TRAVIS PERKINS, WREXHAM

Drainage Strategy

Produced by

MJM Consulting Engineers
Southgate House
Southgate
Wakefield
West Yorkshire
WF1 1TL

Tel: +44 (1924) 811000

Client

Travis Perkins

Job no 9003
Date 17/10/2024

Document Record:				
Project Name	Travis Perkins, Wrexham			
	P01	**P02**	**P03**	**P04**
Remarks:	Draft Issue	Site boundary and appendix Updated		
Date:	02/09/2024	17/10/2024		
Prepared by:	EW	CB		
Checked and Authorised by:	CB	CB		

Contents

1 Introduction 1
1.1 Background 1
1.2 Site Location 1
1.3 Development Proposals 2
1.4 Report Structure 3
2 Relevant Policy and Guidance 4
3 Existing Site 5
3.1 Site Specific information 5
3.2 Topographical Survey 5
3.3 Geotechnical Investigation 5
4 Potential Sources of Flooding 6
4.2 Fluvial, Tidal and Surface Water Flooding 6
4.3 Ground Water Flooding 6
4.4 Flooding from Sewers 7
4.5 Flood Risk Summary 7
5 Surface Water Management Strategy 8
5.1 Existing Site Drainage 8
5.2 Sustainable Drainage Systems (SuDS) 8
5.3 SuDS and the Proposed Development 9
5.4 Proposed Site Layout 10
5.5 Discharge to Soakaways or Infiltration Systems 10
5.6 Discharge to Watercourse 10
5.7 Discharge to Sewer 10
5.8 Proposed Surface Water Strategy 10
6 Proposed Foul Drainage 12
6.1 Drainage Maintenance strategy 12
7 Conclusions 13

Appendices

Appendix A – Proposed Site Layout
Appendix B – Topographical Survey
Appendix C – Existing Sewer Records
Appendix D – CCTV Drainage Survey
Appendix E - Brownfield Run Off Calculations
Appendix F - Drainage Calculations
Appendix G – Drainage Layout
Appendix H – Correspondence with Wrexham SAB
Appendix I – Surface Water Drainage Maintenance Strategy

1 Introduction

1.1 Background

1.1.1 MJM Consulting Engineers Ltd (MJM) have been commissioned by Travis Perkins to prepare a Drainage Strategy to accompany a planning application for a new building on existing hard standing and change of surfacing from asphalt to concrete on Croesfoel Industrial Estate.

1.2 Site Location

1.2.1 The site is a previously developed parcel of land, with the proposal on an area of approximately 0.943ha, located on the Croesfoel Industrial Estate. The site is bound by Tudor Ave to the east, existing developed plot to the north and south, and the industrial estate access road to the west. Access is gained through an existing site entrance from the industrial estate access road.

1.2.2 The grid reference of the site is SJ 31091 48487 and OS grid reference is X – 331091, Y - 348487. The site sits within Wrexham County Borough Council limits west of Wrexham. The site location is demonstrated in Figure 1-1 below.



Figure 1-1 Site Location (Source: Google Earth)

1.3 Development Proposals

1.3.1 The proposals comprise of the construction of a new building on an existing hardstanding area and converting existing hardstanding area to concrete surfacing. The proposed site layout is included at **Appendix A**.

1.4 Report Structure

1.4.1 Following this introductory section:

- **Section 2** describes the planning policy context within which the proposals will be assessed;
- **Section 3** details the existing site, considering any site specific information and current survey information which has been gathered;
- **Section 4** discusses the potential sources of flooding for the site;
- **Section 5** summarises a surface water management strategy for the site, considering any existing site drainage, the proposed point of discharge and the appropriateness of Sustainable Drainage Systems (SuDS);
- **Section 6** deals with any requirement for foul water drainage;
- **Section 7** offers a summary and conclusions

2 Relevant Policy and Guidance

2.1.1 As a requirement of the Well-being of Future Generations (Wales) Act 2015, all public bodies in Wales are required to work towards the goal of *'A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems hat support social, economic and ecological resilience and the capacity to adapt the change.'*

2.1.2 As of 7th January 2019, all new developments in Wales of more than 1 building or where construction area covers 100m2 or more requires sustainable drainage systems.

2.1.3 Schedule 3 of the Flood and Water Management Act 2010 established the requirement for SuDS approval bodies (SABs) in local authorities.

2.1.4 SABs have been established to evaluate and approve drainage applications and adopt and maintain SuDs schemes, subject to the conditions and exemptions specified in the 2010 Act.

2.1.5 SuDs must be built in accordance with Statutory SuDs Standards published by Welsh Ministers and SuDS schemes and be approved by the local authority SAB prior to commencement of construction works.

2.1.6 The Statutory SuDs Standards contain a set of 6 standards that must be applied in the design of SuDs in order to obtain SAB approval:

- S1 – Runoff destination
- S2 – Hydraulic control
- S3 – Water quality
- S4 – Amenity
- S5 – Biodiversity
- S6 -Construction, operation and maintenance

3 Existing Site

3.1 Site Specific information

3.1.1 This section of the report contains information from completed surveys of the proposed site.

3.2 Topographical Survey

3.2.1 The existing site has been used as a car dealership. It comprises of 2 buildings and large hardstanding area with a landscaped area to the east of the site.

3.2.2 A topographical survey of the site has been completed and is included at **Appendix B**.

3.2.3 Ground levels across the site fall from north to south. The eastern and western side of the site are separated in the middle by a small retaining wall with a ramp.

3.3 Geotechnical Investigation

3.3.1 A preliminary risk assessment and ground investigation report has been completed for the site and informed the current drainage strategy.

3.3.2 The site investigation indicates that succession of strata can be summarised approximately as follows:

- <0.1m thick - Tarmac hardstanding
- 0.07m-0.62m (mean 0.27m) - Sandy angular to sub rounded fine to coarse sandstone gravel subbase
- 0.62m - 4m bgl - Typically firm and stiff brown very sandy gravelly clay
- 4m – 7m bgl - Medium dense brown slightly clayey very gravelly fine to coarse sand with occasional cobbles
- 7m bgl - Suspected sandstone bedrock

4 Potential Sources of Flooding

4.1.1 This section of the report contains information gathered from Natural Resources Wales.

4.2 Fluvial, Tidal and Surface Water Flooding

4.2.1 The Natural Resource Wales flood map in Figure 3-1 shows the site is located within an area with no likelihood of fluvial, tidal and surface water flooding.



Figure 4-1 Flooding Map (Data Source: Natural Resources Flood Maps)

4.3 Ground Water Flooding

4.3.1 As discussed in Chapter 2 of this document, the site investigation completed indicates that the existing tarmac build up is underlain by typically firm and stiff brown very sandy gravelly clay, 4m – 7m bgl medium dense brown slightly clayey very gravelly fine to coarse sand with occasional cobbles and 7m bgl suspected sandstone bedrock.

4.3.2 During drilling as part of the site investigation no groundwater was encountered. Groundwater monitoring was completed 13th June 2024 to 10th July 2024, revealing groundwater in one borehole between depths of 5.5m bgl and 5.94m bgl.

4.3.3 Given there has been no previous evidence of groundwater flooding either on the site or in the vicinity of the site, and provided the below recommendations are to be followed to ensure the risk of groundwater flooding is not exacerbated, it is considered the risk of groundwater flooding can be summarised as **low**.

4.3.4 The following measures should be considered to ensure flood risk from groundwater remains low:

- No infiltration drainage to be allowed without appropriate ground water level monitoring
- No use of septic tanks
- Drainage systems are sealed and tested in accordance with Sewerage Sector Guidance Appendix C Section E7.
- Avoid construction of basements
- Ensure access routes remain free of groundwater flooding
- Specification of materials resilient to long term exposure to flooding

4.4 Flooding from Sewers

4.4.1 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater known as "combined sewers". Flooding can result when the sewer is overwhelmed by heavy rainfall, becomes blocked, or is of inadequate capacity; this will continue until the water drains away. When this happens to combined sewers, there is a high risk of land and property flooding with water contaminated with raw sewage as well as pollution of rivers due to discharge from combined sewer overflows.

4.4.2 Sewer record information has been obtained from Welsh Water and is attached in **Appendix C** of this note. This search has identified a wastewater pipe running within the western extent of the site and a surface water pipe running under the industrial park access road. No known issues with regards to flooding of these existing sewers is known. Consequently, the risk of flooding to the proposed development from this source is considered **low**.

4.5 Flood Risk Summary

4.5.1 As can be seen from the various searches and maps above, the proposed site is located within an area with no likelihood of fluvial and tidal flooding and is therefore at low risk of flooding. There are no significant risks from surface water flooding. Measures have been suggested in 3.3.4 to ensure the risk of groundwater flooding remains low. The site is also not located in an area susceptible to sewer flooding.

5 Surface Water Management Strategy

5.1 Existing Site Drainage

5.1.1 The site has existing surface water and foul drainage system in place. A CCTV drainage survey of the site has been completed and can be found in **appendix D**.

5.1.2 The existing surface water and foul water drainage discharge into a combined sewer within the south west extents of the site.

5.1.3 The existing drainage has been modelled in Causeway Flow using the CCTV drainage survey. The modelling of the existing site indicates the site currently floods during a 1 in 30 year event and the Brownfield run off rate is 190l/s. For the Causeway Flow calculations refer to **Appendix E**.

5.2 Sustainable Drainage Systems (SuDS)

5.2.1 Section 1.1 of the SuDS Manual (Ciria C753) states the following:

- "Sustainable drainage systems (SuDS) can deliver multiple benefits. Surface water is a valuable resource, and this should be reflected in the way it is managed and used in the built environment. It can add to and enhance biodiversity, beauty, tranquillity and the natural aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate.

- The philosophy of sustainable drainage systems is about maximising the benefits and minimising the negative impacts of surface water run-off from developed areas.

- The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone."

- The SuDS Manual describes the four pillars of SuDS design as Water Quality, Water Quantity, Amenity and Biodiversity as illustrated in Figure 5.1 below which is a representation of The SuDS Manual Figure 2.1.

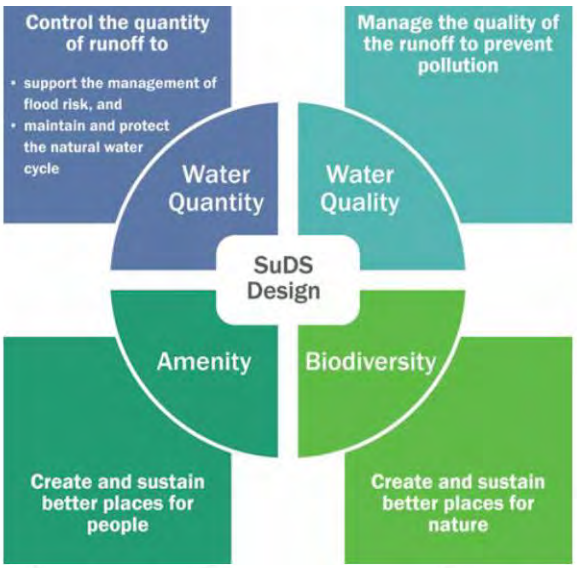


Figure 5.1: Extract Representation of Figure 2.1 of The SuDS Manual

5.3 SuDS and the Proposed Development

Water Quantity

5.3.1 The existing surface water system will be largely retained. Improvements will be made to the capacity of the existing surface water system to provide a 30% betterment on the current brownfield run off rate at a 1 in 100 year storm + 40% allowance for climate change and irradicate flooding in a 1 in 30 and 1 in 100 year event.

5.3.2 The capacity of the surface water drainage will be improved by increasing the required pipe sizes and providing an attenuation tank on site. Refer to Section 5 for more information.

Water Quality

5.3.3 The SuDS design for the development site should ensure the quality of any receiving water body is not adversely affected and preferably enhanced in accordance with the Ciria SuDS Manual C753. Table 26.2 in the Ciria SuDS Manual shows that the development has a medium pollution hazard. It is proposed to have a full retention separator to treat surface water prior to discharge through the existing connection to the existing combined sewer.

Amenity and Biodiversity

5.3.4 Given the nature of the development it is unlikely that there will be opportunities for SuDS to contribute significantly to biodiversity and amenity.

5.4 Proposed Site Layout

5.4.1 Refer to section 1.3 for a description of the development proposals. A proposed site plan is presented within **Appendix A**.

5.5 Discharge to Soakaways or Infiltration Systems

5.5.1 Infiltration testing to BRE Digest 365 has not been carried out to date. A preliminary risk assessment and ground investigation report has been completed for the site.

5.5.2 As discussed in Chapter 2 of this document, the site investigation completed indicates that the existing tarmac build up is underlain by typically firm and stiff brown very sandy gravelly clay, 4m – 7m bgl medium dense brown slightly clayey very gravelly fine to coarse sand with occasional cobbles and 7m bgl suspected sandstone bedrock.

5.5.3 Due to the site being underlain by clayey type material it indicates that the required infiltration rates will not be received and therefore infiltration is not suitable as a form of discharge.

5.6 Discharge to Watercourse

5.6.1 The topographical survey and CCTV drainage survey indicate there is not a watercourse within the vicinity of the site. The nearest identified watercourse is approximately 140m from the site and would require crossing across third party land and A5152.

5.6.2 Due to the above factors and the existing surface water drainage connection on site, discharge to a watercourse has been discounted.

5.7 Discharge to Sewer

5.7.1 A CCTV survey has been completed of the existing drainage on site and indicates that the current surface water drainage system outfalls into a combined sewer located within the site's south western boundary.

5.7.2 The intention is for the surface water drainage to retain the existing connection to the surface water sewer. The discharge rate will be limited to 133l/s by a hydrobrake to provide a 30% betterment on the existing brownfield run off rate.

5.8 Proposed Surface Water Strategy

5.8.1 The drainage system and ground levels will be designed such that:

- Unless an area is designed to hold and/or convey water, flooding does not occur on any part of the site for a 1 in 30-year rainfall event.
- Flooding does not occur during a 1 in 100-year storm event (including allowance for up to 40% increase to allow for the anticipated impacts of climate change) in any part of a building (including a basement) or in any utility plant susceptible to water within the development.
- Any exceedance water from the drainage system up to the 1 in 100-year rainfall event are managed in exceedance routes to minimise as far as practicable the risk of flooding to people and property both on and off site.
- The management of surface water on site will ensure that there is no increased risk of flooding on and offsite as a result of the development.

- The SuDS design for the development site should ensure that the quality of any receiving water body is not adversely affected and preferably enhanced in accordance with Ciria SuDS Manual, Chapter 4.

5.8.2 In summary, all hard standing areas will discharge through the existing connection to the combined sewer.

5.8.3 The existing surface water system will be largely retained. The capacity of the surface water drainage will be improved by increasing some required pipe sizes and providing an attenuation tank on site.

5.8.4 Following completion of a causeway flow model the proposed attenuation tank provides storage of 105m^3.

5.8.5 Surface water discharge rate will be restricted to 133l/s by a hydrobrake to provide a 30% betterment on the existing brownfield run off rate.

5.8.6 Refer to **Appendix F** for the Causeway Flow calculations for the proposed changes to the existing surface water drainage.

5.8.7 A layout of the proposed changes to the existing surface water drainage, are provided in **Appendix G**.

5.8.8 Correspondences with Wrexham SuDS Approval Body (SAB) can be found in **Appendix H**. Initial correspondence indicates that retaining the existing connection and providing 30% betterment would be acceptable.

6 Proposed Foul Drainage

6.1.1 The current foul drainage on site will be retained.

6.1 Drainage Maintenance strategy

6.1.1 For the proposed drainage system to function efficiently, it is important that the network is inspected and maintained on a regular basis. The surface water drainage will not be adopted and is to remain private, therefore it is anticipated that the drainage system will be maintained by the owner. Refer to **Appendix I** for the drainage maintenance plan.

7 Conclusions

7.1.1 All forms of flood risk to the site have been assessed and it has been determined that there is **low** risk of flooding to the proposed development.

7.1.2 The development proposals are in accordance with both National and Local Policy and Guidance relating to Flood Risk and Surface Water Management.

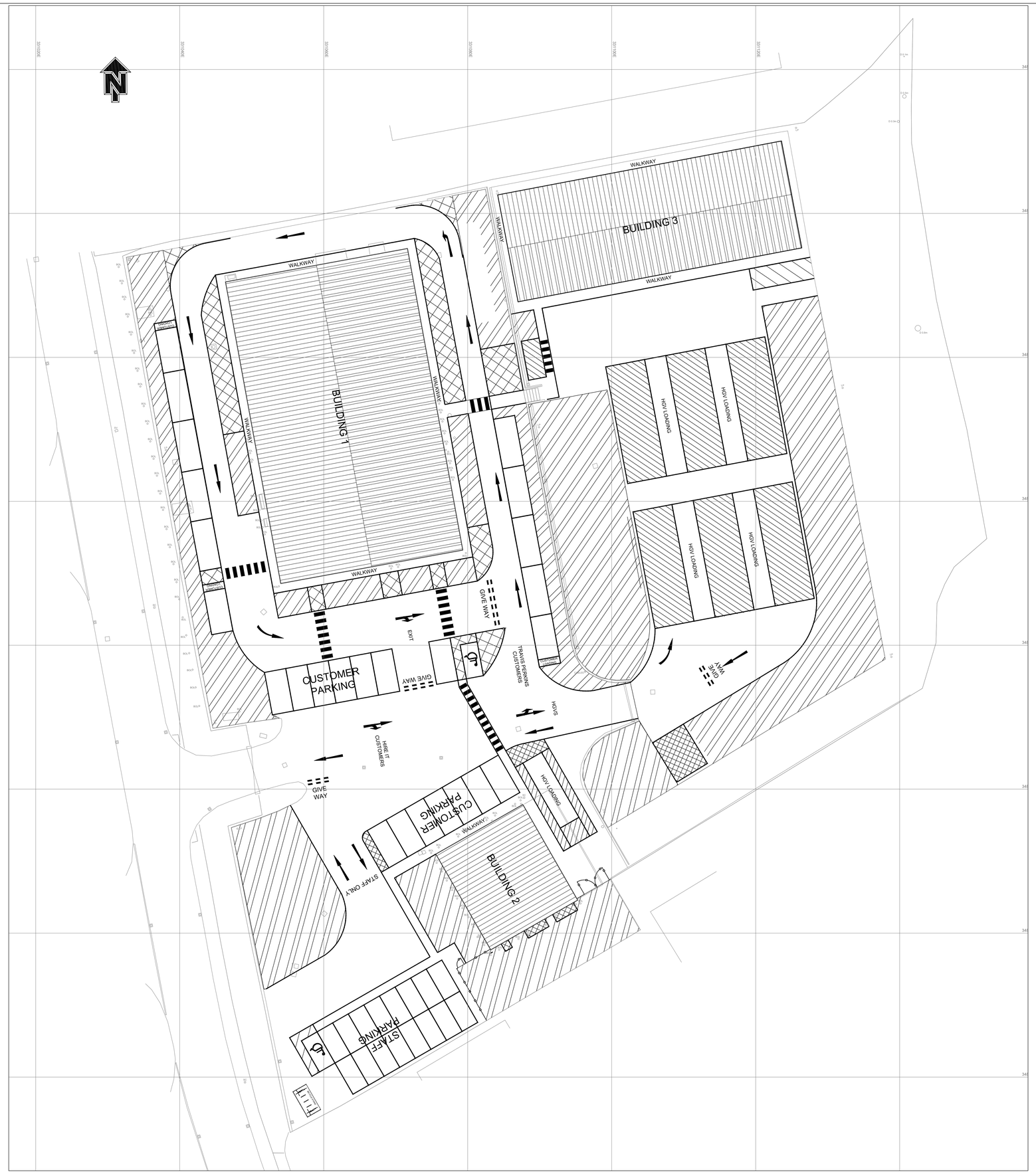
7.1.3 Site Wide Measures are designed to ensure external ground levels will be designed to direct any surface water flow away from building thresholds.

7.1.4 The SuDS strategy will be developed as part of the detailed design to meet the following criteria:

- Unless an area is designed to hold and/or convey water, flooding will not occur on any part of the site for a 1 in 30-year rainfall event.
- Flooding does not occur during a 1 in 100-year storm event (including an allowance for a 38% increase in rainfall intensity due to climate change) in any part of a building (including a basement) or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
- Flows resulting from rainfall in any event exceeding the 1 in 100-year rainfall event are managed in exceedance routes to minimise as far as practicable the risk of flooding to people and property both on and off site.
- The SuDS design for the development site should ensure that the quality of any receiving water body is not adversely affected and preferably enhanced in accordance with Ciria SuDS Manual C753, Chapter 4.

mjm Consulting Engineers Ltd

Appendix A
Proposed Site Layout



DESIGNER RISK INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:-

CONSTRUCTION:

MAINTENANCE/CLEANING:

DECOMMISSIONING/DEMOLITION:

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

5 0 10 20 30 40 50

Scale Bar
1:200

KEY:

- HGV SERVICING ZONE
- EXTERNAL RACKING/STORAGE ZONES (UP TO 5.5m HIGH)
- KEEP CLEAR

SCHEDULE OF ACCOMMODATION:

Site Area - 1.0011 hectares

Building 1 (Showroom/Sales/Warehouse/Offices/Staff Facilities)
GEA - 1,095sqm
GIA - 1,057sqm

Building 2 (Sales/Warehouse)
GEA - 213sqm
GIA - 200sqm

Building 3 (Warehouse)
GEA - 607sqm
GIA - 582sqm

PROPOSED PARKING:

Customer Spaces
15 Car Spaces Incl 1 DDA Space
13 Pick-Up Spaces

Staff Parking
7 Car Spaces Incl 1 DDA Space
5 HGV Spaces

Rev	Date	Amendment		
P04	17.07.24	TITLE BOX AMENDED. RED LINE BOUNDARY OMITTED. SITE AREA AMENDED. PARKING No ADDED.	NT	AJN
P03	25.07.24	SURVEY ADDED.	nt	AJN
P02	18.06.24	CUSTOMER/STAFF PARKING SHOWN. CYCLE PARKING ADDED. VEHICLE ROUTES ADDED.	nt	AJN
P01	18.06.24	FIRST ISSUE	nt	TM

mjm Consulting Engineers Ltd
Southgate House, 38 Southgate, Wakefield WF1 1TL
T: 01924 811 000 mjmc.co.uk

Project:
TRAVIS PERKINS
CROESFOEL INDUSTRIAL ESTATE
WREXHAM, LL14 4BJ

Client:

Drawing Title:
PROPOSED SITE LAYOUT

NT	AN	AN
MJMC Ref: 9003	Scale: 1:200	Sheet Size: A0
Revision Status: P04	Suitability Status: S4	Date: MAY '24

Suitability Description: FOR APPROVAL

Drawing Reference:
Project - Originator - Zone - Level - File Type - Discipline - Number
9003-MJM-XX-XX-DR-D-6611

© THIS DRAWING MAY NOT BE COPIED WITHOUT PRIOR WRITTEN PERMISSION

Appendix B
Topographical Survey



Notes

This drawing and the information contained therein is Issued in confidence and is the copyright of Met Geo Environmental Limited. Disclosure of this information to Third Parties and unauthorised copying or replication of this data without approval is forbidden.

N

Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on S5

Datum : OS Level Datum.
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Station Listing

Station	Easting	Northing	Level
S1	331061.791	348433.544	105.730
S2	331044.289	348476.107	106.494
S3	331034.375	348509.513	106.343
S4	331095.127	348520.096	106.042
S5	331102.714	348459.571	107.102
S1A	331043.329	348437.991	104.638
S5A	331095.058	348419.699	105.565

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
BOLLARD	BOL	MANHOLE (CIRCULAR)	MH
BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	OULET	OUT
CABLE TV SUPPLY	CS	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TC
EARTHING POINT	ES	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	TH
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	WC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	WV
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

Met® GEO ENVIRONMENTAL
Southgate House
Pontefract Road
Stourton
Leeds
West Yorkshire
LS10 1SW
T: +44 [0] 1132 008 900
F: +44 [0] 1132 008 901
E: admin@metgeoenvironmental.com
W: www.metgeoenvironmental.com

Client
TRAVIS PERKINS PLC

Site
FORMER DICKENS VAUXHALL PREMISES
CROESFOEL INDUSTRIAL ESTATE

Title
TOPOGRAPHICAL SURVEY

Surveyed	CC	Drawn	CC
Check	DA	Date	29/05/2024
Scale 1:200	Job No P24-00411	Sheet Size A0	Rev 01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P24-00411	MET	EXT	XX	TOP	M2	G	001

Appendix C
Existing Sewer Records

Dŵr Cymru
Welsh Water

31 October 2023

Searchflow (Account)
42 Kings Hill Avenue
West Malling
Kent
ME19 4AJ

NEW LEGAL REQUIREMENT

IF THIS SEARCH RELATES TO A RECENTLY BUILT PROPERTY, NEW WELSH GOVERNMENT LEGISLATION EFFECTIVE FROM 1ST OCTOBER 2012 REQUIRES THAT ANY SEWERS AND LATERAL DRAINS SERVING THE PROPERTY MUST BE SUBJECT OF A SECTION 104 ADOPTION AGREEMENT WITH DWR CYMRU WELSH WATER.

Drainage and Water Enquiry

Responses as required by the Home Information Pack Regulations

The information contained within this report refers to the existing property at:	DICKENS VAUXHALL WREXHAM CROESFOEL INDUSTRIAL ESTATE RHOSTYLLEN WREXHAM LL14 4BJ
Search report produced by:	Dwr Cymru Welsh Water Pentwyn Road Nelson Treharris Mid Glamorgan CF46 6LY Tel 01443 331155 www.dwrcymru.com www.dwrcymrusearches.com enquiries@dwrcymru.com Water supply - Call 0800 052 0130 Sewerage services - Call 0800 085 3968
Our reference:	444595
Your reference:	32507966

The following records were referenced in compiling this search report

Customer Account System
Asset Information System
Water Quality Database

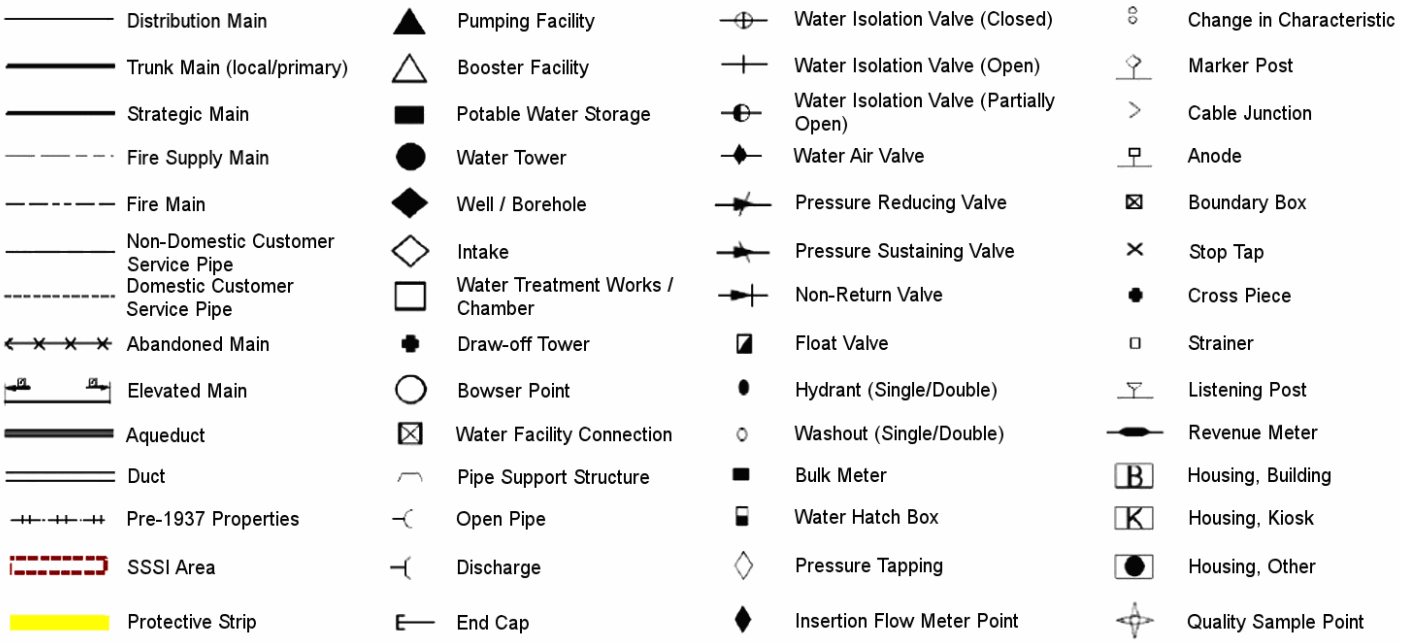
Any enquiries relating to this report should be addressed to our Customer Support Searches Team at the above address. Please quote one of the above references.

WATER RECORD The Dickens Group Of Comp Ltd, Dickens Garage, Croesfoel Industrial Estate, Rhostyllen, WREXHAM, LL14 4BJ



1. Do not scale off this Map. This Map is furnished as a general guide and no warranty as to its correctness is given or implied. This Map must not be relied upon in the event of any development or works in the vicinity of Hafren Dyfrdwy's assets. 2. Reproduction by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and database right 2023. All rights reserved. Ordnance Survey licence number 0100031673. Document users other than Hafren Dyfrdwy business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Water Record



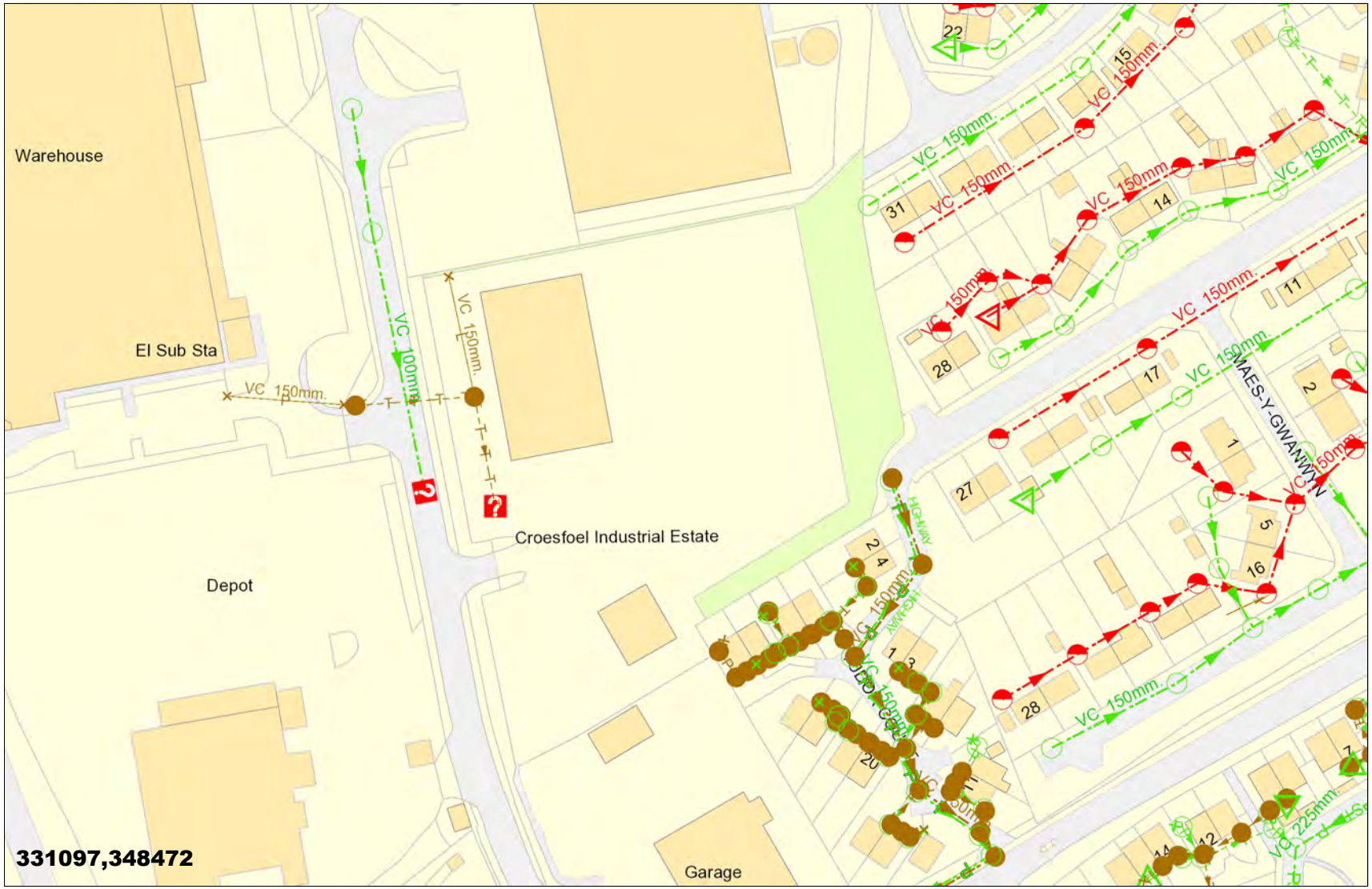
For a detailed glossary of the above terminology please visit: www.severntrentsearches.com/glossary

Dŵr Cymru
Welsh Water

Dickens Vauxhall Wrexham

31/10/2023

Scale: 1: 1500



LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

Sewerage External

- Foul
- Surface Water
- Combined
- Rising Main
- Private
- Treatment Works
- Pumping Station
- Special Purpose
- Unknown End
- Change, Combined Overflow
- Outfall, FOUL
- Lamp Hole, Foul
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

Dwr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best Information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE

Reproduced from the Ordnance Survey's maps with the permission of the Controller of Her Majesty's Stationary Office. Crown Copyright. Licence No: WU298565.

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be Asbestos Cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

"public sewer map" means the map made available under section 199(5) of the 1991 Act(**l**);

"resource main" means (subject to section 219(2) of the 1991 Act) any pipe, not being a trunk main, which is or is to be used for the purpose of—
(a) conveying water from one source of supply to another, from a source of supply to a regulating reservoir or from a regulating reservoir to a source of supply; or
(b) giving or taking a supply of water in bulk;

"sewerage services" includes the collection and disposal of foul and surface water and any other services which are required to be provided by a sewerage undertaker for the purpose of carrying out its functions;

"sewerage undertaker" means the company appointed to be the sewerage undertaker under section 6(1) of the 1991 Act for the area in which the property is or will be situated;

"surface water" includes water from roofs and other impermeable surfaces within the curtilage of the property;

"water main" means (subject to section 219(2) of the 1991 Act) any pipe, not being a pipe for the time being vested in a person other than the water undertaker, which is used or to be used by a water undertaker or licensed water supplier for the purpose of making a general supply of water available to customers or potential customers of the undertaker or supplier, as distinct from for the purpose of providing a supply to particular customers;

"water meter" means any apparatus for measuring or showing the volume of water supplied to, or of effluent discharged from any premises;

"water supplier" means the company supplying water in the water supply zone, whether a water undertaker or licensed water supplier;

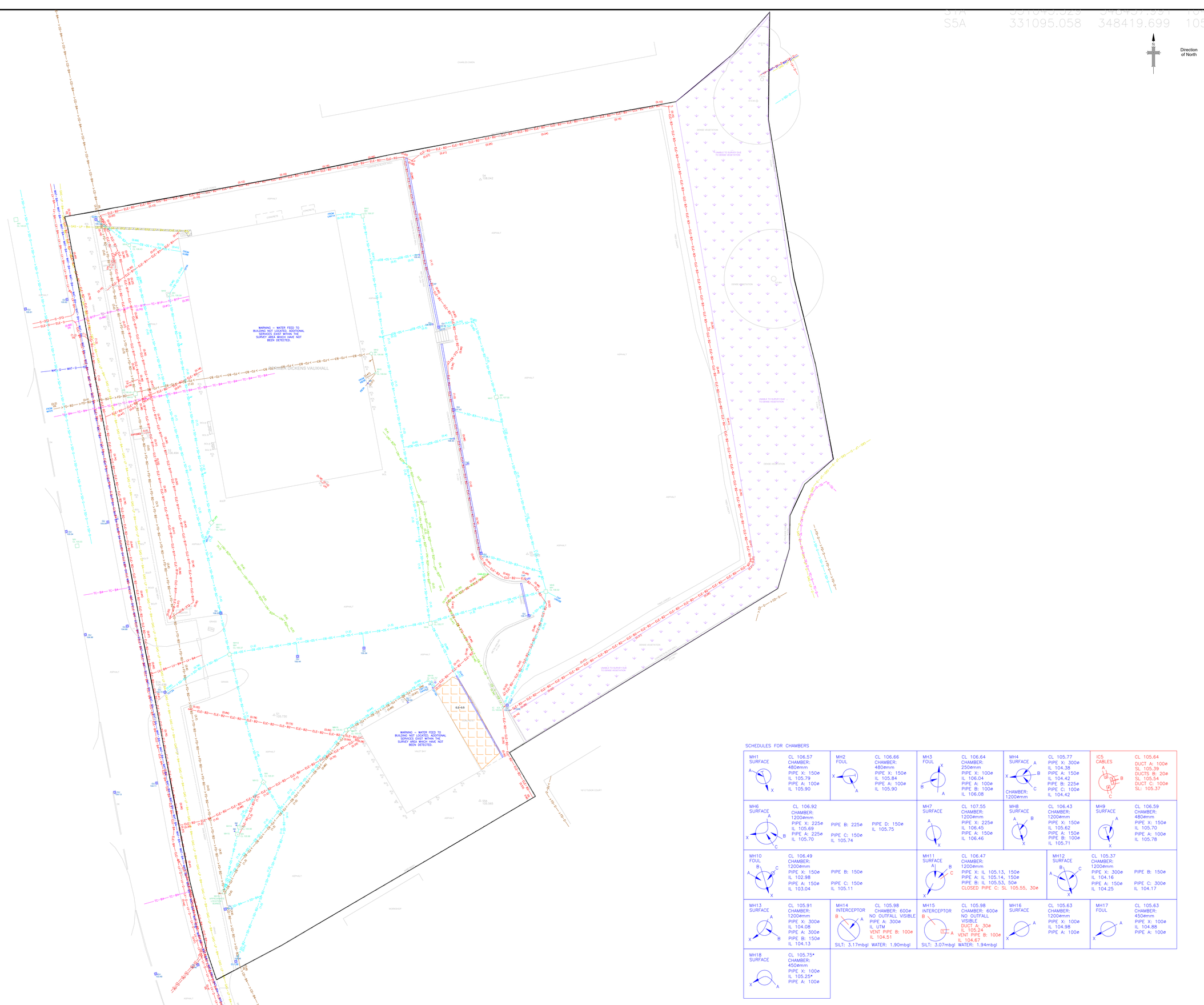
"water supply zones" in relation to a calendar year means the names and areas designated by a water undertaker within its area of supply that are to be its water supply zones for that year; and

"water undertaker" means the company appointed to be the water undertaker under section 6(1) of the 1991 Act for the area in which the property is or will be situated.

2. In this Schedule, references to a pipe, including references to a main, a drain or a sewer, shall include references to a tunnel or conduit which serves or is to serve as the pipe in question and to any accessories for the pipe.

Note:
(**a**) 1991 c. 56
(**b**) S.I. 2000/3184. These Regulations apply in relation to England.
(**c**) S.I. 2001/3911. These Regulations apply in relation to Wales.
(**d**) Section 51A is inserted by section 92(2) of the Water Act 2003 (c.37). Section 104(1) is amended by section 96(4) of that Act.
(**e**) To which there are various amendments made to sections 102 and 104 by section 96 of the Water Act 2003.
(**f**) Inserted by section 56 of and Schedule 4 to the Water Act 2003.
(**g**) Subsection (1A) is inserted by section 92(5) of the Water Act 2003.
(**h**) Section 106(1A) is inserted by section 99 of the Water Act 2003.
(**i**) 1989 c.15.
(**j**) To which there are various amendments made by section 101(1) of and Schedule 8 to the Water Act 2003.
(**k**) To which there are various amendments made by section 101(1) of and Schedule 8 to the Water Act 2003.
(**l**) Section 199 is amended by section 97(1) and (8) of the Water Act 2003.

Appendix D
CCTV Drainage Survey



SCHEDULES FOR CHAMBERS

MH1 SURFACE	CL 106.57 CHAMBER: 480mm PIPE X: 150e IL 105.79 PIPE A: 100e IL 105.90	MH2 FOUL	CL 106.66 CHAMBER: 480mm PIPE X: 150e IL 105.84 PIPE A: 100e IL 105.90	MH3 FOUL	CL 106.64 CHAMBER: 250mm PIPE X: 100e IL 106.04 PIPE A: 100e PIPE B: 100e IL 106.08
MH4 SURFACE CHAMBER: 1200mm	CL 105.77 PIPE X: 300e IL 104.38 PIPE A: 150e IL 104.42 PIPE B: 225e PIPE C: 100e IL 104.42	IC5 CABLES	CL 105.64 DUCT A: 100e SL 105.39 DUCTS B: 20e SL 105.54 DUCT C: 10oe SL: 105.37		
MH6 SURFACE	CL 106.92 CHAMBER: 1200mm PIPE X: 225e IL 105.69 PIPE A: 225e IL 105.70 PIPE B: 225e PIPE C: 150e IL 105.74 PIPE D: 150e IL 105.75	MH7 SURFACE	CL 107.55 CHAMBER: 1200mm PIPE X: 225e IL 106.45 PIPE A: 150e IL 106.46	MH8 SURFACE	CL 106.43 CHAMBER: 1200mm PIPE X: 150e IL 105.62 PIPE A: 150e PIPE B: 100e IL 105.71
MH9 SURFACE	CL 106.59 CHAMBER: 480mm PIPE X: 150e IL 105.70 PIPE A: 100e IL 105.78	MH10 FOUL	CL 106.49 CHAMBER: 1200mm PIPE X: 150e IL 102.98 PIPE A: 150e IL 103.04 PIPE B: 150e PIPE C: 150e IL 105.11	MH11 SURFACE	CL 106.47 CHAMBER: 1200mm PIPE X: IL 105.13, 150e PIPE A: IL 105.14, 150e PIPE B: IL 105.53, 50e CLOSED PIPE C: SL 105.55, 30e
MH12 SURFACE	CL 105.37 CHAMBER: 1200mm PIPE X: 300e IL 104.16 PIPE A: 150e IL 104.25 PIPE B: 150e PIPE C: 300e IL 104.17	MH13 SURFACE	CL 105.91 CHAMBER: 1200mm PIPE X: 300e IL 104.08 PIPE A: 300e PIPE B: 150e IL 104.13	MH14 INTERCEPTOR	CL 105.98 CHAMBER: 600e NO OUTFALL VISIBLE PIPE A: 300e IL UTM VENT PIPE B: 100e IL 104.51 SILT: 3.17mbgl WATER: 1.90mbgl
MH15 INTERCEPTOR	CL 105.98 CHAMBER: 600e NO OUTFALL VISIBLE DUCT A: 30e IL 105.24 VENT PIPE B: 100e IL 104.67 SILT: 3.07mbgl WATER: 1.94mbgl	MH16 SURFACE	CL 105.63 CHAMBER: 1200mm PIPE X: 100e IL 104.98 PIPE A: 100e	MH17 FOUL	CL 105.63 CHAMBER: 450mm PIPE X: 100e IL 104.88 PIPE A: 100e
MH18 SURFACE	CL 105.75* CHAMBER: 450mm PIPE X: 100e IL 105.25* PIPE A: 100e				

SUB-SURFACE KEY

DRAINAGE

> FD< B1	FOUL	> CO < B2	COMBINED
> SD< B3	SURFACE	> D< B3	UNIDENTIFIED
> Ra< B2	RISING MAIN	> OF< B4	OVERFLOW

GAS

GAS < B2	GAS (UNSPECIFIED)	GAS < LP < B2	LOW PRESSURE
GAS < MP < B3	MEDIUM PRESSURE	GAS < IP < B4	INTERMEDIATE PRESSURE
		GAS < HP < B1	HIGH PRESSURE

ELECTRICITY

ELE < B1	ELECTRICITY CABLE(S) (UNSPECIFIED)	LV < B2	LOW VOLTAGE
HV < B1	HIGH VOLTAGE	CCT < B2	CCTV CABLE(S)
TL < B3	TRAFFIC LIGHT/CONTROL CABLE(S)		

PIPES, DUCTS & PIPELINES

HEAT < B2	DISTRICT HEATING/ STEAM PIPE(S)	H&C < B3	ROUTE CONTAINING DISTRICT HEATING PIPE(S) & CABLE(S)
FL < B1	FUEL PIPELINE	OIL < B2	OIL PIPELINE
PIPE < B3	UNIDENTIFIED PIPEWORK	< B1	EMPTY DUCT

TELECOMMUNICATIONS

TC < B1	TELECOMMUNICATIONS CABLE(S)		

WATER

WAT < B1	WATER SERVICE (UNSPECIFIED)	WAT < LP < B1	LOW PRESSURE
WAT < MP < B3	MEDIUM PRESSURE	WAT < HP < B2	HIGH PRESSURE
WAT < RAW < C	RAW WATER	WAT < PVT < X	PRIVATE

UNIDENTIFIED

UNI < B1	UNIDENTIFIED POTENTIAL UTILITY	CAB < B2	UNIDENTIFIED CABLE
PWR < B2	POWER (LINEAR RESPONSE DETECTED USING 'POWER' MODE OF EM LOCATOR - INDUCED 50 Hz GROUND CURRENTS)		
RAD < B3	RADIO (LINEAR RESPONSE DETECTED USING 'RADIO' MODE OF EM LOCATOR - RE-RADIATED VLF RADIOWAVES)		
ELE < B2 (0.70)	APPROXIMATE DEPTH BELOW GROUND LEVEL OF APPARATUS IN METRES		

CONFIDENCE LEVELS		
(D)	UNDETECTED	FROM SERVICE RECORDS ONLY
(C)	UNDETECTED	FROM SERVICE RECORDS ONLY, SUPPORTING EVIDENCE FROM VISUAL INSPECTION (UTILITY COVERS, SCARS, ETC.)
(BM)	ASSUMED	UNDETECTED BY REMOTE LOCATION METHODS
(B)/(B)(P)	DETECTED	HORIZONTAL POSITION ONLY ±500mm
(B2)/(B2)(P)	DETECTED	HORIZONTAL POSITION ±250mm VERTICAL POSITION ±40% OF DEPTH
(B1)/(B1)(P)	DETECTED	HORIZONTAL POSITION ±150mm VERTICAL POSITION ±15% OF DEPTH
(A)	VERIFIED	SERVICE HAS BEEN VISUALLY VERIFIED AND SURVEYED USING APPROPRIATE METHODS ±50mm IN POSITION & DEPTH
*	SEE REPORT FOR FULL DISCUSSION OF MAXIMUM ACHIEVABLE ACCURACY	
(P)	SUFFIX DENOTES DATA HAS BEEN PROCESSED POST COLLECTION	

U7R	UNABLE TO RAISE	mbgl	METRES BELOW GROUND LEVEL
U7T	UNABLE TO TRACE	CL	COVER LEVEL
U7M	UNABLE TO MEASURE	-	MEASUREMENT ESTIMATED
OS	SERVICE EXTENDS OFF SITE	SL	SOFFIT LEVEL OF PIPE/DUCT
Ø	DIAMETER OF PIPE OR DUCT	IL	INVERT LEVEL OF PIPE/DUCT

- APPROXIMATE CHAMBER EXTENTS
- EXTENTS OF UTILITY MAPPING SURVEY
- TRENCH SCAR / SURFACE SCAR
- UNABLE TO SURVEY AREA DUE TO DENSE VEGETATION
- UNABLE TO SURVEY AREA DUE TO OBSTRUCTIONS
- UNABLE TO SURVEY AREA DUE TO ACCESS AREA
- CABLE DUCT SHOWING NUMBER OF CABLES
- UNABLE TO SURVEY AREA DUE TO TERRAIN/TOPOGRAPHY
- WINSOR TRAP/INTERCEPTOR ON CHAMBER OUTFLOW
- BACKDROP (INTERNAL/EXTERNAL) ON CHAMBER INFLOW

OTHER POTENTIAL BURIED FEATURES

- AREA OF ELEVATED GPR AMPLITUDE RESPONSE CAUSED BY SUBSURFACE FEATURE OR MATERIAL WITHIN GROUND. MAY POSSIBLY BE RELATED TO UTILITY APPARATUS OR SERVICE TRENCH
- AREA STRONG, REGULARLY SPACED GPR RESPONSES - LIKELY RELATED TO REINFORCED CONCRETE BUT SOMETIMES BURIED STONE SETTS (OR SIMILAR) MAY GIVE ANALOGOUS RESPONSE

INFORMATION FROM CCTV INSPECTION (POSITIONS FROM CCTV DISTANCES)

INCOMING PIPE - ORIGIN UNCERTAIN

END OF SURVEY - PIPE UNSURVEYED BEYOND THIS POINT

PIPE IDENTIFICATION: THE PRIMARY OUTFLOW PIPE IS LABELED MH(NUMBER) X, WITH ADDITIONAL OUTFLOWS AS Y OR Z. INCOMING PIPES ARE LABELED STARTING WITH NUMBER 1 FROM THE FIRST PIPE CLOCKWISE FROM X, PROCEEDING TO B FOR THE NEXT PIPE CLOCKWISE

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

Met GEO ENVIRONMENTAL
Southgate House
Pontefract Road
Stourton
Leeds
West Yorkshire
LS10 1SW
T: +44 (0) 1132 008 900
F: +44 (0) 1132 008 901
E: admin@metgeoenvironmental.com
W: www.metgeoenvironmental.com

Client
TRAVIS PERKINS LTD

Site
CROESFOEL INDUSTRIAL ESTATE
WREXHAM, LL14 4BJ

Title
UTILITY MAPPING SURVEY

Surveyed	HD, AP	Drawn	HD
Chk.	HB	Date	01/07/2024
Scale 1:200	Job No P24-00411	Sheet Size A0	Revision 01

DWG Ref

Year	Number	Originator	Zone	ID	Type	Role	Sheet
P24	00411	MET	EXT	UMS	M2	GU	01

Background topographical information used for this drawing is from drawing 'P24-00411-MET-EXT-XX-M2-GU' dated 07/06/2024.
Grid : OS National Grid using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on SS.
Datum: OS Level Datum using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

This drawing and information contained within is issued in confidence and is the copyright of Met Geo Environmental Ltd. If the topographical information or base mapping has been supplied by a Third Party, Met Geo Environmental Ltd is not liable for any inaccuracies contained therein. If inaccuracies to supplied mapping have been identified (and Met Geo Environmental Ltd have not been commissioned to rectify these inaccuracies) these will be highlighted in the accompanying report. Disclosure of this information to Third Parties and unauthorised copying or replication of this data without approval is forbidden.

The data presented in this drawing have been collected using a combination of the following: consultation of utility asset information, visual survey & inspection of manholes and inspection chambers; electromagnetic location techniques; ground penetrating radar, and, where applicable, trial hole excavations. These techniques have been deployed in accordance with the BSI PAS128 Specification for the Detection, Verification and Location of Underground Utilities using the search methodologies indicated on sheet PAS1 and described in the accompanying report. This drawing should be used in conjunction with the accompanying report which details the limitations of these techniques and any hindering factors encountered during this survey.

Unless otherwise stated, all services shown on this plan have been surveyed using approved detectors and the connections between inspection chambers, if unable to be detected, are generally assumed to be direct unless there are indications to the contrary. The detection confidence for each utility segment is depicted in line with the PAS128 scheme outlined below. Information depicted as QL-C or QL-D Information that has not been located on site (NL) cannot be guaranteed as it is based on utility record information which can be inaccurate and incomplete.

The service routes depicted may reflect the routes of multiple cables or pipes. It is not always possible to differentiate between buried construction features, utilities and other subsurface linear features due to the inherent limitations of the techniques employed. It is therefore possible that some features shown are not utility related. Due to the limitations of electromagnetic techniques all utility identifications should be treated with caution and verified prior to use during design or building works.

If the location or depth of services or features is of particular importance to a project then it is recommended that discussions are held with Met Geo Environmental Ltd. regarding any further considerations that may have arisen due to the nature and methods employed to ascertain the location data presented as part of this survey.

Please note that not all buried pipes, cables and ducts can be detected and mapped in consideration of their depth, location, material type, geology and proximity to other utilities. Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate. Where an area of utilities is likely to affect client project requirements, it is strongly recommended that PAS128 Type A verification surveys are carried out to confirm the position or absence of of utilities where this is critical to the scheme.

No utility mapping survey can be considered a 100% accurate depiction of the sub-surface environment, and the use of these drawings does not remove the requirement for the use of safe digging techniques at all times, in line with the requirements of HSG47 and current CDM regulations.

Appendix E
Brownfield Run Off Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
MH1	0.055	5.00	106.570	1200	331076.086	348514.223	0.780
MH4	0.087	5.00	105.770	1350	331087.002	348448.384	1.390
MH6	0.276	5.00	106.920	1200	331105.714	348453.519	1.230
MH9	0.055	5.00	106.590	1200	331044.699	348501.471	0.890
MH8	0.063	5.00	106.430	1200	331038.409	348509.458	0.810
MH11			106.470	1200	331051.629	348464.618	1.340
MH12	0.229	5.00	105.370	1350	331054.612	348443.350	1.210
MH13	0.077	5.00	105.910	1350	331060.059	348422.717	1.830
MH7	0.062	5.00	107.550	1200	331097.780	348484.934	1.100
MH18	0.021	5.00	105.750	1200	331086.663	348439.147	0.500
MH16			105.630	1200	331073.427	348431.134	0.650
MH14			105.980	1200	331056.137	348415.390	1.930

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	MH8	MH12	68.065	0.600	105.620	104.160	1.460	46.6	150	5.77	50.0
4.000	MH9	MH11	37.499	0.600	105.700	105.140	0.560	67.0	150	5.51	50.0
4.001	MH11	MH12	21.476	0.600	105.130	104.160	0.970	22.1	150	5.67	50.0
1.000	MH1	MH4	66.738	0.600	105.790	104.420	1.370	48.7	150	5.77	50.0
2.000	MH7	MH6	32.401	0.600	106.450	105.700	0.750	43.2	225	5.27	50.0
2.001	MH6	MH4	19.404	0.600	105.690	104.420	1.270	15.3	225	5.37	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.477	26.1	8.5	0.660	1.060	0.063	0.0	59	1.323
4.000	1.230	21.7	7.5	0.740	1.180	0.055	0.0	61	1.118
4.001	2.149	38.0	7.5	1.190	1.060	0.055	0.0	45	1.672
1.000	1.445	25.5	7.5	0.630	1.200	0.055	0.0	55	1.255
2.000	1.995	79.3	8.4	0.875	0.995	0.062	0.0	49	1.301
2.001	3.364	133.8	45.8	1.005	1.125	0.338	0.0	91	3.062

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	MH4	MH12	32.779	0.600	104.380	104.170	0.210	156.1	300	6.20	50.0
1.002	MH12	MH13	21.340	0.600	104.160	104.090	0.070	304.9	300	6.60	50.0
5.000	MH18	MH16	15.473	0.600	105.250	104.980	0.270	57.3	100	5.25	50.0
5.001	MH16	MH13	15.797	0.600	104.980	104.130	0.850	18.6	100	5.40	50.0
1.003	MH13	MH14	8.311	0.600	104.080	104.050	0.030	277.0	300	6.75	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	1.256	88.8	65.1	1.090	0.900	0.480	0.0	191	1.368
1.002	0.895	63.3	112.1	0.910	1.520	0.827	0.0	300	0.907
5.000	1.019	8.0	2.8	0.400	0.550	0.021	0.0	41	0.931
5.001	1.800	14.1	2.8	0.550	1.680	0.021	0.0	30	1.399
1.003	0.939	66.4	125.4	1.530	1.630	0.925	0.0	300	0.952

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	68.065	46.6	150	Circular	106.430	105.620	0.660	105.370	104.160	1.060
4.000	37.499	67.0	150	Circular	106.590	105.700	0.740	106.470	105.140	1.180
4.001	21.476	22.1	150	Circular	106.470	105.130	1.190	105.370	104.160	1.060
1.000	66.738	48.7	150	Circular	106.570	105.790	0.630	105.770	104.420	1.200
2.000	32.401	43.2	225	Circular	107.550	106.450	0.875	106.920	105.700	0.995
2.001	19.404	15.3	225	Circular	106.920	105.690	1.005	105.770	104.420	1.125
1.001	32.779	156.1	300	Circular	105.770	104.380	1.090	105.370	104.170	0.900
1.002	21.340	304.9	300	Circular	105.370	104.160	0.910	105.910	104.090	1.520

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	MH8	1200	Manhole	Adoptable	MH12	1350	Manhole	Adoptable
4.000	MH9	1200	Manhole	Adoptable	MH11	1200	Manhole	Adoptable
4.001	MH11	1200	Manhole	Adoptable	MH12	1350	Manhole	Adoptable
1.000	MH1	1200	Manhole	Adoptable	MH4	1350	Manhole	Adoptable
2.000	MH7	1200	Manhole	Adoptable	MH6	1200	Manhole	Adoptable
2.001	MH6	1200	Manhole	Adoptable	MH4	1350	Manhole	Adoptable
1.001	MH4	1350	Manhole	Adoptable	MH12	1350	Manhole	Adoptable
1.002	MH12	1350	Manhole	Adoptable	MH13	1350	Manhole	Adoptable

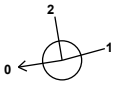
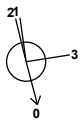
Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	15.473	57.3	100	Circular	105.750	105.250	0.400	105.630	104.980	0.550
5.001	15.797	18.6	100	Circular	105.630	104.980	0.550	105.910	104.130	1.680
1.003	8.311	277.0	300	Circular	105.910	104.080	1.530	105.980	104.050	1.630

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	MH18	1200	Manhole	Adoptable	MH16	1200	Manhole	Adoptable
5.001	MH16	1200	Manhole	Adoptable	MH13	1350	Manhole	Adoptable
1.003	MH13	1350	Manhole	Adoptable	MH14	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
MH1	331076.086	348514.223	106.570	0.780	1200		0	1.000	105.790	150
MH4	331087.002	348448.384	105.770	1.390	1350		1	2.001	104.420	225
							2	1.000	104.420	150
							0	1.001	104.380	300
MH6	331105.714	348453.519	106.920	1.230	1200		1	2.000	105.700	225
							0	2.001	105.690	225
MH9	331044.699	348501.471	106.590	0.890	1200		0	4.000	105.700	150
MH8	331038.409	348509.458	106.430	0.810	1200		0	3.000	105.620	150
MH11	331051.629	348464.618	106.470	1.340	1200		1	4.000	105.140	150
							0	4.001	105.130	150
MH12	331054.612	348443.350	105.370	1.210	1350		1	4.001	104.160	150
							2	3.000	104.160	150
							3	1.001	104.170	300
							0	1.002	104.160	300
MH13	331060.059	348422.717	105.910	1.830	1350		1	5.001	104.130	100
							2	1.002	104.090	300
							0	1.003	104.080	300

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
MH7	331097.780	348484.934	107.550	1.100	1200	 0	2.000	106.450	225
MH18	331086.663	348439.147	105.750	0.500	1200	 0	5.000	105.250	100
MH16	331073.427	348431.134	105.630	0.650	1200	1  0	5.000 5.001	104.980 104.980	100 100
MH14	331056.137	348415.390	105.980	1.930	1200	 1	1.003	104.050	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	0	0	0
100	40	0	0

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH1	12	106.086	0.296	14.5	0.3343	0.0000	SURCHARGED
15 minute winter	MH4	11	105.770	1.390	111.5	1.9891	0.0925	FLOOD
15 minute winter	MH6	11	106.371	0.681	89.1	0.7701	0.0000	SURCHARGED
15 minute winter	MH9	10	105.789	0.089	14.5	0.1005	0.0000	OK
15 minute winter	MH8	12	105.815	0.195	16.6	0.2207	0.0000	SURCHARGED
15 minute winter	MH11	11	105.517	0.387	14.4	0.4379	0.0000	SURCHARGED
15 minute winter	MH12	11	105.370	1.210	193.7	1.7315	3.6091	FLOOD
15 minute winter	MH13	11	104.760	0.680	186.7	0.9725	0.0000	SURCHARGED
15 minute winter	MH7	10	106.519	0.069	16.4	0.0779	0.0000	OK
15 minute winter	MH18	10	105.316	0.066	5.5	0.0746	0.0000	OK
15 minute winter	MH16	11	105.029	0.049	5.5	0.0551	0.0000	OK
15 minute summer	MH14	10	104.334	0.284	186.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH1	1.000	MH4	12.7	0.838	0.497	1.1749	
15 minute winter	MH4	1.001	MH12	110.1	1.564	1.241	2.3083	
15 minute winter	MH6	2.001	MH4	80.6	2.292	0.603	0.7717	
15 minute winter	MH9	4.000	MH11	14.4	1.252	0.660	0.5339	
15 minute winter	MH8	3.000	MH12	14.0	0.897	0.534	1.1983	
15 minute winter	MH11	4.001	MH12	13.3	0.838	0.351	0.3781	
15 minute winter	MH12	1.002	MH13	163.5	2.322	2.585	1.5027	
15 minute winter	MH13	1.003	MH14	186.8	2.653	2.813	0.5793	109.4
15 minute winter	MH7	2.000	MH6	16.2	0.926	0.205	0.8107	
15 minute winter	MH18	5.000	MH16	5.5	1.219	0.681	0.0698	
15 minute winter	MH16	5.001	MH13	5.4	0.806	0.380	0.0917	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH1	11	106.404	0.614	18.7	0.6944	0.0000	FLOOD RISK
15 minute winter	MH4	10	105.770	1.390	150.9	1.9891	6.3876	FLOOD
15 minute winter	MH6	11	106.815	1.125	107.3	1.2720	0.0000	FLOOD RISK
15 minute winter	MH9	11	105.974	0.274	18.7	0.3102	0.0000	SURCHARGED
15 minute winter	MH8	11	106.219	0.599	21.4	0.6770	0.0000	FLOOD RISK
15 minute winter	MH11	12	105.593	0.463	16.8	0.5233	0.0000	SURCHARGED
15 minute winter	MH12	9	105.370	1.210	220.0	1.7315	12.9956	FLOOD
15 minute winter	MH13	10	104.783	0.703	192.0	1.0064	0.0000	SURCHARGED
15 minute winter	MH7	11	106.879	0.429	21.0	0.4855	0.0000	SURCHARGED
15 minute winter	MH18	10	105.328	0.078	7.1	0.0884	0.0000	OK
15 minute winter	MH16	11	105.046	0.066	7.0	0.0749	0.0000	OK
15 minute summer	MH14	9	104.334	0.284	190.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH1	1.000	MH4	16.3	0.926	0.638	1.1749	
15 minute winter	MH4	1.001	MH12	110.4	1.567	1.243	2.3083	
15 minute winter	MH6	2.001	MH4	106.9	2.687	0.799	0.7717	
15 minute winter	MH9	4.000	MH11	16.8	1.252	0.772	0.6602	
15 minute winter	MH8	3.000	MH12	18.7	1.063	0.717	1.1983	
15 minute winter	MH11	4.001	MH12	16.6	0.943	0.437	0.3781	
15 minute winter	MH12	1.002	MH13	163.7	2.324	2.587	1.5027	
15 minute winter	MH13	1.003	MH14	191.9	2.725	2.889	0.5793	125.3
15 minute winter	MH7	2.000	MH6	23.7	0.937	0.299	1.2886	
15 minute winter	MH18	5.000	MH16	7.0	1.232	0.876	0.0925	
15 minute winter	MH16	5.001	MH13	7.0	0.952	0.492	0.1053	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH1	10	106.570	0.780	26.1	0.8822	0.9581	FLOOD
30 minute winter	MH4	15	105.770	1.390	164.3	1.9891	19.6851	FLOOD
15 minute winter	MH6	9	106.920	1.230	159.6	1.3911	8.5025	FLOOD
15 minute winter	MH9	11	106.507	0.807	26.1	0.9124	0.0000	FLOOD RISK
15 minute winter	MH8	10	106.430	0.810	29.9	0.9161	1.1183	FLOOD
15 minute winter	MH11	12	105.794	0.664	23.1	0.7512	0.0000	SURCHARGED
30 minute winter	MH12	15	105.370	1.210	239.4	1.7315	32.4706	FLOOD
15 minute winter	MH13	10	104.815	0.735	198.7	1.0522	0.0000	SURCHARGED
15 minute winter	MH7	9	107.118	0.668	29.4	0.7558	0.0000	SURCHARGED
15 minute winter	MH18	12	105.502	0.252	10.0	0.2845	0.0000	FLOOD RISK
15 minute winter	MH16	12	105.151	0.171	8.6	0.1931	0.0000	SURCHARGED
15 minute summer	MH14	8	104.334	0.284	197.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH1	1.000	MH4	18.4	1.047	0.722	1.1749	
30 minute winter	MH4	1.001	MH12	110.4	1.567	1.243	2.3083	
15 minute winter	MH6	2.001	MH4	112.2	2.821	0.839	0.7717	
15 minute winter	MH9	4.000	MH11	23.1	1.314	1.064	0.6602	
15 minute winter	MH8	3.000	MH12	21.0	1.193	0.805	1.1983	
15 minute winter	MH11	4.001	MH12	22.8	1.298	0.602	0.3781	
30 minute winter	MH12	1.002	MH13	164.3	2.333	2.597	1.5027	
15 minute winter	MH13	1.003	MH14	198.6	2.820	2.990	0.5793	145.2
15 minute winter	MH7	2.000	MH6	28.5	0.926	0.360	1.2886	
15 minute winter	MH18	5.000	MH16	8.6	1.234	1.069	0.1211	
15 minute winter	MH16	5.001	MH13	8.4	1.077	0.596	0.1236	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

mjm Consulting Engineers Ltd

Appendix F
Drainage Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
MH1	0.055	5.00	106.570	1200	331076.086	348514.223	0.780
MH4	0.087	5.00	105.770	1350	331087.002	348448.384	1.390
MH6	0.276	5.00	106.920	1200	331105.714	348453.519	1.230
MH9	0.055	5.00	106.590	1200	331044.699	348501.471	0.890
MH8	0.063	5.00	106.430	1200	331038.409	348509.458	0.810
MH11			106.470	1200	331051.629	348464.618	1.340
MH12	0.229	5.00	105.370	1350	331054.612	348443.350	1.210
MH13	0.077	5.00	105.910	1350	331060.059	348422.717	1.830
MH7	0.062	5.00	107.550	1200	331097.780	348484.934	1.100
MH18	0.021	5.00	105.750	1200	331086.663	348439.147	0.500
MH16			105.630	1200	331073.427	348431.134	0.650
MH14			105.980	1350	331056.137	348415.390	1.930
ATTENUATION TANK			105.065		331062.106	348420.508	1.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	MH8	MH12	68.065	0.600	105.620	104.160	1.460	46.6	150	5.77	50.0
4.000	MH9	MH11	37.499	0.600	105.700	105.140	0.560	67.0	150	5.51	50.0
4.001	MH11	MH12	21.476	0.600	105.130	104.160	0.970	22.1	150	5.67	50.0
1.000	MH1	MH4	66.738	0.600	105.790	104.420	1.370	48.7	150	5.77	50.0
2.000	MH7	MH6	32.401	0.600	106.450	105.700	0.750	43.2	225	5.27	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.477	26.1	8.5	0.660	1.060	0.063	0.0	59	1.323
4.000	1.230	21.7	7.5	0.740	1.180	0.055	0.0	61	1.118
4.001	2.149	38.0	7.5	1.190	1.060	0.055	0.0	45	1.672
1.000	1.445	25.5	7.5	0.630	1.200	0.055	0.0	55	1.255
2.000	1.995	79.3	8.4	0.875	0.995	0.062	0.0	49	1.301

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.001	MH6	MH4	19.404	0.600	105.690	104.420	1.270	15.3	225	5.37	50.0
1.001	MH4	MH12	32.779	0.600	104.380	104.170	0.210	156.1	300	6.20	50.0
1.002	MH12	MH13	21.340	0.600	104.160	104.090	0.070	304.9	375	6.55	50.0
5.000	MH18	MH16	15.473	0.600	105.250	104.980	0.270	57.3	100	5.25	50.0
5.001	MH16	MH13	15.797	0.600	104.980	104.130	0.850	18.6	100	5.40	50.0
1.003	MH13	ATTENUATION TANK	8.311	0.600	104.080	104.065	0.015	554.1	375	6.73	50.0
1.004	ATTENUATION TANK	MH14	7.863	0.600	104.065	104.050	0.015	524.2	450	6.88	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.001	3.364	133.8	45.8	1.005	1.125	0.338	0.0	91	3.062
1.001	1.256	88.8	65.1	1.090	0.900	0.480	0.0	191	1.368
1.002	1.032	114.0	112.1	0.835	1.445	0.827	0.0	304	1.169
5.000	1.019	8.0	2.8	0.400	0.550	0.021	0.0	41	0.931
5.001	1.800	14.1	2.8	0.550	1.680	0.021	0.0	30	1.399
1.003	0.763	84.2	125.4	1.455	0.625	0.925	0.0	375	0.772
1.004	0.881	140.1	125.4	0.550	1.480	0.925	0.0	334	0.991

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.000	68.065	46.6	150	Circular	106.430	105.620	0.660	105.370	104.160	1.060
4.000	37.499	67.0	150	Circular	106.590	105.700	0.740	106.470	105.140	1.180
4.001	21.476	22.1	150	Circular	106.470	105.130	1.190	105.370	104.160	1.060
1.000	66.738	48.7	150	Circular	106.570	105.790	0.630	105.770	104.420	1.200
2.000	32.401	43.2	225	Circular	107.550	106.450	0.875	106.920	105.700	0.995
2.001	19.404	15.3	225	Circular	106.920	105.690	1.005	105.770	104.420	1.125
1.001	32.779	156.1	300	Circular	105.770	104.380	1.090	105.370	104.170	0.900

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.000	MH8	1200	Manhole	Adoptable	MH12	1350	Manhole	Adoptable
4.000	MH9	1200	Manhole	Adoptable	MH11	1200	Manhole	Adoptable
4.001	MH11	1200	Manhole	Adoptable	MH12	1350	Manhole	Adoptable
1.000	MH1	1200	Manhole	Adoptable	MH4	1350	Manhole	Adoptable
2.000	MH7	1200	Manhole	Adoptable	MH6	1200	Manhole	Adoptable
2.001	MH6	1200	Manhole	Adoptable	MH4	1350	Manhole	Adoptable
1.001	MH4	1350	Manhole	Adoptable	MH12	1350	Manhole	Adoptable

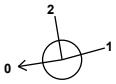
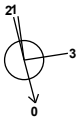
Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.002	21.340	304.9	375	Circular	105.370	104.160	0.835	105.910	104.090	1.445
5.000	15.473	57.3	100	Circular	105.750	105.250	0.400	105.630	104.980	0.550
5.001	15.797	18.6	100	Circular	105.630	104.980	0.550	105.910	104.130	1.680
1.003	8.311	554.1	375	Circular	105.910	104.080	1.455	105.065	104.065	0.625
1.004	7.863	524.2	450	Circular	105.065	104.065	0.550	105.980	104.050	1.480

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.002	MH12	1350	Manhole	Adoptable	MH13	1350	Manhole	Adoptable
5.000	MH18	1200	Manhole	Adoptable	MH16	1200	Manhole	Adoptable
5.001	MH16	1200	Manhole	Adoptable	MH13	1350	Manhole	Adoptable
1.003	MH13	1350	Manhole	Adoptable	ATTENUATION TANK		Junction	
1.004	ATTENUATION TANK		Junction		MH14	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
MH1	331076.086	348514.223	106.570	0.780	1200	 0	1.000	105.790	150
MH4	331087.002	348448.384	105.770	1.390	1350	 1	2.001	104.420	225
						2	1.000	104.420	150
						0	1.001	104.380	300
MH6	331105.714	348453.519	106.920	1.230	1200	 1	2.000	105.700	225
						0	2.001	105.690	225
MH9	331044.699	348501.471	106.590	0.890	1200	 0	4.000	105.700	150
MH8	331038.409	348509.458	106.430	0.810	1200	 0	3.000	105.620	150
MH11	331051.629	348464.618	106.470	1.340	1200	 1	4.000	105.140	150
						0	4.001	105.130	150
MH12	331054.612	348443.350	105.370	1.210	1350	 1	4.001	104.160	150
						2	3.000	104.160	150
						3	1.001	104.170	300
						0	1.002	104.160	375

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
MH13	331060.059	348422.717	105.910	1.830	1350	1	5.001	104.130	100
						2	1.002	104.090	375
						0	1.003	104.080	375
MH7	331097.780	348484.934	107.550	1.100	1200	0	2.000	106.450	225
MH18	331086.663	348439.147	105.750	0.500	1200	0	5.000	105.250	100
MH16	331073.427	348431.134	105.630	0.650	1200	1	5.000	104.980	100
						0	5.001	104.980	100
MH14	331056.137	348415.390	105.980	1.930	1350	1	1.004	104.050	450
ATTENUATION TANK	331062.106	348420.508	105.065	1.000		1	1.003	104.065	375
						0	1.004	104.065	450

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	0	0	0
100	0	0	0

Node MH14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	104.050	Product Number	CTL-SHE-0445-1330-1015-1330
Design Depth (m)	1.015	Min Outlet Diameter (m)	0.500
Design Flow (l/s)	133.0	Min Node Diameter (mm)	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Node ATTENUATION TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	104.065
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	10

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	110.0	0.0	1.000	110.0	0.0

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH1	11	105.871	0.081	14.5	0.0919	0.0000	OK
15 minute winter	MH4	11	105.332	0.952	122.7	1.3619	0.0000	SURCHARGED
15 minute winter	MH6	11	105.879	0.189	89.1	0.2142	0.0000	OK
15 minute winter	MH9	10	105.791	0.091	14.5	0.1025	0.0000	OK
15 minute winter	MH8	10	105.706	0.086	16.6	0.0971	0.0000	OK
15 minute winter	MH11	11	105.199	0.069	14.1	0.0780	0.0000	OK
15 minute winter	MH12	11	104.890	0.730	202.4	1.0444	0.0000	SURCHARGED
15 minute winter	MH13	12	104.622	0.542	224.4	0.7755	0.0000	SURCHARGED
15 minute winter	MH7	10	106.519	0.069	16.4	0.0777	0.0000	OK
15 minute winter	MH18	10	105.316	0.066	5.5	0.0750	0.0000	OK
15 minute winter	MH16	10	105.023	0.043	5.4	0.0485	0.0000	OK
30 minute winter	MH14	22	104.521	0.471	130.8	0.6734	0.0000	OK
30 minute winter	ATTENUATION TANK	22	104.542	0.477	187.3	49.8287	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH1	1.000	MH4	14.2	0.924	0.557	0.9126	
15 minute winter	MH4	1.001	MH12	115.6	1.642	1.303	2.3083	
15 minute winter	MH6	2.001	MH4	85.5	2.240	0.639	0.7321	
15 minute winter	MH9	4.000	MH11	14.1	1.295	0.647	0.4088	
15 minute winter	MH8	3.000	MH12	16.3	1.037	0.625	0.9537	
15 minute winter	MH11	4.001	MH12	14.0	0.957	0.368	0.2739	
15 minute winter	MH12	1.002	MH13	200.0	1.813	1.754	2.3537	
15 minute winter	MH13	1.003	ATTENUATION TANK	223.2	2.192	2.651	0.9167	
15 minute winter	MH7	2.000	MH6	16.2	0.948	0.205	0.7111	
15 minute winter	MH18	5.000	MH16	5.4	1.241	0.677	0.0674	
15 minute winter	MH16	5.001	MH13	5.4	0.835	0.379	0.0871	
30 minute winter	MH14	Hydro-Brake®		130.8				153.9
30 minute winter	ATTENUATION TANK	1.004	MH14	130.8	0.848	0.934	1.2458	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.17%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	MH1	12	106.301	0.511	18.7	0.5782	0.0000	FLOOD RISK
15 minute winter	MH4	12	105.770	1.390	137.2	1.9885	0.0000	FLOOD RISK
15 minute winter	MH6	12	106.605	0.915	114.4	1.0349	0.0000	SURCHARGED
15 minute winter	MH9	10	105.809	0.109	18.7	0.1231	0.0000	OK
15 minute winter	MH8	12	105.924	0.304	21.4	0.3442	0.0000	SURCHARGED
15 minute winter	MH11	12	105.377	0.247	18.1	0.2789	0.0000	SURCHARGED
15 minute winter	MH12	12	105.177	1.017	239.6	1.4553	0.0000	FLOOD RISK
30 minute winter	MH13	22	104.843	0.763	235.2	1.0922	0.0000	SURCHARGED
15 minute winter	MH7	12	106.670	0.220	21.0	0.2484	0.0000	OK
15 minute winter	MH18	10	105.330	0.080	7.1	0.0905	0.0000	OK
15 minute winter	MH16	11	105.041	0.061	7.0	0.0694	0.0000	OK
30 minute winter	MH14	24	104.740	0.690	134.2	0.9877	0.0000	OK
30 minute winter	ATTENUATION TANK	24	104.762	0.697	233.7	72.8734	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	MH1	1.000	MH4	15.5	0.945	0.609	1.1749	
15 minute winter	MH4	1.001	MH12	135.7	1.927	1.529	2.3083	
15 minute winter	MH6	2.001	MH4	96.2	2.418	0.719	0.7717	
15 minute winter	MH9	4.000	MH11	18.1	1.352	0.832	0.5736	
15 minute winter	MH8	3.000	MH12	19.0	1.104	0.726	1.1983	
15 minute winter	MH11	4.001	MH12	16.2	0.993	0.427	0.3781	
15 minute winter	MH12	1.002	MH13	238.1	2.159	2.088	2.3537	
30 minute winter	MH13	1.003	ATTENUATION TANK	233.7	2.119	2.775	0.9167	
15 minute winter	MH7	2.000	MH6	21.5	0.937	0.270	1.2825	
15 minute winter	MH18	5.000	MH16	7.0	1.276	0.877	0.0887	
15 minute winter	MH16	5.001	MH13	6.8	0.959	0.479	0.1016	
30 minute winter	MH14	Hydro-Brake®		133.0				200.7
30 minute winter	ATTENUATION TANK	1.004	MH14	134.2	0.854	0.958	1.2458	

Flow+ v10.7 Copyright © 1988-2024 Causeway Technologies Ltd

mjm Consulting Engineers Ltd

Appendix G
Drainage Layout



STANDARD DRAINAGE NOTES

1. ALL DRAINAGE MATERIALS & SPECIFICATIONS TO BE IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE APPENDIX C 'DESIGN AND CONSTRUCTION GUIDANCE'.
2. REFER TO MJMC CONSULTING ENGINEERS DRAWING No'S **C-5201 & C-5202** FOR ALL STANDARD DRAINAGE DETAILS.
3. THE LOCATION, SIZE AND DEPTH OF ALL EXISTING DRAINS/SEWERS AND SERVICES SHALL BE ESTABLISHED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE. ANY DISCREPANCIES FROM THE INFORMATION INDICATED ON THESE DRAWINGS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
4. ALL PIPES SHALL BE LAID WITH SOFFITS LEVEL AND ALL MANHOLES/INSPECTION CHAMBER INVERT LEVELS SHOWN ARE FOR THE OUT GOING PIPE. UNLESS OTHERWISE INDICATED ON THE DRAWING.
5. ALL VITRIFIED CLAY PIPES AND FITTINGS TO BE IN ACCORDANCE WITH BS. EN295 & BS 65.
6. ALL CIRCULAR CONCRETE PIPES IN TRENCHES AND FITTINGS TO BE IN ACCORDANCE WITH BS EN1916 & BS 5911 AND BE STRENGTH CLASS 120.
7. ALL STRUCTURED WALL PLASTIC PIPES AND FITTINGS TO BE IN ACCORDANCE WITH WIS 4-35-01. MAXIMUM LENGTH OF PIPE FOR LAYING IS 3m.
8. PIPES AND FITTINGS ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
9. ALL CONNECTIONS TO GULLIES & DRAINAGE CHANNELS TO BE 150mm DIAMETER UNLESS NOTED OTHERWISE.
10. ALL CONNECTIONS FROM DRAINAGE CHANNELS TO BE TRAPPED AND RODABLE.
11. COVER LEVELS INDICATED IN MANHOLE SCHEDULES ARE APPROXIMATE AND SHOULD BE CHECKED AGAINST ARCHITECT'S DETAILED LEVELS DRAWINGS.
12. WHERE THE COVER TO PIPES IS LESS THAN 1200mm IN TRAFFICKED AREAS & 900mm IN OTHER AREAS, THEN CONCRETE PROTECTION IS TO BE PROVIDED. NB UNTIL FINAL SURFACE IS CONSTRUCTED, HEAVY TRAFFIC IS NOT TO BE ALLOWED OVER PIPE TRENCHES WITHOUT SPECIFIC PROTECTION MEASURES IN PLACE.
13. SOFT SPOTS IN THE BOTTOM OF TRENCHES SHALL BE REMOVED AND BACKFILLED WITH TYPE 1 SUB-MATERIAL, PIPE BEDDING MATERIAL OR LEAN MIX CONCRETE.
14. ALL CONCRETE WORK IS TO BE IN ACCORDANCE WITH MJM CONSULTING ENGINEERS NBS-SECTION E.
15. RELEVANT CONCRETE MIX DESIGN:-

CONCRETE ELEMENT	DESIGN CHEMICAL CLASS	SPEC. CLAUSE No.
PIPE SURROUND		
MH SURROUND		

16. DRAINAGE CHANNEL SPECIFICATIONS:-

LOCATION	CHANNEL TYPE	LOAD CLASS
YARD		
CAR PARK		
ACCESS ROAD		
PEDESTRIAN AREAS		

17. IF A SIPHONIC ROOF DRAINAGE SYSTEM IS PROPOSED THE SIPHONIC PIPEWORK IS TO BE CONTINUED BELOW GROUND TO THE FIRST EXTERNAL MANHOLE, WHICH IS TO BE VENTED TO BREAK THE SIPHONIC ACTION.
18. ALL DRAINAGE COVERS IN PEDESTRIAN AREAS ARE TO BE FITTED WITH HEEL SAFE LIDS.
19. ALL PETROL INTERCEPTORS ARE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND FITTED WITH ALARMS AND VENTS TO LOCATIONS AS AGREED WITH THE CLIENT.
20. IF A PILED OR SUSPENDED SLAB IS PROPOSED ALL INTERNAL DRAINAGE IS TO BE SUSPENDED FROM THE SLAB WITH ROCKER PIPES USED AT THE EDGES OF THE BUILDING.
21. ALL DOMESTIC FOUL DRAINAGE MUST BE KEPT SEPARATE FROM CONDENSATE DRAINAGE UNTIL OUTSIDE THE BUILDING WITH STEPS TAKEN TO TRAP ANY ODOURS.
22. ALL FOUL RUNS MUST BE VENTED IN ACCORDANCE WITH BUILDING REGULATIONS. VENT LOCATIONS TO BE PROVIDED BY THE ABOVE GROUND DRAINAGE DESIGNER.
23. REGARDLESS OF MANHOLE POSITIONS SHOWN ON THIS DRAWING, THE ACCESS LIDS ARE TO BE POSITIONED AWAY FROM MAIN WHEEL LINES AND BE SQUARE TO KERBS AND OTHER SURFACE FEATURES SUCH AS YARD SLAB JOINTS.
24. ALL TEMPORARY DRAINAGE IS THE RESPONSIBILITY OF THE CONTRACTOR.
25. THE CONTRACTOR SHALL PROVIDE LAND DRAINAGE AS NECESSARY TO PREVENT RUNOFF FROM LANDSCAPED AREAS WASHING SILT ONTO HARDSTANDINGS AND THIRD PARTY LAND.
26. THE CONTRACTOR IS RESPONSIBLE FOR SEWER CONNECTION APPROVALS UNLESS NOTED OTHERWISE.
27. ALL MANHOLE LIDS TO BE PAINTED BLACK IMMEDIATELY PRIOR TO PRACTICAL COMPLETION.
28. JUST PRIOR TO PRACTICAL COMPLETION OF THE PROJECT THE CONTRACTOR SHALL CLEAN ALL DRAIN RUNS BY JETTING AND REMOVING ALL DEBRIS FROM SITE. NO DEBRIS SHALL BE PERMITTED TO ENTER THE PUBLIC SEWER AND/OR WATERCOURSE SYSTEM. ONCE THE DRAINAGE SYSTEM HAS BEEN FULLY CLEANED OUT A CCTV SURVEY OF THE COMPLETE PIPE NETWORK (INCLUDING ATTENUATION TANKS AND CARRIER CHANNELS) SHALL BE CARRIED OUT, WITH A COPY BEING SENT TO THE ENGINEER. VISUAL INSPECTIONS (THROUGH CCTV SURVEY) SHALL BE CARRIED OUT BY A QUALIFIED AND APPROVED CONTRACTOR, AND IN ACCORDANCE WITH THE WSA/FRA MODEL CONTRACT DOCUMENT FOR SEWER CONDITION INSPECTIONS'. THE AS BUILT INVERT AND COVER LEVELS SHALL BE RECORDED BY THE CONTRACTOR AND PASSED TO THE ENGINEER FOR REVIEW.
29. ALL SEWERS AND DRAINS ARE TO BE TESTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE APPENDIX C, SECTION E7.

ATTENUATION TANKS

1. ALL TANK DESIGNS SHALL BE BY SPECIALIST AND A DIRECT WARRANTY FOR PRODUCT LIABILITY. DESIGN AND INSTALLATION SHALL BE PROVIDED BY THE SPECIALIST SUB-CONTRACTOR. ANY ASSOCIATED DESIGN CONSULTANT WARRANTIES MUST BE BACK TO BACK WITH THE TANK SUPPLIER WARRANTY.
2. ATTENUATION TANKS ARE TO BE CORRUGATED STEEL, I.E. TUBOSIDER TWINSTORE SYSTEM. PLASTIC MODULAR TANKS ARE NOT RECOMMENDED DUE TO THE HIGHLY VARIABLE NATURE OF THEIR MATERIAL/CONSTRUCTION AND MUST NOT BE USED BENEATH HEAVILY LOADED AREAS SUCH AS HGV YARDS ND ACCESS ROADS.
3. IF THE CONTRACTOR CHOOSES TO USE GEOCELLULAR TANKS BENEATH LIGHTER LOADED AREAS SUCH AS CAR PARKS, THE CONTRACTOR SHOULD ENSURE THAT THE INFORMATION BELOW IS FULLY CONSIDERED BY THE SPECIALIST SUB-CONTRACTOR:-
   a. TANKS MUST BE DESIGNED AS EARTH RETAINING STRUCTURES IN ACCORDANCE WITH CIRIA DOCUMENTS C697 AND C737 OF 'STRUCTURAL DESIGN AND GEOTECHNICAL DESIGN OF MODULAR GEOCELLULAR DRAINAGE SYSTEMS'.
   b. PARTICULAR CONSIDERATION TO BE GIVEN TO LATERAL SURCHARGE LOADS FROM VEHICLES POSITIONED TO THE SIDE OF THE TANKS.
   c. THE DESIGNER HAS CONSIDERED THE SOIL INVESTIGATION REPORT, WATER LEVELS AND INSTALLATION LEVELS IN THEIR DESIGN.
   d. ACCESS FOR MAINTENANCE AND INSPECTION (I.E. JETTING AND RODDING) WITHIN THE TANK STRUCTURE ITSELF SHOULD BE PROVIDED FOR APPROVAL AND BE IN ACCORDANCE WITH CIRIA 697 REQUIREMENTS BY PROVISION OF A FULL CCTV ACCESSIBLE PIPE (WHETHER A SOLID, PERFORATED OR A HALF HEIGHT PIPE SYSTEM IS UTILISED) THROUGH THE WHOLE LENGTH OF THE TANK.

DESIGNER RISK INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:-

CONSTRUCTION:

- CONTRACTOR TO REVIEW IMPLICATIONS OF ALL ASPECTS FROM THE GEO-ENVIRONMENTAL SITE INVESTIGATION DOCUMENTS INCLUDING, BUT NOT LIMITED TO: CONTAMINATION, GROUND GAS, REQUIREMENTS OF BURIED CONCRETE, WATER LEVELS.
- MAIN CONTRACTOR TO NOTE THAT EXISTING UTILITIES ARE WITHIN THE SITE BOUNDARY.
- CONTRACTOR TO CONSIDER STABILITY OF RETAINING WALLS DURING CONSTRUCTION.
- CONTRACTOR TO LIMIT DEEP EXCAVATIONS THROUGHOUT THE SITE. WHERE THESE CANNOT BE AVOIDED, CONTRACTOR TO PROVIDE APPROPRIATE PROTECTION, SHORING AND DEWATERING.

MAINTENANCE/CLEANING:
N/A

DECOMMISSIONING/DEMOLITION:
N/A

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

KEY

- AREA TO BE DRAINED
- EXISTING SURFACE WATER PIPE
- EXISTING SURFACE WATER MANHOLE Ø1200mm, unless labeled otherwise
- RWP EXISTING RAINWATER PIPE
- G EXISTING SURFACE WATER GULLY
- EXISTING DRAINAGE CHANNEL
- EXISTING DRAINAGE CHANNEL OUTLET
- PROPOSED SURFACE WATER PIPE
- PROPOSED SURFACE WATER MANHOLE Ø1200mm, unless labeled otherwise
- RWP RAINWATER PIPE
- G PROPOSED SURFACE WATER GULLY
- PROPOSED ATTENUATION TANK
- EXISTING COMBINED SEWER MANHOLE

ADDITIONAL NOTES:

1. ALL PIPE AND MANHOLE SIZES AND LEVELS ARE APPROXIMATE AND ARE SUBJECT TO FURTHER DESIGN AND DRAINAGE MODELING.
2. TOPOGRAPHICAL SURVEY COMPLETED BY MET GEO ENVIRONMENTAL DRAWING REF. P24-00411-MET-EXT-XX-TOP-M2-G-001 DATED 29/05/2024.
3. DRAINAGE SURVEY COMPLETED BY MET GEO ENVIRONMENTAL DRAWING REF. P24-00411-MET-EXT-UMS-M2-GU-01 DATED 01/07/2024.

Rev	Date	Amendment		
P01	11.07.24	FIRST ISSUE	EW	AJN

mjm Consulting Engineers Ltd
Southgate House, 38 Southgate, Wakefield WF1 1TL
T: 01924 811 000 mjmc.co.uk

Project:
TRAVIS PERKINS
WREXHAM

Client:

Drawing Title:
PROPOSED DRAINAGE LAYOUT

EW	AJN	AJN
MJMC Ref: 9003	Scale: 1:200	Sheet Size: A0
Revision Status: P01	Suitability Status: S4	Date: JUL '24
Suitability Description: FOR APPROVAL		

Drawing Reference:
Project - Originator - Zone - Level - File Type - Discipline - Number
9003-MJM-XX-XX-DR-C-5200

© THIS DRAWING MAY NOT BE COPIED WITHOUT PRIOR WRITTEN PERMISSION

Appendix H
Correspondence with Wrexham SAB

Emily Wilkes

From: SAB <SAB@wrexham.gov.uk>
Sent: 26 July 2024 15:49
To: Emily Wilkes; SAB
Cc: Alan Newsome
Subject: RE: Wrexham Road Site Redevelopment

Hi Emily,
Please accept my apologies for the delay.

From the explanation that you have provided below, this would appear to be acceptable as it should also resolve the 1 in 30 year flooding if that attenuation is on site. In the SAB submission, we be asking that no flooding is present on site.

Could you include the model results as a part of your submission? Just so that we have the evidence on hand should we need to refer to it.

Have a nice weekend.

Kind regards,

Cathryn Hughes
Swyddog Risg Llifogydd Technegol
Technical Flood Risk Officer

BSc (Hons) Earth and Environmental Science, MSc Sustainable Water Management.

01978 729639 or 07789 745497
Cyngor Bwrdeistref Sirol Wrecsam, Adran Amgylchedd a Thechnegol, De Ffordd yr Abaty, Ystad Ddiwydiannol Wrecsam, Wrecsam LL13 9PW
Wrexham County Borough Council, Environment & Technical Department, Abbey Road South, Wrexham Industrial Estate, Wrexham LL13 9PW
wrecsam.gov.uk | wrexham.gov.uk
twitter.com/cbswrecsam | twitter.com/wrexhamcbc
facebook.com/cyngorwrecsam | facebook.com/wrexhamcouncil

From: Emily Wilkes <emilyw@mjmc.co.uk>
Sent: 24 July 2024 16:25
To: SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: RE: Wrexham Road Site Redevelopment

Hi Cathryn,

Thanks again for the call last week.

We've modelled the existing drainage system and the brownfield site runoff (current outflow) for a 1 in 100 year is 190l/s. The model of the existing drainage system also shows that currently it would flood for a 1 in 30 year storm.

As discussed in the meeting, a 30% betterment for 1 in 100 year + 40% climate change is required, which results in a requirement of an outflow of 133l/s. Restricting flow to 133l/s for the 1 in 100 year storm results in a total flooding amount of approximately 105m^3 across the site, indicating approximately this is the amount of attenuation that could be required.

Prior to proceeding with further design, can you confirm the outflow being restricted to 133l/s under the above conditions is acceptable?

Thanks.

Kind Regards
Emily Wilkes
MEng (Hons)
Senior Engineer

MJM Consulting Engineers Ltd | Southgate House, Southgate, Wakefield, WF1 1TL, UK
T: +44 (1924) 811000 | DD: +44 (1924) 811076 | M: +44 (7720) 461174 | E: emilyw@mjmc.co.uk | vCard | Visit our web site at www.mjmc.co.uk

Contact me on Microsoft Teams



Company registration number: 3145094 - Registered in England.
Please consider the environment before printing this email.
This email and its attachments are intended solely for the use of the individual or organization to which it is addressed. It may contain privileged or confidential information. If you have received this message in error please notify the sender immediately. If you are not the intended recipient you should not use, copy, alter, or disclose the contents of this message. Any views or opinions expressed are solely those of the author and do not necessarily represent those of MJM Consulting Engineers Ltd. Every effort has been made to ensure this email and its attachments are virus free. However, this message and attachments have been transmitted over a public network so MJM Consulting Engineers Ltd accepts no responsibility for loss or damage arising from its use, including damage from viruses.

From: SAB <SAB@wrexham.gov.uk>
Sent: Friday, July 12, 2024 10:39 AM
To: Emily Wilkes <emilyw@mjmc.co.uk>; SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: RE: Wrexham Road Site Redevelopment [Filed 12 Jul 2024 10:52]

Hi Emily,
That would be great. Please could send an invite through?

Kind regards,

Cathryn Hughes
Swyddog Risg Llifogydd Technegol
Technical Flood Risk Officer

Corff Cymeradwyo SDCau (CCS) Wrecsam
Wrexham SuDS Approving Body (SAB)

01978 729639
Cyngor Bwrdeistref Sirol Wrecsam, Adran Amgylchedd a Thechnegol, De Ffordd yr Abaty, Ystad Ddiwydiannol Wrecsam, Wrecsam LL13 9PW
Wrexham County Borough Council, Environment & Technical Department, Abbey Road South, Wrexham Industrial Estate, Wrexham LL13 9PW
wrecsam.gov.uk | wrexham.gov.uk
twitter.com/cbswrecsam | twitter.com/wrexhamcbc
facebook.com/cyngorwrecsam | facebook.com/wrexhamcouncil

From: Emily Wilkes <emilyw@mjmc.co.uk>
Sent: 12 July 2024 09:36
To: SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: RE: Wrexham Road Site Redevelopment

Hello,

I am good, looking forward to the weekend!

Does Wednesday at 15.30 work?

Kind Regards
Emily Wilkes
MEng (Hons)
Senior Engineer

MJM Consulting Engineers Ltd | Southgate House, Southgate, Wakefield, WF1 1TL, UK
T: +44 (1924) 811000 | DD: +44 (1924) 811076 | M: +44 (7720) 461174 | E: emilyw@mjmc.co.uk | vCard | Visit our web site at www.mjmc.co.uk
Contact me on Microsoft Teams

Company registration number: 3145094 - Registered in England.
Please consider the environment before printing this email.
This email and its attachments are intended solely for the use of the individual or organization to which it is addressed. It may contain privileged or confidential information. If you have received this message in error please notify the sender immediately. If you are not the intended recipient you should not use, copy, alter, or disclose the contents of this message. Any views or opinions expressed are solely those of the author and do not necessarily represent those of MJM Consulting Engineers Ltd. Every effort has been made to ensure this email and its attachments are virus free. However, this message and attachments have been transmitted over a public network so MJM Consulting Engineers Ltd accepts no responsibility for loss or damage arising from its use, including damage from viruses.

From: SAB <SAB@wrexham.gov.uk>
Sent: Friday, July 12, 2024 9:26 AM
To: Emily Wilkes <emilyw@mjmc.co.uk>; SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: RE: Wrexham Road Site Redevelopment

Hi Emily,
I am well thank you. Are you?

We have availability on the afternoon of Tuesday 16th July and Wednesday 17th July. Please let us know which date and time would work for yourselves.

Kind regards,

Cathryn Hughes
Swyddog Risg Llifogydd Technegol
Technical Flood Risk Officer

BSc (Hons) Earth and Environmental Science, MSc Sustainable Water Management.

01978 729639 or 07789 745497
Cyngor Bwrdeistref Sirol Wrecsam, Adran Amgylchedd a Thechnegol, De Ffordd yr Abaty, Ystad Ddiwydiannol Wrecsam, Wrecsam LL13 9PW
Wrexham County Borough Council, Environment & Technical Department, Abbey Road South, Wrexham Industrial Estate, Wrexham LL13 9PW
wrecsam.gov.uk | wrexham.gov.uk
twitter.com/cbswrecsam | twitter.com/wrexhamcbc
facebook.com/cyngorwrecsam | facebook.com/wrexhamcouncil

From: Emily Wilkes <emilyw@mjmc.co.uk>
Sent: 12 July 2024 09:13
To: SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: RE: Wrexham Road Site Redevelopment

Morning Cathryn,

I hope you are well!

Thank you for your response below it's been informative.

I think it would be helpful for us to have a discussion so we can explain a bit more about what the current drainage is on the site, the proposals for the site and then to get an idea of what would be expected for a submission for a site like this. Can you please let us know your availability for a teams call?

Thank you.

Kind Regards
Emily Wilkes
MEng (Hons)
Senior Engineer

MJM Consulting Engineers Ltd | Southgate House, Southgate, Wakefield, WF1 1TL, UK
T: +44 (1924) 811000 | DD: +44 (1924) 811076 | M: +44 (7720) 461174 | E: emilyw@mjmc.co.uk | vCard | Visit our web site at www.mjmc.co.uk
Contact me on Microsoft Teams

Company registration number: 3145094 - Registered in England.
Please consider the environment before printing this email.
This email and its attachments are intended solely for the use of the individual or organization to which it is addressed. It may contain privileged or confidential information. If you have received this message in error please notify the sender immediately. If you are not the intended recipient you should not use, copy, alter, or disclose the contents of this message. Any views or opinions expressed are solely those of the author and do not necessarily represent those of MJM Consulting Engineers Ltd. Every effort has been made to ensure this email and its attachments are virus free. However, this message and attachments have been transmitted over a public network so MJM Consulting Engineers Ltd accepts no responsibility for loss or damage arising from its use, including damage from viruses.

From: SAB <SAB@wrexham.gov.uk>
Sent: Tuesday, May 28, 2024 8:25 AM
To: Emily Wilkes <emilyw@mjmc.co.uk>; SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: RE: Wrexham Road Site Redevelopment

Good morning Emily,
Thank you for contacting us. I can confirm that this site will require SAB approval before construction can begin under Schedule 3 of the Flood and Water Management Act 2010.

I have attached our guidance document and the relevant application forms to give you an idea of the information that we require to support the application. For a site of this size, we would strongly recommend that a pre-application is put in to allow us to determine a sensible and agreed method of surface water management before the full application is submitted.

We will accept brownfield runoff rates as a part of the application, although we would encourage that a betterment is made if possible.

Should you wish, we are also happy to meet you out on site for a walk around or meet you to discuss your drainage strategy before the pre SAB application is submitted.

If you have any further questions, please do not hesitate to get in touch.

Kind regards,

Cathryn Hughes
Swyddog Risg Llifogydd Technegol
Technical Flood Risk Officer

BSc (Hons) Earth and Environmental Science, MSc Sustainable Water Management.

01978 729639 or 07789 745497
Cyngor Bwrdeistref Sirol Wrecsam, Adran Amgylchedd a Thechnegol, De Ffordd yr Abaty, Ystad Ddiwydiannol Wrecsam, Wrecsam LL13 9PW
Wrexham County Borough Council, Environment & Technical Department, Abbey Road South, Wrexham Industrial Estate, Wrexham LL13 9PW
wrecsam.gov.uk | wrexham.gov.uk
twitter.com/cbswrecsam | twitter.com/wrexhamcbc
facebook.com/cyngorwrecsam | facebook.com/wrexhamcouncil

From: Emily Wilkes <emilyw@mjmc.co.uk>
Sent: 24 May 2024 13:14
To: SAB <SAB@wrexham.gov.uk>
Cc: Alan Newsome <AlanN@mjmc.co.uk>
Subject: Wrexham Road Site Redevelopment

Hello,

I am getting in touch to seek advice on engagement with Wrexham SAB with regards to the drainage for the redevelopment of an existing site.

The site is approximately 9429m^2 and is located on Wrexham Road. It is a developed site but is currently derelict. Proposed changes to the site include changing a few areas from tarmac to concrete and constructing a new building.

The pre-planning application has been submitted for the site and currently awaiting responses. An existing drainage survey will be completed over the coming weeks, which will provide us with more information of the current situation.

Would you be able to provide guidance on whether we will require approval from Wrexham SAB as the site is being redeveloped?

Let me know if you require any further information.

Kind Regards
Emily Wilkes
MEng (Hons)
Senior Highway Engineer
Highways and Traffic

MJM Consulting Engineers Ltd | Southgate House, Southgate, Wakefield, WF1 1TL, UK
T: +44 (1924) 811000 | DD: +44 (1924) 811076 | M: +44 (7720) 461174 | E: emilyw@mjmc.co.uk | vCard | Visit our web site at www.mjmc.co.uk
Contact me on Microsoft Teams



Company registration number: 3145094 - Registered in England.
Please consider the environment before printing this email.
This email and its attachments are intended solely for the use of the individual or organization to which it is addressed. It may contain privileged or confidential information. If you have received this message in error please notify the sender immediately. If you are not the intended recipient you should not use, copy, alter, or disclose the contents of this message. Any views or opinions expressed are solely those of the author and do not necessarily represent those of MJM Consulting Engineers Ltd. Every effort has been made to ensure this email and its attachments are virus free. However, this message and attachments have been transmitted over a public network so MJM Consulting Engineers Ltd accepts no responsibility for loss or damage arising from its use, including damage from viruses.

Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn ymateb i unrhyw ohebiaeth yn Gymraeg ac ni fydd hyn yn arwain at unrhyw oedi.

Ewch i weld - mi fedrwch chi dalu, rhoi gwybod, gwneud cais, dweud eich dweud, a dod o hyd i wybodaeth ar-lein yn www.wrecsam.gov.uk. Arbedwch bapur - meddyliwch cyn argraffu!

Mae'r neges e-bost hon ac unrhyw atodiadau wedi eu bwriadu ar gyfer yr unigolyn neu'r sefydliad y'i cyfeirir atynt yn unig. Am yr amodau llawn ynglŷn â chynnwys a defnyddio'r neges e-bost hon, ac unrhyw atodiadau, cyfeiriwch at www.wrecsam.gov.uk/top_navigation/disclaimersw.htm

We welcome correspondence in Welsh. We will respond to any correspondence in Welsh and this will not lead to any delay.

Take a look - you can pay, report, request, have your say and find information online at www.wrexham.gov.uk. Save paper - think before you print!

This e-mail message and any attachments are intended solely for the individual or organisation to whom it is addressed. For full conditions in relation to content and use of this e-mail message and any attachments, please refer to www.wrexham.gov.uk/top_navigation/disclaimers.htm
Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn ymateb i unrhyw ohebiaeth yn Gymraeg ac ni fydd hyn yn arwain at unrhyw oedi.

Ewch i weld - mi fedrwch chi dalu, rhoi gwybod, gwneud cais, dweud eich dweud, a dod o hyd i wybodaeth ar-lein yn www.wrecsam.gov.uk. Arbedwch bapur - meddyliwch cyn argraffu!

Mae'r neges e-bost hon ac unrhyw atodiadau wedi eu bwriadu ar gyfer yr unigolyn neu'r sefydliad y'i cyfeirir atynt yn unig. Am yr amodau llawn ynglŷn â chynnwys a defnyddio'r neges e-bost hon, ac unrhyw atodiadau, cyfeiriwch at www.wrecsam.gov.uk/top_navigation/disclaimersw.htm

We welcome correspondence in Welsh. We will respond to any correspondence in Welsh and this will not lead to any delay.

Take a look - you can pay, report, request, have your say and find information online at www.wrexham.gov.uk. Save paper - think before you print!

This e-mail message and any attachments are intended solely for the individual or organisation to whom it is addressed. For full conditions in relation to content and use of this e-mail message and any attachments, please refer to www.wrexham.gov.uk/top_navigation/disclaimers.htm
Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn ymateb i unrhyw ohebiaeth yn Gymraeg ac ni fydd hyn yn arwain at unrhyw oedi.

Ewch i weld - mi fedrwch chi dalu, rhoi gwybod, gwneud cais, dweud eich dweud, a dod o hyd i wybodaeth ar-lein yn www.wrecsam.gov.uk. Arbedwch bapur - meddyliwch cyn argraffu!

Mae'r neges e-bost hon ac unrhyw atodiadau wedi eu bwriadu ar gyfer yr unigolyn neu'r sefydliad y'i cyfeirir atynt yn unig. Am yr amodau llawn ynglŷn â chynnwys a defnyddio'r neges e-bost hon, ac unrhyw atodiadau, cyfeiriwch at www.wrecsam.gov.uk/top_navigation/disclaimersw.htm

We welcome correspondence in Welsh. We will respond to any correspondence in Welsh and this will not lead to any delay.

Take a look - you can pay, report, request, have your say and find information online at www.wrexham.gov.uk. Save paper - think before you print!

This e-mail message and any attachments are intended solely for the individual or organisation to whom it is addressed. For full conditions in relation to content and use of this e-mail message and any attachments, please refer to www.wrexham.gov.uk/top_navigation/disclaimers.htm
Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn ymateb i unrhyw ohebiaeth yn Gymraeg ac ni fydd hyn yn arwain at unrhyw oedi.

Ewch i weld - mi fedrwch chi dalu, rhoi gwybod, gwneud cais, dweud eich dweud, a dod o hyd i wybodaeth ar-lein yn www.wrecsam.gov.uk. Arbedwch bapur - meddyliwch cyn argraffu!

Mae'r neges e-bost hon ac unrhyw atodiadau wedi eu bwriadu ar gyfer yr unigolyn neu'r sefydliad y'i cyfeirir atynt yn unig. Am yr amodau llawn ynglŷn â chynnwys a defnyddio'r neges e-bost hon, ac unrhyw atodiadau, cyfeiriwch at www.wrecsam.gov.uk/top_navigation/disclaimersw.htm

We welcome correspondence in Welsh. We will respond to any correspondence in Welsh and this will not lead to any delay.

Take a look - you can pay, report, request, have your say and find information online at www.wrexham.gov.uk. Save paper - think before you print!

This e-mail message and any attachments are intended solely for the individual or organisation to whom it is addressed. For full conditions in relation to content and use of this e-mail message and any attachments, please refer to www.wrexham.gov.uk/top_navigation/disclaimers.htm

mjm Consulting Engineers Ltd

Appendix I
Surface Water Drainage Maintenance Strategy

Travis Perkins, *Wrexham*
Surface Water Drainage Maintenance Plan – *21th August 2024*

The following surface water management plan applies to the development of a of *a* new warehouse and resurfacing at Croesfoel Industrial Estate, Wrexham.

The underground surface water drainage within the site boundary will be maintained by Travis Perkins upon completion. All proprietary systems will be maintained in accordance with manufacturer's recommendations. The current recommendations, where appropriate, are included below. However, the guidance provided below should be reviewed as and when manufacturer's guidance is updated. All installation and maintenance guides for proprietary systems will be retained on the premises in the Health & Safety file.

In addition to the following guidance on the underground drainage system, the above ground roof rainwater drainage system should be maintained strictly in accordance with the designer's guidance to ensure that roof run-off is conveyed in to the underground system as intended.

Southgate House,
Southgate
Wakefield WF1 1TL

E: info@mjmc.co.uk
T: +44 (1924) 811 000

DIRECTORS J.P. LEACH BSc CEng MIStructE, M.N. DAVISON BEng(Hons) CEng MIStructE, A.P. DICKSON BEng(Hons) CEng MIStructE, C.R. SHORT BSc(Hons.1) CEng MICE MIStructE
TECHNICAL DIRECTOR A.J. NEWSOME BEng(Hons) MSc CEng MIStructE
ASSOCIATES D.E. MACHELL MEng(Hons) CEng MIStructE, R.M. REID MEng(Hons) CEng MIStructE, V.K. HAINES MEng(Hons) CEng MIStructE, T.W. MURPHY MEng(Hons) CEng MICE

Company Registration Number 3145094 . VAT Number 721619645.
A member of the MJMC (Holdings) Limited Group of Companies.

ISO 9001:2008 CERTIFIED

mjmc.co.uk

General

Table 1 below summarises the likely maintenance activities required for each SuDS component, and guidance on specific maintenance activities is given in the following sections.

Table 1 : Maintenance Activities (x = Will be required, o = may be required)

Operation & Maintenance Activity	SuDS Component	
	Attenuation Tank	Interceptor
Regular Maintenance		
Inspection	x	x
Litter & Debris Removal	o	o
Grass Cutting		
Weed & Invasive Plant Control		
Shrub Management (incl. pruning)		
Shoreline Veg. Management		
Aquatic Veg. Management		
Occasional Maintenance		
Sediment Management	x	x
Vegetation Replacement		
Vacuum sweeping and brushing		
Remedial Maintenance		
Structure Rehab / Repair	o	
Infiltration Surface Reconditioning		

Regular Maintenance

Inspection

Regular inspections of SuDS will:

1. Help determine optimum future maintenance activities
2. Help establish ongoing hydraulic, water quality, amenity and biodiversity performance of the system
3. Allow identification of potential performance failures, such as blockage, reduced infiltration and poor
4. water quality resulting from lack of maintenance.

Staff carrying out the landscape maintenance should have appropriate experience of SuDS maintenance and should be capable of keeping sufficiently detailed records of any inspections. If staff do not have appropriate experience, then specific inspection visits will be necessary. Additional inspections of proprietary systems should also be included by those with specific knowledge to do so (Petrol Interceptors).

Inspections should be recorded, and the records saved for future reference. During the first year of operation of all types of SuDS, inspections should usually be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.

Typical routine inspection questions that will indicate when occasional or remedial maintenance activities are required for any type of system include:

- Are inlets or outlets blocked?
- Does any part of the system appear to be leaking (especially ponds and wetlands)?
- Is the vegetation healthy?
- Is there evidence of poor water quality (eg algae, oils, milky froth, odour, unusual colourings)?
- Is there evidence of sediment build-up beyond the designer's stated limits?
- Is there visual evidence of oil accumulation?
- Is there evidence of ponding above an infiltration surface?
- Is there any evidence of structural damage that requires repair?
- Are there areas of erosion or channelling over vegetated surfaces?
- Is there any visual evidence of regular or unplanned over-topping of banks?

Litter and Debris Removal

Litter and debris removal is an integral part of SuDS maintenance for surface features, to reduce the risks of inlet and outlet blockages, to retain amenity value and to minimise pollution risks. High litter removal frequencies is required given the site is to be residential.

Occasional Maintenance

Sediment removal

Sediment that accumulates in treatment components should be removed periodically (whether landscaped or proprietary systems). Sediment can be removed either by hand or using small excavators. For any system that has a waterproof liner, the method of sediment removal should be chosen so there is minimal risk of damaging the liner.

For proprietary treatment systems, a suction tanker will be needed to remove the sediment. The size of tanker will depend on the scale of the proprietary system and its location. For small catchments using treatment channels, silt accumulation in the channel can often be removed with hand tools or a small suction tanker.

Sediment removal from SuDS systems should always be carried out such that no damage is caused to the SuDS, and impacts on ecological systems and aesthetic appearance are minimised

Remedial Maintenance

Structure rehabilitation and repair

The need for component rehabilitation (eg to remove clogged filters, geotextiles and gravels) will typically be 10–25 years, depending on the component design and factors such as the type of catchment and sediment load. For many SuDS components, routine maintenance is sufficient. Rehabilitation activities for each SuDS component are described in the specific instructions for each item below.

Item Specific Maintenance

Gullies

Road gullies draining the site hardstandings should be inspected regularly to ensure that they continue to operate effectively, and are free from damage and blockage by debris or solid objects.

They should be cleaned at least once a year, and incorporated into a planned maintenance schedule.

Any debris or blockages near to the surface of the gully should be removed by hand or by jet-vac. The trap element of the gully can be cleaned through the use of a high-pressure hose.

The seating areas for grates should be cleaned before they are replaced. If grates are allowed to move within their frame, this may cause damage to the frame or seating.

Drainage channels

Drainage channels should be inspected regularly to ensure that the system continues to operate effectively, and is free from damage and blockage by debris or solid objects.

The system should be cleaned at least once a year, and incorporated into a planned maintenance schedule. Channel units can be cleaned through the use of a high-pressure hose. This can be fed into the channel system through access units which are strategically placed along the channel run.

The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface liquids into the drainage channel. Any debris within the throat should be removed.

The seating areas for covers and grates should be cleaned before they are replaced. The covers and grates should be locked into position to prevent these being removed, stolen or dislodged by traffic. Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If grates/ covers are allowed to move within their frame, this may cause damage to the frame or seating.

Pipes and manholes

Manholes are to be inspected annually for signs of blockage, with pipes jet washed and CCTV inspections carried out to the pipelines as appropriate should a blockage occur.

Attenuation tank

The steel corrugated pipe attenuation tank is equipped with access manholes at each inlet and outlet location.

The tank should be maintained in a similar manner to the network of pipes and manholes. It is to be inspected bi-annually for signs of build-up or blockages, with CCTV inspections used appropriately to identify the source and location. Any sediment build-up at inlet or outlet locations should be removed by Jetvac. Entry to the tank should be carried out by someone who has successfully completed a confined space training course. The fabric of the tank itself requires no maintenance, and has a minimum design life of 60 years.

Table 2: Attenuation Tank Maintenance Requirement (CIRIA SuDS Manual)

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Petrol interceptor

The full retention interceptor will be installed with an alarm, which is activated when 90% of the oil storage volume of the interceptor has been reached. This notifies the occupant that the unit is required to be emptied. Should the interceptor fail to be emptied at this time, excessive oil could pass through the interceptor, thus polluting the downstream environment.

The interceptor should be serviced in accordance with the manufacturer's recommended service interval in order to ensure proper operation of the equipment. This should be done routinely without waiting for the alarm to sound. The on-going functional assessment of the unit and oil alarm systems is fundamental if pollution incidents are to be avoided.

The removal of sediment and retained oil/grease should be carried out by a contractor holding the relevant permits to transport and dispose of such waste.

Contaminated surface water can contain substances harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

General guidance for the safe inspection of underground systems and confined spaces

- Contaminated surface water can contain substances harmful to human health. Any person carrying out maintenance on equipment which could potentially contain contaminated water should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.
- When covers are removed precautions should be taken against personnel falling into the unit.
- The working area should be adequately lit and the inspector should be familiar with the area and access points
- Correct posture should be maintained, particularly when lifting. Appropriate lifting equipment should be used when necessary. Proper footing and balance should be maintained at all times, taking care to avoid any sharp edges.