

SuDSmart



Report reference:	Report status:	Date issued:
73188R1	FINAL	05/06/2020
73188R2	FINAL	15/06/2020
73188R3	FINAL	16/09/2020
Report prepared for: Paragon BC, on behalf of Legal & General c/o Furness Partnership, 20 Britton Street, London, EC1M 5TX		

Site address: Apex Plaza, Blagrove Street, Reading, RG1 1PZ

Overview: GeoSmart were commissioned to undertake a review of surface water flood risks at the Site, to discuss the limitations of the Environment Agency's Risk of Flooding from Surface Water maps and to produce a detailed model of the existing drainage network at the Site. Industry standard MicroDrainage software was used to model the drainage network, using site-specific CCTV drainage and ground level surveys. The detailed modelling, which is more accurate than the EA's mapping, confirms there would be no flooding within the area proposed for development in all events up to the 1 in 1000 year storm event.

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Report check and review

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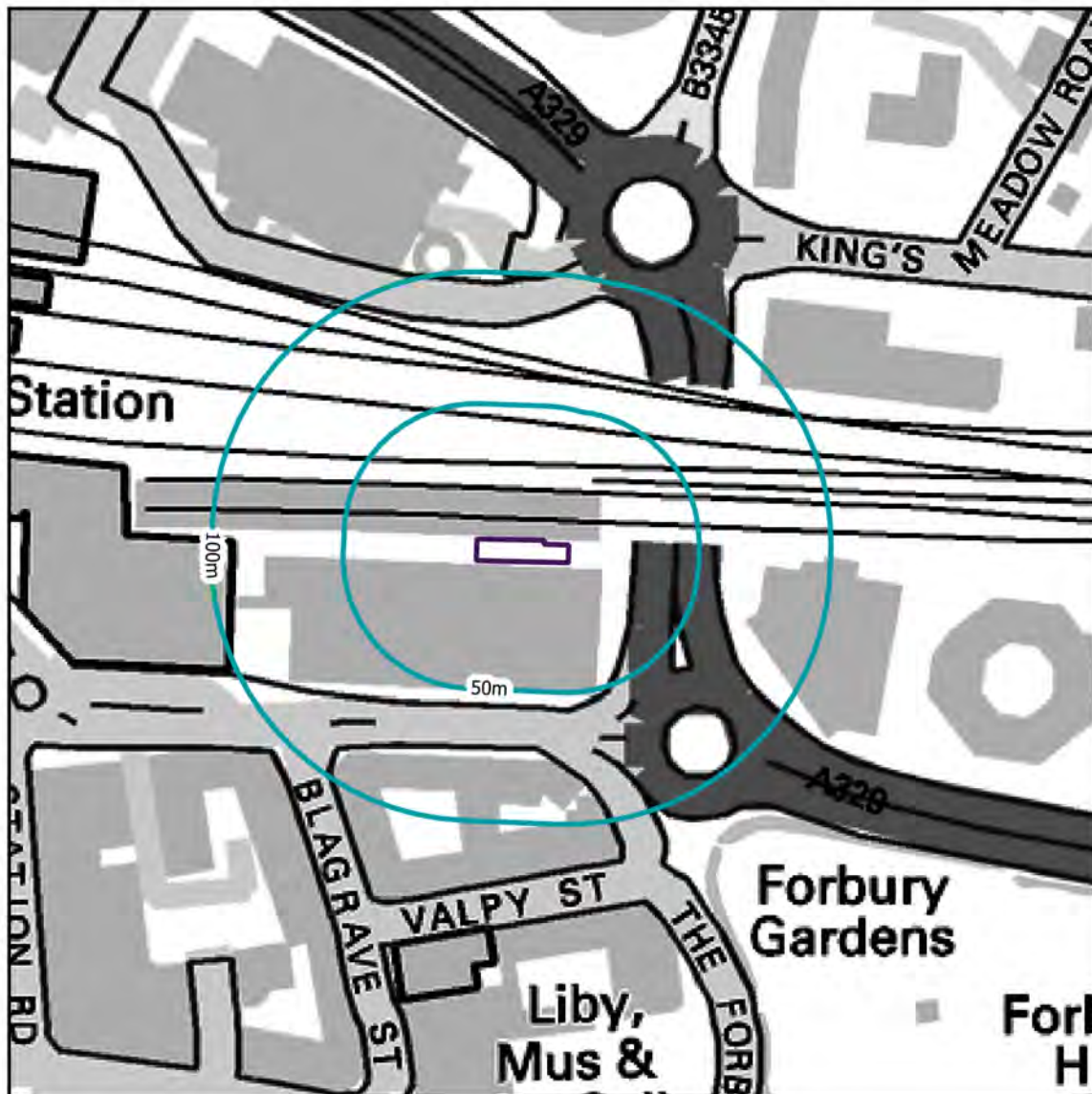
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1. Introduction

GeoSmart were commissioned by Paragon Building Consultancy (BC), on behalf of Legal & General, in May 2020 to investigate the level of surface water (pluvial) flood risk to the rear of the Apex Plaza, Blagrove Street, Reading RG1 1PZ (Figure 1), in the area proposed for development.

Figure 1: Site Location Plan



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The proposed development is for the building of a new changing and shower block, including bike storage, as ancillary space. Site plans are included within Appendix A.

A Flood Risk Assessment (FRA) was produced by gta Civils and Transport (ref: 10610) in September, 2020, to accompany a planning application for the proposed development.

A topographic survey was produced to confirm ground levels and below ground levels and pipe sizes of drainage systems by Plowman Craven in October, 2019 (Appendix B). A CCTV

drainage survey was undertaken by Clear View in December 2019 (Appendix C), below ground drainage systems were generally in good condition, with some infiltration into the piped network noted. Paragon BC also undertook a Site walkover on the 18th of May 2020 and all ground level gully's were in good condition and clear of debris, Site photographs are included in Appendix E.

A drone survey was undertaken in May 2020 (Appendix D) to confirm ground elevations at the Site, to provide additional confirmation of ground levels and drainage systems in the catchment area draining the Site car park.

Project Objective

The objective of the work is to undertake modelling of the Site's existing drainage network, using the surveyed data provided, to confirm whether the extent and depths of flooding shown by the EA's national scale, Risk of Flooding from Surface Water (RoFSW) mapping, are realistic.

An assessment will be made of the hydrological and hydrogeological context of the site and the surface water runoff which could occur on the Site.

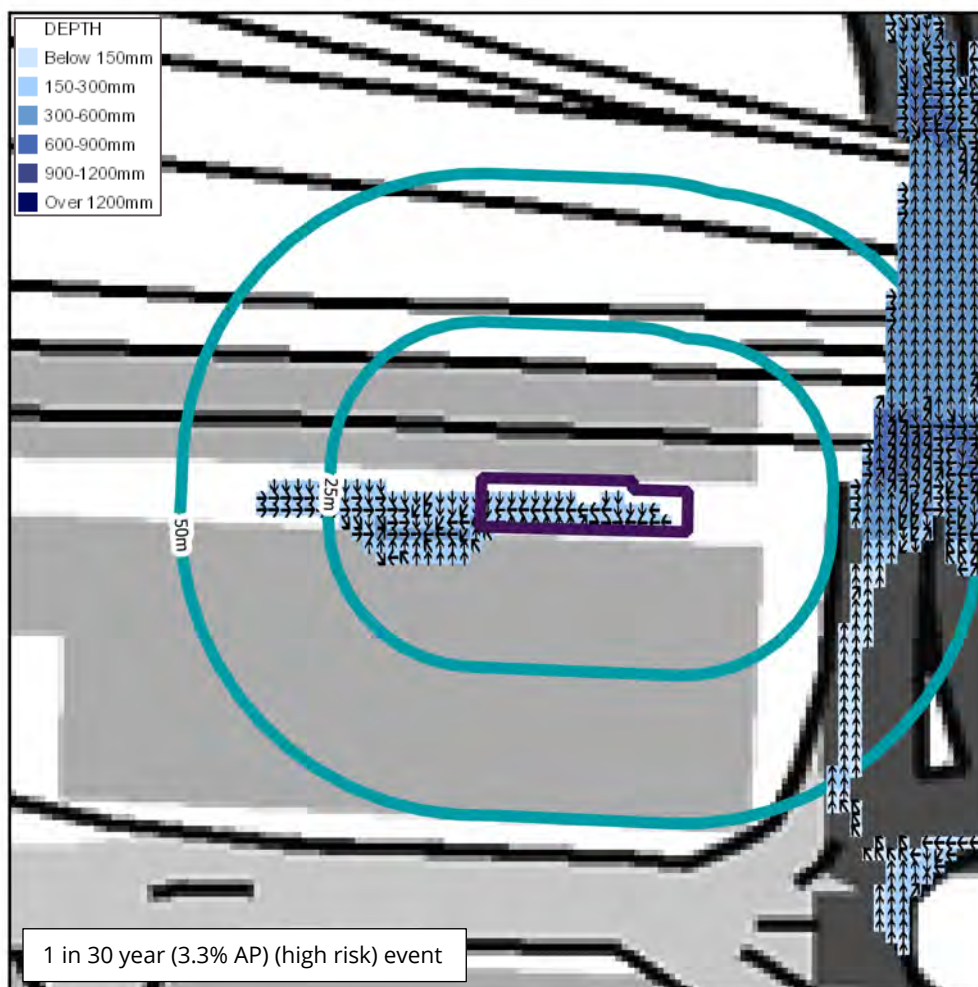
2. Flood risk

The level of flood risk from all sources at the Site are summarised within the FRA (gta Civils & Transport, 2020), the following flood risks have been identified:

- The Site is located within the Environment Agency's (EA) fluvial Flood Zone 1
- The Site and area proposed for development are located within the EA's surface water (pluvial) flood risk zones, where the risk ranges from high to medium in the area proposed for development. The EA's pluvial flooding maps have been produced for the 1 in 30, 100 and 1000 year storm events (Figure 2 & 3), including flood flow routes.
- The FRA confirms the Site overlies a 'Medium-High' Aquifer and is situated outside of the recorded Groundwater Protection Zones.
- The Site is not susceptible to flooding if a nearby reservoir were to fail and the risk of flooding from artificial sources are therefore considered to be minimal.

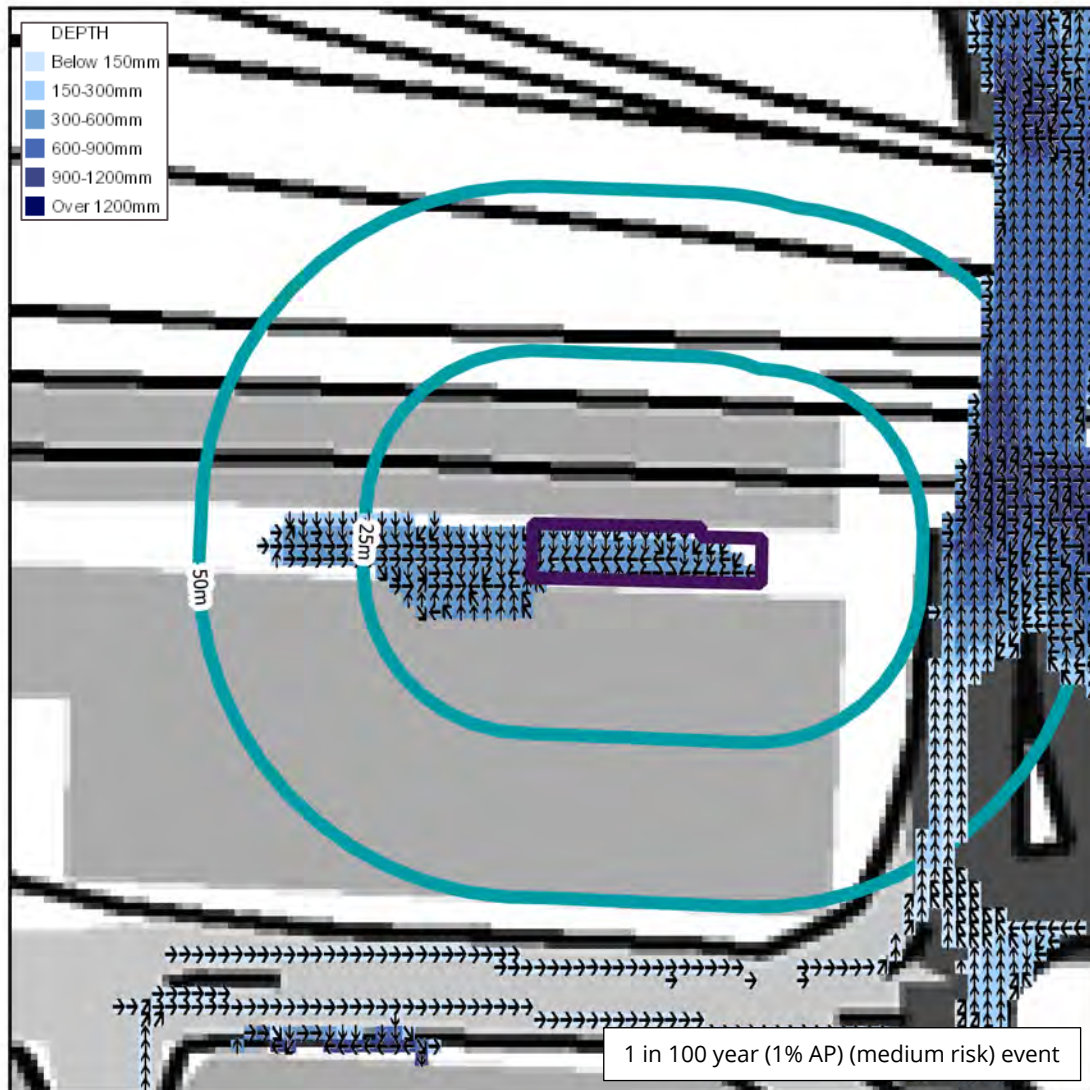
The following maps show flooding depths and flow routes which occur within the EA's national scale Risk of Flooding from Surface Water (RoFSW) mapping.

Figure 2 EA high risk of Flooding from Surface Water Map (EA, 2020)



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Figure 3 EA medium risk of Flooding from Surface Water Map (EA, 2020)



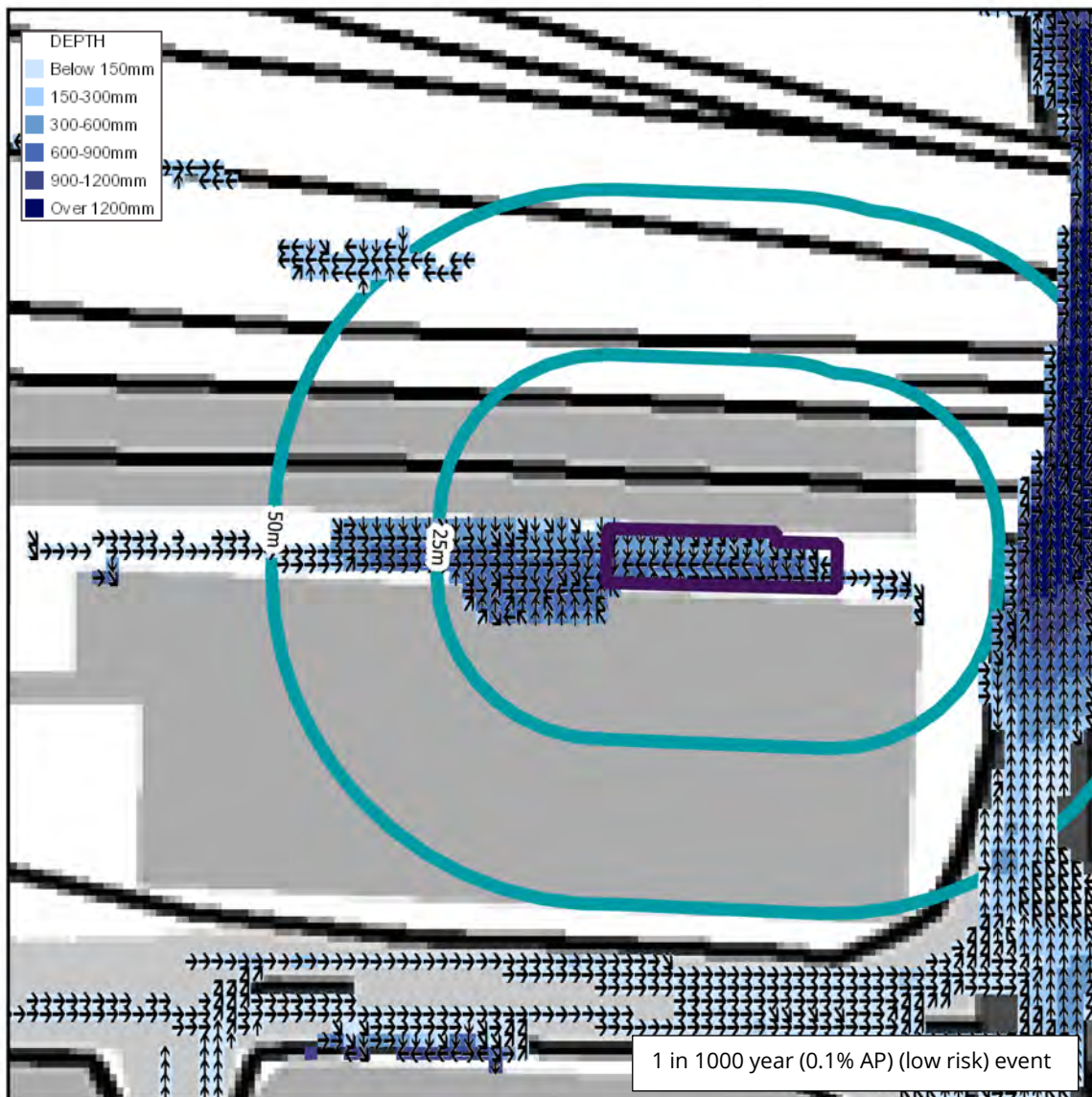
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The 1 in 30 year and 1 in 100 year mapping (Figure 2 and 3) shows the flooding occurring in the area proposed for development is as a result of rainfall within the area of low topography at the entrance of the car park / delivery yard.

The 1 in 1000 year map overleaf (Figure 4) also confirms the flooding in the area proposed for development occurs as a result of the low topography and ramped elevation within the car park / delivery yard area.

There are no direct overland flood flow routes which are mapped as contributing to this area and this is also confirmed within the topographic surveys included in Appendix B and D.

Figure 4 EA low risk of Flooding from Surface Water Map (EA, 2020)



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GeoSmart were commissioned to assess and explain the limitations of the EA's surface water flood risk maps to confirm whether these provide a true reflection of the actual flood risks at the Site.

The following report sections confirm the limitations of the EA's data and provide more detailed modelling of the 1 in 30, 1 in 100 and 1 in 1000 year storm events, including the presence of on-site drainage systems, to assess the impact of the limitations on the resultant flood risk.

3. Risk of Flooding from Surface Water Modelling Limitations

In 2013 the Environment Agency, working with Lead Local Flood Authorities (LLFAs), produced the Risk of Flooding from Surface Water (RoFSW) maps (known at the time of creation and validation as uFMfSW - updated Flood Map for Surface Water).

These maps are often relied on by Local Councils, who take a statutory lead on flooding from surface water, to help inform the requirements for flood mitigation on developments.

More recently, the mapping has been used to inform policy in some Council areas.

The following limitations are however, likely to lessen the accuracy of the EA's flood data as a result of the national-scale of the modelling and data, in line with the limitations set out EA guidance¹.

These limitations could impact the resultant flood depths associated with surface water flooding, but it is difficult to ascertain to what extent these limitations would reduce the likelihood, depth and overall risk of flooding from surface water at the Site until modelling is undertaken.

Table 1: Limitations of the EA's RoFSW mapping

Limitations of the EA's Risk of Flooding from Surface Water (RoFSW) maps
A single drainage rate for all urban areas within the nationally produced modelling. In urban areas such as Lewes Road, a default loss of 12mm/hour is applied to reduce rainfall to represent sewers. Although this does not represent local drainage features already on-Site and the sewer capacity may be higher than this assumption.
There is limited recorded surface water flood data for LLFAs, so in many places LLFAs have not yet been able to validate the nationally produced modelling.
RoFSW does not take individual property threshold heights into account, although the use of a (typically) 0.3m high "upstand" and depth-varying roughness coefficients within the OS MasterMap have been used for the building footprints. As such, the map shows areas that may potentially flood but cannot accurately predict the impacts on individual properties.
The flood extents show predicted patterns of flooding based on modelled rainfall. The patterns of flooding from two similar storm events can vary due to many local circumstances.

In this instance, there are areas of the Site including drainage systems, which could be represented in greater detail to provide a more realistic view of pluvial flooding at the Site. These comprise the inclusion of accurate surveys of the existing drainage network, including accurate ground levels in areas which could be flooded at basement level and including a

¹ EA, 2019. What is the Risk of Flooding from Surface Water map? Accessed from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/842485/What-is-the-Risk-of-Flooding-from-Surface-Water-Map.pdf on 11/05/2020

more accurate assessment of the rainfall event including climate change, which are all elements which are excluded from the EA's analysis. The inclusion of these additional features in a greater level of detail than is represented currently, could potentially impact the extent to which surface water flooding occurs on the Site.

4. Detailed MicroDrainage Modelling

GeoSmart were commissioned to assess the accuracy of the EA's surface water flood risk maps, by producing a detailed model of the existing drainage systems on-Site.

A model of the drained area and drainage network, which contributes to the flooding shown within the EA's mapping, was produced to confirm whether the storm events shown would result in above ground flooding of the drained area and the area proposed for development.

The modelling results and confirmation of the draining catchment area, based upon site-specific topographic survey and roof areas, are included within Appendix F.

The detailed MicroDrainage modelling of the existing on-Site drainage network confirms there would be no flooding above ground in the area proposed for development, in all events up to and including the 1 in 1000 year storm event.

However, the results do show some internal flooding within some of the chambers, in the basement areas during the 100 year + 40% CC and 1 in 1000 year events (shown in Appendix F of the report), with some of the volumes exceeding the chambers.

This would result in a total of approximately 32.3 m³ and 43.9 m³ of flooding, in the 100 year including a 40% CC allowance and 1 in 1000 year events respectively, which could potentially occur above the surface of the basement (shown in Figure 5) in three separate areas. However, the flooding does not occur in or affect the areas proposed for development.

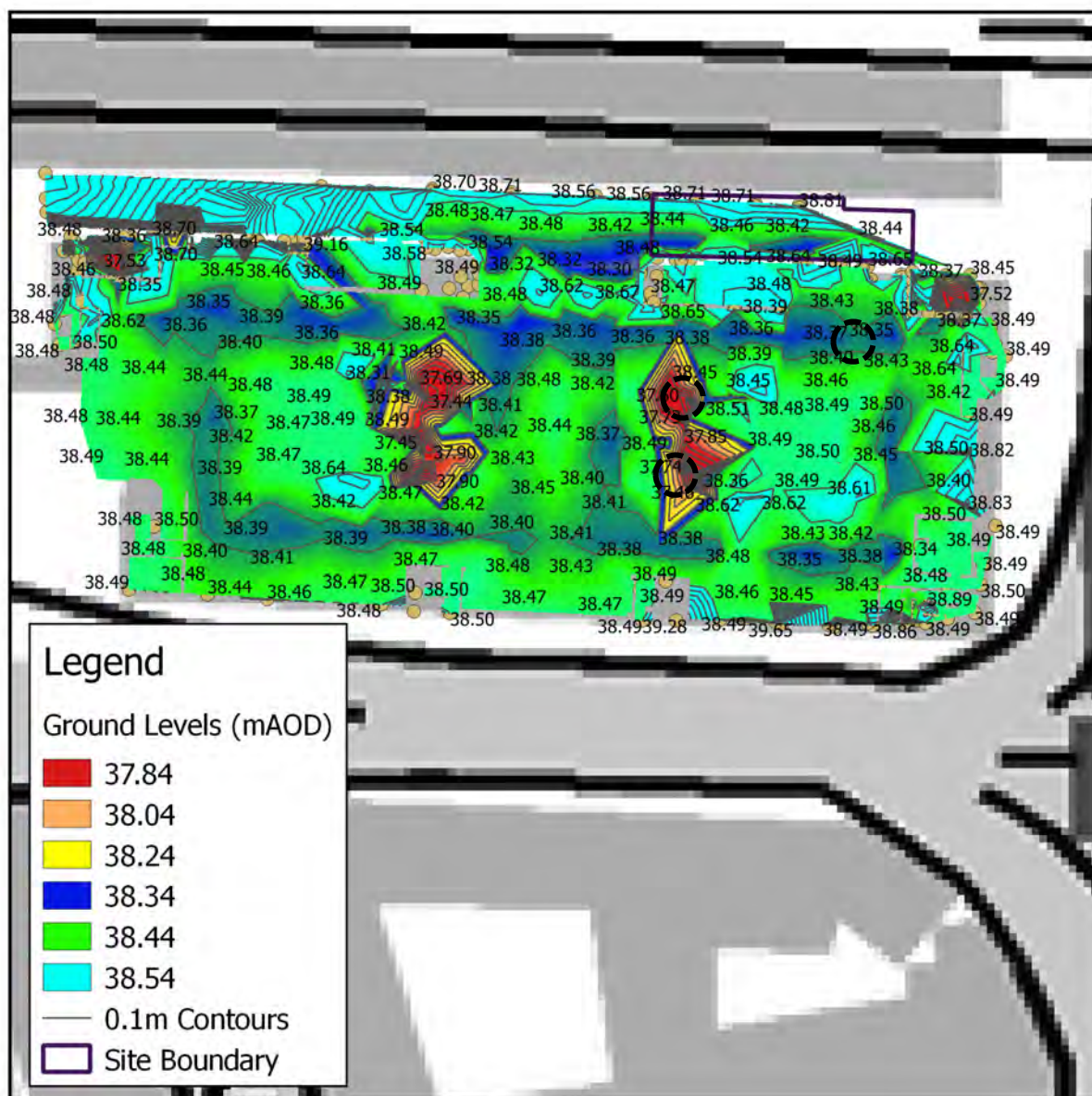
Figure 5: Drainage layout and areas of chamber exceedance



A more detailed analysis of the basement and ground floor levels in the access and loading bay areas have been undertaken to confirm whether or not the additional volume in the areas flooded could potentially be conveyed to the area proposed development and impact it.

A ground level TIN was produced (Figure 6, shown overleaf), using the topographic survey, and this confirms ground levels within the basement, access and in the area proposed for development; but also the areas where the surface water chambers were exceeding their capacity.

Figure 6 Ground level TIN confirming ground levels and used to undertake volume analysis for each level flooded and exceedance of chambers



The table below confirms the capacity of the basement area to store additional surface water volumes, which exceed the manhole chamber cover and begin to flood within the basement.

Table 2 Storage volumes available at basement level

Level (mAOD)	Total storage volume available (m ³)
38.34	137.23
38.24	99.34
38.04	46.06
37.84	16.22

Table 2 confirms the basement would flood to a level of 38.04 mAOD during a 1 in 100 year including a 40% allowance for climate change and 1 in 1000 year storm events, before the lowest existing ground levels (38.34 mAOD) in the area proposed for development were affected.

The ground levels within the basement also undulate gradually and there is a slight increase in ground levels at the entrance of the basement, before it drops externally to a gully. This slight increase in ground levels at the basement entrance would tend to retain a large amount the flooding in the basement area, before flooding ever reaching this gully and also the area proposed for development. The flooding depths would have to increase by approximately 0.4m before flooding occurred in the external yard area and began to impact the area proposed for development.

The calculations show that there is approximately 105m³ of additional capacity in the basement area, above the 1 in 100 year storm event including a 40% allowance for climate change, before the area proposed for development would even begin to flood.

Furthermore, the flooding is likely to be passed to other parts of the drainage system which do still have plenty of capacity, which would reduce flooding depths further. In addition, the presence of walls, lift pits and some un-surveyed areas could retain more flooding within certain areas of the basement and reduce flooding depths further, across the basement area.

The 1 in 1000 year storm event was also modelled and this confirms there would be 43.9 m³ of flooding above the surface of the basement, which is approximately 10m³ of additional flooding above the 1 in 100 year storm event including a 40% allowance for climate change.

As a result of flooding in this event, the depth of flooding within the basement would increase but would still not impact the area proposed for development, as there would still be approximately 93.4 m³ of capacity within the basement area before flooding reached the minimum ground level in the area proposed for development of 38.34 mAOD.

5. Flood Mitigation

The detailed MicroDrainage modelling of the existing drainage network shows, there would be no flooding in the area proposed for development in all events up to and including the 1 in 1000 year storm event.

However, in order to reduce the risks of surface water flooding to a minimum, SuDS features will be included in the proposed development. Sections 3.5 – 3.7 of the FRA (2020) confirm the total roofed area of the unit, including the canopy is 94m². The cycle store, which will be of traditional masonry construction, will have a 50mm thick sedum green roof of 26m² which would intercept, attenuate and filter runoff (i.e. provide interception of the first 5mm, 'first flush'.

The offsite flow rate will also be restricted to 1.0l/s in the critical event and a 3.0m x 2.0m x 0.4m deep cellular attenuation tank will be used to attenuate runoff from the unit roof and canopy, as well as the cycle store, ensuring there would be no above ground flooding in all events up to and including the 1 in 100 year storm event, including a 40% allowance for climate change.

The proposed SuDS strategy would further reduce the rate of rainfall entering into the drainage system, which is likely to reduce the likelihood of pluvial flooding across the wider car park / delivery yard area.

In order to retain the very low pluvial flood risks identified, the drainage systems should be managed and maintained over the lifetime of the existing and proposed developments. A robust regime of inspection and maintenance will ensure the likelihood of a failure or blockage of the drainage network are reduced to a minimum.

6. Conclusions

The Environment Agency's Risk of Flooding from Surface Water maps indicate there is a high to medium risk of flooding in the area proposed for development.

There are several limitations to the Environment Agency's modelling including the lack of on-site drainage systems represented.

Detailed MicroDrainage modelling of the existing on-Site drainage network has been undertaken. This confirms there would be no flooding above ground in the area proposed for development, in all events up to and including the 1 in 1000 year storm event.

As such, the risk of flooding from surface water (pluvial) sources within the car park / delivery yard area is reduced from high/medium to very low.

The likelihood of pluvial flooding across the wider car park / delivery yard area would be reduced further by the proposed SuDS strategy, which includes a green roof on the bike store and a geo-cellular crate system to attenuate flows, discharged to the existing on-site drainage network at a rate of 1 l/s.

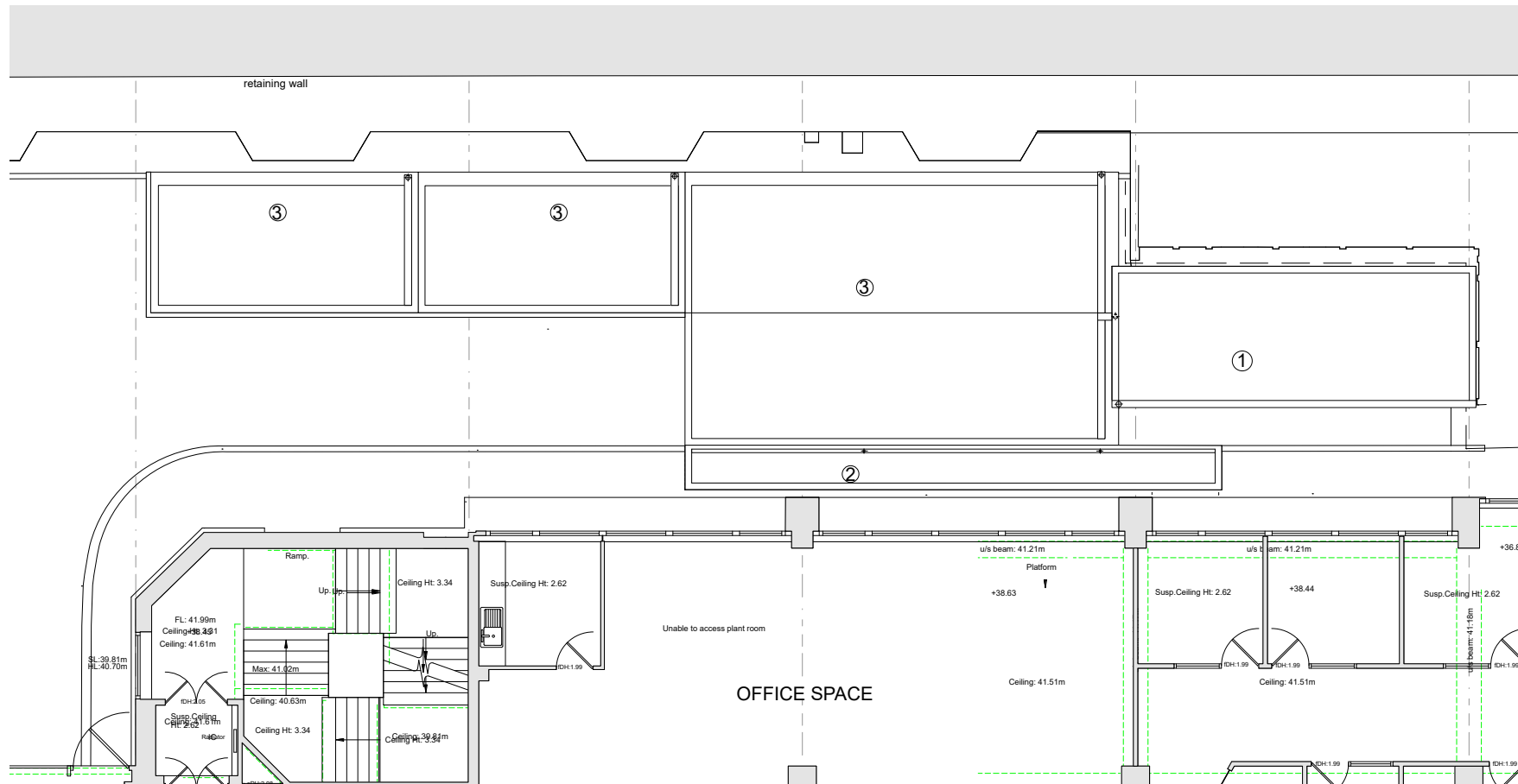
It is likely the minimal raising of finished floor levels, in line with Building Regulations would be sufficient to ensure the proposed development is not at an increased risk of pluvial flooding, as a result of a blockage in the on-Site drainage network.

A robust regime of inspection and maintenance should be implemented to ensure the likelihood of a failure or blockage of the drainage network are reduced to a minimum and the pluvial flood risks remain very low.

7. Appendices

Appendix A

Site Plans



- ① Pitched roof to cycle store as spec ref: J31/111.
- ② Flat roof to canopy as spec ref: J31/112.
- ③ Pitched roof to cabin units as part of system.

B	Layout revised.	25 06 20	MW
A	Canopy reduced in size.	22 05 20	MW
Rev.	Description	Date	Check by

1. Do not scale this drawing. The Contractor is to verify all dimensions & conditions on site and report any discrepancies to the Architect before proceeding.
2. This drawing is to be read in conjunction with all relevant project documentation.
3. This drawing is subject to the approval of the appropriate Statutory Authorities.

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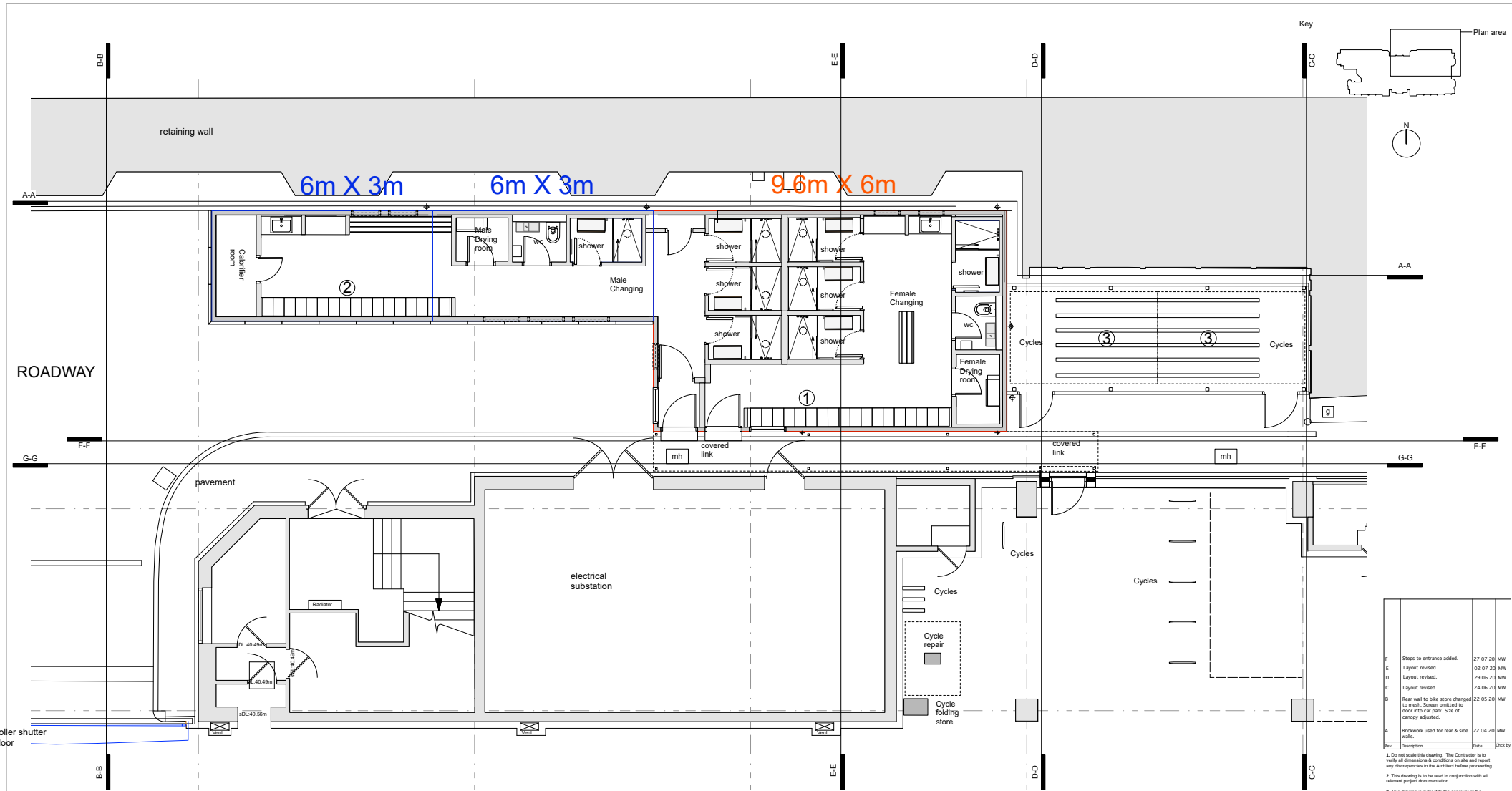
Project :
APEX PLAZA
3 FORBURY ROAD
READING RG1 1AX

Title :
**GROUND FLOOR PLAN
PROPOSED**

Scale : 1:50 @ A1 1:100 @ A3	Date : 04 03 20
Drawn by : MS	Checked by : MW
Drawing No. : 1901_220_002	Revision : B

Status :
TENDER

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CARPARK

- NOTES:
- ① Female lockers as spec ref: N10/116.
 - ② Male lockers as spec ref: N10/115.
 - ③ Two tier cycle storage as spec ref: N10/110.
 - ④ Doors schedule & details see drawings, 304_001, 002 & 003.

Rev.	Description	Date	Drawn by
F	Steps to entrance added.	27 07 20	MW
E	Layout revised.	02 07 20	MW
D	Layout revised.	29 06 20	MW
C	Layout revised.	24 06 20	MW
B	Rear wall to bike store changed to mesh. Screen omitted to floor into car park. Size of canopy adjusted.	22 05 20	MW
A	Brickwork used for rear & side walls.	22 04 20	MW

1. Do not scale this drawing. The Contractor is to verify all dimensions & conditions on site and report any discrepancies to the Architect before proceeding.
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Project :
**APEX PLAZA
3 FORBURY ROAD
READING RG1 1AX**

Title:
**BASEMENT FLOOR PLAN
PROPOSED**

Scale : 1:50 @ A1 Date : 04 03 20
1:100 @ A3

Drawn by : MS Checked by : MW

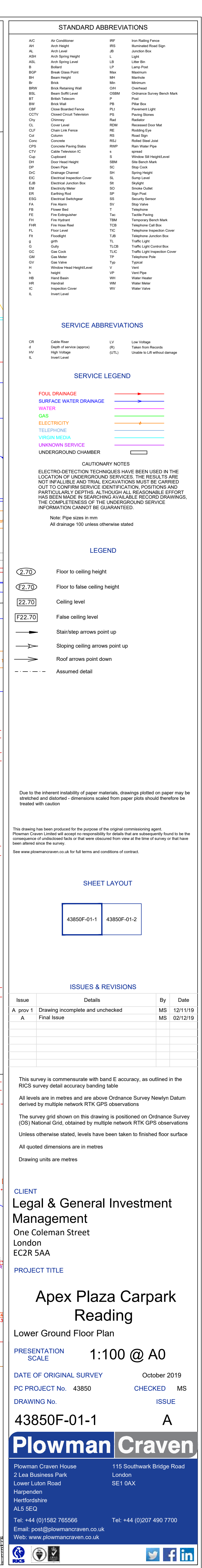
Drawing No. : 1901_220_001 Revision : F

Status :
TENDER

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Appendix B

Topographic Survey



[illegible]

Appendix C

CCTV Survey

Available by accessing the following link:

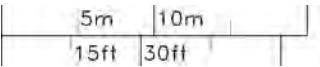
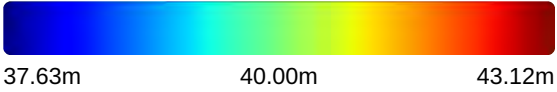
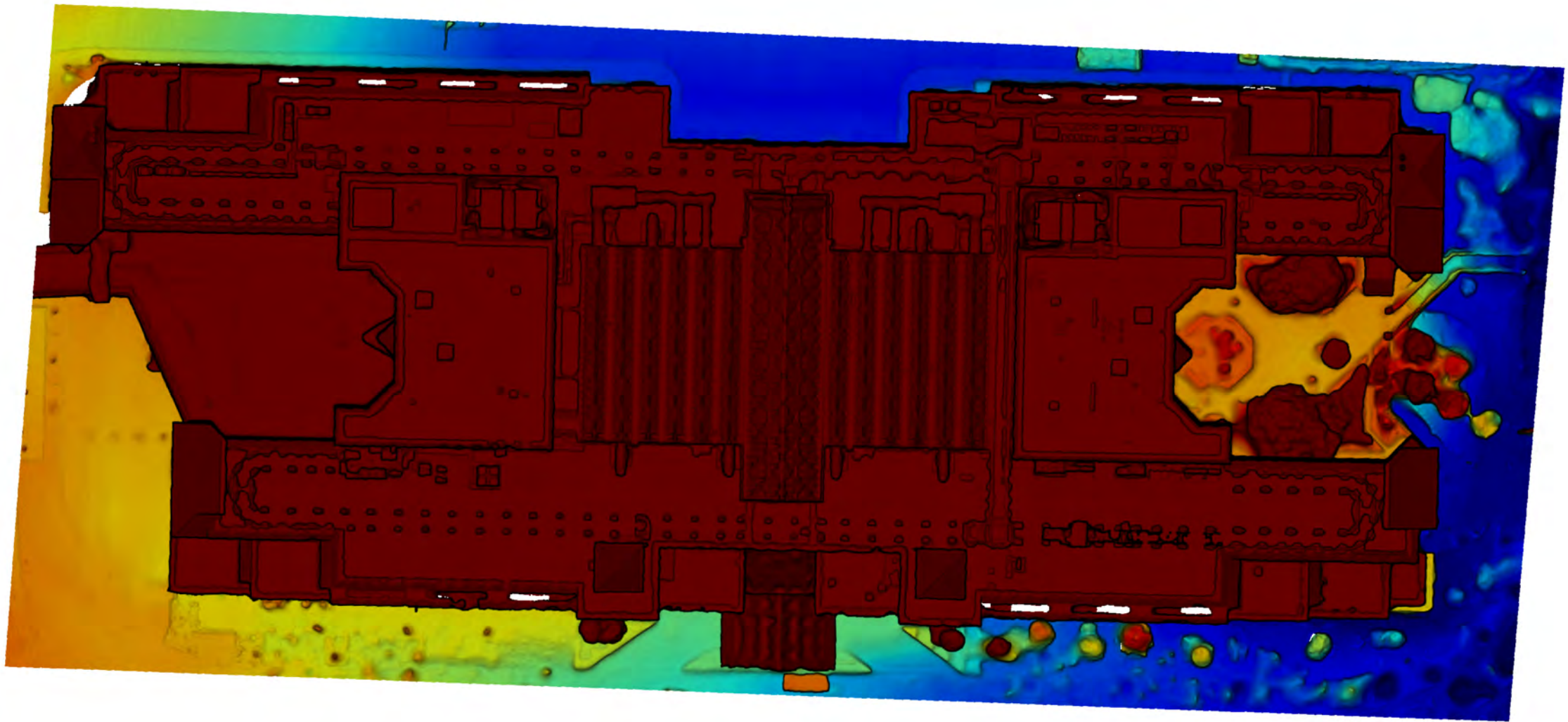
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Appendix D

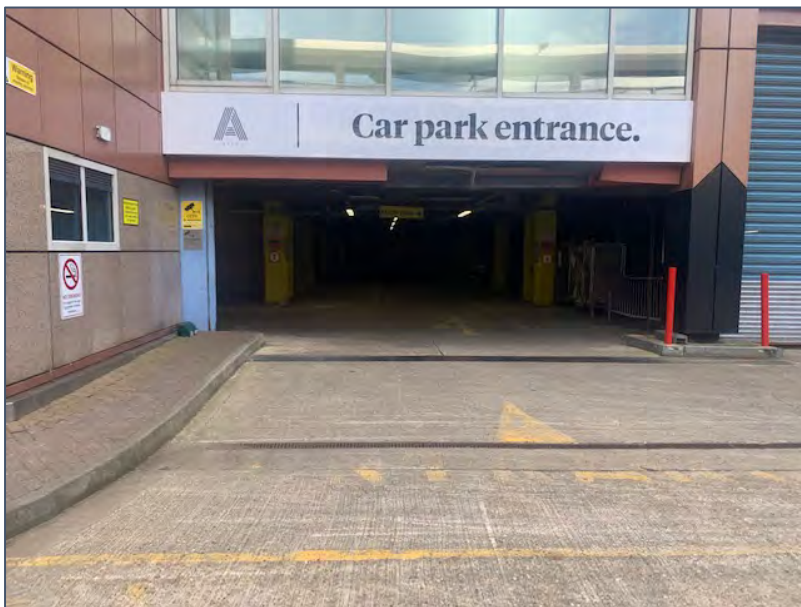
Drone Topographic Survey



Appendix E

Site photographs

Site Photographs – Paragon BC Site walkover on the 18th of May





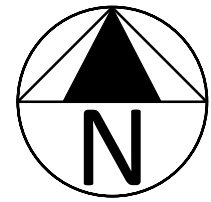




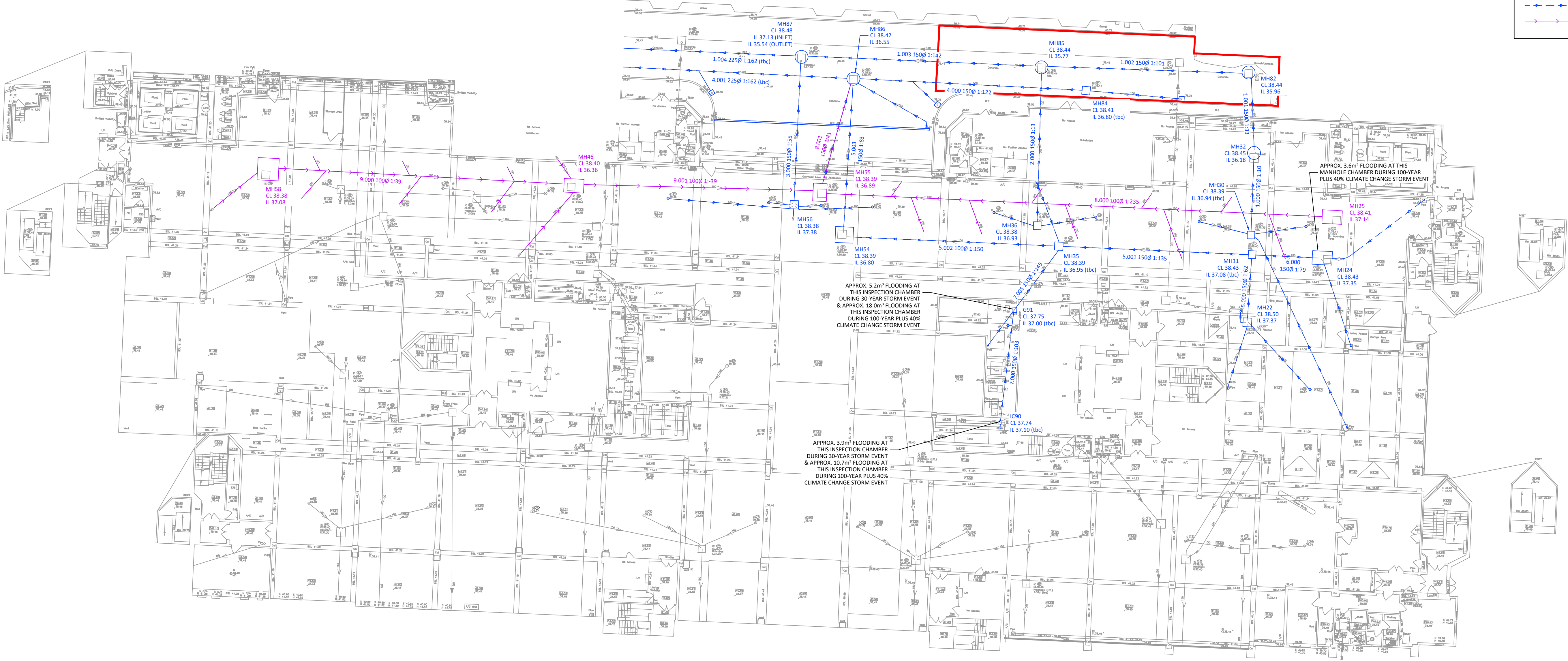
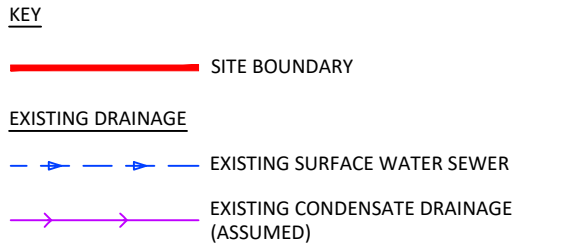


Appendix F

MicroDrainage Modelling Results



- NOTES:
1. ALL EXISTING DRAINAGE IS SHOWN BASED ON TOPOGRAPHICAL SURVEY UNDERTAKEN BY PLOWMAN CRAVEN IN OCTOBER 2019 AND ON CCTV SEWER SURVEY UNDERTAKEN BY CLEARVIEW SURVEYS IN DECEMBER 2019.
 2. WHERE CHAMBER COVERS COULD NOT BE LIFTED, DEPTHS TO INVERT LEVEL HAVE BEEN ASSUMED BASED ON INTERPOLATION OF UPSTREAM AND DOWNSTREAM LEVELS AND WITH REFERENCE TO OBSERVATIONS FROM THE CCTV SURVEY. THESE INVERT LEVELS ARE ANNOTATED AS TO BE CONFIRMED (tbc).
 3. CATCHMENT AREAS HAVE BEEN DETERMINED INDICATIVELY BASED ON INTERPOLATION OF THE POSITION OF DOWNPIPES RELATIVE TO THE ROOF.
 4. CONDENSATE DRAINAGE IS ASSUMED BASED ON SURVEY INDICATING NO APPARENT SURFACE WATER CONNECTIONS AND DUE TO GENERAL LOW LEVEL OF SILTING WITHIN PIPEWORK WHICH IS CONSISTENT WITH DRAINAGE THAT DOESN'T ACHIEVE SELF-CLEANING VELOCITY.



TOTAL IMPERMEABLE
CATCHMENT AREA = 0.281 HA

CATCHMENT PLAN

0 1:500 25
metres

DESIGN BY: Collaboration GeoSmart Information Environmental Thinking tumu CONSULTING				CLIENT: LEGAL & GENERAL c/o FURNESS PARTNERSHIP		PROJECT: APEX PLAZA, BLAGRAVE STREET, READING, RG1 1PZ	
DRAWING STATUS: FOR INFORMATION ONLY				SCALE @ A1: 0 1:200 10 metres		TITLE: EXISTING DRAINAGE LAYOUT	
REV. DESCRIPTION		Date BY CHK		PROJECT No: 19311		DRAWING No: D01	
B UPDATED TO INCLUDE ADDITIONAL CATCHMENT AREA FROM RAMP		01.06.20 PS PS					
A FIRST ISSUE		27.05.20 PS PS					
						REV: B	

20 East Sands
Burbage Marlborough
Wiltshire SN8 3AN

Apex Plaza, Reading
Existing SW Drainage
1000-year return period



Date 01/06/2020

Designed by PS

File 2020-06-01 APEX PLAZA, READING...

Checked by

Micro Drainage

Network 2018.1

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
E1.000	7.476	0.760	9.8	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit
E1.001	7.337	0.220	33.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E1.002	19.243	0.190	101.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E2.000	14.665	1.160	12.6	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
E1.003	22.020	0.155	142.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E3.000	13.681	0.250	54.7	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit
E1.004	16.215	0.100	162.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit
E4.000	21.369	0.175	122.1	0.027	5.00	0.0	0.600	o	150	Pipe/Conduit
E5.000	6.174	0.290	21.3	0.026	5.00	0.0	0.600	o	150	Pipe/Conduit
E6.000	6.329	0.270	23.4	0.051	5.00	0.0	0.600	o	150	Pipe/Conduit
E5.001	17.688	0.130	136.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E7.000	10.341	0.100	103.4	0.017	5.00	0.0	0.600	o	150	Pipe/Conduit
E7.001	7.224	0.050	144.5	0.017	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)
E1.000	36.940	0.028	0.0	3.23	57.1
E1.001	36.180	0.028	0.0	1.75	30.9
E1.002	35.960	0.028	0.0	1.00	17.6
E2.000	36.930	0.000	0.0	2.85	50.3
E1.003	35.770	0.028	0.0	0.84	14.9
E3.000	37.380	0.025	0.0	1.36	24.1
E1.004	35.540	0.053	0.0	1.02	40.7
E4.000	36.800	0.027	0.0	0.91	16.0
E5.000	37.370	0.026	0.0	2.19	38.7
E6.000	37.350	0.051	0.0	2.09	36.9
E5.001	37.080	0.077	0.0	0.86	15.2
E7.000	37.100	0.017	0.0	0.99	17.5
E7.001	37.000	0.034	0.0	0.83	14.7

20 East Sands
Burbage Marlborough
Wiltshire SN8 3AN

Apex Plaza, Reading
Existing SW Drainage
1000-year return period



Date 01/06/2020

Designed by PS

File 2020-06-01 APEX PLAZA, READING...

Checked by

Micro Drainage

Network 2018.1

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
E5.002	19.829	0.150	132.2	0.022	0.00	0.0	0.600	o	100	Pipe/Conduit
E5.003	14.491	0.175	82.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E8.000	46.923	0.200	234.6	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit
E9.000	28.204	0.720	39.2	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit
E9.001	22.601	-0.580	-39.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit
E8.001	10.783	0.265	40.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
E4.001	21.146	0.130	162.7	0.068	0.00	0.0	0.600	o	225	Pipe/Conduit

Network Results Table

PN	US/IL (m)	I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
E5.002	36.950	0.133	0.0	0.67	5.2
E5.003	36.800	0.133	0.0	1.11	19.5
E8.000	37.140	0.000	0.0	0.50	3.9
E9.000	37.080	0.000	0.0	1.24	9.7
E9.001	36.360	0.000	0.0	0.00	0.0
E8.001	36.890	0.000	0.0	1.58	28.0
E4.001	36.550	0.228	0.0	1.02	40.7

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Burbage Marlborough
Wiltshire SN8 3AN

Apex Plaza, Reading
Existing SW Drainage
1000-year return period



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Manhole Schedules for Existing

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
E30	38.390	1.450	Open Manhole	1200	E1.000	36.940	150				
E32	38.450	2.270	Open Manhole	1200	E1.001	36.180	150	E1.000	36.180	150	
E82	38.440	2.480	Open Manhole	1200	E1.002	35.960	150	E1.001	35.960	150	
E36	38.380	1.450	Open Manhole	1200	E2.000	36.930	150				
E85	38.440	2.670	Open Manhole	1200	E1.003	35.770	150	E1.002	35.770	150	
								E2.000	35.770	150	
E56	38.380	1.000	Open Manhole	1240 x 675	E3.000	37.380	150				
E87	38.480	2.940	Open Manhole	1200	E1.004	35.540	225	E1.003	35.615	150	
								E3.000	37.130	150	
E	38.470	3.030	Open Manhole	0		OUTFALL		E1.004	35.440	225	1515
E84	38.410	1.610	Open Manhole	1200	E4.000	36.800	150				
E22	38.500	1.130	Open Manhole	900 x 600	E5.000	37.370	150				
E24	38.430	1.080	Open Manhole	1240 x 675	E6.000	37.350	150				
E31	38.430	1.350	Open Manhole	1240 x 675	E5.001	37.080	150	E5.000	37.080	150	
								E6.000	37.080	150	
E90	37.740	0.640	Open Manhole	300 x 300	E7.000	37.100	150				
E91	37.750	0.750	Open Manhole	450 x 450	E7.001	37.000	150	E7.000	37.000	150	
E35	38.390	1.440	Open Manhole	1240 x 675	E5.002	36.950	100	E5.001	36.950	150	
								E7.001	36.950	150	
E54	38.390	1.590	Open Manhole	1240 x 675	E5.003	36.800	150	E5.002	36.800	100	
E25	38.410	1.270	Open Manhole	1240 x 675	E8.000	37.140	100				
E58	38.380	1.300	Open Manhole	900 x 600	E9.000	37.080	100				
E46	38.400	2.040	Open Manhole	1240 x 675	E9.001	36.360	100	E9.000	36.360	100	
E55	38.390	1.500	Open Manhole	1240 x 675	E8.001	36.890	150	E8.000	36.940	100	
								E9.001	36.940	100	
E86	38.420	1.870	Open Manhole	1200	E4.001	36.550	225	E4.000	36.625	150	
								E5.003	36.625	150	
								E8.001	36.625	150	
E	38.400	1.980	Open Manhole	0		OUTFALL		E4.001	36.420	225	

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Apex Plaza, Reading
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PIPELINE SCHEDULES for Existing

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	o	150	E30	38.390	36.940	1.300	Open Manhole	1200
E1.001	o	150	E32	38.450	36.180	2.120	Open Manhole	1200
E1.002	o	150	E82	38.440	35.960	2.330	Open Manhole	1200
E2.000	o	150	E36	38.380	36.930	1.300	Open Manhole	1200
E1.003	o	150	E85	38.440	35.770	2.520	Open Manhole	1200
E3.000	o	150	E56	38.380	37.380	0.850	Open Manhole	1240 x 675
E1.004	o	225	E87	38.480	35.540	2.715	Open Manhole	1200
E4.000	o	150	E84	38.410	36.800	1.460	Open Manhole	1200
E5.000	o	150	E22	38.500	37.370	0.980	Open Manhole	900 x 600
E6.000	o	150	E24	38.430	37.350	0.930	Open Manhole	1240 x 675
E5.001	o	150	E31	38.430	37.080	1.200	Open Manhole	1240 x 675
E7.000	o	150	E90	37.740	37.100	0.490	Open Manhole	300 x 300
E7.001	o	150	E91	37.750	37.000	0.600	Open Manhole	450 x 450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	7.476	9.8	E32	38.450	36.180	2.120	Open Manhole	1200
E1.001	7.337	33.4	E82	38.440	35.960	2.330	Open Manhole	1200
E1.002	19.243	101.3	E85	38.440	35.770	2.520	Open Manhole	1200
E2.000	14.665	12.6	E85	38.440	35.770	2.520	Open Manhole	1200
E1.003	22.020	142.1	E87	38.480	35.615	2.715	Open Manhole	1200
E3.000	13.681	54.7	E87	38.480	37.130	1.200	Open Manhole	1200
E1.004	16.215	162.1	E	38.470	35.440	2.805	Open Manhole	0
E4.000	21.369	122.1	E86	38.420	36.625	1.645	Open Manhole	1200
E5.000	6.174	21.3	E31	38.430	37.080	1.200	Open Manhole	1240 x 675
E6.000	6.329	23.4	E31	38.430	37.080	1.200	Open Manhole	1240 x 675
E5.001	17.688	136.1	E35	38.390	36.950	1.290	Open Manhole	1240 x 675
E7.000	10.341	103.4	E91	37.750	37.000	0.600	Open Manhole	450 x 450
E7.001	7.224	144.5	E35	38.390	36.950	1.290	Open Manhole	1240 x 675

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Existing SW Drainage
1000-year return period

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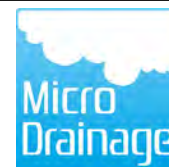
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PIPELINE SCHEDULES for Existing

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E5.002	o	100	E35	38.390	36.950	1.340	Open Manhole	1240 x 675
E5.003	o	150	E54	38.390	36.800	1.440	Open Manhole	1240 x 675
E8.000	o	100	E25	38.410	37.140	1.170	Open Manhole	1240 x 675
E9.000	o	100	E58	38.380	37.080	1.200	Open Manhole	900 x 600
E9.001	o	100	E46	38.400	36.360	1.940	Open Manhole	1240 x 675
E8.001	o	150	E55	38.390	36.890	1.350	Open Manhole	1240 x 675
E4.001	o	225	E86	38.420	36.550	1.645	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E5.002	19.829	132.2	E54	38.390	36.800	1.490	Open Manhole	1240 x 675
E5.003	14.491	82.8	E86	38.420	36.625	1.645	Open Manhole	1200
E8.000	46.923	234.6	E55	38.390	36.940	1.350	Open Manhole	1240 x 675
E9.000	28.204	39.2	E46	38.400	36.360	1.940	Open Manhole	1240 x 675
E9.001	22.601	-39.0	E55	38.390	36.940	1.350	Open Manhole	1240 x 675
E8.001	10.783	40.7	E86	38.420	36.625	1.645	Open Manhole	1200
E4.001	21.146	162.7	E	38.400	36.420	1.755	Open Manhole	0

Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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E1.004	E	38.470	35.440	35.440	0	0
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Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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E4.001	E	38.400	36.420	36.420	0	0
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Simulation Criteria for Existing

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100, 1000

Climate Change (%) 0, 0, 40, 0

										Water Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)
E1.000	E30	15 Winter	1	+0%					36.967	-0.123
E1.001	E32	15 Winter	1	+0%					36.217	-0.113
E1.002	E82	15 Winter	1	+0%	1000/15 Summer				36.008	-0.102
E2.000	E36	120 Winter	1	+0%					36.930	-0.150
E1.003	E85	15 Winter	1	+0%	100/15 Summer				35.821	-0.099
E3.000	E56	15 Winter	1	+0%					37.418	-0.112
E1.004	E87	15 Winter	1	+0%					35.605	-0.160
E4.000	E84	15 Winter	1	+0%	100/15 Summer				36.849	-0.101
E5.000	E22	15 Winter	1	+0%	1/15 Summer	1000/15 Winter			37.589	0.069
E6.000	E24	15 Winter	1	+0%	1/15 Summer	100/15 Summer			37.594	0.094
E5.001	E31	15 Winter	1	+0%	1/15 Summer				37.584	0.354
E7.000	E90	15 Winter	1	+0%	1/15 Summer	30/15 Summer			37.569	0.319
E7.001	E91	15 Winter	1	+0%	1/15 Summer	30/15 Summer			37.565	0.415
E5.002	E35	15 Winter	1	+0%	1/15 Summer				37.557	0.507
E5.003	E54	15 Winter	1	+0%	100/15 Summer				36.883	-0.067
E8.000	E25	120 Winter	1	+0%					37.140	-0.100
E9.000	E58	120 Winter	1	+0%					37.080	-0.100
E9.001	E46	120 Winter	1	+0%	1000/15 Summer				36.360	-0.100
E8.001	E55	120 Winter	1	+0%	1000/15 Summer				36.890	-0.150
E4.001	E86	15 Winter	1	+0%	30/15 Summer				36.669	-0.106

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Apex Plaza, Reading
 Existing SW Drainage
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E30	0.000	0.07	3.6	OK	
E1.001	E32	0.000	0.14	3.6	OK	
E1.002	E82	0.000	0.22	3.6	OK	
E2.000	E36	0.000	0.00	0.0	OK	
E1.003	E85	0.000	0.25	3.6	OK	
E3.000	E56	0.000	0.15	3.2	OK	
E1.004	E87	0.000	0.18	6.6	OK	
E4.000	E84	0.000	0.23	3.4	OK	
E5.000	E22	0.000	0.10	3.1	SURCHARGED	1
E6.000	E24	0.000	0.20	6.1	SURCHARGED	11
E5.001	E31	0.000	0.45	6.4	SURCHARGED	
E7.000	E90	0.000	0.12	1.8	FLOOD RISK	36
E7.001	E91	0.000	0.25	3.2	FLOOD RISK	31
E5.002	E35	0.000	2.09	10.6	SURCHARGED	
E5.003	E54	0.000	0.59	10.6	OK	
E8.000	E25	0.000	0.00	0.0	OK	
E9.000	E58	0.000	0.00	0.0	OK	
E9.001	E46	0.000	0.00	0.0	OK	
E8.001	E55	0.000	0.00	0.0	OK	
E4.001	E86	0.000	0.54	19.9	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100, 1000

Climate Change (%) 0, 0, 40, 0

										Water Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)
E1.000	E30	15 Winter	30	+0%					36.983	-0.107
E1.001	E32	15 Winter	30	+0%					36.240	-0.090
E1.002	E82	15 Winter	30	+0%	1000/15 Summer				36.039	-0.071
E2.000	E36	120 Winter	30	+0%					36.930	-0.150
E1.003	E85	15 Winter	30	+0%	100/15 Summer				35.856	-0.064
E3.000	E56	15 Winter	30	+0%					37.442	-0.088
E1.004	E87	15 Winter	30	+0%					35.646	-0.119
E4.000	E84	15 Winter	30	+0%	100/15 Summer				36.882	-0.068
E5.000	E22	15 Winter	30	+0%	1/15 Summer	1000/15 Winter			38.191	0.671
E6.000	E24	15 Winter	30	+0%	1/15 Summer	100/15 Summer			38.236	0.736
E5.001	E31	15 Winter	30	+0%	1/15 Summer				38.173	0.943
E7.000	E90	30 Winter	30	+0%	1/15 Summer	30/15 Summer			37.744	0.494
E7.001	E91	15 Winter	30	+0%	1/15 Summer	30/15 Summer			37.755	0.605
E5.002	E35	15 Winter	30	+0%	1/15 Summer				37.856	0.806
E5.003	E54	15 Winter	30	+0%	100/15 Summer				36.895	-0.055
E8.000	E25	120 Winter	30	+0%					37.140	-0.100
E9.000	E58	120 Winter	30	+0%					37.080	-0.100
E9.001	E46	120 Winter	30	+0%	1000/15 Summer				36.360	-0.100
E8.001	E55	120 Winter	30	+0%	1000/15 Summer				36.890	-0.150
E4.001	E86	15 Winter	30	+0%	30/15 Summer				36.812	0.037

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Apex Plaza, Reading
 Existing SW Drainage
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
E1.000	E30	0.000	0.18	8.9	OK	
E1.001	E32	0.000	0.33	8.8	OK	
E1.002	E82	0.000	0.54	8.9	OK	
E2.000	E36	0.000	0.00	0.0	OK	
E1.003	E85	0.000	0.62	8.7	OK	
E3.000	E56	0.000	0.36	8.0	OK	
E1.004	E87	0.000	0.45	16.3	OK	
E4.000	E84	0.000	0.56	8.4	OK	
E5.000	E22	0.000	0.23	7.5	SURCHARGED	1
E6.000	E24	0.000	0.48	14.8	FLOOD RISK	11
E5.001	E31	0.000	1.55	22.0	FLOOD RISK	
E7.000	E90	3.908	0.72	11.3	FLOOD	36
E7.001	E91	5.192	0.93	11.7	FLOOD	31
E5.002	E35	0.000	2.52	12.7	SURCHARGED	
E5.003	E54	0.000	0.71	12.7	OK	
E8.000	E25	0.000	0.00	0.0	OK	
E9.000	E58	0.000	0.00	0.0	OK	
E9.001	E46	0.000	0.00	0.0	OK	
E8.001	E55	0.000	0.00	0.0	OK	
E4.001	E86	0.000	1.15	42.5	SURCHARGED	

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100, 1000

Climate Change (%) 0, 0, 40, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
E1.000	E30	15 Winter	100	+40%					36.999	-0.091
E1.001	E32	15 Winter	100	+40%					36.265	-0.065
E1.002	E82	15 Winter	100	+40%	1000/15 Summer				36.096	-0.014
E2.000	E36	120 Winter	100	+40%					36.930	-0.150
E1.003	E85	15 Winter	100	+40%	100/15 Summer				35.935	0.015
E3.000	E56	15 Winter	100	+40%					37.469	-0.061
E1.004	E87	15 Winter	100	+40%					35.691	-0.074
E4.000	E84	15 Winter	100	+40%	100/15 Summer				37.217	0.267
E5.000	E22	15 Winter	100	+40%	1/15 Summer	1000/15 Winter			38.466	0.946
E6.000	E24	15 Winter	100	+40%	1/15 Summer	100/15 Summer			38.434	0.934
E5.001	E31	15 Winter	100	+40%	1/15 Summer				38.403	1.173
E7.000	E90	60 Winter	100	+40%	1/15 Summer	30/15 Summer			37.751	0.501
E7.001	E91	30 Winter	100	+40%	1/15 Summer	30/15 Summer			37.768	0.618
E5.002	E35	15 Winter	100	+40%	1/15 Summer				37.984	0.934
E5.003	E54	15 Winter	100	+40%	100/15 Summer				37.124	0.174
E8.000	E25	120 Winter	100	+40%					37.140	-0.100
E9.000	E58	120 Winter	100	+40%					37.080	-0.100
E9.001	E46	15 Winter	100	+40%	1000/15 Summer				36.448	-0.012
E8.001	E55	15 Winter	100	+40%	1000/15 Summer				37.006	-0.034
E4.001	E86	15 Winter	100	+40%	30/15 Summer				37.044	0.269

20 East Sands
Burbage Marlborough
Wiltshire SN8 3AN

Apex Plaza, Reading
Existing SW Drainage
1000-year return period



Date 01/06/2020

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

PN	US/MH Name	Flooded		Pipe	Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)		
E1.000	E30	0.000	0.33	16.2	OK	
E1.001	E32	0.000	0.60	16.0	OK	
E1.002	E82	0.000	0.94	15.6	OK	
E2.000	E36	0.000	0.00	0.0	OK	
E1.003	E85	0.000	1.07	15.0	SURCHARGED	
E3.000	E56	0.000	0.65	14.4	OK	
E1.004	E87	0.000	0.78	28.2	OK	
E4.000	E84	0.000	1.00	15.2	SURCHARGED	
E5.000	E22	0.000	0.46	15.0	FLOOD RISK	1
E6.000	E24	3.571	0.75	23.3	FLOOD	11
E5.001	E31	0.000	1.88	26.6	FLOOD RISK	
E7.000	E90	10.720	0.73	11.3	FLOOD	36
E7.001	E91	18.011	0.93	11.8	FLOOD	31
E5.002	E35	0.000	2.54	12.8	SURCHARGED	
E5.003	E54	0.000	0.79	14.2	SURCHARGED	
E8.000	E25	0.000	0.00	0.0	OK	
E9.000	E58	0.000	0.00	0.0	OK	
E9.001	E46	0.000	0.00	0.0	OK	
E8.001	E55	0.000	0.03	0.8	OK	
E4.001	E86	0.000	1.73	64.1	SURCHARGED	

20 East Sands Burbage Marlborough Wiltshire SN8 3AN	Apex Plaza, Reading Existing SW Drainage 1000-year return period	
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Micro Drainage	Network 2018.1	

1000 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.700 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440

Return Period(s) (years) 1, 30, 100, 1000

Climate Change (%) 0, 0, 40, 0

										Water Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)
E1.000	E30	15 Winter	1000	+0%					37.005	-0.085
E1.001	E32	15 Winter	1000	+0%					36.286	-0.044
E1.002	E82	15 Winter	1000	+0%	1000/15 Summer				36.188	0.078
E2.000	E36	120 Winter	1000	+0%					36.930	-0.150
E1.003	E85	15 Winter	1000	+0%	100/15 Summer				35.986	0.066
E3.000	E56	15 Winter	1000	+0%					37.479	-0.051
E1.004	E87	15 Winter	1000	+0%					35.705	-0.060
E4.000	E84	15 Winter	1000	+0%	100/15 Summer				37.353	0.403
E5.000	E22	15 Winter	1000	+0%	1/15 Summer	1000/15 Winter			38.500	0.980
E6.000	E24	15 Winter	1000	+0%	1/15 Summer	100/15 Summer			38.436	0.936
E5.001	E31	15 Winter	1000	+0%	1/15 Summer				38.416	1.186
E7.000	E90	60 Winter	1000	+0%	1/15 Summer	30/15 Summer			37.754	0.504
E7.001	E91	30 Winter	1000	+0%	1/15 Summer	30/15 Summer			37.774	0.624
E5.002	E35	15 Winter	1000	+0%	1/15 Summer				38.020	0.970
E5.003	E54	15 Winter	1000	+0%	100/15 Summer				37.190	0.240
E8.000	E25	120 Winter	1000	+0%					37.140	-0.100
E9.000	E58	120 Winter	1000	+0%					37.080	-0.100
E9.001	E46	15 Winter	1000	+0%	1000/15 Summer				36.954	0.494
E8.001	E55	15 Winter	1000	+0%	1000/15 Summer				37.057	0.017
E4.001	E86	15 Winter	1000	+0%	30/15 Summer				37.113	0.338

20 East Sands
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Apex Plaza, Reading
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Network 2018.1

1000 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
E1.000	E30	0.000	0.39	18.9		OK	
E1.001	E32	0.000	0.70	18.7		OK	
E1.002	E82	0.000	1.06	17.6	SURCHARGED		
E2.000	E36	0.000	0.00	0.0		OK	
E1.003	E85	0.000	1.20	16.9	SURCHARGED		
E3.000	E56	0.000	0.76	16.9		OK	
E1.004	E87	0.000	0.88	31.8		OK	
E4.000	E84	0.000	1.18	17.9	SURCHARGED		
E5.000	E22	0.013	0.53	17.3	FLOOD		1
E6.000	E24	6.102	0.79	24.4	FLOOD		11
E5.001	E31	0.000	1.88	26.6	FLOOD RISK		
E7.000	E90	13.991	0.73	11.3	FLOOD		36
E7.001	E91	23.771	0.94	11.8	FLOOD		31
E5.002	E35	0.000	2.54	12.8	SURCHARGED		
E5.003	E54	0.000	0.80	14.4	SURCHARGED		
E8.000	E25	0.000	0.00	0.0	OK		
E9.000	E58	0.000	0.00	0.0	OK		
E9.001	E46	0.000	0.03	0.1	SURCHARGED		
E8.001	E55	0.000	0.03	0.8	SURCHARGED		
E4.001	E86	0.000	1.87	69.2	SURCHARGED		

8. Background SuDS information

SuDS control surface water runoff close to where it falls. SuDS are designed to replicate, as closely as possible, the natural drainage from the Site before development to ensure that the flood risk downstream does not increase as a result of the Site being developed, and that the Site will have satisfactory drainage under current and likely future climatic conditions. SuDS provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban runoff at source; and combine water management with green space with benefits for amenity, recreation and wildlife. Government planning policy and planning decisions now include a presumption in favour of SuDS being used for all development Sites, unless they can be shown to be inappropriate.

For general information on SuDS see our web site: <http://geosmartinfo.co.uk/>

Infiltration SuDS

Government policy for England is to introduce sustainable drainage systems (SuDS) via conditions in planning approvals. Guidance indicates that capturing rainfall runoff on site and infiltrating it into the ground (infiltration SuDS) is the preferred method for managing surface water without increasing flood risk downstream.

The greatest benefit to general flood risk is if all runoff is infiltrated on site, however, this may not be feasible due to physical and economic constraints in which case infiltration may be considered as a part of an integrated drainage solution. The final design capacity for an infiltration SuDS system depends on the site constraints and the requirements of the individual Planning Authority and the Lead Local Flood Authority.

The capacity of the ground to receive infiltration depends on the nature, thickness and permeability of the underlying material and the depth to the high groundwater table. The final proportion of the site drained by infiltration will depend on topography, outfall levels and a suitable drainage gradient. It is important to note that, even if the whole site cannot be drained by infiltration, the use of partial infiltration is encouraged, with the remainder of runoff discharged via other SuDS systems.

Types of infiltration SuDS

Infiltration components include infiltration trenches, soakaways, swales and infiltration basins without outlets, rain gardens and permeable pavements. These are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

An infiltration trench is usually filled with permeable granular material and is designed to promote infiltration of surface water to the ground. An infiltration basin is a dry basin or depression designed to promote infiltration of surface water runoff into the ground. Soakaways are the most common type of infiltration device in the UK where drainage is often connected to over-sized square or rectangular, rubble-filled voids sited beneath lawns. According to the guidance in Building Research Establishment (BRE) Digest 365 (2016) a soakaway must be able to discharge 50% of the runoff generated during a 1 in 10 year storm event within 24 hours in readiness for subsequent storm flow. This is the basic threshold criteria for a soakaway design and the internal surface area of the proposed soakaway design

options should be calculated on this basis by taking into account the soil infiltration rate for the Site.

Developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any machinery access required.

SuDS maintenance and adoption

Regular maintenance is essential to ensure effective operation of the SuDS features over the intended lifespan of the proposed development. A maintenance schedule for SuDS is required. Sewerage undertakers or Local Authorities may adopt SuDS and will require maintenance issues to be dealt with in accordance with their Management Plan. If the SuDS will not be adopted other provision is required with associated financial implications. Maintenance is a long-term obligation requiring the upkeep of all elements of the SuDS, including mechanical components (e.g. pumps), as well as inspections, regular maintenance and repair.

Additional background SuDS information can be found on our website:

<http://geosmartinfo.co.uk/>

9. Further information

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client, and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, GeoSmart may, by prior written agreement, agree to such release, provided that it is acknowledged that GeoSmart accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. GeoSmart accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against GeoSmart except as expressly agreed with GeoSmart in writing.

Further information

Information on confidence levels and ways to improve this report can be provided for any location on written request to info@geosmart.co.uk or via our website. Updates to our model are ongoing and additional information is being collated from several sources to improve the database and allow increased confidence in the findings. Further information on groundwater levels and flooding are being incorporated in the model to enable improved accuracy to be achieved in future versions of the map. Please contact us if you would like to join our User Group and help with feedback on infiltration SuDS and mapping suggestion.

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Ltd is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom,
- sets out minimum standards which firms compiling and selling search reports have to meet,
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals,
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services, and
- by giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports,
- act with integrity and carry out work with due skill, care and diligence,
- at all times maintain adequate and appropriate insurance to protect consumers,
- conduct business in an honest, fair and professional manner,
- handle complaints speedily and fairly,
- ensure that products and services comply with industry registration rules and standards and relevant laws, and
- monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury

Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

Please ask your search provider if you would like a copy of the search code

GeoSmart Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly.

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk. We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

Complaints should be sent to:

Alan White
Operations Manager
GeoSmart Information Limited
Suite 9-11, 1st Floor,
Old Bank Buildings,
Bellstone,
Shrewsbury,
SY1 1HU
Tel: 01743 298 100
alanwhite@geosmartinfo.co.uk

10. Terms and conditions, CDM regulations and data limitations

Terms and conditions can be found on our website:

<http://geosmartinfo.co.uk/terms-conditions/>

CDM regulations can be found on our website:

<http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/>

Data use and limitations can be found on our website:

<http://geosmartinfo.co.uk/data-limitations/>