

Land at Spear Street, Northern Quarter

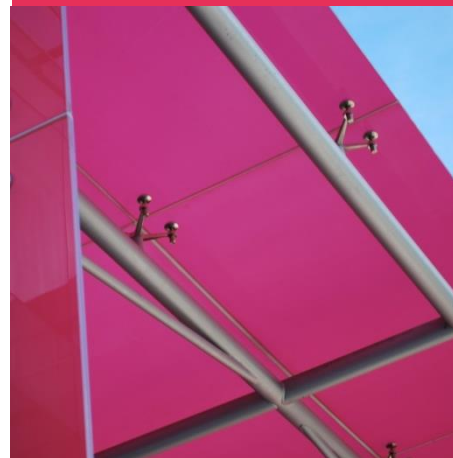
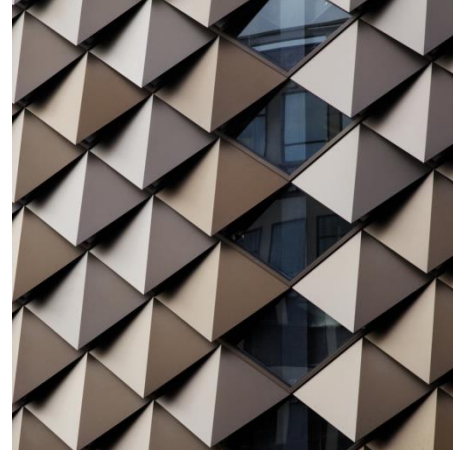
Flood Risk Assessment & Drainage Strategy

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United Utilities Correspondence

1.0 Introduction

1.1 Project Background

- 1.1.1 Curtins have been appointed by M4nchester One Limited to provide a Flood Risk Assessment (FRA) and Drainage Strategy (DS) for the proposed residential building off Spear Street, Manchester.
- 1.1.2 The FRA provides information on the nature of flood risk at the site and an assessment of drainage proposals. The assessment follows Government guidance with regard to development and flood risk.
- 1.1.3 The report is based on currently available information and preliminary discussions.
- 1.1.4 Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.5 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
 - Investigate all potential risks of flooding to the site,
 - Consider the impact the development may have elsewhere with regards to flooding; and
 - Consider proposals to mitigate any potential risk of flooding determined to be present.
- 1.2.3 The site area is 0.013 hectares and following scrutiny of the Environment Agency flood maps it has been identified that the existing site lies within an area classified as Flood Zone 1 indicating that the risk of flooding from rivers and sea is low.
- 1.2.4 The site is located within the Conurbation Core Critical Drainage Area, however based on Environment Agency guidance for development with a site area of 0.5 hectare or less within Critical Drainage Areas; an FRA was not required to support a planning application however this document will support the drainage strategy for the development.

1.2.5 The Assessment reviews the following information:

- Environment Agency flood maps for rivers and sea flooding, surface water flooding and reservoir flooding.
- Strategic Flood Risk Assessment (SFRA) for Manchester, Salford and Trafford Level 1 Dated March 2010 and Level 2 dated March 2011.
- Preliminary Flood Risk Assessment for Manchester City Council dated May 2011.
- United Utilities Public Sewer Records.
- Historic Drainage Records
- Topographical Survey
- Intrusive Investigation Report (B049271/RB/7070)

1.3 Proposed Development

1.3.1 The proposed development is a full planning application for the erection of an eight storey building to provide 11 no. residential apartments (Use Class C3) alongside cycle parking and other associated works.

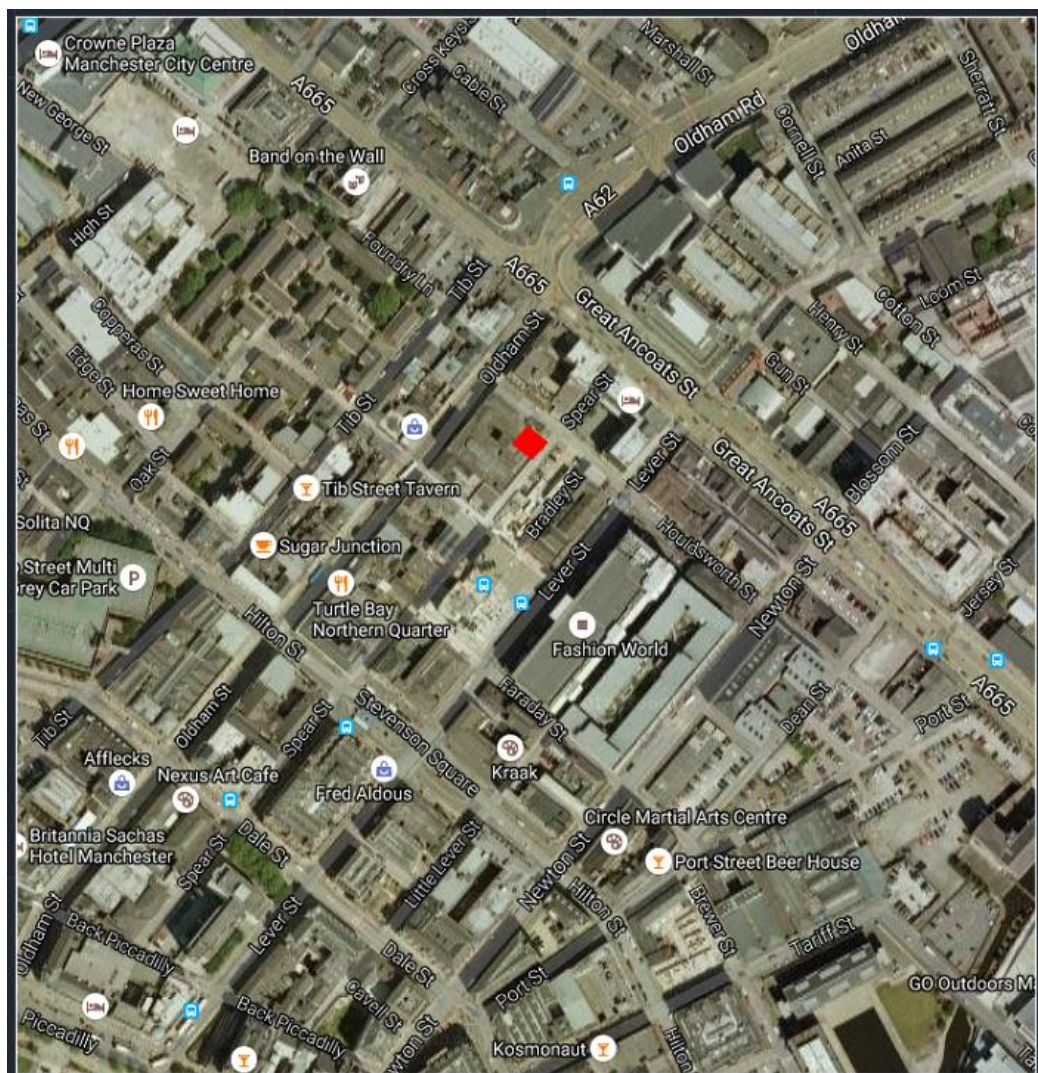
1.3.2 The proposed floor plans are enclosed in Appendix A.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 The site is located off Spear Street in Manchester City Centre. The site is currently not in active use and is secured by boarding.
- 2.1.2 The site is bounded by Houldsworth Street to the north-east, Spear Street to the South-east, Warwick Street to the south-west and Oldham Street to the north-west. To the north, west and south are existing buildings currently in use.
- 2.1.3 The wider area is occupied by further commercial, retail and residential buildings.

Figure 1: Aerial Photograph



2.2 Existing Watercourses

- 2.2.1 The Rochdale Canal is located approximately 320m south east of the site.
- 2.2.2 The River Irwell which is designated as a 'main river' is approximately 950m west of the site.
- 2.2.3 The Ashton Canal is located approximately 800m east of the site.
- 2.2.4 The River Medlock which is designated as a 'main river' is approximately 1600m south of the site.

2.3 Existing Drainage

- 2.3.1 The public sewer records have been obtained for the development site.
- 2.3.2 The records indicate that there are no public sewers located within the site, however the following public sewers are located within the vicinity of the site:
 - There is a 300 x 406 combined public sewer in Spear Street, flowing in a south west direction.
 - There is 225 diameter combined public sewer within Warwick Street which flows in a north west direction.
 - There is a 300 diameter combined public sewer within Oldham Street which flows in a south west direction.
 - There is a 300 diameter combined public sewer within Houldsworth Street which flows in a north west direction.
- 2.3.3 The public sewer records are enclosed in Appendix B.
- 2.3.4 The existing site has been surveyed and no private drainage is visible on site.
- 2.3.5 Survey levels suggest that surface water runs off site onto the public highway and is collected via gullies before discharging into the public sewer in Spear Street.
- 2.3.6 It is recommended that a drainage survey is carried out prior to the detailed design stage of the receiving sewer to determine condition, depth and level information.

2.4 Topography

- 2.4.1 A topographical survey has been carried out on the site. An existing parking area makes up 100% of the site which generally falls in a south easterly direction towards Spear Street. The ground is made up of a compacted stone finish and is considered impermeable.
- 2.4.2 The Topographical Survey is enclosed in Appendix B.

3.0 Development and Flood Risk

3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance

- 3.1.1 In March 2012 the Department of Communities and Local Government published the National Planning Policy Framework (NPPF) and the Planning Practice Guidance was published in March 2014 which provides guidance on how flood risk should be assessed during the planning and development process.

Table 1 (Extract Planning Practice Guidance) Flood Zone Classifications

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea !\[\]\(f80254b170d0ecdc443847276e625120_img.jpg\)](#)), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2 (Extract Planning Practice Guidance) Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable • Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 3 (Extract Planning Practice Guidance) Flood Risk Vulnerability and Flood Zone compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

3.2 Site Specific NPPF Flood Risk Categorisation

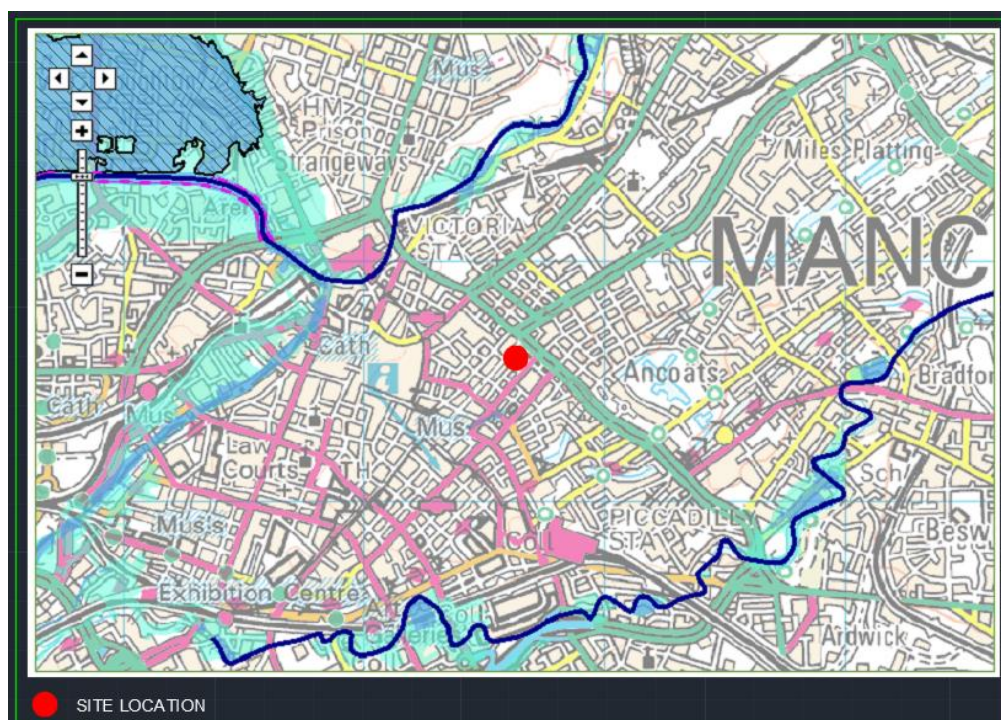
3.2.1 To assess the NPPF flood risk classification for the site, the first step was to inspect the Environment Agency web based flood mapping data for flooding from rivers and seas, surface water and reservoirs. The rivers and sea flood map is used to inform planning of a site's Flood Zone(s), however the surface water and reservoir flood maps should also be used to identify other flood risks.

3.2.2 From the Environment Agency flooding from rivers and seas map:

- Where a site is located in a dark blue shaded zone, this indicates that the site is within Flood Zone 3b where there is a chance of flooding of greater than 1 in 30 (3.3%).
- Where a site is located in a blue shaded zone, this indicates that the site is within Flood Zone 3a where there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Where a site is located in a turquoise shaded zone; this indicates that the site is within Flood Zone 2 where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is located in a white (unshaded) area, it is generally deemed to be classified as Flood Zone 1 where there is a chance of flooding of less than 1 in 1000 (0.1%).

3.2.3 Flooding to the site from rivers and seas is indicated in Figure 2 and it can be seen that the site is located entirely within an area classified as Flood Zone 1 and is considered to be at low risk of flooding from rivers or seas.

Figure 2: Environment Agency Map (Flooding from Rivers and Seas)



3.2.4 From the Environment Agency flooding from surface water map:

- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding where there is a chance of flooding of greater than 1 in 30 (3.3%).
- Where a site is located in a blue shaded zone, this indicates that the site is at medium risk of flooding where there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
- Where a site is located in a turquoise shaded zone; this indicates that the site is at low risk of flooding where there is a chance of flooding between 1 in 1000 (0.1%) and 1 in 100 (1%).
- Where a site is located in a white (unshaded) area; this indicates that the site is at very low risk of flooding where there is a chance of flooding of less than 1 in 1000 (0.1%).

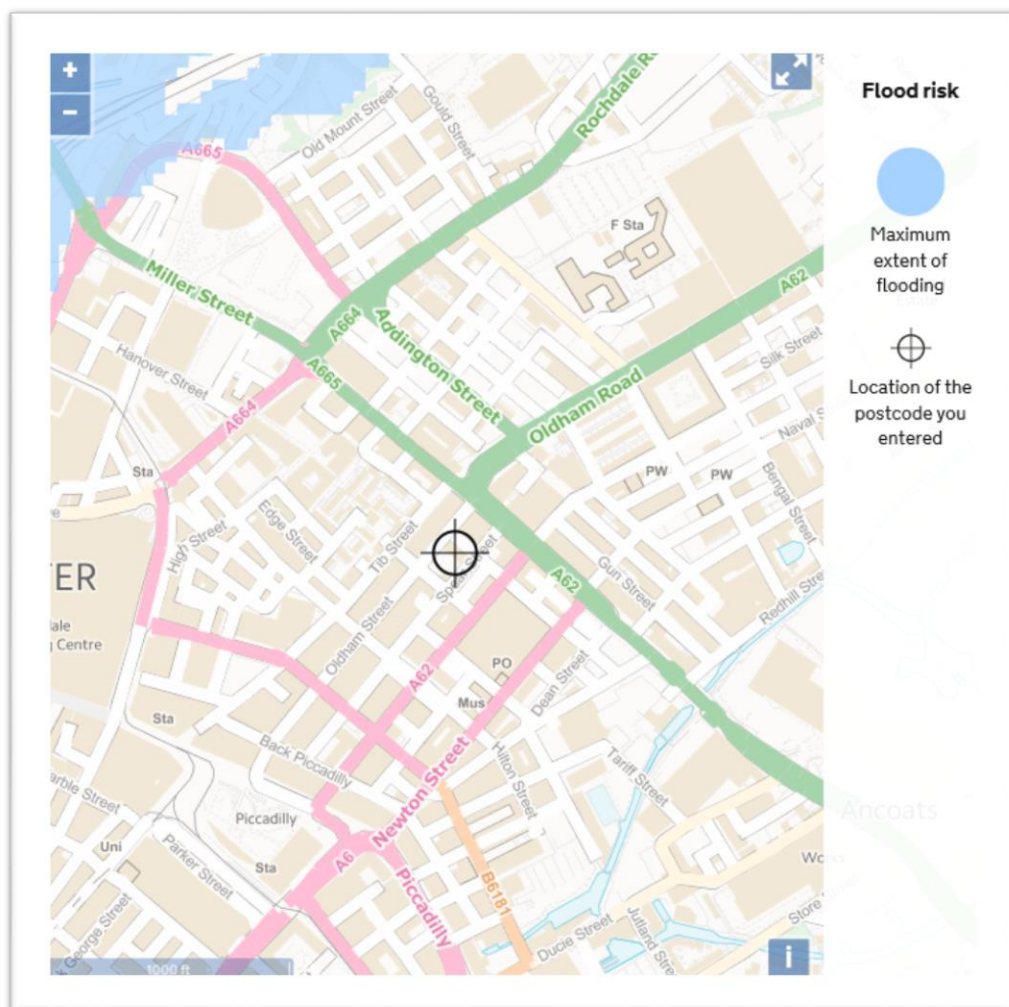
3.2.5 Flooding to the site from surface water is indicated in Figure 3 and it can be seen that the site and the surrounding area is at low risk of surface water flooding.

Figure 3: Environment Agency Map (Flooding from Surface Water)



- 3.2.6 The Environment Agency reservoir flood map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is very unlikely that a reservoir flood would be this large.
- 3.2.7 Flooding to the site from reservoirs is indicated in Figure 4 and it can be seen that the site is located outside an area that could be affected by reservoir flooding and is therefore considered to be very low risk.

Figure 4: Environment Agency Map (Flooding from Reservoirs)



3.3 Site Specific Flood Zone Compatibility

- 3.3.1 The proposals for the site are likely to fall within 'buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels' and would therefore be classified as 'More Vulnerable' development. The site is located within Flood Zone 1, which is compatible with any classification of development. Refer to Table 3 for the Flood Zone compatibility table taken from NPPF technical guidance.

3.4 Sequential and Exception Test

- 3.4.1 As the site is located within Flood Zone 1 (rivers and sea flooding) with areas classified as 'More Vulnerable' development the sequential and exception test are not required to be undertaken.

3.5 Climate Change

- 3.5.1 In February 2016, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Table 4 demonstrates the climate change allowances with central and upper end allowances being considered.
- 3.5.2 Based on the nature of the development, a lifespan of 60 years is anticipated. Therefore, the potential climate change allowance for 2060-2115 ranges between 20% for the central allowance and 40% for the upper end allowance. In spite of the fact that the site lies within Flood Zone 1 and considered to be at low risk of flooding, the proposed use is for residential and therefore 40% climate change on peak rainfall intensity will be included in calculations.

Table 4 (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

4.0 Hydrological Assessment

4.1 Sources of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

4.2 Strategic Flood Risk Assessment

- 4.2.1 A Strategic Flood Risk Assessment (SFRA) for Manchester, Salford and Trafford Level 1 was carried out in March 2010 and Level 2 dated March 2011. A Preliminary Flood Risk Assessment (PFRA) for Manchester City Council was carried out in May 2011. The data and findings of these assessments have been used to inform this report.

4.3 Fluvial Flooding (Rivers and Streams)

- 4.3.1 There is currently no flood risk identified on the Environment Agency maps for the site and is therefore regarded to be at low risk from fluvial flooding.

4.4 Tidal Flooding (Coastal or Estuarine)

- 4.4.1 There is currently no flood risk identified on the Environment Agency flood maps for the site and is therefore regarded to be at low risk from tidal flooding.

4.5 Reservoir Flooding

- 4.5.1 Reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly and essential safety work is carried out.
- 4.5.2 The site is located outside of an area that could be affected by reservoir flooding and is therefore considered being very low risk.
- 4.5.3 The nearest area affected by Reservoir flooding is approximately 320m south of the site.

4.6 Canal Flooding

- 4.6.1 The Rochdale Canal is located approximately 320m south of the site and the Ashton Canal is located approximately 800m east of the site.

- 4.6.2 The SFRA identifies areas potentially at risk of flooding from Canals; the site is not located within an area considered to be at risk and therefore the risk of flooding is considered low.

4.7 Groundwater Flooding

- 4.7.1 The SFRA map indicates that the site is not within an area considered to be at risk of groundwater flooding, shallow groundwater or groundwater rebound.

4.8 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)

- 4.8.1 There are no public sewers or highway drains recorded within the development site.
- 4.8.2 The SFRA does not confirm any historical flood events at the development site.
- 4.8.3 Providing United Utilities and Manchester City Council maintain their drainage assets in the vicinity of the site, the risk of flooding to the proposed development site is considered as low.

4.9 Surface Water Flooding to the site

- 4.9.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.
- 4.9.2 The Environment Agency surface water flood maps indicate that the site and the surrounding highways are at low risk of surface water flooding.

4.10 Surface Water Flooding from the site

- 4.10.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. The proposed surface water drainage network shall be designed to not flood for the critical 1 in 30 year storm event and flood water generated up to the critical 1 in 100 year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.10.2 The development has the potential to increase flood risk where additional run-off from proposed roads, car parks and building roofs are discharged freely into the downstream drainage network. It is therefore encouraged to propose permeable areas, landscaping areas and incorporate sustainable drainage features utilising infiltration or attenuation where possible, however due to the nature of the development this is unlikely to be achievable.
- 4.10.3 A detailed assessment of the proposed surface flows is carried out within the drainage strategy within section 6 of this report.

4.11 Historical Flooding

- 4.11.1 Historical flood events have been listed within the SFRA however the locations are generalised. The SFRA does not address any specific flood events at the development site or immediately surrounding area.

4.12 Summary of Flood Risk

- 4.12.1 From the evidence collated and subsequent negotiations the main types of flooding that may apply to the proposed development site are as follows: groundwater flooding to the basement and surface water flooding from the site.

5.0 Mitigation

5.1 Fluvial/Tidal Flood Mitigation

- 5.1.1 The development site lies within Flood Zone 1 and therefore there is low risk of fluvial and tidal flooding.

5.2 Groundwater Flood Mitigation

- 5.2.1 Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.
- 5.2.2 The proposed ground floor levels are proposed to tie into existing ground levels surrounding the site and therefore is considered to be at low risk of groundwater flooding.
- 5.2.3 It is recommended that groundwater levels are monitored during any ground investigation works to determine site specific groundwater levels. Fluctuations in groundwater levels should also be recorded as part of the investigation.
- 5.2.4 Providing the above mitigation measures were imposed, the risk from groundwater flooding would therefore be considered low post development.

5.3 Surface Water Flooding to the site Mitigation

- 5.3.1 The Environment Agency surface water flood maps indicate that the site and the surrounding highways are at low risk of surface water flooding.
- 5.3.2 The proposals for the site extend to the back of adopted footpath. It is recommended that proposed external back of footpath should fall away from the proposed building so that it does not create low points and encourage any surface water to fall towards the proposed buildings.
- 5.3.3 Providing the above measures are implemented the flooding risk to the development site from the surface water is therefore considered low post development.

5.4 Surface Water Flooding from the site Mitigation

- 5.4.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 year storm event and flood water generated from up to the critical 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

- 5.4.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.
- 5.4.3 Due to the size and location of the proposed building, the use of an infiltration/soakaway type system is unachievable as a maximum distance of 5m from the building cannot be achieved.
- 5.4.4 Due to the proximity of the nearest watercourse to the development, it is unachievable to connect surface water into a watercourse.
- 5.4.5 Therefore, the surface water drainage is proposed to outfall into the existing surrounding combined public sewer network at a restricted discharge rate.
- 5.4.6 To minimise localised flooding within the site, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.
- 5.4.7 Assuming that the proposed drainage system is designed to provide adequate capacity as stated in 5.4.1 and that the private and adopted sewers will be maintained by their adopted authority, it can be assumed risk of flood from blockage or overloading is minimal.
- 5.4.8 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.0 Drainage Strategy

6.1 Existing Drainage

- 6.1.1 The public sewer records indicate that there are no public sewers located within the site, however there is a 300 x 406 combined public sewer within Spear Street, a 225 diameter combined public sewer within Warwick Street, a 300 diameter combined public sewer within Oldham Street and a 300 diameter combined public sewer within Houldworth Street.
- 6.1.2 The existing site has been surveyed and no private drainage is visible on site.
- 6.1.3 Survey levels suggest that surface water runs off site onto the public highway and is collected via gullies before discharging into the public sewer in Spear Street.
- 6.1.4 It is recommended that an existing drainage survey is carried out prior to the detailed design stage of the receiving sewer to determine condition, depth and level information.

6.2 Proposed Foul Water Drainage

- 6.2.1 The invert level of the public sewer in Spear Street should be confirmed as early as possible to allow co-ordination with the structure and determine adequate gravity falls into the combined public sewer.
- 6.2.2 To both sides of the proposed building, soil vent pipes (SVP's) will be housed within the risers collecting foul water from each dwelling. The SVP's will connect direct into the proposed foul drainage network at ground level before being passed forward into the public sewer via a combined connection.
- 6.2.3 A non-return valve will be required at the outfall to ensure that the public sewer network cannot surcharge into the private drainage network which could flood the building.
- 6.2.4 The peak foul flow rate has been calculated at 3.2 l/s for the proposed development.
- 6.2.5 A Pre-Development Enquiry has been issued to United Utilities and they have confirmed that foul drainage will be allowed to discharge to the public combined sewer network at an unrestricted rate and the connection to the public sewer can be at a convenient location.
- 6.2.6 Prior to discharging foul water into the existing public sewer in Spear Street, a Section 106 Agreement with United Utilities will be required.
- 6.2.7 The proposed drainage strategy drawing is enclosed in Appendix D.

6.3 Proposed Surface Water Drainage

- 6.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 year storm event and flood water generated

for up to the critical 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

6.3.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

6.3.3 Due to the size and location of the proposed building, the use of an infiltration/soakaway type system is unachievable as a maximum distance of 5m from the building cannot be achieved. With this in mind, an alternative method of surface water discharge is proposed.

6.3.4 Surface water will outfall into the existing surrounding combined public sewer network at a restricted discharge rate.

6.3.5 A Pre-Development Enquiry has been issued to United Utilities and they have confirmed that surface water drainage will be allowed to discharge to the public combined sewer network and the connection to the public sewer can be at a convenient location.

6.3.6 The assumed FFL for the ground floor is circa 48.5m AOD. Surface water drainage from the development is proposed to connect down to ground floor level via a rain water pipe and outfall by gravity into the public sewer network in Spear Street.

6.3.7 The invert level of the public sewer in Spear Street should be confirmed as early as possible to allow co-ordination with the structure and determine adequate gravity falls into the combined public sewer.

6.3.8 A non-return valve will be required at the outfall to ensure that the public sewer network cannot surcharge into the private drainage network which could flood the building.

6.3.9 The existing site impermeable area is 0.013ha which positively drains to the public sewer in Spear Street. No site drainage is visible however levels suggest surface water runs off the site, being collected by the gullies within Spear Street before connecting into the public sewer network.

6.3.10 The existing site area (0.013ha) has been modelled to derive the run-off rates from the existing site. The results are as follows.

- 1.6 l/s for the 1 in 1 year event;
- 3.8 l/s for the 1 in 30 year event; and
- 4.9 l/s for the 1 in 100 year event.

6.3.11 The existing volume generated from the existing site in the 100 year 6 hour event is approximately 6m³.

6.3.12 The existing catchment drawing, network model and results are enclosed in Appendix C.

6.3.13 The proposed flow rates will be restricted to 50% of the pre-development flow rates with a climate change allowance of 40% for the proposed 100 year event. The restriction of 50% pre-development

flow rates is based on the recommendations within the Manchester Strategic Flood Risk Assessment (SFRA) for brownfield sites within 'Critical Drainage Areas'.

6.3.14 Therefore, in accordance with the SFRA, the proposed flow rates are as follows

- 0.8 l/s for the 1 in 1 year event;
- 1.9 l/s for the 1 in 30 year event; and
- 2.5 l/s for the 1 in 100 year 40% change event.

6.3.15 Given that the above flow rates are negligible, we propose to restrict all storm events to the 1 in 100 year plus climate change rate of 2.5 l/s, using a flow control and a minimum orifice size of 75mm to reduce the risk of blockages.

6.3.16 The flow rates currently modelled are less than the maximum recommended and therefore comply with both the SFRA and United Utilities guidance.

6.3.17 The proposed volume generated from the proposed site is expected to be similar to the existing volume based on a like for like scenario as the impermeable areas are the same.

6.3.18 Detailed modelling confirms that the attenuation for the development can be located within the private surface water network.

6.3.19 The proposed network may require modelling with a surcharged outfall subject to confirmation out outfall levels and could be requested by United Utilities, therefore could affect attenuation volumes.

6.3.20 The proposed drainage drawing, network model and results are enclosed in Appendix D.

6.3.21 It is recommended that sustainable methods of attenuation are implemented where possible, however space on site is limited to incorporate sustainable attenuation systems and therefore options are limited.

6.3.22 Surface water run-off from hard paved areas at risk of contamination should receive a level of treatment.

6.3.23 In accordance with Environment Agency guidance PPG3, treatment should be provided for any areas proposed for:

- Service Yard areas (vehicle maintenance areas, refuelling areas),
- Car parking areas which exceed 800m² or 50 car parking spaces,
- Oil storage areas; and
- Roads

6.3.24 None of the above are applicable to our site.

6.3.25 Surface water discharge will be subject to a Section 106 Agreement with United Utilities.

6.3.26 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.4 Maintenance

- 6.4.1 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 6.4.2 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 6.4.3 A management company may be required for maintenance of attenuation facilities.

7.0 Conclusions

- 7.1.1 An FRA/DS has been conducted for the proposed development off Spear Street, Manchester.
- 7.1.2 The EA flood map (rivers and sea flooding) shows the development site in Flood Zone 1, where the risk of flooding from rivers and seas is considered low.
- 7.1.3 *Fluvial Flooding (Rivers and Streams)* - No flood risk identified on the Environment Agency maps for the site and is therefore regarded to be at low risk from fluvial flooding.
- 7.1.4 *Tidal Flooding (Coastal or Estuarine)* - No flood risk identified on the Environment Agency flood maps for the site and is therefore regarded to be at low risk from tidal flooding.
- 7.1.5 *Reservoir Flooding* - No flood risk identified on the Environment Agency flood maps for the site and is therefore regarded to be at low risk of Reservoir Flooding.
- 7.1.6 *Canal Flooding* – No Flood Risk Identified within SFRA, No Canals located within the vicinity of the site, therefore flood risk from this source is considered low.
- 7.1.7 *Groundwater Flooding* – The SFRA map indicates that the site is not within an area considered to be at risk of groundwater flooding, shallow groundwater or groundwater rebound.

The ground floor levels are proposed to tie into existing with no residential areas on the ground floor and therefore is considered to be at low risk of groundwater flooding.

- 7.1.8 *Public Sewers or Highway Drainage Flooding (Infrastructure Failure)* -. There are no public sewers or highway drains recorded within the development site. The SFRA does not confirm any historical flood events at the development site.

Providing United Utilities and Manchester City Council maintain their drainage assets in the vicinity of the site, the risk of flooding to the proposed development site is considered as low.

- 7.1.9 *Surface Water Flooding to the site* – Very low to low risk identified on the Environment Agency surface water flood maps for the site and is therefore considered to be at low risk of flooding from surface water. It is however noted that the proposed levels should be set with ground levels falling away from the proposed building to ensure that surface water is not encouraged to fall towards properties.
- 7.1.10 *Surface Water Flooding from the site* – The development has the potential to increase flood risk where additional run-off from proposed roads, car parks and building roofs are discharged freely into the downstream drainage network.

To mitigate the risk of Surface Water Flooding as a result of the development: -

- The proposed surface water drainage network shall be designed to not flood for the critical 1 in 30 year storm event and flood water generated up to the critical 1 in 100 year plus climate change storm event shall be constrained within areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- The surface water drainage is proposed to outfall into the existing surrounding combined public sewer network at a restricted discharge rate.
- To minimise localised flooding within the site, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.

Providing the above mitigation measures were imposed, the risk of surface water flooding from the site would therefore be considered low.

7.1.11 *Existing Drainage* – The public sewer records indicate that there are no public sewers located within the site, however there are combined public sewers bounding the site.

7.1.12 The existing site has been surveyed and no private drainage is visible on site. Survey levels suggest that surface water runs off site onto the public highway and is collected via gullies before discharging into the public sewer in Spear Street

7.1.13 It is recommended that a drainage survey is carried out prior to detailed drainage design to confirm the details of the receiving public sewers and determine location, routes, depth, condition and connections.

7.1.14 *Proposed Foul Water Drainage* –The foul drainage from the development is proposed to connect down to ground level and outfall by gravity into the public sewer network in Spear Street.

The invert level of the public sewer in Spear Street should be confirmed as early as possible to allow co-ordination with the structure and determine adequate gravity falls into the combined public sewer.

A non-return valve will be required at the outfall to ensure that the public sewer network cannot surcharge into the private drainage network which could flood the basement.

The peak foul flow rate has been calculated at 3.2 l/s for the proposed development.

A Pre-Development Enquiry has been issued to United Utilities and they have confirmed that foul drainage will be allowed to discharge to the public combined sewer network at an unrestricted rate and the connection to the public sewer can be at a convenient location.

7.1.15 *Proposed Surface Water Drainage* - Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 year storm event and flood water generated for up to the critical 1 in 100 year plus climate change storm

event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.

In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

Infiltration based discharge is considered unlikely with an alternative method of surface water discharge proposed to outfall into the existing surrounding combined public sewer network at a restricted discharge rate due to the lack of a watercourse or surface water sewer in the vicinity of the site.

Surface water drainage from the development is proposed to connect down to ground floor level via a rain water pipe and outfall by gravity into the public sewer network in Spear Street. The invert level of the public sewer in Spear Street should be confirmed as early as possible to allow co-ordination with the structure and determine adequate gravity falls into the combined public sewer.

A non-return valve will be required at the outfall to ensure that the public sewer network cannot surcharge into the private drainage network which could flood the building.

The existing site has been considered Brownfield. Surface water runs off site above ground and discharges into Spear Street public sewer via gullies. An existing drainage network has been modelled to determine existing flow rates for the site.

The existing site flow rates are approximately 1.6 l/s for the 1 in 1 year event, 3.8 l/s for the 1 in 30 year event and 4.9 l/s for the 1 in 100 year event.

The existing volume generated from the existing site in the 100 year 6 hour event is approximately 6m³.

The proposed flow rates will be restricted to 50% of the pre-development flow rates with an allowance of 40% climate change for the proposed 100 year event as recommended within the Manchester Strategic Flood Risk Assessment (SFRA) for brownfield sites within 'Critical Drainage Areas'.

Therefore, in accordance with the SFRA, the proposed flow rates should not exceed 0.8 l/s for the 1 in 1 year event, 1.9 l/s for the 1 in 30 year event and 2.5 l/s for the 1 in 100 year 40% change event. Given that the above flow rates are negligible, we propose to restrict all storm events to the 1 in 100 year plus climate change rate of 2.5 l/s, using a flow control and a minimum orifice size of 75mm to reduce the risk of blockages.

The proposed volume generated from the proposed site is expected to be similar to the existing volume based on a like for like scenario as the impermeable areas are the same.

A Pre-Development Enquiry has been issued to United Utilities and they have confirmed that surface water drainage will be allowed to discharge to the public combined sewer network and the connection to the public sewer can be at a convenient location.

The flow rates currently modelled are less than the maximum recommended and therefore comply with both the SFRA and United Utilities guidance.

Detailed modelling confirms that the attenuation for the development up to the 1 in 100 year + 40% climate change can be accommodated within the private surface water network.

The proposed network may require modelling with a surcharged outfall subject to confirmation of outfall levels and could be requested by United Utilities, which could affect attenuation volumes.

It is recommended that sustainable methods of attenuation are implemented where possible, however space on site is limited to incorporate sustainable attenuation systems and therefore options are limited.

7.1.16 *General Drainage* - Any connections to the public sewer will be subject to a Section 106 Agreement with United Utilities.

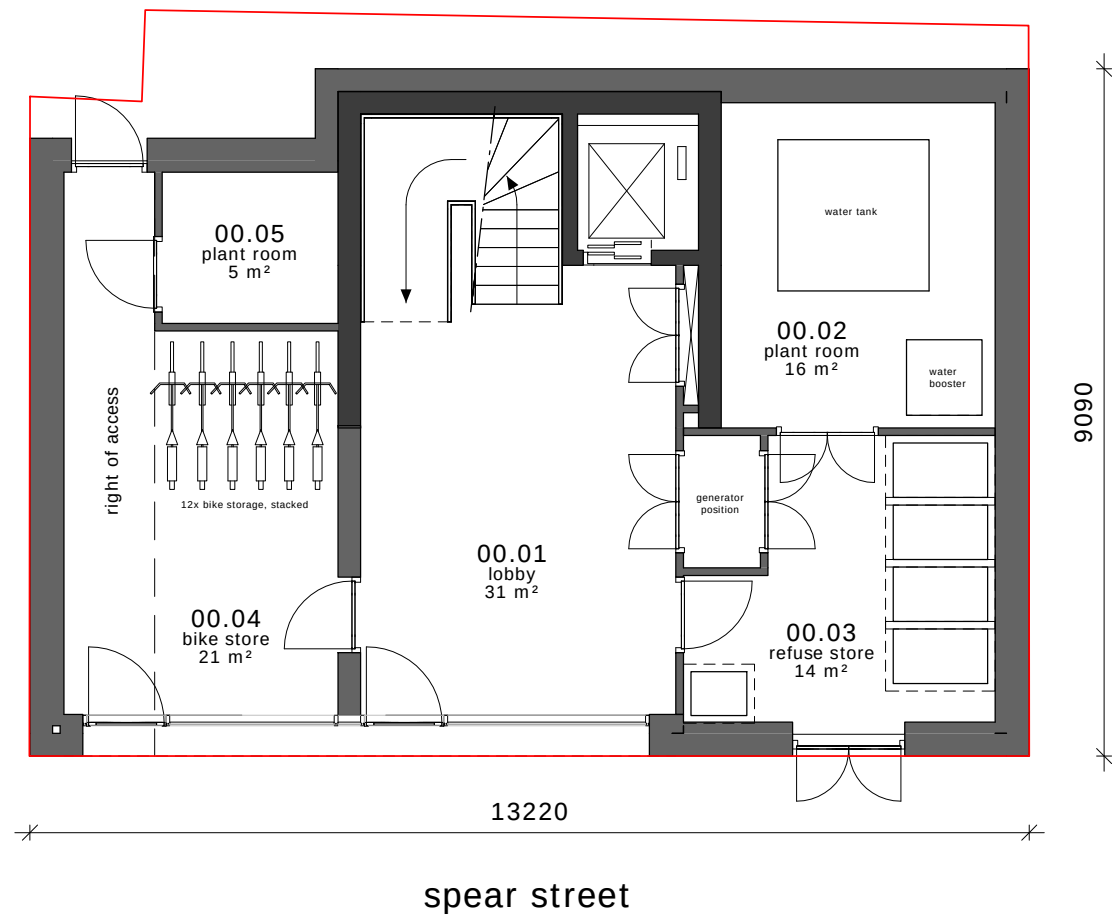
The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event. Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

Appendix A

Proposed Floor Plans



general notes:

- © Mecanoo Architecten bv
- Do not scale this drawing - use figured dimensions only - all dimensions to be checked and verified on site.
- This information should be read in conjunction with all relevant consultant reports.

key:

- structural column/ wall
- facade/ party wall
- interior wall

apartment mix - option 1 (fifth floor: 2x one bed apartment)

one bed apartment (1b-2p):	10	83%
two bed apartment (2b-4p):	2	17%

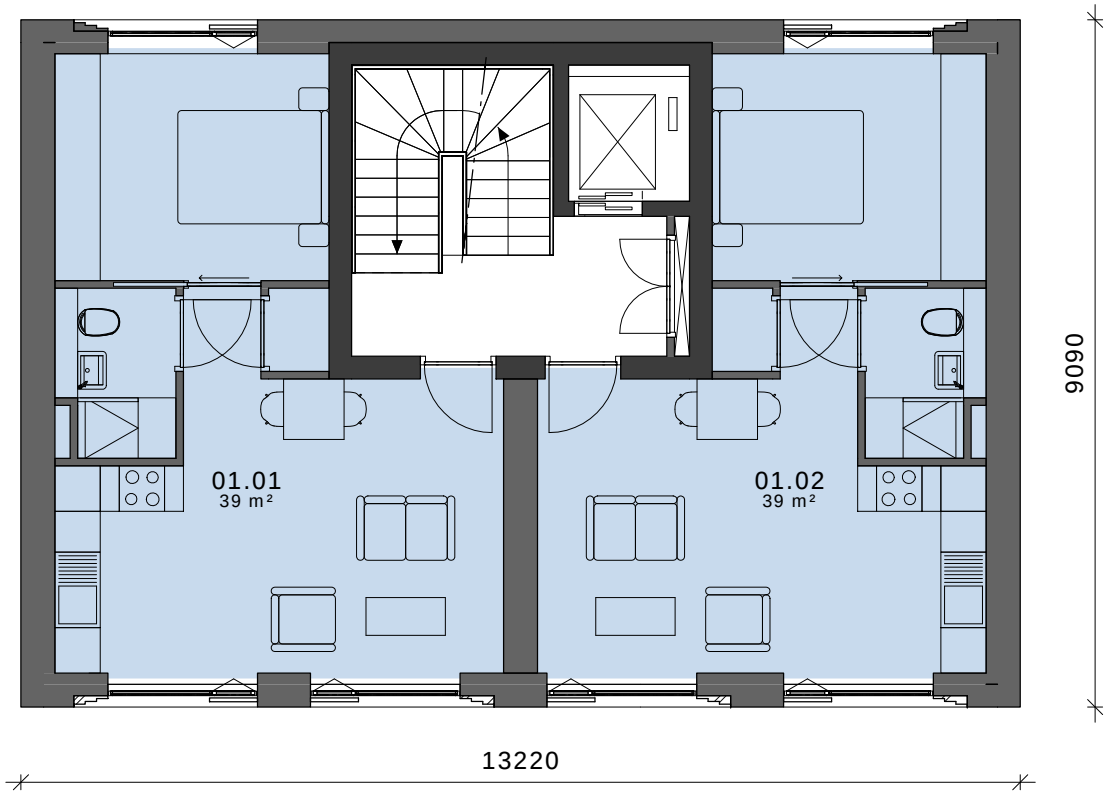
apartment mix - option 2 (fifth floor: 1x two bed apartment)

one bed apartment (1b-2p):	8	73%
two bed apartment (2b-4p):	3	27%



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architecten bv

sheet name:	scale:	paper size:	date:
Ground Floor	1:100	A3	23.11.2016
status:	project number:	revisions:	sheet number:
DRAFT	A689		SP-100



general notes:

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- Do not scale this drawing - use figured dimensions only - all dimensions to be checked and verified on site.
- This information should be read in conjunction with all relevant consultant reports.

key:

- structural column/ wall
- facade/ party wall
- interior wall

apartment mix - option 1 (fifth floor: 2x one bed apartment)

one bed apartment (1b-2p):	10	83%
two bed apartment (2b-4p):	2	17%

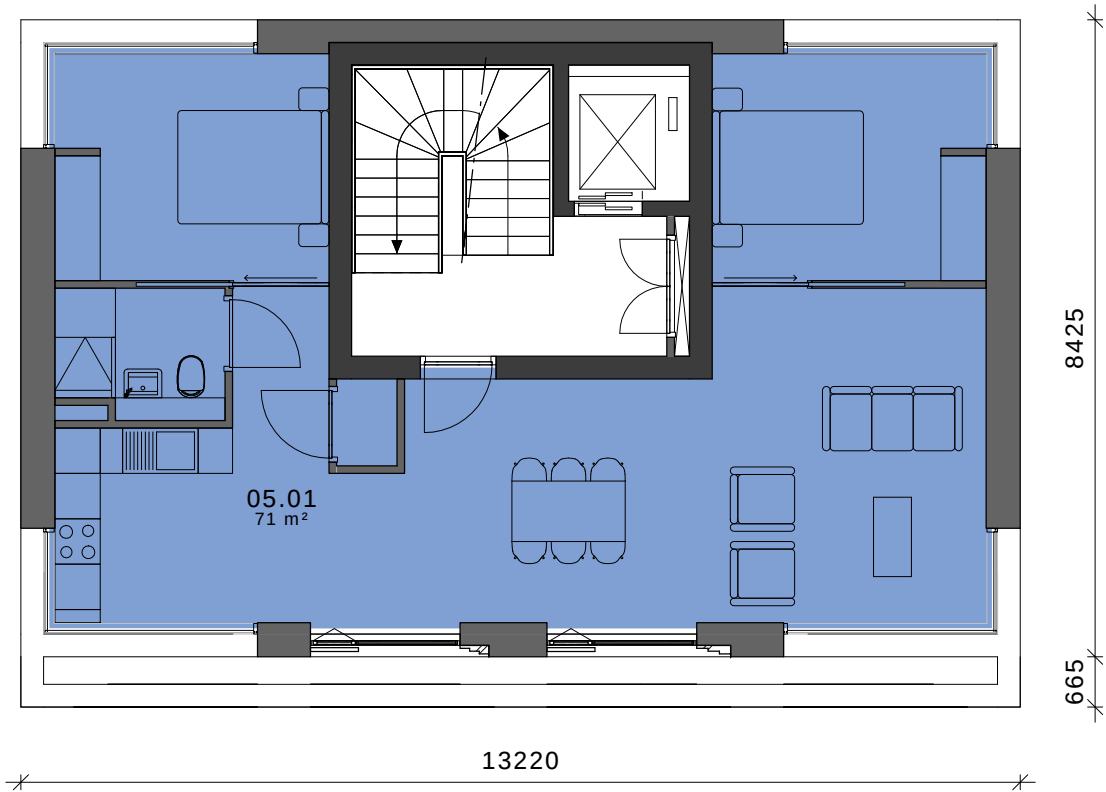
apartment mix - option 2 (fifth floor: 1x two bed apartment)

one bed apartment (1b-2p):	8	73%
two bed apartment (2b-4p):	3	27%



mecanoo
architecten bv

sheet name:	scale:	paper size:	date:
First to Fourth Floor	1:100	A3	23.11.2016
status:	project number:	revisions:	sheet number:
DRAFT	A689		SP-101



general notes:

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- This information should be read in conjunction with all relevant consultant reports.

key:

	structural column/ wall
	facade/ party wall
	interior wall

apartment mix - option 1 (fifth floor: 2x one bed apartment)

	one bed apartment (1b-2p):	10	83%
	two bed apartment (2b-4p):	2	17%

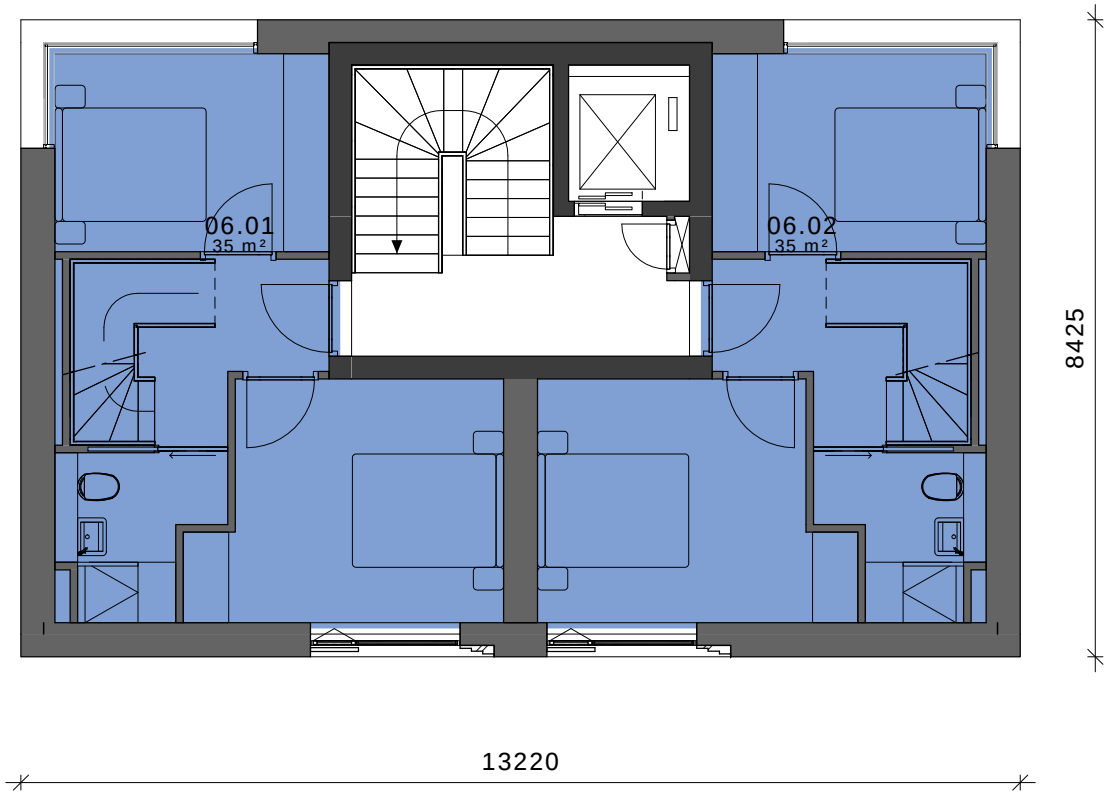
apartment mix - option 2 (fifth floor: 1x two bed apartment)

	one bed apartment (1b-2p):	8	73%
	two bed apartment (2b-4p):	3	27%



mecanoo
architecten bv

sheet name:	scale:	paper size:	date:
Fifth Floor	1:100	A3	23.11.2016
status:	project number:	revisions:	sheet number:
DRAFT	A689		SP-105



general notes:

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- This information should be read in conjunction with all relevant consultant reports.

key:

	structural column/ wall
	facade/ party wall
	interior wall

apartment mix - option 1 (fifth floor: 2x one bed apartment)

	one bed apartment (1b-2p):	10	83%
	two bed apartment (2b-4p):	2	17%

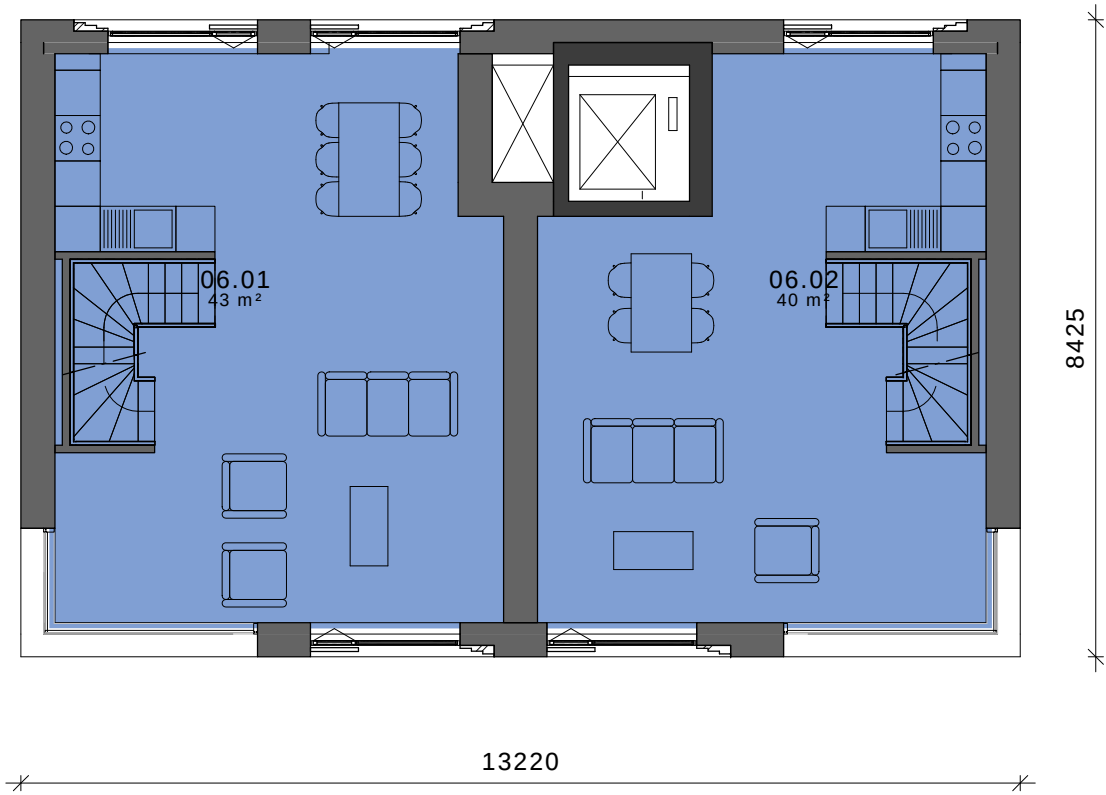
apartment mix - option 2 (fifth floor: 1x two bed apartment)

	one bed apartment (1b-2p):	8	73%
	two bed apartment (2b-4p):	3	27%



mecanoo
architecten bv

sheet name:	scale:	paper size:	date:
Sixth Floor	1:100	A3	23.11.2016
status:	project number:	revisions:	sheet number:
DRAFT	A689		SP-106



general notes:

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- Do not scale this drawing - use figured dimensions only - all dimensions to be checked and verified on site.
- This information should be read in conjunction with all relevant consultant reports.

key:

structural column/ wall

facade/ party wall

interior wall

apartment mix - option 1 (fifth floor: 2x one bed apartment)

one bed apartment (1b-2p):	10	83%
two bed apartment (2b-4p):	2	17%

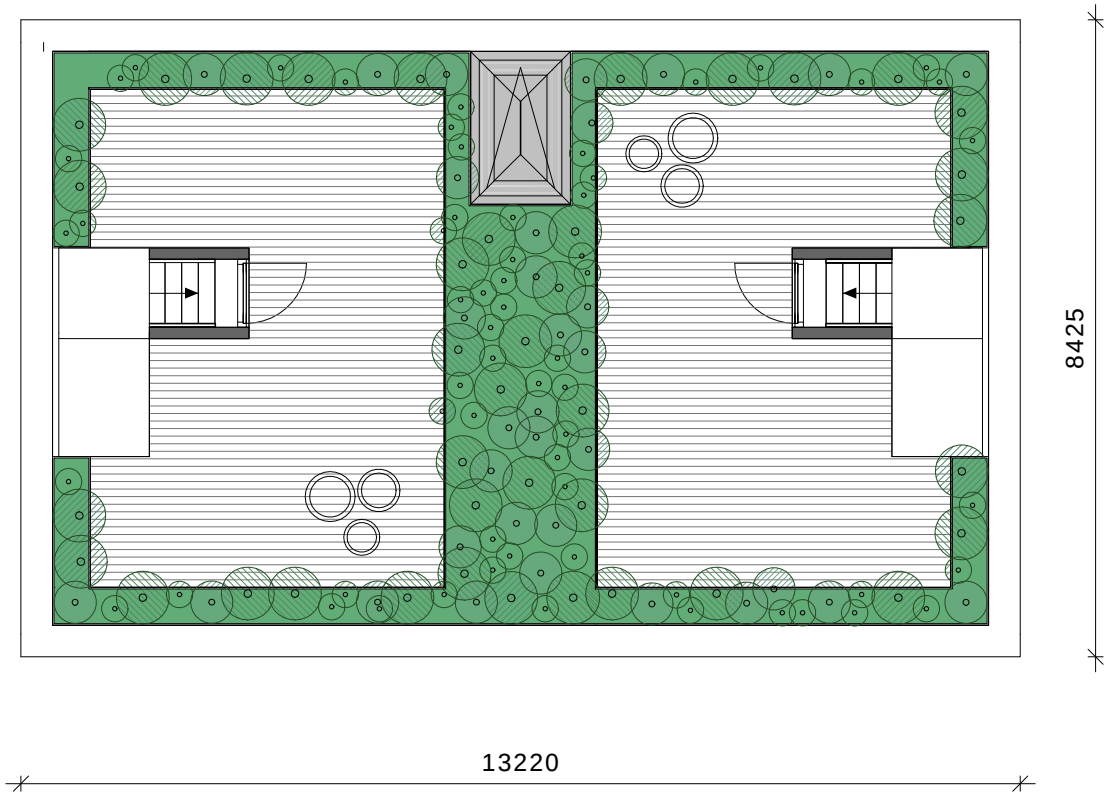
apartment mix - option 2 (fifth floor: 1x two bed apartment)

one bed apartment (1b-2p):	8	73%
two bed apartment (2b-4p):	3	27%



mecanoo
architecten bv

sheet name:	scale:	paper size:	date:
Seventh Floor	1:100	A3	23.11.2016
status:	project number:	revisions:	sheet number:
DRAFT	A689		SP-107



general notes:

- © Mecanoo Architecten bv
- Do not scale this drawing - use figured dimensions only - all dimensions to be checked and verified on site.
- This information should be read in conjunction with all relevant consultant reports.

key:

	structural column/ wall
	facade/ party wall
	interior wall

apartment mix - option 1 (fifth floor: 2x one bed apartment)

	one bed apartment (1b-2p):	10	83%
	two bed apartment (2b-4p):	2	17%

apartment mix - option 2 (fifth floor: 1x two bed apartment)

	one bed apartment (1b-2p):	8	73%
	two bed apartment (2b-4p):	3	27%



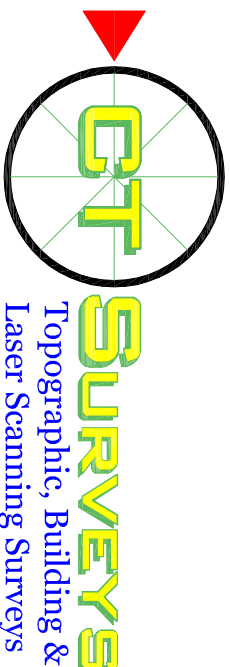
mecanoo
architecten bv

sheet name:	scale:	paper size:	date:
Roof	1:100	A3	23.11.2016
status:	project number:	revisions:	sheet number:
DRAFT	A689		SP-108

Appendix B

United Utilities Public Sewer Records

Topographical Survey



THE OLD MILL,
GHFIELD, TINGLEY
WAKEFIELD
WF3 1LA

Tel : 0113 259 7023
Mob : 07949 195764
email : mail@ct-surveys.com
Web Site : www.ct-surveys.com

ABBREVIATIONS

[illegible]

All services to be field verified.

This drawing and the information contained within has been issued in confidence and remains the copyright of CT Surveys Ltd.

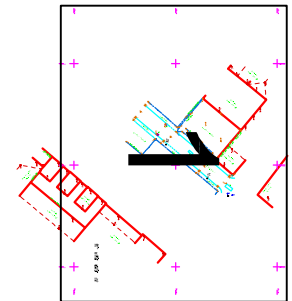
Disclosure of this information to Third Parties and unauthorised copying/replication of data is forbidden without gaining approval from CT Surveys

CT SURVEYS IS A MEMBER OF:

SURVEY NOTES:
The survey is fitted to National Grid and Datum using GPS, and has been drawn at a scale of 1:1000.
Use the scale factor any setting out or design works should strictly use the control coordinates as shown on the drawing.

SURVEY REVISIONS	
PREVIOUS DWG NO.:	
VERSION NO.:	
DATE:	

LAYOUT VIEWS



Northern Group Ltd

Land at Spear Street,
Manchester

3614LR/1



SCALE:	1:100 @ A1	SURVEY DATE:	Month 2016
LEVEL DATUM:	OSGB by GPS	GRID DATUM:	OSGB fixed at ST02
PERCH MARK USER:	Nail at ST02 surveyed by GPS	BM VALUE:	48.194m
		SHEET NUMBER:	1 of 1

**Curtins Consulting Engineers
1st Floor Merchant Exchange
17-19 Whitworth Street West
Bishopsgate
Manchester
M1 5WG**

FAO:

Dear Sirs

Location: Spear Street

I acknowledge with thanks your request dated 08/11/16 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network.

<http://www.unitedutilities.com/work-near-asset.aspx>.

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

If you have any queries regarding this matter please telephone us on 0370 7510101.

Yours Faithfully,



Amanda Simmonds
Property Searches Manager

United Utilities Water Limited

Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
DX 715568 Warrington
Telephone 0370 751 0101

Property.searches@uuplc.co.uk

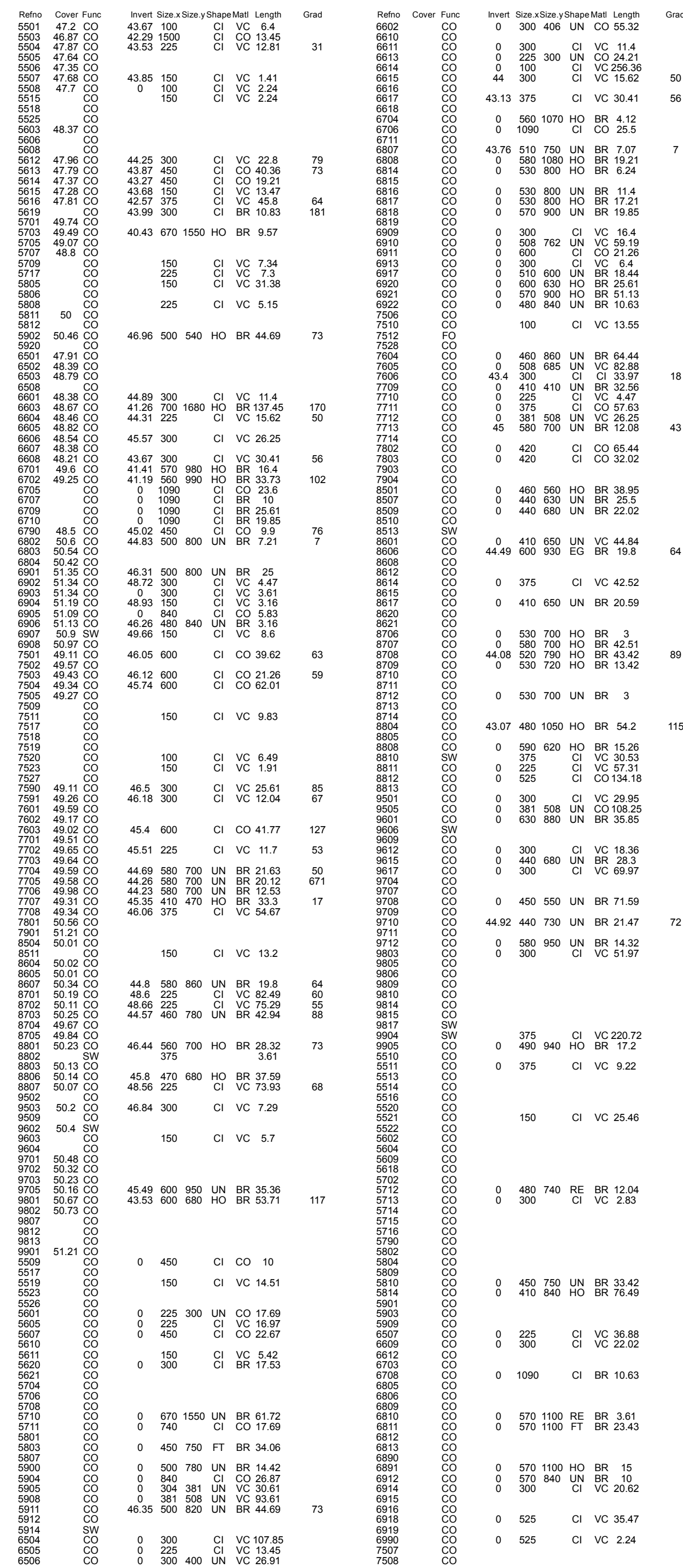
Your Ref: B062731 SPEAR STREET
Our Ref: 16/ 1247239
Date: 10/11/2016

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self-construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

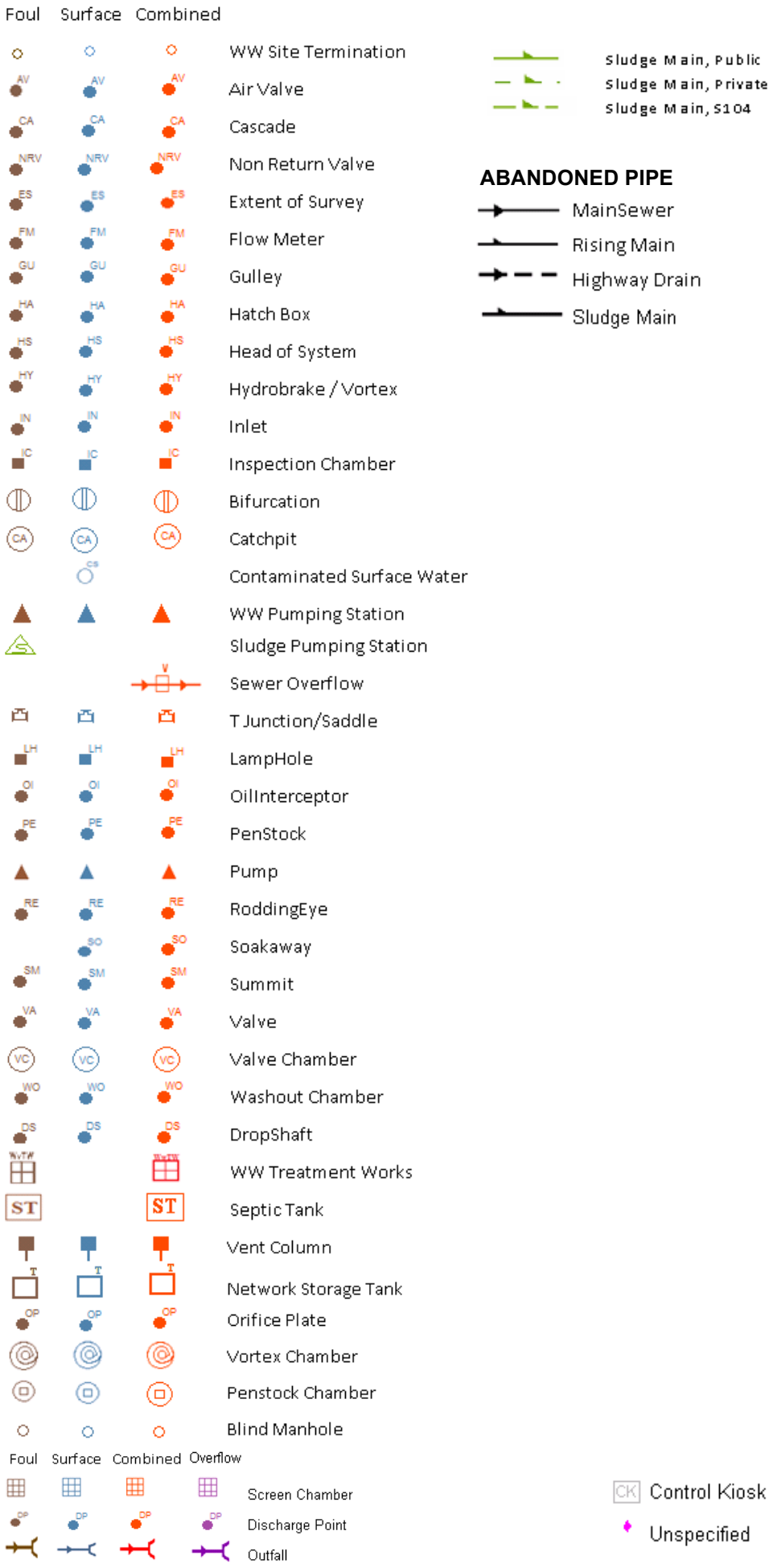
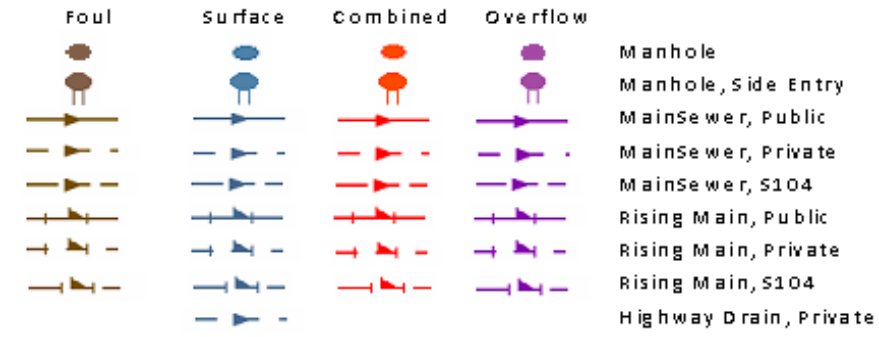
1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only and given in accordance with the best information available. The nature of the relevant system and/or its actual position may be different from that shown on the plan and UUWL is not liable for any damage caused by incorrect information provided save as stated in section 199 of the Water Industry Act 1991. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
5. The position and depth of UUWL apparatus is subject to change and therefore this 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 Map have been made subsequent to issue and prior to any works being carried out.
6. This 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) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
8. 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.
9. 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 UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



OS Sheet No: SJ8498NE Scale: 1:1250 Date: 10/11/2016 335 Nodes Sheet 1 of 2	
 United Utilities <i>helping life flow smoothly</i> SEWER RECORDS	

[illegible]

WASTE WATER SYMBOLOGY



LEGEND

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

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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OS Sheet No: SJ8498NE
Scale: 1:1250 Date: 10/11/2016
335 Nodes
Sheet 2 of 2



SEWER RECORDS

OS Sheet No: SJ8498NE

Scale: 1:1250 Date: 10/11/2016

Printed By: Property Searches

Wastewater Symbolology

Combined Foul Surface Overflow

				Manhole
				Manhole, side entry
				Public sewer
				Private sewer
				S104 sewer
				Rising main, public
				Rising main, private
				Rising main, S104
				Highway drain, private
				Screen chamber
				Discharge point
				Outfall
				Control kiosk
				Sludge main

Abandoned pipe

	Public sewer
	Rising main
	Private sewer
	Sludge main

Manhole function

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

Sewer shape

CI	Circular	U	Unspecified
EG	Egg	SQ	Square
OV	Oval	TR	Trapezoidal
FT	Flat top	AR	Arch
RE	Rectangular	BA	Barrel
		HO	Horse shoe

Sewer material

AC	Asbestos cement	DI	Ductile iron
BR	Brick	VC	Vitrified clay
CO	Concrete	PP	Polypropylene
CSB	Concrete segment	PF	Pitched fibre
CSU	Concrete segment	MA	Masonry, coursed
CC	Concrete box culverted	MA	Masonry, random
PSC	Plastic	RP	Reinforced plastic
GR	Glass reinforced	CI	Cast iron
GRP	Glass reinforced	SI	Spun iron
PVC	Polyvinyl chloride	ST	Steel
PE	Polyethelene	U	Unspecified

			WW pumping :
			Inspection cha
			Extent of surve
			Head of syste
			Soakaway
			Rodding eye
			Lamp hole
			T junction/sadc
			Gulley
			Air valve
			Non return valv
			Sewer overflow
			Cascade
			Flow meter
			Hatch box
			Hydrobrake
			Inlet
			Bifurcation
			Catchpit
			Oil interceptor
			Penstock
			Summit
			Valve
			Valve chamber
			Washout cham
			Drop shaft
			WW treatment
			Septic tank
			Vent column
			Network storag
			Orifice plate
			Vortex chambe
			Penstock chan

Appendix C

Existing Catchment

Existing Micro Drainage Calculations- 1, 30 and 100 year events

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.358	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	10.000	0.100	100.0	0.013	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	45.84	5.22	47.300	0.013	0.0	0.0	0.0	0.77	6.0	1.6
1.001	45.44	5.33	47.200	0.013	0.0	0.0	0.0	0.77	6.0	1.6

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	48.300	1.000	Open Manhole	1200	1.000	47.300	100				
2	48.300	1.100	Open Manhole	1200	1.001	47.200	100	1.000	47.200	100	
	48.250	1.100	Open Manhole	0		OUTFALL		1.001	47.150	100	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	o	100	1	48.300	47.300	0.900	Open Manhole	1200
1.001	o	100	2	48.300	47.200	1.000	Open Manhole	1200

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	10.000	100.0	2	48.300	47.200	1.000	Open Manhole	1200
1.001	5.000	100.0		48.250	47.150	1.000	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.013	0.013	0.013
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.013	0.013	0.013

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.001		48.250	47.150	0.000	0	0
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Simulation Criteria for Storm

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.358		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 0 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

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

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
									(m)
1.000	1	15 Winter	1	+0%					47.336
1.001	2	15 Winter	1	+0%					47.237

	US/MH	Depth	Volume	Flow /	Overflow	Pipe		Level
PN	Name	(m)	(m ³)	Cap.	(l/s)	Flow	Status	Exceeded
						(l/s)		
1.000	1	-0.064	0.000	0.27		1.5	OK	
1.001	2	-0.063	0.000	0.30		1.6	OK	

Appendix D

Proposed Drainage Strategy

Proposed Micro Drainage Calculations 1, 30, 100 year + 40% year events

Proposed Foul Flow Rates

Foul Drainage Calculations For
SPEAR STREET
Rev A

Floor **DU per floor**

Ground Floor 5.2
 FLOOR 1 8
 FLOOR 2 8
 FLOOR 3 8
 FLOOR 4 8
 FLOOR 5 4
 FLOOR 6 3.6
 FLOOR 7 4.4

Types of Building	KDU Frequency Factor
Dwelling, guesthouses, office (intermittent use)	0.5
Hospital, school, restaurant, hotel (frequent use)	0.7
Toilets and/or shower open to public (congested use)	1
Laboratory buildings (special use)	1.2
Types of Appliance	Discharge Unit
Washbasin, shower	0.3
Urinal	0.55
Bath, kitchen sink	1.05
Dishwasher	0.5
Household washing machine	0.65
Commercial washing machine	1.25
WC's (4.0 to 9.0l cistern)	1.2
Floor Drains (DN50 to DN100)	1.3

Total 49.2
 KDU (Frequency) 0.5

Total l/s **3.5**

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	1.000	0.025	40.0	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	2.000	0.050	40.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	46.76	5.01	46.900	0.013	0.0	0.0	0.0	1.60	28.2	1.6
1.001	46.68	5.03	46.875	0.013	0.0	0.0	0.0	1.60	28.2	1.6

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	48.400	1.500	Open Manhole	150	1.000	46.900	150				
2	48.400	1.525	Open Manhole	1500	1.001	46.875	150	1.000	46.875	150	
	48.400	1.575	Open Manhole	0		OUTFALL		1.001	46.825	150	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	o	150	1	48.400	46.900	1.350	Open Manhole	150
1.001	o	150	2	48.400	46.875	1.375	Open Manhole	1500

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	1.000	40.0	2	48.400	46.875	1.375	Open Manhole	1500
1.001	2.000	40.0		48.400	46.825	1.425	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.013	0.013	0.013
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.013	0.013	0.013

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.001		48.400	46.825	0.000	0	0
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Simulation Criteria for Storm

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: 2, DS/PN: 1.001, Volume (m³): 2.7

Unit Reference	MD-SHE-0075-2500-1000-2500
Design Head (m)	1.000
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	46.875
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.5
Flush-Flo™	0.307	2.5
Kick-Flo®	0.627	2.0
Mean Flow over Head Range	-	2.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	2.7	3.000	4.1	7.000	6.2
0.200	2.4	1.400	2.9	3.500	4.5	7.500	6.4
0.300	2.5	1.600	3.1	4.000	4.7	8.000	6.6
0.400	2.5	1.800	3.3	4.500	5.0	8.500	6.8
0.500	2.4	2.000	3.4	5.000	5.3	9.000	7.0
0.600	2.1	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.3	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	6.0		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.360
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

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

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level
1.000	1	15 Winter	100	+40%	100/15 Summer				47.686
1.001	2	15 Winter	100	+40%	100/15 Summer				47.684

	US/MH	Depth	Volume	Flow / Overflow	Pipe	Level
PN	Name	(m)	(m³)	Cap. (l/s)	Flow (l/s) Status	Exceeded
1.000	1	0.636	0.000	0.59	6.4 SURCHARGED	
1.001	2	0.659	0.000	0.18	2.5 SURCHARGED	

Appendix E

United Utilities Correspondence

Toby Grimes

From: Harrison, William <William.Harrison1@uuplc.co.uk>
Sent: 09 December 2016 10:24
To: Zach Gannon
Cc: Wastewater Developer Services
Subject: DE2938 Site of Spear , Great Ancoats, Manchester

Good Morning Zach,

United Utilises have no objections to these proposals and I imposed no flow restrictions on your proposed development,

Kind Regards,

Will Harrison BSc (Hons)
Assistant Developer Engineer
Developer Services & Planning
Operational Services
United Utilities

T : 01925 679319
E : Wastewaterdeveloperservices@uuplc.co.uk

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United Utilities Water Ltd. - Developer Services and Planning
Warrington North Wastewater Treatment Works
Barnard Street Off Old Liverpool Road
Gatewarth Industrial Estate
Warrington
WA5 1DS

From: Zach Gannon [mailto:Zach.Gannon@curtins.com]
Sent: 29 November 2016 10:18
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Cc: Carl Dawson <Carl.Dawson@curtins.com>
Subject: Wastewater Predevelopment Enquiry - Spear Street 063129

Good Morning,

Please find attached predevelopment enquiry and additional information in relation to the proposed development of land off Spear Street, Manchester that we are currently preparing the Flood Risk Assessment and Drainage Strategy for planning.

The proposals consist of a seven storey residential apartment tower housing eleven self-contained dwellings.

Additional information included with the enquiry include a location plan, and a copy of the existing topographical survey with proposed development area highlighted.

I look forward to your response.

Kind Regards,
Zach

Zach Gannon
Technician
T. 0161 236 2394
zach.gannon@curtins.com

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