STAR RADCLIFFE ACADEMY

OUTLINE DRAINAGE STRATEGY

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1.0 INTRODUCTION

1.1 Purpose of this report

This Outline Drainage Strategy has been prepared to support the planning application for the proposed Star Radcliffe Academy development.

The assessment includes a summary of the site, an estimate of the existing and proposed surface water discharge rates, an infiltration assessment, a SuDS assessment, and outline drainage proposals and performance criteria.

This report should be read in conjunction with the Flood Risk Assessment (renaissance, FS1013-REN-XX-XX-T-C-0160, August 2023).

The proposals within this report are intended to demonstrate the feasibility of the overarching drainage strategy to support the planning proposal.

2.0 THE SITE

2.1 Site Location

The proposed development site is located off Spring Lane, Radcliffe.

The site location is described below:

- Post Code M26 2SZ
- OS X (Easting) 378714
- OS Y (Northing) 407606
- Nat. Grid SD 787076

The site location is illustrated in Figure 2.1 below.

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Figure 2.1: Indicative Site Location

2.1 Site Description

The site is circa 4.56 hectares comprising approximately 43% impermeable hard standing. Based on aerial imagery and the topographical survey information (Appendix A), the site is occupied by a school (Spring Lane School) and leisure centre with swimming pool (Radcliffe Leisure Centre) in the south as well as tarmacadam hardstanding associated with car parking beyond. The north-west of the site is occupied by open grassland.

The topographical survey (Appendix A) indicates that the site lies approximately between 77.000m AOD at the north-western boundary and 69.300m AOD at the south-eastern boundary.

A 2300mm diameter surface water culvert is indicated to cross the southern portion of the site, flowing from west to east.

2.2 Existing Site Drainage

CCTV and utility surveys have been carried out to trace the existing drainage on site.

The foul drainage network associated with the existing buildings is indicated to discharge from the site on the eastern boundary underneath the Metrolink track, however, the survey information does not extend far enough to trace the connection into the public sewer network.

CCTV survey information indicates the surface water from the site discharges into the existing combined drainage and the culvert running beneath the southern portion of the site.

A further CCTV survey has been commissioned to confirm the connectivity of the culvert and existing combined drainage into the downstream sewer network / watercourse.

Refer to Appendix B for the United Utilities sewer records.

2.3 Geology

The lower south-eastern part of the site is largely underlain by granular made ground to about 2m depth overlying glacial till. Further granular made ground exists over the upper north-western part of the site but this is largely restricted to an area of former allotments. The natural ground in this area consists of glacial sand and gravel extending 4m in depth resting on glacial till.

The deeper solid geology is the Pennine Middle Coal Measures formation comprising mudstone, siltstone and sandstone. Boreholes have indicated that the depth to the bedrock varies from 12.6m to 20.5m below the existing ground level.

For further details, reference should be made to the phase 2 geo-environmental report produced by Geotechnics.

2.4 Hydrology and Hydrogeology

The closest surface water feature is the Manchester, Bolton and Bury Canal which lies 4m to the north of the site.

Based on the geology across the site, a summary of the Environment Agency aquifer designations is presented below:

STRATUM	COVERAGE	Aquifer Designation
Till, Devensian	Eastern portion of the site	Secondary Aquifer (Undifferentiated). The classification is assigned where it is not possible to attribute either category A or B to the aquifer
Glaciofluvial Sheet Deposits	Western portion of the site	Secondary A Aquifer. This geology is of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic level
Pennine Middle Coal Measures Formation	Full Site	Secondary A Aquifer. This geology is of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic level

Table 2.1 – EA Aquifer Designations of Site Geology

A summary of the pertinent hydrogeological features identified within the geo-environmental data report are provided below:

STRATUM	Distance (m) & Direction	Aquifer Designation
Nearest Groundwater Abstraction	250m	There are two entries within 250m relating to the same location, a pond/reservoir located 13m to the north-east (immediately north of the former Radcliffe West Fork Embankment). Water has been abstracted from a reservoir fed by surface water drainage for use as process water in the paper and printing industry

		initially by the East Lancashire Paper Mill Co. and then by St. Regis Paper Company U.K. Ltd.

Table 2.2 –Summary of Hydrogeological Features

2.5 Proposed Development

The proposed redevelopment consists of the demolition of the existing Spring Lane School and Radcliffe Leisure Centre (also known as Coney Green Leisure Centre). Following these demolition works it is proposed to construct a new 3-storey secondary school building along with a new artificial grass pitch, a multi-use games area (MUGA), a grass pitch, new car parking areas and access roads.

The proposed access road to the south of the site is to be adopted by Bury Council and so does not form part of our assessment of the onsite drainage as it will be covered under a separate design.

Refer to proposed development plans in Appendix C for further details of the proposed development.

3.0 EXISTING & PROPOSED SURFACE WATER DISCHARGE RATES

3.1 Pre-Development Surface Water Run-Off Rates

The privately drained area of the development site is approximately 4.56 Ha (45600m^2) comprising 1.98 Ha (19800 m^2) of impermeable area and 2.58 Ha (25800m^2) of permeable soft landscaping. Refer to the topographical survey in Appendix A and existing drained areas plan in Appendix D for further details.

3.2 Existing Brownfield Run-Off Rates

The existing surface water runoff rate from the site has been calculated using the Rational Method for direct runoff.

$$Q = 2.78CiA$$

Where:

$$Q = Maximum\ flow\ rate\ (l/s)$$

$$C = runoff\ coefficient$$

$$i = Rainfall\ Intensity\ (mm/hr)$$

$$A = Catchment\ Area\ (Ha)$$

The runoff coefficient for the area considered in the calculation has been taken as 1.0.

The rainfall intensity adopted in the calculation is 50 mm/hr.

Based on the existing drained area plan (Appendix E), the Catchment Area is 1.98 Ha.

The existing runoff rate for the site is therefore 275.5 l/s.

3.3 Existing Greenfield Run-Off Rates

As a comparison, the greenfield run-off for the site area has been considered. This has been calculated using the ICP SUDS method in InfoDrainage (Appendix F). The rates presented below are what would be typical of a site with an equivalent area which remains undeveloped / covered in grass or vegetation.

The existing site is partly developed and therefore an urbanised catchment ratio of 0.46 has been adopted in the calculations. This value is based on the proportion of the site that is currently developed according to the existing drained area plan within Appendix E.

The equivalent greenfield run-off rate is tabled below: -

RETURN PERIOD	$Q_{GREENFIELD}$ (l/s)
1 in 1-year	51.9
1 in 2-year	58.8
1 in 30-year	91.8
1 in 100-year	103.7
Q_{bar}	59.7

Table 3.2 – Greenfield Run-off Rates

3.4 Proposed Surface Water Discharge Rate

The non-Statutory Technical Standards for Sustainable Drainage Systems (2015) states that for greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1-year and 100-year rainfall events should never exceed the peak greenfield runoff rate for the same event. For developments which were previously developed (brownfield), the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1-year and 1 in 100-year rainfall events must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event but should never exceed the rate of discharge from the development prior to redevelopment for that event.

As set out within the Bury Council SFRA, developments should aim to restrict the runoff rate from site to *greenfield run-off rate where feasible*.

It is proposed that the discharge rate from site is limited to a maximum of QBAR, 59.7 l/s, for all storm events up to the 1 in 100-year storm with an allowance for climate change.

Restricting the run-off to this rate would result in an 78.3% betterment from the existing run-off rates which complies with the requirements outlined in the Non-Statutory Technical Standards for Sustainable Drainage noted above.

3.5 Attenuation Requirements

The proposed development results in approximately 21890m^2 of impermeable area.

The post development discharge rates will include for an increase in the rainfall intensity of 40% and 45% for the 1 in 30-year and 1 in 100-year storm events respectively to allow for climate change. This is consistent with a design life for the development of 100 years, as outlined by the National Planning Practice Framework (NPPF).

A quick storage estimate for the 1 in 100 year +45% allowance for climate change InfoDrainage, indicates that the approximate attenuation volumes shown in table 3.4 are required to limit the peak surface water discharge to 59.7 l/s. The InforDrainage calculations can be seen in Appendix G.

RETURN PERIOD	DEVELOPMENT AREA (ha)	SURFACE WATER ATTENUATION ESTIMATE (m^3)
1:100 Year +45% CC	2.189	993-1503

Table 3.4 – Surface Water Attenuation Estimate

4.0 SURFACE WATER DISCHARGE & SUDS ASSESSMENT

4.1 Surface Water Discharge Assessment

In accordance with NPPF, the following hierarchy of surface water drainage options has been considered:

- Discharge into the ground (infiltration);
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain, or another drainage system;
- Discharge to a combined sewer.

Infiltration has been considered. Due to the potential contamination risk posed given the presence of made ground on site, the limited infiltration rates, and elevated ground water levels in some locations, infiltration has been discounted as the primary method of discharging surface water from the site. Localised areas of infiltration are being proposed at this stage, however further site investigation will be required to confirm the feasibility.

Opportunities for discharge to a watercourse have been considered. The closest named watercourse is the Manchester, Bolton & Bury Canal which lies immediately to the northwest of the site. The topography of the site is such that the drainage network would be too deep at the point of connection for this to be a suitable discharge point. Bury Council have confirmed that a culverted watercourse flows beneath the southern portion of the site from west to east. Pre-planning advice has been sought from Bury Council LLFA to understand any of their requirements for the surface water drainage network to be connected into the culvert.

Surface water discharge rates from the site are to be restricted to QBAR for the 100-year storm event. Refer to the Outline Drainage Strategy for the Micro-Drainage outputs and initial storage estimate calculations.

Foul water flows will be collected by a dedicated gravity network designed in accordance with BS EN 752 before discharging to the existing combined drainage on site. The connectivity of the existing combined drainage network on site into the public sewer network will need to be confirmed with a CCTV survey. The foul connection will also be subject to agreement under Section 106 of the Water Industry Act.

4.2 Sustainable Urban Drainage

Table 4.1 below provides a summary of typical SuDS techniques outlined within the CIRIA C753 SuDS manual. Based on a review of the suitability of SuDS techniques it is proposed that the development may incorporate the following:

SUDS TECHNIQUE	DESCRIPTION	SUITABILITY FOR DEVELOPMENT SITE	
Rainwater Harvesting	Collection of rainwater run-off for use	Not suitable due to limited potential use for rainwater	×
Soft Landscaping	Grassed areas that allow direct infiltration of rainwater	**Suitable**	✓
Filter Drains	Linear drains / soakaways with either granular fill and perforated pipe, or dense vegetation that treat runoff from adjacent impermeable areas	**Possibly suitable in localised areas – subject to further site investigation works**	?
Swales	Shallow landscape channel that can infiltrate or convey runoff.	**Possibly suitable in localised areas – subject to further site investigation works**	?
Infiltration Basins	Depressions in the ground designed to store and infiltrate runoff to the ground. Can be landscaped to provide amenity value.	**Possibly suitable in localised areas – subject to further site investigation works**	?
Wet Ponds	Basins with permanent pool of water providing water quality treatment, wildlife, and amenity benefit.	Not suitable due to safety adjacent to school site	×

	Designed to provide temporary storage for additional runoff.		
Extended Detention Basins	Dry basins that are designed to temporarily store runoff providing water quality treatment.	**Suitable to provide a mechanism for partial infiltration – subject to further site investigation works**	**?**
Constructed Wetland	Ponds and shallow wetland areas with vegetation to improve pollution removal and enhance wildlife habitat.	Not suitable due to limited space	×
Porous Paving	Granular build-up beneath permeable paving systems that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	**Type B system suitable to car park area – subject to further site investigation works**	**?**
Trees Pits	Managed permeable paving systems around tree pits that can be used to either store runoff (lined system) and increase time of concentration or allow percolation into the ground.	**Suitable**	✓
Soakaways	Infiltration device to temporarily store runoff and allow it to percolate into the ground.	**Suitable to provide a mechanism for partial infiltration – subject to further site investigation works**	**?**
Green Roof	Vegetated roof area that reduces runoff and increases time of concentration.	Bio-solar roof provided but not utilised for storage due to architectural constraints	×
Blue Roof	Roof area designed to store and reduce peak runoff rates during intense storms.	Not suitable due to architectural constraints	×
Underground Storage	Attenuation structures installed below ground to provide runoff storage.	**Suitable within soft landscaping to the east of the site**	✓

× Not suitable ? Potentially suitable subject to further investigation ✓ Suitable

Table 4.1 – SUDs Techniques & Suitability for Development Site

4.3 Water Quality Assessment

The drainage from the site is from the roof and hard paving areas. Water quality is generally affected by frequent rainfall events (1 in 1-year events or less), which is circa 5mm/hr for the proposed development site. To assess the water quality, consideration will be given to the guidance within the National Standard for Sustainable Urban Drainage (NSSUD) and CIRIA Guide C753. The pollution hazard levels for different land uses are presented in table 4.2 and are based on the definitions in the NSSUD and C753.

POLLUTION HAZARD LEVEL	LAND USE
Very Low	Residential roofs
Low	Individual property driveways, non-residential roofs, residential car parks, low traffic roads, non-residential car parking with infrequent change (e.g. Schools, offices)
Medium	Commercial yards and delivery areas, non-residential car parking with frequent change (e.g. hospital, retail), minor roads
High	Site with heavy pollution (e.g. Haulage yards, lorry parks, waste sites, sites with chemical and fuels are delivered, handled, stored etc.)

Table 4.2 – Pollution Hazard Levels

The pollution hazard level is low based on Table 4.2 with the primary consideration given to removal of gross solids and sediment.

The following tables indicate the minimum number of treatment stages required before surface run-off should reach the infiltration or receiving water body and are extracted from the NSSUD.

POLLUTION HAZARD LEVEL	LAND USE	LOW	MEDIUM	HIGH
G1	Source Protection Zone 1, within 50m of a well, spring or borehole that supplies potable water.	1	3	Consult the EA
G2	Into or immediately adjacent to a sensitive receptor that could be influenced by infiltrated water. Includes designated nature conservation, heritage, and landscape sites – including Biodiversity Action Plan (BAP) habitats and Protected Species.	1	3	
G3	Source Protection Zone II and III or Principal Aquifer	1	3	
G4	Secondary Aquifer	1	2	
G5	Unproductive strata	1	2	

Table 4.3 – Groundwater Minimum Treatment Stages

POLLUTION HAZARD LEVEL	NORMAL SURFACE WATER	SENSITIVE SURFACE WATER
Low	0	1
Medium	2	3
High	Consult the EA	

Table 4.4 – Surface Water Body Minimum Treatment Stages

Infiltration is potentially viable in localised areas and discharge into the secondary aquifer will require 1 level of treatment for a low pollution level.

Discharge of surface water to the receiving culverted watercourse will require no treatment stages due to the low pollution hazard level. However, the adoption of SuDS, sumps and good practice will provide inherent treatment to improve the water quality of the runoff.

External areas will pass through silt traps/sumps prior to entering the attenuation and flow control devices. The silt traps and sumps will allow most of the sediment and solids to settle out under low flows, prior to discharging to the culvert.

5.0 OUTLINE DRAINAGE STRATEGY

Refer to Appendix I for the general arrangement drawing of the proposed below ground drainage strategy.

5.1 Surface Water System

The development will have a dedicated surface water network that will collect the rainwater from the proposed building and hard standing areas. The network will then discharge under gravity to the culverted watercourse running across the site subject to agreement with Bury Council LLFA.

The surface water discharge from the site is to be limited to the rate detailed within Section 3.2 of this report using a flow control device within the final manhole of the network prior to discharging into the culvert. Proposed discharge rates are to be confirmed with Bury Council LLFA and United Utilities as part of the detailed design.

Attenuation will be provided in the form of permeable surfacing build-ups and a detention basin. It should be noted that the drainage of the pitches has been designed to fully infiltrate, however this will be subject to further infiltration testing and at this stage they have been included in the overall impermeable area figure.

The surface water drainage network is to be designed in accordance with Building Regulations Part H, BS EN 752 and Code for Adoption. In addition, the following requirements will also be adopted in accordance with the Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance:

- The below ground drainage system will be designed to ensure flooding does not occur on site for the 1 in 30-year rainfall event with no internal flooding for the 1 in 100-year rainfall event.
- The surface water system is to be designed to accommodate the 1-, 2-, 30- and 100-year rainfall events with an increase in the rainfall intensity of 40% and 45% for the 1 in 30-year and 1 in 100-year storm events respectively to allow for climate change. The system will be designed for a maximum storm duration of 6 hours.

Based on initial comments from Manchester Metrolink, all drainage and associated surface finishes adjacent to the Metrolink line to the east of the site will be designed to fall away from the embankment to prevent any impacts on its stability.

5.2 Foul Water System

The site will have a dedicated foul water network that will collect the foul water associated with the development before connecting into the existing combined network in the southern part of the site.

The combined drainage connection will be subject to further survey work to confirm connectivity with the public sewer and a Section 106 application with United Utilities.

The drainage system is to be designed in accordance with Building Regulations Part H, BS EN 752 and Codes for Adoption.

5.3 Phasing & Surface Water Management During Construction

The development is intended to be delivered in a single phase.

Surface water management during construction will be addressed by the Main Contractor as part of their 'Construction Management Plan'.

A brief overview of the key considerations relating to surface water management and flood risk that will need to be incorporated into the Main Contractor's construction methodology include:

- Subject to the level of contamination beneath the site and site remediation required, as well as the quality of working platform compaction to reduce infiltration, consideration should be given to the risk of residual contamination on site affecting groundwaters and adjacent watercourses.
- The risk of diesel spillage and other contamination risk during construction activities are to be assessed and measures implemented to ensure they do not cause a risk to groundwaters and the adjacent watercourse.

6.0 FUTURE MANAGEMENT & MAINTENANCE

The proposed drainage solution uses SuDS techniques in accordance with the CIRIA SUDS Manual C753. The following SuDS features have been adopted in the drainage strategy for Star Radcliffe Academy:-

- Permeable Paving
- Extended Detention Basin
- Soft Landscaping
- Tree Pits
- Inspection chambers, manholes and catchpits.
- Pipes.
- Drainage channels and gullies.
- Flow control device

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

The Main Contractor delivering the development is to update the general requirements to reflect the product specific requirements of the as-installed proprietary SuDS and incorporate these into the Operation & Maintenance Manual for the building.

The Main Contractor should provide a Verification Report, including photographic evidence, to demonstrate that the drainage has been constructed as per the design drawings. As-built drawings should be supplied by the Main Contractor where the drainage varies from the construction drawings.

The maintenance of the specified SuDS should be detailed in accordance with the CIRIA SuDS Manual C753, as per the operation and maintenance guidance outlined below.

6.1 General Maintenance & Inspection Requirements

No work shall be carried out on the drainage system without permission from a nominated person, who has access to information/a working knowledge of the system.

Maintenance/inspection work shall be carried out in a safe/planned manner.

All work is to be carried out by competent persons suitably trained and equipped in accordance with current statutory safe working policies.

Entry into confined spaces shall be kept to a minimum and be restricted to suitably qualified/equipped personnel working in accordance with current statutory safe working policies.

Drainage systems shall be inspected on a regular basis or when any problems arise. Any debris/defects discovered shall be recorded and a programme of cleaning/ repair initiated. Urgent repairs/cleaning shall be actioned as soon as practicable.

It is recommended that the drainage system is inspected a minimum of twice a year, with the system also being inspected after all major storm events.

Clearing of the drainage system can be achieved by a number of methods depending on the nature of the work;

- Rodding – manual/mechanical with flexible rods.
- Jetting – high-pressure water jetting.
- Plunging.

6.2 Inspection Chambers, Manholes and Catchpits

The appropriate health and safety equipment must be used when accessing manholes/catchpits. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access. The following operations should be carried out annually:

- Covers of inspection chambers and manholes shall be removed and the sides, benching and channels cleared.
- Deposits of silt in inspection chambers, catchpits and manholes shall be removed. Any traps shall then be plunged and thoroughly flushed out with clean water. This should be completed in Autumn, after leaf fall has halted.
- Main and branch drains shall be cleared as required and afterwards be flushed with clean water. Any obstructions found shall be removed and not flushed down the system.
- Covers of inspection chambers, manholes and catchpits shall be replaced, bedded in suitable sealing material as required and bolted/locked down as appropriate. Missing bolts and broken items shall be replaced in accordance with the manufacturer's details.

6.3 Pipes

Regular inspection and maintenance are important to identify areas which may have become obstructed/clogged and may not be draining correctly, failure to do so would expose the development to flood risk.

Pipes are proprietary products and therefore the materials used can vary across the site. As such, the manufacturer's recommendations should be followed. Access for maintenance of the pipes is provided through inspection chambers and manholes.

6.4 Drainage Channels and Gullies

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned using a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should always be kept clear to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating. The below table sets out the maintenance schedule for the drainage channel and gully components of the proposed drainage systems.

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular Maintenance	Litter and debris removal.	Monthly or as required.
	Check and remove large debris and/or vegetation growth near pipe runs.	Monthly or as required.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.
Remedial Actions	Inspect access/outlet boxes and rod through poorly performing channels and outlets as initial	As required.

	remediation.	
	Seek advice as to remediation techniques suitable for the type of performance issue.	As required, if above actions do not improve performance.
Monitoring	Initial inspection including channel outlet boxes and gully sumps.	Monthly for 3 months, then six monthly intervals. Also, 48 hours after large storms.

6.5 Flow Control Device

Regular inspection and maintenance are important, to identify if the vortex flow control device has become obstructed/clogged and may not be functioning correctly, as failure to do so would expose the development to a risk of flooding.

Vortex flow control devices are proprietary products and therefore can vary from manufacturer to manufacturer. As such, the manufacturer's recommendations should be followed. Normally, little maintenance is required as a vortex flow control device has no moving parts.

If blockages occur, they tend to do so at the intake of the vortex flow control device.

Vortex flow control devices are generally fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

The smaller conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the vortex flow control device it is vitally important that any building materials etc. are removed from the unit and the chamber.

After the system is made fully functional, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. Units should also be inspected within 48 hours after large storms.

6.6 Permeable Pavements

Regular inspection and maintenance are important for the effective operation of pervious pavements. Maintenance responsibility for a pervious pavement and its surrounding area should be placed with an appropriate responsible organisation. Before handing over the pavement to the client, it should be inspected for clogging, litter, weeds and water ponding, and all failures should be rectified after handover, the pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over the whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturers recommendations – pay particular attention to areas where water runs onto pervious 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 landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered	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 h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

6.7 Extended Detention Basin

Maintenance responsibilities for a basin should always be placed with an appropriate organisation. Adequate access should be provided to all detention basin areas for inspection and maintenance, including for appropriate equipment and vehicles. Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from the site.

The maintenance requirements for detention basins are outlined within Table 13.2 of the CIRIA SUDS Manual C753. A copy of that table is replicated below to set out the maintenance schedule for the cellular attenuation tank component of the proposed drainage systems.

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

6.8 Tree Pits

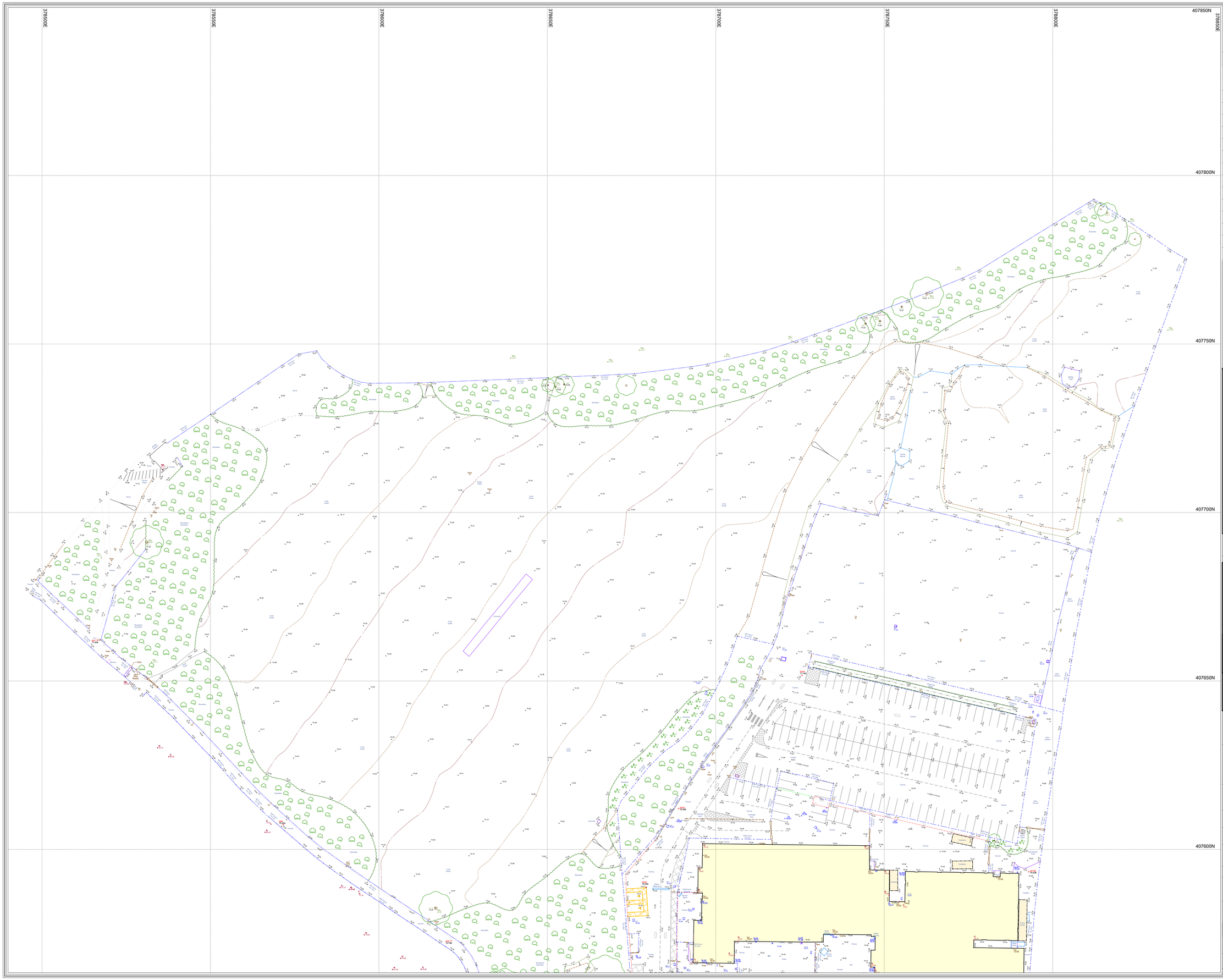
Maintenance requirements of trees will be greatest during the first few years, when the tree is becoming established. Early maintenance should involve regular inspection, removal of invasive vegetation and possible irrigation during long dry periods, particularly in soils with high void ratios. Tree roots need to establish good root-soil contact before they can efficiently

extract water from the soil. The expertise of an arboriculturist/landscape architect with local knowledge should be sought regarding appropriate irrigation schedules. Maintenance responsibility for a tree pit or planter should always be placed with an appropriate organisation.

The maintenance requirements for tree pits are outlined within Table 19.3 of the CIRIA SUDS Manual C753. A copy of that table is replicated below.

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Remove litter and debris	Monthly
	Manage other vegetation and remove nuisance plants	Monthly (during growing season), or as required
	Inspect inlets and outlets	Half yearly (spring – before nesting season, and autumn)
Occasional Maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Remedial actions	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

APPENDIX A
Existing Topographical and Utilities Survey Information



N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
GH1	378768.7125	407439.5951	69.4040
GH2	378723.9184	407434.7625	70.2157
GH3	378686.4828	407493.0440	72.1509
GH4	378652.4071	407522.5137	74.1746
GH5	378621.4679	407572.9205	73.7960
GH6	378571.6364	407607.3930	75.2537
GH7	378516.4417	407662.0965	77.2056
GH20	378718.3002	407481.7274	70.0546
GH21	378678.6761	407524.0673	70.3399
GH22	378679.3056	407588.8192	70.3052
GH23	378688.9806	407612.1280	70.4496
GH24	378725.6336	407651.6431	71.1628
GH100	378762.6144	407486.4439	70.2300
GH101	378790.9402	407525.9993	70.2479
GH102	378792.9497	407593.3598	70.5357

OS Note:

Some services may have been omitted due to parked vehicles. The Ordnance Survey tile is to be used as a guide only.

OS Buildings *Surveyed Buildings*

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigational Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.
The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

Buildings
Wall
Early line
Line marking
Drop kerb / Crossing point
Centre line
Spot Level
Fence types:
SW Interwoven
IR Iron Railings
WM Wire Mesh
PR Post & Rail
PW Post & Wire
CL Chain Link
WF Wooden Panels
CP Concrete Panels
SP Steel Palisade
Overhead Cable
Concrete edge
Tarmac edge
Grass verge
Canopy/Overhang
Hedge
Station and Name
Station Lever
Tree / Bush / Sapling
Area of Undergrowth
Woodland
R. Ridge Level
E. Eave Level
F. Flat Roof Level
TWL Top of Wall Level
Gate

IC Inspection chamber
Pipe Pipe invert
Gy Gully
Bg Back gully
Dp Down pipe
Pipe Pipe above ground
MH Manhole
WL Water level
FL Fixed light
Lp Lamp post
Tp Telegraph post
Ep Electricity post
Tl Traffic light
Bus Bus stop
Sv Stop valve
St Stop tap
Er Earth rod
Wm Water meter
Gas Gas valve
Av Air valve
ICU Unidentified inspection
Wo Wash out
Re Rodding eye
BB Belisha beacon
CTV Cable tv
Mp Marker post
Gmkr Gas marker post
So Soffit

Bo Bollard
IB Illuminated bollard
Bin Rubbish bin
Vp Vent pipe
Grl Ground light
Lava Lattice box
Ld Ladder
Sig Stile
FL Internal floor level
THL Threshold level
Sp Sign post
TW Trafficlite
BH Borehole
ELC Electric
BT British Telecom
CTbox Control box
TT Tactile
BP Brick paved
CPS Concrete paving slabs
CVR Cover
IC Inspection chamber
Rwall Retaining wall
UTR Unable to raise
TCL Tree canopy level
G Girth
MG Multi girth
Stmp Tree Stump
CL Cover level
IL Invert level

Rev	Date	Description	Drawn	Q. Ref

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t. (0133) 283 0044	t. (0172) 785 4481	t. (0207) 224 1806

CLIENT
Mott MacDonald

PROJECT
Land off Spring Lane Radcliffe, Bury M26 2SZ

TITLE
Topographical Survey

SCALE	DATE
A1@ 1: 500	21.01.22
DRAWN	**QUALITY REF**
MT	GH12664

Level datum	See notes
Grid orientation	See notes
Job number	42645

Drawing No.	Rev.
42645_T	0

Comments
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All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

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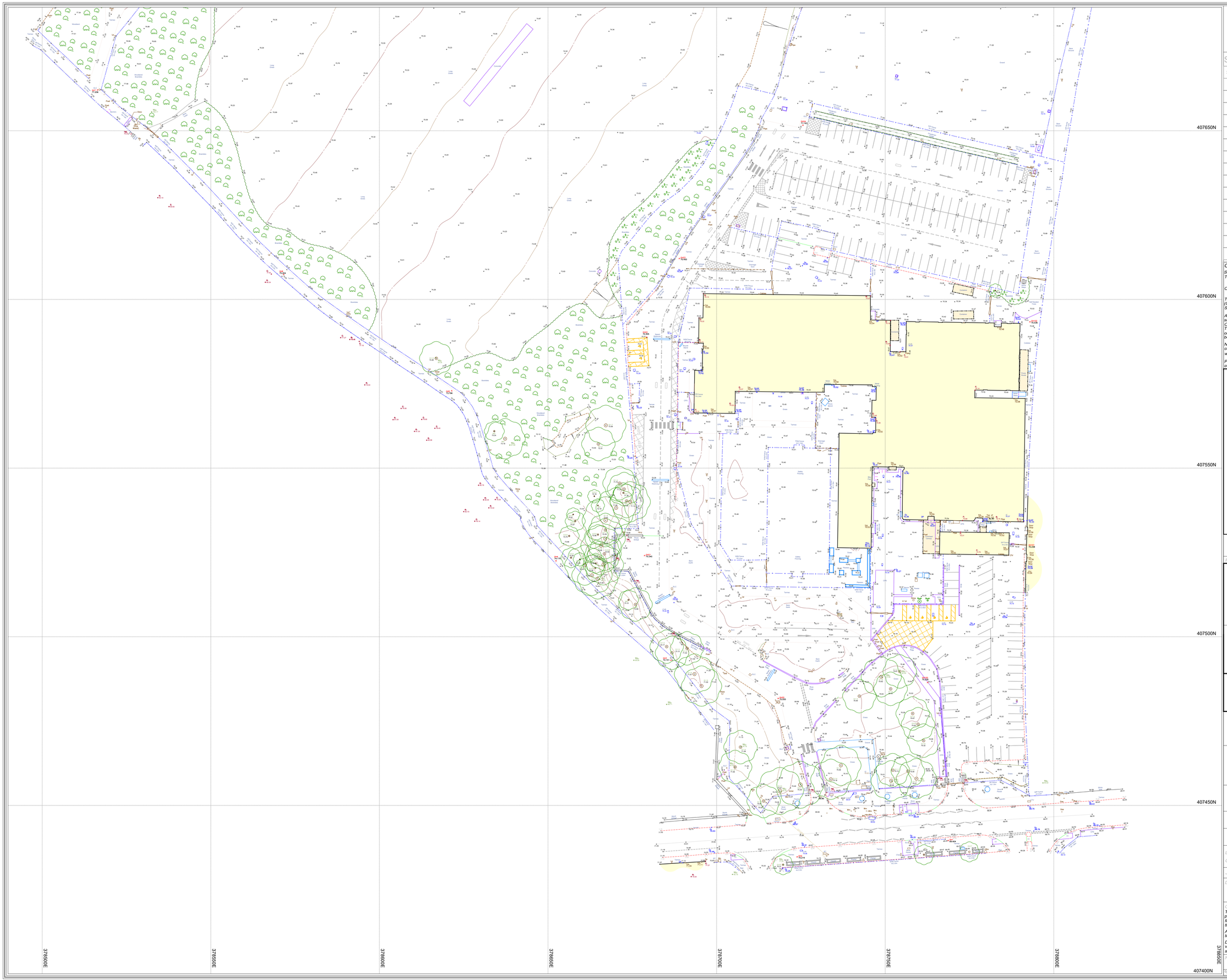

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Legend:

Buildings
Walls
Early line
Line marking
Drop kerb
Accessibility
Centre line
Station and Name
100.000 Station Level
Tree / Bush / Sapling
Area of Undergrowth
Woodland
R: Ridge Level
E: Eaves Level
F: Flat Roof Level
TWL: Top of Wall Level
Gate
Fence types:
IW Interwoven
IR Iron Railings
WM Wire Mesh
PR Post & Rail
PW Post & Wire
CL Chain Link
WP Wooden Panels
CP Concrete Panels
SP Steel Palisade

Overhead Cable
Concrete edge
Tarmac edge
Grass verge
Canopy/Overhang
Drain

IC Inspection chamber
Pinv Pipe invert
Gy Gully
Bg Back gully
Dp Down pipe
Pipe Pipe above ground
MH Manhole
WL Water level
Fl Flood light
Lp Lamp post
Tp Telegraph post
Ep Electricity post
Tl Traffic light
Bus Bus stop
Sv Stop valve
St Stop tap
Er Earth rod
Wm Water meter
Gas Gas valve
Av Air valve
ICU Unidentified inspection
Wo Wrash out
Re Rodding eye
BB Beltelre beacon
CTV Cable tv
Mc Marker post
Gmkr Gas marker post
Sv Soffit

Bo Bollard
Il Illuminated bollard
Bin Rubbish bin
Vp Vent pipe
Gri Ground light
Ldrx Ladder box
Ld Ladder
Sly Stile
IFL Internal floor level
THL Threshold level
Sp Sign post
Tw Trailhole
BH Borehole
ELC Electric
BT British Telecom
Chox Control box
TT Tactile
BP Brick paved
CPS Concrete paving slab
CVR Cover
IC Inspection chamber
Rwall Retaining wall
UTR Unable to raise
TCL Tree canopy level
G Girth
MG Multi girth
Stmp Tree Stump
CL Cover level
IL Invert level

Rev	Date	Description	Drawn	Q. Ref

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CLIENT

Mott MacDonald

PROJECT

Land off Spring Lane Radcliffe, Bury M26 2SZ

TITLE

Topographical Survey

SCALE	DATE
A1@ 1: 500	21.01.22
DRAWN	QUALITY REF
MT	GH12664

Level datum	See notes
Grid orientation	See notes
Job number	42645

Drawing No.	Rev.
42645_T	0

Comments

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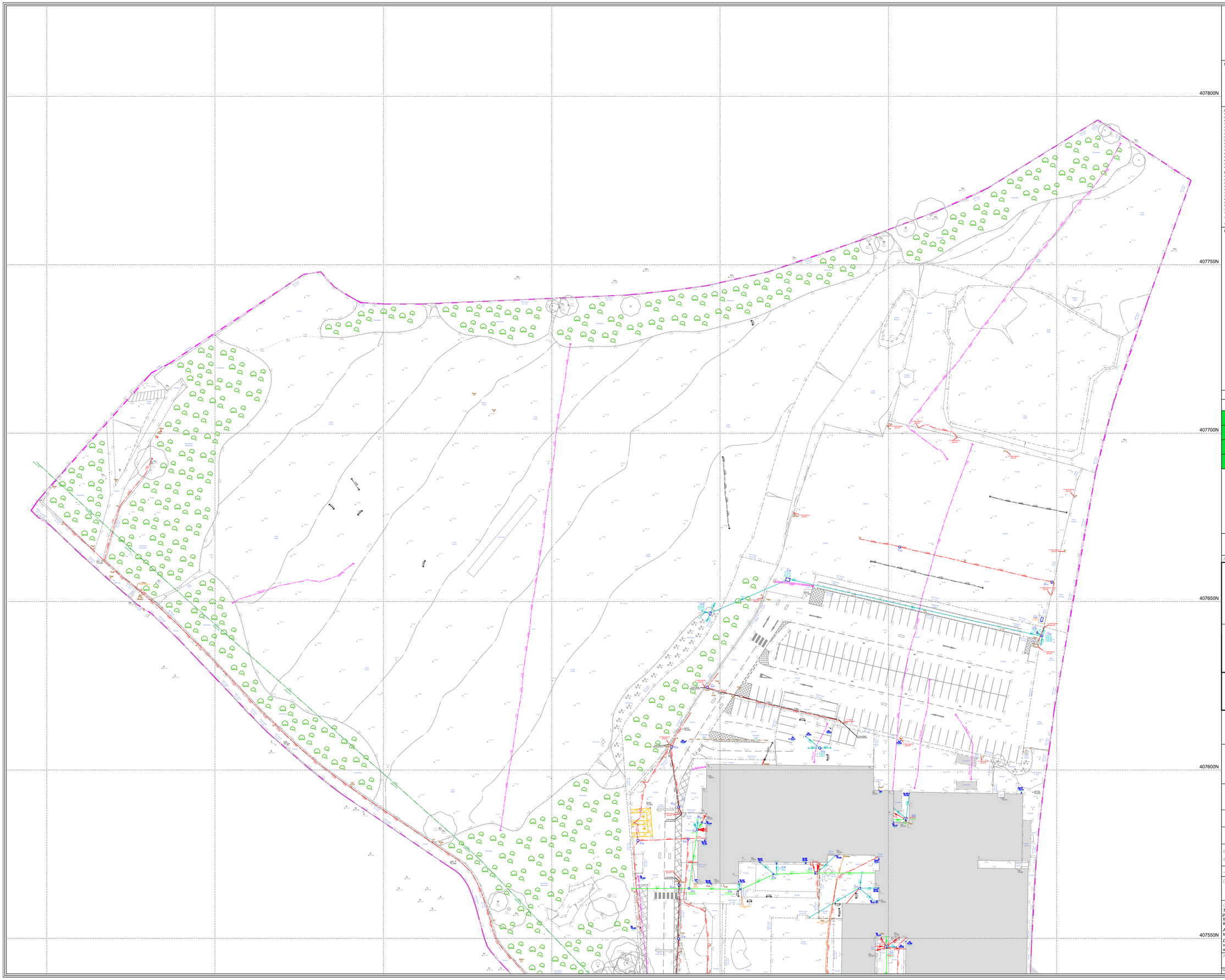

N

NOTES:

In all cases please call the BT Dial before you dig service to mark their own plant before any site works commence 0800 917 2922

Always consult utility plans

1. *Drainage information provided has been determined without man entry into the chambers. Whilst every effort has been made to correctly identify the duct/pipes/chamber detail, it is recommended that this information should be checked in advance of any site work commencement or excavation.*
2. *All water runs are presumed to be straight line connections between chambers unless proven otherwise by the use of a sonde or CCTV survey.*
3. *Elements of foul and surface drainage will be confirmed on the CCTV report to follow.*
4. *Elements of gas and water have been added from statutory records.*
5. *Elements of CATV have been added from statutory records.*
6. *Elements of electricity have been added from statutory records.*

UTILITY LINETYPES:

Air Line	AIR	Electric - Unknown Voltage	EU
Belgian Telecom	BT	Electric Overhead	EOH
Belgian Telecom Overhead	BTOH	Fibre Optic	FO
Communication Cable	CC	Gas Line	GAS
Communication Cable	CB	Gas Line	GAS
Drainage - Combined Water	COMB	Gas Line	GAS
Drainage - Foul Water	FW	Gas Line	GAS
Drainage - Storm Water	SW	Gas Line	GAS
Drainage - Storm Water - Unplasticised PVC	SW UPVC	Gas Line	GAS
Drainage - Foul Water - Unplasticised PVC	FW UPVC	Gas Line	GAS
Drainage - Storm Water - Unplasticised PVC	SW UPVC	Gas Line	GAS
Drainage - Agricultural Pipe Bore/Field Drn	DRAIN	GPR Line	GPR
Earth Cable	ET	Heating Pipe	HTG
Ducts Duct	DUCT	Office Fibre	OFC
Electric & Comms	EC	Oil Pipe	OIL
Electric Low Voltage	ELV	Pedestrian Traffic	PT
Electric High Voltage	EHV	Telecom	TC
		Traffic Light Signals	TL
		Unknown	UNK
		Vapour Recovery	VR
		Water Line	WL
		Water	WTR
		Trench Duct	DUCT

UTILITY SURVEY INFORMATION

Contracted Survey Area		Unable to Raise Cover/s	UTR
Depth to Top of Service (cm)	0.450	Unable to Trace	UTT
End of Trace	EOT	Inaccessible Route	IAR
Field Survey	FS	Obstruction Encountered	OBS
Water Ingress	WI	Ground Contamination	GC
Tapes From Records	TFR	No Visible Exit	NVE
Off Survey Area	OSA	No Plans Visible	NPV
Back Drop	BD	No Depth Indicated	NDI
Sill Level	SL	Base Level	NDI
Above Ground	AG	High Level	NDI
Not Accessible	NA	Depth to Invert - Top of Valve	1.4 or 1.2 x V
Unable to Survey	UTS	APPROXIMATE LOCATION	
Unable to Survey		GPR Anomaly	
Chamber Edge/s		Multiple Services Route	

LEGEND

Buildings	Overhead Cable	IC	Inspection chamber	Bo	Bollard
Wall	Concrete edge	PInv	Pipe invert	IB	Illuminated bollard
Kerb/ Edge	Tarmac edge	Gy	Gully	Bin	Rubbish bin
Drop kerb	Grass verge	Bg	Back gully	Vp	Vent pipe
Gentle slope	Canopy/Overhang	Dp	Down pipe	Gri	Ground light
Top of bank	Verge	Pipe	Pipe above ground	Lea	Letter box
100.000	Bottom of bank	MH	Manhole	Stmp	Tree Stump
Tree / Bush / Sapling	Station and Name	WL	Water lever	Sty	Stile
Area of Undergrowth	Station Level	Fl	Flood light	IFL	Internal floor level
Woodland		Lp	Lamp post	THL	Threshold level
Ridge Level		Tp	Telegraph post	Sp	Sign post
Eaves Level		Ep	Electricity post	Tw	Trafficlite
Flat Roof Level		Tl	Traffic light	BH	Borehole
Gate		Bus	Bus stop	ELC	Electric
Fence types:		Sv	Stop valve	BT	British Telecom
Intervoven		St	Stop tap	Chex	Control box
Iron Railings		Er	Earth rod	TT	Tactile
Wire Mesh		Wm	Water meter	BP	Brick paved
Post & Rail		Gas	Gas valve	CPS	Concrete paving slabs
Post & Wire		Av	Air valve	CVR	Cover
Chain Link		IOU	Unidentified inspection	Rwall	Retaining wall
Wooden Panels		Wo	Wash out	TWL	Top of Wall Level
Close Boarded		Re	Rodding eye	TCL	Tree canopy level
Steel Palisade		BB	Bellshe beacon	G	Girth
		CTV	Cable tv	MG	Multi girth
		Mkr	Marker post	IC	Inspection chamber
		GMkr	Gas marker post	CL	Cover level
		So	Soffit	IL	Invert level
		Fh	Fire hydrant	UTL	Unable to locate

PAS 128 : 2014 LEVEL B SURVEY

QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL	ACCURACY
QL-B0	A UTILITY SEGMENT WHICH IS SUSPECTED TO BE PRESENT BUT WHICH HAS NOT BEEN DETECTED DUE TO AN ABSENCE PROVE, (NO DETECTION POSSIBLE)	UNDEFINED
QL-B1000T	POSITION OF THE UTILITY DETECTED BY ONE OF THE METHODS ADVOCATED IN PAS 128 (EML OR GPR DETECTION) WITH LIMITED CONFIDENCE IN ASPECTS	+/- 500mm HORIZONTAL, UNKNOWN VERTICAL.
QL-B200T	POSITION OF THE UTILITY DETECTED BY ONE OF THE METHODS ADVOCATED IN PAS 128 (EML OR GPR DETECTION) WITH CONFIDENCE IN DEPTH.	+/- 200mm OR +/- 10% OF DETECTED DEPTH, WHICHEVER IS GREATER (HORIZONTAL) 10% OF DETECTED DEPTH (VERTICAL)
QL-B100T	POSITION ADJUSTED OF THE UTILITY DETECTED BY ONE OF THE METHODS ADVOCATED IN PAS 128 (EML / GPR DETECTION)	+/- 100mm OR +/- 10% OF DETECTED DEPTH, WHICHEVER IS GREATER (HORIZONTAL) 10% OF DETECTED DEPTH (VERTICAL)

DISCLAIMER

Whilst every effort has been taken in the preparation of this drawing, the original land marks/apparatus configuration may have been altered since the survey/drawing was produced. The user shall make further enquiries and investigations to satisfy himself as to the accuracy of this drawing and position of the apparatus. The exact positions of the apparatus should be verified by the use of suitable detection devices and safe digging practices in accordance with HSG47, further advice on the location of apparatus should be recommended by the owner. No representation is made by Greenhatch Group, its agents or servants as to the accuracy, completeness, and sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the users responsibility to ensure that the information on the location of apparatus is provided to all persons (either direct labour or contractors) working in proximity to the apparatus.

Rev	Date	Description	Drawn	Q. Ref.

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CLIENT

Mott MacDonald

PROJECT

Land off Spring Lane Radcliffe, Bury M26 2SZ

TITLE

Utility Survey

SCALE	DATE
A1@ 1: 500	26/01/2022
DRAWN	QUALITY REF
MAB/MA/STM	GH12865

Level datum	See notes
Grid orientation	See notes
Job number	42645

Drawing No.	Rev.
42645_T_UG	0

Comments:

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Notes:

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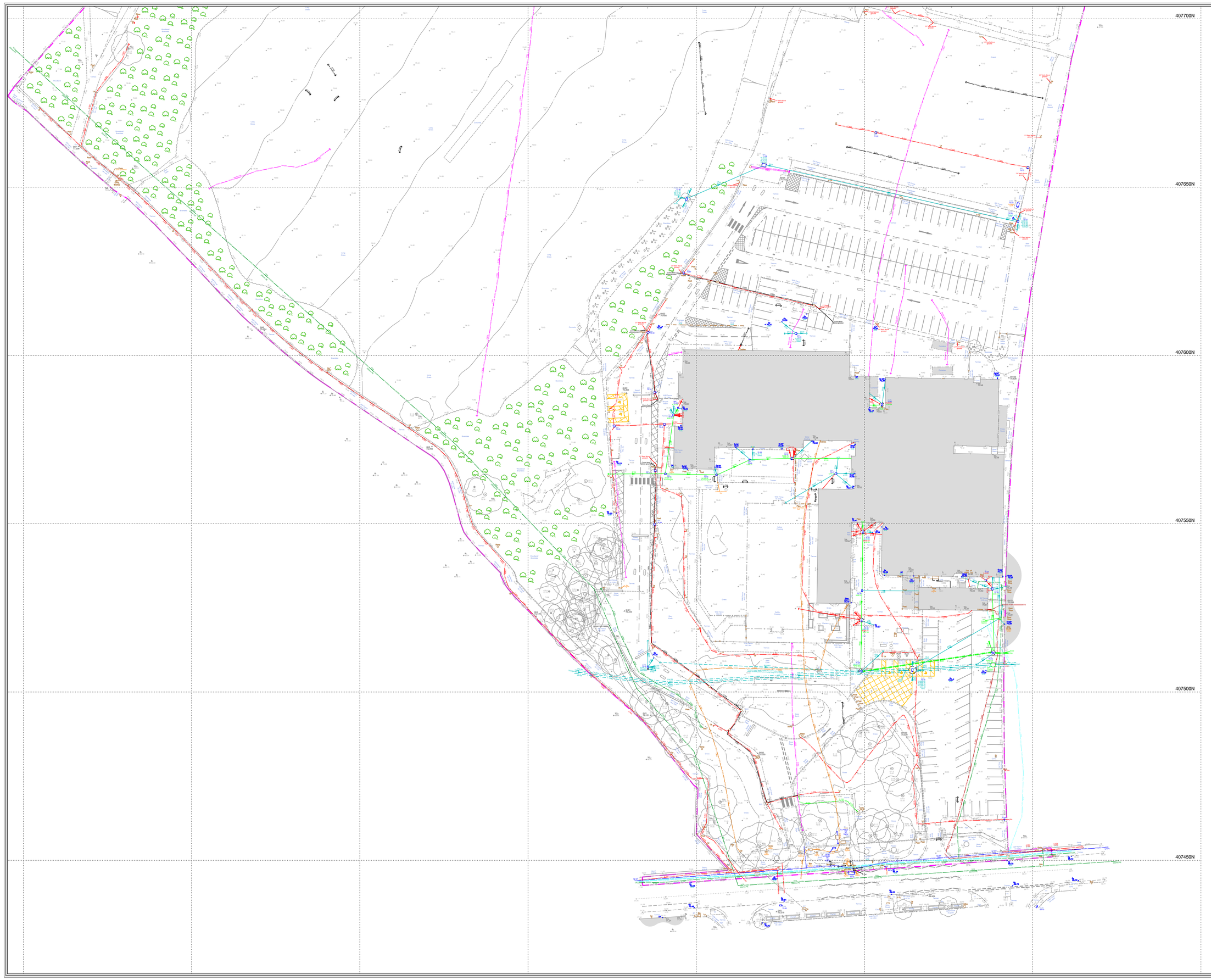

N

NOTES:

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Always consult utility plans

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3. *Details of the drainage will be confirmed on the CCTV report to follow.*
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6. *Elements of electricity have been added from statutory records.*

UTILITY LINETYPES:

Air Line	AIR	Electric - Unknown Voltage	ELEC
British Telecom	BT	Electric Overhead	ELEC
British Telecom Overhead	BT	Flame Optic	TT
Communication Cable	COM	Gas Line	GAS
Communication Cable	COM	Gas Line	GAS
Drainage - Combined Water	COMB	Garage Line	TT
Drainage - Foul Water	FW	GPR Line	GPR
Drainage - Storm Water	SW	Heating Pipes	HTG
Drainage - Approximate Foul/Combined	FW / COMB	Office Fibre	TT
Drainage - Foul Water - Assumed FW	FW / ASSUMED FW	CCTV	TT
Drainage - Storm Water - Assumed FW	SW / ASSUMED FW	Pipe Line	PIPE
Drainage - Approximate Foul/Combined	FW / COMB	Telecom	TT
Earth Cable	TT	Traffic Light Signals	TL
Ducts Foul	FW	Unknown	UNKNOWN
Ducts & Conduits	TT	Vapour Recovery	VR
Electric Low Voltage	ELEC	Water Line	WATER
Electric High Voltage	ELEC	Water	WATER
		Trench Box	DRY / WET / DRY

UTILITY SURVEY INFORMATION

Contracted Survey Area		Unable to Raise Cover	UTR
Depth to Top of Service (cm)	1.450	Unable to Trace	UTT
End of Trace	EOT	Inaccessible Area	IAR
Field Survey	FS	Not Surveyed/Accessible	NS/A
Water Bypass	WB	Ground Contamination	GC
Tapes From Records	TFR	No Visible Exit	NVE
Off Survey Area	OSA	No Plans Visible	NPV
Back Drop	BD	No Depth Indicated	NDI
Sill Level	SL	Base Level	NDI
Above Ground	A/G	High Level	NDI
Unable to Access	UTA	Depth to Top of Valve	1.4 or 1.2 V
Unable to Survey	UTS	APPROPRIATE LOCATION	
Unable to Survey		GPR Anomaly	
Chamber Edards		Multiple Services Route	

LEGEND

Buildings	IC	Inspection chamber	Bo	Bollard
Wall	Pinv	Pipe invert	Il	Illuminated bollard
Fence	Gy	Gully	Bin	Rubbish bin
Kerb line	Bg	Back gully	Vp	Vent pipe
Drop kerb	Dp	Down pipe	Gri	Ground light
Centre line	Pgo	Pipe above ground	Lea	Letter box
Top of kerb	MH	Manhole	Stmp	Tree Stump
100.000	WL	Water level	Sty	Stile
	Fl	Flood light	IFL	Internal floor level
	Lp	Lamp post	THL	Threshold level
	Tp	Telegraph post	Sp	Sign post
	Ep	Electricity post	Tw	Trafficlite
	Tl	Traffic light	BH	Borehole
	Bus	Bus stop	ELC	Electric
	Sv	Stop valve	BT	British Telecom
	St	Stop tap	Chex	Control box
	Er	Earth rod	TT	Tactile
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	Gas	Gas valve	CPS	Concrete paving slabs
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	Wo	Wash out	TWL	Top of Wall Level
	Re	Rodding eye	TCL	Tree canopy level
	BB	Beltona beacon	G	Girth
	CTV	Cable tv	MG	Multi girth
	Mkr	Marker post	IC	Inspection chamber
	Gmkr	Gas marker post	CL	Cover level
	Sc	Soffit	IL	Invert level
	Fh	Fire hydrant	UTL	Unable to locate

Fence types:

Intervoven	
Iron Railings	
Wire Mesh	
Post & Rail	
Post & Wire	
Chain Link	
Wooden Panels	
Close Boarded	
Steel Palisade	

PAS 128 : 2014 LEVEL B SURVEY

QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL	ACCURACY
QL-B1	A UTILITY SEGMENT WHICH IS SUSPECTED TO BE PRESENT BASED ON EVIDENCE FROM TRADITIONAL MAPPING OR AN ASSUMED PATH. **(NO DETECTION POSSIBLE)**	**UNDEFINED**
QL-B2SUP	POSITION OF THE UTILITY DETECTED BY ONE OF THE FOLLOWING METHODS: **(EMI, CIP, GPR DETECTION WITH LIMITED CONFIDENCE IN DEPTH)**	**+/- 500mm HORIZONTAL, UNKNOWN VERTICAL.**
QL-B2SDP	POSITION OF THE UTILITY DETECTED BY ONE OF THE FOLLOWING METHODS: **(EMI, CIP, GPR DETECTION WITH CONFIDENCE IN DEPTH)**	**+/- 250mm OR +/- 10% OF DETECTED DEPTH, WHICHEVER IS GREATER HORIZONTAL, 10% OF DETECTED DEPTH VERTICAL.**
QL-B1MSP	POSITION ADJACENT TO THE UTILITY DETECTED BY ONE OF THE FOLLOWING METHODS: **(EMI, + GPR DETECTION)**	**+/- 250mm OR +/- 10% OF DETECTED DEPTH, WHICHEVER IS GREATER HORIZONTAL, 10% OF DETECTED DEPTH VERTICAL.**

DISCLAIMER

Whilst every effort has been taken in the preparation of this drawing, the original land marks/apparatus configuration may have been altered since the survey/drawing was produced. The user shall make further enquiries and investigations to satisfy himself as to the accuracy of this drawing and position of the apparatus. The exact positions of the apparatus should be verified by the use of suitable detection devices and safe digging practices in accordance with HSG47, further advice on the location of apparatus should be recommended by the owner. No representation is made by Greenhatch Group, its agents or servants as to the accuracy, completeness, and sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the users responsibility to ensure that the information on the location of apparatus is passed to all persons (either direct labour or contractors) working in proximity to the apparatus.

Rev.	Date	Description	Drawn	Q. Ref.

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- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
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CLIENT

Mott MacDonald

PROJECT

Land off Spring Lane Radcliffe, Bury M26 2SZ

TITLE

Utility Survey

SCALE	DATE
A1@ 1: 500	26/01/2022
DRAWN	**QUALITY REF**
MAB/MA/STM	GH12865

Level datum	See notes
Grid orientation	See notes
Job number	42645

Drawing No.	Rev.
42645_T_UG	0

Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

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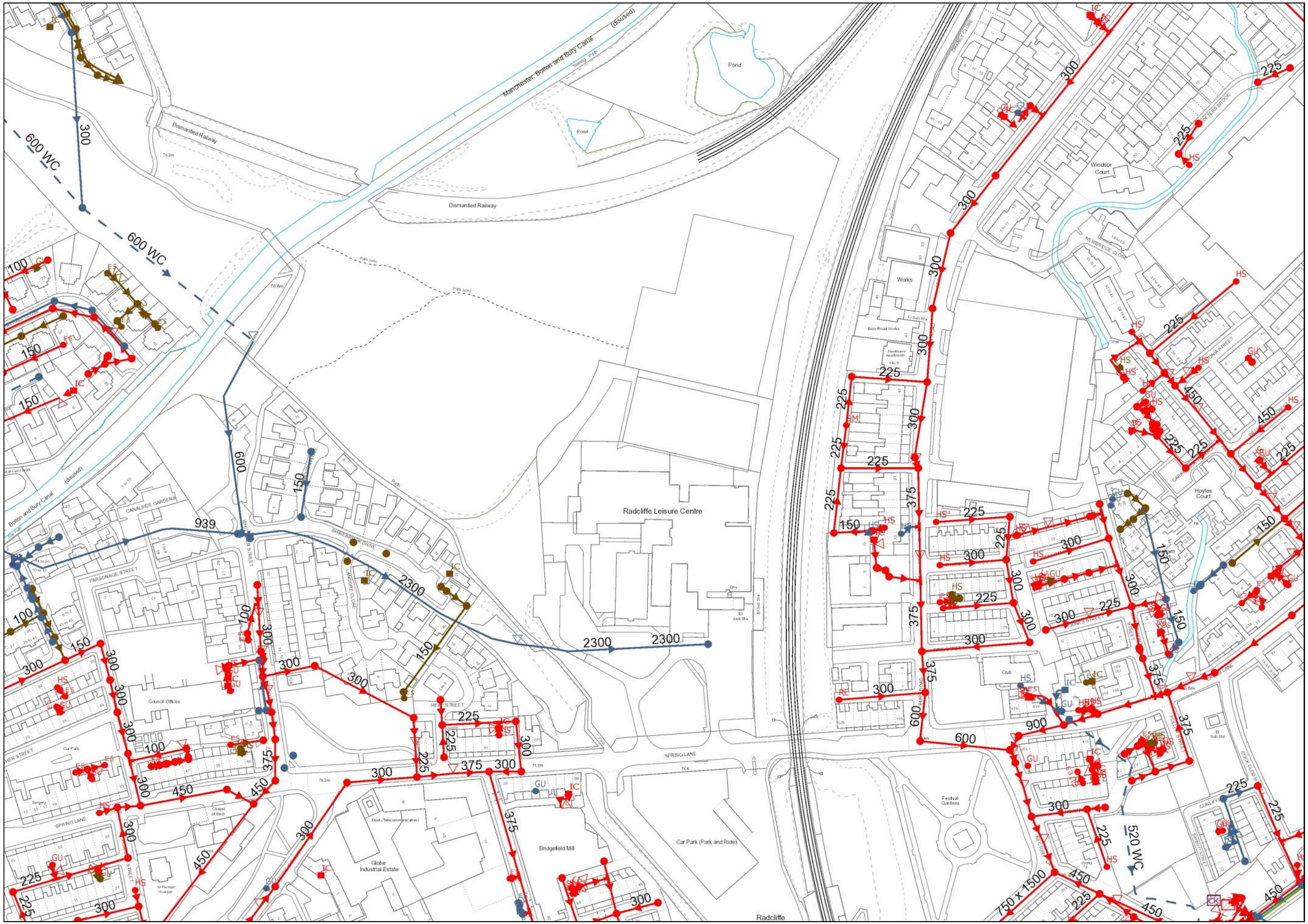
APPENDIX B
United Utilities Sewer Records



United Utilities Maps for SafeDig

Date :	18/01/2022 09:54:12
Centre X:	378736
Centre Y:	407606
Scale :	2000
UserName:	MOTTMACNRT

Extract from maps of United Utilities' Underground Assets

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private service pipes may be shown by a blue broken line. United Utilities Water will not accept liability for any damage caused by the actual position being different from those shown.

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United Utilities
Water for the North West

APPENDIX C
Proposed Development Plans

Area Schedule (Gross Internal Area)		
Level	Name	Area
LEVEL 00	Ground	2801.68 m²
LEVEL 01	First	1510.19 m²
LEVEL 02	Second	1704.48 m²
Grand total: 3		6016.35 m²

Rev	Description	Date	Dr by	App by
P12	Drawing error - reploaded at S4	16.08.23	BT	IK
P11	Issued as S4 - LAP Authorisation	11.08.23	BT	IK
P10	Changing room layout amended and hygiene room added	31.07.23	BT	IK
P09	Issued for Stage 3	04.08.23	BT	IK
P08	Updated for CEM4a	24.07.23	BT	IK
P07	Kitchen layout updated to latest information	21.07.23	BT	IK
P06	Updated following CEM 4	12.07.23	BT	IK
P05	Issued for final comment	06.07.23	SH	IK
P04	WIP issue following Academy comments	04.07.23	SH	IK
P03	Updated to incorporate steel frame	29.06.23	SH	IK
P02	Updated following CEM 3	27.06.23	SH	IK
P01	Stacks added to the back of classrooms	05.06.23	SH	IK

original by	date created	approved by
SH	09/29/22	IK

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client name
Department for Education

project
Star Academy Radcliffe

drawing
Ground Floor + Sports

computer file
Autodesk Docs://Star Academy Radcliffe/FS1013-AHR-ZZ-ZZ-M-A-2001.rvt

plot date

project number	scale	
2023.00187.000	1 : 100	@A0

drawing number	rev	issue status
FS1013-AHR-01-00-D-A-2001	P12	S4

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Rev	Description	Date	Dr by	App by
P09	Issued as S4 - LAP Authorisation	11.08.23	BT	IK
P08	Corridor to IT Server room updated	31.07.23	BT	IK
P07	Issued for Stage 3	04.08.23	BT	IK
P06	Updated following CEM 4	12.07.23	BT	IK
P05	Issued for final comment	06.07.23	SH	IK
P04	WIP issue following Academy comments	04.07.23	SH	IK
P03	Updated to incorporate steel frame	29.06.23	SH	IK
P02	Updated following CEM 3	27.06.23	SH	IK
P01	Stacks added to the back of classrooms	05.06.23	SH	IK

original by	date created	approved by
SH	09/29/22	IK

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client name
DfE

project
Radcliffe Leadership Academy

drawing
First Floor

computer file
Autodesk Docs://Star Academy Radcliffe/FS1013-AHR-ZZ-XX-M3-A-0001.rvt

plot date

project number	scale	
2023.00187.000	1 : 100	@A1

drawing number	rev.	issue status
FS1013-AHR-01-01-D-A-2002	P09	S4

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1 Level 02 - GA Plan - Sheet 1

1 : 100

Rev	Description	Date	Dr by	App by
P09	Issued as S4 - LAP Authorisation	11.08.23	BT	IK
P08	Drawing number updated	31.07.23	BT	IK
P07	Issued for Stage 3	04.08.23	BT	IK
P06	Updated for CEM4a	24.07.23	BT	IK
P05	Issued for final comment	06.07.23	SH	IK
P04	WIP issue following Academy comments	04.07.23	SH	IK
P03	Updated to incorporate steel frame	29.06.23	SH	IK
P02	Updated following CEM 3	27.06.23	SH	IK
P01	Stacks added to the back of classrooms	05.06.23	SH	IK

original by	date created	approved by
SH	09/29/22	IK

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client name
DfE

project
Radcliffe Leadership Academy

drawing
Second Floor

computer file
Autodesk Docs://Star Academy Radcliffe/FS1013-AHR-ZZ-XX-M3-A-0001.rvt

plot date

project number	scale	
2023.00187.000	1 : 100	@A1

drawing number	rev	issue status
FS1013-AHR-01-02-D-A-2002	P09	S4

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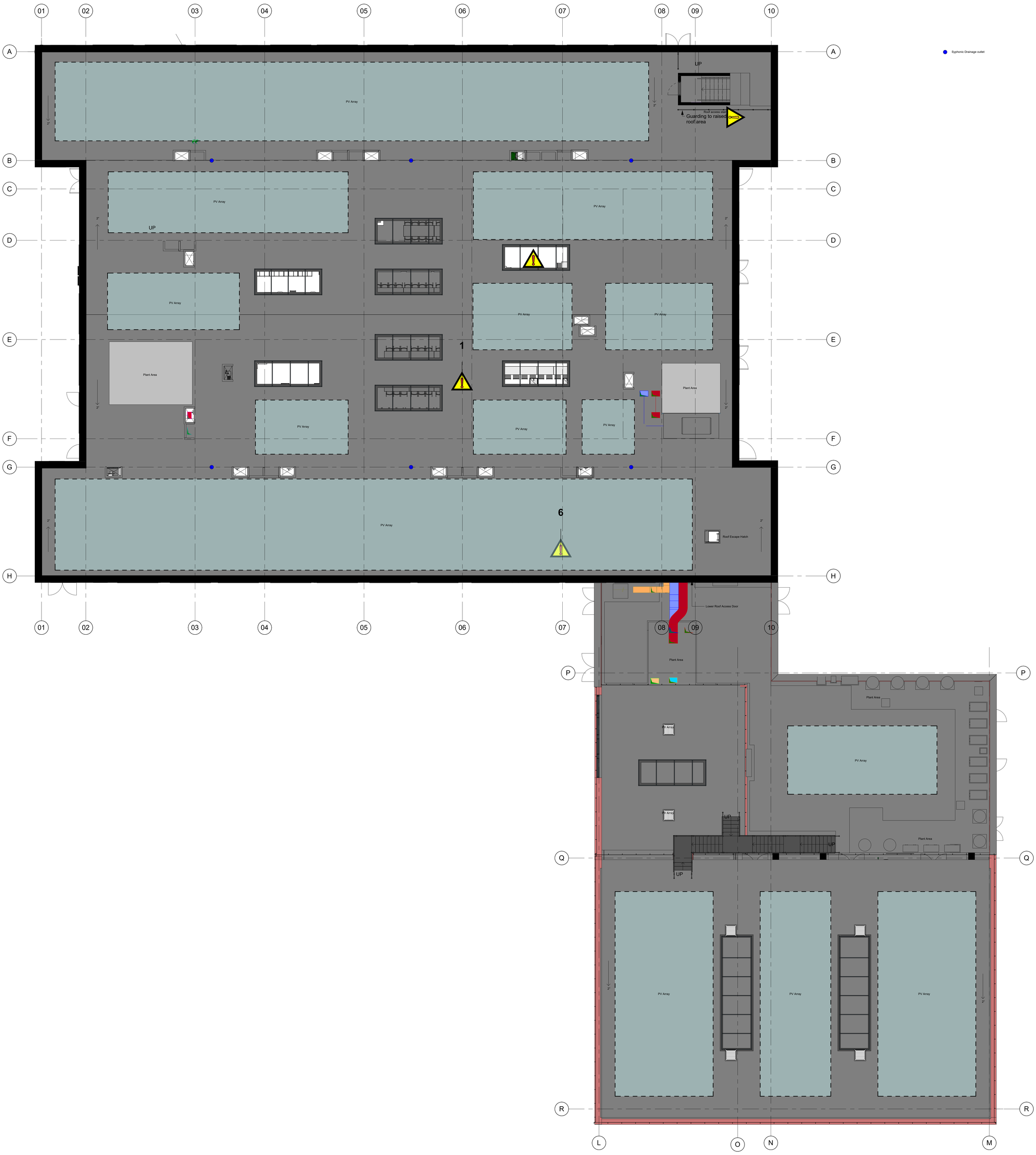

Rev	Description	Date	Dr by	App by
P04	Issued as S4 - LAP Authorisation	11.08.23	BT	IK
P03	Issued for Stage 3	04.08.23	BT	IK
P02	Rooflights to sports hall removed in line with CEM4 MoM 2.4	21.07.23	BT	IK
P01	Updated following CEM 4	12.07.23	BT	IK

original by	date created	approved by
BT	10/03/22	Approver

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client name
DfE

project
Radcliffe Leadership Academy

drawing
Roof Plan

computer file
Autodesk Docs://Star Academy Radcliffe/FS1013-AHR-ZZ-XX-M3-A-0001.rvt

plot date

project number	scale	
2023.00187.000	1 : 100	@A0

drawing number	rev	issue status
FS1013-AHR-01-RF-D-A-2003	P04	S4

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APPENDIX D
Existing Impermeable Areas Plan

NOTES:

1. THIS DRAWING IS INTENDED TO INDICATE THE EXISTING DRAINED AREAS FROM THE STAR RADCLIFFE ACADEMY DEVELOPMENT. IT IS BASED UPON A REVIEW OF THE TOPOGRAPHICAL SURVEY AND AERIAL IMAGES OF THE SITE.
2. FOR THE TOPOGRAPHICAL SURVEY, REFER TO GREENHATCH DRAWING FS1013-GHG-XX-XX-D-U-0002.
3. EXISTING DISCHARGE RATES GIVEN HAVE BEEN CALCULATED USING MICRODRAINAGE. BROWNFIELD RUN-OFF RATES ARE BASED ON THE HARD PAVED AREAS.

KEY

PLANNING BOUNDARY

DEVELOPMENT BOUNDARY
TOTAL AREA: 45620m^2 (4.562ha)

SOFT LANDSCAPING AREA
TOTAL AREA: 25800m^2 (2.58ha)

HARD LANDSCAPING AREA
TOTAL AREA: 19820m^2 (1.982ha)

GREENFIELD RUN-OFF RATES

EVENT	GREENFIELD RUN-OFF
1:1	51.9 l/s
1:2	58.8 l/s
1:30	91.8 l/s
1:100	103.7 l/s
Q_{BAR}	59.7 l/s

GREENFIELD RUN-OFF CALCULATED IN MICRODRAINAGE USING SOURCE CONTROL

Rev:	Description:	Date:	By:	Chkd:
P03	COMMENTS INCORPORATED	08.09.23	HW	PW
P02	STAGE 3 ISSUE	10.08.23	SA	PW
P01	ISSUED FOR PLANNING	08.06.23	HW	PW

renaissance

Renaissance Associates Ltd
Carvers Warehouse
77 Dale Street
Manchester
M1 2HG

Project:

STAR RADCLIFFE ACADEMY

Drawing Title:

EXISTING DRAINED AREAS

Status:

STAGE 3

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	JUN 23	HW	--	PW

Scale: 1:500 Project No: 2303-02

Project: Originator: Volume: Level: Type: Role: Category/Number: Rev:

FS1013-REN-EX-00-D-C-5200-P02

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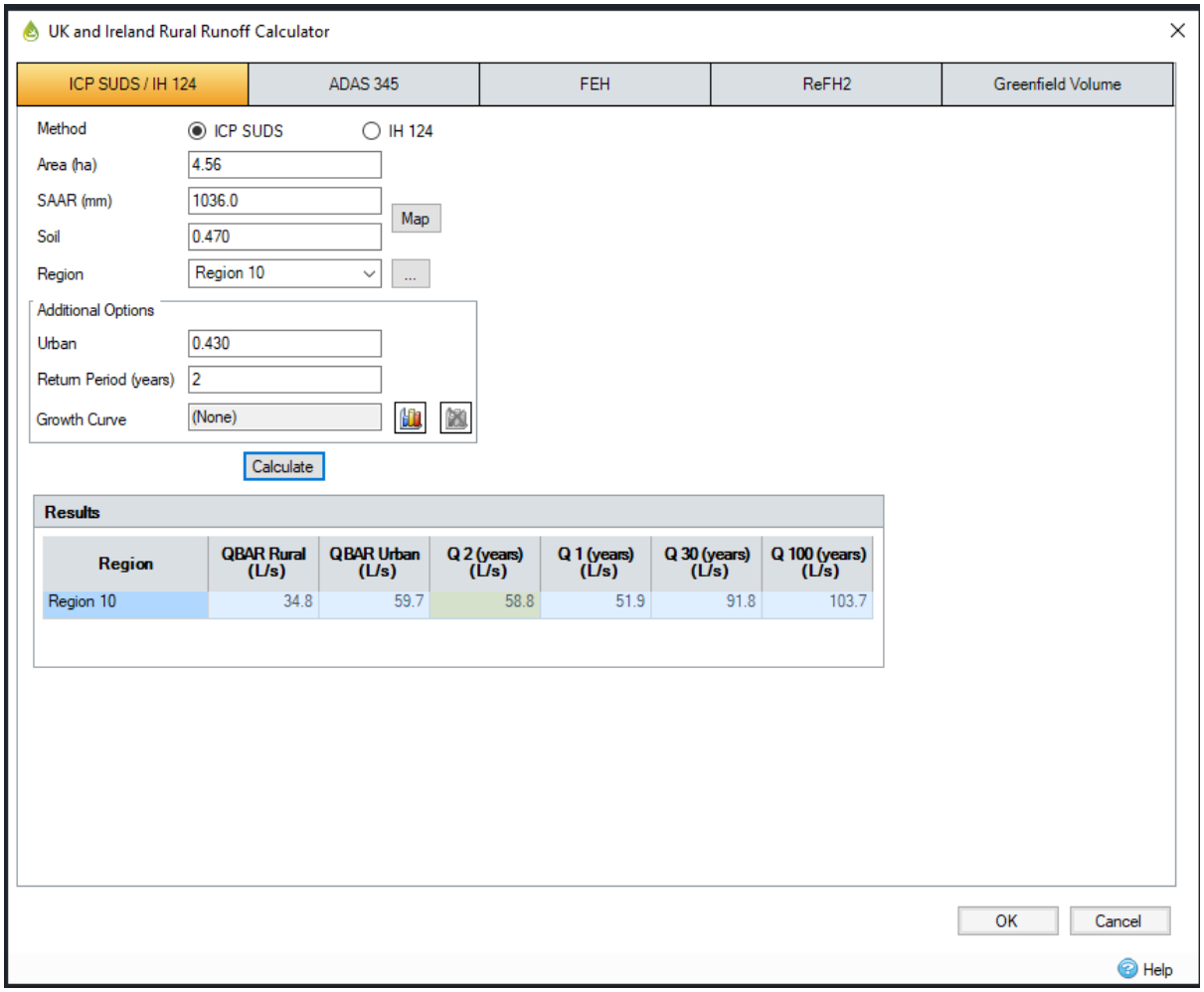
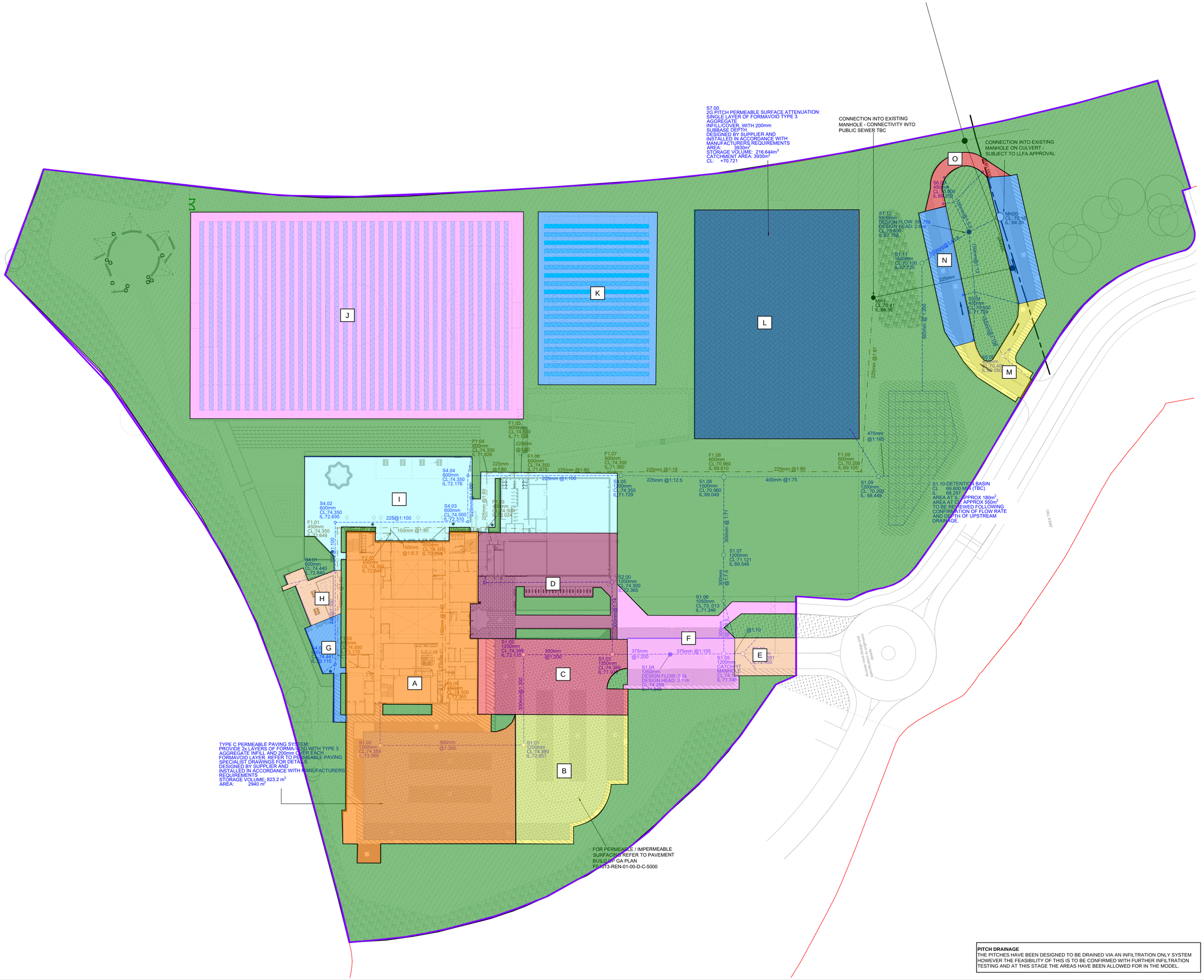
APPENDIX E
InfoDrainage Greenfield Run-off Rates


UK and Ireland Rural Runoff Calculator
ICP SUDS / IH 124
ADAS 345
FEH
ReFH2
Greenfield Volume
Method
ICP SUDS
IH 124
Area (ha)
4.56
SAAR (mm)
1036.0
Map
Soil
0.470
Region
Region 10
...
Additional Options
Urban
0.430
Return Period (years)
2
Growth Curve
(None)
Calculate
Results
Region
QBAR Rural (L/s)
QBAR Urban (L/s)
Q 2 (years) (L/s)
Q 1 (years) (L/s)
Q 30 (years) (L/s)
Q 100 (years) (L/s)
Region 10
34.8
59.7
58.8
51.9
91.8
103.7
OK
Cancel
Help

APPENDIX F
Proposed Impermeable Areas Plan

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH
   - -EXISTING IMPERMEABLE AREA PLAN
   - -PROPOSED BELOW GROUND DRAINAGE DRAWING
   - -MICRODRAINAGE MODEL AND CALCULATION OUTPUTS



PLANNING BOUNDARY

DEVELOPMENT BOUNDARY

PROPOSED IMPERMEABLE AREA SUMMARY		
MANHOLE	HATCH	AREA (ha)
S1.00	A	0.383
S1.01	B	0.105
S1.02	C	0.095
S2.00	D	0.103
S3.00	E	0.020
S1.06	F	0.081
S4.00	G	0.016
S4.01	H	0.017
S4.04	I	0.187
S3G PITCH	J	0.585
S3G MUGA	K	0.174
S2G PITCH	L	0.320
S5.00	M	0.028
S5.01	M	0.063
S6.00	N	0.012
	TOTAL	2.189

SITEWIDE TOTAL AREA	
HATCH	AREA (ha)
IMPERMEABLE AREA	2.189
PERMEABLE AREA	2.373
TOTAL	4.562

PITCH DRAINAGE
THE PITCHES HAVE BEEN DESIGNED TO BE DRAINED VIA AN INFILTRATION ONLY SYSTEM HOWEVER THE FEASIBILITY OF THIS IS TO BE CONFIRMED WITH FURTHER INFILTRATION TESTING AND AT THIS STAGE THE AREAS HAVE BEEN ALLOWED FOR IN THE MODEL.

Rev:	Description:	Date:	By:	Chkd:
P02	ISSUED FOR PLANNING	07.09.23	HW	PW
P01	STAGE 3	10.08.23	SA	PW

renaissance
Renaissance Associates Ltd
Carvers Warehouse
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Manchester
M1 2HG

Project:

STAR RADCLIFFE ACADEMY

Drawing Title:

PROPOSED DRAINED AREAS PLAN

Status:

STAGE 3

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	AUG'23	SA	SA	PW

Scale: 1:500 | Project No: 2303-02

Project - Originator - Volume - Level - Type - Role - Number: FS1013-REN-EX-00-D-C-5201 | Revision: P02

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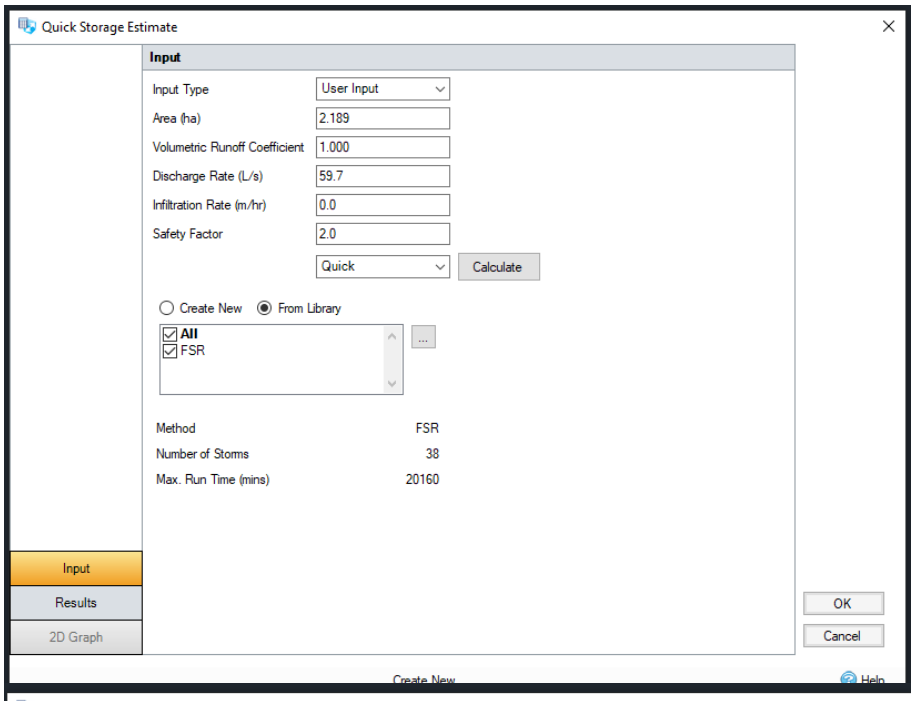
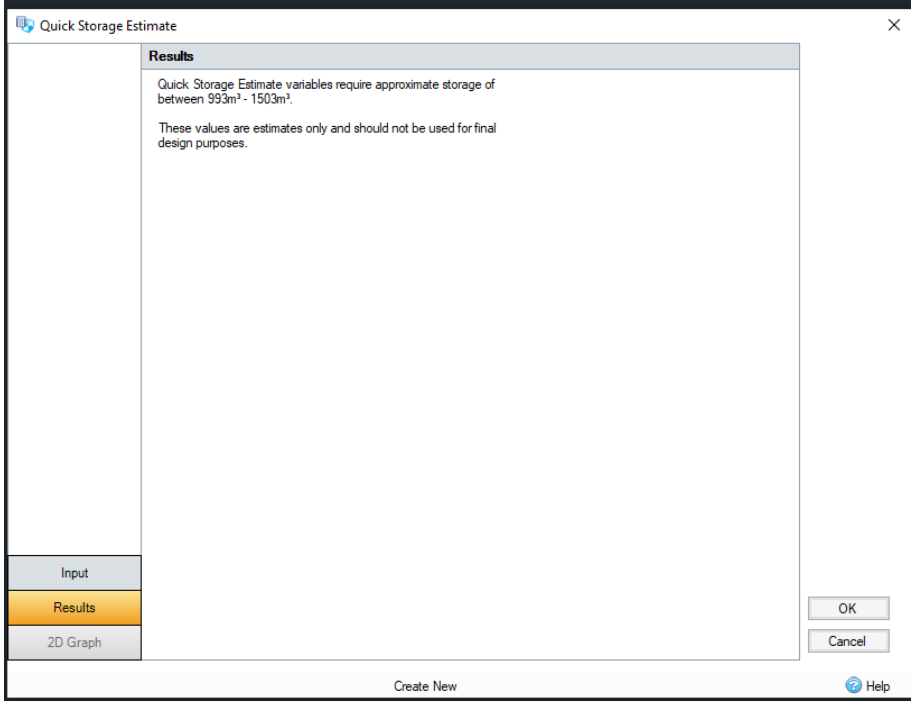
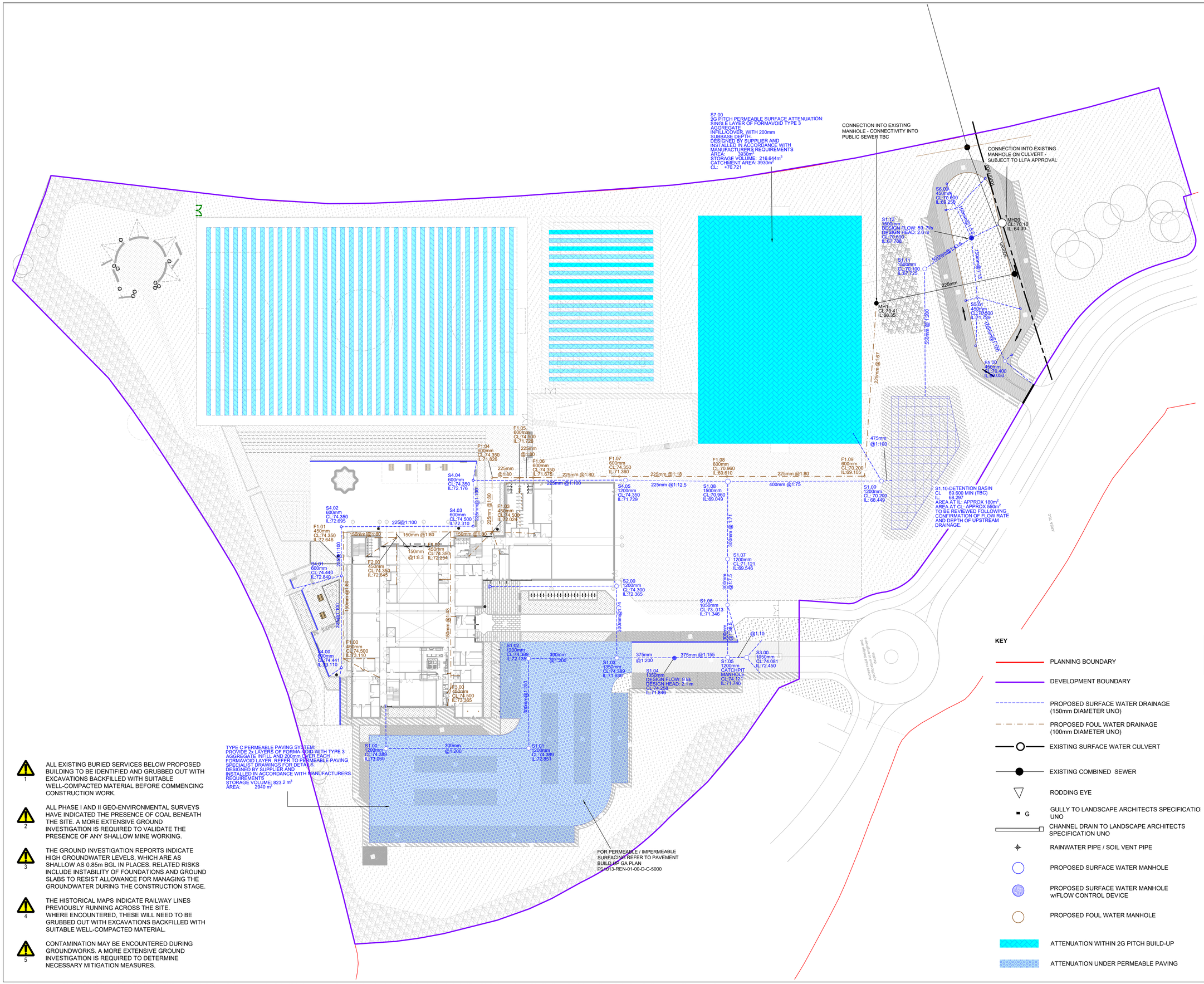
APPENDIX G
InfoDrainage Quick Storage Estimate


Quick Storage Estimate
Input
Input Type
User Input
Area (ha)
2.189
Volumetric Runoff Coefficient
1.000
Discharge Rate (L/s)
59.7
Infiltration Rate (m/hr)
0.0
Safety Factor
2.0
Quick
Calculate
Create New
From Library
All
FSR
Method
FSR
Number of Storms
38
Max. Run Time (mins)
20160
Input
Results
2D Graph
OK
Cancel
Create New
Help


Quick Storage Estimate
Results
Quick Storage Estimate variables require approximate storage of between 993m³ - 1503m³.
These values are estimates only and should not be used for final design purposes.
Input
Results
2D Graph
OK
Cancel
Create New
Help

APPENDIX H
Below Ground Drainage GA



NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RENAISSANCE, ARCHITECTS, LANDSCAPE ARCHITECTS AND BUILDING SERVICES ENGINEERS DRAWINGS.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE BELOW GROUND DRAINAGE DETAILS SHOWN ON DRAWING SERIES C-03100 TO C-03103.
3. FOR ALL ABOVE GROUND DRAINAGE AND ASSOCIATED PUMPS REFER TO BUILDING SERVICES AND ARCHITECT'S DRAWINGS.
4. ALL BELOW GROUND DRAINAGE WORKS TO BE IN ACCORDANCE WITH RELEVANT BUILDING REGULATIONS AND SEWER SECTOR GUIDANCE APPENDIX C- DESIGN AND CONSTRUCTION GUIDANCE. IF DISCREPANCIES ARE NOTED BETWEEN SSG AND DRAWINGS THESE SHOULD BE BROUGHT TO THE ATTENTION OF RENAISSANCE FOR REVIEW.
5. RWPs, SVPs, SSs AND FLOOR GULLEYS ARE TO HAVE RODDABLE ACCESS POINTS ABOVE GROUND FLOOR TO BUILDING SERVICES DETAILS.
6. THE CONTRACTOR IS TO UNDERTAKE A FULL CCTV SURVEY AT COMPLETION OF THE PROJECT TO DEMONSTRATE THAT THE DRAINAGE IS CLEAN. ANY DEFECTS ARE TO BE CORRECTED BY THE CONTRACTOR PRIOR TO HANDOVER OF THE SYSTEM TO THE CLIENT.
7. THE CONTRACTOR IS TO KEEP A RECORD SET OF THE AS INSTALLED DRAINAGE ON SITE AND PROVIDE THIS TO RENAISSANCE UPON COMPLETION OF THE WORKS TO ALLOW FOR PRODUCTION OF A 'FINAL CONSTRUCTION' ISSUE DRAWING.
8. DURING THE WORKS ALTERATIONS TO THE DRAINAGE LAYOUT ARE TO BE MARKED UP BY THE CONTRACTOR AND AGREED WITH RENAISSANCE IN WRITING.
9. THE CHAMBER SIZE OF PCC MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED AN INCREMENT TO ACCOMMODATE THE CONNECTIONS AND BENDS.
10. MANHOLE COVERS ARE TO BE IN ACCORDANCE WITH BS EN 124 FOR THE RATING INDICATED IN THE MANHOLE SCHEDULE. THE CONTRACTOR IS TO SUBMIT DETAILS FOR THE PROPOSED MANHOLE COVERS TO THE ENGINEER AND LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION.
11. ALL INTERNAL COVERS TO BE RECESSED AND TRIPLE SEALED
12. COVER SLABS MUST CARRY THE BSI KITEMARK. WHERE THE CLEAR OPENING OF THE KITEMARKED PRODUCT IS DIFFERENT TO THAT OF THE COVER AND FRAME, A LOAD BEARING REDUCING SLAB SHOULD BE FITTED ABOVE THE COVER SLAB TO BRING THE SIZE DOWN TO REQUIRED SIZE.
13. ALL SEWERS TO BE BSI KITEMARK (CERTIFIED TO WIS 4-35-01)
14. ALL CONCRETE PIPES TO BE TO ES EN 1916 CLASS 120 (54kN/m).
15. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2).
16. IF PLASTIC PIPES ARE TO BE USED THEN THE FOLLOWING MUST APPLY:
    A. BSI KITEMARK (CERTIFIED TO BS EN 13476-1 AND WIS 4-35-01)
    B. PIPES LESS THAN OR EQUAL TO 500mm DIA
    C. BEDDING AND BACKFILL MATERIAL TO CONFORM TO THE REQUIREMENTS OF THE WATER INDUSTRY SPECIFICATION 4-08092 (TABLE A2)
17. THE MINIMUM CRUSHING STRENGTH FOR CLAY PIPES SHOULD BE AS FOLLOWS: 100mm DIA. 40kN/m, 150mm DIA. 40kN/m, 225mm DIA. 45kN/m AND 300mm DIA. 72kN/m.
18. THE MINIMUM CRUSHING STRENGTH FOR CONCRETE PIPES SHOULD BE - (CLASS 120 TO EN 1916/BS8911-1 2002). PLASTIC PIPES SHOULD CONFORM TO WIS 4-35-01 AND BS EN13476.
19. SULPHATE RESISTANT CEMENT (C20-DC3) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDING THAT SUCH PRECAUTIONS ARE NOT NECESSARY.
20. SEWER PIPES TO BE LAID IN MAXIMUM 3 METER LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER PIPES, AND THIS IS AGREED BY THE CONTRACTOR WITH THE PIPE MANUFACTURER.
21. ALL FOUL AND SURFACE WATER BELOW GROUND SYTEMS ARE TO BE VENTED WITHIN THE ABOVE GROUND DRAINAGE TO THE BUILDING SERVICES ENGINEERS DETAILS.

EXTERNAL WORKS SETTING OUT

FOR PROPOSED SITE LEVELS AND CHANNEL / GULLY LOCATIONS, REFER TO LANDSCAPE ARCHITECT'S DRAWINGS.

SVP & RWP SETTING OUT

SVP AND RWP LOCATIONS ARE INDICATIVE. FOR DETAILED SETTING OUT REFER TO ARCHITECTS/ BUILDING SERVICE ENGINEERS DRAWINGS.

ALL CONNECTIONS BETWEEN ABOVE GROUND DRAINAGE AND BELOW GROUND DRAINAGE TO BE SIZED TO SUIT ABOVE GROUND DRAINAGE.

METROLINK LINE

ALL DRAINAGE AND SURFACE FINISHES ADJACENT TO THE METROLINK LINE TO THE EAST OF THE SITE ARE TO FALL AWAY FROM THE EMBANKMENT TO PREVENT ANY IMPACTS ON ITS STABILITY.

PITCH DRAINAGE

PITCHES DESIGNED TO BE DRAINED VIA AN INFILTRATION ONLY SYSTEM. THE FEASIBILITY OF THIS IS TO BE CONFIRMED WITH FURTHER INFILTRATION TESTING HOWEVER AT THIS STAGE AREAS HAVE BEEN ALLOWED FOR IN THE MODEL.

1. ALL EXISTING BURIED SERVICES BELOW PROPOSED BUILDING TO BE IDENTIFIED AND GRUBBED OUT WITH EXCAVATIONS BACKFILLED WITH SUITABLE WELL-COMPACTED MATERIAL BEFORE COMMENCING CONSTRUCTION WORK.
2. ALL PHASE I AND II GEO-ENVIRONMENTAL SURVEYS HAVE INDICATED THE PRESENCE OF COAL BENEATH THE SITE. A MORE EXTENSIVE GROUND INVESTIGATION IS REQUIRED TO VALIDATE THE PRESENCE OF ANY SHALLOW MINE WORKING.
3. THE GROUND INVESTIGATION REPORTS INDICATE HIGH GROUNDWATER LEVELS, WHICH ARE AS SHALLOW AS 0.85m BGL IN PLACES. RELATED RISKS INCLUDE INSTABILITY OF FOUNDATIONS AND GROUND SLABS TO RESIST ALLOWANCE FOR MANAGING THE GROUNDWATER DURING THE CONSTRUCTION STAGE.
4. THE HISTORICAL MAPS INDICATE RAILWAY LINES PREVIOUSLY RUNNING ACROSS THE SITE. WHERE ENCOUNTERED, THESE WILL NEED TO BE GRUBBED OUT WITH EXCAVATIONS BACKFILLED WITH SUITABLE WELL-COMPACTED MATERIAL.
5. CONTAMINATION MAY BE ENCOUNTERED DURING GROUNDWORKS. A MORE EXTENSIVE GROUND INVESTIGATION IS REQUIRED TO DETERMINE NECESSARY MITIGATION MEASURES.

KEY

- PLANNING BOUNDARY
- DEVELOPMENT BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE (150mm DIAMETER UNO)
- PROPOSED FOUL WATER DRAINAGE (100mm DIAMETER UNO)
- EXISTING SURFACE WATER CULVERT
- EXISTING COMBINED SEWER
- RODDING EYE
- G GULLY TO LANDSCAPE ARCHITECTS SPECIFICATIO UNO
- CHANNEL DRAIN TO LANDSCAPE ARCHITECTS SPECIFICATION UNO
- RAINWATER PIPE / SOIL VENT PIPE
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER MANHOLE w/FLOW CONTROL DEVICE
- PROPOSED FOUL WATER MANHOLE
- ATTENUATION WITHIN 2G PITCH BUILD-UP
- ATTENUATION UNDER PERMEABLE PAVING

Rev:	Description:	Date:	By:	Chkd:
P02	COMMENTS INCORPORATED	08.09.23	HW	PW
P01	STAGE 3 ISSUE	07.09.23	SA	PW

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Project:
STAR RADCLIFFE ACADEMY, BURY

Drawing Title:
BELOW GROUND DRAINAGE PLAN

Status:
STAGE 3

Size:	Date:	Drawn by:	Designed by:	Checked by:
A1	AUG'23	SA	SA	AI

Scale: 1:500 | Project No: 2303-02

Project – Originator – Volume – Level – Type – Role – Number: FS1013-REN-EX-00-D-C-5210 | Revision: P02

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APPENDIX J
Proposed Surface Water Micro Drainage Calculations

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)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.360	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.933	4-8	1.240	8-12	0.015

Total Area Contributing (ha) = 2.189

Total Pipe Volume (m³) = 60.457

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	41.795	0.209	200.0	0.383	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	26.346	0.132	199.6	0.105	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	25.923	0.130	199.4	0.095	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	21.127	0.285	74.1	0.103	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.63	73.060	0.383	0.0	0.0	0.0	1.11	78.3	51.9
S1.001	50.00	6.02	72.851	0.488	0.0	0.0	0.0	1.11	78.4	66.1
S1.002	50.00	6.41	72.135	0.583	0.0	0.0	0.0	1.11	78.4«	78.9
S2.000	50.00	5.19	72.365	0.103	0.0	0.0	0.0	1.83	129.2	13.9

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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
S1.003	16.838	0.084	200.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	15.618	0.101	155.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.000	5.544	0.554	10.0	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	15.381	0.400	38.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	13.443	1.800	7.5	0.081	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	22.689	0.395	57.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	26.925	0.269	100.1	0.016	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	14.409	0.144	100.1	0.017	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.002	38.647	0.386	100.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.003	13.408	0.134	100.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.004	44.681	0.447	100.0	0.187	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	29.972	2.430	12.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	5.630	0.651	8.6	0.174	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	5.630	0.090	62.6	0.000	0.00	0.0	0.600	o	250	Pipe/Conduit	
S6.000	27.910	0.279	100.0	0.585	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	46.164	0.462	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.003	50.00	6.63	71.930	0.686	0.0	0.0	0.0	1.28	141.1	92.9
S1.004	50.00	6.81	71.846	0.686	0.0	0.0	0.0	1.45	160.4	92.9
S3.000	50.00	5.03	72.450	0.020	0.0	0.0	0.0	3.20	56.6	2.7
S1.005	50.00	6.91	71.745	0.706	0.0	0.0	0.0	2.54	179.8	95.6
S1.006	50.00	6.95	71.345	0.787	0.0	0.0	0.0	5.79	409.1	106.6
S1.007	50.00	7.13	69.545	0.787	0.0	0.0	0.0	2.08	147.0	106.6
S4.000	50.00	5.34	73.110	0.016	0.0	0.0	0.0	1.31	52.0	2.2
S4.001	50.00	5.53	72.841	0.033	0.0	0.0	0.0	1.31	52.0	4.5
S4.002	50.00	5.94	72.622	0.033	0.0	0.0	0.0	1.57	111.1	4.5
S4.003	50.00	6.08	72.236	0.033	0.0	0.0	0.0	1.57	111.1	4.5
S4.004	50.00	6.55	72.102	0.220	0.0	0.0	0.0	1.57	111.2	29.8
S4.005	50.00	6.69	71.655	0.220	0.0	0.0	0.0	3.75	149.0	29.8
S5.000	50.00	5.02	69.980	0.174	0.0	0.0	0.0	4.48	178.0	23.6
S5.001	50.00	5.07	69.304	0.174	0.0	0.0	0.0	1.77	87.0	23.6
S6.000	50.00	5.36	70.190	0.585	0.0	0.0	0.0	1.31	52.0«	79.2
S6.001	50.00	5.85	69.836	0.585	0.0	0.0	0.0	1.57	111.1	79.2

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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
S5.002	34.907	0.175	200.0	0.000	0.00	0.0	0.600	o	325	Pipe/Conduit	
S1.008	45.060	0.748	60.2	0.000	0.00	0.0	0.600	o	400	Pipe/Conduit	
S7.000	10.891	0.993	11.0	0.320	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	17.375	0.174	100.0	0.000	0.00	0.0	0.600	o	475	Pipe/Conduit	
S1.010	50.965	0.254	200.4	0.000	0.00	0.0	0.600	o	550	Pipe/Conduit	
S1.011	16.322	0.374	43.6	0.000	0.00	0.0	0.600	o	550	Pipe/Conduit	
S8.000	20.336	0.203	100.0	0.028	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	17.578	1.422	12.4	0.063	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	9.636	1.750	5.5	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.012	10.044	3.488	2.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S5.002	50.00	6.34	69.449	0.759	0.0	0.0	0.0	1.17	96.8«	102.8
S1.008	50.00	7.44	69.050	1.766	0.0	0.0	0.0	2.44	306.1	239.1
S7.000	50.00	5.05	69.470	0.320	0.0	0.0	0.0	3.97	158.0	43.3
S1.009	50.00	7.58	68.227	2.086	0.0	0.0	0.0	2.10	372.8	282.5
S1.010	50.00	8.10	67.978	2.086	0.0	0.0	0.0	1.63	386.2	282.5
S1.011	50.00	8.18	67.724	2.086	0.0	0.0	0.0	3.50	831.4	282.5
S8.000	50.00	5.26	69.050	0.028	0.0	0.0	0.0	1.31	52.0	3.8
S8.001	50.00	5.34	68.847	0.091	0.0	0.0	0.0	3.74	148.8	12.3
S9.000	50.00	5.04	69.250	0.012	0.0	0.0	0.0	4.32	76.4	1.6
S1.012	50.00	8.20	67.350	2.189	0.0	0.0	0.0	9.33	659.4	296.4

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.383	0.383	0.383
1.001	-	-	100	0.105	0.105	0.105
1.002	-	-	100	0.095	0.095	0.095
2.000	-	-	100	0.103	0.103	0.103
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.020	0.020	0.020
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.081	0.081	0.081
1.007	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.016	0.016	0.016
4.001	-	-	100	0.017	0.017	0.017
4.002	-	-	100	0.000	0.000	0.000
4.003	-	-	100	0.000	0.000	0.000
4.004	-	-	100	0.187	0.187	0.187
4.005	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.174	0.174	0.174
5.001	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.585	0.585	0.585
6.001	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.320	0.320	0.320
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.028	0.028	0.028
8.001	-	-	100	0.063	0.063	0.063
9.000	-	-	100	0.012	0.012	0.012
1.012	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.189	2.189	2.189

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.012	S	70.160	63.862	0.000	0	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	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	7
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)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Storage Structures for Storm

Porous Car Park Manhole: S1.00, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	29.3
Max Percolation (l/s)	244.2	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.50	Evaporation (mm/day)	3
Invert Level (m)	73.660	Cap Volume Depth (m)	0.560

Porous Car Park Manhole: S1.01, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.01980	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	29.3
Max Percolation (l/s)	244.2	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.50	Evaporation (mm/day)	3
Invert Level (m)	73.660	Cap Volume Depth (m)	0.560

Porous Car Park Manhole: S1.02, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	29.3
Max Percolation (l/s)	244.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.50	Evaporation (mm/day)	3
Invert Level (m)	73.660	Cap Volume Depth (m)	0.560

Porous Car Park Manhole: SMUGA, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	100.0
Max Percolation (l/s)	833.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.50	Evaporation (mm/day)	3
Invert Level (m)	70.190	Cap Volume Depth (m)	0.200

Porous Car Park Manhole: S3G Pitch, DS/PN: S6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	30.0
Membrane Percolation (mm/hr)	1000	Length (m)	100.0
Max Percolation (l/s)	833.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.50	Evaporation (mm/day)	3
Invert Level (m)	70.190	Membrane Depth (mm)	0

Porous Car Park Manhole: S2G Pitch, DS/PN: S7.000

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	1090.0
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

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Porous Car Park Manhole: S2G Pitch, DS/PN: S7.000

Porosity	0.50	Slope (1:X)	0.0
Invert Level (m)	69.470	Depression Storage (mm)	5
Width (m)	10.0	Evaporation (mm/day)	3
Length (m)	392.4	Cap Volume Depth (m)	0.200

Tank or Pond Manhole: S1.10, DS/PN: S1.010

Invert Level (m) 68.297

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	180.0	1.200	552.0

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1 year Return Period Summary of Critical Results by Maximum Outflow (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 7
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 0.360
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 400.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1.00	15 Summer	1	+0%	1/15 Summer			
S1.001	S1.01	15 Summer	1	+0%	1/15 Summer			
S1.002	S1.02	15 Summer	1	+0%	1/15 Summer			
S2.000	S2.00	15 Summer	1	+0%	1/15 Summer	100/15 Summer		
S1.003	S1.03	15 Winter	1	+0%	1/15 Summer			
S1.004	S1.04	360 Winter	1	+0%	1/15 Summer			
S3.000	S3.00	15 Summer	1	+0%				
S1.005	S1.05	15 Summer	1	+0%				
S1.006	S1.06	15 Summer	1	+0%				
S1.007	S1.07	15 Summer	1	+0%				
S4.000	S4.00	15 Summer	1	+0%				
S4.001	S4.01	15 Summer	1	+0%				
S4.002	S4.02	15 Summer	1	+0%	100/15 Summer			
S4.003	S4.03	15 Summer	1	+0%	100/15 Summer			
S4.004	S4.04	15 Summer	1	+0%	100/15 Summer			
S4.005	S4.05	15 Summer	1	+0%	100/15 Summer			
S5.000	SMUGA	120 Summer	1	+0%				
S5.001	S18	120 Summer	1	+0%	2/60 Summer			
S6.000	S3G Pitch	360 Summer	1	+0%				

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1 year Return Period Summary of Critical Results by Maximum Outflow (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
S1.000	S1.00	73.551	0.191	0.000	0.79		13	57.3	SURCHARGED
S1.001	S1.01	73.544	0.393	0.000	0.82		23	57.5	SURCHARGED
S1.002	S1.02	73.539	1.104	0.000	0.63		36	44.3	SURCHARGED
S2.000	S2.00	73.531	0.866	0.000	0.14			15.8	SURCHARGED
S1.003	S1.03	73.531	1.226	0.000	0.23			26.3	SURCHARGED
S1.004	S1.04	73.691	1.471	0.000	0.07			8.7	SURCHARGED
S3.000	S3.00	72.475	-0.125	0.000	0.07			3.1	OK
S1.005	S1.05	71.800	-0.245	0.000	0.08			11.6	OK
S1.006	S1.06	71.395	-0.250	0.000	0.06			21.6	OK
S1.007	S1.07	69.627	-0.218	0.000	0.17			21.6	OK
S4.000	S4.00	73.143	-0.192	0.000	0.05			2.4	OK
S4.001	S4.01	72.889	-0.177	0.000	0.10			4.6	OK
S4.002	S4.02	72.663	-0.259	0.000	0.04			4.6	OK
S4.003	S4.03	72.279	-0.257	0.000	0.05			4.6	OK
S4.004	S4.04	72.209	-0.193	0.000	0.27			28.2	OK
S4.005	S4.05	71.724	-0.156	0.000	0.20			28.3	OK
S5.000	SMUGA	70.022	-0.183	0.000	0.08		17	9.1	FLOOD RISK
S5.001	S18	69.529	-0.025	0.000	0.17			8.9	OK
S6.000	S3G Pitch	70.236	-0.179	0.000	0.09		328	4.5	FLOOD RISK

PN	US/MH Name	Level Exceeded
S1.000	S1.00	
S1.001	S1.01	
S1.002	S1.02	
S2.000	S2.00	
S1.003	S1.03	
S1.004	S1.04	
S3.000	S3.00	
S1.005	S1.05	
S1.006	S1.06	
S1.007	S1.07	
S4.000	S4.00	
S4.001	S4.01	
S4.002	S4.02	
S4.003	S4.03	
S4.004	S4.04	
S4.005	S4.05	
S5.000	SMUGA	
S5.001	S18	
S6.000	S3G Pitch	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S6.001	S23	360 Summer	1	+0%	30/60 Summer			
S5.002	S25	120 Summer	1	+0%				
S1.008	S1.08	15 Summer	1	+0%	100/15 Summer			
S7.000	S2G Pitch	360 Summer	1	+0%				
S1.009	S1.09	15 Summer	1	+0%	100/15 Summer			
S1.010	S1.10	15 Summer	1	+0%	100/15 Summer			
S1.011	S1.11	15 Summer	1	+0%	30/15 Summer			
S8.000	S5.00	15 Summer	1	+0%				
S8.001	S5.01	15 Summer	1	+0%	100/30 Summer			
S9.000	S28	15 Summer	1	+0%				
S1.012	S1.11	15 Summer	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
S6.001	S23	69.998	-0.138	0.000	0.04			4.5	OK
S5.002	S25	69.522	-0.252	0.000	0.12			10.3	OK
S1.008	S1.08	69.163	-0.287	0.000	0.18			49.5	OK
S7.000	S2G Pitch	69.485	-0.210	0.000	0.01		250	2.0	FLOOD RISK*
S1.009	S1.09	68.366	-0.336	0.000	0.19			49.2	OK
S1.010	S1.10	68.117	-0.411	0.000	0.14			49.0	OK
S1.011	S1.11	67.838	-0.436	0.000	0.09			48.6	OK
S8.000	S5.00	69.096	-0.179	0.000	0.09			4.3	OK
S8.001	S5.01	68.893	-0.179	0.000	0.09			12.4	OK
S9.000	S28	69.266	-0.134	0.000	0.03			1.8	OK
S1.012	S1.11	67.714	0.064	0.000	0.12			57.5	SURCHARGED

PN	US/MH Name	Level Exceeded
S6.001	S23	
S5.002	S25	
S1.008	S1.08	
S7.000	S2G Pitch	
S1.009	S1.09	
S1.010	S1.10	
S1.011	S1.11	
S8.000	S5.00	
S8.001	S5.01	
S9.000	S28	
S1.012	S1.11	

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2 year Return Period Summary of Critical Results by Maximum Outflow (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 7
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 0.360
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 400.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1.00	15 Summer	2	+0%	1/15 Summer			
S1.001	S1.01	15 Summer	2	+0%	1/15 Summer			
S1.002	S1.02	15 Summer	2	+0%	1/15 Summer			
S2.000	S2.00	15 Summer	2	+0%	1/15 Summer	100/15 Summer		
S1.003	S1.03	15 Winter	2	+0%	1/15 Summer			
S1.004	S1.04	360 Winter	2	+0%	1/15 Summer			
S3.000	S3.00	15 Summer	2	+0%				
S1.005	S1.05	15 Summer	2	+0%				
S1.006	S1.06	15 Summer	2	+0%				
S1.007	S1.07	15 Summer	2	+0%				
S4.000	S4.00	15 Summer	2	+0%				
S4.001	S4.01	15 Summer	2	+0%				
S4.002	S4.02	15 Summer	2	+0%	100/15 Summer			
S4.003	S4.03	15 Summer	2	+0%	100/15 Summer			
S4.004	S4.04	15 Summer	2	+0%	100/15 Summer			
S4.005	S4.05	15 Summer	2	+0%	100/15 Summer			
S5.000	SMUGA	60 Summer	2	+0%				
S5.001	S18	60 Summer	2	+0%	2/60 Summer			
S6.000	S3G Pitch	360 Summer	2	+0%				

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2 year Return Period Summary of Critical Results by Maximum Outflow (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
S1.000	S1.00	73.702	0.342	0.000	0.99		8	71.9	SURCHARGED
S1.001	S1.01	73.688	0.537	0.000	0.97		46	68.5	SURCHARGED
S1.002	S1.02	73.676	1.241	0.000	0.65		17	46.0	SURCHARGED
S2.000	S2.00	73.774	1.109	0.000	0.18			20.1	SURCHARGED
S1.003	S1.03	73.726	1.421	0.000	0.22			25.3	SURCHARGED
S1.004	S1.04	73.719	1.498	0.000	0.07			8.7	SURCHARGED
S3.000	S3.00	72.479	-0.121	0.000	0.08			4.0	OK
S1.005	S1.05	71.803	-0.242	0.000	0.08			12.3	OK
S1.006	S1.06	71.401	-0.244	0.000	0.08			25.7	OK
S1.007	S1.07	69.637	-0.209	0.000	0.20			25.8	OK
S4.000	S4.00	73.148	-0.187	0.000	0.07			3.1	OK
S4.001	S4.01	72.895	-0.171	0.000	0.13			5.9	OK
S4.002	S4.02	72.669	-0.253	0.000	0.06			6.0	OK
S4.003	S4.03	72.286	-0.250	0.000	0.07			6.0	OK
S4.004	S4.04	72.226	-0.176	0.000	0.35			36.5	OK
S4.005	S4.05	71.733	-0.147	0.000	0.26			36.6	OK
S5.000	SMUGA	70.039	-0.166	0.000	0.15		9	17.0	FLOOD RISK
S5.001	S18	69.558	0.004	0.000	0.32			16.8	SURCHARGED
S6.000	S3G Pitch	70.245	-0.170	0.000	0.14		285	6.7	FLOOD RISK

PN	US/MH Name	Level Exceeded
S1.000	S1.00	
S1.001	S1.01	
S1.002	S1.02	
S2.000	S2.00	
S1.003	S1.03	
S1.004	S1.04	
S3.000	S3.00	
S1.005	S1.05	
S1.006	S1.06	
S1.007	S1.07	
S4.000	S4.00	
S4.001	S4.01	
S4.002	S4.02	
S4.003	S4.03	
S4.004	S4.04	
S4.005	S4.05	
S5.000	SMUGA	
S5.001	S18	
S6.000	S3G Pitch	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S6.001	S23	360 Summer	2	+0%	30/60 Summer			
S5.002	S25	60 Summer	2	+0%				
S1.008	S1.08	15 Summer	2	+0%	100/15 Summer			
S7.000	S2G Pitch	360 Summer	2	+0%				
S1.009	S1.09	15 Summer	2	+0%	100/15 Summer			
S1.010	S1.10	15 Summer	2	+0%	100/15 Summer			
S1.011	S1.11	60 Summer	2	+0%	30/15 Summer			
S8.000	S5.00	15 Summer	2	+0%				
S8.001	S5.01	15 Summer	2	+0%	100/30 Summer			
S9.000	S28	15 Summer	2	+0%				
S1.012	S1.11	15 Summer	2	+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
S6.001	S23	70.023	-0.113	0.000	0.06			6.7	OK
S5.002	S25	69.548	-0.226	0.000	0.20			17.8	OK
S1.008	S1.08	69.178	-0.272	0.000	0.22			62.3	OK
S7.000	S2G Pitch	69.490	-0.205	0.000	0.02		250	2.6	FLOOD RISK*
S1.009	S1.09	68.383	-0.319	0.000	0.24			61.9	OK
S1.010	S1.10	68.136	-0.392	0.000	0.18			61.4	OK
S1.011	S1.11	67.849	-0.425	0.000	0.11			57.0	OK
S8.000	S5.00	69.101	-0.174	0.000	0.12			5.5	OK
S8.001	S5.01	68.899	-0.173	0.000	0.12			16.1	OK
S9.000	S28	69.268	-0.132	0.000	0.04			2.4	OK
S1.012	S1.11	67.908	0.258	0.000	0.13			59.6	SURCHARGED

PN	US/MH Name	Level Exceeded
S6.001	S23	
S5.002	S25	
S1.008	S1.08	
S7.000	S2G Pitch	
S1.009	S1.09	
S1.010	S1.10	
S1.011	S1.11	
S8.000	S5.00	
S8.001	S5.01	
S9.000	S28	
S1.012	S1.11	

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30 year Return Period Summary of Critical Results by Maximum Outflow (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	7
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	0.360
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	400.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 10080
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1.00	15 Summer	30	+0%	1/15 Summer			
S1.001	S1.01	15 Summer	30	+0%	1/15 Summer			
S1.002	S1.02	15 Summer	30	+0%	1/15 Summer			
S2.000	S2.00	15 Winter	30	+0%	1/15 Summer	100/15 Summer		
S1.003	S1.03	15 Summer	30	+0%	1/15 Summer			
S1.004	S1.04	15 Winter	30	+0%	1/15 Summer			
S3.000	S3.00	15 Summer	30	+0%				
S1.005	S1.05	15 Summer	30	+0%				
S1.006	S1.06	15 Summer	30	+0%				
S1.007	S1.07	15 Summer	30	+0%				
S4.000	S4.00	15 Summer	30	+0%				
S4.001	S4.01	15 Summer	30	+0%				
S4.002	S4.02	15 Summer	30	+0%	100/15 Summer			
S4.003	S4.03	15 Summer	30	+0%	100/15 Summer			
S4.004	S4.04	15 Summer	30	+0%	100/15 Summer			
S4.005	S4.05	15 Summer	30	+0%	100/15 Summer			
S5.000	SMUGA	30 Summer	30	+0%				
S5.001	S18	30 Summer	30	+0%	2/60 Summer			
S6.000	S3G Pitch	120 Summer	30	+0%				

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30 year Return Period Summary of Critical Results by Maximum Outflow (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
S1.000	S1.00	73.786	0.426	0.000	1.18		19	86.1	SURCHARGED
S1.001	S1.01	73.745	0.594	0.000	1.22		57	86.2	SURCHARGED
S1.002	S1.02	73.732	1.297	0.000	0.93		67	65.1	SURCHARGED
S2.000	S2.00	74.204	1.539	0.000	0.43			48.6	FLOOD RISK
S1.003	S1.03	74.061	1.756	0.000	0.29			32.4	FLOOD RISK
S1.004	S1.04	74.036	1.815	0.000	0.07			8.8	FLOOD RISK
S3.000	S3.00	72.490	-0.110	0.000	0.16			7.5	OK
S1.005	S1.05	71.811	-0.234	0.000	0.11			16.2	OK
S1.006	S1.06	71.422	-0.223	0.000	0.15			49.2	OK
S1.007	S1.07	69.674	-0.171	0.000	0.38			49.2	OK
S4.000	S4.00	73.163	-0.172	0.000	0.12			5.9	OK
S4.001	S4.01	72.923	-0.143	0.000	0.29			13.0	OK
S4.002	S4.02	72.693	-0.229	0.000	0.12			12.7	OK
S4.003	S4.03	72.336	-0.200	0.000	0.14			13.0	OK
S4.004	S4.04	72.320	-0.082	0.000	0.85			88.6	OK
S4.005	S4.05	71.788	-0.092	0.000	0.63			87.6	OK
S5.000	SMUGA	70.096	-0.109	0.000	0.51		6	58.2	FLOOD RISK
S5.001	S18	69.763	0.209	0.000	1.12			58.4	SURCHARGED
S6.000	S3G Pitch	70.283	-0.132	0.000	0.27		160	13.3	FLOOD RISK

PN	US/MH Name	Level Exceeded
S1.000	S1.00	
S1.001	S1.01	
S1.002	S1.02	
S2.000	S2.00	
S1.003	S1.03	
S1.004	S1.04	
S3.000	S3.00	
S1.005	S1.05	
S1.006	S1.06	
S1.007	S1.07	
S4.000	S4.00	
S4.001	S4.01	
S4.002	S4.02	
S4.003	S4.03	
S4.004	S4.04	
S4.005	S4.05	
S5.000	SMUGA	
S5.001	S18	
S6.000	S3G Pitch	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S6.001	S23	360 Summer	30	+0%	30/60 Summer			
S5.002	S25	30 Summer	30	+0%				
S1.008	S1.08	30 Summer	30	+0%	100/15 Summer			
S7.000	S2G Pitch	360 Summer	30	+0%				
S1.009	S1.09	30 Summer	30	+0%	100/15 Summer			
S1.010	S1.10	60 Summer	30	+0%	100/15 Summer			
S1.011	S1.11	120 Summer	30	+0%	30/15 Summer			
S8.000	S5.00	15 Summer	30	+0%				
S8.001	S5.01	15 Summer	30	+0%	100/30 Summer			
S9.000	S28	15 Summer	30	+0%				
S1.012	S1.11	240 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
S6.001	S23	70.265	0.129	0.000	0.11			11.2	SURCHARGED
S5.002	S25	69.646	-0.128	0.000	0.68			59.9	OK
S1.008	S1.08	69.274	-0.176	0.000	0.59			164.0	OK
S7.000	S2G Pitch	69.507	-0.188	0.000	0.06		216	8.9	FLOOD RISK*
S1.009	S1.09	68.509	-0.193	0.000	0.64			168.6	OK
S1.010	S1.10	68.476	-0.053	0.000	0.34			116.7	OK
S1.011	S1.11	68.377	0.103	0.000	0.12			61.6	SURCHARGED
S8.000	S5.00	69.122	-0.153	0.000	0.22			10.4	OK
S8.001	S5.01	68.927	-0.144	0.000	0.28			36.9	OK
S9.000	S28	69.275	-0.125	0.000	0.07			4.5	OK
S1.012	S1.11	67.970	0.321	0.000	0.13			59.6	SURCHARGED

PN	US/MH Name	Level Exceeded
S6.001	S23	
S5.002	S25	
S1.008	S1.08	
S7.000	S2G Pitch	
S1.009	S1.09	
S1.010	S1.10	
S1.011	S1.11	
S8.000	S5.00	
S8.001	S5.01	
S9.000	S28	
S1.012	S1.11	

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100 year Return Period Summary of Critical Results by Maximum Outflow (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 7
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 0.360
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 18.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 400.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1.00	15 Winter	100	+45%	1/15 Summer			
S1.001	S1.01	15 Summer	100	+45%	1/15 Summer			
S1.002	S1.02	15 Winter	100	+45%	1/15 Summer			
S2.000	S2.00	15 Summer	100	+45%	1/15 Summer	100/15 Summer		
S1.003	S1.03	15 Summer	100	+45%	1/15 Summer			
S1.004	S1.04	240 Winter	100	+45%	1/15 Summer			
S3.000	S3.00	15 Summer	100	+45%				
S1.005	S1.05	15 Summer	100	+45%				
S1.006	S1.06	15 Summer	100	+45%				
S1.007	S1.07	15 Summer	100	+45%				
S4.000	S4.00	15 Summer	100	+45%				
S4.001	S4.01	15 Summer	100	+45%				
S4.002	S4.02	15 Summer	100	+45%	100/15 Summer			
S4.003	S4.03	15 Summer	100	+45%	100/15 Summer			
S4.004	S4.04	15 Summer	100	+45%	100/15 Summer			
S4.005	S4.05	15 Summer	100	+45%	100/15 Summer			
S5.000	SMUGA	15 Summer	100	+45%				
S5.001	S18	15 Summer	100	+45%	2/60 Summer			
S6.000	S3G Pitch	30 Summer	100	+45%				

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100 year Return Period Summary of Critical Results by Maximum Outflow (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
S1.000	S1.00	73.886	0.526	0.000	1.17		53	85.1	SURCHARGED
S1.001	S1.01	73.817	0.666	0.000	1.20		107	84.7	SURCHARGED
S1.002	S1.02	73.805	1.370	0.000	1.01		150	70.7	SURCHARGED
S2.000	S2.00	74.203	1.538	0.150	0.72			81.3	FLOOD
S1.003	S1.03	73.964	1.659	0.000	0.32			36.5	SURCHARGED
S1.004	S1.04	73.991	1.770	0.000	0.07			9.0	FLOOD RISK
S3.000	S3.00	72.506	-0.094	0.000	0.30			14.0	OK
S1.005	S1.05	71.823	-0.222	0.000	0.15			22.6	OK
S1.006	S1.06	71.448	-0.197	0.000	0.26			86.5	OK
S1.007	S1.07	69.725	-0.120	0.000	0.67			86.4	OK
S4.000	S4.00	73.184	-0.151	0.000	0.23			11.1	OK
S4.001	S4.01	73.006	-0.060	0.000	0.51			23.0	OK
S4.002	S4.02	72.981	0.059	0.000	0.27			28.1	SURCHARGED
S4.003	S4.03	72.966	0.430	0.000	0.47			43.1	SURCHARGED
S4.004	S4.04	72.949	0.547	0.000	1.43			149.0	SURCHARGED
S4.005	S4.05	71.945	0.065	0.000	1.01			140.2	SURCHARGED
S5.000	SMUGA	70.194	-0.011	0.000	0.70		3	79.2	FLOOD RISK
S5.001	S18	69.898	0.344	0.000	1.51			78.8	SURCHARGED
S6.000	S3G Pitch	70.326	-0.089	0.000	0.37		162	18.0	FLOOD RISK

PN	US/MH Name	Level Exceeded
S1.000	S1.00	
S1.001	S1.01	
S1.002	S1.02	
S2.000	S2.00	
S1.003	S1.03	
S1.004	S1.04	
S3.000	S3.00	
S1.005	S1.05	
S1.006	S1.06	
S1.007	S1.07	
S4.000	S4.00	
S4.001	S4.01	
S4.002	S4.02	
S4.003	S4.03	
S4.004	S4.04	
S4.005	S4.05	
S5.000	SMUGA	
S5.001	S18	
S6.000	S3G Pitch	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S6.001	S23	360 Summer	100	+45%	30/60 Summer			
S5.002	S25	30 Summer	100	+45%				
S1.008	S1.08	15 Summer	100	+45%	100/15 Summer			
S7.000	S2G Pitch	180 Summer	100	+45%				
S1.009	S1.09	15 Summer	100	+45%	100/15 Summer			
S1.010	S1.10	15 Winter	100	+45%	100/15 Summer			
S1.011	S1.11	30 Winter	100	+45%	30/15 Summer			
S8.000	S5.00	15 Summer	100	+45%				
S8.001	S5.01	15 Summer	100	+45%	100/30 Summer			
S9.000	S28	15 Summer	100	+45%				
S1.012	S1.11	360 Winter	100	+45%	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
S6.001	S23	70.421	0.285	0.000	0.12			12.6	SURCHARGED
S5.002	S25	69.707	-0.067	0.000	0.99			87.6	OK
S1.008	S1.08	69.479	0.029	0.000	1.00			279.4	SURCHARGED
S7.000	S2G Pitch	69.535	-0.160	0.000	0.19		117	26.2	FLOOD RISK*
S1.009	S1.09	68.864	0.162	0.000	1.07			279.8	SURCHARGED
S1.010	S1.10	68.749	0.221	0.000	0.39			133.7	SURCHARGED
S1.011	S1.11	69.218	0.944	0.000	0.16			79.9	SURCHARGED
S8.000	S5.00	69.152	-0.123	0.000	0.41			19.6	OK
S8.001	S5.01	69.058	-0.014	0.000	0.50			67.0	OK
S9.000	S28	69.285	-0.115	0.000	0.12			8.4	OK
S1.012	S1.11	68.845	1.195	0.000	0.13			59.6	SURCHARGED

PN	US/MH Name	Level Exceeded
S6.001	S23	
S5.002	S25	
S1.008	S1.08	
S7.000	S2G Pitch	
S1.009	S1.09	
S1.010	S1.10	
S1.011	S1.11	
S8.000	S5.00	
S8.001	S5.01	
S9.000	S28	
S1.012	S1.11	

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