

Preliminary Flood Risk Assessment & Drainage Strategy

Title	Chesterfield Road, Markham Vale
Client	Wilson Bowden Developments Ltd
Location	Land south of Chesterfield Road, Markham Vale
Project number	25-0382
BIM reference	CRMV-BSP-XX-XX-T-W-0001-P01_Flood_Risk_Assessment
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Authorisation Sheet & Revisions Record

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Executive Summary

Introduction	BSP Consulting has been commissioned by Wilson Bowden Developments Ltd to undertake a Flood Risk Assessment and Drainage Strategy for a proposed logistics and storage development on land south of Chesterfield Road, Markham Vale. This Flood Risk Assessment has been prepared in accordance with the Technical Guidance to the National Planning Policy Framework.
Existing Site Conditions	The site is currently used as arable farm land that is currently accessed from Chesterfield Road in the far north-west site corner. LiDAR DTM indicates that site levels generally fall from the north-west site corner down to the north-east site corner and eastern boundary and vary between 98m and 69m AOD.
Development Description and Planning Context	The development proposals are for a logistics and storage (B8 use class) development with access from the existing roundabout junction on Chesterfield Road to the north, as well as soft landscaping and all other associated infrastructure. In accordance with the NPPF, the project falls under the less vulnerable category in terms of flood risk.
Definition of Flood Hazard	River Doe Lea is an EA Main River that flows south to north along the western side of Bolsover and is located approximately 510m to the north-east of the site at its closest point. Given its relative distance to the development site, River Doe Lea does not present a direct risk of fluvial flooding to the site.
Probability (Rivers/fluvial)	The EA Risk of Flooding from Rivers and Sea mapping indicates that the proposed development site has less than a 1 in 1,000 annual probability of flooding from rivers or the sea. This map shows the indicative extent of the natural floodplain if there were no flood defences or certain other manmade structures.
Climate Change	The implications of climate change of up to 25% have been considered in this assessment and mitigation measures have been determined accordingly.
Development Proposals	The technical guidance to the NPPF states that developments of a less vulnerable category such as the proposed logistic and storage uses are appropriate within Flood Zone 1, without being subject to the application of the Sequential Test.
Flood Risk Management Measures	Due to potential flood risk from surface water, flood risk management measures will be required as outlined in the flood risk management section.
Off-Site Impacts	Surface water runoff will be discharged from the proposed development at a reduced rate via the provision of on-site attenuation. Therefore, the development will bring about

	improvements to the surface water regime in the area and is not anticipated to increase the flood risk adjacent to or downstream of the site for the lifetime of the development.
Residual Risks	The investigations carried out as part of this flood risk assessment and flood risk management measures proposed have demonstrated that the development will be safe, without increasing flood risk elsewhere.
Recommendations	- It is recommended that a sequential approach is adopted in the development design with the proposed units preferentially located away from the areas at highest surface water flooding risk. - In accordance with best practice, external ground levels should comprise falls away from buildings and towards drainage features. The design of surface water drainage features should be such that any surface water flow paths within the site are maintained and/or accommodated while ensuring that buildings remain free from flooding without increasing risk elsewhere. - The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (25%) storm event on site without flooding any buildings. - Based on an initial desktop review, it has been assumed that infiltration drainage techniques will not be viable on-site. It is recommended that on-site infiltration testing is undertaken to confirm the existing ground conditions and infiltration rates of the underlying soils. - The preferred surface water outfall is a restricted discharge to Unnamed Watercourse 'A' in the north-east site corner. The equivalent greenfield (QBar) runoff rate for the developable area of the site (17.75ha) was calculated at 64.7l/s, and it is proposed to restrict runoff from the development to this rate for all storms up to and including the 1 in 100 year (1% AEP) plus 25% climate change storm event. - To achieve the proposed discharge rate, an initial estimated attenuation volume of 10,400m³ will be required. This will be provided by a series of detention basins across the site with the proposed storage volume and discharge rate proportioned accordingly. - To supplement the storage volume provided by the detention basin, multiple SuDS features have been proposed to provide initial source control of runoff, additional

stages of surface water treatment, and biodiversity and amenity benefits. The final design of these features will be confirmed as the drainage design progresses.

- Foul flows will look to be discharged off-site via a pumped connection into the adopted combined sewer within Chesterfield Road to the north. It is recommended that further discussions are undertaken with YW to reach an agreement on a proposed connection point, a pumped discharge rate and to confirm the available capacity within the downstream foul network. The proposed connection will be subject to agreement with YW as part of a S106 agreement.

1.0 Introduction

1.1 Terms of Reference

- 1.1.1 BSP Consulting has been commissioned by Wilson Bowden Developments Ltd to prepare a preliminary Flood Risk Assessment and Drainage Strategy for a proposed logistics and storage development (B8 use class) on land south of Chesterfield Road, Markham Vale.
- 1.1.2 This Flood Risk Assessment has been prepared in accordance with the Department for Communities and Local Government (DCLG) Planning Practice Guidance website section on 'Flood Risk and Coastal Change' and the Site-Specific Flood Risk Assessment Checklist.
- 1.1.3 This report has been produced on behalf of the Client, Wilson Bowden Developments Ltd, and no responsibility is accepted to any third party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of BSP Consulting. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

1.2 Legislation & Guidance

National Planning Policy Framework

- 1.2.1 The National Planning Policy Framework (NPPF) was published on 27 March 2012, with the latest update published in December 2024.
- 1.2.2 Planning Practice Guidance to the NPPF regarding Flood Risk and Coastal Change has been published and this site-specific Flood Risk Assessment is written in compliance with this guidance.
- 1.2.3 The NPPF, and supporting technical guidance, can be downloaded free of charge from the internet at the following link:

<http://www.communities.gov.uk/publications/planningandbuilding/nppf>

National Standards for Sustainable Drainage Systems

- 1.2.4 The National Standards for SuDS were published on 19 June 2025 and are intended to provide guidance on the design of surface water drainage systems for new infrastructure and development, with accompanying requirements providing detail on how to interpret, deliver and evaluate each standard.

Flood & Water Management Act

- 1.2.5 The Flood & Water Management Act (F&WMA) was passed in 2010 and aims to reduce the flood risk associated with extreme weather, compounded by climate change. This act established the EA as responsible for flood risk related to Main Rivers. In this instance, Derbyshire County Council (DCC), as

Lead Local Flood Authority (LLFA), are responsible for local sources of flood risk (that being from ordinary watercourses, surface water run-off and groundwater). As Local Planning Authority, North East Derbyshire District Council (NEDDC) has due regard for drainage and flood risk in accordance with local and national guidance and responses from statutory consultees.

2.0 Background Information

2.1 Site Details

2.1.1 Figure 2.1 below indicates the location of the site. A range of sources have been used to assess the local topography, local watercourses and current site use.

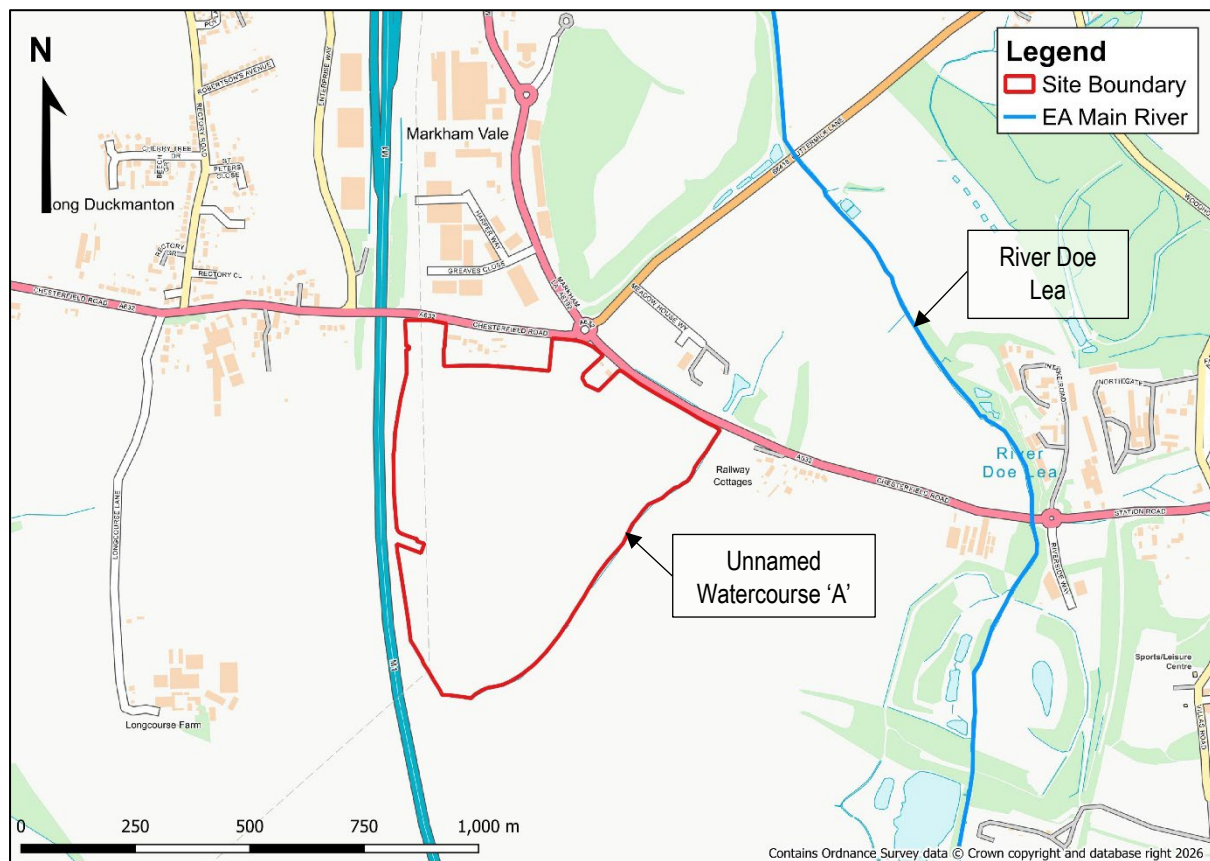


*Figure 2.1 Chesterfield Road, Markham Vale
 – Site Location Plan*

- 2.1.2 The proposed development site is located to the south of Chesterfield Road, Markham Vale, centred on OSGR 444917E, 370825N, and occupies an area of approximately 35.5ha.
- 2.1.3 The site is bound by Chesterfield Road (A632), existing residential dwellings and an electrical sub-station to the north, the M1 and an associated embankment to the west, and arable land to south and east.
- 2.1.4 The site is currently used as arable farm land that is currently accessed from Chesterfield Road in the far north-west site corner. A topographical survey of the site has not been completed at the time of preparing

this report. As such, 1m LiDAR DTM data which is available from the Environment Agency has been assessed. The DTM indicates that site levels generally fall from the north-west site corner down to the north-east site corner and eastern site boundary, and vary between 98m and 69m AOD.

- 2.1.5 Table 2.1 below outlines all the significant watercourses within the vicinity of the site, with the respective locations of all the listed watercourses also indicated on Figure 2.1 above.

Table 2.1: Overall Catchment Context and Local Watercourse Classifications

Classification	Name	Description
Main Rivers	River Doe Lea	An EA Main River that flows south to north along the western side of Bolsover, that is located approximately 510m to the north-east of the site at its closest point.
Ordinary Watercourses	Unnamed Watercourse 'A'	A small ordinary watercourse that runs along the eastern boundary of the site, before it is culverted beneath Chesterfield Road and continues to the north-east where it joins the Doe Lea near Buttermilk Lane.
Manmade Watercourses	N/A	There are no manmade watercourses within the vicinity of the site.

2.2 Approach to the Assessment

- 2.2.1 This study has been supplemented by information from the Environment Agency (EA), Yorkshire Water (YW) and additional information contained on the British Geological Society (BGS), the DEFRA MagicMap and Cranfield Soil and Agrifood Institute Soilscales websites, as well as from previous site investigations.
- 2.2.2 This assessment seeks to draw together the relevant data information from these sources and to collate this with the findings of our investigations and discussions to assess the flood risk and drainage strategy for this site.

3.0 Flood Risk Assessment

3.1 Development Description and Planning Context

- 3.1.1 The development proposals are for a logistics and storage (B8 use class) development with access from the existing roundabout junction on Chesterfield Road to the north, as well as soft landscaping and all other associated infrastructure. An illustrative plan is included in **Appendix A**.
- 3.1.2 The local area benefits from a Level 1 Strategic Flood Risk Assessment (SFRA). The latest assessment is the joint SFRA published in 2012 which covers both Derbyshire and Derby city areas. The accompanying mapping notes the site to fall within Flood Zone 1.
- 3.1.3 In accordance with the NPPF, the proposed logistics/storage use falls under the **less vulnerable** category in terms of flood risk.

3.2 Sequential and Exception Tests

- 3.2.1 The Sequential Test is designed to steer development towards areas of lower flood risk and is required to be completed for development within Flood Zone 2 and 3. As the site is located within Flood Zone 1 the Sequential Test is not required.
- 3.2.2 The Exception Test is designed to require evidence of how flood risk will be managed on the proposed development site, ensuring that it is safe for its lifetime and will not increase flood risk elsewhere. Table 3.1 below indicates whether developments, based on their vulnerability classification, are permitted within each Flood Zone and whether the Exception Test is required. The NPPF states that developments of the less vulnerable category are suitable within Flood Zone 1 without the requirement of an Exception Test.

Table 3.1: Flood Risk Vulnerability and Flood Zone Compatibility (Source: NPPF)

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	X	Exception Test Required	✓
	Zone 3b Functional Floodplain	Exception Test Required	✓	X	X	X

3.3 Definition of Flood Hazard

The potential sources of flooding in the vicinity of the site are as detailed below:

Historic Flooding

- 3.3.1 The Environment Agency's Historic Flood Map indicates that the development site has not flooded previously, with the closest areas being associated with the River Doe Lea to the east, which are at a lower elevation. The dataset shows the maximum extent of all individual recorded flood outlines that have occurred as a result of flooding from rivers, the sea and groundwater sources since records began 1946. The dataset does not account for flooding from other sources, such as sewer flooding or surface water flooding, nor is it exhaustive as it may not include all previous flooding incidents and does not provide information regarding event dates. However, the dataset does provide an insight into the potential for flooding from nearby sources.

Fluvial Flood Risk

- 3.3.2 The EA Risk of Flooding from Rivers and Sea mapping indicates that the proposed development site has less than a 1 in 1,000 annual probability of flooding from Rivers and Sea. This map shows the indicative extent of the natural floodplain, if there were no flood defences or certain other manmade structures, such as surface water sewers, and channel improvements.
- 3.3.3 The only source of fluvial flooding locally is River Doe Lea, an EA Main River which is located approximately 510m to the north-east of the site at its closest point. Given the size of the watercourse and its distance to the site, River Doe Lea does not present a risk of flooding to the site.

Tidal Flood Risk

- 3.3.4 River Doe Lea is a non-tidal EA Main River. Therefore, the site is not at risk of flooding from tidal sources.

Surface Water Flood Risk

- 3.3.5 The site generally slopes from the north-west site corner down to the north-east and along the eastern boundary, along the route of Unnamed Watercourse 'A'. Therefore, it is anticipated that any overland flow routes would preferentially flow towards the north-east site corner and Unnamed Watercourse 'A', which are the lowest part of the site.
- 3.3.6 Figure 3.1 below shows the Risk of Flooding from Surface Water mapping and indicates that the site predominantly has a very low risk (0.1% AEP) of surface water flooding, with the exception of the north-east corner and along the eastern and south-east boundaries which are shown to have a low (0.1% AEP) to high (3.33% AEP) risk of surface water flooding. The area of ponding in the north-east site corner is also upstream of where Unnamed Watercourse 'A' is culverted beneath Chesterfield Road, which would

act as a restriction to the downstream flow within the watercourse following heavy rainfall events. There is also a surface water flow path shown to cross the site from west to east following the natural gradient of the site towards Unnamed Watercourse 'A', however this would only occur in the low risk (0.1% AEP) scenario.

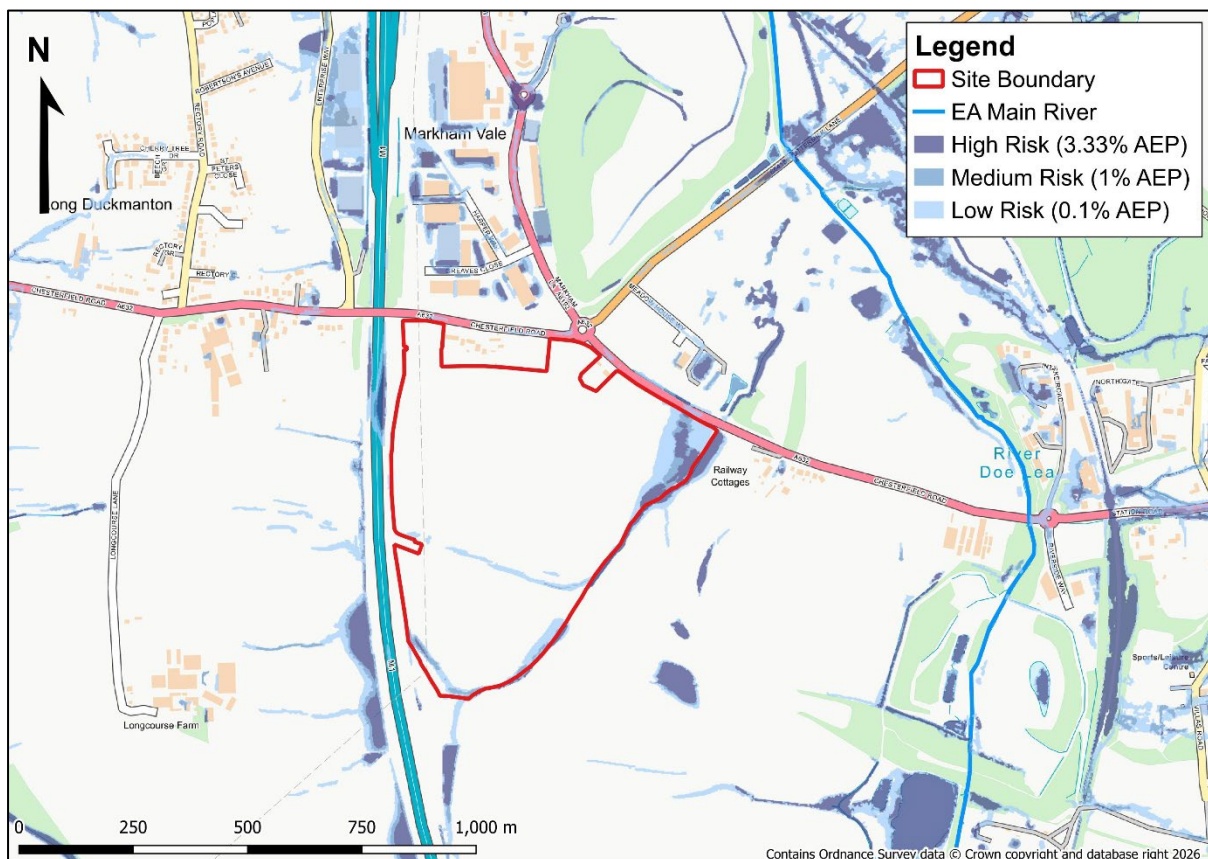


Figure 3.1 Chesterfield Road, Markham Vale
 – Risk of Flooding from Surface Water (Source: EA)

- 3.3.7 The overall risk of surface water flooding to the site is considered to be low. However, it is advised that a sequential approach is adopted within the development design to ensure that the proposed units are located away from the areas of highest surface water flood risk, and that these are left as soft landscaping.
- 3.3.8 Furthermore, it is anticipated that any surface water flow plans that originate within the site would be captured and sufficiently drained by any future surface water drainage system to help reduce any off-site flooding issue.

Flood Risk from Ground Water

- 3.3.9 The British Geological Survey's Geology of Britain mapping indicates that the site is situated upon bedrock geology consisting of Pennine Middle Coal Measures Formation – Mudstone, Siltstone and

Sandstone. No superficial deposits have been recorded at this location. Pennine Middle Coal Measures Formation is generally classed as a moderately productive aquifer.

- 3.3.10 The Environment Agency Aquifer Designation Map identifies the site as being situated on bedrock classed as a Secondary A aquifer: permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important base flow to local rivers. No superficial deposits have been recorded at this location.
- 3.3.11 The 2012 SFRA includes mapping of areas that are susceptible to groundwater flooding on a 1km² grid scale. This mapping indicates that the site location has a low (<25%) susceptibility to groundwater flooding. A previous Phase 1 Ground Investigation report was undertaken by BWB Consulting in 2019, which noted that there is 'limited potential' of groundwater flooding.
- 3.3.12 Based on the information from the above sources, the site is considered to be at low risk of flooding from groundwater sources. Furthermore, as the site is situated in close proximity to the local high point, and the underlying local geology consists of formations with poor permeability, the risk of groundwater flooding is expected to be minimal on-site.

Flood Risk from Sewers and Infrastructure

- 3.3.13 The local sewers are operated and maintained by Yorkshire Water (YW). The available sewer records indicate that there is an existing 150mm combined sewer that runs within the front gardens of the residential dwellings on Chesterfield Road, before turning north-west between the M1 and the industrial units off Greaves Close. There are no adopted sewer assets shown within the site itself. A copy of the sewer record plan is included in **Appendix B**. YW have not raised any concerns regarding existing sewer flooding issues or capacity problems.
- 3.3.14 The EA's Flood Risk from Reservoir mapping indicates that the site lies outside of the predicted maximum flood extents in the unlikely event that all upstream large, raised reservoirs and dams simultaneously fail and release the water they hold; both on a 'dry day', if reservoir flooding were to occur when river levels are at normal levels, and on a 'wet day', should reservoir breach occur if a river is already experiencing an extreme natural flood. As such, the site is not considered to be at risk of flooding from reservoirs.
- 3.3.15 The site is not in close proximity to any Manmade Watercourses such as canals, reservoirs or wet process industry works.
- 3.3.16 The sewers and infrastructure flood risk source can therefore be discounted as a significant source of flood risk to the site.

3.4 **Climate Change**

- 3.4.1 Climate change is recognised as a factor for consideration in terms of its effects on flood risk. In line with the latest update to the planning practice guidance in the NPPF on Flood Risk and Coastal Change, non-residential developments are anticipated to have a minimum lifetime of 75 years, and to assess the effects of climate change the 2070s epoch has been used for peak rainfall intensity.
- 3.4.2 The implications of climate change should be considered in relation to surface water drainage. Guidance from the EA advises that the central allowances for both the 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) events should be assessed, with the development designed to ensure that there is no increase in flood risk elsewhere and the development will be safe from surface water flooding during the 1 in 100-year event when the central allowance for climate change is applied. In this instance, peak rainfall intensity for commercial developments within the Don and Rother Management Catchment are estimated to increase by 25% for both the 3.3% AEP and 1% AEP events. Therefore, it is recommended that the central allowance of 25% is applied to design rainfall intensity to allow for the potential implications of climate change.

3.5 **Detailed Development Proposals**

- 3.5.1 The proposed development and vulnerability classification are discussed in Section 3.1 above.
- 3.5.2 The technical guidance to the NPPF states that developments of a less vulnerable category such as the proposed logistics/storage use are appropriate within Flood Zone 1, without being subject to the application of the Sequential Test.

4.0 Flood Risk Management & Drainage Strategy

4.1 Surface Water Flood Risk Mitigation

- 4.1.1 The development proposals are for a logistics and storage (B8 use class) development with access from the existing roundabout junction on Chesterfield Road to the north, as well as soft landscaping and all other associated infrastructure.
- 4.1.2 It is recommended that a sequential approach is adopted within the development design and that the proposed units are preferentially located away from the areas that have the highest risk of surface water flooding, as shown in Figure 3.1 above.
- 4.1.3 Although the proposed development will see the levelling of ground during construction, in accordance with best practice, external ground levels should comprise falls away from buildings and towards the proposed drainage features. The design of surface water drainage features should be such that any surface water flow paths within the site are maintained and/or accommodated while ensuring that buildings remain free from flooding without increasing risk elsewhere.

4.2 Surface Water Drainage

Sustainable Drainage Systems

- 4.2.1 Standard 1 of the National Standards for Sustainable Drainage Systems (2025) requires that surface water run-off shall discharge to one of the following, listed in order of priority:
- a) collection for non-potable use.
 - b) infiltration to ground.
 - c) discharge to an above ground surface water body.
 - d) discharge to a surface water sewer, or another piped surface water drainage system.
 - e) discharge to a combined sewer.
- 4.2.2 It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak flow rates or positively impact on the existing flood profile.

Rainwater Re-use

- 4.2.3 There is limited scope to incorporate a formal rainwater harvesting system to serve the proposed development. However, there is scope to potentially include some small SuDS features, such as raised planters, on the rainwater down pipes serving the unit roof areas. These will provide opportunities to

provide additional source control measures within the drainage design, as well as to encourage some water re-use for the soft landscaping areas on-site.

Infiltration Based Systems

- 4.2.4 The British Geological Survey's Geology of Britain mapping indicates that the site is situated upon bedrock geology consisting of Pennine Middle Coal Measures Formation – Mudstone, Siltstone and Sandstone. No superficial deposits have been recorded at this location.
- 4.2.5 The Cranfield Soil and Agrifood Institute's Soilscape mapping indicates the majority of the site to be situated on soils categorised as Soilscape 17: slowly permeable, seasonally wet, acid loamy and clayey soils.
- 4.2.6 Based on the above information, it is unlikely that permeable ground conditions are present at the site. As a result, the discharge of surface water runoff by infiltration-based systems has been ruled out as the preferred method for surface water disposal from the proposed development site. However, it is recommended that on-site soakaway testing is undertaken to confirm the existing ground conditions and infiltration rates of the underlying soils.

Open Watercourses

- 4.2.7 Unnamed Watercourse 'A' is suitably located to receive a direct surface water discharge from the site and as such, is the proposed surface water outfall from the site.

Sewers

- 4.2.8 As it is proposed to discharge surface water runoff to Unnamed Watercourse 'A', it will not be necessary to discharge surface water to a sewer.

SuDS Option Feasibility

- 4.2.9 A range of SuDS options have been considered for use within the context of the proposed development site, in-line with CIRIA guidance. Table 4.1 below provides a summary of the options considered for this site.

Table 4.1: Sustainable Urban Drainage Systems Options

SuDS Category	SuDS Technique	Viability	Explanation
Infiltration	Infiltration Trenches	X	Due to the indicated ground conditions, formal infiltration drainage features such as an infiltration basin or soakaways do not appear to be viable. This will be subject to further on-site infiltration testing in due course.
	Infiltration Basins	X	
	Soakaways	X	
	Bioretention/Filter Strips	X	
Filtration	Bioretention/Rain Gardens	✓	Filtration devices could be incorporated within soft landscaped areas across the site, adjacent to internal access roads and walkways; however, these would likely need to be positively drained due to the indicated ground conditions beneath the site. These will essentially act to absorb rainwater as opposed to resulting in runoff during low-flow storm events. There is also potential within the soft landscaping areas to include raingarden features, which will provide some additional attenuation for surface water runoff from impermeable surfaces, as well as surface water treatment, biodiversity and amenity benefits.
	Filter Strips	✓	
Source Control	Green Roofs	✓	Where possible, any flat roofs across the development could include a green roof. However, the presence of solar panels, pitched roofing or limited rooftop access for maintenance will hinder their inclusion.
	Rainwater Harvesting	✓	Due to the nature of the proposed development, the scope for a formal rainwater harvesting is limited. There is some potential to include small attenuation features to collect runoff for re-use within the soft landscaping areas on-site to supplement other SuDS features.
	Pervious Pavements	✓	Pervious paving may be utilised for the external ground level car parking spaces and pedestrian footways where appropriate. These areas will serve to increase the rainfall-runoff response time and provide an initial stage of surface water treatment.
Conveyance	Swales	✓	Where possible, surface level conveyance features such as roadside swales and filter drains could be incorporated within the drainage design. These
	Filter Drains	✓	

	Channels/Rills	✓	features could be used to help convey runoff through the development, as well as providing surface water treatment, biodiversity and amenity benefits.
Retention/ Detention	Detention Basin	✓	It is proposed for surface water runoff from the development to be attenuated by a series of detention basins, prior to a restricted discharge into Unnamed Watercourse 'A'.
	Retention Pond	✗	
	Subsurface Storage	✗	
	Wetlands	✗	

Runoff Assessment

- 4.2.10 The proposed development site has a total area of 35.5ha, which is comprised entirely of greenfield land. However, given that a large proportion of the site is proposed to be soft landscaping to accommodate existing utilities easements, as well as the indicative locations of the proposed detention basin features, it has been assumed that only 50% of the total site area, approximately 17.75ha, will be developed. As such, the ICP SUDS and IH124 (Flood Studies Report) methods have been used to calculate the surface water runoff rate ($QBAR_{RURAL}$) from the developable site area, which is detailed below:

$$QBAR_{RURAL} = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17} \quad \text{Where} \quad AREA = \text{Area (ha)}$$

SAAR = Standard Average Annual Rainfall (mm, 1941-1970)

SPR = Standard Percentage Runoff Coefficient

- 4.2.11 With a developable area of 17.75ha and using Flood Studies Report values for SAAR (742mm) and SPR (0.400), this results in a $QBAR_{RURAL}$ rate of **64.7l/s** and discharge rates for the following return periods:

Rainfall Event	Runoff Rate (l/s)
1 in 1-year	53.7
1 in 30-year	126.7
1 in 30-year + 25% Climate Change	158.4
1 in 100-year	166.2
1 in 100-year + 25% Climate Change	207.7

- 4.2.12 Greenfield runoff calculations are provided in **Appendix C**.

Return Period Design

- 4.2.13 The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (25%) storm event on site without flooding any buildings.

Discharge Rate

- 4.2.14 In accordance with DEFRA guidance, the peak surface water runoff rate for greenfield developments should be restricted to the pre-development discharge rate where reasonably practicable. As such it is proposed to limit the surface water discharge to an overall rate **64.7l/s**.

Drainage Proposals – Main Strategy

- 4.2.15 At this stage, it has been assumed that the proposed development will comprise an approximate impermeable surface area of 11.55ha, or equivalent to 65% of the total developable area. In order to maintain the calculated discharge rate of **64.7l/s** for all storms up to and including the 100-year return period with a 25% allowance for climate change, an estimated on-site attenuation volume of up to **10400m³** will be required. A copy of the initial storage estimation calculations is also provided in **Appendix C**.
- 4.2.16 The required surface water attenuation volume is proposed to be provisioned by a series of surface level detention basins located throughout the development site, before restricted discharge into Unnamed Watercourse 'A' at the north-east site corner. It is anticipated that the estimated attenuation volume and discharge rate will be apportioned between each of the detention basin features as the drainage design progresses.
- 4.2.17 It is recommended that parking spaces and private pedestrian footways are constructed from permeable paving where appropriate and small bioretention features, such as raingardens, are included within the soft landscaping where possible. Both above-mentioned source control methods will act to increase the rainfall-runoff response time by intercepting rainfall at source while also providing improvements to water quality. These measures will ensure that at least the first 5mm of most rainfall events does not result in runoff from the site to surface waters or piped drainage systems.
- 4.2.18 Furthermore, as noted within Table 4.1 above, there is also potential to include additional SuDS features such as swales and filter drains to help the conveyance of runoff through the development site, as well as providing further surface water treatment, biodiversity and amenity benefits. The inclusion of these features will be confirmed as part of the detailed drainage design.
- 4.2.19 The proposed surface water drainage strategy and associated surface water discharge rate will be subject to agreement with DCC as Lead Local Flood Authority.

4.3 Water Quality

Simple Index Approach

- 4.3.1 In order to determine whether the proposed SuDS features for the development will be sufficient at removing pollutants from surface water runoff, the CIRIA SuDS Manual (2015) Simple Index Approach has been applied. This approach provides pollution hazard levels and indices to relevant pollutants based on contributing hardstanding surfaces.
- 4.3.2 Table 4.2 below provides an extract of the land use types and pollutant indices from the CIRIA SuDS Manual which are relevant to the proposed development.

Table 4.2: Pollution hazard indices for different land use classifications (Source: CIRIA SuDS Manual 2015)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7

- 4.3.3 Based on the above, the worst-case indices for the development are 0.7 (Total Suspended Solids), 0.6 (Metals) and 0.7 (Hydrocarbons). Table 4.3 below indicates the mitigation indices for different types of SuDS components, with only those relevant to the development included. Under the Simple Index Approach, in order to suitably mitigate surface water pollutants, the total combined indices for any SuDS components will need to be greater than the worst-case indices above. Where multiple SuDS components are proposed, the primary component is given its full indices, while subsequent component indices are applied with a factor of 50%.

Table 4.3: Indicative SuDS mitigation indices for discharges to surface waters (Source: CIRIA SuDS Manual 2015)

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.25	0.25	0.3

4.3.5 Based on the above, the proposed SuDS components will be able to provide sufficient mitigation for the anticipated pollutants from the development. Where further SuDS components are included in the development proposals these will offer even greater mitigation against surface water runoff pollution.

4.4 Amenity and Biodiversity

4.4.1 The proposed drainage strategy and SuDS approach can be seen to positively contribute to placemaking and environmental enhancement, maximising amenity and biodiversity benefits throughout the anticipated lifetime of the development. The proposed use of the detention basin features, as well as other SuDS features such as swales and small rain garden (bioretention) features will positively contribute to landscape character improvements, health and wellbeing and the delivery of local biodiversity strategies.

4.5 Foul Water Drainage

4.5.1 The foul flows from the proposed development site should look to discharge off-site into the nearest adopted foul sewer network. YW sewer plans show a 150mm combined sewer that runs within the front gardens of the residential dwellings on Chesterfield Road, before turning north-west between the M1 and the industrial units off Greaves Close. Given the indicative levels from the LiDAR datasets, it will not be possible to drain the entire development site via gravity into the combined sewer, and so a pumped connection will be required

4.5.2 A Pre-Planning Sewerage Enquiry was submitted to YW to discuss the proposed foul connection strategy for the development site. In their response, it is stated that a connection from the site into the combined

sewer would be possible. It is recommended that further discussions are undertaken with YW to reach agreement on a proposed connection point, a pumped discharge rate and to confirm the available capacity within the downstream foul network.

- 4.5.3 The proposed foul sewer connection will be subject to agreement with YW via a Section 106 (Water Industry Act 1991) application.

4.6 **Maintenance**

- 4.6.1 The proposed surface water drainage system will require routine maintenance to ensure it remains fully operational and effective. All proposed surface water drainage features implemented into the proposed development, such as permeable paving, swales and the attenuation tank will require private maintenance under a site management company.

5.0 **Off-Site Impacts**

- 5.1.1 Surface water runoff will be discharged from the proposed development at reduced rates via the provision of on-site attenuation. Therefore, the development will bring about improvements to the surface water regime in the area and is not anticipated to increase the flood risk adjacent to or downstream of the site for the lifetime of the development.

6.0 **Overland Flow & Flood Routing Considerations**

- 6.1.1 The routing of potential surface water runoff, should the capacity of the proposed drainage system be exceeded, needs to be built into the layout of the site such that the residual risk of flooding from this element can be easily mitigated.
- 6.1.2 Careful attention will need to be paid to the proposed site levels to ensure that overland flow routes are maintained, and localised low spots are not created.

7.0 **Residual Risks**

- 7.1.1 The investigations carried out as part of this preliminary flood risk assessment and flood risk management measures proposed have demonstrated that the development will be safe, without increasing flood risk elsewhere.

8.0 Recommendations

The following recommendations are made to ensure flood risk at this site is minimised:

- It is recommended that a sequential approach is adopted in the development design with the proposed units preferentially located away from the areas at highest surface water flooding risk.
- In accordance with best practice, external ground levels should comprise falls away from buildings and towards drainage features. The design of surface water drainage features should be such that any surface water flow paths within the site are maintained and/or accommodated while ensuring that buildings remain free from flooding without increasing risk elsewhere.
- The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (25%) storm event on site without flooding any buildings.
- Based on an initial desktop review, it has been assumed that infiltration drainage techniques will not be viable on-site. It is recommended that on-site infiltration testing is undertaken to confirm the existing ground conditions and infiltration rates of the underlying soils.
- The preferred surface water outfall is a restricted discharge to Unnamed Watercourse 'A' in the north-east site corner. The equivalent greenfield (QBar) runoff rate for the developable area of the site (17.75ha) was calculated at **64.7l/s**, and it is proposed to restrict runoff from the development to this rate for all storms up to and including the 1 in 100 year (1% AEP) plus 25% climate change storm event.
- To achieve the proposed discharge rate, an initial estimated attenuation volume of **10,400m³** will be required. This will be provided by a series of detention basins across the site with the proposed storage volume and discharge rate proportioned accordingly.
- To supplement the storage volume provided by the detention basin, multiple SuDS features have been proposed to provide initial source control of runoff, additional stages of surface water treatment, and biodiversity and amenity benefits. The final design of these features will be confirmed as the drainage design progresses.
- Foul flows will look to be discharged off-site via a pumped connection into the adopted combined sewer within Chesterfield Road to the north. It is recommended that further discussions are undertaken with YW to reach an agreement on a proposed connection point, a pumped discharge rate and to confirm the available capacity within the downstream foul network. The proposed connection will be subject to agreement with YW as part of a S106 agreement.

Disclaimer

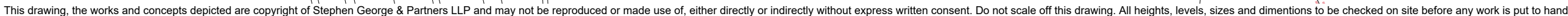
We would note that all comments made in this report are based on the sources stated in Section 1.1. This report and its recommendations are intended for the use of Wilson Bowden Developments Ltd for the above site only.

Project Number: 25-0382
Project Title: Chesterfield Road, Markham Vale
Location: Land south of Chesterfield Road, Markham Vale
BSP Document Ref: CRMV-BSP-XX-XX-T-W-0001-P01_Flood_Risk_Assessment



Appendix A

Proposed Site Plan



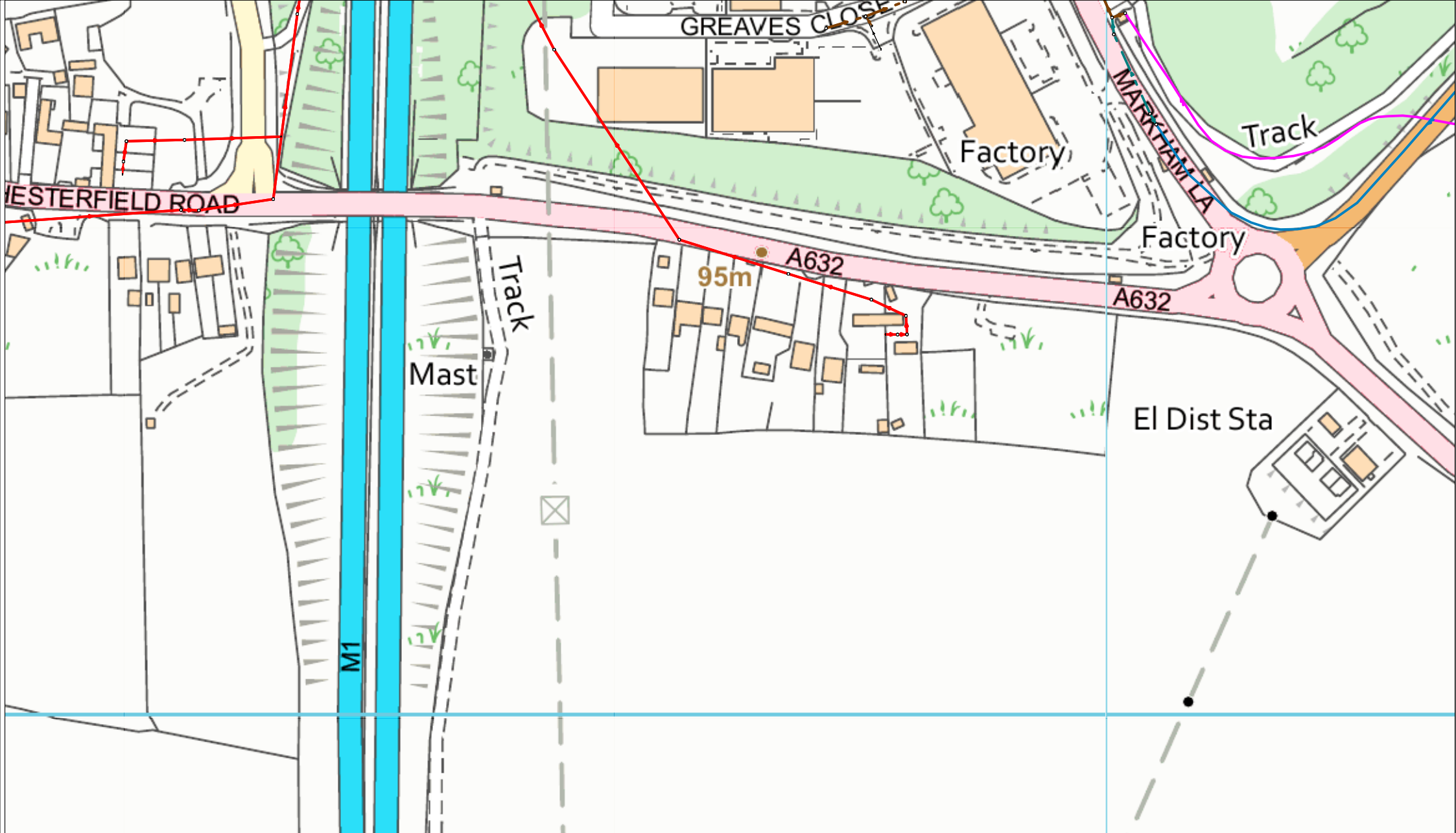
Project:	Dwg no:	Rev:
17-060	MP09-002	-

Project Number: 25-0382
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Appendix B

Yorkshire Water Correspondence & Sewer Records



	444472 : 370961	Map Name : SK4470NW	Title	Partial Key	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
		Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : R Thornton Contact Tel :	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS	
			(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2024. All rights reserved Ordnance Survey Licence number AC0000813445		
				Date Req : 01/04/2026, 14:53:57	Date Gen : 01/04/2026, 14:54:01
				Source : Sewer Network Enquiry	



YorkshireWater

**BSP Consulting
12 Oxford Street
Nottingham
NG1 5BG**

**Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY**

Tel: 0345 120 8482

**Your Ref:
Our Ref: B/00701**

**Email:
planningcosultation@yorkshirewater.co.uk**

1st April 2026

Dear Sir/Madam,

**Land south of Chesterfield Road, Markham Vale, Chesterfield S44 5HT - Pre-Planning
Sewerage Enquiry X266401**

Thank you for your recent enquiry. Our charge of £585.60 plus VAT has been paid through reference IPS-2026-058247. The following comments reflect our view, with regard to the public sewer network only, based on a 'desktop' study of the site and are valid for a maximum period of twelve months:

Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records. The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months: The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months: Development of the site should take place with separate systems for foul and surface water drainage on site. This permission is not an acceptance in respect to any planning conditions imposed under the Grant of Planning Permission.





YorkshireWater

Foul Water

Foul water may discharge the 150m public combined water sewer on Chesterfield Road. This permission is not an acceptance in respect to any planning conditions imposed under the Grant of Planning Permission.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2010. This establishes a preferred hierarchy for surface water disposal. As the proposed site is currently undeveloped no surface water is known to have previously discharged to the public sewer network. As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority/Internal Drainage Board with a view to establishing a suitable watercourse for discharge.

There is a land drain on the eastern edge of that site that would appear an ideal means of surface water disposal.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply online or obtain an application form from our website (www.yorkshirewater.com/developers/sewerage/sewerage-connections/) or by telephoning 0345 120 84 82. Under the provisions of section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer network) any items likely to cause damage to the public sewer network interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes fat, oil, nappies, bandages, syringes, medicines, sanitary towels and incontinence pants. Contravention of the provisions of section 111 is a criminal offence.

The developer should note that the site drainage details submitted have not been approved for the purposes of adoption or diversion. If the developer wishes to have the sewers included in a sewer adoption/diversion agreement with Yorkshire Water (under Sections 104 and 185 of the Water Industry Act 1991), they should contact our Developer Services Team (Telephone 0345 120 84 82) at the earliest opportunity. Sewers intended for adoption and diversion should be designed and constructed in accordance with the WRc publication 'Sewers for Adoption - a design and construction guide for developers' 6th Edition, as supplemented by Yorkshire Water's requirements.





YorkshireWater

All the above comments are based upon the information and records available at the present time and are valid for a period of 12 months. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours faithfully

Reuben Thornton
Town Planning Team



Project Number: 25-0382
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Appendix C

Surface Water Runoff & Storage Calculations

BSP Consulting		Page 1
12 Oxford Street Nottingham NG1 5BG	Chesterfield Road Markham Vale QBar calc	
Date 17/04/2026 File	Designed by MG Checked by TH	
Innovyze		Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years) 2 SAAR (mm) 742 Urban 0.000
Area (ha) 17.750 Soil 0.400 Region Number Region 4

Results 1/s

QBAR Rural 64.7
QBAR Urban 64.7

Q2 years 57.9

Q1 year 53.7
Q30 years 126.7
Q100 years 166.2

Quick Storage Estimate - Inputs

The screenshot shows the 'Quick Storage Estimate' window with the 'Variables' tab selected. The left sidebar contains buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area contains input fields for various variables. At the bottom, there are buttons for 'Analyse', 'OK', 'Cancel', and 'Help', and a status bar that reads 'Enter Return Period between 1 and 1000'.

Variable	Value
FSR Rainfall	[Dropdown]
Return Period (years)	100
Region	England and Wales
Map	M5-60 (mm)
Ratio R	0.368
Cv (Summer)	1.000
Cv (Winter)	1.000
Impervious Area (ha)	11.550
Maximum Allowable Discharge (l/s)	64.7
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	25

Quick Storage Estimate – Results

The screenshot shows the 'Quick Storage Estimate' window with the 'Results' tab selected. The left sidebar contains buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area displays the results of the calculation. At the bottom, there are buttons for 'Analyse', 'OK', 'Cancel', and 'Help', and a status bar that reads 'Enter Return Period between 1 and 1000'.

Global Variables require approximate storage of between 7460 m³ and 10402 m³.

These values are estimates only and should not be used for design purposes.



Nottingham

12 Oxford Street
Nottingham
NG1 5BG

0345 413 4000

Derby

5 Pride Point Drive
Pride Park
Derby
DE24 8BX

0345 413 4000

Leicester

Floor 4
24 De Montfort St
Leicester
LE1 7GB

0345 413 4000

Sheffield

Smithy Wood House
Smithy Wood Cres
Sheffield
S8 0NU

0345 413 4000

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