



Surface Water Drainage Strategy

Site Address

63 Knowsley Street
Cheetham Hill
Manchester
M8 8HX

Client

Andersen Textiles Ltd

Report Reference

SWDS - 2020 - 00039

Prepared By

STM Environmental Consultants Ltd

Date

17/11/2021



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1 Document Control



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Contents

1	Document Control	2
2	Abbreviations.....	7
3	Disclaimer	8
4	Executive Summary.....	9
5	Introduction.....	11
5.1	Proposed Development.....	11
5.2	Report Aims and Objectives.....	12
5.3	Legislative and Policy Context	12
5.3.1	Legislative Context	12
5.3.2	Policy Context.....	12
5.3.3	Manchester City Council - Policy EN 17 - Water Quality	14
6	Site Characteristics	14
6.1	Location and Area	14
6.2	Current Site	16
6.3	Site Topography	16
6.4	Geology and Hydrology.....	16
6.5	Hydrogeology	16
6.6	Flood Risk	17
6.6.1	Fluvial Flood Risk	17
6.6.2	Surface Water Flood Risk.....	17
6.6.3	Groundwater Flood Risk.....	18
6.7	Existing Surface Water Drainage Features	19
7	Hydrological Run-off Assessment	19
7.1	Existing and Proposed Ground Cover	19
8	SuDS Requirements	20
8.1	Peak Flow Control.....	20
8.2	Volume Control Requirements	20
8.3	Run-off and Storage Calculations	21



9	Site Investigation	22
10	SuDS Options.....	22
10.1	SuDS Hierarchy	22
10.2	Assessment of SuDS Options.....	23
10.2.1	Living Roofs.....	23
10.2.2	Basins, Ponds, Filter Strips and Swales	23
10.2.3	Infiltration Devices	23
10.2.4	Permeable Surfaces and Filter Drains.....	24
10.2.5	Tanked Systems.....	24
10.2.6	Rainwater Harvesting	24
11	SuDS Implementation.....	25
11.1	Proposed Drainage System	25
11.1.1	Permeable Block Paving	25
11.1.2	Geocellular Storage.....	26
11.1.3	Discharge Control Device.....	27
11.1.4	Microdrainage Modelling	27
11.1.5	Surface Water Discharge Points	27
11.1.6	Treatment of Run-off	27
11.1.7	Exceedance Flows	28
11.2	Maintenance and Adoption of SuDS	28
12	Conclusion and Recommendations	30
13	References	31
14	Appendices	32
14.1	Appendix 1 – Development Plans	32
14.2	Appendix 2– Site Topography and Drainage Characteristics.....	33
14.2.1	LIDAR Mapping showing Site Topography - (Source: OS 2017).....	33
14.2.2	Topographic Survey	33
14.2.3	Bedrock Hydrogeology (Source: BGS, 2016).....	34

14.2.4	Superficial Hydrogeology (Source: BGS, 2016)	34
14.2.5	Artificial Ground (Source: BGS, 2016).....	35
14.2.6	Bedrock Permeability (Source BGS 2016)	35
14.2.7	Superficial Permeability (Source BGS:2016).....	36
14.2.8	Infiltration Drainage Potential (Source: BGS, 2016)	36
14.2.9	Groundwater Table Depth (Source: BGS 2016).....	37
14.3	Appendix 3 – Flood Risk Mapping	38
14.3.1	Long Term Fluvial Flood Risk Map (EA).....	38
14.3.2	Long Term Pluvial Flood Risk Map (EA)	38
14.3.3	Surface water flood depth during the 1 in 100 & 1 in 1000 year rainfall return periods (Source: EA, 2016).	39
14.3.4	Groundwater flooding susceptibility (Source: BGS, 2016).....	40
14.4	Appendix 4 – Run-Off Rate and Storage Calculations	41
14.4.1	UK SuDS	41
14.4.2	Microdrainage Quick Storage Estimates - Greenfield Runoff (1.2l/s) 42	
14.5	Appendix 5 – SuDS Suitability Assessment.....	43
14.6	Appendix 6 – Descriptions Of SuDS Techniques.....	46
14.6.1	Permeable Paving	46
14.6.2	Geocellular structures, oversized pipes and tanks	47
14.7	Appendix 7 – SuDS Maintenance Manual	49
14.7.1	Pervious Pavements	49
14.7.2	Geo-Cellular Maintenance.....	51
14.8	Appendix 8 - Microdrainage	53
14.8.1	Layout of Network	53
14.8.2	Layout of Network - Features, Exceedance flows and Sewer Connection	54

14.8.3	Layout of Network - Features, Exceedance flows and Sewer Connection	55
14.8.4	Microdrainage results	56
14.9	Appendix 9 - Asset Mapping	57

List of Tables

Table 1: Breakdown of Ground Cover in the Proposed Development.....	20
Table 2: Summary of Permeable and Impermeable Areas.....	20
Table 3: Calculation of post-development run-off rates for the site.	21

List of Figures

Figure 1: Site location map and aerial photo	15
Figure 2 SuDS Hierarchy	23
Figure 3 Block Permeable Paving with sub-base	46
Figure 4 Block Permeable Paving with Geocellular Module	46
Figure 5 Plastic or Grid Permeable Paving with Sub-base.....	47

2 Abbreviations

Abbreviation	Description
STM	STM Environmental Consultants Limited
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
SuDS	Sustainable Drainage Systems
GWSPZ	Groundwater Source Protection Zone

3 Disclaimer

This report and any information or advice which it contains, is provided by STM Environmental Consultants Ltd (STM) and can only be used and relied upon by Andersen Textiles Ltd (Client).

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4 Executive Summary

Location	63 Knowsley Street, Cheetham Hill, Manchester, M8 8HX Grid reference: 383871, 399753		
Proposed Development	7 wholesale units at ground floor with ancillary storage at first and second floor, and car parking.		
Current Use	Car park		
Hydrology	River Irwell 580m SW.		
Geology	Diamicton Till superficial deposits and the bedrock is classified as belonging to the Chester Pebble Bed (Sandstone). The BGS also identifies the site has been covered by infilled land (artificial deposits).		
Hydrogeology	Unproductive superficial and principal bedrock aquifer.		
Permeability	Highly variable superficial and freely draining bedrock.		
Infiltration Potential	Good potential.		
Fluvial Flood Risk	Low.		
Surface Water Flood Risk	Low.		
Groundwater Flood Risk	Low.		
Site Area	1160m ²		
Existing and Proposed Site Layout	Ground Cover	Existing	Proposed (Without SuDS)
	Buildings	0	581
	Driveways/Patio	1160	579
	Gardens/ Soft landscaping	0	0
	Total Impermeable Area	1160	1160

Run-Off Rates	Greenfield (GF) (l/s)	Pre - Development (PD) (l/s)	Post Development (PD) (l/s)
Qbar	0.4022	0.8771	0.8771
1 in 1	0.3418	0.7456	0.7456
1 in 30	0.9250	2.0174	2.0174
1 in 100	1.2829	2.7981	2.7981
1 in 100 + CC (40%)	1.9017	4.1480	4.1480
SuDS Target Requirement	As the development is taking place on an already developed site the non-statutory technical standards for sustainable drainage systems S3 (peak flow) and S5 and S6 (volume controls) apply.		
Storage Required to meet Planning Requirement	Using the Microdrainage quick storage estimate method the total storage volume required to match greenfield discharges or pre-development rate was calculated to be 57 - 82m ³ .		
Infiltration Testing	Infiltration testing was not undertaken due to the evidence of infilled ground covering the site as indicate by the BGS.		
SuDS Strategy	The use of permeable paving (16.8m³) and geocellular storage (102.6m³) will provide a total of 119.4m³ of interception and attenuation storage. A further 11.6m³ of storage will be available within the associated pipes and manholes. Excess run-off will be discharged into the nearby United Utilities sewer at a limited rate of 1.2l/s using an Orifice. This matches the greenfield development run-off rate for the major storm events. The proposed permeable paving will reduce the “effective impermeable site area” of the proposed development by 125m² and ensure that discharge rates match the greenfield runoff rate.		
Conclusion	With the proposed SuDS mitigation measures in place, we believe that the proposed development will reduce local flood risk and therefore be in compliance with Condition 17 of the planning permission 127544/FO/2020, the LLFA’s current planning policy and the NPPF.		

5 Introduction

STM Environmental Consultants Limited have been appointment by Andersen Textiles Ltd to undertake a Surface Water Drainage Strategy for a proposed development at 63 Knowsley Street, Cheetham Hill, Manchester, M8 8HX.

5.1 Proposed Development

The SWDS is required to support a planning application (Reference: 127544/FO/2020) for the erection of 3 storey building to create 7 wholesale units at ground floor with ancillary storage at first and second floor, and car parking.

The planning condition 17 states as follows:

Prior to the commencement of above ground development, the following details shall be submitted and approved in writing by the City Council with regard to flood risk:

-  Surface water drainage layout, including proposed overland flow routes for extreme events (up to 1 in 100 year including climate change allowance);
-  Details of any surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester, Trafford and Salford Strategic Flood Risk Assessment.
-  Hydraulic calculations to support the drainage proposals.
-  Details of how the scheme will be maintained and managed after completion.

Reason - To prevent the increased risk of flooding, to improve and protect water quality and ensure future maintenance of the surface water drainage system, pursuant to policy EN17 of the Manchester Core Strategy. Some elements of the drainage of the site have not yet been fully defined. The details are required prior to works commencing on site to ensure the most suitable and appropriate methods of drainage are installed prior to buildings being constructed on site.

Copies of the development plans and decision noticed are presented in [Appendix 1](#).

5.2 Report Aims and Objectives

This report sets out the proposed drainage strategy that will be employed in the designs to meet the requirements of the planning condition and the National Planning Policy Framework.

5.3 Legislative and Policy Context

5.3.1 Legislative Context

Section H3 of the Building Regulations 2010 requires that adequate provision is made for rainwater to be carried from the building roofs and paved areas, and be preferentially discharged to soakaways or some other adequate infiltration system. Where that is not reasonably practicable, a watercourse; or sewer can be used.

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

5.3.2 Policy Context

The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England. The policies set out in this framework apply to the preparation of local and neighbourhood plans and to decisions on planning applications.

Paragraph 163 of the National Planning Policy Framework (NPPF) states that:

When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment

following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

-  within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location
-  development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

Paragraph 165 states that:

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

-  take account of advice from the lead local flood authority;
-  have appropriate proposed minimum operational standards;
-  have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
-  where possible, provide multifunctional benefits.

A major development is defined as:

-  a residential development: 10 dwellings or more or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known
-  a non-residential development: provision of a building or buildings where the total floor space to be created is 1000 square metres or more or where the floor area is not yet known, a site area of 1 hectare or more.

Evidence that sustainable drainage (SuDS) has been considered should be submitted for Minor Developments.

5.3.3 Manchester City Council - Policy EN 17 - Water Quality

Development should avoid any adverse impact on water quality, including during the construction phase, and wherever possible should seek to enhance water quality, both chemical and ecological;

Development should minimise surface water run-off from development and associated roads, and maximise the use of appropriate sustainable drainage systems, to minimise groundwater contamination, and to avoid pollutants reaching watercourses;

Development close to a watercourse should also ensure that waste or litter cannot enter the watercourse from the site;

Development should, where feasible and appropriate, seek to open up any culverted or hidden watercourse beneath the site to improve the ecological status of that watercourse.

6 Site Characteristics

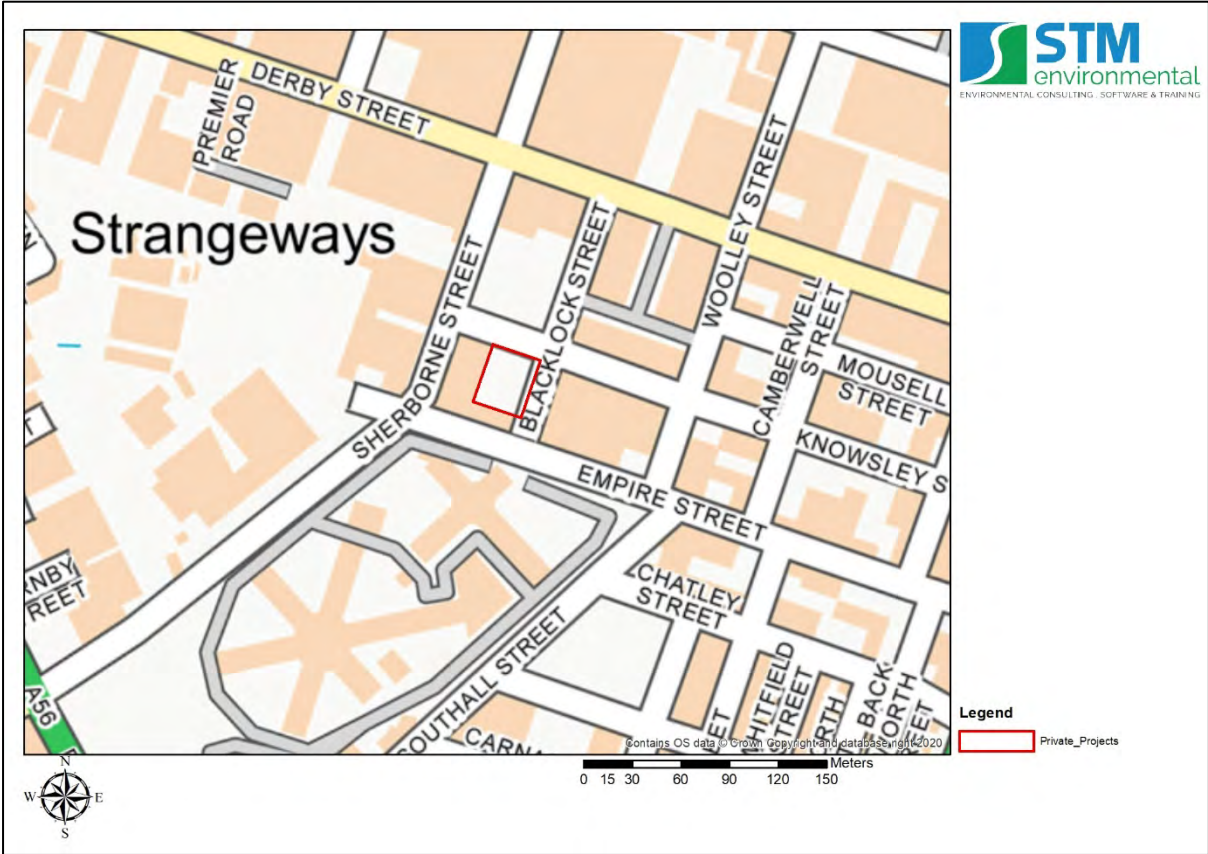
6.1 Location and Area

The site is centred at national grid reference 383871, 399753 and has an area of 1,160m².

It falls within the jurisdiction of Manchester City Council in terms of the planning consultation process on flood risk and surface water management. The LLFA is Manchester District Council.

Figure 1 provides the site location map and aerial imagery.

Figure 1: Site location map and aerial photo



6.2 Current Site

The site is currently used as car parking.

6.3 Site Topography

The mapping provided in [Appendix 2](#) shows that the topography within the site.

The site is flat at 45.3 - 45.5mAOD.

6.4 Geology and Hydrology

The nearest main watercourse is the River Irwell, located 580m south west of the site.

[Appendix 2](#) presents BGS mapping showing the geology in the area of the site.

The BGS Geoindex indicates that the superficial deposits at the site consist of Diamicton till whilst the bedrock is classified as belonging to the Chester Pebble Bed (Sandstone). The BGS also identifies the site to be covered by infilled land (artificial deposits).

6.5 Hydrogeology

[Appendix 2](#) presents mapping from the BGS with indications of the hydrogeological characteristics of the site.

The permeability of the bedrock geology is considered to be freely draining while that of the superficial geology is considered to be highly variable.

The BGS infiltration potential map suggests that there is likely to be good potential for infiltration methods at the site.

The maps also indicate that the groundwater table is greater than 5mBGL.

The site lies upon a principal bedrock aquifer and an unproductive superficial aquifer. The site does not lie within a groundwater source protection zone.

6.6 Flood Risk

6.6.1 Fluvial Flood Risk

Fluvial and tidal risk is assessed using flooding maps produced by the Environment Agency (EA). These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps allow a site to be defined in terms of its Flood Zone (e.g. 1, 2, 3a or 3b) and in terms of the overall flood risk (very low, low, medium or high).

The EA Flood Zones are defined as:

-  Flood zone 1: Less than a 1 in 1000 annual probability of fluvial and/or tidal flooding;
-  Flood zone 2: Between 1 in 100 and 1 in 1000 annual probability of fluvial flooding and/or between 1 in 200 and 1 in 1000 annual probability of tidal flooding;
-  Flood zone 3a: Greater than 1 in 100 annual probability of fluvial flooding and/or greater than 1 in 200 annual probability of tidal flooding;
-  Flood zone 3b: functional flood plain (definition specific to the LLFA). Less than a 1 in 20 annual probability of fluvial and/or tidal flooding.

The site is designated as being within flood zone 1 and is therefore considered to have a low risk of flooding. This equates to a potential yearly risk of flooding of less than 1 in 1000 annual probability of fluvial and/or tidal flooding (0.1 % Annual Expected Probability).

6.6.2 Surface Water Flood Risk

Surface water flooding occurs when high intensity rainfall leads to run-off which flows over the ground surface, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greater than the rate of infiltration, or return into watercourses. Surface water flooding can be exacerbated when the underlying soil and geology is saturated (as a result of prolonged precipitation or a high-water table) or when the drainage network has insufficient capacity.

The chief mechanisms for flooding can be divided into the following categories:

-  Runoff from higher topography – the areas of greatest flood depths tend to be at the base of the steeper land;
-  Localised surface water runoff – within the central parts of the borough, surface water flooding tends to be a result of localised ponding of surface water;
-  Sewer Flooding – areas where extensive and deep surface water flooding is likely to be influenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas.
-  Low Lying Areas – areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
-  Railway Cuttings – leading to internal ponding and transport disruption;
-  Railway Embankments – discrete surface water flooding locations along the up-stream side of the raised network rail embankments where water flows are interrupted and ponding can occur.

A map showing the site and the modelled prediction of surface water flood risk and depth provided by the EA is available in [Appendix 3](#). This indicates that the site is at low risk of flooding.

The site will not witness any surface water flooding during the 1 in 30 or 1 in 100 years rainfall return period.

The site will witness surface water flooding depth of up to 150mm during the 1 in 1000 years event.

6.6.3 Groundwater Flood Risk

Groundwater flooding occurs when water rises from the underlying aquifer at the location of a spring – where the underlying impermeable geology meets the ground surface. This tends to occur after much longer periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although

increasingly it is also being associated with more localised floodplain sands and gravels.

Groundwater susceptibility mapping provided by BGS is presented in [Appendix 3](#). This indicates that there is no significant potential for groundwater flooding to occur at the surface.

6.7 Existing Surface Water Drainage Features

The existing surface water runoff from the car park drains into the United Utilities sewer.

A utility search was undertaken which identified United Utilities as the waste water operator in the area.

United Utilities operates a combined sewer within the local area. The closest sewer run is located to the north of the site along Knowsley Street, flowing west to east across the northern boundary. The closest asset ID is 8707, it's cover level is 45.87mAOD and its invert level is 42.4mAOD.

7 Hydrological Run-off Assessment

To minimise the impact of the new development on local flood risk, the NPPF requires that the water drainage arrangements for any development site are that the volumes and peak flow rates leaving the site post-development are improved upon those of the existing conditions. The following run-off assessment predicts the Greenfield, pre- and post-development run-off rates and provides the required SuDS necessary for complying with the relevant planning policies.

7.1 Existing and Proposed Ground Cover

A summary of the existing and proposed site ground cover is shown below in Table 1 and Table 2 below.

Table 1: Breakdown of Ground Cover in the Proposed Development

Ground Cover	Existing Area (m ²)	Proposed Area (m ²) (Without SuDS)	Difference
Buildings	0	581	581
Driveways/Patio	1160	579	-581
Gardens/ Soft landscaping	0	0	0
Total	1160	1160	

Table 2: Summary of Permeable and Impermeable Areas

	Impermeable Area (m ²)	Permeable Area (m ²)	Total Area (m ²)
Existing Site	1160	0	1160
Proposed Site	1160	0	1160
Difference	0	0	

8 SuDS Requirements

8.1 Peak Flow Control

With regard to peak flow control, the non-statutory technical standards for sustainable drainage systems state that:

 S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event 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.

8.2 Volume Control Requirements

With regard to volume control, the non-statutory technical standards for sustainable drainage systems state that:

- S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.
- S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

8.3 Run-off and Storage Calculations

The IH124 method was applied to calculate the Greenfield and post-development run-off rates that include the 40% allowances for climate change. The full results are presented in [Appendix 4](#). Table 3 and Table 4 below give a summary of the results.

Table 3: Calculation of post-development run-off rates for the site.

	Greenfield (l/s)	Greenfield + CC	Pre - Development	Pre - Development + CC	Post Development	Post Development + CC
Qbar	0.4022	0.5962	0.8771	1.3003	0.8771	1.3003
1 in 1	0.3418	0.5067	0.7456	1.1053	0.7456	1.1053
1 in 30	0.9250	1.3712	2.0174	2.9907	2.0174	2.9907
1 in 100	1.2829	1.9017	2.7981	4.1480	2.7981	4.1480

As the development is taking place on an already developed site S3 (peak flow) and S5 and S6 (volume controls) apply. Therefore, the target discharge rate to the sewer or watercourse from this site, was set to no more than the 1 in 100 greenfield runoff rate which was calculated to be 1.2l/s.

The quick storage estimate tool in Microdrainage was used to estimate the approximate storage required. The storage volume required to match greenfield rates is estimated to be **57 - 82m³**. Screenshots of the quick storage estimate and variables are available in [Appendix 4](#).

9 Site Investigation

A site investigation has not been undertaken due to the evidence that this site is located on infilled land as indicated by the BGS artificial deposits layer file.

10 SuDS Options

As mentioned above, planning policies require that SuDS strategies consider source control (i.e. disposal of runoff within the plot boundary), followed by site control (site wide disposal) and then regional control (appropriate for larger development with strategic drainage infrastructure). They also require that those methods that give the most benefits in terms of sustainability are prioritised for employment (generally known as the SuDS Hierarchy) as further described below.

10.1 SuDS Hierarchy

The SuDS Hierarchy sets out the preferred method of selecting which Sustainable Drainage System should be used. Generally, 'soft SuDS' such as ponds and swales are the preferred drainage systems as they mimic natural drainage and provide a number of benefits including attenuation of surface water flows and flow rates as well as pollution.

Smaller developments which may not have the physical room for pond and swales would need to consider other options. In these cases, preference should be given to infiltration systems. However, care should be taken if implementing infiltration systems near aquifer protection zones, close to buildings or structural foundations or in areas where soils may be polluted.

The SuDS hierarchy is summarised in Figure 2 below.

Figure 2 SuDS Hierarchy

Most Sustainable Least Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living roofs	✓	✓	✓
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✓	✓	✓
	Filter strips and swales	✓	✓	✓
	Infiltration devices - soakaways - infiltration trenches and basins	✓	✓	✓
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviers	✓	✓	
	Tanked systems - over-sized pipes/tanks - storms cells	✓		

10.2 Assessment of SuDS Options

An assessment was made of the suitability of a range of potential SuDS techniques that could be implemented as part of the development. The results of the assessment are summarised in [Appendix 5](#) and are further discussed below.

10.2.1 Living Roofs

Although buildings account for more than 581m² of the site cover, given the proposed pitched style roofs, living roofs will not be suitable option.

10.2.2 Basins, Ponds, Filter Strips and Swales

Basins, ponds, filters strips and swales are not suitable due to limited space.

10.2.3 Infiltration Devices

Infiltration techniques should be given priority in any SuDS design as they deal with discharge on the site returning water to the aquifer and subsequently rivers via baseflow.

However, care must be taken to ensure that contamination of groundwater is prevented. The Environment Agency publication 'Groundwater protection: Policy and practice (GP3) Section G, 2012, states that the Environment Agency will support sustainable drainage systems for new discharges to ground subject to an appropriate risk assessment to demonstrate that ground conditions are suitable and infiltration systems do not present an unacceptable risk of promoting mobilisation of contaminants or creating new pathways for contaminant migration.

Mapping provided by the BGS showing the infiltration potential of the site is presented in [Appendix 3](#). The map indicates that although there is good potential for infiltration SuDS in the area, given that the location is covered by infilled land, it is thought that infiltration is not suitable for this site location.

10.2.4 Permeable Surfaces and Filter Drains

Over 580m² of the development will consist of car parking and driveways which could be designed to be permeable.

10.2.5 Tanked Systems

A tanked system incorporating a hydro brake restricting flow to the sewer would be a viable option if infiltration is not suitable. However, this option is ranked as being the least sustainable in the SuDS hierarchy.

10.2.6 Rainwater Harvesting

The use of rainwater butts and or harvesting tanks could be employed within each individual building and patios, although they would have a limited storage capacity and will be required to be an active system.

Detailed descriptions of some of the proposed SuDS techniques are available in [Appendix 7](#).

11 SuDS Implementation

11.1 Proposed Drainage System

The proposed drainage system will convert the car parking spaces into permeable block paving with a sub-base. Geocellular storage crates will be installed below the concrete roadway to provide for stormwater control before discharging into the United Utilities sewer along Knowsley Street to the north at a controlled discharge rate.

The proposed scheme is described in more detail below.

11.1.1 Permeable Block Paving

The car parking area within the yard to the front of the proposed units accounts for 125m². Runoff from this area will be managed using permeable block paving.

Permeable Paving (Marshalls Prior or similar) combines hardstanding with SuDS and works in a very different way to traditional pavement. It is designed to allow rainfall to percolate immediately through the surface near to where the raindrop lands – so surface ponding is completely eradicated without the need for an additional channel drainage system.

The construction will consist of 80mm interlocking concrete blocks with jointing, with a 200mm underlying bedding layer Dense Bitumen Macadam (DBM) and a 450mm sub-base consisting of a graded aggregate (Marshalls Priora Aggregates or similar) with a porosity of 0.30). This 450mm construction will allow for the heavy goods vehicles to manoeuvre over it without causing damage to its intended design.

This construction over 125m² will provide approximately 16m³ of interception, attenuation, and treatment storage. The construction will form a long strip along the western boundary, covering half of the car parking spaces (to allow for heavier vehicles to manoeuvre fully in and out the site) and will also be placed below the bin storage area in the north.

The water flows into a specially prepared sub-base, where the voids between the stones which make up the structure act as a temporary reservoir. During a rainstorm,

the water is collected in the sub-base ('attenuated') before it is slowly released either by natural infiltration into the ground beneath the pavement.

The construction of the permeable concrete block paving and the underlying sub-base will act as a filter medium and over time the microbial organisms will cultivate in the pavement helping to break down any hydrocarbons from fuel leaks, exhaust fumes and oil sumps drips.

The permeable block paving will be lined and will drain into the geocellular storage that is described below. The inclusion of the permeable surface will reduce the effective impermeable area by 125m².

11.1.2 Geocellular Storage

The remaining hardstanding (460m²) forms the roadway and turning area of the site. This will remain as impermeable concrete to allow for heavy goods vehicles.

Catchment gullies will convey the surface water runoff from the roadway and the downpipes from the proposed building (581m²) will drain into geocellular attenuation.

Two geocellular storage structures will be installed and cover an area of 180m² with a thickness of 0.6m. The geocellular storage crates ([Geocell Drainage Crates](#) or similar) will have a porosity of 95%, stacked together to create the desired storage volume of thus providing a total storage volume of 102.6m³.

Excess stormwater from the geocellular units will be conveyed to a manhole located in the centre of the driveway which will convey it to the outfall on the northern boundary of the site via an Orifice flow control device (or similar) which will restrict the flow to 1.2l/s.

11.1.3 Discharge Control Device

An orifice flow control device chamber will be used to limit the discharge from the site into the United Utilities surface water sewer to 1.2l/s. Ensuring the surface water runoff rate is limited to the greenfield 1 in 100-year scenario.

Details and examples of product specification sheets are available in [Appendix 7](#).

11.1.4 Microdrainage Modelling

Microdrainage Modelling was carried out to assess the performance of the proposed drainage system under a variety of modelled storm events. The designed system including the proposed attenuation storage, provides a total storage of 130m³ when all pipes, manholes and storage structures are included.

No flooding was indicated during any of the modelled scenarios, including the 1 in 100 year plus 40% climate change.

Full results, drainage layout including the proposed discharge point and exceedance flows of this are available in [Appendix 8](#).

11.1.5 Surface Water Discharge Points

As there is no nearby watercourse, run-off from the development will be conveyed via 225mm diameter lateral drains to the surface water sewer on Knowsley Street. The closest surface water asset identified is 8707, it has a cover level of 45.87 mAOD and invert level of 42.11 mAOD.

A copy drainage asset search is available in [Appendix 9](#).

11.1.6 Treatment of Run-off

Treatment of roof water runoff will be provided through the provision of trapped gullies and water butts to intercept gross solids and sediment, guidance will be provided to householders on appropriate maintenance requirements including regular cleaning of gullies.

11.1.7 Exceedance Flows

The site is flat at 45.3 - 45.5m AOD. Knowsley Street road runs northwest to east across the northern boundary. The elevation review of the LIDAR 1m DTM Mapping indicates that in the event of exceedance on the site, that overland flows would be contained within the kerbsides within the yard area before flowing gradually onto Knowsley Road and away from the site to the northwest. Knowsley Street slopes gradually to the west as indicated by the 1m DTM LIDAR data.

Furthermore, a slotted drainage gully will be fitted to the entrance of all buildings and will extend around the perimeter of the site to ensure the conveyance of exceedance flows away from the new builds.

It can be seen from the design proposals; the proposed system includes approximately 120m³ of storage capacity. In addition, a safety factor of 2 was applied to the Microdrainage modelling, which gives a further degree of confidence that exceedance flows are unlikely to occur. However, in the unlikely event that an inundation of the proposed system results in overland flows, then appropriate level design will be employed to ensure that flood waters are directed away from buildings.

A map displaying the exceedance flow is available in [Appendix 8](#).

11.2 Maintenance and Adoption of SuDS

All SuDS features will be properly installed by competent persons. They will be maintained regularly to ensure that their design capacity and attenuation characteristics provide the required storage volume.

Landscaping and adjacent areas will be designed such that they do not cause soil, mulch and other materials to be washed onto the permeable surfaces and into drains causing clogging.

Owners of the properties/persons responsible for maintenance of SuDS components will be provided with operation and maintenance manuals which will include information such as:

- the location of SuDS components;
- an explanation of design intent and objective of the SuDS;
- the requirements for regular and occasional inspection and maintenance;
- visual indicators that may trigger maintenance.

Regular maintenance of SuDS components is relatively straightforward with the main tasks consisting of:

- Regular visual inspections – checking inlets are not blocked and verifying that clogging has not occurred;
- Litter and debris removal;
- Grass cutting;
- Preventive sweeping;
- Weeding and invasive plant control;
- Oil and stain removal.

Occasional maintenance activities to ensure the long-term performance of the SuDS features include:

- Sediment removal
- Vegetation and plant replacement

These simple measures will ensure that the storage capacity of the system is maintained and that the need for reconstruction and replacement of components is minimised.

Further details on SuDS maintenance measures that will be employed at the site can be found in [Appendix 8](#).

12 Conclusion and Recommendations

The use of permeable paving (16.6m^3) and geocellular storage (102.8m^3) will provide a total of 119.4m^3 of interception and attenuation storage. A further 11m^3 of storage will be available within the associated pipes and manholes giving a total of 130m^3 of storage.

Excess run-off from the system will be discharged into the nearby United Utilities sewer via an Orifice at a maximum rate of 1.2l/s . This matches the greenfield run-off rate for the 1 in 100-year storm event.

No flooding will be witnessed during the 1 in 100 plus 40% climate change event.

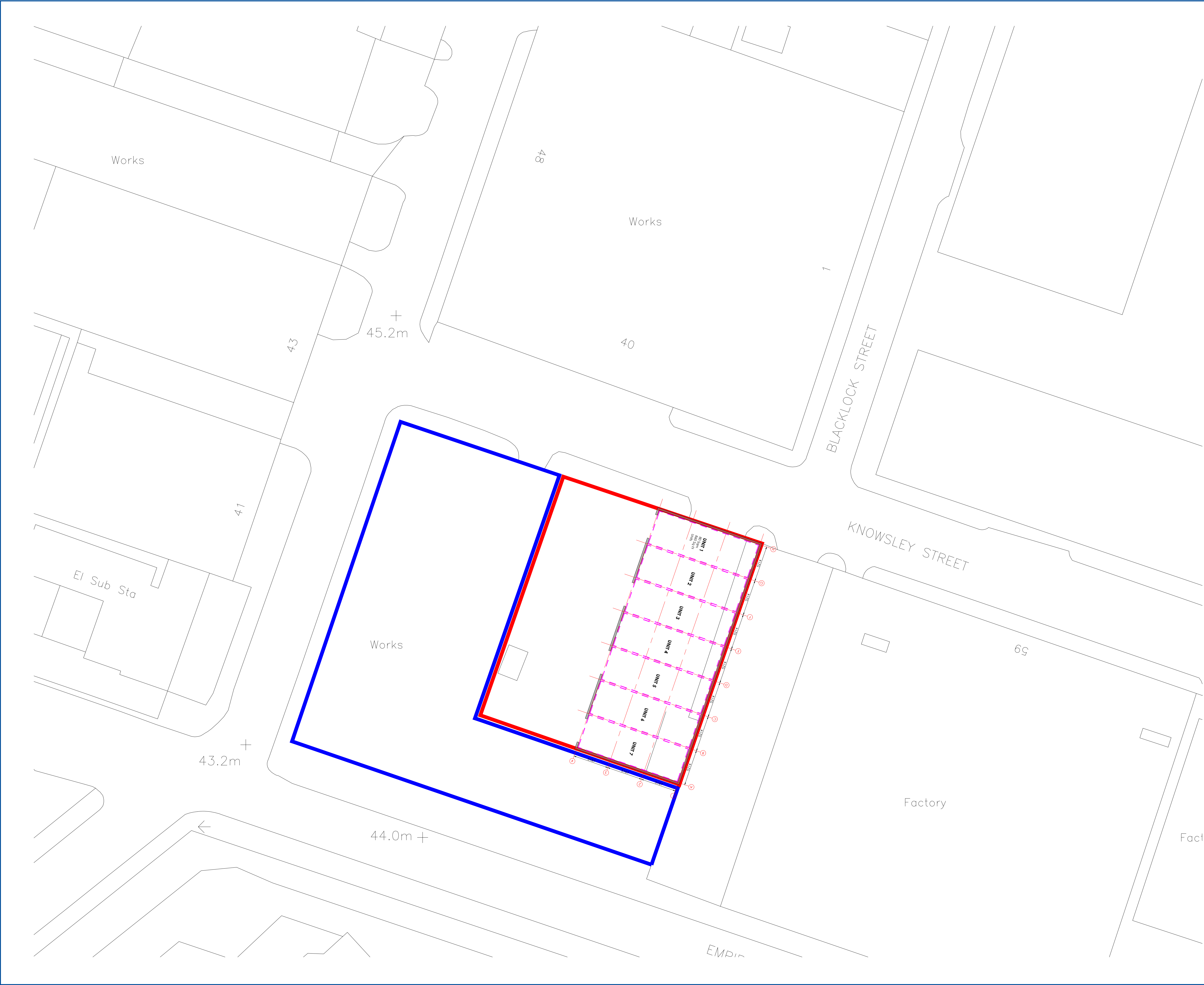
With the proposed SuDS mitigation measures in place, it is considered that the proposed development will reduce local flood risk and enhance the local environment and will therefore be in compliance with the LLFA's current planning policy and the NPPF.

13 References

1. Communities and Local Government - National Planning Policy Framework NPPF, March 2012.
2. Manchester City Council – Local Plan, 2018.
3. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.

14 Appendices

14.1 Appendix 1 – Development Plans



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LOCATION PLAN

SCALE 1:250

REV:	DESCRIPTION:	BY:	DATE:
STATUS:			

gsm

industrial

0161 203 4541

0161 205 1980

Providence Works, Norton St, Manchester, M40 8EH

www.gsmindproperties.co.uk

CLIENT:

Amir
Andersen Textiles
63 Knowsley St
Manchester

SITE:

Style House
Knowsley St / Blacklock St
Manchester, M8 8HX

TITLE:

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
AS SHOWN	07.10.15	BWM	
PROJECT NO:	DRAWING NO:	REVISION:	



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SITE PLAN

SCALE 1:100

B	CAR PARK & REFUSE PROVISIONS	BM	18.08.16

REV:	DESCRIPTION:	BY:	DATE:
STATUS:	PLANNING		

gsm industrial
0161 203 4541 0161 205 1980
Providence Works, Norton St, Manchester, M40 8EH www.gsmindustrialproperties.co.uk

CLIENT:	Amir Andersen Textiles 63 Knowsley St Manchester
---------	---

SITE:	Style House Knowsley St / Blacklock St Manchester, M8 8HX
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TITLE:			
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
AS SHOWN	07.10.15	BWM	
PROJECT NO:	DRAWING NO:		REVISION:
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SITE PLAN

SCALE 1:100

B	CAR PARK & REFUSE PROVISIONS	BM	18.08.16

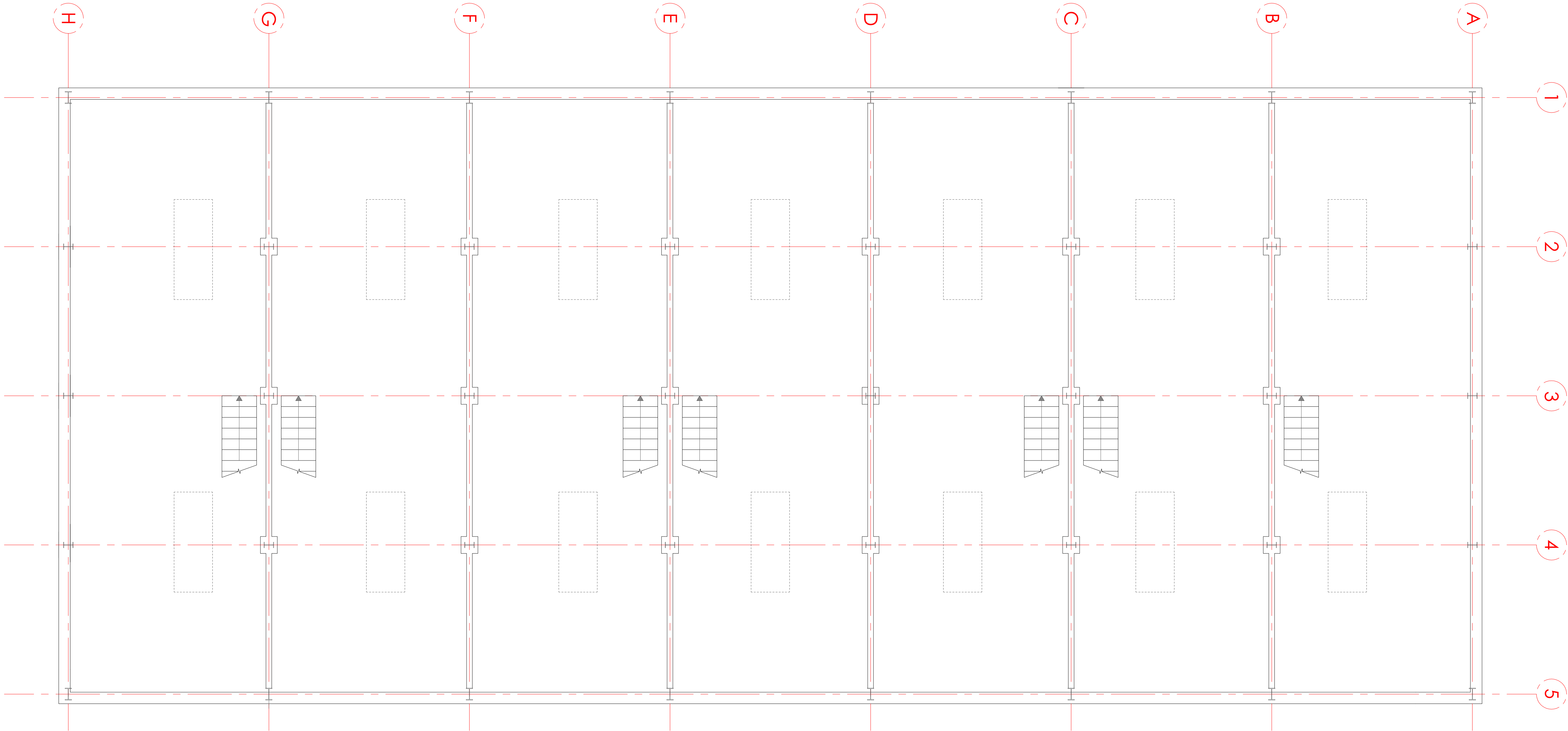
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STATUS:	PLANNING		

gsm industrial
0161 203 4541 0161 205 1980
Providence Works, Norton St, Manchester, M40 8EH www.gsmindproperties.co.uk

CLIENT:	Amir Andersen Textiles 63 Knowsley St Manchester
---------	---

SITE:	Style House Knowsley St / Blacklock St Manchester, M8 8HX
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TITLE:			
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
AS SHOWN	07.10.15	BWM	
PROJECT NO:	DRAWING NO:	REVISION:	
	001B		



SECOND FLOOR PLAN

SCALE 1:50

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STATUS: PLANNING			

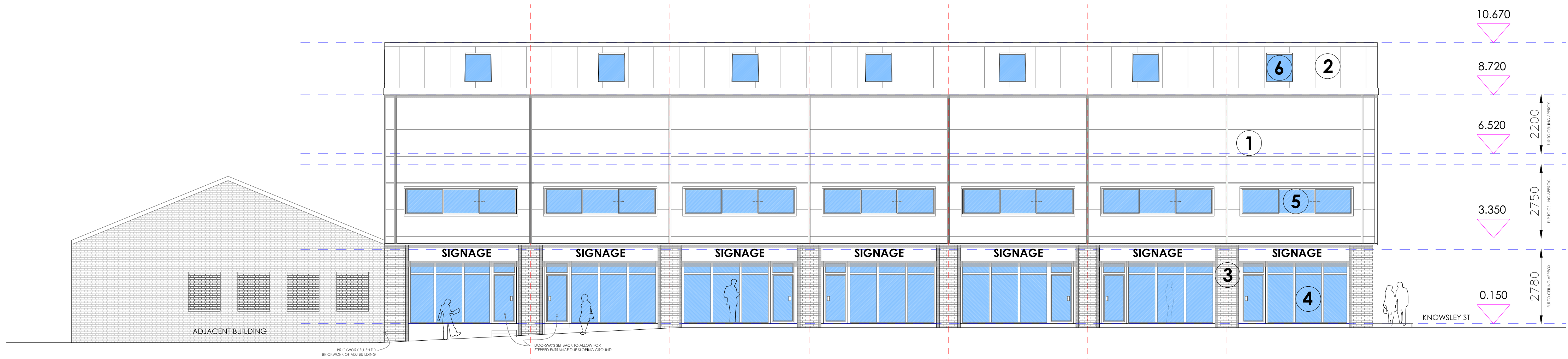
gsmindustrial

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Providence Works, Norton St, Manchester, M40 8EHwww.gsmindproperties.co.uk

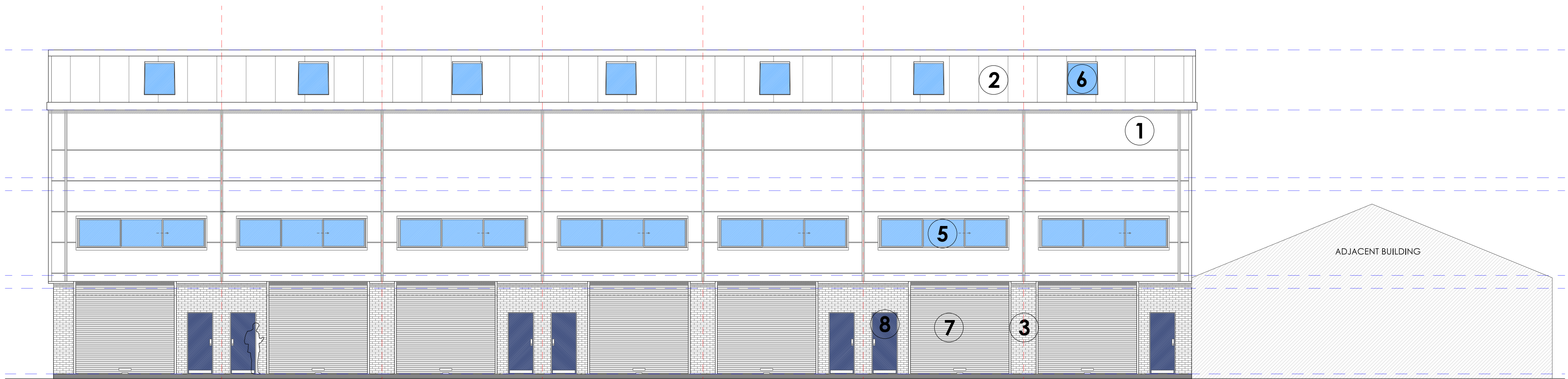
CLIENT:	Amir Andersen Textiles 63 Knowsley St Manchester
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SITE:	Style House Knowsley St / Blocklock St Manchester, M8 8HX		
TITLE:	FLOOR PLANS		
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AS SHOWN	07.10.15	BWM	
PROJECT NO:	DRAWING NO:	REVISION:	
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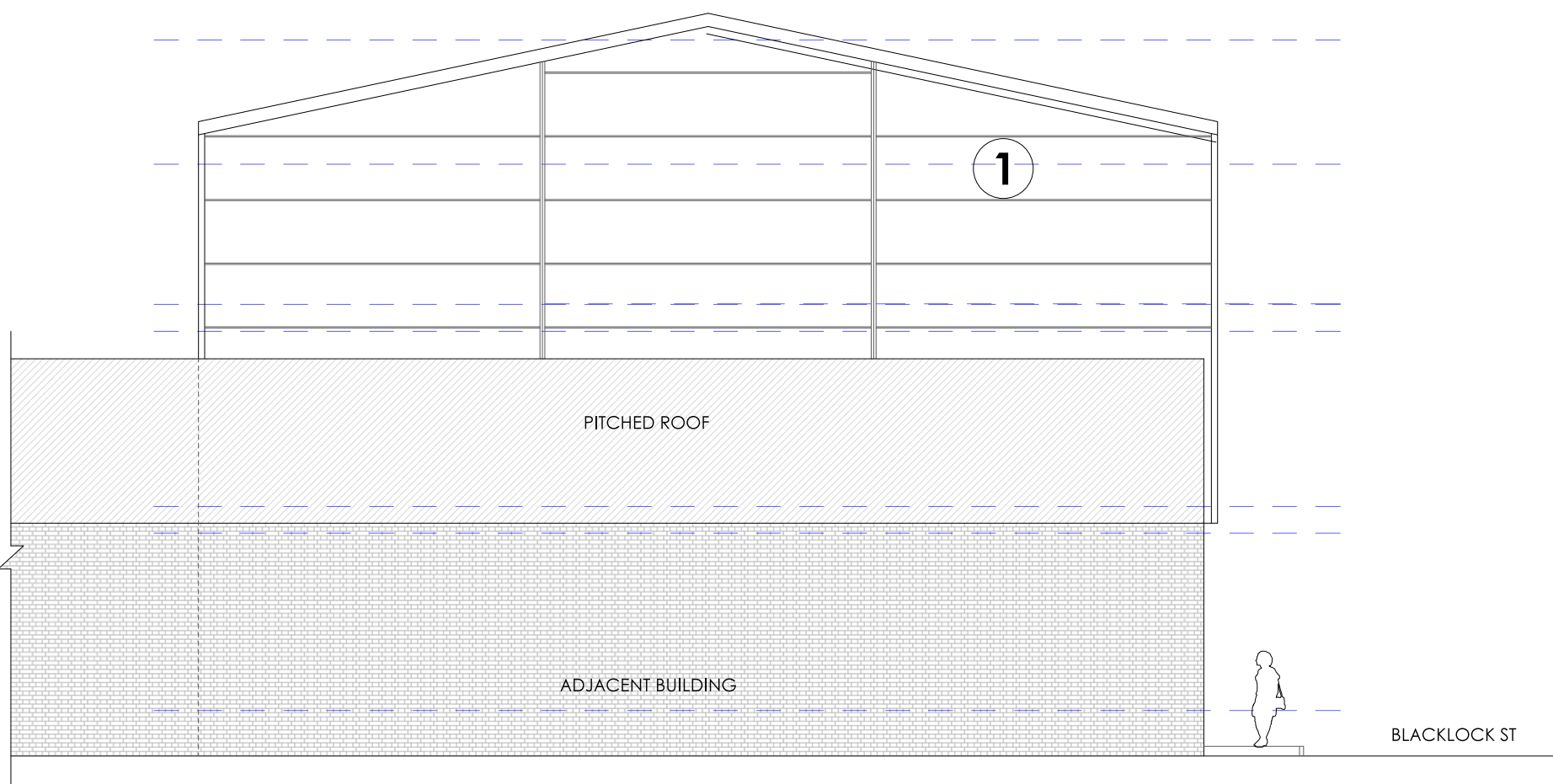
EAST (BLACKLOCK ST) ELEVATION

SCALE 1:100



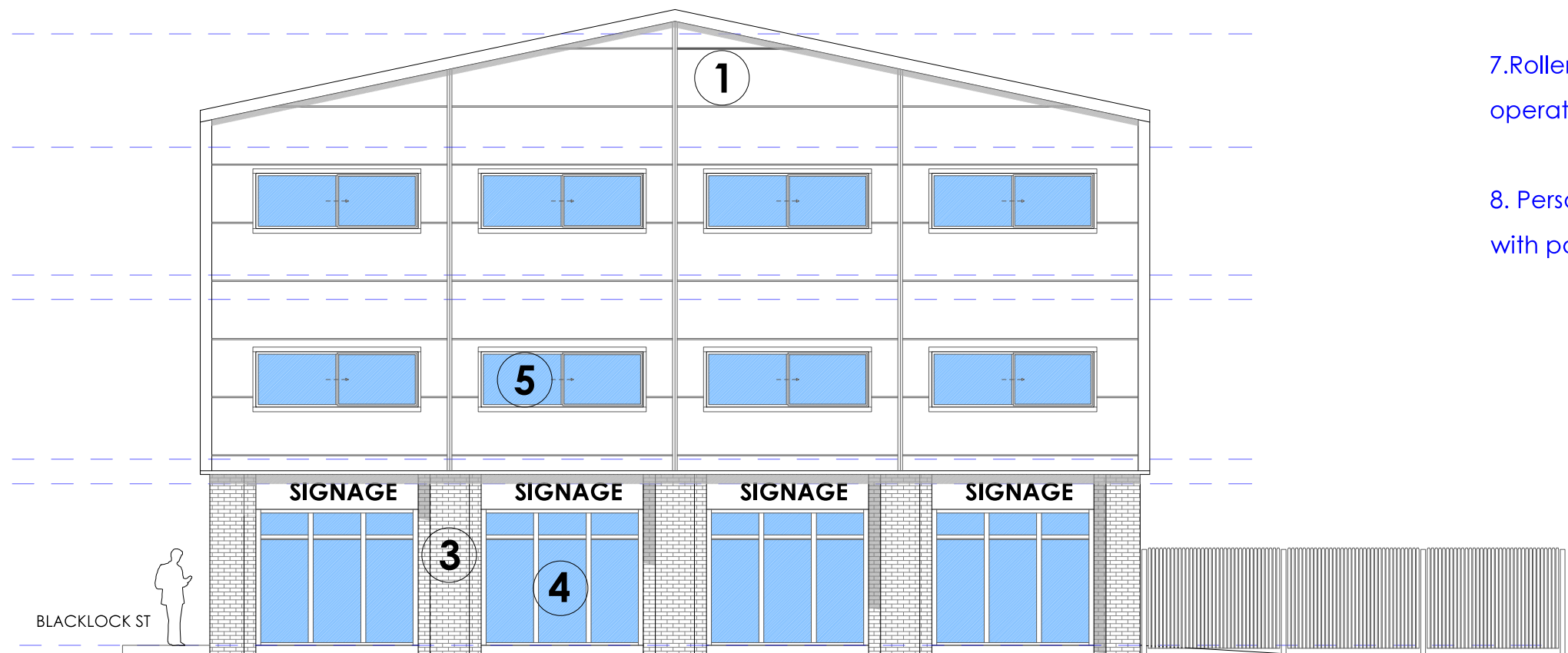
WEST (COURTYARD) ELEVATION

SCALE 1:100



RETURN (SOUTH) ELEVATION

SCALE 1:100



KNOWSLEY ST (NORTH) ELEVATION

SCALE 1:100

MATERIAL KEY

CONDITIONAL APPROVAL OF MATERIALS TO BE DISCHARGED

1. Horizontal insulated composite wall panels, smooth outside finish colour: metallic silver/grey fbc , Kingspan Optimo KS600-1000 or similar approved with A+ green rating (BRE global)
2. Trapezoidal insulated composite roof panels, colour: goosewing/merlin grey. KS 1000/2000RW or similar approved with A+ rating.
- 3.Red facing brick at ground floor level to all exposed elevations. Facing brick to match existing adjacent buildings as far as practically possible.
4. Shop front glazing system - aluminum/UPVC framed glazing front and public access door. Double glazed low emissive Pilkington K safety glass. Framing colour and specification to be confirmed.
5. Window units - similar style and specification to that off adjacent building located on Knowsley St. Aluminum/UPVC double glazed units, horizontal sash casements, framing colour to match shop front glazing.
6. Rooflight - Trapezoidal GRP composite panels
- 7.Roller Shutter Doors - 3.2m Width 3.2m height 3 Phase electrically operated shutter doors, galvanized finish.
8. Personnel Doors - Rear access personnel doors / fire doors complete with panic bar and emergency ironmongery. Colour to be confirmed.

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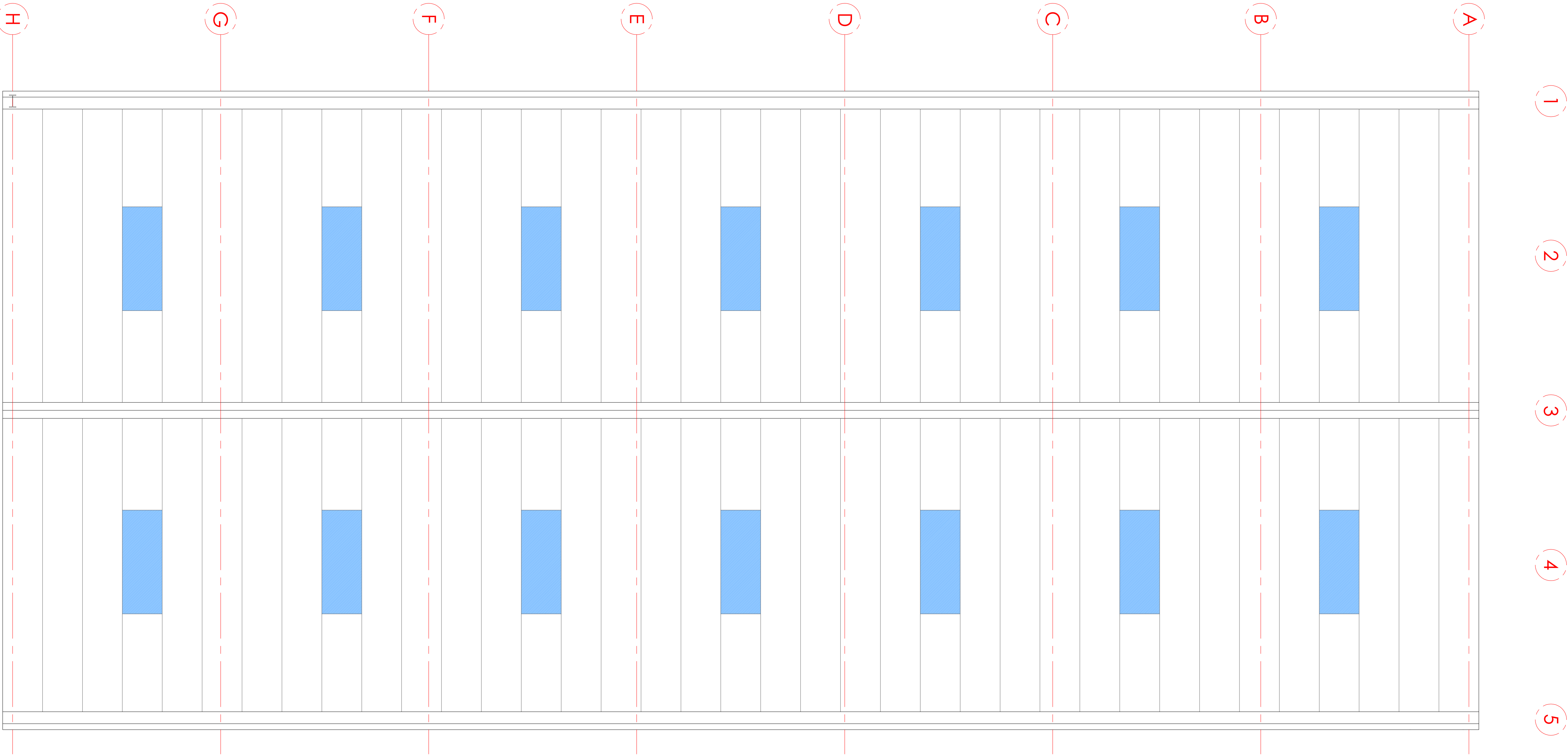
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			



CLIENT:	Amir Andersen Textiles 63 Knowsley St Manchester
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SITE:	Style House Knowsley St / Blacklock St Manchester, M8 8HX
TITLE:	

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
AS SHOWN	07.10.15	BWM	
PROJECT NO:	DRAWING NO:	REVISION:	
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ROOF PLAN

SCALE 1:50

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REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			



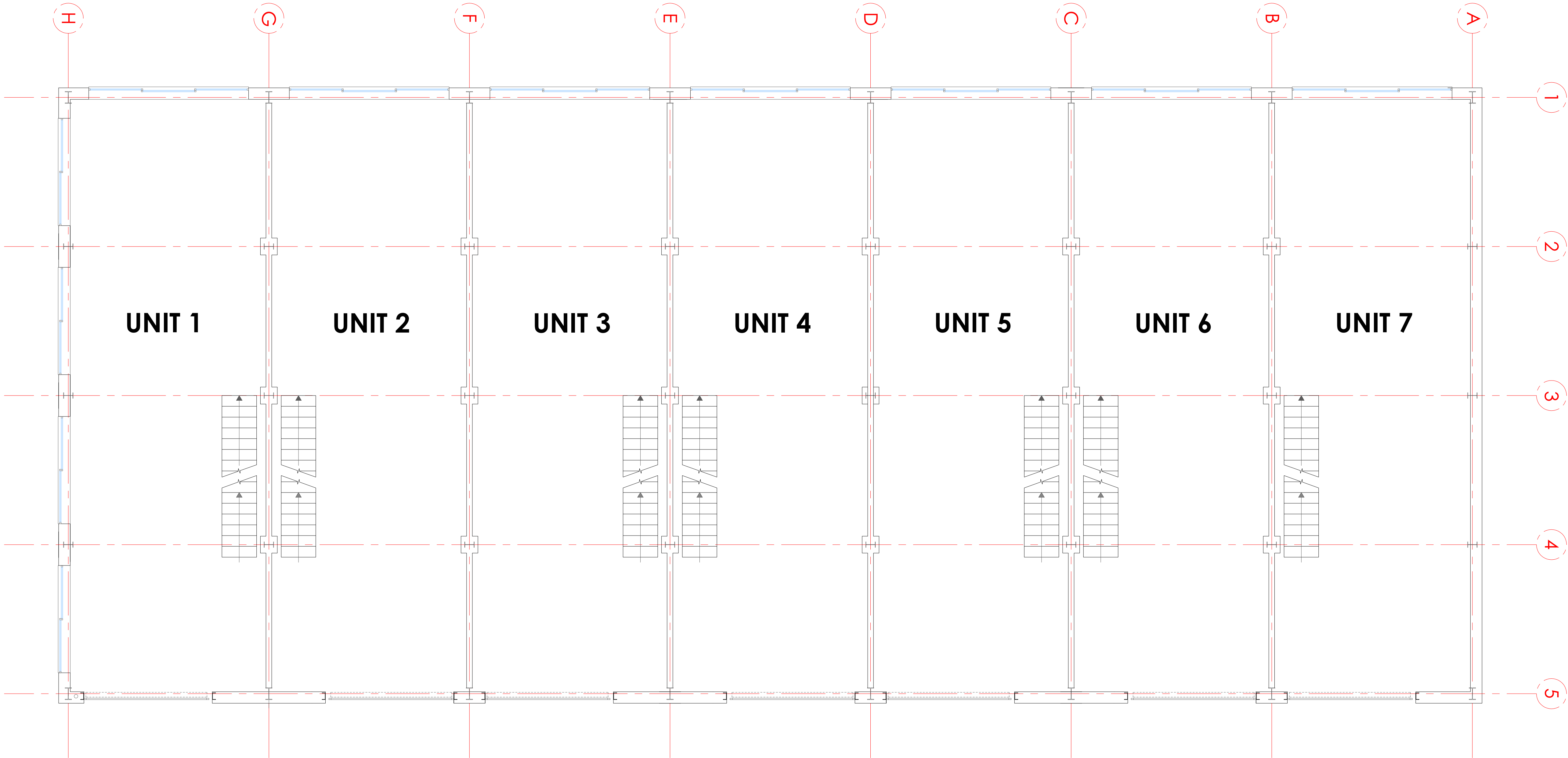
0161 203 4541 0161 205 1980

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CLIENT:

Amir
Andersen Textiles
63 Knowsley St
Manchester

SITE: Style House Knowsley St / Blocklock St Manchester, M8 8HX			
TITLE: FLOOR PLANS			
SCALE AT A1: AS SHOWN	DATE: 07.10.15	DRAWN: BWM	CHECKED:
PROJECT NO:	DRAWING NO: 05	REVISION:	



FIRST FLOOR PLAN
SCALE 1:50

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STATUS: PLANNING			



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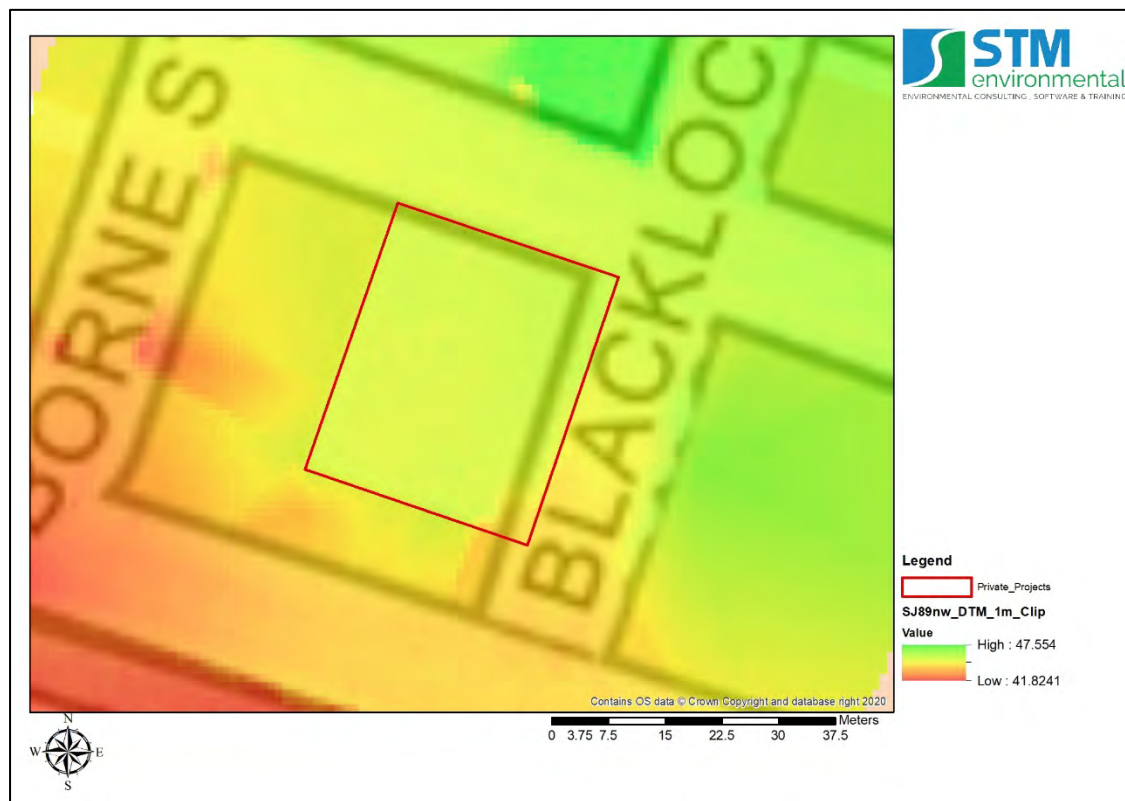
Providence Works, Norton St, Manchester, M40 8EH www.gsmindproperties.co.uk

CLIENT:	Amir Andersen Textiles 63 Knowsley St Manchester
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SITE:		Style House Knowsley St / Blocklock St Manchester, M8 8HX	
TITLE:		FLOOR PLANS	
SCALE AT A1: AS SHOWN	DATE: 07.10.15	DRAWN: BWM	CHECKED:
PROJECT NO:	DRAWING NO: 03	REVISION:	

14.2 Appendix 2– Site Topography and Drainage Characteristics

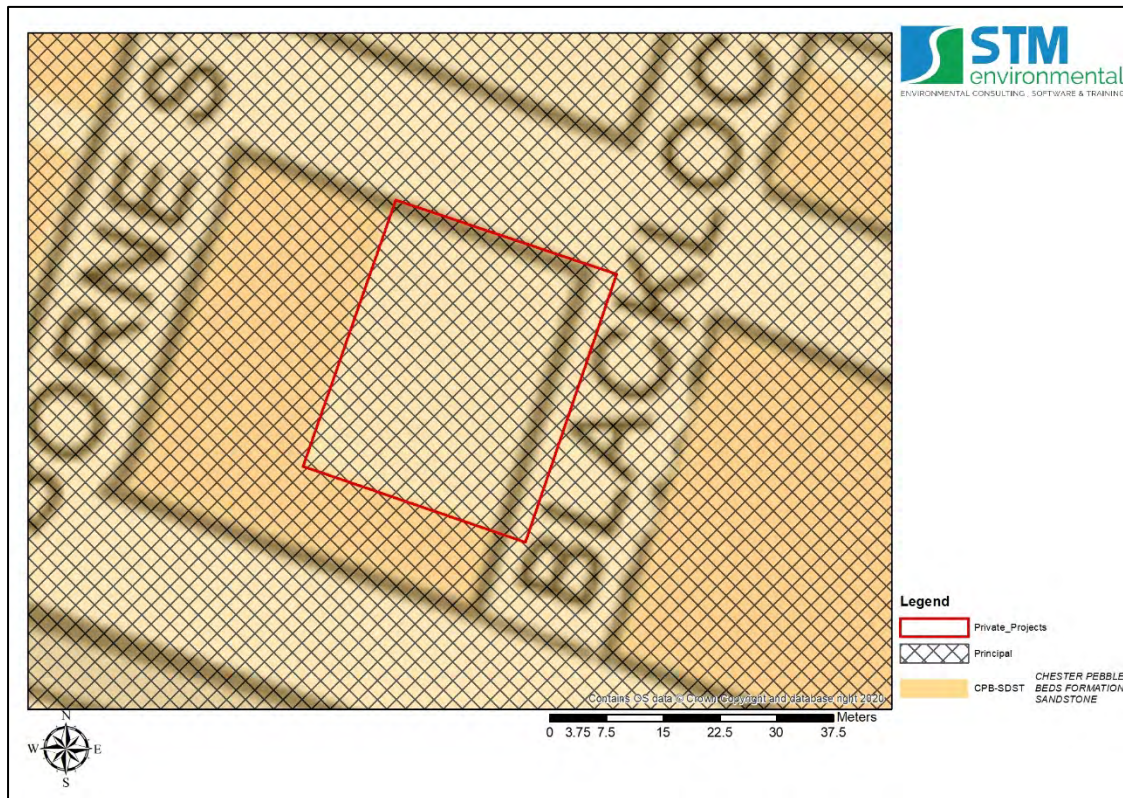
14.2.1 LIDAR Mapping showing Site Topography - (Source: OS 2017)



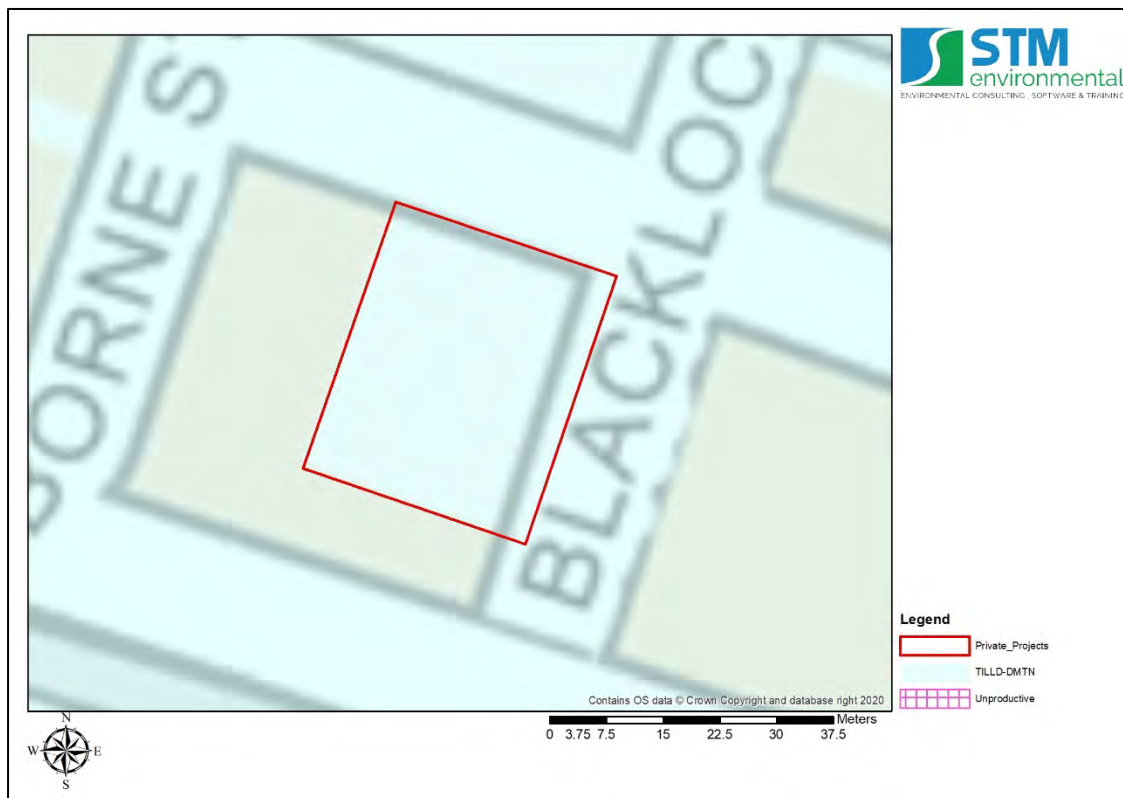
14.2.2 Topographic Survey

Not conducted.

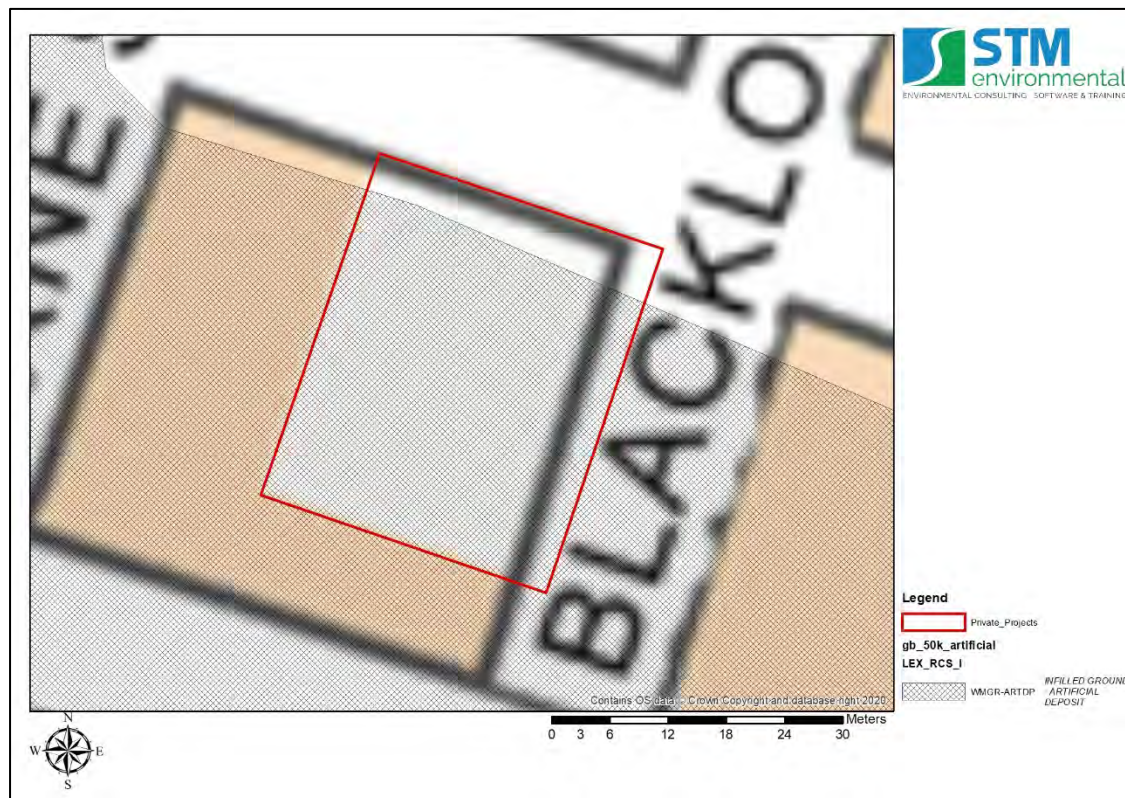
14.2.3 Bedrock Hydrogeology (Source: BGS, 2016)



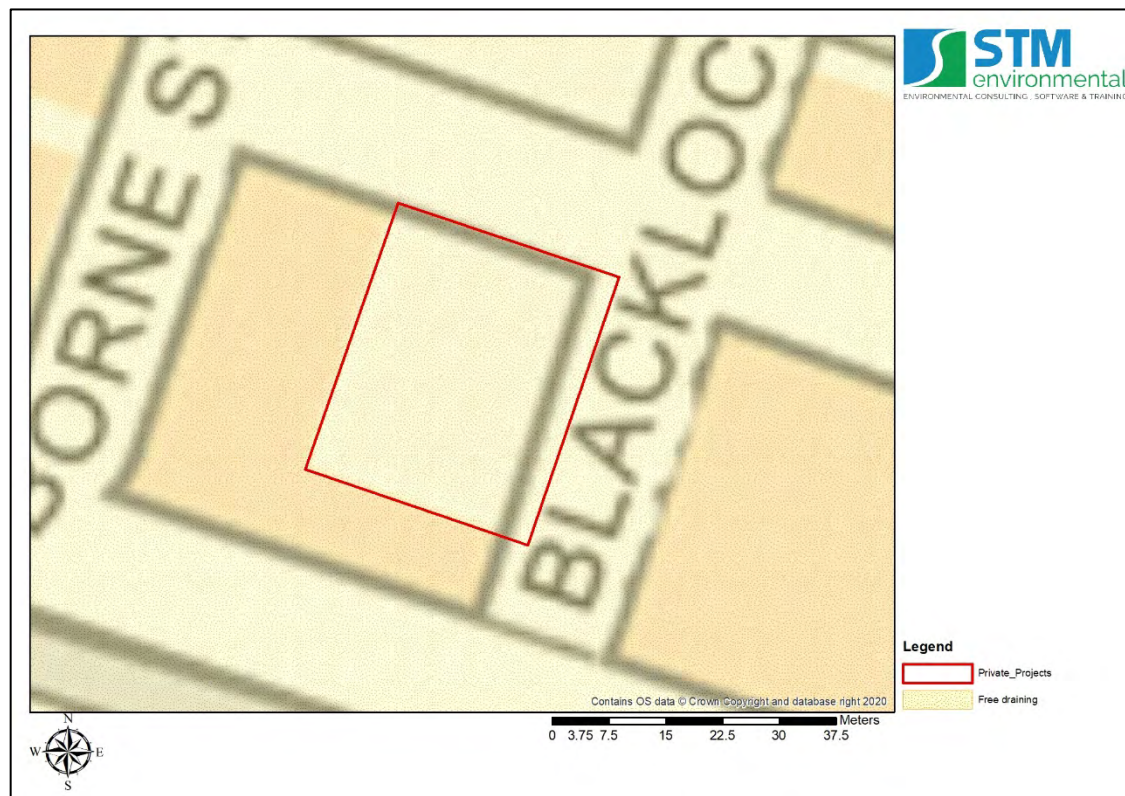
14.2.4 Superficial Hydrogeology (Source: BGS, 2016)



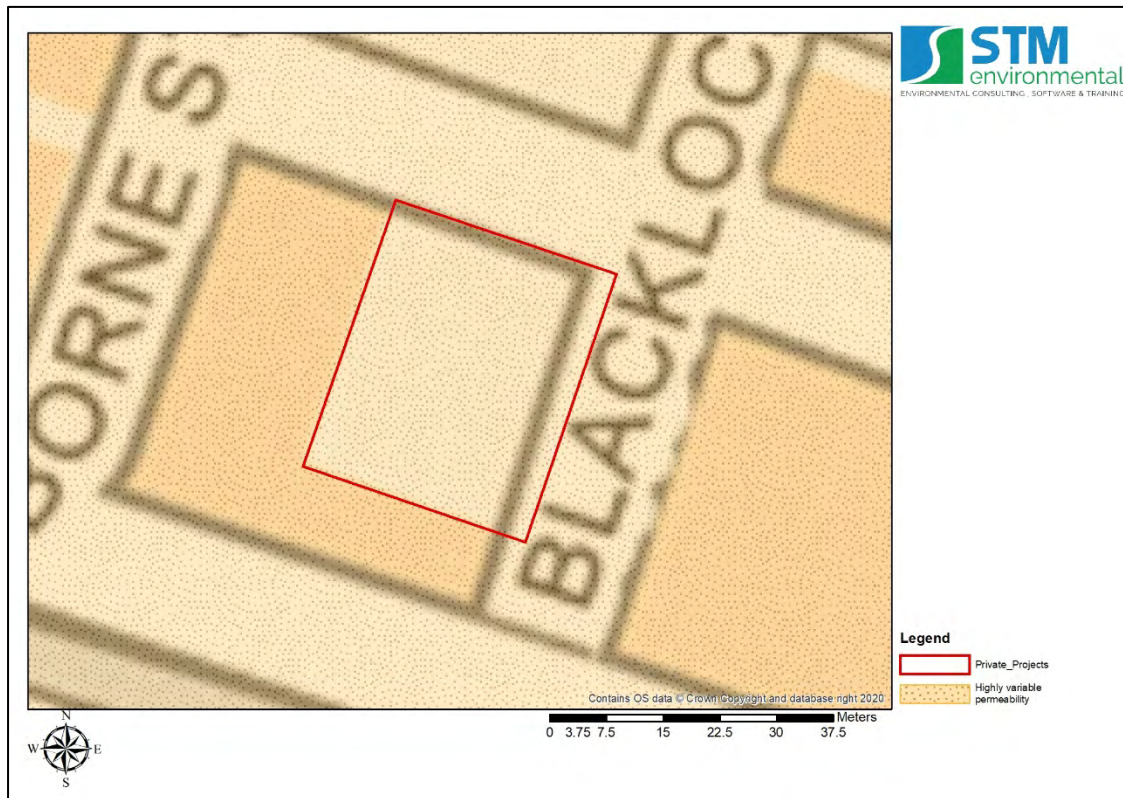
14.2.5 Artificial Ground (Source: BGS, 2016)



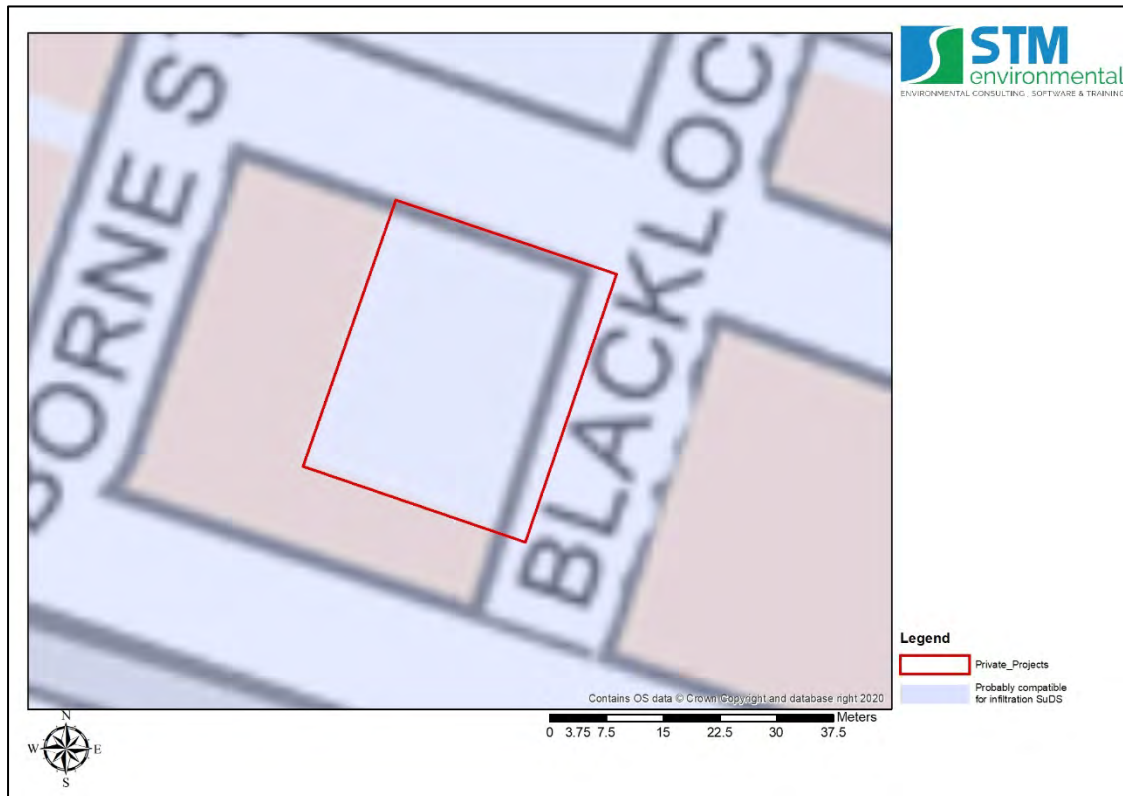
14.2.6 Bedrock Permeability (Source BGS 2016)



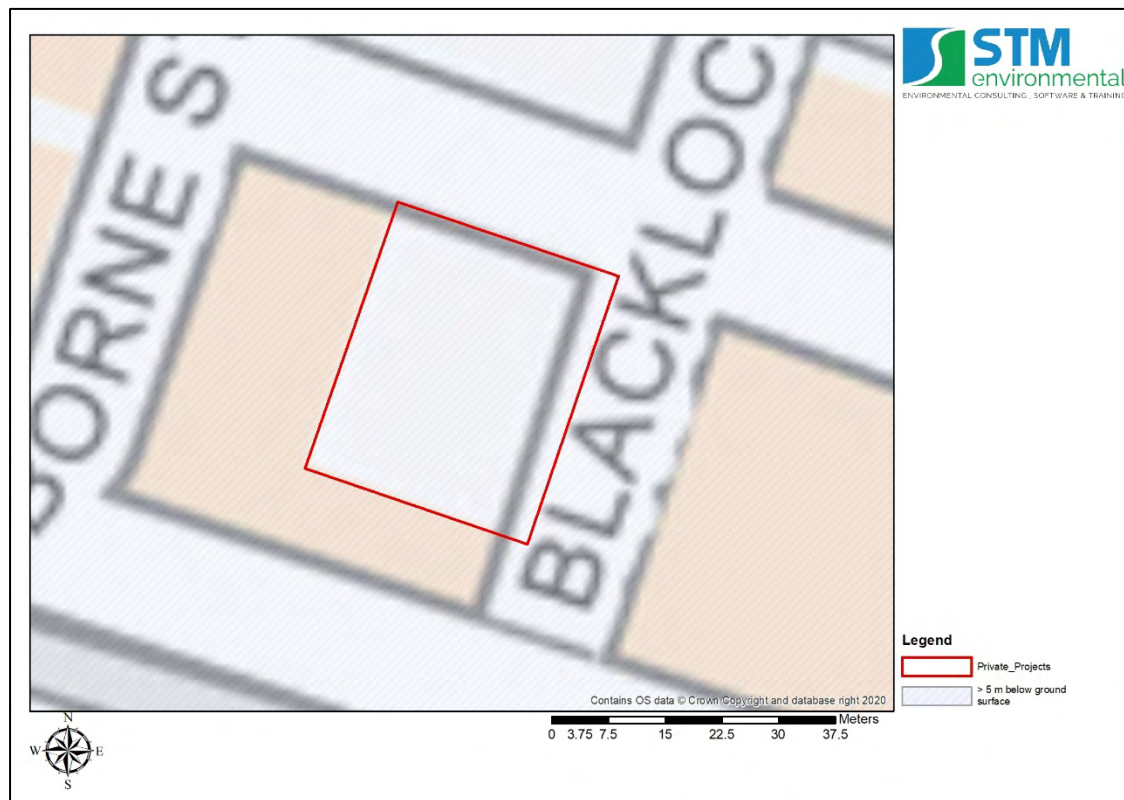
14.2.7 Superficial Permeability (Source BGS:2016)



14.2.8 Infiltration Drainage Potential (Source: BGS, 2016)



14.2.9 Groundwater Table Depth (Source: BGS 2016)

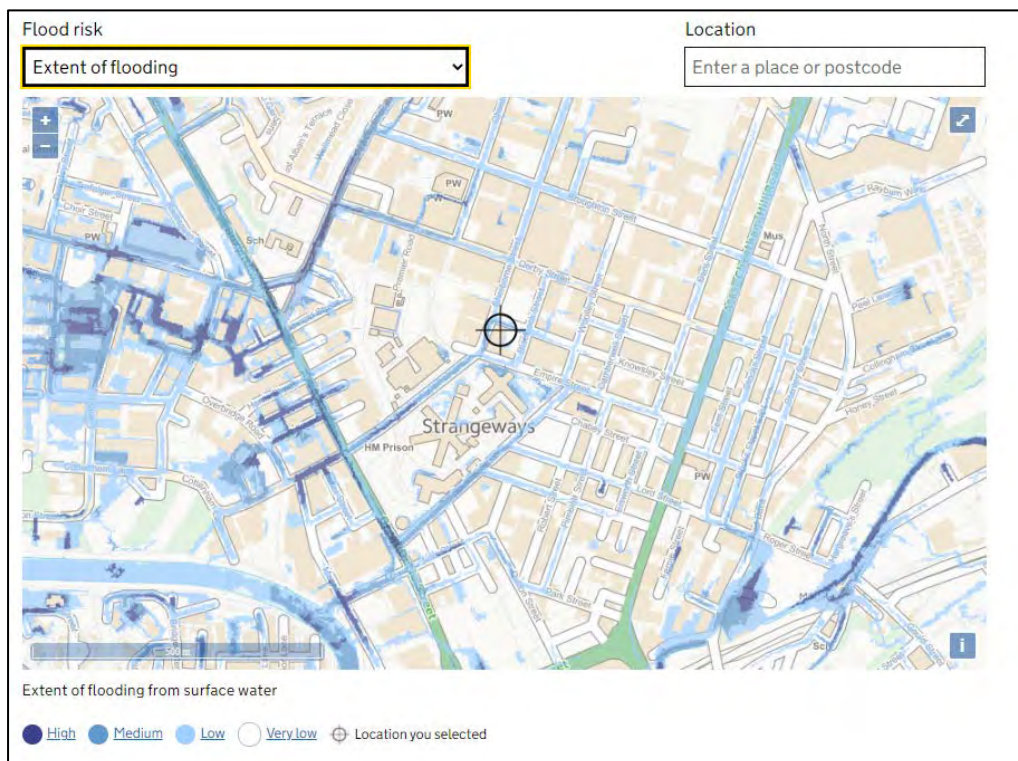


14.3 Appendix 3 – Flood Risk Mapping

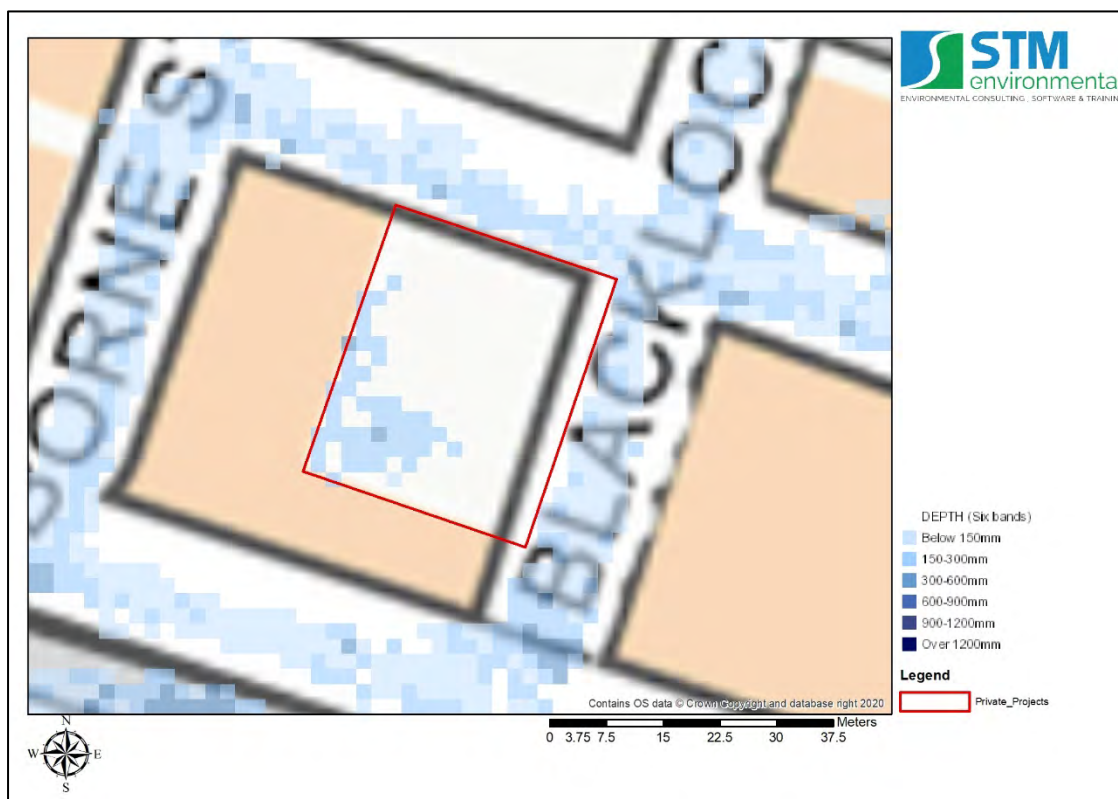
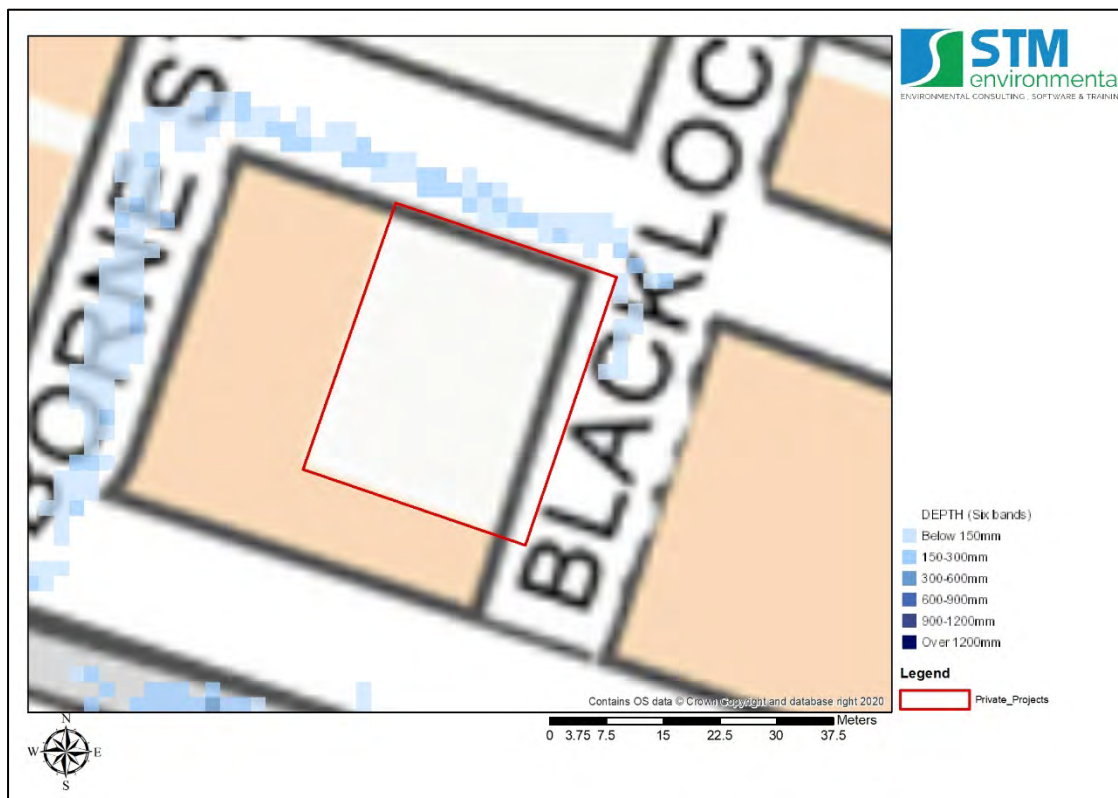
14.3.1 Long Term Fluvial Flood Risk Map (EA)



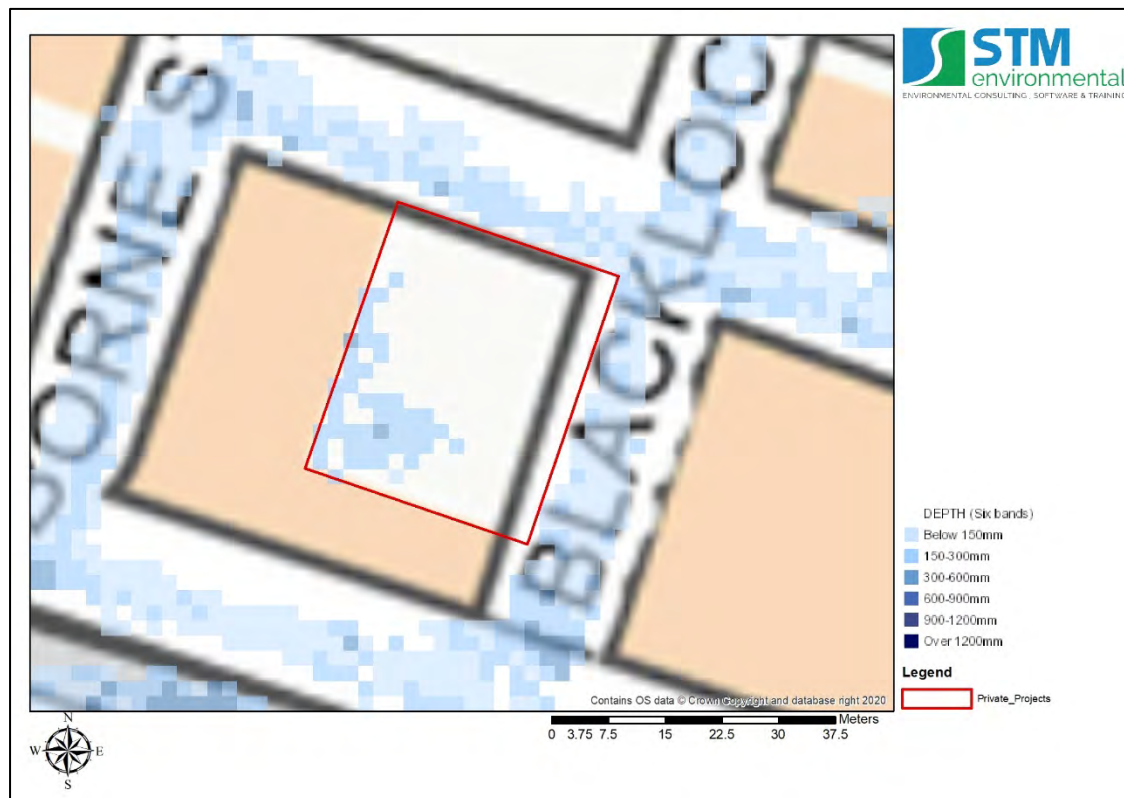
14.3.2 Long Term Pluvial Flood Risk Map (EA)



14.3.3 Surface water flood depth during the 1 in 100 & 1 in 1000 year rainfall return periods (Source: EA, 2016).



14.3.4 Groundwater flooding susceptibility (Source: BGS, 2016).



14.4 Appendix 4 – Run-Off Rate and Storage Calculations

14.4.1 UK SuDS

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Matthew Ashdown
Site name:	63 Knowsley Street
Site location:	M8 8HX

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.49424° N
Longitude:	2.24457° W
Reference:	2389287416
Date:	Feb 08 2021 16:20

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.1160
-----------------------	--------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	899	899
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

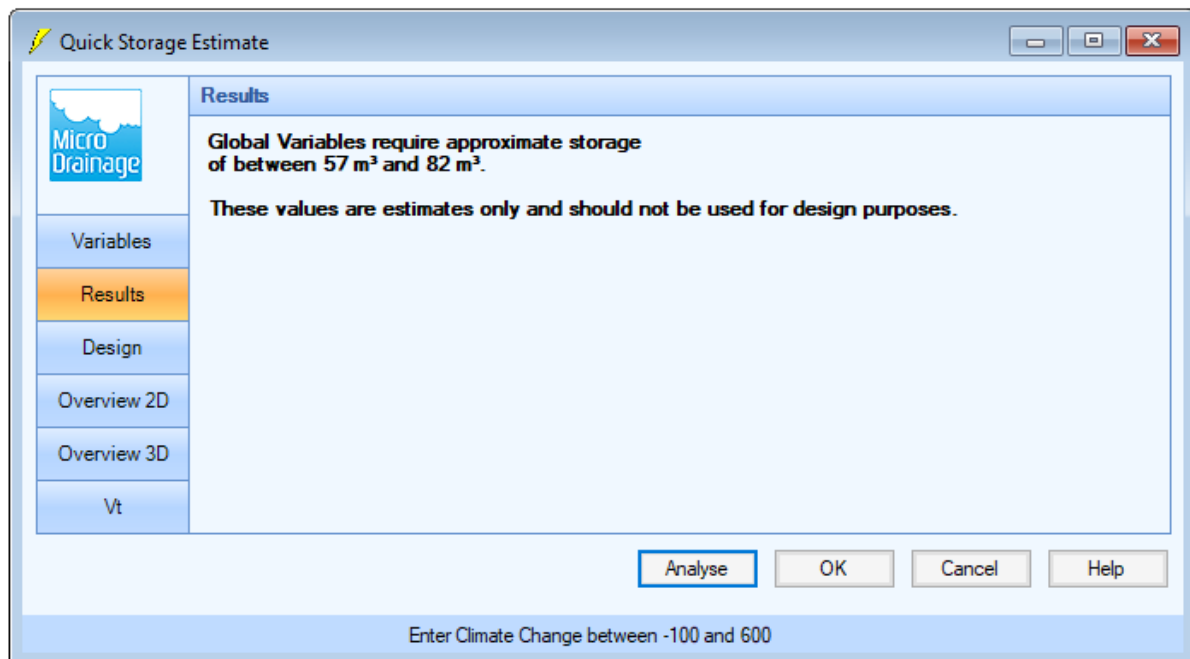
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	0.75	0.75
1 in 1 year (l/s):	0.65	0.65
1 in 30 years (l/s):	1.28	1.28
1 in 100 year (l/s):	1.56	1.56
1 in 200 years (l/s):	1.78	1.78

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

14.4.2 Microdrainage Quick Storage Estimates - Greenfield Runoff (1.2l/s)



Micro Drainage

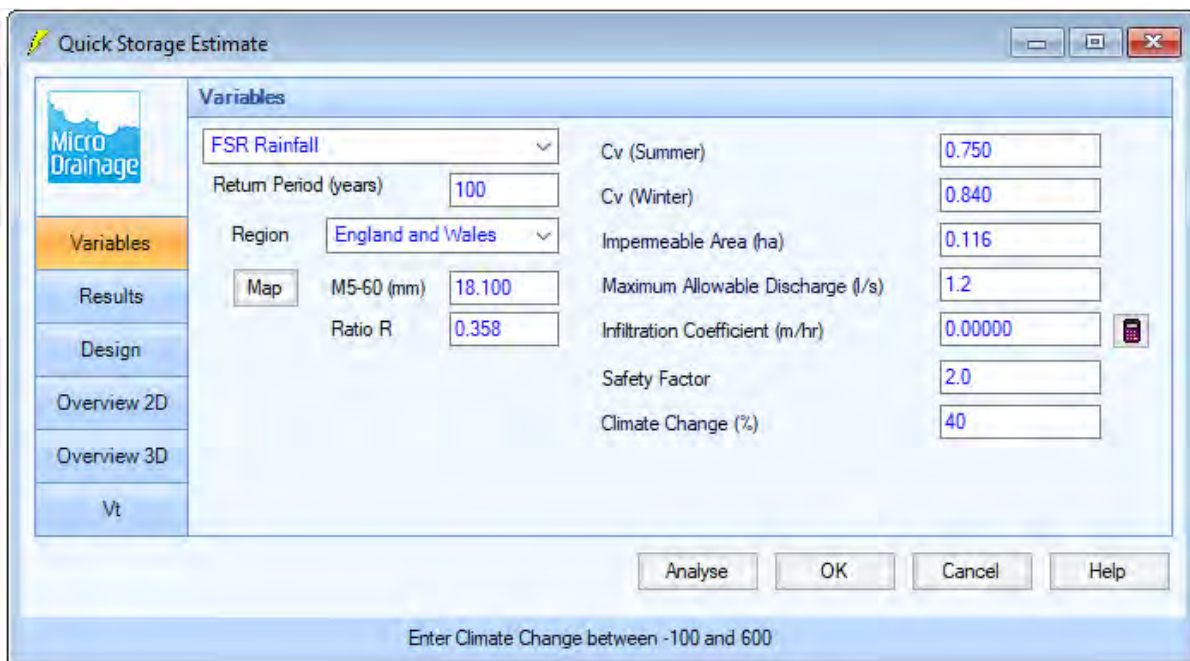
Results

Global Variables require approximate storage of between 57 m³ and 82 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Micro Drainage

Variables

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map M5-60 (mm) 18.100

Ratio R 0.358

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 0.116

Maximum Allowable Discharge (l/s) 1.2

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 40

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

14.5 Appendix 5 – SuDS Suitability Assessment



SuDS Technique	Typical Uses	Potential Issues	Potential Suitability
Rainwater harvesting	Capture of rainwater into a tank(s) for use (usually non-potable) such as irrigation, toilet flushing, vehicle or plant cleansing.	Care is needed to prevent the development of bacteria, algae and insect infestation.	Suitable on small scale for interception storage
Infiltration: Soakaways Infiltrations trenches and basins	Infiltration components are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, into the groundwater.	Free draining bedrock with low groundwater, in a principal aquifer. Artificial ground. Maintenance	Unsuitable - Artificial ground

SuDS Technique	Typical Uses	Potential Issues	Potential Suitability
Green/brown /blue roofs	Used on flat or shallow pitched roofs to provide a durable roof covering which also provides thermal insulation, amenity space, biodiversity habitat as well as attenuation of rainwater.	Maintenance - Ensuring safe access	Unsuitable - Weight
Raingardens	Creation of planted landscaped areas to allow the diversion of a portion of rainwater from either downpipes or surrounding paved surfaces. Raingardens can either allow infiltration into the ground or have tanked systems for water retention.	Require maintenance	Unsuitable.
Permeable pavements / surfaces	Permeable hard surfaces that allow rainwater to pass through either into the ground or to tanked systems. Good as interception storage.	Potential impact of saturation on pavement stability to be considered. May require extensive use of impermeable membranes and under-drainage. Maintenance required.	Suitable - Lined
Swales	Dry ditches used as landscape features to allow the storage and infiltration of rainwater. Often used as linear features alongside roads, footpaths or rail lines but capable of being integrated into the design of many open spaces.	Finding available space in proposed site layout	Unsuitable - space
Detention basin/ponds	Landscape features designed to store and in some cases infiltrate rainwater. Detentions basins are usually dry, whereas a pond should retain water. These features need areas of open space but can often be combined with	Potential health and safety issues. Finding available	Unsuitable - space

SuDS Technique	Typical Uses	Potential Issues	Potential Suitability
	other sustainable drainage techniques.	space in proposed site layout	
Storage tanks/ Geocellular storage	Usually below ground level, they attenuate rainwater for later slow release back into the drainage system.	Pumping may sometimes be required to empty the tank into the drainage system	Suitable
Oversized piping	Using larger than necessary pipework creates additional space to store rainwater.	Lacks the wider benefits of the green infrastructure-based techniques	Suitable

14.6 Appendix 6 – Descriptions Of SuDS Techniques

14.6.1 Permeable Paving

Various options are available for the type of permeable paving that can be installed. Permeable block paving allows for infiltration through gaps in the surface. This can be underlain by a geotextile membrane and fine gravel course followed by with a sub-base or geocellular crates as shown in the figures below.

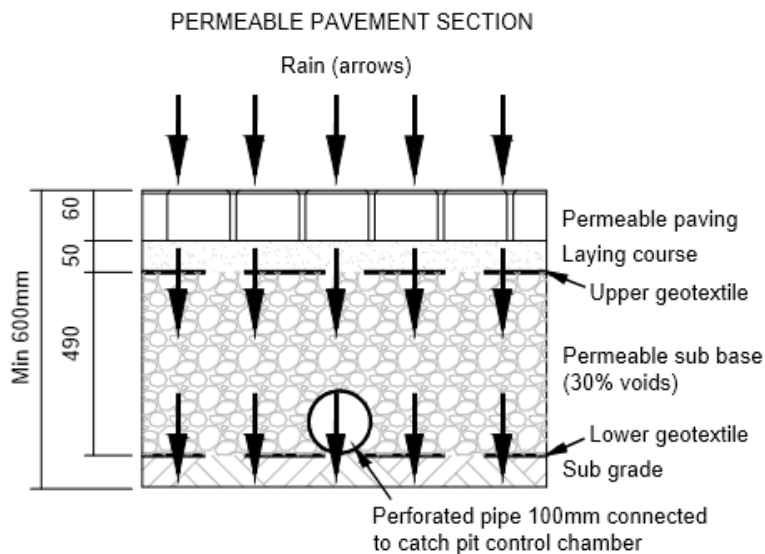


Figure 3 Block Permeable Paving with sub-base

The use of geocellular module storage provides structural strength (up to 400kN/m²) and high-water storage capacity with void space of 95%+.

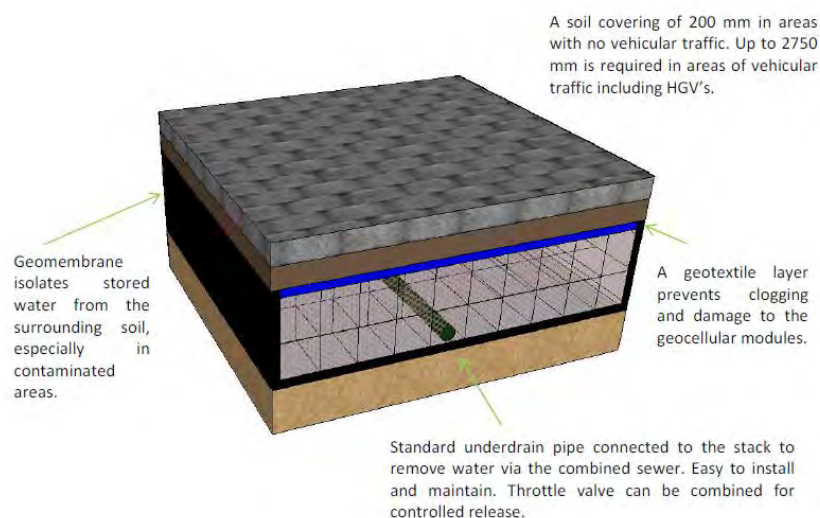


Figure 4 Block Permeable Paving with Geocellular Module

The plastic or concrete grid system is usually installed with a depth of 40 mm, with gaps between filled with an appropriate planting soil and seeded with a turf mix.

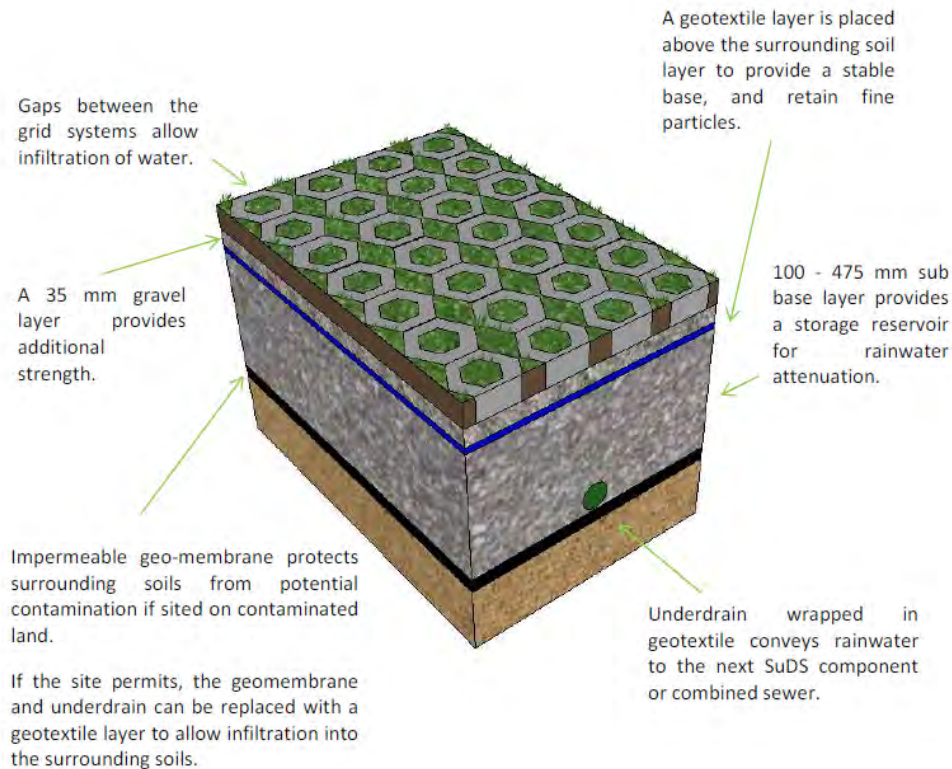


Figure 5 Plastic or Grid Permeable Paving with Sub-base

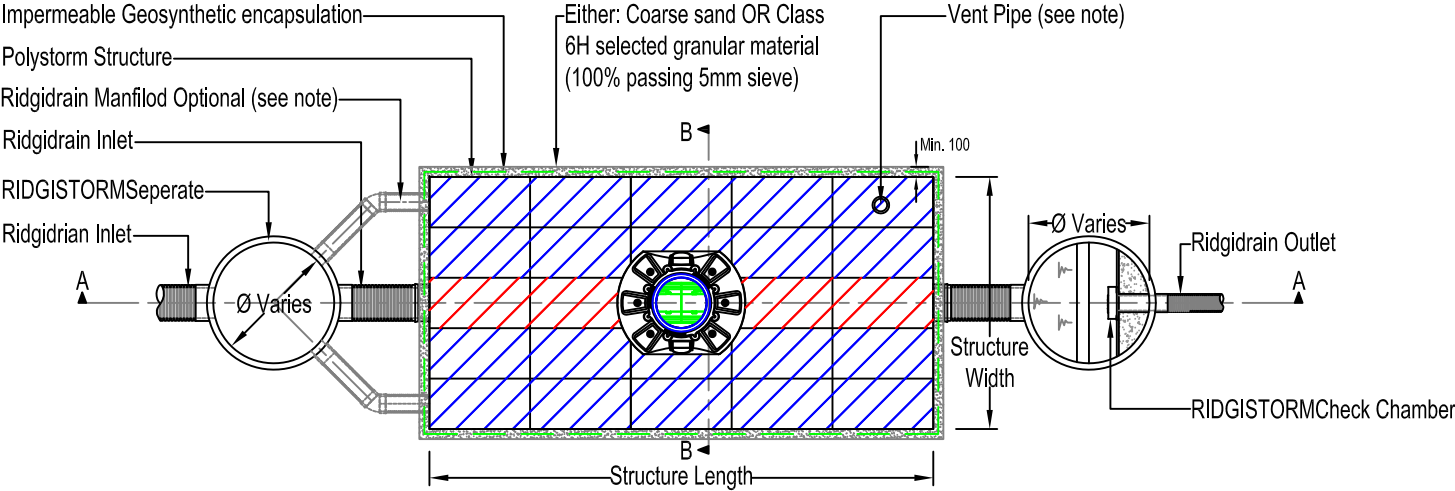
14.6.2 Geocellular structures, oversized pipes and tanks

Modular plastic geocellular structures, with a high void ratio, are a new below ground storage arrangement that can replace underground pipes or tanks that have been used to store water. They can also be used to convey or infiltrate surface water runoff into the ground.

Underground storage features attenuate an agreed volume with a control structure to limit the discharge rate. Structural design must be provided to ensure integrity of the box, pipe or tank under loading. Silt interception and management arrangement is critical to long-term effectiveness of these structures and this must be demonstrated at design stage and confirmed for the design life of the development. It can be implemented either in the form of a modular box system with inlet and outlet pipework connected to the sides of the structure or in the form of a honeycomb structure with

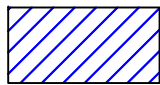
perforated pipes running under or through the box. Water is forced into the box when flows increase. There are now shallow, load bearing boxes which can be used under pavements and in particular below permeable pavement which protects the box from silt contamination and provides treatment with enhanced storage. Moreover, geocellular systems can be installed above a high-water table.





TYPICAL ATTENUATION TANK PLAN
(Scale 1:75)

KEY:



POLYSTORM (PSM1, 1A & 2 CELL)



POLYSTORM (PSM4 CELL)

POLYSTORM ACCESS NOTES

1. Refer to Polypipe drawing No. PSM_SD_PSM_004 for typical integration into Polystorm structure.

VENTILATION NOTE

For information on Ventilation Options please refer to drawing ref: PSM_SD_PSM_002

MANIFOLD NOTE

Where single pipe hydraulic capacity is exceeded manifold detail may be required. For information on Manifold connections please refer to drawing ref: PSM_SD_008

NOTE A

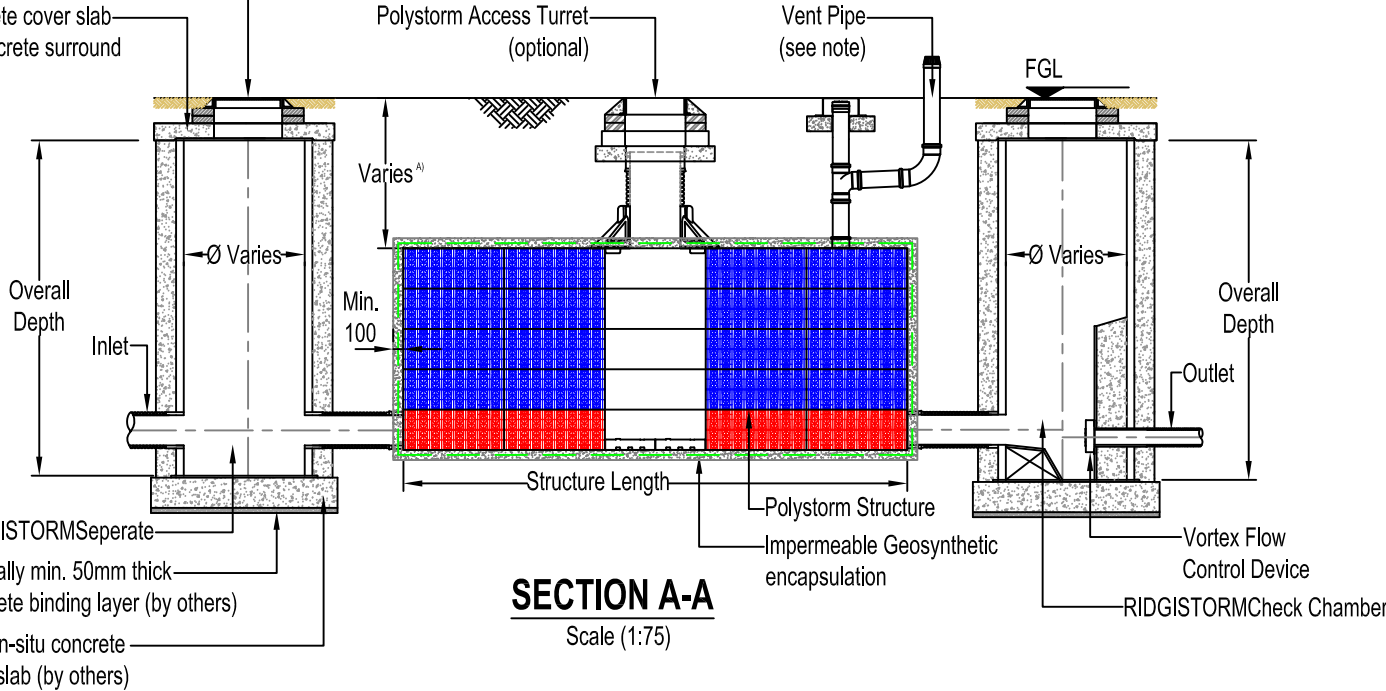
For information on tank cover depths please refer to drawing ref: PSM_SD_PSM_005 or alternatively contact the Technical Team:- 01509 61500

NOTES

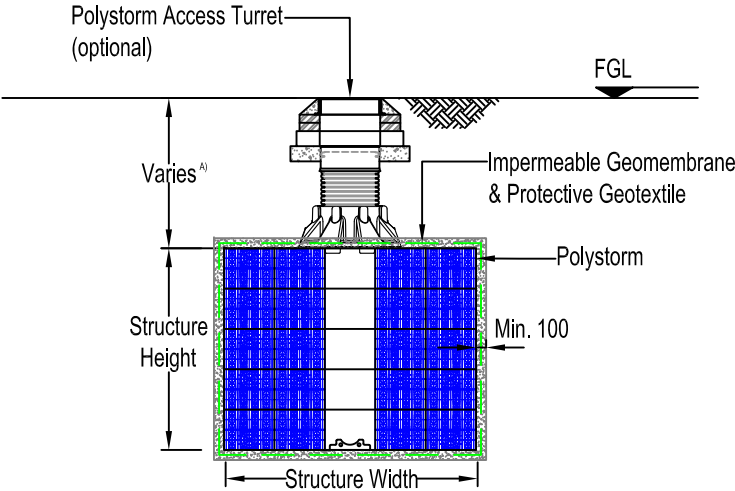
1. All dimensions in millimetres, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing or construction tolerances.
3. All site temporary and enabling works by others.
4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
5. This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.

Appropriately load rated cover & frame in accordance with BS EN 124. Clear access opening above ladder to be maintained (By Others)

Precast Concrete cover slab bedded on concrete surround (by others)



SECTION A-A
Scale (1:75)



SECTION B-B
Scale (1:75)

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PROJECT

POLYSTORM STANDARD DETAILS

TITLE

POLYSTORM ATTENUATION DETAIL

STATUS

FOR INFORMATION

DATE

17/03/16

DRAWN BY

JL

ORIGINAL SIZE

A3

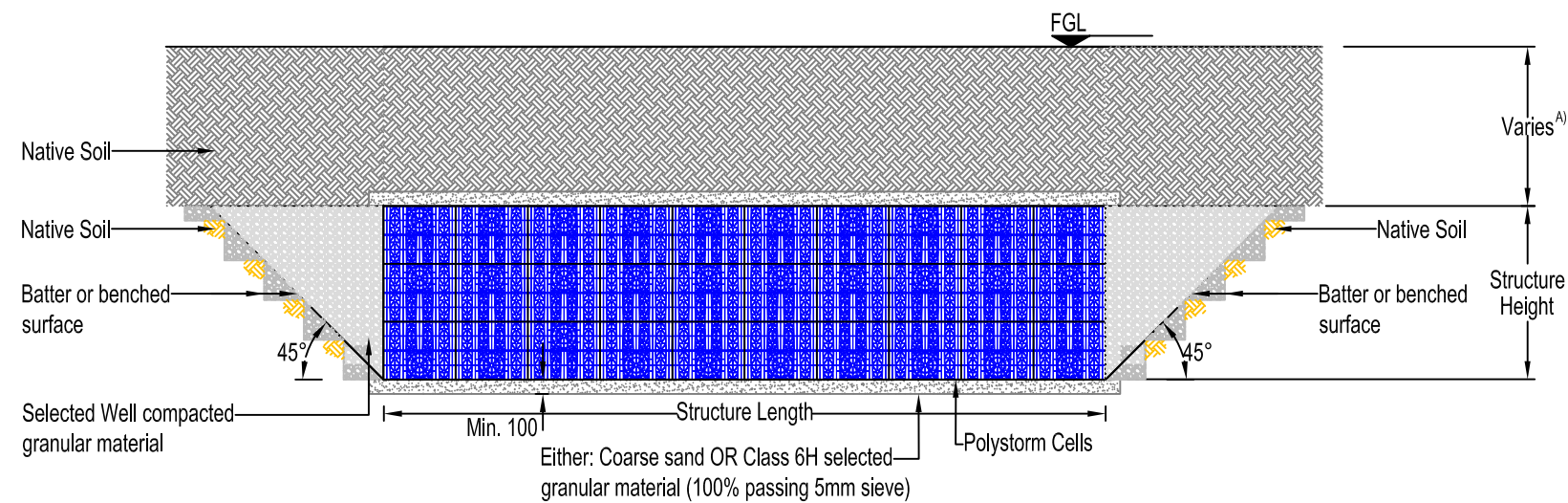
SCALE

AS SHOWN

DRAWING No.

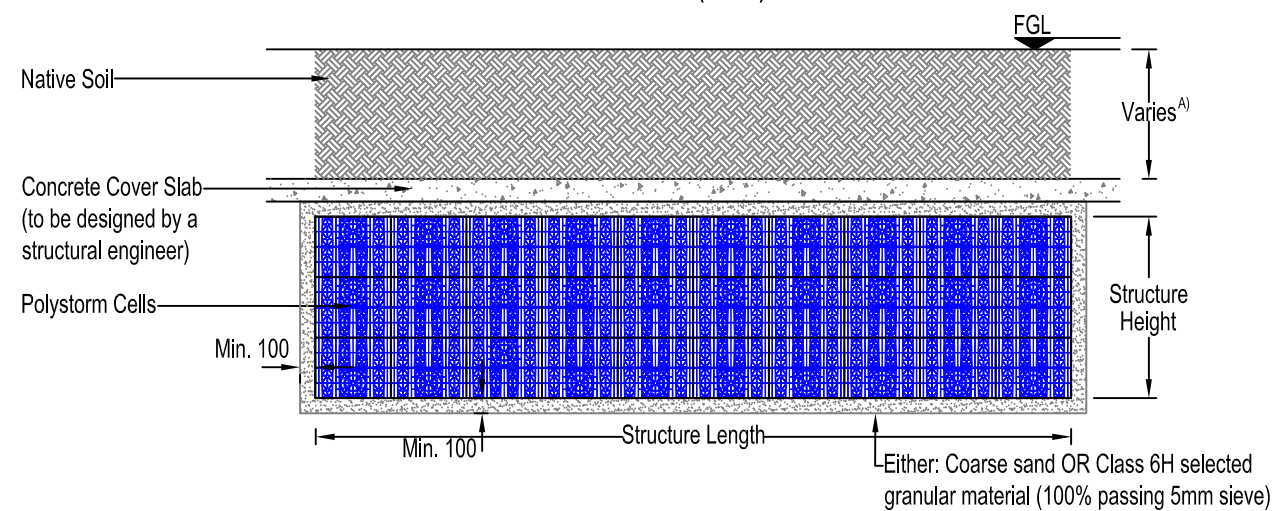
PSM_SD_PSM_001

REV.



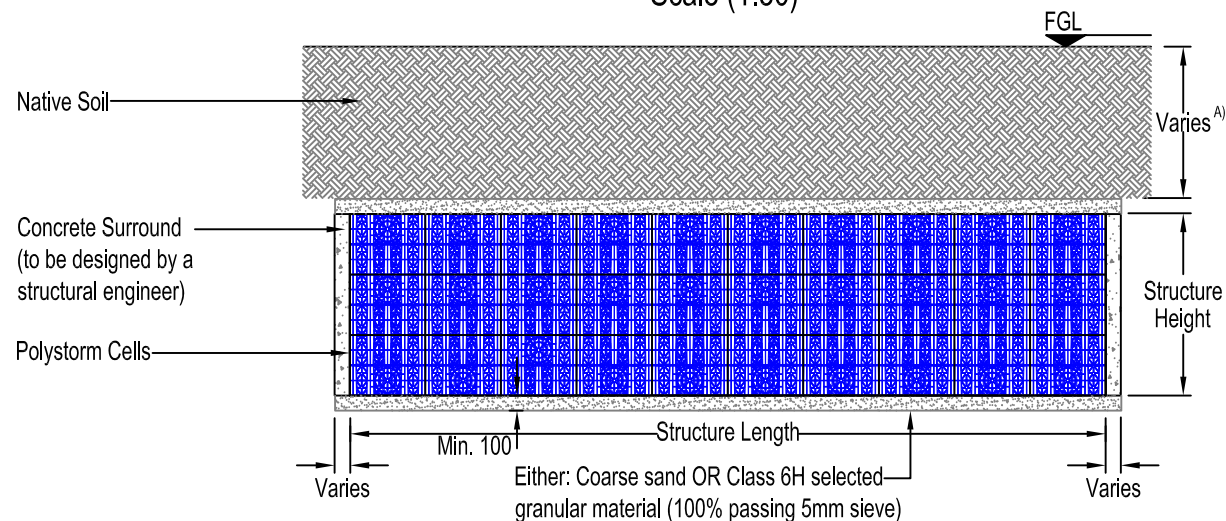
SOIL IMPROVEMENTS DETAIL

Scale (1:50)



CONCRETE COVER SLAB DETAIL

Scale (1:50)



THRUST RELIEF DETAIL

Scale (1:50)

NOTE A

For information on tank cover depths and advice on which improvement method would be appropriate, please contact the Technical Team:- 01509 61500

NOTES

1. All dimensions in millimetres, unless otherwise stated.
2. All dimensions are nominal and may vary within manufacturing or construction tolerances.
3. All site temporary and enabling works by others.
4. Polypipe products to be installed in accordance with Polypipe civils recommendations (refer to Polypipe technical guidance for further information), giving due consideration to the requirements of the organisation who will be taking ultimate owner ship of the installation.
5. This drawing is intended for guidance only. Confirmation of the information contained within this document should be sought from the consulting engineers before final design or construction activities commence.

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PROJECT	POLYSTORM STANDARD DETAILS		FOR INFORMATION	
	DATE	DRAWN BY	ORIGINAL SIZE	SCALE
TITLE	17/03/16	JL	A3	AS SHOWN
	DRAWING No.		REV.	
POLYSTORM ENHANCED INSTALLATION DETAIL		PSM_SD_IM_001		

14.7 Appendix 7 – SuDS Maintenance Manual

The information presented below is taken from the CIRIA SuDS Manual (Report c753).

Further details on installation and maintenance can be found in this manual.

14.7.1 Pervious Pavements

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing areas	As required
	Removal of weeds or management using Weed killer applied directly into the weeds rather than spraying.	As required -once per year on less frequently used pavements
	Remediate any landscaping which, through vegetation maintenance or	As required

Maintenance Schedule	Required Action	Typical Frequency
Remedial actions	soil slip, has been raised to within 50 mm of the level of the paving.	
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and lost material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial Inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth -if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor Inspection chambers	Annually

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

14.7.2 Geo-Cellular Maintenance

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from manhole, storage structure and components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct geocellular and/or replace or clean void fill, if performance failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/ debris removal for large systems. If maintenance is not undertaken

for long periods, deposits can become hard-packed and require considerable effort to remove.

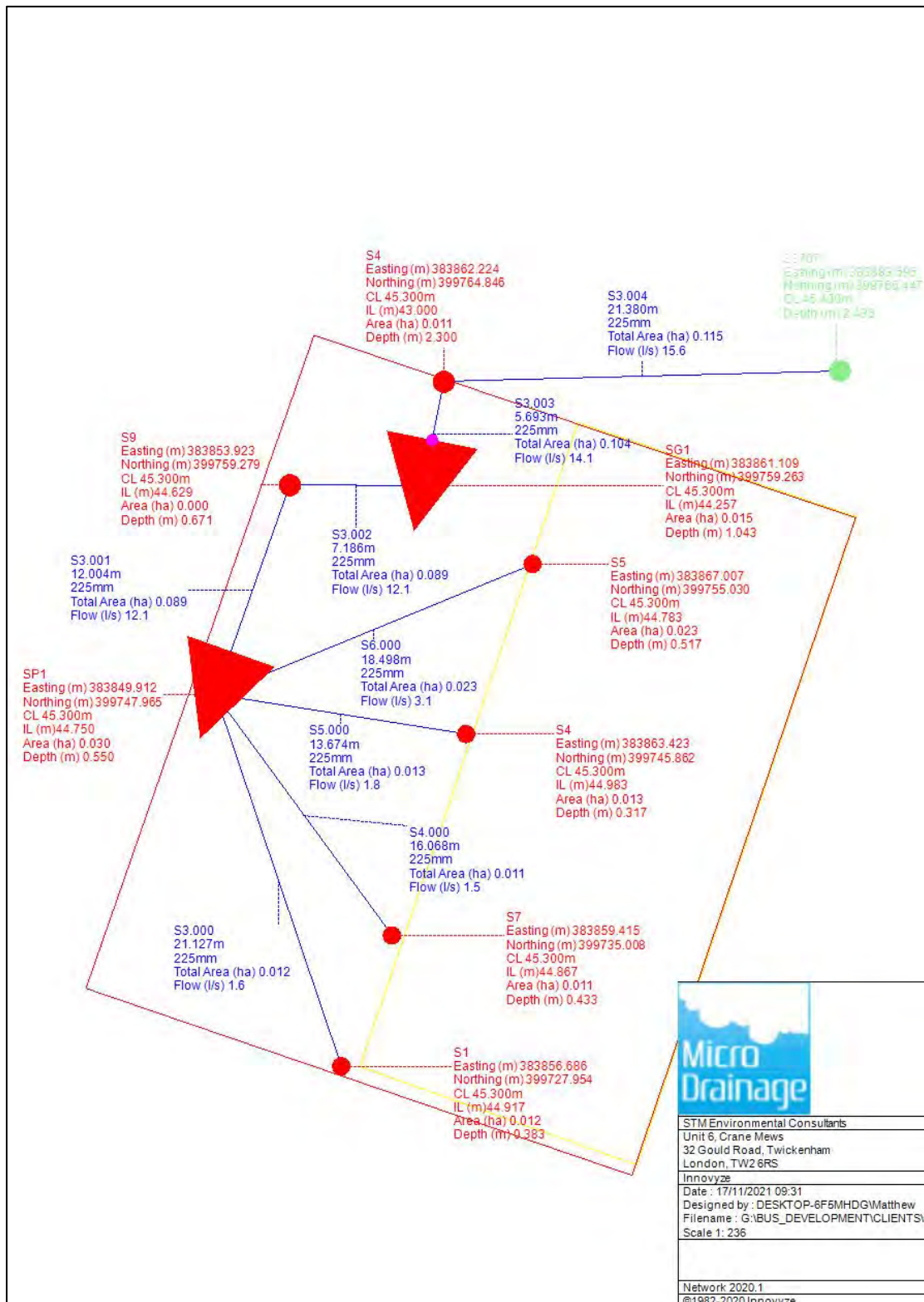
Replacement of the geocellular units will be necessary if the system becomes blocked with silt. Effective monitoring will give information on changes in infiltration rate and provide a warning of potential failure in the long term.

Areas draining to infiltration components should be regularly swept to prevent silt being washed off the surface. This will minimize the need for maintenance.

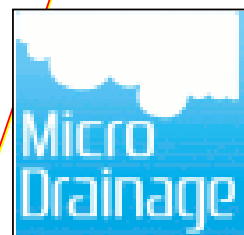
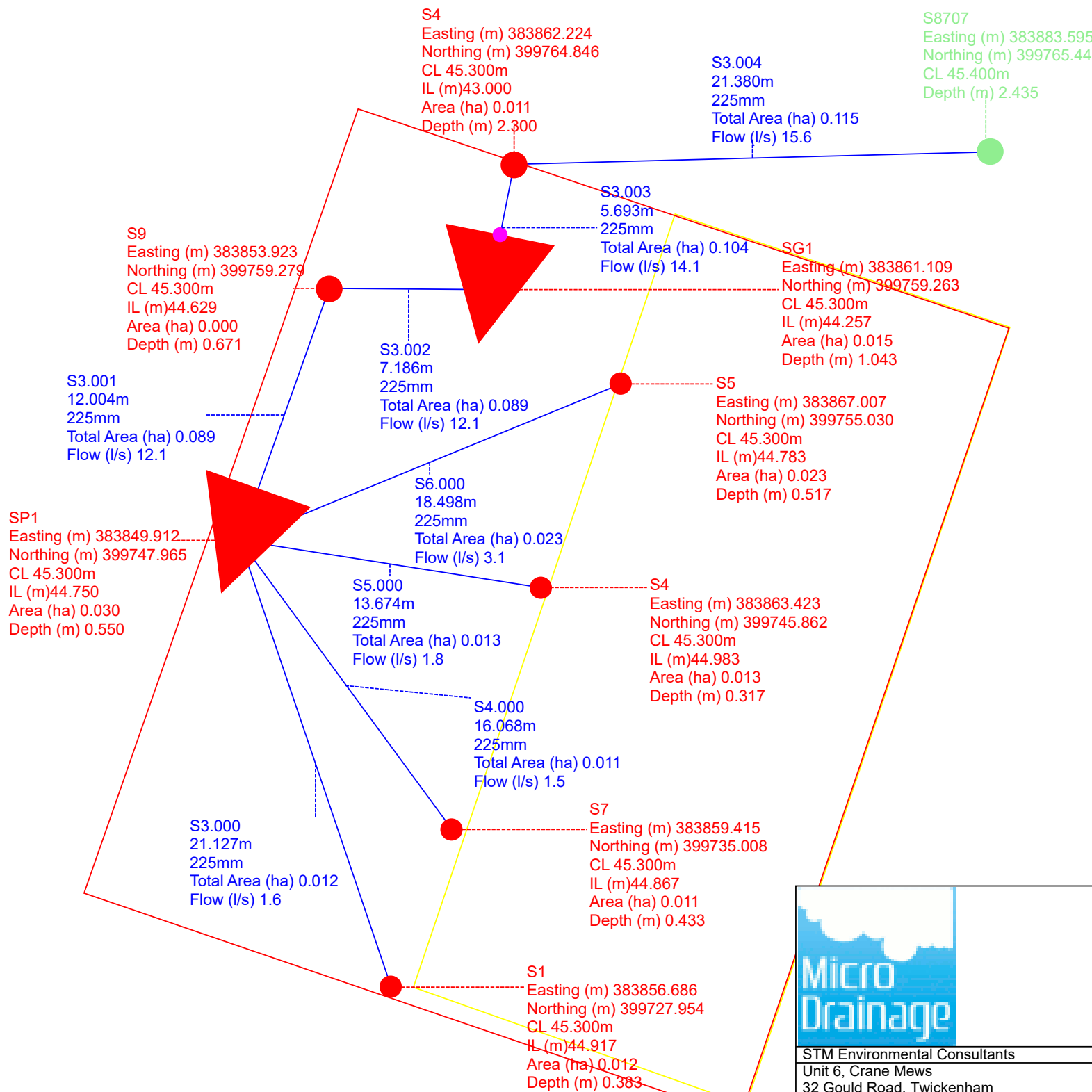
Maintenance responsibility should be placed with an appropriate organisation, and maintenance schedules should be developed during the design phase.

14.8 Appendix 8 - Microdrainage

14.8.1 Layout of Network



PDF copy to follow this page.



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London, TW2 6RS

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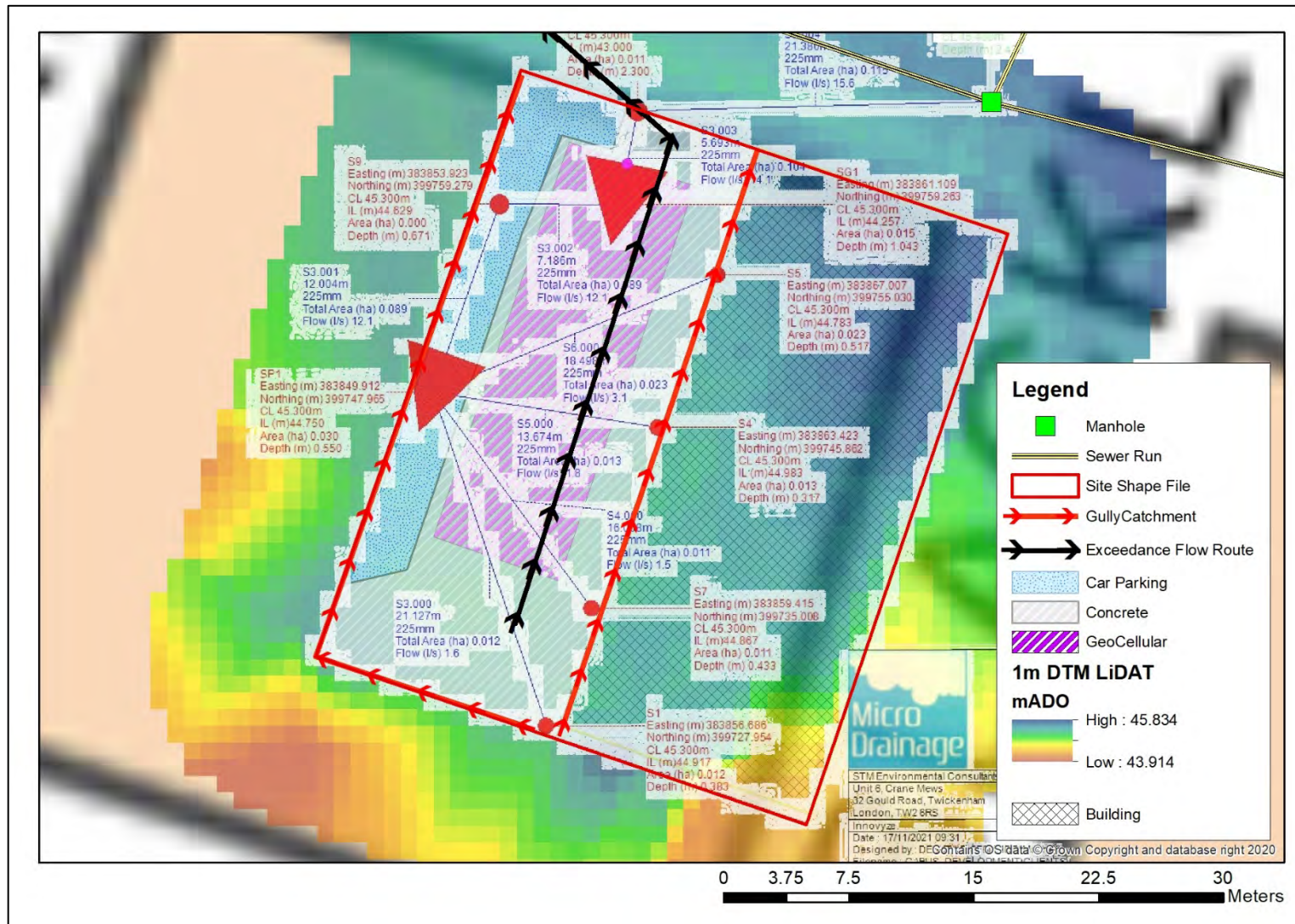
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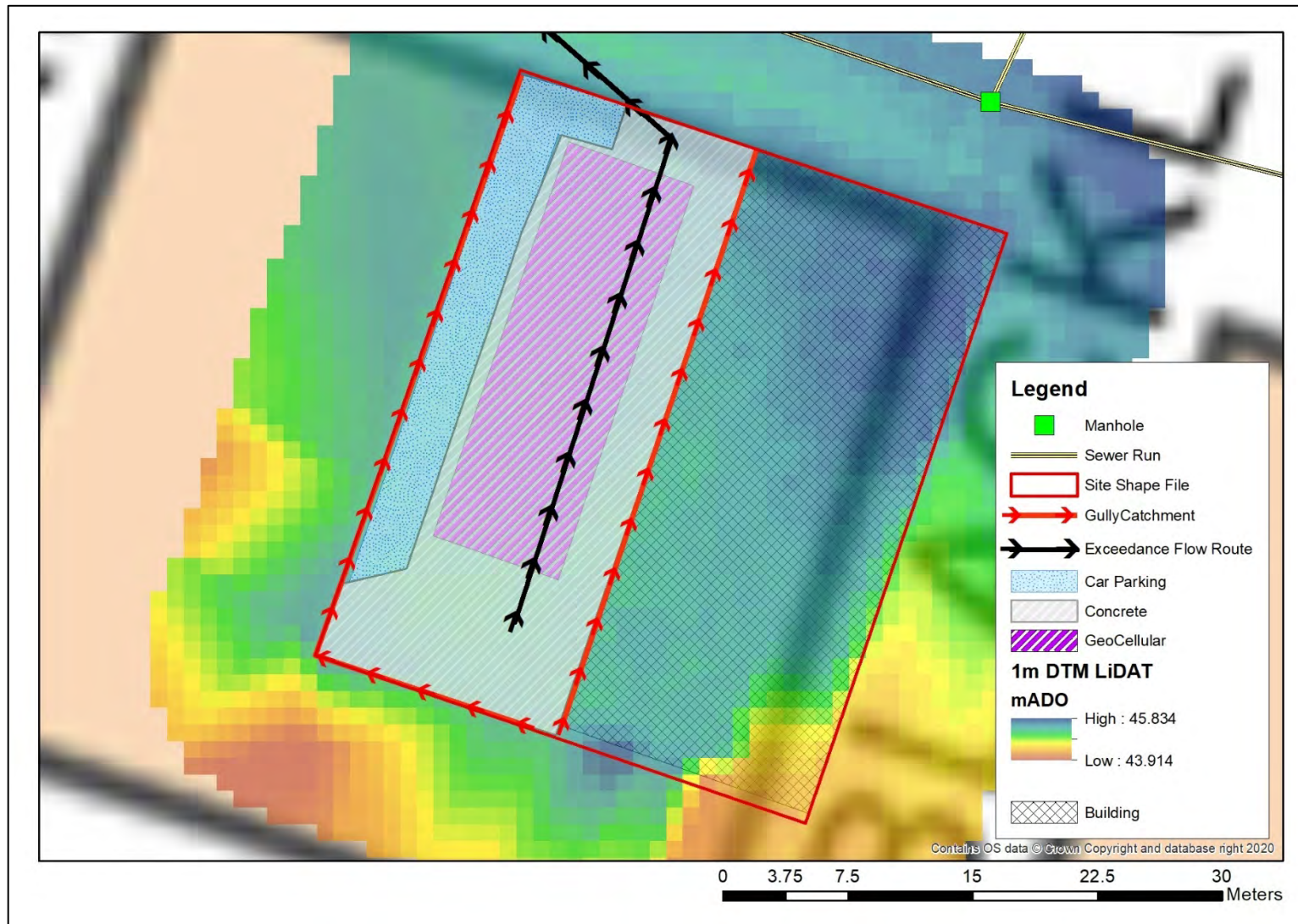
Network 2020.1

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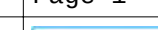
14.8.2 Layout of Network - Features, Exceedance flows and Sewer Connection



14.8.3 Layout of Network - Features, Exceedance flows and Sewer Connection



14.8.4 Microdrainage results

STM Environmental Consultants		Page 1
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
Date 17/11/2021 09:25 File 63 KNOWSLEY STREET.MDX	Designed by Matthew Checked by	
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STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.067	4-8	0.046	8-12	0.002

Total Pipe Volume (m³) = 4.598

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
S3.000	21.127	0.161	131.2	0.012	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	16.068	0.095	169.1	0.011	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	13.674	0.167	81.9	0.013	5.00	0.0	0.600	o	225	Pipe/Conduit	

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
S3.000	50.00	5.31	44.917	0.012	0.0	0.0	0.0	1.14	45.3	1.6
S4.000	50.00	5.27	44.867	0.011	0.0	0.0	0.0	1.00	39.9	1.5
S5.000	50.00	5.16	44.983	0.013	0.0	0.0	0.0	1.45	57.5	1.8

STM Environmental Consultants		Page 3
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	45.300	0.383	Open Manhole	1000	S3.000	44.917	225				
S7	45.300	0.433	Open Manhole	1000	S4.000	44.867	225				
S4	45.300	0.317	Open Manhole	1000	S5.000	44.983	225				
S5	45.300	0.517	Open Manhole	1000	S6.000	44.783	225				
SP1	45.300	0.550	Open Manhole	1200	S3.001	44.750	225	S3.000	44.756	225	6
								S4.000	44.772	225	22
								S5.000	44.816	225	66
								S6.000	44.783	225	33
S9	45.300	0.671	Open Manhole	1200	S3.002	44.629	225	S3.001	44.629	225	
SG1	45.300	1.043	Open Manhole	1200	S3.003	44.257	225	S3.002	44.557	225	300
S4	45.300	2.300	Open Manhole	1200	S3.004	43.000	225	S3.003	44.166	225	1166
S8707	45.400	2.435	Open Manhole	1200		OUTFALL		S3.004	42.965	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	383856.686	399727.954	383856.686	399727.954	Required	
S7	383859.415	399735.008	383859.415	399735.008	Required	
S4	383863.423	399745.862	383863.423	399745.862	Required	
S5	383867.007	399755.030	383867.007	399755.030	Required	
SP1	383849.912	399747.965	383849.912	399747.965	Required	
S9	383853.923	399759.279	383853.923	399759.279	Required	
SG1	383861.109	399759.263	383861.109	399759.263	Required	
S4	383862.224	399764.846	383862.224	399764.846	Required	

STM Environmental Consultants				Page 4															
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Date 17/11/2021 09:25		Designed by Matthew																	
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<u>Manhole Schedules for Storm</u> <table border="1"> <thead> <tr> <th>MH Name</th> <th>Manhole Easting (m)</th> <th>Manhole Northing (m)</th> <th>Intersection Easting (m)</th> <th>Intersection Northing (m)</th> <th>Manhole Access</th> <th>Layout (North)</th> </tr> </thead> <tbody> <tr> <td>S8707</td> <td>383883.595</td> <td>399765.447</td> <td></td> <td></td> <td>No Entry</td> <td>  </td> </tr> </tbody> </table>						MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)	S8707	383883.595	399765.447			No Entry	
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)													
S8707	383883.595	399765.447			No Entry														
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STM Environmental Consultants		Page 5
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
Date 17/11/2021 09:25 File 63 KNOWSLEY STREET.MDX	Designed by Matthew Checked by	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	o	225	S1	45.300	44.917	0.158	Open Manhole	1000
S4.000	o	225	S7	45.300	44.867	0.208	Open Manhole	1000
S5.000	o	225	S4	45.300	44.983	0.092	Open Manhole	1000
S6.000	o	225	S5	45.300	44.783	0.292	Open Manhole	1000
S3.001	o	225	SP1	45.300	44.750	0.325	Open Manhole	1200
S3.002	o	225	S9	45.300	44.629	0.446	Open Manhole	1200
S3.003	o	225	SG1	45.300	44.257	0.818	Open Manhole	1200
S3.004	o	225	S4	45.300	43.000	2.075	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.000	21.127	131.2	SP1	45.300	44.756	0.319	Open Manhole	1200
S4.000	16.068	169.1	SP1	45.300	44.772	0.303	Open Manhole	1200
S5.000	13.674	81.9	SP1	45.300	44.816	0.259	Open Manhole	1200
S6.000	18.498	0.0	SP1	45.300	44.783	0.292	Open Manhole	1200
S3.001	12.004	99.2	S9	45.300	44.629	0.446	Open Manhole	1200
S3.002	7.186	99.2	SG1	45.300	44.557	0.518	Open Manhole	1200
S3.003	5.693	62.7	S4	45.300	44.166	0.909	Open Manhole	1200
S3.004	21.380	604.7	S8707	45.400	42.965	2.210	Open Manhole	1200

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Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S3.000	S1	1000		383856.686	399727.954	383856.686	399727.954	
S4.000	S7	1000		383859.415	399735.008	383859.415	399735.008	
S5.000	S4	1000		383863.423	399745.862	383863.423	399745.862	
S6.000	S5	1000		383867.007	399755.030	383867.007	399755.030	
S3.001	SP1	1200		383849.912	399747.965	383849.912	399747.965	
S3.002	S9	1200		383853.923	399759.279	383853.923	399759.279	
S3.003	SG1	1200		383861.109	399759.263	383861.109	399759.263	
S3.004	S4	1200		383862.224	399764.846	383862.224	399764.846	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S3.004	S8707	1200		383883.595	399765.447	

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Setting Out Information - Site Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S3.000	S1	1000		383856.686	399727.954	383856.686	399727.954	
S4.000	S7	1000		383859.415	399735.008	383859.415	399735.008	
S5.000	S4	1000		383863.423	399745.862	383863.423	399745.862	
S6.000	S5	1000		383867.007	399755.030	383867.007	399755.030	
S3.001	SP1	1200		383849.912	399747.965	383849.912	399747.965	
S3.002	S9	1200		383853.923	399759.279	383853.923	399759.279	
S3.003	SG1	1200		383861.109	399759.263	383861.109	399759.263	
S3.004	S4	1200		383862.224	399764.846	383862.224	399764.846	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S3.004	S8707	1200		383883.595	399765.447	

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
3.000	User	-	100	0.012	0.012	0.012
4.000	User	-	100	0.011	0.011	0.011
5.000	User	-	100	0.013	0.013	0.013
6.000	User	-	100	0.023	0.023	0.023
3.001	User	-	100	0.030	0.030	0.030
3.002	-	-	100	0.000	0.000	0.000
3.003	User	-	100	0.015	0.015	0.015
3.004	User	-	100	0.011	0.011	0.011
				Total	Total	Total
				0.115	0.115	0.115

STM Environmental Consultants		Page 9
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
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Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S3.000	S1	225	0.158	0.319	Unclassified	1000	0	0.158	Unclassified
S4.000	S7	225	0.208	0.303	Unclassified	1000	0	0.208	Unclassified
S5.000	S4	225	0.092	0.259	Unclassified	1000	0	0.092	Unclassified
S6.000	S5	225	0.292	0.292	Unclassified	1000	0	0.292	Unclassified
S3.001	SP1	225	0.325	0.446	Unclassified	1200	0	0.325	Unclassified
S3.002	S9	225	0.446	0.518	Unclassified	1200	0	0.446	Unclassified
S3.003	SG1	225	0.818	0.909	Unclassified	1200	0	0.818	Unclassified
S3.004	S4	225	2.075	2.210	Unclassified	1200	0	2.075	Unclassified

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)
---------------------	--------------	--------------	--------------	------------------	-----------	--------

S3.004	S8707	45.400	42.965	0.000	1200	0
--------	-------	--------	--------	-------	------	---

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.200	Storm Duration (mins)	30
Ratio R	0.358		

STM Environmental Consultants		Page 10
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
Date 17/11/2021 09:25 File 63 KNOWSLEY STREET.MDX	Designed by Matthew Checked by	
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<u>Online Controls for Storm</u> <u>Orifice Manhole: SG1, DS/PN: S3.003, Volume (m³): 1.4</u> Diameter (m) 0.024 Discharge Coefficient 0.600 Invert Level (m) 44.257		
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STM Environmental Consultants		Page 11
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
Date 17/11/2021 09:25	Designed by Matthew	
File 63 KNOWSLEY STREET.MDX	Checked by	
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Storage Structures for Storm

Porous Car Park Manhole: SP1, DS/PN: S3.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	34.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.750	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SG1, DS/PN: S3.003

Invert Level (m)	44.300	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	180.0	180.0	0.600	180.0	212.2
0.500	180.0	206.8	0.601	0.0	212.2

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
S3.000	S1	0.500
S4.000	S7	0.500
S5.000	S4	0.500
S6.000	S5	0.500
S3.001	SP1	0.500
S3.002	S9	0.500
S3.003	SG1	0.500
S3.004	S4	0.500

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32 Gould Road, Twickenham

London, TW2 6RS

Date 17/11/2021 09:25

File 63 KNOWSLEY STREET.MDX

Innovyze

Network 2020.1

Page 13



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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 2

Number of Online Controls 1

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 0.357

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S3.000	S1	15 Winter	1	+0%					44.944
S4.000	S7	15 Winter	1	+0%					44.895
S5.000	S4	15 Winter	1	+0%					45.009
S6.000	S5	15 Winter	1	+0%	100/15 Summer				44.864
S3.001	SP1	30 Winter	1	+0%					44.806
S3.002	S9	30 Winter	1	+0%					44.690
S3.003	SG1	480 Winter	1	+0%	30/480 Winter				44.366
S3.004	S4	15 Winter	1	+0%					43.044

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.000	S1	-0.198	0.000	0.03			1.4	OK	
S4.000	S7	-0.197	0.000	0.04			1.3	OK	
S5.000	S4	-0.199	0.000	0.03			1.6	FLOOD RISK	
S6.000	S5	-0.144	0.000	0.28			2.7	OK	

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STM Environmental Consultants		Page 14
Unit 6, Crane Mews 32 Gould Road, Twickenham London, TW2 6RS		
Date 17/11/2021 09:25 File 63 KNOWSLEY STREET.MDX	Designed by Matthew Checked by	
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.001	SP1	-0.169	0.000	0.14		15	6.2	OK	
S3.002	S9	-0.164	0.000	0.16			6.2	OK	
S3.003	SG1	-0.115	0.000	0.01		357	0.4	OK	
S3.004	S4	-0.181	0.000	0.08			1.4	OK	

Date 17/11/2021 09:25
File 63 KNOWSLEY STREET.MDX

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PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		
S3.001	SP1	-0.117	0.000	0.46		8	20.5	OK	
S3.002	S9	-0.106	0.000	0.54			20.7	OK	
S3.003	SG1	0.001	0.000	0.01		562	0.6	SURCHARGED	
S3.004	S4	-0.152	0.000	0.23			3.8	OK	

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Unit 6, Crane Mews
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Date 17/11/2021 09:25
File 63 KNOWSLEY STREET.MDX

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Page 17



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

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coefficient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Online Controls 1
Number of Offline Controls 0

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

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales Cv (Summer)
M5-60 (mm) 18.200 Cv (Winter)

Ratio R 0.357
0.750
0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S3.000	S1	15 Winter	100	+40%					44.977
S4.000	S7	15 Winter	100	+40%					44.936
S5.000	S4	15 Winter	100	+40%					45.040
S6.000	S5	15 Winter	100	+40%	100/15 Summer				45.022
S3.001	SP1	15 Winter	100	+40%					44.910
S3.002	S9	15 Winter	100	+40%					44.815
S3.003	SG1	480 Winter	100	+40%	30/480 Winter				44.665
S3.004	S4	15 Winter	100	+40%					43.100

PN	US/MH Name	Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.000	S1	-0.165	0.000	0.15		6.4	OK	
S4.000	S7	-0.156	0.000	0.16		5.8	OK	
S5.000	S4	-0.168	0.000	0.14		7.1	FLOOD RISK	
S6.000	S5	0.014	0.000	1.21		11.9	FLOOD RISK	

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PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		
S3.001	SP1	-0.065	0.000	0.85		8	38.2		OK
S3.002	S9	-0.039	0.000	1.00			37.9		OK
S3.003	SG1	0.183	0.000	0.02		821	0.8	SURCHARGED	
S3.004	S4	-0.125	0.000	0.41			6.7		OK

14.9 Appendix 9 - Asset Mapping

PDF to follow this page.

STM Environmental Ltd

**Unit 6
Crane Mews, 32 Gould Road,
Twickham,
TW2 6RS**

FAO:

How to contact us:

**United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP**

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

**Your Ref: 63 Knowsley
Our Ref: UUPS-ORD-250254
Date: 22/02/2021**

Dear Sirs

Location: 63 Knowsley Street

I acknowledge with thanks your request dated 12/02/2021 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



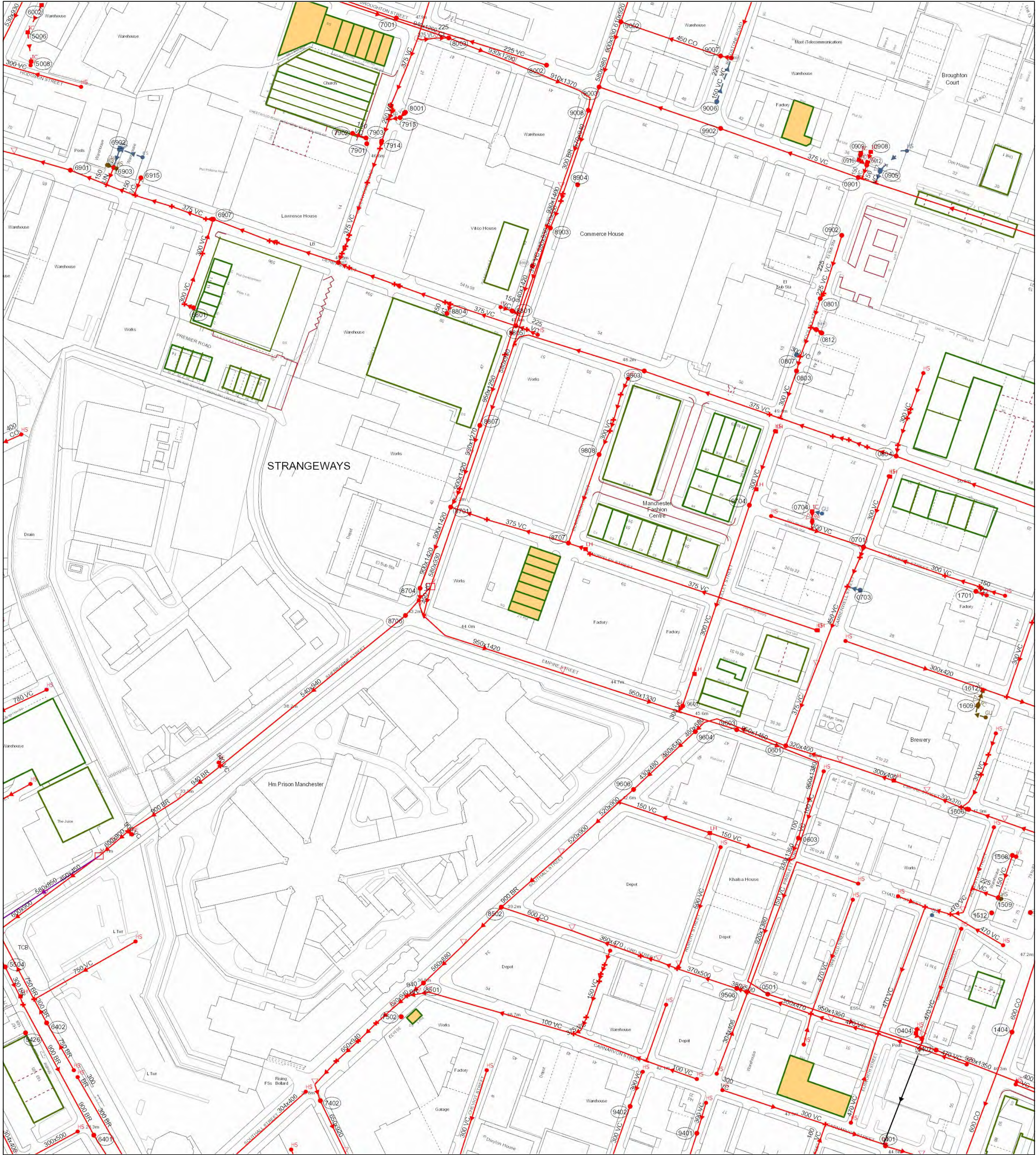
Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

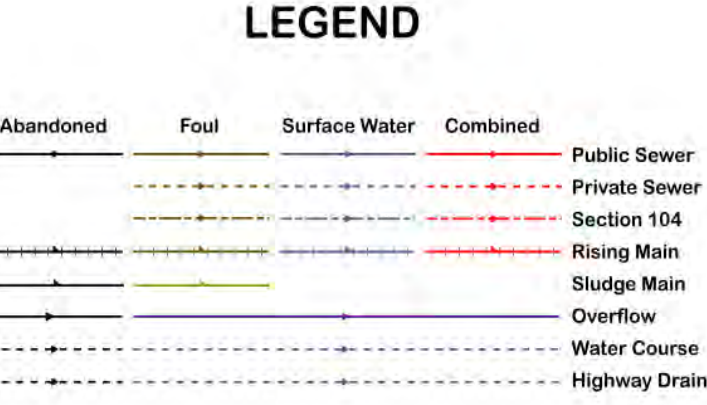
These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



Reho	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
0811	49.67	CO	0	300			VC	3.162278	
0804	50.9	CO	47.4	375			VC	16.76305	
1404	46.61	CO	40.72	600			CO	85.44004	1 in 38
6907	42.41	CO	37.44	375			VC	4	
7001	47.71	CO	44.93	225			VC	67.6767	1 in 88
6401	28.13	CO	32.73	300			BR	52.13362	1 in 145
6903		CO		150			UN	10.27689	
6915		CO		150			VC	10.28776	
6801	42.48	CO	0	300			VC	5.385165	
9902	47.32	CO	37.5	300			VC	70.83784	
8501	36.48	CO	30.87	620			BR	11.60175	1 in 112
0912		CO		150			VC	8.640379	
8008	50.2	CO	38.21	300			BR	45.54119	
5504	27.36	CO	24.01	300			BR	23.27371	
8001	46.11	CO	30.01	630			VC	17.72005	
8707	45.8	CO	42.4	375			VC	46.84015	
8001	47.18	CO	45.28	150			VC	4.24064	1 in 14
9402	41.75	CO	38.81	300			VC	118.596	1 in 47
0701	48.96	CO	44.49	375			VC	3.162278	
8704	43.45	CO	35.53	920			BR	10	
0807	49.39	BR	0	300			VC	2.236068	
8704	48.1	CO	44.33	300			VC	117.0043	1 in 43
7402	32.78	CO	29.37	650			BR	32.20248	1 in 66
8708	42.4	CO	38.15	540			BR	131.5029	
1608	47.98	CO	44.28	300			VC	4.123106	
0902	50.88	CO	48.05	225			VC	33.52611	
7907	46.61	CO	41.2	375			VC	35.78514	
9803	48.25	CO	45.08	375			VC	77.15124	
8002	46.83	CO	47.03	225			VC	88.97701	1 in 80
0803	49.42	CO	46.14	300			VC	27.51363	
9003	50.27	CO	46.83	570			BR	62.20767	
7914	46.79	CO	41.99	375			VC	4.123106	
0703	48.57	SW	45.0	450			VC	7.28011	
1509		CO		225			VC	15.28911	
8801		CO	31.57	150			VC	3.42654	
8502	38.99	BR	29.8948	900			BR	29.8948	1 in 93
9401	42.71	CO	39.38	300			VC	137.8768	
0901	43.98	CO	34.98	650			BR	98.03061	1 in 654
9002	50.61	CO	47.19	600			BR	18.97367	1 in 105
6901	38.11	CO	35.12	375			VC	32.28003	1 in 17
9808	47.06	CO	42.99	300			VC	51.88521	1 in 115
8805	47.43	CO	42.43	375			VC	37.94733	
6902		BR		150			PF	10.56117	
9007	50.87	CO	48.09	450			VC	24.88755	1 in 216
1508		CO		150			VC	58.18955	
9508	43.61	CO	39.34	370			VC	34.78505	
9603	45.74	CO	35.21	850			BR	48.49648	
0812		CO		150			VC	3.695551	
8003	48.67	CO	45.64	375			VC	57.24509	1 in 18
8005	50.82	CO	48.15	450			CO	6.082763	1 in 152
0901	51.58	CO	48.23	375			VC	80.65358	1 in 117
0402	45.65	CO	34.82	920			BR	96.59604	1 in 508
6402	27.69	CO	24.5	300			BR	14.74482	
9601	45.29	CO	36.54	225			VC	1.414214	
7915	47.23	CO	43.81	150			VC	6.082763	
8902	46.09	CO	36.08	940			BR	27.20294	
9604	45.01	CO	39.9	460			BR	23.34524	1 in 12
8701	45.1	CO	35.76	900			BR	48.10405	1 in 481
0801	46.61	CO	46.44	300			VC	16.76305	
0601	46.3	CO	41.83	320			VC	50.96193	
8003	45.27	CO	36.36	930			BR	38.52642	
0401	44.58	CO	39.72	320			VC	20.89061	
9006	50.66	SW	40.68	150			VC	12.54911	1 in 141
9606	42.96	CO	33.23	520			BR	53.81579	
7902		CO		150			VC	7.678768	
6903		CO	35.13	930			BR	15	
8903	45.67	CO	45.64	580			BR	208.8163	1 in 39



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

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

MANHOLE FUNCTION

FO Foul
SW Surface Water
CO Combined
OV Overflow

SEWER SHAPE

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

SEWER MATERIAL

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

Address or Site Reference:

63 Knowsley Street,

Scale: 1:1250 **Date:** 22/02/2021

Sheet: 1 of 1

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The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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