

YEW TREE CARE HOME, NORTHERN MOOR, WYTHENSHAW, M23 OEA

DRAINAGE ASSESSMENT

Final Report v1.1
June 2022

Report Title	Yew Tree Care Home, Northern Moor, Wythenshawe, M23 0EA Drainage Assessment Final Report v1.1
Client	Liberty Care Development Ltd
Date of issue	21 June 2022

Prepared by	Emmy Matema BSc, Assistant Flood Risk Consultant Tim Brook BSc (Hons), Principal Engineer
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Checked and Approved by	James Aldridge BEng (Hons) MSc MCIWEM, <i>Director</i>
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1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by Liberty Care Developments Ltd to prepare a Drainage Assessment (DA) report to accompany a full planning application for the proposed redevelopment of Yew Tree Care Home, Northern Moor, Wythenshawe, M23 0DU.

The assessment has been undertaken in accordance with the requirements of the revised National Planning Policy Framework (NPPF) updated on 27 July 2021 and the Planning Practice Guidance (PPG) updated on 24 June 2021.

1.2 Structure of the Report

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Background information relating to the development site
- Section 3** National and local drainage planning policy
- Section 4** Presents an illustrative foul water drainage scheme
- Section 5** Presents an illustrative surface water drainage scheme
- Section 6** Presents a summary of key findings

1.3 Relevant Documents

The assessment has been informed by the following documents:

- Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment, March 2011
- Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment, User Guide, May 2010
- Greater Manchester Surface Water Management Plan, JBA Consulting, January 2012

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 0.27 hectare (ha) site is located at the corner of Yew Tree Lane and Willenhall Road, Wythenshawe, at Ordnance Survey National Grid Reference SJ 821 905, as shown in **Figure 1**.

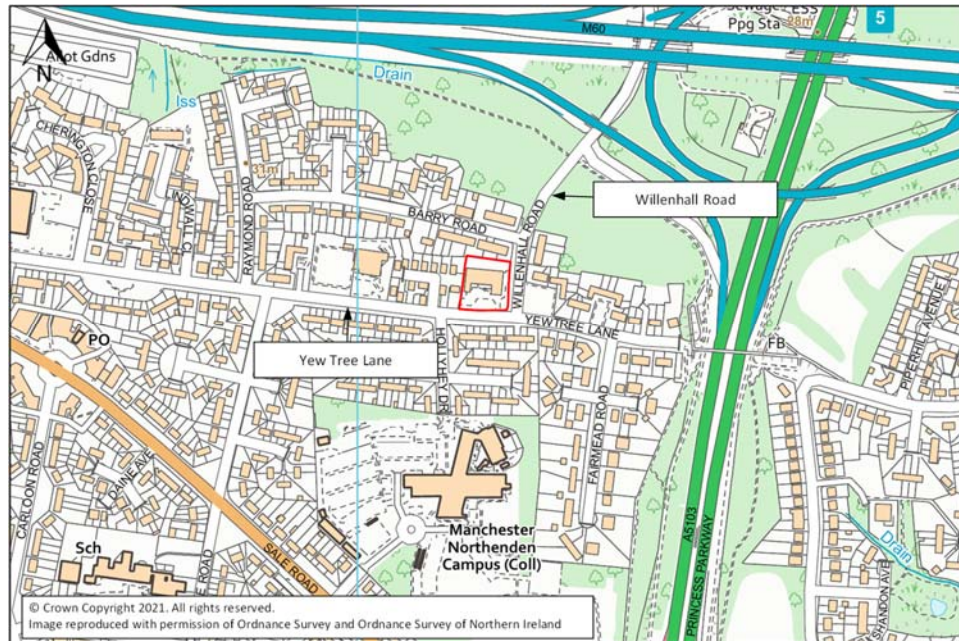


Figure 1: Site Location

2.2 Existing and Proposed Development

The site currently comprises Yew Tree Manor Nursing and Residential Care Home. The proposals are for the demolition of the existing building and the redevelopment of the site to accommodate a 59 bed care home, 19 car parking spaces, two motorcycle spaces, a sub-station and a recycling store (**Appendix A**).

The PPG classifies residential care homes as More Vulnerable to flood risk.

2.3 Waterbodies in the Vicinity of the Site

There are no waterbodies within a 200 m radius of the site.

2.4 Ground Conditions

According to the Soilsapes soils dataset produced by the Cranfield Soil and AgriFood Institute¹, soil conditions at the site and within the surrounding area are naturally wet, very acid, sandy and loamy soils.

The National Geoscience Data Centre's Single Onshore Borehole Index² holds records of three boreholes within 200 m of the site. Borehole ref: SJ89SW62 notes damp/wet superficial deposits of coarse sand and medium gravel, boulder clay and sandy marl to 9.5 m below ground level (m bgl), with groundwater struck at 3.2 m bgl. Borehole ref: SJ89SW64 notes damp/moist superficial deposits of sandy clay, sand and medium

¹ www.landis.org.uk/soilsapes/

² <https://www.bgs.ac.uk/products/onshore/SOBI.html>

gravel and marl to 8.5 m bgl, with groundwater struck at 8.8 m bgl. Borehole ref: SJ89SW18 notes loam and gravel between 2.4 m and 5.3 m bgl, gravel and clay between 5.3 m and 18.8 m bgl.

British Geological Survey mapping of surface geology³ indicates the underlying bedrock formation comprises siltstone, mudstone and sandstone (Tarpoley Siltstone Formation), overlain by sand and gravel (Glaciofluvial Sheet deposits, Devensian).

According to the MAGIC website⁴ the Sand and Gravel superficial deposits at the site are classified as a Secondary A aquifer whilst the underlying siltstone, mudstone and sandstone bedrock is classified as a Secondary B aquifer.

The site is not shown to be located within a designated groundwater source protection zone.

2.5 Site Levels

A topographic survey of the site has been undertaken by Chris Partington Land Surveyors and is provided in **Appendix B**. The ground at the site is relatively flat. The ground levels at the site range from approximately 32.61 m Above Ordnance Datum (AOD) to 33.29 m AOD.

LiDAR data has been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 2**.

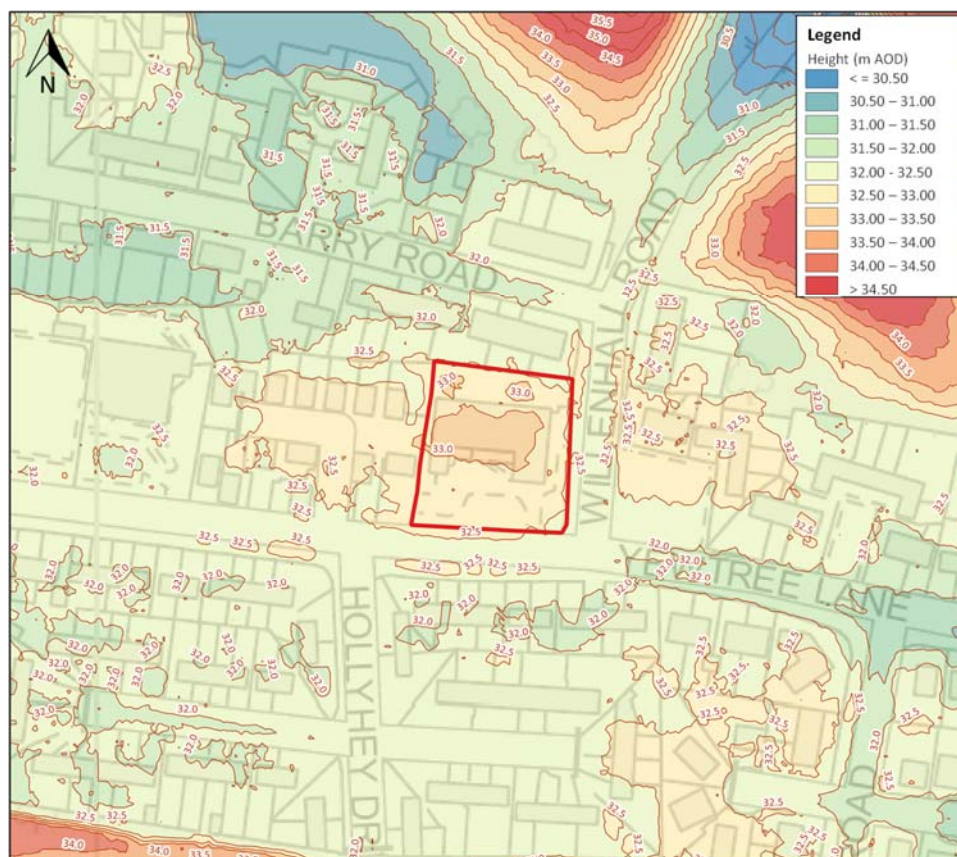


Figure 2: Digital Terrain Model from LiDAR Data

³ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁴ <https://magic.defra.gov.uk/MagicMap.aspx>

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Guidance

The thrust of national planning policy, as articulated in the 2021 NPPF, is that inappropriate development in areas at risk of flooding should be avoided where possible.

NPPF Paragraph 169 states, Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- (a) Take account of advice from the lead local flood authority;
- (b) Have appropriate proposed minimum operational standards;
- (c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
- (d) Where possible, provide multifunctional benefits.

Non-statutory technical standards for sustainable drainage published by DEFRA in March 2015 set out how surface water runoff generated during the present day 1 in 30 and 1 in 100 AEP rainfall events and for events exceeding the present day 1 in 100 AEP event should be managed, how peak runoff rates should be restricted and how runoff volumes should be controlled.

3.2 Local Planning Policy and Guidance

Manchester City Council Core Strategy, Development Plan Document, adopted July 2012.

The following policies are relevant in respect of flood risk and drainage:

Policy EN 14: Flood Risk

- All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required.
- The City of Manchester contains many sections of rivers which are culverted or 'hidden'; where these are indicated in the SFRA beneath the proposed development site, further investigations will be required and the development proposal should take this into account; where feasible and appropriate development should seek to open up culverted / hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure.

Policy EN 17: Water Quality

With reference to the Manchester-Salford-Trafford SFRA and other relevant documents:

- Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses;
- Development should, where feasible and appropriate, seek to open up any culverted or hidden watercourse beneath the site to improve ecological status of that watercourse

3.3 Legislation Originating from the European Union

The Water Framework Directive (WFD) provides a legal framework for the protection, improvement and sustainable use of inland surface waters, groundwater, transitional waters, and coastal waters across England, and seeks to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters
- Achieve at least 'good' status for all waterbodies by 2015
- Promote the sustainable use of water as a natural resource
- Conserve habitats and species that depend directly on water
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts.

The WFD applies to any proposed development which has the potential to impact on a waterbody. Where this is the case, the Environment Agency may require evidence demonstrating that the proposed development does not compromise the aims of the WFD.

4 FOUL WATER MANAGEMENT

4.1 Foul Water Loadings

The anticipated domestic foul loading from the site has been calculated in accordance with British Flows and Loads (residential care homes, 350 litres/person/day). The expected total peak flow rate from the development would be 1.6 l/s.

4.2 Existing Assets

United Utilities sewer records (**Appendix C**) indicate the presence of the following public sewers:

- A 225 mm diameter reducing in size to a 150 mm diameter combined water sewer flowing in a north westerly direction to the north of the site
- A 150 mm diameter combined water sewer flowing into the aforementioned sewer adjacent to the north of the site
- A 225 mm diameter combined water sewer flowing in a southerly direction adjacent to Willenhall Road to the east of the site
- A 2250 mm diameter combined water sewer and 300 mm diameter combined water sewer within Yew Tree Lane flowing in an easterly direction.

4.3 New Connections

United Utilities has advised, by way of a pre-planning sewerage enquiry response (**Appendix D**), that there is existing capacity in the local foul sewerage network to receive and treat domestic foul water from the proposed development and that foul water can discharge without restriction into the 2250 mm diameter combined sewer in Yew Tree Lane.

A preliminary foul water drainage layout is provided in **Appendix E**.

4.4 Easements, Diversions and Disconnections

Based on a review of the information available there should be no requirement for any diversions or disconnections.

5 SURFACE WATER MANAGEMENT

5.1 Surface Water Drainage at the Existing Site

No on site drainage details have been provided to date, however, Google Street View clearly shows rainwater pipes collecting roof water which are expected to connect into a private on site system. Several inspection chambers and gullies are noted to be present on site, as depicted in **Appendix B**. Runoff from the site is assumed to discharge into the 2250 mm diameter public combined water sewer in Yew Tree Lane (refer to **Section 4.2**).

The site has a total area of 0.267 ha of which 0.142 ha currently comprises impermeable areas and 0.125 ha permeable areas.

Runoff rates from existing impermeable areas have been calculated using the Modified Rational Method. Details of the input parameters and the output results are provided in **Appendix F**.

The runoff rates from the existing site are presented in **Table 1**.

Table 1: Peak Runoff Rate - Existing Site

AEP of rainfall event	Impermeable Runoff Rate 0.142 ha (l/s)
1 in 1	17.9
1 in 2	22.9
1 in 30	41.6
1 in 100	52.5

5.2 Surface Water Drainage at the Redeveloped Site

5.2.1 Disposal of Surface Water

In accordance with the PPG⁵, surface water runoff should be disposed of according to the following hierarchy: Into the ground (infiltration); To a surface water body; To a surface water sewer, highway drain, or another drainage system; To a combined sewer.

As detailed in **Section 2.4** the site is underlain by soils with potentially high groundwater. As such, the disposal of surface water via infiltration is unlikely to be feasible; however, infiltration tests have not been undertaken at this stage. Such tests may be undertaken at the detailed design stage in accordance with the guidelines in BRE365⁶. It is subsequently proposed to direct all runoff from the redeveloped site to the 2250 mm diameter public combined water sewer.

It is noted that the adjacent development (planning ref: 125967/JO/2020), located to the immediate west of the site, secured condition discharge to dispose of surface water at a restricted rate into the 2250 mm diameter public combined water sewer in Yew Tree Lane.

5.2.2 Post Development Impermeable Area

The area of impermeable surfaces within the proposed development has been calculated to be 0.174 ha, based on the development proposals presented in **Appendix A**. A 10% allowance has been included for urban creep, which equates to a total impermeable area of 0.191 ha.

⁵ Paragraph 080, Reference ID: 7-080-20150323

⁶ BRE Digest 365 Soakaway Design, Building Research Establishment, 2016

5.2.3 Peak Flow Control

It is proposed to restrict surface water runoff to the existing 1 in 1 AEP event rate, as outlined in **Table 1**, with a 50% betterment post development, thus equating to 9.0 l/s. However, a pre-development enquiry response from United Utilities (**Appendix D**) has stipulated a proposed flow rate of 6.0 l/s. This represents a 66.5% betterment in the 1 in 1 year AEP event.

5.2.4 Volume Control

As outlined within the CIRIA SuDS Manual 2015 extra runoff volumes in extreme events may be managed by releasing all runoff (above the 1 in 1 AEP event) from the site at a maximum rate of 2 l/s/ha or QBAR, whichever is the higher value.

It is proposed to restrict peak discharge rates to the existing 1 in 1 AEP event rate with a 66.5% betterment in up to the 1 in 100 AEP event, including an allowance for climate change. This will minimise the impact of the increase in the volume of surface water discharged from the site.

5.2.5 Attenuation Storage

Attenuation storage will be provided to restrict surface water runoff generated across roofs and hardstanding.

The proposed drainage network has been modelled using the Network module of MicroDrainage (**Appendix G**). The attenuation storage facility has been sized to store the 1 in 100 AEP rainfall event including a 45% increase in rainfall intensity to allow for climate change in accordance with Environment Agency guidance⁷.

Assuming a peak discharge rate of 6.0 l/s, a total storage volume of 61.8 m³ would be required.

The storage volume could be accommodated within the pipe network and permeable pavement sub-base within the car park, with an area of 544.0 m², a depth of 0.32 m, which would fill to a depth of 0.267 m.

A preliminary surface water drainage layout is provided in **Appendix E**.

5.2.6 Exceedance Routes

Flows resulting from rainfall in excess of the 1 in 100 AEP rainfall event including an allowance for climate change will be managed in exceedance routes. It is assumed that as the development proposals progress, the design of the site would ensure flood flows are directed away from built development.

5.2.7 Pollution Control

The CIRIA SuDS Manual⁸ identifies residential roofs and residential car parks as having a very low and low pollution hazard level respectively. Table 26.2 of the CIRIA SuDS Manual indicates that the pollution hazard indices associated with residential roofs and residential car parks for total suspended solids, hydrocarbons and metals are 0.20, 0.20 and 0.05 and 0.50, 0.40 and 0.40 respectively.

Table 26.3 of the CIRIA SuDS Manual indicates that the SuDS mitigation indices for permeable paving for total suspended solids, hydrocarbons and metals are 0.70, 0.60 and 0.70 respectively. As such, the proposed surface water drainage system provides adequate water quality treatment.

The use of permeable block paving will also help prevent debris from entering the surface water drainage system, reducing the risk of blockage.

⁷ Flood Risk Assessments: climate change allowances (<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>)

⁸ Table 26.2

5.2.8 Adoption and Maintenance of SuDS

The proposed surface water drainage system at the site will be private and maintained by the owner and/or a management company.

An indicative maintenance schedule is presented in **Table 2**.

Table 2: Maintenance Requirements

Schedule	Required action	Frequency
Permeable Paving		
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth- if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies accumulation rates and establish appropriate removal frequencies	Annually
	Monitor inspection chambers	
Flow Control Unit		
Routine maintenance	Remove litter and debris and inspect for sediment accumulation	Six Monthly
	Remove sediment from sump	As necessary – Indicated by system inspections
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six Monthly
	Inspect flow control unit and establish appropriate replacement frequencies	Six Monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first year of operation, then every six months

6 SUMMARY

This report has been prepared on behalf of Liberty Care Developments Ltd and relates to the proposed redevelopment of Yew Tree Care Home, Northern Moor, Wythenshawe.

Foul water will discharge unrestricted to the existing combined sewer in Yew Tree Lane.

Surface water runoff from the developed site can be sustainably managed in accordance with planning policy.

APPENDIX A

Proposed Layout



Notes				
Do not scale, use figured dimensions only.				
All dimensions to be verified on site prior to the commencement of any work or the production of any shop drawing. All discrepancies to be reported to the Architect.				
This drawing is to be read in conjunction with all related Architect's and Engineer's drawings and any other relevant information.				
This drawing is copyright © of C Squared Architects Ltd.				
REV	DATE	REVISION	INITIALS	CHECK
P1	13/05/22	Preliminary for Planning	JO	HPC
P2	30/05/22	For Client Comment	JO	HPC
P3	17/06/22	Substation / Bins Store / Meters	JO	HPC

Key

+32.65
(+32.94)

Proposed Level
Existing Level

Tree Existing Context
(Refer to Tree Survey and Arboricultural Report)

Existing Site Tree Retained
(Refer to Tree Survey and Arboricultural Report)

Proposed Tree
(Refer to Landscape Architects Layout)

Existing Building Footprint (to be Demolished)

Site Boundary

1:1

10mm

20

30

40

50

60

70

80

90

100

200

2m

4

6

8

10

12

14

16

18

20

C Squared architects

Client
Liberty Care Developments Ltd

Project
Proposed Care Home, Yewtree Lane, Northern Moor, Wythenshawe

Drawing Title
Proposed Site Plan

Scale
1:200 @ A1

Date
13/05/22

Drawn by
JO

Checked by
HPC

Drawing No.
L0206-105

Revision
P3

PLANNING

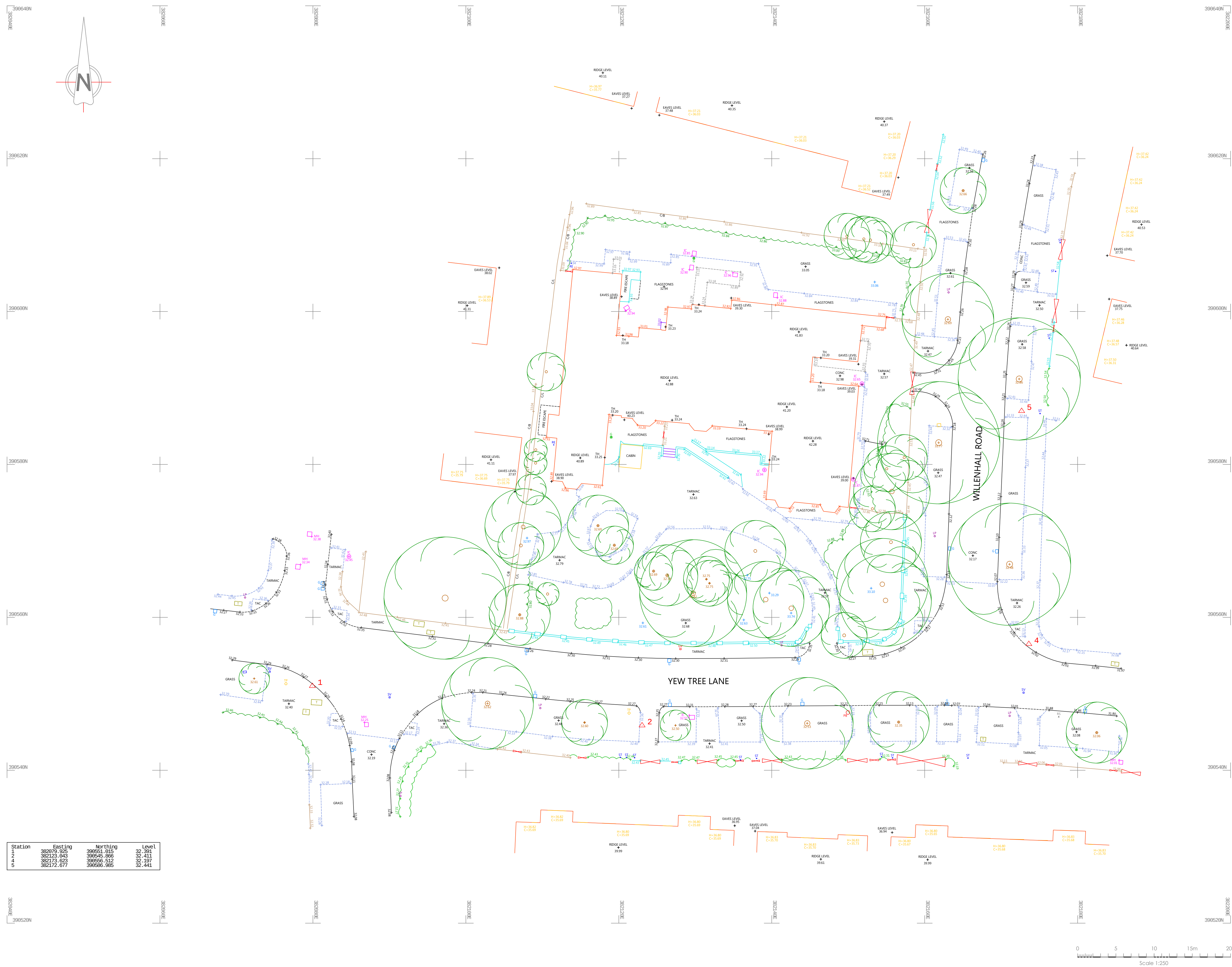
Address
The Barns
Stretton Road
Warrington
Cheshire
WA4 4NP

Telephone
01925 357555

Website
csquaredarchitects.co.uk

APPENDIX B

Topographic Survey



Station	Easting	Northing	Level
1	382079.925	390551.015	32.391
2	382123.043	390545.866	32.411
4	382173.623	390556.512	32.197
5	382172.677	390586.985	32.441

Abbreviations/Symbols (Measured Building Surveys):

C:	Window Cill Height
H:	Window Head Height
BH:	Beam Height
DH:	Door Height
COL:	Column
SVP:	Soil Vent Pipe
FL:	Floor Level
TH:	Threshold Level
2.50	Floor to Ceiling Height
	
	Vaulted Ceiling

Line types

	Hedge Lines
	Drainage Runs
	Overhead Electricity Cables
	Overhead Telephone Cables

Symbols

	Tree/Bush		Glass House
	Control Station		Osbn
	Borehole		
	Trial Hole		

Abbreviations (Topographic Survey):

AH:	Arch Height
AV:	Air Valve
BB:	Bellini Beacon
BBC:	Bellini Box, Cables Box, Etc.
BOL:	Bollard
CI:	Circuit Inspection Chamber
BS/PS:	Bus Stop
BS/PL:	Bus Stop / Lamp Post
C:	C Inspection Chamber
CCTV:	Closed Circuit Television
CL:	Color Light
CP:	Catch Pit
E:	Earth
ER:	Earth Rod
EC:	Electricity Inspection Chamber
EP:	Electricity Pole
FI:	Fire Hydrant
FP:	Flag Pole
GV:	Gas Valve
G:	Gully
IC:	Inspection Chamber
KO:	Kerb Outlet
LP:	Lamp Post
LC:	Letter Box
LC:	Lighting Column
MK:	Marker
MH:	Manhole
MP:	Moorring Post
MS:	Mile Stone
NNEX:	Nynex Inspection Chamber
O/H:	Over Hang
P:	Post
PO/IC:	Post Office Inspection Chamber
R/S:	Road Sign
RE:	Reading Eye
RTW:	Retaining Wall
S/P:	Sign Post
SNP:	Street Name Plate
ST:	Stop Tap
SV:	Stop Valve
TC:	Telescan Inspection Chamber
TCB:	Telephone Call Box
TH:	Threshold Level
TL:	Traffic Light
TP:	Telegraph Pole
TROUGH:	Trough
WO:	Water Outlet
WM:	Water Meter

Fence Descriptions:

B/W:	Barbed Wire
C/B:	Close Boarded
C/BARRIER:	Crash Barrier
C/L:	Chain Link
C/P:	Chestnut Paling
C/I:	Corrugated Iron
I/R:	Iron Railing
MISC:	Miscellaneous
P/R:	Post & Rail
P/W:	Post & Wire
P/C:	Post & Chain
S/PAL:	Steel Palisade
W/M:	Wire Mesh

Survey Notes:

Coordinates and Levels related to Ordnance Survey Datum - GPS OSG836

Revision	Date	Description



Chris Partington Land Surveyors

44a Green Lane
Sale
Cheshire
M33 5PP
t: 0161 976 1194
www.cpls.co.uk e:survey@cpls.co.uk

Client

C Squared Architects

Project

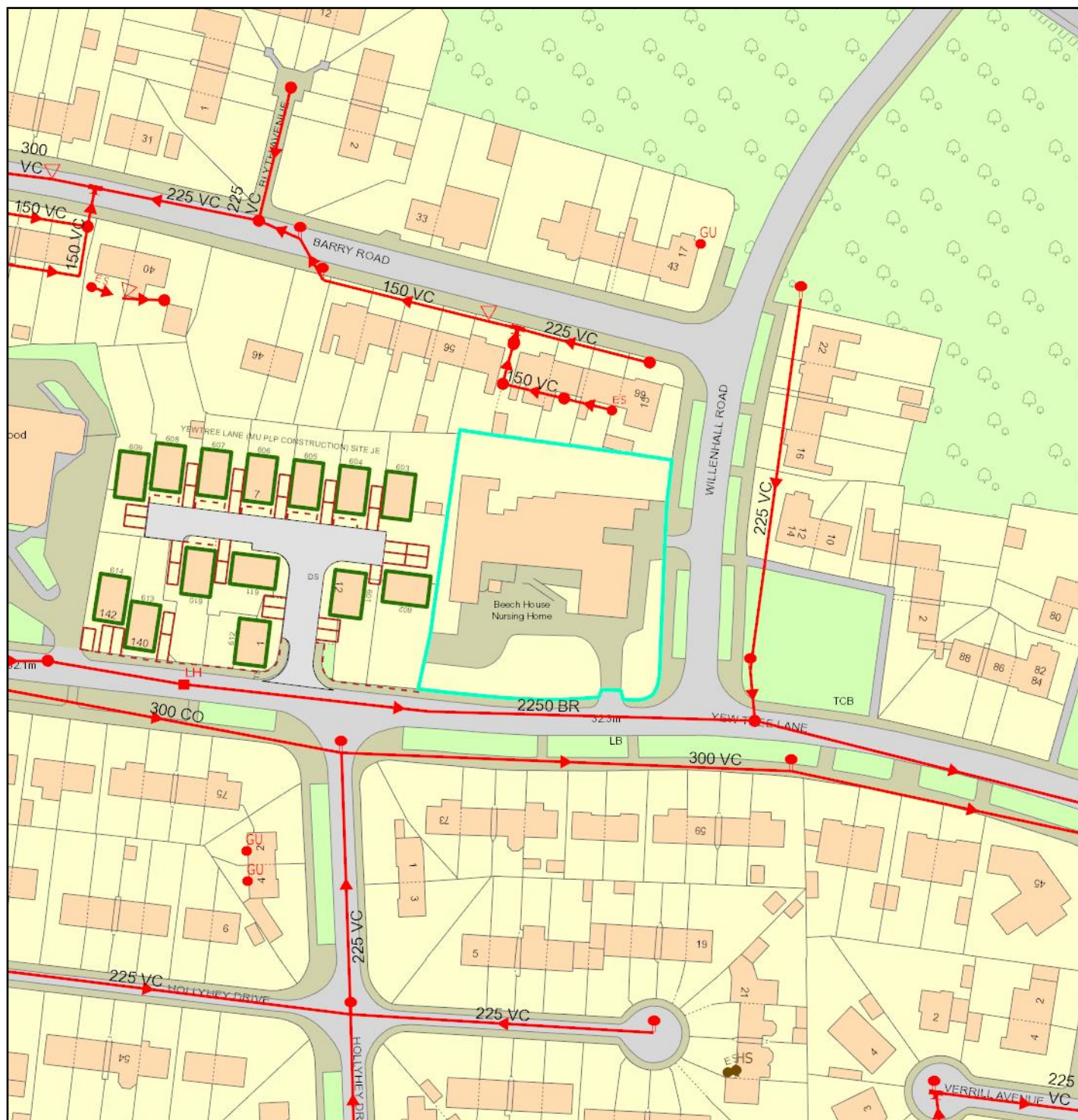
Yew Tree Manor, Northern Moor
Site Survey

Scale 1:250	Surveyed By J C	Date 05.04.22
Drawing No.	Checked By CPLS	Date 06.04.22
050422JC-01	Drawn By J C	Date 06.04.22

APPENDIX C

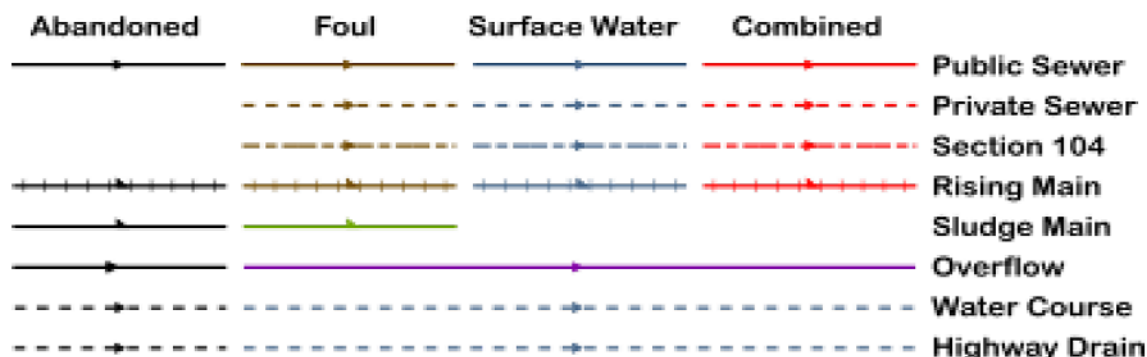
Public Sewer Records

Beech House Yew Tree Lane, Manchester, M23 0EA



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Wastewater Symbolology



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

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

APPENDIX D

Pre-development Enquiry Response

From: [Wastewater Developer Services](#)
To: [Tim Brook](#)
Cc: [Wastewater Developer Services](#); [Emmy Matema](#)
Subject: PDE for: Yewtree Lane M23 OEA UU Ref : 4200049245
Date: 09 May 2022 13:41:50
Attachments: [image001.jpg](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)

Good afternoon Tim,

Pre Development Enquiry for: Yewtree Lane M23 OEA UU Reference Number : 4200049245

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 2250mm diameter public combined sewer within Yew Tree Lane located to the South of your proposed development at an unrestricted rate.

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.

Please ensure all proposed manhole chambers cover levels and finished floor levels are higher than the receiving public sewer.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

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.

Waterbody

-

United Utilities acknowledge that the nearest watercourse is a significant distance off-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 2250mm diameter public combined sewer within Yew Tree Lane located South of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. The submitted greenfield calculations are based on the entire site area, whereas QBar should be based on the impermeable area (0.085Ha) to be drained to the sewer, and as such United Utilities request that any agreed rate does not exceed 6l/s (anticipated QBar rate from the site impermeable areas only).

Using the Modified Rational Method, $Q \text{ bar} = 2.78 * C_i A = 2.78 * 1 * 50 * 0.085 = 11.815 \text{ l/s}$ the rate after 50% betterment for Manchester Area will be 6l/s.

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.

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 public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records.

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/wastewater-services/sewer-connections/sewer-connection/>

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,

	Mohammed Aljafarawi Developer Engineer Developer Services & Metering Customer Services Email: Mohammed.Aljafarawi@uuplc.co.uk unitedutilities.com
---	---

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From: Tim Brook [<mailto:Tim.Brook@weetwood.net>]

Sent: 28 April 2022 12:12

To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>

Cc: Emmy Matema <Emmy.Matema@weetwood.net>

Subject: 5556 Northern Moor, Yewtree Lane, Wythenshawe - pre-development enquiry

EXTERNAL EMAIL This email originated outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hello,

Please find attached a completed pre-development enquiry form and supporting documentation for the above scheme. The proposals are for a new 59-bed care home on the site of an existing residential care home.

A desktop study indicates shallow groundwater levels in the area, and as there are no available watercourses in the vicinity, existing drainage connections will therefore be utilised where feasible though connection locations are to be confirmed. We have indicatively annotated on the attached proposed site plan the location of a preferred connection.

The estimated existing rate of surface water discharge from the site equates to 20.6 l/s in the 1-year rainfall event, calculated using the Modified Rational Method.

Kind Regards

Tim

Tim Brook

Principal Engineer

tim.brook@weetwood.net

We're recruiting! For more information, please have a look at our [vacancies](#)

cid:image001.jpg@01D85AF6.964182C0



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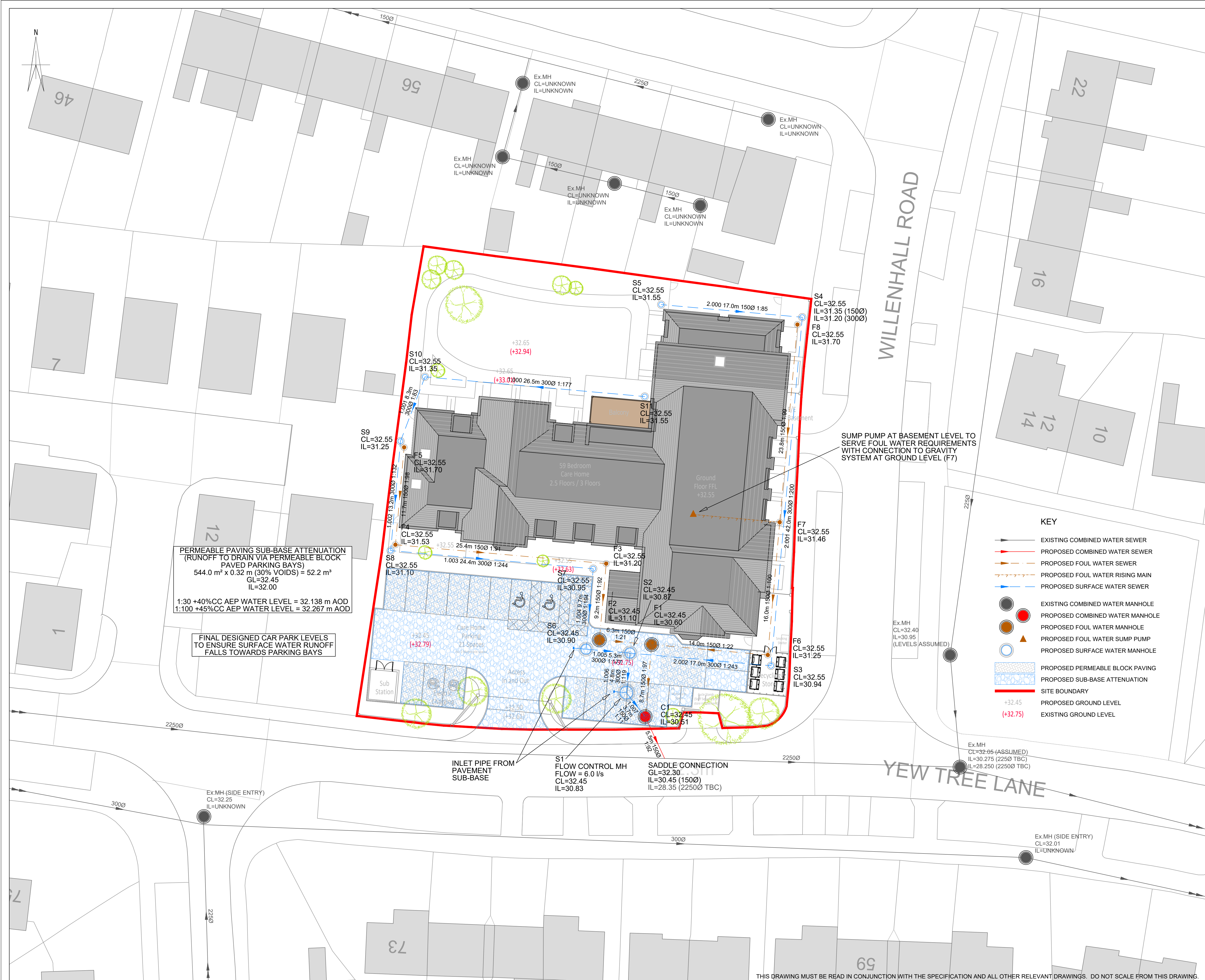
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APPENDIX E

Preliminary Drainage Layout



- NOTES
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT WEETWOOD DRAWINGS.
 2. PROPOSED SITE LAYOUT TAKEN FROM C SQUARED ARCHITECTS 'PROPOSED SITE PLAN' (REF: L0206-105 P3, JUN 2022).
 3. EXISTING LEVEL INFORMATION TAKEN FROM CHRIS PARTINGTON LAND SURVEYORS 'SITE SURVEY' DRAWING (REF: 050422JC-01, APR 2022).
 4. EXISTING DRAINAGE INFORMATION TAKEN FROM UNITED UTILITIES SEWER RECORDS (FEB 2022). NOTED INVERT LEVELS ASSUMED.

P2	21.06.22	SITE LAYOUT UPDATED, DRAINAGE AMENDED TO SUIT	TB	JA
P1	24.05.22	INITIAL ISSUE	TB	JA

Rev	Date	Description	Drawn	Check
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Hanover Walk, Leeds
LS3 1AB
Tel 0113 244 1377
info@weetwood.net
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Client
LIBERTY CARE DEVELOPMENTS LTD

Drawing Status	Date
PRELIMINARY	MAY 2022
Project	Scale (A1)
YEW TREE LANE NORTHERN MOOR WYTHENSHAW	1:200
	Drawn
	TB
	Checked
	JA
	Project No
	5556

Title	Revision
PROPOSED DRAINAGE LAYOUT	104
	P2

APPENDIX F

Peak Runoff Rate from Existing Site

The peak discharge rates of surface water runoff from the impermeable areas at the site have been calculated based on the Modified Rational Method⁹.

The following parameters have been obtained from the maps in Volume 3 of the Wallingford Procedure:

M5-60 minute rainfall depth:	18 mm
Ratio of M5-60 to M5-2 day rainfall:	0.381
Average Annual Rainfall:	829 mm
Winter Rain Acceptance Potential/ Soil Type :	0.3
The Urban Catchment Wetness Index (UCWI) value:	88.2

A time of concentration of 5 minutes has been used comprising a time of entry of 3 minutes and a time of flow of 2 minutes.

A rainfall estimation calculation has been carried out to convert the M5-60 minute rainfall to the 5-minute duration rainfall for the 1 in 1 and 1 in 100 annual exceedance probability (AEP) rainfall events. The calculated rainfall intensities for these events are 34.6 and 106.6 mm/hr respectively.

The flow rate as given by the Modified Rational Method is:

$$Q = 2.78 \times C_v \times C_r \times \text{rainfall intensity} \times \text{impermeable area}$$

where:

C_v is the volumetric runoff coefficient = $P_r / \text{PIMP} = 0.7102$

where P_r is Percentage Runoff and PIMP is Percentage Impermeable Area

C_r is the routing coefficient = 1.3

Impermeable Area = 0.142 ha

The peak discharges of surface runoff from impermeable areas of the existing site are shown in the table below:

AEP of rainfall event	Peak discharge for 0.142 ha impermeable area (l/s)
1 in 1	17.9
1 in 2	22.9
1 in 30	41.6
1 in 100	52.5

⁹ The Wallingford Procedure, Volume 4, 1981

APPENDIX G

Surface Water Attenuation - Storage Volume Calculation

Weetwood		Page 1
Suite 1 Park House	5556	
Broncoed Bus Park	Northern Moor, Wythenshawe	
Wrexham Rd Mold	Surface Water Calculations	
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File 2022-06-21 5556 R2.mdx	Checked by	
Micro Drainage		Network 2020.1

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)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.380	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.000
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

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.150	4-8	0.041

Total Area Contributing (ha) = 0.191

Total Pipe Volume (m³) = 11.144

Network Design Table for Storm

« - 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
S1.000	26.493	0.150	176.6	0.041	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	8.256	0.100	82.6	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)
S1.000	50.00	5.37	31.550	0.041	0.0	0.0	0.0	1.18	83.4	5.6
S1.001	50.00	5.45	31.350	0.041	0.0	0.0	0.0	1.73	122.4	5.6

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Weetwood		Page 6
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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.041	0.041	0.041
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.008	0.008	0.008
1.003	-	-	100	0.018	0.018	0.018
1.004	-	-	100	0.009	0.009	0.009
1.005	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.010	0.010	0.010
2.001	-	-	100	0.026	0.026	0.026
2.002	-	-	100	0.011	0.011	0.011
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.068	0.068	0.068
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.191	0.191	0.191

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)
S1.008	S-JUNC	32.300	30.450	0.000	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 * 10m ³ /ha Storage	2.000
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

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)	18.000	Storm Duration (mins)	30
Ratio R	0.380		

Weetwood		Page 7																																																																																										
Suite 1 Park House	5556																																																																																											
Broncoed Bus Park	Northern Moor, Wythenshawe																																																																																											
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Micro Drainage	Network 2020.1																																																																																											
<u>Online Controls for Storm</u> <u>Hydro-Brake® Optimum Manhole: S1-FC, DS/PN: S1.007, Volume (m³): 3.1</u> Unit Reference MD-SHE-0108-6000-1450-6000 Design Head (m) 1.450 Design Flow (l/s) 6.0 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 108 Invert Level (m) 30.830 Minimum Outlet Pipe Diameter (mm) 150 Suggested Manhole Diameter (mm) 1200 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.450</td><td>6.0</td><td>Kick-Flo®</td><td>0.888</td><td>4.8</td></tr><tr><td>Flush-Flo™</td><td>0.429</td><td>6.0</td><td>Mean Flow over Head Range</td><td>-</td><td>5.3</td></tr></table> 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 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>3.7</td><td>1.200</td><td>5.5</td><td>3.000</td><td>8.4</td><td>7.000</td><td>12.6</td></tr><tr><td>0.200</td><td>5.4</td><td>1.400</td><td>5.9</td><td>3.500</td><td>9.1</td><td>7.500</td><td>13.0</td></tr><tr><td>0.300</td><td>5.9</td><td>1.600</td><td>6.3</td><td>4.000</td><td>9.7</td><td>8.000</td><td>13.4</td></tr><tr><td>0.400</td><td>6.0</td><td>1.800</td><td>6.6</td><td>4.500</td><td>10.2</td><td>8.500</td><td>13.8</td></tr><tr><td>0.500</td><td>6.0</td><td>2.000</td><td>7.0</td><td>5.000</td><td>10.7</td><td>9.000</td><td>14.2</td></tr><tr><td>0.600</td><td>5.9</td><td>2.200</td><td>7.3</td><td>5.500</td><td>11.2</td><td>9.500</td><td>14.6</td></tr><tr><td>0.800</td><td>5.3</td><td>2.400</td><td>7.6</td><td>6.000</td><td>11.7</td><td></td><td></td></tr><tr><td>1.000</td><td>5.0</td><td>2.600</td><td>7.9</td><td>6.500</td><td>12.2</td><td></td><td></td></tr></table>			Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.450	6.0	Kick-Flo®	0.888	4.8	Flush-Flo™	0.429	6.0	Mean Flow over Head Range	-	5.3	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.7	1.200	5.5	3.000	8.4	7.000	12.6	0.200	5.4	1.400	5.9	3.500	9.1	7.500	13.0	0.300	5.9	1.600	6.3	4.000	9.7	8.000	13.4	0.400	6.0	1.800	6.6	4.500	10.2	8.500	13.8	0.500	6.0	2.000	7.0	5.000	10.7	9.000	14.2	0.600	5.9	2.200	7.3	5.500	11.2	9.500	14.6	0.800	5.3	2.400	7.6	6.000	11.7			1.000	5.0	2.600	7.9	6.500	12.2		
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)																																																																																							
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Weetwood

Suite 1 Park House

Broncoed Bus Park

Wrexham Rd Mold

5556

Northern Moor, Wythenshawe

Surface Water Calculations

Date 21/06/2022 16:53

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Micro Drainage

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Storage Structures for Storm

Porous Car Park Manhole: S6, DS/PN: S1.005

Infiltration Coefficient Base (m/hr) 0.00000

Width (m) 10.0

Membrane Percolation (mm/hr) 1000

Length (m) 35.9

Max Percolation (l/s) 99.7

Slope (1:X) 0.0

Safety Factor 2.0

Depression Storage (mm) 5

Porosity 0.30

Evaporation (mm/day) 3

Invert Level (m) 32.000

Cap Volume Depth (m) 0.320

Porous Car Park Manhole: S1-FC, DS/PN: S1.007

Infiltration Coefficient Base (m/hr) 0.00000

Width (m) 10.0

Membrane Percolation (mm/hr) 1000

Length (m) 18.5

Max Percolation (l/s) 51.4

Slope (1:X) 0.0

Safety Factor 2.0

Depression Storage (mm) 5

Porosity 0.30

Evaporation (mm/day) 3

Invert Level (m) 32.000

Cap Volume Depth (m) 0.320

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	S11	0.283	1.830	0.000	2.113
S1.001	S10	0.339	0.541	0.000	0.880
S1.002	S9	0.368	0.890	0.000	1.258
S1.003	S8	0.410	1.682	0.000	2.092
S1.004	S7	0.452	0.622	0.000	1.074
S1.005	S6	1.753	0.290	34.464	36.507
S2.000	S5	0.159	0.291	0.000	0.450
S2.001	S4	0.382	2.927	0.000	3.308
S2.002	S3	0.455	1.138	0.000	1.593
S1.006	S2	1.787	0.242	0.000	2.029
S1.007	S1-FC	2.863	0.041	17.760	20.663
S1.008	S-C1	2.194	0.087	0.000	2.281
Total		11.445	10.581	52.224	74.250

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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 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.380
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 40, 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Overflow	
							Cap.	(l/s)
S1.000	S11 15 minute	1 year Winter I+0%	32.550	31.601	-0.249	0.000	0.07	
S1.001	S10 15 minute	1 year Winter I+0%	32.550	31.399	-0.251	0.000	0.06	
S1.002	S9 15 minute	1 year Winter I+0%	32.550	31.304	-0.246	0.000	0.07	
S1.003	S8 30 minute	1 year Winter I+0%	32.550	31.223	-0.177	0.000	0.10	
S1.004	S7 30 minute	1 year Winter I+0%	32.550	31.221	-0.029	0.000	0.09	
S1.005	S6 30 minute	1 year Winter I+0%	32.450	31.221	0.021	0.000	0.06	
S2.000	S5 15 minute	1 year Winter I+0%	32.550	31.576	-0.124	0.000	0.07	
S2.001	S4 15 minute	1 year Winter I+0%	32.550	31.245	-0.255	0.000	0.05	
S2.002	S3 30 minute	1 year Winter I+0%	32.550	31.220	-0.020	0.000	0.05	
S1.006	S2 30 minute	1 year Winter I+0%	32.450	31.220	0.050	0.000	0.09	
S1.007	S1-FC 30 minute	1 year Winter I+0%	32.450	31.220	0.240	0.000	0.17	
S1.008	S-C1 30 minute	1 year Winter I+0%	32.450	30.575	-0.085	0.000	0.39	

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Broncoed Bus Park	Northern Moor, Wythenshawe	
Wrexham Rd Mold	Surface Water Calculations	
Date 21/06/2022 16:53	Designed by TB	
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Micro Drainage		Network 2020.1

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 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.380
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 40, 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.
S1.000	S11	15 minute 30 year Winter I+40%	32.550	32.154	0.304	0.000	0.20
S1.001	S10	60 minute 30 year Winter I+40%	32.550	32.144	0.494	0.000	0.11
S1.002	S9	60 minute 30 year Winter I+40%	32.550	32.143	0.593	0.000	0.13
S1.003	S8	60 minute 30 year Winter I+40%	32.550	32.142	0.742	0.000	0.22
S1.004	S7	60 minute 30 year Winter I+40%	32.550	32.139	0.889	0.000	0.26
S1.005	S6	60 minute 30 year Winter I+40%	32.450	32.138	0.938	0.000	0.07
S2.000	S5	60 minute 30 year Winter I+40%	32.550	32.142	0.442	0.000	0.12
S2.001	S4	60 minute 30 year Winter I+40%	32.550	32.140	0.640	0.000	0.10
S2.002	S3	60 minute 30 year Winter I+40%	32.550	32.138	0.898	0.000	0.16
S1.006	S2	60 minute 30 year Winter I+40%	32.450	32.137	0.967	0.000	0.07
S1.007	S1-FC	60 minute 30 year Winter I+40%	32.450	32.135	1.155	0.000	0.17
S1.008	S-C1	960 minute 30 year Summer I+40%	32.450	30.575	-0.085	0.000	0.39

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Broncoed Bus Park	Northern Moor, Wythenshawe	
Wrexham Rd Mold	Surface Water Calculations	
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File 2022-06-21 5556 R2.mdx	Checked by	
Micro Drainage		Network 2020.1

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 1 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.380
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 40, 45

PN	US/MH Name	Event	US/CL (m)	Level (m)	Water	Surcharged	Flooded	Flow / Cap.
					Depth (m)	Volume (m ³)		
S1.000	S11	15 minute 100 year Winter I+45%	32.550	32.347	0.497	0.000	0.27	
S1.001	S10	15 minute 100 year Winter I+45%	32.550	32.314	0.664	0.000	0.26	
S1.002	S9	15 minute 100 year Winter I+45%	32.550	32.302	0.752	0.000	0.30	
S1.003	S8	120 minute 100 year Winter I+45%	32.550	32.271	0.871	0.000	0.19	
S1.004	S7	120 minute 100 year Winter I+45%	32.550	32.269	1.019	0.000	0.22	
S1.005	S6	120 minute 100 year Winter I+45%	32.450	32.267	1.067	0.000	0.07	
S2.000	S5	120 minute 100 year Winter I+45%	32.550	32.271	0.571	0.000	0.10	
S2.001	S4	120 minute 100 year Winter I+45%	32.550	32.269	0.769	0.000	0.09	
S2.002	S3	120 minute 100 year Winter I+45%	32.550	32.268	1.028	0.000	0.14	
S1.006	S2	120 minute 100 year Winter I+45%	32.450	32.266	1.096	0.000	0.07	
S1.007	S1-FC	120 minute 100 year Winter I+45%	32.450	32.265	1.285	0.000	0.17	
S1.008	S-C1	120 minute 100 year Winter I+45%	32.450	30.575	-0.085	0.000	0.39	

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