Manchester One Extension

Drainage Strategy



boothking

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This document uses revision codes in accordance with ISO EN 19650:

P##: Preliminary (non-contractual) - review, comment or approval.
C##: Contractual - Approved for stage completion.

This document uses status codes in accordance with ISO EN 19650:

Work in progress
S0: WIP

Shared (non-contractual)
S1: Coordination
S2: Information
S3: Review
S4 & S5: Approval

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A1, **An**, etc. (where "n" relates to the project stage)

This document uses project stages in accordance with the IStructE Structural Plan of Work 2020:

2: Concept
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4.5 Production Design
5: Construction
6: Handover

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1. Introduction & Scope

1.1. Introduction

Booth King Partnership Ltd. (BKP) was commissioned by Bruntwood to prepare a Drainage Strategy for the proposed extension to the Manchester One building, located at 53 Portland Street, Manchester, M1 3LD.

This Drainage Strategy has been prepared in accordance with the National Planning Policy Framework (NPPF), Planning Practice Guidance, and Environment Agency (EA) guidance, including Flood Risk and Coastal Change (www.gov.uk/guidance/flood-risk-and-coastal-change).

It is assumed that, wherever practicable, post-development ground levels will remain close to existing. Should this or any other key assumptions change, the conclusions of this report may require reassessment to confirm their continued validity.

This report is based on information obtained from the topographical survey, architectural drawings, CCTV survey, and available drainage record plans.

1.2. Scope

Booth King Partnership Ltd. was instructed to prepare a Drainage Strategy for the areas affected by the proposed extension as shown within the drainage strategy boundary in blue on Figure 1 below, which covers a total area of 0.131 Ha. The site is located within Flood Zone 1 and the strategy has been prepared to support a planning application to Manchester City Council.

This report sets out the proposed drainage strategy for the site affected and describes how the system will be managed and maintained over time to ensure it continues to operate effectively.



Figure 1. General Arrangement Plan

It has been considered that Flood Risk Assessment is not necessary for the following reasons:
• The site is smaller than 1ha in size
• The site is in Flood Zone 1
• The site is at low surface water flood risk
• The site is not in a reservoir inundation zone

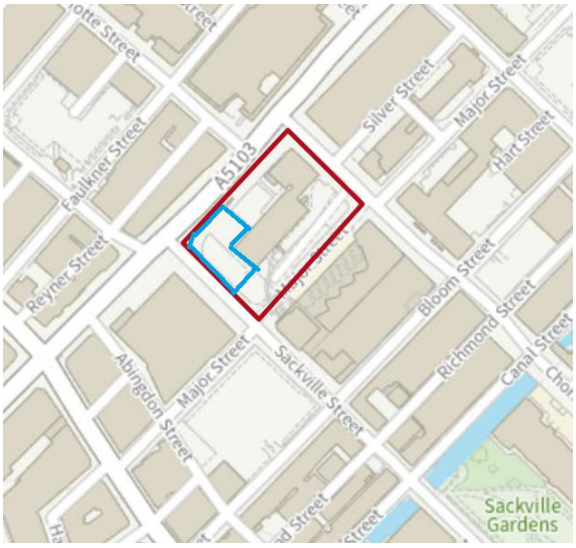


Figure 2. Flood Zone Map (Appendix E)

- A Phase I and Phase II Site Investigation has been prepared by NX (reference NX587). The investigation indicates that the site comprises approximately 3.7 m of made ground, underlain by brown sandy gravelly clay. Based on these ground conditions, infiltration drainage is not considered viable for this site.

- The brownfield runoff rate for the proposed extension site has been calculated as 17.3 l/s. A restricted discharge rate of 5.0 l/s is proposed, providing far more than 50% betterment for all storm events. The table below presents the proposed discharge rates for all return periods, demonstrating an improvement to the existing drainage network. The drainage system will be designed to accommodate a 1 in 100 year storm event plus 45% allowance for climate change.

Storm Event	Brownfield Flow Rates	Proposed Flow Rates
2	17.3 l/s	5 l/s
30	43.1 l/s	5 l/s
100	54.4 l/s	5 l/s
100 + 45% cc	78.3 l/s	5 l/s

- Foul water discharge rates are to be confirmed by the M&E consultant and submitted to United Utilities once available.

- Sustainable Drainage Systems (SuDS) will be incorporated and maintained for the lifetime of the development. Filter drains are proposed to intercept surface water runoff from hardstanding areas.

- Further investigation is required to confirm that the 525 mm diameter United Utilities combined sewer encroaching the site is fully abandoned. Previous survey information recorded significant debris within the pipe and indicated that it was abandoned; however, formal confirmation from United Utilities is required.

2. Existing Site

2.1. Location

The site is located at 53 Portland Street, Manchester, M1 3LD, where is located Manchester One building and adjacent hardstanding and landscaping area. The site affected by the drainage strategy covers an area of approximately 0.131 Ha (shown bounded in blue in Figure 3 below), and it is located at Ordnance Survey Grid reference E: 384259, N: 397953.

The Site Location Plan can be found in Appendix A.

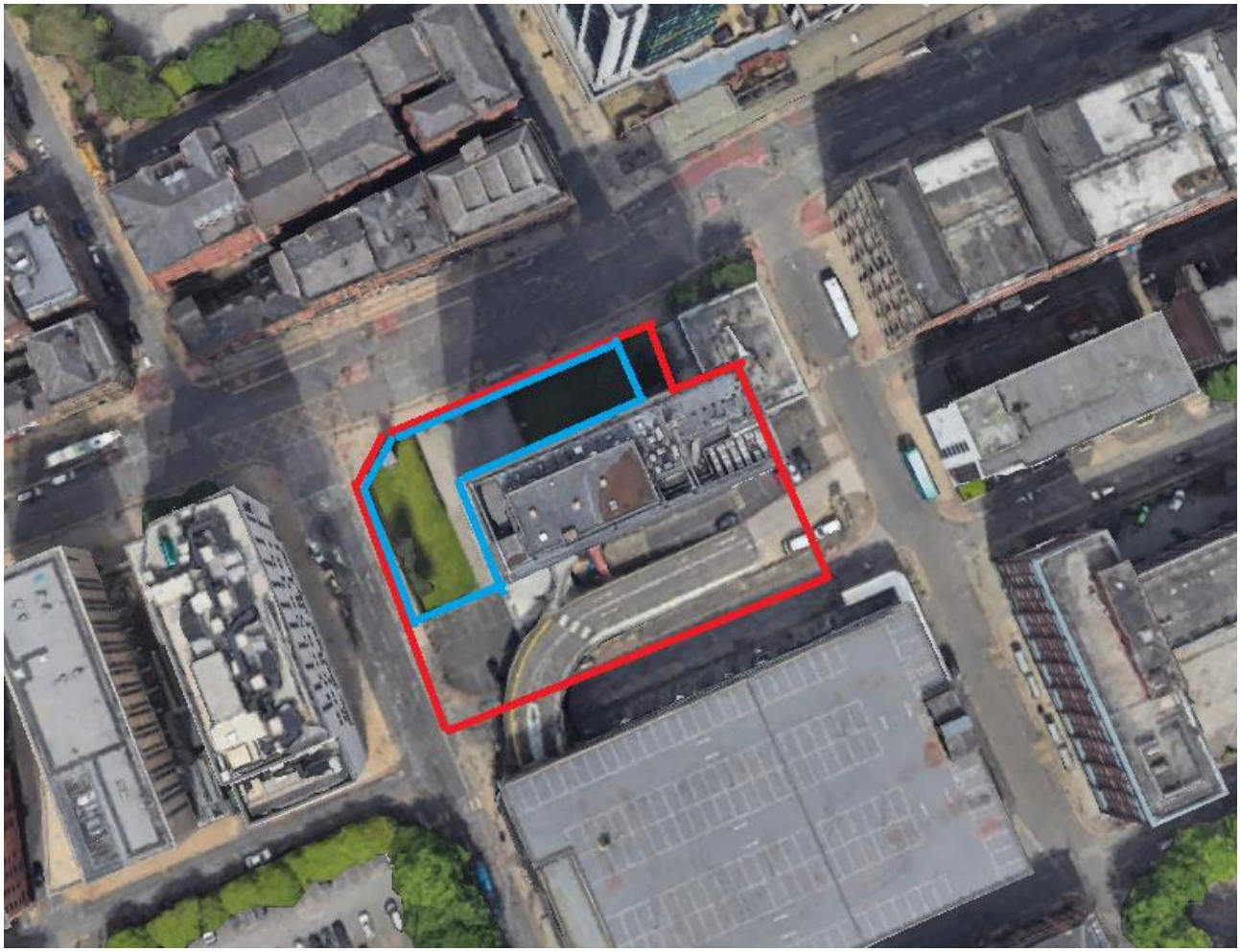


Figure 3. Existing Site

2.2. Site Levels

A topographic survey of the site shows that the site levels vary from 43.6500m AOD, at the north boundary of the site and the lowest level of 42.9m AOD at the south part of the site.

The topographical survey is contained in Appendix B.

2.3. Existing Drainage

A private drainage network currently serves the Manchester One building and the adjacent hardstanding areas. A drainage survey, included in Appendix C, confirms that this network connects to a final combined manhole within the overall site boundary which then discharges into the United Utilities (UU) combined public sewer in Portland Street.

United Utilities records, provided in Appendix D, together with the drainage survey, identify an existing UU combined sewer encroaching into the site from Chamber no 2914 in Sackville Street. This pipe, with a diameter of 525 mm, served Silver Street, which ran along the line of Manchester One but was almost completely destroyed during WW2. The sewer was observed during a previous survey and found to be full of debris and collapsed and is understood to be abandoned. Further investigations will be undertaken to confirm its status, and discussions will be held with United Utilities to formally record this sewer as abandoned.

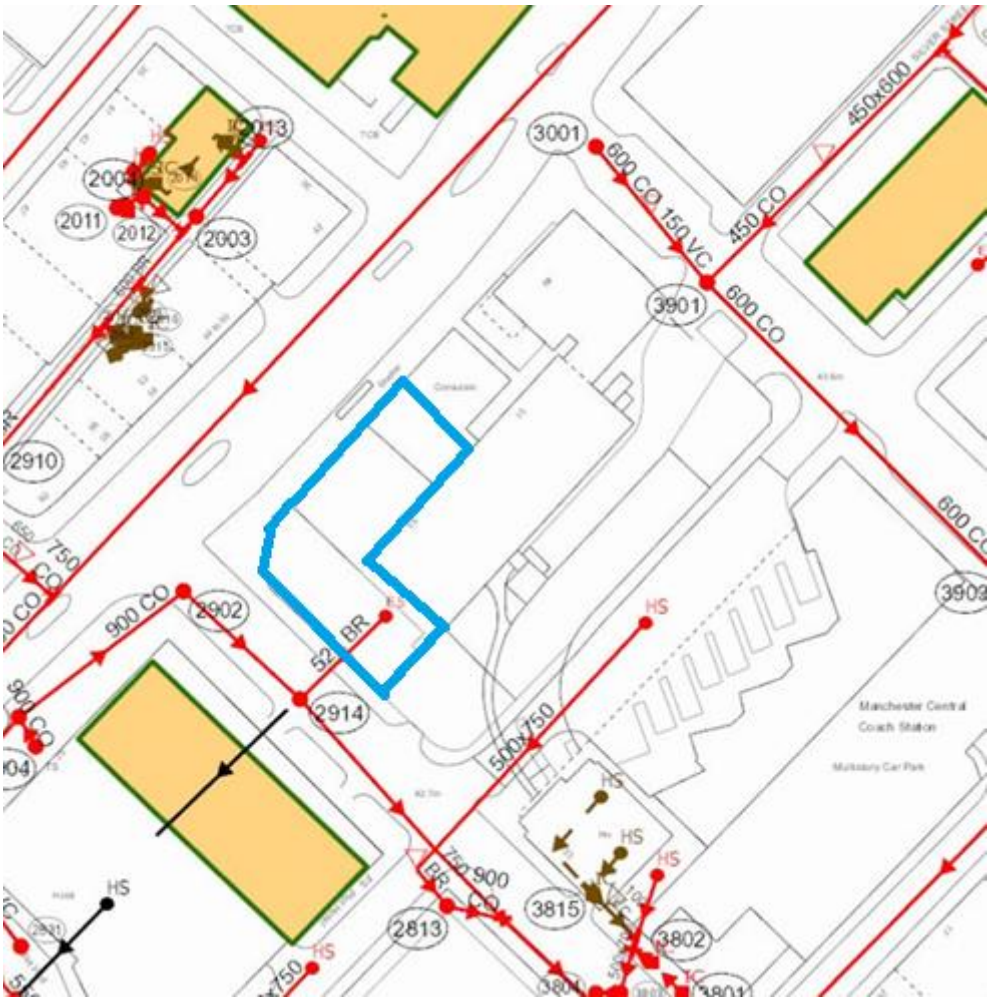


Figure 4. United Utilities Sewer Records Extract (Proposed Extension site shown in blue)

3. Surface Water

In accordance with the NPPF and SFRA, consideration should be given to natural water flows at the site. The development should be safe for its lifetime and should not adversely affect flow or increase flood risk elsewhere, including increasing run-off rates. The disposal of surface water should be dealt with in a sustainable way and climate change should also be accounted for. The site drainage strategy is discussed in Section 4.

3.1. Climate Change

There is evidence to suggest that the climate is changing with sea levels predicted to continue to rise along with more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall. The NPPF recommends that the effects of climate change be accounted for in FRA, with consideration of the EA flood maps and local authority SFRA.

Increased rainfall or higher intensity short-duration rainfall may increase as a result of climate change. The Department for Environment Food & Rural Affairs have developed an interactive map and requires all new development to allow for a 45% increase in rainfall to allow for climate change for peak rainfall allowances.

A 45% increase is therefore being allowed for within the new surface water drainage design to take account of climate change.

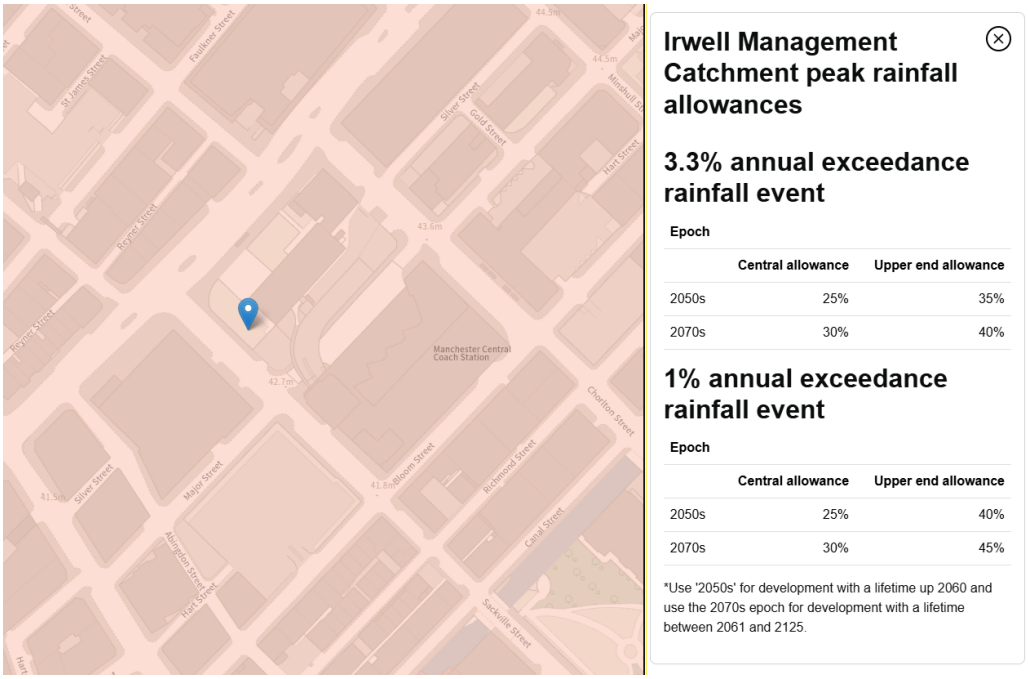


Figure 5. Climate Change Allowance Interactive Map

3.2. Sustainable Drainage Systems (SuDS)

SUDS are a desirable way to manage surface water disposal within new developments and SUDS methods for surface water drainage management are discussed further within the SUDS Manual.

The types of benefits that can be achieved by SUDS will be dependent on the site, but fit broadly into four categories: water quantity, water quality, amenity and biodiversity. These are also referred to as the four pillars of SUDS design (Figure 10):

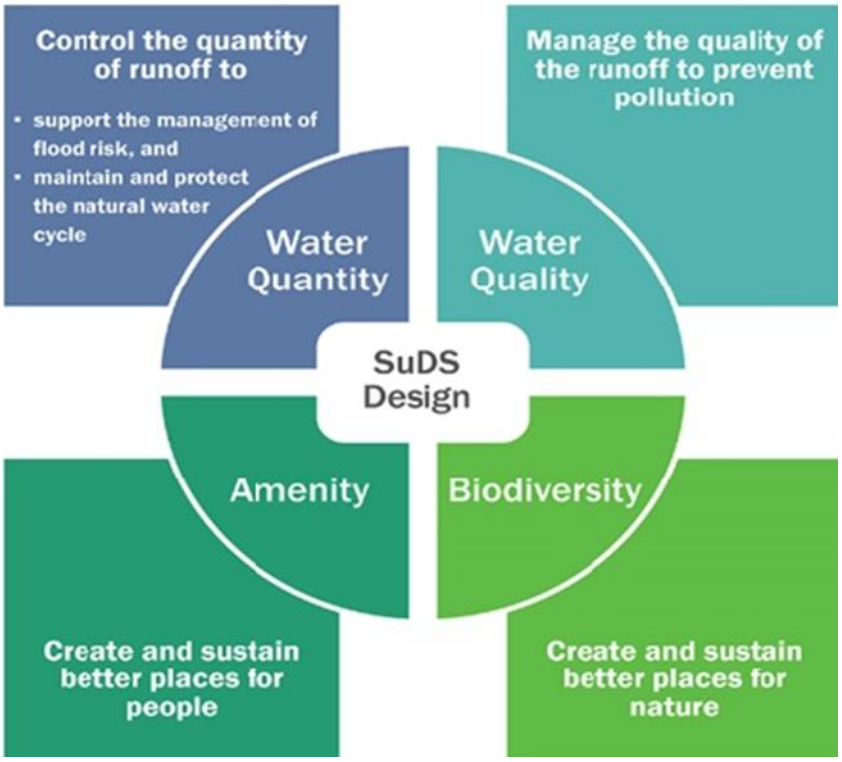


Figure 6. Four Pillars of SuDS

The proposed development will address the above 4 pillars of SuDS design criteria with the inclusion of a range of sustainable features through a comprehensive treatment train.

- **Water Quantity**: the quantity of run-off from the site will be unchanged, but will be released from the site at a significantly reduced flow, as set out in more detail in the Drainage Strategy in Section 5, whilst taking account of likely increases in future rainfall due to climate change.
- **Water Quality**: the quality of run-off from the site is improved by the inclusion of cellular attenuation tank, allowing for settlement of particles in the water. The flows arising from the building roofs will initially be treated via a network of pipes. All flows will be collated within the site prior to discharge into existing private network.
- **Biodiversity** will be addressed by the existing green areas and vegetation areas around the overall development, as well as by the inclusion of a significant planting regime creating a better environment for nature to thrive.
- **Amenity** is provided through the proposed green areas, which presents the opportunity to create visually attractive areas within the proposed site which have the ability to connect people to water. Such features have been shown to improve the well-being of people that live within the proposed development.

4. Drainage Strategy

It is proposed to erect a new extension to the commercial building with associated landscape areas; refer proposed drainage general arrangement for layout provided in Appendix F.

4.1. Proposed Foul Water Network

Additional foul water flow from the proposed extension will be limited to the ground floor only and will connect into the existing private foul system on the site, prior to its connection into the Adopted combined sewer system in Portland Street.

The Drainage Strategy drawings can be found in Appendix E.

4.2. Proposed Surface Water Network

Sustainable drainage, developed in accordance with the principles of sustainable development, is collectively known as Sustainable Drainage Systems (SuDS). At a given site, SuDS are designed to manage the environmental risks associated with urban runoff while also enhancing the surrounding environment where possible. The key objectives of SuDS are to minimise the impact of development on both the quantity and quality of surface water runoff, while maximising opportunities for amenity and biodiversity enhancement (CIRIA C753, 2015).

The 'Management Train Approach' should form the foundation of the surface water drainage strategy for the proposed development. Its primary aim is to treat and control runoff as close to the source as possible, thereby protecting downstream environments and enhancing the site's overall amenity value.

This approach applies a hierarchy of drainage techniques to progressively reduce pollution, flow rates, and stormwater discharge volumes from the site. The key stages are outlined below:

1. Prevention – Incorporating good site design and management practices to minimise runoff and pollution, including the use of rainwater harvesting and reuse systems.
2. Source Control – Managing runoff at or near its point of origin through measures such as soakaways, green roofs, and permeable pavements.
3. Site Control – Managing surface water at a local scale using methods such as below-ground storage or attenuation systems, detention basins, and large infiltration devices.
4. Regional Control – Managing surface water from multiple areas or sites through features such as wetlands and balancing ponds.

SuDS techniques can be applied to all development sites; however, an assessment of the existing site conditions is necessary to identify any potential limitations.

- Land Use Characteristics: The size and nature of the development plot provide opportunities to incorporate a variety of source control and site control SuDS features, both above and below ground.
- Site Characteristics: The presence of cohesive clay soils and potential ground contamination render infiltration-based SuDS techniques unsuitable.
- Catchment Characteristics: The site is classified as brownfield land.

Infiltration has been determined to be unfeasible as confirmed in the NX site investigation report and is therefore excluded from consideration as a drainage solution.

The proposed design philosophy is as follows:

- Surface water will be treated using the 'Management Train' approach, ensuring contaminants are removed and contained within SuDS features prior to discharge.
- Due to the presence of made ground and cohesive clay soils, infiltration techniques are not considered viable.
- The site will discharge to the combined sewer system in Portland Street at a controlled rate of 5.0 l/s, with an indirect connection into the existing private combined sewer system.
- Source control measures will include the use of water butts and filter drains where possible.
- The design will seek to minimise the proportion of impermeable surfaces within the development wherever practicable.

The outline drainage strategy involves collecting runoff from roof areas and other hardstanding surfaces and conveying it via new below-ground surface water drainage pipework, which will ultimately discharge into the combined sewer system.

Although the site is clasified as a brownfield site, in this case it is propose to allow more than 50% betterment for all storm events.

Storm Event	Brownfield Flow Rates	Proposed Flow Rates
2	17.3 l/s	5 l/s
30	43.1 l/s	5 l/s
100	54.4 l/s	5 l/s
100 + 45% cc	78.3 l/s	5 l/s

Figure 7. Brownfield Run Off Calculation

The site drainage network will be designed in accordance with current best practice to have sufficient capacity not to flood both during the critical 1 in 30-year storm (plus 40% allowance for climate change) and 1 in 100-year storm event (plus 45% allowance for climate change). In this way the risk of off-site flooding, which could result in damage to other buildings and essential services, will be minimised and the risk of flooding elsewhere should not be increased as a result of the development proposals.

A Hydrobrake flow control device which controls the rate of discharge into the final combined manhole will be incorporated on the surface water system.

Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, French drains with silt traps or by the use of Sustainable Drainage techniques.

Further discussion with the appropriate approving bodies will be required to finalise the Drainage Strategy.

Causeway Flow output for the Critical Storm is enclosed in Appendix G.

5. Conclusion

This Drainage Strategy has been prepared by Booth King Partnership Ltd. (BKP) on behalf of Bruntwood. in support of the planning application for the proposed development at Manchester One, Portland Street, Manchester, M1 3LD.

The strategy has been undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF), Planning Practice Guidance: Flood Risk and Coastal Change, Environment Agency (EA) guidance, and the Local Strategic Flood Risk Assessment (SFRA) Levels 1 and 2.

The key findings of this assessment are summarised as follows:

- The site is located entirely within Flood Zone 1, indicating a low probability of fluvial or tidal flooding in accordance with EA mapping.
- There are no recorded historic flood events affecting the site. The risk of flooding from reservoirs, sewers, or artificial sources is considered low.
- The risk of groundwater flooding is assessed as low, based on site levels and the proposed finished floor levels which will be set at or above existing ground levels to mitigate residual risk.
- The risk of surface water flooding is considered to be very low within the site boundary. Localised ponding identified to the north-east lies outside the development footprint and does not pose a risk to the proposed buildings.

Surface water management for the proposed development has been designed in accordance with Sustainable Drainage System (SuDS) principles and the Management Train Approach, ensuring treatment and attenuation of runoff as close to source as practicable.

Due to the presence of cohesive clay soils and potential ground contamination, infiltration-based SuDS techniques are not considered viable. As such, the proposed drainage strategy will discharge to the combined sewer in Portland Road at a controlled rate of 5.0 l/s for the 1 in 100-year event, including a 45% allowance for climate change, in agreement with United Utilities.

The proposed surface water drainage network has been designed to ensure:

- No flooding occurs within the site for up to the 1 in 30-year storm event (+40% CC); and
- All surface water is safely managed on site during the 1 in 100-year storm event (+45% CC) without increasing flood risk to third parties.

Source control measures, including incorporating permeable paving and water butts where practicable, together with site control features such as filter drains and attenuation, have been incorporated to reduce runoff volumes, improve water quality, and deliver biodiversity and amenity benefits.

The proposed foul water drainage system will discharge to the existing combined sewer via new manholes constructed as part of the proposed extension.

Overall, the proposed development will:

- Not increase flood risk to the site or surrounding areas;
- Will be safe for its lifetime
- Provide a sustainable and robust drainage solution; and
- Comply with NPPF, EA, and local planning policy requirements for flood risk management and surface water control.

It is therefore concluded that the proposed development is appropriate in flood risk terms and that the proposed drainage strategy is technically feasible, sustainable, and in full accordance with relevant planning and environmental standards.

6. Maintenance Plan

The Drainage network has been designed with minimal maintenance in mind. The maintenance is generally of a 'common sense' approach and is to comprise:

- Regular day to day care: - litter collection, grass cutting and checking the inlets and outlets where water enters or leaves a drainage feature.
- Occasional tasks: - managing vegetation in wet areas and removing any silt that builds up in the drainage features.
- Remedial work: - repairing damage when, and where, necessary.

Specific recommendations for each feature are provided in the following sections and should be referred to in the first instance if there are any issues. Please contact Booth King Partnership Ltd if any further advice is required.

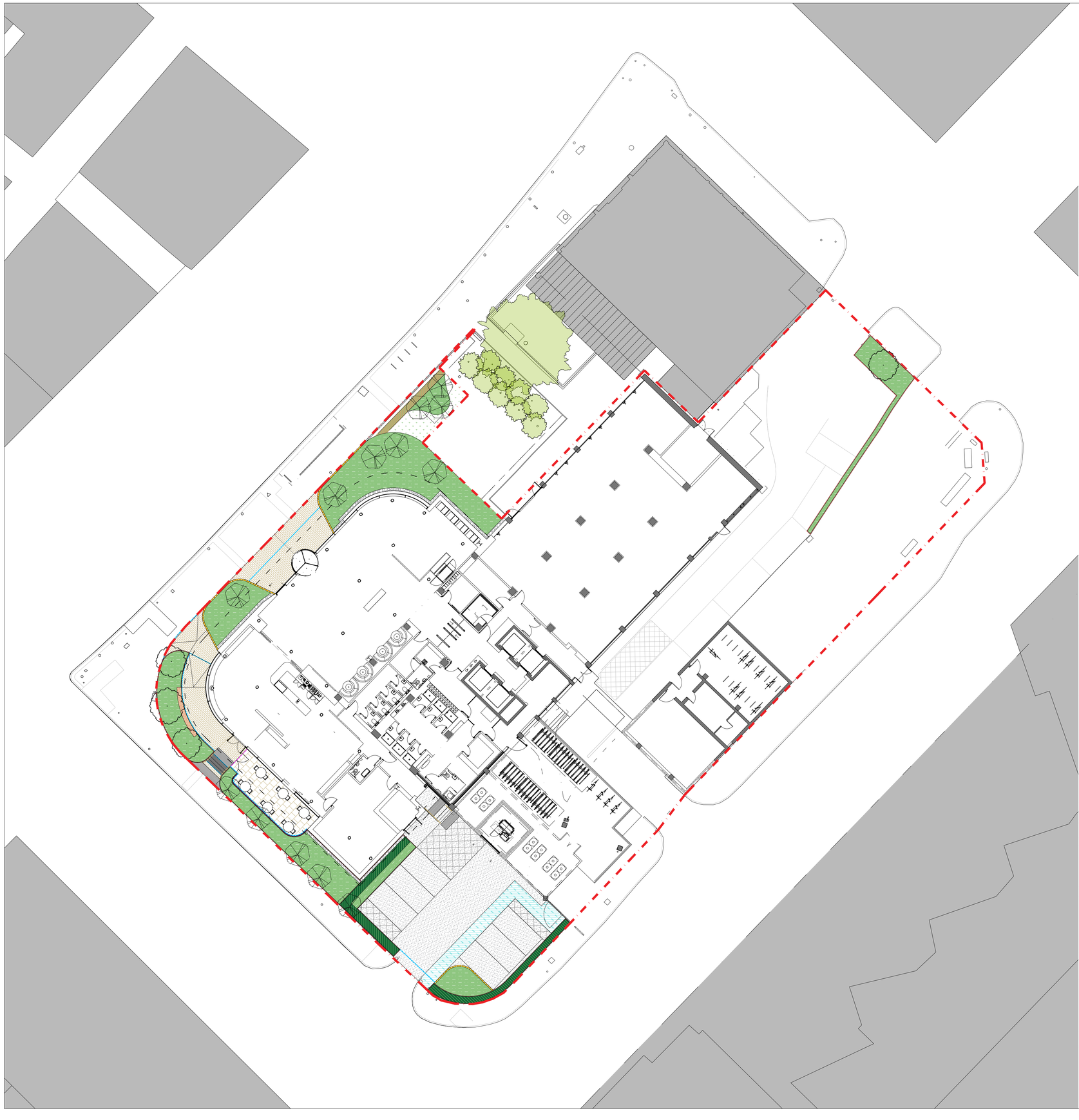
During the works the Contractor, subject to agreement from their client, will ensure that all drains on which the proposed drainage works rely will be jetted out and made good as required to ensure correct operation.

Maintenance Activity	Required Action	Frequency
Inspection	▪ Inspect for sediment and debris in pre-treatment component such as gullies, sump units and catch pits.	Monthly for the first year and on a 6-monthly basis thereafter.
Gutters	▪ Clear gutters and any leaf guards.	On a 6-monthly basis or as required following inspection regime.
Sump Units	▪ Remove all obstructions and debris from all sump units (gullies, channels and catch pits).	On a 6-monthly basis or as required following inspection regime.
Pipe Work	▪ Inspect all pipework for all silt accumulation and high pressure jet any pipe work which has silt accumulation. Care is to be taken that any silts within the pipework are not flushed using chamber bungs.	On a 6-monthly basis or as required following inspection regime.
Manholes	▪ Covers should be lifted and inspected for litter and debris to ensure that the runs are free flowing.	On a 6-monthly basis or as required following inspection regime.
Attenuation tank	▪ Tank should be jetted through to clean out any debris or silt that has settled.	Every 12 months or less subject to inspection of the condition of the adjacent manhole chambers
Flow Control	▪ Check flow control manhole to ensure emptying is occurring.-Little to no water should be present after consecutive days of dry weather. ▪ Check function of the emergency drain down. ▪ Check for build-up of debris and silt. ▪ Clear and remove as necessary.	6 monthly basis. After extreme events.

7. References

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13.	EA: Accounting for residual uncertainty: updating the freeboard guide. Report – SC120014
14.	Code of Practice Flows and Loads – 4 Sizing Criteria, Treatment Capacity for Sewage Treatment Systems
15.	PLACES FOR EVERYONE JOINT DEVELOPMENT PLAN DOCUMENT FOR BOLTON, BURY, MANCHESTER, OLDHAM, ROCHDALE, SALFORD, TAMESIDE, TRAFFORD AND WIGAN 2022 to 2039 ADOPTED 21 MARCH 2024

APPENDIX A – PROPOSED GENERAL ARRANGEMENT PLAN



LEGEND

APPROX.
SITE BOUNDARY

SURFACES

SURFACE TYPE 01 -
CARPARK

SURFACE TYPE 02 -
CLAY PAVERS

SURFACE TYPE 03 -
STEPS

SURFACE TYPE 04 -
HAZARD WARNING TACTILE PAVING

SURFACE TYPE 05 -
AMENITY PAVING

SURFACE TYPE 06 -
PAINTED TARMAC FOR CYCLE PATH

SURFACE TYPE 07 -
GRAVEL STRIP

SOFT LANDSCAPE

PROPOSED TREE PLANTING

PROPOSED MULTI-STEM TREE PLANTING

EXISTING TREES

EXISTING HEDGEROW TO BE
RETAINED

PLANTING TYPE 01 -
TURF

PLANTING TYPE 02 -
ORNAMENTAL PLANTING

PLANTING TYPE 03 -
NATIVE HEDGEROW
POTENTIAL OF RELOCATION OF
EXISTING HEDGEROW ON SITE

FURNITURE TYPE

FURNITURE TYPE 01 -
TIMBER TOP BENCH WITH CONCRETE BASE
STREET LIFE OR SIMILAR APPROVED

FURNITURE TYPE 02 -
HAND RAIL TO STEPS

EDGE TYPE

PROPOSED DRAIN

EDGE TYPE 01 -
RAISED KERB TO MATCH EXISTING KERB
ALONG PORTLAND STREET

EDGE TYPE 02 -
1.1M FRAMELESS GLASS BALUSTRADE

EDGE TYPE 03 -
METAL PLANTER EDGE

EDGE TYPE 04 -
PROPOSED SUBSTATION FENCE
TO ARCHITECT'S SPECIFICATION

EXISTING KERB TO BE RETAINED

0 10m

North

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All dimensions are to be checked on site.
Area measurements for indicative purposes only.

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BRUNTWOOD

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Drawing title

GENERAL ARRANGEMENT PLAN -
GROUND FLOOR

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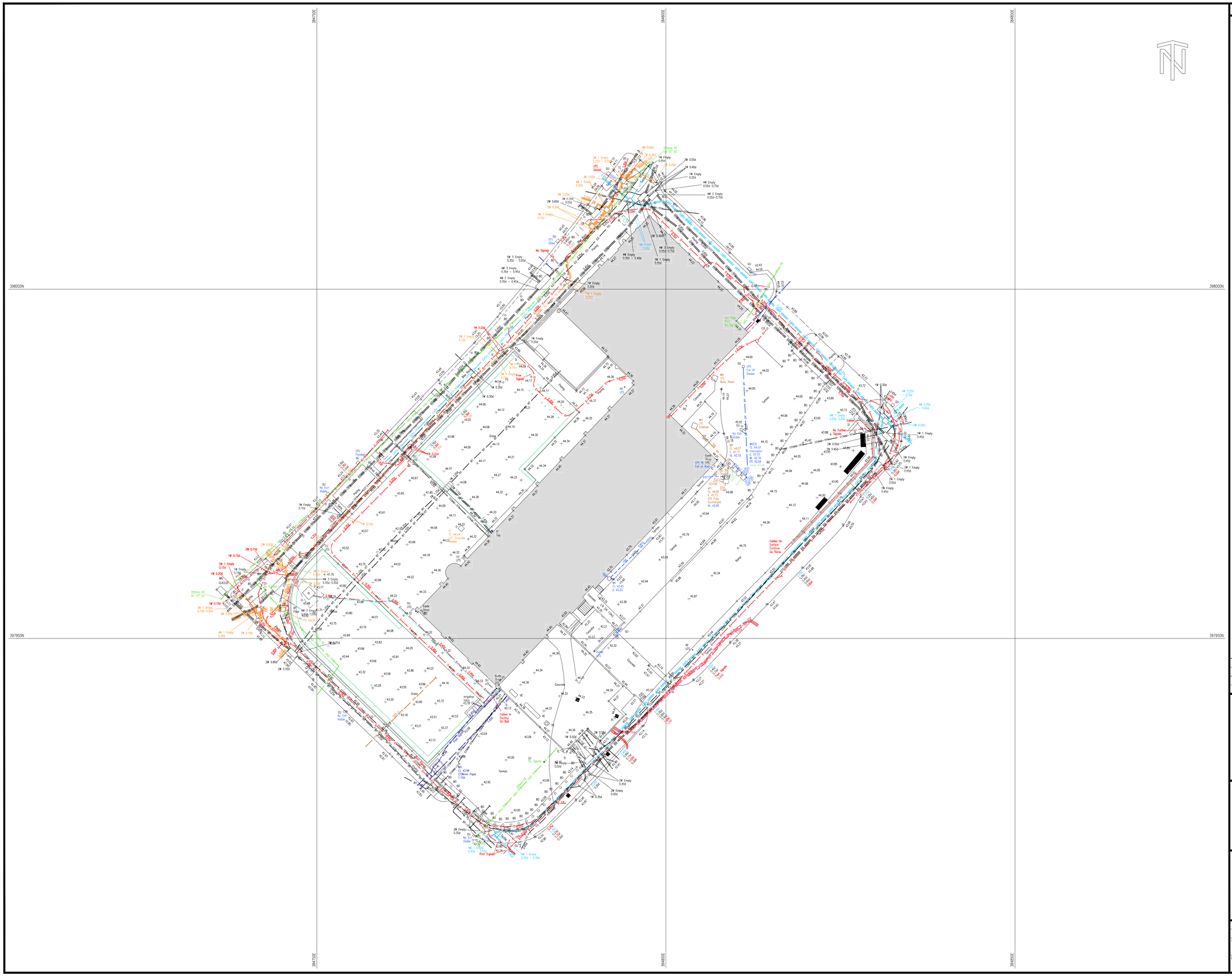
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Revision

P02

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APPENDIX B – TOPOGRAPHICAL SURVEY



NOTES

KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

STANDARD ABBREVIATIONS

STREET FURNITURE

A/C - AIR CONDITIONING
AE - AERIAL
AL - ALARM
AV - ASSET VALVE
BA - BUOYANCY AID
BB - BELISHA BEACON
BD - BUILDING DIVIDE
BH - BOREHOLE
BI - BOLLARD ILLUMINATED
BL - BASEMENT LIGHT
BO - BOLLARD
BP - BOUNDARY POST
BR - BOULDER
BS - BUS STOP
BU - BUSH
CA - CABLE
CB - CONTROL BOX
CC - CLOSE CIRCUIT TV
CIB - CIGARETTE BIN
Col - COLUMN
CT - CLOSE CIRCUIT TV POLE
DP - DOWN PIPE
DR - DRAIN
Dr Ch - DRAINAGE CHANNEL
DU - DUCT
EL - ELECTRIC
EP - ELECTRICITY POLE
ER - EARTH ROD
FA - FENDOR ANCHOR
FB - FLOWER BED
FH - FIRE HYDRANT
FL - FLOODLIGHT
FS - FLAG STAFF
GA - GAS
GM - GAS METER
G - GIRTH
GP - GATE POST
GU - GULLY
GV - GAS VALVE
Hyd - HYDRANT
IC - INSPECTION COVER
JT - TRAFFIC COVER
JB - JUNCTION BOX
KO - KERB OFFLET
LA - LADDER
LB - LITTER BIN
LC - LIGHTING COLUMN
LI - LIGHT
LP - LAMP POST
MBO - MOORING BOLLARD
MA - MAST
MH - MANHOLE
MO - MONUMENT
MP - MILE POST
MR - MOORING RING
MW - MONITORING WELL
NP - NAME PLATE
OH - OVERHEAD
OSBM - ORDNANCE SURVEY BENCH MARK
PA - PLAY APPARATUS
PB - PILLAR BOX
PH - PUBLIC HOUSE
PI - PIPE
PL - PLANT
PM - PARKING METER
PN - PLANTER
PO - POST
PP - PETROL PUMP
RH - RIDGE HEIGHT
RS - ROAD SIGN
RI - ROAD SIGN ILLUMINATED
RTW - RETAINING WALL
RWP - RAINWATER PIPE
SA - STANCHION
SC - SPEED CAMERA
SD - SATELLITE DISH
SF - SAFETY FENCE
SG - SIGNAL
SI - SIGN
SI - SIGN ILLUMINATED
SMP - SERVICE MARKER POST
SS - SECURITY SENSOR
ST - STOP TAP
SU - STUMP
SV - STOP VALVE
SW - SWITCHGEAR
SY - STAY
TA - TANK
TBM - TEMPORARY BENCH MARK
TCB - TELEPHONE CALL BOX
TE - TELEPHONE
TM - TICKET MACHINE
TS - TRAFFIC SIGNAL
TP - TELEGRAPH POLE
UTL - UNABLE TO LIFT
VDP - VEHICLE DETECTOR PAD
VP - VENT PIPE
WE - WATER TO BELOW
WM - WATER METER
WO - WASH OUT
WP - WASTE PIPE

FENCE TYPES

BW - BARBED WIRE
CB - CLOSE BOARDED
CI - CORRUGATED IRON
CP - CONCRETE PANEL
HR - HANDRAIL
MW - MESH RAILING
PAL - PALISADE
P/C - POST & CHAIN
P/P - POST & PANEL
P/R - POST & RAIL
PRB - PEDESTRIAN SAFETY BARRIER
P/W - POST & WIRE
W/M - WIRE MESH

LEVELS

BL43.45 - BED LEVEL
EV43.45 - EAVE LEVEL
IL43.45 - INVERT LEVEL
43.45 - SPOT LEVEL
RF43.45 - ROOF LEVEL
RL43.45 - RIDGE LEVEL
SB43.45 - SOFFIT BED LEVEL
SL43.45 - SOFFIT LEVEL
TH43.45 - THRESHOLD LEVEL
WL43.45 - WATER LEVEL

SYMBOLS

HEDGE
GATE
BUILDING
TREE CANOPY
CONTROL STATION
EMBANKMENT
TREE
BUSH

UNDERGROUND SERVICE KEY

Foul/Combined water drain
Foul/Combined drain 300D and above
Surface water drains
Surface water drain 300D and above
Combined Water Drain
Surface water drain 300D and above
End of trace
Electric cables
HV cables
Gas
Water
Telephone
Catv
CCTV
Comms
Fibre Optics
Pipe
Vents
Fuel
Offsets
Vapour Recovery
Gauge Lines
Unidentified GPR
Unidentified EML
Taken From Records
Assumed Routes
Empty Ducts
Earth Rod
Rising Main
Overhead
Heating Pipes
Traffic Signals
Multi User
Trench Scar
Service Duct

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

AR - assumed route
BD - bed dip
BG - backdrop
CP - cable pit
CL - cover level
CR - cable riser
DD - drain down
EBD - external back drop
EOT - end of trace
EP - electricity pole
FH - fire hydrant
FL - flooded
GV - gully
GV - gas valve
HOR - head of run
HL - high level
IC - inspection chamber
IBD - internal back drop
IL - invert level
MH - manhole
PI - pipe riser
PB - pipe riser
RS - rodding eye
RWP - rainwater pipe
SL - silted
SL - silt level
SV - stop valve
SVP - soil vent pipe
TE - trapped exit
TFR - taken from records
TP - telegraph pole
UDO - unable to determine outfall
UTF - unable to find
UTL - unable to lift
UTS - unable to survey
UTT - unable to trace
VP - vent pipe
WL - water level
WM - water meter
WO - wash out valve

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS SURVEY. WHERE POSSIBLE, THESE HAVE BEEN VERIFIED BY EXCAVATION. THE DATA SHOWN UNDERGROUND UTILITIES ARE BELIEVED TO BE ACCURATE AND OF THE HIGHEST QUALITY, HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT AVAILABLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

N D OLIVER & CO LTD HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS IS (FIRST, SIZES, MATERIALS) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE DEPTHS, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED, DEPTHS ARE GENERALLY WITHIN +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED, ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE, GRANTY SERVICE AND DRAINS ARE USUALLY TO INVERT (SHOE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT N D OLIVER & CO LTD WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS, HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILISING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

Rev	Date	Drawn	Description	Ch'k'd	App'd

N D OLIVER & CO
CHARTERED GEOMATIC SURVEYORS
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E: mail@ndoliver.com www.ndoliver.com

Client

BRUNTWOOD
UNION, 2-10
ALBERT SQUARE
MANCHESTER
M2 6LW

Title

MANCHESTER ONE
53 PORTLAND ST
MANCHESTER, M1 3LD

TOPOGRAPHICAL & UTILITIES SURVEY
SHEET 1 OF 1

Surveyed	TB	Drawn	BW/AU	Drawn Date:	11/12/2024
Checked	AM	Approved	NDO		
Scale	1:250 @ A1	Project	13094	Status	ORIG
		CAD File	P:\13094\DRAWINGS\13094_001.DWG		
Drawing No	13094 / 001			Rev	0

APPENDIX C – SITE DRAINAGE SURVEY

AQUABLAST
DRAINS & SEWERAGE

BRITISH WATER
expertise worldwide

CHAS®
Accredited Contractor
CHAS.co.uk

Environment Agency

MANCHESTER ONE
DRAIN SURVEY
29.01.26

AQUABLAST
DRAINS & SEWERAGE

RECOMMENDATIONS.

1. The main 225mm dia drain from MH 8 still requires inspecting once UU have fixed the issue after Manchester one's boundary.

2. There are 2x buried manhole chambers that will require inspecting if and when they are exposed during the construction works.

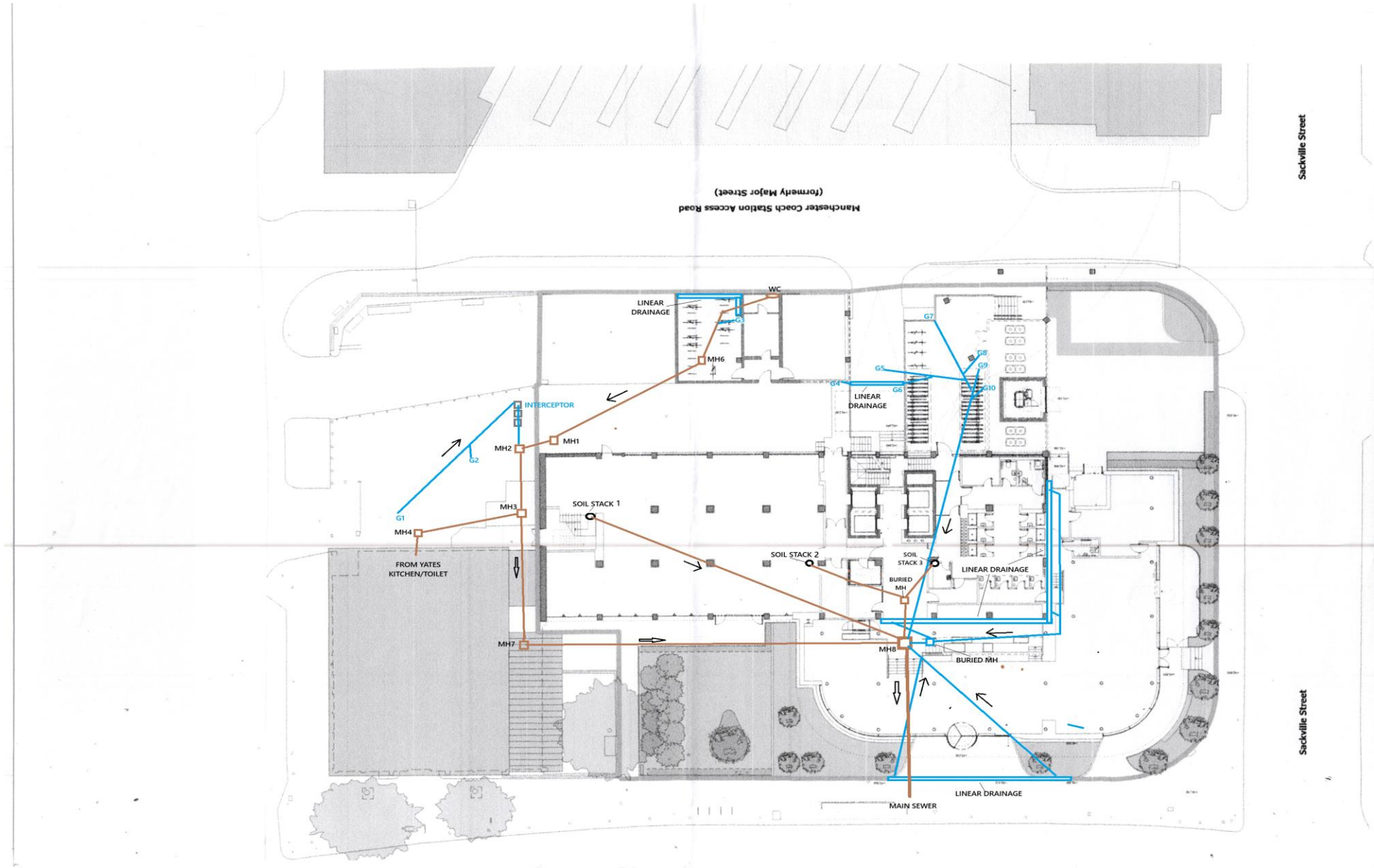
3. The drains to the rear of Yates require extensive work, This would best be discussed in addition to this survey.

4. Installing a non return for the basement sub station would reduce the risk of future flooding and should be fairly straight forward

5. AN ADDITIONAL UPDATED RECOMMENDATIONS REPORT FOR THE DRAIN ISSUES IDENTIFIED WILL FOLLOW WITH COST REPAIRS.

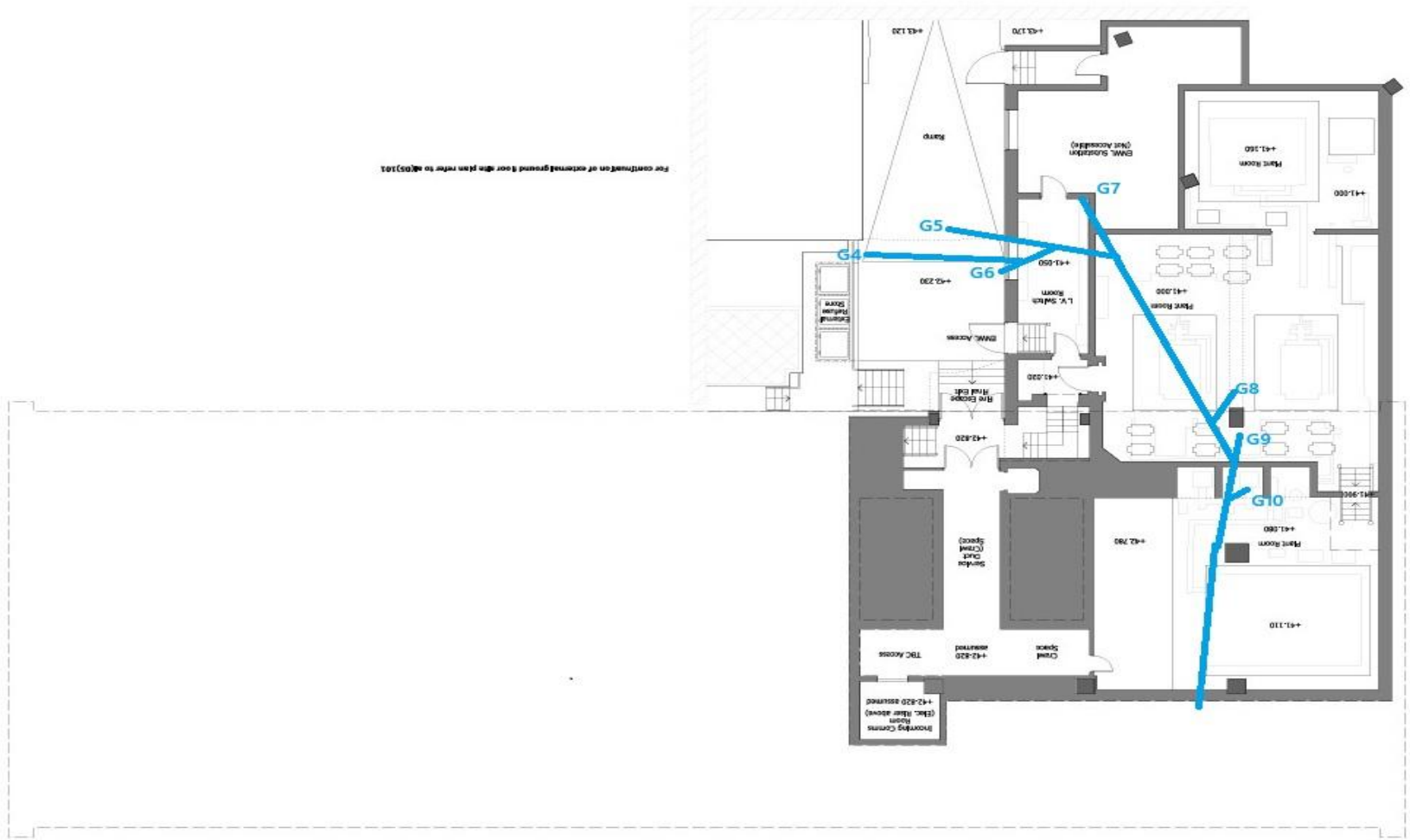
AQUABLAST
DRAINS & SEWERAGE

Drainage plan Manchester One



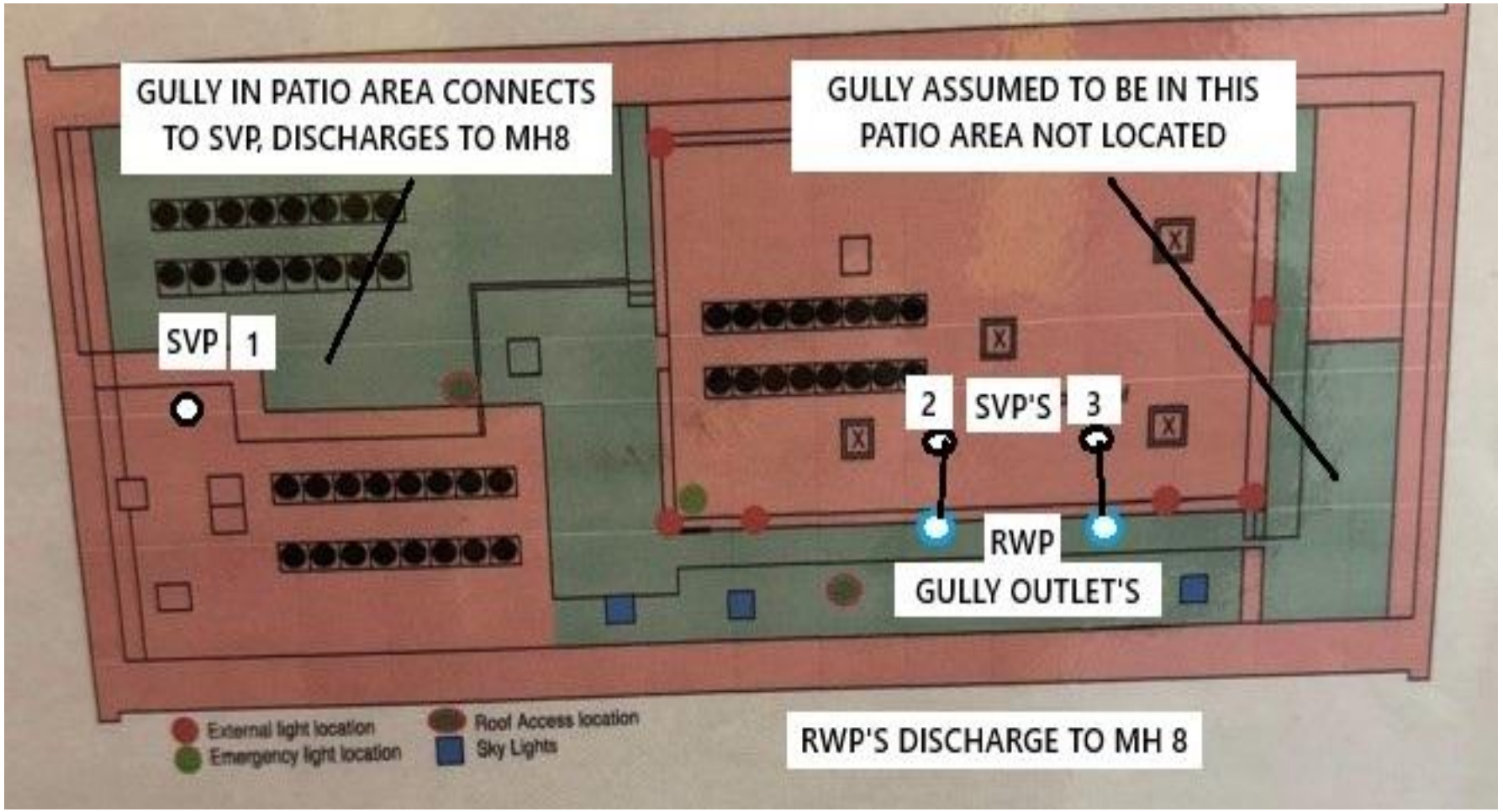
AQUABLAST
DRAINS & SEWERAGE

Basement Drainage plan Manchester One



Roof Drainage plan Manchester One.

The Soil vent pipes (SVP) appear to pick up the roof's rainwater runoff; two patio areas have gully outlets but have not been located. The pipes are cast 6" cast iron and have not had a condition survey.
Some maintenance points have been highlighted to the building team to avoid blockages, which is being address.







AQUABLAST
DRAINS & SEWERAGE

MANHOLE CHAMBER 1 Drainage plan Manchester One.

The manhole chamber base is collapsing and has a large void below.
The brick walls are also showing signs of collapsing due to no ground support.





AQUABLAST
DRAINS & SEWERAGE

INTERCEPTOR Drainage plan Manchester One.

The oil interceptor does not function as it was intended and is full of fat from Yates due to cook oil/fats being poured down the gully.
The manhole cover requires replacing.
It is recommended the interceptor is removed as part of other recommendations for drainage in the area of Manchester one to the rear of Yates.



AQUABLAST
DRAINS & SEWERAGE

MANHOLE CHAMBER 2 Drainage plan Manchester One.

Manhole chamber has always been blocked when we have been carrying out PPM. The drain coming from MH1 is 6” and then reduces to 4” and continues in 4” through MH3, MH7 .



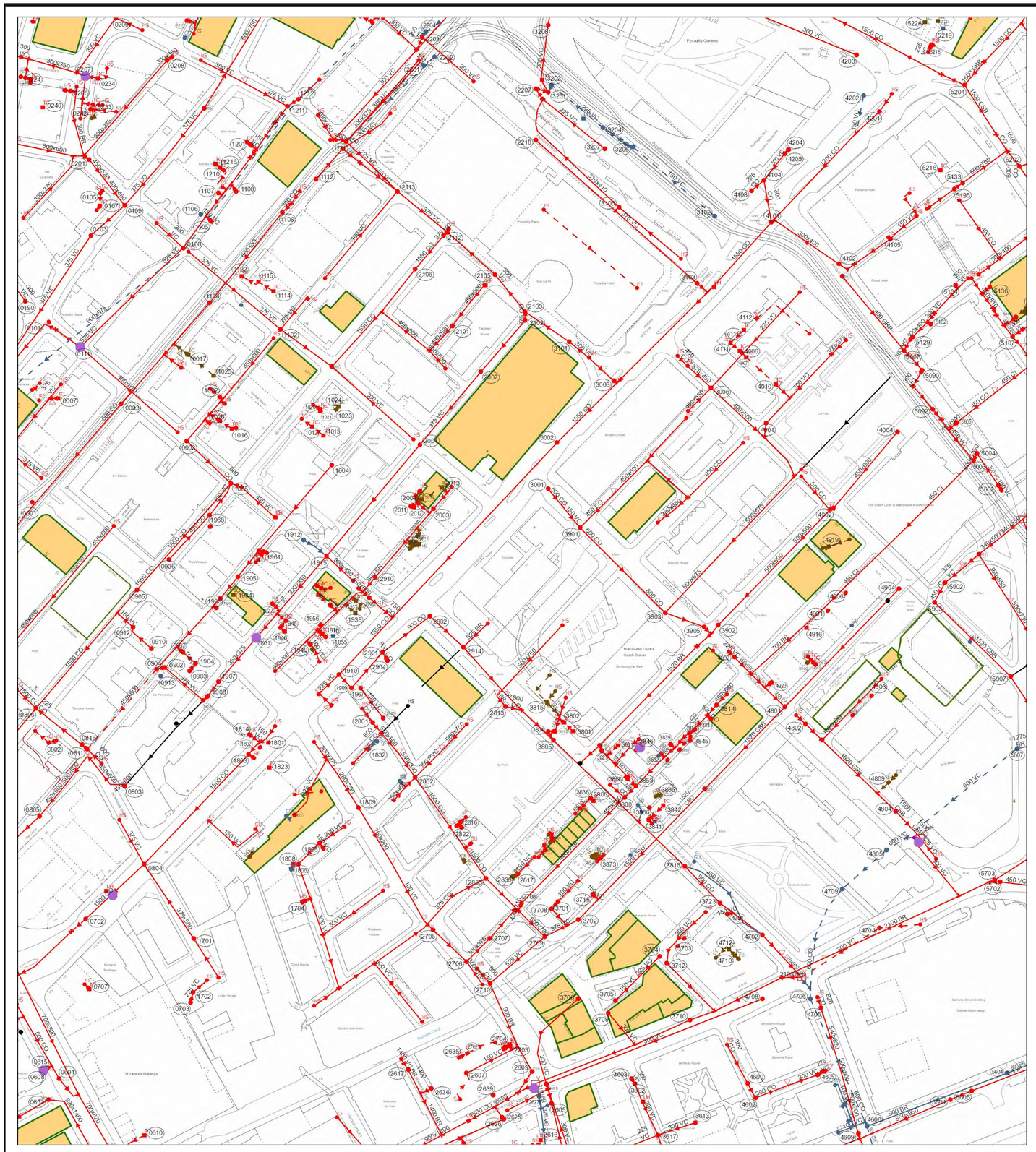
AQUABLAST
DRAINS & SEWERAGE

MANHOLE CHAMBER 6 Drainage plan Manchester One.

Manhole chamber 6 requires a new cover and some pointing.
This has backed up from MH 1.
Recommend double sealed cover in this area.



APPENDIX D – UNITED UTILITIES SEWER RECORDS



Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
1212	44.72	CO	40.02	375			VC	7.211102	1 in 361
4704	39.49	CO	34.11	300			VC	52.0216	1 in 2.15857235
1221	44.78	CO	40.76	225			VC	20.51828	1 in 20
4705	39.01	CO	32.58	540			VC	36.68787	1 in 26
5090	44.8	CO	39.37	300			CO	4.472136	
4201	46.53	CO	41.4	1200			CO	87.37457	1 in 61
4708		CO	0	300			VC	131.103	
2204	44.75	SW	43.92	150			VC	1.414214	1 in 1
5002	44.97	CO	39.72	300			VC	21.63331	1 in 62
0101	42.33	CO	39.02	525			VC	34.05877	1 in 110
3825		CO		150			VC	3.428825	
1906	42.05	CO	39.56	450			BR	53.8145	
0905	42.03	CO	32.95	1500			CO	87.96593	1 in 54
1910	42.14	CO	35.85	900			CO	10.27567	1 in 93
3207	45.24	CO	43.52	225			CO	44.82187	
1905		CO	0	0			UN	15.93075	
0001	41.79	CO	37.67	600			CO	55.16547	
0912		CO		150			VC	12.02503	
1201		CO		150			VC	4.736042	
5003	44.8	CO	38.43	450			CI	103.9497	
1904		CO	0	150			VC	9.508459	
3808	41.73	CO	0	700			BR	3.605551	
3816	41.58	SW	31.53	450			VC	61.31353	
2102	44.44	CO	39.04	375			VC	38.28838	
2822		CO		150			VC	2.647056	
4001	44.58	CO	39.62	300			VC	8.062258	
2813	42.57	CO	0	900			CO	9.219544	
3001	44.05	CO	0	600			CO	14.21267	
1206	45.27	CO	0	375			VC	40.60788	
4701		CO		150			VC	3.181881	
3206	45.19	SW	42.79	225			VC	3.162278	
1701	38.93	CO	0	375			VC	50.47772	
2625		CO	0	1500			VC	1.414214	
3905	42.91	CO	36.1	600			CO	5.656854	
4202	46.43	SW	45.36	150			VC	21.37756	
4904	43.33	CO	38.54	1520			CSB	92.75706	1 in 49
5903	43.62	CO	36.7	1520			CSB	60.10791	1 in 118
1903	41.6	CO	38.99	375			VC	28.66375	1 in 21
5135		CO		500			CO	5.733982	
3709	38.43	CO	33.68	300			CO	23.43075	
0703		CO		225			VC	5.776804	
0904	41.33	CO	37.89	450			BR	59.5483	1 in
1909	42.01	CO	35.81	900			CO	26.71336	1 in 19
1002		CO		150			VC	2.200355	
4906	43.26	CO	41.95	450			CI	14.14214	1 in 7
3101	44.68	CO	39.42	300			VC	30.23243	1 in 62
4002	44.08	CO	38.13	1550			CO	1	
2218		CO	0	375			VC	121.8277	
4203	46.31	CO	41.36	300			VC	158.4037	1 in 170
4004	44.33	CO	40.73	450			BR	56.0803	1 in 63
3839		CO		150			VC	3.22479	
2910		CO		600			BR	10.95603	
0806	40.83	CO	31.31	1500			CO	66.68597	
0811		CO	0	450			BR	4.037282	
4901	43.04	CO	39.84	700			BR	55.97304	
1949		CO		100			VC	2.902814	
0906	42.19	CO	39.18	450			CO	33.97058	
3002	44.38	CO	37.69	1550			CO	179.6942	1 in 97.6598919
1105	43.97	CO	40.56	150			VC	4.24264	
5107	44.87	CO	40.08	460			BR	9.219544	1 in 71
5703	39.99	CO	30.46	2100			BR	132.0233	
1802	41.36	CO	37.87	1500			CO	6.403124	1 in 2
2904	42.44	CO	35.59	900			CO	5.454705	1 in 5
2626	37.07	CO	34.75	1500			CO	41.2111	
4902	42.6	CO	37.91	450			BR	13.51005	
3811	41.71	CO	0	630			BR	4.24264	
2709	40.08	CO	30.38	525			VC	40.66392	1 in 17
4204		CO		300			VC	3.128673	
1805	40.73	CO	37.13	300			VC	16.94531	1 in 7
0907		CO	0	150			VC	4.598767	
0804	40.05	CO	33.35	1500			CO	45.27692	
1206	45.27	CO	41.14	375			VC	43.56604	
3807	41.54	CO	37.86	450			BR	22.11946	
4105	45.75	CO	42.18	150			VC	24.41311	
3702	39.93	CO	31	375			VC	21.2575	1 in 79
5108		CO		150			VC	1.443565	
0601	38.11	CO	33.52	600			CO	15.96853	
3708		CO		100			VC	12.87465	
5204	46.76	CO	39.81	1500			CSB	14.31782	
2706	39.88	CO	35.55	300			VC	18.38478	
1104	44.09	CO	40.13	600			CO	75.82216	1 in 63
2902	42.9	CO	32.9	900			CO	25.66232	
5092	44.6	CO	39.38	450			VC	7.81025	
5004	44.74	CO	39.23	540			BR	2.236068	1 in 6
0903		CO	0	150			VC	5.263027	
1956		CO		225			VC	1.107291	
1107	44.21	CO	40.11	150			VC	2.236068	
3202	45.25	SW	42.94	225			VC	4.472136	1 in 22
0109	43.96	CO	39.68	375			VC	25.4951	1 in 40
2627	36.77	SW	29.16	2100			BR	7.071068	
4702	39.82	CO	37.32	900			CO	16.27882	1 in 4
3602	37.42	CO	0	300			VC	31.79413	
2900	42.71	CO	37.53	650			CO	8.922686	
0003	42.91	CO	38.91	600			CO	76.57676	1 in 64
0816		CO	0	450			BR	26.79278	
0100	42.4	CO	39.03	300			VC	47.20169	1 in 66
3204	45.27	SW	43.45	225			VC	37.64306	1 in 25
2207	45.33	CO	43.02	225			VC	4.123106	1 in 2
3722	40.12	CO	0	300			VC	5	
4205		CO		300			VC	19.16525	
1209	44.78	CO	39.01	300			VC	12.80625	
3613	37.24	CO	32.42	300			VC	22.13594	1 in 9
1108	44.33	CO	40.85	150			VC	5	
1907	41.72	CO	39.1	350			BR	10	
2001		CO	0	375			VC	81.95041	
0201	44.68	CO	41.15	450			BR	16.40122	1 in 61
4805	40.39	SW	32.75	600			VC	33.30165	
5901	43.76	CO	39	320			CI	12.04159	1 in 241
0209	46.31	CO	40.06	300			VC	38.01316	
3902		CO	0	1520			BR	17.03327	
4605	38.56	CO	32.05	300			VC	3.605551	
3723	40.74	CO	36.74	900			CO	30	1 in 52
2203	44.76	CO	41.01	300			VC	7.615773	
1112	44.64	CO	39.43	300			VC	22.67157	1 in 57
0910		CO		150			VC	16.8695	
3903	43.1	CO	36.69	600			CO	23.4094	1 in 40
4602	38.66	CO	32.55	300			CO	19.31321	1 in 80
3701		CO		100			VC	5.422171	
5601	38.65	CO	0	550			BR	55.54278	
0002	42.98	CO	40	600			CO	34.65545	1 in 40
5202	46.2	CO	40.98	1500			CO	22.21841	
2708	40.43	CO	32.3	450			BR	4.705158	
3105	45.21	CO	40.75	310			VC	81.86182	
2802	41.25	CO	33.93	1500			CO	69.63476	1 in 464
3705	38.54	CO	37.1	150			VC	18.38478	1 in 21
1808	40.44	CO	34.5	300			VC	42.37924	
1806	40.64	CO	0	300			VC	3	
5902	43.51	CO	37.55	450			CO	12.52996	1 in 45
4801	42.14	CO	36.59	1520			CSB	64.78819	1 in 65
2201	44.89	SW	41.17	150			VC	2.828427	
3706	38.6	CO	0	300			VC	58.20703	
5005	44.45	CO	39.04	710			BR	3.6106	
2710	39.97	CO	27.9	900			BR	55.15432	1 in 102
3208	45.15	CO	38.55	300			VC	40.60788	1 in 71
2102	44.44	CO	39.02	375			VC	3	1 in 75
0108	43.74	CO	39.59	525			VC	80.62395	1 in 187
3617	36.36	CO	30.02	300			VC	19.92486	
4108		CO		225			CO	9.229943	
3603	37.54	CO	31.7	300			VC	3.605551	1 in
5807	41.18	SW	26.88	600			VC	93.27757	1 in 16
0602	37.86	CO	0	930			BR	39.44617	
5702	39.97	CO	32.34	450			VC	6	
5133		CO		500			CO	31.0403	
1912	43.11	SW	40.52	300			BR	8.062258	1 in 47
0207	45.7	CO	42.36	300			BR	5.385165	
2011		CO		150			VC	4.538065	
2607	38.54	CO	33.93	150			VC	32.64965	
4609	37.91	CO	0	500			BR	3.162278	
0702	39.24	CO	36.45	1500			CO	10.63015	1 in
3814	41.93	CO	36.7	490			BR	7.81025	
1803	41.27	CO	35.16	1500			CO	85.58621	1 in 47
1925		CO		150			VC	1.886142	
2113	44.63	CO	38.63	375			VC	36.23534	
4802	41.76	CO	34.87	1520			CO	13.07271	1 in 87
0803	40.94	CO	38.31	490			BR	1.414214	
4803	41.07	CO	38.7	1520			CO	22.1543	1 in 6
3605	36.78	SW	26.44	375			CO	6.708204	
1109	44.58	CO	40.93	600			CO	65.43699	1 in 84
2202	44.88	SW	43.99	150			VC	69.31089	1 in 630
3813	41.88	CO	41.08	630			CO	2.828427	1 in 1
2103	44.47	CO	38.91	300			VC	27.01851	1 in 68
2106	44.2	CO		1550			CO	72.38365	
3810	41.62	CO	37.79	700			BR	10.63015	1 in 152
0902	41.39	CO	37.64	375			CO	4.857104	1 in 54
2003		CO		600			BR	50.75463	
1211	44.84	CO	39.98	525			VC	11.40175	
5907	42.2	CO	35.78	1520			CSB	34.75216	1 in 29
3103	45.14	CO	40.03	375			VC	7.81025	
0111	42.53	CO	39.14	525			VC	17.20465	
1809	40.77	CO	37.08	260			CO	37.21559	
2707	40.05	CO	36.08	300			VC	21.20658	
4102	45.48	CO	41.56	300			VC	44.33577	
5604	40.27	SW	27.99	900			BR	84.50444	1 in 352
5605	39.89	CO	35.27	550			BR	13	
2901	42.59	CO	34.39	900			CO	33.58457	1 in 23
5104	45.6	CO	43.23	150			VC	2.236068	
1001		CO	0	100			VC	21.78638	
3853		CO	37.86	450			BR	9.134214	
5102	45.29	CO	42.39	150			VC	2.236068	
3800		CO	0	450			BR	26.02634	
3006	44.64	CO	39.99	400			VC	69.27865	
3201	45.05	CO	38.99	300			VC	39.31926	1 in 94
1005	42.97	CO	34.41	1550			CO	80.05623	1 in 55
2609	37.26	CO	27.36	900			BR	14.4222	
1704		CO		225			VC	4.022377	
3003	44.68	CO	39.08	300			VC	2.236068	
2105	44.48	CO	38.49	375			VC	36.12478	
3601	37.2	CO	26.66	300			VC	3.162278	
5007	45.11	CO	41.09	400			GRP	7.071068	1 in 51
4600		CO	0	300			CO	9.287006	
4104		CO		300			CO	24.13276	
3820	20.93	CO	0	1520			BR	14.86607	
3102	45.41	SW	43.59	150			VC	60.30754	
3901	43.89	CO	38.57	600			CO	67.88225	1 in 36
2705	39.78	CO	0	300			VC	26.1725	
4101	45.76	CO	39.59	1550			CO	122.7355	
4903	41.07	CO	38.22	1520			CO	15.48001	
3712		CO	0	300			VC	38.18377	
0805	40.39	CO	37.28	500			BR	19.10497	
1908	41.69	CO	40.16	350			BR	3.681198	
2914	42.83	CO		900			CO	48.45311	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
2007	44.21	CO	40.14	375			VC	53.64089	
2816		CO		450			VC	4.297369	
4103	45.41	CO	42.04	400			GRP	54.67175	1 in 59
1702		CO		225			VC	10.52833	
0103	43.37	CO	39.02	375			VC	102.3426	1 in 787
3804	42.27	CO	34.63	300			CO	5.830952	1 in 2
2112	44.5	CO	37.91	1550			CO	24.83949	
0208	45.61	CO	42.67	300			BR	71.5891	
3836		CO		150			VC	12.15527	
3703	40.02	CO	36.47	300			VC	13.71911	
2101	44.1	CO	39.63	490			BR	9.219544	
5136		CO		150			VC	5.838102	
3821	40.97	CO	35.59	1520			CSU	102.6675	1 in 55
1911		CO		0			UN	18.80264	
3841		CO		150			VC	2.795898	
2801	41.73	CO	36.72	550			BR	7.81025	
5218		CO		225			VC	3.884445	
2805	40.54	CO	0	375			CO	26.09649	
1960		CO		150			VC	3.327264	
3860		CO		100			VC	1.943032	
2004		CO		225			VC	8.731195	
1907		CO		150			VC	21.36225	
2636		CO		150			VC	6.79433	
3805	42.14	CO	32.25	900			CO	102.5524	1 in 142
1814		CO		150			VC	6.788168	
1004		CO		0			UN	63.43118	1 in
4706	39.12	SW	27.98	600			CO	78.79086	1 in 343
4606	38.12	SW	27.75	900			CO	59.20304	1 in 348
1821		CO		225			VC	36.89669	
2617		CO	0	1400			BR	41.59327	
3716		CO		150			VC	4.222183	
2814		CO		225			VC	5.400752	
1102	43.99	CO	38.59	375			VC	35.80503	1 in 16
3873		CO		225			VC	2.534748	
1801	41.44	CO	39.39	1500			CO	7.211102	1 in 5
3710	38.61	CO	29.6	2100			BR	94.32648	
1915	43.08	CO	40.19	320			BR	46.09772	1 in 85
4709		SW		600			CO	66.42013	
4923		CO		150			VC	4.871193	
1927		CO		150			VC	5.270319	
4804	40.39	CO	32.52	1500			CSB	20.41156	1 in 34
1961		CO		150			VC	2.728328	

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

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

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

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

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

SEWER MATERIAL

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

Address or Site Reference:

BRUNTWOOD ESTATES 53 PORTLAND STREET,
MANCHESTER,
M1 3LD

Scale: 1:1250 **Date:** 10/12/2025

Sheet: 1 of 1

Printed by: Property Searches

SEWER RECORDS

United Utilities
Water for the North West

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

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APPENDIX E – FLOOD ZONE MAP

Flood map for planning

Your reference	Location (easting/northing)	Created
Unspecified	**384286/397967**	**4 February 2026 11:53**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

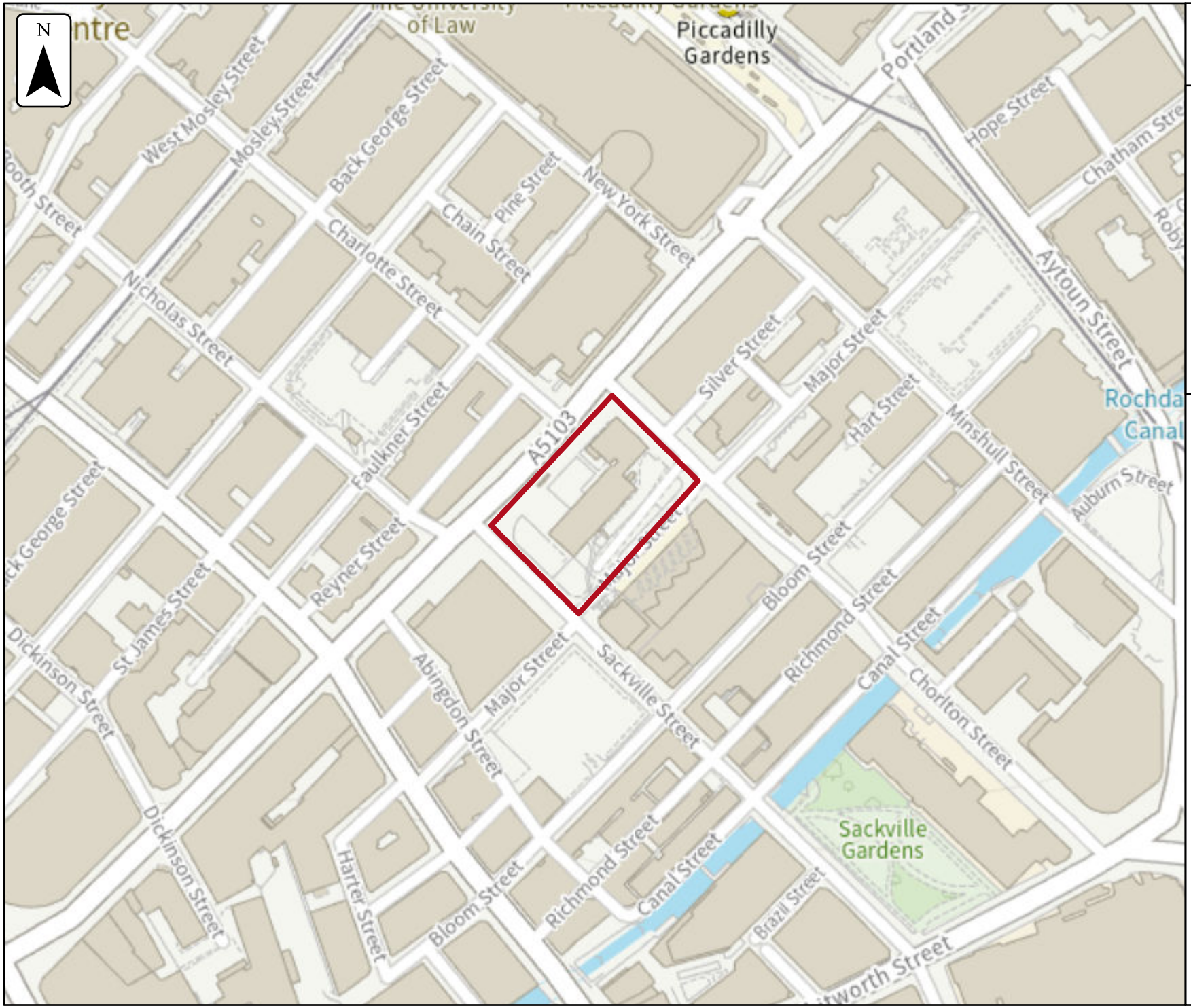
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3

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Environment Agency

Flood map for planning

Your reference
Unspecified

Location (easting/northing)
384286/397967

Scale
1:2,500

Created
4 Feb 2026 11:53

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60 m

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APPENDIX F – DRAINAGE STRATEGY GENERAL ARRANGEMENT

Existing connection from Manchester 1 buildilng

A new combined manhole is proposed on the existing private combined sewer to provide an indirect connection to the United Utilities combined sewer on Portland Road, serving the proposed extension building and associated hardstanding areas, including additional foul flows.

Surface water discharge restricted to 5 l/s for all storm events up to 1 in 100 years plus 45% climate change.

CW 8
Ø1200
CL 43.650 m
IL 41.223 m

SW 7 - Hydro-Brake
Ø1200
CL 43.650 m
IL 41.235 m
Flow = 5 l/s
Design Head = 1.2 m.
Fitted with non-return valve

SW 5
Ø450
CL 44.000 m
IL 42.650 m

SW 6
Ø450
CL 43.650 m
IL 42.537 m

SW 4
Ø600
CL 43.750 m
IL 41.340 m

SW 3
Ø600
CL 43.580 m
IL 41.392 m

SW 2
Ø600
CL 43.200 m
IL 41.488 m

SW 1
Ø600
CL 42.900 m
IL 41.600 m

ACO channel

Ø150

C 1.000 Ø225 @1:150.0 L 15.781m

C 1.000 Ø225 @1:150.0 L 7.766m

C 1.000 Ø225 @1:150.0 L 14.372m

C 1.000 Ø225 @1:150.0 L 16.869m

C 2.000 Ø150 @1:80.0 L 9.059m

MH07
MH04
MH03
MH02
MH01
MH08
MH BURIED

Stormwater attenuation tank to cater flows for storm events greater than 1 in 30 year event, up to and including 1 in 100 year event + 45% climate change.
Storage volume 6m³ (12x6 by 0.5m deep) with 92% void ratio.
IL 41.60
Top of attenuation 42.10
CL 42.90

2902

2914

The existing Ø525 mm United Utilities combined sewer is abandoned and is currently full of debris. Confirmation and records of correspondence with United Utilities regarding the abandonment of this pipe are to be provided.

Further details are included within the Drainage Strategy Report.

Gas Pipe

Existing gas pipe crosses the existing car park. The proposed attenuation is located more than 3 m away from the gas pipe.

Storm Event	Brownfield Flow Rates	Proposed Flow Rates
2	17.3 l/s	5 l/s
30	43.1 l/s	5 l/s
100	54.4 l/s	5 l/s
100 + 45% cc	78.3 l/s	5 l/s

TOPOGRAPHICAL NOTES:

The Topographical and buried services shown on this drawing were provided to Booth King by others. Booth King have not verified this information and therefore we can not guarantee its accuracy. The position and alignment of services may differ from that shown and other buried services may be present.

The contractor must verify the location of all buried services before any excavation or piling works begin. Damage to existing services could present a major health and safety risk plus associated commercial penalties.

Levels information shown is based on information available.
This office is to be made aware of any discrepancies found on site.

DRAINAGE NOTES:

1. All adoptable works to be in accordance with SSG appendix C where applicable.
2. All manhole cover levels to be confirmed by Architect.
3. Clay pipes to be flexibly jointed and comply with the requirements of BS EN 295.
4. Concrete pipes to be flexibly jointed and comply with the requirements of BSEN 1916 and BS 5911.
5. Plastic pipes (PVC-U) to be flexibly jointed and comply with the requirements of BS EN 1401-1 1998.
6. All surface water pipes to be laid at a gradient no flatter than 1:80 (UNO).
7. All foul water pipes to be laid at a gradient no flatter than 1:40 (UNO).
8. For minimum depths requiring pipe protection refer to drainage details drawings.
9. Protection to drains and gully connections may be concrete bed surround between cover depths of 450mm to 200mm.
10. Until final surface is placed, heavy traffic is not to be allowed over pipe trenches without special precautions.
11. Pipes and fittings are to be laid in accordance with the manufacturers recommendations.
12. All Manholes should be concrete manhole rings (UNO).
13. All SVP & RWP positions TBC by Architect.
14. Rodding access is to be provided at all pop-ups & RWPS.
15. For setting out of all pop-up positions refer to Architect's details.
16. Civil engineering contractor to arrange for:
    a. Own services and temporary supplies.
    b. Pathway & partial closure as deemed required by their method statement. Including costs.
    C. Temporary adequate over pumping as deemed required by civil engineers method of construction.
17. The contractor should confirm the locations for existing services prior construction.

NOTES:

1. Do not scale from this drawing.
2. This drawing is copyright and is sent to you in confidence. It must not be copied, used or disclosed, in whole or in part, to third parties without written permission. It remains the property of Booth King Partnership Ltd. (BKPL) and must be returned on request.
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5. All dimensions shown on this drawing are in millimetres unless noted otherwise.
6. If the Contractor consider that they do not have sufficient information to safely complete the works detailed on this drawing, they should contact the Engineer.
7. This document uses revision codes in accordance with ISO EN 19650:
   P. Preliminary (non-contractual) - review, comment or approval.
   C. Contractual - Approved for stage completion.
8. This document uses status codes in accordance with ISO EN 19650:
   Work in progress:
   S0 - WIP
   Shared (non-contractual):
   S1 - Coordination, **S2** - Information, **S3** - Review, **S4** & **S5** - Approval.
   Published (contractual):
   A1, **An**, etc. (where "n" relates to the project stage)
9. This document uses project stages in accordance with the IStructE Structural Plan of Work 2020:
   2 - Concept, **3** - Coordination, **4** - Technical Design,
   4.5 - Production Design, **5** - Construction, **6** - Handover.
10. Only documents with a revision code C# (where '#' relates to a revision number) and status code A4 or A5 are suitable for construction. Any deviations to that which is on site is not the liability of BKPL.

DRAINAGE LINE TYPES KEY:

REF.	DESCRIPTION
	Existing FW network
	Existing SW network
	Existing CW network
	Existing drainage to be grubbed up
	Proposed FW network
	Proposed SW network
	Existing UU Combined
	Site Boundary
	Filter Drain
	Landscape Areas

REV.	DATE	REVISION DETAILS	INITIALS
P01	05/02/26	Stage 2 - Preliminary Issue	AL
		CURRENT DRAWING REVISION CHECKED BY	AA
		CURRENT DRAWING REVISION APPROVED BY	

DRAWING STATUS: S1

PROJECT STAGE: Stage 2

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PROJECT: Manchester 1 - Extension

TITLE: Drainage Strategy GA Plan

SCALE (A1)	AUTHOR	DATE	REVISION	BKPL No.
1:150	AA	05/02/26	P01	15868

DRAWING REF: 15868-BKP-XX-ZZ-DR-C-5000

APPENDIX G – SURFACE WATER DRAINAGE CALCULATION

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1		5.00	42.900	600	384771.580	397929.815	1.300
2	0.013	5.00	43.200	600	384759.411	397941.497	1.712
3	0.018	5.00	43.580	600	384749.521	397951.925	2.188
4	0.018	5.00	43.750	600	384749.641	397959.690	2.410
5	0.013	5.00	44.000	450	384767.787	397976.666	1.350
6			43.650	450	384761.476	397970.179	1.113
7			43.650	1200	384760.230	397971.391	2.415
8			43.650	1200	384761.533	397972.733	2.427

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	16.869	0.600	41.600	41.488	0.112	150.0	225	5.26	50.0
1.001	2	3	14.372	0.600	41.488	41.392	0.096	150.0	225	5.49	50.0
1.002	3	4	7.766	0.600	41.392	41.340	0.052	150.0	225	5.61	49.7
1.003	4	7	15.781	0.600	41.340	41.235	0.105	150.0	225	5.86	48.7
2.000	5	6	9.050	0.600	42.650	42.537	0.113	80.0	150	5.13	50.0
2.001	6	7	1.738	0.600	42.537	42.515	0.022	80.0	150	5.16	50.0
1.004	7	8	1.871	0.600	41.235	41.223	0.012	150.0	150	5.90	48.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.065	42.3	0.0	1.075	1.487	0.000	0.0	0	0.000
1.001	1.065	42.3	1.8	1.487	1.963	0.013	0.0	31	0.528
1.002	1.065	42.3	4.2	1.963	2.185	0.031	0.0	48	0.685
1.003	1.065	42.3	6.5	2.185	2.190	0.049	0.0	59	0.775
2.000	1.125	19.9	1.8	1.200	0.963	0.013	0.0	30	0.695
2.001	1.125	19.9	1.8	0.963	0.985	0.013	0.0	30	0.695
1.004	0.818	14.5	8.2	2.265	2.277	0.062	0.0	81	0.842

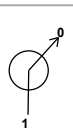
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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	16.869	150.0	225	Circular	42.900	41.600	1.075	43.200	41.488	1.487
1.001	14.372	150.0	225	Circular	43.200	41.488	1.487	43.580	41.392	1.963
1.002	7.766	150.0	225	Circular	43.580	41.392	1.963	43.750	41.340	2.185
1.003	15.781	150.0	225	Circular	43.750	41.340	2.185	43.650	41.235	2.190
2.000	9.050	80.0	150	Circular	44.000	42.650	1.200	43.650	42.537	0.963
2.001	1.738	80.0	150	Circular	43.650	42.537	0.963	43.650	42.515	0.985
1.004	1.871	150.0	150	Circular	43.650	41.235	2.265	43.650	41.223	2.277

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	600	Manhole	Adoptable
1.002	3	600	Manhole	Adoptable	4	600	Manhole	Adoptable
1.003	4	600	Manhole	Adoptable	7	1200	Manhole	Adoptable
2.000	5	450	Manhole	Adoptable	6	450	Manhole	Adoptable
2.001	6	450	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.004	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	384771.580	397929.815	42.900	1.300	600				
						0	1.000	41.600	225
2	384759.411	397941.497	43.200	1.712	600		1	1.000	41.488	225
						0	1.001	41.488	225
3	384749.521	397951.925	43.580	2.188	600		1	1.001	41.392	225
						0	1.002	41.392	225
4	384749.641	397959.690	43.750	2.410	600		1	1.002	41.340	225
						0	1.003	41.340	225
5	384767.787	397976.666	44.000	1.350	450				
						0	2.000	42.650	150
6	384761.476	397970.179	43.650	1.113	450		1	2.000	42.537	150
						0	2.001	42.537	150

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
7	384760.230	397971.391	43.650	2.415	1200	 1	2.001	42.515	150
						2	1.003	41.235	225
						0	1.004	41.235	150
8	384761.533	397972.733	43.650	2.427	1200	1 	1.004	41.223	150

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	20.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	0	0

Node 7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	41.235	Product Number	CTL-SHE-0103-5000-1200-5000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	41.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.92	Time to half empty (mins)	16

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.0	12.0	0.500	12.0	18.1	0.501	0.0	18.1

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	41.600	0.000	0.0	0.0000	0.0000	OK
15 minute winter	2	10	41.513	0.025	1.2	0.0110	0.0000	OK
15 minute winter	3	10	41.431	0.039	2.7	0.0173	0.0000	OK
15 minute winter	4	13	41.420	0.080	4.4	0.0346	0.0000	OK
15 minute winter	5	10	42.675	0.025	1.2	0.0089	0.0000	OK
15 minute winter	6	11	42.564	0.027	1.2	0.0043	0.0000	OK
15 minute winter	7	13	41.424	0.189	4.6	0.2132	0.0000	SURCHARGED
15 minute winter	8	13	41.279	0.056	4.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.0200	
15 minute winter	2	1.001	3	1.1	0.334	0.027	0.0502	
15 minute winter	3	1.002	4	2.8	0.480	0.065	0.0646	
15 minute winter	4	1.003	7	3.6	0.418	0.085	0.3804	
15 minute winter	5	2.000	6	1.2	0.582	0.059	0.0183	
15 minute winter	6	2.001	7	1.2	0.580	0.058	0.0035	
15 minute winter	7	1.004	8	4.2	0.652	0.290	0.0120	2.5

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	1	41.600	0.000	0.0	0.0000	0.0000	OK
15 minute winter	2	10	41.518	0.030	1.7	0.0131	0.0000	OK
15 minute winter	3	13	41.499	0.107	4.0	0.0478	0.0000	OK
15 minute winter	4	14	41.498	0.158	6.0	0.0684	0.0000	OK
15 minute summer	5	10	42.680	0.030	1.7	0.0106	0.0000	OK
15 minute summer	6	11	42.569	0.032	1.7	0.0051	0.0000	OK
15 minute winter	7	13	41.498	0.263	7.0	0.2973	0.0000	SURCHARGED
15 minute winter	8	14	41.282	0.059	4.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	0.0	0.000	0.000	0.0265	
15 minute winter	2	1.001	3	1.6	0.363	0.039	0.1517	
15 minute winter	3	1.002	4	4.0	0.502	0.095	0.1864	
15 minute winter	4	1.003	7	5.3	0.426	0.125	0.5493	
15 minute summer	5	2.000	6	1.7	0.636	0.084	0.0239	
15 minute summer	6	2.001	7	1.7	0.638	0.083	0.0045	
15 minute winter	7	1.004	8	4.7	0.671	0.325	0.0131	3.8

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	25	41.802	0.202	11.1	2.2826	0.0000	OK
30 minute winter	2	25	41.801	0.313	10.7	0.1361	0.0000	SURCHARGED
30 minute winter	3	25	41.800	0.408	7.0	0.1824	0.0000	SURCHARGED
30 minute winter	4	25	41.800	0.460	6.7	0.1986	0.0000	SURCHARGED
15 minute winter	5	10	42.700	0.050	4.4	0.0175	0.0000	OK
15 minute winter	6	10	42.592	0.055	4.3	0.0087	0.0000	OK
30 minute winter	7	25	41.798	0.563	7.3	0.6370	0.0000	SURCHARGED
30 minute summer	8	35	41.284	0.061	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	-11.1	-0.467	-0.263	0.6521	
30 minute winter	2	1.001	3	-7.3	0.359	-0.172	0.5716	
30 minute winter	3	1.002	4	4.5	0.461	0.106	0.3089	
30 minute winter	4	1.003	7	4.7	0.447	0.111	0.6276	
15 minute winter	5	2.000	6	4.3	0.800	0.219	0.0492	
15 minute winter	6	2.001	7	4.3	0.816	0.215	0.0091	
30 minute winter	7	1.004	8	5.0	0.681	0.346	0.0137	12.6

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	29	42.095	0.495	15.7	5.6057	0.0000	SURCHARGED
30 minute winter	2	29	42.095	0.607	16.5	0.2640	0.0000	SURCHARGED
30 minute winter	3	29	42.095	0.703	12.0	0.3141	0.0000	SURCHARGED
30 minute winter	4	29	42.094	0.754	7.1	0.3259	0.0000	SURCHARGED
15 minute winter	5	10	42.710	0.060	6.1	0.0211	0.0000	OK
15 minute winter	6	10	42.603	0.066	6.1	0.0105	0.0000	OK
30 minute winter	7	29	42.094	0.859	7.2	0.9710	0.0000	SURCHARGED
180 minute winter	8	112	41.284	0.061	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	-15.7	-0.547	-0.371	0.6709	
30 minute winter	2	1.001	3	-11.7	0.346	-0.275	0.5716	
30 minute winter	3	1.002	4	-5.4	0.469	-0.128	0.3089	
30 minute winter	4	1.003	7	4.7	0.481	0.112	0.6276	
15 minute winter	5	2.000	6	6.1	0.862	0.304	0.0636	
15 minute winter	6	2.001	7	6.0	0.889	0.301	0.0117	
30 minute winter	7	1.004	8	5.0	0.681	0.346	0.0137	17.7

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	28	42.000	0.400	15.1	4.5330	0.0000	SURCHARGED
30 minute winter	2	28	42.000	0.512	15.7	0.2229	0.0000	SURCHARGED
30 minute winter	3	28	42.000	0.608	11.4	0.2718	0.0000	SURCHARGED
30 minute winter	4	28	42.000	0.660	6.0	0.2850	0.0000	SURCHARGED
15 minute winter	5	10	42.706	0.056	5.5	0.0199	0.0000	OK
15 minute winter	6	10	42.599	0.062	5.5	0.0099	0.0000	OK
30 minute winter	7	28	41.999	0.764	7.8	0.8639	0.0000	SURCHARGED
30 minute summer	8	45	41.284	0.061	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	1	1.000	2	-15.1	-0.501	-0.357	0.6709	
30 minute winter	2	1.001	3	-11.4	0.356	-0.269	0.5716	
30 minute winter	3	1.002	4	-5.4	0.470	-0.128	0.3089	
30 minute winter	4	1.003	7	4.7	0.463	0.112	0.6276	
15 minute winter	5	2.000	6	5.5	0.842	0.274	0.0586	
15 minute winter	6	2.001	7	5.4	0.865	0.271	0.0108	
30 minute winter	7	1.004	8	5.0	0.681	0.346	0.0137	16.2

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	1	47	42.880	1.280	11.7	5.8877	0.0000	FLOOD RISK
60 minute winter	2	47	42.880	1.392	12.7	0.6056	0.0000	SURCHARGED
60 minute winter	3	47	42.880	1.488	9.5	0.6653	0.0000	SURCHARGED
60 minute winter	4	47	42.880	1.540	10.1	0.6652	0.0000	SURCHARGED
60 minute winter	5	47	42.877	0.227	4.3	0.0800	0.0000	SURCHARGED
60 minute winter	6	47	42.878	0.341	5.3	0.0542	0.0000	SURCHARGED
60 minute winter	7	47	42.878	1.643	12.4	1.8582	0.0000	SURCHARGED
60 minute winter	8	47	41.289	0.066	5.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	1	1.000	2	-11.7	-0.416	-0.276	0.6709	
60 minute winter	2	1.001	3	-8.5	0.336	-0.201	0.5716	
60 minute winter	3	1.002	4	4.8	0.452	0.113	0.3089	
60 minute winter	4	1.003	7	8.5	0.469	0.200	0.6276	
60 minute winter	5	2.000	6	4.3	0.795	0.216	0.1593	
60 minute winter	6	2.001	7	4.3	0.817	0.216	0.0306	
60 minute winter	7	1.004	8	5.7	0.703	0.392	0.0151	29.9

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APPENDIX H – BROWNFIELD RUN-OFF CALCULATION

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.131	5.00	42.900	600	384771.580	397929.815	1.300
2			43.200	600	384759.411	397941.497	1.712

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	16.869	0.600	41.600	41.488	0.112	150.0	225	5.26	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.065	42.3	17.8	1.075	1.487	0.131	0.0	102	1.019

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	16.869	150.0	225	Circular	42.900	41.600	1.075	43.200	41.488	1.487

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	384771.580	397929.815	42.900	1.300	600	 0	1.000	41.600	225
2	384759.411	397941.497	43.200	1.712	600	1 	1.000	41.488	225

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Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	20.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	45	0	0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	41.684	0.084	11.7	0.1927	0.0000	OK
15 minute winter	2	10	41.568	0.080	11.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	11.5	0.886	0.272	0.2194	5.4

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Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	41.706	0.106	17.5	0.2429	0.0000	OK
15 minute winter	2	10	41.587	0.099	17.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	17.3	0.982	0.408	0.2965	8.1

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	41.812	0.212	44.0	0.4863	0.0000	OK
15 minute winter	2	10	41.662	0.174	43.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	43.1	1.195	1.019	0.6046	20.3

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	41.969	0.369	61.6	0.8475	0.0000	SURCHARGED
15 minute winter	2	10	41.688	0.200	60.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	60.0	1.511	1.418	0.6502	28.5

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Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	41.912	0.312	55.6	0.7166	0.0000	SURCHARGED
15 minute winter	2	10	41.681	0.193	54.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	54.4	1.375	1.284	0.6408	25.7

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	42.191	0.591	80.6	1.3579	0.0000	SURCHARGED
15 minute winter	2	10	41.701	0.213	78.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	78.3	1.970	1.850	0.6641	37.3

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