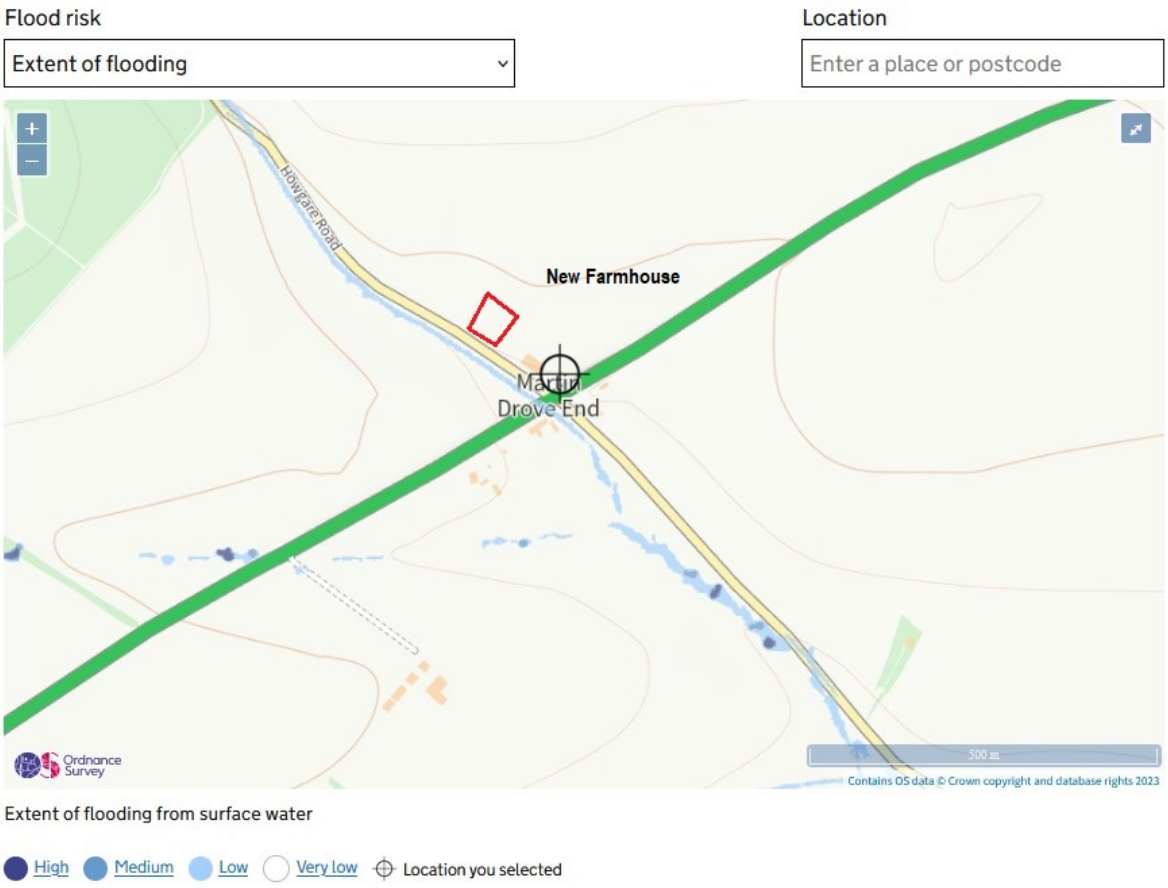

Figure 3 UK Government Indicative Surface Water Flood Map

2.0 Existing/Proposed Surface Water Drainage Arrangements

2.1 Existing Surface Water Drainage

The proposed new Farmhouse area is currently fields, there are no formal drainage provisions in the area of the new Farmhouse.

2.2 Proposed Surface Water Drainage Strategy & Calculations

As the underlying strata is known to be chalk from BGS website and site knowledge, an assumed conservative rate of $1x10^{-5}$m/s has been used in these preliminary calculations. This rate has been used in the design of the soakaway structures for disposing of the roof water from the new Farmhouse & Garage. To assess the sizing of these structures, the sides and not the base, have been used in the calculations. The form of the proposed soakaway at this stage is a traditional gravel filled soakaway – a void ratio of 30% has been used. The performance of these units has been analysed using Causeway Flow the surface water calculations are available in Appendix C – Site Drainage Strategy. The calculations have been prepared for the 1:100yr +45% climate change. To finalise the design parameters post planning a full Site Investigation will be required including infiltration testing in accordance with BRE365. There may also be scope to incorporate some Rainwater Harvesting into the detailed design for irrigation of the new garden areas, however this can't be used to provide any benefit in reducing soakaway sizes.

2.2 Site Geology

The British Geological Survey map indicates that the site is underlain by the Seaford Chalk Formation.

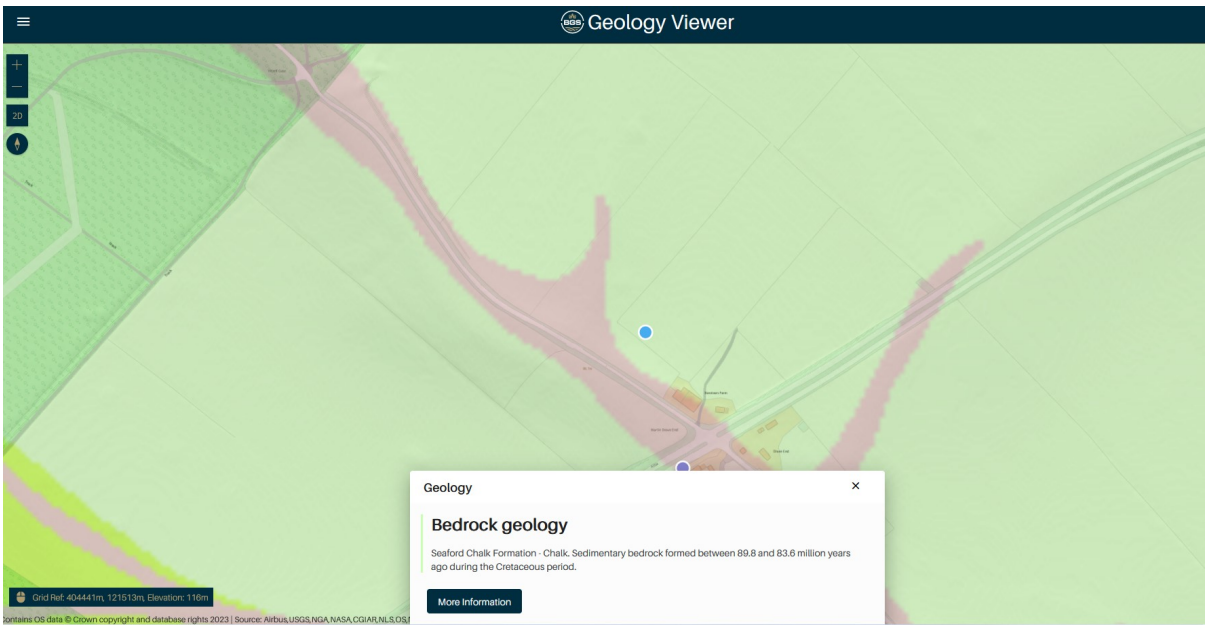

Figure 4 – Extract from British Geolgical Surveying (BGS) online mapping

Currently there has been no formal Site Investigation, post planning a full site investigation will be commissioned to provide design information for surface water infiltration and treated effluent disposal from the proposed domestic sewage treatment plant.

A desktop study of the available data from the BGS and Environment Agency websites has been undertaken to assess the form of the drainage disposal from the new Farmhouse.

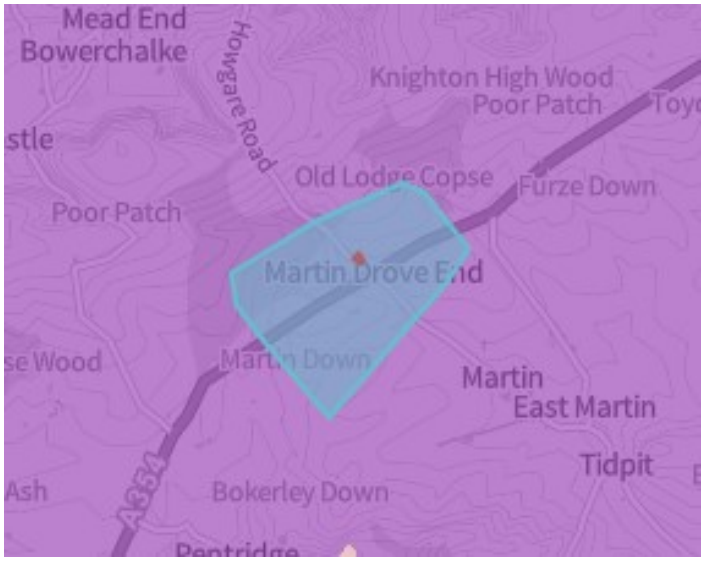

Figure 5 – DEFRA Aquifer designation map

The site is located over a recorded principal aquifer associated with the Seaford Chalk Formation. A review of other available data on the DEFRA MagicMap was undertaken to assess whether any Source Protection Zones

(SPZ's) Figure 6, Nitrate Vulnerability information Figure 7 & Groundwater vulnerability Figure 8 would affect the site.

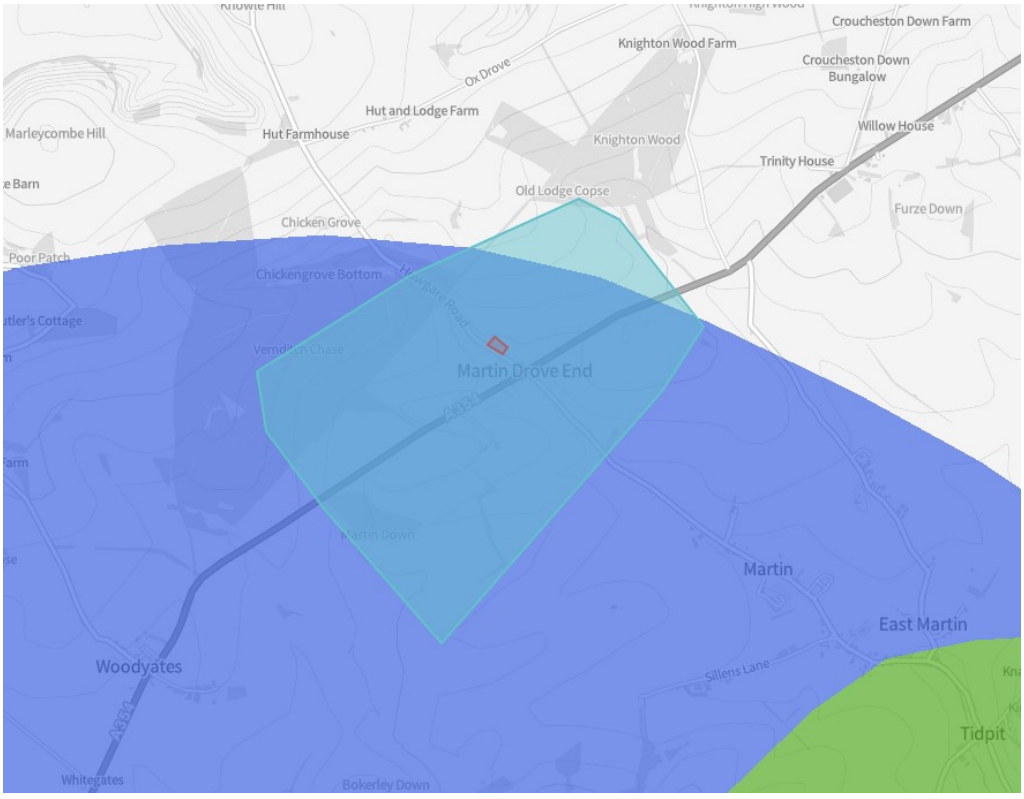

Figure 6 – Source Protection zones identified on MagicMap

The site is located within the Zone 3 Total Catchment Source Protection Zone (SPZ) but not near to the Inner or outer SPZ's as shown on MagicMap.

Figure 7 – Nitrate Vulnerability Map identified on MagicMap

The site is shown as being within the recorded nitrate vulnerability zone (Figure 7), however the new Farmhouse will be provided with its own Sewage Treatment Plant that will be selected for nitrate compliance (e.g. GRAF unit). The land is currently rough grazing land as such the intensity of use of fertilizers will be unchanged.

Figure 8 – Ground Water Vulnerability map from DEFRA MagicMap

The above figure identifies that the site is within am area of Ground Water Vulnerability and that underlying geology is a soluble rock risk. The site may therefore be at risk of dissolution features as identified by the cross hatching. As part of the intrusive investigation the specialist will be asked to provide comment on the risk of dissolution features within the underlying geology, it is anticipated that a watching brief may be all that is required.

2.3 Proposed Surface Water and Sustainable Drainage (SuDS)

For sustainable best practice the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration)
2. to a surface water body
3. to a surface water sewer, highway drain, or another drainage system
4. to a combined sewer.

On this site, based on the chalk bedrock the surface water will be disposed of by infiltration. The new dwelling driveway is accessed off a gravel track that serves the existing farm buildings. At the demise boundary of the new Farmhouse a cattlegrid is being proposed and a linear drainage channel, both these areas will drain to a

nearby soakaway, a such the risk of surface from the new drive entering the existing track and Howgare Road is very minimal.

The surface water drainage system will be designed to a 1 in 100year (plus 45% allowance for climate change), as identified on the Climate Change website for this area / catchment.

2.4 Pollution Control Considerations

This is a single property the only surface water generated will be from the roofs and parking areas. As the parking areas are proposed to be gravel finish, where the driveway is more steeply sloping, infiltration trenches can be cut across the subgrade slope to allow the surface water to infiltrate into the ground more effectively.

Based on the information contained within the SuDS Manual C753 with reference to Chapter 26, Table 26.2 below shows the proposed development has having a very low pollution hazard indices.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Notes

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Where a site land use falls outside the defined categories, the indices should be adapted (and agreed with the drainage approving body) or else the more detailed risk assessment method should be adopted.

Where nutrient or bacteria and pathogen removal is important for a particular receiving water, equivalent indices should be developed for these pollutants (if acceptable to the drainage approving body) or the risk assessment method adopted.

Referring to Table 26.4 below as the driveway areas are being constructed from gravel it can be considered that the Permeable Pavement mitigation indices are more than adequate at controlling any pollution risk.

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1]	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.6[4]	0.5	0.6
A soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.8[4]	0.8	0.8
Proprietary treatment systems[5, 6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Notes

1 All designs must include a minimum of 1 m unsaturated depth of aquifer material between the infiltration surface and the maximum likely groundwater level (as required in infiltration design – Chapter 25).

2 For example as recommended in Sniffer (2008a and 2008b), Scott Wilson (2010) or other appropriate guidance.

3 Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater – see note 1.

4 If significant volumes of sediment are allowed to enter an infiltration system, there will be a high risk of rapid clogging and subsequent system failure.

5 See Chapter 14 for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **www.britishwater.co.uk/Publications/codes-of-practise.aspx**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution, where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

The drive will be constructed as a gravel surface and will incorporate a geotextile layer as required by table 26.4 above.

3.0 Existing/Proposed Foul Water Drainage

3.1 Existing Foul drainage

A mapping enquiry was made to Wessex Water. From a review of the obtained information there are no adopted sewers within any proximity of the site. Due to its rural location most of the foul drainage for individual properties will be via septic tanks or package sewage treatment plants. The underlying chalk is generally very good for infiltration.

3.2 Proposed Foul Water Drainage

The new Farmhouse dwelling is being provided with an appropriately sized package sewage treatment plant. Based on recent experience one of the GRAF units achieve high treatment levels of the effluent, Natural England recommended the GRAF One2 Clean units as they achieve high levels of Nitrate & Phosphate mitigation. The treated effluent from the GRAF unit will be discharged to a purpose designed and constructed drainage field, this will require permeability testing in accordance with Building Regulations & BS6297:2007. The new dwellings foul generation is estimated to be about 1m^3/day which is within the parameters of General Binding Rules (5m^3/day) required by the Environment Agency. As the site is situated outside of the inner and outer SPZ requirements then the General Binding Rules are considered to be complied with. It is expected that the VP rate may be in excess of the permitted highest rate of VP15, so an enhanced drainage field incorporating additional sand layers may be required.

4.0 Management and Maintenance

4.1 Responsibility and Maintenance

Maintenance of surface water drainage assets will be notified to Ms Besant as owner of the new Farmhouse.

The gravity piped network serving the Farmhouse and hardstanding areas will be designed to facilitate access for regular inspection and maintenance in accordance with Building Regulations.

Silt traps have been provided upstream of the soakaways; these will be provided with an appropriate sump. These will need to be inspected regularly with deposits removed as required.
Due to the nature of the gravel filled soakaways the performance of these will need to be visually monitored.
Porous paving will be mechanically swept on an annual basis to maintain the open joints between blocks, to ensure the effectiveness of the system. Manufacturers generally recommend that the permeable paviours are removed (approximately every 20years) and the bedding layer removed/replaced.

5.0 Flood Risk Management Measures

5.1 Flood Mitigation Measures

Finished floor levels will be set above surrounding ground levels to protect from flooding from any exceedance flows. There is a potential of overland flow from the surrounding fields. Which can be mitigated by the provision of ditches, filter drains or bunding to direct these flows away from the building, these features will be considered as part of the detailed design, post planning. These overland flows currently will end up in Howgare Road and the ditch system associated with the road. As the scheme will be intercepting some of these flows and diverting them to soakaways, there will be a net benefit to the area.

6.0 Off Site Impacts

The off-site impacts as a result of this Farmhouse are not anticipated to be very significant, as the proposals are to dispose of surface water to via soakaways etc. The soakaways will be designed to accommodate the 1:100yr +45% climate change. The soakaways will be designed to accommodate all flows below ground, with no flooding.

In the event of any exceedance flows greater than the 1 in 100year return period these will naturally flow towards the road and fields around and will not put new or existing dwellings at any increased risk of flooding.

7.0 Residual Risks

There are no residual flood risks associated with the development proposals.

8.0 Conclusion

This report presents the foul and surface water drainage strategy proposed for this site.

Foul drainage will discharge into sewage treatment plant and associated infiltration field.

Where possible surface water from the site will be discharged into the ground via the use of infiltration features including permeable paving, soakaways and soft landscaping.

Appendix A – Architect's Layout Drawing

Appendix B – Existing Topographic Survey

Appendix C – Site Drainage Strategy

Proposed Drainage Scheme 23340-GAP-XX-XX-DR-C-9000

Proposed Surface Water Calculations

native species boundary hedge

buffer planting

field hedge reinstated with native species

access gate with cattle grid and aco drain

existing access to highway

buffer planting

double garage with store

potential pond / SUDS attenuation

SITE LAYOUT

(indicative) - scale 1/500

0 2m 10m 20m

Rev	Date	Description	Drn
-	-	-	-

boon brown

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Project

PROPOSED DEVELOPMENT AT SUNDOWN FARM FORDINGBRIDGE, MARTIN SP6 3JT

Client

MS CAROL BESENT

Drawing Title

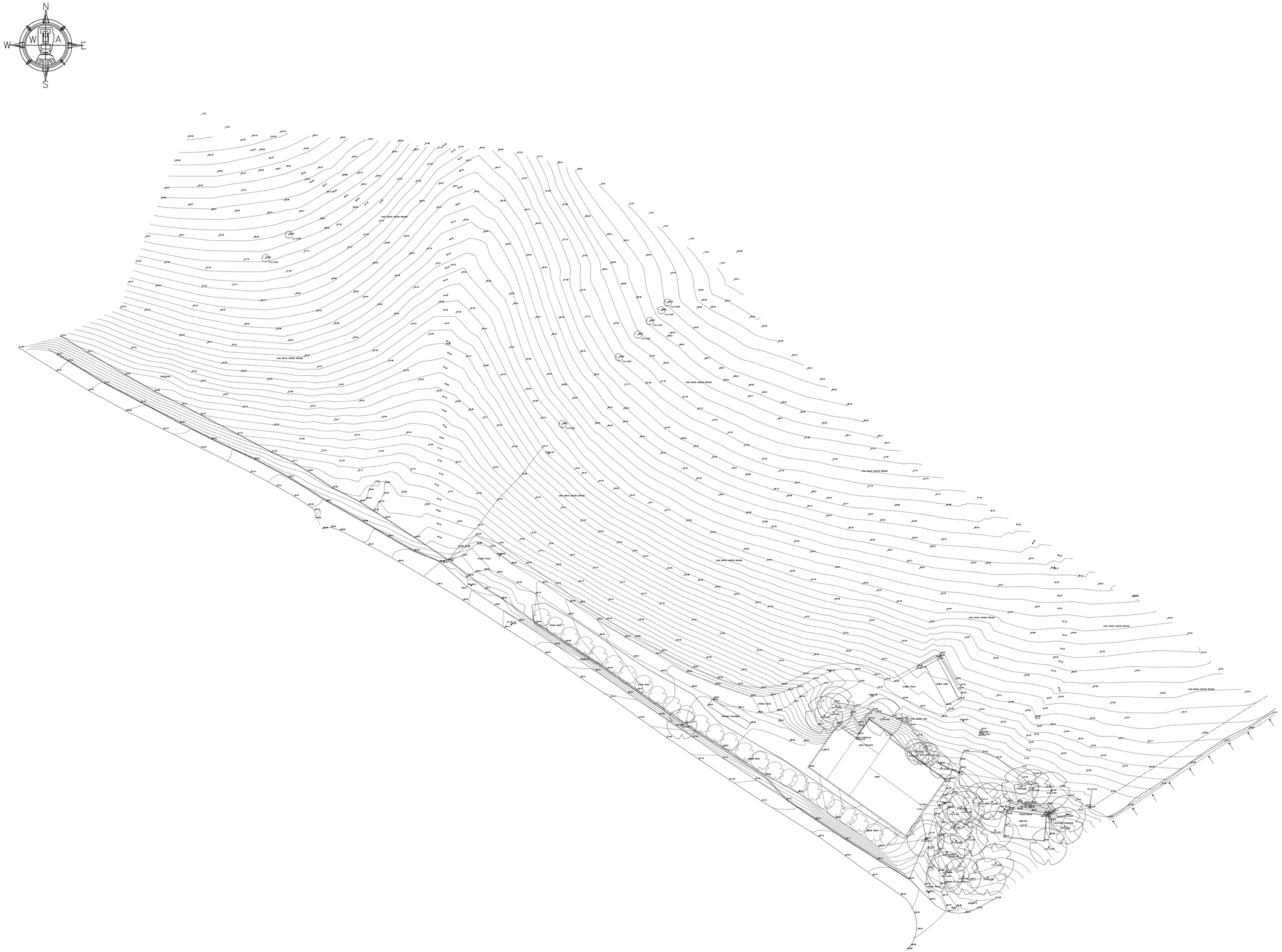
INDICATIVE SITE LAYOUT

Scale	Date	Drawn	Chk'd
1 : 500 @ A3	10/01/23	HE	TS

DWG No. 4885 - SK04 **Rev.** -

RIBA Chartered Practice RTPI Chartered Town Planner Landscape Institute Registered practice

Appendix B – Existing Topographic Survey



0 10 20 50 100

SCALE BAR 1:500

REV	DETAILS	BY	DATE
A			DATE_A
B			DATE_B
C			DATE_C
D			DATE_D

GENERAL NOTES

Closed traverse technique are used when possible. Open traverse technique used when no closing measurement is possible. Whilst no physical access is possible to off site and roof detail,the information is given in good faith. Survey drawing accurate within limitations of site conditions at time of survey. All critical dimensions should be checked after site clearance.

Coordinates related to OS GB grid .Coordinates fed from OS Tablet using a best fit technique or from GPS RTK Network where available. (Subject to such accuracies using this methodology.)
Surveyed features such as Walls, Fences, Hedges, Ditches are physical features on the ground and do not imply legal boundaries.
All work regardless of its type or format is subject to our full terms and conditions. A copy of which can be found at www.wasurveyors.com

On accepting us for any project you agree to our terms and conditions.
All critical dimensions/levels to be verified/checked before construction or crucial design by contractors or site engineer.
This drawing is not designed to be used for constructed measurements or setting out.
We must be notified immediately, in writing, of any anomalies, emissions or discrepancies.

SITE SPECIFIC NOTES

Levels related to GPS Datum and converted to OSGB grid using average readings from 2 Base Stations. Differential GPS-Base to Rover.
Checked against OS Spot Level Data. Check Value 88.70
This methodology is not precise OS Datum but an averaged approximation.
All site work should be related to control station coordinates and level value. Always treat site control as local.

IMPORTANT NOTICE

Trees shown on this drawing have been marked to show their generic spreads and girths. Where identification of tree species or "exact" sizing is important in the project design we would strongly recommend that the services of a specialist arborist/tumber be employed. We wish it to be known that we are not specialists in the field of tree identification or canopies.

IMPORTANT NOTICE

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed. Where accurate information is critical to the final project design we would recommend that entry into the chamber be undertaken using a specialist team, appropriately qualified for confined space entry. These teams can be supplied upon request.

KEY

TREES
S.G.(Spread G metres)
G. 450(Girth metres)
TET. 18.10 (Height to Datum)
T.E.T Not always obtainable in winter

LEVEL DATA
Spot levels +.43.62
Contours Z = 0.250m 43.00

CONTROL DATA
Survey stations STN

FEATURES

Fences shown thus	PF	Power Cables	P
Walls		Tele Cables	T
Hedges		Foliage	
Undefined Boundary		Bank Symbol	
		Stile/Pedestrian Gate	

Services

Manhole rectangular (MH) Manhole circular (MH) Stop Valve (SV) Inspection cover (IC) + Road sign (RDS)
Manhole square (MH) Manhole triangular (MH) Gully (G) Lamp post (LP) Elec. pole (EP) Tel pole (TP)

LEGEND

BARBED WIRE FENCE	BWF	BOLLARD	BOL
CORRUGATED IRON FENCE	CIF	BELISHA BEACON	BB
CLOSE BOARD FENCE	CBF	BRITISH TELECOM BOX	BT
CHAIN LINK FENCE	CLF	BRITISH TELECOM INSPECTION COVER	BT
CHESTNUT PALING	CPF	BUS STOP	BS
CRASH BARRIER	CB	CABLE TELEVISION INSPECTION COVER	CATV
IRON RAILINGS	IRF	CABLE TELEVISION BOX	CATB
INTERWOVEN FENCE	IWF	CARTWAY KOD	CR
IRON MESH FENCE	IMF	ELECTRICITY BURIED CABLE MARKER	ELBC
LARCH LAP FENCE	LLF	ELECTRICITY CABLE PIT	ELCP
MISCELLANEOUS FENCE	Misc F	ELECTRICITY CONTROL BOX	ECB
PANAL FENCE	PF	ELECTRICITY PYLON	E PYLON
PALISADE FENCE	Pall F	ELECTRICITY SUPPLY	ES
POST AND CHAIN FENCE	PCF	FIRE HYDRANT	FH
POST AND RAIL FENCE	PRF	FLAG STAFF	FS
POST AND WIRE FENCE	PWF	FLOWERBED	FB
STOCK WIRE FENCE	SWF	FOOTPATH	FP
WIRE MESH FENCE	MWF	GULLY	G
TRELLIS	TLS	INSPECTION COVER	IC
RETAINING WALL	RW	LAMP POST	LP
FEATHERBOARD FENCE	FBF	LETTER BOX	LB
BASEMENT LEVEL	BTL	LITTER BIN	BIN
BED LEVEL	BL	KERB OUTLET	KO
COVER LEVEL	CL	MANHOLE (STEEL OR SURFACE)	MH
DAMP PROOF COURSE	DPC	NAME PLATE	NP
FLOOR LEVEL	FL	NAME BOARD	NB
INVERT LEVEL	IL	CAMERA POST	CAM
OUTFALL LEVEL	OL	OVERHEAD CABLE	OHC
THRESHOLD LEVEL	THL	POST	P
POOL WATER	PW	RAIN WATER PIPE	RWP
SURFACE WATER	SW	RAISED FLOWERBED	RFB
GULLY POT	GU	REFLECTOR POST	RP
UNABLE TO LIFT	UTL	ROAD SIGN	RS
OBSTRUCTED	OBS	RODDING EYE	RE
WATER LEVEL	WL	SERVICE MARKER POST	SMP
SURFACE GULLY	SGU	SOIL VENT PIPE	SVP
CONCRETE	CONC	STOP COCK	SC
PAVING SLABS	PAVS	STOP VALVE	SV
BRICK PAVING	PAV	TELEGRAPH POLE	TP
STONE SETS	SS	TELEPHONE CALL BOX	TCB
TACTILE PAVING	TAC	TRAFFIC LIGHTS	TL
DRAINAGE CHANNEL	DRC	WATER TAP	TAP
WALL TOP	WLT	WATER METER	WM

SURVEYORS
Waterhouse and Associates Established 1997
Chartered Civil Engineering Surveyors

Land Surveyors – Aerial Mapping – Measured Building Surveys
Hydrographic Surveys – Site Control – Boundary Demarcation
Professional Photography & CAD

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Nr Honiton, Devon, EX12 3BL, UK
Email: info@wasurveyors.com www.wasurveyors.com
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citb Reg No CSCS 0146160
chartered ices

DRAWING SHEET LAYOUT

1

CLIENTS NAME
Carol Besent

CLIENTS ADDRESS
Sundown Farm
Martin Drove End
Fordingbridge
SP6 3JT

PROJECT SITE ADDRESS
Sundown Farm
Martin Drove End
Fordingbridge
SP6 3JT

PROJECT TITLE

DRAWING TITLE
Topographic Survey
Full Survey Overview

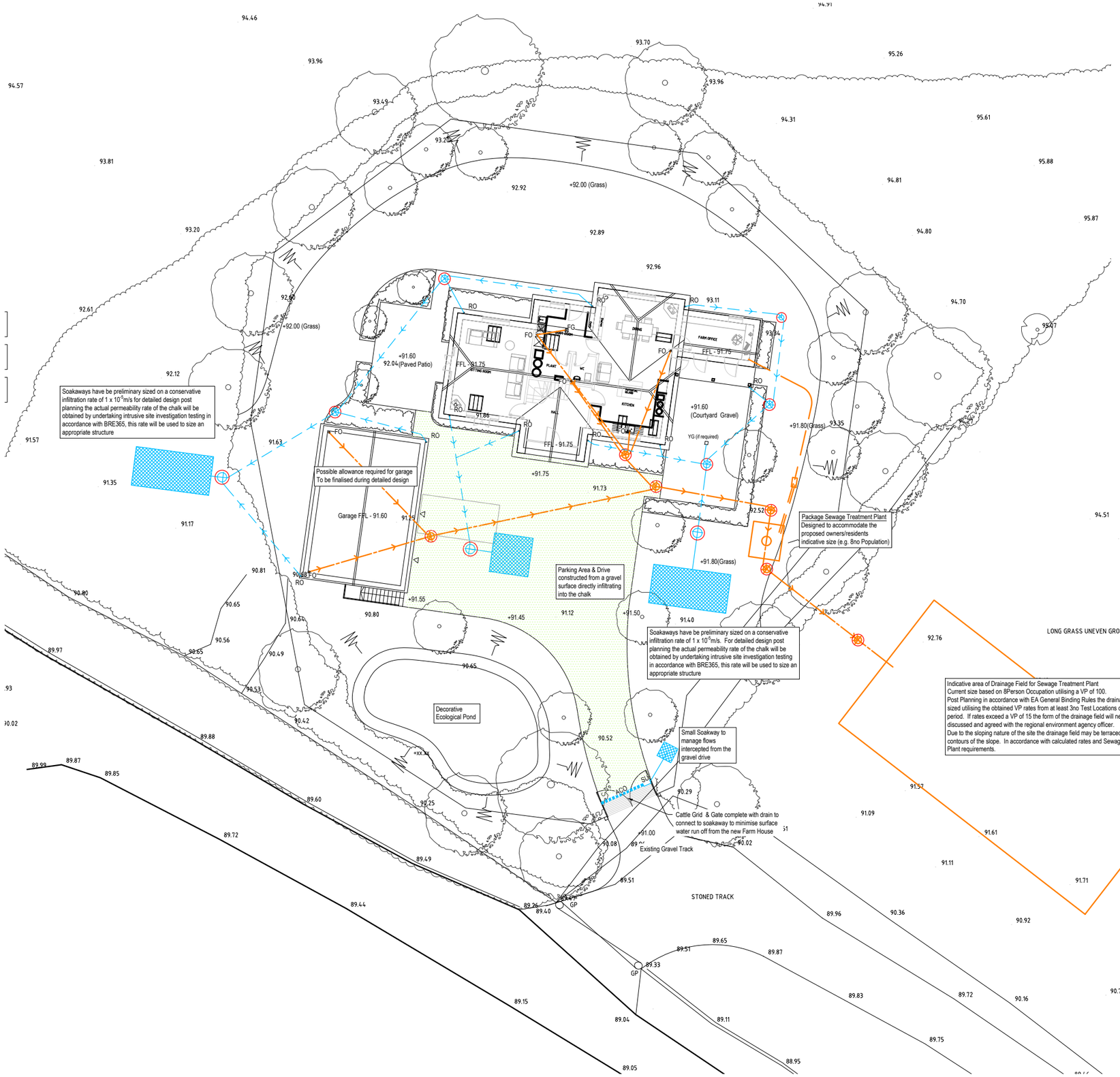
SURVEYED JDW/SJW	DRAWN JDW/SJW	DESIGNED
CHECKED SJW	APPROVED	DATE NOV 2022
SCALE 1/500	A1	

DRAWING No:- 22.1117 REV REV

Appendix C – Site Drainage Strategy

Proposed Drainage Scheme 23340-GAP-XX-XX-DR-C-9000

Proposed Surface Water Calculations



DRAINAGE LEGEND

- Proposed surface water sewer (& manhole)
- Proposed foul water sewer (& manhole)
- RO — Rainwater collection pipe
- SU ACO — Drainage channel (with sump unit)
- FO — Foul Outlet
- Soakaway

Refer to Architects / M&E Drawings for exact positions of internal connections & RO's
Unless specified otherwise, all Inspection chambers and catchpits are to be 450 Ø
Unless otherwise noted all drainage to be 100 Ø

NOT FOR CONSTRUCTION

SW DESIGN COMMENTARY

The surface water drainage design has been prepared using the following design criteria. The system is designed to keep all runoff below ground for al rainfall events.

Return Period	100 years
Climate Change	+ 45%
Storm Durations	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960 & 1,440 minutes
M5-60	20mm
r	0.30
Cv	1.00

Surface water flows are being disposed of via infiltration either by soakaways or permeable paving. The driveway/parking area is currently proposed to have a gravel finish. There is a pond currently proposed on the landscaping plan, this is not formally going to be used as part of the drainage strategy for the site.

The remaining hard standing areas will be directed to the soft landscaping areas.

Soakaway structures will be provided with a catchpit upstream of the structure to intercept any sediments/detritus.

Rev	Date	Revision Description	Issued by
P02	27.07.23	Scale Bar checked	MR
P01	22.06.23	Preliminary Issue	MR

Drawing Status: S2 - Suitable for Information

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Consulting Civil and Structural Engineers
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Telephone: 01202 600900
Website: www.gapltd.net

Client: Ms Carol Besant

Project: Sundown Farm, Martin Drove End

Drawing Title: Planning Drainage Strategy

Scale: As Indicated @A1 | Drawn: | Checked: MR

Project-Originator-Zone-Level-Type-Role: 23340-GAP-XX-XX-DR-C | Drawing No.: 9000 | Revision: P02

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	10	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Typical Soakaway	0.004	5.00	91.450	25.055	69.251	2.450

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	35	0	0
100	45	0	0

Node Typical Soakaway Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Invert Level (m)	89.000	Depth (m)	2.000
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	1000	Inf Depth (m)	2.000
Safety Factor	2.0	Pit Width (m)	2.500	Number Required	1
Porosity	0.30	Pit Length (m)	2.500		

Approval Settings

Node Size	✓	Backdrops	✓
Node Losses	✓	Minimum Backdrop Height (m)	
Link Size	✓	Maximum Backdrop Height (m)	1.500
Minimum Diameter (mm)	150	Full Bore Velocity	✓
Link Length	✓	Minimum Full Bore Velocity (m/s)	
Maximum Length (m)	100.000	Maximum Full Bore Velocity (m/s)	3.000
Coordinates	✓	Proportional Velocity	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Minimum Proportional Velocity (m/s)	0.750
Cover Depth	✓	Maximum Proportional Velocity (m/s)	3.000
Minimum Cover Depth (m)		Surcharged Depth	✓
Maximum Cover Depth (m)	3.000	Return Period (years)	

Approval Settings

Maximum Surcharged Depth (m)	0.100	Discharge Rates	✓
Flooding	✓	Discharge Volume	✓
Return Period (years)	30	100 year 360 minute (m^3)	
Time to Half Empty	x		

Results for 1 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
720 minute winter	Typical Soakaway	465	89.392	0.392	0.1	0.7471	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)
15 minute summer	Typical Soakaway	Infiltration	0.0

Results for 30 year +35% 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
360 minute summer	Typical Soakaway	336	90.351	1.351	0.5	2.5784	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)
15 minute summer	Typical Soakaway	Infiltration	0.0

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
720 minute winter	Typical Soakaway	660	91.345	2.345	0.3	3.8283	0.0000	OK

Link Event (Outflow)	US Node	Link	Outflow (l/s)
15 minute summer	Typical Soakaway	Infiltration	0.0