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Date: **19th April 2023**

Rev: **P02**

Client

**Crown Advisory Ltd
11 Virgil Street,
Manchester,
M15 4ED**

Site Address

**Hyde Road,
Manchester,
M12 6BW**

Document Title

Drainage Strategy Report



Contents

Executive Summary	4
1.0 Introduction.....	5
2.0 Development Description and Location	6
2.1 Site Location	6
2.2 Existing Site Description	6
2.3 Topography.....	7
2.4 Hydrology.....	7
3.0 Flood Risk Review	8
3.1 Fluvial Flood Risk Review	8
4.0 Drainage Strategy	9
4.1 External Consultation	9
4.2 Existing Drainage	9
4.3 Existing Runoff.....	10
4.4 Geology.....	10
4.5 Hydrological Assessment.....	10
4.6 Sustainable Drainage Systems (SuDS) Assessment	10
4.7 Climate Change.....	14
4.8 Outline Surface Water Drainage Strategy	14
4.9 Pollution Control.....	15
4.10 Maintenance.....	15
4.11 Foul Water Strategy.....	16
Appendix A – Architects Drawings	
Appendix B – Topographical Survey	
Appendix C – Brennan Consult Drawings	
Appendix D – Hydraulic Calculations	
Appendix E – United Utilities Sewer Records	

Revision History

Issue	Date	Status	Prepared By	Signature
P01	11.03.23	First Issue	Lee Meadowcroft BSc (Hons) PgDip MScCHE CEng MStructE MICE IHBC	
P02	19.04.23	Site Plan Updated	Lee Meadowcroft BSc (Hons) PgDip MScCHE CEng MStructE MICE IHBC	

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Executive Summary

Item	Brief Description
Development Proposed	The construction of a commercial unit with associated access, landscaping and car parking on land off Hyde Road, Ardwick, Manchester, M12 6BW.
Site Area	0.288ha (Redline Area)
Flood Zone Classification	Flood Zone 1 – Low Risk
Geology	At this time a Phase 2 site Investigation has not been undertaken. The British Geological Survey dataset would indicate the superficial deposits to be Alluvium (clay, silt and sand) with the Bedrock Geology comprising the Chester Formation - Sandstone.
Infiltration Rate	Based on the assessment of the BGS data set, it is anticipated that infiltration will not be suitable as a means of draining the site. However, as part of the future Phase 2 intrusive site investigation, infiltration tests will be undertaken.
Nearest Watercourses	The Cornbrook culverted watercourse is located approximately 15m to the south of the site in unmade land beyond Apsley Grove.
Nearest Adopted Sewers and Drainage Networks	The United Utility sewer records have been reviewed and indicate a 750x600mm foul water sewer that passes beneath Apsley Grove to the south of the site in a westerly direction. There is also a 1220x550 brick egg combined sewer in Hyde Road to the north of the site. The majority of the site is classed as unmade and thus no formal private drainage networks have been identified.
Surface Water Drainage Strategy and SuDS Hierarchal Approach	Based on the underlying ground anticipated to be unsuitable for infiltration, the proposed strategy is to outfall to the culverted Cornbrook watercourse at restricted rates.
Existing Discharge Rate	Greenfield @ 2880m ² 1 yr – 1.4l/s Qbar – 1.6 30 yr – 2.7l/s 100 yr – 3.4l/s
Proposed Discharge Rate	5l/s to achieve minimum rate to reduce risk of blockage.
Allowance for Climate Change	25% - based on a commercial development with 25-year design life.
Proposed Attenuation & SuDS Methods	Geocellular attenuation tank.
Maintenance Responsibility	Development Owner
Foul Drainage Outfall	New connection to foul public sewer in Apsley Grove should an existing outfall not be located.

Figure 1: Flood Risk and Drainage Strategy Summary

1.0 Introduction

- 1.1 Brennan Consult has been appointed Crown Advisory Ltd to prepare this Drainage Strategy Report to support a planning submission for a proposed commercial unit with car parking on land off Hyde Road, Ardwick, Manchester, M12 6BW. The assessment has been undertaken in line with Section 10 of the 'National Planning Policy Framework' plus the accompanying Technical Guidance on Flood Risk.
- 1.2 The outline Site Master Plan as indicated in Appendix A provides details of the proposed development intent.
- 1.3 This Drainage Strategy Report has been commissioned by Crown Advisory Ltd and is specific to their interests in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.
- 1.4 The report has been commissioned to identify any drainage related issues associated with the proposed development and any likely constraints that could be imposed. The following issues have been addressed within this report.
 - Determine any 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 and devise an outline Drainage layout.
 - Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change. Include for a reduction in predevelopment discharge rates where possible.
 - Devise an appropriate outline foul water drainage strategy.

2.0 Development Description and Location

2.1 Site Location

2.1.1 The site is referenced in Figure 2, and a site location map is provided in Appendix A.

Item	Brief Description
Project name	Hyde Road, Manchester
Site address and location	Land off Hyde Road, Ardwick, Manchester, M12 6BW.
Council Area	Manchester City Council
Approximate Grid Reference	OS: 385396, 397013
General Locality	The site is located approx. 1km to the south east of Manchester City Centre within the suburb of Ardwick.

Figure 2 Site Referencing Information

2.2 Existing Site Description

- 2.2.1 The development site is rectangular in plan shape and currently encompasses a temporary car park on unmade land. Access is from both Hyde Road to the north and Apsley Grove to the south.
- 2.2.2 The site is also bounded by a concert venue to the west and commercial properties to the east, with a further unmade car park on land to the south beyond Apsley Grove.
- 2.2.3 Figure 3 identifies the overall site location details.



Figure 3 Site Location plan

2.3 Topography

- 2.3.1 A full topographical survey has been undertaken at the site. This has identified a reasonable fall from the northern boundary adjacent Hyde Road at 42.50m AOD down 41.20m AOD along the southern boundary adjacent Apsley Grove.

2.4 Hydrology

- 2.4.1 The closest identified watercourse is the culverted Cornbrook (sized at 3710x1540mm), located approximately 15m beyond the southern boundary beyond the Apsley Grove footpath, flowing in a westerly direction. The River Medlock is located approximately 500m to the north of the site flowing generally in a westerly direction.

3.0 Flood Risk Review

3.1 Fluvial Flood Risk Review

3.1.1 Figure 4 below locates the site on the Environment Agency's indicative flood plain 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 the National Planning Policy Framework (NPPF) Flood Risk Guidance Notes, 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.

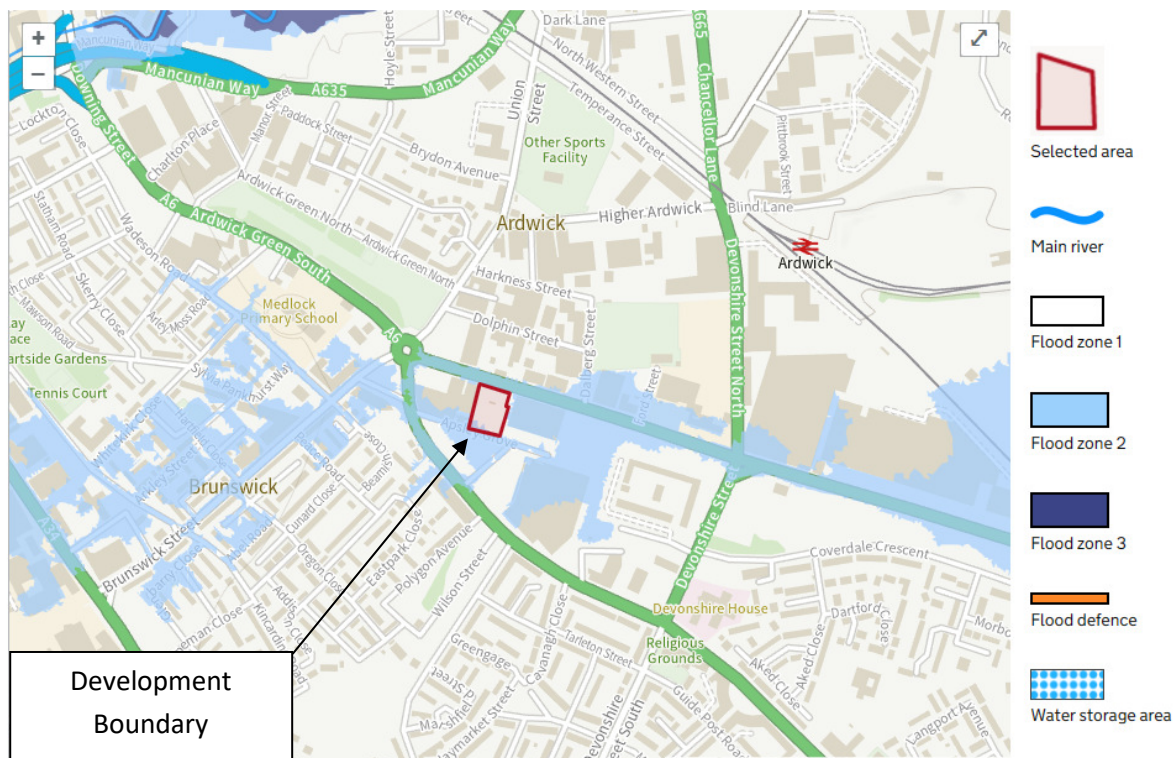


Figure 4 EA Indicative Flood Maps

3.1.2 In addition, the development application boundary is less than 1ha in plan area. In line with criteria set within the NPPF a Flood Risk Assessment is not required to support a planning application if the development is less than 1ha and in Flood Zone 1.

4.0 Drainage Strategy

4.1 External Consultation

- 4.1.1 Brennan Consult have been in contact with United Utilities via a predevelopment drainage enquiry for the development site. At this time their considered response is awaited. In the mean-time it would be anticipated that evidence should be provided that the SuDS Hierarchy has been assessed. Should this assessment confirm that infiltration is not feasible they would then expect connection to the culverted Cornbrook before allowing a connection to the combined water sewer.

4.2 Existing Drainage

4.2.1 United Utilities

The United Utility sewer records have been reviewed and indicate a 750x600mm foul water sewer that passes beneath Apsley Grove to the south of the site in a westerly direction. There is also a 1220x550 brick egg combined sewer in Hyde Road to the north of the site. Refer to Figure 5 below and Appendix E.

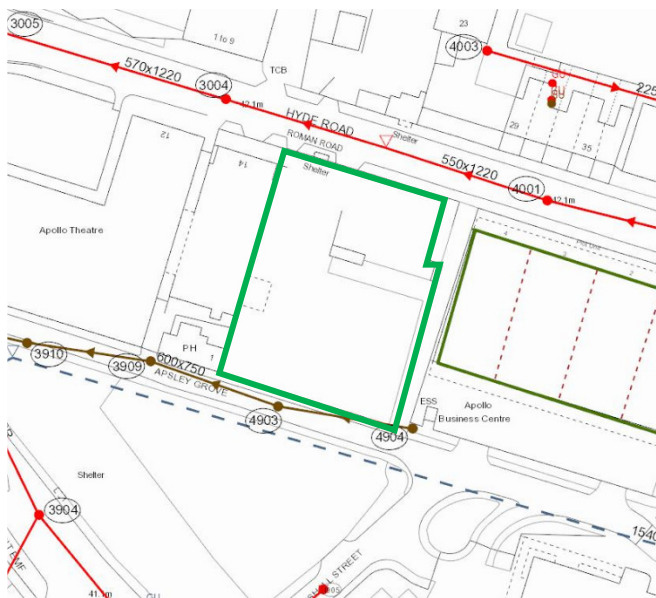


Figure 5 United Utilities Sewer Records

4.2.1 Private Drainage

The site encompasses unmade land currently used for car parking, thus no positive drainage has been identified.

4.3 Existing Runoff

- 4.3.1 The current site can be classed as Greenfield. Figure 6 below defines the existing greenfield runoff rates based on a site area of 0.288ha.

Existing Site Area (ha)	1yr Greenfield Rate	Qbar	30yr Greenfield Rate	100yr Greenfield Rate
0.288	1.4 l/s	1.6 l/s	2.7 l/s	3.4 l/s

Figure 6 Existing Greenfield Runoff Rates

- 4.3.2 Taking into account the minimum orifice size to reduce the risk of blockage, a maximum rate of 5l/s will be applied to the peak post development runoff rate.

4.4 Geology

- 4.4.1 At this time a Phase 2 site Investigation has not been undertaken. The British Geological Survey dataset would indicate the superficial deposits to be Alluvium (clay, silt and sand) with the Bedrock Geology comprising the Chester Formation - Sandstone. In light of these findings it is considered that infiltration would not be suitable but will be confirmed following the completion of infiltration testing. However, other elements such as the 5m offset required from foundations & boundary features need to also be taken into consideration.

4.5 Hydrological Assessment

- 4.5.1 As discussed in previous sections, a review of the topographical survey, OS Maps and Environment Agency maps would indicate the closest watercourse to be the Culverted Cornbrook, located 15m beyond the southern boundary.

4.6 Sustainable Drainage Systems (SuDS) Assessment

4.6.1 SuDS Objectives

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

4.6.2 SuDS Design Themes

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- i. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- ii. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- iii. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- iv. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

4.6.3 SuDS Site Constraints

SuDS techniques are suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- *Land Use Characteristics:* The size and type of development provides the opportunity to include site control SuDS devices only.
- *Site Characteristics:* The underlying ground is identified as cohesive. Thus, infiltration is unlikely to be suitable. Though subject also to other considerations.
- *Catchment Characteristics:* The site is currently classed as Greenfield with no positive drainage.
- *Environmental and Amenity Performance:* The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. SuDS will be considered where feasible. Safety to all future users is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

4.6.4 SuDS Methods

Figures 7 and 8 on the following pages provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the commercial development.

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not suitable:</u> Proposed roof profile would not enable a green roof to be incorporated.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Not suitable:</u> No end use for a commercial development such as this.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have severe effect on viability of the development. - Running and maintenance costs would not be acceptable to our client and future occupiers. - The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Underlying cohesive ground would indicate that the underlying ground is not suitable for infiltration. Further investigations to be undertaken.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Initial investigation would indicate that the underlying ground is not suitable for infiltration. Further investigations to be undertaken.
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream.	<u>Not Suitable:</u> Rear parking to be constructed in heavy duty surfacing. Limited spaces at the front to make any significant benefits.
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also allow filtering of particulate matter, improving water quality	<u>Not suitable:</u> No available area for attenuation pond to be allocated.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not suitable:</u> Space constraints on site do not permit above ground areas for flood storage.

Figure 7 Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc. - Can be very effective infiltration devices subject to ground conditions.	<u>Suitable:</u> To be incorporated as part of the offline attenuation measures beneath the rear parking areas
Large Diameter Pipes, Culverts or Tanks	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. - Generally, be suitable for adoption by the statutory water company (e.g. Severn Trent Water).	<u>Not suitable:</u> Oversized pipes more suitable to larger developments where the drainage is adopted.

Figure 8 Sub-Surface SuDS Methods

4.6.5 SuDS Hierarchal Approach

Based on the SuDS assessment in Figure 7 and 8, 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 below:

Method	Suitability	Suitability for Development
Infiltration to Ground	Maybe	Initial assessment has determined that the underlying ground is unsuitable for infiltration-based options. Further investigation required.
Connection to Watercourse	Yes	Connection to the Culverted Cornbrook watercourse at restricted rates.
Connection to Surface Water Sewer	No	No viable surface water sewer that is reasonably accessible by gravity in close proximity.
Connection to a Combined Sewer	No	Higher options available.

Figure 9 SuDS Hierarchal Approach

4.6.6 SuDS Design Philosophy

The SuDS philosophy for the development site is the promotion of Source Control and Site Control techniques with discharge to the adjacent culverted watercourse.

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the local watercourse.
- Reduce the impermeable fraction of the post development area.
- Geocellular attenuation tank to retain the peak storm events.

4.7 Climate Change

- 4.7.1 In May 2022, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Rather than nation wide allowances, each area will have its own peak rainfall allowances. In the case of the Manchester area, this is the Irwell Management Catchment peak rainfall allowances.
- 4.7.2 Based on the nature of the development, a lifespan of circa 25 years is anticipated. Therefore, the potential climate change allowance for the 2050's Central Allowance for commercial developments is 25%, which will be included in the hydraulic calculations.

4.8 Outline Surface Water Drainage Strategy

- 4.8.1 At this time, the general principal of the surface water drainage strategy is to collect the runoff from the roof of the new building and direct it to a below ground surface water drainage network. The network would flow south along both sides and outfall to the culverted Cornbrook via a new connection at a peak rate of 5l/s. This is considered the minimum rate to prevent blockage. An online geocellular attenuation tank will act as the means of retaining the flow rates in excess of this.
- 4.8.2 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. This is to provide no flooding up to the 30-year storm return period criterion.
- 4.8.3 Flooding can occur on a local scale beyond the 30yr criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site-specific basis. In the case of this development, exceedance flows will be all those over and above the 30-year design criterion. Using storage within the external hard standing and soft landscaping areas would be achievable and would direct flood water away from the new property with flows directed back into the surface water drainage network as the water levels in the drainage network recede.

- 4.8.4 Although it is envisaged that source control measures could be included in the final scheme, this strategy will assume for outline calculations purposes that only Site Control methods are incorporated. A hydraulic model of the new surface water network has been simulated in the Microdrainage Design Software. This takes into account the 5.0l/s discharge rate for the extreme event, and assumes no source control measures are incorporated and no infiltration to ground is possible. It is noted that these rates and volumes are preliminary for this outline assessment and are likely to alter at detailed design stage when more site-specific information is made available.
- 4.8.5 Drawing 2851-100 in Appendix C indicates the Drainage Strategy Plan based on the Architects master plan intent, with the hydraulic calculations in Appendix D.
- 4.8.6 Any future drainage calculations carried out as part of a site wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate change allowances.

4.9 Pollution Control

- 4.9.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps or by the use of Sustainable Drainage techniques. Being a residential led scheme, the pollution risk is considered to be very low.

4.10 Maintenance

- 4.10.1 The long-term maintenance of the new drainage and SuDS infrastructure will be with the property owners and a maintenance company in line with best practice guidance. Annual inspections will need to be carried out and clearing of gullies, channel drains, catchpits constructed.

Typically the maintenance regime will be in line with Figure 10 below.

Future Maintenance of the Drainage System			
Responsibility	Feature	Maintenance	Frequency
Development Owner	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.
	Geocellular Attenuation Tanks	Regular maintenance / removal of blockages and debris.	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.

Figure 10 Outline Management and Maintenance Strategy

4.11 Foul Water Strategy

- 4.11.1 The foul water drainage strategy is to construct a new foul water drainage network along the western side of the new building that flows south and outfalls to the foul public sewer via a new connection in Apsley Grove.
- 4.11.2 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance.
- 4.11.3 An indicative foul water drainage layout can be found on the drainage strategy drawing in Appendix C.

Appendix A – Architects Drawings

LEGEND

Site Boundary

P7	11/04/23	SA	SH	Amended Entrance Accesses	
P6	29/03/23	SA	SH	Amended Drawing in Client Comments	
P5	23/03/23	AK	SH	Amended Drawing & CDA Ramp	
P4	24/10/22	SA	SH	Amended Car Park Layout & Roof Height	
P3	17/10/22	SA	SH	Amended Site Levels	
P2	05/10/22	SA	SH	Amended Drawings	
P1	29/09/22	SA	SH	Initial Issue	
No.	Date	Drawn	Chk	App	Revision or reason for issue

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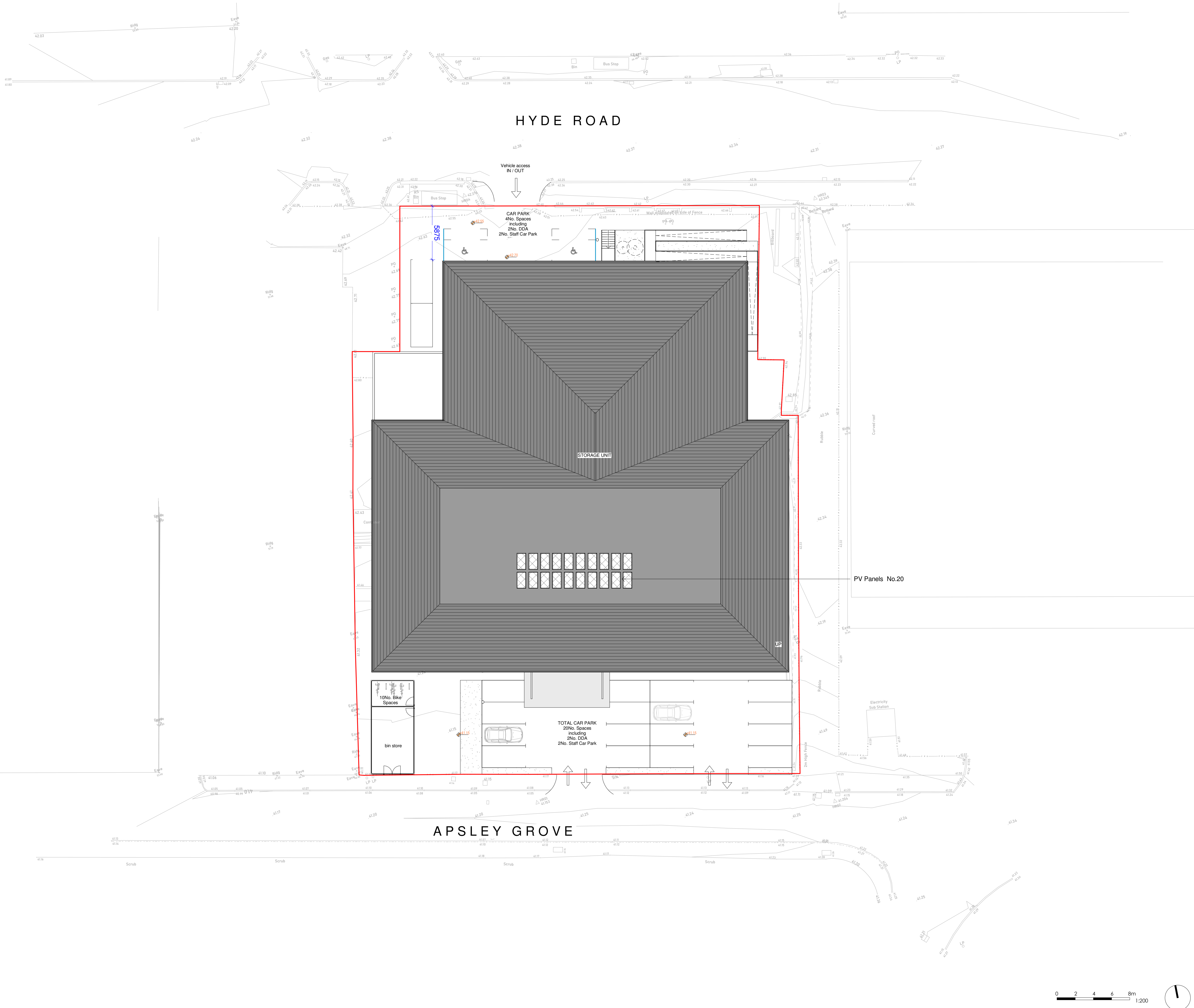
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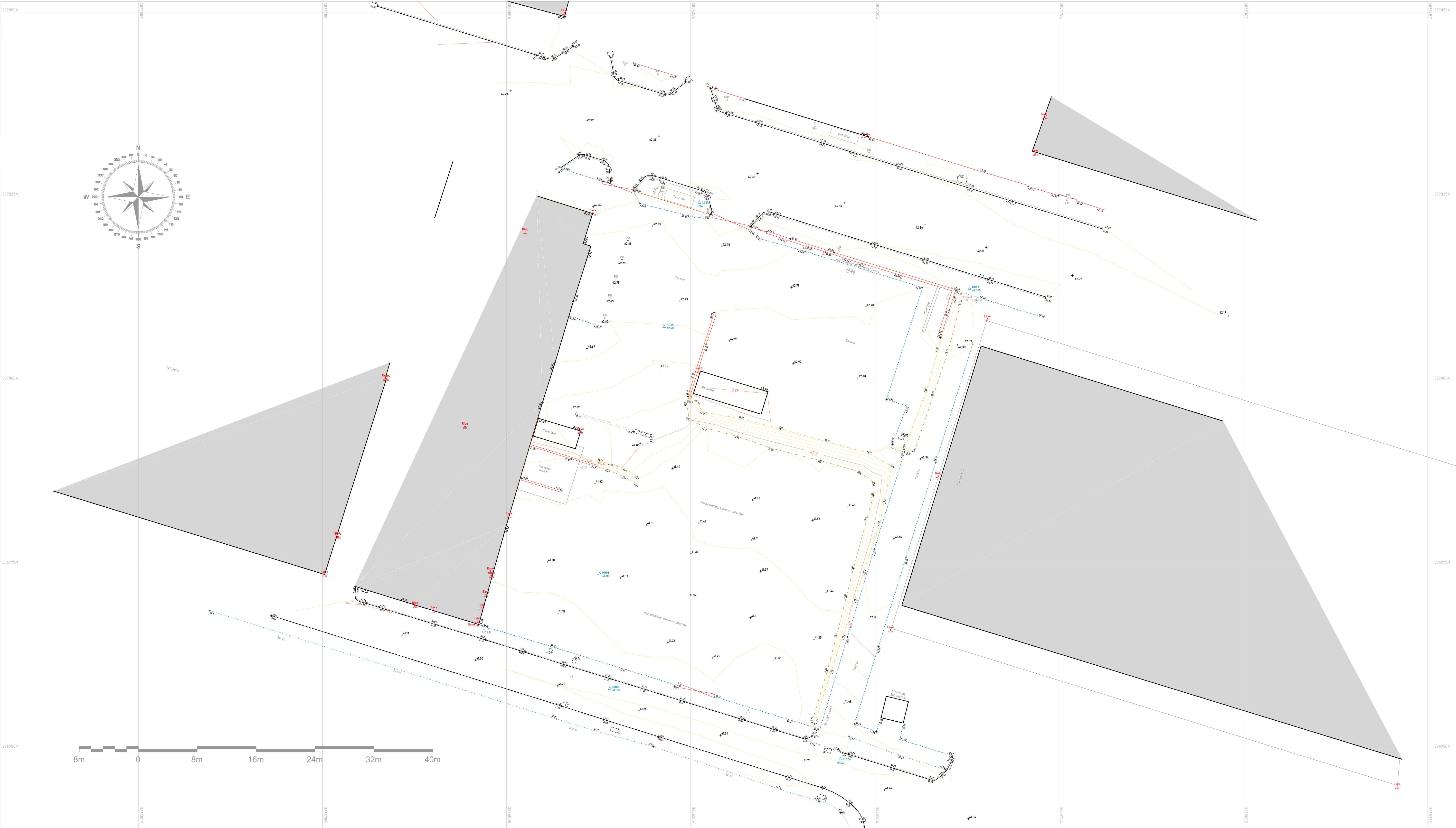
Drawing Title
Proposed Site Plan

Drawing Number
A1414/02/001
Drawing Status
Preliminary

Revision
P7



Appendix B – Topographical Survey



Grid	Building Canopy	Wall	Fence	Gate	Manhole	Control Station	Lamp Post	Pipe	Tree	Station	Eastings	Northings	Level
Contours (Minor)	Embankment Top	Channel	Fence Closed Board	Waters Edge	Inspection Chamber	Levels Spot	Telegraph Pole	Down Pipe	Tree Canopy	HR01	385414.019	396958.198	41.153
Contours (Major)	Embankment Bottom	Kerb	Fence Chain Link	Drain	Road Gully	Levels Eaves	Electrical Pole	Borehole	Vegetation Extents	HR02	385445.312	396948.635	41.204
Building	Change Of Surface	Drop Kerb	Fence Post & Rail	Overhead Cable	BT Cover	Levels Ridge	Stop Tap	Bollard	Hedge	HR03	385462.869	397012.534	42.345
Building Garage	Concrete	Road Edge	Fence Post & Wire	Steps	Electrical Cover	Levels Invert	Gas Valve	Trial Pit		HR04	385426.150	397024.256	42.374
										HR05	385421.391	397007.380	42.619
										HR06	385412.650	396973.768	41.281

Project

Hyde Road

Drawing Title

Topographic Survey

Drawing Number

10342_001

Revision

-

Scale @ A1

1:250

Client

CreateIt Studios

Date

October 2022

Surveyor

WB & MS

Drawn by

WB

Checked by

NB

Revision notes

Rev	Date	Comments
-	-	-

Drawing Notes

Survey undertaken on the 11th of October, 2022.

Coordinated to National Grid using GPS, Levels to OS Datum.

Sheet Layout



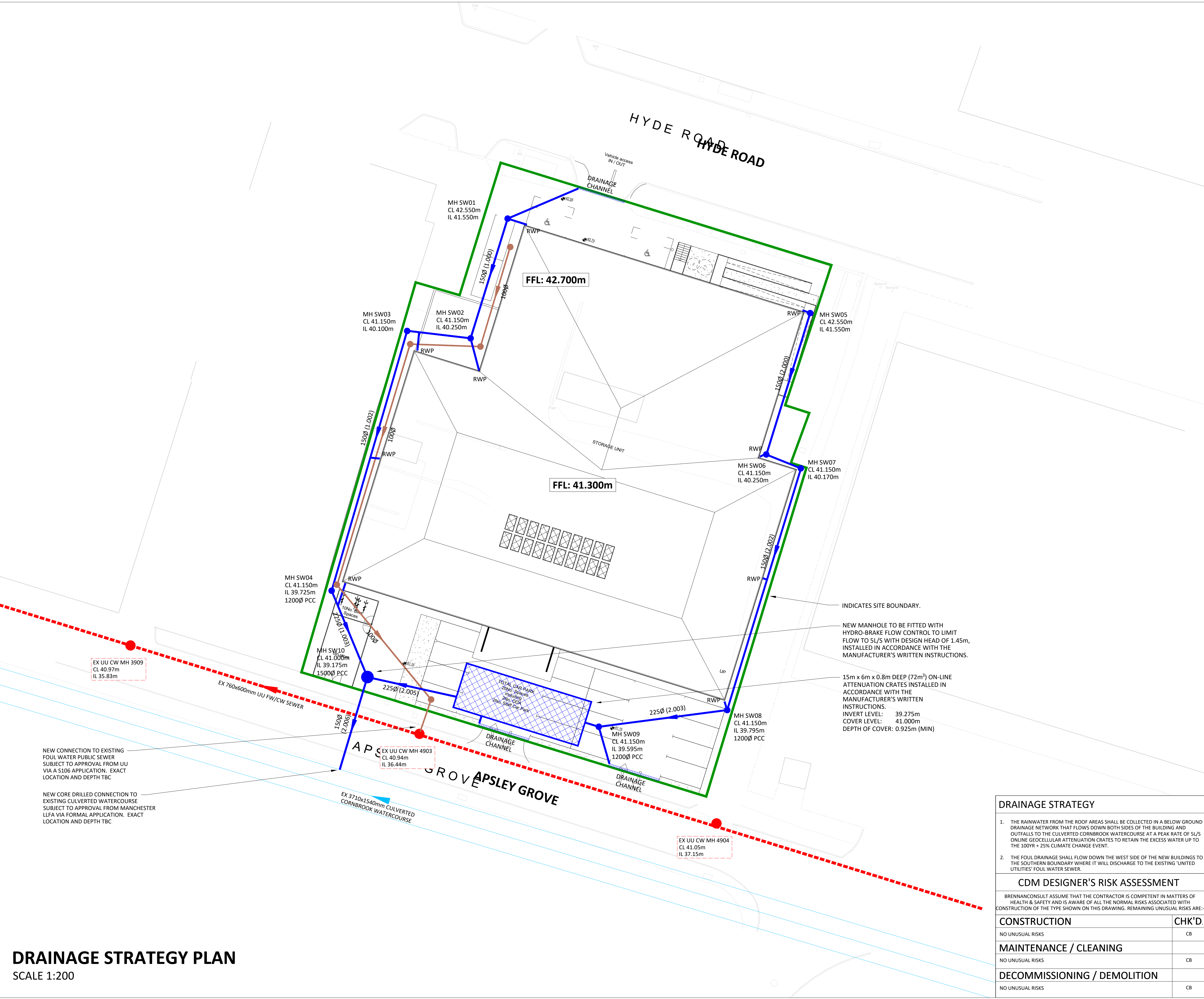
NTB Survey
Geodesy Solutions

Email info@ntbsurvey.com | www.ntbsurvey.com | Tel: 01254 496307

Project Title Hyde Road, Manchester - Drainage Strategy Report
Project No 2851-BCL-00-XX-RP-D-0001
Date 19th April 2023



Appendix C – Brennan Consult Drawings



DRAINAGE STRATEGY PLAN
SCALE 1:200

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GENERAL NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ASSOCIATED DRAWINGS. ANY DISCREPANCY IS TO BE RAISED PRIOR TO CONSTRUCTION. ANY CONSTRUCTION WORKS WHICH COMMENCE BEFORE THESE DRAWINGS ARE APPROVED ARE AT THE RISK OF THE BUILDING CONTRACTOR.
- ALL DIMENSIONS ARE IN MILLIMETERS (mm). DO NOT SCALE FROM THIS DRAWING. WORK TO STATED DIMENSIONS ONLY.
- BUILDING CONTRACTOR TO ENSURE ALL WORKS COMPLY WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH APPROVED DOCUMENT REGULATION 7.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, FABRICATION, ERECTION AND REMOVAL OF ALL TEMPORARY WORKS AND SHALL PROVIDE ALL TEMPORARY BRACING AS NECESSARY TO MAINTAIN STRUCTURAL STABILITY DURING CONSTRUCTION.
- IF THE CONTRACTOR CONSIDERS THAT HE DOES NOT HAVE SUFFICIENT INFORMATION TO SAFELY COMPLETE THE WORKS DETAILED ON THIS DRAWING, HE SHOULD CONTACT THE ENGINEER.

DRAINAGE NOTES

- ALL PRIVATE DRAINAGE WITHIN THE SITE IS TO COMPLY WITH THE REQUIREMENTS OF BS EN 752 AND BUILDING REGULATIONS PART H.
- DETAILS OF EXISTING SEWERS SHALL BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO THE COMMENCEMENT OF WORKS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY. THE CONTRACTOR SHOULD CHECK THE LEVELS OF ALL NEW OUT FALLS IN RELATION TO EXISTING SEWERS PRIOR TO ANY CONSTRUCTION TO ENSURE THE PROPOSED DESIGN CAN BE ACHIEVED.
- THE CONTRACTOR SHALL ASCERTAIN THE DEPTHS, SIZES AND LOCATIONS OF ALL SERVICES TO BE CROSSED BEFORE EXCAVATION COMMENCES. ANY CONFLICT IN LEVELS BETWEEN NEW AND EXISTING SEWERS TO BE NOTIFIED TO THE ENGINEER.
- ALL PIPES, CONNECTIONS, GULLIES, ACCESS FITTINGS, INSPECTION CHAMBERS, AND MANHOLES ARE TO COMPLY WITH THE BUILDING REGULATIONS.
- PIPE BEDDING MATERIAL TO BE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS, TAKING ACCOUNT OF THE DEPTH & LOADING IN RELATION TO THE PIPE STRENGTH, AND MODIFIED IF NECESSARY WHERE BELOW WATER LEVEL. BEDDING PROPOSALS ARE TO BE ISSUED FOR CONSIDERATION.
- PIPES CONNECTED TO CHAMBERS ARE TO HAVE SOFFITS LEVEL U.N.O. PIPES 150mm IN DIAMETER OR SMALLER MAY BE LOWERED TO CENTRE LINES LEVEL.
- ALL RWP CONNECTIONS TO BE 100mm DIAMETER U.N.O. LAID TO A FALL NO FLATTER THAN 1:40 AND WITH ROD ACCESS AT THE BASE.
- ALL BRICKWORK IN CONNECTION WITH DRAINAGE IS TO BE SOLID CLASS B ENGINEERING BRICK TO BS3921.
- ALL PRECAST CONCRETE PIPES, CHAMBER PRODUCTS AND ROAD GULLIES SHALL BE TO BS5911 AND BE KITE MARKED.
- ALL INSITU AND CONCRETE PRODUCTS SHALL COMPLY WITH CLASS DS1 REQUIREMENTS FOR SULPHATE EXPOSURE IN ACCORDANCE WITH BRE SPECIAL DIGEST 1, CONCRETE IN AGGRESSIVE GROUND (2001) PART 1: TABLE 2.
- UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL CLEAN ALL DRAINAGE BY JETTING, REMOVING ALL DEBRIS FROM SITE. NO DEBRIS SHALL BE PERMITTED TO ENTER THE EXISTING DRAINAGE SYSTEM.
- ALL PROPRIETARY PRODUCTS TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS WRITTEN INSTRUCTIONS.
- ALL RWP's TO DISCHARGE BY DIRECT CONNECTION INTO RODDABLE ACCESS GULLY, WITH INTEGRAL TRAP.
- ALL SVP's & WWP's POP UP's TO CONSIST OF SLOW BENDS.

DRAINAGE LEGEND

INDICATES NEW FW DRAINAGE

INDICATES EXISTING CW SEWER

INDICATES NEW SW DRAINAGE

INDICATES EXISTING CULVERTED WATERCOURSE

ALL MANHOLES TO BE CONCRETE ENCASED PPIC'S UNO, REFER TO DETAIL ON DRAWING 2851 - 101.

ALL MANHOLE COVERS TO BE B125 LOAD RATING TO PEDESTRIAN AREAS AND D400 TO CAR PARK AND SERVICE YARD. RECESSED COVERS TO BLOCK PAVED AREAS.

P02	SITE PLAN UPDATED	PG	19.04.23	LM
P01	PRELIMINARY ISSUE	PG	08.03.23	LM
REV	REVISION DESCRIPTION	BY	DATE	CHECKED

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Cheadle | Stockport | SK8 1PY

16-18 HYDE ROAD, MANCHESTER, M12 6AW

COMMERCIAL DEVELOPMENT DRAINAGE STRATEGY PLAN

CONSTRUCTION		CHK'D	
NO UNUSUAL RISKS	CB		
MAINTENANCE / CLEANING			
NO UNUSUAL RISKS	CB		
DECOMMISSIONING / DEMOLITION			
NO UNUSUAL RISKS	CB		

Status PRELIMINARY							
Project No.	Originator	Zone	Level	Type	Role	Drawing No.	Revision
2851	BCL	00	XX	DR	D	0100	P02
Scale	Size	Drawn	Date	Checked	Passed		
1:200	A1	PG	MAR 23	LM	CB		

Appendix D – Hydraulic Calculations

Brennan Consult		Page 1
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	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)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.361	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	0.184	4-8	0.042

Total Area Contributing (ha) = 0.226

Total Pipe Volume (m³) = 3.614

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	15.000	1.300	11.5	0.029	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	8.000	0.150	53.3	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	32.000	0.300	106.7	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	11.000	0.150	73.3	0.034	0.00	0.0	0.600	o	225	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	4.08	41.550	0.029	0.0	0.0	0.0	2.98	52.7	3.9
1.001	50.00	4.18	40.250	0.045	0.0	0.0	0.0	1.38	24.4	6.1
1.002	50.00	4.73	40.100	0.069	0.0	0.0	0.0	0.97	17.2	9.3
1.003	50.00	4.85	39.725	0.103	0.0	0.0	0.0	1.53	60.8	13.9

Brennan Consult		Page 2
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023 File Hyde Road - SW Network.MDX	Designed by paulg Checked by	
Innovyze	Network 2017.1.2	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	18.000	1.300	13.8	0.021	4.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	5.000	0.080	62.5	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	30.000	0.300	100.0	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.003	15.000	0.200	75.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.004	2.000	0.020	100.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.005	10.000	0.100	100.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	11.000	0.100	110.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	50.00	4.11	41.550	0.021	0.0	0.0	0.0	2.72	48.1	2.8
2.001	50.00	4.18	40.250	0.041	0.0	0.0	0.0	1.27	22.5	5.6
2.002	50.00	4.67	40.170	0.057	0.0	0.0	0.0	1.00	17.8	7.7
2.003	50.00	4.84	39.795	0.091	0.0	0.0	0.0	1.51	60.1	12.3
2.004	50.00	4.86	39.595	0.107	0.0	0.0	0.0	1.31	52.0	14.5
2.005	50.00	4.99	39.275	0.123	0.0	0.0	0.0	1.31	52.0	16.7
1.004	50.00	5.18	39.175	0.226	0.0	0.0	0.0	0.96	16.9«	30.6

Brennan Consult		Page 3
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	Checked by	
Innovyze	Network 2017.1.2	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
1.000	o	150	SW01	42.550	41.550	0.850	Open Manhole		450
1.001	o	150	SW02	41.150	40.250	0.750	Open Manhole		450
1.002	o	150	SW03	41.150	40.100	0.900	Open Manhole		450
1.003	o	225	SW04	41.150	39.725	1.200	Open Manhole		1200
2.000	o	150	SW05	42.550	41.550	0.850	Open Manhole		450
2.001	o	150	SW06	41.150	40.250	0.750	Open Manhole		450
2.002	o	150	SW07	41.150	40.170	0.830	Open Manhole		450
2.003	o	225	SW08	41.150	39.795	1.130	Open Manhole		450
2.004	o	225	SW09	41.150	39.595	1.330	Open Manhole		1200
2.005	o	225	TANK	41.000	39.275	1.500	Open Manhole		1200
1.004	o	150	SW10	41.000	39.175	1.675	Open Manhole		1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
1.000	15.000	11.5	SW02	41.150	40.250	0.750	Open Manhole		450
1.001	8.000	53.3	SW03	41.150	40.100	0.900	Open Manhole		450
1.002	32.000	106.7	SW04	41.150	39.800	1.200	Open Manhole		1200
1.003	11.000	73.3	SW10	41.000	39.575	1.200	Open Manhole		1200
2.000	18.000	13.8	SW06	41.150	40.250	0.750	Open Manhole		450
2.001	5.000	62.5	SW07	41.150	40.170	0.830	Open Manhole		450
2.002	30.000	100.0	SW08	41.150	39.870	1.130	Open Manhole		450
2.003	15.000	75.0	SW09	41.150	39.595	1.330	Open Manhole		1200
2.004	2.000	100.0	TANK	41.000	39.575	1.200	Open Manhole		1200
2.005	10.000	100.0	SW10	41.000	39.175	1.600	Open Manhole		1200
1.004	11.000	110.0	WATERCOURSE	40.800	39.075	1.575	Open Manhole		0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	WATERCOURSE	40.800	39.075	38.800	0	0

Brennan Consult		Page 4
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	Checked by	
Innovyze		Network 2017.1.2

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	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	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.361		

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Brennan Consult		Page 5
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	Checked by	
Innovyze	Network 2017.1.2	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW10, DS/PN: 1.004, Volume (m³): 2.8

Unit Reference	MD-SHE-0099-5000-1450-5000
Design Head (m)	1.450
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	99
Invert Level (m)	39.175
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.450	5.0
Flush-Flo™	0.432	5.0
Kick-Flo®	0.882	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	3.2	1.200	4.6	3.000	7.0	7.000	10.5
0.200	4.5	1.400	4.9	3.500	7.5	7.500	10.8
0.300	4.9	1.600	5.2	4.000	8.0	8.000	11.2
0.400	5.0	1.800	5.5	4.500	8.5	8.500	11.5
0.500	5.0	2.000	5.8	5.000	8.9	9.000	11.8
0.600	4.9	2.200	6.1	5.500	9.3	9.500	12.1
0.800	4.4	2.400	6.3	6.000	9.7		
1.000	4.2	2.600	6.6	6.500	10.1		

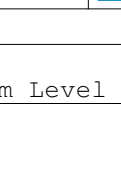
Brennan Consult		Page 6
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	Checked by	
Innovyze	Network 2017.1.2	

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 2.005

Invert Level (m) 39.275 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	90.0	90.0	5.200	0.0	120.4
0.400	90.0	105.2	5.600	0.0	120.4
0.800	90.0	120.4	6.000	0.0	120.4
0.801	0.0	120.4	6.400	0.0	120.4
1.600	0.0	120.4	6.800	0.0	120.4
2.000	0.0	120.4	7.200	0.0	120.4
2.400	0.0	120.4	7.600	0.0	120.4
2.800	0.0	120.4	8.000	0.0	120.4
3.200	0.0	120.4	8.400	0.0	120.4
3.600	0.0	120.4	8.800	0.0	120.4
4.000	0.0	120.4	9.200	0.0	120.4
4.400	0.0	120.4	9.600	0.0	120.4
4.800	0.0	120.4	10.000	0.0	120.4

Brennan Consult		Page 7
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	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 * 10m ³ /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	0.361
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	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, 25	

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	SW01	15 Winter	1	+0%				
1.001	SW02	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
1.002	SW03	15 Winter	1	+0%	30/15 Summer			
1.003	SW04	15 Winter	1	+0%	100/60 Winter			
2.000	SW05	15 Winter	1	+0%				
2.001	SW06	15 Winter	1	+0%	100/15 Summer			
2.002	SW07	15 Winter	1	+0%	30/15 Summer			
2.003	SW08	15 Winter	1	+0%	100/15 Summer			
2.004	SW09	15 Winter	1	+0%	30/15 Summer			
2.005	TANK	60 Winter	1	+0%	30/15 Summer			
1.004	SW10	15 Summer	1	+0%	1/15 Summer			

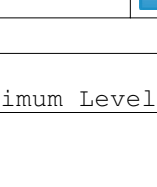
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	41.577	-0.123	0.000	0.08		3.7	OK	

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Brennan Consult		Page 8
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	Checked by	
Innovyze	Network 2017.1.2	

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

PN	US/MH Name	Water	Surcharged	Flooded	Pipe			Status	Level
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		Exceeded
1.001	SW02	40.301	-0.099	0.000	0.25		5.4	OK	2
1.002	SW03	40.173	-0.077	0.000	0.47		7.8	OK	
1.003	SW04	39.797	-0.153	0.000	0.22		11.3	OK	
2.000	SW05	41.574	-0.126	0.000	0.06		2.7	OK	
2.001	SW06	40.303	-0.097	0.000	0.27		4.8	OK	
2.002	SW07	40.234	-0.086	0.000	0.37		6.4	OK	
2.003	SW08	39.861	-0.159	0.000	0.19		9.8	OK	
2.004	SW09	39.694	-0.126	0.000	0.40		11.5	OK	
2.005	TANK	39.393	-0.107	0.000	0.10		4.2	OK	
1.004	SW10	39.499	0.174	0.000	0.32		4.9	SURCHARGED	

Brennan Consult		Page 9
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	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	0.361
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	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, 25

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%				
1.001	SW02	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
1.002	SW03	15 Winter	30	+0%	30/15 Summer			
1.003	SW04	15 Winter	30	+0%	100/60 Winter			
2.000	SW05	15 Winter	30	+0%				
2.001	SW06	15 Winter	30	+0%	100/15 Summer			
2.002	SW07	15 Winter	30	+0%	30/15 Summer			
2.003	SW08	15 Winter	30	+0%	100/15 Summer			
2.004	SW09	15 Winter	30	+0%	30/15 Summer			
2.005	TANK	120 Winter	30	+0%	30/15 Summer			
1.004	SW10	120 Winter	30	+0%	1/15 Summer			

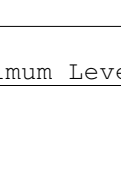
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	41.594	-0.106	0.000	0.19	9.2	OK	

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Brennan Consult		Page 10
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023 File Hyde Road - SW Network.MDX	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

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status	Level
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		Exceeded
1.001	SW02	40.477	0.077	0.000	0.63		13.4	SURCHARGED	2
1.002	SW03	40.414	0.164	0.000	1.23		20.3	SURCHARGED	
1.003	SW04	39.851	-0.099	0.000	0.58		29.8	OK	
2.000	SW05	41.588	-0.112	0.000	0.15		6.6	OK	
2.001	SW06	40.375	-0.025	0.000	0.71		12.6	OK	
2.002	SW07	40.334	0.014	0.000	1.02		17.4	SURCHARGED	
2.003	SW08	39.912	-0.108	0.000	0.52		27.6	OK	
2.004	SW09	39.846	0.026	0.000	1.11		32.1	SURCHARGED	
2.005	TANK	39.692	0.192	0.000	0.11		4.9	SURCHARGED	
1.004	SW10	39.689	0.364	0.000	0.33		5.0	SURCHARGED	

Brennan Consult		Page 11
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	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 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	0.361
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	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)

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, 25

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	100	+25%				
1.001	SW02	15 Winter	100	+25%	30/15 Summer	100/15 Summer		
1.002	SW03	15 Winter	100	+25%	30/15 Summer			
1.003	SW04	120 Winter	100	+25%	100/60 Winter			
2.000	SW05	15 Winter	100	+25%				
2.001	SW06	15 Winter	100	+25%	100/15 Summer			
2.002	SW07	15 Winter	100	+25%	30/15 Summer			
2.003	SW08	120 Winter	100	+25%	100/15 Summer			
2.004	SW09	120 Winter	100	+25%	30/15 Summer			
2.005	TANK	120 Winter	100	+25%	30/15 Summer			
1.004	SW10	120 Winter	100	+25%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW01	41.606	-0.094	0.000	0.30		14.8	OK	

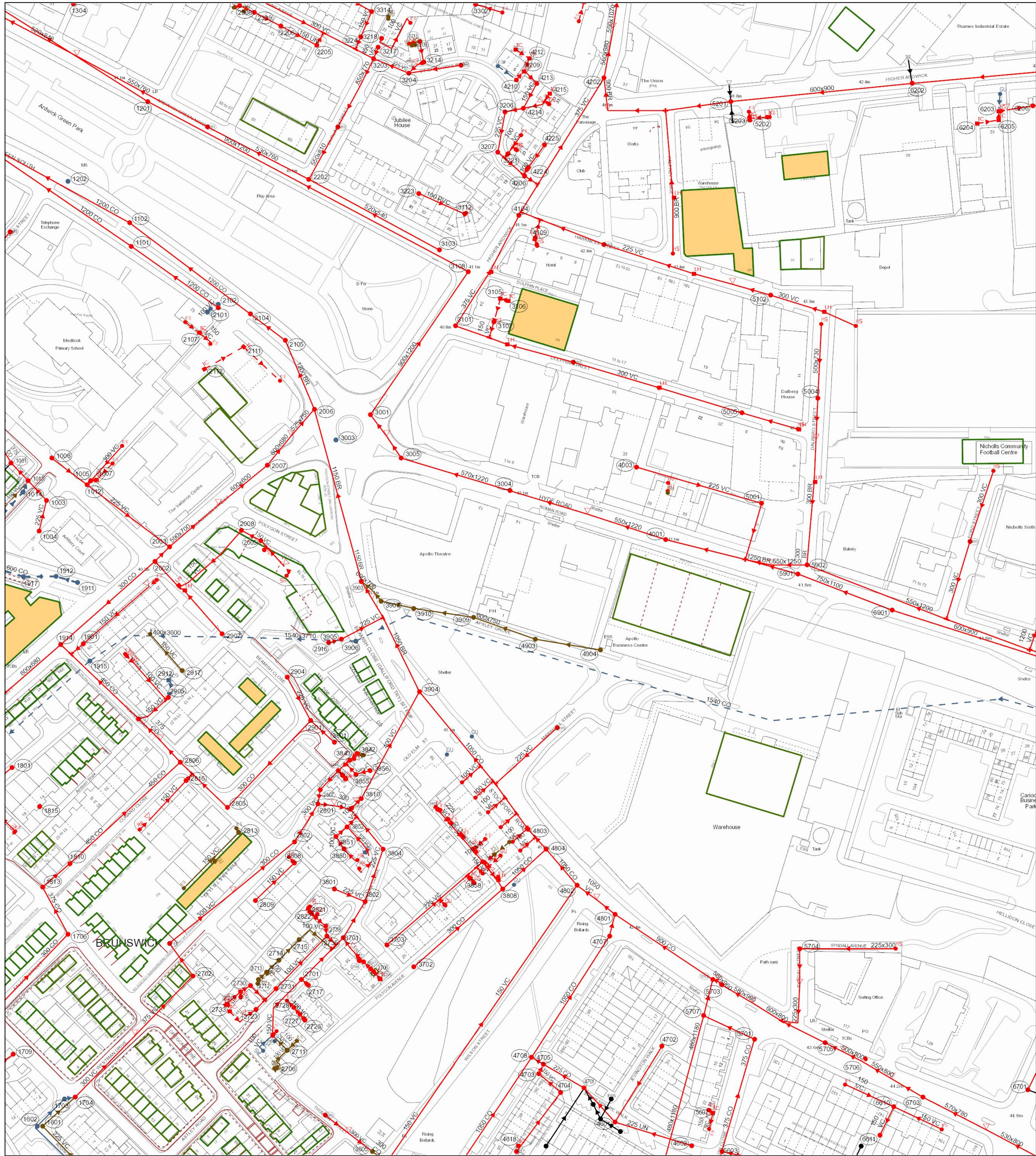
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Brennan Consult		Page 12
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	Hyde Road, Manchester Surface Water Network V1 08.03.23	
Date 07/03/2023	Designed by paulg	
File Hyde Road - SW Network.MDX	Checked by	
Innovyze	Network 2017.1.2	

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

PN	US/MH Name	Water		Surcharged		Flooded		Pipe		Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)				
1.001	SW02	41.150	0.750	0.068	0.96		20.3		FLOOD		2
1.002	SW03	41.033	0.783	0.000	1.86		30.8		FLOOD RISK		
1.003	SW04	40.402	0.452	0.000	0.33		17.0		SURCHARGED		
2.000	SW05	41.599	-0.101	0.000	0.24		10.7		OK		
2.001	SW06	40.879	0.479	0.000	1.08		19.1		FLOOD RISK		
2.002	SW07	40.781	0.461	0.000	1.54		26.2		SURCHARGED		
2.003	SW08	40.407	0.387	0.000	0.28		15.0		SURCHARGED		
2.004	SW09	40.404	0.584	0.000	0.61		17.6		SURCHARGED		
2.005	TANK	40.403	0.903	0.000	0.11		4.6		SURCHARGED		
1.004	SW10	40.399	1.074	0.000	0.33		5.0		SURCHARGED		

Appendix E – United Utilities Sewer Records



Reho	Cover	Func	Invert	Size x	Size y	Shape	Mat	Length	Grad
2101	41	CO	36.81	225			VC	7.296957	1 in 47
4705		CO		225			VC	5.774441	
4703	41.46	CO	36.67	150			VC	39.87572	1 in 128
4904	41.05	FO	37.15	600			BR	36.48657	1 in 53
2206		UN		150			VC	22.33533	
2916	40.88	CO	36.73	225			VC	7.28011	1 in 28
2008		VC		150			VC	49.89992	
3712	40.3	CO	36.98	450			VC	5.52364	1 in 136
4701	42.59	CO	38.02	300			VC	66.95171	1 in 61
3213		CO		100			VC	11.664537	
3843		VC		100			VC	8.613932	
2821	42.73	CO	40.86	150			VC	3.798414	1 in 115
4801	42.11	CO	34.49	570			BR	26.35185	
3004	42.11	CO	34.49	570			BR	62.34184	
3108	40.25	CO	36.0	900			BR	11.31371	
3217		CO		450			BR	200.4121	
3852		CO		100			VC	6.721007	
3107	40.79	CO	0	150			VC	7.610318	
1101		CO		1200			VC	9.086352	
4602	42.92	CO	41.2	225			UN	11.5034	1 in 96
1915	39.82	SW	37.57	1400			VC	44.23034	1 in 250
3809	41.32	CO	38.18	225			VC	38.28838	1 in 63
3224	41.57	CO	38.43	150			VC	7.55271	1 in 27
3806	41.57	CO	38.43	150			VC	18.6372	
3205	41.51	CO	0	225			VC	29.18667	1 in 27
2308		FO		150			VC	8.95472	
2917		FO		150			VC	26.92055	
3202	41.2	CO	37.79	550			BR	33.12099	
4802	42.1	CO	36.61	1050			CO	26.24881	
3807	40.94	CO	35.02	600			BR	7.81025	1 in 98
5001	42.72	CO	38.47	225			VC	32.28003	
2731		CO		100			VC	40.37925	
6001	42.64	CO	37.75	300			VC	44.82215	
3805	42.27	FO	38.05	300			CO	10	1 in 29
3207	41.08	CO	39.29	225			VC	19.86237	
5901	41.8	CO	34.94	750			BR	30.85322	
2809		VC		150			VC	29.93174	
2808		VC		150			VC	4.528341	1 in 20
1703	39.94	SW	37.57	225			VC	6.082763	
4805	40.3	CO	36.98	300			VC	46.01857	1 in 31
3702	42.13	CO	36.11	225			VC	65.16202	
4206	40.82	CO	35.11	225			VC	8.63443	
2202		CO		530			BR	63.96346	
6202	42.56	CO	35.64	600			BR	100.4986	1 in 176
2701	41.64	CO	40.19	225			VC	32.52891	1 in 120
2900	40.84	CO	38.58	225			UN	27.29469	1 in 91
4702	42.92	CO	41.27	225			UN	49.29621	1 in 63
2730		CO		100			BR	11.31397	
3001	41.14	CO	33.82	100			BR	65.69221	
3206	41.44	CO	39.82	225			VC	22.5317	1 in 43
6701	44.84	CO	39.70	620			BR	38.91015	1 in 79
3904	40.99	CO	34.84	1050			BR	57.27988	
3801	40.91	CO	39.81	225			VC	18.39476	1 in 153
5902	41.83	CO	35.40	550			BR	30	
2003	40.3	CO	34.92	550			BR	35.4683	1 in 273
3896		CO		100			VC	8.071027	
3810	40.89	CO	35.53	400			VC	67.11929	1 in 164
3910	41.03	CO		600			BR	18.43009	
4003		CO		225			VC	71.8401	
3708		CO		150			VC	1.969939	
1813	36.73	CO	37.37	375			CO	19.84943	
2704	40.4	CO	36.55	300			VC	44.81287	1 in 407
2205		UN		150			UN	7.816346	
4801	42.25	CO	35.74	1050			CO	12.80525	1 in 256
3706		CO		100			VC	2.164789	
2007	40.63	CO	34.64	600			BR	20.81553	1 in 103
2902	40.25	CO		300			VC	69.42622	
3112		CO		100			PVC	0.9776645	
1101	40.26	FO	37.3	620			BR	36.87818	1 in 115
3909	40.97	FO	35.83	600			BR	33.37664	
3875		UN		100			UN	3.739093	
4803	41.52	CO	35.22	1050			CO	96.87399	1 in 277
2816	41.24	CO		150			VC	5.15235	
1304	41.24	CO		510			BR	26.17801	
3103	41.08	CO	38.23	520			BR	81.88406	
4213		VC		150			VC	15.57534	
3808	41.73	CO		1050			CO	32.55764	
4804		CO		1050			CO	14.86607	
4704		VC		150			VC	18.87115	
4708	42.32	CO	36.02	1050			VC	79.61156	1 in 295
2705		CO		100			VC	7.10969	
2711		CO		100			VC	11.52469	
4803	42.82	CO	40.28	375			CO	64.86055	1 in 184
2801		CO		225			VC	16.40122	
5704	43.35	CO	37.8	500			BR	0	
3221		CO		100			BR	3.146605	
1014	39.88	SW	37.43	300			UN	0.2847779	1 in 494
1003	40.08	CO		300			VC	14.81592	
3906	41.12	SW	38.22	1540			CO	63.03174	
1704	39.94	CO	37.74	300			VC	47.38143	1 in 169
2702	40.66	CO	36.68	600			VC	22.2036	1 in 222
1006	39.75	CO	37.75	225			VC	24.37136	
1801	39.78	CO	37.85	225			VC	50.44799	1 in 29
2727		CO		100			VC	5.121381	
1706	36.53	CO	37.39	100			CO	29.52665	
4707	42.12	CO	35.72	1050			CO	12.36932	
2801	40.87	CO	36.18	300			VC	6.095386	1 in 91
3707		CO		100			VC	10.71214	
4803	40.94	CO	36.44	100			BR	36.95551	1 in 61
3218		CO		150			VC	31.43092	
2717		CO		150			VC	4.94865	
5706	44	CO	36.66	150			BR	11.38034	1 in 140
5701	43.21	CO	39.91	375			CO	30.8707	
5004	43.34	CO	36.28	600			VC	23.60173	
2715	40.81	FO	100				VC	24.34178	
2105	40.81	CO	34.05	1200			CO	24.33394	
1901		VC		150			VC	8.984591	
3805	41.06	CO	35.55	375			CO	4.24064	
3302		VC		150			VC	14.85161	1 in 210
3903	41.06	CO	34.54	1150			BR	98.49385	
2712		FO		100			VC	6.088152	1 in 68
5102	43.4	CO	39	300			VC	21.84033	
4103	42	CO	37.89	225			VC	49.59935	1 in 229
3851		CO		100			VC	8.152136	
4202	41.69	CO	34.25	960			BR	27.45996	
1012		VC		225			VC	56.92889	
2822		CO		150			VC	7.269161	
1601	40.03	FO	37.89	150			BR	24.08119	1 in 39
5201	41.82	CO	0	600			BR	36.34556	
3204	40.08	CO	40.22	225			BR	20.93013	
1102	40.97	CO	33.24	1200			CO	103.8316	
2006	41.07	CO	34.95	1200			BR	41.21066	
3005		CO		570			BR	14.4222	
6206		CO		225			VC	8.80193	
4214		CO		150			VC	10.32188	
2703		VC		100			VC	3.14676	
5703	43.04	CO	36.07	960			BR	2.828427	1 in 57
5702	42.94	CO	35.94	900			CO	64.89993	1 in 302
2005		VC		150			VC	12.15399	
1201		CO		900			BR	129.0239	
2201	41.1	CO	36.96	550			BR	81.88406	1 in 132
4701	42.7	CO	40.4	225			VC	26.02852	
4617		CO		100			VC	40.71896	
1911	39.85	SW	38.08	600			CO	12.39315	1 in 413
1013	39.89	CO	37.27	300			VC	13.93931	1 in 106
1004	40.08	CO	37.44	225			VC	17.42556	1 in 249
3905	41.78	CO	36.45	225			VC	25.94224	
3855		CO		100			VC	6.032089	
3844		CO		100			VC	14.48119	
6703	44.31	CO	36.85	580			BR	19.72308	1 in 197
2901	40.77	CO	38.19	300			CO	66.48308	1 in 104
1810		CO		450			VC	82.80701	
2807		CO		100			VC	7.896434	
2728		VC		100			VC	5.302296	
4001	42.18	CO	34.93	550			BR	45.22168	1 in 206
2738		VC		150			VC	5.554268	
3701	41.73	CO	39.91	225			VC	23.32881	1 in 106
2907	40.5	CO	36.71	300			CO	54.00096	1 in 36
4104	41.22	CO	35.31	375			BR	89.98815	1 in 121
5705	43.75	CO	36.51	600			BR	45.70278	1 in 6
3214		VC		100			VC	3.867427	
5707		CO		480			BR	20.81553	
2813		VC		150			VC	2.860996	
6610		VC		150			VC	17.50085	
3804	41.24	CO	39.41	225			VC	28.42534	1 in 60
6006	43.16	CO	39.89	300			BR	87.12406	1 in 99
1914	39.83	CO	35.47	600			BR	103.5916	1 in 113
1005		CO		300			VC	3.26756	
3314		CO		150			VC	15.14967	
6901	41.8	CO	35.46	750			BR	55.71355	1 in 107
2802	40.68								