FERNBROOK
CONSULTING ENGINEERS

Sustainable Drainage Strategy

10a & 10b Burwell Road, Stevenage

April 2022

Prepared for

S J M and Co Ltd

Sustainable Drainage Strategy
10a & 10b Burwell Road, Stevenage

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1. Introduction

1.1 Fernbrook Consulting Engineers has been appointed by S J M and Co to provide a Sustainable Drainage Strategy for the proposed residential development at 10a and 10b Burwell Road, Stevenage.

1.2 This report has been prepared with reference to the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG), the Local Flood Risk Management Strategy, the Non-Statutory Technical Standards for Sustainable Drainage Systems and CIRIA C753 The SuDS Manual.

Site Characteristics

1.3 Refer to **Table 1-1** below for the site details and the site location plan shown in **Figure 1-1** below.

Table 1-1 Site Details

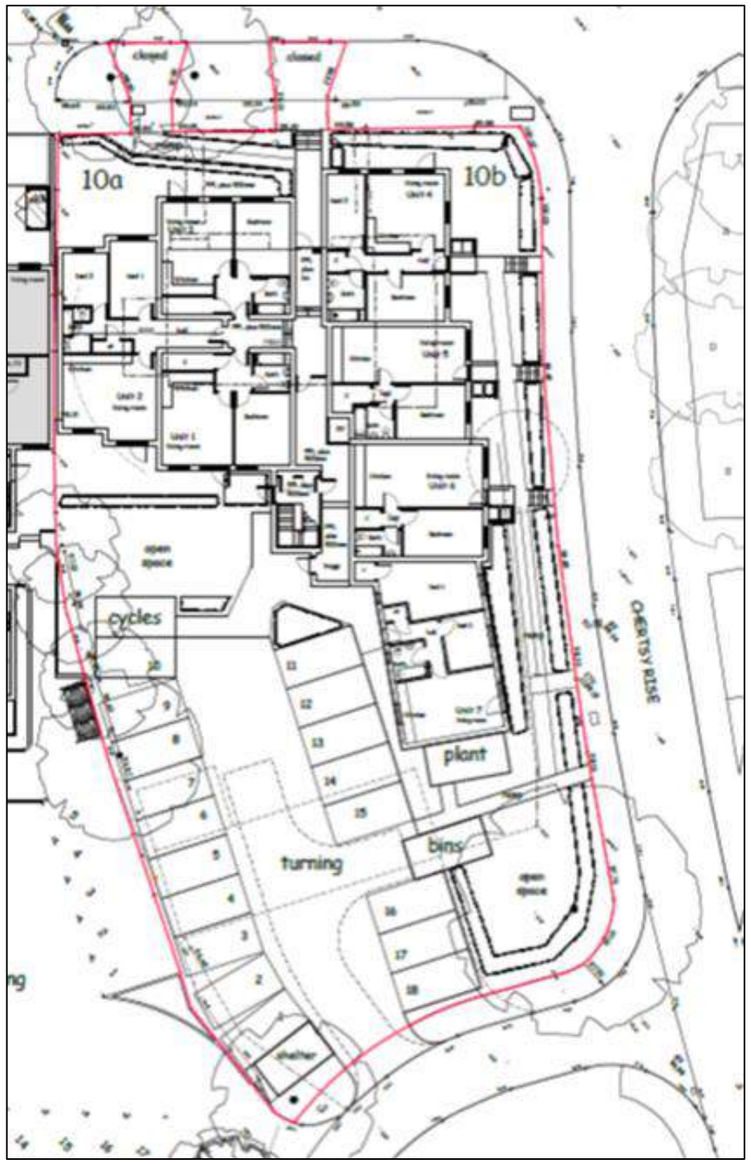
Site Address	**10a & 10b Burwell Road, Stevenage, SG2 9RF**
Grid reference	526005mE, 223680mN (TL 26005 23680)
Site Area	0.153 ha
Existing Use	Residential
Boundaries	North – Burwell Road
	East – Chertsey Rise
	South – Residential / Access road
	West – Burwell Court (Residential)
Access	Chertsey Rise

Figure 1-1 Site Location Plan

Development Proposals

1.4 The development proposals are comprised of the provision of up to 20no. residential units with access from Chertsey Rise. An excerpt of the proposed development plan is included in **Figure 1-2** below, and the full plan is included in **Appendix A**.

Figure 1-2 Proposed Development Plan



2. Policy Review

National Planning Policy Framework

2.1 The National Planning Policy Framework (NPPF) sets out policies to ensure that flood risk is considered during the planning process to prevent inappropriate development in areas at risk of flooding and to direct development away from areas at high risk. The Planning Practice Guidance is the online technical guidance to the NPPF, providing guidance and links to current documents.

2.2 All land in England and Wales is classified into three main Flood Zones, which refer to the probability of river or sea flooding (ignoring the existence of defences). The three Flood Zones are:

- Flood Zone 1 (Low Probability) – less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%);
- Flood Zone 2 (Medium Probability) – having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) in any year or having between a 1 in 200 and 1 in 1000 annual probability of sea flooding in any year (0.5% - 0.1%);
- Flood Zone 3a (High Probability) – having a 1 in 100 or greater annual probability of river flooding (≥1%) or having a 1 in 200 or greater annual probability of sea flooding (≥0.5%);
- Flood Zone 3b (the Functional Floodplain) – having a 1 in 20 or greater annual probability of river flooding. The zone comprises land where water flows to be stored in times of flood.

2.3 The NPPF states that "inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

Flood and Water Management Act

2.4 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with the UK Government's response to Sir Michael Pitt's Review of the Summer 2007 floods.

2.5 The Lead Local Flood Authority (LLFA) for the site is Hertfordshire County Council. All LLFAs have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from surface run-off, groundwater and ordinary watercourses (i.e. non-main rivers).

2.6 Relevant to any site, the FWMA will encourage the uptake of sustainable drainage systems (SuDS) by removing the automatic right to connect to sewers and providing for Lead Local Flood Authorities to adopt SuDS for new developments.

2.7 The development proposals will adhere to the Act through the provision of SuDS as a fundamental element of the surface water drainage system. Furthermore, the developer is committed to work with the relevant stakeholders, such as the EA and Hertfordshire County Council (as LLFA), in implementing the requirements of the FWMA where necessary.

Sustainable Drainage Systems: Non-statutory technical standards

2.8 The Non-statutory technical standards for sustainable drainage systems were published in March 2015. This document sets out non-statutory technical standards for sustainable drainage systems. They should be used in conjunction with the Planning Practice Guidance (PPG).

2.9 The LPA may set local requirements for planning permission that have the effect of more stringent requirements than the non-statutory technical standards.

2.10 In addition, SuDS should be designed in accordance with CIRIA 753 SuDS Manual, which represents current best practice.

2.11 The Non-Statutory Technical Standards for Sustainable Drainage Systems: Best Practice Guidance was published by Local Authority SuDS Officer Organisation (LASOO) in July 2015 to provide an interpretation of the technical standard.

HCC's Local Flood Risk Management Strategy 2: 2019-2029, (adopted 18 February 2019)

2.12 The key principles of the Hertfordshire Local Flood Risk Management Strategy 2 are:

1. Taking a risk-based approach to local flood risk management
2. Working in partnership to manage flood risk in the county
3. Improving the LLFAs understanding of flood risk to better inform decision making
4. Supporting those at risk of flooding to manage that risk
5. Working to reduce the likelihood of flooding where possible
6. Ensuring that flood risk arising from new development is managed

2.13 The proposals will comply with the LFRMS by assessing the existing flood risk to ensure that flood risk is not increased on site or elsewhere. The surface water management strategy will be designed to take the effects of climate change into account and provide sustainable drainage systems to manage water contribute to reducing existing flood risk within the local area.

3. Baseline Conditions

Topography

3.1 Based on the Topographical survey by SJ Geomatics, the site appears to fall north to south from a high point of 99.93m in the north to a low point of 95.55m in the south. Refer to **Appendix B** for the Site Survey drawing.

Geology

3.2 Based on the British Geology Survey (BGS) online data, the site appears to be underlain by Lowestoft Formation (Diamicton) over Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated). Refer to **Figure 3-1** and **Figure 3-2** below for excerpts of the BGS maps.

Figure 3-1 Superficial Deposits

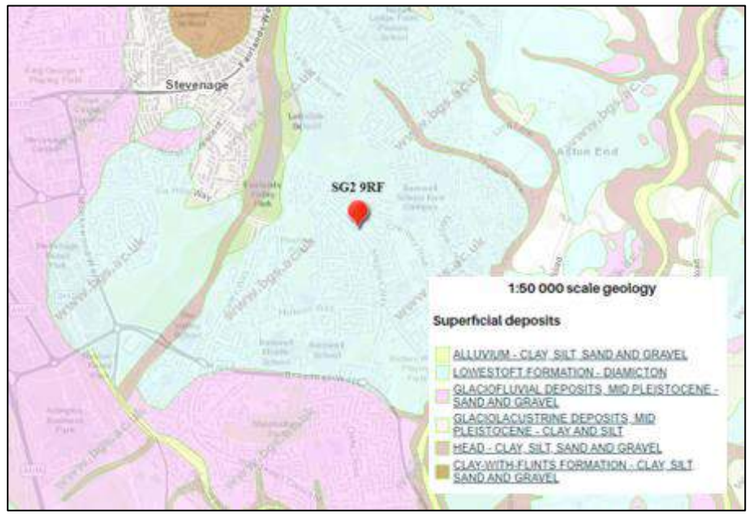
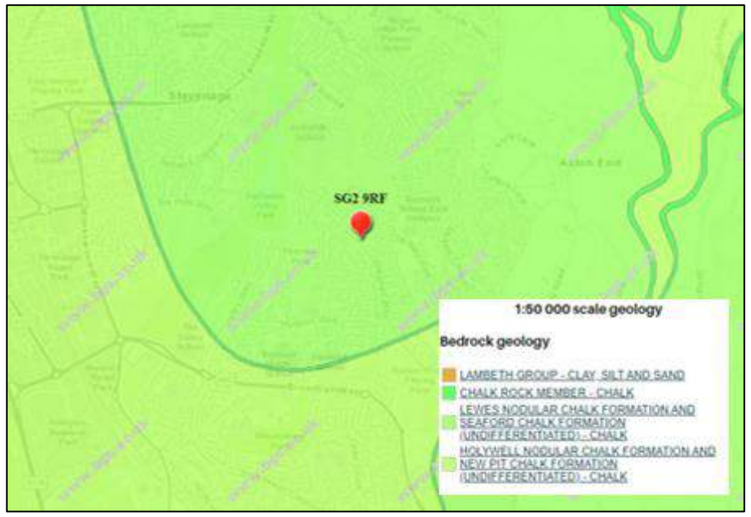


Figure 3-2 Bedrock Geology



3.3 A site investigation for the March Hare Site to the west of the site confirmed that the local area is underlain by Clay over Chalk. Refer to **Appendix C** for historic borehole records.

3.4 Based on Defra's Magic Map application, the site is not located within a Source Protection Zone. Refer to **Figure 3-3** below.

Figure 3-3 Source Protection Zone

Hydrology

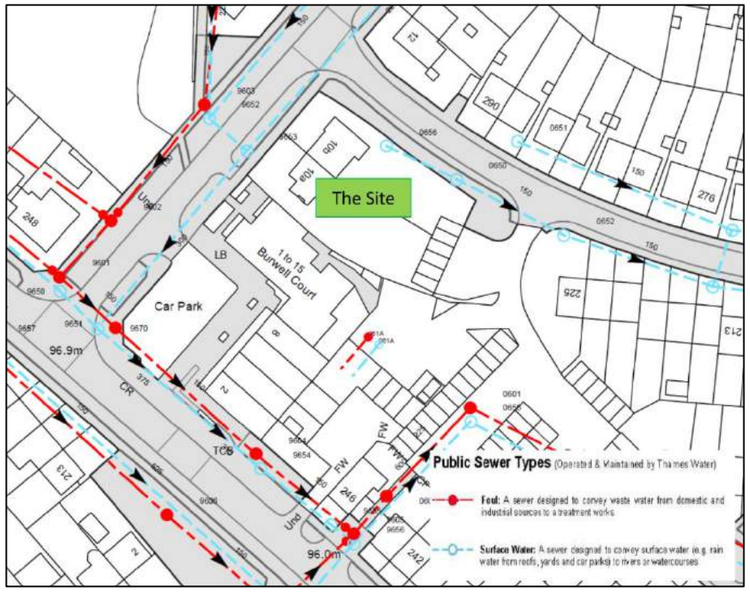
3.5 There are no watercourses or waterbodies in close proximity to the site.

Existing Sewer Infrastructure

3.6 Based on the Thames Water sewer records there appears to be a 225mm diameter surface water sewer conveying flows along the southside footway of Burwell Road and a 150mm diameter surface water sewer conveying flows southbound along the site's east boundary.

3.7 There also appears to be surface water and foul sewers south of the site serving the residential units at Burwell Court. Refer to **Figure 3-4** below and **Appendix D** for Thames Water sewer records.

Figure 3-4 Anglian Water Sewer Record Extract



4. Surface Water Management

4.1 This section of the report seeks to provide greater detail on the drainage proposals to demonstrate that surface water can be management without increasing flood risk on site or elsewhere.

4.2 This surface water drainage strategy has been developed based on the Non-statutory Technical Guidance for Sustainable Drainage Systems and CIRIA Guidance C753 "The SuDS Manual", Hertfordshire County Council (HCC) SuDS guidance, and the Environment agency standing advice for groundwater discharge.

4.3 In accordance with the NPPF, the proposed residential development will allow for a 40% increase to rainfall intensity to allow for predicted impacts of climate change on surface water runoff.

Pre-development surface water run-off conditions

4.4 The site is comprised of 2no. residential dwellings. The total site area is 0.153 ha and is comprised of approximately 0.073 ha impermeable area. Based on the proximity of the existing Thames Water surface water sewers it is assumed that runoff is conveyed to the sewer at an unrestricted rate.

4.5 To ensure that pre-development runoff rates are not exceeded, the brownfield runoff rates were calculated. The brownfield rates were determined using the Wallingford procedure rational method for an assumed critical 5-minute storm: Q = 2.78 x C x i x A

Where: Q = Peak discharge (l/s)
C = Dimensionless Runoff coefficient
i = Rainfall intensity (mm/hr)
A = Contributing impermeable areas (ha)

4.6 Refer to **Table 4-1** below for results, and **Appendix E** for calculations.

Table 4-1 Pre-development runoff rates

Rainfall event	Greenfield Runoff rate (l/s)	Brownfield Runoff rate (l/s)
Q1	1.4	10.3
Q30	3.8	22.9
Q100	5.2	29.2

Post-development surface water runoff

4.7 In accordance with the Building Act 2000 Clause H3.3 surface water run off not collected for re-use must be discharged in the following hierarchy:

1) To ground (infiltration techniques);
2) To a surface water body;
3) To a surface water sewer; or
4) To the combined sewer.

4.8 Refer to **Table 4-2** for an assessment of the drainage hierarchy.

Table 4-2 Drainage Hierarchy Assessment

Disposal method	Feasible	Comments
1st) Infiltration	✓	The site appears to be underlain by Chalk.
2nd) Watercourse	×	No watercourses in close proximity to site.
3rd) Surface Water sewer	✓	Thames Water surface water sewers in close proximity to site.
4th) Combined sewer	×	No combined sewers in close proximity

4.9 Based on the drainage hierarchy assessment, the proposed drainage strategy will seek to infiltrate surface water runoff to the Chalk bedrock. This strategy has assumed a conservative infiltration rate of 10^{-6} m/s, to be confirmed at the detailed design stage via in-situ soakaway testing in accordance with BRE 365.

4.10 Therefore, the applicant requests that the requirement to complete infiltration testing is maintained by planning condition worded similarly to the below:

The development hereby permitted shall not commence until details of the design of a surface water drainage scheme have been submitted to and approved in writing by the planning authority. The design must satisfy the SuDS Hierarchy and be compliant with the national Non-Statutory Technical Standards for SuDS, NPPF and Ministerial Statement on SuDS. The required drainage details shall include:

a) the results of infiltration testing completed in accordance with BRE Digest: 365 and confirmation of groundwater levels.

Sustainable Drainage Systems

4.11 The proposed strategy will seek to maximise the use of Sustainable Drainage Systems (SuDS) to increase the biodiversity, provide amenity, control discharge volumes, and manage water quality.

4.12 The opportunities and constraints for the use of SuDS within the site are assessed in **Table 4-3**. The assessment is based on the management train approach outlined in CIRIA C753 "The SuDS Manual".

Table 4-3 SuDS Hierarchy

SuDS Component	Feasible	Comment
Green Roofs	✓	Sedum roofs will be maximised across flat roof areas, including bin stores and cycle shelters.
Swales	✗	Unfeasible due to spatial constraints.
Ponds / Basins	✗	This is a narrow site with limited space for ponds close to the outfall / lowest part of the site.
Permeable Surfacing	✓	Opportunities to utilise permeable paving will be maximised in parking areas to improve the water quality of the surface water discharge.
Tanked systems	✓	Should attenuation be required this could be achieved by use of oversized sewers or geo-cellular storage attenuation below the surface.

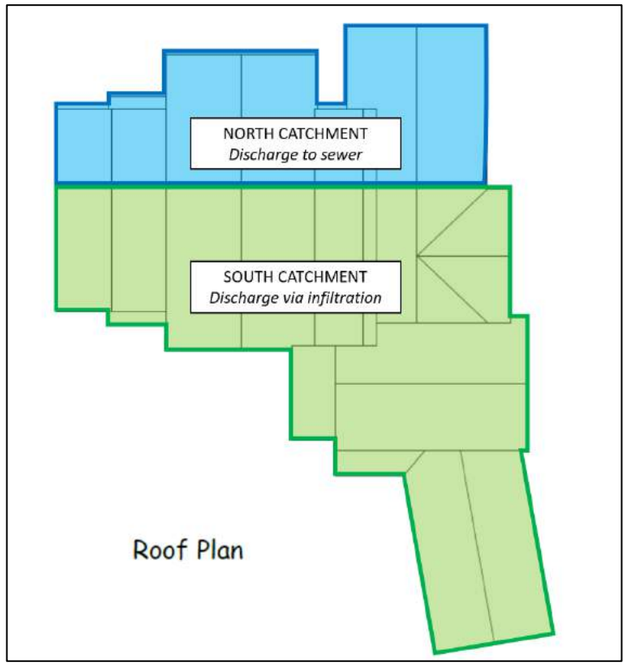
4.13 Based on the SuDS Hierarchy, the most appropriate SuDS for this development are Sedum roofs, permeable paving and tanked systems.

Peak Flow Control

4.14 The proposed drainage will be designed to ensure that flooding does not occur on any part of the site for the 1 in 30 year rainfall event, and any flooding up to the 1 in 100 year plus 40% for climate change will be contained on site within the parking area.

4.15 The site area is 0.153 ha and post-development impermeable areas on site will be 0.106 ha (69% PIMP overall). Due to the varying levels across the site and proximity of the public sewer, the northern roof areas (184m^2) will be drained to the existing sewer in Burwell Road. Refer to **Figure 4-1** below for an indicative roof catchment plan and drawing ***21210-MA-XX-XX-DR-C-0510 in Appendix E.***

Figure 4-1 Indicative Roof Catchment Plan



4.16 Runoff from the southern impermeable areas across the site could be managed by conveying flows towards permeable paving with a geo-cellular sub-base in the parking area.

4.17 Therefore, the proposed drainage strategy will seek to restrict the total surface water runoff from the site to a maximum of 8.5 l/s using a flow control device for all events up to the 1 in 100 year plus 40% climate change rainfall event.

4.18 Restricting to greenfield rates would require a small diameter orifice plate or similar flow control device. It is not considered best practice to use small diameter orifices due to the increased flood risk due to potential blockages.

4.19 The peak surface water run-off generated from the Site for the 1 year, 30 year and 100 year rainfall events, for the pre and post-development scenarios, is detailed in **Table 4-4** below.

Table 4-4 Comparison of runoff rates

Return Period	Existing Brownfield Rate (l/s)	Max Rate (l/s)	Reduction
1 in 1 year	10.3	2.6	-75%
1 in 30 year	22.9	5.5	-76%
1 in 100 year	29.2	8.5	-71%
1 in 100 year + 40% CC	-	8.5	-

4.20 In accordance with the Non-statutory Technical Guidance for Sustainable Drainage Systems, the post-development discharge rate does not exceed the rate of discharge from the development prior to redevelopment.

4.21 Thames Water has been consulted on the proposals under Pre-planning enquiry **ref. DS6091986**.

Storage Requirements

4.22 Runoff from the southern catchment would be conveyed to permeable paving in the parking area. The permeable paving sub-base will be lined with a permeable geotextile to allow surface water to infiltrate to the anticipated chalk bedrock. Refer to **Figure 4-2** for an indicative illustration of permeable paving with a geo-cellular sub-base.

Figure 4-2 Permeable Paving with Geo-cellular sub-base

4.23 The proposed sub-base would be 300mm deep with a total volume of 94m^3 (95% void ratio). The base of the soakaway will be a minimum of 1m above existing groundwater levels. Based on local geotechnical investigations, no groundwater is expected within 5m bgl.

4.24 Refer to **Table 4-5** for the basin volumes and **Appendix E** for drawing ***21210-MA-XX-XX-DR-C-0500*** illustrating how the Site could be drained, accompanied by MicroDrainage calculations.

Table 4-5 Soakaway Volumes and Half-drain times

Return period	Volume (m^3)	Half-drain time (mins)	Water Depth (mm)
1 in 1 year	16	1392	50
1 in 30 year	38	1968	120
1 in 100 year + 40% CC	74	3792	120

Alternative Drainage Strategy

4.25 To mitigate the potential that infiltration is unfeasible, an alternative drainage strategy has been considered following the drainage hierarchy based on discharging to the existing Thames Water sewer in Chertsey Rise.

4.26 This alternative strategy would seek to attenuate surface water runoff in the permeable paving sub-base which would be lined with an impermeable geotextile. Surface water would be restricted to a maximum of 10.1 l/s for all events up to the 1 in 100 year + 40% climate change rainfall event using an orifice flow control. This is equivalent to the 1 in 1 year brownfield runoff rate. Refer to **Table 4-6** below for a comparison of runoff rates.

Table 4-6 Comparison of runoff rates

Return period	Existing Runoff (l/s)	Proposed Runoff Rate (l/s)			Reduction
		North Catchment	South Catchment	Total	
1 in 1 year	10.3	2.6	0.4	3.0	-71%
1 in 30 year	22.9	5.5	0.7	6.2	-73%
1 in 100 year + 40% CC	40.9	8.5	1.6	10.1	-75%

4.27 Refer to **Table 4-7** for the Attenuation volumes and **Appendix F** for drawing ***21210-MA-XX-XX-DR-C-0505*** illustrating how the Site could be drained, accompanied by MicroDrainage calculations.

Table 4-7 Attenuation Volumes and Half-drain times

Return period	Proposed Runoff Rate (l/s)	Volume (m^3)	Half-drain time (mins)
1 in 1 year	3.0	13	704
1 in 30 year	6.2	28	520
1 in 100 year + 40% CC	10.1	49	648

Urbanisation & Long Term Storage

4.28 Based on the development proposals, it is unlikely that the building would be extended. Therefore, urban creep has not been considered.

4.29 The proposed strategy will infiltrate surface water runoff, therefore there is no requirement to provide long term storage.

Overland Flow Routes

4.30 The proposed surface water drainage network within the Site will be designed to contain the critical duration of 1 in 30 year return period storm. Any flooding for up to the critical 1 in 100 year return period storm with a 40% allowance for climate change shall be conveyed southbound away from buildings towards the parking area.

4.31 The site will be designed so that exceedance flows above the 1 in 100 year, including climate change rainfall event will be conveyed southbound towards Chertsey Rise. Refer to drawing ***21210-MA-XX-XX-DR-D-0515*** for the Indicative Overland Flow Routes in **Appendix E**.

Water Quality Management

4.32 SuDS will be provided to form a management train in line with the best practice. Source control techniques including sedum roofs and permeable paving could be provided within the catchments to manage runoff and reduce the time of concentration within the pipe network, reducing the risk of sewer surcharge and flash flooding, and provide water quality benefits.

4.33 In line with CIRIA C753 The SuDS Manual, Tables 26.2 and 26.3, the pollution hazards indices associated with a residential development are mitigated by the proposed SuDS. The recommended stages of treatment in terms of water quality would be provided through the permeable paving with an infiltration blanket below.

4.34 Refer to **Table 4-8** below for the Simple Index Method assessment, and **Appendix G** for Mitigation data.

Table 4-8 Simple Index Method

Pollution Hazard Indices			
Pollution hazard	**TSS**	**Metals**	**Hydrocarbons**
Low – Residential	0.50	0.40	0.40
Pollution Mitigation Indices provided			
SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Permeable Paving	0.70	0.60	0.70
Infiltration Blanket	0.20	0.20	0.20
Total	***0.90***	***0.80***	***0.90***
Check	***+0.40***	***+0.40***	***+0.50***

Maintenance

4.35 The maintenance of all SuDS components will be in accord with the best practices and the CIRIA C753 The SuDS Manual.

4.36 Thames Water would be unlikely to adopt a drainage network based on infiltration via permeable paving with a geo-cellular sub-base. Therefore, the drainage will likely be maintained privately by a management company. A management company would likely be financed by a yearly maintenance fee chargeable to residents.

4.37 The recommended Operation and Maintenance requirements for the proposed SuDS are outlined in **Table 4-9**. Refer to **Appendix G** for a recommended SuDS Management Plan.

Table 4-9 SuDS Management Plan

Maintenance Task	Description	Frequency
Regular Maintenance		
Litter management	Pick up all litter in SuDS and landscape areas and remove from site	Monthly
Tree / Grass maintenance	Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ.	As required or monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	Monthly
Hard surfaces	Sweep all paving regularly. Maintain annual vacuum in autumn following leaf fall.	Annually
Occasional tasks		
Inspection and control chambers	Annual inspection, remove silt and check free flow	Annually
Silt management	Inspect catchpits for silt accumulation	Annually
	Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows, spread, rake and overseed.	As required
Remedial work		
Repairs	Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required.	As required

5. Foul Drainage

5.1 It is assumed that foul flows from the 2no. existing dwellings drain to the Thames Water sewers in Burwell Road.

5.2 The proposed drainage strategy will seek to convey foul flows from 20no. residential units to the existing foul sewer to west of the site. The post-development peak flow rate is estimated to be 0.92 l/s.

5.3 Refer to drawing ***21210-FCE-XX-XX-DR-D-0500*** for the Indicative Drainage Strategy illustrating how foul flows could be drained in **Appendix E**.

6. Conclusion

6.1 Fernbrook Consulting Engineers has been appointed by S J M and Co to provide a Sustainable Drainage Strategy for the proposed residential development at Land to the rear of 10a and 10b Burwell Road, Stevenage, SG2 9RF.

6.2 The development proposals are comprised of the provision of up to 20no. residential dwellings with access from Chertsey Rise.

6.3 The proposed drainage strategy will seek to dispose of surface water runoff via infiltration to the underlying chalk geology. If this is unfeasible, the strategy will discharge to the Thames Water sewer in Chertsey Rise at 10.1 l/s for all rainfall events up to the 1 in 100 year rainfall event plus 40% climate change allowance scenario.

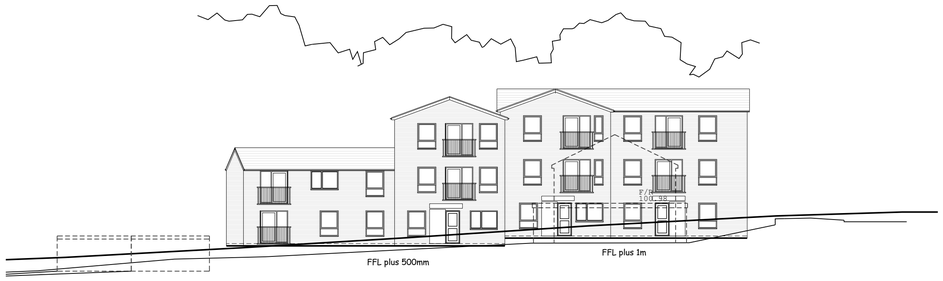
6.4 The drainage strategy will provide 94m^3 attenuation storage within geo-cellular sub-base of the permeable paving.

6.5 Foul flows will be conveyed to the existing foul sewer to the west of the site.

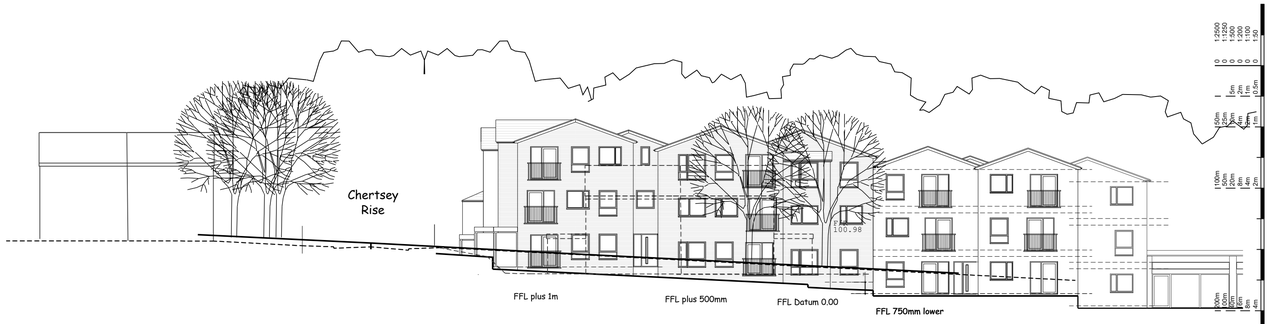
6.6 In conclusion, this report demonstrates that the proposals are consistent with the aims of the NPPF and its Planning Practice Guidance, along with the aims of the Local Flood Risk Management Strategy. Surface water runoff can be adequately managed without increasing the risk of flooding on site or elsewhere.

APPENDIX A – PROPOSED DEVELOPMENT PLAN

info@fernbrook.co



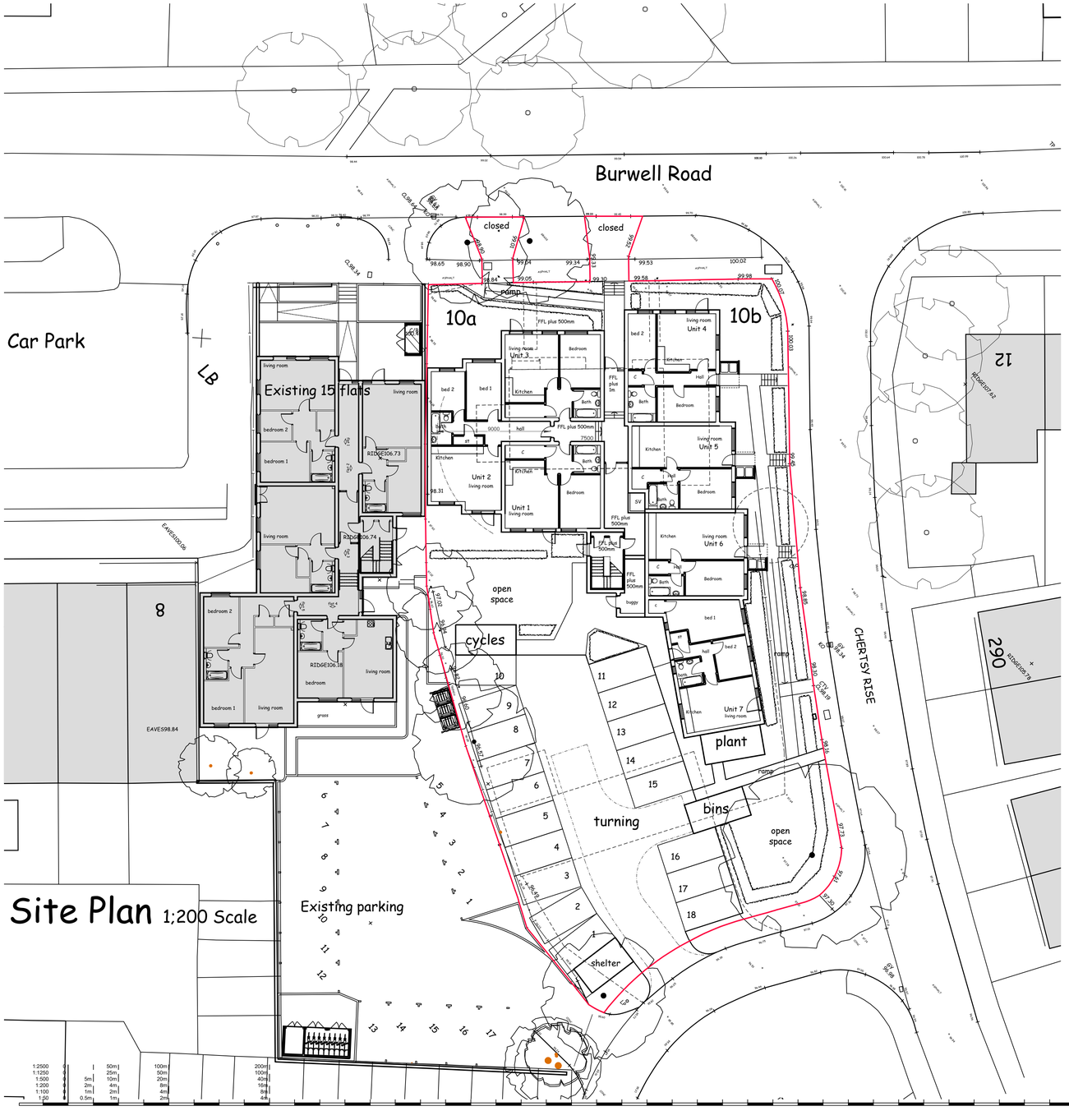
Elevation to Chertsey Rise



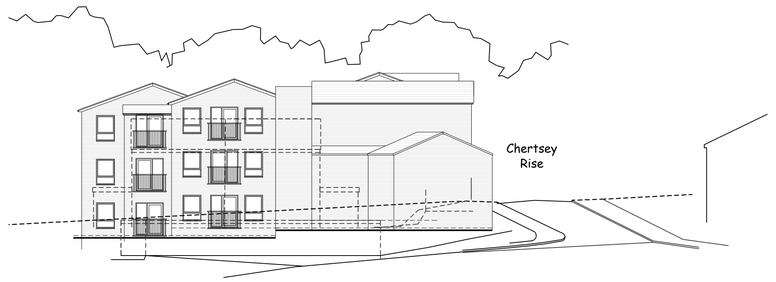
Street Elevation
Burwell Road

Datum 90.00

Elevations 1;200 Scale



Site Plan 1;200 Scale



Rear Elevation (from service road)

Location Plan 1;1250 Scale

notes:

any discrepancies should be reported immediately

all dimensions should be checked on site prior to commencement of work

site/survey based on ordnance survey information provided by prodat systems plc, (www.promap.co.uk) prodat does not guarantee that all past or current uses or features will be identified in the product

the product does not give details about the actual state or condition of the site nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the site for any particular purpose, or relied upon for determining salability or value, or used as a substitute for any physical investigation or inspection.

drawings to be read in accordance with the dwelling emission rate (der/ter) calculation. the building must be built 'as designed' meeting the criteria set for air permeability.

note
when printing off pdf's.
it is the responsibility of the user to verify that the resulting prints are to scale on the appropriate sized sheet.
also that the scale bars on the plan measure correctly.

Date	Description	Rev
March 22	windows	D/E
Jan 22	Topo added	C
Dec 21	Gen	B
May 21	Gen	A

hps Architecture & Planning
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www.hertfordplanning.co.uk

Chartered Institute of Architectural Technologists

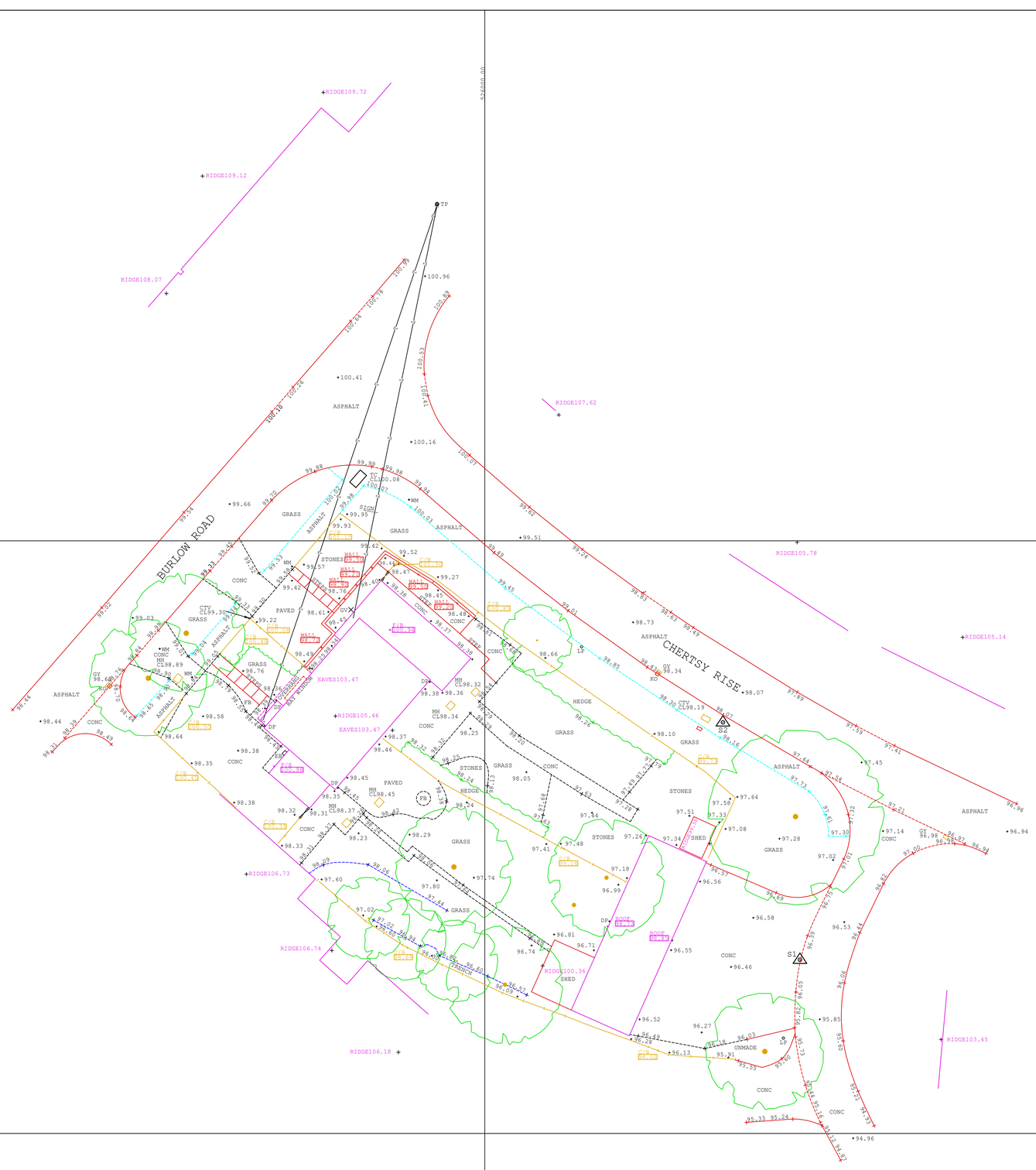
Description

Project	Burwell 10 & 10a Stevenage SG2 9RF
Drawing	General Arrangement
Date	01/04/2022
Scale	1:200
Sheet size	A1
Drawn	mRn

13761-P200-E

APPENDIX B – TOPOGRAPHICAL SURVEY

info@fernbrook.co



Co-ordinate Table				
Station	Type	Easting (mE)	Northing (mN)	Level (mZ)
S1	FM Nail	526026.596	223664.658	96.240
S2	FM Nail	526020.099	223684.684	98.105

SURVEY RELATED TO OSGB36(15) ORDNANCE SURVEY GRID CO-ORDINATES TRANSFORMED FROM ETR89 (WGS84) USING GEIOD MODELS OSGM15/OSTN15

N

Grid North

NOTES

1. GRID AND LEVELS RELATED TO ORDNANCE SURVEY GPS NETWORK
2. ALL LEVELS ON KERB LINES ARE CHANNEL LEVELS UNLESS NOTED OTHERWISE.
3. SERVICE ROUTES HAVE BEEN IDENTIFIED BY LIFTING OF INSPECTION COVERS & VISUAL INSPECTION FROM THE SURFACES.
4. FOR SAFETY REASONS, DRAINAGE PIPE SIZES HAVE BEEN DETERMINED FROM THE SURFACE AND SHOULD BE TREATED AS APPROXIMATE ONLY.
5. DRAINAGE PIPE SIZES ARE DIAMETERS AND ARE SHOWN IN MILLIMETERS.
6. TREE SPECIES SHOULD BE CHECKED BY AN ARBORIST IF CRITICAL.

Revisions	
A	
B	
C	

Drawing No: SJG3870 — Revision: - — Sheet: 1/1

Surveyed By:-	Drawn By:-	Checked By:-	Sheet Size	Date
MJ	MJ	SJ	A1	23/12/2021

Client:-
Clovercourt Ltd.

Scale:- 1:200

Project:-
10a & 10b Burwell Road, Stevenage.

SYMBOLS

Banking
Hedge
Tree
Bush
Gate
O/H Electric
O/H Telecom
S1 Control Station

LEGEND

AV	Air Valve	MH	Manhole
BD	Bollard	MK	Marker
BH	Borehole	NP	Name Plate
CB	Cable Box	O/H	Overhead
CHY	Chimney	OSBM	Ordnance Bench Mark
CL	Cover Level		
CONC	Concrete	P	Post Or Pillar
CTV	Cable TV	PM	Parking Meter
DK	Drop Kerb	RE	Rodding Eye
DP	Down Pipe	RS	Road Sign
DR	Drain	SAP	Sapling
ELC	Electricity	SC	Stop Cock
EP	Elec.Pole	SL	Sump Level
ER	Earth Rod	ST	Stop Tap
FB	Flower Bed	SV	Sluice Valve
FH	Fire Hydrant	TAR	Tarmac
FP	Footpath	TC	Telecom Cover
GY	Gully	TCB	Telephone Call Box
GP	Gate Post	TL	Traffic Lights
GV	Gas Valve	TP	Telegraph Pole
IC	Inspec. Cover	TV	Television Box
IL	Invert Level	UTL	Unable to lift
JB	Junction Box	VP	Vent Pipe
KO	Kerb Outlet	WL	Water Level
LB	Letter Box	WM	Water Meter
LP	Lamp Post	WO	Wash Out

FENCE TYPES

B/W	Barbed Wire	C/P	Chestnut Paling
C/B	Close Boarded	I/R	Iron Railing
C/I	Corrugated Iron	I/W	Interwoven
C/L	Chainlink	P/R	Post & Rail
		P/S	Palisade
		P/W	Post & Wire

BOX AROUND LEVEL INDICATES LEVEL AT TOP OF FEATURE

SURVEYED BY:-

SJ GEOMATICS SURVEYORS

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IP19 8AR
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Company Registration Number 8081329

APPENDIX C – LOCAL GEOTECHNICAL DATA

info@fernbrook.co

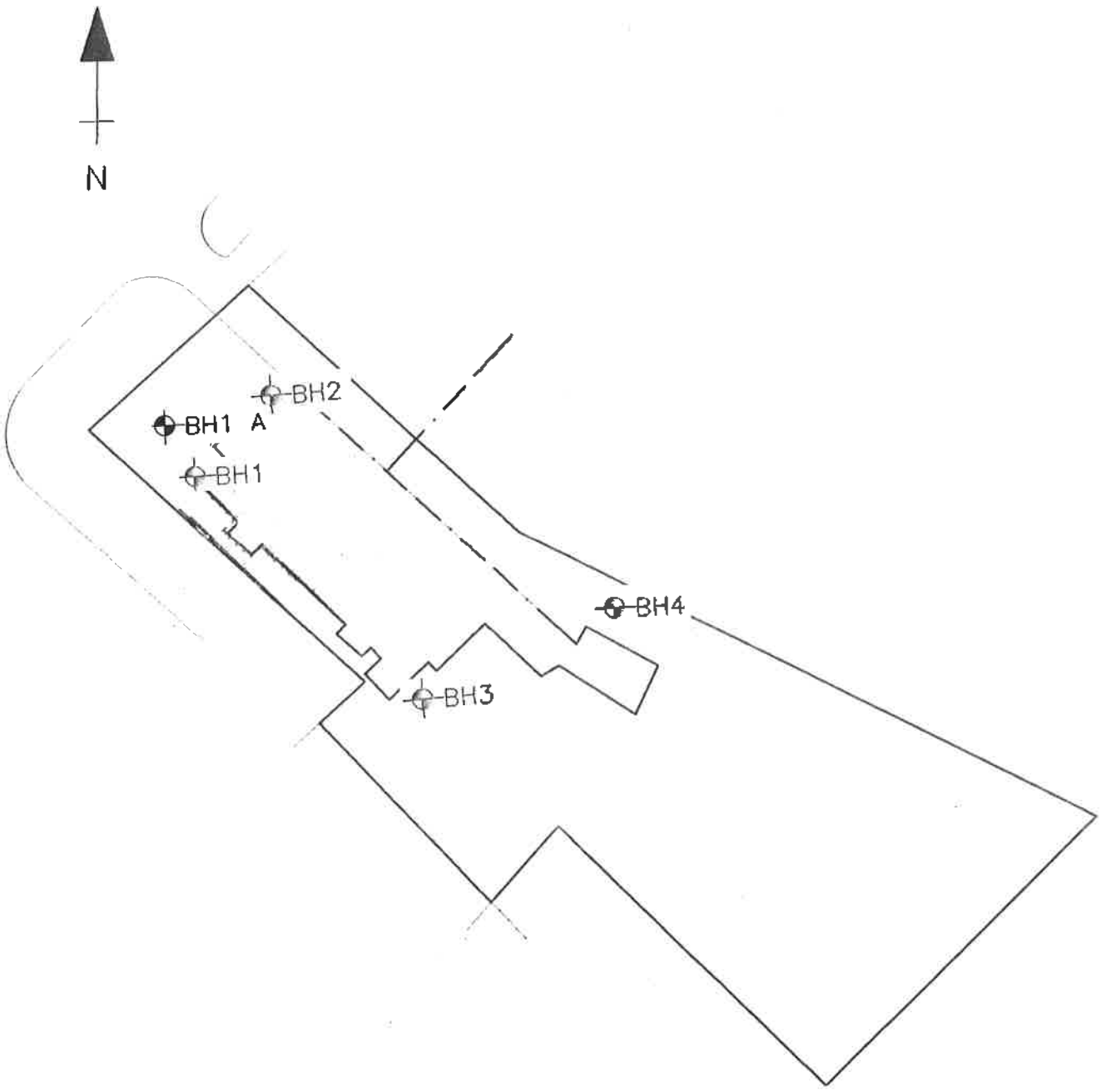
HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon, Ware, Herts SG11 1NJ
Telephone: Ware (01920) 822233
Fax: Ware (01920) 822200

Appendix No.	1
Sheet No.	1
Job No.	13618
Date	May 2017

March Hare Site, 10 Burwell Road, Stevenage, SG2 9RF

Site Plan



Not to Scale

HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon, Ware, Herts SG11 1NJ
Telephone: Ware (01920) 822233
Fax: Ware (01920) 822200

Appendix No. 2
Sheet No. 2
Job No. 13618
Date May 2017

March Hare Site, 10 Burwell Road, Stevenage, SG2 9RF

Borehole One A

Description of Strata	Depth	Reduced Level	Legend	Thickness (m)	Water Level	Samples No.	Samples Type	Samples Depth (m)	S.P.T N-Value or Vane Strength	Casing Depth (m)
Sandy Brick Rubble FILL	0.70			0.70	DRY	1	U	0.00		
Stiff Orange Brown Very Chalky Sandy CLAY With Occassional Flints	1.50			0.80		2	U	1.00	N=26	1.00
White Moderatley Weathered Weak CHALK	5.00			3.50		3	U	2.00	N=9	
						4	U	3.00	N=14	
								4.00	N=10	
Borehole Complete At 5.00m										

Remarks:

Scale 1:50

Key : U–Undisturbed Sample (100mm diameter) B –Bulk Sample ▼–Water Struck D –Disturbed Sample ▽–Water Standing W–Water Sample P–Piston Sample N=S.P.T. N=Value V=Vane Strength (kN/m²)

HERTS & ESSEX SITE INVESTIGATIONS

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Appendix No. 2
Sheet No. 4
Job No. 13618
Date May 2017

March Hare Site, 10 Burwell Road, Stevenage, SG2 9RF

Borehole Three

Description of Strata	Depth	Reduced Level	Legend	Thickness (m)	Water Level	Samples No.	Samples Type	Samples Depth (m)	S.P.T N-Value or Vane Strength	Casing Depth (m)
Sandy Topsoil	0.20			0.20	DRY	1	U	0.00		
Firm brown Sandy CLAY With Occassional Flints	0.90			0.70						
Stiff Orange Brown Very Chalky Sandy CLAY With Occassional Flints	2.10			1.20		2	U	1.00	N=29	1.00
Medium Dense FLINT Band	2.20			0.10		3	U	2.00	N=21	
White Moderatley Weathered Weak CHALK	5.00			2.80		4	U	3.00	N=9	
								4.00	N=7	
Borehole Complete At 5.00m										

Remarks:

Scale 1:50

Key : U–Undisturbed Sample (100mm diameter) B –Bulk Sample ⧗ –Water Struck D –Disturbed Sample ⧖ –Water Standing W–Water Sample P–Piston Sample N–S.P.T. N–Value V–Vane Strength (kN/m²)

HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon, Ware, Herts SG11 1NJ
Telephone: Ware (01920) 822233
Fax: Ware (01920) 822200

Appendix No. 2
Sheet No. 5
Job No. 13618
Date May 2017

March Hare Site, 10 Burwell Road, Stevenage, SG2 9RF

Borehole Four

Description of Strata	Depth	Reduced Level	Legend	Thickness (m)	Water Level	Samples No.	Samples Type	Samples Depth (m)	S.P.T N-Value or Vane Strength	Casing Depth (m)
Brick Rubble FILL	0.20			0.20	DRY	1	U	0.00		
Stiff Orange Brown, Very Chalky Sandy CLAY With Occassional Flints				1.70		2	U	1.00	N=27	1.00
	1.90					3	U	2.00	N=15	
White Moderatley Weathered Weak CHALK				3.10		4	U	3.00	N=10	
	5.00							4.00	N=10	
Borehole Complete At 5.00m										

Remarks:

Scale 1:50

Key : U–Undisturbed Sample (100mm diameter) B –Bulk Sample ▼–Water Struck D –Disturbed Sample ▽–Water Standing W–Water Sample P–Piston Sample N–S.P.T. N–Value V–Vane Strength (kN/m²)

APPENDIX D – THAMES WATER CORRESSPONDENCE

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4554059

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 526007,223674

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0858	106.22	104.92
9853	107.63	106.51
9854	107.55	105.53
8850	107.68	106.09
0853	107.15	105.18
0854	107.1	104.45
0852	107.25	105.32
9852	108.09	106
9855	108.22	106.4
9851	108.21	106.28
0855	106.9	104.87
0851	107.9	106.58
0850	108.26	n/a
9850	108.46	107.18
9955	108.63	106.69
9954	108.8	107.55
9953	n/a	n/a
161A	n/a	n/a
1758	n/a	n/a
1754	99.49	97.92
1701	100.16	98.25
1755	100.4	97.51
1751	100.87	99.32
1753	99.91	99.02
1703	n/a	n/a
171A	n/a	n/a
1752	102.24	100.5
1757	n/a	n/a
1702	n/a	n/a
1756	103.44	101.56
1750	104.01	102.61
1852	104.9	103.32
1853	104.9	103.19
1801	104.91	103.65
1851	105.56	104.51
0856	106.11	103.99
181A	n/a	n/a
1803	n/a	n/a
1802	n/a	n/a
1850	106.79	105.26
1901	105.8	104.86
8705	99.2	96.85
8704	99.11	97.84
9751	105.83	104.03
9753	103.55	102.03
9752	103.96	101.86
9750	105.67	104.5
9603	99.37	98.37
9652	99.11	97.44
9755	n/a	n/a
971A	n/a	n/a
971B	n/a	n/a
9701	n/a	n/a
9756	106.18	104.6
9702	n/a	n/a
9754	101.92	100.75
0756	105.31	104.03
0701	103.07	102.39
0751	103.35	102.14
0750	103.78	102.27
0752	103.33	101.46
0651	98.1	97.23
0702	n/a	n/a
0755	105.11	n/a
0754	n/a	n/a
0859	106.04	104.26
071A	n/a	n/a
0753	102.49	101.05
0857	105.94	103.74
2601	97.67	95.65
2650	98.74	96.69
2501	89.98	88.15
2602	98.37	96.24
1556	95.25	93.27
1652	96.3	n/a
1553	92.03	91.18
1504	92.13	90.56
1602	n/a	n/a
1501	91.99	90.25
1653	95.81	92.88
1550	91.78	n/a
1502	91.63	89.94
1551	91.55	90.52
1508	91.51	89.73
1503	91.53	89.67
1657	93.29	91.99
1555	n/a	n/a
1559	n/a	n/a
1552	91.43	90.88
1509	91.56	90.81
1560	91.44	90.54

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1608	n/a	n/a
1606	95.31	92.87
1605	96.47	93.69
1654	96.12	93.33
1554	90.94	89.68
1655	96.51	94.12
1604	96.71	95.19
1603	96.68	95.28
2657	96.72	94.43
0502	98.37	96.81
0553	97.87	96.34
051B	n/a	n/a
0501	99.28	97.95
0552	97.38	95.87
0550	93.89	92.38
1505	93.33	91.74
9502	n/a	n/a
9550	96.55	94.2
9501	96.63	95.14
0551	93.45	n/a
0602	93.67	90.9
9656	95.96	92.76
9605	95.71	92.37
9655	96.32	93.69
0603	95.36	92.19
0655	94.59	92.31
0601	94.67	91.86
061A	n/a	n/a
961A	n/a	n/a
1601	95.06	92.99
1651	95.68	93.44
0654	96.3	94.19
1650	96.84	95.63
0652	n/a	n/a
0653	96.91	94.62
1607	n/a	n/a
0650	98.05	96
0656	n/a	n/a
8452	103.78	102.06
8454	103.92	102.49
9452	101.59	99.84
9451	103.95	102.3
9454	n/a	n/a
9450	103.56	102.4
9453	101.55	100.45
851B	n/a	n/a
851A	n/a	n/a
9555	102.07	n/a
8555	n/a	n/a
9503	100.26	98.32
9551	100.04	97.6
9552	99.44	97.09
9504	99.4	97.56
9553	98.9	96.45
9554	98.81	97.36
9606	96.65	95.4
9654	96.29	93.93
9604	96.04	93.72
9657	97.3	94.43
9651	97.08	94.83
9670	n/a	n/a
9607	97.31	95.81
9650	97.17	95.05
9601	97.25	94.21
8606	n/a	n/a
9602	97.67	94.96
9653	98.89	96.66
0405	98.9	97.48
0453	97.02	n/a
2401	91.05	89.09
0454	99.47	97.62
0404	99.81	98.48
0452	97.29	95.56
0403	98.99	97.75
0451	99.63	98.12
0402	97.88	96.25
1452	94.52	93.32
0401	97.69	96.42
0450	97.6	n/a
1450	91.59	90.64
2451	90.82	89.32
2452	89.99	88.56
2450	90.94	89.62
2550	89.97	88.69
8855	103.73	102.78
7852	103.89	101.5
8802	n/a	n/a
7853	103.72	101.65
7851	103.93	102.15
7850	104.38	102.45
7901	n/a	n/a
8955	104.76	103.31
7951	106.11	104.09

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8953	105.81	n/a
781A	n/a	n/a
7751	102.51	99.23
7703	n/a	n/a
7750	102.24	99.13
8756	101.21	98.75
8707	n/a	n/a
8706	101.07	99.3
8751	102.1	98.83
8702	101.02	99.49
8701	100.79	99.34
8851	104.26	100.68
8853	104.08	100.03
8854	104.23	100.18
8852	104.12	100.55
871A	n/a	n/a
8755	n/a	n/a
8856	104.71	102.37
8801	105.44	102.2
8752	99.57	97.55
8750	103.67	102.55
7605	n/a	n/a
7606	n/a	n/a
7653	102.2	100.23
7652	101.87	99.74
7651	101.76	99.03
7602	101.79	99.83
761B	n/a	n/a
7601	101.56	n/a
8605	101.85	98.83
8604	n/a	n/a
8603	101.62	100.29
8650	100.62	99.72
8754	99.16	96.88
8602	98.78	96.71
8753	98.95	96.72
8601	98.2	96.48
8703	99.25	97.49
7551	106.49	105.24
7552	106.78	104.81
8553	106.71	104.46
8502	106.44	105.01
8554	105.07	103.78
8509	n/a	n/a
8651	101.74	99.93
8508	n/a	n/a
8510	n/a	n/a
8507	n/a	n/a
8505	n/a	n/a
8501	102.88	101.82
8551	102.67	101.03
8550	102.84	101.37
8506	n/a	n/a
8552	101.52	98.96
8403	104.16	102.4
8453	105.32	103.71
8401	106.73	105.2
8450	106.59	104.71
8451	106.61	104.81
8402	107.22	105.75
7553	108.24	106.45
8504	107.05	105.58
8556	106.96	105.25
8503	106.86	105.35

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0800 009 4540.

Dominic Ramdeen

Fernbrook Consulting Engineers
Forma Suite
40 Bowling Green Lane
London
EC1R 0NE

Wastewater pre-planning
Our ref DS6091986

03 March 2022

Pre-planning enquiry: Confirmation of sufficient capacity

Site: 10a & 10b Burwell Road, Stevenage, SG2 9RF

Dear Dominic,

Thank you for providing information on your development.

Existing site: general housing (2 units)
Proposed site: flats (20 units)
Proposed foul water discharge by gravity to TWMH 961A
Proposed surface water: 8.5l/s discharged to TWMH 9653 & 1.6l/s to TWMH 0650.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 10.1 l/s then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

Diversion

There are existing public sewers crossing the site. New buildings will need to be kept between 3 and 6.5m away from existing sewer depending on the size and depth of the sewer. Alternatively, it may be possible for sewers to be diverted around the new development. If you wish us to review a diversion proposal, please submit this via a Section 185 Diversion application. On some occasions it may be possible to abandon existing public sewers. Please contact us for further information on this process.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 0800 009 3921.

Kind Regards,

Leigh Khan
Developer Services – Adoptions Engineer
Tel: 0800 009 3921
developer.services@thameswater.co.uk
Get advice on making your sewer connection correctly at connectright.org.uk
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

APPENDIX E – DRAINAGE STRATEGY – OPTION 1: CALCULATIONS & DRAWINGS

info@fernbrook.co

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Dominic Ramdeen
Site name:	Burwell Road
Site location:	Stevenage, SG2 9RF

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.89729° N
Longitude:	0.1702° W
Reference:	201975779
Date:	Jan 12 2022 16:36

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics	Default	Edited
SAAR (mm):	637	637
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	1.63	1.63
1 in 1 year (l/s):	1.39	1.39
1 in 30 years (l/s):	3.75	3.75
1 in 100 year (l/s):	5.21	5.21
1 in 200 years (l/s):	6.1	6.1

FERNBROOK CONSULTING ENGINEERS

PROJECT	10a & 10b BURWELL ROAD, STEVENAGE		
SUBJECT	PRELIMINARY DRAINAGE CALCULATIONS		
JOB NO.	21210	**PAGE NO.**	1
DATE	25.01.2022	**REV NO.**	P01
BY	DR	**CHECKED**	CR

EXISTING SITE INFORMATION

Total Site Area	0.1530	ha
Impermeable Area	0.073	ha
PIMP	48	%

MODIFIED RATIONALE METHOD

$$Q_n = 2.78\ CiA$$

where:

C	*Runoff Coefficients*	=	1	(in this case 1 as using impermeable area)
i_n	*Rainfall Intensity for n return period (mm/hr)*			
A	*Impermeable Area (Ha)*			
Q_n	*Runoff for n return period (l/s)*			

Rainfall Intensity

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.8	*mm/hr*
i_{10}	94.9	*mm/hr*
i_{30}	113.02	*mm/hr*
i_{100}	143.9	*mm/hr*

PRE-DEVELOPMENT SURFACE WATER RUNOFF

		C	i_n	*A*		Q_n	
Q_1	2.78	1	50.8	0.073	=	**10.31**	**l/s**
Q_{10}	2.78	1	94.9	0.073	=	**19.26**	**l/s**
Q_{30}	2.78	1	113.0	0.073	=	**22.94**	**l/s**
Q_{100}	2.78	1	143.9	0.073	=	**29.20**	**l/s**

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.407	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall TWMH 9653 (pipe 1.002)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.017	4-8	0.001

Total Area Contributing (ha) = 0.018

Total Pipe Volume (m³) = 0.359

Time Area Diagram at outfall (pipe 2.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.081	4-8	0.007

Total Area Contributing (ha) = 0.088

Total Pipe Volume (m³) = 2.293

Network Design Table for Storm

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	Auto Design

Network Results Table

Innovyze Network 2020.1.3

Network Design Table for Storm

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

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	Auto Design
1.000	7.730	0.450	17.2	0.018	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	11.225	0.850	13.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	1.382	0.990	1.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	28.577	0.500	57.2	0.004	4.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	4.728	1.000	4.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	20.601	0.150	137.3	0.084	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	3.510	0.050	70.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.05	98.950	0.018	0.0	0.0	0.0	2.44	43.2	2.4
1.001	50.00	4.12	98.500	0.018	0.0	0.0	0.0	2.79	49.3	2.4
1.002	50.00	4.12	97.650	0.018	0.0	0.0	0.0	8.60	152.0	2.4
2.000	50.00	4.36	97.500	0.004	0.0	0.0	0.0	1.33	23.6	0.5
2.001	50.00	4.37	97.000	0.004	0.0	0.0	0.0	4.67	82.5	0.5
2.002	50.00	4.63	96.000	0.088	0.0	0.0	0.0	1.34	94.7	11.9
2.003	50.00	4.66	95.850	0.088	0.0	0.0	0.0	1.88	132.8	11.9

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002	TWMH 9653	98.890	96.660	96.660	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.003		96.600	95.800	95.850	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.407		

Online Controls for Storm

Orifice Manhole: 3, DS/PN: 1.002, Volume (m³): 1.3

Diameter (m) 0.065 Discharge Coefficient 0.600 Invert Level (m) 97.650

Depth/Flow Relationship Manhole: 6, DS/PN: 2.003, Volume (m³): 2.2

Invert Level (m) 95.850

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	0.0000	1.800	0.0000	3.400	0.0000	5.000	0.0000
0.400	0.0000	2.000	0.0000	3.600	0.0000	5.200	0.0000
0.600	0.0000	2.200	0.0000	3.800	0.0000	5.400	0.0000
0.800	0.0000	2.400	0.0000	4.000	0.0000	5.600	0.0000
1.000	0.0000	2.600	0.0000	4.200	0.0000	5.800	0.0000
1.200	0.0000	2.800	0.0000	4.400	0.0000	6.000	0.0000
1.400	0.0000	3.000	0.0000	4.600	0.0000		
1.600	0.0000	3.200	0.0000	4.800	0.0000		

Storage Structures for Storm

Cellular Storage Manhole: 6, DS/PN: 2.003

Invert Level (m) 95.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00360 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00360

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	330.0	330.0	0.301	0.0	330.0
0.300	330.0	330.0			

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.407 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

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)
1.000	1	15 Summer	1	+0%					98.976	-0.124
1.001	2	15 Summer	1	+0%					98.524	-0.126
1.002	3	15 Winter	1	+0%	30/15 Summer				97.766	-0.034
2.000	4	15 Winter	1	+0%					97.516	-0.134
2.001	5	15 Summer	1	+0%					97.007	-0.143
2.002	5	15 Winter	1	+0%					96.071	-0.229
2.003	6	1440 Winter	1	+0%					95.901	-0.249

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Pipe Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	0.07			2.7	OK	
1.001	2	0.000	0.06			2.7	OK	
1.002	3	0.000	0.04			2.6	OK	
2.000	4	0.000	0.03			0.6	OK	
2.001	5	0.000	0.01			0.6	OK	
2.002	5	0.000	0.13			10.5	OK	
2.003	6	0.000	0.00		1392	0.0	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.407 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

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)
1.000	1	15 Winter	30	+0%					98.992	-0.108
1.001	2	15 Summer	30	+0%					98.539	-0.111
1.002	3	15 Winter	30	+0%	30/15 Summer				98.071	0.271
2.000	4	15 Winter	30	+0%					97.525	-0.125
2.001	5	15 Summer	30	+0%					97.016	-0.134
2.002	5	15 Winter	30	+0%					96.130	-0.170
2.003	6	1440 Winter	30	+0%					95.970	-0.180

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Pipe Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	0.18			6.6	OK	
1.001	2	0.000	0.15			6.6	OK	
1.002	3	0.000	0.09			5.5	SURCHARGED	
2.000	4	0.000	0.07			1.5	OK	
2.001	5	0.000	0.02			1.5	OK	
2.002	5	0.000	0.39			32.4	OK	
2.003	6	0.000	0.00		1968	0.0	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

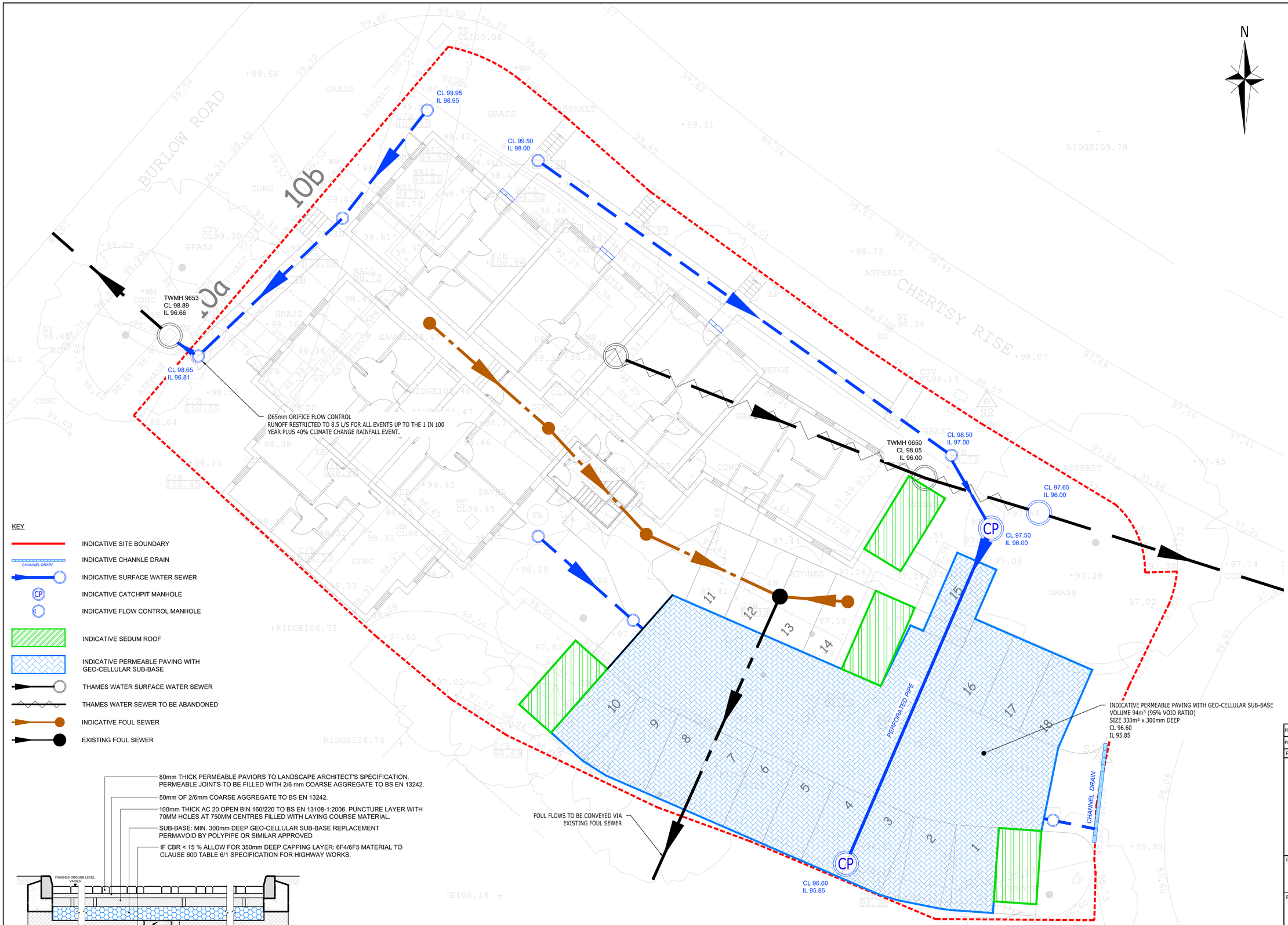
Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.407 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

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)
1.000	1	15 Winter	100	+40%					99.008	-0.092
1.001	2	15 Winter	100	+40%					98.636	-0.014
1.002	3	15 Winter	100	+40%	30/15 Summer				98.600	0.800
2.000	4	15 Winter	100	+40%					97.534	-0.116
2.001	5	15 Winter	100	+40%					97.020	-0.130
2.002	5	15 Winter	100	+40%					96.187	-0.113
2.003	6	1440 Winter	100	+40%					96.082	-0.068

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Pipe Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	1	0.000	0.32			12.0	OK	
1.001	2	0.000	0.27			11.8	OK	
1.002	3	0.000	0.14			8.5	FLOOD RISK	
2.000	4	0.000	0.12			2.7	OK	
2.001	5	0.000	0.04			2.7	OK	
2.002	5	0.000	0.71			58.8	OK	
2.003	6	0.000	0.00		3792	0.0	OK	



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NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

CDM NOTES

THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

1. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

KEY

- INDICATIVE SITE BOUNDARY
- INDICATIVE CHANNLE DRAIN (CHANNEL DRAIN)
- INDICATIVE SURFACE WATER SEWER
- INDICATIVE CATCHPIT MANHOLE
- INDICATIVE FLOW CONTROL MANHOLE
- INDICATIVE SEDUM ROOF
- INDICATIVE PERMEABLE PAVING WITH GEO-CELLULAR SUB-BASE
- THAMES WATER SURFACE WATER SEWER
- THAMES WATER SEWER TO BE ABANDONED
- INDICATIVE FOUL SEWER
- EXISTING FOUL SEWER

INDICATIVE PERMEABLE PAVING DETAIL
(SCALE 1:20)

DRAFT

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01.2	FOR COORDINATION	DR	CR	-	16.02.22
P01.1	FOR COORDINATION	DR	CR	-	07.02.22

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The Finsbury Business Centre
40 Bowling Green Lane
London
EC1R 0NE
info@fernbrook.co

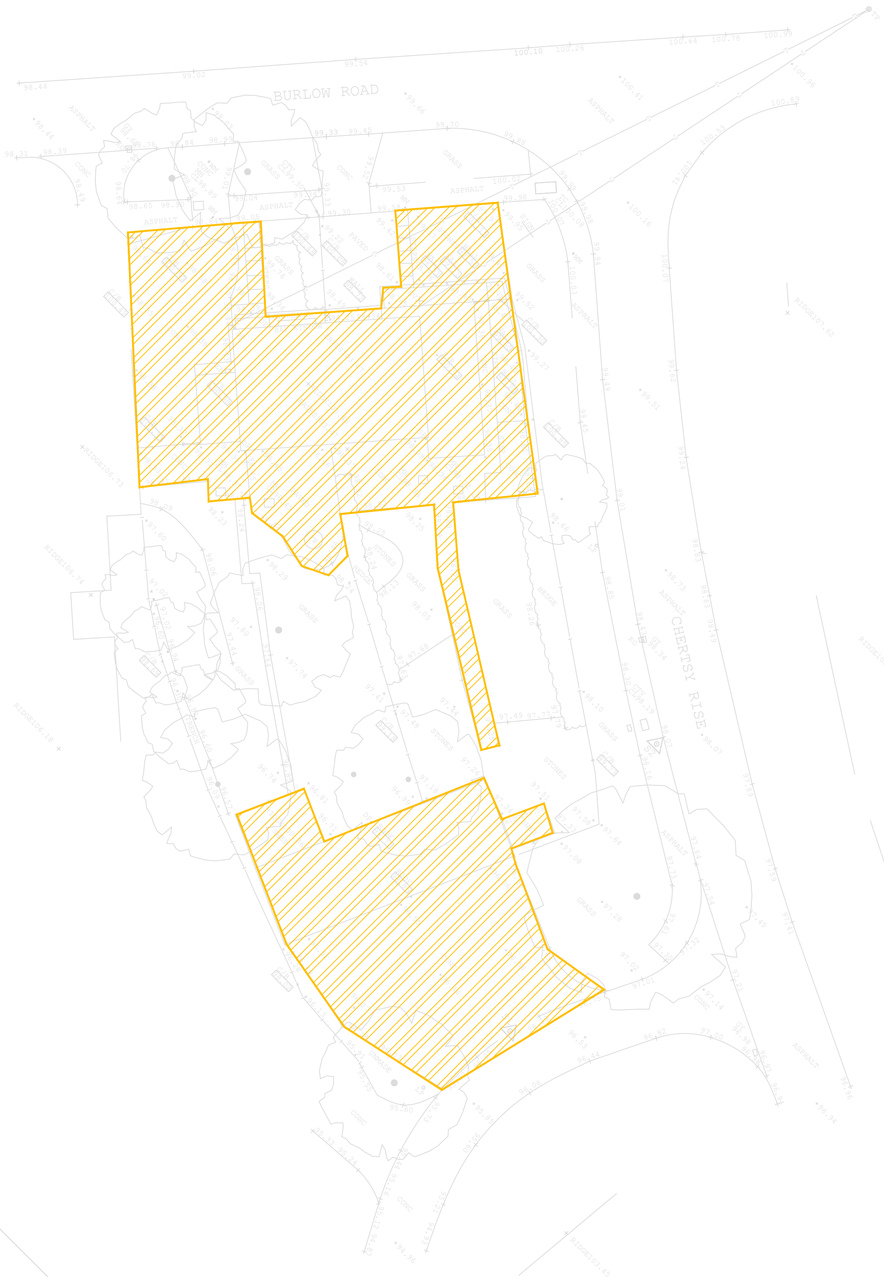
Client
S J M AND CO LIMITED

Project Title:
10A & 10B BURWELL ROAD
STEVENAGE, SG2 6HE

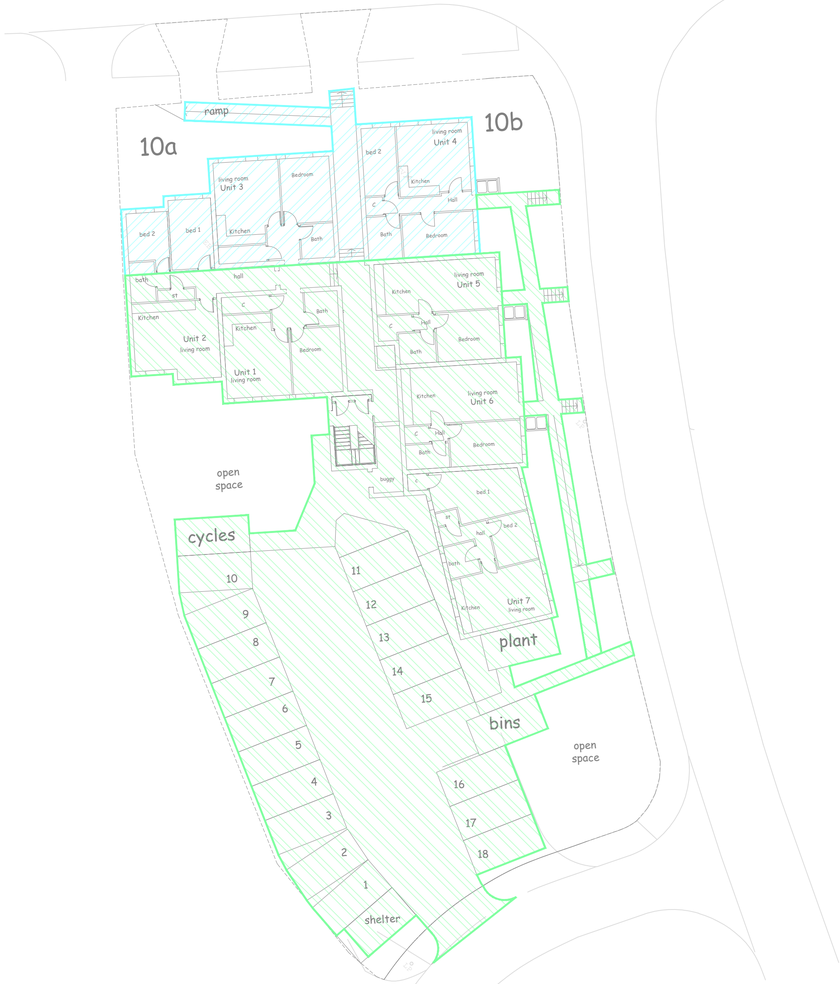
Drawing Title:
INDICATIVE SURFACE WATER & FOUL DRAINAGE STRATEGY

A1 Scale	Date	Designed by
1:100	FEB 2022	DR
Drawn by	Checked by	Approved by
DR	-	-

Drawing Number: 21210-FCE-XX-XX-DR-D-0500 Rev P01.2



PRE-DEVELOPMENT SCENARIO



POST-DEVELOPMENT SCENARIO

KEY

PRE-DEVELOPMENT IMPERMEABLE AREA
= 0.073ha

POST-DEVELOPMENT IMPERMEABLE AREA
NORTH CATCHMENT = 0.018ha

POST-DEVELOPMENT IMPERMEABLE AREA
SOUTH CATCHMENT = 0.088ha

NOTES

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FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01	FOR INFORMATION	DR	CR	DR	08.04.22
P01.1	FOR COORDINATION	DR	CR	-	16.02.22

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London
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Client

S J M AND CO LIMITED

Project Title:

10A & 10B BURWELL ROAD
STEVENAGE, SG2 6HE

Drawing Title:

INDICATIVE SURFACE WATER DRAINAGE CATCHMENT PLAN

A1 Scale	Date	Designed by
1:200	FEB 2022	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number	Rev
21210-FCE-XX-XX-DR-D-0510	P01

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KEY

INDICATIVE OVERLAND FLOW ROUTE

NOTES

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2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01	FOR INFORMATION	DR	CR	DR	08.04.22
P01.1	FOR COORDINATION	DR	CR	-	16.02.22

FERNBROOK

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Client

S J M AND CO LIMITED

Project Title:

10A & 10B BURWELL ROAD
STEVENAGE, SG2 6HE

Drawing Title:

INDICATIVE OVERLAND FLOW ROUTES

A1 Scale	Date	Designed by
1:100	FEB 2022	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number	Rev
21210-FCE-XX-XX-DR-D-0515	P01

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APPENDIX F – DRAINAGE STRATEGY – OPTION 2: CALCULATIONS & DRAWINGS

info@fernbrook.co

Innovyze Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.407	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall TWMH 9653 (pipe 1.002)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.017	4-8	0.001

Total Area Contributing (ha) = 0.018

Total Pipe Volume (m^3) = 0.359

Time Area Diagram at outfall TWMH 0650 (pipe 2.002)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.078	4-8	0.010

Total Area Contributing (ha) = 0.088

Total Pipe Volume (m^3) = 2.091

Network Design Table for Storm

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	Auto Design

Network Results Table

Innovyze Network 2020.1.3

Network Design Table for Storm

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

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	Auto Design
1.000	7.730	0.450	17.2	0.018	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	11.225	0.850	13.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	1.382	0.990	1.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	28.577	1.000	28.6	0.004	4.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	4.689	0.950	4.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	20.555	0.050	411.1	0.084	4.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	2.840	0.050	56.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.05	98.950	0.018	0.0	0.0	0.0	2.44	43.2	2.4
1.001	50.00	4.12	98.500	0.018	0.0	0.0	0.0	2.79	49.3	2.4
1.002	50.00	4.12	97.650	0.018	0.0	0.0	0.0	8.60	152.0	2.4
2.000	50.00	4.25	98.000	0.004	0.0	0.0	0.0	1.89	33.4	0.5
2.001	50.00	4.27	97.000	0.004	0.0	0.0	0.0	4.57	80.7	0.5
3.000	50.00	4.45	96.100	0.084	0.0	0.0	0.0	0.77	54.4	11.4
2.002	50.00	4.48	96.050	0.088	0.0	0.0	0.0	1.34	23.6	11.9

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002	TWMH 9653	98.890	96.660	96.660	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.002	TWMH 0650	97.000	96.000	96.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.407		

Online Controls for Storm

Orifice Manhole: 3, DS/PN: 1.002, Volume (m³): 1.3

Diameter (m) 0.065 Discharge Coefficient 0.600 Invert Level (m) 97.650

Orifice Manhole: 6, DS/PN: 2.002, Volume (m³): 2.5

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 96.050

Storage Structures for Storm

Cellular Storage Manhole: 6, DS/PN: 2.002

Invert Level (m) 96.050 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	330.0	0.0	0.151	0.0	0.0
0.150	330.0	0.0			

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.407 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	1	+0%					98.976
1.001	2	15 Summer	1	+0%					98.524
1.002	3	15 Winter	1	+0%	30/15 Summer				97.766
2.000	4	15 Summer	1	+0%					98.013
2.001	5	15 Summer	1	+0%					97.007
3.000	6	15 Winter	1	+0%	100/15 Summer				96.204
2.002	6	960 Winter	1	+0%	100/240 Winter				96.091

		Surcharged Flooded				Half Drain Pipe			
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	1	-0.124	0.000	0.07			2.7	OK	
1.001	2	-0.126	0.000	0.06			2.7	OK	
1.002	3	-0.034	0.000	0.04			2.6	OK	
2.000	4	-0.137	0.000	0.02			0.6	OK	
2.001	5	-0.143	0.000	0.01			0.6	OK	
3.000	6	-0.196	0.000	0.26			12.4	OK	
2.002	6	-0.109	0.000	0.03		704	0.4	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.407 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%					98.992
1.001	2	15 Summer	30	+0%					98.539
1.002	3	15 Winter	30	+0%	30/15 Summer				98.071
2.000	4	15 Summer	30	+0%					98.021
2.001	5	15 Summer	30	+0%					97.016
3.000	6	15 Winter	30	+0%	100/15 Summer				96.276
2.002	6	480 Winter	30	+0%	100/240 Winter				96.137

		Surcharged Depth	Flooded Volume		Half Drain Pipe Overflow	Time	Flow		Level
PN	US/MH Name	(m)	(m³)	Flow / Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
1.000	1	-0.108	0.000	0.18			6.6	OK	
1.001	2	-0.111	0.000	0.15			6.6	OK	
1.002	3	0.271	0.000	0.09			5.5	SURCHARGED	
2.000	4	-0.129	0.000	0.05			1.5	OK	
2.001	5	-0.134	0.000	0.02			1.5	OK	
3.000	6	-0.124	0.000	0.64			30.7	OK	
2.002	6	-0.063	0.000	0.05		520	0.7	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

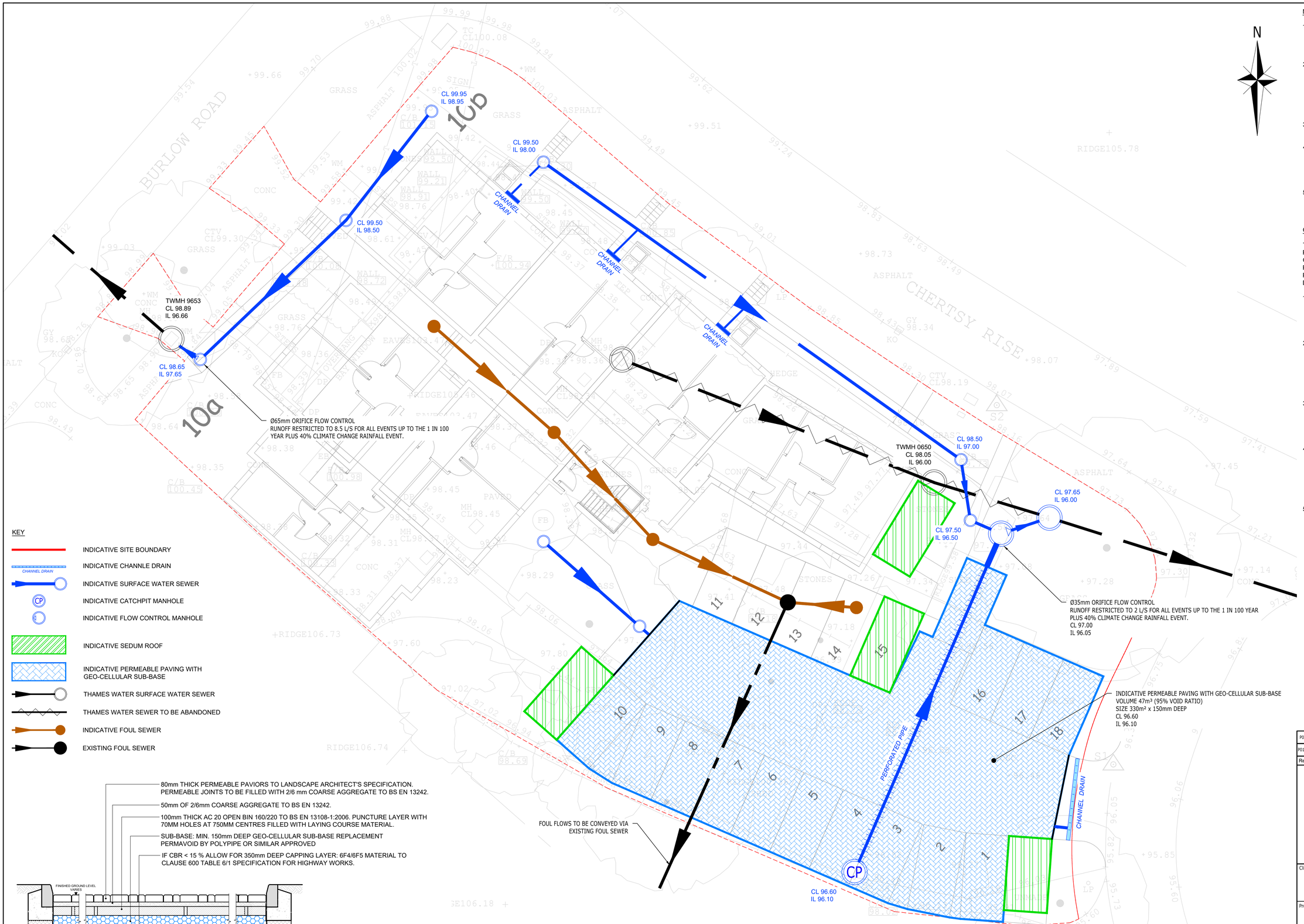
Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.407 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%					99.008
1.001	2	15 Winter	100	+40%					98.636
1.002	3	15 Winter	100	+40%	30/15 Summer				98.600
2.000	4	15 Summer	100	+40%					98.029
2.001	5	15 Summer	100	+40%					97.020
3.000	6	480 Winter	100	+40%	100/15 Summer				96.451
2.002	6	480 Winter	100	+40%	100/240 Winter				96.452

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Pipe Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	1	-0.092	0.000	0.32			12.0	OK	
1.001	2	-0.014	0.000	0.27			11.8	OK	
1.002	3	0.800	0.000	0.14			8.5	FLOOD RISK	
2.000	4	-0.121	0.000	0.08			2.7	OK	
2.001	5	-0.130	0.000	0.04			2.7	OK	
3.000	6	0.051	0.000	0.12			5.6	FLOOD RISK	
2.002	6	0.252	0.000	0.11		648	1.6	SURCHARGED	



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NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY. TO CHECK THAT THIS DRAWING HAS BEEN PRINTED TO THE INTENDED SCALE THIS BAR SHOULD BE 50mm LONG @ A1 OR 25mm LONG @ A3.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

CDM NOTES

THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

1. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

KEY

- INDICATIVE SITE BOUNDARY
- CHANNEL DRAIN — INDICATIVE CHANNLE DRAIN
- INDICATIVE SURFACE WATER SEWER
- CP — INDICATIVE CATCHPIT MANHOLE
- INDICATIVE FLOW CONTROL MANHOLE
- INDICATIVE SEDUM ROOF
- INDICATIVE PERMEABLE PAVING WITH GEO-CELLULAR SUB-BASE
- THAMES WATER SURFACE WATER SEWER
- THAMES WATER SEWER TO BE ABANDONED
- INDICATIVE FOUL SEWER
- EXISTING FOUL SEWER

INDICATIVE PERMEABLE PAVING DETAIL
(SCALE 1:20)

FOR INFORMATION ONLY

Rev	Description	Drn	Chk	App	Date
P01	FOR INFORMATION	DR	CR	DR	08.04.22
P01.1	FOR COORDINATION	DR	CR	-	16.02.22

FERNBROOK
The Finsbury Business Centre
40 Bowling Green Lane
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EC1R 0NE
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Client
S J M AND CO LIMITED

Project Title:
10A & 10B BURWELL ROAD
STEVENAGE, SG2 6HE

Drawing Title:
INDICATIVE SURFACE WATER
& FOUL DRAINAGE STRATEGY
(OPTION 2)

A1 Scale	Date	Designed by
1:100	FEB 2022	DR
Drawn by	**Checked by**	**Approved by**
DR	CR	DR

Drawing Number: 21210-FCE-XX-XX-DR-D-0505 — Rev: P01

APPENDIX G – DRAINAGE MAINTENANCE PLAN

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SuDS MANAGEMENT PLAN

This long-term Management Plan of the Sustainable Drainage System should be implemented at **10a & 10b Burwell Road, Stevenage, SG2 9RF** to ensure that the drainage network functions as designed. This plan is intended to cover all on-site drainage structures. The Site Management Team should oversee and implement the SuDS Management Plan and designate a qualified person who will be responsible for the proper operation and maintenance of the foul and stormwater structures.

Stormwater Runoff Quality

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Drainage System

Maintenance and cleaning of gullies, channel drains, inspection chambers, manholes, and SuDS components will assure adequate performance. This maintenance program is outlined below;

Maintenance Program

The Site Management Team will conduct the operation and maintenance plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms (attached) should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file at the property and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request.

Concurrent with inspection and cleaning, all litter shall be picked up and removed from the parking areas, external bin store, wetland areas, and soft landscaping.

Regular maintenance should include;

1. Inspect sedum roof inlets/outlets and remove any debris every 6 months or as determined to be reasonable based on experience with the installed systems to ensure that the system continues to work as intended and is free of debris; quarterly, inspect inspection chambers and manholes; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.
2. Inspection of external cycle and refuse stores for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the stormwater management system.
3. Permeable paving inlets, vents and overflows should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 6 months after.

Winter Maintenance Program

Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

Fertiliser Use

Only slow-release organic low-phosphorous fertilisers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system.

Maintenance Task	Description	Frequency
Regular Maintenance		
Litter management	Pick up all litter in suds and landscape areas and remove from site	Monthly
Landscaped & Vegetated Areas	Trim plants and grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ	As required or monthly
Inlets and outlets	Inspect monthly, remove silt from slab aprons and debris. Strim 1m round for access	Monthly
Hard surfaces	Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	Annually
Occasional tasks		
Inspection and control chambers	Annual inspection, remove silt and check free flow	Annually
Remedial work		
	Inspect suds system regularly to check for damage or failure. Undertake remedial work as required.	As required

Drainage Operation and Maintenance Log

Site Maintenance Supervisor:_____ Date:_____

☐ Routine ☐ Response to rainfall event __ in ☐ Other:_____

BMP	Frequency	Date Performed	Comments
Inlets/outlets and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Communal terrace and private patios	Monthly Sweeping		
	Rubbish & Litter Removal as Necessary		
Landscaped & Vegetated Areas	Maintenance as necessary		
Permeable paving	Inspect and identify areas not operating property every 3 months (for the first 3 months) and every 6 months after		
	Full bi-annual inspection		