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NEWFOUNDLAND ROAD DEEPCUT
CAMBERLEY
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DRAINAGE STRATEGY AND MANAGEMENT & MAINTENANCE REQUIREMENTS

Contents

Document Control

Revision	Purpose	Date	By	Approved
-	Initial issue	06/11/23	RR	JOD

Prepared By: RR
Approved By: JOD

Project No.	**23-158**	**Revision**	-	**Date**	06/11/23

1 INTRODUCTION

1.1.1 Hodel Ltd. have been appointed by Little Rock Developments ltd, to design the below-ground foul and surface water drainage for the development at the former museum, Newfoundland Road, Deepcut, Camberley.

1.1.2 This report outlines the proposed drainage design and has been written in accordance with National Planning Policy Framework.

2 EXISTING SITE

2.1.1 The site was previously an MOD museum with associated hardstanding. The site is located within Flood Zone 1 with a low probability of flooding as defined by the Environment Agency (EA) on their Flood Map for Planning.

2.1.2 The existing impermeable area of the roof and hardstanding area is approximately 1955m^2.

2.1.3 The British National Grid reference is E:490606, N:157607.

2.1.4 The general topography of the site is a fall to the south.

2.2 Geology

2.2.1 The SI undertaken by GES indicates that the site is underlain by River Terrace Deposits and soils of the Camberley Sand Formation.

2.3 Surface Water & Groundwater

2.3.1 HM Government's map for Flood Risk from Rivers or Sea indicates that the site is at very low risk of flooding from Rivers or Sea.

2.3.2 HM Government's Surface Water Flood map indicates that the site is at very low risk of flooding from surface water.

2.4 Existing Surface Water Strategy

2.4.1 The surface water generated on the site currently discharges unrestricted to a mixture of soakaways and surface water sewer connections.

2.5 Existing Foul Water Strategy

2.5.1 The foul generated on-site currently discharges via a pump to an unknown location.

3 PROPOSED SITE

3.1.1 The proposal is to retain the property and convert it into two commercial units with associated hardstanding.

3.1.2 The proposed impermeable area is approximately 2436m^2, which is an increase of 481m^2.

3.2 Proposed Surface Water Strategy

3.2.1 This site is being developed as a serviced plot, whereby a surface water connection has been provided along with a set discharge rate of 13.6 l/s as per the Waterman drawing DC2-WTM-CD-218-XX-DR-03-0500 rev C01 dated 28.02.20 (appendix 6.7).

3.2.2 Infiltration testing has been undertaken on-site by GES and provided low to moderate infiltration based on extrapolated data.

3.2.3 The proposed surface water scheme has been developed based on the principles within the Waterman scheme.

3.2.4 The proposed discharge rate of 13.6l/s shall be achieved with the installation of a HydroBrake unit, with the required attenuation being provided within a 93.6m^3 geocellular attenuation tank. The surface water scheme has been designed to accommodate for the 1:100 year event with a 40% allowance for climate change.

3.2.5 Catchpits and gullies shall be specified to prevent pollutants from entering the attenuation tank and public surface water sewer system.

3.3 Proposed Foul Water Strategy

3.3.1 The proposal is to collect the foul water, and discharge to the provided foul connection point within the site boundary that then discharges to the public sewer system.

4 MAINTENANCE REQUIREMENTS

4.1.1 The pipework has been designed to be self-cleansing and as such should require no maintenance. If a blockage occurs, the system has been designed so that easy rodding or jetting can take place.

4.1.2 Catchpits will be installed upstream of the attenuation tank to collect silts/debris and prevent it from entering the attenuation system. These catchpits should be inspected and cleared out twice annually.

4.1.3 Inspections should be undertaken after any adverse weather event with the required maintenance or remediation works undertaken to ensure the system remains fully operational.

4.1.4 Below is a table setting out the various elements of the drainage system and maintenance requirements. The list is of actions is not exhaustive and some actions may not always be required.

Drainage Feature	**Inspection Frequency / Requirement**	**Maintenance Requirement**	**Responsibility**
Gullies/channels	Every 6 months, for silt and debris.	Silt and debris to be cleared from gully pots.	Management Company
Rainwater Downpipes	Every 12 months, for silt and leaves.	Silt to be cleared from gully pot, leaves to be cleared from gutters and downpipes.	Management Company
Pipework	If a problem occurs, by CCTV survey.	As recommended by CCTV survey company.	Management Company
Catchpits/sumps	First 3 months	Soon after site works have completed, a large amount of build-up is normally expected within the drainage system. Lift the cover to the silt trap chamber and assess any silt build up. Any build up should be removed and disposed of.	
	Every 6 months, for silt and debris.	Silt and debris to be cleared.	Management Company
Attenuation Tank	Refer to 4.1.5	Refer to 4.1.5	Management Company
Hydro-Brake	As per manufacturer's requirements.	As per manufacturer's requirements.	Management Company

4.1.5 Operations and maintenance requirements for attenuation storage tanks as per Table 21.3 of the CIRIA SuDS Manual 2015

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 is may cause risk to performance)	Monthly
	Remove sediment from pre-treatment structures and/or internal forebays	Annually or as required.
Remedial actions	Repair/rehabilitate inlets, outlets, 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 the inside of the tank for sediment build-up and remove if necessary.	Every 5 years or as required.

5 CONCLUSION

5.1.1 It is proposed to attenuate surface water generated on-site and discharge to the surface water sewer at a restricted rate of 13.6l/s, via the provided surface water connection. The network has been designed to contain the 1 in 100 year event with a 40% allowance for climate change, with no above ground flooding.

There shall be no increase to risk of flooding on or off site.

5.1.2 Foul water is to discharge to the foul sewer via the connection provided onsite.

5.1.3 Ongoing maintenance will be required, as detailed in the maintenance schedule above.

6 APPENDICES

6.1 Engineering Layout

6.2 Drained Areas Analysis Sketch

6.3 Flood Risk from Rivers and Sea

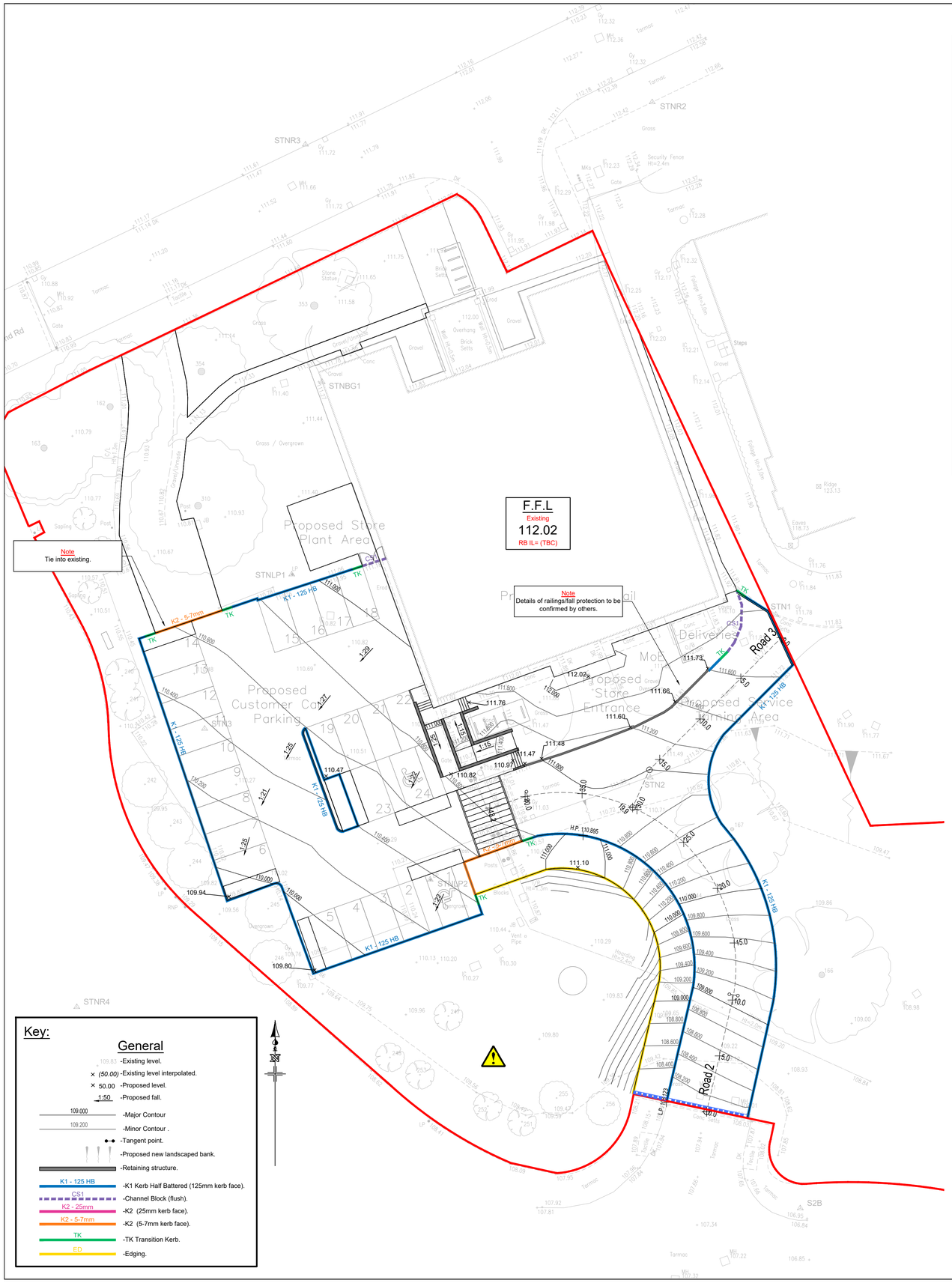
6.4 Flood Risk from Surface Water

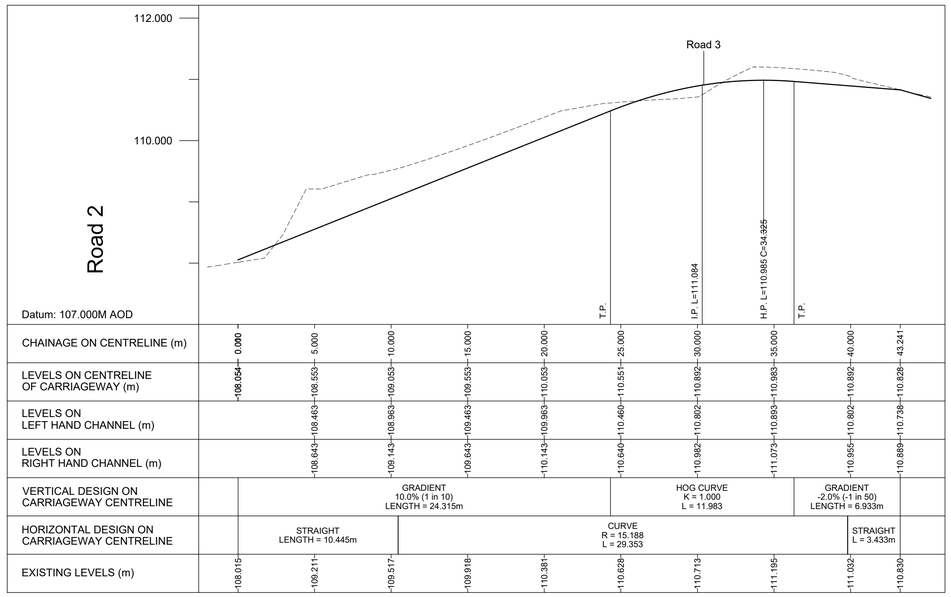
6.5 Flood Map for Planning

6.6 Microdrainage Calculations

6.7 Waterman Scheme

APPENDIX 6.1 ENGINEERING LAYOUT





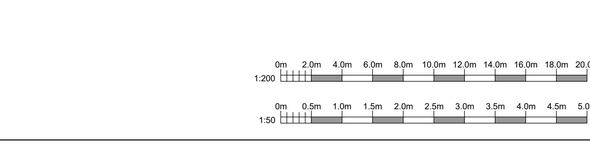
Datum: 107.000M AOD										
CHAINAGE ON CENTRELINE (m)	0.000	5.000	10.000	15.000	20.000	25.000	30.000	35.000	40.000	43.241
LEVELS ON CENTRELINE OF CARRIAGEWAY (m)	108.054	108.553	109.053	109.553	110.053	110.551	110.892	110.983	110.892	110.828
LEVELS ON LEFT HAND CHANNEL (m)		108.463	108.963	109.463	109.963	110.460	110.802	110.893	110.802	110.738
LEVELS ON RIGHT HAND CHANNEL (m)		108.643	109.143	109.643	110.143	110.640	110.992	111.073	110.955	110.889
VERTICAL DESIGN ON CARRIAGEWAY CENTRELINE		GRADIENT 10.0% (1 in 10) LENGTH = 24.315m				HOG CURVE K = 1.000 L = 11.983			GRADIENT -2.0% (-1 in 50) LENGTH = 6.933m	
HORIZONTAL DESIGN ON CARRIAGEWAY CENTRELINE		STRAIGHT LENGTH = 10.445m		CURVE R = 15.188 L = 29.353					STRAIGHT L = 3.433m	
EXISTING LEVELS (m)	108.015	109.211	109.517	109.918	110.381	110.628	110.713	111.195	111.032	110.830

Scale H =1:200 V=1:50

Road 2

Existing Ground Profile

Proposed Ground Profile



Datum: 110.000M AOD						
CHAINAGE ON CENTRELINE (m)	0.000	5.000	10.000	15.000	16.289	19.869
LEVELS ON CENTRELINE OF CARRIAGEWAY (m)	111.721	111.593	111.360	111.083	110.999	110.909
LEVELS ON LEFT HAND CHANNEL (m)	111.661	111.533	111.294	110.577		
LEVELS ON RIGHT HAND CHANNEL (m)	111.832	111.653	111.420	111.189		
VERTICAL DESIGN ON CARRIAGEWAY CENTRELINE		GRADIENT -2.5% L = 4.320m	HOG K = 1.000	GRADIENT -5.0% (-1 in 20) LENGTH = 5.750m	HOG K = 1.000 G = -6.7%	
HORIZONTAL DESIGN ON CARRIAGEWAY CENTRELINE		STRAIGHT LENGTH = 16.269m				
EXISTING LEVELS (m)	111.771	111.699	111.620	111.461	111.411	

Scale H =1:200 V=1:50

Road 3

Existing Ground Profile

Proposed Ground Profile

1:200 0m 2.0m 4.0m 6.0m 8.0m 10.0m 12.0m 14.0m 16.0m 18.0m 20.0m

1:50 0m 0.5m 1.0m 1.5m 2.0m 2.5m 3.0m 3.5m 4.0m 4.5m 5.0m

NOTES

1. Do not scale this drawing.
2. This drawing is to be read in conjunction with all other relevant Engineer's and Architect's drawings and specifications.

RISK ASSESSMENT

Residual Risks Identified

1. Previously an MOD site.

Contractor's General Risk Items

(List is not exhaustive but includes commonly raised issues)

1. Location of all buried services.
2. Existing drainage:
   i) Gases, confined spaces, diseases.
   ii) Maintain flow in drains during works.
3. Manual lifting of heavy objects; manhole covers, drainage pipes, concrete rings, kerbs,etc.
4. Excavation for drainage trenches and manholes.
5. Security:
   Keep site secure from members of the public.
   maintain public safety when accessing site.

Rev	Date	By	Chkd.	Revision notes
C	06/11/23		JOD	Drawing updated to suit updated site layout.
B	27/10/23		JOD	Drawing updated to suit updated site layout.
A	27/09/23		JOD	Kerb added to back of delivery area.
-	26/09/23		JOD	Issued for comment.

Job Title

Newfoundland Road
Deepcut

Drawing Title

External Levels Drawing

Client

Little Rock Developments ltd

HODEL CONSULTING ENGINEERS
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Scale at A1:	Status:	
1:50 1:200	FOR COMMENT	
Drawn: Date: Sept'23	Checked: JOD Date: Sept'23	Approved: - Date:
Drawing No.: 23-158_C01		Revision: C

MH REF	COVER LEVEL	INVERT LEVEL	DEPTH TO INVERT	CHAMBER TYPE	CHAMBER SIZE	REMARKS
F1	110.58	109.91	0.67	PPIC	450 Ø	New chamber constructed online of existing foul drain run. Invert level to be confirmed onsite prior to construction.
F2	110.95	109.75	1.20	PPIC	450 Ø	
F3	111.66	110.46	1.20	PPIC	450 Ø	
F4	110.80	109.60	1.20	PPIC	450 Ø	
F5	109.66	108.46	1.20	PPIC	450 Ø	
F6	108.36	106.00	2.36	PPIC	450Ø	Demarcation Chamber. Restricted access chamber.
S1	110.24	108.79	1.45	PC RING	1200 Ø	PC Ring Catchpit min 600mm sump.
S2	111.23	110.24	0.99	PPIC	450 Ø	
S3	110.80	109.90	0.90	PPIC	450 Ø	PPIC Catchpit Chamber min 300mm sump.
S4	110.92	108.45	2.47	PC RING	1200 Ø	IL from S5= 109.92
S5	111.70	110.60	1.10	PPIC	450 Ø	New chamber constructed online of existing surface water drain run. Invert level to be confirmed onsite prior to construction.
S6	109.77	108.27	1.50	PC RING	1200 Ø	PC Ring Catchpit min 600mm sump.
S7	108.63	106.63	2.00	PC RING	1200 Ø	HydroBrake Chamber. Unit ref: MD-SHE-0165-1360-1200-1360 Flow rate restricted to 13.6 l/s as per Waterman drawing DC2-WTM-CD-218-XX-DR-03-0500 rev C01 dated 28.02.20. HydroBrake to be installed on internal weir wall inline with manufacturers details. Sump depth as per manufacturers details.

NOTES

1. Do not scale this drawing.
2. This drawing is to be read in conjunction with all other relevant Engineer's and Architect's drawings and specifications.

RISK ASSESSMENT

Residual Risks Identified

1. Previously an MOD site.

Contractor's General Risk Items

(List is not exhaustive but includes commonly raised issues)

1. Location of all buried services.
2. Existing drainage:
   i) Gases, confined spaces, diseases.
   ii) Maintain flow in drains during works.
3. Manual lifting of heavy objects; manhole covers, drainage pipes, concrete rings, kerbs,etc.
4. Excavation for drainage trenches and manholes.
5. Security;
   Keep site secure from members of the public.
   maintain public safety when accessing site.

Existing Manhole (catchpit).
Ref: IC22 (from CCTV)
Designation: Surface Water
CL = 111.66 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing Manhole.
Ref: IC21 (from CCTV)
Designation: Surface Water
CL = 109.21(from Topo)
IL = 107.21
DP = 2.00 (from CCTV)

Existing Manhole.
Ref: IC16 (from CCTV)
Designation: Foul
CL = 111.99 (from Topo)
IL = 111.22
DP = 0.77 (from CCTV)

Existing Manhole (catchpit).
Ref: IC4(from CCTV)
Designation: Surface Water
CL = 112.28 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing Manhole (catchpit).
Ref: IC3(from CCTV)
Designation: Surface Water
CL = 112.25 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing Manhole.
Ref: IC12 (from CCTV)
Designation: Foul
CL = 112.21(from Topo)
IL = 110.91
DP = 1.30 (from CCTV)

Existing Manhole.
Ref: IC13 (from CCTV)
Designation: Foul
CL = 112.14 (from Topo)
IL = 110.48
DP = 1.66 (from CCTV)

Existing Manhole.
Ref: IC11(from CCTV)
Designation: Foul
CL = 111.40 (from Topo)
IL = 110.49
DP = 0.91(from CCTV)

Note
All existing drainage serving adjacent development assumed to be redundant apart from chambers IC16 & IC18.

Note
Details of internal drainage to be confirmed.

F.F.L
Existing
112.02
RB IL= (TBC)

Existing Manhole (catchpit).
Ref: IC2(from CCTV)
Designation: Surface Water
CL = 111.96 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing Manhole.
Ref: IC14 (from CCTV)
Designation: Foul
CL = 111.84 (from Topo)
IL = 110.14
DP = 1.70 (from CCTV)

Survey abandoned:
Unable to pass at 7.03m
Remedial works required as per CCTV recommendations.

Existing RWP.

Existing Manhole (catchpit).
Ref: IC1(from CCTV)
Designation: Surface Water
CL = 111.81(from Topo)
IL = 110.66 **TBC**
DP = 1.15 (from GPR)

Existing Manhole.
Ref: IC15 (from CCTV)
Designation: Foul
CL = 111.90 (from Topo)
IL = 109.80
DP = 2.10 (from CCTV)

150Ø Capped End.

Existing Manhole.
Ref: IC16 (from CCTV)
Designation: Foul
CL = 111.77 (from Topo)
IL = 108.77
DP = 3.00 (from CCTV)

Existing Manhole (Soakaway).
Ref: IC6 (from CCTV)
Designation: Surface
CL = 110.82 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing Manhole (Soakaway).
Ref: IC5 (from CCTV)
Designation: Surface
CL = 111.47 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing RWP.

Survey abandoned:
Unable to pass

Note
Existing foul and surface water drains to serve adjacent development must remain active and be protected during and after construction.

Existing Manhole.
Ref: IC18 (from CCTV)
Designation: Surface Water
CL = 108.98 (from Topo)
IL = 107.38
DP = 1.60 (from CCTV)

Existing Manhole (Unable to CCTV).
Ref: IC20 (from CCTV)
Designation: Surface
CL = 109.77 (from Topo)
IL = NA
DP = NA (from CCTV)

Existing Manhole.
Ref: IC9 (from CCTV)
Designation: Foul
CL = 110.30 (from Topo)
IL = 109.80 **TBC**
DP = 0.50 (from GPR)

Existing Pump Chamber.
Ref: IC15 (from CCTV)
Designation: Foul
No power at time of survey.
Flooded.

Note
Geocellular attenuation tank
Length = 13.00m
Width= 6.00m
Structure Depth= 1.20m
Cover Level =109.19 (lowest point)
Base Level = 106.68
Soffit Level = 107.88
Incoming Pipe Level = 106.68
Tank to be installed and vented as per manufacturer's requirements.

Note
HydroBrake Chamber.
Unit ref: MD-SHE-0165-1360-1200-1360
Flow rate restricted to 13.6 l/s as per Waterman drawing DC2-WTM-CD-218-XX-DR-03-0500 rev C01 dated 28.02.20.
HyrdroBrake to be installed on internal weir wall inline with manufacturers details.
Sump depth as per manufacturers details.

Note
New Foul and Surface water connections subject to Southern Water S106 approval.

Existing Manhole.
Ref: IC19 (from CCTV)
Designation: Surface Water
CL = 108.01 (from Topo)
IL = 106.58
DP = 1.43 (from CCTV)

Existing Manhole.
Ref: IC17 (from CCTV)
Designation: Foul
CL = 108.11(from Topo)
IL = 105.20
DP = 2.91 (from CCTV)

Key:

Private Drainage

- 150Ø, 1:80 / S1 — -Surface water drain.
- S1 — -Surface water chamber. (CP denotes catchpit chamber minimum 300mm sump).
- R — -Rain water down pipe.
- RE — -Rodding eye.
- RG — -Road gully, 150Ø outlet.
- SU — -Channel drain and sump/gully unit.
- TD — -Threshold drain detail by Architect.
- S1 — -Vortex flow control (HydroBrake).
- ATT1 — -Prefabricated void forming attenuation tank.
- 150Ø, 1:80 / F1 — -Foul water drain.
- F1 — -Foul water chamber.
- SS — -Stub stack.
- DP — -Drain Point (Architect to confirm).
- SVP — -Soil and vent pipe.
- FG — -Trapped foul gully, -100Ø outlet.

Existing Drainage/Sewers

- 150Ø — -Surface water drain to remain.
- 150Ø — -Foul water drain to remain.
- 150Ø — -Surface water drain to be abandoned and filled with pfa cement grout.
- 150Ø — -Foul water drain to be abandoned and filled with pfa cement grout.
- 150Ø — -Surface water sewer / public lateral to remain.
- 150Ø — -Foul water sewer / public lateral to remain.

General

- 109.83 — -Existing level.
- -Exceedance Routing.

0m 2.0m 4.0m 6.0m 8.0m 10.0m 12.0m 14.0m 16.0m 18.0m 20.0m
1:200

Rev	Date	By	Chkd.	Revision notes
-	06/11/23		JOD	Issued for comment.

Job Title
Newfoundland Road
Deepcut

Drawing Title
Drainage Layout.

Client
Little Rock Developments ltd

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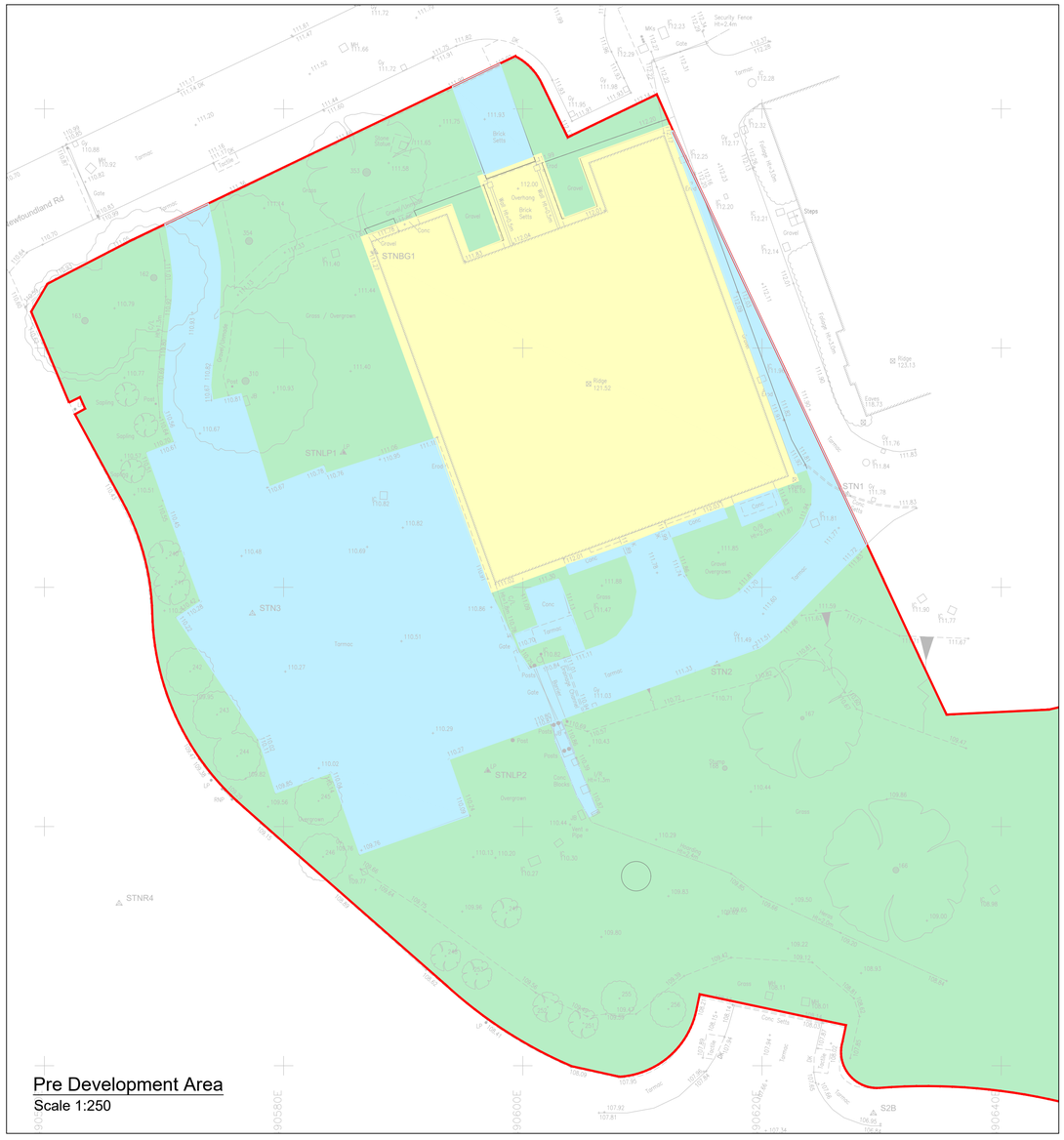
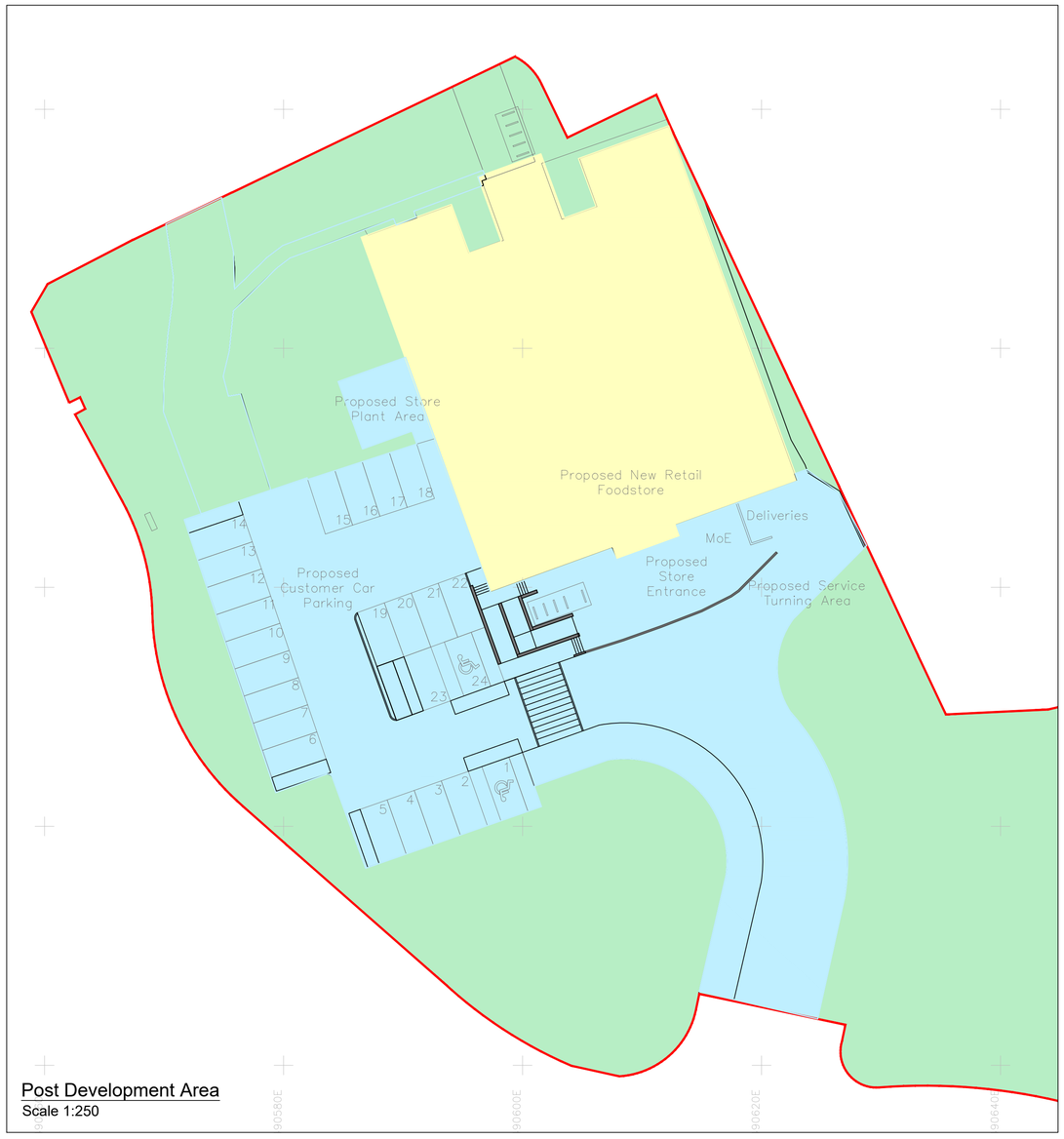
Scale at A1:	Status:	
1:50 1:200	FOR COMMENT	
Drawn:	Checked:	Approved:
Date: Nov'23	JOD Date: Nov'23	- Date:
Drawing No.:		Revision:
23-158_C02		-

APPENDIX 6.2 DRAINED AREAS ANALYSIS SKETCH





Areas Key:

Pre Development Areas

Soft Landscaping Area =	5432m²
Hardstanding Area =	1105m²
Building Roof Area =	850m²
Total Impermeable Area =	1955m²
Total Area =	7387m²

Post Development Areas

Soft Landscaping Area =	4951m²
Hardstanding Area = (Permeable)	0m²
Hardstanding Area =	1582m²
Building Roof Area =	854m²
Total Impermeable Area =	2436m²
Total Area =	7387m²

0m 2.5m 5.0m 7.5m 10.0m 12.5m 15.0m 17.5m 20.0m 22.5m 25.0m
1:250

NOTES

1. Do not scale this drawing.
2. This drawing is to be read in conjunction with all other relevant Engineer's and Architect's drawings and specifications.

Rev	Date	By	Chkd.	Revision notes
-	06/11/23		JOD	Issued for comment.

Job Title

Newfoundland Road
Deepcut

Drawing Title

Drained Areas.

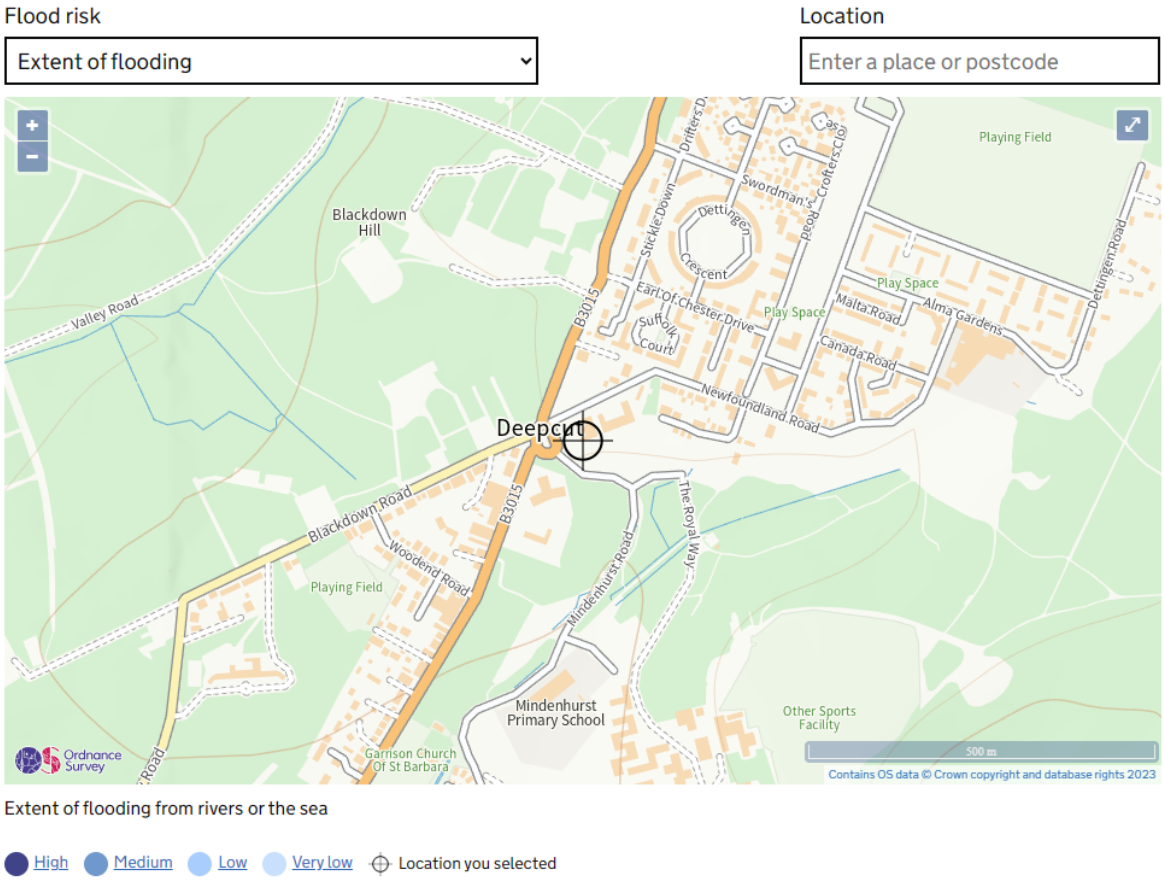
Client

Little Rock Developments ltd

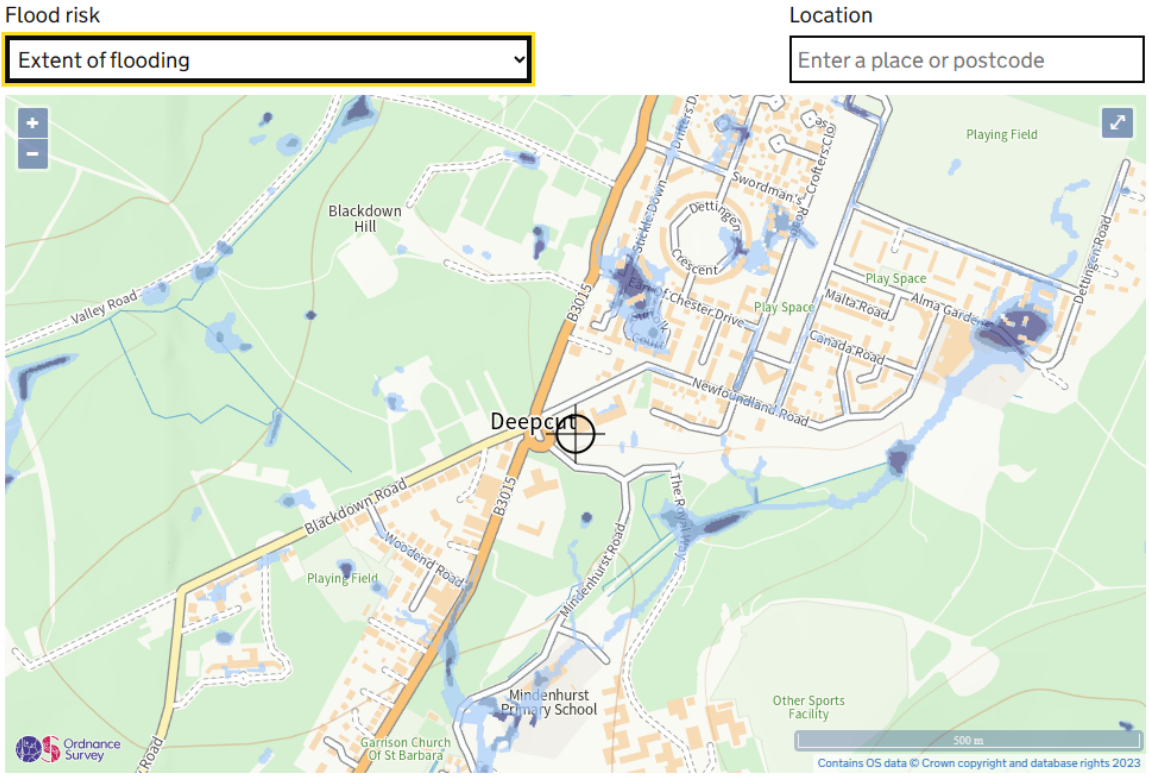
HODEL CONSULTING ENGINEERS
01732 617555
mail@hodel.uk

Scale at A1: 1:50 1:200	Status: FOR COMMENT	
Drawn: Date: Nov'23	Checked: JOD Date: Nov'23	Approved: - Date:
Drawing No.: 23-158_SKC01		Revision: -

APPENDIX 6.3 FLOOD RISK FROM RIVERS OR SEA



APPENDIX 6.4 FLOOD RISK FROM SURFACE WATER



Extent of flooding from surface water

High Medium Low Very low Location you selected

APPENDIX 6.5 FLOOD MAP FOR PLANNING

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**490601/157603**	**6 Nov 2023 9:31**

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

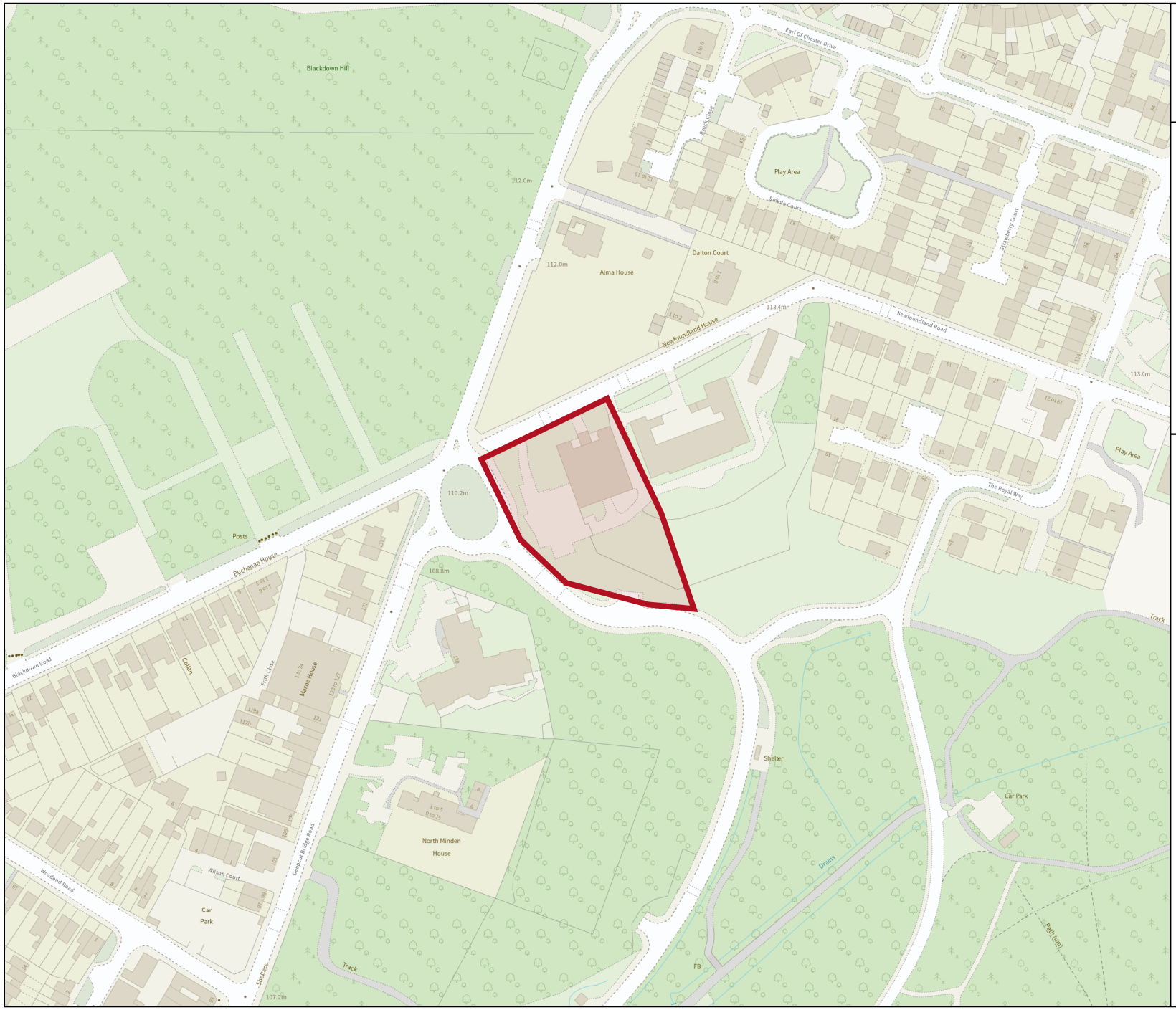
You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 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.



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
490601/157603

Scale
1:2500

Created
6 Nov 2023 9:31

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

0 20 40 60m

APPENDIX 6.6 MICRODRAINAGE CALCULATIONS

Existing Network Details for Existing

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.000	10.428	0.130	80.2	0.096	5.00	0.0	0.600	o	225	Pipe/Conduit
2.000	27.266	0.340	80.2	0.044	5.00	0.0	0.600	o	150	Pipe/Conduit
2.001	5.269	1.240	4.2	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit
1.001	16.691	0.210	79.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
3.000	14.504	2.160	6.7	0.045	5.00	0.0	0.600	o	150	Pipe/Conduit
1.002	13.662	0.180	75.9	0.023	5.00	0.0	0.600	o	300	Pipe/Conduit
1.003	12.106	1.640	7.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
4.000	8.338	0.050	166.8	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit
1.004	3.594	0.050	71.9	0.024	5.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	108.790	0.096	0.0	1.46	58.1
2.000	110.240	0.044	0.0	1.12	19.9
2.001	109.900	0.058	0.0	4.92	87.0
1.001	108.660	0.154	0.0	1.47	58.4
3.000	110.660	0.045	0.0	3.91	69.2
1.002	108.450	0.222	0.0	1.81	127.7
1.003	108.270	0.222	0.0	5.82	411.5
4.000	106.680	0.000	0.0	1.21	85.9
1.004	106.630	0.245	0.0	1.54	61.4

Simulation Criteria for Existing

Volumetric Runoff Coeff 1.000 Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000
Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000 Run Time (mins) 60
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800 Output Interval (mins) 1

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales Ratio R 0.400 Cv (Summer) 1.000 Storm Duration (mins) 30
Return Period (years) 1 M5-60 (mm) 19.800 Profile Type Summer Cv (Winter) 0.840

Online Controls for Existing

Hydro-Brake® Optimum Manhole: S7, DS/PN: 1.004, Volume (m³): 3.5

Unit Reference	MD-SHE-0165-1360-1200-1360	Objective	Minimise upstream storage	Invert Level (m)	106.630
Design Head (m)	1.200	Application	Surface	Minimum Outlet Pipe Diameter (mm)	225
Design Flow (l/s)	13.6	Sump Available	Yes	Suggested Manhole Diameter (mm)	1500
Flush-Flo™	Calculated	Diameter (mm)	165		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	13.6	Flush-Flo™	0.364	13.6	Kick-Flo®	0.801	11.2	Mean Flow over Head Range	-	11.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.9	0.500	13.4	1.200	13.6	2.000	17.3	3.000	21.0	5.000	26.9	7.000	31.6	9.000	35.7
0.200	12.8	0.600	13.1	1.400	14.6	2.200	18.1	3.500	22.6	5.500	28.1	7.500	32.7	9.500	36.6
0.300	13.5	0.800	11.3	1.600	15.6	2.400	18.9	4.000	24.1	6.000	29.3	8.000	33.7		
0.400	13.6	1.000	12.5	1.800	16.5	2.600	19.6	4.500	25.5	6.500	30.5	8.500	34.7		

Storage Structures for Existing

Cellular Storage Manhole: ATT1, DS/PN: 4.000

Invert Level (m) 106.680 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	78.0	66.0	1.200	78.0	106.8	1.201	0.0	106.8

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Hot Start Level (mm) 0 Foul Sewage per hectare (l/s) 0.000 MADD Factor * 10m³/ha Storage 2.000 Flow per Person per Day (l/per/day) 0.000
Hot Start (mins) 0 Manhole Headloss Coeff (Global) 0.500 Additional Flow - % of Total Flow 0.000 Inlet Coeffiecient 0.800

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 19.800 Ratio R 0.400 Cv (Summer) 1.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	15 Summer	1	+0%	30/15 Summer				108.882	-0.133	0.000	0.35			16.8	OK	
2.000	S2	15 Summer	1	+0%	100/15 Summer				110.307	-0.083	0.000	0.40			7.6	OK	
2.001	S3	15 Summer	1	+0%					109.937	-0.113	0.000	0.14			9.6	OK	
1.001	Junction	15 Summer	1	+0%					108.767	-0.118	0.000	0.45			26.4	OK*	
3.000	S5	15 Summer	1	+0%					110.695	-0.115	0.000	0.12			7.8	OK	
1.002	S4	15 Summer	1	+0%	100/15 Summer				108.575	-0.175	0.000	0.36			38.2	OK	
1.003	S6	15 Summer	1	+0%					108.339	-0.231	0.000	0.12			38.3	OK	
4.000	ATT1	30 Summer	1	+0%	10/15 Summer				106.797	-0.183	0.000	0.10		17	5.8	OK	
1.004	S7	30 Summer	1	+0%	1/15 Summer				106.998	0.143	0.000	0.43			13.5	SURCHARGED	

10 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Hot Start Level (mm) 0 Foul Sewage per hectare (l/s) 0.000 MADD Factor * 10m³/ha Storage 2.000 Flow per Person per Day (l/per/day) 0.000
Hot Start (mins) 0 Manhole Headloss Coeff (Global) 0.500 Additional Flow - % of Total Flow 0.000 Inlet Coeffiecient 0.800

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 19.800 Ratio R 0.400 Cv (Summer) 1.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	15 Summer	10	+0%	30/15 Summer				108.926	-0.089	0.000	0.67			32.5	OK	
2.000	S2	15 Summer	10	+0%	100/15 Summer				110.341	-0.049	0.000	0.77			14.6	OK	
2.001	S3	15 Summer	10	+0%					109.955	-0.095	0.000	0.28			19.9	OK	
1.001	Junction	15 Summer	10	+0%					108.829	-0.056	0.000	0.89			52.0	OK*	
3.000	S5	15 Summer	10	+0%					110.710	-0.100	0.000	0.24			15.1	OK	
1.002	S4	15 Summer	10	+0%	100/15 Summer				108.640	-0.110	0.000	0.71			75.0	OK	
1.003	S6	15 Summer	10	+0%					108.368	-0.202	0.000	0.23			75.3	OK	
4.000	ATT1	30 Summer	10	+0%	10/15 Summer				107.017	0.037	0.000	0.21		23	13.2	SURCHARGED	
1.004	S7	15 Summer	10	+0%	1/15 Summer				107.065	0.210	0.000	0.43			13.5	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Hot Start Level (mm) 0 Foul Sewage per hectare (l/s) 0.000 MADD Factor * 10m³/ha Storage 2.000 Flow per Person per Day (l/per/day) 0.000
Hot Start (mins) 0 Manhole Headloss Coeff (Global) 0.500 Additional Flow - % of Total Flow 0.000 Inlet Coeffiecient 0.800

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 19.800 Ratio R 0.400 Cv (Summer) 1.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	15 Summer	30	+0%	30/15 Summer				109.047	0.032	0.000	0.82			39.8	SURCHARGED	
2.000	S2	15 Summer	30	+0%	100/15 Summer				110.362	-0.028	0.000	0.98			18.5	OK	
2.001	S3	15 Summer	30	+0%					109.963	-0.087	0.000	0.36			25.2	OK	
1.001	Junction	15 Summer	30	+0%					108.885	0.000	0.000	1.10			64.4	SURCHARGED*	
3.000	S5	15 Summer	30	+0%					110.716	-0.094	0.000	0.30			19.2	OK	
1.002	S4	15 Summer	30	+0%	100/15 Summer				108.668	-0.082	0.000	0.88			92.3	OK	
1.003	S6	15 Summer	30	+0%					108.379	-0.191	0.000	0.29			92.1	OK	
4.000	ATT1	30 Winter	30	+0%	10/15 Summer				107.166	0.186	0.000	0.22		27	13.5	SURCHARGED	
1.004	S7	30 Summer	30	+0%	1/15 Summer				107.172	0.317	0.000	0.43			13.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Hot Start Level (mm) 0 Foul Sewage per hectare (l/s) 0.000 MADD Factor * 10m³/ha Storage 2.000 Flow per Person per Day (l/per/day) 0.000
Hot Start (mins) 0 Manhole Headloss Coeff (Global) 0.500 Additional Flow - % of Total Flow 0.000 Inlet Coeffiecient 0.800

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 19.800 Ratio R 0.400 Cv (Summer) 1.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	15 Summer	100	+0%	30/15 Summer				109.340	0.325	0.000	1.02			49.8	SURCHARGED	
2.000	S2	15 Summer	100	+0%	100/15 Summer				110.581	0.191	0.000	1.25			23.6	SURCHARGED	
2.001	S3	15 Summer	100	+0%					109.972	-0.078	0.000	0.45			31.1	OK	
1.001	Junction	15 Summer	100	+0%					108.885	0.000	0.000	1.37			80.1	SURCHARGED*	
3.000	S5	15 Summer	100	+0%					110.725	-0.085	0.000	0.39			24.9	OK	
1.002	S4	15 Summer	100	+0%	100/15 Summer				108.784	0.034	0.000	1.10			116.2	SURCHARGED	
1.003	S6	15 Summer	100	+0%					108.395	-0.175	0.000	0.36			115.1	OK	
4.000	ATT1	60 Summer	100	+0%	10/15 Summer				107.431	0.451	0.000	0.22		48	13.6	SURCHARGED	
1.004	S7	60 Summer	100	+0%	1/15 Summer				107.437	0.582	0.000	0.43			13.5	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Hot Start Level (mm) 0 Foul Sewage per hectare (l/s) 0.000 MADD Factor * 10m³/ha Storage 2.000 Flow per Person per Day (l/per/day) 0.000
Hot Start (mins) 0 Manhole Headloss Coeff (Global) 0.500 Additional Flow - % of Total Flow 0.000 Inlet Coeffiecient 0.800

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 19.800 Ratio R 0.400 Cv (Summer) 1.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 100
Climate Change (%) 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	15 Summer	100	+20%	100/15 Summer				109.662	0.647	0.000	1.22			59.2	SURCHARGED	
2.000	S2	15 Summer	100	+20%	100/15 Summer				110.797	0.407	0.000	1.47			28.0	SURCHARGED	
2.001	S3	15 Summer	100	+20%					109.979	-0.071	0.000	0.53			37.0	OK	
1.001	Junction	15 Summer	100	+20%					108.885	0.000	0.000	1.64			95.9	SURCHARGED*	
3.000	S5	15 Summer	100	+20%					110.733	-0.077	0.000	0.47			29.9	OK	
1.002	S4	15 Summer	100	+20%	100/15 Summer				108.874	0.124	0.000	1.30			137.4	SURCHARGED	
1.003	S6	15 Summer	100	+20%					108.408	-0.162	0.000	0.43			137.2	OK	
4.000	ATT1	60 Winter	100	+20%	100/15 Summer				107.655	0.675	0.000	0.22		56	13.3	SURCHARGED	
1.004	S7	60 Winter	100	+20%	100/15 Summer				107.659	0.804	0.000	0.43			13.5	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

Areal Reduction Factor 1.000 Hot Start Level (mm) 0 Foul Sewage per hectare (l/s) 0.000 MADD Factor * 10m³/ha Storage 2.000 Flow per Person per Day (l/per/day) 0.000
Hot Start (mins) 0 Manhole Headloss Coeff (Global) 0.500 Additional Flow - % of Total Flow 0.000 Inlet Coeffiecient 0.800

Number of Input Hydrographs 0 Number of Online Controls 1 Number of Offline Controls 0 Number of Storage Structures 1 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 19.800 Ratio R 0.400 Cv (Summer) 1.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	40

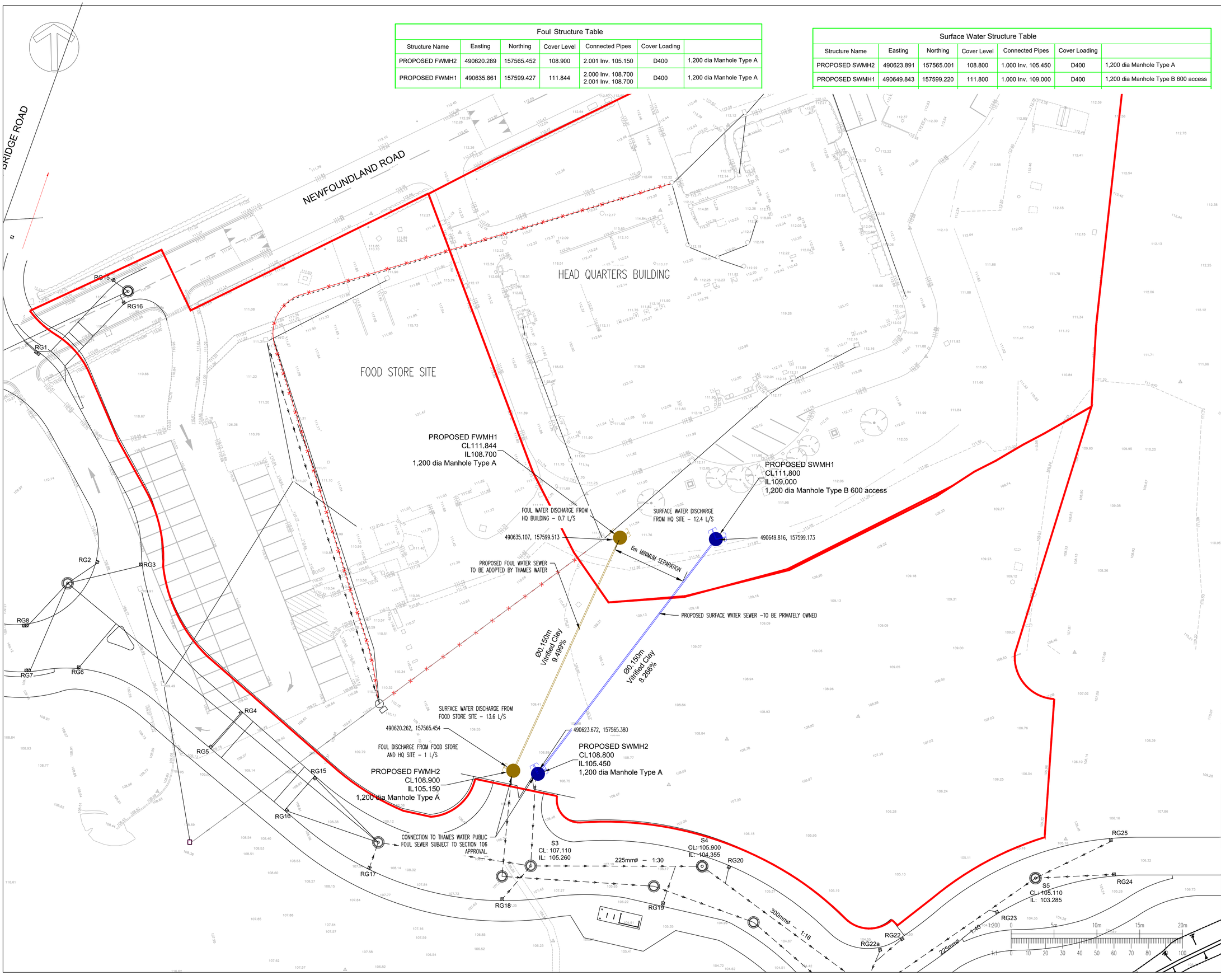
WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	15 Summer	100	+40%	100/15 Summer				109.982	0.967	0.000	1.41			68.9	FLOOD RISK	
2.000	S2	15 Summer	100	+40%	100/15 Summer				111.079	0.689	0.000	1.68			31.8	FLOOD RISK	
2.001	S3	15 Summer	100	+40%	100/15 Summer				110.125	0.075	0.000	0.58			40.5	SURCHARGED	
1.001	Junction	15 Summer	100	+40%					108.885	0.000	0.000	1.88			109.6	SURCHARGED*	
3.000	S5	15 Summer	100	+40%					110.740	-0.070	0.000	0.55			34.9	OK	
1.002	S4	15 Summer	100	+40%	100/15 Summer				108.968	0.218	0.000	1.48			156.6	SURCHARGED	
1.003	S6	15 Summer	100	+40%					108.419	-0.151	0.000	0.49			156.2	OK	
4.000	ATT1	60 Winter	100	+40%	100/15 Summer				107.877	0.897	0.000	0.22			13.4	SURCHARGED	
1.004	S7	60 Winter	100	+40%	100/15 Summer				107.879	1.024	0.000	0.44			13.9	SURCHARGED	

APPENDIX 6.7 WATERMAN SCHEME

Foul Structure Table						
Structure Name	Easting	Northing	Cover Level	Connected Pipes	Cover Loading	
PROPOSED FWMH2	490620.289	157565.452	108.900	2.001 Inv. 105.150	D400	1,200 dia Manhole Type A
PROPOSED FWMH1	490635.861	157599.427	111.844	2.000 Inv. 108.700 2.001 Inv. 108.700	D400	1,200 dia Manhole Type A

Surface Water Structure Table						
Structure Name	Easting	Northing	Cover Level	Connected Pipes	Cover Loading	
PROPOSED SWMH2	490623.891	157565.001	108.800	1.000 Inv. 105.450	D400	1,200 dia Manhole Type A
PROPOSED SWMH1	490649.843	157599.220	111.800	1.000 Inv. 109.000	D400	1,200 dia Manhole Type B 600 access



GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.
6. SEWERS TO BE CONSTRUCTED IN ACCORDANCE WITH THAMES WATER REQUIREMENTS
7. FOR DRAINAGE SPECIFICATION REFER TO DOCUMENT: DC2-WTM-CD-218-XX-SP-03-0101

KEY:

- SITE BOUNDARY
- PROPOSED FOUL WATER SEWER AND MANHOLE
- PROPOSED SURFACE WATER SEWER AND MANHOLE
- FOUL SEWER TO BE ABANDONED
- EXISTING FOUL SEWER
- EXISTING ABANDONED FOUL SEWER
- SURFACE WATER STUB CONNECTION
- FOUL STUB CONNECTION

Rev	Date	Description	By
C01	28.02.20	MANHOLE SCHEDULE ADDED. CONSTRUCTION ISSUE.	KH
R03	24.02.20	6m FOUL AND SURFACE SEPARATION ADDED. DRAINAGE SPECIFICATION REFERENCE ADDED.	KH
R02	14.02.20	FOUL DISCHARGE RATE ADDED. HQ RED LINE AMENDED. SW AND FW STUBS ADDED.	KH
R01	07.02.20	SURFACE WATER NETWORK ADDED. UPDATES ACCORDING TO COMMENTS FROM SKANSKA	KH
P01	23.12.19	PRELIMINARY ISSUE	KH

Amendments

Project
MINDENHURST, SURREY

Title
RLC HQ AND FOOD STORE
FOUL AND SURFACE WATER
DRAINAGE LAYOUT

Client
SKANSKA

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Drawing Status
CONSTRUCTION

Designed by	KH	Checked by	DP	Project No	WIE14198
Drawn by	KH	Date	DECEMBER 2019	Computer File No	
Scales @ A1 work to figured dimensions only		1:200		DC2-WTM-CD-218-XX-DR-03-0500 RLC HQ and Foodstore Drainage Layout.dwg	

DC2-WTM -CD-218 -XX-DR- 03-0500 C01

File Path: N:\Central\Projects\WIE14198 - Princess Royal Barracks\100\7_CAD\02_Drawings\

A1-Wat-S, Site Wide Topo, Spine and Loop Road Drainage, Spine Road General Arrangement