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Date: **5th February 2024**

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Client

**Cassel & Fletcher Property
Management Ltd
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Site Address

**Land at 42-46 Drake Street
Rochdale
OL16 1NU**

Document Title

Drainage Strategy Report



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Report Title Drainage Strategy Report
Project No 2960-BCL-00-XX-RP-D-0001
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Revision History

Issue	Date	Status	Prepared By	Signature
P01	02.02.24	First Issue	Lee Meadowcroft BSc (Hons) PgDip MScCHE CEng MStructE MICE IHBC	
P02	05.02.24	Minor revisions to suit comments	Lee Meadowcroft BSc (Hons) PgDip MScCHE CEng MStructE MICE IHBC	

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Executive Summary

Item	Brief Description
Proposed Development	The construction of multi level apartment block and retail unit development on vacant land at 42-46 Drake Street, Rochdale, OL16 1NU.
Site Area	0.038ha (Redline Area)
Flood Zone Classification	Flood Zone 1 – Low Risk
Geology	A detailed Phase 2 site Investigation has been undertaken. The findings from this identified a variable depth of made ground (0.7m – 3.9m) over medium dense fine to medium sand to depth.
Infiltration Rate	Based on the assessment of the ground conditions, it is considered that infiltration has the potential to be suitable as a means of draining the site. However, the building takes up the full development footprint and so the 5m offset requirement to foundations would negate the construction of any soakaways.
Nearest Watercourses	The River Roch, the largest identified watercourse, is located approximately 120m to both the northeast and east of the site beyond a commercial led area and bus station, flowing generally in a westerly direction.
Nearest Adopted Sewers and Drainage Networks	The United Utilities sewer records have been reviewed and indicate there to be no public sewers within the site boundary. Beyond the site boundary to the south east in Nelson Street there is a 375mm diameter combined water sewer that outfalls to a larger 1500x950 brick combined sewer in Drake Street flowing north westerly. In parallel with this is a 730x300 brick culvert that passes beneath Drake Street and is anticipated to outfall to the River Roch. The current site is undeveloped, and no positive drainage has been identified.
Surface Water Drainage Strategy and SuDS Hierarchal Approach	Based on current site information, the proposed strategy is to construct a new private drainage network beneath the building and outfall to the surface water culvert in Nelson Street at restricted rates.
Existing Discharge Rate	Existing site is classes as greenfield. The rates below are based on the greenfield area of 380m². 1 yr – 0.3 l/s Qbar – 0.3 l/s 30 yr – 0.5 l/s 100 yr – 0.6 l/s
Proposed Discharge Rate	5l/s to satisfy RBC policy and reduce the risk of blockage.

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Item	Brief Description
Allowance for Climate Change	45% - based on a residential development with 100-year design life.
Proposed Attenuation & SuDS Methods	Geocellular attenuation tank and flow controls.
Maintenance Responsibility	Management Company,
Foul Drainage Outfall	New foul water connection to the 375mm diameter combined water sewer in Nelson Street.

Figure 1: Flood Risk and Drainage Strategy Summary

1.0 Introduction

- 1.1 Brennan Consult has been appointed by Cassel & Fletcher Property Management Ltd to prepare this Drainage Strategy Report to support a planning submission for the construction of multi level apartment block and retail unit development on vacant land at 42-46 Drake Street, Rochdale, OL16 1NU. 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 Cassel & Fletcher Property Management Ltd to 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	42-46 Drake Street, Rochdale.
Site address and location	Land at 42-46 Drake Street, Rochdale, OL16 1NU.
Council Area	Rochdale Borough Council (RBC)
Approximate Grid Reference	OS: 389813, 413284
General Locality	The site is located within the heart of Rochdale Town Centre.

Figure 2 Site Referencing Information

2.2 Existing Site Description

- 2.2.1 The development site is largely rectangular in plan shape and currently encompasses an area of vacant unmade and grassed land. Nelson street runs along the south eastern boundary with Drake Street to the north east. A retail unit is located to the north, with a small access road to the south west.
- 2.2.2 The general area is predominantly retails with some commercial and residential units.
- 2.2.3 Figure 3 identifies the overall site location details.

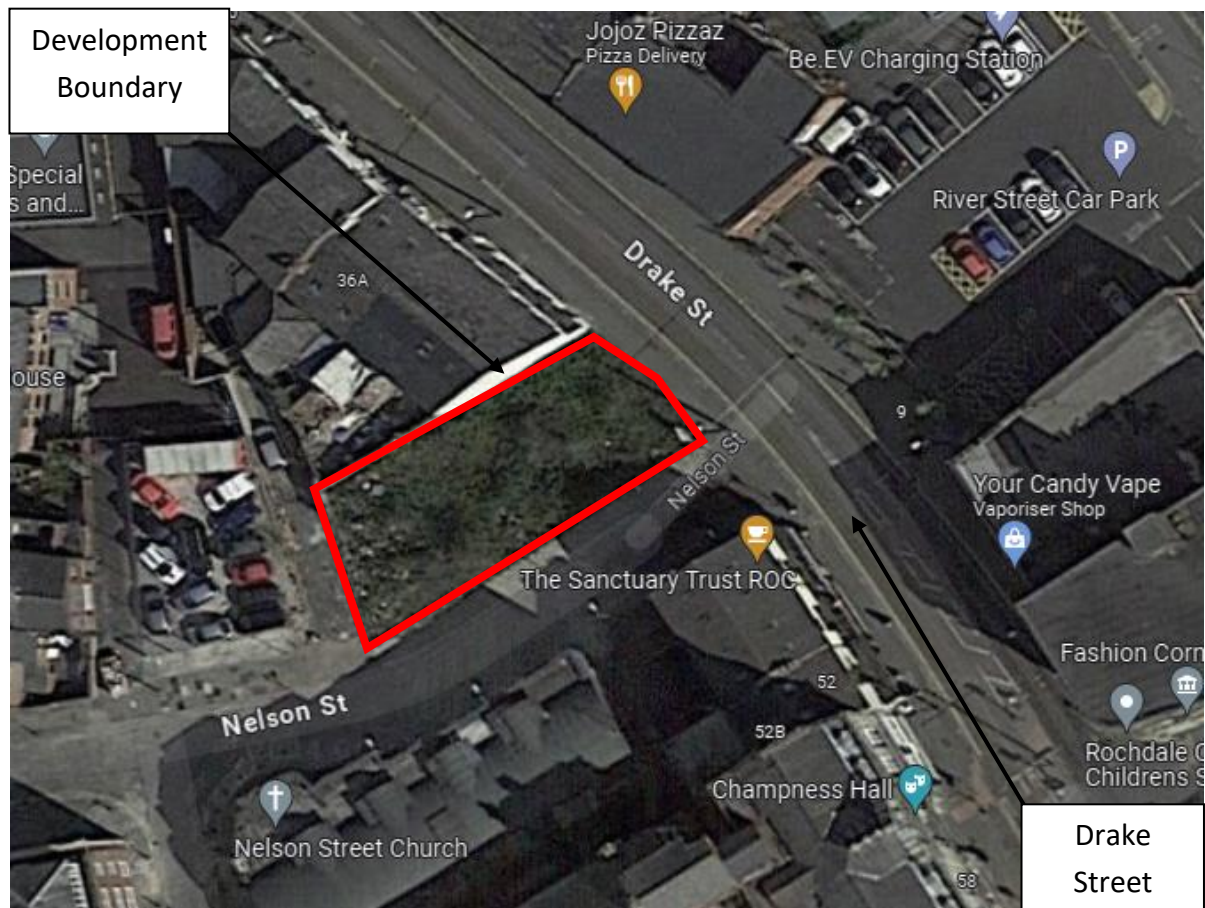


Figure 3 Site Location plan.

2.3 Topography

- 2.3.1 A full topographical survey has been undertaken at the site. This has identified the land to fall generally in a north easterly direction from 128.75m AOD at the south west corner down to 125.87m AOD at the north east corner. The footpath to Nelson Street and Drake Street aligns with this drop in ground level.

2.4 Hydrology

- 2.4.1 The River Roch, the largest identified watercourse is located approximately 120m to the northeast and east of the site beyond a commercial led area and bus station, flowing generally in a westerly direction.

3.0 Drainage Strategy

3.1 External Consultation

- 3.1.1 Brennan Consult have been in contact with United Utilities via a predevelopment drainage enquiry for the development site. Their considered response is still awaited. However, from recent experience we would anticipate that UU would require evidence that the SuDS Hierarchy has been assessed. Should it be proven that infiltration is not feasible then UU would expect connection to the culvert in Nelson Street at a rate agreed with the Lead Local Flood Authority. Refer to Appendix E for further details.

3.2 Existing Drainage

3.2.1 United Utilities

The United Utilities sewer records have been reviewed and indicate there to be no public sewers within the site boundary. Beyond the site boundary to the south east in Nelson Street there is a 375mm diameter combined water sewer that outfalls to a larger 1500x950 brick combined sewer in Drake Street flowing north westerly. In parallel with this is a 730x300 brick culvert that passes beneath Drake Street and is anticipated to outfall to the River Roch beyond the commercial buildings.

3.2.2 Private Drainage

The current site is undeveloped, and no drainage has been identified.

3.3 Existing Runoff

- 3.3.1 The current site encompasses unmade vacant land and thus can be classed as Greenfield with the. Figure 4 below defines the existing Greenfield runoff rates based on the site area of 0.038ha.

Existing Site Area (ha)	1yr Greenfield Rate	Qbar Greenfield Rate	30yr Greenfield Rate	100yr Greenfield Rate
0.038	0.3 l/s	0.3 l/s	0.5 l/s	0.6 l/s

Figure 4 Existing Greenfield Runoff Rates

- 3.3.2 Taking into consideration of RBC policy to reduce blockage risk, a peak flow rate of 5 l/s will be applied to the post development drainage design.

3.4 Geology

- 3.4.1 A detailed Phase 2 site Investigation has been undertaken. The findings from this identified a variable depth of made ground (0.7m – 3.9m) over medium dense fine to medium sand to depth.
- 3.4.2 Based on the assessment of the ground conditions, it is considered that infiltration has the potential to be suitable as a means of draining the site. However, the building takes up the full development footprint and so the 5m offset requirement to foundations would negate the construction of any soakaways.

3.5 Hydrological Assessment

- 3.5.1 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 River Roch, located some 120m to the north and east of the beyond 3rd party land ownership.

3.6 Sustainable Drainage Systems (SuDS) Assessment

3.6.1 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).

3.6.2 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.

3.6.3 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:* Based on the building taking the full development footprint, infiltration is not feasible.
- *Catchment Characteristics:* The site is currently undeveloped and so will be classed as Green-field.
- *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.

3.6.4 SuDS Methods

Figures 5 and 6 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 residential 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> Architectural proposals for the development and maintenance issues deem this unsuitable.
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 external areas are proposed.
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> Building takes up the full development footprint and so infiltration is not feasible.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> No external areas.
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> No external areas.
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 or swales 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 5 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 attenuation measures beneath building.
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. United Utilities).	<u>Not Suitable:</u> No external areas for large, oversized pipes.

Figure 6 Sub-Surface SuDS Methods

3.6.5 SuDS Hierarchal Approach

Based on the SuDS assessment in Figure 5 and 6, 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	No	Building takes up the full development footprint and so infiltration is not feasible.
Connection to Watercourse	Yes	New connection to be made to culvert in Nelson Street at restricted discharge rates.
Connection to Surface Water Sewer	No	No surface water sewers in close proximity.
Connection to a Combined Sewer	No	Higher options available.

Figure 7 SuDS Hierarchal Approach

3.6.6 SuDS Design Philosophy

The SuDS philosophy for the development site is the promotion of Site Control techniques with discharge to the culvert in Nelson Street at restricted rates.

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 surface water culvert.
- Site control in the form of a geocellular attenuation tank and flow control to retain the peak storm events.

3.7 Climate Change

3.7.1 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 Rochdale area, this is the Irwell Management Catchment peak rainfall allowances.

3.7.2 Based on the nature of the development, a lifespan of circa 100 years is anticipated. Therefore, the potential climate change allowance for the 2070's Upper End Allowance for residential developments is 45%, which will be included in the hydraulic calculations.

3.8 Outline Surface Water Drainage Strategy

3.8.1 Greenfield surface water runoff rates have been determined for the existing development site (refer to section 3.3 for details). However, to comply with RBC requirements a peak flow rate of 5l/s will be applied to reduce the blockage risk.

3.8.2 The general principal of the surface water drainage strategy is to collect the runoff from the roof of the new apartment block and direct it to a new below ground surface water drainage network beneath the centre of the building. The network will then outfall to the existing 730x300 brick culvert in Nelson Street. A flow control will be located online of the network to restrict flows to 5l/s and an online geocellular tank acting as the means of attenuation behind the flow control.

3.8.3 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2008, Building Regulations part H and latest guidance. This is to provide no flooding up to the 30-year storm return period criterion.

3.8.4 Although it is envisaged that Source Controls measures could be included in the final scheme, this strategy will assume for outline calculation purposes that only Site Control methods are incorporated. A fully detailed hydraulic surface water network has been simulated in the Microdrainage Design Software. This takes into account the peak flow control of 5l/s and indicates no flooding up the 1 in 100-year 45% CC event. 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.

3.8.5 Drawing 2960-BCL-00-XX-DR-D-0100 in Appendix C indicates the Drainage Strategy Plan based on the Architects master plan intent, with the hydraulic calculations in Appendix D.

3.9 Pollution Control

3.9.1 The development includes roof areas only that will add limited pollution to the downstream network.

3.10 Maintenance

3.10.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints. The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

3.10.2 There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – 'basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections.'
- Occasional Maintenance – 'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example.'
- Remedial Maintenance – 'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.'

3.10.3 Specific maintenance needs should be monitored, and maintenance schedules adjusted to suit the location and condition of the drainage feature in question.

Operation and Maintenance Activity	SuDS Component		
	Piped Network / Inspection Chambers	Flow Control	Attenuation Storage Tanks
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	■	
Occasional Maintenance			
Sediment management ¹	■	■	■
Remedial Maintenance			
Structure rehabilitation / repair	□	□	□
■ Will be required □ May be required ¹ Sediment should be collected and managed in pre-treatment systems, upstream of the main device.			

Figure 8: Extract from The SuDS Manual Table 32.1: Typical key SuDS components operation and maintenance activities.

Inspection, Manhole and Catchpit Chambers

- 3.10.4 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.
- 3.10.5 Pipes are proprietary products, and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with the drainage specification.
- 3.10.6 Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.
- 3.10.7 Access for maintenance is provided through access chambers and manholes.
- 3.10.8 Regular inspection and maintenance are important to identify areas which may have been obstructed / clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

Channels & Gullies

- 3.10.9 Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel

units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

- 3.10.10 Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove manhole and chamber covers to sewers and flow control on network– inspect to ensure water is flowing freely and that the water flow route is unobstructed. Remove debris and silt as required.	Half Yearly Undertake one of these inspections after leaf fall in autumn
Occasional Maintenance	None required	
Remedial Actions	Re-line or replace pipework if unable to clear blockages by jetting.	As required
Monitoring	Inspect chambers for build-up of silt and debris	Half yearly

Figure 9 – Operation & maintenance requirements for pipe network, manholes & inspection chambers, drainage channels & gullies.

Geocellular Attenuation Tank

- 3.10.11 Geocellular tanks are modular storage systems made with plastic units. These units can be assembled to achieve the required volume and usually on multiple layers. Generally, the units have 95% of voids content and are used to create an efficient below ground structure to store surface water.
- 3.10.12 The geocellular units and geotextile are proprietary products and therefore manufacturer's recommendations should also be taken into consideration.
- 3.10.13 Access for maintenance should be provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.
- 3.10.14 Regular inspection and maintenance are important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockages by sediment, algae or other matter; remove and replace surface infiltration medium as required.	Annually.
	Remove sediments from pre-treatment structures and/or internal forebays.	Annually, or as required.
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

Figure 10 – Operation & maintenance requirements for attenuation storage tanks - Based on CIRIA SuDS Manual 2015

Flow Control Units

- 3.10.15 Flow control units are located in catchpit chambers to act as the means of controlling the downstream flow rate. They are constructed in Stainless steel with no moving parts. The vortex is sized to suit the required flow rate which will vary depending on the head of water that backs up behind.
- 3.10.16 The control units are proprietary products and therefore manufacturer's recommendations should also be taken into consideration.

Maintenance Schedule	Required Action	Typical Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

Figure 11 – Operation & maintenance requirements for Flow Controls - Based on CIRIA SuDS Manual 2015

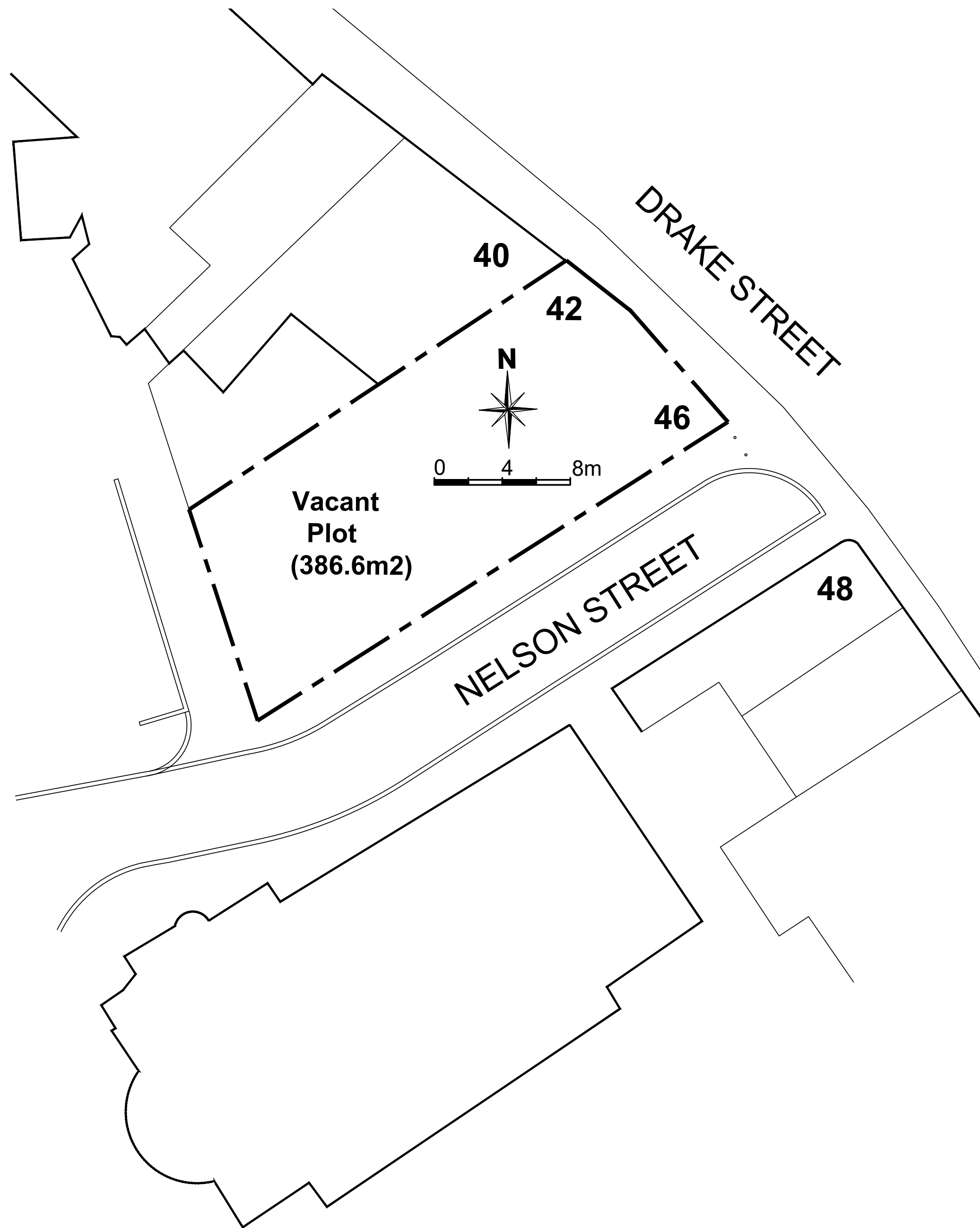
3.11 Foul Water Strategy

- 3.11.1 The foul water drainage strategy is to construct a new network beneath the development building that will outfall to the existing 375mm diameter combined water sewer in Nelson Street.
- 3.11.2 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2017, Building Regulations Part H and the latest Sewer Sector Adoption guidance.
- 3.11.3 An indicative foul water drainage layout can be found on the drainage strategy drawing in Appendix C.

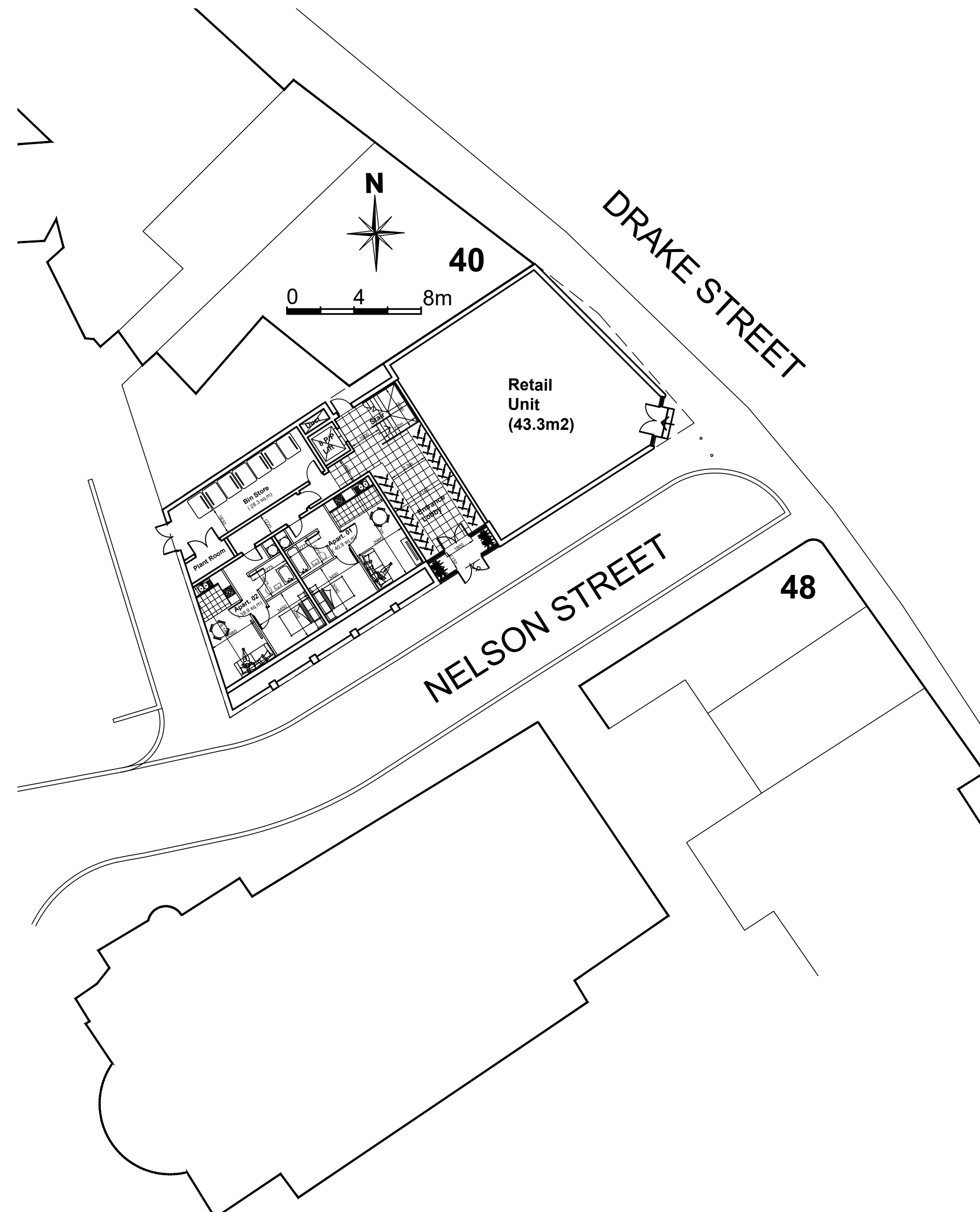
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Appendix A – Architects Drawings



SITE PLAN EXISTING



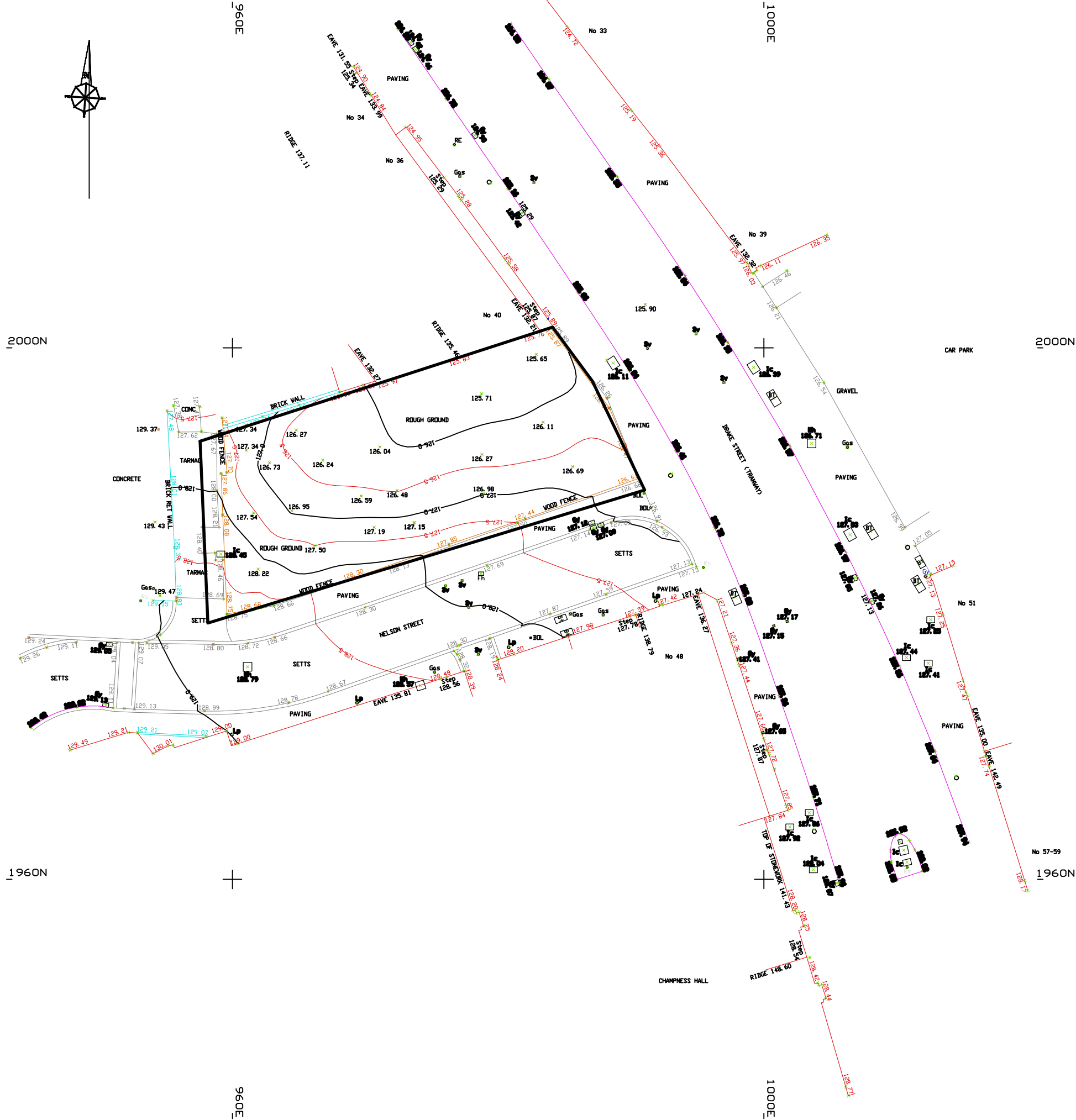
SITE PLAN PROPOSED

REV:	DATE:	DETAILS:
BM ARCHITECTURAL DESIGNS APARTMENT 8 224 GREAT CLOWES STREET MANCHESTER M7 2ZS TEL: 07415 493002		
PROJECT:	NEW BUILDING, 42-46 DRAKE STREET AND NELSON STREET, ROCHDALE OL16 1NU	
CLIENT:	CASSEL AND FLETCHER PROPERTY MANAGEMENT LTD.	
TITLE:	SITE PLANS	
SCALE:	1:200@A1	DATE: 01/ 2024 DRAWN: BM
STATUS:	PLANNING	
DRAWING NO:	BM/0124/DRAKE/PL1	REV:

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Appendix B – Topographical Survey



CHRIS HEATON SURVEYS
LAND SURVEYORS

21 The Croft
Euxton
Chorley
Lancs PR7 6LH
Email: info@wemap.com

Tel/Fax 01257 271090

CLIENT				TITLE			
MILLERBROOK PROPERTIES LTD				42-46 DRAKE STREET, ROCHDALE			
Scale	Date	Drawn	Checked	Job Ref	Dwg Ref	Revision	Date
1/200	NOV 16	CH/EEH	C.H.	6965			

LEGEND

SPOT HEIGHT

MANHOLE

INSPECT COVER

GULLY

FLOOR LEVEL

STEP LEVEL

INVERT LEVEL

WATER METER

FIRE HYDRANT

ROAD SIGN

LAMP POST

TELE. POLE

ELEC. POLE

GATE POST

MARKER

STOP VALVE

GAS VALVE

ELEC. IC

BT/TELECOM

POST

PEG

LAMP HOLE

KERB

FENCE

BUILDING

HEDGE

TOP BANK

BOT. BANK

CANOPY

WALL

FOOTPATH

ROAD

MARKING

CONTOUR

JAPANESE KNOTWEED

NOTES:-

1. ALL SURVEY STATIONS ARE EITHER NAILS OR PEGS AND ARE RELATED TO A LOCAL SITE GRID.

2. ALL LEVELS ALONG KERBS ARE TAKEN AT THE BASE OF THE KERB (GUTTER).

3. ALL LEVELS ARE RELATED TO A LOCAL SITE DATUM BASED ON ORDNANCE DATUM.

4. THE LEVEL OF ANY POINT IS INDICATED BY THE POSITION OF THE CROSS.

5. TO CONFIRM PLAN SCALE CHECK BETWEEN THE GRID INTERSECTIONS.

6. ALL VOLUMES MUST BE CHECKED.

7. PHYSICAL BOUNDARIES ON SITE ARE NOT NECESSARILY LEGAL BOUNDARIES.

8. ALL SERVICES WHICH ARE VISIBLE AT THE TIME OF SURVEY ARE SHOWN.

9. TO CHECK THE PLAN SCALE THE GRID IS 40 METRES.

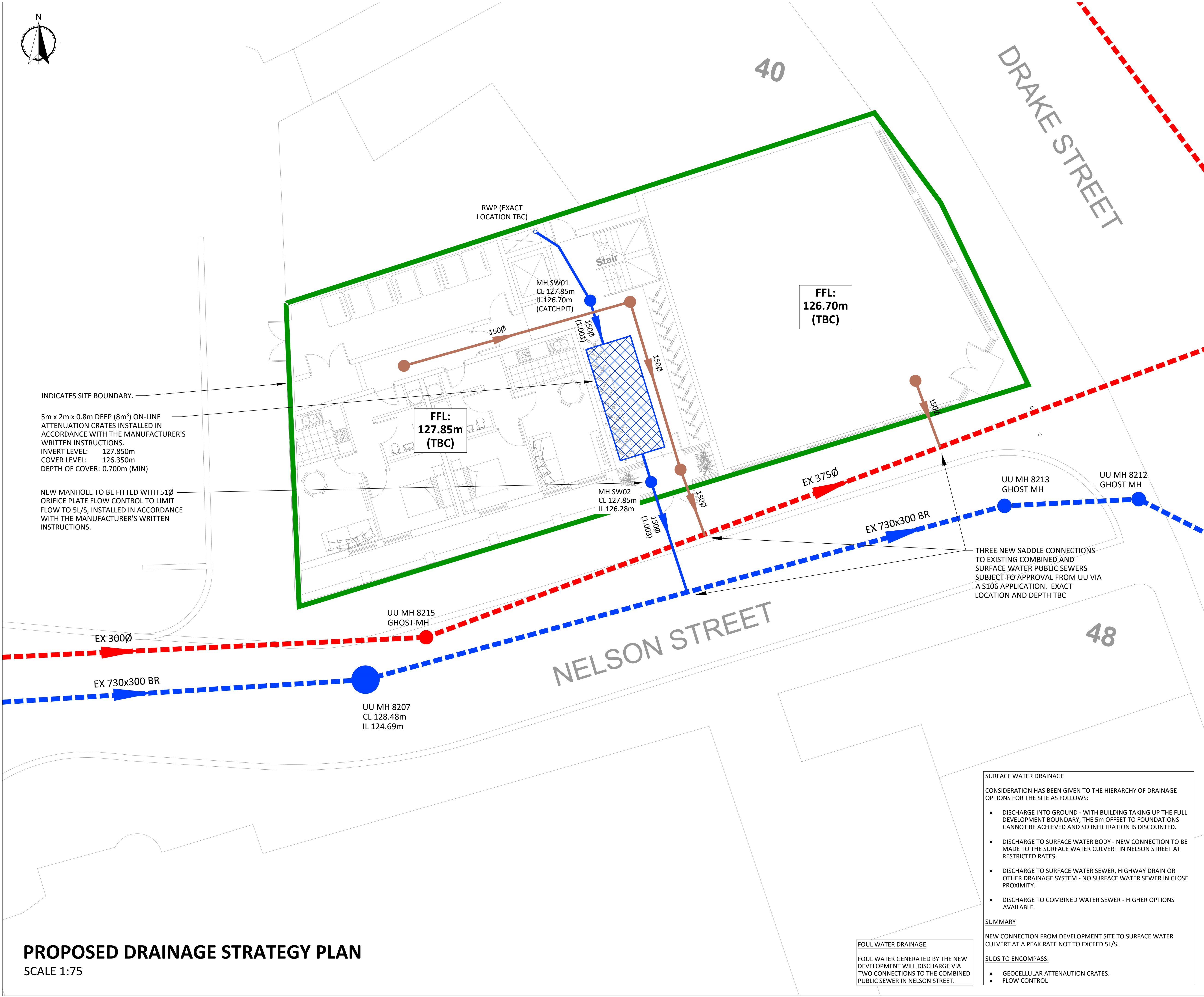
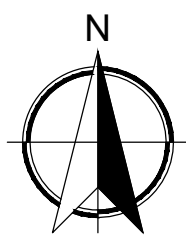
NB ALL LEVELS AND DIMENSIONS MUST BE CHECKED BEFORE CONSTRUCTION

NB ALL UNDERGROUND SERVICE POSITIONS ARE ASSUMED AND MUST BE CHECKED BEFORE CONSTRUCTION

Project Title 42- 46 Drake Street, Rochdale.
Report Title Drainage Strategy Report
Project No 2960-BCL-00-XX-RP-D-0001
Date 5th February 2024



Appendix C – Brennan Consult Drawings



© THIS DRAWING AND ITS CONTENTS ARE STRICTLY THE COPYRIGHT OF BRENNANCONSULT LTD

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 LEGEND

INDICATES NEW FW DRAINAGE	INDICATES EXISTING CW SEWER
INDICATES NEW SW DRAINAGE	INDICATES EXISTING SW SEWER
SITE BOUNDARY	

CDM DESIGNER'S RISK ASSESSMENT

BRENNANCONSULT ASSUME THAT THE CONTRACTOR IS COMPETENT IN MATTERS OF HEALTH & SAFETY AND IS AWARE OF ALL THE NORMAL RISKS ASSOCIATED WITH CONSTRUCTION OF THE TYPE SHOWN ON THIS DRAWING. REMAINING UNUSUAL RISKS ARE:-

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

P01	PRELIMINARY ISSUE	PG	02.02.24	LM
REV	REVISION DESCRIPTION	BY	DATE	CHECKED

BrennanConsult

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Cheadle | Stockport | SK8 1PY

42-46 DRAKE STREET, ROCHDALE, OL16 1NU

RESIDENTIAL DEVELOPMENT DRAINAGE STRATEGY PLAN

Status: **PRELIMINARY**

Project No.	Originator	Zone	Level	Type	Role	Drawing No.	Revision
2960	BCL	00	XX	DR	D	0100	P01

Scale	Size	Drawn	Date	Checked	Passed
1:75	A1	PG	FEB 24	LM	CB

Project Title 42- 46 Drake Street, Rochdale.
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Appendix D – Hydraulic Calculations

Brennan Consult		Page 1
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	DrakeStreet, Rochdale Surface Water Network	
Date 02/02/2024	Designed by paulg	
File Drake Street SW Network...	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)	4	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.271	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	0.037	4-8	0.001

Total Area Contributing (ha) = 0.038

Total Pipe Volume (m³) = 0.230

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
1.000	4.000	0.400	10.0	0.038	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	2.000	0.200	10.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	2.000	0.070	28.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	5.000	1.000	5.0	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)
1.000	50.00	4.02	127.100	0.038	0.0	0.0	0.0	3.20	56.6	5.1
1.001	50.00	4.03	126.700	0.038	0.0	0.0	0.0	3.20	56.6	5.1
1.002	50.00	4.05	126.350	0.038	0.0	0.0	0.0	1.89	33.4	5.1
1.003	50.00	4.07	126.280	0.038	0.0	0.0	0.0	4.54	80.2	5.1

Brennan Consult		Page 2																																																																																																																																																																												
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	DrakeStreet, Rochdale Surface Water Network																																																																																																																																																																													
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Innovyze	Network 2017.1.2																																																																																																																																																																													
PIPELINE SCHEDULES for Storm Upstream Manhole <table><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., (mm)</th><th>L*W</th></tr><tr><td>1.000</td><td>o</td><td>150</td><td>RWP</td><td>127.850</td><td>127.100</td><td>0.600</td><td>Open Manhole</td><td></td><td>450</td></tr><tr><td>1.001</td><td>o</td><td>150</td><td>SW01</td><td>127.850</td><td>126.700</td><td>1.000</td><td>Open Manhole</td><td></td><td>450</td></tr><tr><td>1.002</td><td>o</td><td>150</td><td>TANK</td><td>127.850</td><td>126.350</td><td>1.350</td><td>Open Manhole</td><td></td><td>1200</td></tr><tr><td>1.003</td><td>o</td><td>150</td><td>SW02</td><td>127.850</td><td>126.280</td><td>1.420</td><td>Open Manhole</td><td></td><td>600</td></tr></table> Downstream Manhole <table><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., (mm)</th><th>L*W</th></tr><tr><td>1.000</td><td>4.000</td><td>10.0</td><td>SW01</td><td>127.850</td><td>126.700</td><td>1.000</td><td>Open Manhole</td><td></td><td>450</td></tr><tr><td>1.001</td><td>2.000</td><td>10.0</td><td>TANK</td><td>127.850</td><td>126.500</td><td>1.200</td><td>Open Manhole</td><td></td><td>1200</td></tr><tr><td>1.002</td><td>2.000</td><td>28.6</td><td>SW02</td><td>127.850</td><td>126.280</td><td>1.420</td><td>Open Manhole</td><td></td><td>600</td></tr><tr><td>1.003</td><td>5.000</td><td>5.0</td><td>SEWER</td><td>127.800</td><td>125.280</td><td>2.370</td><td>Open Manhole</td><td></td><td>0</td></tr></table> Free Flowing Outfall Details for Storm <table><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><tr><td>1.003</td><td>SEWER</td><td>127.800</td><td>125.280</td><td>124.000</td><td>0</td><td>0</td></tr></table> Simulation Criteria for Storm <table><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 Coeffiecient</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><tr><td>Number of Input Hydrographs</td><td>0</td><td>Number of Storage Structures</td><td>1</td></tr><tr><td>Number of Online Controls</td><td>1</td><td>Number of Time/Area Diagrams</td><td>0</td></tr><tr><td>Number of Offline Controls</td><td>0</td><td>Number of Real Time Controls</td><td>0</td></tr></table> Synthetic Rainfall Details <table><tr><td>Rainfall Model</td><td>FSR</td><td>Profile Type</td><td>Summer</td></tr><tr><td>Return Period (years)</td><td>4</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>19.000</td><td>Storm Duration (mins)</td><td>30</td></tr><tr><td>Ratio R</td><td>0.271</td><td></td><td></td></tr></table>			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	RWP	127.850	127.100	0.600	Open Manhole		450	1.001	o	150	SW01	127.850	126.700	1.000	Open Manhole		450	1.002	o	150	TANK	127.850	126.350	1.350	Open Manhole		1200	1.003	o	150	SW02	127.850	126.280	1.420	Open Manhole		600	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	4.000	10.0	SW01	127.850	126.700	1.000	Open Manhole		450	1.001	2.000	10.0	TANK	127.850	126.500	1.200	Open Manhole		1200	1.002	2.000	28.6	SW02	127.850	126.280	1.420	Open Manhole		600	1.003	5.000	5.0	SEWER	127.800	125.280	2.370	Open Manhole		0	Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)	1.003	SEWER	127.800	125.280	124.000	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 Coeffiecient	0.800	Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000	Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60	Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1	Number of Input Hydrographs	0	Number of Storage Structures	1	Number of Online Controls	1	Number of Time/Area Diagrams	0	Number of Offline Controls	0	Number of Real Time Controls	0	Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	4	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.000	Storm Duration (mins)	30	Ratio R	0.271			©1982-2017 XP Solutions	
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W																																																																																																																																																																					
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Brennan Consult		Page 3
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	DrakeStreet, Rochdale Surface Water Network	
Date 02/02/2024	Designed by paulg	
File Drake Street SW Network...	Checked by	
Innovyze	Network 2017.1.2	
Online Controls for Storm Orifice Manhole: SW02, DS/PN: 1.003, Volume (m³): 0.5 Diameter (m) 0.051 Discharge Coefficient 0.600 Invert Level (m) 126.280		
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Brennan Consult		Page 4
Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY	DrakeStreet, Rochdale Surface Water Network	
Date 02/02/2024	Designed by paulg	
File Drake Street SW Network...	Checked by	
Innovyze		Network 2017.1.2

Storage Structures for Storm

Cellular Storage Manhole: SW02, DS/PN: 1.003

Invert Level (m) 126.350 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	10.0	10.0	5.200	0.0	20.1
0.400	10.0	15.1	5.600	0.0	20.1
0.800	10.0	20.1	6.000	0.0	20.1
0.801	0.0	20.1	6.400	0.0	20.1
1.600	0.0	20.1	6.800	0.0	20.1
2.000	0.0	20.1	7.200	0.0	20.1
2.400	0.0	20.1	7.600	0.0	20.1
2.800	0.0	20.1	8.000	0.0	20.1
3.200	0.0	20.1	8.400	0.0	20.1
3.600	0.0	20.1	8.800	0.0	20.1
4.000	0.0	20.1	9.200	0.0	20.1
4.400	0.0	20.1	9.600	0.0	20.1
4.800	0.0	20.1	10.000	0.0	20.1

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Oak House, 2 Gatley Road Cheadle Stockport, SK8 1PY				DrakeStreet, Rochdale Surface Water Network				
Date 02/02/2024				Designed by paulg				
File Drake Street SW Network...				Checked by				
Innovyze				Network 2017.1.2				
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								
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		0.271		
Region England and Wales		Cv (Summer)		0.750				
M5-60 (mm)		19.000		Cv (Winter)		0.840		
Margin for Flood Risk Warning (mm)						300.0		
Analysis Timestep		2.5		Second Increment (Extended)				
DTS Status						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, 45						
Water								
US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.
1.000	RWP	15 Winter	100	+45%				
1.001	SW01	60 Winter	100	+45%	100/15 Summer			
1.002	TANK	60 Winter	100	+45%	30/15 Summer			
1.003	SW02	60 Winter	100	+45%	1/15 Winter			
Surcharged Flooded								
US/MH	Depth	Volume	Flow /	Overflow	Pipe	Level		
PN	Name	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded
1.000	RWP	-0.071	0.000	0.54		21.6	OK	
1.001	SW01	0.265	0.000	0.43		12.0	SURCHARGED	
1.002	TANK	0.610	0.000	0.67		11.2	SURCHARGED	
1.003	SW02	0.675	0.000	0.08		4.9	SURCHARGED	
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Project Title 42- 46 Drake Street, Rochdale.
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Date 5th February 2024



Appendix E – UU Pre Development Enquiry Response