

MILTON MOUNT HALL

OLD ROAD EAST

GRAVESEND

KENT

DA12 1NQ

**DRAINAGE STRATEGY REPORT INCLUDING MANAGEMENT AND
MAINTENANCE REQUIREMENTS**

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Document Control

Revision	Purpose	Date	By	Approved
-	Initial issue	25/11/2021	MJ	JRH

Prepared By: MJ

Approved By: JRH

Project No.

21-080

Revision

-

Date

25/11/2021

1 INTRODUCTION

- 1.1.1 Hodel Ltd. has been appointed by Wakes Construction Ltd. to produce a strategy for below ground foul and surface water drainage for the proposed development at Milton Mount Hall, Gravesend.
- 1.1.2 This report outlines the proposed drainage strategy and has been written in accordance with the requirements of the National Planning Policy Framework.

2 EXISTING SITE

- 2.1.1 The 1896m² site includes two buildings previously used as a Scout hall and Nursery. It 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 is approximately 400m², 21% of the site.
- 2.1.3 The British National Grid reference is E:564944, N:172977. It is bounded by Old Road East to the north and residential properties in all other directions.
- 2.1.4 The general topography of the site is a fall from the north to the south with an average gradient of approximately 1:13. The northern side of the site retains the public highway.

2.2 Geology

- 2.2.1 A site investigation (SI) by Ground and Environmental Services Ltd, 12722, found the site to be underlain by Thanet Formation Sands with varying quantities of sands, silts, clays and gravels. Lewes Chalk was encountered in borehole 1 at a depth of 15.1m bgl.

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 majority of the site is at very low risk of flooding, sections of the south-eastern corner are at Low risk.
- 2.3.3 DEFRA's Groundwater Source Protection Zone map indicates that the site is within a Zone 1 groundwater source protection zone.
- 2.3.4 DEFRA's Groundwater Vulnerability Zone map indicates that the site is in a High vulnerability zone with soluble rock risk.

2.4 Existing Surface Water Strategy

- 2.4.1 Surface water generated onsite currently partially discharges to a soakaway and partially discharges to the foul sewer to the west of the buildings.

2.5 Existing Foul Water Strategy

- 2.5.1 The foul water discharges to the foul sewer to the west of the buildings.

3 PROPOSED SITE

- 3.1.1 The proposal is to construct a block of 9 flats, a terrace of 5 houses, and associated parking area.
- 3.1.2 The proposed impermeable area is approximately 1155m², 61% of the site, an increase of 755m².

3.2 Proposed Surface Water Strategy

- 3.2.1 As per CIRIA C753, the options for controlling water at source have been assessed as per the SuDS hierarchy. As part of the SI, falling head infiltration testing was undertaken and gave results of 6.97x10⁻⁵m/s, therefore soakaways are proposed to discharge to surface water generated on the roof and hardstanding areas.
- 3.2.2 Surface water is to drain below ground via traditional methods and into two soakaways. The proposed soakaways are of geo-cellular construction with a void ratio of 95% and a combined volume of 85.2m³ to give a storage capacity of approximately 80.9m³. As according to calculations through Innovyze:MicroDrainage, during the critical 1 in 100 year event with a 40% allowance for climate change, the surface water shall be entirely held within the network.
- 3.2.3 BRE365 testing is to be undertaken at the locations of the soakaways to confirm the preliminary falling head test infiltration rate and soakaway sizing.
- 3.2.4 Catchpits and gullies have been specified to mitigate the risk of pollutants entering the network, these are to be maintained as per the maintenance schedule.

Calculations and results derived from MicroDrainage, can be found in Appendix 6.3

3.3 Proposed Foul Water Strategy

- 3.3.1 It is proposed to continue discharging foul water to the foul sewer.

4 MANAGEMENT & MAINTENANCE REQUIREMENTS

- 4.1.1 The pipework for all drainage systems has been designed to be self-cleansing and as such should require no regular maintenance. If a blockage occurs, the system has been detailed so that easy rodding or jetting can take place.
- 4.1.2 Drainage that requires regular maintenance or after any largescale rainfall event is detailed in Table 1.

Table 1 - Drainage Maintenance

Drainage Feature	Inspection Frequency / Requirement	Maintenance Requirement	Responsibility
Gullies	Every 6 months, for silt and debris.	Silt and debris to be cleared from gully pots.	Homeowner/ Management Company
Gutters	Every 12 months, for silt and debris.	Silt and debris to be cleared from gutters.	Homeowner/ 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.	Homeowner/ Management Company
Catchpits & Sumps	Every 6 months, for silt, debris or other obstructions.	Silt and debris or obstructions to be cleared from catchpit chambers.	Homeowner/ Management Company
Pipework	If a problem occurs, by CCTV surveys	As recommended by CCTV survey company.	Homeowner/ Management Company

5 CONCLUSION

- 5.1.1 Surface water generated onsite is to drain via gravity to two soakaways where it shall infiltrate to ground onsite. The network has been sized to accommodate the critical 1 in 100 year event with a 40% allowance for climate change.
- 5.1.2 There shall be no increased risk of flooding on or off site.
- 5.1.3 The foul water shall continue to discharge to the foul sewer.
- 5.1.4 Ongoing maintenance will be required for the surface water drainage, as detailed in the above table.

6 APPENDICES

- 6.1 Engineering Layout
- 6.2 Drained Areas Analysis Sketch
- 6.3 MicroDrainage Calculations and Results
- 6.4 Flood Risk from Rivers and Sea
- 6.5 Flood Risk from Surface Water
- 6.6 Groundwater Source Protection
- 6.7 Groundwater Vulnerability
- 6.8 Flood Map for Planning

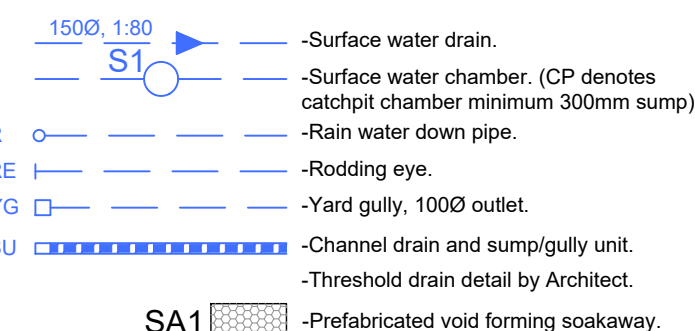
Gravesham Borough Council

APPENDIX 6.1 ENGINEERING LAYOUT

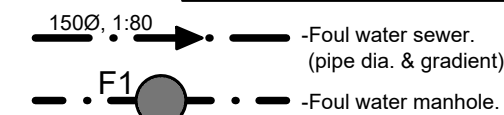
Gravesend Borough Council

Key:

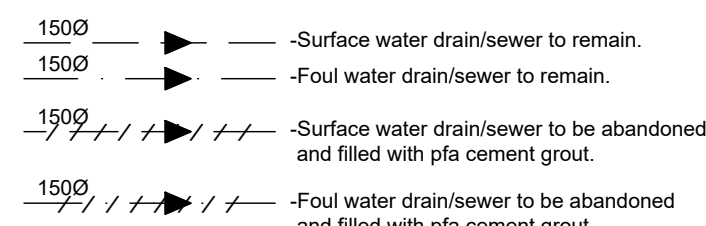
Private Drainage



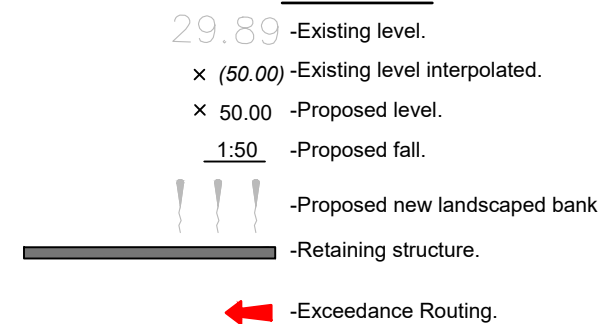
Adoptable Drainage



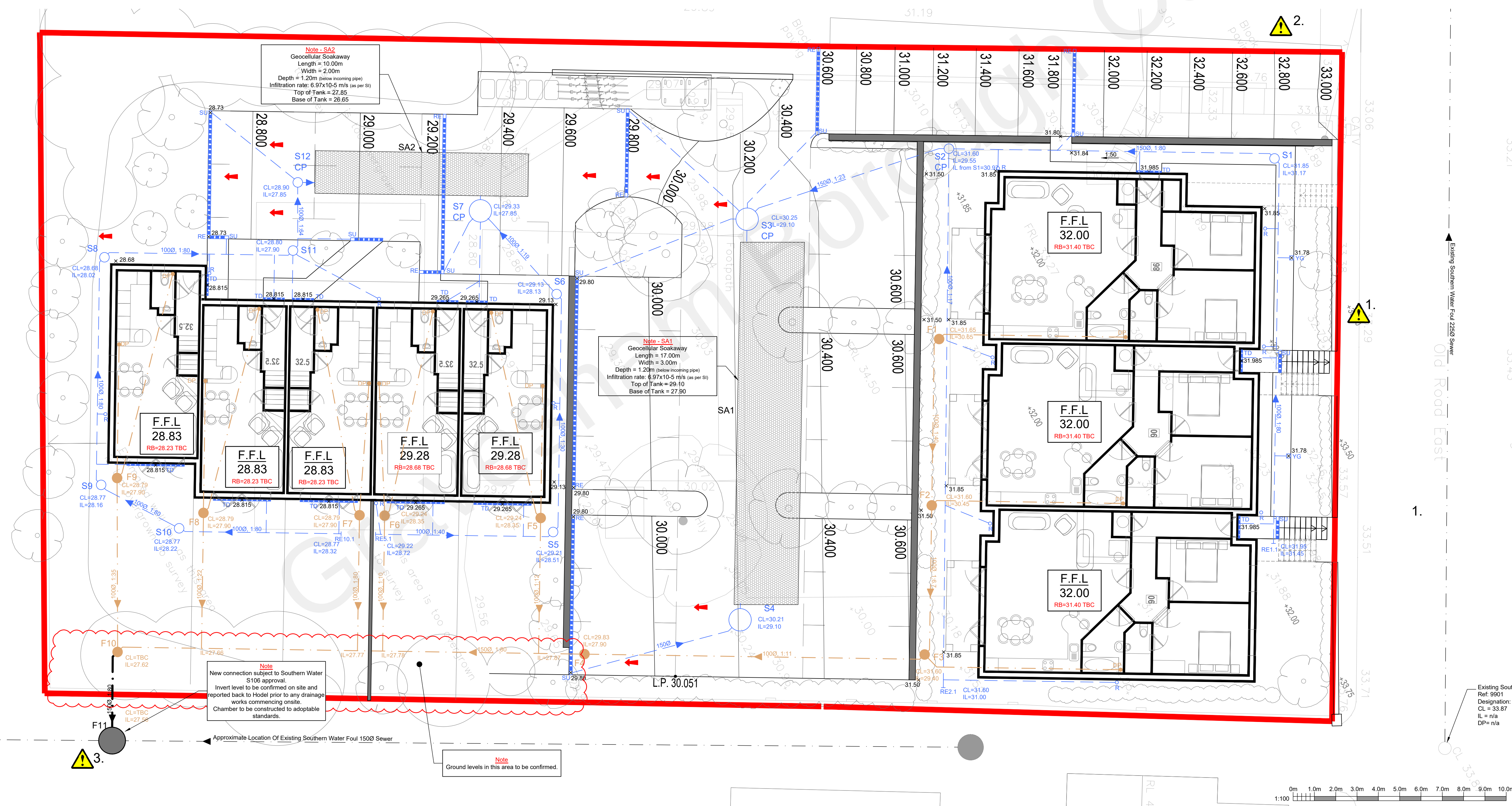
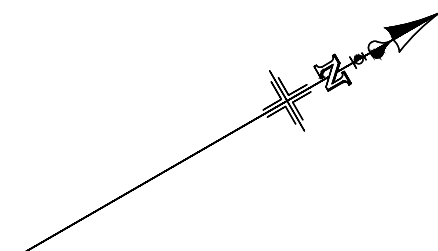
Existing Drainage/Sewers



General



Note
Foul and surface water drain points as per Architects information.



NOTES

- Do not scale this drawing.
- 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

- Existing Highway Wall.
- Existing live access way.
- Invert level of existing Foul sewer to be confirmed to Hodel prior to any drainage works commencing onsite.

Contractor's General Risk Items

(List is not exhaustive but includes commonly raised issues)

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

Rev	Date	By	Chkd.	Issued for approval.	Revision notes
-	25/11/21	JH			

Job Title
Milton Mount Hall
Old Road East
Gravesend
DA12 1NQ

Drawing Title

Engineering Layout

Client
Wakes LTD

HODEL
CONSULTING
ENGINEERS
mail@hodel.uk

Scale at A1:
1:100

Status:
FOR APPROVAL

Drawn:
Date: Nov '21

Checked:
Date: Nov '21

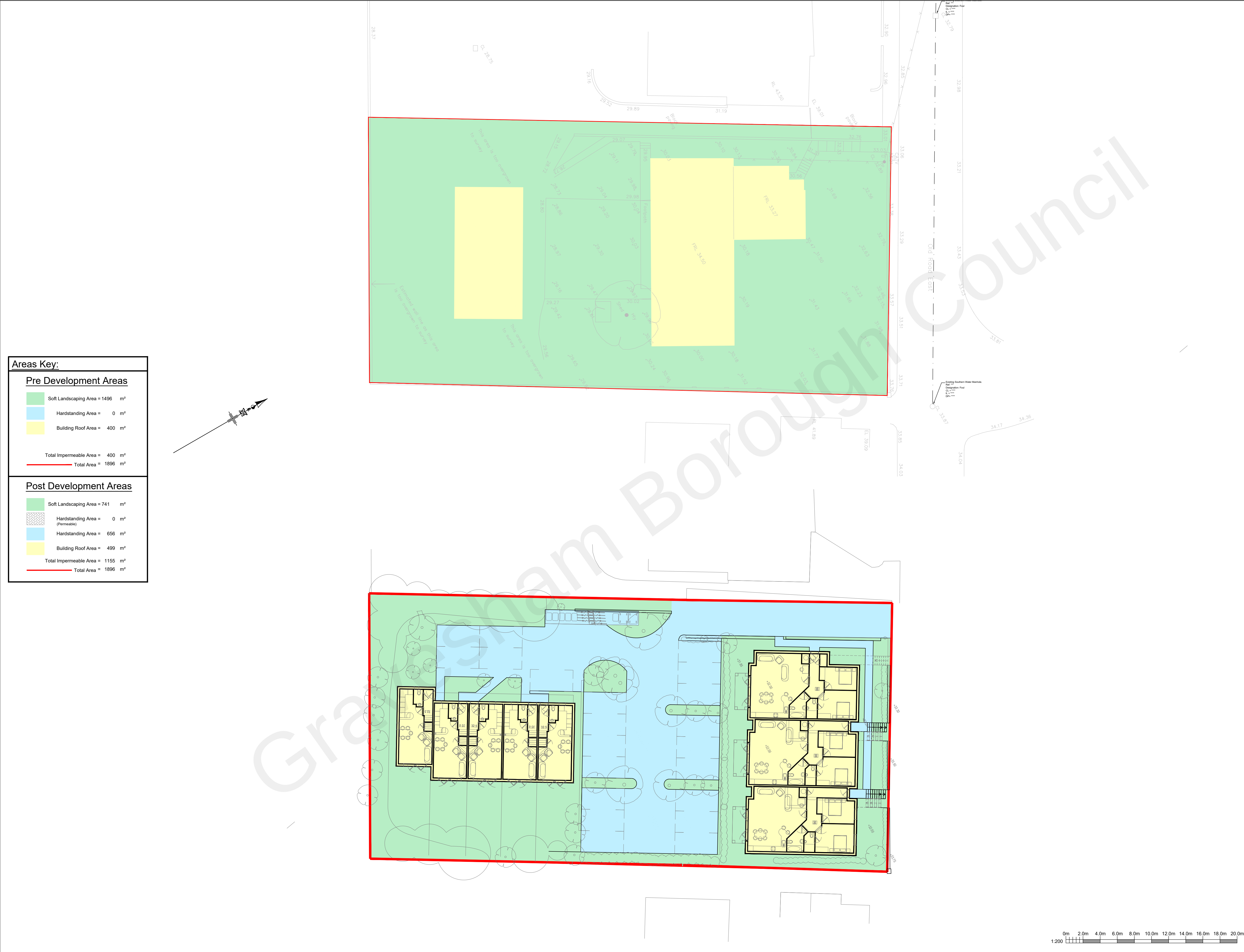
Approved:
Date: XXX

Drawing No.:
21-080_C01

Revision:
-

APPENDIX 6.2 DRAINED AREAS ANALYSIS SKETCH

Gravesham Borough Council



Areas Key:	
Pre Development Areas	
	Soft Landscaping Area = 1496 m²
	Hardstanding Area = 0 m²
	Building Roof Area = 400 m²
Total Impermeable Area = 400 m²	
Total Area = 1896 m²	
Post Development Areas	
	Soft Landscaping Area = 741 m²
	Hardstanding Area = 0 m² (Permeable)
	Hardstanding Area = 656 m²
	Building Roof Area = 499 m²
Total Impermeable Area = 1155 m²	
Total Area = 1896 m²	

NOTES

- Do not scale this drawing.
- 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
-	24/11/21			Preliminary issue

Job Title

Milton Mount Hall

Old Road East

Gravesend

DA12 1NQ

Drawing Title

Drained Areas Analysis Sketch

Client

Wakes LTD

01732 617555

HODEL

CONSULTING ENGINEERS

mail@hodel.uk

Scale at A1:	Status:	
1:200	PRELIMINARY	
Drawn:	Checked:	Approved:
		-
Date:	Date:	Date:
Nov '21	Nov '21	XXX

Drawing No.:	Revision:
21-080_SKC01	-

APPENDIX 6.3 MICRODRAINAGE CALCULATIONS AND RESULTS

Gravesham Borough Council

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	25.116	0.320	78.5	0.008	5.00	0.0	0.600	o	100	Pipe/Conduit
1.001	15.608	0.200	78.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit
2.000	17.411	0.500	34.8	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit
1.002	10.211	0.450	22.7	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit
1.003	8.872	0.000	0.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit
3.000	8.941	0.000	0.0	0.012	5.00	0.0	0.600	o	225	Pipe/Conduit
1.004	1.721	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit
4.000	13.946	0.180	77.5	0.003	5.00	0.0	0.600	o	100	Pipe/Conduit
4.001	11.159	0.140	79.7	0.004	0.00	0.0	0.600	o	100	Pipe/Conduit
4.002	5.295	0.130	40.7	0.004	0.00	0.0	0.600	o	100	Pipe/Conduit
4.003	4.144	0.000	0.0	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit
5.000	10.449	0.140	74.6	0.002	5.00	0.0	0.600	o	100	Pipe/Conduit
5.001	8.851	0.130	68.1	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit
5.002	3.203	0.150	21.4	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit
5.003	4.614	0.000	0.0	0.005	0.00	0.0	0.600	o	150	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	31.250	0.008	0.0	0.87	6.8
1.001	30.930	0.020	0.0	1.14	20.1
2.000	31.230	0.009	0.0	1.31	10.3
1.002	29.550	0.040	0.0	2.12	37.5
1.003	29.100	0.070	0.0	0.00	0.0
3.000	29.100	0.012	0.0	0.00	0.0
1.004	29.100	0.083	0.0	0.00	0.0
4.000	28.270	0.003	0.0	0.88	6.9
4.001	28.090	0.007	0.0	0.86	6.8
4.002	27.950	0.011	0.0	1.21	9.5
4.003	27.850	0.017	0.0	0.00	0.0
5.000	28.270	0.002	0.0	0.89	7.0
5.001	28.130	0.004	0.0	0.93	7.3
5.002	28.000	0.008	0.0	2.19	38.7
5.003	27.850	0.014	0.0	0.00	0.0

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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
4.004	1.797	0.000	0.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
4.004	27.850	0.031	0.0	0.00	0.0

Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.008	0.008	0.008
	User	-	100	0.000	0.000	0.008
1.001	User	-	100	0.011	0.011	0.011
	User	-	100	0.000	0.000	0.011
	User	-	100	0.000	0.000	0.011
2.000	User	-	100	0.007	0.007	0.007
	User	-	100	0.003	0.003	0.009
1.002	User	-	100	0.006	0.006	0.006
	User	-	100	0.005	0.005	0.011
1.003	User	-	100	0.005	0.005	0.005
	User	-	100	0.025	0.025	0.030
3.000	User	-	100	0.012	0.012	0.012
1.004	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.003	0.003	0.003
4.001	User	-	100	0.004	0.004	0.004
4.002	User	-	100	0.004	0.004	0.004
4.003	User	-	100	0.006	0.006	0.006
5.000	User	-	100	0.002	0.002	0.002
5.001	User	-	100	0.002	0.002	0.002
5.002	User	-	100	0.004	0.004	0.004
5.003	User	-	100	0.005	0.005	0.005
4.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.114	0.114	0.114

Simulation Criteria for Existing

Volumetric Runoff Coeff 0.750 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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point Cv (Winter) 0.840
Return Period (years) 2 Summer Storms Yes Storm Duration (mins) 30
FEH Rainfall Version 2013 Winter Storms No
Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750

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Online Controls for Existing

Weir Manhole: SA1, DS/PN: 1.004, Volume (m³): 0.7

Discharge Coef 0.544 Width (m) 0.001 Invert Level (m) 30.199

Weir Manhole: SA2, DS/PN: 4.004, Volume (m³): 0.2

Discharge Coef 0.544 Width (m) 0.010 Invert Level (m) 29.149

Storage Structures for Existing

Cellular Storage Manhole: SA1, DS/PN: 1.004

Invert Level (m) 27.900 Infiltration Coefficient Side (m/hr) 0.25092 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	51.0	51.0	1.200	51.0	99.0	1.201	0.0	99.0

Cellular Storage Manhole: SA2, DS/PN: 4.004

Invert Level (m) 26.650 Infiltration Coefficient Side (m/hr) 0.25092 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	20.0	20.0	1.200	20.0	48.8	1.201	0.0	48.8

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2 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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840
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) 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

									Water Surcharged Flooded			Half Drain Pipe				
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Level Exceeded
1.000	RE1.1	15 Winter	2	+0%					31.281	-0.069	0.000	0.21			1.4	OK
1.001	S1	15 Winter	2	+0%					30.970	-0.110	0.000	0.16			2.9	OK
2.000	RE2.1	15 Winter	2	+0%					31.256	-0.074	0.000	0.15			1.5	OK
1.002	S2	15 Winter	2	+0%					29.593	-0.107	0.000	0.18			6.0	OK
1.003	S3	15 Winter	2	+0%	10/15 Summer				29.230	-0.095	0.000	0.62			10.3	OK
3.000	S4	15 Winter	2	+0%					29.153	-0.172	0.000	0.12			2.0	OK
1.004	SA1	480 Winter	2	+0%					28.199	-1.001	0.000	0.00		484	0.0	OK
4.000	RE5.1	15 Winter	2	+0%					28.290	-0.080	0.000	0.09			0.6	OK
4.001	S5	15 Winter	2	+0%					28.119	-0.071	0.000	0.18			1.1	OK
4.002	S6	15 Winter	2	+0%					27.981	-0.069	0.000	0.20			1.7	OK
4.003	S7	15 Winter	2	+0%					27.902	-0.098	0.000	0.26			2.5	OK
5.000	RE8.1	15 Winter	2	+0%					28.285	-0.085	0.000	0.05			0.3	OK
5.001	S8	15 Winter	2	+0%					28.151	-0.079	0.000	0.10			0.7	OK
5.002	S9	15 Winter	2	+0%					28.022	-0.128	0.000	0.05			1.2	OK
5.003	S10	15 Winter	2	+0%					27.897	-0.103	0.000	0.21			2.0	OK
4.004	SA2	360 Winter	2	+0%					26.911	-1.039	0.000	0.00		324	0.0	OK

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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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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) 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

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

US/MH					Water				Surcharged Flooded				Half Drain		Pipe		Level Exceeded
PN	Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	
1.000	RE1.1	15 Winter	10	+0%					31.293	-0.057	0.000	0.37			2.4	OK	
1.001	S1	15 Winter	10	+0%					30.989	-0.091	0.000	0.32			5.9	OK	
2.000	RE2.1	15 Winter	10	+0%					31.266	-0.064	0.000	0.28			2.7	OK	
1.002	S2	15 Winter	10	+0%					29.613	-0.087	0.000	0.36			12.2	OK	
1.003	S3	15 Winter	10	+0%	10/15 Summer				29.341	0.016	0.000	1.32			21.8	SURCHARGED	
3.000	S4	15 Winter	10	+0%					29.173	-0.152	0.000	0.22			3.7	OK	
1.004	SA1	360 Winter	10	+0%					28.369	-0.831	0.000	0.00			0.0	OK	
4.000	RE5.1	15 Winter	10	+0%					28.297	-0.073	0.000	0.16			1.0	OK	
4.001	S5	15 Winter	10	+0%					28.132	-0.058	0.000	0.36			2.3	OK	
4.002	S6	15 Winter	10	+0%					27.996	-0.054	0.000	0.42			3.5	OK	
4.003	S7	15 Winter	10	+0%					27.931	-0.069	0.000	0.56			5.4	OK	
5.000	RE8.1	15 Winter	10	+0%					28.290	-0.080	0.000	0.09			0.6	OK	
5.001	S8	15 Winter	10	+0%					28.160	-0.070	0.000	0.20			1.3	OK	
5.002	S9	15 Winter	10	+0%					28.033	-0.117	0.000	0.11			2.6	OK	
5.003	S10	15 Winter	10	+0%					27.922	-0.078	0.000	0.47			4.3	OK	
4.004	SA2	240 Winter	10	+0%					27.061	-0.889	0.000	0.00			0.0	OK	

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The Gatehouse Pattenden Lane TN12 9QS	21-080 Milton Mount Hall Old Road East, Gravesend DA12 1NQ	
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XP Solutions	Network 2020.1.3	

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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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) 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

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

US/MH					Water				Surcharged Flooded				Half Drain		Pipe		Level Exceeded
PN	Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	
1.000	RE1.1	15 Winter	30	+0%					31.301	-0.049	0.000	0.50			3.3	OK	
1.001	S1	15 Winter	30	+0%					30.999	-0.081	0.000	0.43			8.0	OK	
2.000	RE2.1	15 Winter	30	+0%					31.273	-0.057	0.000	0.37			3.7	OK	
1.002	S2	15 Winter	30	+0%					29.625	-0.075	0.000	0.49			16.5	OK	
1.003	S3	15 Winter	30	+0%	10/15 Summer				29.359	0.034	0.000	1.79			29.4	SURCHARGED	
3.000	S4	15 Winter	30	+0%					29.185	-0.140	0.000	0.30			4.9	OK	
1.004	SA1	360 Winter	30	+0%					28.521	-0.679	0.000	0.00			0.0	OK	
4.000	RE5.1	15 Winter	30	+0%					28.301	-0.069	0.000	0.21			1.4	OK	
4.001	S5	15 Winter	30	+0%					28.140	-0.050	0.000	0.48			3.1	OK	
4.002	S6	15 Winter	30	+0%					28.004	-0.046	0.000	0.57			4.8	OK	
4.003	S7	15 Winter	30	+0%					27.948	-0.052	0.000	0.76			7.3	OK	
5.000	RE8.1	15 Winter	30	+0%					28.293	-0.077	0.000	0.12			0.8	OK	
5.001	S8	15 Winter	30	+0%					28.165	-0.065	0.000	0.27			1.8	OK	
5.002	S9	15 Winter	30	+0%					28.038	-0.112	0.000	0.15			3.5	OK	
5.003	S10	15 Winter	30	+0%					27.937	-0.063	0.000	0.63			5.9	OK	
4.004	SA2	240 Winter	30	+0%					27.195	-0.755	0.000	0.00			0.0	OK	

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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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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) 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0

									Water	Surcharged	Flooded					Half Drain	Pipe		
PN	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Time	Flow		Level	
	Name	Storm	Period	Change		Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded	
1.000	RE1.1	15 Winter	100	+0%						31.310	-0.040	0.000	0.65			4.3		OK	
1.001	S1	15 Winter	100	+0%						31.011	-0.069	0.000	0.56			10.4		OK	
2.000	RE2.1	15 Winter	100	+0%						31.280	-0.050	0.000	0.49			4.8		OK	
1.002	S2	15 Winter	100	+0%						29.638	-0.062	0.000	0.64			21.5		OK	
1.003	S3	15 Winter	100	+0%	10/15 Summer					29.390	0.065	0.000	2.33			38.3	SURCHARGED		
3.000	S4	15 Winter	100	+0%						29.199	-0.126	0.000	0.39			6.4		OK	
1.004	SA1	480 Winter	100	+0%						28.753	-0.447	0.000	0.00		483	0.0		OK	
4.000	RE5.1	15 Winter	100	+0%						28.306	-0.064	0.000	0.28			1.8		OK	
4.001	S5	15 Winter	100	+0%						28.148	-0.042	0.000	0.63			4.0		OK	
4.002	S6	15 Winter	100	+0%						28.043	-0.007	0.000	0.73			6.2		OK	
4.003	S7	15 Winter	100	+0%						27.969	-0.031	0.000	0.97			9.4		OK	
5.000	RE8.1	15 Winter	100	+0%						28.297	-0.073	0.000	0.16			1.1		OK	
5.001	S8	15 Winter	100	+0%						28.171	-0.059	0.000	0.35			2.4		OK	
5.002	S9	15 Winter	100	+0%						28.044	-0.106	0.000	0.19			4.6		OK	
5.003	S10	15 Winter	100	+0%						27.954	-0.046	0.000	0.82			7.6		OK	
4.004	SA2	360 Winter	100	+0%						27.396	-0.554	0.000	0.00		324	0.0		OK	

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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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

					Water Surcharged Flooded				Half Drain Pipe								
US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
1.000	RE1.1	15 Winter	100	+20%					31.318	-0.032	0.000	0.78			5.2		OK
1.001	S1	15 Winter	100	+20%					31.021	-0.059	0.000	0.67			12.5		OK
2.000	RE2.1	15 Winter	100	+20%					31.285	-0.045	0.000	0.59			5.8		OK
1.002	S2	15 Winter	100	+20%					29.699	-0.001	0.000	0.77			25.7		OK
1.003	S3	15 Winter	100	+20%	100/15 Summer				29.423	0.098	0.000	2.79			45.9	SURCHARGED	
3.000	S4	15 Winter	100	+20%					29.210	-0.115	0.000	0.47			7.7		OK
1.004	SA1	480 Winter	100	+20%					28.924	-0.276	0.000	0.00		483	0.0		OK
4.000	RE5.1	15 Winter	100	+20%					28.310	-0.060	0.000	0.33			2.2		OK
4.001	S5	15 Winter	100	+20%	100/15 Summer				28.198	0.008	0.000	0.73			4.7	SURCHARGED	
4.002	S6	15 Winter	100	+20%	100/15 Summer				28.120	0.070	0.000	0.85			7.1	SURCHARGED	
4.003	S7	15 Winter	100	+20%	100/15 Summer				28.024	0.024	0.000	1.12			10.8	SURCHARGED	
5.000	RE8.1	15 Winter	100	+20%					28.300	-0.070	0.000	0.19			1.3		OK
5.001	S8	15 Winter	100	+20%					28.175	-0.055	0.000	0.42			2.8		OK
5.002	S9	15 Winter	100	+20%					28.048	-0.102	0.000	0.23			5.5		OK
5.003	S10	15 Winter	100	+20%					27.969	-0.031	0.000	0.99			9.2		OK
4.004	SA2	360 Winter	100	+20%					27.545	-0.405	0.000	0.00		324	0.0		OK

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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 2 Number of Offline Controls 0 Number of Storage Structures 2 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 564944 172977 TQ 64944 72977 Cv (Summer) 0.750
FEH Rainfall Version 2013 Data Type Point Cv (Winter) 0.840

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

									Water	Surcharged	Flooded	Half Drain			Pipe		
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
1.000	RE1.1	15 Winter	100	+40%					31.326	-0.024	0.000	0.91			6.0		OK
1.001	S1	15 Winter	100	+40%					31.032	-0.048	0.000	0.78			14.6		OK
2.000	RE2.1	15 Winter	100	+40%					31.291	-0.039	0.000	0.68			6.8		OK
1.002	S2	15 Winter	100	+40%	100/15 Summer				29.837	0.137	0.000	0.90			30.0	SURCHARGED	
1.003	S3	15 Winter	100	+40%	100/15 Summer				29.461	0.136	0.000	3.25			53.5	SURCHARGED	
3.000	S4	15 Winter	100	+40%					29.221	-0.104	0.000	0.55			9.0		OK
1.004	SA1	480 Winter	100	+40%					29.095	-0.105	0.000	0.00		483	0.0		OK
4.000	RE5.1	15 Winter	100	+40%					28.314	-0.056	0.000	0.39			2.5		OK
4.001	S5	15 Winter	100	+40%	100/15 Summer				28.264	0.074	0.000	0.85			5.4	SURCHARGED	
4.002	S6	15 Winter	100	+40%	100/15 Summer				28.164	0.114	0.000	0.98			8.2	SURCHARGED	
4.003	S7	15 Winter	100	+40%	100/15 Summer				28.035	0.035	0.000	1.28			12.3	SURCHARGED	
5.000	RE8.1	15 Winter	100	+40%					28.302	-0.068	0.000	0.23			1.5		OK
5.001	S8	15 Winter	100	+40%					28.180	-0.050	0.000	0.49			3.3		OK
5.002	S9	15 Winter	100	+40%					28.053	-0.097	0.000	0.27			6.4		OK
5.003	S10	15 Summer	100	+40%	100/15 Summer				28.025	0.025	0.000	1.15			10.7	SURCHARGED	
4.004	SA2	360 Winter	100	+40%					27.694	-0.256	0.000	0.00		324	0.0		OK

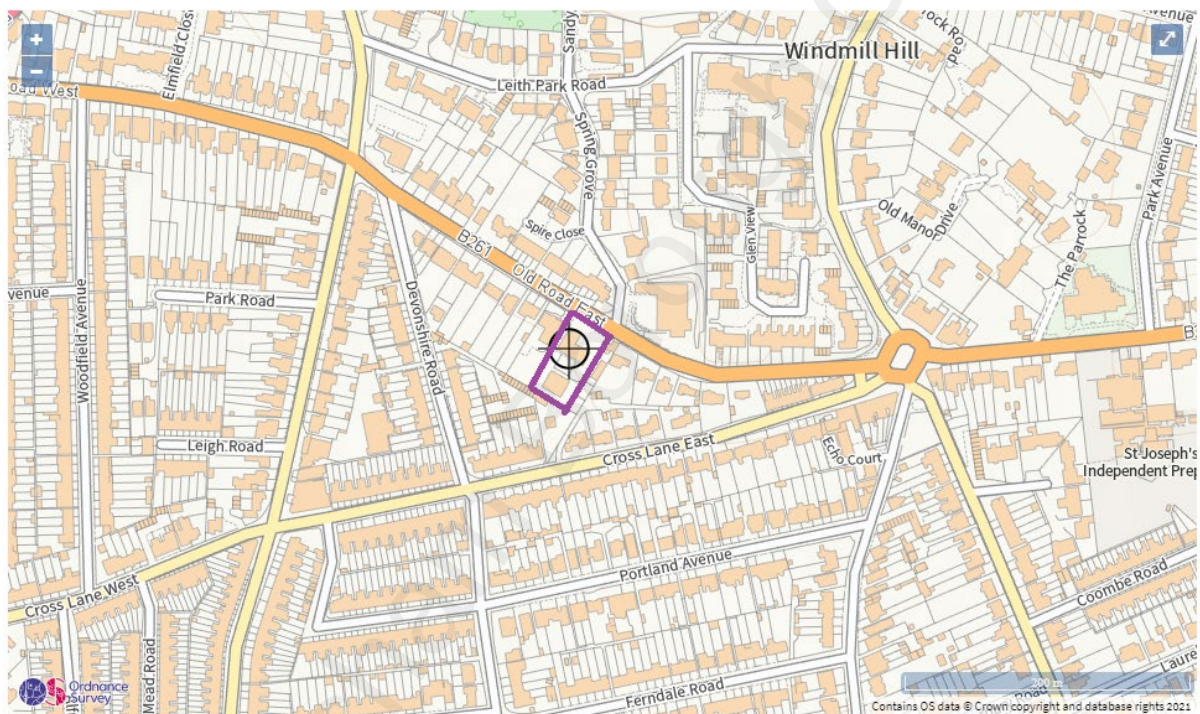
APPENDIX 6.4 FLOOD RISK FROM RIVERS OR SEA

Flood risk

Extent of flooding

Location

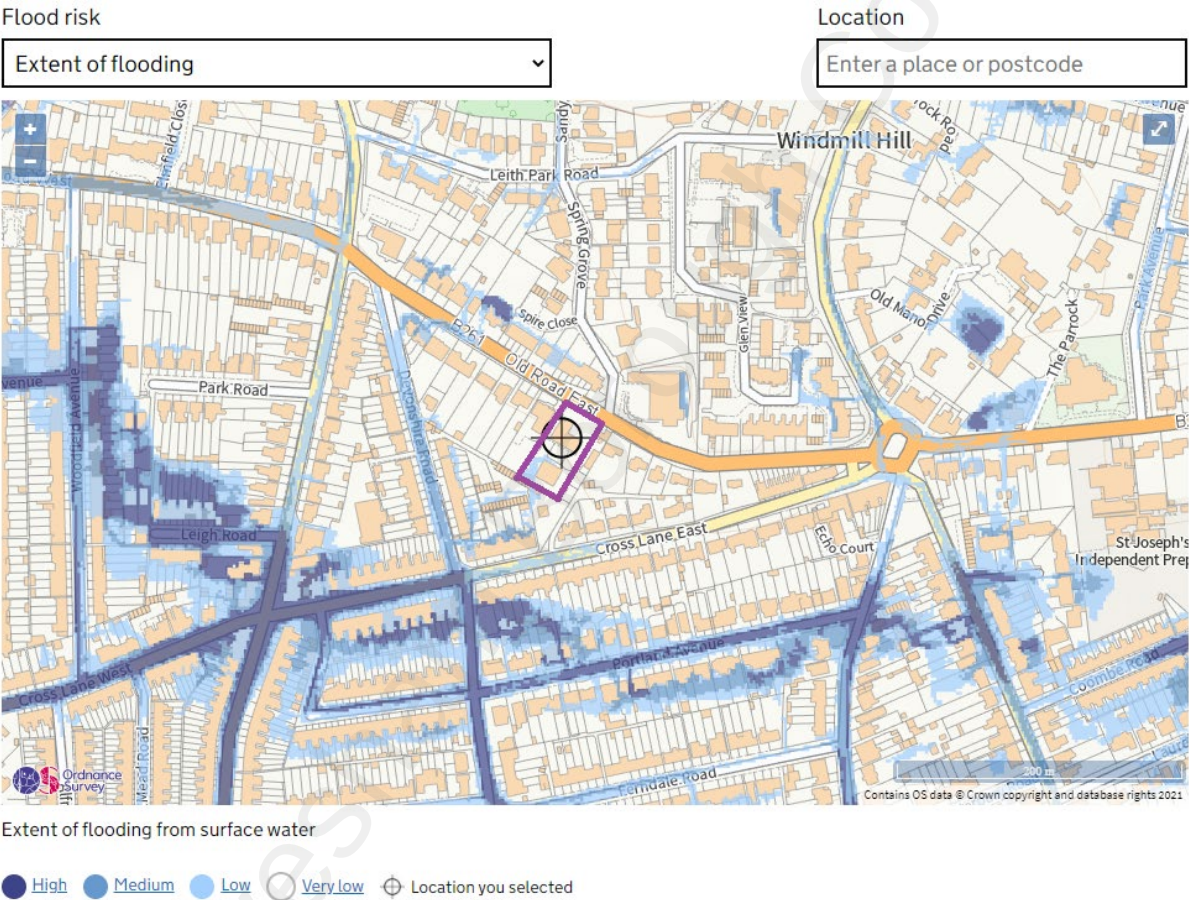
Enter a place or postcode



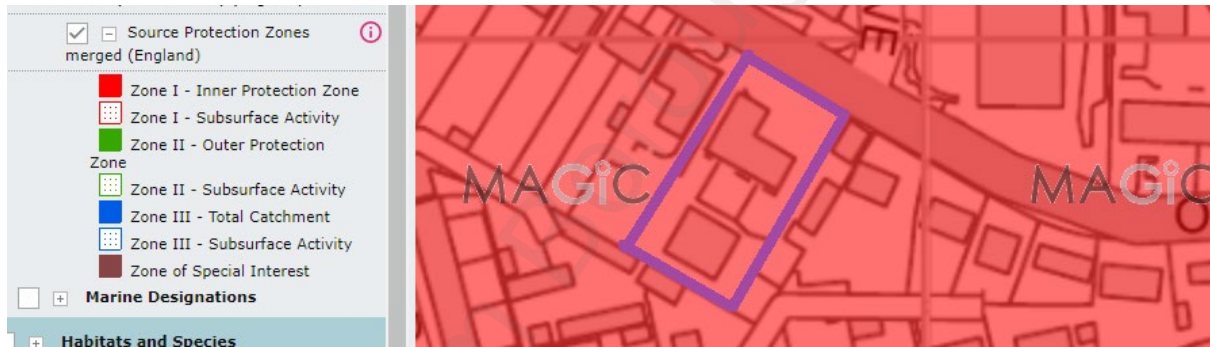
Extent of flooding from rivers or the sea

● High ● Medium ● Low ● Very low ⊕ Location you selected

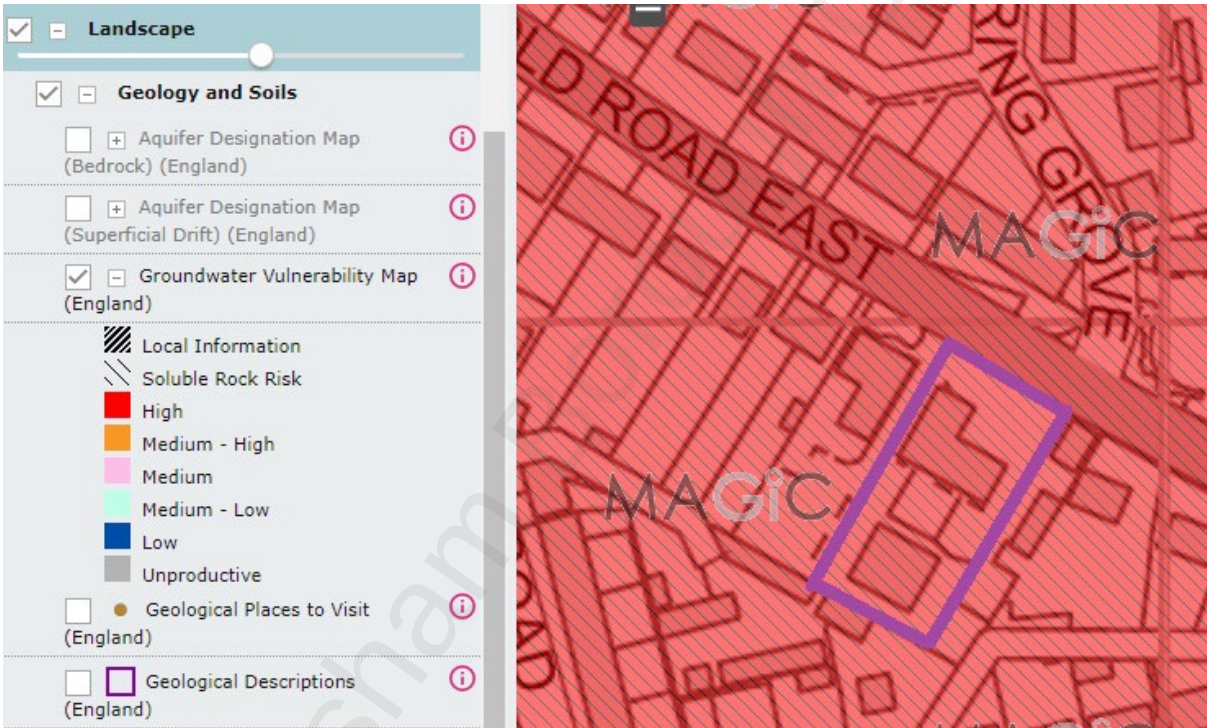
APPENDIX 6.5 FLOOD RISK FROM SURFACE WATER



APPENDIX 6.6 GROUNDWATER SOURCE PROTECTION



APPENDIX 6.7 GROUNDWATER VULNERABILITY



APPENDIX 6.8 FLOOD MAP FOR PLANNING

Gravesham Borough Council

Flood map for planning

Your reference
21-080

Location (easting/northing)
564965/172983

Created
27 Sep 2021 10:56

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

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

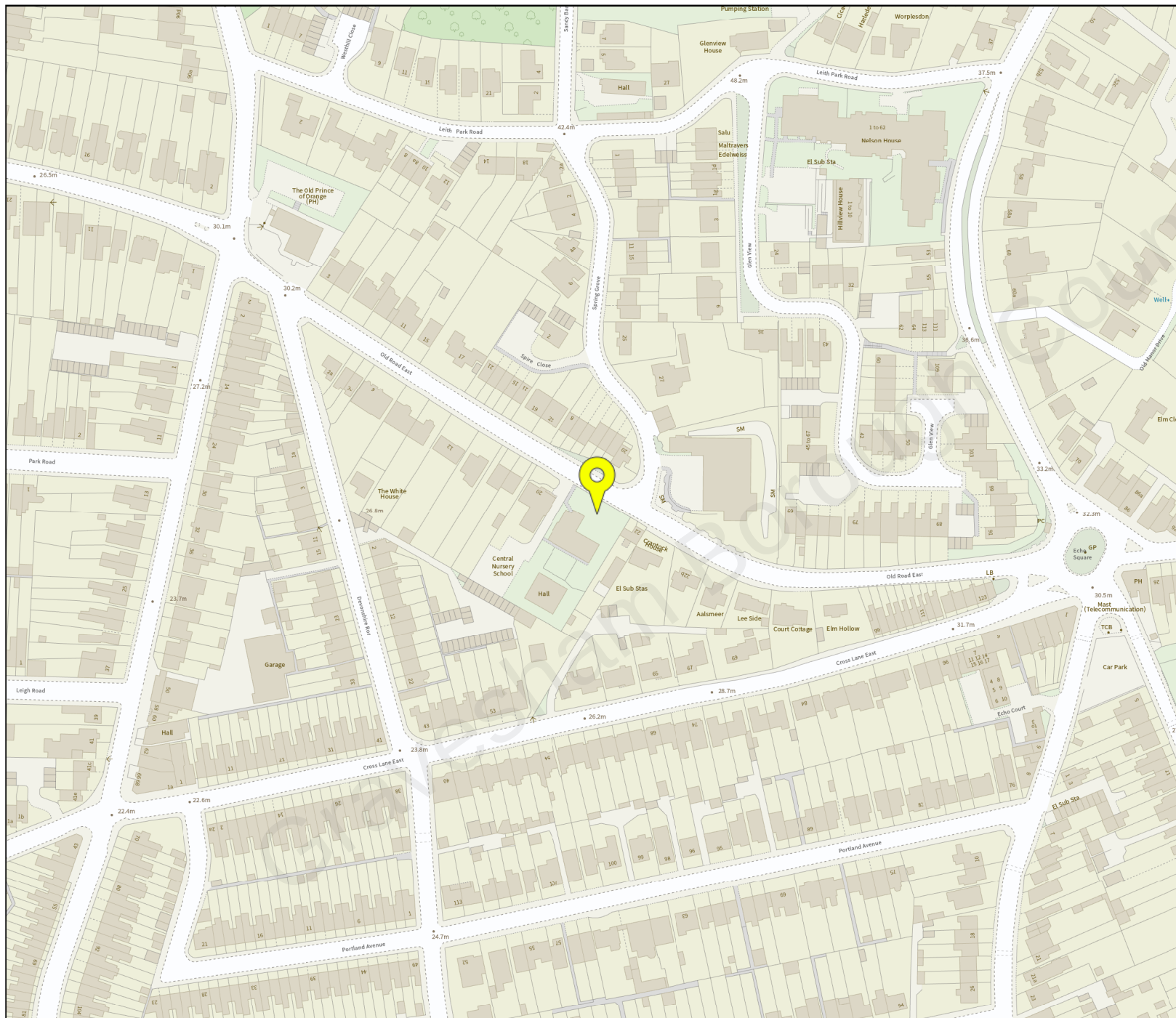
Notes

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

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

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
21-080

Location (easting/northing)
564965/172983

Scale
1:2500

Created
27 Sep 2021 10:56

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

0 20 40 60m