CUNDALL

Greenhead College

Drainage Strategy

Galliford Try

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Principal author	Checked by	Verified by
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Executive Summary

Cundall have prepared this Drainage Strategy as part of the planning submission for the proposed development at Greenhead College, Greenhead Road, Huddersfield.

Cundall have submitted a pre-planning enquiry to Yorkshire Water regarding the disposal of foul and surface water. Foul water flows are permitted to the 450mm sewer in Greenhead Road. Surface water must be restricted to 30% existing flows and should discharge to similar points of connection as existing.

An existing network model has been created and shows there is 43m^3 of flooding during the 1 in 100 year event + 30% climate change. This is due to the original site not being designed with modern climate change factor design criteria. The proposed drainage strategy reduces the flooding in the existing network to 3m^3 which reduces the flood risk for the overall site.

The drainage system will be designed to ensure no overland flooding in the proposed network for all events up to and including the 100-year design storm (+ 30% climate change). The proposed discharge from the development has been set at 149l/s (30% betterment to existing brownfield flows).

There are no net changes in foul water flows from the site.

Contents

1.0

Introduction

1.0 Introduction

1.1 Reason for Report and Planning Context

Cundall have prepared this Drainage Strategy (DS) to accompany the planning application for the proposed redevelopment of Greenhead College in Huddersfield.

1.2 Scope of Report

This report has been written to meet the requirements of a site-specific DS in accordance with the National Planning Policy Framework (NPPF) and includes the following:

- An appraisal of the existing site and its current drainage pattern
- Surface water drainage proposals
- Foul water drainage proposals

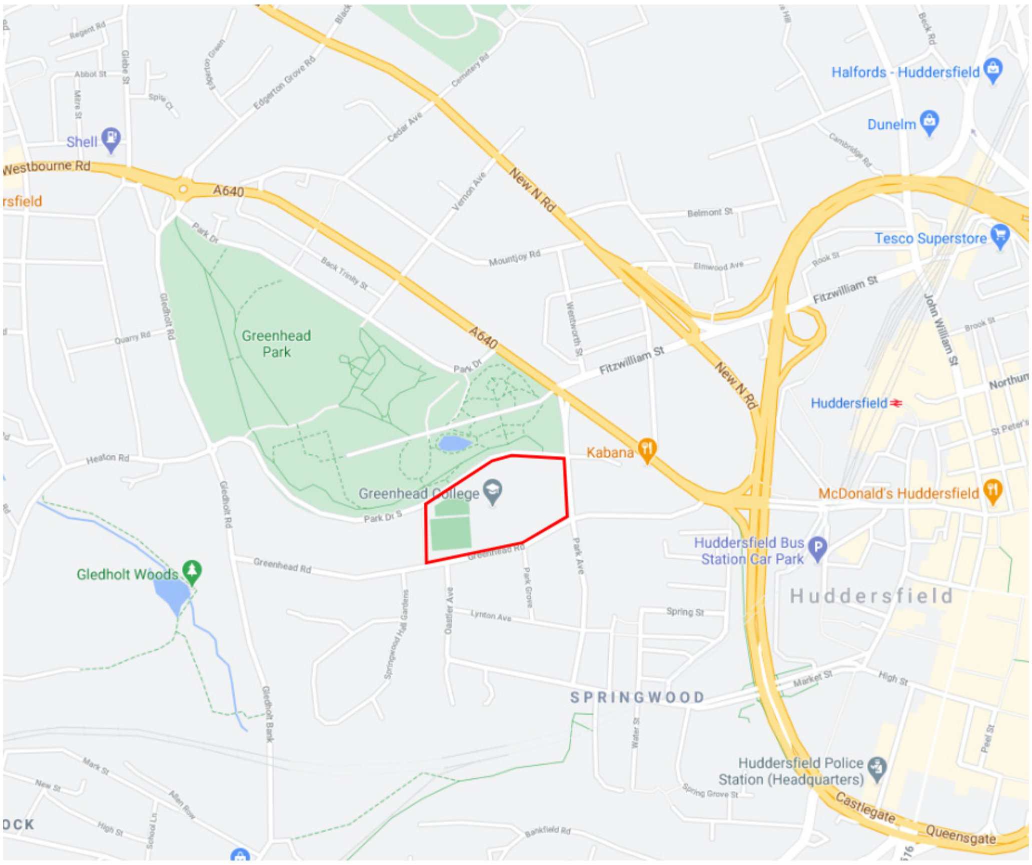


Figure 1: Site location (Source: Google Maps)

2.0 The Site

2.1 Site Description

The site is located within the jurisdiction of Kirklees Council, to the west of Huddersfield centre. The approximate National Grid Reference SE 13735 16738 and the postcode is HD1 4ES. A site location plan can be seen in Figure 1. It has an area of approximately 2.5 hectares and slopes generally from the west to east with levels from 132m to 122m with a retaining wall running the length of the site to the east of the all weather pitch. The Topographical Survey is shown in Appendix 1. The site is currently in use as Greenhead College , with the main built form at the centre of the site spanning from north to south. To the east there is an additional block and car park, to the west there is sport provision including an all weather pitch and changing facilities.

2.1.1 Surrounding area

The site is bound by streets to the north, east and south and housing to the west. North of the site lies Greenhead Park, which is a large park consisting of open greenery, mature trees and various water features. The other three sides of the site are residential developments. The nearest Main River, according to the Environment Agency Classification, is the River Colne which lies 550m south of the site. The elevation of the river is approximately 50m lower than the site.

2.2 Proposed Development

2.2.1 Development

The proposed development is to demolish part of the existing central building and replace it with new accommodation. The new block is a four-story building located on the existing car park located to the east of the site. At the centre of the development, in place of the demolished building, there will be a small infill building (referred to as the infill area from here on in). The proposed development can be seen in Figure 2 (Appendix 2).

Figure 2: Proposed Development (Source: Oobe Site Plan)

2.3 Flood Risk

All forms of flood risk posed to the site and the potential impact of development on flood risk elsewhere has been assessed as low. Flood Risk is covered in the separate document Flood Risk Assessment, reference NE8659-CCS-ZZ-XX-RT-D-0001, which accompanies this report as part of the planning submission.

2.4 Consultations

2.4.1 Kriklees – Lead Local Flood Authority (LLFA)

At the pre application stage the LLFA gave some comments on an early design of the site. Key points include:

- The site lies in a Flood Zone 1
- No historic flooding has been recorded in or near the site
- Critical 1 in 30 year storm must be attenuated
- Volume generated by storm up to 1 in 100 + 30% climate change must be stored on site
- A 30% betterment of the current discharge rate needs to be provided.

Further comments were received on the 27/10/21:

- The simulated maximum water levels in the MHs for the critical 1 in 100-year storm (plus 30% CC) are not provided in the calculations.
- The volume of flooding (if any) produced by the critical storm is not shown in the calculations.
- The rating and size of the hydrobrake on the outlet from the storage tank (SW08) is not indicated.
- The PN numbers in the calculations are not indicated on the drainage plan making cross-referencing very difficult.
- The calculations indicate several hydrobrakes with outlet diameters less than the acceptable diameter of 75 mm – these small diameter outlets will be prone to blockage and should be avoided.
- The outlet from MH SW 24 connects to the YW sewer in Greenhead Road without any apparent attenuation. (Note that the flow through this MH can discharge at an unattenuated rate provided a compensatory reduction is made to the main outlet to the sewer in Park Drive South).
- Exceedance flood routing plan.

These comments have been addressed in this report.

2.4.2 Environment Agency

The Environment Agency have not been directly consulted as there was no flood risk identified from relevant sources and discharge is not to watercourse, however their flood maps have been used extensively throughout this report.

2.4.3 Sewerage Undertaker

Cundall have submitted a pre-planning enquiry to Yorkshire Water (YW) regarding the disposal of foul and surface water. Foul water flows are permitted to the 450mm sewer in Greenhead Road. Surface water must be restricted to a reduction of 30% on existing flows and should discharge to similar points of connection as existing. Furthermore, YW have also provided existing sewer records for site review. The pre-planning enquiry response has been included in Appendix 3.

Further comments were received on the 02/11/21 relating to the way the discharge rate has been calculated. Discussions are currently on-going.

3.0 Existing Drainage

3.1 Public Sewerage System

Existing YW sewer records have been acquired for the site to assess development impacts on infrastructure and potential connection locations, they can be seen in Appendix 4. YW assets are located in Park Drive South, Park Avenue and Greenhead Road.

3.2 Private Drainage

An initial CCTV survey was undertaken on the 20.10.20. The survey shows that all drainage associated the main building is combined and drainage of the newer Rostron building and changing block are separate foul and surface water networks. At present there are 4 combined sewer connections to the Yorkshire Water network, two in Park Drive South and two in Greenhead Road. Further to this there are two soakaways on-site, one for the Rostron building to the North East and the other for the astro-turf pitch to the South West.

There are multiple impermeable areas across the development that have no visible positive drainage. The largest of these is the existing car park (where the new building has been proposed) with an area of approximately 0.2ha. There is a suspected overland flow route though the pedestrian entrance at the southeast of the college on to Greenhead Road. The peak overland flow from this area has been estimated at 32l/s using the modified rational method.

There are multiple locations in the existing network where manhole cover levels and invert levels do not match the topography and they should be surveyed before works commence on site. Evidence of this discrepancy can be seen on the CCTV survey in Appendix 5.

High Pressure Jetting and a further CCTV survey was undertaken on the 08.04.21. This survey found multiple cracks in pipes and high levels of rooting. It is recommended that these runs be or refurbished or diverted as part of the works.

4.0 Proposed Drainage Strategy

4.1 Drainage Design General

All new drainage for the development will be designed and installed in accordance with the following British Standards and codes of practice and building control documents.

- BS EN 752 – Drain and Sewer Systems Outside Buildings
- Building Regulations Part H – Drainage and waste disposal

The new drainage pipelines will be constructed from a combination/choice of UPVC, cast iron (ductile), vitrified clay and concrete. Manhole construction associated with the drainage network will be constructed from UPVC pre-formed inspection chambers, engineering brickwork or pre-cast concrete sections, depending on the depth and size of the chamber.

A CCTV survey of the drainage must be carried out on completion of the works to ensure the system is adequately constructed and provides an effective disposal system.

4.2 Surface Water Discharge & Hierarchy

Building Regulations Approved Document H gives a hierarchy of how surface water should be disposed of as shown in Figure 3. Firstly, surface water should be discharged into the ground. If this is not reasonably practicable, to a watercourse and where this is not reasonably practicable, to a surface water sewer and as a last resort, a combined sewer. The following sections work through that hierarchy.

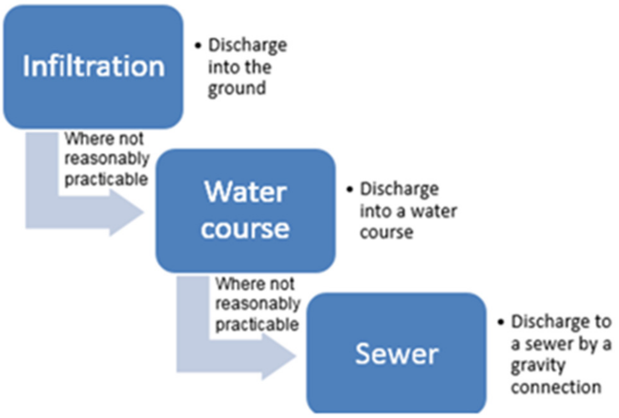


Figure 3: The surface water discharge hierarchy

Infiltration

Infiltration has been used on site in two locations. These two existing soakaways shall be retained as part of the proposed development and their infiltration rates confirmed prior to construction. Soakaway testing has been conducted in line with BRE365 and found the permeability to between $1.6\text{x}10^{-6}$m/s to $7\text{x}10^{-7}$m/s. Two falling head tests were conducted alongside the BRE365 tests and permeability from the test was $3.5\text{x}10^{-6}$m/s and $3.3\text{x}10^{-9}$m/s. On top of this the water table at the west of the site is high, limiting the potential for infiltration. Therefore in line with the SuDS Manual it is not deemed as acceptable to provide new infiltration points within the site other than those that currently exist.

Water Course

The site is over 300m away from the nearest watercourse and there is no opportunity to connect directly to an existing water course. Thus, without a watercourse within a practicable proximity to discharge to it is proposed that the surface water runoff from the site will be discharged into a local sewer by a gravity connection.

Sewer

Discharging from the site through infiltration or to an existing water course have not been deemed viable options. Therefore, the proposed surface water runoff from the site will be discharged via existing connections to YW sewers. Two connections are north of the site to the sewer under Park Drive South and another two are to the south connection to the sewer under Greenhead Road.

Strategy

All surface water shall be treated where required in accordance with the SuDS Manual. The majority of new hard standing areas (shown in Figure 4) are to be made of permeable paving to provide both attenuation and water treatment. The new building will be fitted with a green roof to provide treatment which shall be connected to a geocellular tank to provide attenuation.

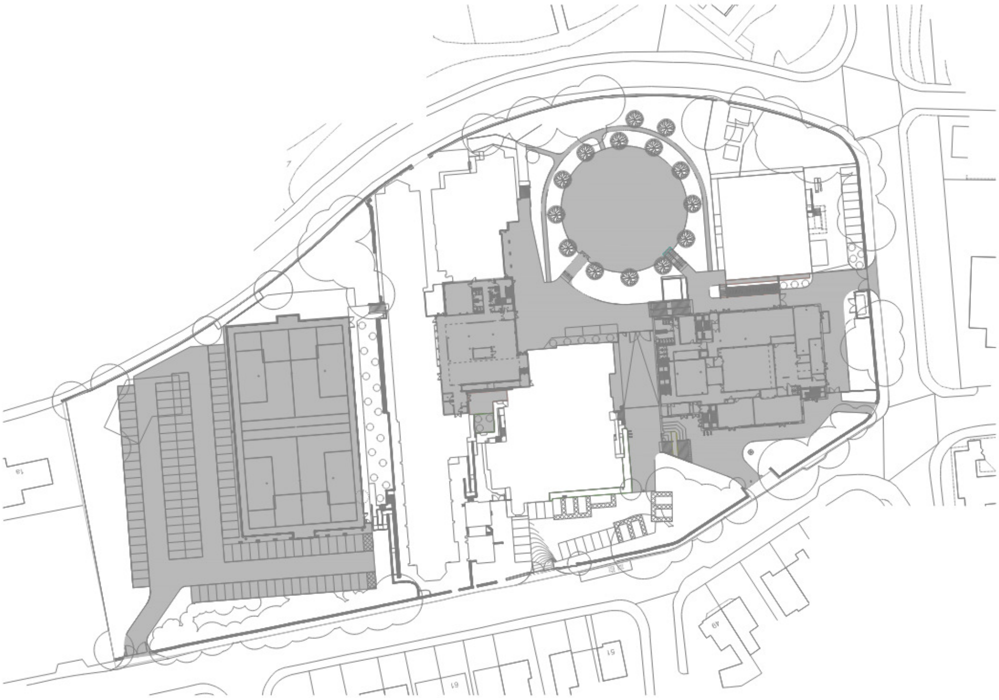


Figure 4: Area shown in grey indicates new hard standing/new buildings

In accordance with local and national policies, the development will ensure no flooding for up to and including the 30-year return period and no overland flooding affecting accommodation on site or any uncontrolled flows leaving the site for up to the 100-year return period with a further allowance for climate change (30%).

The proposed drainage layout can be seen in Appendix 6.

4.2.1 Surface Water Restrictions and SuDS Strategy

In accordance with the pre – application response from the LLFA the flow rate from the site shall be limited to 30% betterment of the current discharge rate. An existing drainage Microdrainage model (section 4.32) was made to determine the brownfield runoff rate. The model shows a discharge rate through the 4 connections of 180l/s. There is also a suspected overland flow route though the pedestrian entrance at the southeast of the college on to Greenhead Road. The peak overland flow from this area has been estimated at 32l/s using the modified rational method. The brownfield runoff rate is 212l/s. Therefore, the proposal is to restrict storm water flows to 149l/s for storms up to 1 in 100 year +30% climate change allowance.

4.2.2 Attenuation, SuDS and Water Treatment

The surface water elements and drainage design were conducted using a pragmatic approach. SuDS techniques selected for the site comprise of a green roof, permeable paving and geocellular storage.

4.2.2.1 Water Treatment

Using the simple index approach there are two separate area classifications

1. Non-residential Roofs
2. Non-residential carparking with infrequent change

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

1. The vast majority of surface water treatment from the roof will be via a green roof (with a small area to discharge directly into the geocellular tanks where the plant and space requirement limit the extent of the green roof).
2. Surface Water treatment for all external hardstanding areas will be provided by permeable paving.

By using source control options, such as permeable paving and a green roof which provide both treatment and storage of the first 5mm of rainfall, the impact of the first flush is minimised. In accordance with Table 24.6 of the CIRIA SuDS C753 manual both green roof and permeable paving are deemed to satisfy the requirements of interception.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

4.2.2.2 Storage Requirements

To ensure the attenuation is available and protected for the risk of the occurrence of consecutive storms, the storage elements are designed to half empty within 24 hours and fully empty within 48 hours in the worst-case storm simulation. The total volume of storage provided by the geocellular tanks is 155m^3.

4.2.2.3 Ownership

All drainage within the site boundary is privately owned and all new proposed drainage shall be privately drained.

4.3 Microdrainage model

Two models were produced to simulate both the existing network and the proposed network to review the impact the proposed development had on flood risk.

4.3.1 Design Criteria

Table 1: Design Criteria

Design Criteria	Value
M5-60 (mm)	19
r	0.349
Climate Change (%)	30
Time of Entry (mins)	4
PIMP (%)	100

4.3.2 Existing site

An initial model was made to assess the hydraulic capacity on the existing network and to calculate the brownfield runoff rate. The design criteria outlined in section 4.3.1 was applied to the network, although the network was not designed to modern climate change standards. The model shows 43.4m^3 of flooding for the critical storm duration (15mins, 1 in 100 year +30% climate change) with a discharge rate from the site of 180l/s. This discharge rate doesn't take into account the overland flow route to the southeast (peak discharge at approximately 32l/s). Therefore, the total peak discharge rate including overland flow is 212l/s. The results of the model can be seen in Appendix 7.

4.3.3 Proposed development

The proposed network model used the design criteria outlined in section 4.3.1. The model shows there is no flooding in the proposed drainage network for return periods up to and including 1 in 100 years + 30%cc and furthermore, flooding was reduced in the existing combined system to 3m^3. The discharge rate for the site was reduced to 145l/s. This discharge rate is lower than the 30% betterment of brownfield (149l/s) required in the pre-application response. The results of this model can be seen in Appendix 8.

4.4 Flood Exceedance Routing

A flood exceedance plan has been produced to show the overland flood route for blockage or failure of the system. This has been produced in Appendix 9.

4.5 Proposed SuDS Maintenance Schedule

The following operation and maintenance schedules should be followed for the SuDS items with reference to the CIRIA SuDS Manual (2016) for additional guidance on each element. The operation and maintenance of the proposed SuDS features shall be the responsibility of the building occupier.

Permeable paving needs to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. As per the table below, once a year should be sufficient, but inspection reports should be regularly checked by the management company to confirm that this is appropriate. A brush and suction cleaner should be used for regular sweeping, any jointing material lost should be replaced.

Table 2: Operation and Maintenance recommendations for permeable paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto permeable surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscape which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 hours after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

The **Green Roof** will require regular maintenance and inspection. Most maintenance is generally required during the establishment stage (12 to 15 months). Where possible this should be delegated to specialist trained contractors.

Table 3: Operation and Maintenance recommendations for green roof

Maintenance Schedule	Required Action	Frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six months and annually or as required
	During establishment (i.e. year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove nuisance and invasive vegetation, including weeds	Six months or as required
	Mow grasses, prune shrubs and manage other planting – clippings should be removed and not allowed to accumulate	Six months or as required
Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Geocellular storage needs to be regularly inspected and the necessary maintenance carried out to ensure their long-term operation capacity. The primary maintenance requirements will be removing litter and debris (monthly). As per the table below, once a year for most other maintenance should be sufficient, but inspection reports should be regularly checked by the management company to confirm that this is appropriate.

Table 4: Operation and Maintenance recommendations for geocellular storage

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 risk to performance)	Monthly
Remedial actions	Repair/rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect/check pipes to ensure that they are in good condition and operating as designed	Annually
	Survey inside of pipes for sediment build-up and remove if necessary	Every 5 years or as required

4.6 Foul Water

There is no net change in foul water flows from site and it shall continue to flow unrestricted to YW network. This has been noted in the pre-planning application correspondence.

5.0 Conclusions and Recommendations

5.1 Surface Water

There is no net increase to hard standing area in the development. Surface water flows are to be restricted to 149l/s (30%betterment to existing) which shall reduce flood risk and potential capacity issues downstream.

In accordance with current legislation, SuDS have been proposed at source, as both treatment and storage.

Attenuation is provided for the excess flows which provides storage for all events up to and including the 1 in 100 year plus 30% climate change design storm event.

Attenuation is proposed in the form of attenuation crates and permeable paving to provide storage for all events up to and including the 1 in 100 year plus 30% climate change design storm event.

Maintenance schedules for all SuDS elements have been included in this report.

5.2 Foul Water

There is no net change in foul water flows from the site. Flows are to continue to discharge unrestricted into existing foul water drainage.

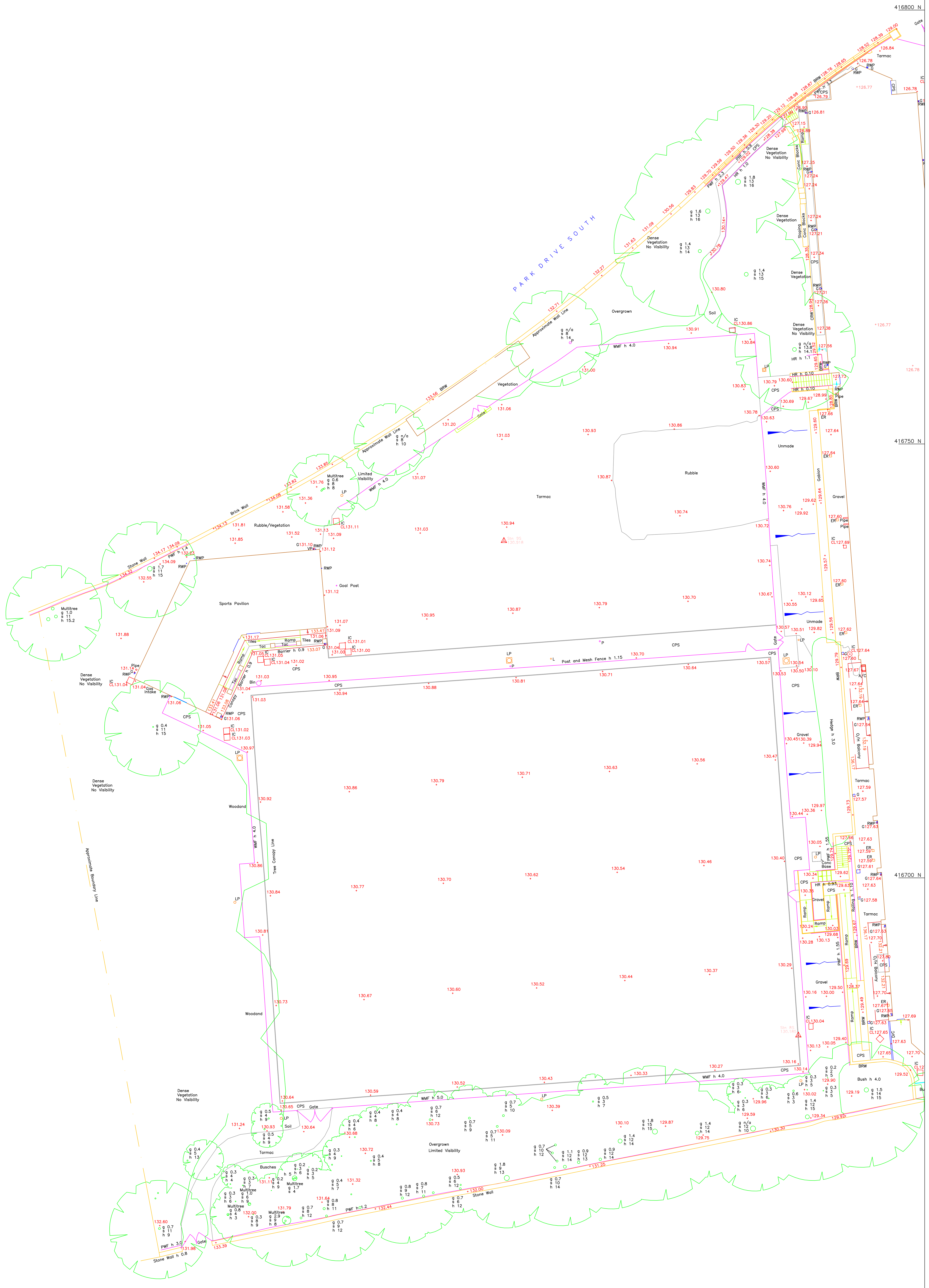
6.0 Appendices

List of Appendices

1. Topographical Survey
2. Proposed Site Plan
3. Pre-Planning Enquiry Response
4. Yorkshire Water Sewer Plan
5. Existing Drainage
6. Proposed Drainage Layout
7. Existing Network Microdrainage Model
8. Proposed Network Microdrainage Model
9. Flood Exceedance Plan

6.1 Appendix 1 – Topographical Survey

N



SURVEY STATIONS			
Name	Easting	Northing	Height
2S	413793.217	416801.543	122.546
3S	413787.543	416739.838	124.335
4S	413822.335	416695.253	122.129
5S	413760.632	416670.387	125.700
8S	413705.530	416681.824	130.185
9S	413671.599	416738.814	130.918

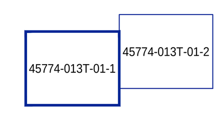
STANDARD ABBREVIATIONS

A/C	Air Conditioner	LB	Litter Bin
ATM	Automated Telling Machine	LP	Lamp Post
B	Bollard	Max	Maximum
BB	Belisha Beacon	Mb	Multibole
Bh	Borehole	MH	Manhole
Br	Brick	Min	Minimum
BrS	Brick Setts	Mkr	Marker
BRW	Brick Retaining Wall	NB	Notice Board
BS	Bus Stop	NP	Name Plate
BT	British Telecom	OBF	Open Boarded Fence
BW	Brick Wall	O/H	Overhead
BWF	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
CBF	Close Boarded Fence	P	Post
CCTV	Closed Circuit Television	PB	Pillar Box
CIF	Corrugated Iron Fence	PGM	Permanent Ground Marker
CL	Cover Level	PLt	Pavement Light
CLF	Chain Link Fence	PM	Parking Meter
Col	Column	PRF	Post and Rail Fence
Conc	Concrete	PS	Paving Stones
CoW	Cable on Wall	PWF	Post and Wire Fence
CPS	Concrete Paving Slabs	RE	Rodding Eye
CTV	Cable Television IC	RG	Road Gully
d	depth	RS	Road Sign
DC	Duct Cover	RSJ	Rolled Steel Joist
DH	Duct Height	RWP	Rain Water Pipe
DP	Down Pipe	s	spread
DrC	Drainage Channel	SB	Sign Board
EIC	Electrical Inspection Cover	SBM	Site Bench Mark
EJB	Electrical Junction Box	SC	Stop Cock
EP	Electricity Pole	SF	Security Fence
ER	Soiling Rod	ShB	Shrub Bed
ESG	Electrical Switchgear	SL	Sump Level
FB	Flower Bed	SO	Smoke Outlet
FH	Fire Hydrant	SP	Sign Post
FL	Floor Level	SV	Stop Valve
Flt	Floodlight	T	Telephone
g	girth	Tac	Tactile Paving
G	Gully	TBM	Temporary Bench Mark
GC	Gas Cock	TCB	Telephone Call Box
GM	Gas Meter	TCP	Traffic Control Post
GP	Gate Post	TIC	Telephone Inspection Cover
GV	Gas Valve	TJB	Telephone Junction Box
h	height	TL	Traffic Light
HR	Handrail	TLCB	Traffic Light Control Box
IB	Illuminated Bollard	TLIC	Traffic Light Inspection Cover
IC	Inspection Cover	TP	Telephone Pole
IL	Invert Level	Typ	Typical
IRF	Iron Railing Fence	V	Vent
IRS	Illuminated Road Sign	VP	Vent Pipe
JB	Junction Box	W	Window
KO	Kerb Outlet	WM	Water Meter
L	Light	WV	Water Valve

The identification of service covers has been made by a surface inspection only - critical identifications should be verified by the lifting of covers or a full utilities survey

Due to the inherent instability of paper materials, drawings plotted on paper may be stretched and distorted - dimensions scaled from paper plots should therefore be treated with caution

SHEET LAYOUT



ISSUES & REVISIONS

Issue	Details	By	Date
A prov 1	Drawing incomplete and unchecked	PCL	15/10/20
A	Original Issue	PCL	24/10/20

This survey is commensurate with band F accuracy, as outlined in the RICS survey detail accuracy banding table

All levels are in metres and are above Ordnance Survey Newlyn Datum derived by multiple network RTK GPS observations

The survey grid shown on this drawing is positioned on Ordnance Survey (OS) National Grid, obtained by multiple network RTK GPS observations

Unless otherwise stated, levels have been taken to finished floor surface

All quoted dimensions are in metres

Drawing units are metres

CLIENT
Mace Group
155 Moorgate
London
EC2M 5XB

PROJECT TITLE

Greenhead College

West Yorkshire, HD1 4ES

3D Topographical survey

PRESENTATION SCALE 1:200 @ A0

DATE OF ORIGINAL SURVEY September 2020

PC PROJECT No.45774-013 CHECKED MG

DRAWING No. 45774-013T-01-1 ISSUE A

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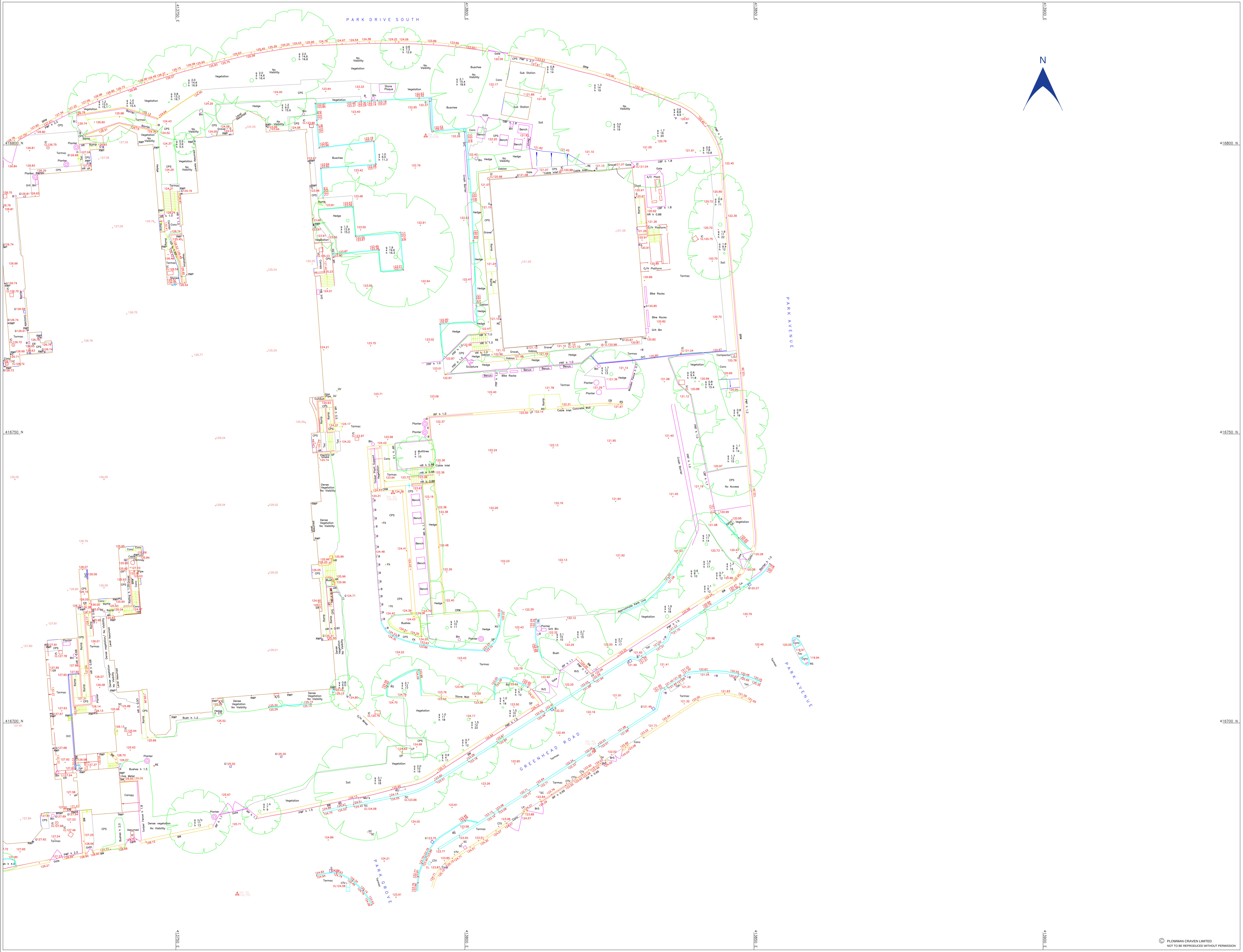

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CCTV	Closed Circuit Television	PB	Pillar Box
CIF	Corrugated Iron Fence	PGM	Permanent Ground Marker
CL	Cover Level	PLt	Pavement Light
CLF	Chain Link Fence	PM	Parking Meter
Col	Column	PRF	Post and Rail Fence
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CPS	Concrete Paving Slabs	RE	Rodding Eye
CTV	Cable Television IC	RG	Road Gully
d	depth	RS	Road Sign
DC	Duct Cover	RSJ	Rolled Steel Joist
DH	Duct Height	RWP	Rain Water Pipe
DP	Down Pipe	s	spread
DrC	Drainage Channel	SB	Sign Board
EIC	Electrical Inspection Cover	SBM	Site Bench Mark
EJB	Electrical Junction Box	SC	Stop Cock
EP	Electricity Pole	SF	Security Fence
ER	Soiling Rod	ShB	Shrub Bed
ESG	Electrical Switchgear	SL	Sump Level
FB	Flower Bed	SO	Smoke Outlet
FH	Fire Hydrant	SP	Sign Post
FL	Floor Level	SV	Stop Valve
Flt	Floodlight	T	Telephone
g	girth	Tac	Tactile Paving
G	Gully	TBM	Temporary Bench Mark
GC	Gas Cock	TCB	Telephone Call Box
GM	Gas Meter	TCP	Traffic Control Post
GP	Gate Post	TIC	Telephone Inspection Cover
GV	Gas Valve	TJB	Telephone Junction Box
h	height	TL	Traffic Light
HR	Handrail	TLCB	Traffic Light Control Box
IB	Illuminated Bollard	TLIC	Traffic Light Inspection Cover
IC	Inspection Cover	TP	Telephone Pole
IL	Invert Level	Typ	Typical
IRF	Iron Railing Fence	V	Vent
IRS	Illuminated Road Sign	VP	Vent Pipe
JB	Junction Box	W	Window
KO	Kerb Outlet	WM	Water Meter
L	Light	WV	Water Valve

The identification of service covers has been made by a surface inspection only - critical identifications should be verified by the lifting of covers or a full utilities survey

Due to the inherent instability of paper materials, drawings plotted on paper may be stretched and distorted - dimensions scaled from paper plots should therefore be treated with caution

SHEET LAYOUT

45774-013T-01-1 | 45774-013T-01-2

ISSUES & REVISIONS

Issue	Details	By	Date
A prov 1	Drawing incomplete and unchecked	PCL	15/10/20
A	Original Issue	PCL	24/10/20

This survey is commensurate with band F accuracy, as outlined in the RICS survey detail accuracy banding table

All levels are in metres and are above Ordnance Survey Newlyn Datum derived by multiple network RTK GPS observations

The survey grid shown on this drawing is positioned on Ordnance Survey (OS) National Grid, obtained by multiple network RTK GPS observations

Unless otherwise stated, levels have been taken to finished floor surface

All quoted dimensions are in metres

Drawing units are metres

CLIENT

Mace Group

155 Moorgate
London
EC2M 5XB

PROJECT TITLE

Greenhead College

West Yorkshire, HD1 4ES

3D Topographical survey

PRESENTATION SCALE: 1:200 @ A0

DATE OF ORIGINAL SURVEY: September 2020

PC PROJECT No. 45774-013 | CHECKED: MG

DRAWING No.: 45774-013T-01-2 | ISSUE: A

Plowman Craven

Plowman Craven House
2 Lea Business Park
Lower Luton Road
Harpenden
Hertfordshire
AL5 5EQ
Tel: +44 (0)1582 765566
Email: post@plowmancraven.co.uk
Web: www.plowmancraven.co.uk

115 Southwark Bridge Road
London
SE1 0AX
Tel: +44 (0)207 490 7700

6.2 Appendix 2 – Proposed Site Plan

This drawing is not to be scaled. All dimensions to be checked on site. Discrepancies, ambiguities and / or omissions between this drawing and information given elsewhere must be reported immediately to head office for clarification before proceeding.

Legend

Site Boundary

Hardworks

- Proposed Tarmacadam - Impermeable
- Proposed Tarmacadam - Permeable
- Tactile Paving
- Paving Type 1 - Permeable
- Existing Surfacing
- Steps
- Electric charging point

Softworks

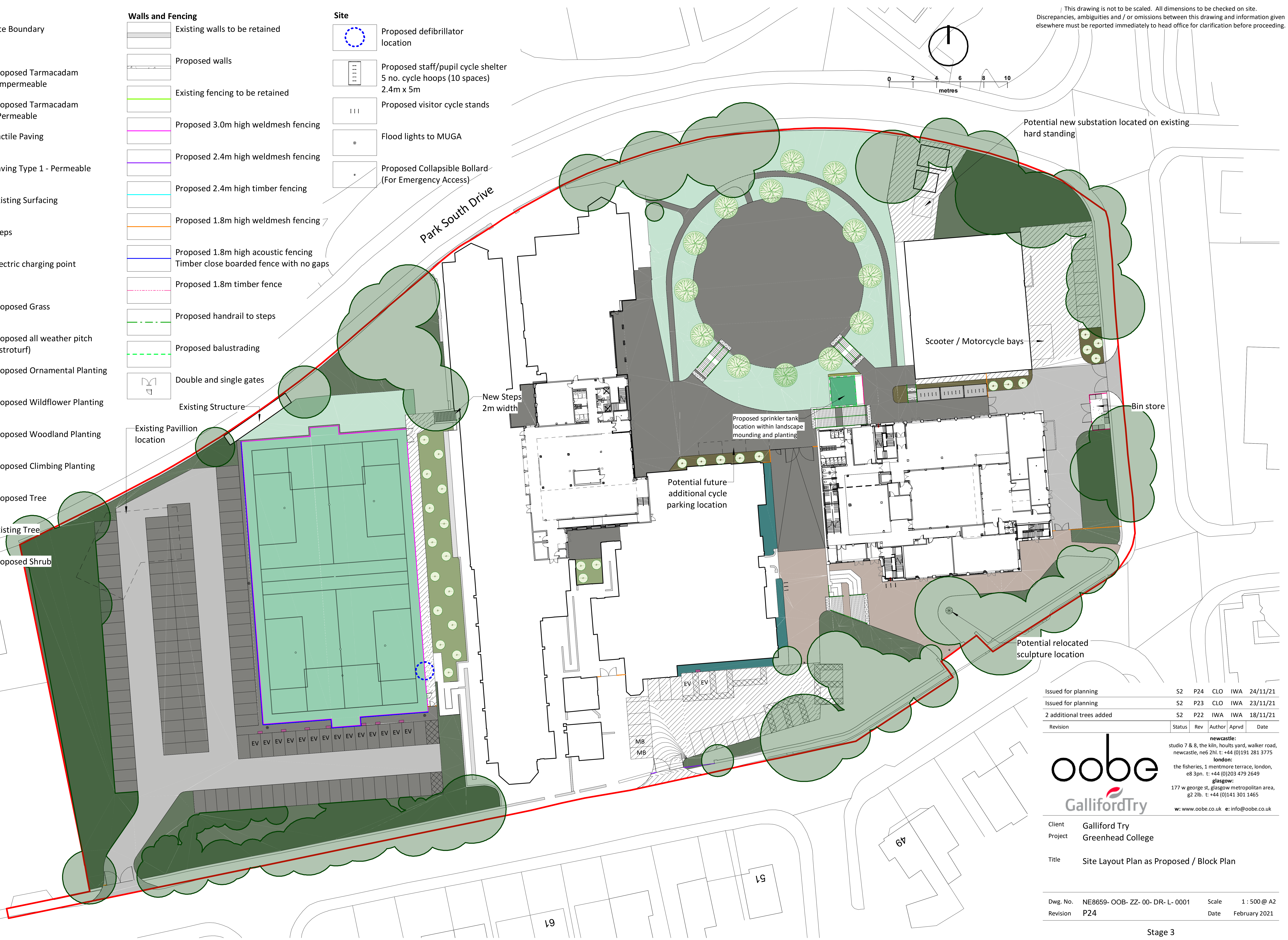
- Proposed Grass
- Proposed all weather pitch (astroturf)
- Proposed Ornamental Planting
- Proposed Wildflower Planting
- Proposed Woodland Planting
- Proposed Climbing Planting
- Proposed Tree
- Existing Tree
- Proposed Shrub

Walls and Fencing

- Existing walls to be retained
- Proposed walls
- Existing fencing to be retained
- Proposed 3.0m high weldmesh fencing
- Proposed 2.4m high weldmesh fencing
- Proposed 2.4m high timber fencing
- Proposed 1.8m high weldmesh fencing
- Proposed 1.8m high acoustic fencing Timber close boarded fence with no gaps
- Proposed 1.8m timber fence
- Proposed handrail to steps
- Proposed balustrading
- Double and single gates

Site

- Proposed defibrillator location
- Proposed staff/pupil cycle shelter 5 no. cycle hoops (10 spaces) 2.4m x 5m
- Proposed visitor cycle stands
- Flood lights to MUGA
- Proposed Collapsible Bollard (For Emergency Access)



Revision	Status	Rev	Author	Aprvd	Date
Issued for planning	S2	P24	CLO	IWA	24/11/21
Issued for planning	S2	P23	CLO	IWA	23/11/21
2 additional trees added	S2	P22	IWA	IWA	18/11/21

oobe
GallifordTry

newcastle:
studio 7 & 8, the kiln, hoults yard, walker road, newcastle, ne6 2hl. t: +44 (0)191 281 3775
london:
the fisheries, 1 mentmore terrace, london, e8 3pn. t: +44 (0)203 479 2649
glasgow:
177 w george st, glasgow metropolitan area, g2 2lb. t: +44 (0)141 301 1465

w: www.oobe.co.uk **e:** info@oobe.co.uk

Client: Galliford Try
Project: Greenhead College

Title: Site Layout Plan as Proposed / Block Plan

Dwg. No.: NE8659- OOB- ZZ- 00- DR- L- 0001
Scale: 1 : 500 @ A2
Revision: P24
Date: February 2021

Stage 3

6.3 Appendix 3 – Pre-Planning Enquiry Response

YorkshireWater

For telephone enquiries ring:
George Mullaney on 0345 120 8482

29th April 2021

Your Ref:
Our Ref: X007875

Dear

Greenhead College, Greenhead Road, Huddersfield, HD1 4ER – Pre-Planning Sewerage Enquiry - Commercial - U229138

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Development of the site should take place with separate systems for foul and surface water drainage on site, with a combined sewer off site.

Foul Water

Foul water domestic waste can discharge to the 450mm diameter public combined sewer recorded in Greenhead Road but existing private foul drainage can be utilised.

Foul water from kitchens and/or food preparation areas of any restaurants and/or canteens etc. must pass through a fat and grease trap of adequate design before any discharge to the public sewer network.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

Looking at the information provided peak flows have been used to calculate existing flows. Yorkshire Water require the below guidance to used whan assessing the site. We also need to know the size and fall on the final oufalls from the surface water systems into the combined systems to see if any were acting as throttles.

If other methods of surface water disposal are not viable and subject to providing satisfactory evidence as to why they have been discounted, curtilage surface water discharges to the public sewer will be restricted to the level of run-off - i.e. same rate of discharge - to that from the existing use of the site less a 30% reduction in the existing discharge. Any discharge of surface water from the site should discharge to similar points of connection to that of the existing use of the site.

You will need to demonstrate positive drainage, based on a 1 in 1 year storm, to the public sewer to Yorkshire Water by means of investigation and calculation carried out at your expense.

To do this, Yorkshire Water requires to see existing and proposed drainage layouts with pipe sizes, gradients, gullies, downpipes and connection points, measured impermeable areas of the present and proposed use of the site, along with the calculations that show the existing and proposed discharge rate from the site to the public sewer.

Surface water run-off from communal parking (greater than 800 sq metres or more than 50 car parking spaces) and hardstanding must pass through an oil, petrol and grit interceptor/separator of adequate design before any discharge to the public sewer network. Roof water should not pass through the traditional 'stage' or full retention type of interceptor/separator. It is good drainage practice for any interceptor/separator to be located upstream of any on-site balancing, storage or other means of flow attenuation that may be required.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

Under the provisions of section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer network) any items likely to cause damage to the public sewer network interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes fat, oil, nappies, bandages, syringes, medicines, sanitary towels and incontinence pants. Contravention of the provisions of section 111 is a criminal offence.

YorkshireWater

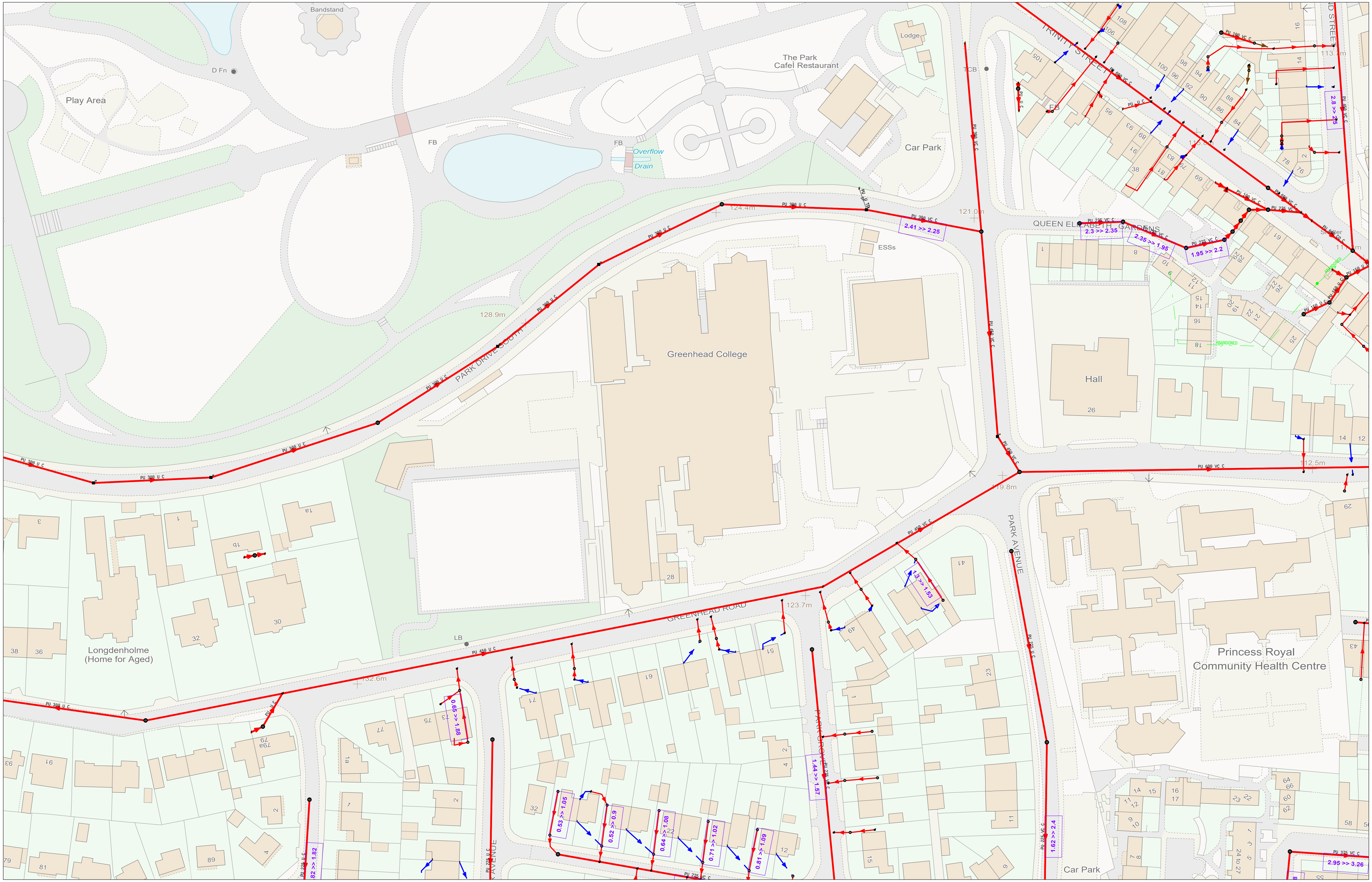
Yorkshire Water's Trade Effluent team must be consulted in respect of any proposed trade effluent discharge to the public sewer.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

George Mullaney
Development Services Technician

6.4 Appendix 4 – Yorkshire Water Plan



Date Requested : 15/01/2021, 14:33:32

Date Generated : 15/01/2021, 14:33:34

Scale : 1:1250

The position and depth of any YW apparatus shown on this map are approximate only.

UPN: Undefined

Originator: S P Midgley, Waste Water Technical, 75 4486

6.5 Appendix 5 – Existing Drainage

©Land Survey Solutions Limited 01/01/2010

Original Sheet Size A0H

UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

1D 5C	1 Duct 5 Cables	CUW	Camera under water	PDR	Poor depth response
Ø	Diameter	DCr	Depth To Crown	RB ●	Rest Bend
AC	Audible Connection	DI	Depth To Invert	RBC	Rectangular Brick Chamber
AR	Assumed Route	DS	Depth To Silt	RCC	Rectangular Conc Chamber
BL	Base Level	DTB	Depth To Base	SA	Survey Abandoned
CB	Concrete Benching	DTW	Depth To Water	SL	Silt Level
CBC	Circular Brick Chamber	DTS	Depth To Surcharge	SuL	Surcharge Level
CCC	Circular Conc Chamber	EBD	External Backdrop	TFR	Taken From Records
CL	Cover Level	EOT	End Of Trace	UTC	Unable To CCTV
CPC	Circ Plastic Chamber	IBD	Internal Backdrop	UTL	Unable To Lift
CrL	Crown Level	IL	Invert Level	UTT	Unable To Trace

BT	BT CABLE(S)
O/BT	OVERHEAD BT CABLE(S)
COM	COMMUNICATIONS CABLE(S)
O/H COM	OVERHEAD COMMUNICATIONS CABLE(S)
CTV	CABLE TV CABLE(S)
DUCT	DUCT
E	ELECTRIC CABLE(S)
O/E	OVERHEAD ELECTRIC CABLE(S)
FO	FIBREOPTIC CABLE(S)
FUEL	FUEL PIPE(S)
GM	GAS MAIN
GS	GAS SERVICE
GPR	GROUND PENETRATING RADAR (GPR) TRACE
HW	HOT WATER PIPE
LC	LIGHTING CIRCUIT
OIL	OIL PIPE(S)
SCAR	VISIBLE SCARRING
SEC	SECURITY CABLING
TS	TRAFFIC SIGNAL
UIT	UNIDENTIFIED TRACE
WM	WATER MAIN
WS	WATER SERVICE
	COMBINED SEWER
CW RM	COMBINED WATER RISING MAIN
EW	EFFLUENT WATER
	FOUL SEWER
FW RM	FOUL WATER RISING MAIN
	RISING MAIN
	SURFACE WATER SEWER
SW RM	SURFACE WATER RISING MAIN
	INVESTIGATION EXTENTS
Note:	UTILITIES COMMENT BOX (GENERAL NOTES)
d0.37m	DEPTH TO SERVICE
??-AR	SERVICE ASSUME ROUTE
??-TFR	SERVICE TAKEN FROM RECORDS

NORTH Indicative

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out to confirm any identifications, positions and depths.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the camber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

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The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

Do not scale from this drawing.

AVAILABILITY OF UTILITY RECORD DRAWINGS

UTILITY	AVAILABILITY	UTILITY	AVAILABILITY	UTILITY	AVAILABILITY
SEWER	NO	BT	PUBLIC	OIL PIPES	NO
WATER MAIN	NO	CABLE TV	NO	OTHERS	NO
GAS MAIN	PUBLIC	ELECTRICITY	NO		

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPSWICH BRENTWOOD COVENTRY GLASGOW NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE GREENHEAD ACADEMY. GREENHEAD ROAD, HD1 4ES.				
DRAWING DETAIL DRAINAGE SURVEY. SHEET 2 OF 2				
CLIENT MACE GROUP.				SCALE 1:200
SURVEYOR SH	SURVEY DATE 20/10/20	CHECKED BY JTM	APPROVED BY RAG	DWG STATUS CHECK
DRAWING NUMBER 27817UG-02			REVISION	ISSUE DATE ?

UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

1D 5C	1 Duct 5 Cables	CUW	Camera under water	PDR	Poor depth response
Ø	Diameter	DCr	Depth To Crown	RB ●	Rest Bend
AC	Audible Connection	DI	Depth To Invert	RBC	Rectangular Brick Chamber
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CrL	Crown Level	IL	Invert Level	UTT	Unable To Trace

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O/BT	OVERHEAD BT CABLE(S)
COM	COMMUNICATIONS CABLE(S)
O/H COM	OVERHEAD COMMUNICATIONS CABLE(S)
CTV	CABLE TV CABLE(S)
DUCT	DUCT
E	ELECTRIC CABLE(S)
O/E	OVERHEAD ELECTRIC CABLE(S)
FO	FIBREOPTIC CABLE(S)
FUEL	FUEL PIPE(S)
GM	GAS MAIN
GS	GAS SERVICE
GPR	GROUND PENETRATING RADAR (GPR) TRACE
HW	HOT WATER PIPE
LC	LIGHTING CIRCUIT
OIL	OIL PIPE(S)
SCAR	VISIBLE SCARRING
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TS	TRAFFIC SIGNAL
UIT	UNIDENTIFIED TRACE
WM	WATER MAIN
WS	WATER SERVICE
	COMBINED SEWER
CW RM	COMBINED WATER RISING MAIN
EW	EFFLUENT WATER
	FOUL SEWER
FW RM	FOUL WATER RISING MAIN
	RISING MAIN
	SURFACE WATER SEWER
SW RM	SURFACE WATER RISING MAIN
	INVESTIGATION EXTENTS
Note:	UTILITIES COMMENT BOX (GENERAL NOTES)
d0.37m	DEPTH TO SERVICE
??-AR	SERVICE ASSUME ROUTE
??-TFR	SERVICE TAKEN FROM RECORDS

N
NORTH
Indicative

DRAWING NOTES

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Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

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Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

Do not scale from this drawing.

AVAILABILITY OF UTILITY RECORD DRAWINGS

UTILITY	AVAILABILITY	UTILITY	AVAILABILITY	UTILITY	AVAILABILITY
SEWER	NO	BT	N/A	OIL PIPES	N/A
WATER MAIN	N/A	CABLE TV	N/A	OTHERS	N/A
GAS MAIN	N/A	ELECTRICITY	N/A		

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

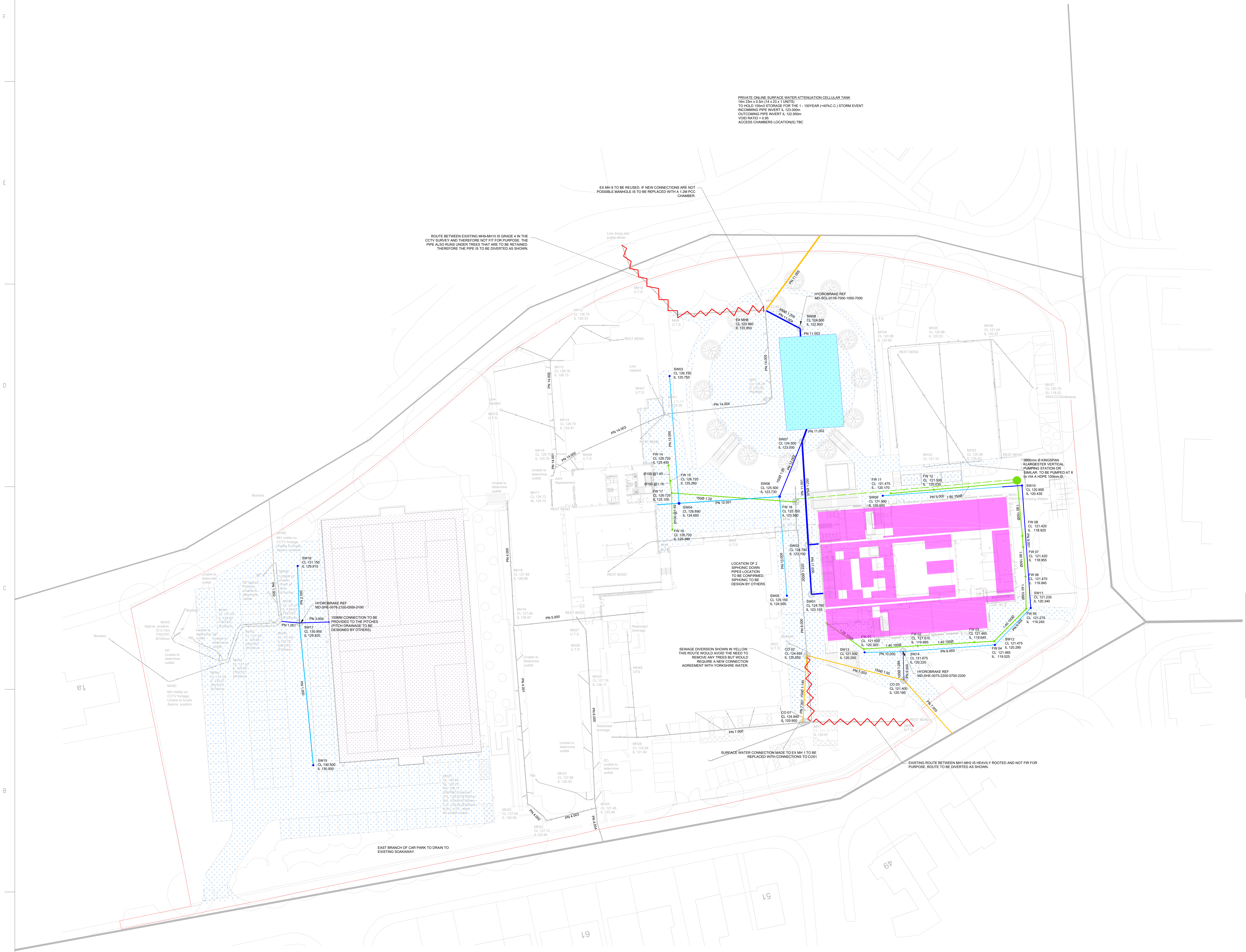
IPSWICH BRENTWOOD COVENTRY GLASGOW NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE				
GREENHEAD ACADEMY. GREENHEAD ROAD, HD1 4ES.				
DRAWING DETAIL: CCTV DRAINAGE SURVEY. SHEET 1 OF 2				
CLIENT: MACE GROUP.				SCALE: 1:200
SURVEYOR: SH	SURVEY DATE: 20/10/20	CHECKED BY: JTM	APPROVED BY: RAG	DWG STATUS: CHECK
DRAWING NUMBER: 27817UG-01			REVISION:	ISSUE DATE: ?

ISO 9001 REGISTERED FIRM
RICS
chartered ices
THE SURVEY ASSOCIATION

Original Sheet Size A0H

6.6 Appendix 6 – Proposed Drainage Layout



LEGEND

- FOUL WATER DRAINAGE
- FOUL WATER RISING MAIN
- SURFACE WATER DRAINAGE
- PERFORATED PIPES
- COMBINED SEWER DIVERSION
- EXISTING SEWER TO BE ABANDONED
- FW PPIC
- SW PPIC
- 1200mmØ PCC MANHOLE
- 2.6mØ FW TANK AND PUMPING STATION
- PERMEABLE PAVING
- SPORTS PITCH
- ATTENUATION CRATES
- GREEN ROOF

1029730 A1

Based on.

Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

1. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE SEWER SECTION GUIDANCE APPENDIX C. ALL PRIVATE DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH BUILDING REGULATIONS 2002 EDITION.
2. CONTRACTOR TO ESTABLISH POSITION SIZE AND DEPTH OF ALL EXISTING SEWERS AND SERVICES PRIOR TO COMMENCEMENT ON SITE.
3. THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT, AND TEMPORARY AND PERMANENT DIVERSION WORKS, AS NECESSARY TO ALL EXISTING SERVICES.
4. THE CONTRACTOR SHALL ALLOW FOR ALL TRAFFIC MANAGEMENT IN CONNECTION WITH ROAD AND SEWER WORKS.
5. THE CONTRACTOR SHALL ALLOW FOR KEEPING SEWER TRENCHES AND EXCAVATIONS AS DRY AS PRACTICABLE BY PUMPING FROM TEMPORARY SUMPS AND DEWATERING AS APPROPRIATE. THE POINT AND METHOD OF DISCHARGE TO BE AGREED WITH THE DRAINAGE AUTHORITY.
6. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS 4027, UNLESS AGREED OTHERWISE WITH THE ADOPTING AUTHORITY.
7. PRECAST CONCRETE PRODUCTS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS 5911 AND BE KITEMARKED. CONCRETE PIPES TO BE CLASS H UNLESS NOTED OTHERWISE.
8. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN124, HAVE MINIMUM 675 x 675 CLEAR OPENINGS WITH 150 DEEP FRAMES UNLESS OTHERWISE SPECIFIED. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITHOUT CUSHION INSERTS AND BE KITEMARKED. LOAD CLASS D400 IN VEHICULAR TRAFFICKED AREAS AND LOAD CLASS B125 IN SOFT LANDSCAPED AREAS.
9. CLASS Z BEDDING DETAIL SHALL BE PROVIDED WHERE COVER TO THE PIPE BARREL IS LESS THAN 1.2M IN VEHICULAR TRAFFICKED AREAS AND 0.9M ELSEWHERE, TO ALL ROAD GULLY CONNECTIONS AND WITHIN AREAS OF DEEP ROOTING VEGETATION.
10. WHERE CLASS Z TRENCH BEDDING DETAIL IS USED, THE CONCRETE BED AND SURROUND SHALL BE DISCONTINUED AT EACH PIPE JOINT OVER THE FULL CROSS SECTION BY MEANS OF A SHAPED COMPRESSIBLE FILLER.
11. SELECTED BACKFILL MATERIAL SHALL CONSIST OF UNIFORM MATERIAL FREE FROM STONES LARGER THAN 40mm, CLAY LUMPS LARGER THAN 75mm, TREE ROOTS, ORGANIC MATTER AND FROZEN SOIL. SELECTED BACKFILL MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 225mm, EACH LAYER COMPACTED TO FORM A STABLE TRENCH BACKFILL.
12. GENERAL BACKFILL MATERIAL TO BE FREE FROM STONES LARGER THAN 40mm. GENERAL BACKFILL MATERIAL IS TO BE PLACED IN LAYERS NOT EXCEEDING 150mm THICKNESS AND EACH LAYER COMPACTED BY HAND. NO MECHANICAL COMPACTION OF FILL MATERIAL SHALL BE PERMITTED WITHIN 300mm ABOVE THE CROWN/BARREL OF THE PIPE.
13. BACKFILLING AND REINSTATEMENT TO TRENCHES IN PUBLIC HIGHWAYS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS AND SPECIFICATIONS OF THE ADOPTING AUTHORITY, OR, IN THE ABSENCE OF SUCH, IN ACCORDANCE WITH THE REQUIREMENTS OF "THE STREET WORKS REGULATIONS 1992" AND RELEVANT PROVISIONS OF H.A.U.C. "SPECIFICATION FOR THE REINSTATEMENT OF OPENINGS IN HIGHWAYS" JUNE 1992, BOTH UNDER SECTION 71 OF THE NEW ROADS AND STREET WORKS ACT 1991.
14. BACKFILL TO DRAINAGE TRENCHES IN HARD PAVED AREAS SHALL BE G.S.B. TYPE.
15. ALL REDUNDANT EXISTING DRAINAGE TO BE GRUBBED UP OR GROUTED, ANY EXISTING LIVE DRAINAGE SHOULD BE REPORTED TO THE ENGINEER AND RECONNECTED.
16. ANY EXISTING DRAINAGE WHICH BECOMES UNDER TRAFFICKED AREAS IN THE NEW SCHEME SHOULD BE SUBJECT TO THE FOLLOWING REMEDIALS/REVISIONS. WHERE DEPTH OF COVER IS LESS THAN 1200MM, THE EXISTING PIPEWORK SHALL BE EXPOSED & SURROUNDED WITH 150MM CONCRETE AS CLASS "Z" BEDDING. WHERE THE EXISTING MANHOLE COVER & FRAME IS NOT AS MANHOLE DETAIL A OR B, OR TO BS497 GRADE A, OR EN124 CLASS D, THEN IT SHOULD BE CHANGED FOR SUCH.
17. CONTRACTOR TO TAKE MEASURES TO PROTECT THEIR OPERATIVES WITH RESPECT TO THE PRESENCE OF GAS IN SEWER TRENCHES AND MANHOLES THROUGH THE USE OF GAS MONITORING EQUIPMENT AND BREATHING APPARATUS AS REQUIRED.
18. CONTRACTOR TO CCTV SURVEY ALL NEW DRAINAGE ON COMPLETION OF WORKS.
19. ALL SURFACE WATER AND FOUL DRAINAGE IS 100mm DIAMETER UNLESS NOTED OTHERWISE.
20. ADDITIONAL ALLOWANCES SHOULD BE MADE FOR FOUL WATER POP UPS NOT INDENTIFIED. ESTIMATED AT 5 NO. POP UPS AND 20m OF ASSOCIATED PIPEWORK.
21. ALL PIPE CONNECTIONS SHALL BE SOFFIT TO SOFFIT.
22. ALL POP UP CONNECTIONS SHALL BE 100mmØ UNLESS NOTED OTHERWISE.
23. WHERE IL LEVEL AT BRANCH CONNECTION IS SHOWN, IT IS THE SMALLER Ø PIPE AT CROWN TO CROWN.
24. ALL PIPES SHALL BE LAID WITH LEVEL SOFFITS AND ALL MANHOLES/INSPECTION CHAMBER INVERT LEVELS SHOWN ARE FOR THE OUT GOING PIPE (UNLESS NOTED OTHERWISE). PIPE RUNS SHALL BE LAID TO THE INVERT LEVELS AS DETAILED ON THE CONTRACT DRAWINGS. (NOTE THAT ALL PIPE GRADIENTS INDICATED ON THE DRAWING ARE APPROXIMATE).
25. ALL GULLY, SVP & S/S TO BE SUITABLE FOR ROD AND JET ACCESS FROM ABOVE SLAB.

Issue	Date	Description	By	Chkd	Verfd
P12	23.11.21	RE-ISSUED FOR PLANNING	MAK	MLC	MLC
P11	08.11.21	ISSUED TO SUIT COMMENTS	EH	MAK	MLC
P10	22.10.21	STAGE 4 ISSUE	EH	MAK	MLC
P09	08.10.21	ISSUED FOR CONTRACTORS PROPOSAL	EH	MAK	MLC
P08	16.09.21	ISSUED FOR PLANNING	DF	MLC	DF
P07	14.09.21	ISSUED FOR PLANNING	DF	MLC	DF
P06	27.08.21	ISSUED FOR PLANNING	MAK	MLC	GM
P05	26.03.21	ISSUED FOR ISP	MAK	MLC	GM
P04	23.03.21	UPDATED TO SUIT COMMENTS	MAK	MLC	GM
P03	11.03.21	UPDATED TO INLCUDED INFILL	MAK	MLC	GM
P02	10.03.21	UPDATED TO INLCUDED SW	MAK	MLC	GM
P01	09.03.21	ISSUED FOR INFORMATION	MAK	MLC	GM

Project
GREENHEAD COLLEGE HUDDERSFIELD

Client
GALIFORD TRY

Architect
RYDER

Title
PROPOSED DRAINAGE

Drawing No.	Drawing Status
NE8659-CCS-ZZ-XX-DR-D-0501	S3
Job No.	**Scale**
1029730	1:500

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515
Website: www.cundall.com

True scale at 1:1

6.7 Appendix 7 – Existing Network Microdrainage Model

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.349	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	9.873	0.140	70.5	0.009	4.00	0.0	0.600	o	100	Pipe/Conduit	
2.001	9.952	0.140	71.1	0.018	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.002	31.240	0.277	112.8	0.041	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	12.321	0.320	38.5	0.023	4.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	32.373	0.320	101.2	0.053	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	44.117	0.590	74.8	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.002	6.123	0.180	34.0	0.047	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.003	12.575	0.420	29.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	50.00	4.18	130.070	0.009	0.0	0.0	0.0	0.92	7.2	1.3
2.001	50.00	4.36	129.930	0.027	0.0	0.0	0.0	0.91	7.2	3.6
2.002	50.00	4.91	129.790	0.068	0.0	0.0	0.0	0.95	16.7	9.2
3.000	50.00	4.13	126.990	0.023	0.0	0.0	0.0	1.63	28.8	3.1
4.000	50.00	4.54	126.990	0.053	0.0	0.0	0.0	1.00	17.7	7.2
3.001	50.00	5.17	126.670	0.106	0.0	0.0	0.0	1.16	20.6	14.4
3.002	50.00	5.23	126.080	0.153	0.0	0.0	0.0	1.73	30.6	20.7
3.003	50.00	5.34	125.900	0.153	0.0	0.0	0.0	1.85	32.6	20.7

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	31.797	0.619	51.4	0.021	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.004	8.644	0.148	58.4	0.053	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	43.415	0.970	44.8	0.088	4.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	47.660	2.440	19.5	0.192	4.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	23.555	0.942	25.0	0.049	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.002	10.013	0.110	91.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.000	16.855	0.220	76.6	0.033	4.00	0.0	0.600	o	100	Pipe/Conduit	
8.001	9.816	0.130	75.5	0.019	0.00	0.0	0.600	o	100	Pipe/Conduit	
8.002	7.656	0.250	30.6	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.003	22.929	1.250	18.3	0.064	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.004	26.470	1.020	26.0	0.041	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.005	21.941	0.410	53.5	0.036	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.006	21.865	0.375	58.3	0.050	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.007	21.545	0.368	58.5	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	50.00	4.38	126.170	0.021	0.0	0.0	0.0	1.41	24.9	2.8
3.004	50.00	5.45	125.480	0.226	0.0	0.0	0.0	1.32	23.3«	30.6
6.000	50.00	4.48	121.840	0.088	0.0	0.0	0.0	1.51	26.7	11.9
7.000	50.00	4.35	123.310	0.192	0.0	0.0	0.0	2.29	40.5	26.0
6.001	50.00	4.67	120.870	0.328	0.0	0.0	0.0	2.02	35.7«	44.5
6.002	50.00	4.83	120.160	0.328	0.0	0.0	0.0	1.05	18.6«	44.5
8.000	50.00	4.32	126.130	0.033	0.0	0.0	0.0	0.88	6.9	4.5
8.001	50.00	4.50	125.910	0.052	0.0	0.0	0.0	0.89	7.0«	7.0
8.002	50.00	4.57	125.780	0.072	0.0	0.0	0.0	1.83	32.3	9.8
8.003	50.00	4.74	125.530	0.136	0.0	0.0	0.0	2.36	41.8	18.4
8.004	50.00	4.96	124.280	0.177	0.0	0.0	0.0	1.98	35.1	24.0
8.005	50.00	5.22	123.260	0.213	0.0	0.0	0.0	1.38	24.4«	28.9
8.006	50.00	5.50	122.850	0.263	0.0	0.0	0.0	1.32	23.3«	35.6
8.007	50.00	5.77	122.475	0.274	0.0	0.0	0.0	1.32	23.3«	37.0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	User	-	100	0.009	0.009	0.009
2.001	User	-	100	0.018	0.018	0.018
2.002	User	-	100	0.041	0.041	0.041
3.000	User	-	100	0.023	0.023	0.023
4.000	User	-	100	0.053	0.053	0.053
3.001	User	-	100	0.030	0.030	0.030
3.002	User	-	100	0.047	0.047	0.047
3.003	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.021	0.021	0.021
3.004	User	-	100	0.053	0.053	0.053
6.000	User	-	100	0.088	0.088	0.088
7.000	User	-	100	0.099	0.099	0.099
	User	-	100	0.054	0.054	0.153
	User	-	100	0.039	0.039	0.192
6.001	User	-	100	0.049	0.049	0.049
6.002	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.011	0.011	0.011
	User	-	100	0.022	0.022	0.033
8.001	User	-	100	0.019	0.019	0.019
8.002	User	-	100	0.020	0.020	0.020
8.003	User	-	100	0.024	0.024	0.024
	User	-	100	0.040	0.040	0.064
8.004	User	-	100	0.041	0.041	0.041
8.005	User	-	100	0.036	0.036	0.036
8.006	User	-	100	0.050	0.050	0.050
8.007	User	-	100	0.011	0.011	0.011
				Total	Total	Total
				0.896	0.896	0.896

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.002		131.500	129.513	129.513	300	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
3.004		127.300	125.332	125.330	450	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
6.002		122.400	120.050	120.050	450	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
8.007		124.500	122.107	122.107	300	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.349		

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
2.000	EX MH 44	15 Summer	1	+0%	30/15 Summer			
2.001	EXMH 42	15 Winter	1	+0%	30/15 Summer			
2.002	EX MH 40	15 Winter	1	+0%	30/15 Summer			
3.000	EX MH 18	15 Summer	1	+0%	30/15 Summer	100/15 Summer		
4.000	EX MH	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
3.001	EX MH19	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
3.002	EX MH20	15 Winter	1	+0%	30/15 Summer			
3.003	EX MH22	15 Winter	1	+0%	30/15 Summer			
5.000	EX MH 25	15 Winter	1	+0%	100/15 Summer			
3.004	EX MH 24	15 Winter	1	+0%	1/15 Summer			
6.000	EX MH 29	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
7.000	EX MH 04	15 Winter	1	+0%	30/15 Summer	30/15 Summer		
6.001	EX MH 01	15 Winter	1	+0%	1/15 Summer			
6.002	EX MH 02	15 Winter	1	+0%	1/15 Summer			
8.000	EX MH 13	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
8.001	EX MH 14	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
8.002	EX MH 16	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
8.003	EX MH 46	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
8.004	EX MH 11	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
8.005	EX MH 07	15 Winter	1	+0%	1/15 Summer	100/15 Summer		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000	EX MH 44	130.099	-0.071	0.000	0.19			1.3	OK
2.001	EXMH 42	129.978	-0.052	0.000	0.47			3.1	OK
2.002	EX MH 40	129.862	-0.078	0.000	0.46			7.4	OK
3.000	EX MH 18	127.024	-0.116	0.000	0.12			3.1	OK
4.000	EX MH	127.058	-0.082	0.000	0.41			7.0	OK
3.001	EX MH19	126.760	-0.060	0.000	0.66			13.1	OK
3.002	EX MH20	126.173	-0.057	0.000	0.70			18.0	OK
3.003	EX MH22	125.984	-0.066	0.000	0.60			17.9	OK
5.000	EX MH 25	126.204	-0.116	0.000	0.12			2.8	OK
3.004	EX MH 24	125.709	0.079	0.000	1.25			25.5	SURCHARGED
6.000	EX MH 29	121.911	-0.079	0.000	0.45			11.8	OK
7.000	EX MH 04	123.399	-0.061	0.000	0.66			25.8	OK
6.001	EX MH 01	121.713	0.693	0.000	1.04			35.4	SURCHARGED
6.002	EX MH 02	120.690	0.380	0.000	2.11			35.0	SURCHARGED
8.000	EX MH 13	126.191	-0.039	0.000	0.68			4.5	OK
8.001	EX MH 14	125.991	-0.019	0.000	0.99			6.4	OK
8.002	EX MH 16	125.837	-0.093	0.000	0.31			8.6	OK
8.003	EX MH 46	125.595	-0.085	0.000	0.39			15.4	OK
8.004	EX MH 11	124.364	-0.066	0.000	0.59			19.7	OK
8.005	EX MH 07	123.509	0.099	0.000	0.93			21.5	SURCHARGED

PN	US/MH Name	Level Exceeded
2.000	EX MH 44	
2.001	EXMH 42	
2.002	EX MH 40	
3.000	EX MH 18	4
4.000	EX MH	6
3.001	EX MH19	4
3.002	EX MH20	
3.003	EX MH22	
5.000	EX MH 25	
3.004	EX MH 24	
6.000	EX MH 29	1
7.000	EX MH 04	10
6.001	EX MH 01	
6.002	EX MH 02	
8.000	EX MH 13	6
8.001	EX MH 14	6
8.002	EX MH 16	5
8.003	EX MH 46	4
8.004	EX MH 11	1
8.005	EX MH 07	6

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
8.006	EX MH 08	15 Winter	1	+0%	1/15 Summer	30/15 Summer		
8.007	EX MH 09	15 Winter	1	+0%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
8.006	EX MH 08	123.177	0.177	0.000	1.10			24.3	SURCHARGED
8.007	EX MH 09	122.723	0.098	0.000	1.13			24.9	SURCHARGED

PN	US/MH Name	Level Exceeded
8.006	EX MH 08	16
8.007	EX MH 09	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
2.000	EX MH 44	15 Winter	30	+0%	30/15 Summer			
2.001	EXMH 42	15 Winter	30	+0%	30/15 Summer			
2.002	EX MH 40	15 Winter	30	+0%	30/15 Summer			
3.000	EX MH 18	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
4.000	EX MH	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
3.001	EX MH19	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
3.002	EX MH20	15 Winter	30	+0%	30/15 Summer			
3.003	EX MH22	15 Winter	30	+0%	30/15 Summer			
5.000	EX MH 25	15 Winter	30	+0%	100/15 Summer			
3.004	EX MH 24	15 Winter	30	+0%	1/15 Summer			
6.000	EX MH 29	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
7.000	EX MH 04	15 Winter	30	+0%	30/15 Summer	30/15 Summer		
6.001	EX MH 01	15 Winter	30	+0%	1/15 Summer			
6.002	EX MH 02	15 Winter	30	+0%	1/15 Summer			
8.000	EX MH 13	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
8.001	EX MH 14	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
8.002	EX MH 16	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
8.003	EX MH 46	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
8.004	EX MH 11	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
8.005	EX MH 07	15 Winter	30	+0%	1/15 Summer	100/15 Summer		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000	EX MH 44	130.206	0.036	0.000	0.43			2.9	SURCHARGED
2.001	EXMH 42	130.187	0.157	0.000	1.13			7.5	SURCHARGED
2.002	EX MH 40	130.040	0.100	0.000	1.16			18.6	SURCHARGED
3.000	EX MH 18	127.342	0.202	0.000	0.28			7.3	SURCHARGED
4.000	EX MH	127.429	0.289	0.000	0.78			13.3	FLOOD RISK
3.001	EX MH19	127.327	0.507	0.000	0.98			19.6	SURCHARGED
3.002	EX MH20	126.792	0.562	0.000	1.10			28.0	SURCHARGED
3.003	EX MH22	126.569	0.519	0.000	1.00			29.6	SURCHARGED
5.000	EX MH 25	126.246	-0.074	0.000	0.29			6.9	OK
3.004	EX MH 24	126.214	0.584	0.000	2.21			45.2	SURCHARGED
6.000	EX MH 29	123.975	1.985	0.000	0.63			16.2	SURCHARGED
7.000	EX MH 04	124.752	1.292	1.876	0.82			32.2	FLOOD
6.001	EX MH 01	123.586	2.566	0.000	1.56			52.8	SURCHARGED
6.002	EX MH 02	121.295	0.985	0.000	3.16			52.4	SURCHARGED
8.000	EX MH 13	126.626	0.396	0.000	1.00			6.7	FLOOD RISK
8.001	EX MH 14	126.467	0.457	0.000	1.56			10.1	FLOOD RISK
8.002	EX MH 16	126.258	0.328	0.000	0.56			15.5	SURCHARGED
8.003	EX MH 46	126.219	0.539	0.000	0.74			29.3	SURCHARGED
8.004	EX MH 11	125.824	1.394	0.000	0.89			29.7	SURCHARGED
8.005	EX MH 07	125.016	1.606	0.000	1.59			36.7	FLOOD RISK

PN	US/MH Name	Level Exceeded
2.000	EX MH 44	
2.001	EXMH 42	
2.002	EX MH 40	
3.000	EX MH 18	4
4.000	EX MH	6
3.001	EX MH19	4
3.002	EX MH20	
3.003	EX MH22	
5.000	EX MH 25	
3.004	EX MH 24	
6.000	EX MH 29	1
7.000	EX MH 04	10
6.001	EX MH 01	
6.002	EX MH 02	
8.000	EX MH 13	6
8.001	EX MH 14	6
8.002	EX MH 16	5
8.003	EX MH 46	4
8.004	EX MH 11	1
8.005	EX MH 07	6

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
8.006	EX MH 08	30 Winter	30	+0%	1/15 Summer	30/15 Summer		
8.007	EX MH 09	15 Winter	30	+0%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
8.006	EX MH 08	123.964	0.964	4.207	1.51			33.3	FLOOD
8.007	EX MH 09	123.180	0.555	0.000	1.58			34.8	SURCHARGED

PN	US/MH Name	Level Exceeded
8.006	EX MH 08	16
8.007	EX MH 09	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
2.000	EX MH 44	15 Winter	100	+30%	30/15 Summer			
2.001	EXMH 42	15 Winter	100	+30%	30/15 Summer			
2.002	EX MH 40	15 Winter	100	+30%	30/15 Summer			
3.000	EX MH 18	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
4.000	EX MH	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
3.001	EX MH19	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
3.002	EX MH20	15 Winter	100	+30%	30/15 Summer			
3.003	EX MH22	15 Winter	100	+30%	30/15 Summer			
5.000	EX MH 25	15 Winter	100	+30%	100/15 Summer			
3.004	EX MH 24	15 Winter	100	+30%	1/15 Summer			
6.000	EX MH 29	15 Winter	100	+30%	30/15 Summer	100/15 Winter		
7.000	EX MH 04	30 Winter	100	+30%	30/15 Summer	30/15 Summer		
6.001	EX MH 01	15 Winter	100	+30%	1/15 Summer			
6.002	EX MH 02	15 Winter	100	+30%	1/15 Summer			
8.000	EX MH 13	30 Winter	100	+30%	30/15 Summer	100/15 Summer		
8.001	EX MH 14	30 Winter	100	+30%	30/15 Summer	100/15 Summer		
8.002	EX MH 16	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
8.003	EX MH 46	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
8.004	EX MH 11	15 Winter	100	+30%	30/15 Summer	100/15 Winter		
8.005	EX MH 07	15 Winter	100	+30%	1/15 Summer	100/15 Summer		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000	EX MH 44	130.723	0.553	0.000	0.68			4.6	SURCHARGED
2.001	EXMH 42	130.694	0.664	0.000	1.61			10.7	SURCHARGED
2.002	EX MH 40	130.441	0.501	0.000	1.65			26.6	SURCHARGED
3.000	EX MH 18	127.690	0.550	0.314	0.39			10.2	FLOOD
4.000	EX MH	127.608	0.468	7.595	1.28			21.7	FLOOD
3.001	EX MH19	127.642	0.822	1.712	1.18			23.6	FLOOD
3.002	EX MH20	127.533	1.303	0.000	1.29			33.1	FLOOD RISK
3.003	EX MH22	127.262	1.212	0.000	1.06			31.5	SURCHARGED
5.000	EX MH 25	126.877	0.557	0.000	0.38			9.0	SURCHARGED
3.004	EX MH 24	126.812	1.182	0.000	2.97			60.5	SURCHARGED
6.000	EX MH 29	125.940	3.950	0.279	1.21			31.2	FLOOD
7.000	EX MH 04	124.773	1.313	22.967	1.00			39.4	FLOOD
6.001	EX MH 01	124.645	3.625	0.000	1.78			60.4	FLOOD RISK
6.002	EX MH 02	121.634	1.324	0.000	3.61			59.8	SURCHARGED
8.000	EX MH 13	126.763	0.533	3.123	1.55			10.2	FLOOD
8.001	EX MH 14	126.705	0.695	4.621	2.51			16.2	FLOOD
8.002	EX MH 16	126.723	0.793	2.883	0.69			19.3	FLOOD
8.003	EX MH 46	126.761	1.081	0.998	0.78			30.7	FLOOD
8.004	EX MH 11	126.540	2.110	0.028	1.12			37.6	FLOOD
8.005	EX MH 07	125.233	1.823	2.641	1.76			40.4	FLOOD

PN	US/MH Name	Level Exceeded
2.000	EX MH 44	
2.001	EXMH 42	
2.002	EX MH 40	
3.000	EX MH 18	4
4.000	EX MH	6
3.001	EX MH19	4
3.002	EX MH20	
3.003	EX MH22	
5.000	EX MH 25	
3.004	EX MH 24	
6.000	EX MH 29	1
7.000	EX MH 04	10
6.001	EX MH 01	
6.002	EX MH 02	
8.000	EX MH 13	6
8.001	EX MH 14	6
8.002	EX MH 16	5
8.003	EX MH 46	4
8.004	EX MH 11	1
8.005	EX MH 07	6

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
8.006	EX MH 08	60 Winter	100	+30%	1/15 Summer	30/15 Summer		
8.007	EX MH 09	15 Summer	100	+30%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
8.006	EX MH 08	123.979	0.979	18.572	1.52			33.5	FLOOD
8.007	EX MH 09	123.258	0.633	0.000	1.65			36.2	SURCHARGED

PN	US/MH Name	Level Exceeded
8.006	EX MH 08	16
8.007	EX MH 09	

6.8 Appendix 8 – Proposed Network Microdrainage Model

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.349	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	35.150	0.180	195.3	0.071	4.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	14.284	0.095	150.4	0.050	4.00	0.0	0.600	o	100	Pipe/Conduit	
3.000	7.380	0.075	98.4	0.212	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	4.304	0.030	143.5	0.071	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	30.506	0.277	110.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	12.321	0.320	38.5	0.023	4.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.07	130.000	0.071	0.0	0.0	0.0	0.55	4.3«	9.6
2.000	50.00	4.38	129.915	0.050	0.0	0.0	0.0	0.62	4.9«	6.7
3.000	50.00	4.12	129.895	0.212	0.0	0.0	0.0	1.01	17.9«	28.7
1.001	50.00	5.18	129.820	0.404	0.0	0.0	0.0	0.64	5.0«	54.7
1.002	50.00	5.71	129.790	0.404	0.0	0.0	0.0	0.96	16.9«	54.7
4.000	50.00	4.13	126.990	0.023	0.0	0.0	0.0	1.63	28.8	3.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	32.373	0.320	101.2	0.055	4.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	44.117	0.590	74.8	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	6.123	0.180	34.0	0.047	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.003	12.575	0.420	29.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	31.797	0.619	51.4	0.021	4.00	0.0	0.600	o	150	Pipe/Conduit	
4.004	8.644	0.148	58.4	0.053	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	41.267	0.485	85.1	0.086	4.00	0.0	0.600	o	150	Pipe/Conduit	
7.001	16.614	0.300	55.4	0.049	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.000	31.229	2.440	12.8	0.058	4.00	0.0	0.600	o	150	Pipe/Conduit	
7.002	24.711	0.455	54.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
9.000	34.525	0.115	300.2	0.017	4.00	0.0	0.600	o	100	Pipe/Conduit	
9.001	29.861	0.095	314.3	0.012	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.002	12.903	0.045	286.7	0.016	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.003	22.461	0.075	299.5	0.007	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	50.00	4.54	126.990	0.055	0.0	0.0	0.0	1.00	17.7	7.5
4.001	50.00	5.17	126.670	0.108	0.0	0.0	0.0	1.16	20.6	14.6
4.002	50.00	5.23	126.080	0.155	0.0	0.0	0.0	1.73	30.6	20.9
4.003	50.00	5.34	125.900	0.155	0.0	0.0	0.0	1.85	32.6	20.9
6.000	50.00	4.38	126.170	0.021	0.0	0.0	0.0	1.41	24.9	2.8
4.004	50.00	5.45	125.480	0.228	0.0	0.0	0.0	1.32	23.3«	30.9
7.000	50.00	4.63	121.840	0.086	0.0	0.0	0.0	1.09	19.3	11.7
7.001	50.00	4.84	120.950	0.135	0.0	0.0	0.0	1.35	23.9	18.3
8.000	50.00	4.18	123.310	0.058	0.0	0.0	0.0	2.83	50.0	7.8
7.002	50.00	5.14	120.650	0.193	0.0	0.0	0.0	1.37	24.2«	26.1
9.000	50.00	5.31	120.550	0.017	0.0	0.0	0.0	0.44	3.4	2.4
9.001	50.00	6.47	120.435	0.029	0.0	0.0	0.0	0.43	3.4«	4.0
9.002	50.00	6.95	120.340	0.046	0.0	0.0	0.0	0.45	3.5«	6.2
9.003	50.00	7.80	120.295	0.053	0.0	0.0	0.0	0.44	3.5«	7.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
10.000	9.483	0.030	316.1	0.015	4.00	0.0	0.600	o	100	Pipe/Conduit	
9.004	7.139	0.035	204.0	0.024	0.00	0.0	0.600	o	100	Pipe/Conduit	
7.003	17.803	0.178	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
11.000	12.260	0.055	222.9	0.080	4.00	0.0	0.600	o	300	Pipe/Conduit	
11.001	25.487	0.100	254.9	0.071	0.00	0.0	0.600	o	375	Pipe/Conduit	
12.000	27.605	1.100	25.1	0.037	4.00	0.0	0.600	o	100	Pipe/Conduit	
12.001	24.836	0.920	27.0	0.078	0.00	0.0	0.600	o	75	Pipe/Conduit	
13.000	49.787	0.100	497.9	0.042	4.00	0.0	0.600	o	75	Pipe/Conduit	
12.002	14.561	0.730	19.9	0.034	0.00	0.0	0.600	o	75	Pipe/Conduit	
11.002	11.057	0.050	221.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
11.003	16.846	0.050	336.9	0.100	0.00	0.0	0.600	o	375	Pipe/Conduit	
11.004	9.653	0.050	193.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
14.000	16.855	0.220	76.6	0.033	4.00	0.0	0.600	o	100	Pipe/Conduit	
14.001	9.816	0.130	75.5	0.019	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000	50.00	4.37	120.250	0.015	0.0	0.0	0.0	0.43	3.4	2.0
9.004	50.00	8.03	120.220	0.092	0.0	0.0	0.0	0.53	4.2«	12.5
7.003	50.00	8.32	120.195	0.285	0.0	0.0	0.0	1.00	17.8«	38.6
11.000	50.00	4.19	123.155	0.080	0.0	0.0	0.0	1.05	74.1	10.8
11.001	50.00	4.57	123.100	0.151	0.0	0.0	0.0	1.13	124.8	20.4
12.000	50.00	4.30	125.750	0.037	0.0	0.0	0.0	1.55	12.2	5.0
12.001	50.00	4.63	124.650	0.115	0.0	0.0	0.0	1.23	5.4«	15.6
13.000	50.00	6.99	123.850	0.042	0.0	0.0	0.0	0.28	1.2«	5.7
12.002	50.00	7.15	123.730	0.191	0.0	0.0	0.0	1.43	6.3«	25.9
11.002	50.00	7.31	123.000	0.342	0.0	0.0	0.0	1.21	134.1	46.3
11.003	50.00	7.59	122.340	0.442	0.0	0.0	0.0	0.98	108.4	59.9
11.004	50.00	7.82	122.255	0.442	0.0	0.0	0.0	0.72	12.7«	59.9
14.000	50.00	4.32	126.130	0.033	0.0	0.0	0.0	0.88	6.9	4.5
14.001	50.00	4.50	125.910	0.052	0.0	0.0	0.0	0.89	7.0«	7.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
14.002	7.656	0.250	30.6	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
14.003	22.929	1.250	18.3	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
14.004	26.470	1.020	26.0	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
14.005	21.941	0.410	53.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
11.005	23.002	0.153	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
14.002	50.00	4.57	125.780	0.072	0.0	0.0	0.0	1.83	32.3	9.8
14.003	50.00	4.74	125.530	0.096	0.0	0.0	0.0	2.36	41.8	13.0
14.004	50.00	4.96	124.280	0.121	0.0	0.0	0.0	1.98	35.1	16.4
14.005	50.00	5.22	123.260	0.121	0.0	0.0	0.0	1.38	24.4	16.4
11.005	50.00	8.28	122.250	0.563	0.0	0.0	0.0	0.82	14.5«	76.2

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.071	0.071	0.071
2.000	User	-	100	0.050	0.050	0.050
3.000	User	-	100	0.212	0.212	0.212
1.001	User	-	100	0.071	0.071	0.071
1.002	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.023	0.023	0.023
5.000	User	-	100	0.055	0.055	0.055
4.001	User	-	100	0.030	0.030	0.030
4.002	User	-	100	0.047	0.047	0.047
4.003	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.021	0.021	0.021
4.004	User	-	100	0.053	0.053	0.053
7.000	User	-	100	0.086	0.086	0.086
7.001	User	-	100	0.049	0.049	0.049
8.000	User	-	100	0.058	0.058	0.058
7.002	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.017	0.017	0.017
9.001	User	-	100	0.012	0.012	0.012
9.002	User	-	100	0.016	0.016	0.016
9.003	User	-	100	0.007	0.007	0.007
10.000	User	-	100	0.015	0.015	0.015
9.004	User	-	100	0.024	0.024	0.024
7.003	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.080	0.080	0.080
11.001	User	-	100	0.071	0.071	0.071
12.000	User	-	100	0.037	0.037	0.037
12.001	User	-	100	0.078	0.078	0.078
13.000	User	-	100	0.042	0.042	0.042
12.002	User	-	100	0.034	0.034	0.034
11.002	-	-	100	0.000	0.000	0.000
11.003	-	-	100	0.100	0.100	0.100
11.004	-	-	100	0.000	0.000	0.000
14.000	User	-	100	0.011	0.011	0.011
	User	-	100	0.022	0.022	0.033
14.001	User	-	100	0.019	0.019	0.019
14.002	User	-	100	0.020	0.020	0.020
14.003	User	-	100	0.024	0.024	0.024
14.004	User	-	100	0.025	0.025	0.025
14.005	-	-	100	0.000	0.000	0.000
11.005	-	-	100	0.000	0.000	0.000
				Total 1.479	Total 1.479	Total 1.479

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002		131.500	129.513	129.513	300	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
4.004		127.300	125.332	125.330	450	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
7.003		122.400	120.017	120.017	450	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
11.005	25	123.960	122.097	122.475	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	6.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.349		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: EX MH 40, DS/PN: 1.002, Volume (m³): 1.4

Unit Reference	MD-SHE-0076-2100-0500-2100
Design Head (m)	0.500
Design Flow (l/s)	2.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	129.790
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.1
Flush-Flo™	0.149	2.1
Kick-Flo®	0.345	1.8
Mean Flow over Head Range	-	1.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.1	3.000	4.8	7.000	7.2
0.200	2.1	1.400	3.4	3.500	5.2	7.500	7.4
0.300	2.0	1.600	3.6	4.000	5.5	8.000	7.7
0.400	1.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.1	2.000	4.0	5.000	6.1	9.000	8.2
0.600	2.3	2.200	4.1	5.500	6.4	9.500	8.4
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Hydro-Brake® Optimum Manhole: SW 14, DS/PN: 9.004, Volume (m³): 1.9

Unit Reference	MD-SHE-0075-2200-0700-2200
Design Head (m)	0.700
Design Flow (l/s)	2.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	120.220
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Hydro-Brake® Optimum Manhole: SW 14, DS/PN: 9.004, Volume (m³): 1.9

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	2.2
Flush-Flo™	0.208	2.2
Kick-Flo®	0.453	1.8
Mean Flow over Head Range	-	1.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	2.8	3.000	4.3	7.000	6.4
0.200	2.2	1.400	3.0	3.500	4.6	7.500	6.6
0.300	2.2	1.600	3.2	4.000	4.9	8.000	6.8
0.400	2.0	1.800	3.4	4.500	5.2	8.500	7.0
0.500	1.9	2.000	3.6	5.000	5.5	9.000	7.2
0.600	2.1	2.200	3.7	5.500	5.7	9.500	7.4
0.800	2.3	2.400	3.9	6.000	6.0		
1.000	2.6	2.600	4.0	6.500	6.2		

Hydro-Brake® Optimum Manhole: SW 08, DS/PN: 11.004, Volume (m³): 4.1

Unit Reference	MD-SCL-0116-7000-1000-7000
Design Head (m)	1.000
Design Flow (l/s)	7.0
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	116
Invert Level (m)	122.255
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	7.0
Flush-Flo™	0.232	7.0
Kick-Flo®	0.579	5.4
Mean Flow over Head Range	-	5.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.5	0.300	6.9	0.500	6.2	0.800	6.3
0.200	6.9	0.400	6.6	0.600	5.5	1.000	7.0

Hydro-Brake® Optimum Manhole: SW 08, DS/PN: 11.004, Volume (m^3): 4.1

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	7.6	2.400	10.5	5.000	14.9	8.000	18.6
1.400	8.2	2.600	10.9	5.500	15.6	8.500	19.2
1.600	8.7	3.000	11.7	6.000	16.2	9.000	19.7
1.800	9.2	3.500	12.6	6.500	16.9	9.500	20.2
2.000	9.7	4.000	13.4	7.000	17.5		
2.200	10.1	4.500	14.2	7.500	18.1		

Storage Structures for Storm

Porous Car Park Manhole: SW 15, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00250	Width (m)	31.0
Membrane Percolation (mm/hr)	1000	Length (m)	21.7
Max Percolation (l/s)	186.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	129.995	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 16, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00250	Width (m)	31.0
Membrane Percolation (mm/hr)	1000	Length (m)	16.0
Max Percolation (l/s)	137.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	130.605	Cap Volume Depth (m)	0.450

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

Invert Level (m) 129.895

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	2275.0	0.300	2275.0	0.301	0.0

Porous Car Park Manhole: SW 17, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00250	Width (m)	31.0
Membrane Percolation (mm/hr)	1000	Length (m)	24.0
Max Percolation (l/s)	206.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	130.355	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 09, DS/PN: 9.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	60.5
Max Percolation (l/s)	67.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.605	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 12, DS/PN: 9.003

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0
Membrane Percolation (mm/hr)	1000	Porosity	0.30
Max Percolation (l/s)	21.7	Invert Level (m)	120.600

Porous Car Park Manhole: SW 12, DS/PN: 9.003

Width (m)	5.0	Depression Storage (mm)	5
Length (m)	15.6	Evaporation (mm/day)	3
Slope (1:X)	0.0	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 14, DS/PN: 9.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.7
Max Percolation (l/s)	85.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	120.800	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 03, DS/PN: 12.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	25.0
Membrane Percolation (mm/hr)	1000	Length (m)	8.5
Max Percolation (l/s)	59.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	125.955	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 04, DS/PN: 12.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0
Membrane Percolation (mm/hr)	1000	Length (m)	8.5
Max Percolation (l/s)	35.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	125.695	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 05, DS/PN: 13.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.5
Membrane Percolation (mm/hr)	1000	Length (m)	45.0
Max Percolation (l/s)	118.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	124.705	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW 06, DS/PN: 12.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	91.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	124.115	Cap Volume Depth (m)	0.450

Tank or Pond Manhole: TANK, DS/PN: 11.003

Invert Level (m) 122.340

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	310.0	0.800	310.0	0.801	0.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	6.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	12
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.286
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SW 15	480 Winter	1	+0%	100/60 Summer			
2.000	SW 16	120 Winter	1	+0%	1/60 Winter			
3.000	PITCH	1440 Winter	1	+0%				
1.001	SW 17	120 Winter	1	+0%	1/30 Winter			
1.002	EX MH 40	120 Winter	1	+0%	1/30 Winter			
4.000	EX MH 18	15 Summer	1	+0%	100/15 Summer			
5.000	EX MH INT	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
4.001	EX MH 19	15 Winter	1	+0%	30/15 Summer			
4.002	EX MH 20	15 Winter	1	+0%	30/15 Summer			
4.003	EX MH22	15 Winter	1	+0%	30/15 Summer			
6.000	EX MH 25	15 Winter	1	+0%	100/15 Summer			
4.004	EX MH 24	15 Winter	1	+0%	1/15 Summer			
7.000	EX MH 29	15 Winter	1	+0%	30/15 Summer			
7.001	CO 01	15 Winter	1	+0%	30/15 Summer			
8.000	EX MH 04	15 Summer	1	+0%	100/15 Winter			
7.002	CO 02	15 Winter	1	+0%	1/15 Summer			
9.000	SW 09	180 Summer	1	+0%	30/30 Winter			
9.001	SW 10	120 Winter	1	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW 15	130.026	-0.074	0.000	0.15		241	0.6	OK
2.000	SW 16	130.062	0.047	0.000	0.49		19	2.3	SURCHARGED
3.000	PITCH	129.916	-0.129	0.000	0.05			0.8	OK
1.001	SW 17	130.045	0.125	0.000	0.59		28	2.6	SURCHARGED
1.002	EX MH 40	130.035	0.095	0.000	0.13			2.1	SURCHARGED
4.000	EX MH 18	127.023	-0.117	0.000	0.11			2.9	OK
5.000	EX MH INT	127.056	-0.084	0.000	0.39			6.6	OK
4.001	EX MH 19	126.756	-0.064	0.000	0.61			12.2	OK
4.002	EX MH 20	126.169	-0.061	0.000	0.65			16.6	OK
4.003	EX MH22	125.981	-0.069	0.000	0.56			16.6	OK
6.000	EX MH 25	126.203	-0.117	0.000	0.11			2.6	OK
4.004	EX MH 24	125.666	0.036	0.000	1.13			23.1	SURCHARGED
7.000	EX MH 29	121.922	-0.068	0.000	0.58			10.9	OK
7.001	CO 01	121.044	-0.056	0.000	0.71			15.7	OK
8.000	EX MH 04	123.349	-0.111	0.000	0.15			7.3	OK
7.002	CO 02	120.833	0.033	0.000	0.94			21.6	SURCHARGED
9.000	SW 09	120.582	-0.068	0.000	0.22		23	0.8	OK
9.001	SW 10	120.530	-0.005	0.000	0.33			1.1	OK

PN	US/MH Name	Level Exceeded
1.000	SW 15	
2.000	SW 16	
3.000	PITCH	
1.001	SW 17	
1.002	EX MH 40	
4.000	EX MH 18	
5.000	EX MH INT	5
4.001	EX MH 19	
4.002	EX MH 20	
4.003	EX MH22	
6.000	EX MH 25	
4.004	EX MH 24	
7.000	EX MH 29	
7.001	CO 01	
8.000	EX MH 04	
7.002	CO 02	
9.000	SW 09	
9.001	SW 10	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
9.002	SW 11	120 Winter	1	+0%	1/15 Summer			
9.003	SW 12	120 Winter	1	+0%	1/15 Summer			
10.000	SW 13	120 Winter	1	+0%	1/15 Summer			
9.004	SW 14	120 Winter	1	+0%	1/15 Summer			
7.003	CO 03	15 Winter	1	+0%	1/15 Summer			
11.000	SW 01	15 Winter	1	+0%				
11.001	SW 02	15 Winter	1	+0%				
12.000	SW 03	30 Summer	1	+0%	30/15 Summer			
12.001	SW 04	30 Winter	1	+0%	1/15 Summer			
13.000	SW 05	60 Winter	1	+0%	1/30 Summer			
12.002	SW 06	60 Winter	1	+0%	1/15 Winter			
11.002	SW 07	15 Winter	1	+0%				
11.003	TANK	240 Winter	1	+0%	100/60 Winter			
11.004	SW 08	240 Winter	1	+0%	1/60 Summer			
14.000	EX MH 13	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
14.001	EX MH 14	15 Winter	1	+0%	30/15 Summer			
14.002	EX MH 16	15 Winter	1	+0%				
14.003	EX MH 46	15 Winter	1	+0%	100/15 Summer			
14.004	EX MH 11	15 Winter	1	+0%	100/15 Summer			
14.005	EX MH 07	15 Winter	1	+0%	30/15 Summer			
11.005	EX MH 08	15 Winter	1	+0%	30/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
9.002	SW 11	120.518	0.078	0.000	0.35			1.2	SURCHARGED
9.003	SW 12	120.508	0.113	0.000	0.42		26	1.4	SURCHARGED
10.000	SW 13	120.495	0.145	0.000	0.16			0.5	SURCHARGED
9.004	SW 14	120.492	0.172	0.000	0.57		35	2.2	SURCHARGED
7.003	CO 03	120.437	0.092	0.000	1.24			20.6	SURCHARGED
11.000	SW 01	123.238	-0.217	0.000	0.17			10.0	OK
11.001	SW 02	123.199	-0.276	0.000	0.16			16.8	OK
12.000	SW 03	125.790	-0.060	0.000	0.32		5	3.7	OK
12.001	SW 04	125.089	0.364	0.000	1.15		8	6.1	SURCHARGED
13.000	SW 05	124.147	0.222	0.000	1.38		12	1.7	SURCHARGED
12.002	SW 06	124.089	0.284	0.000	1.17		12	7.2	SURCHARGED
11.002	SW 07	123.119	-0.256	0.000	0.22			22.1	OK
11.003	TANK	122.466	-0.249	0.000	0.06			5.3	OK
11.004	SW 08	122.463	0.058	0.000	0.47			5.3	SURCHARGED
14.000	EX MH 13	126.188	-0.042	0.000	0.61			4.0	OK
14.001	EX MH 14	125.985	-0.025	0.000	0.91			5.9	OK
14.002	EX MH 16	125.834	-0.096	0.000	0.28			7.9	OK
14.003	EX MH 46	125.582	-0.098	0.000	0.26			10.2	OK
14.004	EX MH 11	124.344	-0.086	0.000	0.37			12.5	OK
14.005	EX MH 07	123.339	-0.071	0.000	0.54			12.5	OK
11.005	EX MH 08	122.361	-0.039	0.000	0.90			12.3	OK

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

PN	US/MH Name	Level Exceeded
9.002	SW 11	
9.003	SW 12	
10.000	SW 13	
9.004	SW 14	
7.003	CO 03	
11.000	SW 01	
11.001	SW 02	
12.000	SW 03	
12.001	SW 04	
13.000	SW 05	
12.002	SW 06	
11.002	SW 07	
11.003	TANK	
11.004	SW 08	
14.000	EX MH 13	2
14.001	EX MH 14	
14.002	EX MH 16	
14.003	EX MH 46	
14.004	EX MH 11	
14.005	EX MH 07	
11.005	EX MH 08	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 6.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 12
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.286
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SW 15	240 Winter	30	+0%	100/60 Summer			
2.000	SW 16	30 Winter	30	+0%	1/60 Winter			
3.000	PITCH	960 Winter	30	+0%				
1.001	SW 17	15 Winter	30	+0%	1/30 Winter			
1.002	EX MH 40	30 Summer	30	+0%	1/30 Winter			
4.000	EX MH 18	15 Winter	30	+0%	100/15 Summer			
5.000	EX MH INT	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
4.001	EX MH 19	15 Winter	30	+0%	30/15 Summer			
4.002	EX MH 20	15 Winter	30	+0%	30/15 Summer			
4.003	EX MH22	15 Winter	30	+0%	30/15 Summer			
6.000	EX MH 25	15 Winter	30	+0%	100/15 Summer			
4.004	EX MH 24	15 Winter	30	+0%	1/15 Summer			
7.000	EX MH 29	15 Winter	30	+0%	30/15 Summer			
7.001	CO 01	15 Winter	30	+0%	30/15 Summer			
8.000	EX MH 04	15 Winter	30	+0%	100/15 Winter			
7.002	CO 02	15 Winter	30	+0%	1/15 Summer			
9.000	SW 09	180 Winter	30	+0%	30/30 Winter			
9.001	SW 10	120 Winter	30	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW 15	130.082	-0.018	0.000	0.58		108	2.4	OK
2.000	SW 16	130.467	0.452	0.000	1.83		8	8.6	SURCHARGED
3.000	PITCH	129.955	-0.090	0.000	0.13			2.0	OK
1.001	SW 17	130.180	0.260	0.000	1.52		15	6.6	SURCHARGED
1.002	EX MH 40	130.170	0.230	0.000	0.13			2.1	SURCHARGED
4.000	EX MH 18	127.122	-0.018	0.000	0.27			7.0	OK
5.000	EX MH INT	127.209	0.069	0.000	0.78			13.3	SURCHARGED
4.001	EX MH 19	127.108	0.288	0.000	0.96			19.3	SURCHARGED
4.002	EX MH 20	126.614	0.384	0.000	1.04			26.7	SURCHARGED
4.003	EX MH22	126.419	0.369	0.000	0.93			27.7	SURCHARGED
6.000	EX MH 25	126.223	-0.097	0.000	0.27			6.4	OK
4.004	EX MH 24	126.110	0.480	0.000	2.06			42.0	SURCHARGED
7.000	EX MH 29	122.600	0.610	0.000	1.04			19.5	SURCHARGED
7.001	CO 01	122.283	1.183	0.000	1.08			24.1	SURCHARGED
8.000	EX MH 04	123.373	-0.087	0.000	0.37			17.9	OK
7.002	CO 02	121.925	1.125	0.000	1.51			34.8	SURCHARGED
9.000	SW 09	120.707	0.057	0.000	0.56		67	1.9	SURCHARGED
9.001	SW 10	120.731	0.196	0.000	0.60			2.0	FLOOD RISK

PN	US/MH Name	Level Exceeded
1.000	SW 15	
2.000	SW 16	
3.000	PITCH	
1.001	SW 17	
1.002	EX MH 40	
4.000	EX MH 18	
5.000	EX MH INT	5
4.001	EX MH 19	
4.002	EX MH 20	
4.003	EX MH22	
6.000	EX MH 25	
4.004	EX MH 24	
7.000	EX MH 29	
7.001	CO 01	
8.000	EX MH 04	
7.002	CO 02	
9.000	SW 09	
9.001	SW 10	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
9.002	SW 11	60 Winter	30	+0%	1/15 Summer			
9.003	SW 12	60 Winter	30	+0%	1/15 Summer			
10.000	SW 13	30 Summer	30	+0%	1/15 Summer			
9.004	SW 14	30 Winter	30	+0%	1/15 Summer			
7.003	CO 03	15 Winter	30	+0%	1/15 Summer			
11.000	SW 01	15 Winter	30	+0%				
11.001	SW 02	15 Winter	30	+0%				
12.000	SW 03	30 Winter	30	+0%	30/15 Summer			
12.001	SW 04	60 Winter	30	+0%	1/15 Summer			
13.000	SW 05	60 Winter	30	+0%	1/30 Summer			
12.002	SW 06	120 Winter	30	+0%	1/15 Winter			
11.002	SW 07	15 Winter	30	+0%				
11.003	TANK	360 Winter	30	+0%	100/60 Winter			
11.004	SW 08	360 Winter	30	+0%	1/60 Summer			
14.000	EX MH 13	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
14.001	EX MH 14	15 Winter	30	+0%	30/15 Summer			
14.002	EX MH 16	15 Winter	30	+0%				
14.003	EX MH 46	15 Winter	30	+0%	100/15 Summer			
14.004	EX MH 11	15 Winter	30	+0%	100/15 Summer			
14.005	EX MH 07	15 Winter	30	+0%	30/15 Summer			
11.005	EX MH 08	15 Winter	30	+0%	30/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
9.002	SW 11	120.769	0.329	0.000	0.77			2.6	SURCHARGED
9.003	SW 12	120.781	0.386	0.000	0.61		30	2.0	SURCHARGED
10.000	SW 13	120.837	0.487	0.000	0.95			3.0	SURCHARGED
9.004	SW 14	120.810	0.490	0.000	0.57		10	2.2	SURCHARGED
7.003	CO 03	120.881	0.536	0.000	2.01			33.3	SURCHARGED
11.000	SW 01	123.301	-0.154	0.000	0.41			24.5	OK
11.001	SW 02	123.271	-0.204	0.000	0.42			45.1	OK
12.000	SW 03	125.962	0.112	0.000	0.59		6	7.0	SURCHARGED
12.001	SW 04	125.848	1.123	0.000	1.35		20	7.2	SURCHARGED
13.000	SW 05	124.715	0.790	0.000	2.35		17	2.9	SURCHARGED
12.002	SW 06	124.246	0.441	0.000	1.26		27	7.7	SURCHARGED
11.002	SW 07	123.192	-0.183	0.000	0.52			52.2	OK
11.003	TANK	122.679	-0.036	0.000	0.09			7.7	OK
11.004	SW 08	122.670	0.265	0.000	0.61			6.9	SURCHARGED
14.000	EX MH 13	126.397	0.167	0.000	0.96			6.4	SURCHARGED
14.001	EX MH 14	126.197	0.187	0.000	1.57			10.1	SURCHARGED
14.002	EX MH 16	125.861	-0.069	0.000	0.55			15.4	OK
14.003	EX MH 46	125.613	-0.067	0.000	0.57			22.6	OK
14.004	EX MH 11	124.403	-0.027	0.000	0.89			29.6	OK
14.005	EX MH 07	123.641	0.231	0.000	1.24			28.6	SURCHARGED
11.005	EX MH 08	122.651	0.251	0.000	1.63			22.4	SURCHARGED

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

PN	US/MH Name	Level Exceeded
9.002	SW 11	
9.003	SW 12	
10.000	SW 13	
9.004	SW 14	
7.003	CO 03	
11.000	SW 01	
11.001	SW 02	
12.000	SW 03	
12.001	SW 04	
13.000	SW 05	
12.002	SW 06	
11.002	SW 07	
11.003	TANK	
11.004	SW 08	
14.000	EX MH 13	2
14.001	EX MH 14	
14.002	EX MH 16	
14.003	EX MH 46	
14.004	EX MH 11	
14.005	EX MH 07	
11.005	EX MH 08	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 6.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 12
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.286
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SW 15	180 Winter	100	+30%	100/60 Summer			
2.000	SW 16	30 Winter	100	+30%	1/60 Winter			
3.000	PITCH	960 Winter	100	+30%				
1.001	SW 17	15 Winter	100	+30%	1/30 Winter			
1.002	EX MH 40	15 Winter	100	+30%	1/30 Winter			
4.000	EX MH 18	15 Winter	100	+30%	100/15 Summer			
5.000	EX MH INT	30 Winter	100	+30%	30/15 Summer	100/15 Summer		
4.001	EX MH 19	15 Winter	100	+30%	30/15 Summer			
4.002	EX MH 20	15 Winter	100	+30%	30/15 Summer			
4.003	EX MH22	15 Winter	100	+30%	30/15 Summer			
6.000	EX MH 25	15 Winter	100	+30%	100/15 Summer			
4.004	EX MH 24	15 Winter	100	+30%	1/15 Summer			
7.000	EX MH 29	15 Winter	100	+30%	30/15 Summer			
7.001	CO 01	15 Winter	100	+30%	30/15 Summer			
8.000	EX MH 04	15 Winter	100	+30%	100/15 Winter			
7.002	CO 02	15 Winter	100	+30%	1/15 Summer			
9.000	SW 09	240 Winter	100	+30%	30/30 Winter			
9.001	SW 10	30 Summer	100	+30%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW 15	130.149	0.049	0.000	0.70		119	2.9	SURCHARGED
2.000	SW 16	130.625	0.610	0.000	2.28		8	10.7	SURCHARGED
3.000	PITCH	130.015	-0.030	0.000	0.14			2.2	OK
1.001	SW 17	130.356	0.436	0.000	1.87		18	8.1	SURCHARGED
1.002	EX MH 40	130.351	0.411	0.000	0.14			2.2	SURCHARGED
4.000	EX MH 18	127.643	0.503	0.000	0.34			9.0	FLOOD RISK
5.000	EX MH INT	127.603	0.463	2.704	0.91			15.4	FLOOD
4.001	EX MH 19	127.611	0.791	0.000	1.12			22.4	FLOOD RISK
4.002	EX MH 20	127.216	0.986	0.000	1.18			30.2	SURCHARGED
4.003	EX MH22	126.958	0.908	0.000	1.06			31.4	SURCHARGED
6.000	EX MH 25	126.584	0.264	0.000	0.34			8.0	SURCHARGED
4.004	EX MH 24	126.535	0.905	0.000	2.66			54.3	SURCHARGED
7.000	EX MH 29	124.431	2.441	0.000	1.10			20.5	SURCHARGED
7.001	CO 01	123.831	2.731	0.000	1.40			31.2	SURCHARGED
8.000	EX MH 04	123.490	0.030	0.000	0.60			28.8	SURCHARGED
7.002	CO 02	123.242	2.442	0.000	2.02			46.4	SURCHARGED
9.000	SW 09	120.850	0.200	0.000	0.56		149	1.9	SURCHARGED
9.001	SW 10	120.853	0.318	0.000	0.37			1.2	FLOOD RISK

PN	US/MH Name	Level Exceeded
1.000	SW 15	
2.000	SW 16	
3.000	PITCH	
1.001	SW 17	
1.002	EX MH 40	
4.000	EX MH 18	
5.000	EX MH INT	5
4.001	EX MH 19	
4.002	EX MH 20	
4.003	EX MH22	
6.000	EX MH 25	
4.004	EX MH 24	
7.000	EX MH 29	
7.001	CO 01	
8.000	EX MH 04	
7.002	CO 02	
9.000	SW 09	
9.001	SW 10	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
9.002	SW 11	120 Winter	100	+30%	1/15 Summer			
9.003	SW 12	60 Winter	100	+30%	1/15 Summer			
10.000	SW 13	15 Winter	100	+30%	1/15 Summer			
9.004	SW 14	60 Winter	100	+30%	1/15 Summer			
7.003	CO 03	15 Winter	100	+30%	1/15 Summer			
11.000	SW 01	15 Winter	100	+30%				
11.001	SW 02	15 Winter	100	+30%				
12.000	SW 03	60 Winter	100	+30%	30/15 Summer			
12.001	SW 04	60 Winter	100	+30%	1/15 Summer			
13.000	SW 05	120 Winter	100	+30%	1/30 Summer			
12.002	SW 06	240 Winter	100	+30%	1/15 Winter			
11.002	SW 07	15 Winter	100	+30%				
11.003	TANK	480 Winter	100	+30%	100/60 Winter			
11.004	SW 08	480 Winter	100	+30%	1/60 Summer			
14.000	EX MH 13	15 Winter	100	+30%	30/15 Summer	100/15 Winter		
14.001	EX MH 14	15 Winter	100	+30%	30/15 Summer			
14.002	EX MH 16	15 Winter	100	+30%				
14.003	EX MH 46	15 Winter	100	+30%	100/15 Summer			
14.004	EX MH 11	15 Winter	100	+30%	100/15 Summer			
14.005	EX MH 07	15 Winter	100	+30%	30/15 Summer			
11.005	EX MH 08	15 Winter	100	+30%	30/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
9.002	SW 11	120.888	0.448	0.000	0.61			2.0	SURCHARGED
9.003	SW 12	120.893	0.498	0.000	0.44			1.5	SURCHARGED
10.000	SW 13	120.961	0.611	0.000	2.15			6.7	SURCHARGED
9.004	SW 14	120.902	0.582	0.000	0.57		47	2.2	SURCHARGED
7.003	CO 03	121.407	1.062	0.000	2.65			43.9	FLOOD RISK
11.000	SW 01	123.369	-0.086	0.000	0.68			41.0	OK
11.001	SW 02	123.337	-0.138	0.000	0.70			75.7	OK
12.000	SW 03	126.061	0.211	0.000	0.45		27	5.3	SURCHARGED
12.001	SW 04	126.052	1.327	0.000	1.40		47	7.5	SURCHARGED
13.000	SW 05	124.759	0.834	0.000	2.35		49	2.9	SURCHARGED
12.002	SW 06	124.405	0.600	0.000	1.35		44	8.2	SURCHARGED
11.002	SW 07	123.260	-0.115	0.000	0.82			82.5	OK
11.003	TANK	123.017	0.302	0.000	0.15			13.4	SURCHARGED
11.004	SW 08	123.069	0.664	0.000	0.61			6.9	SURCHARGED
14.000	EX MH 13	126.760	0.530	0.228	1.29			8.5	FLOOD
14.001	EX MH 14	126.472	0.462	0.000	2.07			13.4	FLOOD RISK
14.002	EX MH 16	125.921	-0.009	0.000	0.80			22.2	OK
14.003	EX MH 46	125.798	0.118	0.000	0.79			31.3	SURCHARGED
14.004	EX MH 11	125.170	0.740	0.000	1.09			36.4	SURCHARGED
14.005	EX MH 07	123.986	0.576	0.000	1.56			35.8	SURCHARGED
11.005	EX MH 08	122.910	0.510	0.000	2.09			28.6	SURCHARGED

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

PN	US/MH Name	Level Exceeded
9.002	SW 11	
9.003	SW 12	
10.000	SW 13	
9.004	SW 14	
7.003	CO 03	
11.000	SW 01	
11.001	SW 02	
12.000	SW 03	
12.001	SW 04	
13.000	SW 05	
12.002	SW 06	
11.002	SW 07	
11.003	TANK	
11.004	SW 08	
14.000	EX MH 13	2
14.001	EX MH 14	
14.002	EX MH 16	
14.003	EX MH 46	
14.004	EX MH 11	
14.005	EX MH 07	
11.005	EX MH 08	

6.9 Appendix 9 – Flood Exceedance Plan

LEGEND

FLOOD EXCEEDANCE ROUTE

1029730 A1

Based on	
Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

1. THE ARROWS ON THIS DRAWING INDICATE OVERLAND FLOW DIRECTION DU TO SYSTEM FAILURE
2. DRAWING TO BE READ IN CONJUNCTION WITH OTHER DRAINAGE DRAWINGS

Issue	Date	Description	By	Chkd	Verfd
P02	23.11.21	SITE LAYOUT UPDATED	MAK	MLC	MLC
P01	10.11.21	ISSUED FOR INFORMATION	EH	MAK	MLC

Project
GREENHEAD COLLEGE
HUDDERSFIELD

Client
GALIFORD TRY

Architect
RYDER

Title
FLOOD EXCEEDANCE PLAN

Drawing No.
NE8659-CCS-ZZ-XX-DR-D-0508

Drawing Status
S2-INFORMATION

Job No.
1029730

Scale
1:500

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True scale at 1:1

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