



**Land Between Villiers Road
and Penrhyn Road,
Knowsley Business Park
Prescot
L34 9ET**

**Flood Risk Assessment
& Drainage Strategy Report**

for

Pembury Developments Limited

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1.0 EXECUTIVE SUMMARY

The proposal is for the development comprising the erection of a new building for Class E (industrial), B2 general industrial and B8 storage/distribution including ancillary offices, landscaping, yards, access points off Villiers Road, car parking, cycle parking and associated engineering works site located at land between Villiers Road and Penrhyn Road, Knowsley Business Park.

In accordance with the NPPF and local strategic flood risk assessment, this report has studied and assessed the flood risk to the site by all sources.

A review of the EA Flood Maps shows that the site is located entirely within Flood Zone 1 (land defined as having less than a 1 in 1000 annual probability of flooding from of river or sea water) and is defined as 'less vulnerable' leading to the conclusion the development is considered 'appropriate' in accordance with NPPF guidelines.

As the site is within Flood Zone 1, the sequential and exception tests are not required by the local authority.

Further to this, the site is considered to be at 'low risk' from all sources of flooding; tidal, fluvial, pluvial, sewer, groundwater and artificial sources.

A review of the site indicates that it is undeveloped and can be classed as 'Greenfield' for drainage purposes. There are two identified connections to the surrounding United Utilities (UU) adopted surface water sewer network and one connection surround UU adopted foul water sewer network.

The surface drainage strategy as outlined below is to restrict the proposed flow rate to ensure that the flood risk to the site and surrounding catchment is not increased by development.

The drainage hierarchy has been considered in the drainage strategy discussed in section 5. The surface water runoff will be collected from the new impermeable areas and directed via the underground network to the two existing connections to the public sewer. Flow rates will be restricted to Greenfield rates with the upstream attenuation taking the form of two below ground attenuation tanks. A detailed Drainage layout with hydraulic calculations has been prepared to support this approach and can be found in the Appendices. Sustainable Drainage Systems (SuDS) have been incorporated into the design and will take the form of rainwater harvesting, permeable paving and attenuation measures.

There is no residual flood risk from the development site to the surrounding district due to the restriction in storm water flow rates. The development does not therefore increase the risk of flooding to other adjacent neighbourhoods. Out of chamber or gully flooding for the extreme 100 year plus climate change event may occur within the development site and is classed as exceedance flows. Flood water from this event will be contained within the development site and directed away from the unit to the external yard and parking areas.

Foul flows will be collected by a new gravity network and discharge to the United Utilities foul sewer via the existing connection.

2.0 DEVELOPMENT DETAILS

2.1 CONTEXT

This Flood Risk Assessment & Drainage Strategy report has been prepared by Burrows Graham Limited on behalf of Pembury Developments Limited to support the planning application for the development comprising the erection of a new building for Class E (industrial), B2 general industrial and B8 storage/distribution including ancillary offices, landscaping, yards, access points off Villiers Road, car parking, cycle parking and associated engineering works site located at land between Villiers Road and Penrhyn Road, Knowsley Business Park.

2.2 AIM OF STUDY

This FRA and Drainage Strategy has been developed in due cognisance of all relevant available policy information. The report will assess and satisfy the requirements of the National Planning Policy Framework (NPPF) and all relevant flood risk planning policies.

2.3 SITE DETAILS

Site Name:	Land between Villiers Road and Penrhyn Road, Knowsley Business Park
Reference:	343045, 396487
Site Area:	2.14 Ha
Site Description:	The broadly rectangular shape of the site is currently classed as unmade land, with heavy vegetation to the western side. The site is located within Knowsley Business Park and is currently accessed from Villiers Road.

Looping around the site from the west to the north is Penrhyn Road, with Villiers Road along the southern boundary. The Business Park encompasses a large number of varying sized commercial units with associated car parking and landscaping. Beyond the site to the north west by approximately 2km is Kirby Town Centre.

The site area measures 2.14 hectares and is located within the Knowsley Metropolitan Borough Council (KMBC).

A review of the topographical information indicates the site to have a nominal fall from east at 31.100m AOD to the west at 28.000m AOD.

Full details can be found on the topographical survey in Appendix B.



Figure 1: Site Location

3.0 PLANNING OBLIGATIONS

3.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

Local planning authorities are advised by the National Planning Policy Framework (NPPF) to consult the Environment Agency (EA) and Lead Local Flood Authorities (LLFA) on all developments of an area greater than 1Ha and those that are at an increased risk of flooding.

This report has been prepared to assess the requirements of the NPPF in accordance with the current EA and LLFA policies and will primarily assess the following;

- Determining whether the site is likely to be affected by flooding and whether it would increase flood risk elsewhere.
- Assessing whether the proposed development is appropriate in the suggested location.
- Detailing any measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe, and that flood risk would not be increased elsewhere.
- Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
- Discuss Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk.
- Devise an appropriate surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change.
- Consider the recommendations of the Knowsley Council Strategic Flood Risk Assessment (SFRA) and other local policies.

On review of the EA Flood Maps, the site is situated entirely within Flood Zone 1 (land defined as having less than a 1 in 1000 annual probability of flooding from river or sea water). This site is therefore classified as 'less vulnerable' and the development is acceptable in line with the National Planning Policy Guidelines.

The sequential and exception tests are tools used by local planning authorities during the allocation of sites for development. As this site is within Flood Zone 1 neither are required.

3.2 STRATEGIC FLOOD RISK ASSESSMENT

Knowsley Metropolitan Borough Council have produced the Knowsley Level 2 Strategic Flood Risk Assessment (2012) to demonstrate and define its understanding and role in managing flood risk in the borough. A fundamental aim of the strategy is that Knowsley Metropolitan Borough Council embraces and supports its role as Lead Local Flood Authority, and this means taking the lead in helping with infrastructure development and re-development and working with other bodies in dealing with flood risk. The Council wants to encourage and wherever possible enforce current thinking and guidance and be able to provide improvements through working better together. The Strategy is aimed at providing an overview and assessment of local flood risk, setting out objectives and measures for how Knowsley Metropolitan Borough Council will manage and reduce local flood risk. This Strategy builds on existing and developing approaches to flood risk management and promotes the use of a wide range of

measures to manage flood risk. Risk should be managed in a co-ordinated way within catchments and balance the needs of communities, the economy and the environment.

The full report can be obtained from Knowsley Metropolitan Borough Council website. The main objectives of the report are:

- 1) To better understand local flood risk and make best use of available information to better manage flood risk to people, businesses, property, infrastructure and the natural environment;
- 2) To reduce the potential impact and costs of flooding in the Borough;
- 3) To ensure resilience of local water bodies and drainage assets;
- 4) To ensure appropriate development in areas of flood risk;
- 5) To develop a collaborative partnership approach to flood risk management, and cooperate with other Risk Management Authorities (RMAs) and key stakeholders working across catchments;
- 6) To assist communities in understanding information on flood risk and supporting themselves;

3.3 LOCAL FLOOD RISK MANAGEMENT STRATEGY

The aim of this document is to set out the council's approach to managing flood risk in the short and long term. It outlines how Knowsley Metropolitan Borough Council will engage with others to mitigate the flood risk to neighbouring catchments, in particular those areas which have increased flood risk. The proposed development is not within a critical drainage catchment and the drainage strategy has been produced in line with the fundamental principles set out.

3.4 KNOWSLEY COUNCIL POLICIES

In 2016, Knowsley Metropolitan Borough Council prepared the Sustainable Drainage & Surface Water Management Document with the aim of how SuDS can be integrated into the fabric of development starting at the planning stage and leading through the concept, outline and detailed design stages.

The main principles of the report that affect this development are:

- Details of how runoff is collected from roofs, roads and other hard surfaces to keep water at or near the surface
- Site control features with approximate volumes and flow control locations and details
- Flow routes including low flow, overflow and exceeding routes
- Confirmation of sub-catchments with location of flow controls
- Confirm the destination of the "controlled flow of clean water" from the site – the ground by infiltration, a watercourse or the surface water sewer.
- Post development runoff rates as close to greenfield rates.
- Detailed SuDS management train approach to be incorporated throughout the scheme with appropriate measures from prevention, source control through to site control.

- 20% climate change allowance where the design life does not exceed 48 years, i.e. up to 2069. Assessment to be undertaken of the 40% climate change allowance.
- Exceedance flows beyond the 30-year event can be incorporated as long as the water is managed and does not flow off site or cause flood risk to the development building.
- Detailed plans and hydraulic calculations to be provided at planning stage.

3.5 KNOWSLEY POLICIES

In 2016 Knowsley Metropolitan Borough Council prepared the Knowsley Local Plan: Core Strategy plan for Knowsley that sets out integrated economic, environmental, transport and social framework for the development in Knowsley up until the year 2028. Policy CS24 (Managing Flood Risk) includes sections and Core Strategy Policy Links on Flood Risk and Sustainable Drainage Policies.

This policy of the Knowsley Local Plan has been assessed for the scheme as part of this FRA and all the main elements such as reducing flood risk and incorporating SuDS methods have all been incorporated.

4.0 FLOOD RISK

The NPPF (2021) guidelines require the developer to assess the impact of the proposed development runoff on the downstream catchment in conjunction with assessing the risk of runoff from the surrounding area on the proposed development layout.

In the following sections the flood risk to the site from all sources will be assessed. As the site will restrict runoff from the site there is no increased flood risk to the downstream network.

4.1 FLUVIAL & TIDAL FLOODING

The site is not located near the sea or a tidally influenced watercourse, therefore the risk of tidal flooding is deemed to be low.

The closest identified watercourse is Knowsley Brook, located some 100m to the north west at its closest point to the site and which flows generally in a westerly direction before ultimately discharging into Croxteth Brook.

Figure 2 below locates the site on the Environment Agency's indicative floodplain map. It is clear from this that the red line boundary sits outside of a fluvial generator of flood water from any identified water body or river. It is considered therefore that the site lays outside of the active 100-year and extreme event floodplains, thus lying within 'Flood Zone 1 Classification' in accordance with NPPF Guidance, i.e. probability of annual fluvial flooding significantly less than 1 in 1000 in any one year (<0.1%). The risk from fluvial flood water is diminished to acceptable levels, removing the requirement for further investigation and assessment of the fluvial flood regime.

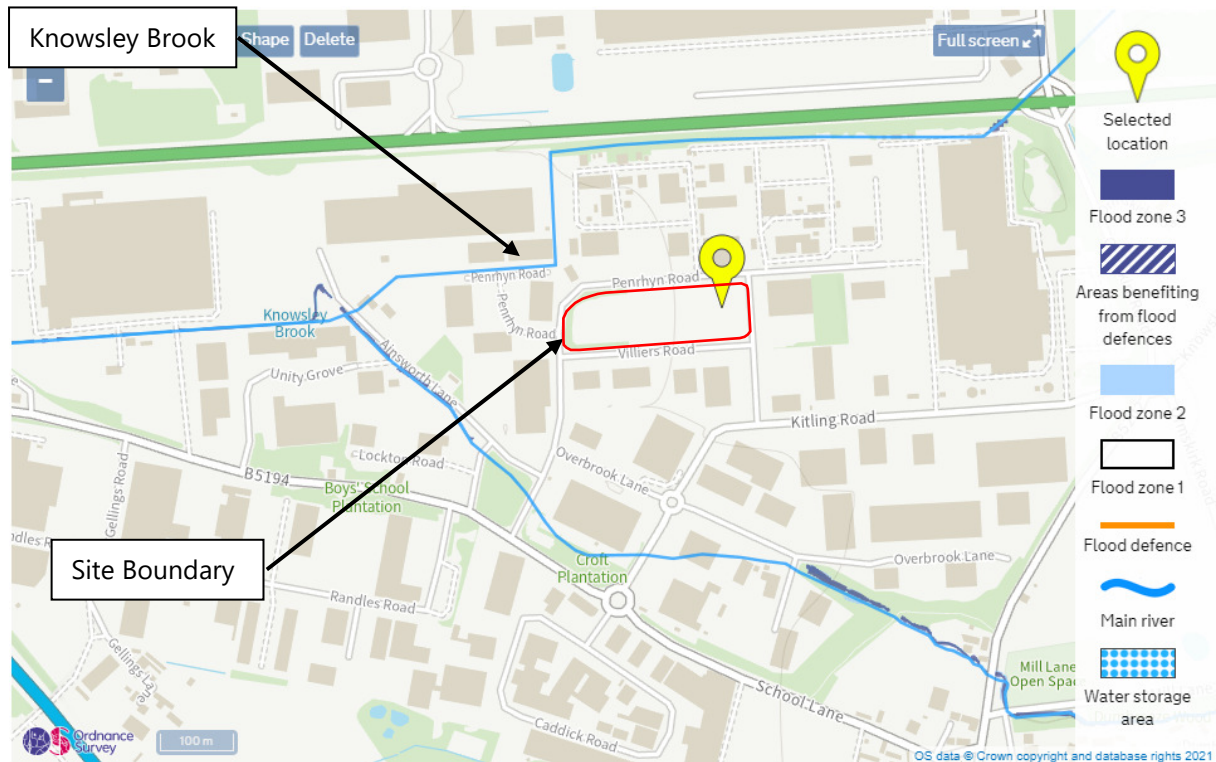


Figure 2: Extract from EA Indicative Fluvial Flood Risk Maps

4.2 SURFACE WATER FLOODING

A review of the EA surface water flood maps (Figure 3 below) shows that the site is classified as 'Very low risk'. Furthermore the development will mitigate against this risk by modifying the existing levels to suit the development intent and directing all areas into a new underground drainage network and as such will not pose a flood risk to the development.

There are no existing surface water flow routes through the site that would need to be maintained.

Therefore, based on this assessment, the site can be considered at low risk from surface water flooding.

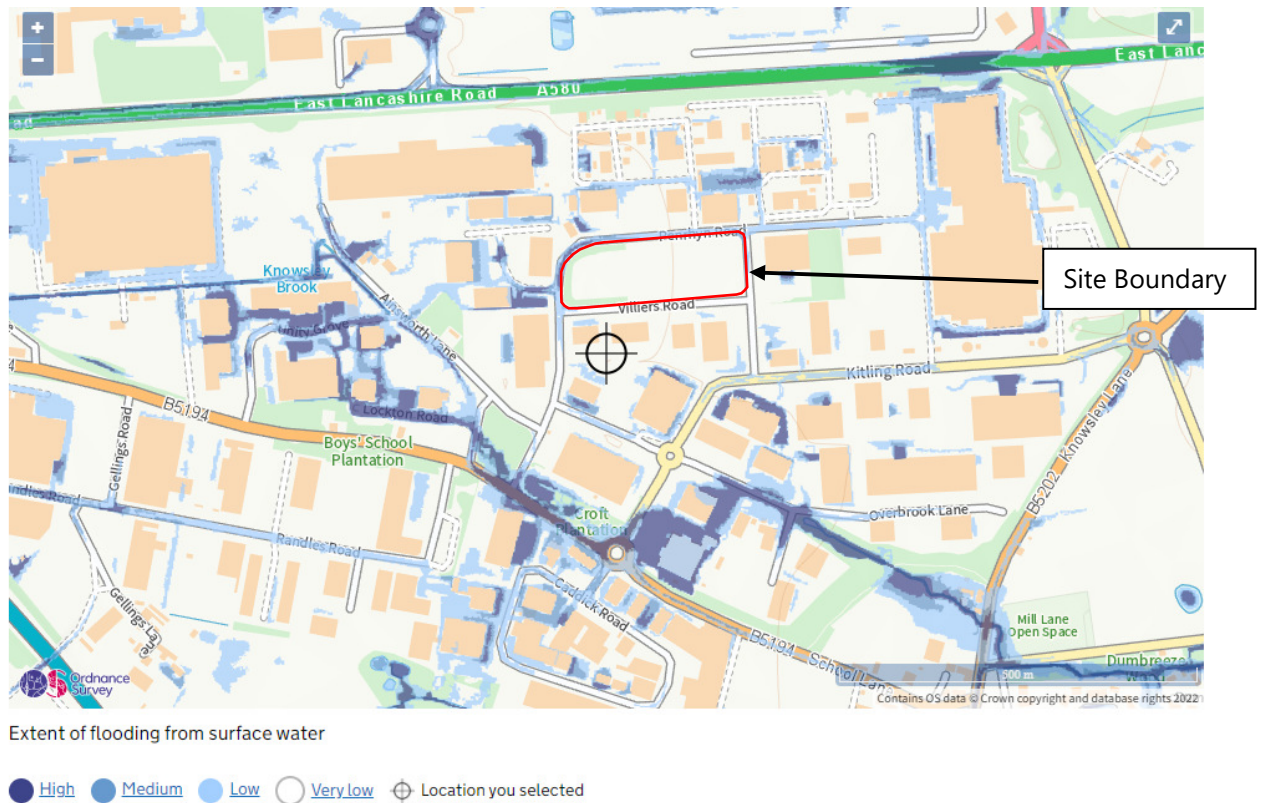


Figure 3: Extract from EA Surface Water Flood Risk Maps

4.3 GROUNDWATER FLOODING

Groundwater flooding occurs when the water table, the level of water below the ground, rises above the ground surface or into cellars and basements. Groundwater flooding is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks. The KMBC Level 2 SFRA indicates 'the GEM dataset appears to reflect the findings of the Mersey and North Merseyside Water Resources study more closely, which gives some confidence with respect to its use to assess the source of groundwater flooding'.

The Level 1 & 2 SFRA presents in Appendix E DEFRA's Groundwater Emergence Map (GEM), which identifies areas where, in exceptionally wet winters, groundwater may be expected to rise to be close to or at the ground surface. It also indicates that the lower lying areas of the Alt floodplain extending into Kirkby Brook, Knowsley Brook and Croxteth Brook are at risk, as well as areas of the River Alt within Stockbridge Village extending southwards towards Huyton.

A site investigation carried out at the site has found the ground water depths to range between 0.20m and 2.40m below ground level. However, these shallow levels could be attributable to perched water levels.

A review of the DEFRA 'Magic' Groundwater Vulnerability Map has identified that the area is at Medium-high risk of the groundwater flooding.

As the development building will be raised above the existing ground levels and is located away from the River alt areas, the site is considered to have a low susceptibility to groundwater flooding.

4.4 SEWER FLOODING

The United Utilities (UU) sewer records have been reviewed and confirm that there are a number of UU adopted surface water sewer network bounding the site on all sides. This range in size from 225mm diameter to 900mm diameter and generally flow in a north westerly direction where they merge and outfall to Knowsley Brook in 3rd party land.

The extensive UU adopted drainage network serving the surrounding urban district ensures that the development footprint is protected from the impact of both upstream and downstream runoff. It is speculated that complete protection may well exist beyond a storm event equivalent to the 30-year statistical event. Beyond this projection, there may be a small degree of peripheral 'Exceedance' flooding within the areas above the sewers. However, this is expected to be localised and restricted to the location of specific manhole covers located outside the development footprint within the highways. Thus, flood risk to the site from sewers is diminished to acceptable levels and considered to be low.

4.5 ARTIFICIAL FLOODING

A review of the EA online mapping tool shows that the site is located in an area with low risk of flooding from reservoirs and other artificial features.

5.0 DRAINAGE STRATEGY

5.1 CONSULTATION

United Utilities

In January 2022 a pre planning sewerage enquiry was submitted to United Utilities. A response was received on the 2nd February 2022 to inform on all aspects of foul and surface water drainage associated with the new development. A copy of their feedback can be found in Appendix E.

The Main points are:

1. No existing sewers shown to be crossing within the site boundary.
2. Foul can discharge unrestricted to the foul sewer, ideally to Penrhyn Road to the north. If this is not suitable then alternative to be agreed with UU.
3. Surface water to follow the SuDS hierarchical approach.
4. If infiltration to ground found not to be viable then connection to the surface water sewer is acceptable. Pass forward flow rate to be agreed with the LLFA but should not exceed 11l/s.
5. Formal S106 sewer connection applications to be submitted in due course.

5.2 EXISTING DRAINAGE & RUNOFF RATES

The site area currently encompasses un-made land and as such can be considered for drainage purposes as Greenfield.

	Area (ha)	1 year	Qbar	30 year	100 year
Greenfield Runoff Rates	2.14	4.4 l/s	5.0 l/s	8.6 l/s	10.5 l/s

Table 1: Existing Greenfield Runoff Rates

5.3 GEOLOGY

A detailed Phase 2 Site Investigation has been completed at the site. This has found the underlying ground to encompass made ground over a sandy clay. Soakaway testing was carried out as part of the intrusive investigation and based on the cohesive nature of the ground the test could not be completed. An extract from the site investigation is shown in Figure 4 below.

9.0 Soakaway Assessment

Testing was not completed due to the slow fall in water level, indicating a very low infiltration rates which is typical and reflective of the natural ground conditions encountered i.e., clay. Therefore, the Site is not considered suitable for conventional depth soakaway drainage design.

Figure 4: Extract from Phase 2 Site investigation Regarding Soakaway Results

5.4 SUSTAINABLE DRAINAGE

Sustainable Drainage Systems (SuDS) are utilised in line with the CIRIA 753 guidance and aim to minimise the development's impact on the runoff quantity and quality and maximise amenity and biodiversity opportunities.

The management train approach is a fundamental principle of SuDS systems, it aims to primarily reduce pollution, flow rates and volume of runoff from the site. The main objective is to treat the runoff as close to the source as possible and it is imperative that at least two of the following should be included within the drainage strategy.

- **Prevention** – The use of good site design and rainwater re-use measures to prevent runoff.
- **Source Control** – Controlling the runoff as close to source as possible by using green roofs, porous pavements and soakaways.
- **Site Control** – Use of water management techniques within local area, ie. detention basins and geocellular storage.
- **Regional Control** – Management of water from a number of sites in a specific location, ie. balancing ponds and wetlands.

The drainage strategy for this development will incorporate prevention, source control and site control measures. Prevention in the form of rainwater harvesting, Source control in the form of permeable paving and site control with two below ground geocellular attenuation tanks with a restricted outflow.

Whilst it would be beneficially to include more of these techniques, the space on site means it is not viable to include any additional above ground 'Green' SuDS measures.

5.5 SURFACE WATER STRATEGY

Based on the SuDS review, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail in Table 2 below:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	The Phase 2 site investigation has confirmed that infiltration will not be possible at the site.
Connection to Watercourse	No	The closest watercourse is the Knowsley Brook, located some 100m from the site within 3 rd party land.
Connection to Surface Water Sewer	Yes	Reuse the existing on-site private connection to the UU surface water sewer network.
Connection to a Combined Sewer	No	There are other viable options which would take precedence.

Table 2: SuDS Hierarchal Approach

Surface water generated from the roof of the new buildings will merge with the runoff from the new service yard and car parking areas and direct it through a surface water drainage network where a flow control chamber will discharge the flows to the UU sewers at Greenfield rates. Due to these reductions, below ground geocellular attenuation crates will be used as the means of retaining the water. These tanks will be sized as a minimum to suit the 30-year storm event.

Water from the western half of the roof will pass through a rainwater harvesting tank with the water reused within the offices. The staff car park will be constructed in permeable paving to reduce the runoff to the sewer. Due to there being two separate surface water networks and outfall locations, each control will be set at a maximum of 5l/s in line with guidance to reduce the risk of blockage. Thus although the peak flow will be below the extreme 100 year plus climate change event, it will marginally exceed the low order events. Table 3 below defines the post development flows rates based on the local policy and as taken from the completed hydraulic calculations. Note that these peak flow rates are below the requested 11 l/s suggested by United Utilities as part of their pre development response. Full details of this strategy can be found on the BGL drawing in Appendix C and the hydraulic calculations in Appendix D.

	1 year	30 year	100 year
Greenfield Runoff Rates	4.4 l/s	8.6 l/s	10.5 l/s
BGL Designed Flow Rates (Total from the 2 Networks)	8.8 l/s	9.2 l/s	10.0 l/s

Table 3: Post Development Runoff Rates

The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2008 and Building Regulations part H guidance, i.e. to show no flooding to the 30 year storm return period criterion.

Events exceeding this up to and including the 100 year plus climate change allowance have been assessed. Flooding from these events is classed as exceedance flooding and will be directed away from buildings, where it will be stored in the highways and hard paving area and drain back into the surface water network as the levels recede.

A climate change factor of **40%** is deemed appropriate for this development which is primarily low risk (commercial units & car park) with a design life of 50 years.

Runoff from roofs is generally considered to be clean and will be discharged directly into the surface water network. Runoff from the car parks and HGV yards will be directed via a bypass petrol interceptors. These will be selected and sized in accordance with the current guidance. Silt will be prevented from entering the drainage system by the use of trapped gullies, silt boxes and separators.

5.6 MANAGEMENT AND MAINTENANCE STRATEGY

The long-term maintenance of the new drainage infrastructure will be with the owner / occupier of the proposed commercial unit in line with best practice guidance. Annual inspections will need to be carried out and clearing of drainage channels, gullies, catchpits and petrol interceptors undertaken.

Typically the maintenance regime will be in line with Table 4 below.

<u>Future Maintenance of the Drainage System</u>			
Responsibility	Feature	Maintenance	Frequency
Owner / Occupier / Management Company	Drainage Channel.	Regular maintenance / removal of blockages and silts.	Ad-hoc flushing / jetting and emptying of silt traps required.
	Rainwater gutters, downpipes and above ground drainage.	Regular maintenance and inspections.	Ad-hoc sweeping and emptying of silt and debris required. Annual visual inspections to check for damage/leaks.
	Flow control chambers.	Regular maintenance / removal of blockages and debris.	Annual inspection and following significant rainfall events.
	Geocellular Attenuation / Tanks	Regular maintenance / removal of blockages and debris.	Annual inspection and following significant rainfall events.
	Permeable Paving	Brushing and Vacuuming, removal of weeds	Annual inspection and following significant rainfall events.
	Pipes, sewers, manholes, outfall headwall.	Regular maintenance / removal of blockages and debris.	Annual inspection and removal of silts if required.

Table 4: Outline Management and Maintenance Strategy

5.7 FOUL WATER STRATEGY

Foul flows will discharge to the United Utilities foul sewer located outside the site boundary via an existing connection. The site will drain by a private gravity network to this sewer and be designed in line with Building Regulations Guidance. A Section 106 agreement with United Utilities Water will be sought at detailed design stage.

6.0 MANAGEMENT, MAINTENANCE AND RISK

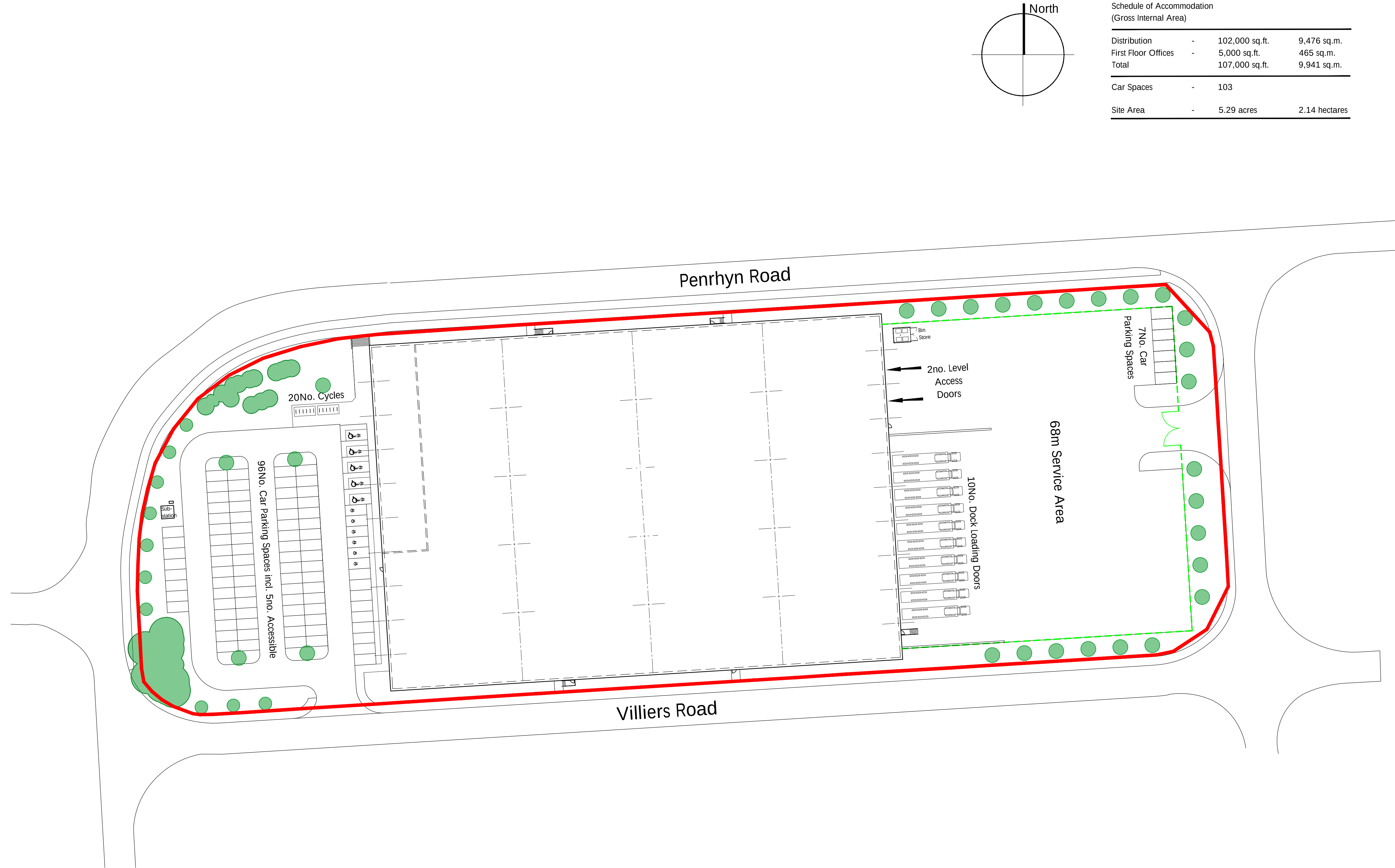
A private management company will maintain the drainage infrastructure as part of the site wide management and maintenance strategy. Typically, the maintenance regime will be in line with the table on the drainage strategy drawing.

The use of SuDS in the form of Prevention, Source Control and Site Control measures will help to minimise the flood risk impact to the surrounding watercourse network.

Up to and including the 100-year plus increase in rainfall allowance due to climate change (CC) event, the report has justified that there is no risk of flooding.

Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified.

APPENDIX A – SITE MASTERPLAN



Schedule of Accommodation (Gross Internal Area)			
Distribution	-	102,000 sq.ft.	9,476 sq.m.
First Floor Offices	-	5,000 sq.ft.	465 sq.m.
Total		107,000 sq.ft.	9,941 sq.m.
Car Spaces	-	103	
Site Area	-	5.29 acres	2.14 hectares

notes

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G	16/02/22	Red line boundary amended.	sih
F	14/02/22	Red line boundary added.	sih
E	10/02/22	Indicative trees revised in accordance with proposed landscape scheme.	sih
D	08/02/22	Titleblock amended. Substation indicated. Bin store added. External ramp omitted. Retaining wall added to service yard dock.	sih
C	01/02/22	Car parking amended.	sih
B	31/01/22	4no. car park spaces relocated to service yard. External fire escape stairs, office stair and ramp added.	sih
A	21/01/22	Building proportions reverted to original scheme.	sih
no.	date	revision	by



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Pembury Developments Ltd.

project

Penrhyn Road
Knowsley

drawing

Proposed Site Layout Plan

scale	1:500 @ a1	drawn	sih
checked	mjl	date	19/01/22

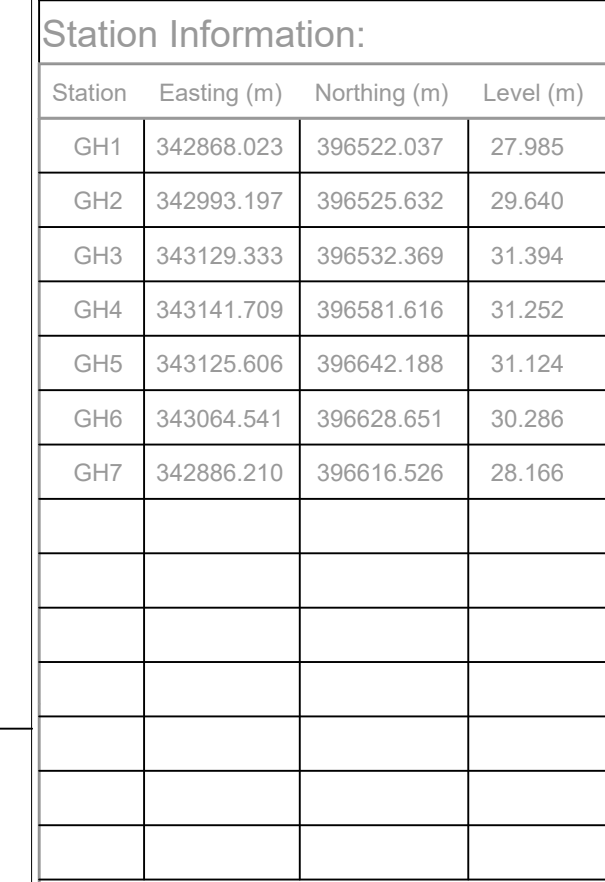
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PLANNING

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APPENDIX B – TOPOGRAPHICAL SURVEY

[illegible]

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- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
- Measured Building Surveys
- 3D Laser Scanning
- Revit & BIM Models

St Albans	Newcastle	London
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PROJECT

**Penrhyn Road
Knowsley Business Park
Knowsley**

Level datum	See note
Grid orientation	See note
Job number	42584

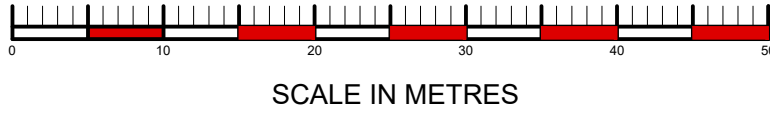
Comments

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.

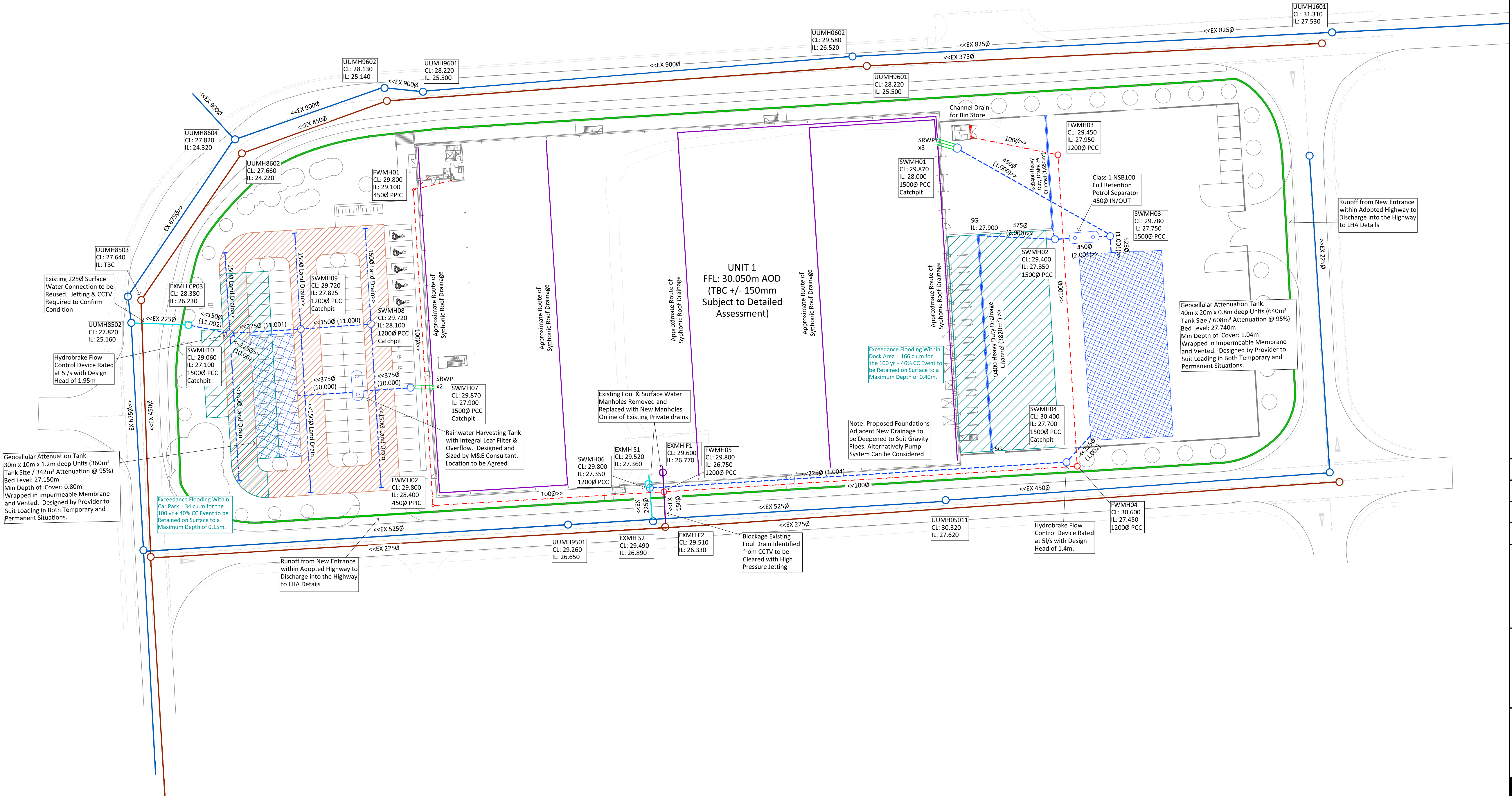
APPENDIX C – BGL DRAINAGE STRATEGY



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MAINTENANCE	
DEMOLITION	
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT	
GENERAL NOTES: 1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL THE RELEVANT ARCHITECTS, ENGINEERS' AND SERVICE ENGINEERS DRAWINGS & SPECIFICATIONS.	

KEY:	
	Existing UU Foul Water Sewer
	Existing Foul Water Drainage
	Existing UU Surface Water Sewer
	Existing Surface Water Drainage
	Surface Water Drainage Pipe
	Surface Water Drainage Manhole
	Surface Water Drainage Channel
	Foul Water Drainage Pipe
	Foul Water Drainage Manhole
	Filter / Land Drainage Pipe
	Syphonic Drainage Pipe
	Permeable Paving (0.38m Depth)
	Exceedance Flooding for the 100yr + 40% CC Event
	Planning Boundary

Note not all Existing Drainage is Shown on this Drawing. Refer to GPR and CCTV Surveys for the Full Extent of Existing Identified Drainage .



P01	08.02.22	PG	Preliminary Issue	RM
REV.	DATE	BY	REVISION	CHK'D

CLIENT	
PEMBURY DEVELOPMENTS LTD	

	Arden Hall, 66 Brooklands Road, Sale, Cheshire M33 3SJ Tel: +44 (0)161 804 8046

PROJECT	
Penrhyn Road, Knowsley	

DRAWING TITLE	
Drainage Strategy Plan	
DRAWING STATUS	DRAWN BY
PRELIMINARY	PG
SCALE @ A1	CHECKED BY
1:250	RM
DATE	
08.02.22	
DRAWING No.	REV.
21133-BGL-XX-XX-DR-C-0250	P01

APPENDIX D – BGL HYDRAULIC CALCULATIONS

		Page 1
	Land Off Penrhyn Road Knowsley Greenfield Runoff Rates	
Date 18/01/2022 File	Designed by paulg Checked by	
Innovyze Source Control 2017.1.2		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 1 Soil 0.300 Area (ha) 2.140 Urban 0.000 SAAR (mm) 873 Region Number Region 10 Results l/s QBAR Rural 5.0 QBAR Urban 5.0 Q1 year 4.4 Q1 year 4.4 Q30 years 8.6 Q100 years 10.5		
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	Pembury Knowsley SW Network No. 1	
Date 08/02/2022 File Knowsley - SW Network 1...	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.500	Add Flow / Climate Change (%)	0
Ratio R	0.389	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)
0-4	0.392	4-8	0.760

Total Area Contributing (ha) = 1.152

Total Pipe Volume (m³) = 14.848

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	37.000	0.115	321.7	0.605	4.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	17.000	0.049	350.0	0.382	4.00	0.0	0.600	o	375	Pipe/Conduit	
2.001	12.000	0.100	120.0	0.165	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.55	28.000	0.605	0.0	0.0	0.0	1.13	179.4	81.9
2.000	50.00	4.29	27.900	0.382	0.0	0.0	0.0	0.96	106.3	51.7
2.001	50.00	4.40	27.850	0.547	0.0	0.0	0.0	1.85	295.0	74.1

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Date 08/02/2022 File Knowsley - SW Network 1...	Designed by paulg Checked by	
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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
1.001	5.000	0.010	500.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
1.002	9.000	0.040	225.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	94.000	0.360	261.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.001	50.00	4.63	27.750	1.152	0.0	0.0	0.0	0.99	215.4	156.0
1.002	50.00	4.80	27.740	1.152	0.0	0.0	0.0	0.87	34.5«	156.0
1.003	50.00	6.75	27.700	1.152	0.0	0.0	0.0	0.80	32.0«	156.0

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Date 08/02/2022 File Knowsley - SW Network 1...	Designed by paulg Checked by	
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW05, DS/PN: 1.003, Volume (m³): 3.7

Unit Reference	MD-SHE-0100-5000-1400-5000
Design Head (m)	1.400
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	27.700
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0
Flush-Flo™	0.416	5.0
Kick-Flo®	0.855	4.0
Mean Flow over Head Range	-	4.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	1.200	4.7	3.000	7.1	7.000	10.7
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.0
0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.4
0.400	5.0	1.800	5.6	4.500	8.6	8.500	11.7
0.500	5.0	2.000	5.9	5.000	9.1	9.000	12.0
0.600	4.9	2.200	6.2	5.500	9.5	9.500	12.3
0.800	4.3	2.400	6.4	6.000	9.9		
1.000	4.3	2.600	6.7	6.500	10.3		

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Storage Structures for Storm Cellular Storage Manhole: TANK, DS/PN: 1.002 Invert Level (m) 27.740 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>800.0</td><td>800.0</td><td>5.200</td><td>0.0</td><td>890.6</td></tr><tr><td>0.400</td><td>800.0</td><td>845.3</td><td>5.600</td><td>0.0</td><td>890.6</td></tr><tr><td>0.800</td><td>800.0</td><td>890.5</td><td>6.000</td><td>0.0</td><td>890.6</td></tr><tr><td>0.801</td><td>0.0</td><td>890.6</td><td>6.400</td><td>0.0</td><td>890.6</td></tr><tr><td>1.600</td><td>0.0</td><td>890.6</td><td>6.800</td><td>0.0</td><td>890.6</td></tr><tr><td>2.000</td><td>0.0</td><td>890.6</td><td>7.200</td><td>0.0</td><td>890.6</td></tr><tr><td>2.400</td><td>0.0</td><td>890.6</td><td>7.600</td><td>0.0</td><td>890.6</td></tr><tr><td>2.800</td><td>0.0</td><td>890.6</td><td>8.000</td><td>0.0</td><td>890.6</td></tr><tr><td>3.200</td><td>0.0</td><td>890.6</td><td>8.400</td><td>0.0</td><td>890.6</td></tr><tr><td>3.600</td><td>0.0</td><td>890.6</td><td>8.800</td><td>0.0</td><td>890.6</td></tr><tr><td>4.000</td><td>0.0</td><td>890.6</td><td>9.200</td><td>0.0</td><td>890.6</td></tr><tr><td>4.400</td><td>0.0</td><td>890.6</td><td>9.600</td><td>0.0</td><td>890.6</td></tr><tr><td>4.800</td><td>0.0</td><td>890.6</td><td>10.000</td><td>0.0</td><td>890.6</td></tr></tbody></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	800.0	800.0	5.200	0.0	890.6	0.400	800.0	845.3	5.600	0.0	890.6	0.800	800.0	890.5	6.000	0.0	890.6	0.801	0.0	890.6	6.400	0.0	890.6	1.600	0.0	890.6	6.800	0.0	890.6	2.000	0.0	890.6	7.200	0.0	890.6	2.400	0.0	890.6	7.600	0.0	890.6	2.800	0.0	890.6	8.000	0.0	890.6	3.200	0.0	890.6	8.400	0.0	890.6	3.600	0.0	890.6	8.800	0.0	890.6	4.000	0.0	890.6	9.200	0.0	890.6	4.400	0.0	890.6	9.600	0.0	890.6	4.800	0.0	890.6	10.000	0.0	890.6
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																	
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0.801	0.0	890.6	6.400	0.0	890.6																																																																																	
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4.800	0.0	890.6	10.000	0.0	890.6																																																																																	
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		Pembury Knowsley SW Network No. 1						
Date 08/02/2022 File Knowsley - SW Network 1...		Designed by paulg Checked by						
Innovyze		Network 2017.1.2						
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 1								
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 0.389								
Region England and Wales Cv (Summer) 0.750								
M5-60 (mm) 19.500 Cv (Winter) 0.840								
Margin for Flood Risk Warning (mm) 300.0								
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status OFF								
DVD Status ON								
Inertia Status ON								
Profile(s) Summer and Winter								
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440								
Return Period(s) (years) 1, 30, 100								
Climate Change (%) 0, 0, 40								
US/MH Return Climate First (X) First (Y) First (Z) Overflow								
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.
1.000	SW01	15 Winter	1	+0%	30/15 Summer			
2.000	SG	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
2.001	SW02	15 Winter	1	+0%	30/15 Summer			
1.001	SW03	15 Winter	1	+0%	30/15 Summer			
1.002	TANK	480 Winter	1	+0%	30/30 Summer			
1.003	SW05	480 Winter	1	+0%	1/360 Winter			
Water Surcharged Flooded Pipe								
PN	US/MH Name	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Level Exceeded
1.000	SW01	28.238	-0.212	0.000	0.53		84.4	OK
2.000	SG	28.200	-0.075	0.000	0.55		47.5	OK 19
2.001	SW02	28.161	-0.139	0.000	0.35		61.6	OK
1.001	SW03	28.134	-0.141	0.000	0.88		142.1	OK
1.002	TANK	27.932	-0.033	0.000	0.17		4.7	OK
1.003	SW05	27.927	0.002	0.000	0.15		4.7 SURCHARGED	
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		Pembury Knowsley SW Network No. 1						
Date 08/02/2022 File Knowsley - SW Network 1...	Designed by paulg Checked by							
Innovyze	Network 2017.1.2							
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm								
Simulation Criteria								
Areal Reduction Factor 1.000		Additional Flow - % of Total Flow 0.000						
Hot Start (mins) 0		MADD Factor * 10m³/ha Storage 2.000						
Hot Start Level (mm) 0		Inlet Coefficient 0.800						
Manhole Headloss Coeff (Global) 0.500		Flow per Person per Day (l/per/day) 0.000						
Foul Sewage per hectare (l/s) 0.000								
Number of Input Hydrographs 0		Number of Storage Structures 1						
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 0.389					
Region England and Wales Cv (Summer)		0.750						
M5-60 (mm)		19.500 Cv (Winter)	0.840					
Margin for Flood Risk Warning (mm)		300.0						
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status		OFF						
DVD Status		ON						
Inertia Status		ON						
Profile(s)		Summer and Winter						
Duration(s) (mins)		15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440						
Return Period(s) (years)		1, 30, 100						
Climate Change (%)		0, 0, 40						
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SW01	15 Winter	30	+0%	30/15 Summer			
2.000	SG	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
2.001	SW02	15 Winter	30	+0%	30/15 Summer			
1.001	SW03	15 Winter	30	+0%	30/15 Summer			
1.002	TANK	600 Winter	30	+0%	30/30 Summer			
1.003	SW05	600 Winter	30	+0%	1/360 Winter			
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	28.689	0.239	0.000	1.25	198.2	SURCHARGED	
2.000	SG	28.713	0.438	0.000	1.46	125.3	FLOOD RISK	19
2.001	SW02	28.602	0.302	0.000	1.00	178.1	SURCHARGED	
1.001	SW03	28.490	0.215	0.000	2.35	378.2	SURCHARGED	
1.002	TANK	28.237	0.272	0.000	0.18	5.0	SURCHARGED	
1.003	SW05	28.231	0.306	0.000	0.16	4.9	SURCHARGED	
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		Pembury Knowsley SW Network No. 1						
Date 08/02/2022 File Knowsley - SW Network 1...		Designed by paulg Checked by						
Innovyze		Network 2017.1.2						
Micro Drainage								
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm								
Simulation Criteria								
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000								
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000								
Hot Start Level (mm) 0 Inlet Coefficient 0.800								
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000								
Foul Sewage per hectare (l/s) 0.000								
Number of Input Hydrographs 0 Number of Storage Structures 1								
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 0.389								
Region England and Wales Cv (Summer) 0.750								
M5-60 (mm) 19.500 Cv (Winter) 0.840								
Margin for Flood Risk Warning (mm) 300.0								
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status OFF								
DVD Status ON								
Inertia Status ON								
Profile(s) Summer and Winter								
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440								
Return Period(s) (years) 1, 30, 100								
Climate Change (%) 0, 0, 40								
US/MH Return Climate First (X) First (Y) First (Z) Overflow								
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.
1.000	SW01	15 Winter	100	+40%	30/15 Summer			
2.000	SG	960 Winter	100	+40%	30/15 Summer	100/15 Summer		
2.001	SW02	960 Winter	100	+40%	30/15 Summer			
1.001	SW03	960 Winter	100	+40%	30/15 Summer			
1.002	TANK	960 Winter	100	+40%	30/30 Summer			
1.003	SW05	960 Winter	100	+40%	1/360 Winter			
Water Surcharged Flooded								
PN	US/MH	Level	Depth	Volume	Flow / Overflow	Pipe		Level
	Name	(m)	(m)	(m³)	Cap. (l/s)	Flow (l/s)	Status	Exceeded
1.000	SW01	29.338	0.888	0.000	2.34	370.2	SURCHARGED	
2.000	SG	28.891	0.616	166.333	0.18	15.0	FLOOD	19
2.001	SW02	28.917	0.617	0.000	0.12	21.5	SURCHARGED	
1.001	SW03	28.922	0.647	0.000	0.28	45.3	SURCHARGED	
1.002	TANK	28.925	0.960	0.000	0.24	6.9	SURCHARGED	
1.003	SW05	28.934	1.009	0.000	0.16	4.9	SURCHARGED	
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	Pembury Knowsley SW Network No. 2	
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.500	Add Flow / Climate Change (%)	0
Ratio R	0.388	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)
0-4	0.544	4-8	0.116

Total Area Contributing (ha) = 0.660

Total Pipe Volume (m³) = 4.868

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
10.000	25.000	0.103	242.7	0.363	4.00	0.0	0.600	o	375	Pipe/Conduit	
10.001	5.000	0.025	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
11.000	16.000	0.200	80.0	0.092	4.00	0.0	0.600	o	150	Pipe/Conduit	
11.001	16.000	0.200	80.0	0.096	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000	50.00	4.36	27.900	0.363	0.0	0.0	0.0	1.16	128.0	49.2
10.001	50.00	4.43	27.150	0.363	0.0	0.0	0.0	1.11	78.3	49.2
11.000	50.00	4.24	28.100	0.092	0.0	0.0	0.0	1.12	19.9	12.5
11.001	50.00	4.42	27.825	0.188	0.0	0.0	0.0	1.46	58.2	25.5

		Page 3																																																																																																																																																																							
		Pembury Knowsley SW Network No. 2																																																																																																																																																																							
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Innovyze		Network 2017.1.2																																																																																																																																																																							
PIPELINE SCHEDULES for Storm Upstream Manhole <table><thead><tr><th>PN</th><th>Hyd Sect</th><th>Diam (mm)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr></thead><tbody><tr><td>10.000</td><td>o</td><td>375</td><td>SW07</td><td>29.870</td><td>27.900</td><td>1.595</td><td>Open Manhole</td><td>1500</td></tr><tr><td>10.001</td><td>o</td><td>300</td><td>TANK</td><td>29.150</td><td>27.150</td><td>1.700</td><td>Open Manhole</td><td>300</td></tr><tr><td>11.000</td><td>o</td><td>150</td><td>SW08</td><td>29.720</td><td>28.100</td><td>1.470</td><td>Open Manhole</td><td>1200</td></tr><tr><td>11.001</td><td>o</td><td>225</td><td>SW09</td><td>29.400</td><td>27.825</td><td>1.350</td><td>Open Manhole</td><td>1200</td></tr><tr><td>10.002</td><td>o</td><td>225</td><td>SW10</td><td>29.060</td><td>27.100</td><td>1.735</td><td>Open Manhole</td><td>1500</td></tr><tr><td>10.003</td><td>o</td><td>225</td><td>EX CP03</td><td>28.380</td><td>26.230</td><td>1.925</td><td>Open Manhole</td><td>1200</td></tr></tbody></table> Downstream Manhole <table><thead><tr><th>PN</th><th>Length (m)</th><th>Slope (1:X)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr></thead><tbody><tr><td>10.000</td><td>25.000</td><td>242.7</td><td>TANK</td><td>29.150</td><td>27.797</td><td>0.978</td><td>Open Manhole</td><td>300</td></tr><tr><td>10.001</td><td>5.000</td><td>200.0</td><td>SW10</td><td>29.060</td><td>27.125</td><td>1.635</td><td>Open Manhole</td><td>1500</td></tr><tr><td>11.000</td><td>16.000</td><td>80.0</td><td>SW09</td><td>29.400</td><td>27.900</td><td>1.350</td><td>Open Manhole</td><td>1200</td></tr><tr><td>11.001</td><td>16.000</td><td>80.0</td><td>SW10</td><td>29.060</td><td>27.625</td><td>1.210</td><td>Open Manhole</td><td>1500</td></tr><tr><td>10.002</td><td>9.000</td><td>200.0</td><td>EX CP03</td><td>28.380</td><td>27.055</td><td>1.100</td><td>Open Manhole</td><td>1200</td></tr><tr><td>10.003</td><td>12.000</td><td>200.0</td><td>SW SEWER</td><td>27.820</td><td>26.170</td><td>1.425</td><td>Open Manhole</td><td>0</td></tr></tbody></table> Free Flowing Outfall Details for Storm <table><thead><tr><th>Outfall Pipe Number</th><th>Outfall Name</th><th>C. Level (m)</th><th>I. Level (m)</th><th>Min I. Level (m)</th><th>D,L (mm)</th><th>W (mm)</th></tr></thead><tbody><tr><td>10.003</td><td>SW SEWER</td><td>27.820</td><td>26.170</td><td>25.700</td><td>0</td><td>0</td></tr></tbody></table> Simulation Criteria for Storm <table><tbody><tr><td>Volumetric Runoff Coeff</td><td>0.750</td><td>Additional Flow - % of Total Flow</td><td>0.000</td></tr><tr><td>Areal Reduction Factor</td><td>1.000</td><td>MADD Factor * 10m³/ha Storage</td><td>2.000</td></tr><tr><td>Hot Start (mins)</td><td>0</td><td>Inlet Coefficient</td><td>0.800</td></tr><tr><td>Hot Start Level (mm)</td><td>0</td><td>Flow per Person per Day (l/per/day)</td><td>0.000</td></tr><tr><td>Manhole Headloss Coeff (Global)</td><td>0.500</td><td>Run Time (mins)</td><td>60</td></tr><tr><td>Foul Sewage per hectare (l/s)</td><td>0.000</td><td>Output Interval (mins)</td><td>1</td></tr></tbody></table> Number of Input Hydrographs 0 Number of Storage Structures 1 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				PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	10.000	o	375	SW07	29.870	27.900	1.595	Open Manhole	1500	10.001	o	300	TANK	29.150	27.150	1.700	Open Manhole	300	11.000	o	150	SW08	29.720	28.100	1.470	Open Manhole	1200	11.001	o	225	SW09	29.400	27.825	1.350	Open Manhole	1200	10.002	o	225	SW10	29.060	27.100	1.735	Open Manhole	1500	10.003	o	225	EX CP03	28.380	26.230	1.925	Open Manhole	1200	PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)	10.000	25.000	242.7	TANK	29.150	27.797	0.978	Open Manhole	300	10.001	5.000	200.0	SW10	29.060	27.125	1.635	Open Manhole	1500	11.000	16.000	80.0	SW09	29.400	27.900	1.350	Open Manhole	1200	11.001	16.000	80.0	SW10	29.060	27.625	1.210	Open Manhole	1500	10.002	9.000	200.0	EX CP03	28.380	27.055	1.100	Open Manhole	1200	10.003	12.000	200.0	SW SEWER	27.820	26.170	1.425	Open Manhole	0	Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)	10.003	SW SEWER	27.820	26.170	25.700	0	0	Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000	Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000	Hot Start (mins)	0	Inlet 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	©1982-2017 XP Solutions	
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)																																																																																																																																																																	
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11.000	o	150	SW08	29.720	28.100	1.470	Open Manhole	1200																																																																																																																																																																	
11.001	o	225	SW09	29.400	27.825	1.350	Open Manhole	1200																																																																																																																																																																	
10.002	o	225	SW10	29.060	27.100	1.735	Open Manhole	1500																																																																																																																																																																	
10.003	o	225	EX CP03	28.380	26.230	1.925	Open Manhole	1200																																																																																																																																																																	
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)																																																																																																																																																																	
10.000	25.000	242.7	TANK	29.150	27.797	0.978	Open Manhole	300																																																																																																																																																																	
10.001	5.000	200.0	SW10	29.060	27.125	1.635	Open Manhole	1500																																																																																																																																																																	
11.000	16.000	80.0	SW09	29.400	27.900	1.350	Open Manhole	1200																																																																																																																																																																	
11.001	16.000	80.0	SW10	29.060	27.625	1.210	Open Manhole	1500																																																																																																																																																																	
10.002	9.000	200.0	EX CP03	28.380	27.055	1.100	Open Manhole	1200																																																																																																																																																																	
10.003	12.000	200.0	SW SEWER	27.820	26.170	1.425	Open Manhole	0																																																																																																																																																																	
Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)																																																																																																																																																																			
10.003	SW SEWER	27.820	26.170	25.700	0	0																																																																																																																																																																			
Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000																																																																																																																																																																						
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000																																																																																																																																																																						
Hot Start (mins)	0	Inlet 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																																																																																																																																																																						

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	Pembury Knowsley SW Network No. 2																					
Date 08/02/2022 File Knowsley - SW Network 2...	Designed by paulg Checked by																					
Innovyze	Network 2017.1.2																					
<u>Synthetic Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Profile Type</td> <td>Summer</td> </tr> <tr> <td>Return Period (years)</td> <td>2</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.500</td> <td>Storm Duration (mins)</td> <td>30</td> </tr> <tr> <td>Ratio R</td> <td>0.388</td> <td></td> <td></td> </tr> </table>			Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	2	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.500	Storm Duration (mins)	30	Ratio R	0.388		
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Ratio R	0.388																					
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	Pembury Knowsley SW Network No. 2	
Date 08/02/2022 File Knowsley - SW Network 2...	Designed by paulg Checked by	
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW10, DS/PN: 10.002, Volume (m³): 4.3

Unit Reference	MD-SHE-0092-5000-1950-5000
Design Head (m)	1.950
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	92
Invert Level (m)	27.100
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.950	5.0
Flush-Flo™	0.403	4.2
Kick-Flo®	0.821	3.4
Mean Flow over Head Range	-	4.0

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

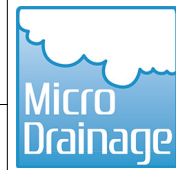
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	1.200	4.0	3.000	6.1	7.000	9.1
0.200	3.9	1.400	4.3	3.500	6.6	7.500	9.4
0.300	4.1	1.600	4.6	4.000	7.0	8.000	9.7
0.400	4.2	1.800	4.8	4.500	7.4	8.500	10.0
0.500	4.1	2.000	5.1	5.000	7.8	9.000	10.3
0.600	4.0	2.200	5.3	5.500	8.1	9.500	10.6
0.800	3.5	2.400	5.5	6.000	8.5		
1.000	3.7	2.600	5.7	6.500	8.8		

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	Pembury Knowsley SW Network No. 2																																																																																					
Date 08/02/2022 File Knowsley - SW Network 2...	Designed by paulg Checked by																																																																																					
Innovyze	Network 2017.1.2																																																																																					
Storage Structures for Storm Cellular Storage Manhole: TANK, DS/PN: 10.001 Invert Level (m) 27.150 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>300.0</td><td>300.0</td><td>5.200</td><td>0.0</td><td>383.2</td></tr><tr><td>0.400</td><td>300.0</td><td>327.7</td><td>5.600</td><td>0.0</td><td>383.2</td></tr><tr><td>0.800</td><td>300.0</td><td>355.4</td><td>6.000</td><td>0.0</td><td>383.2</td></tr><tr><td>1.200</td><td>300.0</td><td>383.1</td><td>6.400</td><td>0.0</td><td>383.2</td></tr><tr><td>1.201</td><td>0.0</td><td>383.2</td><td>6.800</td><td>0.0</td><td>383.2</td></tr><tr><td>2.000</td><td>0.0</td><td>383.2</td><td>7.200</td><td>0.0</td><td>383.2</td></tr><tr><td>2.400</td><td>0.0</td><td>383.2</td><td>7.600</td><td>0.0</td><td>383.2</td></tr><tr><td>2.800</td><td>0.0</td><td>383.2</td><td>8.000</td><td>0.0</td><td>383.2</td></tr><tr><td>3.200</td><td>0.0</td><td>383.2</td><td>8.400</td><td>0.0</td><td>383.2</td></tr><tr><td>3.600</td><td>0.0</td><td>383.2</td><td>8.800</td><td>0.0</td><td>383.2</td></tr><tr><td>4.000</td><td>0.0</td><td>383.2</td><td>9.200</td><td>0.0</td><td>383.2</td></tr><tr><td>4.400</td><td>0.0</td><td>383.2</td><td>9.600</td><td>0.0</td><td>383.2</td></tr><tr><td>4.800</td><td>0.0</td><td>383.2</td><td>10.000</td><td>0.0</td><td>383.2</td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	300.0	300.0	5.200	0.0	383.2	0.400	300.0	327.7	5.600	0.0	383.2	0.800	300.0	355.4	6.000	0.0	383.2	1.200	300.0	383.1	6.400	0.0	383.2	1.201	0.0	383.2	6.800	0.0	383.2	2.000	0.0	383.2	7.200	0.0	383.2	2.400	0.0	383.2	7.600	0.0	383.2	2.800	0.0	383.2	8.000	0.0	383.2	3.200	0.0	383.2	8.400	0.0	383.2	3.600	0.0	383.2	8.800	0.0	383.2	4.000	0.0	383.2	9.200	0.0	383.2	4.400	0.0	383.2	9.600	0.0	383.2	4.800	0.0	383.2	10.000	0.0	383.2
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																	
0.000	300.0	300.0	5.200	0.0	383.2																																																																																	
0.400	300.0	327.7	5.600	0.0	383.2																																																																																	
0.800	300.0	355.4	6.000	0.0	383.2																																																																																	
1.200	300.0	383.1	6.400	0.0	383.2																																																																																	
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2.000	0.0	383.2	7.200	0.0	383.2																																																																																	
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3.200	0.0	383.2	8.400	0.0	383.2																																																																																	
3.600	0.0	383.2	8.800	0.0	383.2																																																																																	
4.000	0.0	383.2	9.200	0.0	383.2																																																																																	
4.400	0.0	383.2	9.600	0.0	383.2																																																																																	
4.800	0.0	383.2	10.000	0.0	383.2																																																																																	
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		Pembury Knowsley SW Network No. 2						
Date 08/02/2022 File Knowsley - SW Network 2...		Designed by paulg Checked by						
Innovyze		Network 2017.1.2						
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 1								
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 0.388								
Region England and Wales Cv (Summer) 0.750								
M5-60 (mm) 19.500 Cv (Winter) 0.840								
Margin for Flood Risk Warning (mm) 300.0								
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status OFF								
DVD Status ON								
Inertia Status ON								
Profile(s) Summer and Winter								
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440								
Return Period(s) (years) 1, 30, 100								
Climate Change (%) 0, 0, 40								
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
10.000	SW07	15 Winter	1	+0%	30/15 Summer			
10.001	TANK	240 Winter	1	+0%	30/15 Winter			
11.000	SW08	15 Summer	1	+0%	30/15 Summer	100/15 Summer		
11.001	SW09	15 Winter	1	+0%	30/15 Summer			
10.002	SW10	15 Winter	1	+0%	1/15 Summer	100/180 Winter		
10.003	EX CP03	15 Winter	1	+0%				
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
10.000	SW07	28.081	-0.194	0.000	0.47	52.1	OK	
10.001	TANK	27.372	-0.078	0.000	0.08	4.0	OK	
11.000	SW08	28.195	-0.055	0.000	0.72	13.3	OK	2
11.001	SW09	27.934	-0.116	0.000	0.47	24.2	OK	
10.002	SW10	27.470	0.145	0.000	0.14	4.2	SURCHARGED	7
10.003	EX CP03	26.284	-0.171	0.000	0.13	4.2	OK	
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Pembury Knowsley
SW Network No. 2



Date 08/02/2022

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File Knowsley - SW Network 2...

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Network 2017.1.2

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
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	0.388
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

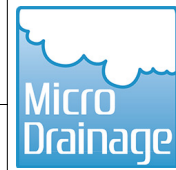
Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

	US/MH		Return Climate		First (X)		First (Y)		First (Z)		Overflow
PN	Name	Storm	Period	Change	Surcharge		Flood		Overflow		Act.
10.000	SW07	15	Winter	30	+0%	30/15 Summer					
10.001	TANK	360	Winter	30	+0%	30/15 Winter					
11.000	SW08	15	Winter	30	+0%	30/15 Summer		100/15		Summer	
11.001	SW09	15	Winter	30	+0%	30/15 Summer					
10.002	SW10	360	Winter	30	+0%	1/15 Summer		100/180		Winter	
10.003	EX CP03	60	Winter	30	+0%						

PN	US/MH Name	Water	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)			Flow (l/s)		
10.000	SW07	28.293	0.018	0.000	1.15		127.7	SURCHARGED	
10.001	TANK	27.811	0.361	0.000	0.08		4.1	SURCHARGED	
11.000	SW08	28.650	0.400	0.000	1.60		29.5	SURCHARGED	2
11.001	SW09	28.133	0.083	0.000	1.18		60.9	SURCHARGED	
10.002	SW10	27.810	0.485	0.000	0.14		4.2	SURCHARGED	7
10.003	EX CP03	26.284	-0.171	0.000	0.13		4.2	OK	

Pembury Knowsley
SW Network No. 2



Date 08/02/2022

Designed by paulg

File Knowsley - SW Network 2...

Checked by

Innovyze

Network 2017.1.2

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	1
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	0.388
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

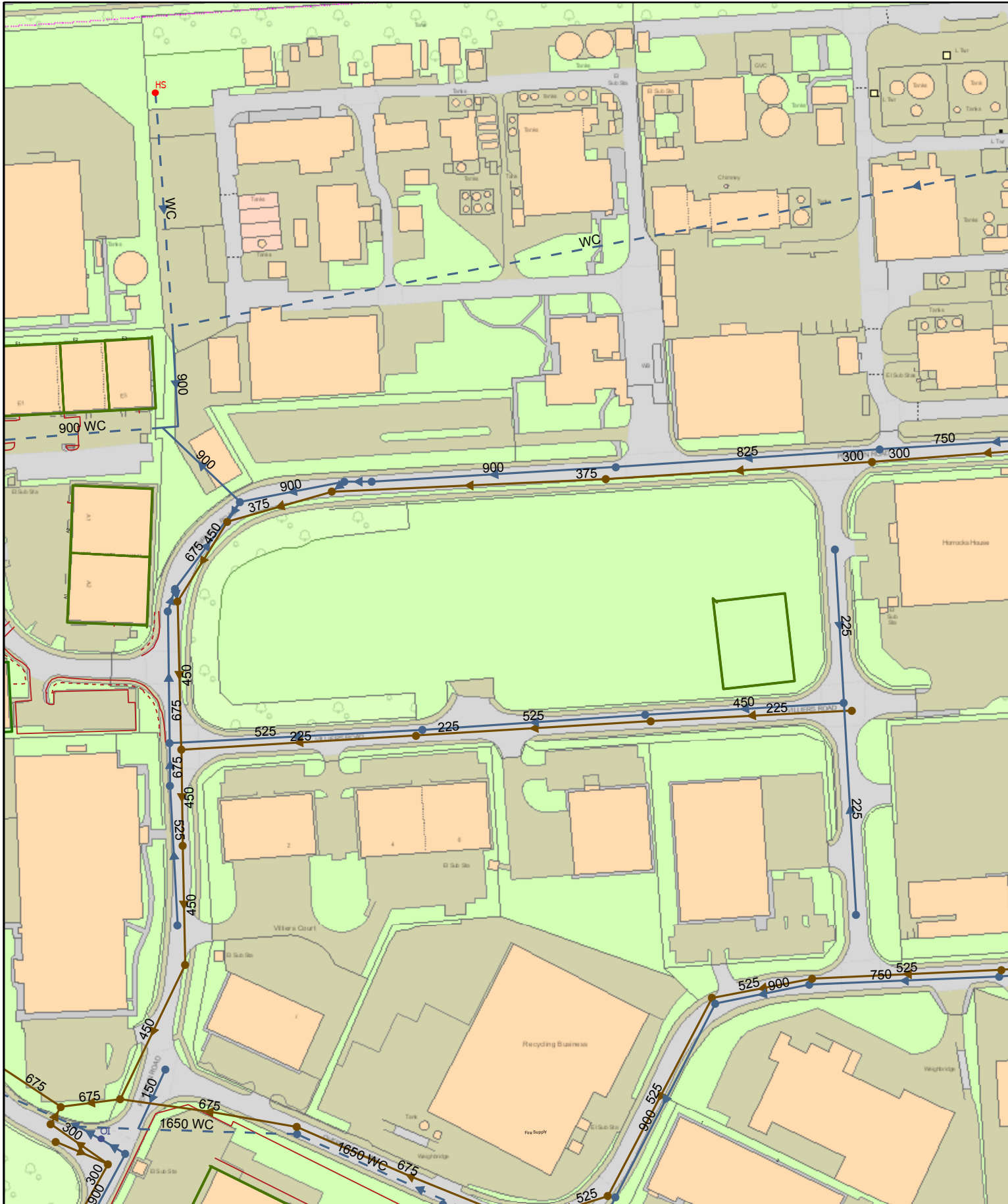
Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

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

US/MH				Return	Climate	First (X)		First (Y)		First (Z)	Overflow
PN	Name	Storm	Period	Change		Surcharge		Flood		Overflow	Act.
10.000	SW07	480	Winter	100	+40%	30/15	Summer				
10.001	TANK	480	Winter	100	+40%	30/15	Winter				
11.000	SW08	15	Winter	100	+40%	30/15	Summer	100/15	Summer		
11.001	SW09	480	Winter	100	+40%	30/15	Summer				
10.002	SW10	480	Winter	100	+40%	1/15	Summer	100/180	Winter		
10.003	EX CP03	480	Winter	100	+40%						

PN	US/MH Name	Water	Surcharged	Flooded	Pipe		Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)		
10.000	SW07	29.096	0.821	0.000	0.22	24.7	SURCHARGED	
10.001	TANK	29.094	1.644	0.000	0.18	9.2	FLOOD RISK	
11.000	SW08	29.721	1.471	1.048	2.57	47.4	FLOOD	2
11.001	SW09	29.096	1.046	0.000	0.25	12.8	SURCHARGED	
10.002	SW10	29.093	1.768	33.018	0.17	5.0	FLOOD	7
10.003	EX CP03	26.290	-0.165	0.000	0.16	5.0	OK	

APPENDIX E – UNITED UTILITIES SEWER RECORDS & CORRESPONDENCE



Date: 30/12/2021

Extract from Map of Public Sewers

Printed By:
Property Searches

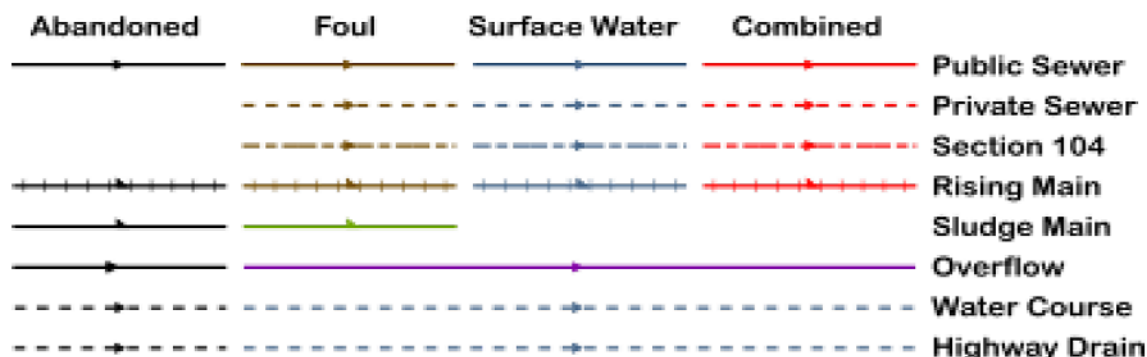
Land on the south side of Penrhyn Road, Knowlsey, Prescott



The position of 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 pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

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Wastewater Symbolology



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

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

From: Perry, Graham <Graham.Perry@uuplc.co.uk>
Sent: 02 February 2022 17:52
To: Roque Menezes
Cc: Wastewater Developer Services
Subject: Pre Development Enquiry for : Land off Penrhyn Road Knowsley L34 9HY UU reference Number : 4200046628

Pre Development Enquiry for: Land off Penrhyn Road Knowsley L34 9HY UU reference Number : 4200046628

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

<https://www.unitedutilities.com/builders-developers/working-near-our-assets/>

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 375mm diameter public foul water sewer within Penrhyn Rd located north of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

- 1. into the ground (infiltration);**
- 2. to a surface waterbody;**
- 3. to a surface water sewer or highway drain;**
- 4. to a combined sewer.**

For guidance, The **North West SuDS Pro-Forma** provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

<https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs>

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 900mm diameter public surface water sewer within Penrhyn Rd located north of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 11l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the public sewerage network under any circumstances

Existing Wastewater Assets Crossing the Site

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

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/>

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address:

DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/>

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/>

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,

Graham Perry



Graham Perry
Development Engineer
Developer Services
M: 07557 577548
T: 01925 679405
unitedutilities.com

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www.unitedutilities.com/subsidiaries

APPENDIX F – CCTV SURVEY



CCTV SURVEYS



**HIGH PRESSURE
JETTING**



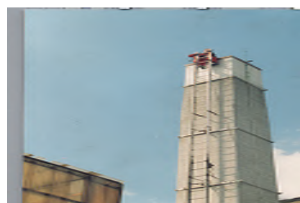
**MAN ENTRY
SURVEYS**



RELINING & REPAIRS



PILING SURVEYS



CHIMNEY SURVEYS



**5 SUFFOLK ROAD
MALDON
ESSEX
CM9 6AX**

Telephone: 07971 910370

CCTV REPORT

CLIENT	PEMBURY DEVELOPMENTS LTD
LOCATION	KNOWSLEY BUSINESS PARK VILLIERS ROAD PRESCOT L34 9ET
DATE	31/01/2022
REF	071428

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2. CONTACT INFORMATION.....	3
3. UTILITY SURVEYS LTD CONTACT DETAILS.....	3
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5. SURVEY BRIEF.....	5
6. SURVEY TECHNIQUES.....	7
7. INDIVIDUAL INSPECTION REPORT.....	8

REGISTER OF APPENDICES

- A. MANHOLE INSPECTION REPORT
- B. COPIES OF SITE HAND WRITTEN DAILY RECORD SHEETS
- C. ANNOTATED SITE DRAWINGS

GENERAL INFORMATION

Utility Surveys Ltd have been appointed by Pembury Developments Ltd to undertake a Sewer Condition Survey at the location identified. This survey commenced on 31 January 2022.

CONTACT INFORMATION

SITE ADDRESS: KNOWSLEY BUSINESS PARK VILLIERS ROAD PRESCOT L34 9ET	SITE CONTACT: N/A CONTACT NO: EMAIL:
CLIENT DETAILS: PEMBURY DEVELOPMENTS LTD LIBERTY HOUSE 222 REGENT STREET LONDON W1B 5TR	CONTACT: CONTACT NO: EMAIL:

UTILITY SURVEYS LTD CONTACT DETAILS

OFFICE	SIMON GARDINER 07971 910370 simon@utilitysurveysltd.co.uk
RIG MANAGER	SIMON GARDINER

SITE DESCRIPTION

Site Description

DEVELOPMENT SITE

Site Boundaries

CLEARLY DEFINED ON SUPPLIED DRAWINGS

SURVEY BRIEF

Sewer Condition Inspection Survey

The Purpose of the Sewer Condition Inspection Survey was to establish the location and extent of foul and/ or surface water drainage systems and to document their condition prior to any further works.

- A full condition survey can only be produced if precleansing / jetting is carried out in conjunction with the CCTV survey.
- If precleansing is not carried out at the time of the survey further faults and conditional defects may be present but not recorded in this report.

In addition Utility Surveys Ltd have;

- Attempted to investigate all agreed areas, although if not all could be fully accessed (see Daily Record Sheet).
- Produced a report to establish the location and extent of foul and surface water drainage systems and to document their condition prior to any further works.
- Provided the basic information from which a remediation or management plan can be instigated.
- Highlighted the requirement for urgent action to repair or remediation works to the surveyed drainage system.
- Incorporated in the results any additional manholes/ drainage found, which may have been buried, obscured or not identified in the original scope of works.

Agreed Restrictions and Exclusions

This report is based upon a Sewer Condition Inspection Survey of an unfamiliar site.

During the course of the survey all reasonable efforts were made to identify and access all Manholes and foul/ surface drainage/ outfall, throughout the site.

Some installations/ areas may not have been inspected due to access and or safety reasons (e.g. Wet Wells, Large Unventilated Tanks, Traffic Management Situations). Unless an accepted safe system of work has been devised.

Access may not have been gained to several areas of the site due to conditions outside the control of the client or contractor, any such areas have been documented within this report (see Daily Record Sheet).

Any diagrams/ CAD drawings in the report are not to be scaled and are illustrative only to indicate approximate locations.

Manhole covers will not be lifted if:

- a) There is a danger of damaging surrounding flooring or finishes.
- b) They are covered, i.e. under fitted carpets, flooring, tiling or paving etc.
- c) Under fittings, fixtures, fencing, equipment etc.

Buried manholes will be located, if possible, position marked. If instructed, excavated in soft ground only up to a depth of 350mm with temporary reinstatement.

No allowance has been made for any precleansing unless stated in the quotation.

Full and free access to all areas affected is to be arranged by the instructing party.

SURVEY TECHNIQUES

The areas set out within the survey brief underwent inspection for a Sewer Condition Inspection Survey each area within the agreed scope of works was surveyed for location extent and condition of foul and/ or surface water drainage systems and CCTV footage gathered for confirmation. Every reasonable effort was made to investigate all aspects of the drainage system. Additional photographs were taken where relevant to the inspection.

There were no deviations from the agreed scope of works.

This Sewer Condition Inspection Survey was carried out in accordance with the Utility Surveys Ltd documented 'in-house' procedure 820 'Code of Working Practice' based on National Sewerage Association guidance. The Sewer Condition Inspection Survey Report states information recorded at the time of survey only, based on visual and CCTV assessment in accordance with sewer classification codings issued by WRC, incorporating the following inspection criteria:

CONDITION of pipe work
LOCATION of pipe work
EXTENT of the pipe work

A defect grade description has been provided for the identification of defective pipe work.

Changes to any of the above criteria shall necessitate the need for reassessment

These gradings and the reports can be used to form the basis of a planned preventative maintenance programme. This can be the subject of further discussions with our technical support team.

Drainage Report



Prepared For

PEMBURY DEVELOPMENTS LTD
LIBERTY HOUSE
222 REGENT STREET
LONDON
W1B 5TR

Site

KNOWSLEY BUSINESS PARK
VILLIERS ROAD
PRESCOT
L34 9ET



UTILITY SURVEYS LIMITED
Surveyor: Simon Gardiner
simon@utilitysurveysltd.co.uk

Total Defects for Project



Total DRB Grades for Project



071428 Knowsley Business Park Prescott - CCTV Survey Report : 31/01/22

Name : UTILITY SURVEYS LIMITED
 Contact : SIMON GARDINER
 Location : 5 SUFFOLK ROAD
 Town : MALDON
 Region : ESSEX
 Postcode : CM9 6AX
 Email : simon@utilitysurveysltd.co.uk
 Contact Number :
 Surveyor : Simon Gardiner
 Valid Certification No : L1103

Client Information

Name : PEMBURY DEVELOPMENTS LTD
 Contact :
 Location : LIBERTY HOUSE
 Town : 222 REGENT STREET
 Region : LONDON
 Postcode : W1B 5TR
 Tel :
 Mobile :
 Email :
 Fax :

Site Information

Name : KNOWSLEY BUSINESS PARK
 Contact :
 Location : VILLIERS ROAD
 Town : PRESCOT
 Region :
 Postcode : L34 9ET
 Tel :
 Mobile :
 Email :
 Fax :

Total Defects for Project



Total DRB Grades for Project



Report interpretation.

Overview:

Each section of the drainage system is allocated a score indicating areas that require attention. These areas are detailed in the Overview section on the following page and also at the bottom right of the first few pages. We use colour coding as an indicator of severity. Additional information concerning rehabilitation options/recommendations is included in the Overview page, which can also be used as an, "at a glance" indication of system condition. More in depth information for each section, including images can be found later in the report. Grade indicators are as follows:

Grade A: Drain is serviceable no recommendations required

Grade B: There is an issue that might require remedial works

Grade C: There is a defect that requires remedial works, the drain is not serviceable.

Observations:

Each section of drainage reported on (manhole to manhole for example), contains detailed information about that drain and any observations made concerning condition are detailed below the header section. The observations are colour coded and given a severity score, with more significant defects being given a higher score, using a scale from 1 to 5 as detailed below:

Severity 1 to 2: These defects may require remedial monitoring

Severity 3: These defects probably require some form of remedial works

Severity 4 to 5: Defects that will require remedial repair or replacement

General:

The information provided is relevant at the time of survey. The coding system in this report is based on the Manual of Sewer Condition Classification, 5th edition (MSCC5) domestic codes (BS EN 13508-1:2003). This is the official standard for the water industry.

The severity system is based on significant experience in general practice and the 1 -5 grades represent the severity of individual defects: 5 representing a more serious defect.

Please feel free to contact us for further explanation or pricing for remedial works required.

Total Defects for Project



Total DRB Grades for Project



Overview

Section: 1 From: S1 To: S2	Grade B	DRB Grade: B Pipe Size: 225 Material: Vitrified Clay (i.e. all clayware) Use: Surface Water
Section: 2 From: S1 To: UP	Grade A	DRB Grade: A Pipe Size: 225 Material: Vitrified Clay (i.e. all clayware) Use: Surface Water
Section: 3 From: F1 To: F2	Grade B	DRB Grade: B Pipe Size: 150 Material: Vitrified Clay (i.e. all clayware) Use: Foul
Section: 4 From: F1 To: UP	Grade A	DRB Grade: A Pipe Size: 150 Material: Vitrified Clay (i.e. all clayware) Use: Foul

Total Defects for Project



Total DRB Grades for Project



Site: VILLIERS ROAD, PRESCOT

Section 1

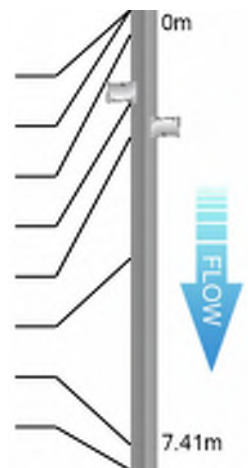
Client: PEMBURY DEVELOPMENTS LTD	Location (Street Name): VILLIERS ROAD	City/Town/Village PRESCOT	Cust Job Ref.	Surveyors Name: Simon Gardiner	Date: 31/01/2022
-------------------------------------	--	------------------------------	---------------	-----------------------------------	---------------------

Start Node Ref: S1	Finish Node Ref: S2	Direction: D	Height/Dia: 225
Start Node Depth: 0.00	Finish Node Depth: 0.00	Use: S	Shape: C
Start Node Coordinate:	Finish Node Coordinate:	Material: VC	Cleaned N

Node Type	Cover Condition	Benching Condition	1/2 Channel Condition	Node Condition Remarks
MH				

Drain Type	Lining Type	Lining Mat.	Year Const.	Weather	Flow Cont.	Length	General Remarks
A				D	N	7.41	

Position	Code	Description	CD	Pic	Video Ref	
00.00m	MH	Start node type, manhole				
00.00m	WL	Water level 5%			0:00:00	
00.40m	DEE	Attached deposits, encrustation 05-07 10%			0:00:00	
01.50m	JN	Junction 02 : 150mm Diameter	0_3		0:00:17	
02.05m	JN	Junction 11 : 150mm Diameter	0_4		0:00:22	
04.00m	DES	S1 Settled deposits fine 10%	S1		0:00:56	
07.00m	DES	F1 Settled deposits fine 10%	F1		0:00:56	
07.41m	MHF	Finish node type, manhole				



Total Defects for section

DRB Grade for Section



Descriptive Report with Remarks and Observation Images

Section 1

Pos	Video Ref	Code	Description	Image
00.00m		MH	Start node type, manhole S1	
00.00m	0:00:00	WL	Water level: 5% Height/Diameter	
00.40m	0:00:00	DEE	Attached deposits, encrustation from 05 o'clock to 07 o'clock: 10% Cross sectional area loss - Severity 3	
01.50m	0:00:17	JN	Junction at 02 o'clock: 150mm Diameter	Image Provided - Ref: 0_3 
02.05m	0:00:22	JN	Junction at 11 o'clock: 150mm Diameter	Image Provided - Ref: 0_4 
04.00m	0:00:56	S1 DES	Settled deposits fine 4m - 7m: 10% Cross sectional area loss - Severity 3	
07.00m	0:00:56	F1 DES	Settled deposits fine Defect End: 10% Cross sectional area loss - Severity 3	
07.41m		MHF	Finish node type, manhole S2	

Total Defects for section



DRB Grade for Section



Site: VILLIERS ROAD, PRESCOT

Section 2

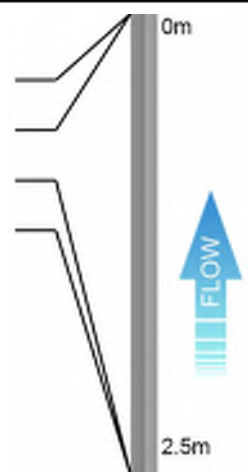
Client: PEMBURY DEVELOPMENTS LTD	Location (Street Name): VILLIERS ROAD	City/Town/Village PRESCOT	Cust Job Ref.	Surveyors Name: Simon Gardiner	Date: 31/01/2022
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Start Node Ref: S1	Finish Node Ref: UP	Direction: U	Height/Dia: 225
Start Node Depth: 0.00	Finish Node Depth: 0.00	Use: S	Shape: C
Start Node Coordinate:	Finish Node Coordinate:	Material: VC	Cleaned N

Node Type	Cover Condition	Benching Condition	1/2 Channel Condition	Node Condition Remarks
MH				

Drain Type	Lining Type	Lining Mat.	Year Const.	Weather	Flow Cont.	Length	General Remarks
A				D	N	2.5	

Position	Code	Description	CD	Pic	Video Ref
00.00m	MH	Start node type, manhole			
00.00m	WL	Water level 10%			0:00:00
02.50m	REM	General remark		1_2	0:00:30
02.50m	SA	Survey abandoned			



Total Defects for section

DRB Grade for Section



Descriptive Report with Remarks and Observation Images

Section 2

Pos	Video Ref	Code	Description	Image
00.00m		MH	Start node type, manhole S1	
00.00m	0:00:00	WL	Water level: 10% Height/Diameter	
02.50m	0:00:30	REM	General remark BAG IN PIPE	Image Provided - Ref: 1_2 
02.50m		SA	Survey abandoned BLANKED OFF / END OF PIPE	

Total Defects for section



DRB Grade for Section



Site: VILLIERS ROAD, PRESCOT

Section 3

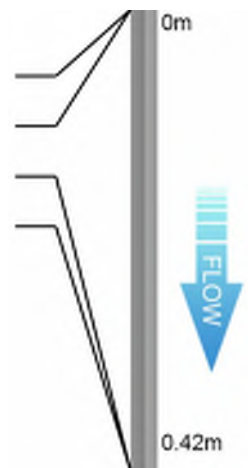
Client: PEMBURY DEVELOPMENTS LTD	Location (Street Name): VILLIERS ROAD	City/Town/Village PRESCOT	Cust Job Ref.	Surveyors Name: Simon Gardiner	Date: 31/01/2022
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Start Node Ref: Start Node Depth: Start Node Coordinate:	F1 0.00	Finish Node Ref: Finish Node Depth: Finish Node Coordinate:	F2 0.00	Direction: Use: Material:	D F VC	Height/Dia: Shape: Cleaned	150 C N
--	------------	---	------------	---------------------------------	--------------	----------------------------------	---------------

Node Type	Cover Condition	Benching Condition	1/2 Channel Condition	Node Condition Remarks
MH				

Drain Type	Lining Type	Lining Mat.	Year Const.	Weather	Flow Cont.	Length	General Remarks
A				D	N	0.42	

Position	Code	Description	CD	Pic	Video Ref
00.00m	MH	Start node type, manhole			
00.00m	WL	Water level 0%			0:00:00
00.42m	DER	Settled deposits coarse 50%		2_2	0:00:00
00.42m	SA	Survey abandoned			



Total Defects for section

DRB Grade for Section



Descriptive Report with Remarks and Observation Images

Section 3

Pos	Video Ref	Code	Description	Image
00.00m		MH	Start node type, manhole F1	
00.00m	0:00:00	WL	Water level: 0% Height/Diameter	
00.42m	0:00:00	DER	Settled deposits coarse: 50% Cross sectional area loss - Severity 3	Image Provided - Ref: 2_2 
00.42m		SA	Survey abandoned UNABLE TO PASS DEBRIS	

Total Defects for section



DRB Grade for Section



Site: VILLIERS ROAD, PRESCOT

Section 4

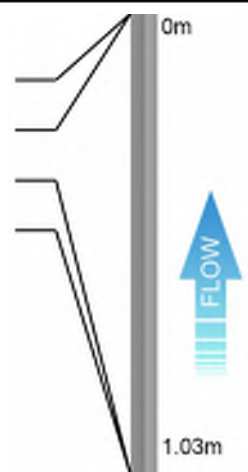
Client: PEMBURY DEVELOPMENTS LTD	Location (Street Name): VILLIERS ROAD	City/Town/Village PRESCOT	Cust Job Ref.	Surveyors Name: Simon Gardiner	Date: 31/01/2022
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Start Node Ref: F1	Finish Node Ref: UP	Direction: U	Height/Dia: 150
Start Node Depth: 0.00	Finish Node Depth: 0.00	Use: F	Shape: C
Start Node Coordinate:	Finish Node Coordinate:	Material: VC	Cleaned N

Node Type	Cover Condition	Benching Condition	1/2 Channel Condition	Node Condition Remarks
MH				

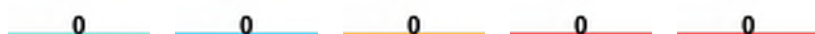
Drain Type	Lining Type	Lining Mat.	Year Const.	Weather	Flow Cont.	Length	General Remarks
A				D	N	1.03	

Position	Code	Description	CD	Pic	Video Ref
00.00m	MH	Start node type, manhole			
00.00m	WL	Water level 10%			0:00:00
01.03m	REM	General remark		3_2	0:00:17
01.03m	SA	Survey abandoned			



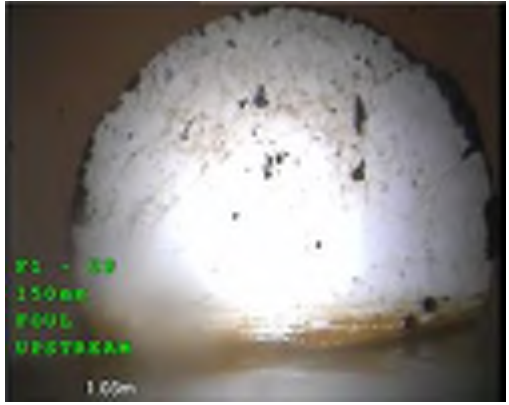
Total Defects for section

DRB Grade for Section

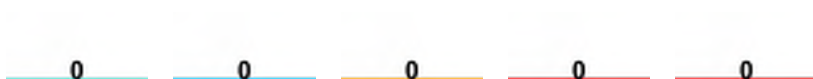


Descriptive Report with Remarks and Observation Images

Section 4

Pos	Video Ref	Code	Description	Image
00.00m		MH	Start node type, manhole F1	
00.00m	0:00:00	WL	Water level: 10% Height/Diameter	
01.03m	0:00:17	REM	General remark BLANKED OFF	Image Provided - Ref: 3_2 
01.03m		SA	Survey abandoned END OF PIPE / BLANKED OFF	

Total Defects for section



DRB Grade for Section



A guide to defects and other observations in drainage systems

More detailed information can be found in the National Standard (BS EN 13508-1:2003) and in the Manual of Sewer Condition Classification (MSCC) 5th Edition, written by the Water Research Centre (WRc).

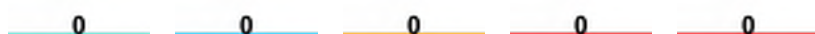
Use	
Code	Description
C	Combined
F	Foul
S	Surface Water
T	Trade Effluent
W	Culverted Watercourse
Z	Other
Common Materials	
Code	Description
VC	Vitrified Clay
PVC	Polyvinyl Chloride
CO	Concrete
CI	Cast Iron
PF	Pitch Fibre
PE	Polyethylene
DI	Ductile Iron

Start Node	Description	Finish Node
MH	Manhole	MHF
IC	Inspection Chamber	ICF
GY	Gulley	GYF
RE	Rodding Eye	REF
SK	Soakaway	SKF
BN	Buchan Trap	BNF
BR	Major Connection without Ref	BRF
CP	Catch Pit	CPF
OC	Other Special Chamber	OCF
OF	Outfall	OFF
OS	Oil Separator	OSF
WR	Major Connection without mh	WRF
LH	Lamphole	LHF

Code	Observation	Description	Attributes	
B	Broken	Pieces pipe have visibly moved	Defined by clock references. Associated with deformity in rigid pipe	
CC CL CM CR	Cracks	Cracks are break lines that are not visibly open	Defined by clock reference position/s. Longitudinal and radiating cracks attract only one clock reference	
CN	Connection	Lateral pipe has been connected after original construction	Described by clock reference position and diameter	

Total Defects for section

DRB Grade for Section



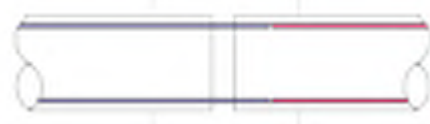
CX(I)	Defective Connection (Intruding)	Defective by intrusion or damage due to factors including: cracks, fractures, obstruction, position etc	Described by clock reference position and diameter (+ % intrusion)	
CU	Loss of Vision	Lens of camera is obscured by debris, water etc. Operator is unable to see drain clearly	'W' can be added if loss of vision is due to water	
D	Deformed	Pipe has lost its structure	Described by percentage loss of height or width. Recorded in 5% increments	
DEE	Deposits Encrustation	Eg. Attached scale deposits evident	Described by clock referenced position and percentage loss of cross-sectional area (5% increments)	
DEG	Deposits Grease	Attached grease deposits evident	Described by clock referenced position and percentage loss of cross-sectional area (5% increments)	
DER DES	Deposits Coarse/Fine	Settled deposits on the invert of the pipe.	Described by percentage loss of height or diameter. Recorded in 5% increments.	
FC FL FM FR	Fractures	Fractures are visibly open. Pieces of pipe have not moved	Defined by clock reference position/s. Longitudinal and radiating fractures attract only one clock reference	
H	Holes	Section of pipe fabric is missing	Defined by clock reference location. Normally two clock references	
I	Infiltration	Water is infiltrating the pipe, normally via a joint but could be via another defect	Can be described in Remarks using terms such as Seeper, Dripper and Runner	
JDL	Joint Displaced Large	Pipe has moved at joint, perpendicular to axis of pipe	More than 1.5 times the pipe wall thickness must be visible	

Total Defects for section

DRB Grade for Section

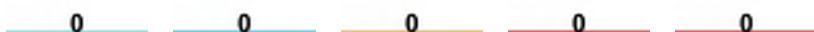
0 0 0 0 0



JDM	Joint Displaced Medium	Pipe has moved at joint, perpendicular to axis of pipe	Between 1 and 1.5 times the pipe wall thickness must be visible	
JN	Junction	Lateral pipe was installed at construction	Described by clock reference position and diameter	
JX	Defective Junction	Lateral pipe was installed at construction but is defective in some way	Joint can be defective due to factors including: cracks, fractures, obstruction, position etc	
LD LU LL LR	Line Deviation	LD = Line Down, LU = Line Up, LL = Line Left, LR = Line Right. Not related to CIPP lining.	Additional modifiers are added: Q = Quarter (22.5), H = Half (45), F = Full (90). In degrees.	
LC	Lining Changes	If the drain is lined, the lining material has changed	Position of lining material change	
MC	Material Change	The pipe material has changed	Position of change is noted. Type of material change can be defined	
OB	Obstruction/Obstacle	An obstruction or obstacle is affecting the flow through the pipe	Described in percentage loss of cross-sectional area	
OJL	Open Joint Large	Pipe has moved at joint, along the axis of pipe	More than 1.5 times the pipe wall thickness must be visible	
OJM	Open Joint Medium	Pipe has moved at joint, along the axis of pipe	Between 1 and 1.5 times the pipe wall thickness must be visible	
PC	Pipe Length Changes	Length of individual pipe changes	New length described at this position	

Total Defects for section

DRB Grade for Section



R	Roots	Evidence of root ingress	Roots will normally infiltrate via bad joints, cracks, fractures, breaks etc	
REM	Remark	General remark	Used for additional information	
S	Surface Damage	This might include corrosion, spalling and chemical attack	Position only. Additional information can be added in Remarks	
SA	Survey Abandoned	Used when a survey cannot continue for any reason	The reason for abandoning a survey should be noted in the remarks area	
SC	Shape Changes	Dimension of drain changes	Diameter dimension change recorded. Second dimension is recorded for no circular pipe changes	
SR	Sealing Ring	Sealing ring intrudes into pipe at joint	Described by clock reference position	
V	Vermin	Evidence of Vermin in pipe	Can also be used for evidence within manhole etc	
WL	Water Level	Used to record changes in water level. Always shown at the beginning of every survey, if dry noted as 00.	Described by percentage of height or diameter. Recorded in 5% increments	
XP	Collapsed	Drain is suffering from complete loss of structural integrity. Always followed by SA - Survey Abandoned	Percentage loss of cross-sectional area is recorded. Other related structural defects are not recorded	

REGISTER OF APPENDICES

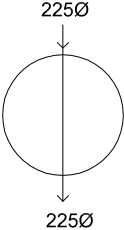
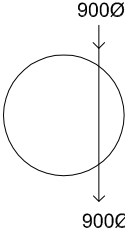
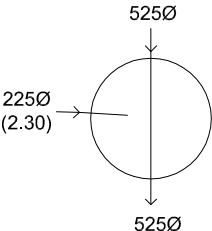
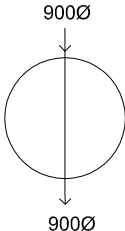
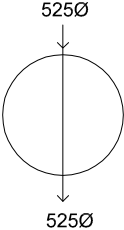
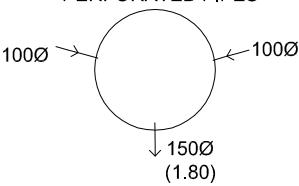
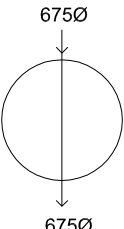
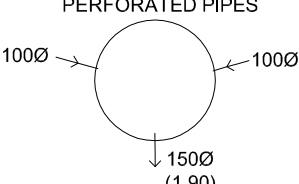
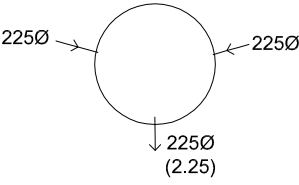
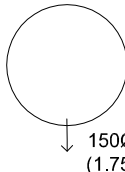
- A. MANHOLE INSPECTION REPORT
- B. COPIES OF SITE HAND WRITTEN DAILY RECORD SHEETS
- C. ANNOTATED SITE DRAWINGS

UTILITY SURVEYS LTD

5 SUFFOLK ROAD
MALDON
ESSEX
CM9 6AX

LOCATION: KNOWSLEY BUSINESS PARK VILLERS ROAD PRESCOT JOB REF: 071428

CLIENT: PEMBURY DEVELOPMENTS LTD DATE: 31/01/2022

MH No. S1 DEPTH. 2.16 COVER. SH CONSTRUCTION. Co Ring REMARKS.		MH No. 9602 DEPTH. 3.10 COVER. SH CONSTRUCTION. Co Ring REMARKS. OFFSET NO OTHER PIPES VISABLE	
MH No. S2 DEPTH. 2.60 COVER. SH CONSTRUCTION. Co Ring REMARKS.		MH No. 9601 DEPTH. 2.90 COVER. SH CONSTRUCTION. Co Ring REMARKS.	
MH No. 9501 DEPTH. 2.65 COVER. SH CONSTRUCTION. Co Ring REMARKS.		MH No. CP 01 DEPTH. 2.50 COVER. SH CONSTRUCTION. Co Ring REMARKS. NO OTHER PIPES VISABLE	PERFORATED PIPES 
MH No. 8502 DEPTH. 2.66 COVER. SH CONSTRUCTION. Co Ring REMARKS.		MH No. CP 02 DEPTH. 2.40 COVER. SH CONSTRUCTION. Co Ring REMARKS.	PERFORATED PIPES 
MH No. 8501 DEPTH. COVER. CONSTRUCTION. REMARKS.	OFFSET UNABLE TO CONFIRM DETAILS CONFINED SPACE ENTRY REQUIRED	MH No. CP 03 DEPTH. 2.50 COVER. SH CONSTRUCTION. Co Ring REMARKS.	PERFORATED PIPES 
MH No. 8604 DEPTH. COVER. CONSTRUCTION. REMARKS.	OFFSET UNABLE TO CONFIRM DETAILS CONFINED SPACE ENTRY REQUIRED	MH No. CP 04 DEPTH. 2.50 COVER. SH CONSTRUCTION. Co Ring REMARKS. NO OTHER PIPES VISABLE	
KEY: C - Circular L - Light Duty Co - Concrete S - Square M - Medium Duty Br - Brick T - Triangular H - Heavy Duty R - Rectangular			

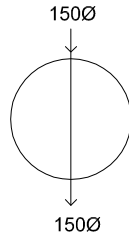
UTILITY SURVEYS LTD

5 SUFFOLK ROAD
MALDON
ESSEX
CM9 6AX

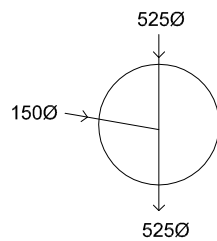
LOCATION: KNOWSLEY BUSINESS PARK VILLERS ROAD PRESCOT JOB REF: 071428

CLIENT: PEMBURY DEVELOPMENTS LTD DATE: 31/01/2022

MH No. F1
DEPTH. 2.83
COVER. SH
CONSTRUCTION. Co Ring
REMARKS.



MH No. F2
DEPTH. 3.18
COVER. SH
CONSTRUCTION. Co Ring
REMARKS.



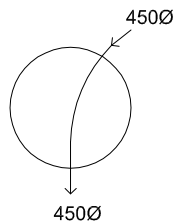
MH No. 9502
DEPTH.
COVER.
CONSTRUCTION.
REMARKS.

UNABLE
TO LIFT
STUCK IN FRAME

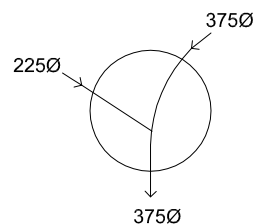
MH No. 8503
DEPTH.
COVER.
CONSTRUCTION.
REMARKS.

UNABLE
TO LIFT
FRAME LOOSE IN
TARMAC

MH No. 8602
DEPTH. 3.40
COVER. SH
CONSTRUCTION. Co Ring
REMARKS.



MH No. 9603
DEPTH. 3.40
COVER. SH
CONSTRUCTION. Co Ring
REMARKS.



KEY:
C - Circular
S - Square
T - Triangular

L - Light Duty
M - Medium Duty
H - Heavy Duty

Co - Concrete
Br - Brick
R - Rectangular



CATCHPIT 03



MH F2 – MH F1 50% DEBRIS

CCTV Sewer Survey – Daily Record Sheet

Date 31/01/2022 Job No 071428

Client Pembury Developments Ltd

Site Address KNOWSLEY BUSINESS PARK

VILLERS ROAD

PRESCOT L349ET

Rig Manager	S. GARDINER	Operative	M. CAMPBELL
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UTILITYSURVEYS LTD.

5 Suffolk Road
Maldon
Essex
CM9 6AX

Tel: 07971910370

Manhole		Sewer dia.	Recorded Metreage	Survey Abandoned	Remarks
Start	Finish				
S1	S2	225	7-41		
S1	UP	225	2-50		BLANKED OFF
F1	F2	150	0-40		50% DEBRIS
F1	UP	150	1-03		BLANKED OFF
TOTAL					

Standing Time	
---------------	--

Meterage check	X
----------------	---

Length	OK
--------	----

Reason for standing time

Remarks CATCHPITS 01, 02, 03 & 04 INCOMING P.I.P.S APPEAR TO BE
PERFORATED LAND DRAINS OUTGOING P.I.P.S SITED

Special Instructions; Site Contact ---

Checked

