Flood Risk Assessment & Drainage Strategy for a Development at Hyde Road, Manchester East, M18 7BA Rev 2

Contract Ref: FD336

For Kellen Homes and Jigsaw Homes North

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Quality Assurance Record

Contributors for Townsend Water Engineering Limited:

Name	Role
Charles Townsend	Project Manager
Alice Osborne	Engineering Assistant

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Limitation of Liability and Use

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1. EXECUTIVE SUMMARY

A summary of the main conclusions for the FRA is presented below:

- The proposed site is for a residential development of 152 dwellings at Hyde Road, Manchester East, M18 7BA (Grid Ref: 387784, 396230);
- The development site is 1.37ha;
- The site lies at a low risk of fluvial flooding, Flood Zone 1 (EA Flood Maps);
- The development is at risk of surface water flooding in the west to a depth of 60cm. It is recommended that the finished floor levels are raised by 600mm in the west. With the raising of the FFL's and the inclusion of a new drainage system attenuating the site up to the 1 in 100-year event plus 45% climate change, the site is believed to be at low risk of surface water flooding;
- The site is at low risk of groundwater flooding;
- The site is at low risk of sewer flooding;
- The site is not at risk of reservoir flooding;
- Infiltration will not be feasible on this site due to failed infiltration tests;
- The site will be required to have attenuation up to and including the 1 in 100-year event plus climate change of **45%** plus 10% urban creep for the surface water;
- The site will discharge at a brownfield runoff rate of 7l/s into the UU surface water sewer in Mount Road to the south-east via a pumped system;
- The proposed impermeable area is 0.7819ha. The impermeable area of the site has been increased by 10% for urban creep;
- Attenuation will be held in a detention basin, rain gardens, swales and oversized pipes; and
- The pollution index control indicates that the water quality is sufficient.

2. INTRODUCTION

2.1 Purpose of this Report

Townsend Water Engineering Ltd. has been appointed by Kellen Homes for a Flood Risk Assessment (FRA) & Drainage Strategy for a residential development of 152 dwellings at Hyde Road, Manchester East, M18 7BA (Grid Ref: 387784, 396230). This report has been prepared in support of the application for full planning permission for the proposed development at the former Buzz Bingo site ("the site").

The project involves the redevelopment of the former Buzz Bingo site on Hyde Road within East Manchester, M18 7BA.

The client's objective is to secure full planning permission for a residential development comprising c. 152 new homes in a mix of houses and apartments. The scheme will be 100% affordable, with the precise tenure to be confirmed at a later date.

the proposed development will comprise the following:

- A total of c. 152 new dwellings:
    - c. 126 apartments in 3 buildings, 2 being 5 storeys in height and 1 at 6 storeys
    - c. 25 homes in a mix of 2-, 3-bedroom properties
- 50% car parking provision
- Hard and soft landscaping, including a new pocket park
- Site access will be provided off Kirkmanshulme Lane

The report is based on the available flood risk information for the site detailed in Section 1.2 and prepared in accordance with the planning policy requirements set out in Section 1.3. The scope of the FRA is consistent with the 'Site Specific Flood Risk Assessment Checklist' from the National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance (PPG):

https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section

2.2 Sources of Information and Consultation

This report has been informed by:

- Existing draft Site Plan drawings and respective topographic plan delivered by Kellen Homes;
- e3p PHASE II GEOENVIRONMENTAL SITE ASSESSMENT: Buzz Bingo (Ref:18-376-R2-1) 06 February 2026 for Kellen Homes Ltd;
- Greater Manchester SFRA (2019) and interactive maps;
- Manchester, Salford, Trafford Strategic Flood Risk Assessment (2011) Groundwater Flooding Map;
- Manchester City Council March 2014 Local Flood Risk Management Strategy;
- BGS website http://mapapps.bgs.ac.uk/geologyofbritain/home.html?mode=boreholes;
- Defra Magic Map https://magic.defra.gov.uk/magicmap.aspx;
- Cranfield University Soil Mapping http://www.landis.org.uk/soilscapes/;
- The EA online flood maps;
- Flood Zone Map https://flood-map-for-planning.service.gov.uk/; and
- Flood Risk Map: https://flood-warning-information.service.gov.uk/long-term-flood-risk/.

2.3 Policy Context

This report has been prepared in accordance with the relevant national, regional and local planning policy and statutory guidance as follows:

- National policy contained within the National Planning Policy Framework (NPPF) dated December 2024;
- The NPPF Planning Practice Guidance (PPG) dated in December 2024; and
- Places for Everyone Joint Development Plan (adopted March, 2024) & Manchester City Council Core Strategy Development Plan Document (Adopted July 2012).

2.4 Structure of this Report

The Report has been prepared based on the following structure:

- Section 3 refers to spatial planning considerations by reference to the proposed land use, flood zoning and NPPF vulnerability;
- Section 4 presents the assessment of existing flood risk at the site;
- Section 5 presents the proposed development and findings of flooding;
- Section 6 presents the drainage strategy; and
- Section 7 provides references.

Additional Appendices are provided that deal with the following:

- Appendix A: Topographical Survey
- Appendix B: e3p Report
- Appendix C: Proposed Site Layout
- Appendix D: Drainage Strategy and Calculations
- Appendix E: Simple Pollution Index

3. SPATIAL PLANNING CONSIDERATION

3.1 Location and Background

The location of the proposed development site is shown in Figure 1 and Figure 2, with location details found in Table 1. The proposed site is for a residential development of 152 dwellings at Hyde Road, Manchester East, M18 7BA (Grid Ref: 387784, 396230).

The development site is 1.37ha and is a brownfield site. The site is located within the administrative boundary of Manchester City Council ("MCC").

The existing buildings on site are subject to prior approval for demolition.

Table 1: Site Details Grid reference details taken from the site https://www.streetmap.co.uk/

Reference	Value
OS X (Eastings)	387784
OS Y (Northings)	396230
Nearest Post Code	M18 7BA
Nat. Grid	SJ 87784 96230

The site is bounded by Hyde Road to the north, and the Kirkmanshulme Lane to the south. An existing hotel and wedding venue are located to the east and Co-op Academy Belle Vue to the west. Manchester City Council also own a car park to the south of the site which is earmarked for future development.

The Site is currently occupied by a large, predominantly brick built building, relating to its former use as bingo hall, with a large rear car park. There are a small number of established trees along the frontage with Hyde Road.

There are no listed buildings or structures within the site, and it is not within a conservation area.

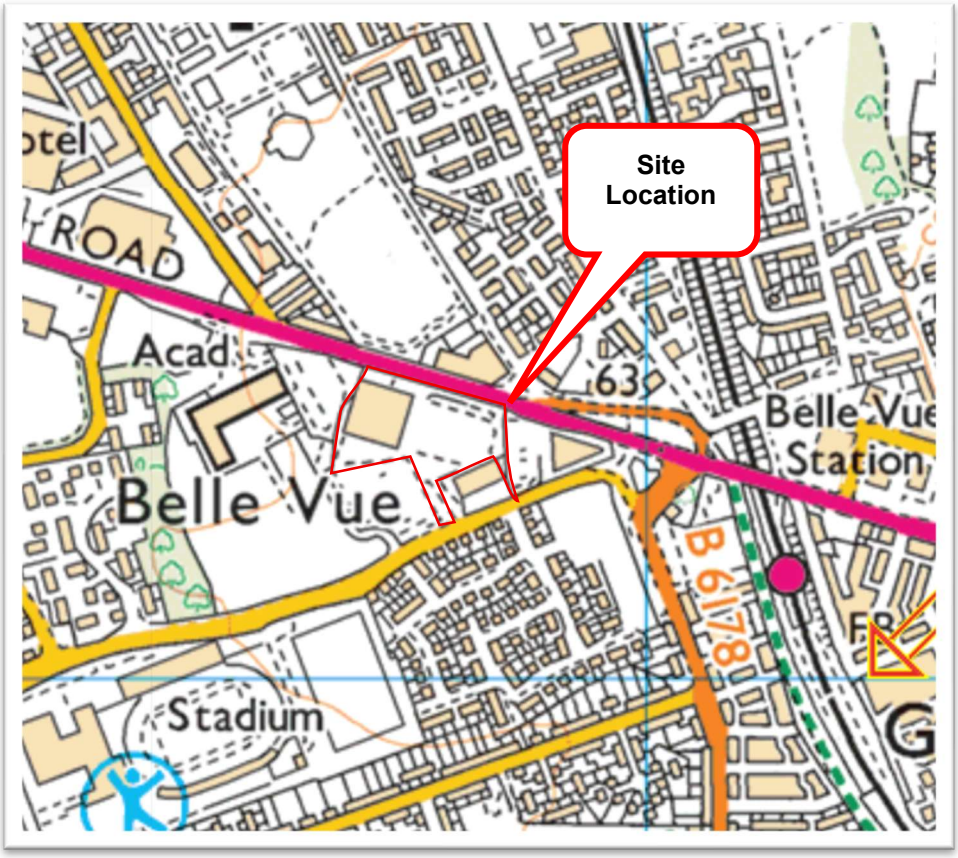


Figure 1: Site Location (Source: Street Map OS Map)

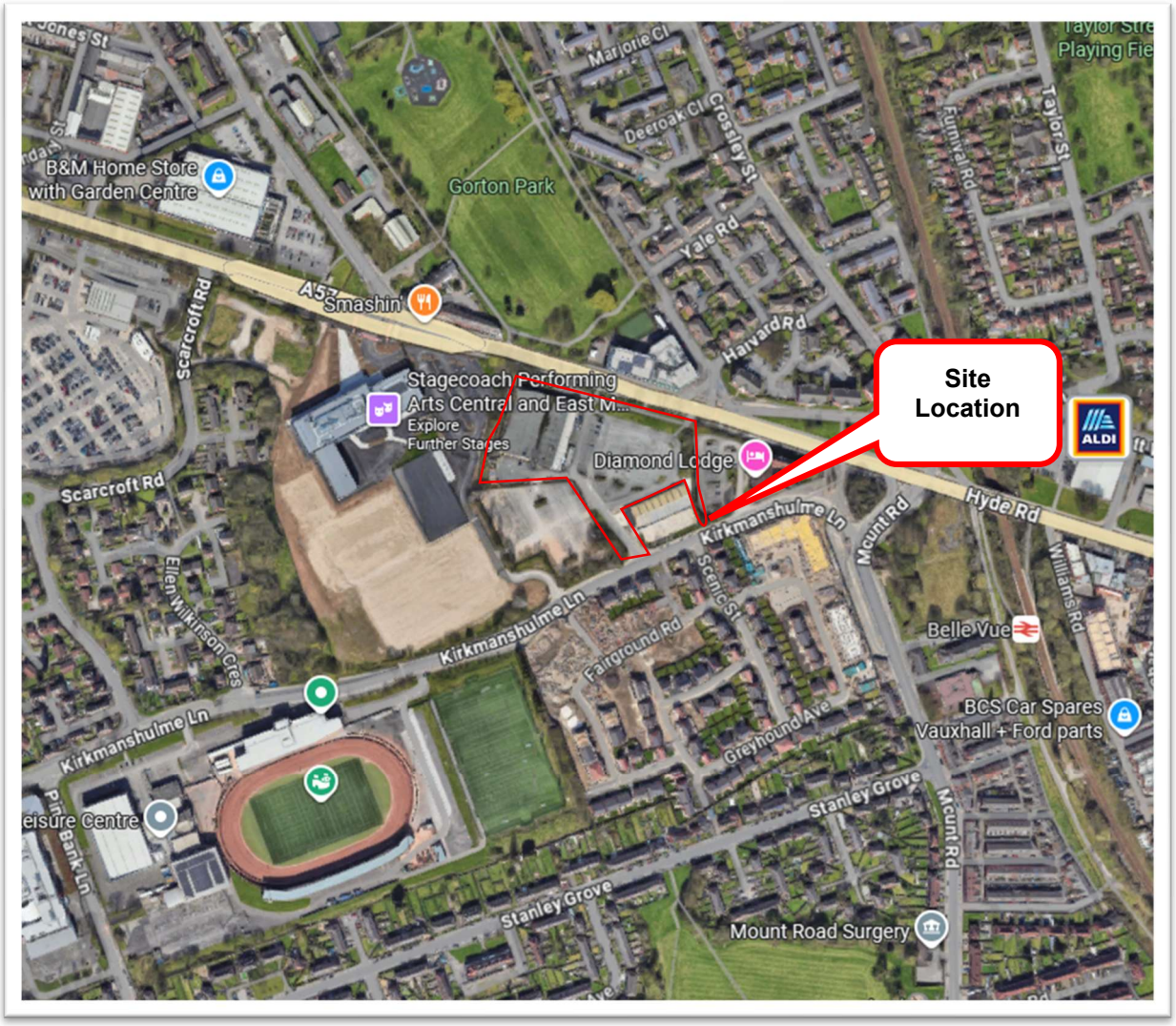


Figure 2: Aerial View of the Site (Source: Google Maps)

3.2 Topography

The existing ground elevations on site is shown in the topographic drawing (Figure 3 and Appendix A). They indicate that the site is uneven with levels ranging between 61.4mAOD near the site entrance in the south (Kirkmanshulme Lane), to 63mAOD in the east of the site.



Figure 3: Topographical Survey

3.3 Geology and Soil

The geology at the site has been obtained from the British Geological Survey (BGS) website. The bedrock beneath the site is described as 'Chester Formation – Sandstone'. (Figure 4: Bedrock underneath the Site (Source: BGS Bedrock Geology Mapping)). Superficial deposits are described as 'Till, Devensian – Diamicton'.

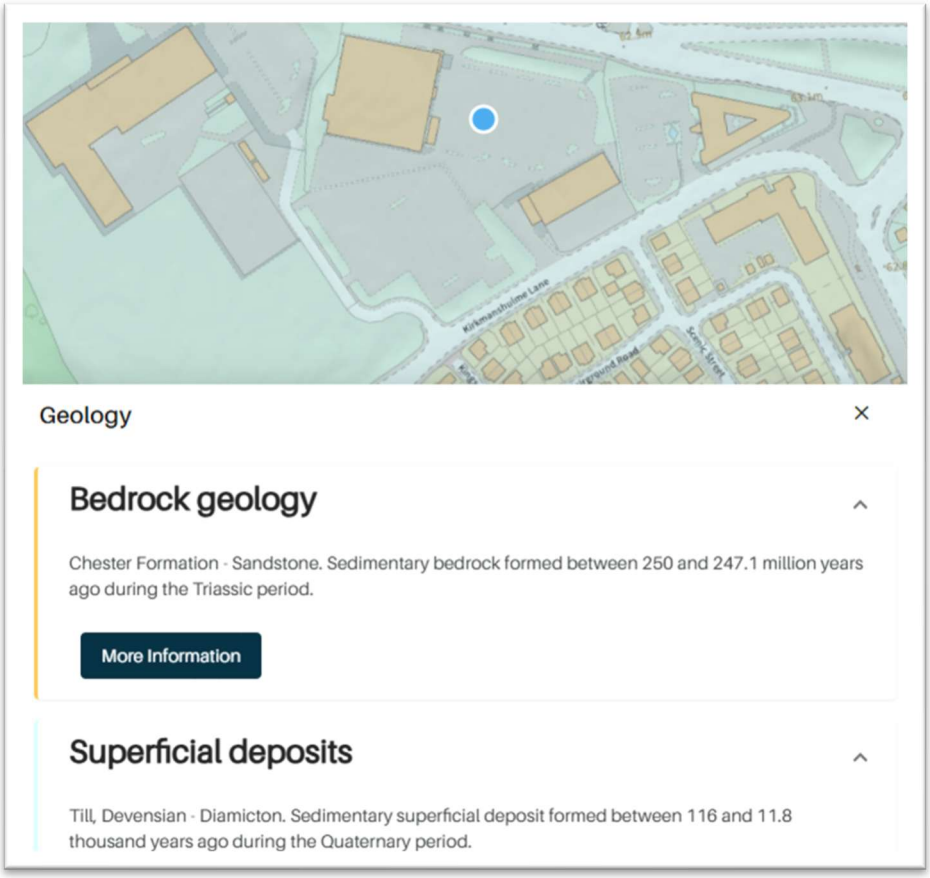


Figure 4: Bedrock underneath the Site (Source: BGS Bedrock Geology Mapping)

Soilscapes Viewer describes the soil conditions at the site as Soilscapes 17 - 'Slowly permeable seasonally wet acid loamy and clayey soils'. Please see Figure 5 below.

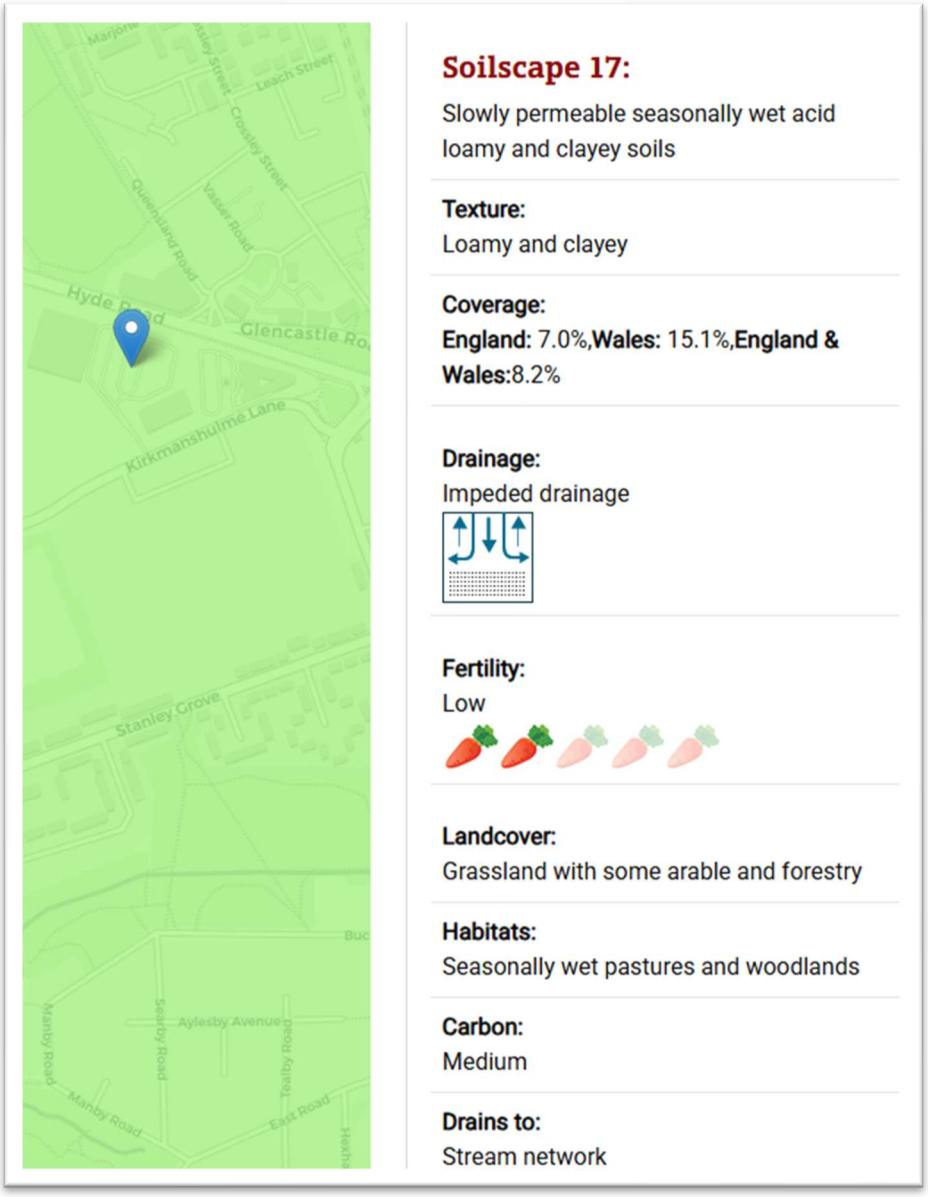


Figure 5: Soilscapes 17

In the report e3p PHASE II GEOENVIRONMENTAL SITE ASSESSMENT: Buzz Bingo (Ref:18-376-R2-1) 06 February 2026 for Kellen Homes Ltd, soakaway testing was undertaken – the tests failed and the site is not suitable for infiltration (Figure 6 and Appendix B).

5.6. SOIL INFILTRATION

In-situ BRE 365 Soakaway tests were undertaken over a 24-hour period within trial pits complete as TP/SA101, TP/SA106, and TP/SA109.

The results are presented in Table 5.7, and the test certificates are included within APPENDIX XI.

Table 5.7 Soil Infiltration Results

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
TP/SA101	1.70 – 2.65	Firm medium strength yellowish brown slightly sandy slightly gravelly CLAY	1	FAIL
TP/SA106	0.45 – 1.06	Stiff brown mottled light grey slightly gravelly CLAY	1	FAIL
TP/SA109	0.40 – 1.10	Soft greyish brown slightly sandy CLAY	1	FAIL

Soil infiltration was taken over the wetted area from between 75% and 25% of the effective depth. In all locations the BRE 365 soakaway tests failed to achieve a 25% storage depth, with the head of water remaining constant over monitoring period with minor fluctuations.

The data presented above, derived from in-situ testing using the BRE 365 test method, forms only part of the overall ground model assessment and the design process for the infiltration drainage system. Due to the presence of low permeability clay soils extending to depths greater than 7.0m, it is considered unsuitable as a stratum for infiltration drainage systems due to its distinct geological characteristics and soil mechanics properties.

Figure 6: e3p PHASE II GEOENVIRONMENTAL SITE ASSESSMENT: Buzz Bingo (Ref:18-376-R2-1) 06 February 2026 for Kellen Homes Ltd.

3.4 Climate Change Allowances for Rainfall

Figure 7 shows anticipated changes in small catchments, recommending a progressive increase, reaching **45%** for the 'Upper End' allowance by 2125. This allowance would be recommended for this proposed development, which is classified as **'More Vulnerable'** and has been taken to have a 100-year design life. The **45%** climate change allowance is based on the 90th percentile, meaning that there is a 90% chance that rainfall will not increase by more than the **45%** increment.

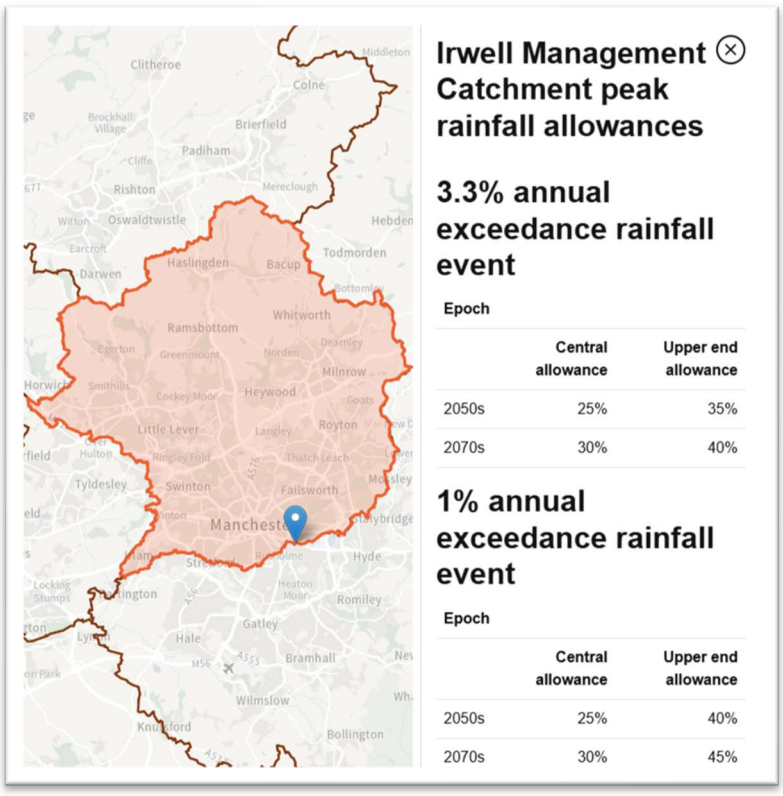


Figure 7: Peak Rainfall Intensity Allowance in Small and Urban Catchments

3.5 Climate Change Allowances for River Flow

The river flow guidance recommends a progressive increase, reaching **35%** for the 'Central' allowance by 2080 in this area. This allowance would be recommended for this proposed development, which is classified as **'More Vulnerable'** and has been taken to have a 100-year design life. The **35%** climate change allowance is based on the 90th percentile, meaning that there is a 90% chance that river flow will not increase by more than the **35%** increment. Please see Figure 10 below.

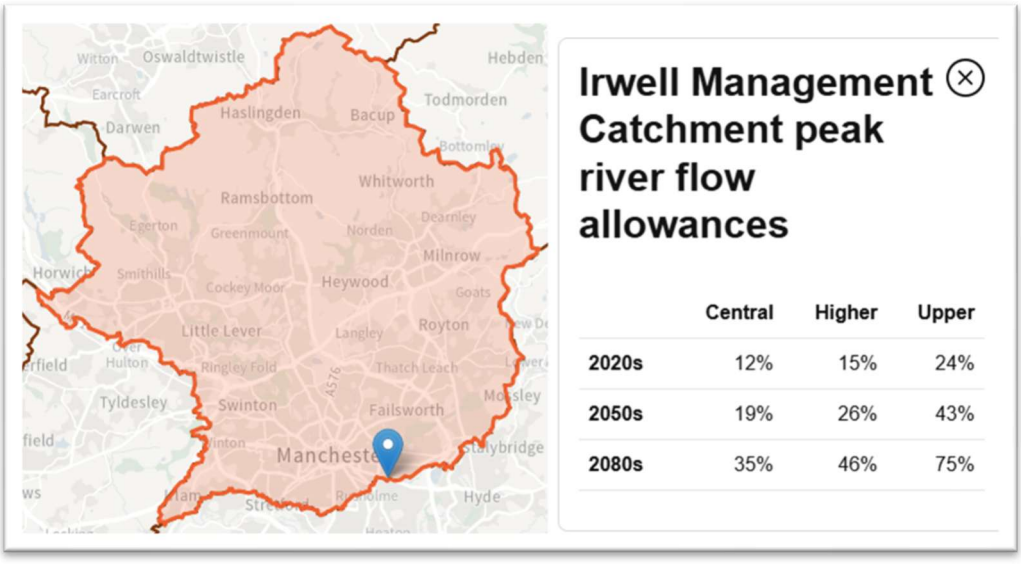


Figure 8: Flood Risk Assessment Climate Change Map Peak River Flow Allowances

4. FLOOD HAZARD FOR EXISTING SITE

4.1 Source of Flood Risk

Flood sources and their possibilities at the site is further described below.

4.2 Fluvial Flood Risk

The proposed site is within **Flood Zone 1** (area at **low** risk of flooding). Areas within Flood Zone 1 have less than 0.1% chance of flooding from rivers and seas. Please see Figure 9:

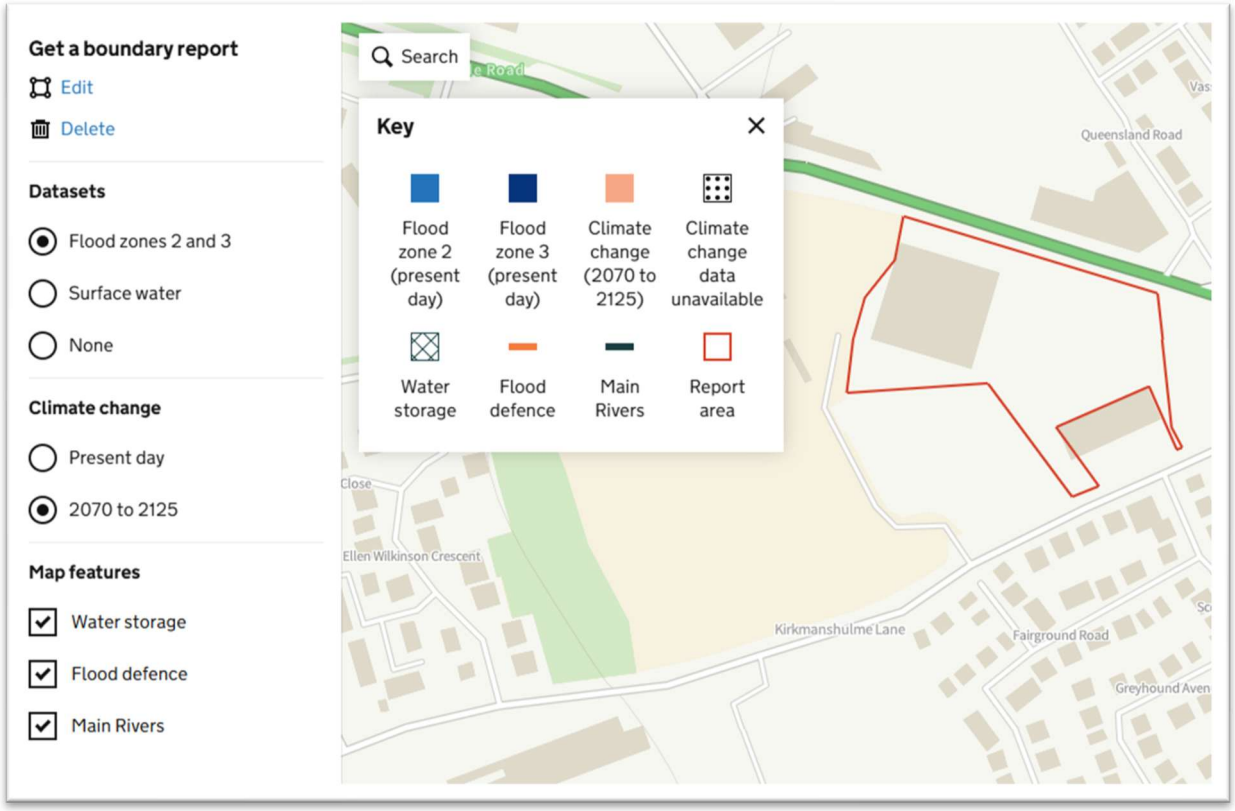


Figure 9: Environment Agency (EA) Flood Map for Planning

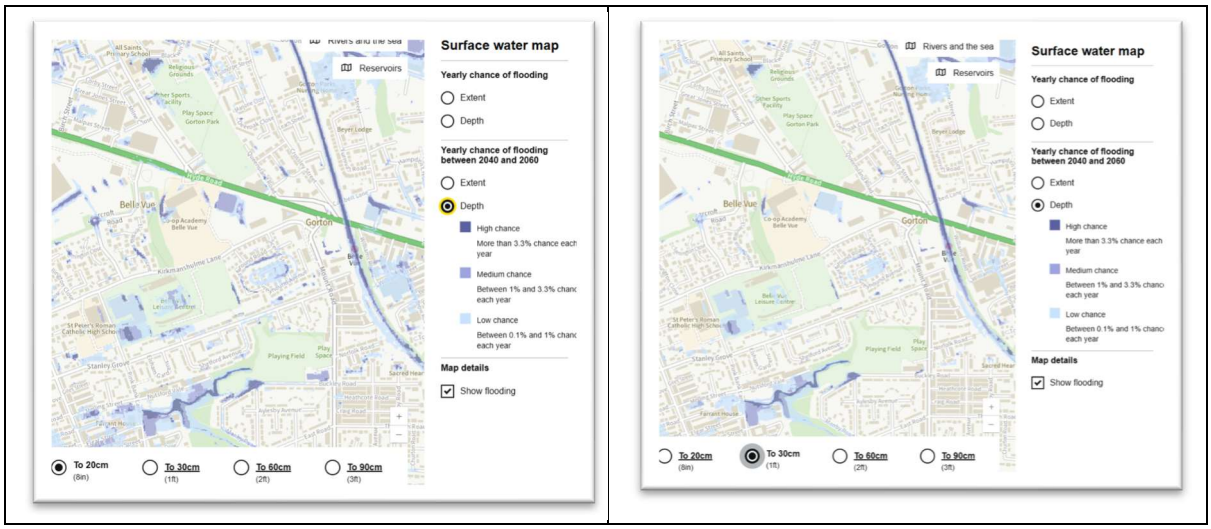
4.2.1 Surface Water (SW)

The EA surface water flood extents and flood depth have been obtained from the EA open dataset. The site is at risk of surface water flooding in the 1 in 30 year event, this increases in the 1 in 100 year and 1 in 1000 year event. Please see Figure 10.



Figure 10:Extent of Flooding from Surface Water 1 in 30 Year, 1 in 100 Year and 1 in 1000 Year AEP (Source: EA Open Dataset Tool: ArcGIS)

On the EA Long Term Flood Risk Map (SW yearly chance of flooding between 2040 and 2060) there is surface water flooding within the site to a depth of 60cm (Figure 11).



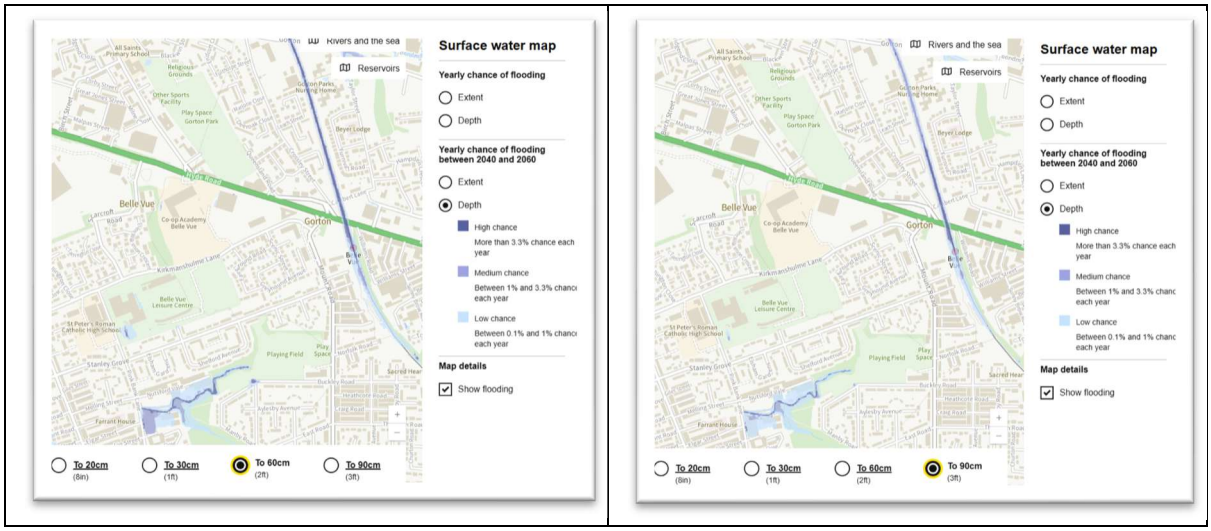


Figure 11: EA Long Term Flood Risk Map (SW Yearly Chance of Flooding Between 2040 and 2060)

Please see the proposed layout over the surface water flood depths to 20cm, 30cm and 60cm plus climate change (Figure 12).



Figure 12: Surface Water Flood Depths Plus Climate Change to a depth of 20cm, 30cm and 60cm Over Proposed Layout

4.2.2 Flood Risk from Reservoir /Canals / Other Artificial Sources

The EA Extent of Flooding from Reservoirs map (Figure 13:Extent of Flooding from Reservoirs (Source; EA Flood Warning Information Service)), based only on large reservoirs (over 25,000 m^3 of water), shows that the site is not within potential risk of flooding in the event of a breach from reservoirs.

Flooding from reservoirs is considered to be extremely unlikely and the risk of flooding to the site is considered to be low.

There is no flood risk from canals or other artificial sources as there are no canals or artificial sources within the vicinity of the site.

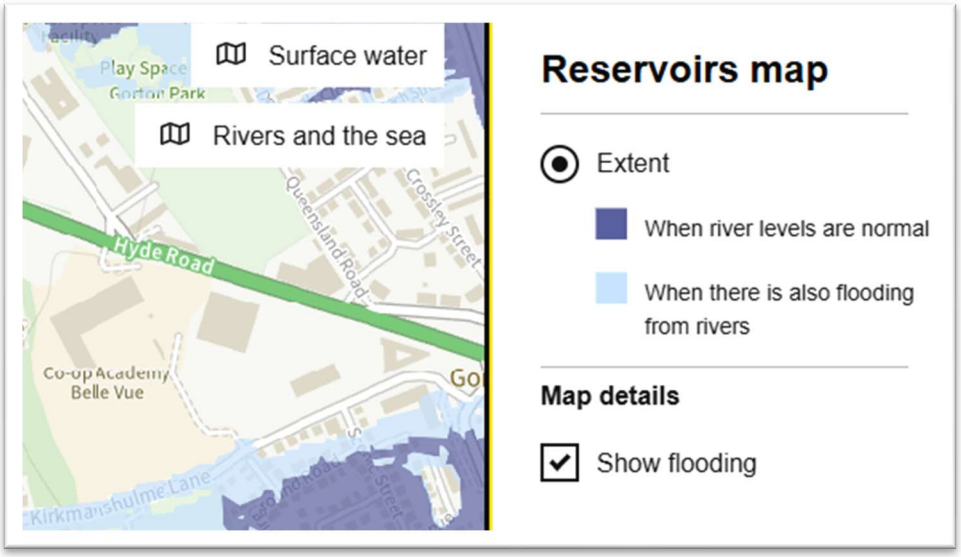


Figure 13:Extent of Flooding from Reservoirs (Source; EA Flood Warning Information Service)

4.2.3 Flood Risk from Groundwater

The site is not within a groundwater flood alert area, please see Figure 14.

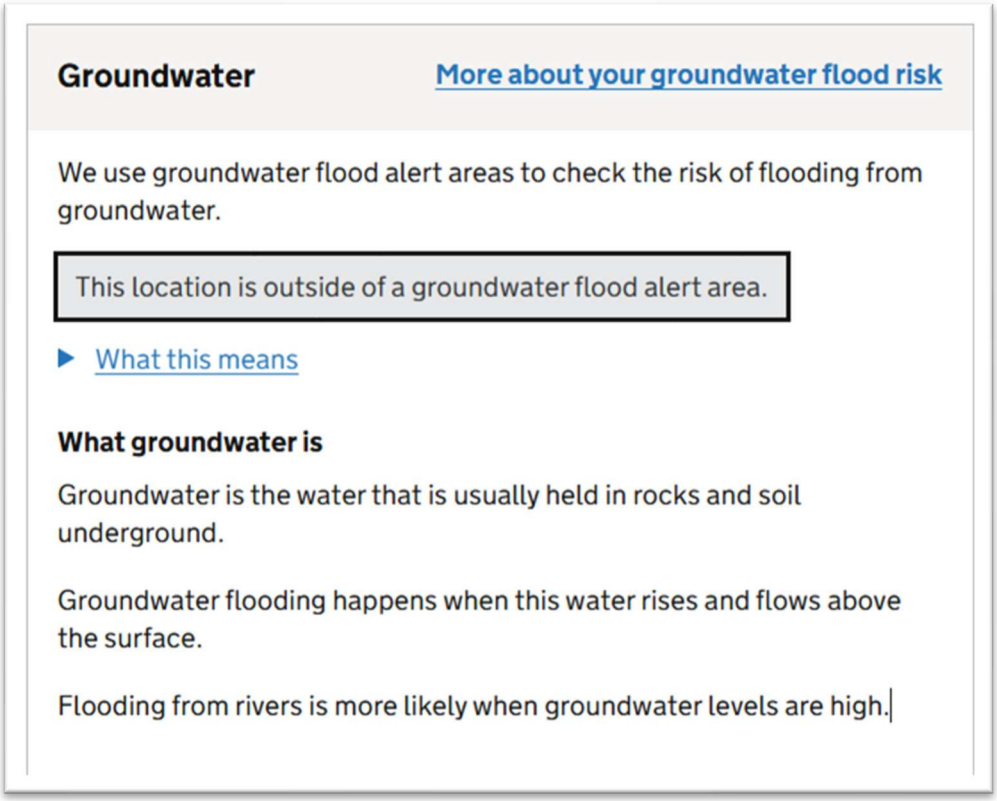


Figure 14: Risk of Groundwater Flooding to Site (Long Term Flood Risk Checker - EA)

On the Manchester, Salford, Trafford Strategic Flood Risk Assessment (2011) Groundwater Flooding Map[1], the site is shown to be at no risk of groundwater flooding (Figure 15).

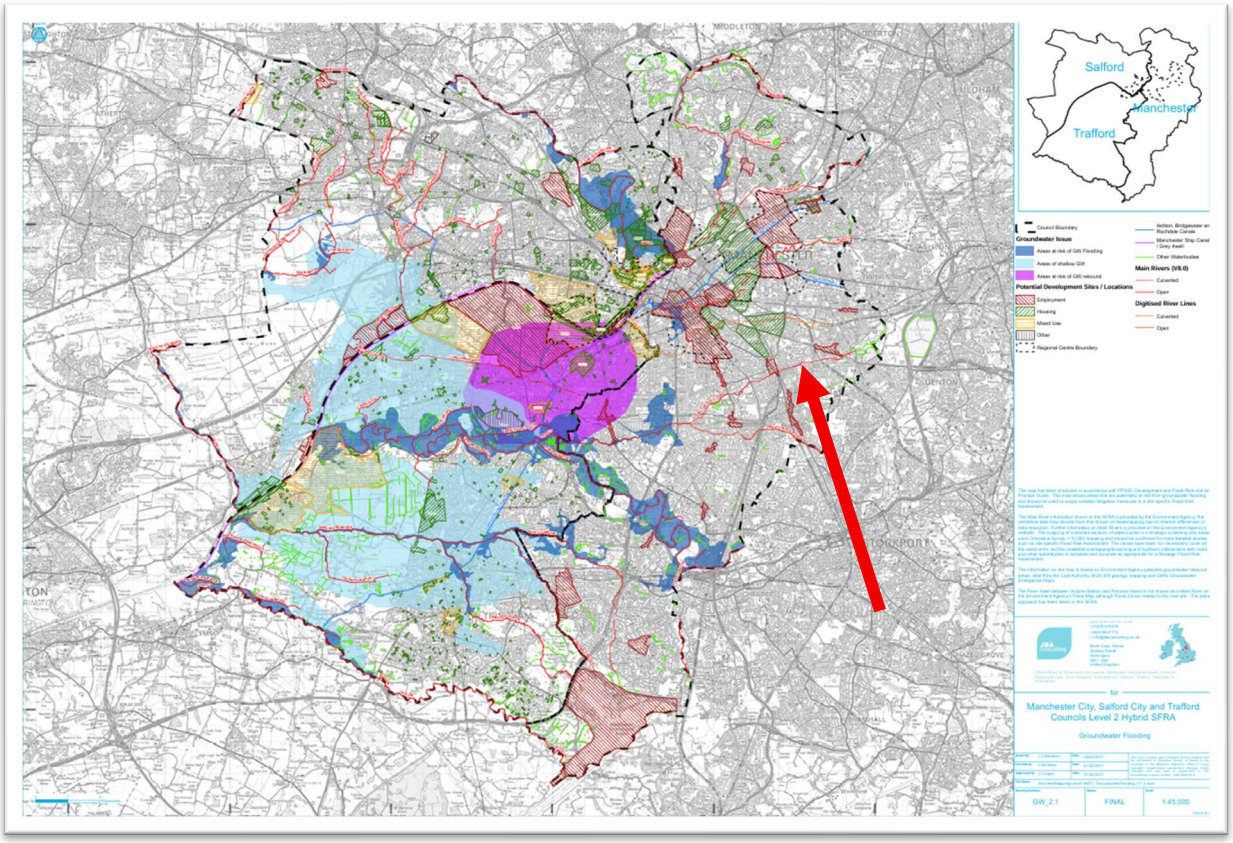


Figure 15: Manchester, Salford, Trafford Strategic Flood Risk Assessment (2011) (Groundwater Flooding Mapping)

In the report e3p PHASE II GEOENVIRONMENTAL SITE ASSESSMENT: Buzz Bingo (Ref:18-376-R2-1) 06 February 2026 for Kellen Homes Ltd, groundwater was noted between 0.5-1.8mbgl and perched. As the groundwater did not reach surface level and the dwellings will not have basements, the site is at low risk from groundwater flooding (Figure 16).

Groundwater

Groundwater was encountered as seepages in three trial pit locations from 0.50–1.80 m bgl. During preliminary return monitoring, groundwater depths varied sporadically across the site between 0.22 m and 6.00 m bgl. Groundwater is is perched and discontinuous,

Figure 16: e3p PHASE II GEOENVIRONMENTAL SITE ASSESSMENT: Buzz Bingo (Ref:18-376-R2-1) 06 February 2026 for Kellen Homes Ltd

[1] MST_GroundwaterFlooding_GW_2.1.pdf

4.2.4 Flood Risk from Sewers

According to the United Utilities (UU) sewer map, there are no sewers entering the site. Therefore, the risk of flooding from sewers is low. There are UU sewers in the roads to the north and south of the site, outside of the site red line boundary. Please see Figure 17 below:

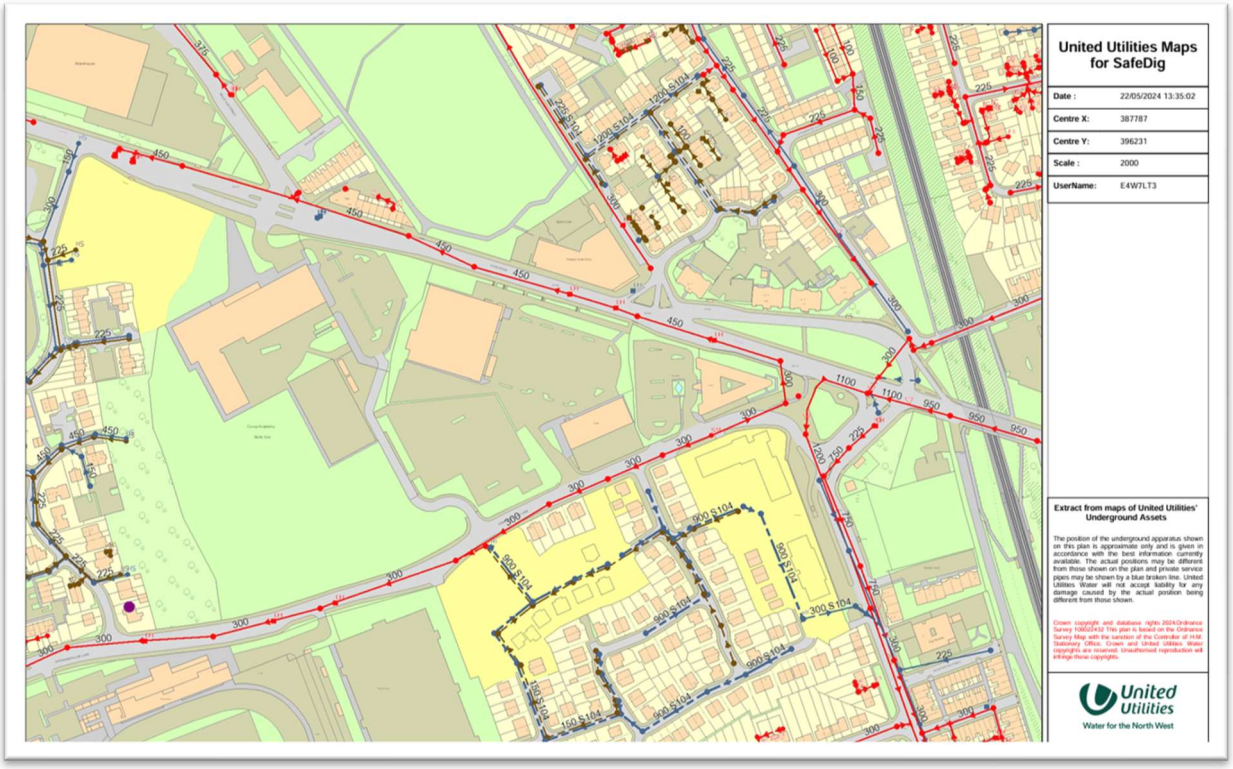


Figure 17: UU Sewer Map

4.3 Existing Surface Water Drainage Arrangements

The site currently drains into the existing sewer network.

4.4 NPPF Vulnerability

The **residential** development will be classed as **'More Vulnerable'** under the NPPF vulnerability classification (Table 3). The flood risk vulnerability and flood zone compatibility are displayed in Table 3:Flood Risk Vulnerability and Flood Zone Compatibility (Source NPPF Technical Guide). As noted in Section 2.4, the site is within **Flood Zone 1** according to the EA flood risk map for planning.

Table 2:Flood Risk Vulnerability Classification (Source: NPPF Technical Guide)

More Vulnerable (MV)
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[6].
Sites used for holiday or short let caravans and camping, subject to a specific warning and evacuation plan.[7]

Table 3:Flood Risk Vulnerability and Flood Zone Compatibility (Source NPPF Technical Guide)

Flood Zone	Definition	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
1	T>1,000	✔	✔	✔	✔	✔
2	$100<T_{fluv}<1,000$ $200<T_{tidal}<1,000$	✔	✔	Exc. Test	✔	✔
3a	$T_{fluv}<100$ $T_{tidal}<200$	Exc. Test	✔	✕	Exc. Test	✔
3b (functional floodplain)	$T_{fluv}<20$	Exc. Test	✔	✕	✕	✕

As the development is **'More Vulnerable'** and it is located in **Flood Zone 1,** according to Table 3:Flood Risk Vulnerability and Flood Zone Compatibility (Source NPPF Technical Guide), the exception test is not required.

Furthermore, the site is marked for residential use on the Greater Manchester 2019 SFRA maps '2018 Baseline Land Supply' (Figure 18).

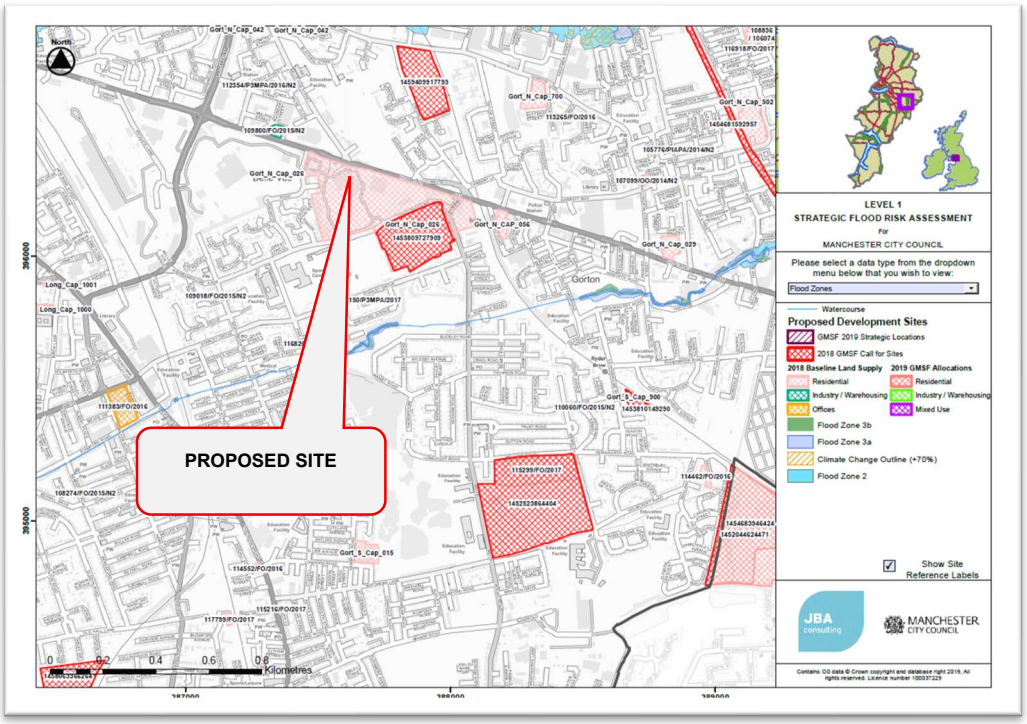


Figure 18: Greater Manchester 2019 SFRA Map 23

The site is referred to in the Places for Everyone Joint Development Plan (adopted March 2024).

As the site is in a Flood Zone 1 and is allotted for residential development the proposed site passes the sequential test.

5. ASSESSMENT OF FLOOD RISK FOR PROPOSED DEVELOPMENT

5.1 Development Proposals

The proposed site is for a residential development of 152 dwellings at Hyde Road, Manchester East, M18 7BA (Grid Ref: 387784, 396230), as shown on the indicative masterplan Figure 19 and Appendix C.

The development area is 1.37ha. The proposed impermeable area is 0.7819ha. Please see Figure 19 below:

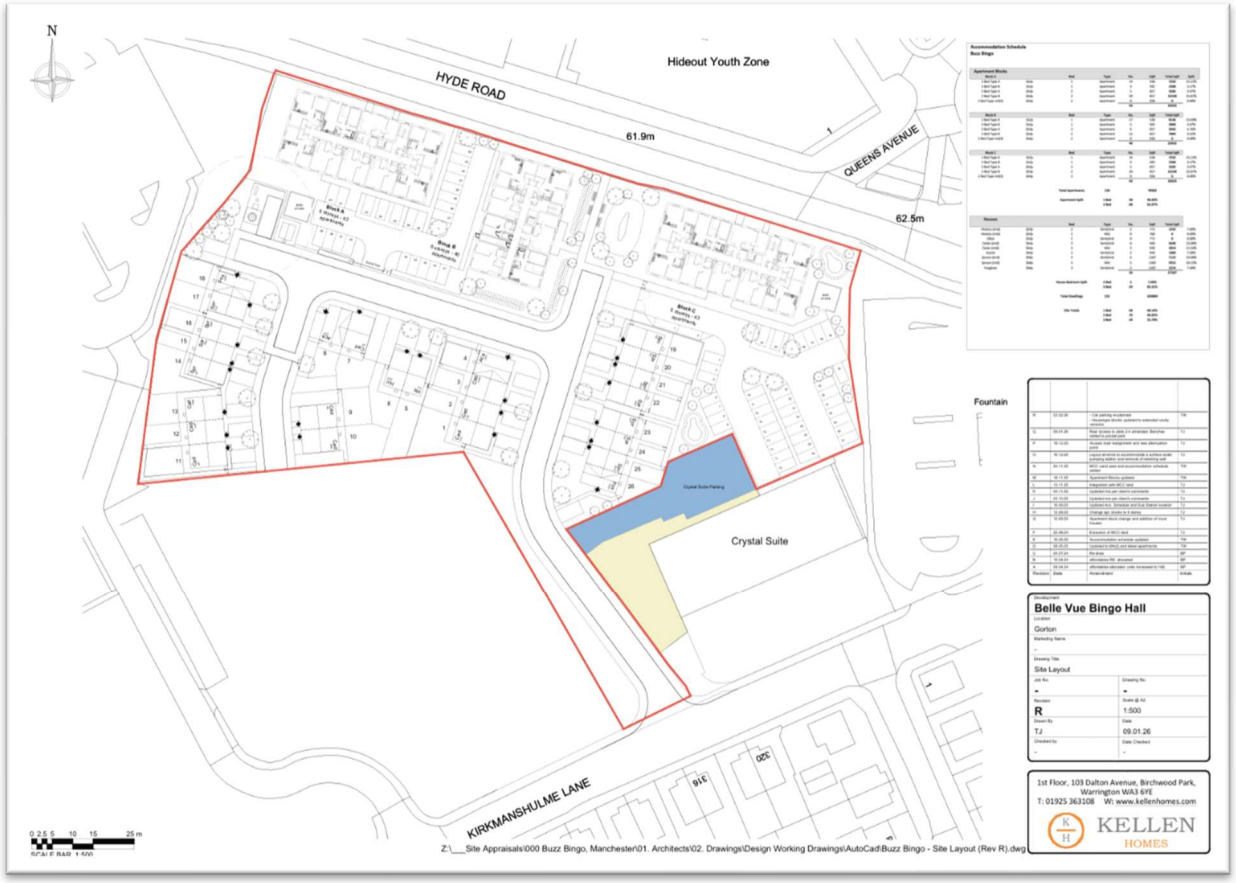


Figure 19: Proposed Site (Source: Client)

5.2 Fluvial Flood Management

The site is in a **Flood Zone 1**, an area at **low** risk of fluvial flooding. Therefore, the risk of fluvial flooding to the site is medium.

5.3 Surface Water flooding

The EA surface water flood extents and flood depth have been obtained from the EA open dataset. The western part of the site is at risk of surface water flooding up to 60cm depth. Please see Figure 10, Figure 11 and Figure 12.

It is recommended that the finished floor levels (FFL) are raised by 600mm in this area.

Therefore, with the inclusion of a new drainage system with attenuation up to and including the 1 in 100-year event plus climate change of **45%**, the site is at low risk of surface water flooding.

6. DRAINAGE STRATEGY

Please find below the Drainage Strategy.

6.1 Existing Drainage Arrangements

6.1.1 Surface Water

The existing drainage arrangements is that all the surface water from the existing site drains to the sewer network as it is a brownfield site – a bingo hall and car park.

6.2 Infiltration Rates

Infiltration is not possible at the site as test failed to infiltrate (e3p PHASE II GEOENVIRONMENTAL SITE ASSESSMENT: Buzz Bingo (Ref:18-376-R2-1) 06 February 2026 for Kellen Homes Ltd).

6.3 Run-off

The discharge has been set at a brownfield runoff rate of 7l/s.

6.4 Surface Water Drainage Strategy

The drainage strategy is based on the tenants of the national standards for sustainable drainage systems.

These standards are intended for application in the design of surface water drainage systems for new infrastructure and development, whether on greenfield or brownfield sites. They are not designed to apply to retrofit SuDS designs, which often have different objectives and face broader constraints. However, the standards could serve as a starting point for retrofit design. It is important to acknowledge that constraints specific to retrofit projects may prevent the full application of the standards.

These standards only apply to the management of surface water runoff that is essentially uncontaminated and consists predominantly of rainwater. For some land uses, where there is a higher risk (for example, a large car park), the inclusion of proprietary measures as opposed, or in addition, to SuDS may be needed. However, where there is a risk of pollution, an Environmental Permit or Registration of an Exemption may be required from the Environment Agency.

There are 7 standards which are indicated below:

Standard 1: Runoff Destination;

Standard 2: Management of everyday rainfall;

Standard 3: Management of extreme rainfall;

Standard 4: Water Quality;

Standard 5: Amenity;

Standard 6: Biodiversity; and

Standard 7: Design of drainage for construction, operation, maintenance and structural integrity.

- **Standard 1: Runoff Destination**

In accordance with the Flood Risk and Coastal Change Planning Practice Guidance, where possible, preference should be given to multi-functional sustainable drainage systems, and to solutions that allow surface water to be discharged according to the following hierarchy of drainage options:

- 1. Rainwater Harvesting
- 2. Into the ground (infiltration);
- 3. To a watercourse;
- 4. To a surface water sewer, highway drain, or another drainage system; and
- 5. To a combined sewer.

In accordance with the statement full rainwater harvesting is required in areas of rainfall scarcity. This is not an area of rain scarcity so full rainwater harvesting is not required.

As commented in section 2.3, infiltration does not work in this site. The surface water will run through swales, a detention basin and rain gardens, which have been designed with permeable materials underneath which will enable some infiltration and holding of the water on the site.

There is no watercourse within the vicinity of the site.

There is a public surface water sewer in Mount Road to the east that the site will be connected to. The surface water will require a pumped system.

- **Standard 2: Management of Everyday Rainfall (Interception)**

Given the impermeable nature of the site, interception for the first 5mm of rainfall will be achieved through storage in the SuDS features as absorption / evaporation. This can be achieved using regional control SuDS (the detention basin, swale and raingardens).

Within the guidance this statement can be satisfied by comparing the size of detention basin (108m^2), rain gardens (80m^2) and swale (80m^2) and then comparing this value against the impermeable areas and if the SuDS systems have a higher area than the impermeable area then this standard is achieved.

Townsend Water Engineering has taken these calculations from Kellen Homes Drainage Strategy, please find the results in Table 4 and Appendix D:

Table 4: Summary of Impermeable Areas/ Permeable Areas

Type of SuDS	Impermeable Area (ha)	Area of Permeable Area that Drains the 1st 5mm of Rainfall According to the Guidance (ha)
Total Impermeable Area	0.7819	
Detention Basin		0.05
Rain Gardens		0.04
Swale		0.04
TOTAL	0.7819	0.13

The total impermeable area is 0.7819 and the area that drains the first 5mm of rainfall is 0.13ha, therefore, in accordance with the National Standards of SuDS Guidance, the site drainage fails this statement.

However, there are reasons why:

- Firstly, this site cannot infiltrate as it is a brownfield site and therefore the high multipliers cannot be used as the SuDS cannot drain into the ground. If the SuDS could infiltrate, the site would satisfy this statement.
- The Local Authorities do not adopt SuDS systems for highway drainage. Therefore, this statement is very difficult to achieve.
- The proposed development is for 100% affordable housing and dwellings. If more SuDS systems are required, less affordable housing can be provided as more land will be needed for SuDS.
- The proposed drainage has a three train SuDS system, which provides flood attenuation, amenity, biodiversity and water quality.

Therefore, we believe it is acceptable to not be able to achieve this statement.

- **Standard 3: Management of Extreme Rainfall and Flooding**

The drainage system is designed so that there is no on-site flooding in the 1 in 30-year event + 40% climate change.

The drainage system is designed so that there is no on-site flooding of any building, nor any off-site flooding for the 1 in 100-year event + 45% climate change.

The ground levels are to be designed such that overland flood routes in exceedance events do not result in adverse flood risk elsewhere.

Modelling of the surface water runoff to the design parameters was carried out using Causeway, an industry leading software which allows design and analysis of SuDS features. (Appendix D) The following conservative assumptions and design parameters have been set within the Hydraulic model:

- Rainfall intensity was obtained using the Flood Estimation Handbook (FEH), and increased by 45%;
- No runoff loss has been assumed in the modelling, therefore, all the design rainfall landing on the impermeable surfaces is expected to reach the detention basin, swale and rain gardens on site;
- As per the conclusions in Section 3.3, the soil has been modelled with an infiltration rate of zero 0.0m/hr;
- The areas of the drives and plots have been increased by 10% for urban creep;
- The discharge has been restricted to 7l/s, which is greenfield rates; and
- Please see Appendix D and Figure 20 for the Drainage Strategy.

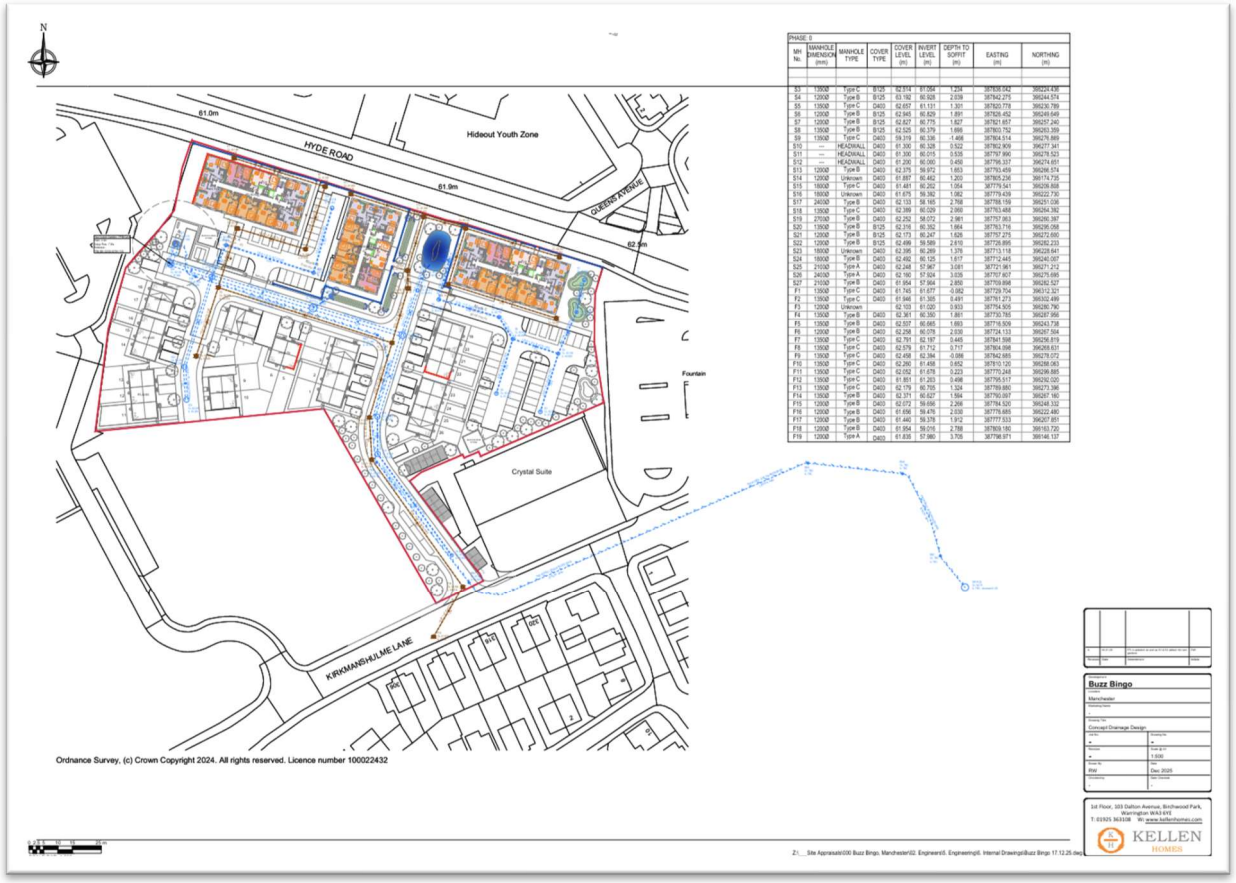


Figure 20: Drainage Strategy Design

- **Standard 4: Water Quality**

Adequate amount of SuDS required to be implemented on the site to achieve a suitable management train to achieve water quality improvements.

Accordingly, the rain gardens, swale and detention basin provides sufficient water quality improvements to meet the minimum targets. Additional source control measures will provide further enhanced treatment over and above minimum requirements. Please see the Simple Pollution Index which indicates that the proposed SuDS is sufficient in Appendix E.

- **Standard 5: Amenity**

Landscaping will be provided around the attenuation basin providing both amenity and biological value.

- **Standard 6: Biodiversity**

The basin, swale and rain gardens have been seeded with flowers and water compatible plants, please see the landscape drawings with the types of plants in it.

- **Standard 7: Design of Drainage for Construction, Operation, Maintenance & Structural Integrity**

Structures which manage surface water runoff require little maintenance, however, a regular maintenance schedule e.g., after heavy rainfall, should be established by the site owners to reduce the risk of blockage within the drainage system and ensure the design remains in good working order. The detention basin, swale and rain gardens will be maintained by a private management company. Oversized pipes will either be maintained by United utilities or management company. Please can this

be conditioned as maintenance needs to be investigated at detailed design. Please find a proposed strategy for maintenance below:

6.4.1 Maintenance Plan

Table 5: Operation and Maintenance Requirements for Attenuation Tank

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

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

Figure 21: Operation and Maintenance Requirements for Detention Basins

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Figure 22: Operation and Maintenance Requirements for Rain Gardens

TABLE 18.3 Operation and maintenance requirements for bioretention systems

Maintenance schedule	Required action	Typical frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Figure 23: Operation and Maintenance Requirements for Swales

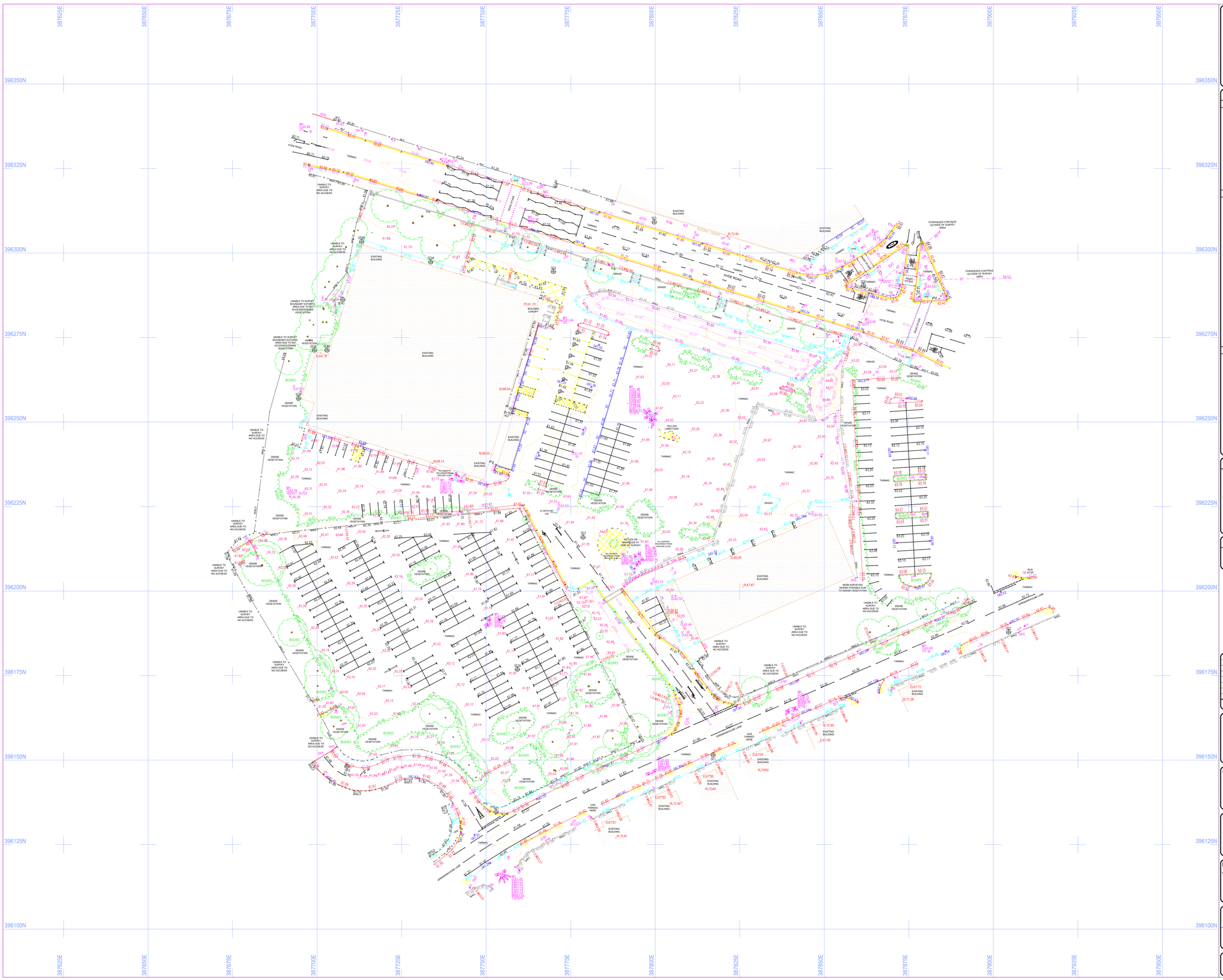
TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

7. REFERENCES

Author	Date	Title/Description
Department for Communities and Local Government	Dec 2024	Guidance to the National Planning Policy Framework
Ministry of Housing, Communities and Local Government.	Dec 2024	National Planning Policy Framework

Appendix A: Topographical Survey



N

W E

S

SURVEY ORIENTATED TO OS GRID (OSGB36-15)

SURVEY LEGEND

FEATURES

- TOP OF BANK
- BOTTOM OF BANK
- SURVEY STATION
- TREE
- HEDGE
- TREE CANOPY
- BUSHES
- VEGETATION

SURVEY ANNOTATIONS

AV	AIR VALVE
B	BOLLARD
BS	BUS STOP
BT	BRITISH TELECOM IC
CPS	CONCRETE PAVING SLABS
CP	CATCH PIT
DR	DRAIN
EB	ELECTRIC CONTROL BOX
EL	ELECTRICAL IC
EP	ELECTRICITY POLE
ER	EARTH ROD
FH	FIRE HYDRANT
FP	FLAG POLE
G	GULLY
GH	GREENHOUSE
GP	GATE POST
GV	GAS VALVE
IC	INSPECTION COVER
JB	JUNCTION BOX
JKW	JAPANESE KNOT WEED
KO	KERB OUTLET
LH	LAMP HOLE
LP	LAMP POST/LIGHT COLUMN
MH	MANHOLE
MP	MONITOR POINT
NP	NAME PLATE
OHC	OVERHEAD CABLES
PB	POST BOX
PM	PARKING METER
PS	POST
PYL	ELECTRICITY PYLON
RE	RODDING EYE
RS	ROAD SIGN
RWP	RAIN WATER PIPE
ST	STOP TAP
SM	SERVICE MARKER
SP	SIGN POST
SV	STOP VALVE / SLUICE VALVE
SVP	SOIL VENT PIPE
TB	TELEPHONE BOX
TL	TRAFFIC LIGHTS
TM	TELEPHONE MAST
TP	TELEGRAPH POLE
TPS	TACTILE PAVING SLABS
VP	VENT PIPE
WM	WATER METER
WO	WASH OUT
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY

BOUNDARY ANNOTATIONS

BARB WIRE FENCE	BW.F
CHAIN LINK FENCE	C/L.F
CONC POST AND PANEL	CP&P.F
CONC POST TIMB PANEL	CP&TP.F
ELECTRIC FENCE	EL.F
HERAS FENCE	HER.F
IRON RAIL FENCE	IR.F
KNEE RAIL FENCE	KR.F
MISCELLANEOUS FENCE	MISC.F
POST AND WIRE FENCE	P&W.F
RANCH STYLE FENCE	RS.F
SECURITY FENCE	SEC.F
TIMBER FENCE	T.F
BRICK WALL	B.W
BLOCK WALL	BL.W
CONCRETE WALL	C.W
GABION WALL	G.W
MISCELLANEOUS WALL	MISC.W
RETAINING WALL	R.W
RETAINING LOG WALL	RL.W
STONE WALL	S.W

LEVEL PREFIX ANNOTATIONS

ASL	ARCH SPRING LEVEL
BL	BED LEVEL
BD	BACK DROP
CL	COVER LEVEL
DH	TOP OF DOOR
DTC	DEPTH TO CROWN
FFL	FINISHED FLOOR LEVEL
IL	INVERT LEVEL
PL	PARAPET LEVEL
RL	ROOF/RIDGE LEVEL
SL	SOFFIT LEVEL
TOF	TOP OF FENCE
TOP	TOP OF PIPE
TOW	TOP OF WALL
TRH	TREE HEIGHT
THR	THRESHOLD LEVEL
WL	WATER LEVEL
WS	WINDOW SILL
WSF	WINDOW SOFFIT

GEOTECHNICAL INFORMATION

- TRIAL HOLE / PIT — TH
- BORE HOLE — BH
- WINDOW SAMPLE — WS
- MONITORING POINT — MP
- PROBE HOLE — PH

DISCLAIMER:

ONLY MANHOLES AND SERVICES SHOWN WERE VISIBLE AT THE TIME OF SURVEY.

MAN ENTRY TO SEWERS HAS NOT BEEN UNDERTAKEN, DEPTHS, PIPESIZES ETC ARE MEASURED FROM GROUND LEVEL.

DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED PRIOR TO ANY WORK COMMENCING.

BOUNDARIES SHOWN ARE PHYSICAL AND MAY NOT REPRESENT LEGALLY CONVEYED OWNERSHIP.

TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE AVERAGE SPREAD, THE TREE CANOPY LAYER DENOTES THE TREES EXTREMITY.

SURVEY NOTES

ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

SURVEY STATIONS

Name	Easting	Northing	Height
HP1	387752.939	396134.635	61.631
HP2	387708.813	396148.161	61.585
SC1	387817.140	396151.801	62.011
SC2	387776.845	396215.869	61.438
SC3	387778.649	396215.869	61.438
SC3A	387759.221	396176.900	61.824
SC4	387769.887	396294.538	62.102
SC4A	387733.604	396297.377	61.583
SC4B	387713.170	396303.399	61.058
SC4C	387707.549	396286.281	61.008
SC4D	387688.784	396271.272	61.033
SC4E	387684.524	396257.058	61.031
SC5	387799.657	396308.172	61.910
SC6	387861.575	396295.417	62.499

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DESCRIPTION	REV	DATE	DRWN	APPR

SurveyEng Ltd
Land Surveyors & Engineers
14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCS
BL5 3GE
TEL/FAX: 0800 772 3040
MOB: 07850069993
info@surveyeng.co.uk

CLIENT
KELLEN HOMES

PROJECT TITLE
HYDE ROAD, MANCHESTER

DRAWING DETAIL
TOPOGRAPHICAL LAND SURVEY

PROJECT ENGINEER	JB	DATE	08.11.2025
DRAWN	AH	SCALE	1:500@A1

DRAWING NUMBER	REVISION
KH.TS.09	-

Appendix B: e3p Report

5.5. SOIL DENSITY/MOISTURE CONTENT RELATIONSHIP

Dry density/moisture content relationship analysis has been conducted on soils utilising compaction tests utilising a 4.5 kg rammer. The results of the tests has been summarised in Table 5.6. The full test results can be found in APPENDIX VIII.

Table 5.6 Summary of Dry Density and Moisture Content

LOCATION	LABORATORY DESCRIPTION	TOP DEPTH (m)	METHOD OF COMPACTION	INITIAL MOISTURE CONTENT (%)	OPTIMUM MOISTURE CONTENT (%)	MATERIAL RETAINED ON 37.5mm SIEVE (%)	MAX DRY DENSITY (mg/m^3)	MATERIAL RETAINED ON 20.0mm TEST SIEVE (%)
TP105	Made Ground	0.20	4.5kg	26.1	18	4	1.59	19
TP106	Made Ground	0.60	4.5kg	28.2	17	10	1.70	23

The compaction tests have indicated that the Made Ground is slightly wet of the optimum. It should be noted that if this material is excavated for use in a cut/fill operation, careful consideration should be taken in the stabilisation of this material.

Engineering of this type of material will need to be completed during dry weather periods only.

5.6. SOIL INFILTRATION

In-situ BRE 365 Soakaway tests were undertaken over a 24-hour period within trial pits complete as TP/SA101, TP/SA106, and TP/SA109.

The results are presented in Table 5.7, and the test certificates are included within APPENDIX XI.

Table 5.7 Soil Infiltration Results

LOCATION	DEPTH (m)	MATERIAL	TEST NO.	SOIL INFILTRATION RATE (m/s)
TP/SA101	1.70 – 2.65	Firm medium strength yellowish brown slightly sandy slightly gravelly CLAY	1	FAIL
TP/SA106	0.45 – 1.06	Stiff brown mottled light grey slightly gravelly CLAY	1	FAIL
TP/SA109	0.40 – 1.10	Soft greyish brown slightly sandy CLAY	1	FAIL

Soil infiltration was taken over the wetted area from between 75% and 25% of the effective depth. In all locations the BRE 365 soakaway tests failed to achieve a 25% storage depth, with the head of water remaining constant over monitoring period with minor fluctuations.

The data presented above, derived from in-situ testing using the BRE 365 test method, forms only part of the overall ground model assessment and the design process for the infiltration drainage system. Due to the presence of low permeability clay soils extending to depths greater than 7.0m, it is considered unsuitable as a stratum for infiltration drainage systems due to its distinct geological characteristics and soil mechanics properties.

Appendix C: Site Layout

N

HYDE ROAD

Hideout Youth Zone

61.9m

1

QUEENS AVENUE

62.5m

Block A
5 storeys - 43 apartments

Block B
6 storeys - 40 apartments

Block C
5 storeys - 43 apartments

BIKE STORE

BIKE STORE

Sliding Gate

Crystal Suite Parking

Crystal Suite

Fountain

KIRKMANSHULME LANE

316

320

0 2.5 5 10 15 25 m

SCALE BAR 1:500

Z:___Site Appraisals\000 Buzz Bingo, Manchester\01. Architects\02. Drawings\Design Working Drawings\AutoCad\Buzz Bingo - Site Layout (Rev R).dwg

Accommodation Schedule
Buzz Bingo

Apartment Blocks

Block A		Bed	Type	No.	Sqft	Total Sqft	Split
1 Bed Type A	1b2p	1	Apartment	14	538	**7532**	11.11%
1 Bed Type B	1b2p	1	Apartment	4	592	**2368**	3.17%
2 Bed Type A	2b3p	2	Apartment	5	657	**3285**	3.97%
2 Bed Type B	2b3p	2	Apartment	20	657	**13140**	15.87%
2 Bed Type m4(3)	2b4p	2	Apartment	0	936	**0**	0.00%
				43		**26325**	

Block B		Bed	Type	No.	Sqft	Total Sqft	
1 Bed Type A	1b2p	1	Apartment	17	538	**9146**	13.49%
1 Bed Type B	1b2p	1	Apartment	5	592	**2960**	3.97%
2 Bed Type A	2b3p	2	Apartment	6	657	**3942**	4.76%
2 Bed Type B	2b3p	2	Apartment	12	657	**7884**	9.52%
2 Bed Type m4(3)	2b4p	2	Apartment	0	936	**0**	0.00%
				40		**23932**	

Block C		Bed	Type	No.	Sqft	Total Sqft	
1 Bed Type A	1b2p	1	Apartment	14	538	**7532**	11.11%
1 Bed Type B	1b2p	1	Apartment	4	592	**2368**	3.17%
2 Bed Type A	2b3p	2	Apartment	5	657	**3285**	3.97%
2 Bed Type B	2b3p	2	Apartment	20	657	**13140**	15.87%
2 Bed Type m4(3)	2b4p	2	Apartment	0	936	**0**	0.00%
				43		**26325**	

Total Apartments	**126**		**76582**	
Apartment Split	**1 Bed**	**58**	**46.03%**	
	2 Bed	**68**	**53.97%**	

Houses

		Bed	Type	No.	Sqft	Total Sqft	
Hickory (end)	2b3p	2	Semi/end	2	771	**1542**	7.69%
Hickory (mid)	2b3p	2	Mid	0	768	**0**	0.00%
Olive	2b3p	2	Semi/end	0	771	**0**	0.00%
Cedar (end)	3b4p	3	Semi/end	6	940	**5640**	23.08%
Cedar (mid)	3b4p	3	Mid	3	938	**2814**	11.54%
Acacia	3b4p	3	Semi/end	2	940	**1880**	7.69%
Spruce (end)	3b6p	3	Semi/end	6	1187	**7122**	23.08%
Spruce (mid)	3b6p	3	Mid	5	1183	**5915**	19.23%
Foxglove	3b6p	3	Semi/end	2	1187	**2374**	7.69%
				26		**27287**	

House Bedroom Split	**2 Bed**	**2**	**7.69%**
	3 Bed	**24**	**92.31%**
Total Dwellings		**152**	**103869**
Site Totals	**1 Bed**	**58**	**38.16%**
	2 Bed	**70**	**46.05%**
	3 Bed	**24**	**15.79%**

Revision	Date	Amendment	Initials
R	03.02.26	- Car parking re-planned - Housetype blocks updated to extended cavity versions	TW
Q	09.01.26	Rear access to plots 2-4 amended. Benches added to pocket park	TJ
P	18.12.25	Access road realignment and new attenuation pond	TJ
O	16.12.25	Layout amends to accommodate a surface water pumping station and removal of retaining wall	TJ
N	24.11.25	MCC Land area and accommodation schedule added	TW
M	18.11.25	Apartment Blocks updated	TW
L	13.11.25	Integration with MCC land	TJ
K	04.11.25	Updated mix per client's comments	TJ
J	03.10.25	Updated mix per client's comments	TJ
I	16.09.25	Updated Acc. Schedule and Sub Station location	TJ
H	12.09.25	Change apt. blocks to 6 storey	TJ
G	12.09.25	Apartment block change and addition of more houses	TJ
F	22.08.24	Exclusion of MCC land	TJ
E	16.05.25	Accommodation schedule updated	TW
D	08.05.25	Updated to M4(2) and latest apartments	TW
C	04.07.24	Re-draw	BP
B	15.04.24	affordables RE- allocated.	BP
A	09.04.24	affordables allocated. units increased to 168.	BP

Development
Belle Vue Bingo Hall

Location
Gorton

Marketing Name
-

Drawing Title
Site Layout

Job No.	Drawing No.
-	-
Revision	**Scale @ A2**
R	1:500
Drawn By	**Date**
TJ	09.01.26
Checked by	**Date Checked**
-	-

1st Floor, 103 Dalton Avenue, Birchwood Park, Warrington WA3 6YE
T: 01925 363108 W: www.kellenhomes.com

KELLEN HOMES

Appendix D: Drainage Strategy and Calculations



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PHASE: 0

MH No.	MANHOLE DIMENSION (mm)	MANHOLE TYPE	COVER TYPE	COVER LEVEL (m)	INVERT LEVEL (m)	DEPTH TO SOFFIT (m)	EASTING (m)	NORTHING (m)
S3	1350Ø	Type C	B125	62.514	61.054	1.234	387836.042	396224.436
S4	1200Ø	Type B	B125	63.192	60.928	2.039	387842.275	396244.574
S5	1350Ø	Type C	D400	62.657	61.131	1.301	387820.778	396230.789
S6	1200Ø	Type B	B125	62.945	60.829	1.891	387826.452	396249.649
S7	1200Ø	Type B	B125	62.827	60.775	1.827	387821.657	396257.240
S8	1350Ø	Type B	B125	62.525	60.379	1.696	387800.752	396263.359
S9	1350Ø	Type C	D400	59.319	60.336	-1.466	387804.514	396276.869
S10	---	HEADWALL	D400	61.300	60.328	0.522	387802.909	396277.341
S11	---	HEADWALL	D400	61.300	60.015	0.535	387797.990	396278.523
S12	---	HEADWALL	D400	61.200	60.000	0.450	387796.337	396274.651
S13	1200Ø	Type B	D400	62.375	59.972	1.653	387793.459	396266.574
S14	1200Ø	Unknown	D400	61.887	60.462	1.200	387805.236	396174.735
S15	1800Ø	Type C	D400	61.481	60.202	1.054	387779.541	396209.808
S16	1800Ø	Unknown	D400	61.675	59.392	1.082	387779.439	396222.730
S17	2400Ø	Type B	D400	62.133	58.165	2.768	387788.159	396251.036
S18	1350Ø	Type C	D400	62.389	60.029	2.060	387763.488	396264.392
S19	2700Ø	Type B	D400	62.252	58.072	2.981	387757.063	396260.397
S20	1350Ø	Type B	B125	62.316	60.352	1.664	387763.716	396295.058
S21	1200Ø	Type B	B125	62.173	60.247	1.626	387757.275	396272.600
S22	1200Ø	Type B	B125	62.499	59.589	2.610	387726.895	396282.233
S23	1800Ø	Unknown	D400	62.395	60.269	1.376	387713.118	396228.641
S24	1800Ø	Type B	D400	62.492	60.125	1.617	387712.445	396240.007
S25	2100Ø	Type A	D400	62.248	57.967	3.081	387721.961	396271.212
S26	2400Ø	Type A	D400	62.160	57.924	3.035	387707.607	396275.695
S27	2100Ø	Type B	D400	61.954	57.904	2.850	387709.898	396282.527
F1	1350Ø	Type C	D400	61.745	61.677	-0.082	387729.704	396312.321
F2	1350Ø	Type C	D400	61.946	61.305	0.491	387761.273	396302.499
F3	1200Ø	Unknown		62.103	61.020	0.933	387754.505	396280.790
F4	1350Ø	Type B	D400	62.361	60.350	1.861	387730.785	396287.956
F5	1350Ø	Type B	D400	62.507	60.665	1.693	387716.509	396243.738
F6	1200Ø	Type B	D400	62.258	60.078	2.030	387724.133	396267.504
F7	1350Ø	Type C	D400	62.791	62.197	0.445	387841.598	396256.819
F8	1350Ø	Type C	D400	62.579	61.712	0.717	387804.098	396268.631
F9	1350Ø	Type C	D400	62.458	62.394	-0.086	387842.685	396278.072
F10	1350Ø	Type C	D400	62.260	61.458	0.652	387810.120	396288.063
F11	1350Ø	Type C	D400	62.052	61.678	0.223	387770.248	396299.885
F12	1350Ø	Type C	D400	61.851	61.203	0.498	387795.517	396292.020
F13	1350Ø	Type C	D400	62.179	60.705	1.324	387789.880	396273.396
F14	1350Ø	Type B	D400	62.371	60.627	1.594	387790.097	396267.160
F15	1200Ø	Type B	D400	62.072	59.656	2.266	387784.520	396248.332
F16	1200Ø	Type B	D400	61.656	59.476	2.030	387776.685	396222.480
F17	1200Ø	Type B	D400	61.440	59.378	1.912	387777.533	396207.851
F18	1200Ø	Type B	D400	61.954	59.016	2.788	387809.180	396163.720
F19	1200Ø	Type A	D400	61.835	57.980	3.705	387798.971	396146.137

LEGEND

- S1 CL: 000.000 IL: 000.000 — Proposed Surface Water Drainage
- F1 CL: 000.000 IL: 000.000 — Proposed Foul Water Drainage
- Proposed Headwall
- Concrete Protection
- Proposed Surface Water Rising Main
- Proposed Flow Control Chamber
- Road Gully
- Proposed SW Dragout
- Proposed FW Dragout
- Underbuild
- Rainwater Garden

Revision	Date	Amendment	Initials
B	09.01.26	Updated site plan	RW
A	06.01.26	FFL's updated, rain gardens (with headwalls) added. Underbuild added to plots	RW

Development
Buzz Bingo

Location
Manchester

Marketing Name
-

Drawing Title
Concept Engineering Design

Job No.	Drawing No.
-	-
Revision	**Scale @ A1**
B	1:500
Drawn By	**Date**
RW	Dec 2025
Checked by	**Date Checked**
-	-

1st Floor, 103 Dalton Avenue, Birchwood Park, Warrington WA3 6YE
T: 01925 363108 W: www.kellenhomes.com
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SCALE BAR 1:500

Z:___Site Appraisals\000 Buzz Bingo, Manchester\02. Engineers\5. Engineering\6. Internal Drawings\Buzz Bingo 17.12.25.dwg

Appendix E: Simple Pollution Index

SIMPLE INDEX APPROACH: TOOL

HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Hazard Level*	*Pollution Hazard Indices* Total Suspended	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Individual driveway	Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**

DESIGN CONDITIONS: 1 | 2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component
If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Swale	0.5	0.6	0.6
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Bioretention system (where the system is not designed as an infiltration component)	0.8	0.8	0.8
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	Detention basin	0.5	0.5	0.6
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:				
	Aggregated Surface Water Pollution Mitigation Index	**>0.95**	**>0.95**	**>0.95**

DESIGN CONDITIONS: 1 | 2 | 3

SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B

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Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: → None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS: 1 | 2 | 3 | 4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**>0.95**	**>0.95**	**>0.95**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but interception requires separate evaluation.

Sufficiency of Pollution Mitigation Indices Total Suspended	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS: 1

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England