Drainage Strategy

And

Flood Risk Assessment

for

Proposed Development

Former Wheatfield Day Centre

Whitefield M45 6DP

Client Name: Onward
Our ref: LRD31990
Date: July 2022
Revision: 001

SUTCLIFFE

Drainage Strategy & Flood Risk Assessment

DOCUMENT VERIFICATION

Report Reference: LRD31990 Issue: 01 Date: April 2022

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Revision History:

Rev	Date	Description	Prepared	Checked	Approved
01	April 2022	Issued for Planning	DS	MP	DS

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Sutcliffe

Contents

1.0 Introduction

2.0 Existing flood risk

3.0 Drainage Hierarchy

3.1 Infiltration to ground

3.2 Discharge to water course

3.3 Discharge to surface water network

3.4 Discharge to combined sewer

4.0 Existing surface water drainage

5.0 Proposed surface water drainage

6.0 Climate Change

7.0 Discussion with Utility Company

8.0 Proposed surface water discharge rate

9.0 SuDS Interception

10.0 Water quality management

11.0 Proposed surface water drainage layout

12.0 Flood exceedance / drainage failure

13.0 Surface water drainage management and maintenance plan

Appendix A Existing site layout

Proposed site layout

Appendix B Borehole logs

Appendix C Infiltration test results

Appendix D Existing drainage layout

Appendix E Hydraulic calculations

Appendix F Proposed Drainage Layout

Drainage Areas Plan

Appendix G Flood Exceedance

Appendix H Correspondence

1.0 Site Description and Proposals

The site is currently void of development with the previous development having been demolished. The slab and access road are still present. The remainder of the site is covered with vegetation.

The total site are is approximately 1.03Ha

The site can be located by the following references.

Postcode M45 6DP

Coordinates 381195, 405724

Grid reference SD 81195 05724

A copy of the existing and proposed sites are included in Appendix A.

2.0 Existing Flood Risk

A site specific Flood Risk Assessment has been carried out and should be referred to for more information.

A summary from the FRA is.

- That the site is located within a Zone 1, very low risk flood area and the site is, therefore, considered not to be at risk of flooding from rivers or sea.
- That the site is indicated as having low risk surface water flooding with a water depth of below 300mm. The surface water flooding enters the site from the north west corner of the site and flows to the south east of the site.
- That the site is not at risk from flooding from reservoirs or other man-made water features

Therefore, from the above observations we confirm that the site has a low risk of flooding from surface water but no other sources.

3.0 Drainage Hierarchy

3.1 Infiltration to ground

Infiltration to ground is, in the main, provided by the provision of soakaways and permeable paving.

To provide infiltration via soakaways the ground conditions must be suitable to allow infiltration to occur and the ground water table must be at least 1.0m below the base of any soakaways provided.

To allow infiltration via permeable paving the ground conditions must be suitable to allow infiltration to occur.

Soakaways cannot be located within 5m of boundaries, highways or existing / proposed buildings.

The site has few areas that could accommodate soakaways, should infiltration be available.

3.1.1 Underlying geology

From the Phase 1 Preliminary Risk Assessment the superficial deposit is noted as Devensian Till (clay) and the solid geology is noted as being a mixture of mudstone, siltstone and sandstone across the site.

3.1.2 Intrusive ground investigation

From the Phase 2 Interpretative Ground Assessment the ground investigation logs record the ground as generally having a band of made ground to depths of between 1.0m and 2.4m below existing ground levels overlying silty / sandy clay becoming stiff with depth. The underlying rock was not encountered by any of the boreholes, which extended to a depth of 15.45m below existing ground levels.

A copy of the borehole logs are included in Appendix B.

3.1.3 British Geological Survey

A review of the BGS web site for logs in and around the proposed site, at the following web site address, Borehole records - British Geological Survey (bgs.ac.uk), was made and several boreholes were available to view, located approximately 200m to the west of the site.

All logs were viewed and it was apparent That they were all deep boreholes into the underlying rock and did not record the upper strata. One of the boreholes identifies rock at a depth of approximately 6m.

3.1.4 Infiltration Test

Two infiltration tests in accordance with BRE365 have been carried out and an infiltrate rate was not able to be calculated due to the nature of the ground.

There was no movement of water within the test pits.

The infiltration site notes are included in Appendix C.

3.2 Discharge to a Water Course

An inspection of historic / current maps and the Environment Agency maps reveal that there are no water courses located in the vicinity of the site.

3.3 Discharge to surface water network

A review of the existing drainage network within the surroundings of the development site was made and of United Utility sewer records. The review indicated that there are surface water sewers within reasonable distance of the site.

There are recorded surface water sewers located in both Oxbow Way, located to the south east of the site, and Brightwater Close, located to the east of the site.

There are no records available recording the depth or pipe diameters of the sewers but the surface water sewer located in Brightwater Close has been

identified as being suitable from the existing fall to the start of the sewer from the development site.

3.4 Discharge to combined sewer

A review of the existing drainage network and of United Utility sewer records within the surroundings of the development site was made and of United Utility sewer records.

The review indicated that there is a combined sewer located within the site.

A copy of the existing drainage drawings are included in Appendix D.

4.0 Existing site surface water drainage

There is currently no existing drainage on site.

The development previously occupying the site has been demolished.

A copy of the existing drainage network is included in Appendix D.

5.0 Proposed surface water drainage

The above discussion of the surface water drainage hierarchy has indicated that the proposed surface water drainage discharge point will be to the surface water sewer located in Brightwater Close. The surface water sewer located in Oxbow Way was investigated but proved to be too shallow to allow a connection from the development to

The reason for the above decision is based on the discussion of the drainage hierarchy. It has been proved that it is not possible to provide infiltration and there are no water courses or available surface water drainage networks within reasonable distance of the site.

The NPPF, paragraph 196, states that major developments should incorporate SuDS unless there is clear evidence that it would be inappropriate.

The below table lists the potential SuDS options and identifies whether the SuDS element is site appropriate and also provides a brief commentary as to its suitability for this development in relation to the site layout provided.

SuDS Option	Appropriate To Development	Comments
Soakaways	N	No infiltration rates were obtained for either of the infiltration tests carried out.
Infiltration basin	N	Not appropriate for this project.
Sand filter	N	Not appropriate for this project.

Filter strip	N	Not appropriate for this project.
Filter drains	N	Not appropriate for this project.
Detention basin	N	Not appropriate for this project.
Swales	N	Not appropriate for this project.
Rainwater harvesting / Rainwater Butts	P	RWH is a possibility for this site. Rainwater Butts are a possibility for this site
Green roofs	N	Green roofs are not appropriate for general housing where pitched roofs are provided.
Geo-cellular storage systems	P	These are a potential storage method and should be wrapped in geo membrane to retain the attenuated surface water.
Permeable pavements	P	Due to the nature of the site layout, proposed services to each house etc. it would not be practical to provide permeable paving to all plots but may be applicable to some plots. A lined system would be required as infiltration is not possible.
Ponds	N	Not appropriate for this project.
Oversized pipes	Y	These will be required to satisfy United Utilities as part of the proposed Section 104 Agreement that will be entered into to formally adopt the drainage located under the proposed adopted highway.
Tanks	P	A possible alternative to geo-cellular storage system, but generally more expensive, but may be required due to the location of required off line attenuation adjacent to the proposed highway.
Flow control devices	Y	Required to control off site discharge rates .

Where; Y: Suitable for use on a project of this size and nature
N: Not suitable for use on a project of this size and nature
P: Potentially suitable for use on a project of this size and nature

The following SuDS features have been identified as being potentially appropriate for this development.

The client has stated that rainwater harvesting is not appropriate for this development due to their high installation and maintenance costs that they are unable to recover from tenants as a social landlord. Rainwater butts are acceptable to the client.

Geo-cellular storage systems can be utilised as offline attenuation for storm events that are greater than 30 year events, up to the 100 year storm event including an allowance for climate change.

Permeable paving may be a potential option but will not be used as attenuation due to the S104 adoption requirements that all surface water attenuation is retained within the sewer network up to and including the 30 year storm event. Any additional storm attenuation greater than 30 year events will be difficult to attenuate to the site levels and no cost benefit would be achievable. Permeable paving will, however, provide benefit for interception and water quality and are discussed in later sections of this drainage strategy.

Oversized pipes will be used to accommodate the storm events up to and including the 30 year storm events as part of the Section 104 sewers.

Tanks may be required in lieu of geo-cellular attenuation and will depend on discussion with the Highway Authority in relation to the location of the required off line attenuation.

A flow control device will be required to reduce the surface water discharge from the site at green field runoff rates.

Therefore, from the above it is proposed to use a traditional drainage network with off line attenuation will be provided for this development. The client has stated that permeable paving is acceptable as a SuDS solution that can be incorporated into the drainage scheme.

6.0 Climate Change

From the DEFRA website the current peak rainfall allowances are provided.

Catchment peak river flow allowances are provided for the 2020's, 2050's and the 2080's.

The life span for residential housing is taken as 100 years, which puts the allowance for consideration of climate change into the 2080's

The following information is provided by the EA on the DEFRA web site.

Catchment:	Irwell Management Catchment
Central allowance:	35%
Higher allowance:	46%
Upper end allowance:	75%

The site is located in a zone 1 and the classification of the site use is 'More Vulnerable,' as categorised by the EA.

Therefore, in accordance with the DEFRA guidance we are required to consider the central allowance when carrying out hydraulic calculations for site drainage networks.

The higher allowance should be used when interrogating the site drainage networks for any affect that flooding may have on, or off, the development.

For this development the upper end allowance is only considered appropriate as a sensitivity test and will help assess the how sensitive the development is to climate

change and will ensure that the development is safe against large scale climate change over its lifetime.

7.0 Discussions with Utility Company

A pre-development enquiry was submitted to United Utilities and their response is included in Appendix H.

United Utilities have requested that any surface water connection to their network be to the existing surface water sewer in Brightwater Close.

As this connection will require access through 3rd party land we investigated a surface water discharge into Oxbow Way, where no 3rd party permissions would be required through privately owned land, but we were unable to achieve a suitable design.

8.0 Proposed surface water discharge rate

The site has been previously developed but has been demolished prior to this development.

The site is, therefore, classed as greenfield runoff as there is no current positive drainage network for the site.

The SuDS Manual, C753, and DEFRA Technical Standards direct the developer to discharge surface water at rates at greenfield runoff rates.

Greenfield runoff rates for the site have been calculated as being.

Q_{bar}: 6.4 l/s

Q_{1yr}: 5.6 l/s

Q_{2yr}: 6.0 l/s

Q_{30yr}: 10.9 l/s

Q_{100yr}: 13.4 l/s

The above greenfield runoff rates are reasonable to maintain throughout the life time of the development.

Therefore, it is reasonable to discharge surface water from the site at the Q_{bar} runoff rate of 6.4 l/s.

A copy of the greenfield calculation is included in Appendix F.

9.0 SuDS interception

The SuDS Manual, C753, seeks to intercept the first 5mm of rainfall. Interception is deemed to be delivered using one or a combination of the following.

- Rainwater harvesting / butts
- Infiltration

- Evapotranspiration using temporary shallow ponding or storage within the soil or upper aggregate layers

The below table lists the potential interception options and identifies whether the element is site appropriate and also provides a brief commentary as to its site suitability for this development in relation to the site layout provided.

Interception System	**Interception methods that can be assumed to be compliant for zero runoff from the first 5mm rainfall for 80% of events during the summer and 50% in the winter**	**Comments for provision / non provision of interception system**
Green Roof	All surfaces that have green roofs	Not appropriate for this project.
Rainwater harvesting system / Water butts	All surfaces drained to RWH systems designed to BS 8515:2009+A1 whether for surface water management or just water supply, provided the RWH design is based on regular daily demand for non-potable water	The client has stated that the use of a rain water harvesting tanks are not practical due to their high installation and maintenance costs, which would be borne by the housing association and not the occupier. The client stated that rainwater butts are acceptable to them.
Soakaway or other infiltration system	Areas of the site drained to systems that are designed to infiltrate runoff for events greater than a 1 month return period. Note: design of the infiltration system should be in accordance with C753 chapters 14 & 25	This is not possible for this site due to no infiltration via soakaways being possible.
Permeable pavements	All permeable pavements (lined or unlined) can be deemed to comply. Where the pavement also drains an adjacent impermeable are, compliance can be assumed when the permeable pavement is not lined. Refer to C753 for more details and description. Where the pavement also drains adjacent impermeable areas and is lined it is deemed not to comply	Permeable paving is a acceptable to the client where appropriate. The highway will not be permeable due to adoption requirements and services / sewers.
Filter strips / swales	Refer to C753 for compliance notes	Not appropriate for this project.
Infiltration trenches	Roads drained by infiltration trenches can be considered to provide interception	Not appropriate for this project.

Detention basins	Refer to C753 for compliance notes	Not appropriate for this project.
Bioretention area and rain water gardens	Refer to C753 for compliance notes	Not appropriate for this project.
Ponds	Areas drained by ponds that is maintained by the provision of an outlet structure are not deemed to intercept	Not appropriate for this project.

From the above table we have identified which interception systems may, or may not, be appropriate for this development.

The only form of potential interception is permeable paving to the private driveways. Some of the private driveways will not be suitable due to incoming services as listed in the above table. If permeable paving is provided then it would require to be lined due to infiltration not being available for this site.

10.0 Water quality management

Water quality needs to be considered in accordance with Section 26 of the SuDS manual.

We need to allocate suitable hazard indices (Table 26.2, C753) as follows.

Land Use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Property drives	Low	0.5	0.4	0.4
Total Indices	**N/A**	**0.7**	**0.6**	**0.45**

We determine the pollution mitigation indices in accordance with Table 26.3, C753 as follows.

	Mitigation indices		
SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events		

	up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.

From the above table there is only 1 appropriate options to provide water quality management, which is permeable paving. Permeable paving can be provided to all driveways.

From the tables above the total mitigation index is required to be greater than or equal to the pollution hazard index, as below table. (The table will require amending once the final solution has been specified). At this stage of deign we cannot commit to a final solution as it will likely be finalised by the appointed principal contractor during the construction phase.

	Total suspended solids (TSS)	Metals	Hydro-carbons
Total hazard indices	0.7	0.6	0.45
Total mitigation indices	0.7	0.6	0.7

11.0 Proposed surface water drainage layout

From the above discussions and decision making processes the following surface water drainage network is proposed.

The maximum surface water discharge rate from the site will be set at 6.4 l/s in accordance with greenfield runoff rates and United Utilities requirements.

This discharge rate is reasonable and can be managed and maintained throughout the lifetime of the development.

From the above discussion and evidence we confirm that the proposed drainage layout will discharge into the existing surface water sewer located in Brightwater Close. The existing surface water sewer is a 225mm ∅. This is the surface water sewer that United Utilities have directed surface water discharge to.

The onsite drainage will consist of a piped drainage network in conjunction with an off line geo-cellular or concrete attenuation tank to manage surface water discharge from the site to a maximum rate of 6.4 l/s up to and including a 1 in 100 year storm event including an allowance of 35% for climate change. The drainage system will then be interrogated for a climate change of 46%.

A copy of the proposed preliminary drainage layout is included in Appendix F.

Hydraulic calculations have been carried out for the 1 year, 2 year, 30 year and 100 year + 35 & 46% climate change and a copy of the calculations are included in Appendix E.

A copy of the drainage areas plan indicating both permeable and impermeable areas is included in Appendix F.

12.0 Flood exceedance / Drainage failure / Sensitivity test

There is no flooding up to and including the 100 year storm event with an allowance of 35% for climate change and the discharge rate does not exceed 6.4 l/s.

In accordance with paragraph 167 (d) of the NPPF, we need to confirm that in the event of a drainage failure, or flood exceedance, event, that the development will remain safe and will not increase flood risk elsewhere and be safely managed.

The drainage network was interrogated using the higher allowance of 46%. The discharge rate did exceed 6.5 l/s, giving a discharge rate of 6.9 l/s, but no flooding was calculated.

A sensitivity test was carried out using the upper end allowance.

A flood flow analysis was carried out for the 100 year storm event with an allowance of 75% climate change for a 360 minute storm duration.

The results were saved and the output has been included on the flood exceedance drawing included in Appendix G.

Flooding was found to occur at two locations on the drainage network. The majority of flooding occurred at the low point of the drainage network and there was minor flooding at the off line attenuation. The flooding is seen to flow within the site with depths of flow ranging from less than 25mm to a maximum depth of 205mm.

Where there are vulnerable properties within a development, that cannot be relocated for whatever reason, it is necessary to incorporate appropriate flood resilience so that, in the event of a flood it can be brought back into use without significant refurbishment. This site does not have any vulnerable properties and there are no properties affected by flooding. All exceedance flooding is retained within the road or at low points around buildings

It can be seen from the exceedance / residual flooding drawing that there is safe access and egress in a flood event.

13.0 Management & Maintenance Plan

A Management & Maintenance Plan is required to ensure that the SuDS elements are maintained and managed to ensure they remain effective throughout the lifetime of the development.

Chapter 32 of The SuDS Manual, C753, provides information of maintenance requirements for SuDS systems.

This section of the drainage strategy will be developed in line with the end user so that they can have an input as to how it will be managed.

At this stage of the design process we would request a planning condition in relation to Management & Maintenance.

Appendix A

Existing Site Layout

Proposed Site Layout

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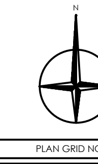

PLAN GRID NORTH

File Name: Layerserv00995A.dwg

LEGEND

AV	AIR VALVE	PP	PETROL PUMP
BT	BT INSPECTION COVER	RE	RODDING EYE
CB	CONTROL BOX	RWP	RAINWATER PIPE
CCTV	CCTV CAMERA POST	SOF	SOFFIT LEVEL
COM	COMMUNICATIONS COVER	SV	STOP VALVE
CTV	CABLE TV COVER	TCB	TELEPHONE CALL BOX
DC	DRAINAGE CHANNEL	TL	TRAFFIC LIGHT
DP	DOWN PIPE	TLB	TRAFFIC LIGHT BOX
DR	DRAIN	TP	TELEGRAPH POLE
EIC	ELEC INSPECTION COVER	WM	WATER METER
ELB	ELECTRIC BOX	WO	WATER OUTLET
ER	EARTH ROD	WST	WATER STOP TAP
EP	ELECTRICITY POLE	WSV	WATER STOP VALVE
FFL	FINISHED FLOOR LEVEL	EOT	END OF TRACE
FH	FIRE HYDRANT	OSA	OUT OF SURVEY AREA
G	GULLY	UTL	UNABLE TO LIFT
GLT	GROUND LIGHT	UTS	UNABLE TO SONDE
GST	GAS TAP	UTT	UNABLE TO TRACE
GSV	GAS VALVE	S/L	SIGNAL LOSS
IC	INSPECTION COVER	BLK	BLOCKED
IL	INVERT LEVEL	NFH	NO FURTHER GPR CONTACTS
KO	KERB OUTLET	BD	BACKDROP PIPE
LP	LAMP POST	NVP	NO VISIBLE PIPE
MH	MANHOLE	ToP	TOP OF PIPE
MKR	MARKER		EOT SYMBOL
OP	OUTFALL PIPE		INDICATES DIRECTION
PN	PYLON		GPR EOT SYMBOL

BT	BT
CABLE DUCT	Duct
CABLE TV	CATV
CCTV	CCTV
TELECOMS	COM
EARTH ROD STRIP	ER
ELECTRIC	ELEC
FIBRE-OPTICS	F/O
FUEL LINE	FL
GPR DETECTION LINE	GPR
MAINS GAS	GAS
MAINS WATER	W
SEWER CW	CW
SEWER FW	FW
SEWER SW	SW
TRAFFIC SIGNAL CABLE	TS
UNIDENTIFIED TRACE	UNID
UNIDENTIFIED CABLE	UNC
UNIDENTIFIED PIPE	UNP
VEHICLE DETECTION CABLE	VDC
Rail	Rail

Linetypes With Suffixes (S) (A) (R) show Statutory Authority, Assumed and Recorded Underground Data.

NOTES:

All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

Services shown as "From Statutory Authority Plans" line styles are taken from Statutory Records plans supplied by the relevant regional authority. These services were not located and are shown for indicative purposes only.

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Where similar services run in close proximity it may be impossible to separately trace individual services as the trace signal can experience interference. In such cases, services will be shown as a single, annotated line. The displayed depth will refer to the shallowest detected utility.

Successful tracing of non-conductive materials may be limited. Drainage gulleys are dye tested where possible to prove connectivity but it is not always possible to introduce the sonde due to narrow pipe sizes and/or accumulated silt.

Depth information of underground services/features are generally accurate to within +/- 10% (i.e. a pipe at 2m deep may be accurate to +/-200mm) but this cannot be guaranteed. Depths shown usually refer to the top of the service. Gravity sewer and drain depths are usually to invert (base of drainage channel) unless otherwise stated.

Some above ground features may have been obscured at time of survey. It is not always possible to operate the Ground Penetrating Radar in areas including, but not limited to, dense vegetation, rubble, debris and/or rough/uneven ground.

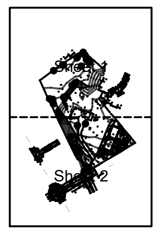
Existing record information that was made available to Layer Surveys by the Client or by the statutory utility provider should be regarded only as an indication and cannot be guaranteed.

Excavation in the vicinity of services shown should be carried out with due diligence (Ref. HSG47).

SURVEY STATIONS

Name	Easting	Northing	Height
LS1	381198.043	405630.329	96.13
LS1A	381189.522	405668.136	93.96
LS2	381232.315	405692.047	93.12
AR1	381213.901	405656.546	93.88
AR2	381226.034	405675.972	93.30

Sheet Layout



0 20m 40m 80m 120m
SCALE BAR 1:200

REV	DATE	DESCRIPTION
A	05/11	AMENDED LEVELS

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See the Complete Picture

Client

Sutcliffe
18-20 Harrington Street
Liverpool
L2 9QA

Project Title

Wheatfields Day Centre
Manchester
M45 6DQ

Surveyed	Drawn	Checked
A.R	B.M	Layer Surveys

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	SEPT 21	995	01	A0	A

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N

PLAN GRID NORTH

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LEGEND

Cast Iron
Concrete
Clay
Corrugated
Galvanised Metal
Plastic
Vitrified Clay
Asbestos Cement
Brick
Steel
Unknown
Stone
Concrete Flag
Concrete Block
Asphalt
Tarmac
Metal Grating
Metal Cover
Metal Manhole Cover
Concrete Manhole Cover
Plastic Manhole Cover
Tree
Tree with Root Protection

NOTES:

Grid Reference is O.S.(Ireland) Datum. Established using network RTK.
Heights are O.S.(Ireland) Datum. Established using network RTK.

Services shown as 'From Statutory Authority Plans' the lines are taken from the Statutory Authority plans supplied by the relevant Statutory Authority. Layer Surveys cannot be responsible for the accuracy of statutory authority plans only.

DISCLAIMER:

All Layer Surveys drilled and augered exact shaft can moderate up to date information on underground services, however the performance of the exploratory hole may be affected by the presence of services or other obstructions and block out surface utilities, however the performance of the exploratory hole may be affected by the presence of services or other obstructions and block out surface utilities. Layer Surveys cannot be responsible for all utilities present on site from, based located in the appropriate Statutory Authority records and cannot be responsible for any utilities not shown on Statutory Authority records and undertake no dig where appropriate.

Where similar services run in close proximity it may be impossible to accurately determine which service is which, and care will be shown in the interpretation of the information provided by the Statutory Authority and Service Providers.

Successful tracing of non-conductive materials may be limited. Drainage systems may be blocked or collapsed and cannot be traced. Care should always prevails to introduce the sonde due to narrow pipes size and/or blockages in the pipes.

Depth information of underground services/features are generally accurate to within ±0.5m of the stated depth, unless otherwise stated. Depths quoted are to the top of the pipe or feature unless otherwise stated.

Line above ground features may have been obscured at time of survey, it including but not limited to, dense vegetation, subbase, debris and/or obstructions.

Existing record information that was made available to Layer Surveys by the Client or by Statutory Authorities, should not be regarded as 100% indication and cannot be guaranteed.

Deposition in the vicinity of services shown should be carried out with due care and attention.

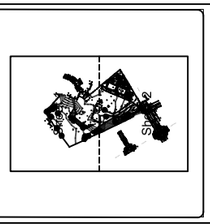
Grid Reference: Irish Grid

SURVEY STATIONS

Name	E	N	Height
L31	391168.943	402503.129	96.13
L31A	391253.515	402668.147	93.95
L32	391182.572	402668.124	93.95
A321	391213.051	402656.942	93.95
A322	391213.051	402656.942	93.95

Revision			
A	05/11	AMENDED LEVELS	
Rev	Date	Description	

Sheet Layout



Scale: 1:500 Date: 12/11/2019

Layer Surveys Ltd
Get the Complete Picture

Client

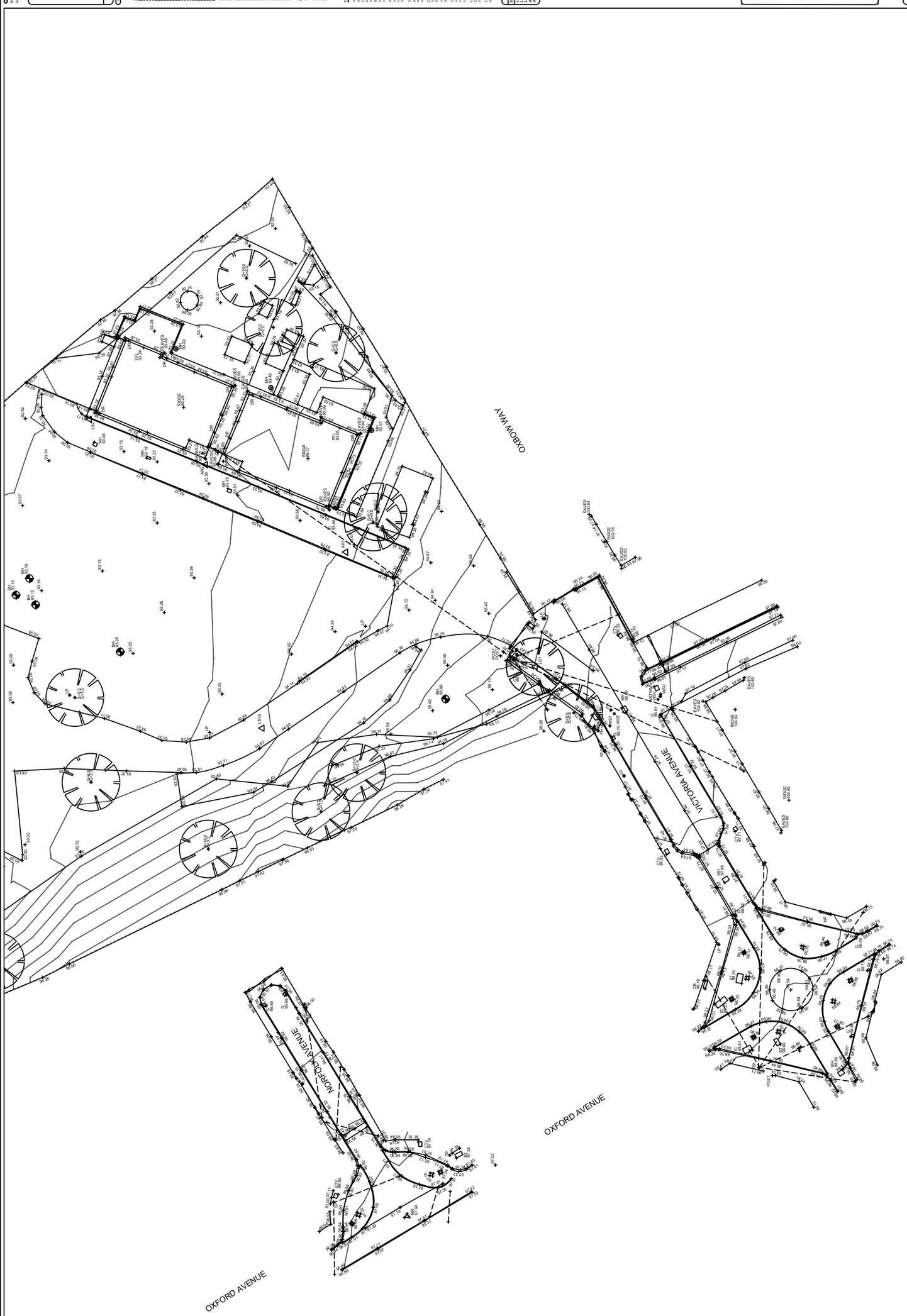
Sulcliffe
16-20 Harrington Street
Dublin
D02 F449
L2 PQA

Project Title

Wheatfields Day Centre
Malahide
K45 6DQ

Surveyed	Drawn	Checked
A.K	N.K	Liam Sweeney

Scale	Date	Drawing Ref.	No.	Size	Rev.
1:500	12/11/21	7301	1	A0	A



Notes:

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Written dimensions to be taken in preference to scaled dimensions.
Due to the inaccuracies of scanning, scanned images should not be scaled.

REV:	DATE:	DESCRIPTION:	BY:
A	15.7.21	Bungalows Added	PO
B	16.7.21	Areas Revised	PO
C	7.10.21	Drain Shown and Layout Adjusted	PO
D	1.11.21	Further landscaping shown	PO
E	23.11.21	Site Entrance Revised	PO
F	25.02.22	Parking shown for 31-37 Victoria Avenue	PO
G	1.3.22	Increased Road Radius Near Plot 17	PO
H	4.3.22	Revised Road Layout	PO
I	4.3.22	Pinch Point Increased	PO
J	11.3.22	Road widend at bends	PO
K	22.3.22	Parking outside 33 & 35 reinstated	PO

Unit Type Key

- 3B5P Houses
  Type A
  18 no. @ 84m2 (90% NDSS)
- 2B3P Walk Up Apartments
  Type B
  6 no. @ 55/63m2 (90% NDSS)
- 2B3P Bungalows
  Type C
  6 no. @ 55m2 (90% NDSS)

Total 30 no. units

CLIENT:

Onward Homes

PROJECT:

Former Wheatfields Day Care Centre
Victoria Avenue, Whitefield

PADDOCK JOHNSON

Studio 2, The Lyceum,
Bath Street, Port Sunlight,
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DRAWING NUMBER:

21059-PJA-00-ZZ-DR-A-1000-K

DRAWING TITLE:

Proposed Site Plan

STATUS:

PLANNING

SCALE:	DATE:	BY:	CHECKED:
1 : 500@A2	30.6.21	PO	VA

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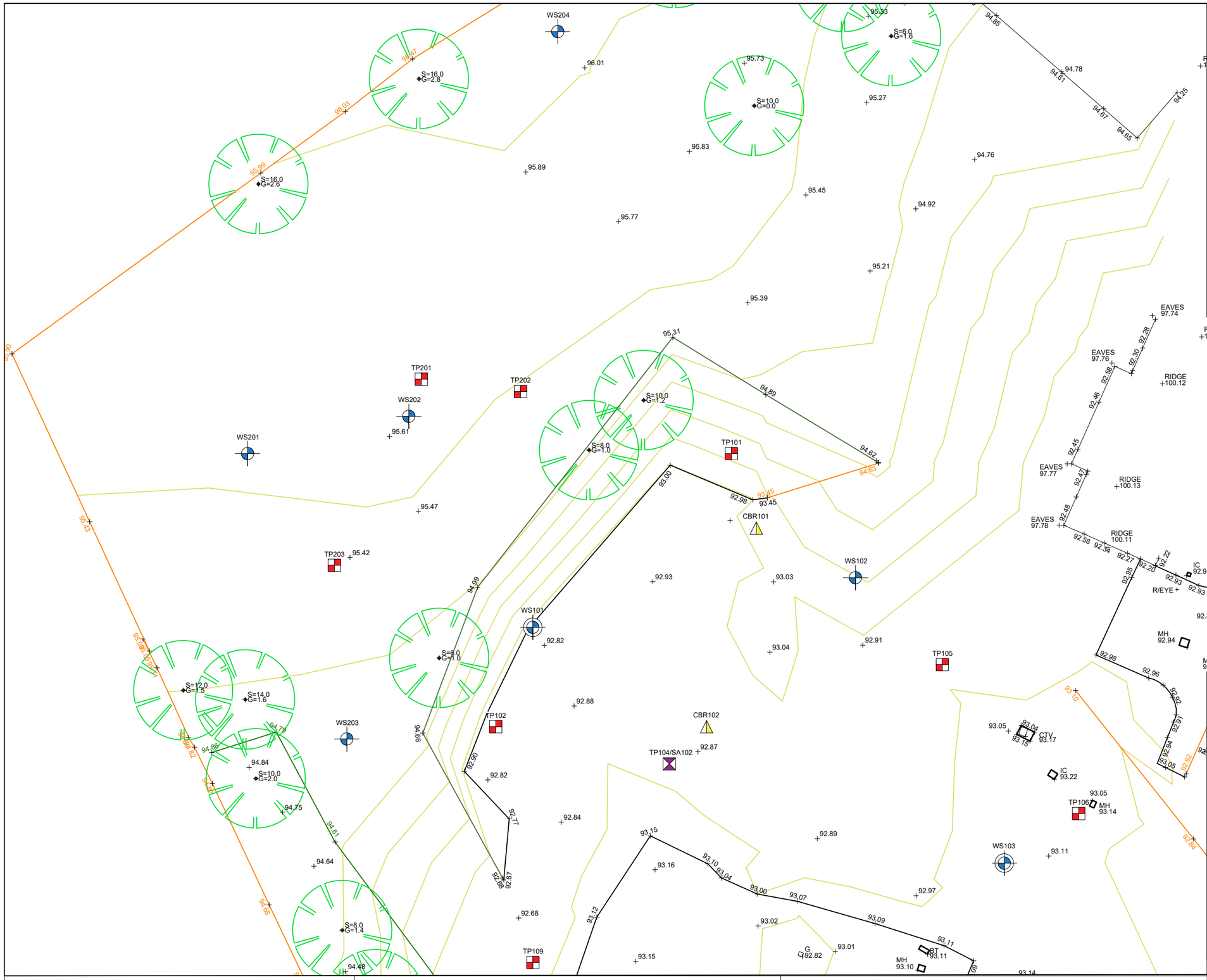
Appendix B

Borehole Logs



Legend

- Dynamic Sampling Borehole Locations (WS)
- Dynamic Sampling Borehole Locations with Gas / Groundwater Installations (WS)
- Trial Pit Locations (TP)
- Trial Pit Locations with BRE 365 "Soakaway" Testing (TP / SA)
- Plate Load Bearing Tests for California Bearing Ratio (CBR)

CO-ORDINATES

WS101 SD81170,05735	TP101 SD81186,05749
WS102 SD81196,05739	TP102 SD81167,05727
WS103 SD81208,05716	TP103/SA101 SD81222,05700
WS104 SD81202,05691	TP104/SA102 SD81181,05724
WS105 SD81195,05649	TP105 SD81203,05732
WS106 SD81184,05667	TP106 SD81214,05720
WS107 SD81177,05695	TP107 SD81198,05639
WS108 SD81210,05705	TP108 SD81215,05685
WS201 SD81147,05749	TP109 SD81170,05708
WS202 SD81160,05752	TP201 SD81161,05755
WS203 SD81155,05726	TP202 SD81169,05754
WS204 SD81172,05783	TP203 SD81154,05740
CBR101 SD81188,05743	
CBR102 SD81184,05727	
CBR103 SD81187,05689	
CBR104 SD81200,05670	

Rev	Description	Date	By	Chkd
P01	PRELIMINARY DRAWING	06/22	DE	DB

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Drawing Status
FOR INFORMATION

Client
ONWARD

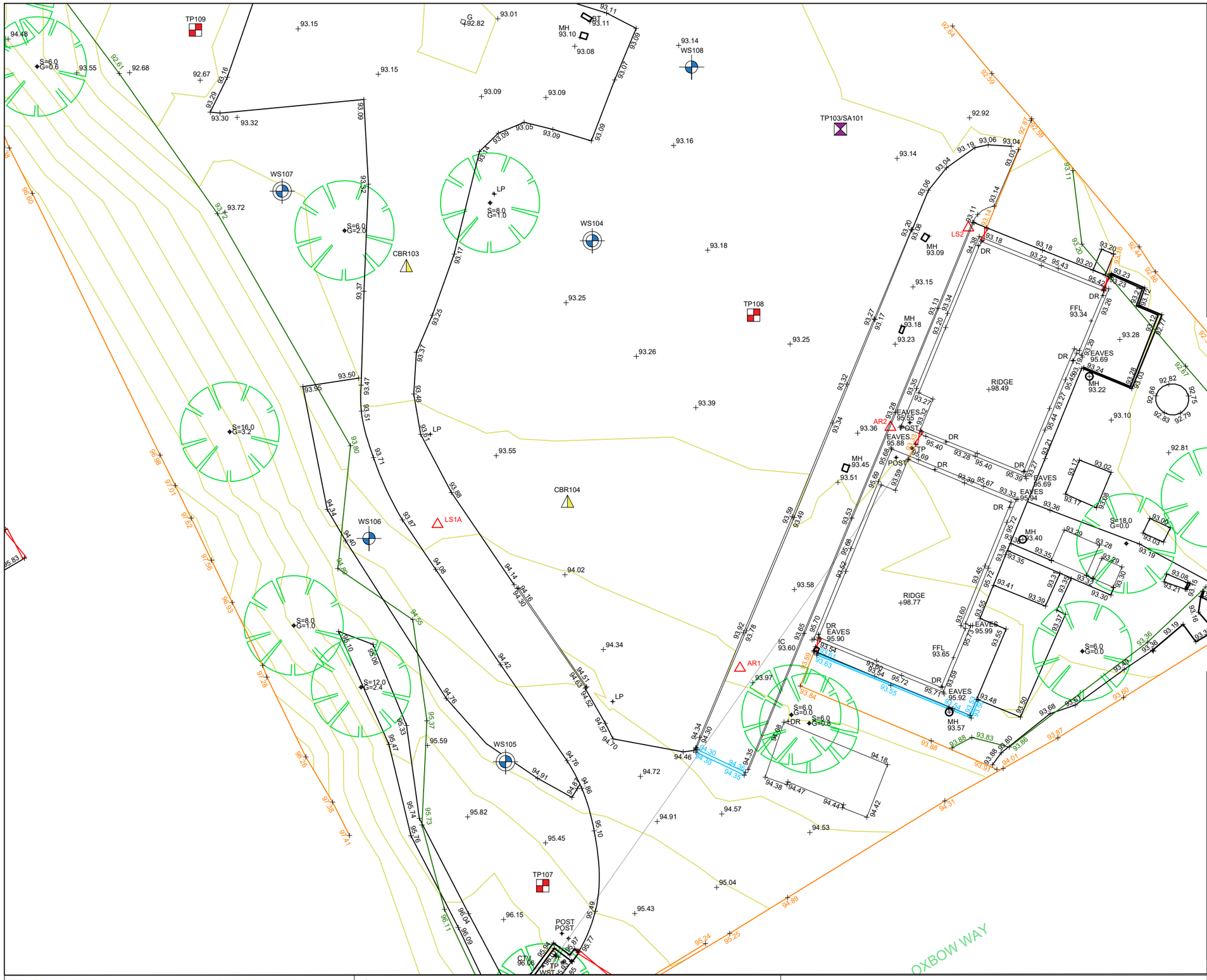
Project
FORMER WHEATFIELD DAY CENTRE
WHITEFIELD

Drawing Title
SITE INVESTIGATION LOCATIONS
ON EXISTING PLAN (NORTHERN)

Date	Drawn By	Checked By
JUNE 2022	D EVANS	D BOWEN

Scale at A3	Project Number
NTS	31990LG

Sheet Number	Revision
31990-SUT-ZZ-OO-DR-G-720-0001	P01



Legend

- Dynamic Sampling Borehole Locations (WS)
- Dynamic Sampling Borehole Locations with Gas / Groundwater Installations (WS)
- Trial Pit Locations (TP)
- Trial Pit Locations with BRE 365 "Soakaway" Testing (TP / SA)
- Plate Load Bearing Tests for California Bearing Ratio (CBR)

CO-ORDINATES

WS101 SD81170,05735	TP101 SD81186,05749
WS102 SD81196,05739	TP102 SD81167,05727
WS103 SD81208,05716	TP103/SA101 SD81222,05700
WS104 SD81202,05691	TP104/SA102 SD81181,05724
WS105 SD81195,05649	TP105 SD81203,05732
WS106 SD81184,05667	TP106 SD81214,05720
WS107 SD81177,05695	TP107 SD81198,05639
WS108 SD81210,05705	TP108 SD81215,05685
WS201 SD81147,05749	TP109 SD81170,05708
WS202 SD81160,05752	TP201 SD81161,05755
WS203 SD81155,05726	TP202 SD81169,05754
WS204 SD81172,05783	TP203 SD81154,05740
CBR101 SD81188,05743	
CBR102 SD81184,05727	
CBR103 SD81187,05689	
CBR104 SD81200,05670	

Rev	Description	Date	By	Chkd
P01	PRELIMINARY DRAWING	06/22	DE	DB

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Drawing Status
FOR INFORMATION

Client
ONWARD

Project
FORMER WHEATFIELD DAY CENTRE
WHITEFIELD

Drawing Title
SITE INVESTIGATION LOCATIONS
ON EXISTING PLAN (SOUTHERN)

Date	Drawn By	Checked By
JUNE 2022	D EVANS	D BOWEN

Scale at A3	Project Number
NTS	31990LG

Sheet Number	Revision
31990-SUT-ZZ-OO-DR-G-720-0001	P01

Sutcliffe	Site: Former Wheatfields Day Centre	Trial Pit Number: TP201

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	Vegetation over dark brown, sandy CLAY with roots (TOPSOIL).		
0.20-0.60	ES1				(0.70) 0.90	Brown to light brown sandy CLAY. Sand is fine to medium.		
					(0.20) 1.10	Orange brown slightly sandy CLAY. Sand is fine.		
					(0.90) 2.00	Grey slightly silty sandy CLAY. Sand is fine.		
					(0.40) 2.40	Brown slightly sandy slightly gravelly CLAY with grey bands of organic material. Sand is fine. Gravel is fine angular to subrounded and of mixed lithologies.		
						Complete at 2.40m		

Remarks

Trial pit dry

Scale (approx)	Logged By	Figure No.
1:25	AT	31990LG.TP201

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Sutcliffe	Site: Former Wheatfields Day Centre	Trial Pit Number: TP202

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Vegetation over black, sandy CLAY. Sand is fine (TOPSOIL).		
					0.30			
					(0.60)	Brown sandy gravelly CLAY. Sand is fine to medium. Gravel is fine, subangular and of mixed lithologies.		
					0.90			
					(0.10)	Black clayey sandy PEAT. Sand is fine.		
					1.00			
					(1.60)	Grey brown slightly silty slightly sandy CLAY. Sand is fine.		
					2.60	Complete at 2.60m		

Remarks

Trial pit dry

Scale (approx)	Logged By	Figure No.
1:25	AT	31990LG.TP202

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Sutcliffe	Site: Former Wheatfields Day Centre	Trial Pit Number: TP203

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Vegetation over brown, sandy CLAY with roots (TOPSOIL).		
					0.40	Light brown slightly sandy slightly gravelly CLAY with grey bands. Sand is fine. Gravel is fine to medium, subangular and of mixed lithologies.		
					(1.60)			
					2.00	Complete at 2.00m		

Remarks

Trial pit dry

Scale (approx)	Logged By	Figure No.
1:25	AT	31990LG.TP203

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Sutcliffe	Site: Former Wheatfields Day Centre	Number: WS201

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.90)	Overgrown vegetation over dark brown grey, slightly sandy gravelly CLAY. Sand is fine. Gravel is fine to medium, subangular and of mixed lithologies. (TOPSOIL)		
					0.90	Soft light brown, slightly silty very sandy CLAY. Sand is fine.		
1.20-1.65	SPT N=6		1,0/0,2,2,2		(0.70)			
					1.60 (0.30) 1.90	Light brown, very clayey slightly silty, fine to medium grained SAND.		
2.00-2.45	SPT N=12		3,3/3,3,3,3		(0.40) 2.30	Stiff yellowish brown, very sandy gravelly CLAY. Sand is fine to medium. Gravel is fine, angular to subangular and of mixed lithologies.		
3.00-3.45	SPT N=15		3,5/3,4,4,4		(1.70)	Stiff brown slightly sandy gravelly CLAY with grey veining. Sand is fine. Gravel is fine to medium, angular to subangular and of mixed lithologies.		
			Water strike(1) at 4.00m, no rise after 20 mins.		4.00			▼1
4.00-4.45	SPT N=31		4,4/5,8,8,10		(0.90)	Very stiff grey brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine, angular to subangular and of mixed lithologies.		
5.00-5.45	SPT N=6		1,1/1,1,2,2		4.90 5.00	Medium dense grey brown slightly clayey fine to medium grained SAND with occasional coal fragments.		
					(0.45) 5.45	Loose grey brown fine to medium grained SAND.		
						Complete at 5.45m		

Remarks

Scale (approx)	Logged By
1:50	AT

Figure No. 31990LG.WS201

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Sutcliffe	Site: Former Wheatfields Day Centre	Number: WS202

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20-0.60	ES1				(0.90)	Grass over MADE GROUND: light brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium subangular and of brick.		
					0.90 (0.20) 1.10	Dark brown slightly clayey PEAT.		
1.20-1.65	SPT N=6		0,0/1,1,2,2			Stiff to very stiff brown slightly sandy gravelly CLAY. Sand is fine. Gravel is fine subangular and of mixed lithologies.		
2.00-2.45	SPT N=10		1,1/2,2,3,3		(2.30)			
3.00-3.45	SPT N=24		2,3/3,5,8,8					
					3.40 (0.60)	Stiff brown grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine to medium subangular and of mixed lithologies.		
4.00-4.45	SPT N=7		2,2/1,2,2,2		4.00 (1.00)	Medium dense brown fine to medium grained SAND.		
5.00-5.45	SPT N=14		2,2/3,3,4,4		5.00 (1.00)	Very stiff brown very sandy CLAY. Sand is fine to medium.		
6.00-6.45	SPT N=21		3,3/4,5,5,7		6.00	Complete at 6.45m		

Remarks
Borehole dry

Scale (approx)	Logged By
1:50	AT

Figure No. 31990LG.WS202

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Sutcliffe	Site: Former Wheatfields Day Centre	Number: WS203

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	Vegetation over brown, slightly sandy, gravelly CLAY. Sand is fine. Gravel is fine to medium, subangular and of mixed lithologies. (TOPSOIL)		
1.20-1.65	SPT N=25		1,1/2,1,7,15		(1.55) 1.95	MADE GROUND: brown clayey fine to medium grained SAND.		
2.00-2.45	SPT N=13		2,2/4,3,3,3		(0.20) 2.15	MADE GROUND: black decomposing WOOD.		
					(0.75) 2.90	Stiff brown grey slightly silty slightly sandy CLAY. Sand is fine		
3.00-3.45	SPT N=11		2,2/2,3,3,3		(1.10) 4.00	Very stiff black grey slightly sandy CLAY. Sand is fine.		▼1
4.00-4.45	SPT N=24		Water strike(1) at 4.00m, no rise after 20 mins. 3,4/5,6,6,7		(1.00) 5.00	Very stiff light brown very sandy CLAY. Sand is fine to medium.		
5.00-5.45	SPT N=21		3,4/6,5,5,5		(1.00) 6.00	Medium dense grey brown clayey fine to medium grained SAND.		
						Complete at 6.45m		

Remarks	Scale (approx)	Logged By
	1:50	AT
	Figure No. 31990LG.WS203	

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Sutcliffe	Site: Former Wheatfields Day Centre	Number: WS204

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			Onward	31990LG
	Location	**Dates** 26/05/2022	**Engineer** Michael Wiggins	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	Grass over dark brown, sandy CLAY with roots (TOPSOIL).		
0.20-0.50	ES1				(0.30) 0.50	MADE GROUND: brown slightly sandy CLAY. Sand is fine.		
					(0.20) 0.70	MADE GROUND: black to dark brown sandy CLAY with organic material - possibly relic topsoil layer.		
					(0.30) 1.00	Stiff to very stiff brown slightly sandy CLAY. Sand is fine.		
1.20-1.65	SPT N=4		1,1/1,1,1,1			Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is fine, subangular and of mixed lithologies.		
2.00-2.45	SPT N=13		2,2/3,3,3,4		(2.10)			
3.00-3.45	SPT N=12		2,3/3,4,3,2		3.10	Very stiff brown friable very sandy gravelly CLAY. Sand is fine		
					(0.90) 4.00			
4.00-4.45	SPT(C) N=38		10,11/13,12,6,7			Complete at 6.02m		
4.45-4.90	SPT(C) N=20		5,4/4,4,7,5					
4.90-5.35	SPT(C) N=22		7,6/6,5,5,6					
5.35-5.80	SPT(C) N=43		9,10/11,9,11,12					
5.80-6.02	SPT(C) 38/70		/13,13,12					

Remarks
Driving cobble from 3.00m to 4.00m - continued with CPT to 6.02m

Scale (approx)	Logged By
1:50	AT

Figure No. 31990LG.WS204

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Appendix C

Infiltration Test Results

Sutcliffe Soakaway Test
Field Record Sheet

Site:	Former Wheatfields Day Centre, Whitefield
Client:	Onward
Job No.:	31990LG

Infiltration Pit:	TP103(SA)	**Test No:** 1	**Start Time: 10:00**
			Date: 20/9/2021

Pit Dimensions (m)			
Length:	1.7	Width:	0.6

Depth:	2.3

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	0.85		
30	0.85		
60	0.85		
230	0.85		

Start Depth	0.85
Effective 75% depth	1.2125
Effective 50% depth	1.575
Effective 25% depth	1.9375

Elapsed Time	N/A
Elapsed Time	N/A

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Sketch Pit Dimensions

Comments:

Sutcliffe Soakaway Test
Field Record Sheet

Site:	Former Wheatfields Day Centre, Whitefield
Client:	Onward
Job No.:	31990LG

Infiltration Pit:	TP104 (SA)	**Test No:**	1	**Start Time: 10:50**
				Date:20/09/2021

Pit Dimensions (m)				
Length:	1.8	Width:	0.6	Depth: 2.15

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.1		
30	1.1		
60	1.1		
230	1.1		

Start Depth	1.1		
Effective 75% depth	1.3625	Elapsed Time	N/A
Effective 50% depth	1.625		
Effective 25% depth	1.8875	Elapsed Time	N/A

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Sketch Pit Dimensions

Comments:

Appendix D

Existing Drainage Layout

H7" D286!622?!7" :1%"#5#2:1% DD # !:8 87231 21 !768D4 168 DD#2E6@"! 2149 1% 6856A"161 //2#% 1/" 36!7!7" G"8! 61?2#@ !621##"1!49 A 64G4"BĀ16!"%Ā!646!673 !"# 36442! //"D! 46 G64629 19 42882#% @ 5" / :8"% G9!7" /!: 4 D286!626"615%6?#"1! ?#2@728" 87231B

]#231 /2D9#657!1% % ! G 8" #657!8')_ W#%1 1/" Q:#A"9)"'>>(*>B Ā1 : !72#68"%#"D#2%:/!6213646!1?#615!7"8" /2D9#657!8B

LEGEND

	Abandoned	Foul	Surface Water	Combined
Public Sewer				
Private Sewer				
Section 104				
Rising Main				
Sludge Main				
Overflow				
Water Course				
Highway Drain				

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO Foul
SW Surface Water
CO Combined
OV Overflow

SEWER SHAPE

CI Circular
TR Trapezoidal
EG Egg
AR Arch
OV Oval
BA Barrel
FT Flat Top
HO HorseShoe
RE Rectangular
UN Unspecified
SQ Square

SEWER MATERIAL

AC Asbestos Cement
BR Brick
PE Polyethylene
RP Reinforced Plastic Matrix
CO Concrete
CSB Concrete Segment Bolted
CSU Concrete Segment Unbolted
CC Concrete Box Culverted
PSC Plastic / Steel Composite
GRC Glass Reinforecd Plastic
DI Ductile Iron
PVC Polyvinyl Chloride
CI Cast Iron
SI Spun Iron
ST Steel
VC Vitrified Clay
PP Polypropylene
PF Pitch Fibre
MAC Masonry, Coursed
MAR Masonry, Random
U Unspecified

Address or Site Reference:

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Ä\.HVO.V$ZK
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Scale:)L)>,' **Date:** '=&'=&>'>)

Sheet:) 2 ?)

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SEWER RECORDS

United Utilities
Water for the North West

Appendix E

Qbar Hydraulic Calculations
Proposed Drainage Network Hydraulic Calculations

Sutcliffe

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	970	Region Number	Region 10

Results	**l/s**
QBAR Rural	6.4
QBAR Urban	6.4
Q2 years	6.0
Q1 year	5.6
Q30 years	10.9
Q100 years	13.4

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.328	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)	400

Designed with Level Soffits

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

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	16.806	0.042	400.2	0.073	5.00	0.0	0.600	o	900	Pipe/Conduit	
1.001	6.431	0.016	400.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.002	16.704	0.042	400.0	0.016	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.003	33.293	0.083	400.0	0.069	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.004	22.274	0.056	400.0	0.084	0.00	0.0	0.600	o	900	Pipe/Conduit	
2.000	14.496	0.036	400.0	0.075	5.00	0.0	0.600	o	900	Pipe/Conduit	
2.001	30.035	0.075	400.0	0.033	0.00	0.0	0.600	o	900	Pipe/Conduit	
2.002	13.864	0.035	399.5	0.117	0.00	0.0	0.600	o	900	Pipe/Conduit	
3.000	3.717	0.037	100.0	0.000	5.00	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	5.18	92.439	0.073	0.0	0.0	0.0	1.56	992.5	9.9
1.001	50.00	5.25	92.397	0.073	0.0	0.0	0.0	1.56	992.7	9.9
1.002	50.00	5.43	92.381	0.089	0.0	0.0	0.0	1.56	992.7	12.0
1.003	50.00	5.78	92.339	0.158	0.0	0.0	0.0	1.56	992.7	21.4
1.004	50.00	6.02	92.256	0.242	0.0	0.0	0.0	1.56	992.7	32.8
2.000	50.00	5.15	92.346	0.075	0.0	0.0	0.0	1.56	992.7	10.2
2.001	50.00	5.48	92.310	0.109	0.0	0.0	0.0	1.56	992.7	14.7
2.002	50.00	5.62	92.235	0.226	0.0	0.0	0.0	1.56	993.3	30.6
3.000	50.00	5.04	92.298	0.000	0.0	0.0	0.0	1.57	111.1	0.0

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Network Design Table for Surface Network 1

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
3.001	6.037	0.060	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	10.331	0.248	41.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	24.556	0.246	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	21.852	0.219	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	19.202	0.192	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.009	11.229	0.112	100.0	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)
3.001	50.00	5.14	92.260	0.000	0.0	0.0	0.0	1.00	17.8	0.0
1.005	50.00	6.13	92.200	0.468	0.0	0.0	0.0	1.56	27.6«	63.4
1.006	50.00	6.54	91.754	0.468	0.0	0.0	0.0	1.00	17.8«	63.4
1.007	50.00	6.90	91.509	0.468	0.0	0.0	0.0	1.00	17.8«	63.4
1.008	50.00	7.22	91.290	0.468	0.0	0.0	0.0	1.00	17.8«	63.4
1.009	50.00	7.40	91.098	0.468	0.0	0.0	0.0	1.00	17.8«	63.4

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Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.058	0.058	0.058
	User	-	100	0.005	0.005	0.063
	User	-	100	0.010	0.010	0.073
1.001	-	-	100	0.000	0.000	0.000
1.002	User	-	100	0.016	0.016	0.016
1.003	User	-	100	0.032	0.032	0.032
	User	-	100	0.017	0.017	0.049
	User	-	100	0.017	0.017	0.067
	User	-	100	0.002	0.002	0.069
1.004	User	-	100	0.021	0.021	0.021
	User	-	100	0.016	0.016	0.037
	User	-	100	0.016	0.016	0.053
	User	-	100	0.013	0.013	0.066
	User	-	100	0.016	0.016	0.082
	User	-	100	0.002	0.002	0.084
2.000	User	-	100	0.022	0.022	0.022
	User	-	100	0.028	0.028	0.050
	User	-	100	0.025	0.025	0.075
2.001	User	-	100	0.033	0.033	0.033
2.002	User	-	100	0.015	0.015	0.015
	User	-	100	0.016	0.016	0.031
	User	-	100	0.023	0.023	0.054
	User	-	100	0.017	0.017	0.071
	User	-	100	0.042	0.042	0.113
	User	-	100	0.005	0.005	0.117
3.000	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.468	0.468	0.468

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	EXMH 2710	92.336	90.986	0.000	1500	0

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Simulation Criteria for Surface Network 1

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 Coeffiecient	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 Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	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)	19.000	Storm Duration (mins)	30
Ratio R	0.328		

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Online Controls for Surface Network 1

Non Return Valve Manhole: MH2, DS/PN: 3.001, Volume (m³): 3.6

Hydro-Brake® Optimum Manhole: S12, DS/PN: 1.005, Volume (m³): 36.8

Unit Reference	MD-SHE-0107-6400-1800-6400
Design Head (m)	1.800
Design Flow (l/s)	6.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	92.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.800	6.4
Flush-Flo™	0.466	6.0
Kick-Flo®	0.953	4.8
Mean Flow over Head Range	-	5.4

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.6	1.200	5.3	3.000	8.1	7.000	12.2
0.200	5.3	1.400	5.7	3.500	8.7	7.500	12.6
0.300	5.8	1.600	6.1	4.000	9.3	8.000	13.0
0.400	6.0	1.800	6.4	4.500	9.9	8.500	13.3
0.500	6.0	2.000	6.7	5.000	10.4	9.000	13.7
0.600	5.9	2.200	7.0	5.500	10.8	9.500	14.1
0.800	5.5	2.400	7.3	6.000	11.3		
1.000	4.9	2.600	7.6	6.500	11.7		

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Offline Controls for Surface Network 1

Pipe Manhole: S12, DS/PN: 1.005, Loop to PN: 3.000

Diameter (m)	0.300	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	10.0	Coefficient of Contraction	0.600
Length (m)	5.000	Upstream Invert Level (m)	93.850

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Storage Structures for Surface Network 1

Tank or Pond Manhole: MH1 , DS/PN: 3.000

Invert Level (m) 92.299

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	112.0	1.600	112.0	1.601	0.0

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

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 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 Storage Structures 1
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.328
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.000 Cv (Winter) 1.000

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

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

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	S1	120 Summer	1	+0%					92.689
1.001	S2	120 Summer	1	+0%					92.689
1.002	S3	120 Summer	1	+0%					92.689
1.003	S4	120 Summer	1	+0%					92.690
1.004	S6	120 Summer	1	+0%					92.690
2.000	S9	120 Summer	1	+0%					92.690
2.001	S10	120 Summer	1	+0%					92.690
2.002	S11	120 Summer	1	+0%					92.690
3.000	MH1	15 Summer	1	+0%					92.298
3.001	MH2	15 Summer	1	+0%					92.260
1.005	S12	120 Summer	1	+0%	1/15 Summer			0	92.690
1.006	S13	360 Winter	1	+0%					91.816
1.007	S14	240 Summer	1	+0%					91.570
1.008	S15	360 Winter	1	+0%					91.352
1.009	S16	360 Winter	1	+0%					91.161

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	-0.650	0.000	0.01			5.1	OK	
1.001	S2	-0.607	0.000	0.01			3.4	OK	
1.002	S3	-0.591	0.000	0.01			3.3	OK	
1.003	S4	-0.549	0.000	0.01			5.6	OK	
1.004	S6	-0.466	0.000	0.01			5.7	OK	
2.000	S9	-0.556	0.000	0.01			5.6	OK	
2.001	S10	-0.520	0.000	0.01			5.2	OK	
2.002	S11	-0.445	0.000	0.02			8.1	OK	
3.000	MH1	-0.300	0.000	0.00			0.0	OK	
3.001	MH2	-0.150	0.000	0.00			0.0	OK	
1.005	S12	0.340	0.000	0.24	0.0		6.0	SURCHARGED	
1.006	S13	-0.089	0.000	0.35			6.0	OK	
1.007	S14	-0.088	0.000	0.36			6.0	OK	
1.008	S15	-0.088	0.000	0.36			6.0	OK	
1.009	S16	-0.087	0.000	0.37			6.0	OK	

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

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 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 Storage Structures 1
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.328
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.000 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2
Climate Change (%) 0

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	S1	120 Winter	2	+0%					92.794
1.001	S2	120 Winter	2	+0%					92.794
1.002	S3	120 Winter	2	+0%					92.794
1.003	S4	120 Winter	2	+0%					92.794
1.004	S6	120 Winter	2	+0%					92.794
2.000	S9	120 Winter	2	+0%					92.794
2.001	S10	120 Winter	2	+0%					92.794
2.002	S11	120 Winter	2	+0%					92.794
3.000	MH1	15 Summer	2	+0%					92.298
3.001	MH2	15 Summer	2	+0%					92.260
1.005	S12	120 Winter	2	+0%	2/15 Summer			0	92.794
1.006	S13	120 Summer	2	+0%					91.816
1.007	S14	360 Winter	2	+0%					91.570
1.008	S15	480 Summer	2	+0%					91.352
1.009	S16	960 Summer	2	+0%					91.161

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	-0.545	0.000	0.01			4.3	OK	
1.001	S2	-0.503	0.000	0.01			2.6	OK	
1.002	S3	-0.487	0.000	0.00			2.7	OK	
1.003	S4	-0.445	0.000	0.01			4.6	OK	
1.004	S6	-0.362	0.000	0.01			5.1	OK	
2.000	S9	-0.452	0.000	0.01			4.7	OK	
2.001	S10	-0.416	0.000	0.01			4.6	OK	
2.002	S11	-0.340	0.000	0.01			7.6	OK	
3.000	MH1	-0.300	0.000	0.00			0.0	OK	
3.001	MH2	-0.150	0.000	0.00			0.0	OK	
1.005	S12	0.444	0.000	0.24	0.0		6.0	SURCHARGED	
1.006	S13	-0.089	0.000	0.35			6.0	OK	
1.007	S14	-0.088	0.000	0.36			6.0	OK	
1.008	S15	-0.088	0.000	0.36			6.0	OK	
1.009	S16	-0.087	0.000	0.37			6.0	OK	

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

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 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 Storage Structures 1
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.328
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.000 Cv (Winter) 1.000

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

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

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	S1	240 Winter	30	+0%	30/120 Summer				93.809
1.001	S2	240 Winter	30	+0%	30/60 Summer				93.809
1.002	S3	240 Winter	30	+0%	30/60 Summer				93.809
1.003	S4	240 Winter	30	+0%	30/60 Summer				93.809
1.004	S6	240 Winter	30	+0%	30/60 Summer				93.809
2.000	S9	240 Winter	30	+0%	30/60 Summer				93.809
2.001	S10	240 Winter	30	+0%	30/60 Summer				93.809
2.002	S11	240 Winter	30	+0%	30/60 Summer				93.809
3.000	MH1	15 Summer	30	+0%					92.298
3.001	MH2	15 Summer	30	+0%					92.260
1.005	S12	240 Winter	30	+0%	30/15 Summer			0	93.809
1.006	S13	240 Winter	30	+0%					91.816
1.007	S14	240 Winter	30	+0%					91.571
1.008	S15	240 Winter	30	+0%					91.353
1.009	S16	240 Winter	30	+0%					91.162

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.470	0.000	0.01			5.0	SURCHARGED	
1.001	S2	0.512	0.000	0.00			2.4	SURCHARGED	
1.002	S3	0.528	0.000	0.01			3.2	SURCHARGED	
1.003	S4	0.570	0.000	0.01			3.8	SURCHARGED	
1.004	S6	0.654	0.000	0.01			4.5	SURCHARGED	
2.000	S9	0.563	0.000	0.01			5.5	SURCHARGED	
2.001	S10	0.600	0.000	0.01			5.0	SURCHARGED	
2.002	S11	0.675	0.000	0.02			8.5	SURCHARGED	
3.000	MH1	-0.300	0.000	0.00			0.0	OK	
3.001	MH2	-0.150	0.000	0.00			0.0	OK	
1.005	S12	1.459	0.000	0.25	0.0		6.1	SURCHARGED	
1.006	S13	-0.088	0.000	0.36			6.1	OK	
1.007	S14	-0.088	0.000	0.36			6.1	OK	
1.008	S15	-0.088	0.000	0.36			6.1	OK	
1.009	S16	-0.086	0.000	0.38			6.1	OK	

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

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 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 Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.328
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	19.000	Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	35

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S1	60 Summer	100	+35%	100/15 Summer			
1.001	S2	60 Summer	100	+35%	100/15 Summer			
1.002	S3	60 Summer	100	+35%	100/15 Summer			
1.003	S4	60 Summer	100	+35%	100/15 Summer			
1.004	S6	60 Summer	100	+35%	100/15 Summer			
2.000	S9	60 Summer	100	+35%	100/15 Summer			
2.001	S10	60 Summer	100	+35%	100/15 Summer			
2.002	S11	60 Summer	100	+35%	100/15 Summer			
3.000	MH1	360 Winter	100	+35%	100/30 Summer			
3.001	MH2	360 Winter	100	+35%	100/30 Summer			
1.005	S12	60 Summer	100	+35%	100/15 Summer		100/30 Summer	16
1.006	S13	60 Summer	100	+35%				
1.007	S14	60 Summer	100	+35%				
1.008	S15	60 Summer	100	+35%				
1.009	S16	60 Summer	100	+35%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S1	94.061	0.722	0.000	0.05			27.3	SURCHARGED
1.001	S2	94.059	0.763	0.000	0.05			23.6	SURCHARGED
1.002	S3	94.058	0.778	0.000	0.05			28.1	SURCHARGED
1.003	S4	94.056	0.817	0.000	0.06			47.2	SURCHARGED
1.004	S6	94.052	0.896	0.000	0.10			70.2	SURCHARGED
2.000	S9	94.056	0.810	0.000	0.06			31.6	SURCHARGED
2.001	S10	94.054	0.845	0.000	0.05			36.6	FLOOD RISK
2.002	S11	94.051	0.917	0.000	0.14			74.2	SURCHARGED
3.000	MH1	93.626	1.028	0.000	0.13			8.2	SURCHARGED
3.001	MH2	93.714	1.304	0.000	0.40			6.0	SURCHARGED
1.005	S12	94.046	1.696	0.000	0.26	133.1		6.5	SURCHARGED
1.006	S13	91.818	-0.086	0.000	0.38			6.5	OK
1.007	S14	91.573	-0.086	0.000	0.39			6.5	OK
1.008	S15	91.355	-0.085	0.000	0.39			6.5	OK
1.009	S16	91.164	-0.084	0.000	0.40			6.5	OK

PN	US/MH Name	Level Exceeded
1.000	S1	
1.001	S2	
1.002	S3	
1.003	S4	
1.004	S6	
2.000	S9	
2.001	S10	
2.002	S11	
3.000	MH1	
3.001	MH2	
1.005	S12	
1.006	S13	
1.007	S14	
1.008	S15	
1.009	S16	

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

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 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 Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.328
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	19.000	Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	46

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S1	60 Summer	100	+46%	100/15 Summer			
1.001	S2	60 Summer	100	+46%	100/15 Summer			
1.002	S3	60 Summer	100	+46%	100/15 Summer			
1.003	S4	60 Summer	100	+46%	100/15 Summer			
1.004	S6	60 Summer	100	+46%	100/15 Summer			
2.000	S9	60 Summer	100	+46%	100/15 Summer			
2.001	S10	60 Summer	100	+46%	100/15 Summer			
2.002	S11	60 Summer	100	+46%	100/15 Summer			
3.000	MH1	360 Winter	100	+46%	100/30 Summer			
3.001	MH2	360 Winter	100	+46%	100/30 Summer			
1.005	S12	60 Summer	100	+46%	100/15 Summer		100/15 Summer	18
1.006	S13	60 Summer	100	+46%				
1.007	S14	60 Summer	100	+46%				
1.008	S15	60 Summer	100	+46%				
1.009	S16	60 Summer	100	+46%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S1	94.096	0.757	0.000	0.05			30.5	SURCHARGED
1.001	S2	94.094	0.797	0.000	0.06			29.1	SURCHARGED
1.002	S3	94.092	0.812	0.000	0.06			34.3	SURCHARGED
1.003	S4	94.090	0.851	0.000	0.08			57.7	SURCHARGED
1.004	S6	94.085	0.929	0.000	0.13			85.8	SURCHARGED
2.000	S9	94.090	0.844	0.000	0.06			33.3	SURCHARGED
2.001	S10	94.088	0.878	0.000	0.06			44.1	FLOOD RISK
2.002	S11	94.084	0.949	0.000	0.18			90.7	SURCHARGED
3.000	MH1	93.892	1.294	0.000	0.20			12.0	SURCHARGED
3.001	MH2	93.959	1.549	0.000	0.69			10.3	SURCHARGED
1.005	S12	94.078	1.728	0.000	0.26	165.6		6.5	SURCHARGED
1.006	S13	91.819	-0.086	0.000	0.39			6.5	OK
1.007	S14	91.573	-0.085	0.000	0.39			6.5	OK
1.008	S15	91.355	-0.085	0.000	0.39			6.5	OK
1.009	S16	91.165	-0.084	0.000	0.41			6.5	OK

PN	US/MH Name	Level Exceeded
1.000	S1	
1.001	S2	
1.002	S3	
1.003	S4	
1.004	S6	
2.000	S9	
2.001	S10	
2.002	S11	
3.000	MH1	
3.001	MH2	
1.005	S12	
1.006	S13	
1.007	S14	
1.008	S15	
1.009	S16	

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Appendix F

Proposed Drainage Layout
Drainage Areas Plan

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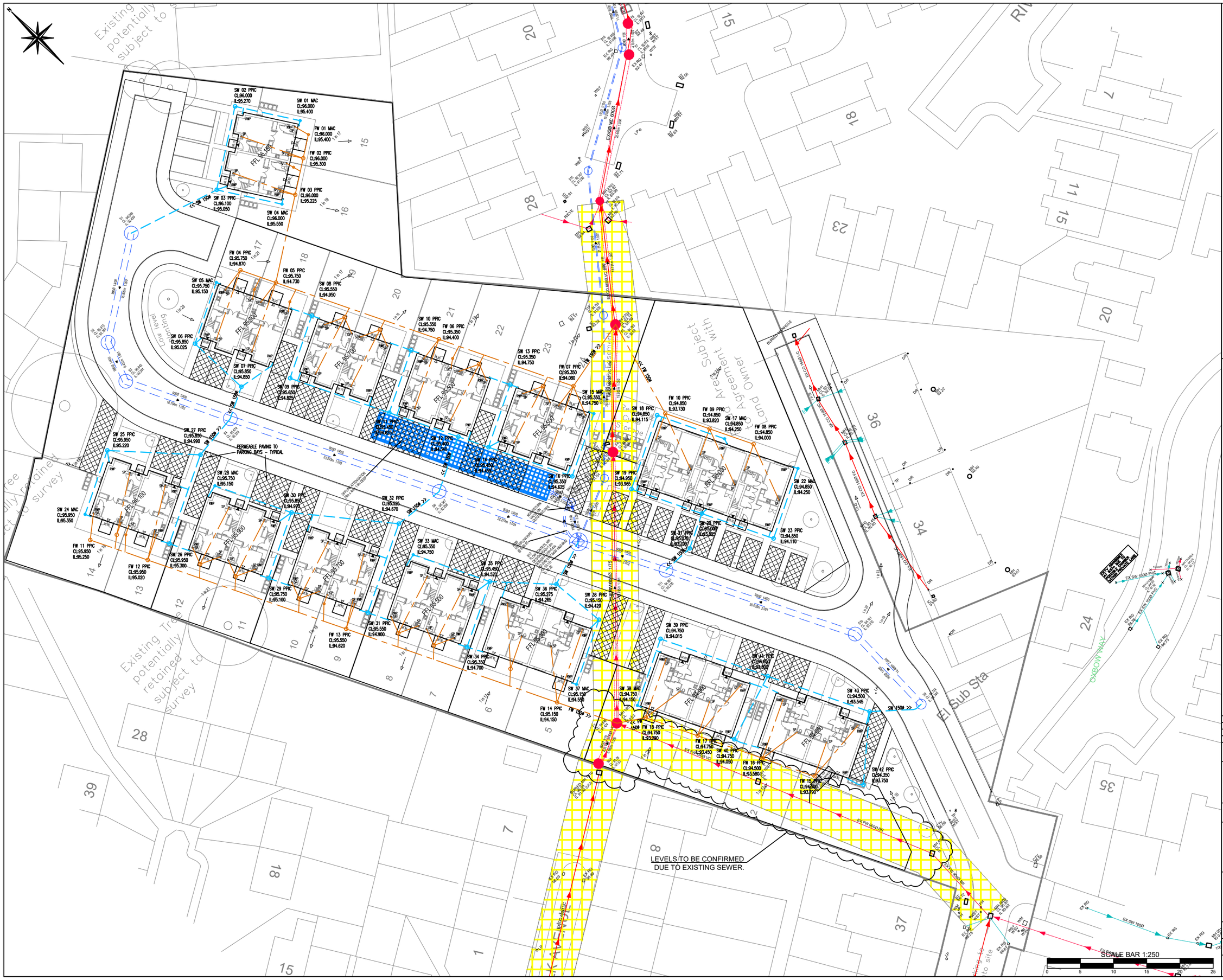

GENERAL NOTES

1. THIS DRAWING TO READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL AND ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR / FABRICATOR PRIOR TO COMMENCEMENT OF WORKS.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
4. ALL WORKS TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE ENGINEER'S SPECIFICATIONS, RELEVANT BRITISH STANDARDS AND WHERE APPLICABLE LOCAL AUTHORITIES REQUIREMENTS.

DRAINAGE KEY

- SITE BOUNDARY
- SURFACE WATER SEWER / MH
- FOUL WATER SEWER / MH
- COMBINED WATER SEWER / MH
- PRIVATE SURFACE WATER SEWER / MH
- PRIVATE FOUL WATER SEWER / MH
- SEWER EASEMENT (AS DIMENSIONED)
- EXISTING SURFACE WATER SEWER / MH
- EXISTING FOUL WATER SEWER / MH
- RWP — Rainwater pipe location
- SP — Soil pipe location
- Permeable driveway
- Surface Water Attenuation Cells

NOTE: ALL RWP/SP/BIG POSITIONS TO BE CONFIRMED BY ARCHITECT PRIOR TO START OF WORKS ON SITE

Rev	Description	Date	By	Chkd
P03	PRIVATE DRAINAGE ADDED	30.06.22	AJB	DS
P02	SITE PLAN UPDATED	23.03.22	MJG	DS
P01	PRELIMINARY ISSUE	11.11.21	JG	DS

Drawing Status
PRELIMINARY DRAWING

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Architectural & Environmental Investigations
Building Surveying
the Planning Services
www.sutcliffe.co.uk

Client
ONWARD

Project
FORMER WHEATFIELDS
DAY CENTRE
WHITEFIELD

Drawing Title
INDICATIVE DRAINAGE LAYOUT

Date	Drawn By	Checked By
NOV. 2021	JG	DS

Scale at A1	Project Number
1:250	31990

Sheet Number	Revision
31990-SUT-ZZ-XX-DR-C-6020	P03

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Client
ONWARD

Project
FORMER WHEATFIELDS FAY CENTRE WHITEFIELD

Drawing Title
DRAINED AREAS PLAN

Rev	Description	Date	By	Chkd
P01	ISSUED FOR COMMENT	29.06.22	AJB	DS

Date	Drawn By	Checked By
JULY 2022	AJB	DS

Scale at A3	Project Number
1:500	31990

Sheet Number	Revision
31990-SUT-ZZ-XX-DR-C-6003	P01

Appendix G

Flood Exceedance

Sutcliffe

Summary of Results for 360 minute 100 year Winter (Surface Network 1)

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

WARNING: The analysis maybe unstable. Please see the method of analysis help for more details.

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	S1	94.203	0.864	0.000	0.01			8.1	SURCHARGED
1.001	S2	94.199	0.902	0.000	0.02			8.1	SURCHARGED
1.002	S3	94.198	0.918	0.000	0.02			9.8	SURCHARGED
1.003	S4	94.203	0.964	0.000	0.02			17.5	SURCHARGED
1.004	S6	94.218	1.062	0.000	0.04			26.8	SURCHARGED
2.000	S9	94.197	0.951	0.000	0.02			8.3	SURCHARGED
2.001	S10	94.202	0.992	96.479	0.02			12.0	FLOOD
2.002	S11	94.222	1.087	0.000	0.05			25.0	SURCHARGED
3.000	MH1	94.509	1.911	0.000	0.70			42.7	SURCHARGED
3.001	MH2	95.116	2.706	1.991	1.80			26.7	FLOOD
1.005	S12	94.230	1.880	0.000	0.27	54.5		6.6	SURCHARGED
1.006	S13	91.820	-0.084	0.000	0.39			6.6	OK
1.007	S14	91.574	-0.084	0.000	0.39			6.6	OK
1.008	S15	91.356	-0.084	0.000	0.40			6.6	OK
1.009	S16	91.166	-0.083	0.000	0.41			6.6	OK

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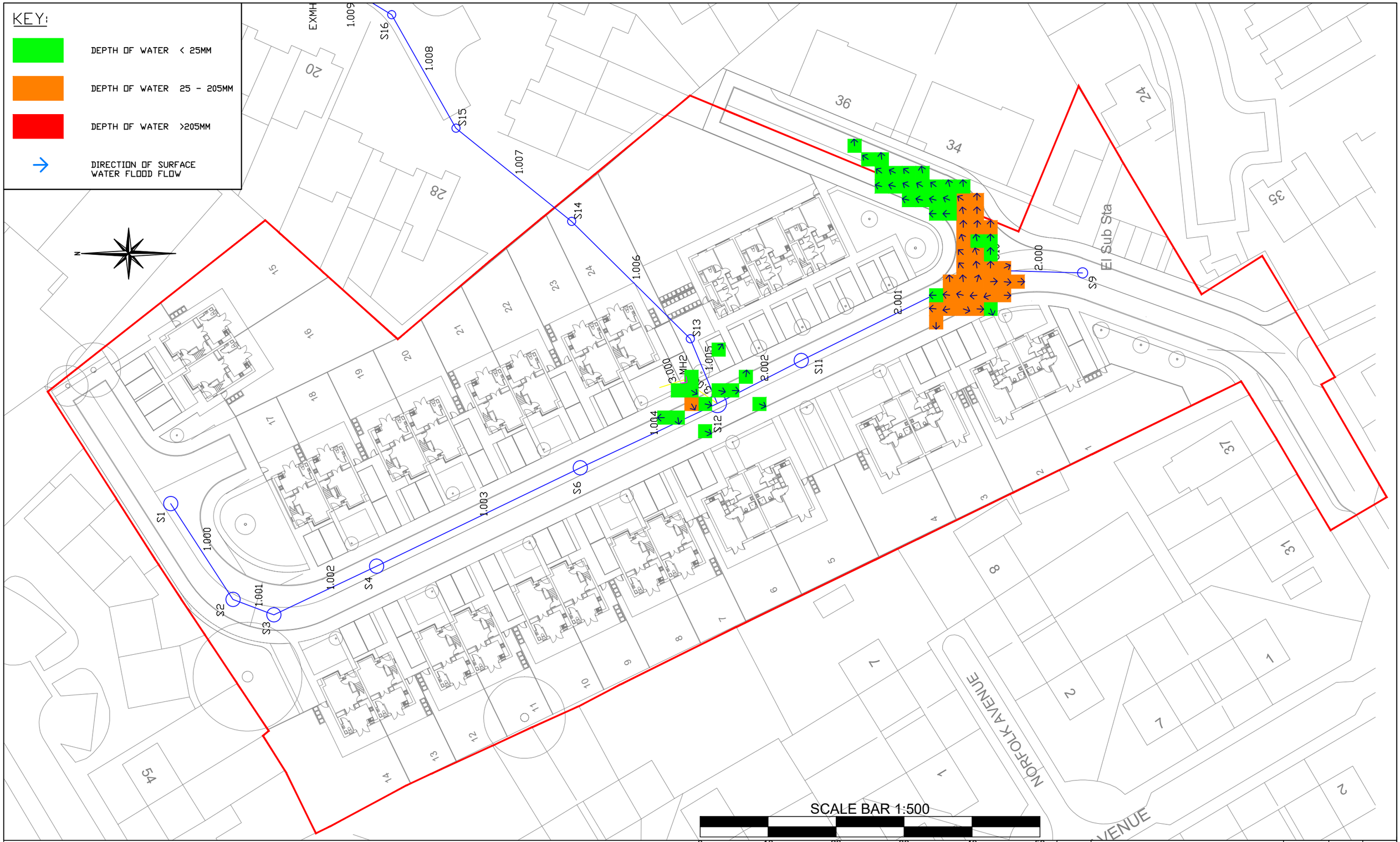

Rev	Description	Date	By	Chkd
P01	ISSUED FOR COMMENT	20.06.22	AJB	DS

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Client
ONWARD

Project
FORMER WHEATFIELDS DAY CENTRE
WHITEFIELDS

Drawing Title
FLOOD EXCEEDANCE DRAWING

Drawing Status
PRELIMINARY DRAWING

Date	Drawn By	Checked By
JUNE 2022	AJB	DS

Scale at A3	Project Number
1:500	31990

Sheet Number	Revision
31990-SUT-ZZ-XX-DR-C-6002	P01

Appendix H

Correspondence

From:	Wastewater Developer Services
To:	Dave Samuels
Cc:	Wastewater Developer Services
Subject:	Pre Development Enquiry for: Former Wheatfields Day Centre M45 8SG UU Reference Number : 4200045674
Date:	16 December 2021 12:08:28
Attachments:	image001.png

Good Afternoon Dave,

Pre Development Enquiry for: Former Wheatfields Day Centre M45 8SG UU Reference Number : 4200045674

-

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 600mm diameter public combined sewer within your proposed development at an unrestricted rate
Please ensure any proposed connections are not against the flow

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.
This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

https://www.gov.uk/government/publications/groundwater-protection-position-statements

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

-

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the public surface water sewer within Oxbrow Way located South of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 6.4l/s.
The Sewer records in this area are incomplete and we are unable to confirm pipe diameters. We would recommend Investigation as part of enabling works to verify this.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

The area to the West of the site is topographically elevated above the proposed development. Sewers by design can surcharge but are only designed to hold a finite quantity of flow. In extreme events, sewers can experience flooding. Given that there are sewers located on elevated ground to your site and some located on-site, we would request that any potential exceedance routes are taken into consideration in order to protect the proposed dwellings.

We note there are multiple locations on-site where properties are set lower than the cover levels of existing manholes. As a result, should these ever flood, the adjacent properties could be at risk.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the pubic sewerage network under any circumstances

Sewer Adoptions

You have indicated on your application form that you intend to put the sewers forward for adoption (including any SuDS components that can come within the meaning of a sewer).

United Utilities assess adoption applications based on the current Design & Construction Guidance and local practices which have now replaced 'Sewers For Adoption 6th Edition'.

We recommend that you submit a pre design assessment to the sewer adoption mailbox (SewerAdoptions@uuplc.co.uk) stating pre design assessment in the title

Please refer to link**s** below to obtain further guidance:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-adoptions/

Site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

If you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements set out in the Design & Construction Guidance. The proposed design should give consideration to long term operability and give United Utilities a safe and cost effective proposal for the lifetime of the assets. In these cases, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 application, has been assessed and accepted in writing by United Utilities. Any work carried out prior to the technical assessment being approved is done entirely at the developer's own risk and could be subject to change.

SuDS

If your development proposal incorporates any SuDS component(s) which interact with a sewer network you plan on offering for adoption to United Utilities; contact should be made with our technical team at your earliest convenience, please complete the 'Section 104 pre-application form : ' and include as much relevant detail as you can. These discussions can help prevent delays later in the development process.

Section 104 Pre application form (1b)

As per the sewerage sector guidance, all SuDS should be designed in accordance with the

standards within the Design & construction guidance & the CIRIA SuDS manual (C753)

Codes For Adoption

The new Codes for Adoption are outlined on the Water UK Website. The link below takes you to their webpage:

https://www.water.org.uk/technical-guidance/developers-services/codes-for-adoption/

A free copy of the new Design & Construction Guidance can be downloaded via the link below**:**

https://www.water.org.uk/wp-content/uploads/2020/03/SSG-App-C-Des-Con-Guide-v-2-100320-C.pdf

Existing Wastewater Assets Crossing the Site

According to our public sewer records there are public sewers located within your site boundary. We will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe unless there happens to be a formal easement agreement in place, in which case the specified easement width would apply.
We note, that there is an existing public combined sewer which has been suggested to be located in rear gardens, this reduces future access for maintenance purposes and does not represent best practice. As a result you may wish to reconsider the site layout or a sewer diversion.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/

-

-

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: **DeveloperServicesWater@uuplc.co.uk**. Further information for this service can be found on our website via the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,

Kind regards

Mike Duckworth
Developer Services Engineer
Developer Services & Metering
Customer Services
T: 07768702161
unitedutilities.com

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