

NOMA, 2&3 Angel Square

Drainage Strategy

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050930

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Glossary

Term	Definition
Attenuation	A method to reduce a flood peak to prevent flooding, often utilising temporary storage, but increasing the duration of the flow.
Brownfield	Land previously developed that has potential to be regenerated.
Catchment	A surface water catchment is the area which water drains into a watercourse. A groundwater catchment is the area that consists of the groundwater river flow.
Design Flood Level	This is the level of flooding that flood defences or mitigation measures are designed against. This is typically the 1% (1 in 100) flood level.
Discharge	The rate of flow of water measured in terms of volume per unit time.
EA	Environment Agency.
Flood Defence	A natural or man-made infrastructure used to prevent certain areas from inundation from flooding, and / or the provision of flood warning systems.
Floodplain	Area of land adjacent to a water course which water flows or is stored during a flood event or would otherwise be flooded in the absence of flood defences.
Flood Resilience	Improving flood resistance, e.g. reducing the risk of properties against flooding events.
Flood Risk	The level of risk to personal safety and damage to property resulting from flooding due to the frequency or likelihood of flood events.
Flood Risk Assessment (FRA)	An assessment of the flood risks to the proposed development over its expected lifetime and the possible flood risks to the surrounding areas, assessing flood flows, flood storage capacity and runoff.
Flood Risk Management (FRM)	Managing and/or reducing flood risk to people, property and the environment.
Flood Zones	The statistical chance of a flood event occurring in any one year, stated as a percentage. PPS25 identifies three flood zones.
Fluvial Flooding	Related or connected to a watercourse (river or stream).
Greenfield	Land which has not been previously developed.
Groundwater	Water present within underground strata known as aquifers.
Inundation	Flooding of land with water.
m AOD	Metres Above Ordnance Datum.
Mitigation	Actions taken to reduce either the probability of flooding or the consequences of flooding or a combination of the two.
Previously Developed Land	Land which is or was occupied by a permanent structure (excluding agricultural or forestry buildings) and associated fixed surface infrastructure.
Red line boundary	Boundary drawn to indicate the site area on which the planning application is based.
Residual Risk	The risk that remains after risk management and mitigation measures have been implemented
Risk	Risk is the probability that an event will occur and the impact (or consequences) associated with that event.
Runoff	Water flow over surfaces to the drainage system. Runoff occurs if the ground is impermeable or if permeable ground is saturated.
Strategic Flood Risk Assessment (SFRA)	An SFRA is the assessment and 'categorisation' of flood risk on an area-wide basis in accordance with PPS25.
Surface Water Flooding	Surface water flooding occurs when the volume of water is unable to filtrate through the ground to enter drainage systems, and therefore runs quickly off land and results in localised flooding. This type of flooding is usually associated with intense rainfall.
Sustainable Drainage Systems (SuDS)	SuDS are used as a strategy to manage surface water in a sustainable manner or least damaging solution through management practices and physical structures.
Sustainable Development	Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.
Water Table	The top surface of the saturated zone within the aquifer.

1 Executive Summary

This drainage strategy has been prepared in support of the planning application to set the principles for the drainage design to serve the 2&3 Angel Square development. The exact configuration and nature of the drainage would be determined at the detailed design stage and any discharge of planning conditions. This report should be read in conjunction with the Buro Happold Flood Risk Assessment (FRA).

The Site is located to the north of Manchester City Centre, approximately 220m east of Manchester Victoria Railway Station and it is surrounded by the Co-op Group headquarters and Angel Square to the west, Miller Street to the south, Angel Street to the north and Angel Gardens to the east.

The drainage strategy will be in accordance with Section H of the Building Regulations, the Manchester City Council Lead Local Flood Authority (LLFA) and United Utilities (UU) requirements.

To be in line with UU and the LLFA criteria, the proposed surface water discharge rate will be based on what was previously agreed with UU for the NOMA marketing suite (5l/s) and the Qbar value of the rest of the development area, given a total proposed discharge rate flow of 9.55l/s that has been agreed with UU. Attenuation storage will be required to facilitate the reduction of the proposed flows, and SuDS will be included wherever practicable. The surface water network will ultimately discharge to the Miller Street combined sewer via the public combined sewer located within the access road between Angel Gardens and the site.

With regards to foul water, the development will be designed with separate systems for both foul and surface water drainage which will remain separate until the point of discharge to the public combined sewer located within the access road between Angel Gardens and the site. United Utilities confirmed that the foul water from this site can be drained at an unrestricted rate to the public combined sewer network.

2 Introduction

2.1 Appointment and Brief

This drainage strategy has been prepared in support of the planning application for the 2&3 Angel Square development (herein referred to as the proposed development). This report should be read in conjunction with the Buro Happold Flood Risk Assessment (FRA).

This report will review and discuss the following:

- Site constraints;
- Review of existing external sewer network;
- Proposed surface water drainage strategy; and
- Proposed foul water drainage strategy

2.2 Limitations

This report is based on the interpretation and assessment of data provided by third parties. It should be noted that the detailed design of the drainage and associated Sustainable Drainage Systems (SuDS) features for the site has not been finalised and the assumptions and information presented herein is subject to design development. Operation and maintenance of all SuDS (including proprietary systems) will need to be considered once the proposed development has been finalised with all specific information presented to those responsible for the maintenance of the facility. Buro Happold cannot be held responsible for the accuracy of third-party data or the conclusions that come from this information or as a result of changes arising from the developing design. The conclusions and findings of this report may change if the proposed development is amended or updated after the date of publishing.

2.3 Review of Available Information

At the time of this report, there were an existing topographical survey provided by ND Oliver dated 22/04/2021, a multi utility infrastructure constraints plan where all the existing utilities of the area are shown, this was provided by WDA dated 21/12/2021 and a CCTV survey of the existing abandoned highway drainage provided by Drain Alert dated 15/09/2021. It should be noted that operational drainage was only found in the NOMA marketing suite area (southern part of the site).

3 Site Description

3.1 Existing Site

The proposed development is located to the north of Manchester City Centre, approximately 220m east of Manchester Victoria Railway Station. The post code and grid reference of the site are M60 0AG and SJ 84368 98985. The site is surrounded by the Co-op Group headquarters and Angel Square to the west, Miller Street to the south, Angel Street to the north and Angel Gardens to the east. The site area is currently occupied by an existing public car park, managed by RCP Parking, with the main access from Angel Street and the temporary NOMA marketing suite is currently under construction in the southern side of the development (Planning Application number: 129631/FO/2021). The immediate surrounding area comprises urban development including residential, warehouses, office and manufacturing facilities. A recent site visit indicates that there is no existing traditional drainage capturing surface water for the car parks, meaning the new marketing suite area only has operational drainage. Figure 1 below shows the boundary of the site and its relative location.

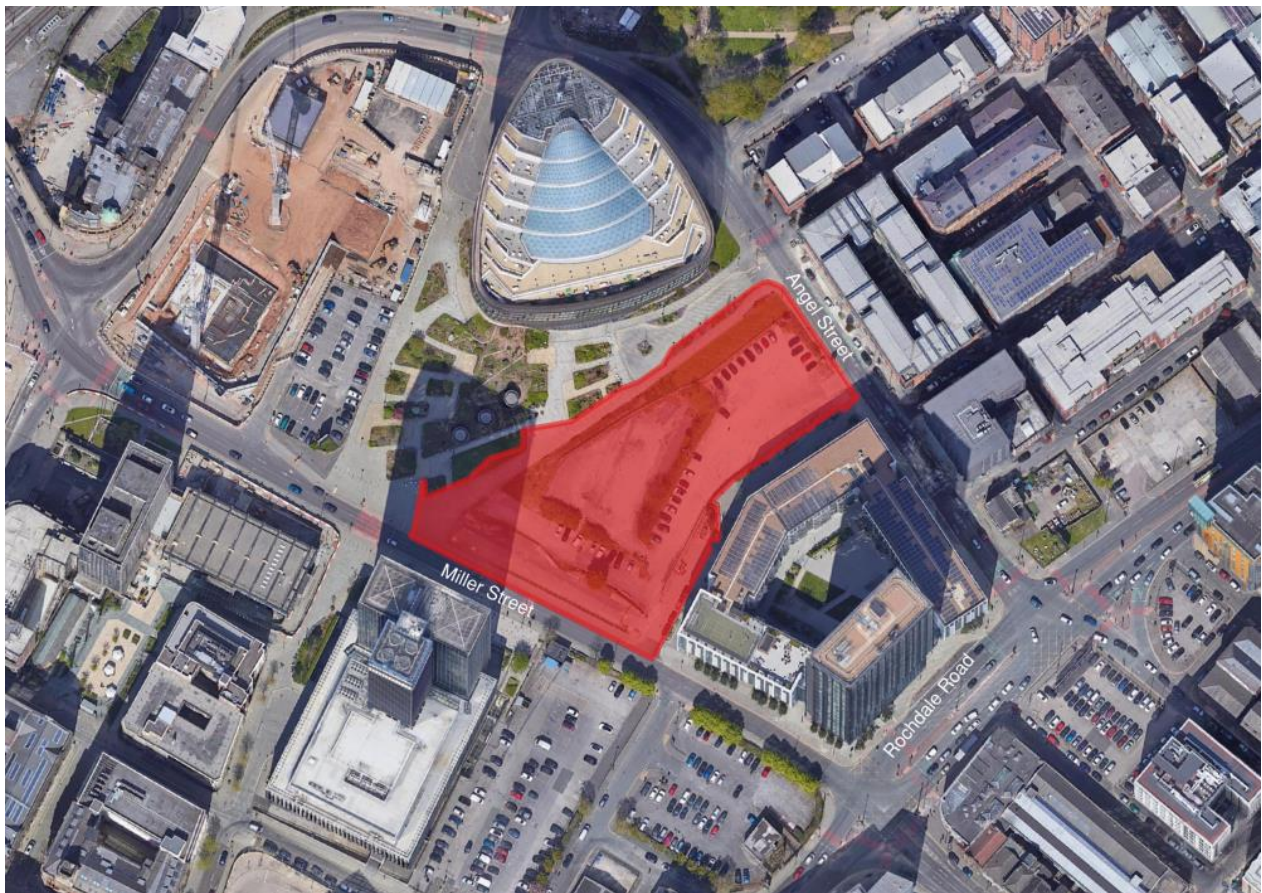


Figure 1-Indicative 2&3 Angel Square site Plan (Map Data from Google Earth©2022)

3.2 Existing Topography

The highest point of the site is located in the northeast corner along Angel Street with an approximate level of +47.70m AOD. The site slopes down towards the southwest to a low point on Miller Street at a level of approximate

+41.10mAOD. The site levels reduce approximately 6.60m over a distance of approximately 150m (east to west); giving an average gradient of 1:23. Refer to Appendix A for Topographical survey.

3.3 Existing Waterbodies

The nearest watercourses to the Site are the River Irk 200m to the north and the River Irwell, 300m to the west, which are designated as Main River.

3.4 Existing Drainage

Record information obtained from United Utilities (UU) from previous consultations for the same scheme and site location, indicates the following drainage systems are present in the vicinity of the Site:

- 1500 x 600mm brick combined sewer that conveys flows in a north-westerly direction beneath Miller Street.
- 1850mm diameter brick combined sewer beneath Angel Street which flows in a south-easterly direction.
- 400mm diameter combined sewer located at the access road between Angel Gardens and the site (south-eastern part of the development)
- An abandoned 1850mm diameter brick sewer is noted on the sewer records. UU have verbally confirmed on previous submissions for this scheme that although the sewer has been abandoned, there are no records available confirming whether the sewer has been grouted up or grubbed up and removed.
- Existing abandoned 300mm diameter highway drain that connects to the combined sewer located at Miller Street. This sewer is currently used to drain the marketing Suite and it will be proposed to be used to discharge some of the surface water for the external areas of this scheme.

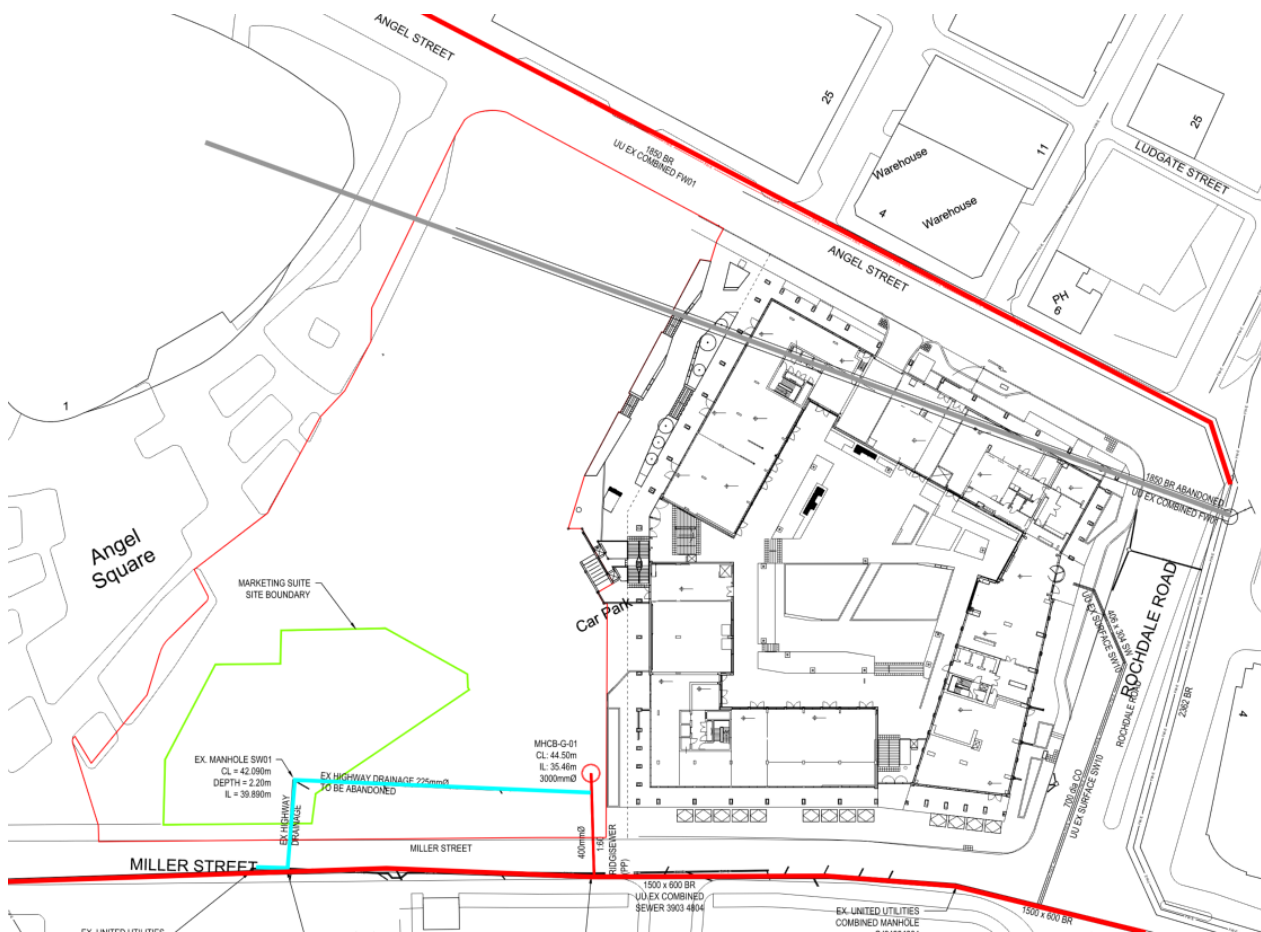


Figure 2-Existing sewers around the site

In addition, a data screening to the LLFA was requested to identify any culvert conduits that could be located within the site and not registered in the public records. Refer to Appendix B for data screening.

3.5 Existing Utilities

The Multi Utility Infrastructure Constraint Plan provided by WDA (refer to Appendix C) shows that the utilities for the site are mainly located to the southern area (public footpath along Miller Street) or to the north within the public footpath along Angel Street. It should be noted that there were some utilities within Unit 2 on the southern part of the site, but they were decommissioned and diverted prior the commencement of the works for the NOMA marketing suite.

During the Ground Investigation that was undertaken in 2021, it indicated an abandoned chamber that is not recorded in any utility survey, sewer records or data screening. The chamber looks abandoned as shown in Figure 3 and Figure 4. The site has been a car park for the last 20 years and no drainage is located in that area which suggest that the chamber was part of a private network that was abandoned and covered with tarmac as shown on Figure 3. Figure 5 shows the location where this chamber was found.



Figure 3-Abandoned chamber found during GI (1)



Figure 4-Abandoned chamber found during GI (2)

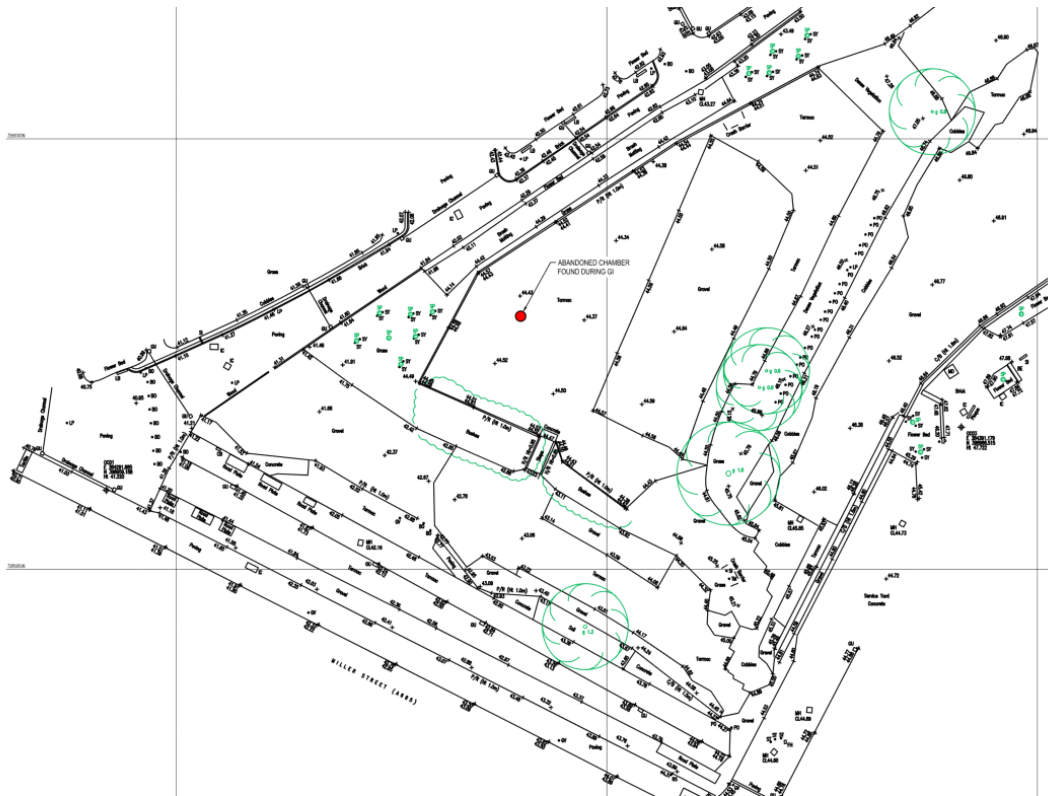


Figure 5-Abandoned chamber found during GI

4 Proposed development

The development comprises of the proposal to erect two high quality commercial office buildings of 13 and 14 storeys, with associated public realm, car parking, extensive cycle parking facilities, and highway and access arrangements. At this stage it is not yet known how the delivery of the Proposed Development might be phased; there are a number of potential scenarios that could arise dependent on the requirements of future occupiers. These scenarios are outlined below:

- Scenario 1: 2 Angel Square delivered first; or,
- Scenario 2: 3 Angel Square delivered first; or,
- Scenario 3: Both buildings delivered concurrently.

In advance of works starting on 2&3 Angel Square, the NOMA marketing suite is proposed to be constructed on site as a temporary building in the southwestern corner of the site and will consist of a single storey building with associated public realm. Figure 6 shows the proposed development:



Figure 6-Landscape Masterplan (Planit IE)

5 Proposed surface water drainage strategy

5.1 General

The surface water drainage system will be provided to collect surface water runoff from the site. This will include runoff from roof and surrounding hardstanding areas. Primary runoff from ground will be from hard impermeable surfaces such as roof and any exposed areas of hard standing. Allowance will be made to include green areas that may fall towards the buildings as infiltration is not viable in the proposed development.

Collection of external surface water runoff will be captured by series of gullies, linear/ channel drains, collector pipes and SuDS whenever possible, that connects to the external below ground drainage system.

5.2 Consultation

5.2.1 United Utilities

A wastewater pre-development enquiry was submitted to United Utilities 29/04/2022 to determine the proposed surface water and foul water discharge rates and potential points of connections. United Utilities confirmed that foul water from the development can be discharged at an unrestricted rate to the existing combined sewer within Miller Street and with regards to surface water, it has been agreed to discharge 9.55l/s to the same public sewer. Refer to Appendix D for correspondence with United Utilities.

5.2.2 Manchester City Council Lead Local Flood Authority

A meeting with the Manchester City Council Lead Local Flood Authority (LLFA) was held 3/05/2022 where the proposed drainage strategy and their requirements were discussed. In addition, it was requested a data screening was applied for to confirm no existing culverted watercourses or historic flooding incidents are register within the site area. Refer to Appendix E for correspondence.

5.3 Climate change

Climate change allowances are based on the Irwell Management Catchment peak rainfall allowance table for the 1% annual exceedance rainfall event produced by the EA. For the proposed development, the design life is considered as more than 50 years and design is considered at the upper end.

Allowance category	Total potential change anticipated for the 2050's	Total potential change anticipated for the 2070's
Upper End	+40%	+45%
Central	+25%	+30%

Table 1-Climate change allowances for peak rainfall in England (1981-2000 baseline)

5.4 Drainage hierarchy

Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H 2010 (2015 edition). This hierarchy is briefly described below:

- Step 1. Disposal on Site
Disposal via infiltration SuDS (Sustainable Drainage Systems) methods should be considered as the first option. The SuDS Manual (CIRIA C753) provides descriptions of the various methods of providing infiltration SuDS including systems such as soakaways, basins and filter strips, together with swales, pervious pavements, detention basins, ponds and other wetland solutions.

Infiltration SuDS such as soakaways should be located, as a minimum, 5m away from any building footprints and title boundaries. Also, the Ground Investigation report shows that the site is underlain mostly by clay and with the proximity to the proposed buildings and surrounding developments, this option is not considered to be viable.
- Step 2. Disposal to a Watercourse
The nearest watercourses to the site are the River Irk 200m to the north and the River Irwell, 300m to the west, which are designated as Main River. Due to the proximity of the watercourses to the proposed development, any direct connection to the watercourses is not considered viable.
- Step 3. Disposal to a Public Sewer
In the event that infiltration SuDS are deemed not suitable, surface water flows will need to be restricted and connected into the existing public sewers. The peak flow rates of surface water leaving the site shall be no greater than 9.55 l/s as per the pre-development response from UU. Attenuation must be provided to cater for the 1 in 100 year plus 45% climate change rainfall event.
It is envisaged to dispose surface water to the public sewer located within the access road between the proposed site and Angel Gardens where it ultimately discharges to the 600 x 1500mm diameter public combined sewer within Miller Street.

5.5 Sustainable Urban Drainage System (SuDS)

Sustainable Urban Drainage Systems are used to reduce the impact of surface water from storm events on the existing environment mimicking the natural run-off characteristics of the site and removing pollutants from the urban run-off at source. There are various solutions which are described in the SuDS Manual (CIRIA C753) and include ground level features including swales and ponds, below ground systems (such as tanks, and infiltration techniques like soakaways).

The proposed development considers the use of sustainable drainage techniques in accordance with local policy. The CIRIA SuDS Manual contains a hierarchy of sustainable methods of capturing and storing rainwater in a descending order: from drainage into the ground to recharging water resources. Where infiltration is not possible, surface water should be stored on site in open water features and then released at a controlled rate. The final option is to store surface water in tanks or cellular storage below ground.

Subject to the ground conditions and infiltration rates SuDS features that could be considered through the detailed design stage include permeable paving, in ground geo-cellular storage tanks and rain gardens. Non-infiltration SuDS features will not reduce the amount of surface water discharged; however, it will significantly delay and mitigate the peak flood flows from the site.

The hierarchy of SuDS techniques is shown in Table 2:

Table 2 SuDS techniques

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Suitability for the Proposed Development	Comments
Most Sustainable ↑ ↓ Least Sustainable	Living roofs	√	√	√	No	Green roofs are not considered for this scheme, given the limited roof space available due to mechanical plant space and introduction of PV and sustainable requirements for the buildings
	Basins & ponds	√	√	√	No	Due to restricted outside space and its intended uses (footpath, vehicular access) there is no location suitable to accommodate a basin or pond. Due to the water quality and maintenance, proposed water feature will be in a different system and will not be within this category.
	-Constructed Wetlands				No	
	-Balancing ponds				No	
	-Detention basins				No	
	-Retention ponds				No	Rain gardens are not envisaged to be used in the scheme as they will limit the trees species and number that can be used. However, there is intention of proposed levels will be designed to direct/drain some of the impermeable areas to the green areas.
	Filter strips & swales	√	√	√	No	
	Rain Gardens	√	√	√	No	
	Infiltration devices	√	√	√	No	Infiltration techniques should be avoided as the site is mostly underlain by clay. Refer to Ground Investigation report.
	-soakaways					
	-infiltration trenches & basins					Areas currently of hard standing can be replaced with permeable surfacing to allow for attenuation underneath subject to ground investigation results and coordination with landscape architect
	Permeable surfaces	√	√		Yes	
	-gravelled areas				No	
	-solid paving blocks				No	
	-porous pavers				No	Unsuited to landscape design

	Tanked systems	✓			Yes	Underground attenuation tanks are proposed within hardstand areas subject to coordination of services and other constraints.
	-over-sized pipes/tanks				No	Due to limited space and site constraints, oversized pipes are not considered suitable
	-attenuation cells				Yes	Attenuation cells are proposed under hardstand areas

5.6 SUDs measures proposed for the development

5.6.1 Permeable Paving

Permeable paving should be considered in most hardstand areas. For this development and due to the levels, it is envisaged that the main advantage of introducing permeable paving is to significantly delay and mitigate the peak flood flows from the site and also provide some attenuation (subject to detail design). As it is envisaged to use clay paving and natural stone paving, the jointing areas may not be enough to capture all the water and it will be proposed to combine this system with some linear drainage and/or gullies. Due to the ground conditions, the proposed permeable paving will not have infiltration to the ground (System C). Suitable areas for permeable paving have been shown in Figure 7:



Figure 7- Area available for permeable paving

5.6.2 Underground tanks/cellular crates

Tanks and/or cellular crates provide an underground storage structure with a high void ratio that is suitable for attenuating surface water flows. The flows can be released either into the in-situ ground through infiltration (if ground conditions permit), or into the public sewer drainage system via flow control devices.

Due to the restricted external space for other SuDS features, underground storage structures will form part of a series of attenuation features which will contribute to attenuating the 1 in 100 year storm events + 45% Climate Change. Attenuation tanks will be installed in the same phasing than the buildings, i.e. if one plot is developed first, the correspondence attenuation tank will be installed.

5.7 SUDs Operation and Maintenance Plan

Regular maintenance of the sustainable drainage system is essential to maintain its performance and avoid failure of the mechanical/electrical components. It is anticipated that the maintenance of the attenuation tanks will be undertaken by an experienced contractor, in cases where geo-cellular units are installed the suppliers will normally offer a maintenance contract for periodic inspections and flushing the system to remove any silt and debris that have been collected. A similar maintenance agreement is normal with the pumping equipment, with the respective suppliers. An agreed maintenance programme will be prepared in accordance with the CIRIA guidance and supervised by the adopting authority. This will be included within the Building Manual for the development on completion. An outline maintenance plan is shown in Appendix F.

5.7.1 Details of the party responsible for maintenance of each feature

Adoptable drainage features shall be adopted by the Lead Local Flood Authority (Manchester City Council) or the Water Authority (United Utilities).

It is currently understood that all drainage, including SuDS features will remain within the ownership of the developer.

5.7.2 Inspection and Maintenance

A specification for inspection and maintenance actions, including frequency of maintenance tasks required for each proposed SuDS, setting out a minimum standard to which the SuDS system must be maintained. This will include information relating to:

- Schedule of cleaning;
- Inspection;
- General repair and maintenance; and
- Replacement details and lifespan.

This information will include specific requirements of proprietary products. This information will need to be collated during the detailed design as part of the H&S File and O&M Manual for the building(s). Maintenance will be in accordance with the specific requirements of each feature and the chosen attenuation supplier, generally:

- Geocellular tank – operation and maintenance in accordance with the tank manufacturers guidance and warranty requirements. This will be product specific; and

- Permeable paving - operation and maintenance in accordance with landscape architect's specification which should be prepared in accordance with the manufacturer's guidance and warranty requirements. This will be product specific.

5.8 Maintenance Options, Risks and Safeguards

There are many options that will allow the successful operation and maintenance of a SuDS feature for the lifetime of the proposed development. With each maintenance option there may be associated risks for the onsite and surrounding land and property owners; LPA, LHA and LLFA should the chosen maintenance option become compromised.

The most appropriate maintenance option will be specific to the SuDS features employed.

5.9 Safety and Access

Consideration will be given to safety in design and appropriate consideration of access during the design of the SuDS features used.

CDM Regulations 2015 will be considered and applied to the planning, design and construction and long-term maintenance of the SuDS systems used.

5.10 Existing and proposed impermeable areas

The site boundary has a total area of 0.83ha, where circa 0.70ha can be considered as existing impermeable area shown on Figure 8. It should be noted that there is a section of the public footpath within the site boundary (circa 270m²) that will remain unchanged and therefore, will not be included in the drainage strategy and attenuation volume calculations.



Figure 8- Existing impermeable area

The proposed development will have an estimated impermeable area of circa 0.75ha (as permeable paving cannot infiltrate to the ground it will be considered impermeable area as well) as shown on Figure 9. This is the area that will be used to estimate the proposed attenuation volume.



Figure 9-Proposed impermeable area

5.11 Proposed discharge rate

The site can be split in two: NOMA marketing suite area and the remaining area. The NOMA marketing suite has an area of 0.12ha where United Utilities previously checked that only 0.073ha has operational drainage and therefore can be classified as brownfield. They also estimated that the brownfield land generates 10l/s ($Q = 2.78 \times A \times i = 2.78 \times 0.073 \times 50$).

A recent visit to site confirmed there is no presence of operational drainage in the rest of the remaining area (0.71ha) and therefore, it will be considered as greenfield for the calculations.

The proposed flow rate will be based on the LLFA requirements:

'Details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. for brownfield at least a 50% reduction in runoff rate compared to the existing rates, greenfield runoff rates for greenfield. Note overlap with asset manager consent: LLFA/UU/EA etc.'

Therefore, from the existing brownfield area, the proposed flow will be:

Existing brownfield runoff (l/s)	Reduction	Proposed flow (l/s)
10	50%	5

Table 3-Proposed brown field flow

For the greenfield area, 0.71ha, it has been used the Greenfield runoff tool from HR Wallingford where it indicates that for the remaining area, the proposed discharge rate will be 4.4l/s. Refer to Appendix G for calculations.

Hence, the proposed discharge rate for the site will be **9.55l/s**:

Proposed brownfield flow (l/s)	Proposed greenfield flow (l/s)	Total proposed flow (l/s)
5	4.55	9.55

Table 4-Proposed flow

5.12 Proposed Attenuation

To facilitate the reduction in discharge rates from site, attenuation storage will be required. Using the flow rates calculated in section 5.11, the proposed attenuation volume for the site will be calculated based on the 100-year storm event plus 45% climate change to avoid property flooding and to not increase the flood risk offsite. Proposed impermeable areas are shown in Figure 9.

Using the MicroDrainage Source Control tool, the indicative attenuation volume for the site is approx. **500m³** (subject to detail design):

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall: [Dropdown]

Return Period (years): [100]

Region: [England and Wales]

Map: [M5-60] Ratio R: [0.359]

Cv (Summer): [0.750]

Cv (Winter): [0.840]

Impervious Area (ha): [0.753]

Maximum Allowable Discharge (l/s): [9.6]

Infiltration Coefficient (m/hr): [0.00000]

Safety Factor: [2.0]

Climate Change (%): [45]

Buttons: [Analyse] [OK] [Cancel] [Help]

Enter Climate Change between -100 and 600

Figure 10- Quick storage estimate variable

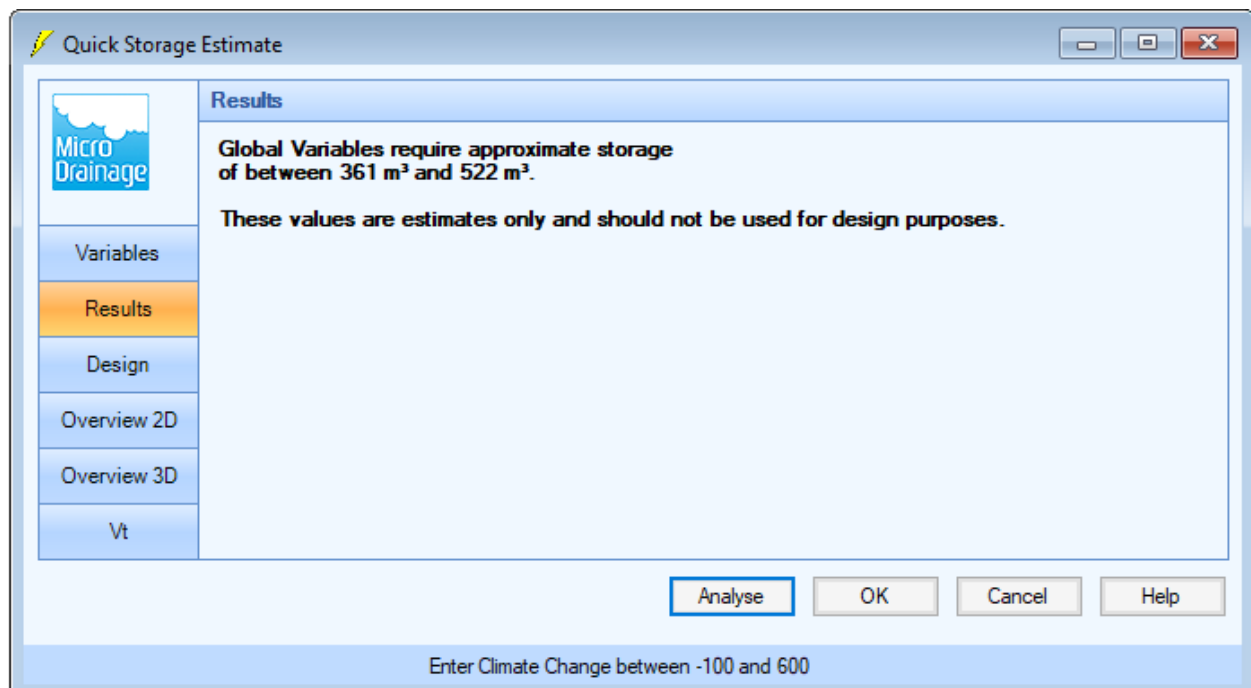


Figure 11- Quick storage estimate results

5.13 Proposed Strategy

The strategy for the surface water drainage of the scheme will be to collect the surface water runoff generated and discharge to a below ground network that connects to the existing public combined sewer on the access road between the site and Angel Gardens, which ultimately discharges to the public combined sewer located at Miller Street, at a restricted flow rate. Proposed discharge rate and attenuation will be proportional to the area of the plot.

Permeable paving will be used where possible to provide some attenuation and to delay and mitigate the peak flood flows from the site. Due to the proposed finishes, it is envisaged that some linear drainage and/or gullies will be also required to ensure all runoff is captured within the site boundary. Refer to Appendix H for Proposed surface and foul water drainage general arrangement.

As a result of the levels, surface water system can be split in four catchments:

- **Catchment 1:** This catchment will comprise the Unit 2 building and the eastern public realm up to the Unit 3 access road and it has an area of 2730m². Discharge rate for this catchment will be 3.2 l/s and the attenuation volume required will be 170m³ that will be provided between the permeable paving and the below ground attenuation tank.
- **Catchment 2:** This catchment will include the western public realm up to the Unit 3 building and it has an area of 930m². Discharge rate for this catchment will be 1.1 l/s and the attenuation volume required will be 60m³ that will be provided between the permeable paving and the below ground attenuation tank. Due to the levels, this catchment will discharge to the attenuation tank of Catchment 4.
- **Catchment 3:** This catchment will comprise the Unit 3 building, the eastern access road and externals and part of the southern external works. This catchment has an area of 3240m². Due to levels and space constraints on site, this catchment will receive flow from Catchment 2 (1.1l/s) and Catchment 4 (1.4 l/s) prior to discharge to the combined public sewer. Discharge rate for this catchment will be 6.3l/s (3.8 l/s from

Catchment 3 + 1.4l/s from Catchment 4 + 1.1 l/s from Catchment 2) and the attenuation volume required will be 200m³ that will be provided in a below ground attenuation tank.

- Catchment 4:** This catchment will include the western and part of the southern public realm and it has an area 1145m². Due to levels on site, this catchment will receive flow from Catchment 2 (1.1l/s) and will convey the water through Unit 3 to the proposed discharge point on the eastern side of the site. Discharge rate for this catchment will be 2.5 l/s (1.4l/s from Catchment 4 + 1.1 l/s from Catchment 2) and the attenuation volume required will be 70m³ that will be provided between the permeable paving and the below ground attenuation tank.

Figure 12 and Table 5 indicates the proposed catchments areas and summary of discharge rates and attenuation volumes required,



Figure 12-Proposed catchments

	Area (m ²)	Discharge rate (l/s)	Attenuation volume required (m ³)
Catchment 1	2730	3.2	170
Catchment 2	935	1.1	60
Catchment 3	3240	3.8	200
Catchment 4	1145	1.4	70
TOTAL	8050	9.55	500

Table 5- Catchment summary table

The requirement for a petrol interceptor is not envisaged given the car park is within the lower ground of the buildings however, this is to be confirmed and potential for wash down facility confirmed at detailed design stage.

Pumped solutions are not currently envisaged but will be reviewed as the design progresses. Detailed pump assessment, design and specification to be confirmed by proprietary supplier / MEP engineer.

5.14 Designing for Exceedance

The proposed site levels are similar to the existing site levels, which means the proposed site will generally fall from northeast to the southwest corner. Any exceedance events will follow the flow paths to Miller Street to the south and Angel Square public realm to the west. The main roads and public realm created will act as the flow paths and divert flow away from buildings to less vulnerable areas. Figure 13- Exceedance routes indicates the exceedance routes for the proposed development:



Figure 13- Exceedance routes

6 Foul Drainage Strategy

6.1 General Drainage Strategy

A separate foul drainage system will be provided to collect all foul water generated from site via gravitational flow (where possible) from below ground floor level and discharge to the existing public sewer. Where gravitational discharge is not possible the proposed foul water shall be pumped.

All foul water drainage above the ground slab will be designed by building services engineering. All foul water ground slab installation, slab penetrations, under slab drainage and the external foul drainage system is considered as civil infrastructure. Close coordination is required between the civil and building services engineers to connect the above and below ground slab drainage systems.

Under slab foul water drainage will be provided to collect foul water discharge from ground slab installations, and sewer vent pipes (SVPs) and convey by gravity to an external below ground foul drainage system.

External foul water drainage will be provided to collect foul water drainage and convey by gravity to the receiving public sewer. The external foul drainage systems will include pipe sewers, concrete and brick manholes, vent pipes, connector pipes and associated works.

6.2 Proposed Foul Water Drainage

Foul water disposal should be in accordance with the Part H "Drainage and Waste Disposal" of the Building Regulations.

Disposal will be to the public combined sewers in the vicinity of the site. Any new connections to the existing sewer system will require approval from the relevant authority. United Utilities confirmed that the foul water from this site can be drained at an unrestricted rate to the public combined sewer network.

Foul drainage will need to make an allowance for grease traps/interceptors for kitchen areas in the above ground drainage systems. Refer to Appendix H for Proposed surface and foul water drainage general arrangement.

It should be noted that due to the FFL for the lower ground level of Unit 2, two options could be considered (subject to detailed design):

- Foul water network that drains the building, including the lower ground level by gravity but will require deep excavations (5-7m depth).
- Drain the lower ground level by a pumped system and keep the rest by gravity reducing the depth of the excavations.

7 Conclusions

This drainage strategy has been prepared in support of the planning application to set the principles for the drainage design to serve the 2&3 Angel Square development. The exact configuration and nature of the drainage would be determined at the detailed design / discharge of planning conditions stage. This report should be read in conjunction with the Buro Happold Flood Risk Assessment (FRA).

As a result of the existing conditions on site, surface water flows are anticipated to discharge to the existing combined public sewer located within the boundary.

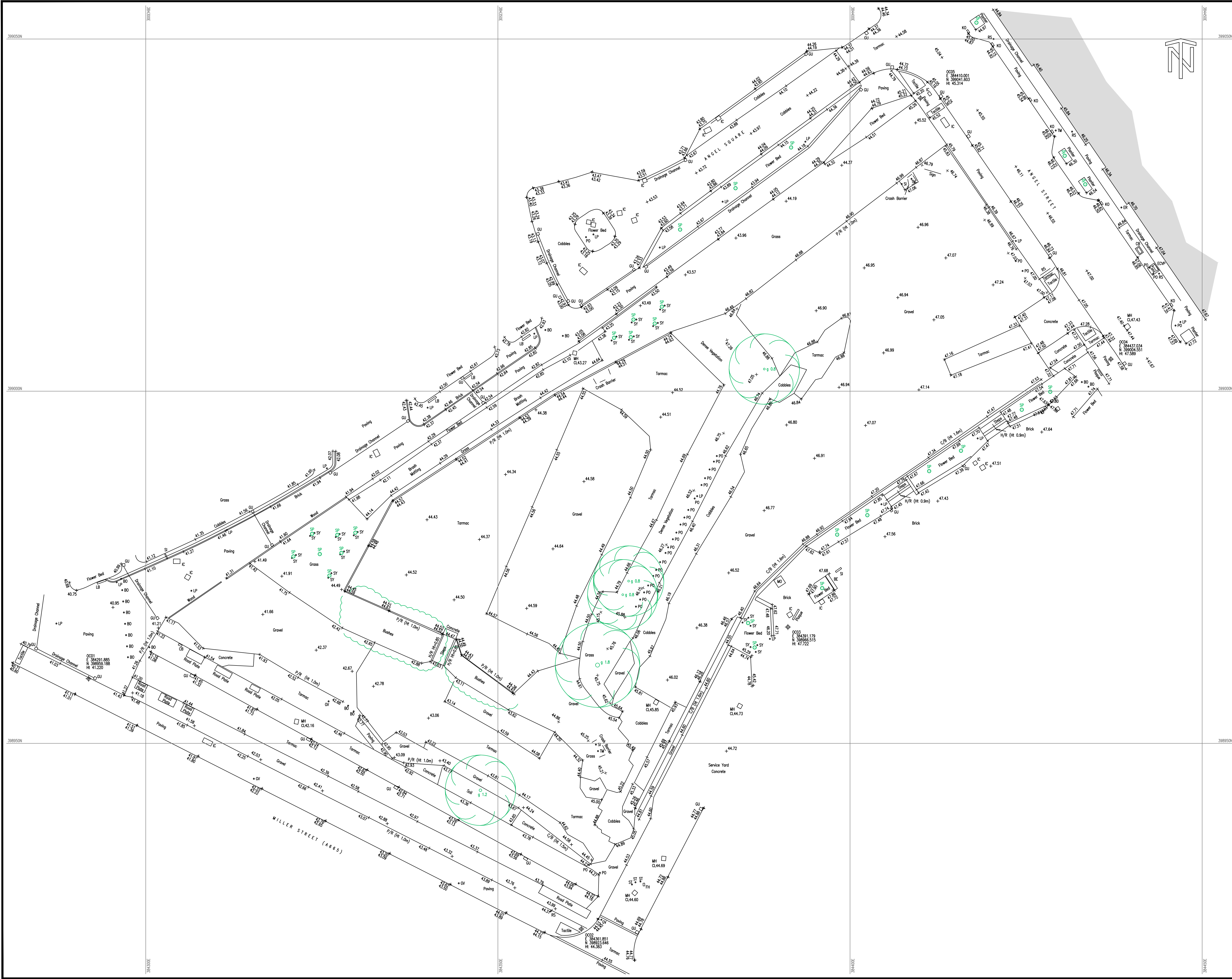
The strategy for the surface water drainage of the scheme will be to collect the surface water runoff generated and discharge to the existing combined public sewer located within the boundary at a restricted flow rate.

Attenuation storage will be required to facilitate the reduction of the proposed flows, and SuDS will be included wherever practicable.

Proposed surface water discharge rate is 9.55l/s and it has been estimated that the attenuation volume require will be 500m³ that will be provided mainly within below ground tanks and permeable paving.

A separate foul drainage system will be provided to collect all foul water generated from site via gravitational flow (where possible) from below ground floor level and discharge to the existing public sewer. United Utilities confirmed that the foul water from this site can be drained at an unrestricted rate to the public combined sewer network.

Appendix A Topographical survey



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

STANDARD ABBREVIATIONS

STREET FURNITURE	LA - LADDER	TS - TRAFFIC SIGNAL
AC - AIR CONDITIONING	LB - LITTER BIN	TP - TELEGRAPH POLE
AL - ALARM	LC - LIGHTING COLUMN	UL - UNABLE TO LEFT
AV - AERIAL	LP - LAMP POST	VB - VEHICLE BELOW
AW - AIR VALVE	MB - MOORING BOLLARD	VP - VENT PIPE
BA - BATTERY	MA - MAST	WB - WASH OUT
BB - BUILDING BEACON	MM - MANHOLE	WM - WATER METER
BD - BUILDING DIVIDE	MD - MONUMENT	WO - WASH OUT
BE - BENCH	ME - MILE POST	WP - WASTE PIPE
BF - BENCH FOUNTAIN	MF - MONUMENT	
BL - BOLLARD	MM - MONITORING WELL	
BM - BOUNDARY POINT	MP - MAST PLATE	
BO - BOULDER	OH - OVERHEAD	
BS - BUS STOP	OSM - ORDNANCE SURVEY	
BU - BUSH	PA - PLAY APPARATUS	
CA - CABLE	PS - PILLAR BOX	
CB - CONTROL BOX	PH - PUBLIC HOUSE	
CC - CLOSE CIRCUIT TV	PI - PIPE	
CD - CIGARETTE BIN	PL - PLANT	
CE - COLUMN	PM - PARKING METER	
CF - CLOSE CIRCUIT TV POLE	PN - PUMP	
CG - CLOSURE	PP - PETROL PUMP	
CH - CHIMNEY	PR - ROAD SIGN	
CI - CLOSURE	RS - ROAD SIGN	
CL - CLOSURE	RW - RETAINING WALL	
CM - CLOSURE	RR - RAINWATER PIPE	
CO - CLOSURE	SA - STATION	
CP - CLOSURE	SC - SPEED CAMERA	
CQ - CLOSURE	SD - SAFETY FENCE	
CR - CLOSURE	SE - SIGNAL	
CS - CLOSURE	SI - SIGN	
CT - CLOSURE	SM - SERVICE MARKER POST	
CU - CLOSURE	SS - SECURITY SENSOR	
CV - CLOSURE	ST - STOP TAP	
CW - CLOSURE	SU - STUMP	
CX - CLOSURE	SV - STOP VALVE	
CY - CLOSURE	SW - SWITCHGEAR	
CZ - CLOSURE	SY - STAY	
DA - DRAIN	TA - TAP	
DB - DRAIN	TB - TEMPORARY BENCH MARK	
DC - DRAIN	TC - TELEPHONE CALL BOX	
DD - DRAIN	TE - TELEPHONE	
DE - DRAIN	TF - TICKET MACHINE	

SYMBOLS

STATION TABLE

STATION	EASTING	NORTHING	LEVEL
OCO1	E 384291.885	N 398959.188	Ht 41.220
OCO2	E 384301.851	N 398923.646	Ht 44.383
OCO3	E 384301.179	N 398966.515	Ht 47.722
OCO4	E 384337.034	N 399004.551	Ht 47.589
OCO5	E 384410.001	N 399041.603	Ht 45.314

Rev	Date	Drawn	Description	Ch'd	App'd

CHARTERED GEOMATIC SURVEYORS
Jupiter House, 21 Roebuck Lane, Sale, Manchester, M33 7YJ
T: 0161 973 3495 F: 0161 962 6819
E: mail@ndoliver.com www.ndoliver.com

Client
GARDINER & THEOBALD LLP
MERCHANT EXCHANGE
17-19 WHITWORTH STREET WEST
MANCHESTER
M1 5WG

Title
ANGEL SQUARE
MILLER STREET
MANCHESTER
TOPOGRAPHICAL SURVEY
SHEET 1 OF 1

Surveyed	PG	Drawn	BW	Drawn Date
Checked	AM	Approved	ND	26/04/2021
Scale	1:250 @ A1	Project	11164	Status
Drawing No	11164 / 001	CAD File	11164_001.dwg	ORIG
				Rev
				0

Appendix B LLFA data screening



**MANCHESTER
CITY COUNCIL**

Lead Local Flood Authority

Highways Service
Growth and Neighbourhoods Directorate
Manchester City Council
PO Box 532
Town Hall
Manchester
M60 2LA

Email: floodriskmanagement@manchester.gov.uk

DATE 10/05/2021

Dear Sir or Madam,

RE: Our Ref: MCC010/05/2022

We acknowledge with thanks your payment received on 09/05/2022 for our LLFA data screen service.

Please find enclosed plan showing the results of the data screen. The position of features shown on this plan is approximate only and is given in accordance with the best information currently available.

The enclosed plan cannot be used to substitute a competent site investigation.

The enclosed plan is being provided to you subject to Manchester City Council's terms and conditions which are shown attached.

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

If you have any queries regarding this matter, please do not hesitate to contact us.

Yours Faithfully,

A handwritten signature in black ink, appearing to read 'N. A. Bayliss-Rowe'.

Neil Bayliss-Rowe, Highways Development Control & Flood Risk Manager, Lead Local Flood Authority

TERMS AND CONDITIONS – LLFA DATA SCREEN

These provisions apply to LLFA data supplied by Manchester City Council (“MCC”).

TERMS AND CONDITIONS:

- This data Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- MCC has taken all reasonable care to compile this data Map. This data Map and any information supplied with it is provided for general guidance only and MCC makes no representation, undertaking or warranty of any kind as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position of any culverted assets shown on the data Map are approximate only. MCC strongly recommends that a comprehensive site investigation is undertaken in addition to reviewing this data Map to determine and ensure the precise location of any assets. The exact location, positions and depths should be obtained by an appropriate survey which may include but shall not be limited to GPR and CCTV.
- The data screened may be modified over time without notice and therefore this data Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the data Map have been made subsequent to issue and prior to any works being carried out.
- This data Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) or for the purpose of determining the suitability of a point of connection to discharge.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising from damages of any kind caused to assets by reason of the actual position and/or existence of assets being different from those shown on the data Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent MCC from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

DATA SCREEN SYMBOLOGY

Bridge

-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Trash Screen

-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Culvert Orifice

-  Very Good
-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Culvert Conduit

-  CCTV surveyed
-  Not CCTV surveyed
-  Ordinary Watercourse Conduit
-  MCC SuDS
-  MCC Flood Incident Points
-  MCC Section 19 Report
-  MCC Flood Incident Polygons
-  MCC Local Authority Boundary

Supplementary Information where available:

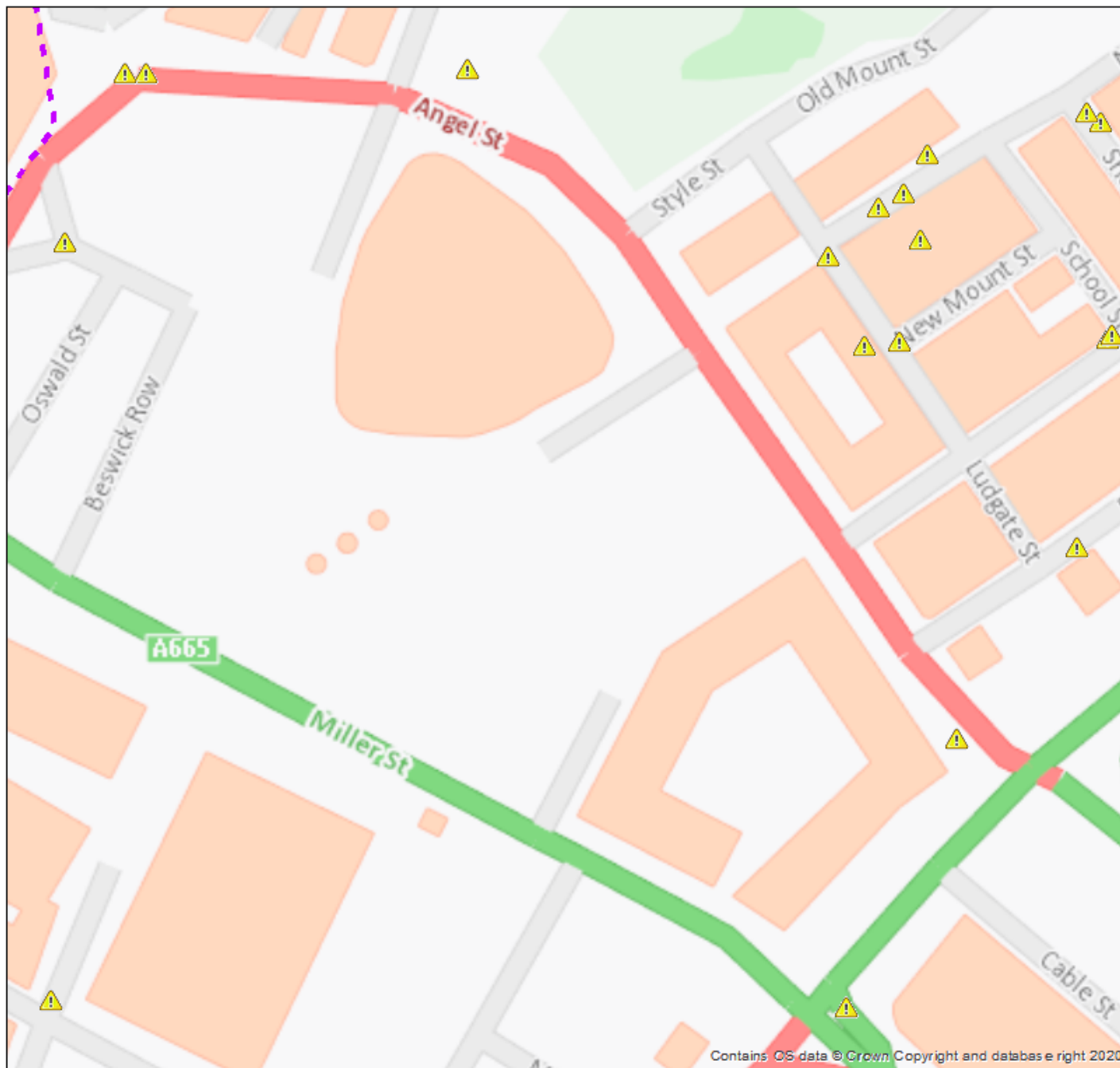
Critical Drainage Area – The site is within the Conurbation Core CDA.

Flood Incidents - There are no recorded flood incidents onsite. The nearest recorded (approximately 50m northeast of the Site) is 'flooding on the highway' dated 16/03/2022.

Culvert Conduits – The LLFA asset register does not record any known or indicative culverted ordinary watercourses within the site boundary. The closest indicative culverted ordinary watercourse is approximately 150m to the northwest.

Survey and Design Archive – The 1984 Manchester City Council drainage survey does not record any known or indicative ordinary watercourses within the site boundary. A georeferenced extract is enclosed.

Any other information identified by LLFA officer during screening – United Utilities records available to us indicate an abandoned combined sewer may cross the northern part of the site. We recommend United Utilities are consulted to confirm whether this asset exists onsite and whether it has been properly decommissioned.



**MANCHESTER
CITY COUNCIL**

LLFA DATA SCREEN

Address/Site Ref:

Angel Square

Our Ref: **MCC010/05/2022**

Author: Manchester City Council LLFA

Date: 10/05/2022

Scale: 1:1,493

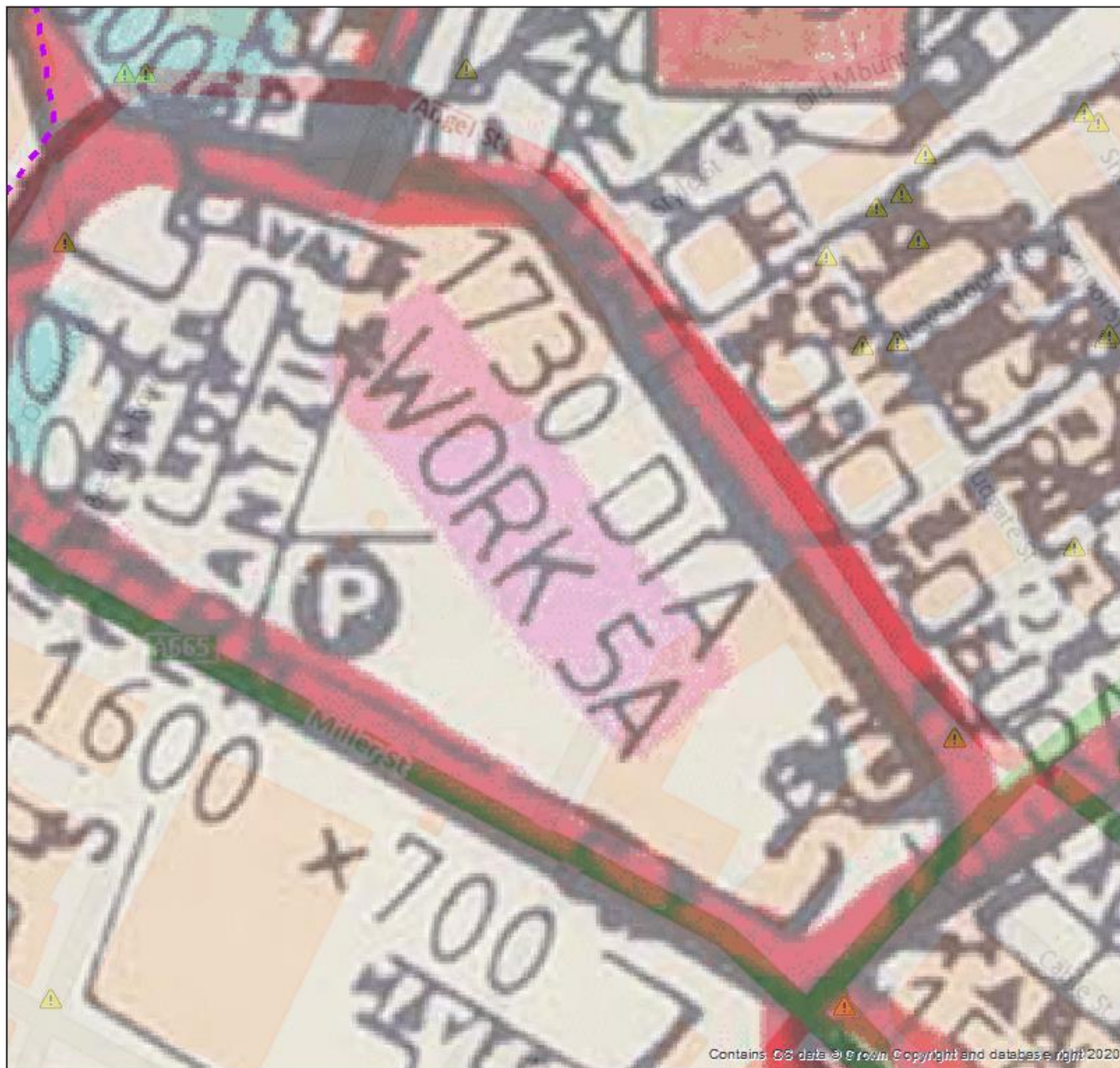
The position of features shown on this plan is approximate only and is given in accordance with the best information currently available. Manchester City Council will not accept liability for any loss or damage caused by the actual position being different from those shown.

0 10 20 40
Meters



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**MANCHESTER
CITY COUNCIL**

LLFA DATA SCREEN

Address/Site Ref:

Angel Square

Our Ref:

MCC010/05/2022

Author: Manchester City Council LLFA

Date: 10/05/2022

Scale: 1:1,493

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

0 10 20 40
Meters

N



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Appendix C Multi Utility Infrastructure Constraint Plan



The Utility Information on this drawing has been taken from records supplied by each individual affected Utility Company under a C2 request and is given without warranty, the accuracy thereof cannot be guaranteed, nor can we guarantee the accuracy of the transfer of information to this drawing. No Liability of any kind whatsoever is accepted by WDA Ltd for any error or omission.

This drawing is solely for visual guidance.

Safe Digging practices in accordance with HS(G)47 Avoiding Danger from Underground Services must be used to verify and establish the actual position of each individual service.

RELATED DRAWINGS:

ELECTRICITY:	157-WDA-SS-EX-DR-UC-E100-001
GAS:	157-WDA-SS-EX-DR-UC-G100-001
TELECOMMUNICATIONS:	157-WDA-SS-EX-DR-UC-T100-001
WATER (POTABLE):	157-WDA-SS-EX-DR-UC-W100-001
WATER (SEWERS):	157-WDA-SS-EX-DR-UC-W100-002
TELECOMS PRIVATE DUCT:	157-WDA-SS-EX-DR-UC-M100-001
GAS PRIVATE PIPEWORK:	157-WDA-SS-EX-DR-UC-M100-002
STREET LIGHTING:	157-WDA-SS-EX-DR-UC-M100-003
Background Plan base on Simpson Haugh & Partners Drng No. 10257-SHP-ZZ-TY-PL-A-G100-001 P02 22/07/2020	

UTILITY LEGEND

	Water Main
	Water Main (Abandoned)
	Water-Trunk Main
	Surface Water Drain
	Foul Water Sewer
	Foul Water Sewer (Abandoned)
	33kV Electricity Cable
	6.6kV Electricity Cable
	6.6kV Electricity Cable (Abandoned)
	LV Electricity Cable
	LV Electricity Cable (Abandoned)
	Street Lighting
	Gas - Low Pressure
	Future Proofing Main laid by 3rd parties and not gas charged or connected into the NGG network
	British telecom Cable
	British Telecom Duct (Unoccupied)
	British telecom Cable (Planned)
	Private Telecom Cable Ducts
	CenturyLink Cable
	City Fibre
	Gamma Fibre Duct
	Gamma Fibre Optic in OLO Duct
	Gamma Fibre Optic in Shared Duct
	Sky
	Virgin Media Cable
	Vodafone Cable
	Zayo Cable
	Zayo Cable Abandoned
	Trunk Water Main Easement No Work Permitted over or within 5M (Horizontal) of the asset
	315mm Water Main Easement No Work Permitted over or within 5M (Horizontal) of the asset

Client(s) NOMA GP Ltd

Project NOMA, MANCHESTER
MASTERPLAN STUDY 2021

Drg Title MULTI UTILITY
INFRASTRUCTURE
CONSTRAINTS PLAN (2021)

Drawing No.	Rev
157-WDA-SS-EX-DR-UC-MU100-001	01

Scale	Sheet	Drawn	Checked	Date
1:1000	A1	CP		MAY 2021

Drawing revisions:

Revision	Event	Drawn By	Checked By	Date
01	All Utilities Layouts updated	WD/CP		21/12/2021

Utilities Infrastructure Consultants



Site Appraisals | Masterplanning | Diversions | New Infrastructure

m: 07593 789 872 or 07526 943 594 | e: info@wdassociates.co.uk
1 New Walk, Totnes, TQ9 5HA

www.wdassociates.co.uk

This drawing remains the property of William Downie Associates and should not be distributed, copied or revised without prior consent.

Appendix D Correspondence with United Utilities

Francisco Rodriguez

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 08 June 2022 16:48
To: Francisco Rodriguez
Cc: Cameron Robinson
Subject: FW: PDE for: Project Noma Plots 2 and 3 UU ICS Ref: 02148156

****External Email. This email originated from outside Buro Happold.****

Good afternoon Francis,

Thanks for your email. After reviewing the ground investigation report, I can confirm that infiltration is not feasible.

Accordingly, we accept discharged surface water from the site into to the 600*1500mm diameter public combined sewer within Miller Street located East of the proposed site at a rate of 9.55l/s.

Kind regards,



Mohammed Aljafarawi
Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

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www.unitedutilities.com/subsidiaries

Francisco Rodriguez

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 24 May 2022 11:00
To: Francisco Rodriguez
Cc: Cameron Robinson
Subject: RE: PDE for: Project Noma Plots 2 and 3 UU ICS Ref: 02148156

Follow Up Flag: Follow up
Flag Status: Flagged

****External Email. This email originated from outside Buro Happold.****

Good afternoon Francisc,

Thanks for your email. United Utilities not considering discharge surface water to the public combined sewer is feasible while more sustainable drainage options available as clarified below:

1. Soakaway or some other adequate infiltration system
2. A combined sewer

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

If an evidence based assessment has been carried out and confirms that infiltration is not feasible. Then according to our record surface water runoff from the site should be discharged into to the 600*1500mm diameter public combined sewer within Miller Street located East of the proposed site at a rate of 9.55l/s.

We have noted you stated "Discharge to ground – not feasible as per ground investigation report previously attached", the previous report does not show clear evidence of discounted infiltration. [We would be grateful if the applicant can submit the ground investigation report and soil infiltration test report under the BRE365 standard to prove the feasibility of infiltration.](#)

Kind regards,



Mohammed Aljafarawi
Developer Engineer
Developer Services & Metering
Customer Services
unitedutilities.com

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----- Original Message -----

From: Francisco Rodriguez [francisco.rodriguez@burohappold.com]

Sent: 23/05/2022 11:01

To: wastewaterdeveloperservices@uuplc.co.uk; cameron.robinson@burohappold.com

Subject: RE: PDE for: Project Noma Plots 2 and 3 UU Ref : 4200049295

EXTERNAL EMAIL This email originated outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi Mohammed,

We have received a finalised site boundary for the site as shown on the attached pdf. The site boundary is now 0.83ha. We hope the procedure use originally is still the same and therefore the proposed surface water flow rate is envisaged to be:

1. 5 l/s from the Marketing suite plus (0.12ha)
2. 4.55l/s from the rest of the site that is treated as greenfield (no operational drainage, 0.71 ha).

Could you please confirm that the total surface water flow rate of 9.55l/s for the site is acceptable?

A prompt response will be appreciated.

Kind Regards

Francis

Francisco Rodriguez (Francis)

Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds

T: +44 (0)1132 042200

www.burohappold.com | [Twitter](#) | [Instagram](#)

BURO HAPPOLD

From: Cameron Robinson <Cameron.Robinson@BuroHappold.com>
Sent: 16 May 2022 11:32
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Cc: Francisco Rodriguez <Francisco.Rodriguez@BuroHappold.com>
Subject: RE: PDE for: Project Noma Plots 2 and 3 UU Ref : 4200049295

Hi Mohammed,

Thank you very much for your reply.

As per your email I have outlined the below items requested:

1. Foul Water

1. Proposed discharge at an unrestricted rate to the existing 600x1500mm dia. public combined sewer to east of the development off Miller Street as per drawing NMA-BHE-XX-XX-DR-C-3102 previously attached, showing FW stub location

2. Surface Water

1. Drainage hierarchy previously considered as such:
 1. Discharge to ground – not feasible as per ground investigation report previously attached
 2. Discharge to waterbody – significant distance to nearest waterbody noted, thus not feasible
 3. Discharge to highway drainage – existing abandoned highways drain within site which discharges to public sewer located in Miller Street. Connection currently envisaged for Marketing Suite; application no. 4200039900
 4. Discharge to public sewer – proposed discharge to 600x1500mm dia. public combined sewer to east of development off Miller Street as per drawing NMA-BHE-XX-XX-DR-C-3102 previously attached, showing SW stub location

Furthermore we have engaged early in the process with LLFA to discuss SuDS as MCC require this early on major developments in Manchester; this included culvert screening at their request.

The 0.12ha marketing suite (REF: 4200039900) on the Noma plot has been accepted to discharge at 5l/s – having estimated greenfield runoff for the remaining site are (0.63ha, which generates a Qbar of 4.03l/s) we envisage a total discharge rate of 9.03l/s will be acceptable (see attached greenfield runoff estimation from HR Wallingford online tool).

Therefore, if you have no objections to the above can you confirm that a discharge rate of 9.03l/s is suitable?

We appreciate a timely response so please do let me know if you require anything further.

Cheers,

Cameron

Cameron Robinson
Graduate Infrastructure Engineer
Buro Happold | Cities - Infrastructure (Leeds)

T: +44 (0)113 204 2200
www.burohappold.com | [Twitter](#) | [Instagram](#)

BURO HAPPOLD

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 12 May 2022 11:20
To: Cameron Robinson <Cameron.Robinson@BuroHappold.com>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>; Francisco Rodriguez <Francisco.Rodriguez@BuroHappold.com>
Subject: PDE for: Project Noma Plots 2 and 3 UU Ref : 4200049295

****External Email. This email originated from outside Buro Happold.****

Good afternoon Cameron,

Pre Development Enquiry for: Project Noma Plots 2 and 3 UU Reference Number : 4200049295

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

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

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

Foul Water

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

Our preferred point of discharge would be to the 600*1500mm public combined sewer Miller Street located to the East of your proposed development at an unrestricted rate.

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

Please ensure all proposed manhole chambers cover levels and finished floor levels are higher than the receiving public sewer.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

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

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

This is outlined as follows, in order of priority:

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

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

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

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

Infiltration

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

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

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

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

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

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

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

Waterbody

United Utilities acknowledge that the nearest watercourse is a significant distance off-site.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

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

Once evidence is provided as outlined above, United Utilities will consider a connection to the 600*1500mm diameter public combined sewer within Miller Street located East of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 10l/s.

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

Levels

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

Land drainage / Overland flows / track drainage

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

Existing Water Assets Crossing the Site

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

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

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

Connection Application

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

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

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

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

Kind regards,

 Water for the North West	Mohammed Aljafarawi Developer Engineer Developer Services & Metering Customer Services Email: Mohammed.Aljafarawi@uuplc.co.uk unitedutilities.com
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From: Cameron Robinson [<mailto:Cameron.Robinson@BuroHappold.com>]
Sent: 03 May 2022 11:07
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Cc: Francisco Rodriguez <Francisco.Rodriguez@BuroHappold.com>
Subject: Wastewater Pre-Development Enquiry: 2,3 Angel Square REF 4200026941

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Good morning,

I hope you are doing well.

Please find attached pre-development enquiry for 2,3 Angel Square (ref. 4200026941)

This is following previous communications from 2019 since the project has now resumed, of which I have attached the email chain as pdf and reference number above. The site hasn't changed during this time so we hope we can obtain the same discharge rate (10l/s) as it was agreed previously.

We have also attached an indicative drainage strategy with two proposed points of connection.

Please feel free to reach out if you require any further information.

Cheers,

Cameron

Cameron Robinson
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Appendix E Correspondence with the LLFA

Francisco Rodriguez

From: Laura Peacock <Laura.Peacock@manchester.gov.uk>
Sent: 05 May 2022 16:42
To: Chatfield, Jennifer; Alan Cave; Paul Thomson; Francisco Rodriguez; Ross Ogilvie
Cc: Jennifer Atkinson
Subject: RE: 2&3 Angel Sq - SUDS Pre-app
Attachments: Angel_Square.docx

Follow Up Flag: Follow up
Flag Status: Flagged

****External Email. This email originated from outside Buro Happold.****

Good afternoon,

Thanks all for your time on the call,

Please find attached the notes we ran through.

I've summarised the points we discussed RE green SuDS:

- We would like to see conversations had about whether you can link in with the wider Angel Sq.
- Without being too prescriptive, we would recommend considering green SuDS at different levels if you are constricted with the roof (e.g. green walls or green SuDS at ground level, SuDS-enabling the proposed landscaping etc.).
- We recommend exploring if you can use rainwater harvesting to reach volume control standards for SuDS. This could include irrigation components to serve your landscaping, and would not necessarily require storage at roof level. We discussed that this is not the same as attenuation storage.
- We have encouraged holistic consideration of sustainability; while carbon of the building is important we would also recommend considering carbon impacts offsite and what the development is doing for the region. We would point to the carbon emissions required to treat surface water discharged to the public sewer – this is documented e.g. [here](#). We also discussed other non-carbon sustainability issues with the pressure on the public sewer network resulting in raw sewage spills into rivers.

As discussed if you wish to discuss anything further pre-submission, please drop me an email.

Thanks again for your time,

Kind Regards,
Laura

-----Original Appointment-----

From: Chatfield, Jennifer <jchatfield@deloitte.co.uk>
Sent: 03 May 2022 17:03
To: Chatfield, Jennifer; Alan Cave; Paul Thomson; Francisco Rodriguez; Laura Peacock; Ross Ogilvie; Matt Stirton
Cc: Jim Boothroyd; Josh Croke; Wray, Katie; Jennifer Atkinson
Subject: 2&3 Angel Sq - SUDS Pre-app
When: 05 May 2022 15:30-16:30 (UTC+00:00) Dublin, Edinburgh, Lisbon, London.
Where: Microsoft Teams Meeting

Microsoft Teams meeting

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Condition X: No development shall take place until surface water drainage works have been implemented in accordance with Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacements national standards and details that have been submitted to and approved in writing by the Local Planning Authority.

In order to avoid/discharge the above drainage condition the following additional information has to be provided:

- *Maximised integration of green SuDS components (utilising infiltration or attenuation) if practicable; - Interception/bioretention can substitute infiltration.*
- *Details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. for brownfield at least a 50% reduction in runoff rate compared to the existing rates, greenfield runoff rates for greenfield. Note overlap with asset manager consent: LLFA/UU/EA etc.*
- *An existing and proposed impermeable areas drawing to accompany all discharge rate calculations. Make sure any existing greenfield/brownfield split accounted for.*
- *Runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonable practicable to the greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment;*
- *Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event with allowance for climate change in any part of a building; - CC to be max appropriate for dev. lifetime & current EA guidance – i.e. currently 40% unless clear it will be decommissioned.*
- *Assessment of overland flow routes for extreme events that is diverted away from buildings (including basements). Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site.*
- *Evidenced-based progression through drainage hierarchy. Results of ground investigation carried out under Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Proposal of the attenuation that is achieving half emptying time within 24 hours. If no ground investigations are possible or infiltration is not feasible on site, evidence of alternative surface water disposal routes (as follows) is required.*
- *Where surface water is connected to Main River, any works within or adjacent to the river that would affect it would require consent from Environment Agency. An email of acceptance of proposed flows and/or new connection will suffice.*
- *Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.*
- *Where surface water is connected to the ordinary watercourse, agreement in principle from Manchester City Council as Lead Local Flood Authority is required. Please note that all new connections to the watercourses shall comply with reduction of flows to Greenfield runoff rates. An email of acceptance of proposed flows and/or new connection will suffice.*

- Where surface water is connected to ordinary watercourse, any works within or adjacent to the watercourse that would affect it would require consent from Manchester City Council as Lead Local Flood Authority. Consent forms can be obtained on the website at:

http://www.manchester.gov.uk/downloads/download/5567/land_drainage_consent_and_guidance.com

- For sites where proposed development would cause unusual pollution risk to surface water (large car park areas (>50 parking spaces) or industrial estates), evidence of pollution control measures (preferably through SuDS) is required.
- Where an application is part of a larger site which already has planning permission it is essential that the new proposal does not compromise the drainage scheme already approved.
- Hydraulic calculation of the proposed drainage system;
- Construction details of flow control and SuDS elements.

Reason: To promote sustainable development, secure proper drainage and to manage the risk of flooding and pollution. This condition is imposed in light of national policies within the NPPF and NPPG and local policies EN08 and EN14.

If there is no clear adoption policy in place to take over the proposed drainage system after construction, we suggest the following construction and maintenance condition to be considered by the LPA:

Condition X: No development hereby permitted shall be occupied until details of the implementation, maintenance and management of the sustainable drainage scheme have been submitted to and approved by the local planning authority. The scheme shall be implemented and thereafter managed and maintained in accordance with the approved details. Those details shall include:

- Verification report providing photographic evidence of construction as per design drawings;
- As built construction drawings if different from design construction drawings;
- Management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.

Reason: To manage flooding and pollution and to ensure that a managing body is in place for the sustainable drainage system and there is funding and maintenance mechanism for the lifetime of the development.

Appendix F SUDs Maintenance plan

The table below is based on the CIRIA C753 SuDs Manual, 2015.

SUDS COMPONENTS MAINTENANCE REQUIREMENTS		
SUDS COMPONENT	Geocellular Attenuation Tanks	
MAINTENANCE	ACTION	FREQUENCY
Regular maintenance	Check inlets, outlets, control structures and overflows	Monthly or annually, as required
Occasional tasks	Jetting and suction where silt has settled	As required
Remedial work	Reinstate	As required
SUDS COMPONENT	Permeable paving	
MAINTENANCE	ACTION	FREQUENCY
Regular maintenance	Check outlets and control structures	Monthly, depending on detail
	Surface brushing for appearance and to reduce silt accumulation	Monthly
	Brushing and suction sweep or jet wash and suction sweep particularly for block pavement in autumn after leaf fall	Annually
	Mow grass edges to paving at 35-50mm and remove weeds and leaves	As required
Occasional tasks	Jetting and suction where silt has accumulated in joints or voids. Replace grit and vibrate surface to lock for permeable block paving	As required
Remedial work	Where sinkage or surface damage occurs uplift blocks, remove grit bedding layer, geotextile if present and reinstate to design profile	As required
	Repair or replace inlets, outlets or control structures to design detail	As required

Appendix G Greenfield runoff calculation

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Cameron Robinson

Site name: Noma 2,3

Site location: Manchester

Site Details

Latitude: 53.48719° N

Longitude: 2.23712° W

Reference: 2409449464

Date: May 23 2022 10:53

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

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.71

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics: Default Edited

SOIL type: 4 4

HOST class: N/A N/A

SPR/SPRHOST: 0.47 0.47

Hydrological characteristics: Default Edited

SAAR (mm): 891 891

Hydrological region: 10 10

Growth curve factor 1 year: 0.87 0.87

Growth curve factor 30 years: 1.7 1.7

Growth curve factor 100 years: 2.08 2.08

Growth curve factor 200 years: 2.37 2.37

Notes

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

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

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

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

(3) Is $SPR/SPRHOST \leq 0.3$?

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

Greenfield runoff rates: Default Edited

Q_{BAR} (l/s): 4.55 4.55

1 in 1 year (l/s): 3.95 3.95

1 in 30 years (l/s): 7.73 7.73

1 in 100 year (l/s): 9.46 9.46

1 in 200 years (l/s): 10.77 10.77

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

Appendix H Proposed Surface and Foul Water drainage General Arrangement



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MAINTENANCE/CLEANING/OPERATION

DECOMMISSIONING/DEMOLITION

GENERAL NOTES
1. THIS DRAWING AND SCHEME DESIGN IS BASED ON THE FOLLOWING DRAWINGS AND INFORMATION:
• TOPOGRAPHICAL SURVEY BY ND OLIVER AND CO (11164_001)
• UTILITY SURVEY DRAWING No. 157-WDA-SS-EX-DR-UC-MU100-001-Rev01 RECEIVED MAY 2022 BY WDA
• LOWER GROUND FLOOR LAYOUT DRAWING No. 947-GPA-ZZ-01-DR-A-SK201-P04 RECEIVED 20/05/2022 BY CARTWRIGHT PICKARD
• LANDSCAPE LAYOUT - DRAWING No. PL2190.1-PLA-XX-XX-DR-L-1000-S2-P05 RECEIVED 26/05/2022 BY PLANT
• OS TILE INFORMATION (BACKGROUND CONTEXT ONLY)
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, DETAILS AND SPECIFICATIONS.
3. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.

P02 UPDATED LANDSCAPE BACKGROUND 22.06.2022 FR PT PT
P01 ISSUED FOR PLANNING 27.05.2022 FR PT PT

Rev	Description	Date	Iss'd	Rev'd	App'd
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STAGE 2
Project Stage

PLANNING
Status of Drawing

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Client: MEPCO/FEDERATED HERMES
Architect: CARTWRIGHT PICKARD
Project: **Project Noma Plots 2 and 3**
Dwg Title: PROPOSED DRAINAGE SURFACE AND FOUL WATER GENERAL ARRANGEMENT

Job No: 0050930
Scale@A1: 1:250
Drawn/Designed By: FR
Checked By: PT
Approved By: PT

Drawing No: NMA-BHE-XX-XX-DR-C-3100
Revision: P02

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