East Midlands Gateway
Phase 2 (EMG2)

Document DCO 6.13G/MCO 6.13G

ENVIRONMENTAL STATEMENT

Volume 2 Technical Appendices

Appendix 13G

Flood Risk Assessment (EMG2 Works)

July 2025

13

The East Midlands Gateway Phase 2 and Highway Order 202X and The East Midlands Gateway Rail Freight and Highway (Amendment) Order 202X

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SEGRO

A CAF GROUP COMPANY

ADVISORY

SEGRO (Properties) Ltd
East Midlands Gateway 2
Flood Risk Assessment – EMG2 Works

www.bwbconsulting.com

ADVISORY

SEGRO (Properties) Ltd
East Midlands Gateway 2
Flood Risk Assessment – EMG2 Works

Birmingham
Livery Place, 35 Livery Street, Colmore Business District, Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street, Manchester, M1 3HU
0161 233 4260

Nottingham
Waterfront House, Station Street, Nottingham NG2 3DQ
T: 0115 924 1100

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Author:	Craig Crowe BSc (Hons) MSc GradCIWEM
Checked:	Sian Renwick MSci (Hons)
Approved:	Robin Green BSc (Hons)

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The information presented, and conclusions drawn, are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.

EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements set out in the National Policy Statement for National Networks (NPSNN). It has been produced on behalf of SEGRO (Properties) Ltd in respect of a Development Consent Order (DCO) for the proposed East Midlands Gateway Phase 2 (EMG2) and the East Midlands Gateway Rail Freight Interchange Material Change Order (MCO). The DCO and MCO comprises a number of elements which, due to their geographical locations, are covered by three individual assessments of flood risk. This FRA focuses on the 'EMG2 Works' and the 'Highway Works' located within the immediate vicinity of the EMG2 Main Site – referred to as the 'study site' within the report.

This report demonstrates that the proposed development is not at significant flood risk, subject to the recommended flood mitigation strategies being implemented. Moreover, in compliance with the requirements of the NPSNN, the development will not increase flood risk to the wider catchment area subject to suitable management of surface water runoff.

The Environment Agency (EA) Flood Map for Planning identifies that the study site is located entirely within Flood Zone 1. The nearest Flood Zone extents are located approximately 260m to the south and are attributed to the Diseworth Brook.

It is reported that the neighbouring village of Diseworth has experienced a number of flood events between 2000 and 2024. The flooding prompted Leicestershire County Council (LCC) to commission the production of the Diseworth and Long Whatton Catchment Study and subsequently the Long Whatton and Diseworth Flood Risk Mitigation and Resilience Study. To inform the latter study, a bespoke 1D-2D InfoWorks Integrated Catchment Model was produced to identify flood depths, extents and mechanisms within the catchment. LCC have provided the model for use in this FRA as it provides coverage of the study site.

The detailed hydraulic model identifies that the proposed development is at a low risk from fluvial flooding; including from the Hall Brook which flows along a portion of the western boundary of the study site.

The model identifies the potential for surface water overland flow pathways to form within the study site under the baseline conditions; these flow towards the Hall Brook and the Diseworth Brook. The flow routes are relatively shallow and originate from within the study site itself. There are no significant overland flow pathways passing through the study site from upstream third-party land.

It is proposed that the minor flood risk posed by the shallow surface water flow routes will be addressed through the implementation of a surface water drainage strategy. The drainage strategy will be designed to intercept and store rainwater falling on the development, before discharging it to the local watercourse at a restricted rate, equivalent to a 39% reduction to the greenfield (pre-development) 1 in 1-year runoff rate. Therefore, the surface water discharge rate from the development will be less than the existing runoff rate, thereby offering a degree of downstream betterment. Additionally, the drainage strategy seeks to direct all surface water runoff from the development to an outfall located downstream of Diseworth, thus reducing the volume and rate of surface water runoff directed towards the village.

The principles of the surface water drainage strategy have been built into the integrated Long Whatton & Diseworth hydraulic model, which has predicted a reduction in downstream flood depths. In Diseworth, the benefits are most pronounced on the Hall Brook, which is a result of the runoff from the development area being redirected away from the village. On the Diseworth Brook, the benefits are most evident upstream of the A42 embankment; these benefits are as a result of surface water runoff from the development area being attenuated at a significantly restricted rate within the EMG2 Works.

The risk of flooding to the study site from other sources of flooding, including sewers, groundwater, reservoirs and canals, has been identified to be low.

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1. INTRODUCTION

1.1 This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements set out in the National Policy Statement for National Networks (NPSNN). It has been produced on behalf of SEGRO (Properties) Ltd in respect of a Development Consent Order (DCO) for the proposed East Midlands Gateway Phase 2 (EMG2) and the East Midlands Gateway Rail Freight Interchange Material Change Order (MCO).

1.2 The DCO and MCO comprises a number of elements and due to their geographical location, they are covered by three individual assessments. This FRA focuses on the 'EMG2 Main Site' and the 'Highway Works' located within the immediate vicinity of the Main Site.

1.3 Summary information is included as **Table 1.1**.

Table 1.1: Site Summary

Site Name	EMG2 Works Study Site • Works No. 1 to 5 • A453 EMG2 Access Works (Works No. 6) • EMG2 principal access alteration location. • Hyam's Lane Works (Works No. 7) • Public right of way amendments on Long Holden (Works No. 17) • A453 pedestrian crossing (Works No. 15) • Community Park (Works No. 21)
NGR (approx.)	SK459250
Development Type	Class B8/B2 Office and Warehouse
Flood Zone Classification	Flood Zone 1
NPPF Vulnerability	Less Vulnerable
Anticipated Development Lifetime	75 years*
Environment Agency Office	East Midlands
Lead Local Flood Authority	Leicestershire County Council (LCC)

** In accordance with Paragraph 006 of the Flood Risk and Coastal Change Planning Practice Guidance.*

Sources of Data

i. Topographical Survey undertaken in April 2022 by Greenhatch Group (reference: 34529A_T_REV1)

ii. CCTV Survey of public sewer and piped watercourse (reference: 34529A_CCTV_REV1)

iii. Leicestershire County Council (LCC) Consultation and model information

iv. Environment Agency (EA) Surface Water Flood Risk Maps
v. EA Flood Map for Planning
vi. 2022 EA 1m Light Detecting and Ranging (LiDAR) data
vii. North West Leicestershire District Council (NWLDC) Level 1 Strategic Flood Risk Assessment Update
viii. NWLDC Strategic Flood Risk Assessment Climate Change Addendum
ix. LCC Preliminary Flood Risk Assessment
x. LCC Preliminary Flood Risk Assessment Addendum
xi. Greater Nottingham Strategic Flood Risk Assessment Addendum
xii. LCC Local Flood Risk Management Strategy
xiii. LCC Flood Risk Management Strategy Action Plan
xiv. Humber River Basin Flood Risk Management Plan
xv. North West Leicestershire Local Plan
xvi. Diseworth and Long Whatton Catchment Study
xvii. Long Whatton & Diseworth Flood Risk Mitigation & Resilience Study
xviii. Site visit undertaken by BWB Consulting Ltd in June 2022
xix. Hydraulic modelling undertaken by BWB Consulting in 2025, reference: EMG2-BWB-ZZ-XX-T-W-0002_HMR
xx. Factual GI Report undertaken by Fairhurst in 2023 (reference: 765514-01)
xxi. Drainage Strategy prepared by BWB Consulting (reference: EMG2-BWB-WAT-ZZ-DR-CD-0501)
xxii. Severn Trent Water (STW) Sewer Records
xxiii. British Geological Survey (BGS) Drift & Geology Maps

Situational Context

1.4 The proposed development comprises a number of interrelated component parts as follows, and collectively they are referred to as the EMG2 Project:

- **EMG2 Works:**
  - Construction of logistics and advanced manufacturing development and ancillary buildings (DCO, Works No. 1);
  - Construction of road infrastructure (DCO, Works No. 2);
  - Construction of bus interchange (DCO, Works No. 3);
  - Construction of HGV parking (DCO Works No. 4);
  - Provision of hard and soft landscaping (DCO Works No. 5);
  - Creation of a Community Park (DCO, Work No. 21); and
  - Upgrade of the EMG1 substation (DCO, Work No. 20)[1].

[1] Note – Due to its distance from the other EMG2 Works, for the purpose of assessing flood risk the upgrade of the EMG1 substation is included in the Highway Works Flood Risk Screening Report (ref: EMG2-BWB-ZZ-XX-T-W-0007).

- **Highways Works**[2]
  - A453 access junction works to the EMG2 Main Site (Works No. 6);
  - Hyam's Lane works (Works No. 7);
  - Works to the M1 northbound (Works No. 8);
  - Construction of link road from the M1 northbound to the A50 westbound (Works No. 9);
  - Works to the A50 westbound (Works No. 10);
  - Works to the link road from the M1 southbound and A50 eastbound to M1 Junction 24 (Works No. 11);
  - Works to the M1 Junction 24 roundabout and A453 northbound approaches (Works No. 12);
  - Improvements to the EMG1 access junction (Works No. 13);
  - Construction of the Active Travel Link between the EMG1 access junction and the A453 west of Finger Farm roundabout (Works No. 14);
  - Provision of an uncontrolled crossing of the A453 at the East Midland Airport signalised access junction (Works No. 15);
  - Works to M1 northbound signage on the approach to M1 Junction 23A (Works No. 16);
  - Works to Long Holden (Works No. 17);
  - Works to the A42/A453 Finger Farm roundabout (Works No. 18); and
  - Upgrade to public footpath L57 to a cycle track (Works No. 19).
- **EMG1 Works**
  - Construction of a new rail-served warehouse building on land adjacent to the rail-freight terminal referred to as Plot 16 (MCO, Works No. 3A) together with associated access (MCO, Works No. 5A) and landscaping (MCO, Works No. 6A).
  - Alterations to the existing rail-freight terminal to improve its operation and efficiency;
  - An expansion of the EMG1 Management Suite by the EMG1 site entrance to cater for the additional demand on management facilities resulting from EMG1 (MCO, Works No. 3B);
  - Enhancements to the Public Transport Interchange by way of the installation of EV charging infrastructure for buses and provision of a drop-off layby adjacent to the transport hub (MCO, Works No. 5B and 5C); and
  - Provision of a signalised crossing over the EMG1 exit road approach to the access junction to EMG1 (MCO, Works No. 8A).

1.5 An illustrative site location plan is provided as **Figure 1.1**, which also identities the approximate extent of the development component parts. For ease of reference and for the purpose of the FRAs, the individual components have been grouped together based upon the geographical location, as shown in **Figure 1.2**.

[2] Note - Due to their geographical location for the purpose of assessing flood risk Works No. 6, 7, 15, 17, and 21 are included in this EMG2 Works Flood Risk Assessment).

1.6 This FRA has been prepared in relation to the 'EMG2 Works' inclusive of the Highway Works within the immediate vicinity (Works Nos. 1 to 7, 12, 17 & 21), referred to as 'the study site' throughout. Due to its distance from the other EMG2 Works, for the purpose of assessing flood risk, the upgrade of the EMG1 substation (Works No. 20) is included in the Highway Works Flood Risk Screening Report.

1.7 The EMG1 Works and Highway Works have been reviewed under separate cover (references: EMG2-BWB-ZZ-XX-T-W-0005 and EMG2-BWB-ZZ-XX-T-W-0007, respectively).

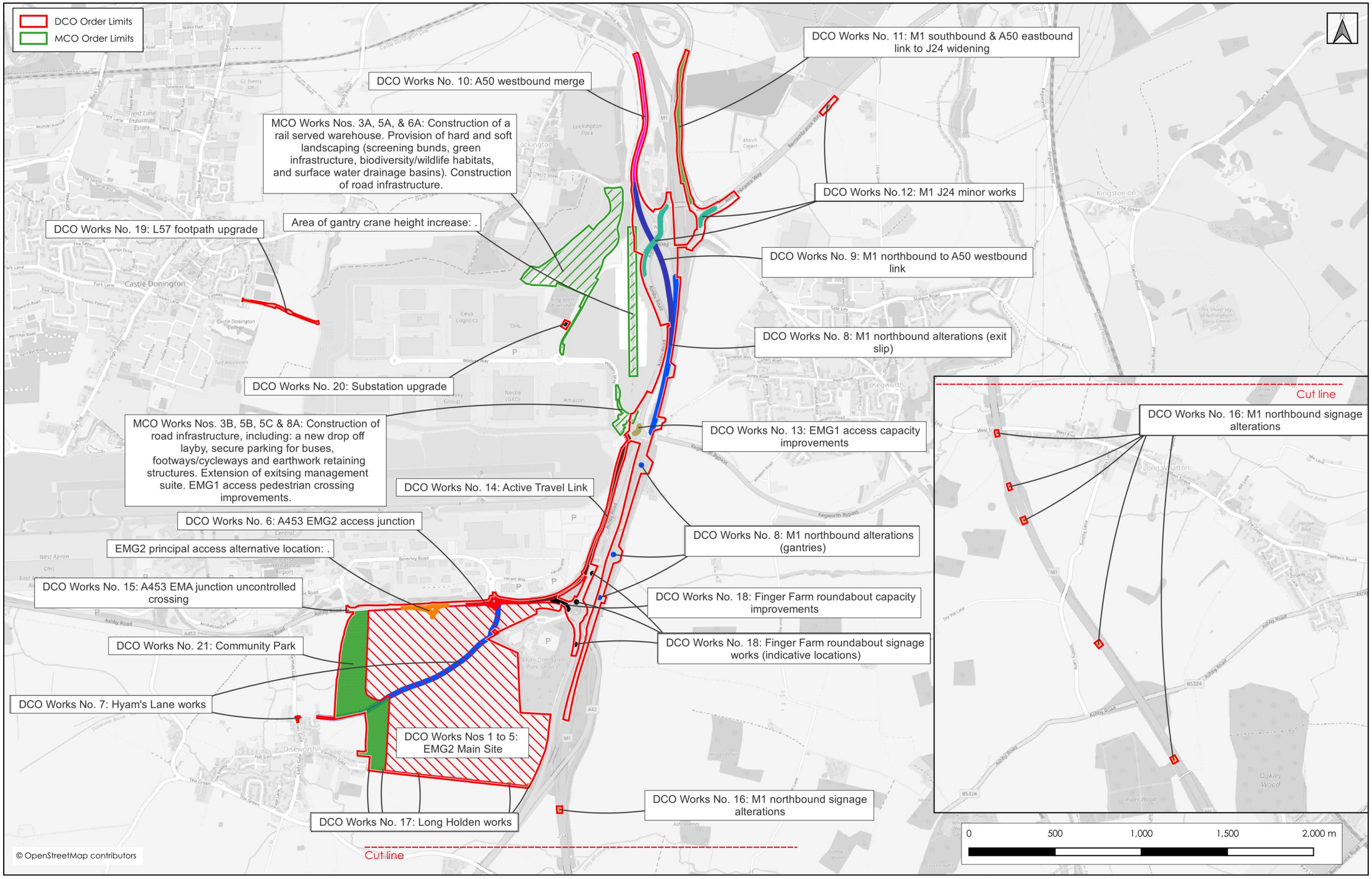


Figure 1.1: The EMG2 Project

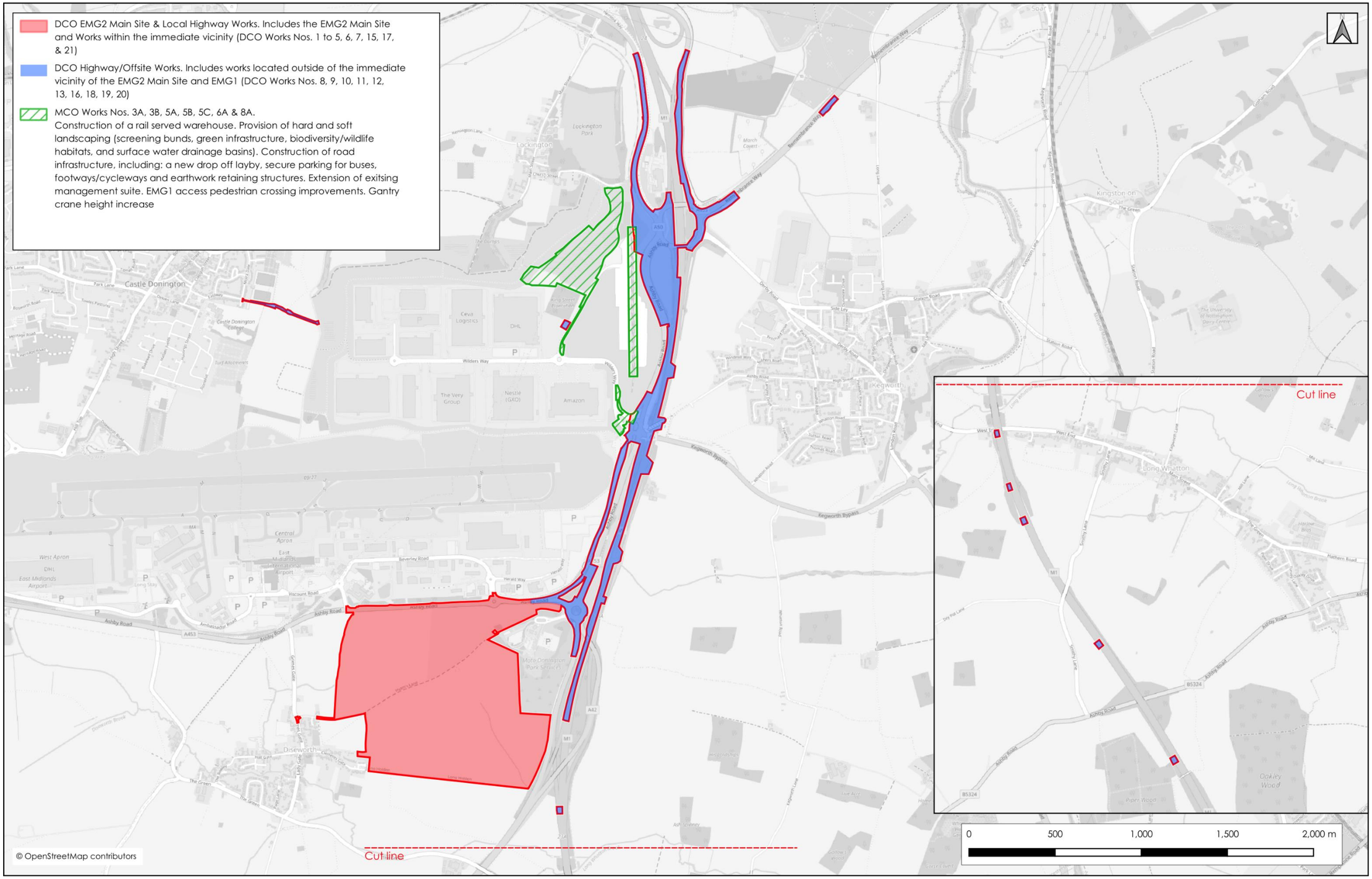


Figure 1.2: Grouping of EMG2 Project Components for the Purpose of the Flood Risk Assessments

Existing Site

1.8 The study site is bound to the north by East Midlands International Airport (EMIA), which lies beyond the Ashby Road (A453). Donnington Park Services is located immediately adjacent to the north-east. The A42 and the M1 motorway bound the site to the east. The south of the site is bound by the Long Holden public byway, with agricultural fields beyond. The west of the site is bound by agricultural fields. The village of Diseworth is located approximately 150m south-west of the study site. A public byway, known as Hyam's Lane, bisects the study site from south-west to north-east.

1.9 The Hall Brook flows along a portion of the western boundary before flowing in a south-westerly direction to its confluence with the Diseworth Brook approximately 500m south-east of the study site.

1.10 A series of field ditches are present in the south-east corner of the study site. These exit via a piped connection (500mm diameter) beneath Long Holden before entering a larger pipe system (525mm to a 700mm diameter) which runs alongside the A42 and outfalls to the Diseworth Brook beneath the A42 road bridge.

1.11 A public surface water sewer is also present in the east of the study site. This runs in parallel to the A42 culvert between the Donnington Services and the Diseworth Brook, outfalling just upstream of the A42 culvert.

1.12 A public foul water rising main is shown to flow along Hyam's Lane in a north-easterly direction. The rising main originates from a pumping station to the west off Grimes Lane and enters a public foul water gravity sewer to the north of the site beyond Ashby Road.

1.13 The study site includes a stretch of the Ashby Road (A453) from which a new access in the EMG2 Main Site is to be formed. This stretch of the A453 is understood to be positively drained to the Hall Brook.

1.14 The study site's location and key watercourses are illustrated within **Figure 1.3**.

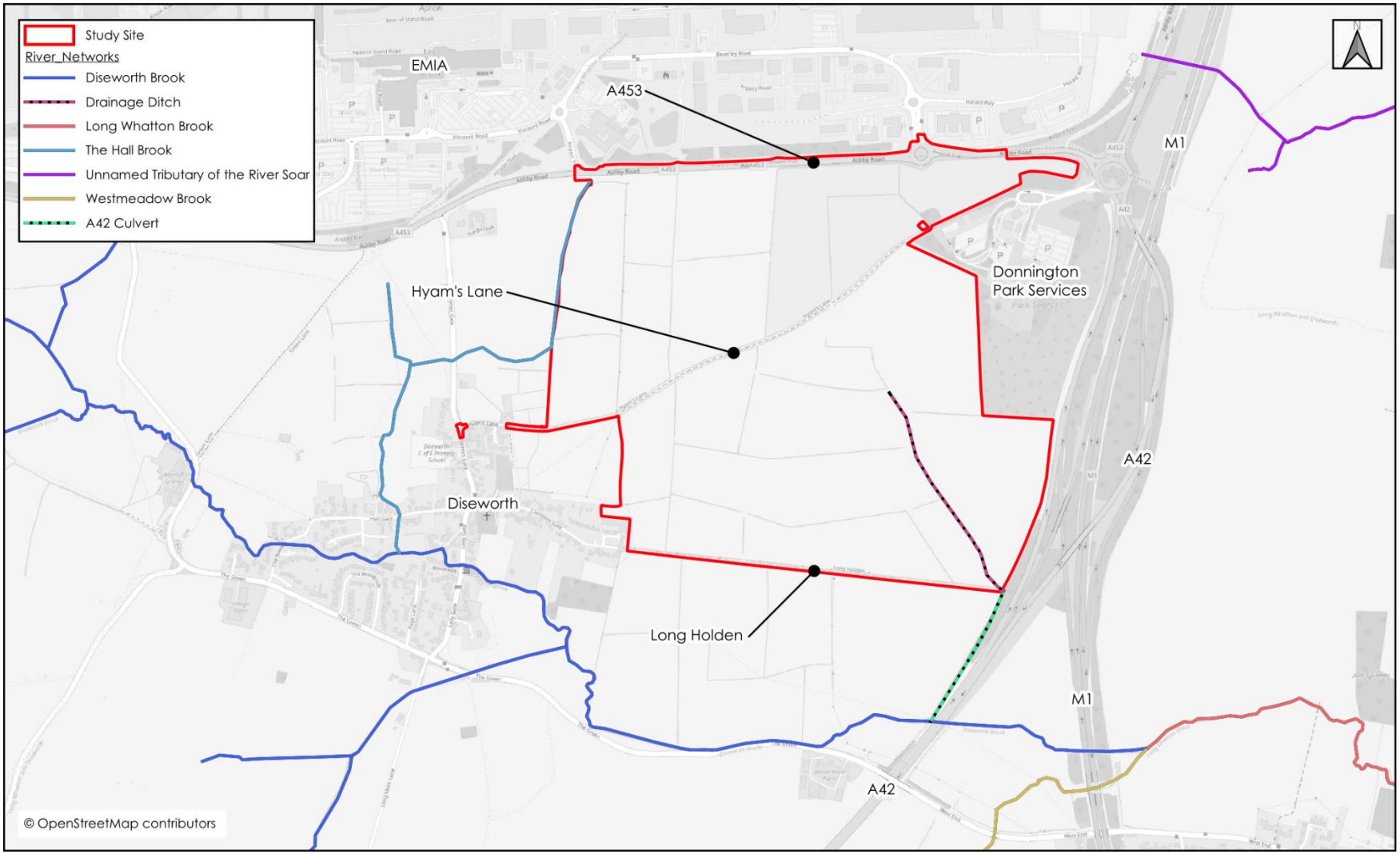


Figure 1.3: Site Location and Watercourse Network

1.15 The generalised topography of the study site is shown in **Figure 1.4**, with a full topographical survey (reference: 34529A_T_REV1) included as **Appendix 1**. The study site can be split into two topographical catchments generally located to the north and south of Hyam's Lane. The northern catchment falls in a westerly direction towards the Hall Brook, with levels ranging from approximately 92.7metres Above Ordnance Datum (mAOD) in the north-east to approximately 67.1mAOD in the south-west. The southern catchment falls generally in a southerly direction with levels ranging from approximately 91.0mAOD in the north-east to approximately 52.6mAOD in the south-east.

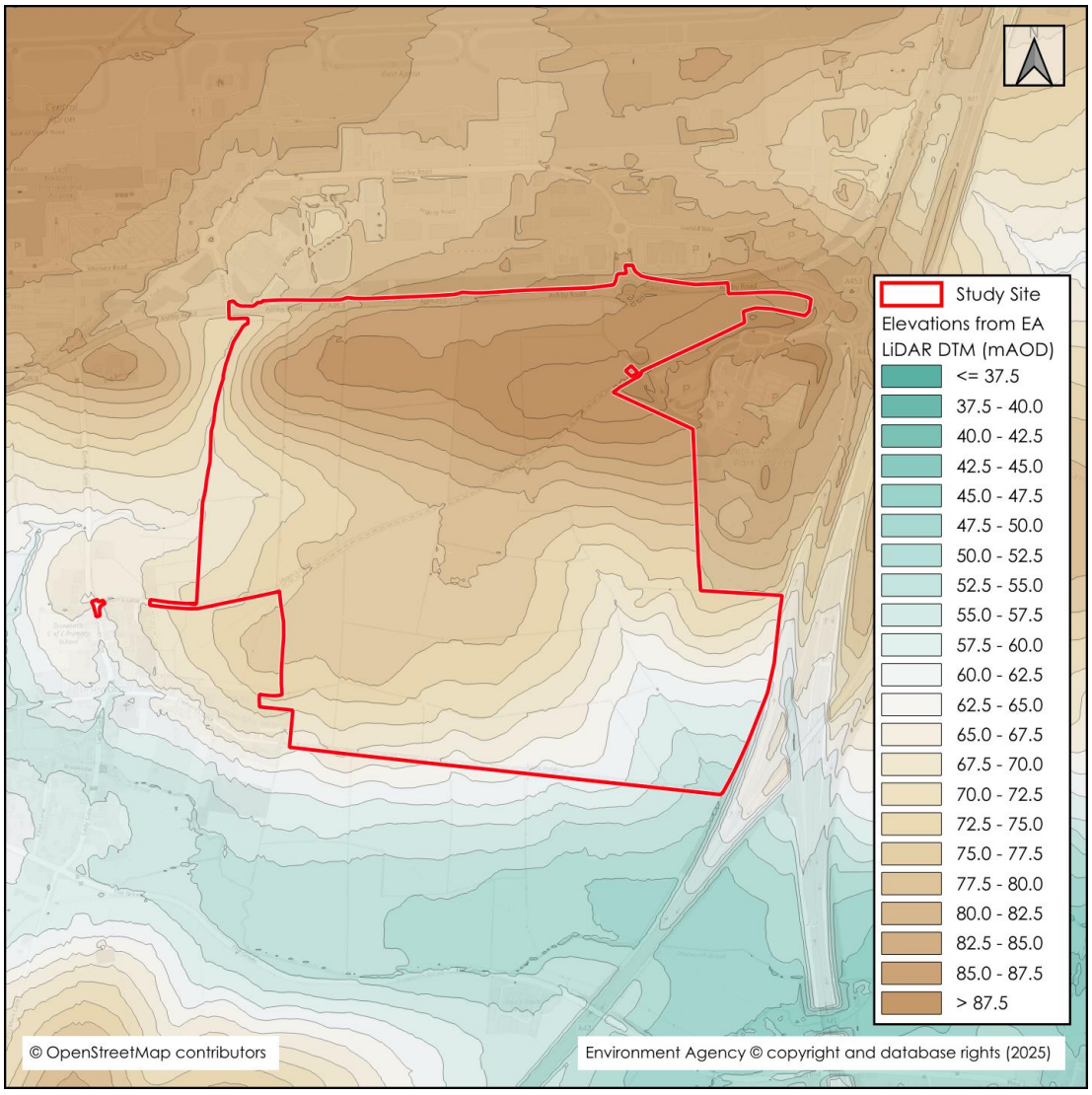


Figure 1.4: Existing Site Topography based on EA 1m LiDAR

1.16 The location of the proposed EMG2 Main Site and community park are currently greenfield in nature and is currently utilised for agricultural practices.

Proposed Development

1.17 The proposals within the EMG2 Main Site are for a multi-unit logistics/industrial development (Class B2 and B8) together with supporting and co-located office functions. Proposed access/egress for is to be achieved via Ashby Road (A453). A Parameters Plan is included as **Appendix 2**.

1.18 The proposed development units will be set up in a tiered arrangement upon a series of terraced plateaus created by reprofiling ground levels. A series of earth bunds will also be located on the western boundary to help screen the development.

1.19 The study site also includes the following within the coverage of this FRA:

- A453 EMG2 Access Works (Works No. 6) – associated with the construction of a new access from the existing roundabout and signalised crossing of the A453.
- Hyam's Lane Works (Works No. 7) – associated with improving the lane for use as cycle infrastructure.
- Long Holden Works (Works No. 17) – associated with providing new pedestrian connections between the EMG2 Main Site and Long Holden bridleway.
- Community Park (Works No. 21) - The community park is to be located between the EMG2 Main Site and the Hall Brook. A series of sustainable drainage systems (SuDS) basin will be located within the park which will serve the built EMG2 development.
- Pedestrian Crossing the A453 (Works No. 15)

1.20 As these are elements are generally associated with landscaping, relatively minor improvements to existing highway infrastructure and public rights of way, this FRA has primarily focussed upon the EMG2 Main Site.

2. FLOOD RISK PLANNING POLICY & GUIDANCE

National Policy Statement for National Networks

2.1 The NPSNN[3] provides planning policy guidance for the promoters of nationally significant infrastructure projects. The NPSNN includes guidance about the generic, and other, impacts which should specifically be considered in assessing and designing projects. It also sets the context for the examination of proposals by the Planning Inspectorate (PINS).

2.2 Paragraph 5.128 highlights the requirement for an FRA to accompany the application and must demonstrate that the project will be safe for its lifetime, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

2.3 The NPSNN specifically refers to the NPPF for further, more detailed guidance on flood risk.

National Planning Policy Framework

2.4 The NPPF[4] sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk.

2.5 Flood risk is identified as a combination of the probability and the potential consequences of flooding:

Flood Risk = Probability x Consequences

2.6 The probability is the chance of a flood occurring expressed as a return period or annual exceedance probability (AEP), and the consequences are the potential impacts of the flood (for example, damage to buildings or risk to people's safety).

2.7 Potential sources of flood risk are rivers and the sea, direct rainfall on the ground surface resulting in surface water runoff, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes, and other artificial sources.

2.8 The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere. When considering flood risk, the NPPF requires development to account for future climate change.

National Planning Practice Guidance – Flood Risk and Coastal Change

2.9 The NPPF is accompanied by the Planning Practise Guidance (PPG) category entitled "Flood Risk and Coastal Change"[5]. This sets out the vulnerability to flooding of different land uses. It encourages development to be located in areas of lower flood risk where

[3] National Policy Statement for National Networks, Department for Transport, March 2024
[4] Revised National Planning Policy Framework, Ministry of Housing, Communities & Local Government, amended 2024
[5] Planning Practice Guidance: https://www.gov.uk/guidance/flood-risk-and-coastal-change, amended 2022

possible and stresses the importance of preventing increases in flood risk off site to the wider catchment area.

2.10 The PPG requires development to be designed to include flood risk management and resilience against the "design flood" for its lifetime. The PPG also states that all potential sources of flooding should be considered when preparing an FRA.

2.11 The "design flood" is an event of a given probability generally defined as:

- river flooding likely to occur with a 1% AEP (a 1 in 100 chance each year); or
- tidal flooding likely to occur with a 0.5% AEP (1 in 200 chance each year); or
- surface water flooding likely to occur with a 1% AEP (a 1 in 100 chance each year),

plus, an appropriate allowance for climate change.

2.12 The PPG includes a series of tables that define Flood Zones (Table 1), the flood risk vulnerability classification of development land uses (Table 2) and 'compatibility' of development within the defined Flood Zones (Table 3).

2.13 This FRA is written in accordance with the NPPF and the associated PPG.

Flood Map for Planning

2.14 With particular reference to planning and development, the Flood Map for Planning identifies Flood Zones in accordance with Table 1 of the PPG. Further details on the Flood Zone classifications are outlined in **Table 2.1**.

Table 2.1: Flood Zone Classifications

Flood Zone	Description
Flood Zone 1 (Low Probability)	Land having less than a 1 in 1000 annual probability of river or sea flooding (<0.1% AEP). All land outside of Flood Zone 2 and 3.
Flood Zone 2 (Medium Probability)	Land having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1% AEP); or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1% AEP).
Flood Zone 3a (High Probability)	Land having a 1 in 100 or greater annual probability of river flooding (>1% AEP); or land having a 1 in 200 or greater annual probability of flooding from the sea (>0.5% AEP). This is represented by "Flood Zone 3" on the Flood Map for Planning.
Flood Zone 3b (The Functional Floodplain)	Flood Zone 3b (The Functional Floodplain) is defined as land where water must flow or be stored in times of flood. This is not identified or separately distinguished from Zone 3a on the Flood Map for Planning.

2.15 The site is shown to be located within Flood Zone 1, as shown in **Figure 2.1**. The nearest Flood Zone extents are located approximately 260m south of the study site associated with the Diseworth Brook.

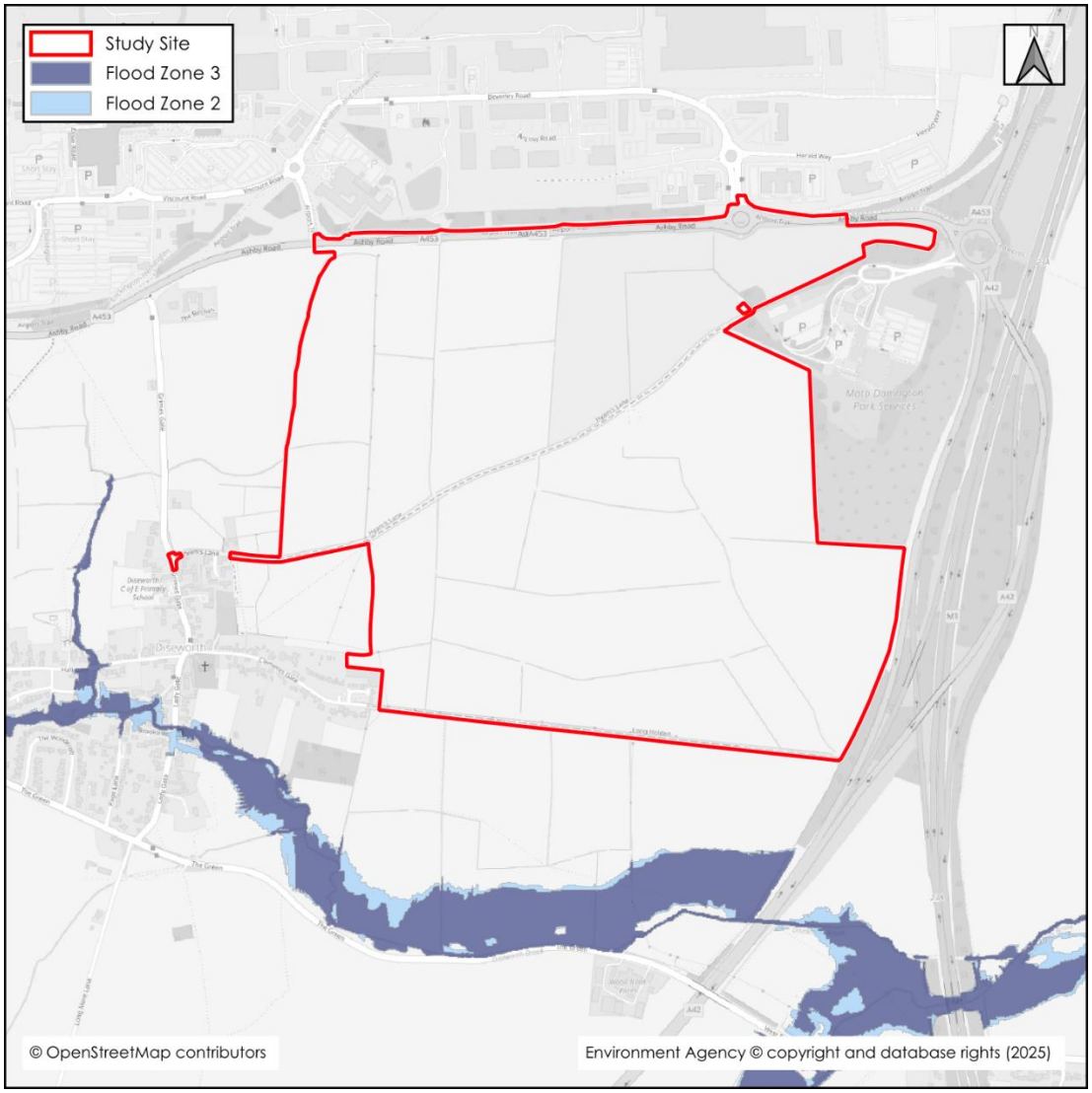


Figure 2.1: Flood Map for Planning

Climate Change

2.16 Predicted future changes in peak rainfall intensity caused by climate change are provided by the EA[6], with a range of projections applied to River Basin District Management Catchments.

2.17 The site falls within the Soar Management Catchment. **Table 2.2** identifies the relevant peak rainfall climate change allowances from this Management Catchment.

[6] Environment Agency, Flood risk assessments: climate change allowances: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances, last accessed April 2025.

Table 2.2: Peak Rainfall Climate Change Allowances for the Soar Management Catchment

Allowance Category	Total potential change anticipated for the '2050s' epoch (2022 to 2060)		Total potential change anticipated for the '2070s' epoch (2061 to 2125)	
	1 in 30-Year	1 in 100-Year	1 in 30-Year	1 in 100-Year
Upper End	35%	40%	35%	40%
Central	20%	20%	25%	25%

2.18 The future increase in rainfall will need to be considered when designing a development to ensure its drainage system is sufficient to address the local surface water flood risk for its lifetime and so that it does not increase flood risk elsewhere. The increase in rainfall will also need to be considered when assessing the flood risk from surface water runoff from surrounding urban and rural catchments.

Hydraulic Modelling

2.19 When determining the appropriate allowance to assess, catchment size, catchment urbanisation, and anticipated lifespan of the development should be considered. The EA guidance identifies that the central allowance should be considered for developments with a lifespan up to the 2100s, and the upper allowance used for those with a lifespan beyond the 2100s. The development has an anticipated lifespan of 75 years, meaning a +25% allowance has been considered.

2.20 However, in accordance with EA climate change guidelines and the NPSNN, the upper end allowance will also be assessed as a credible maximum storm event. Therefore, a climate change allowance of 40% was assessed.

Drainage Design

2.21 Similarly, it is required for the drainage systems for less vulnerable developments in this location to accommodate surface water run-off generated by a 1 in 100-year rainfall event with an uplift of 25% to allow for climate change.

2.22 However, additional checks of the drainage design are to be made with a 40% uplift to ensure that runoff is still retained on the site, without the development or the surrounding area being placed at significant flood risk.

Local Plan

2.23 The North West Leicestershire Local Plan[7] sets out policies to ensure sustainable development within the district. The plan has been reviewed and the relevant policies and objectives for this FRA have been summarised below:

[7] North West Leicestershire Local Plan (North West Leicestershire District Council, November 2017)

Objective 9

2.24 Objective 9 states that *"New developments need to be designed to use water efficiently, to reduce flood risk and the demand for water within the district, whilst at the same time taking full account of flood risk and ensuring the effective use of Sustainable Drainage Systems (SuDS)"*.

Policy Cc2 – Flood Risk

2.25 The risk and impact of flooding will be minimised through:

- Directing new development to areas with the lowest probability of flooding;
- Ensuring that all new development addresses the effective management of all sources of flood risk;
- Ensuring that development does not increase the risk of flooding elsewhere; and
- Ensuring wider environmental benefits of developments in relation to flood risk.

2.26 A proposal will be supported where:

- It is located in an area that is not at risk of flooding with reference to the EA's flood risk maps and the Council's SFRA, unless a Sequential Test, and if necessary an Exception Test, as set out in the PPG on flood risk, proves the development is acceptable;
- Site-specific FRAs should consider the issues of flooding from sewers, canal infrastructure failure, groundwater rising from former coal mining areas, and watercourses;
- Suitable flood protection/mitigation measures can be agreed as appropriate to the level and nature of flood risk and satisfactorily implemented and maintained; and
- There will be no increase in the risk of flooding for properties elsewhere. For previously undeveloped sites, the rate of runoff from the development site should be no greater than the existing (greenfield) rate of runoff from the site.

Policy Cc3 – Sustainable Drainage Systems

2.27 When assessing development proposals where it is necessary to manage surface water drainage, SuDS should be incorporated into developments in accordance with national and local standards unless it can be clearly demonstrated;

a) That SuDS are not technically, operationally or financially deliverable or viable and that surface water drainage issues from the development can be alternatively mitigated; or

b) That the SuDS scheme will itself adversely affect the environment or safety.

1) Where appropriate, every effort should be made to link SuDS into wider initiatives to enhance green infrastructure, improve water quality and benefit wildlife or contribute to the provision of the ecosystem service.

2) Arrangements in accordance with national policy will need to be put in place for the management and maintenance of the SuDS over the whole period during which they are needed.

2.28 An updated Local Plan is currently in production and undergoing consultation. Proposed policies *AP7 -Flood Risk* and *AP8 – Sustainable Drainage Systems* have been reviewed and align with the currently adopted policies.

Strategic Flood Risk Assessment

2.29 A Strategic Flood Risk Assessment (SFRA) is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future.

2.30 Although superseded, the North West Leicestershire SFRA (2015 Update)[8] provides information specific to the site location in the form of fluvial, surface water and groundwater flood risk mapping, as well as records of historical flooding. Information from the Level 1 SFRA will be referenced within **Section 3** and **Section 4,** where applicable. The report acts as a hybrid Level 1 and 2 SFRA and is used to facilitate the application of Sequential and Exception Tests to screen allocated development sites. The study site is not referenced within the SFRA.

2.31 A further update to the SFRA[9] was produced in 2024 to inform the emerging Local Plan for North West Leicestershire. The study site is referred to as a potential employment site under *EMP90 Land South of EMA*. The following flood risk summary of the EMG2 Main Site is provided:

- *"This site is proposed for employment development and therefore is less vulnerable. The site is located within Flood Zone 1 and therefore considered sequentially acceptable.*
- *The site is larger than 1 hectare, therefore a Flood Risk Assessment is required.*
- *In general, the site is currently considered to be at a low risk from surface water flooding.*
- *There is no groundwater data available."*

Preliminary Flood Risk Assessment

2.32 A Preliminary Flood Risk Assessment (PFRA) is an assessment of floods that have taken place in the past and floods that could take place in the future. It generally considers flooding from surface water runoff, groundwater and ordinary watercourses, and is prepared by the Lead Local Flood Authority (LLFA).

2.33 The LCC PFRA[10] considers flooding from surface water runoff, groundwater, ordinary watercourses and canals. It also references the historical river flooding which occurred

[8] Strategic Flood Risk Assessment Update (Atkins, June 2015)
[9] Strategic Flood Risk Assessment Update (Atkins, March 2024)
[10] Preliminary Flood Risk Assessment (URS Scott Wilson, June 2011)

in Diseworth from the Hall Brook and Diseworth Brook. However, no date is provided for these events.

2.34 An addendum to the PFRA[11] was produced in December 2017. The addendum notes that the majority of flooding within the Leicestershire area is a result of ordinary watercourses and surface water runoff; however, no locations or watercourses within close proximity to the study site are referenced within the addendum. Information from the PFRA will be referenced within **Section 3,** where applicable.

Local Flood Risk Management Strategy

2.35 A Local Flood Risk Management Strategy (LFRMS) is prepared by an LLFA to help understand and manage flood risk at a local level.

2.36 The LFRMS aims to ensure that the knowledge of local flood risk issues is communicated effectively so that they can be better managed. The LFRMS also aims to promote sustainable development and environmental protection.

2.37 The LCC LFRMS[12] has been reviewed but no new relevant information was identified. The LCC LFRMS Action Plan[13] highlights the key objectives of the LFRMS and associated actions to achieve them. This action plan referred to the delivery of the Diseworth Flood Alleviation Scheme with a timeframe of March 2026; however, no further information on this scheme is provided.

River Basin Flood Risk Management Plan

2.38 Flood Risk Management Plans (FRMPs) explain the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. FRMPs set out how risk management authorities will work with communities to manage flood and coastal risk. Risk management authorities include the EA, Natural Resources Wales (NRW), local councils, Internal Drainage Boards, National Highways, and LLFAs.

2.39 The first FRMPs were published in March 2016 and the plans have since been updated in December 2022. These describe actions to manage flood risk across England between 2021 to 2027.

2.40 The study site is located within the Humber River Basin District, and the Humber River Basin FRMP[14] has been reviewed. However, there are no objectives relevant to the study site.

Other Relevant Policy and Guidance

2.41 This FRA has considered the following documents when assessing sources of flood risk and when recommending mitigation and resilience measures.

[11] Preliminary Flood Risk Assessment Addendum (Leicestershire County Council, December 2017)
[12] Local Flood Risk Management Strategy (Leicestershire County Council, February 2024)
[13] Local Flood Risk Management Strategy Action Plan (Leicestershire County Council, February 2024)
[14] Humber River Basin District Flood Risk Management Plan (Environment Agency, December 2022)

Flood Risk to People and New Developments

2.42 The Flood Risk to People (FD2321/TR1)[15] document was prepared as a research project considering flood hazard and factors that affect it.

2.43 Flood Risk Assessment Guidance for New Development (FD2320/TR2)[16] provides a framework and guidance for assessing and managing flood risks for new developments and sets flood hazard thresholds.

2.44 Hazard ratings are derived using the following equation in line with the above:

$$Hazard\ Rating = D * (V+0.5) + DF$$

Where:
D = depth
V = velocity
DF = debris factor

2.45 A supplementary note[17] provides clarification of the hazard rating thresholds which should be used for development planning and control use. **Table 2.3** identifies the thresholds of the flood hazard categories.

Table 2.3: Hazard to People[18]

Threshold for Flood Hazard Rating	Degree of Flood Hazard	Description
< 0.75	Very Low	**Caution** "Flood zone with shallow flowing water or deep standing water"
0.75 - 1.25	Moderate	**Danger for some (i.e.: children, the elderly and the infirm)** "Danger: Flood Zone with deep or fast flowing water"
1.25 - 2.0	Significant	**Danger for most (includes the general public)** "Danger: Flood Zone with deep fast flowing water"
2.0 >	Extreme	**Danger for all (includes the emergency services)** "Extreme Danger: Flood Zone with deep fast flowing water"

[15] Flood Risk to People Methodology (FD2321/TR1), Defra/Environment Agency, 2006
[16] Flood Risk Assessment Guidance for New Development (FD2320/TR2), Defra/Environment Agency, 2005
[17] Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. (http://randd.defra.gov.uk/Document.aspx?Document=FD2321_7400_PR.pdf)
[18] 2008, DEFRA. Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purposes.

3. HISTORICAL FLOODING & PREVIOUS STUDIES

EA Recorded Flood Outlines

3.1 There are no EA Recorded Flood Outlines within the study site or the immediate surrounding area. The nearest outline is located approximately 2.5km to the east. This is associated with the River Soar exceeding channel capacity in 1983 and 1998.

Preliminary and Strategic Flood Risk Assessment

3.2 There are no references of historical flooding at the study site itself within the North West Leicestershire SFRA 2015 Update and LCC PFRA. However, both reports reference historical flooding of houses and roads on Hall Gate and Lady Gate in Diseworth from the Hall Brook and Diseworth Brook, in November 2000 and 2012, and of the B5401 in Long Whatton from the Long Whatton Brook. No additional records of historical flooding are reported within the North West Leicestershire SFRA 2024 update.

3.3 Although the Hall Brook and Diseworth Brook are known to take runoff from EMIA, these reports state the cause of flooding is a result of local issues regarding channel maintenance. This has been confirmed through correspondence with LCC (**Appendix 4**).

Environment Agency Consultation

3.4 In pre-application consultation, the EA confirmed that they hold no flood data relevant to the study site.

Diseworth and Long Whatton Catchment Study

3.5 The Diseworth and Long Whatton Catchment Study[19] was commissioned by LCC to determine the flooding mechanisms in Diseworth and Long Whatton, including the contribution that runoff from EMIA may have on flood risk in the catchment.

3.6 At the time of the report, the most recent flooding event in Diseworth and Long Whatton occurred in November 2012. Two localities within Diseworth are reported to have suffered flooding in the event – Shakespeare Close and Hall Gate.

3.7 The principal cause of flooding at Shakespeare Close was reported to be the channel geometry at this location, specifically a constriction and a reduction in channel capacity.

3.8 The flooding at Hall Gate was reported to be due to an exceedance of the Hall Brook channel capacity due to increased runoff from overland flows. At times during winter months, the runoff from EMIA is pumped to the River Trent and the Hall Brook does not receive discharge from the eastern attenuation basin; this was confirmed as the case in November 2012. It is therefore reported that flows were generated by runoff from the farmland to the north of the village, causing an increase in peak flows further

[19] Diseworth and Long Whatton Catchment Study (URS, January 2014)

downstream. This increase was sufficient to cause the watercourse to exceed channel capacity.

Long Whatton & Diseworth Flood Risk Mitigation & Resilience Study

3.9 Following on from The Diseworth and Long Whatton Catchment Study, Arcadis Consulting (UK) Limited were commissioned by LCC to produce the Long Whatton & Diseworth Flood Risk Mitigation & Resilience Study[20]. The purpose of the study was to further evaluate the flood mechanisms and to evaluate flood mitigation options. This study makes reference to a number of historical flooding incidents in Diseworth and Long Whatton, as follows: 2000, 2012, 2017, 2018, 2019 and 2020.

3.10 To inform the study, a bespoke 1D-2D hydraulic model was produced to provide flood depths, extents and mechanisms within the catchment. The model was developed using InfoWorks ICM due to its ability to represent fluvial networks, overland flows and sub-surface drainage in an integrated 1D-2D environment. Therefore, the model allows for representation of a number of key hydraulic features within the catchment including:

i. The Diseworth Brook;
ii. The Hall Brook;
iii. The Long Whatton Brook;
iv. Minor tributaries and land drainage;
v. Surface water and combined sewers;
vi. Property roof runoff;
vii. Local highway drainage;
viii. The M1 and A42 drainage catchments;
ix. EMIA drainage infrastructure including storage ponds;
x. Non-EMIA ponds; and
xi. The study site.

3.11 The observed historical flood incidents in the catchment were utilised to provide verification of the model results, providing direct evidence of both flood extents and depths. The model was shown to correlate well with respect to depths and extents in areas demonstrating historical flooding in Diseworth.

3.12 The results of the modelling demonstrated that the primary cause of flooding in Diseworth is the limited capacity of the channel and the lack of functional floodplain. It was reported that the EMIA drainage systems form a larger proportion of channel flow in lower magnitude flood events; however, the impact lessens in the higher magnitude events due to the effective attenuation capacity and the timing associated with the utilisation of the storage basins.

3.13 The investigation acknowledged that the peak discharge rates from the EMIA to Diseworth do vary due to antecedent conditions, but that the presence of EMIA ponds and drainage infrastructure significantly attenuates the magnitude of runoff which

[20] Long Whatton & Diseworth Flood Risk Mitigation & Resilience Study (Arcadis Consulting (UK) Limited, August 2020)

would have occurred before the EMIA was constructed. The report concludes the existence of the EMIA provides a significant level of protection to Diseworth.

3.14 A range of options for mitigating flood risk in Diseworth were tested, including options on both the Diseworth Brook and the Hall Brook. However, it was reported that an effective solution could not be identified; therefore, Property Level Resilience (PLR) measures were proposed to help prevent properties from flooding.

3.15 The LLFA provided a copy of their integrated Diseworth and Long Whatton hydraulic model for use in this FRA as it also provides coverage of the study site.

Anecdotal Evidence and Press Reports

3.16 A review has been undertaken for online press reports of historical flooding within Diseworth and Long Whatton, beyond those referenced above; however, none were found.

3.17 During public consultations undertaken in February 2025, anecdotal reports were made of flooding in Diseworth and Long Whatton in winter of 2024/25. The reports made reference to rapid surface water runoff from the EMG2 Main Site being observed.

4. POTENTIAL SOURCES OF FLOOD RISK

4.1 Flooding can occur from a variety of sources, or combination of sources, which may be natural or artificial. **Table 4.1** below identifies the potential sources of flood risk to the study site in its current condition, prior to mitigation. These are discussed in greater detail in the forthcoming section. The mitigation measures proposed to address flood risk issues and ensure the development is appropriate for its location are discussed within **Section 5**.

Table 4.1: Pre-Mitigation Sources of Flood Risk

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial			X		The study site is located entirely within Flood Zone 1, and hydraulic modelling has identified that the Hall Brook remains within bank past the study site. The proposed built development is located over 170m from the Hall Brook.
Pluvial			X		There is the potential for surface water overland flow pathways to form within study site. However, these predominately originate from within the study site itself, are relatively shallow and of a very low flood hazard. There are no significant overland flow pathways passing through the study site from upstream third-party land.
Sewer			X		The LCC hydraulic model indicates that the limited drainage and sewer networks around the study site do not direct any exceedance flows onto the EMG2 Main Site.
Coastal				X	The study site is not at risk from tidal/coastal sources
Canals				X	The Trent and Mersey Canal is located approximately 5.3km north of the study site and therefore does not represent a potential source of flooding.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Groundwater			X		Based on the low permeability of the geology, the local topography, and the measured depth of groundwater, the risk of groundwater emergence in the study site is considered to be low.
Reservoirs and waterbodies			X		The study site is shown to fall partially within an area at risk of inundation as a result of reservoir failure from the EMIA, but the development has been arranged to avoid the area at risk.

Fluvial, Pluvial, and Sewer Flood Risk

4.2 The mechanisms of flooding within the Hall Brook and Diseworth Brook catchment are largely surface water driven, and the LCC LLFA have provided a copy of their integrated Long Whatton & Diseworth hydraulic model to inform the assessment of flood risk at the study site. This model combines fluvial, surface water, private drainage, highway drainage, and public sewer sources, and provides a holistic appraisal of potential flood risk.

4.3 Due to its detail, the model provides a more representative picture of the potential flood risk than the strategic level flood mapping published by the EA in the form of the Flood Map for Planning and the Risk of Flooding from Surface Water (RoFSW) and Risk of Flooding from Rivers and Sea (RoFRS) maps.

4.4 For the purposes of this study, the model was updated to include additional site-specific detail from the topographical survey and a CCTV survey of the public sewer and A42 culvert in the east of the site (included as **Appendix 5** for reference). Further details on the hydraulic modelling amendments are provided within the hydraulic modelling report included as **Appendix 6**. The minor amendments made to the model have been submitted to by Arcadis Consulting (UK) for independent review and approval at the request of the EA and LLFA.

4.5 For ease of reference, the baseline modelled floodplain extents are shown in **Figure 4.1** and peak flood depths for the credible maximum scenario and **Figure 4.2**. The peak flood depths within the model were sampled at multiple points and are summarised within **Table 4.2**.

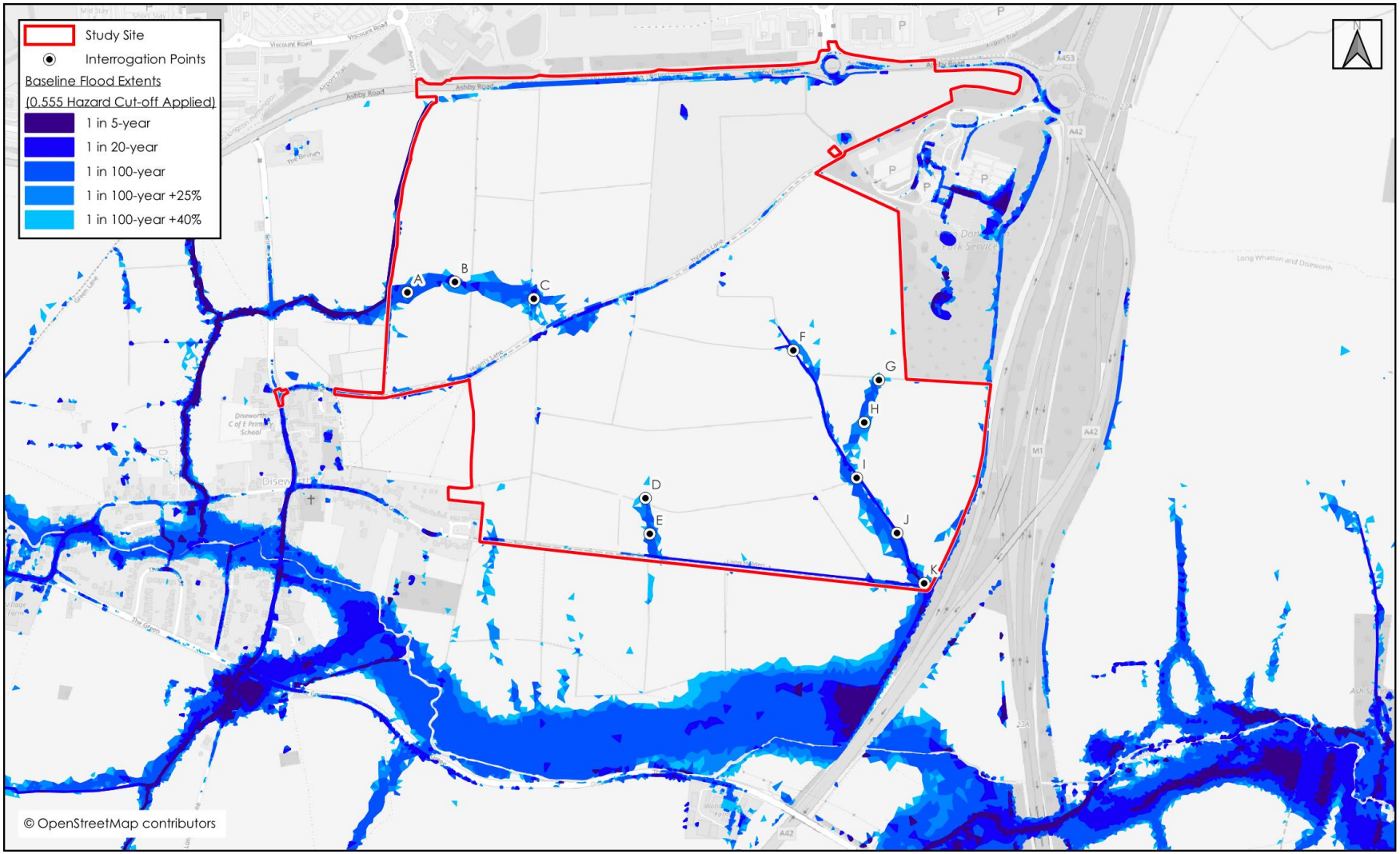


Figure 4.1: Baseline Conditions Modelled Floodplain Extents

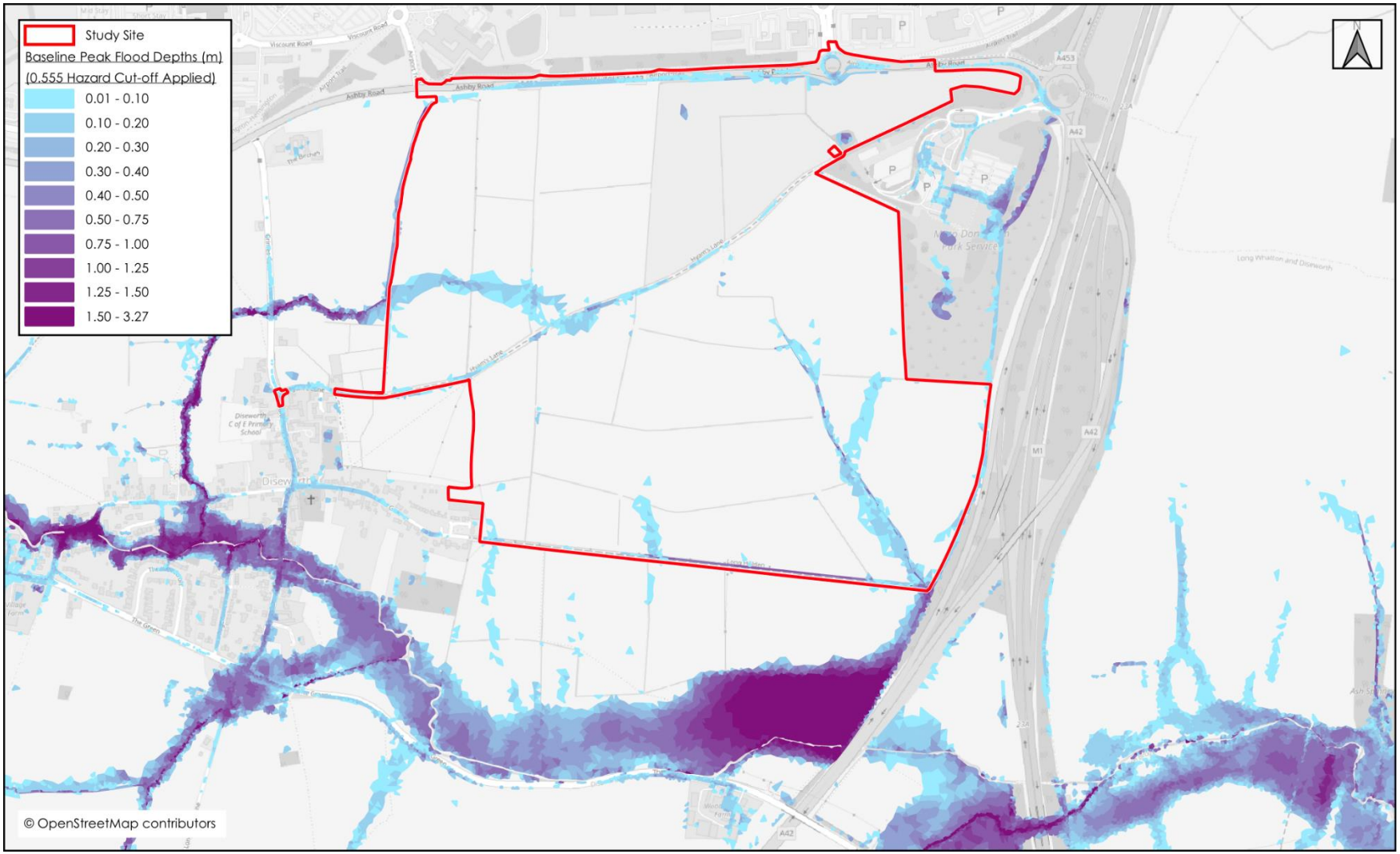


Figure 4.2: Baseline Conditions 1 in 100-year +40% Peak Flood Depths

Table 4.2: Baseline Conditions Modelled Peak Flood Depths

Node ID	20-year	100-year	100-year +25%	100-year +40%
A	-	0.06	0.09	0.10
B	0.13	0.31	0.35	0.38
C	0.16	0.24	0.27	0.29
D	-	-	-	-
E	-	-	0.06	0.06
F	0.23	0.38	0.46	0.50
G		0.06	0.07	0.08
H	-	-	0.07	0.08
I	-	-	-	-
J	0.31	0.49	0.57	0.61
K	-	0.25	0.34	0.39

4.6 The hydraulic modelling has shown that the Hall Brook floodplain is contained to its channel next to the study site, confirming that it poses a low fluvial flood risk to the proposed development. Further to this, the proposed built development at the EMG2 Main Site is located at least 170m to the east of the Hall Brook.

4.7 Additionally, the local sewer network and the EMIA drainage are not predicted to affect the study site. Therefore, the risk of flooding from existing sewer and drainage systems is also low.

4.8 The modelling has identified that there is the potential for surface water overland flow pathways to form within the study site, which are directed towards the downstream receiving watercourses by the fall of the topography. However, these flow routes are relatively shallow and of a very low flood hazard. For example, at the 1 in 100-year +40% event, the overland flows are generally between 0.05m to 0.15m deep. Greater depths and hazards only occur within low-lying areas such as within the drainage channels. Importantly, the overland flow pathways are shown to predominately originate from within the study site. There are no significant overland flow pathways passing through the study site from upstream third-party land. Therefore, these overland flow pathways will be resolved through developing the study site. This is discussed further within **Section 5**.

4.9 It should be noted that in accordance with hydraulic modelling best practice, the model data presented in **Figure 4.1** and **Figure 4.2** have been filtered to remove very shallow and slow moving water in order to identity the main flow pathways. Smaller and shallower flow pathways may be present that are not illustrated. Anecdotal evidence from the local residents has identified that runoff from fields to the north-east of Diseworth has historically been observed to flow towards properties on Clements Gate,

Long Holden and Langley Close, especially when the ground is saturated by preceding wet weather. The topography for the local area (see **Figure 1.4**) suggests that the contributing runoff from the study site towards these properties is limited (the study site generally sheds water to the Hall Brook or the field to the east of Diseworth). However, intercepting and managing as much runoff as possible from the study site as part of the EMG2 Works may help reduce the magnitude of flows generated. This is discussed within **Section 5**.

Groundwater Flood Risk

4.10 Groundwater flooding occurs when the water table rises above ground elevations, or it rises to depths containing basement level development. It is most likely to happen in low lying areas underlain by permeable geology. This is most common on regional scale chalk aquifers, but there may also be a risk on sandstone and limestone aquifers or on thick deposits of sands and gravels underlain by less permeable strata such as that in a river valley.

4.11 BGS mapping shows the study site to be underlain predominantly by Gunthorpe Member – Mudstone, with thin bands of Gunthorpe Member – Siltstone, Dolomitic and Diseworth Sandstone. The bedrock geology is shown in **Figure 4.3**. These bedrock layers are designated as Secondary B Aquifers, defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

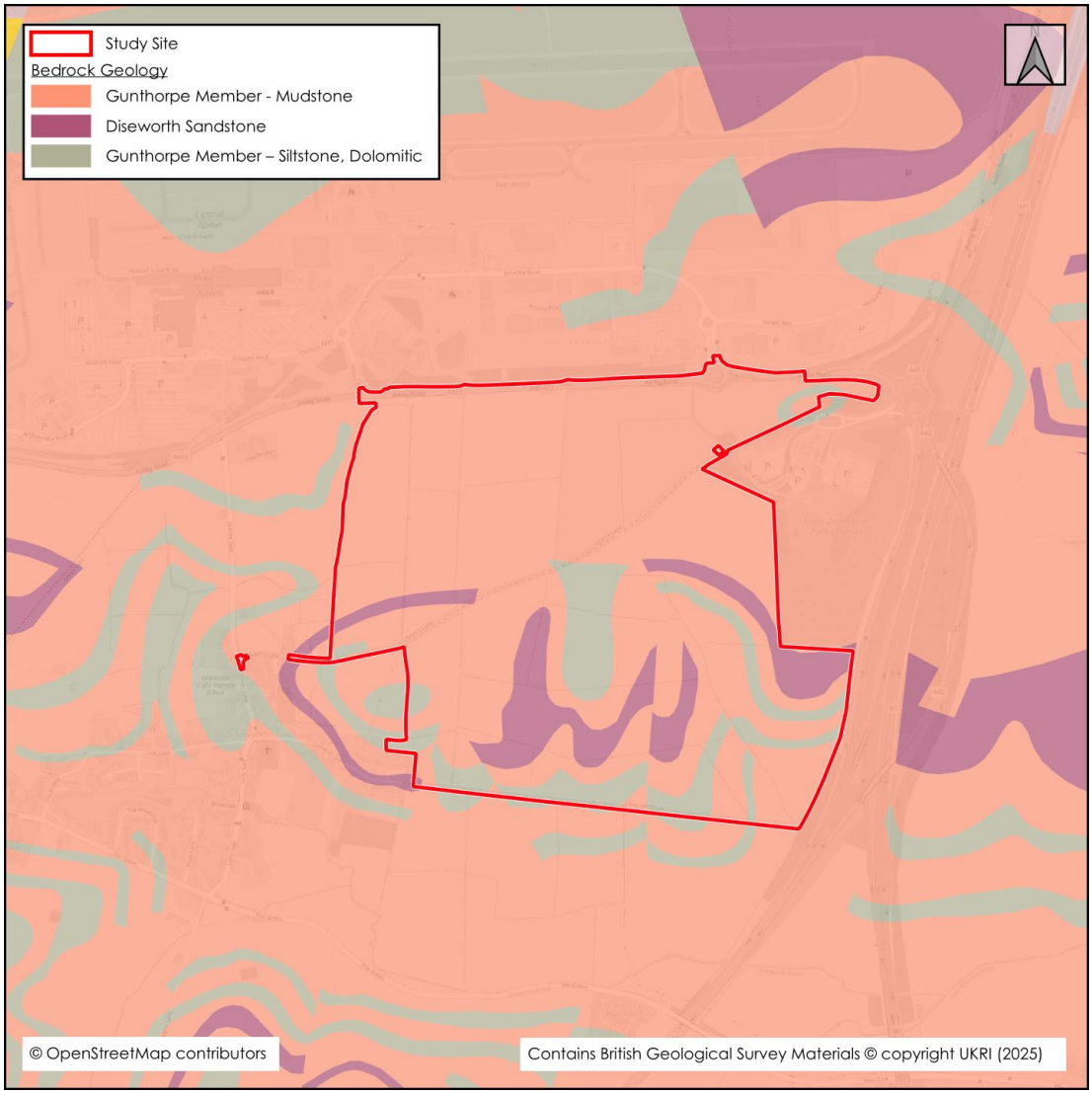


Figure 4.3: BGS Bedrock Map

4.12 Superficial deposits of Glaciofluvial Deposits, Mid Pleistocene – Sand and Gravel, Oadby Member – Diamicton and Head – Clay, Sand and Gravel are expected to be present within the study site. The superficial deposits are shown in **Figure 4.4**.

4.13 The Glaciofluvial Deposits are designated Secondary A Aquifers, defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The Oadby Member – Diamicton and Head – Clay, Silt, Sand and Gravel are designated Secondary Undifferentiated assigned in cases where it has not been possible to attribute either category A or B to a rock type.

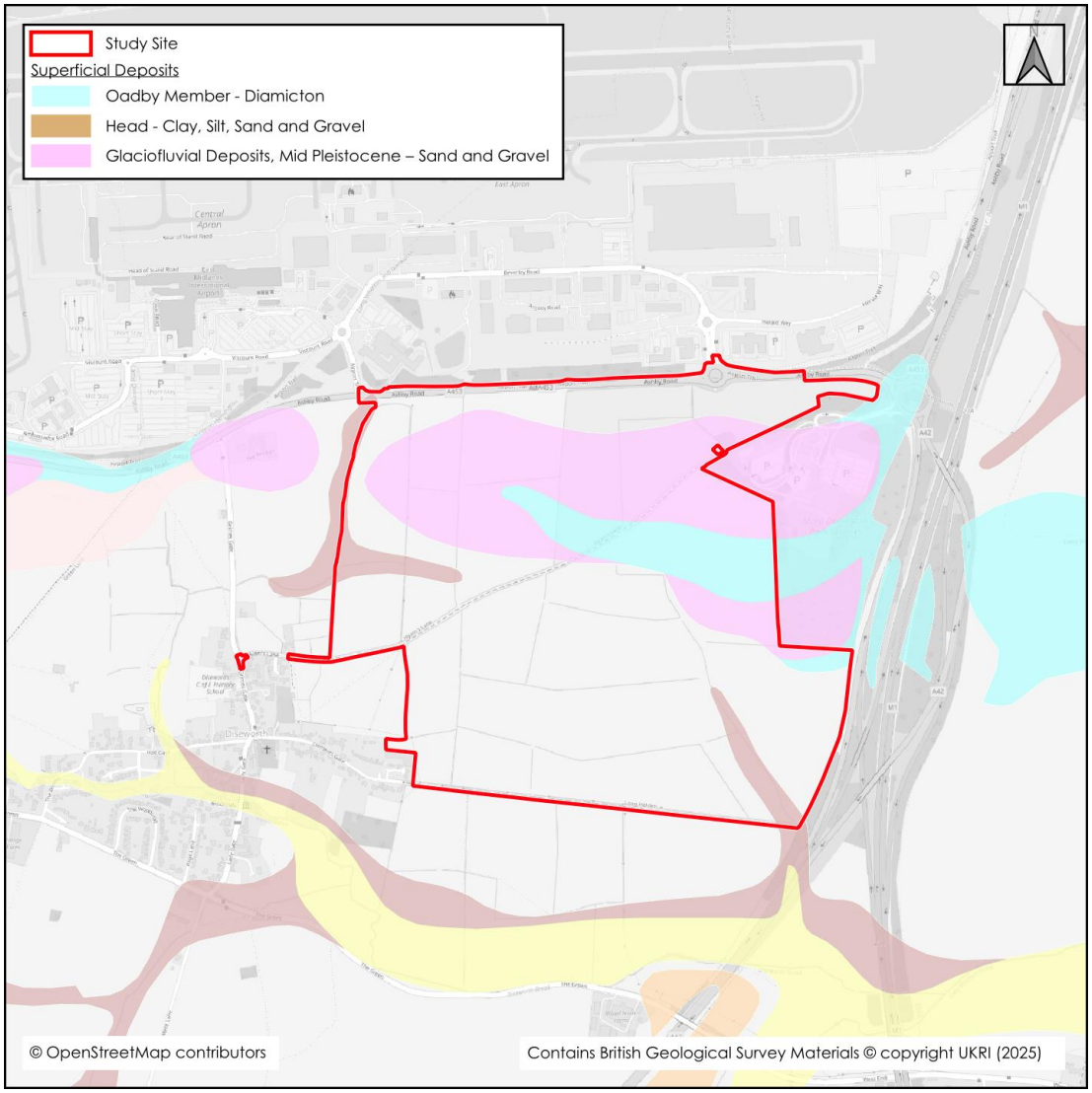


Figure 4.4: BGS Superficial Deposits

4.14 There are no BGS borehole logs located within the study site, but there are three borehole logs in areas immediately surrounding the site underlain by similar geologies (references: SK42NE80, SK42NE158 and SK42SE248). Groundwater levels in these logs range between 4.0 metres below ground level (m bgl) and 7.9m bgl. A further log located to the east (SK42SE244) notes shallow perched shallow groundwater; however, this sits within Made Ground and is therefore not considered to be representative of the natural groundwater levels.

4.15 The North West Leicestershire 2015 SFRA Update states that while the majority of the district is at a low risk from groundwater flooding, parts of North West Leicestershire are susceptible to rising groundwater due to the large-scale closure of the coal mines within the Leicestershire and South Derbyshire coalfield. However, the study site is well removed from areas where historical mining has occurred as per mapping produced by The Coal Authority[21]. It is therefore considered that the groundwater risk from these closures would not impact the study site.

[21] The Coal Authority Interactive Mapping (Interactive Map Viewer | Coal Authority (bgs.ac.uk))

4.16 The North West Leicestershire SFRA does not include groundwater flood risk mapping. However, while the study site does not fall within Nottinghamshire, the Greater Nottingham SFRA Addendum[22] includes groundwater susceptibility mapping that provides coverage. This data suggests that the study site falls within an area where 25% to 50% of the land is potentially susceptible to groundwater flooding. However, the study site is relatively elevated in comparison to the surrounding area and it is raised above the nearby watercourses and floodplains. Therefore, it is considered that the land identified to be potentially susceptible to groundwater flooding is most likely to be associated with the nearby low-lying areas, such as the Diseworth Brook floodplain.

4.17 The Factual Ground Investigation Report (reference: 765514-01) prepared by Fairhurst outlines findings from extensive intrusive ground investigations. This has confirmed the following ground conditions:

- Topsoil (proven from the surface to a maximum depth of between 0.10m and 0.85m bgl);
- Isolated occurrences of Made Ground (proven to a maximum depth of 0.20m and 3.00m bgl), with the deeper Made Ground encountered within the northern site area (location of anticipated historically infilled clay pits – TP08 and BH04);
- Superficial deposits of The Oadby Member and Glaciofluvial Deposits (proven to maximum depths of 16.40m bgl and 17.30m bgl, respectively); and
- Bedrock geology of The Gunthorpe Member and Diseworth Sandstone (proven to a maximum depth of 18.50m bgl for the former, with the maximum depth of the latter not proven).

4.18 Soils were found to be comprise stiff clay beneath a layer of topsoil. Based on the observed conditions, it was anticipated that there would be limited infiltration potential and this was confirmed through a series of eight soakaway tests. Of the eight tests undertaken, two returned a very slow permeability rate of 10^{-6} m/s while the other six tests did not return an infiltration rate at all.

4.19 Groundwater monitoring suggested that two groundwater bodies are present, with a perched layer at a depth of 1.25 m bgl and the groundwater body within the Glaciofluvial, Weathered Gunthorpe Member and Gunthorpe Member at 15.32 m bgl (84.90 m AOD and 52.7 m AOD).

4.20 It was reported that the ground investigations found the ditch in the study site to be dry throughout the works. Therefore, this is likely to be seasonally dry, with its main purpose to drain surface water runoff from the adjacent fields.

4.21 Based on the low permeability of the geology, the local topography, and the measured depth of groundwater, the risk of groundwater emergence in the site is considered to be low. Any potential emergence would be most likely to occur in the low-lying river valleys and floodplains of the Hall Brook and Diseworth Brook.

[22] Greater Nottingham Strategic Flood Risk Assessment Addendum

4.22 However, there is a risk that the perched groundwater could be encountered during the construction phase due to the proposed reprofiling of the site. This risk should be considered in the design of the earthworks. This is discussed further within **Section 5**.

Flood Risk from Reservoirs & Large Waterbodies

4.23 Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain water in times of flood. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.24 To help identify the area potentially at risk, reservoir failure flood risk mapping has been prepared and published by the EA. This shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. The map displays a worst-case scenario and is only intended as a guide. An extract of the mapping is shown in **Figure 4.5**.

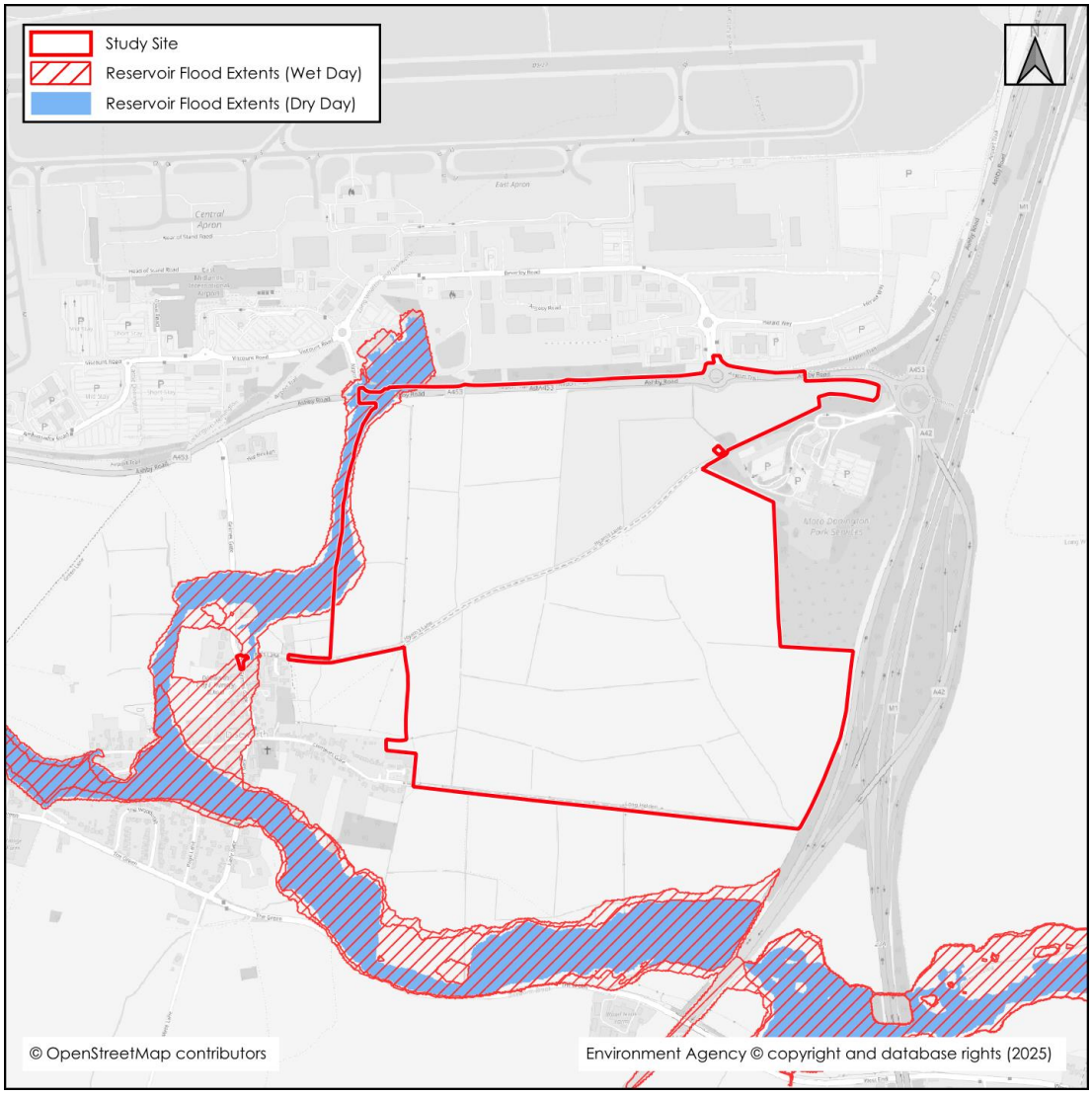


Figure 4.5: EA Reservoir Failure Mapping

4.25 There are two flooding scenarios shown on the reservoir flood maps: a 'dry-day' and a 'wet-day'. The 'dry-day' scenario predicts the flooding that would occur if the dam or reservoir failed when rivers are at normal levels. The 'wet-day' scenario predicts how much worse the flooding might be if a river is already experiencing an extreme flood.

4.26 There is shown to be a slight encroachment of both 'dry-day' and 'wet-day' reservoir failure extents in the very west of the study site, the location of the proposed community park and outside of the area actually proposed for built development. These extents are associated with the Central East Area Balancing Pond of the EMIA.

4.27 The reservoir is operated and maintained by EMIA who have ultimate responsibility for the safety of their reservoir assets. Their responsibilities include regular safety inspections, any necessary design or repairs undertaken where required and an annual statement produced on the operation and maintenance regime. Based on the safety legislation in place and the maintenance and repair responsibilities of EMIA, the actual probability of a significant failure is considered to be low.

4.28 As the proposed built development is removed from the failure flood extents, it is not at risk from this potential source of flooding. This also means that the development will not change the reservoir classification.

5. FLOOD RISK MITIGATION

5.1 **Section 4** has identified the sources of flooding which could potentially pose a risk to the study site. This section of the FRA sets out the mitigation measures which are to be incorporated to address and reduce the risk of flooding to within acceptable levels.

Surface Water Drainage Strategy

5.2 The EMG2 Main Site is essentially wholly greenfield in nature. Storm water will currently drain through a combination of very limited infiltration into the soils and rapid surface water runoff to the local watercourses. The proposed development will introduce large areas of impermeable surfaces which will lead to an increase in surface water runoff, which could cause a detrimental impact to downstream flood risk unless appropriately mitigated.

5.3 The proposed development aims to manage the additional surface water runoff, and address the minor flood risk posed by the shallow surface water overland flows routes that can occur in the baseline conditions, through the implementation of a surface water drainage strategy.

5.4 The drainage strategy will be designed to intercept and store rainwater falling on the development before releasing it to the downstream watercourse. Full details of the drainage strategy are available within the accompanying Sustainable Drainage Statement (SDS) prepared by BWB Consulting (reference: EMG2-BWB-ZZ-XX-RP-CD-0001).

5.5 The drainage strategy will include an attenuated surface water discharge rate, equivalent to a 39% reduction to the greenfield (pre-development) 1 in 1-year runoff rate. Therefore, the surface water discharge rate from the site will be below existing greenfield runoff rates, thereby offering a degree of downstream betterment.

5.6 The excess surface water runoff will be stored within a combination of on-plot below ground storage tanks and above ground SuDS features that will be designed to accommodate the 1 in 100-year storm with a 25% uplift to reflect future climate change. Additionally, the storage will be designed to contain the larger 1 in 100-year +40% climate change storm event within their freeboard.

5.7 The drainage strategy seeks to direct all surface water runoff from the EMG2 Main Site development to the outfall in the southern-eastern corner of the study site, which outfalls to the Diseworth Brook downstream of Diseworth. Therefore, a reduction in the volume and rate of surface water runoff directed towards the Hall Brook and the existing downstream flood risk issues in Diseworth will be provided.

5.8 These surface water drainage principles have been built into the integrated Long Whatton & Diseworth hydraulic model, to allow them to be tested and ascertain the potential impact of the development on the downstream Hall Brook and Diseworth Brook catchment. Further details on how these principles were integrated into the model are included within the hydraulic modelling report (**Appendix 6**). The post-development

modelled floodplain extents and peak flood depths are illustrated in **Figure 5.1** and **Figure 5.2**.

5.9 Peak flood depths were compared against the equivalent baseline scenario to identify changes to flood risk outside of the development area. This analysis has been mapped and is included within the accompanying hydraulic modelling report (**Appendix 6**). The analysis from the 1 in 100-year +40% storm event is included as **Figure 5.3** for ease of reference.

5.10 The development is shown to offer a marginal reduction in downstream flood risk, of between 0.01m and 0.25m, during the 1 in 100-year +40% storm event. In Diseworth, the benefits are most pronounced on the Hall Brook, where the betterment is a result of the runoff from the EMG2 Main Site development area being redirected away from the village. On the Diseworth Brook, the benefits are most evident upstream of the A42 embankment, where the benefits are as a result of surface water runoff from the development area being attenuated at a significantly restricted rate within the EMG2 Works.

5.11 Downstream of the A42 and M1, the development is shown to offer a nominal reduction in flood levels across the village of Long Whatton. During the 1 in 100-year +40% storm event, flood depths are reduced between 0.01m and 0.10m. This is a result of the reduced discharge rate offered by the EMG2 Main Site development.

5.12 To help manage surface water runoff within the development site, ground levels will be profiled to encourage pluvial runoff and overland flows to flow away from the built development towards the nearest drainage feature.

5.13 The road infrastructure or landscaped corridors should be used to provide drainage exceedance (overland flood flow) routes through the development and towards the swales and basins, for storms events that exceed the capacity of the drainage system.

5.14 In the event that the capacity of the swales and basins are exceeded, exceedance flows should be directed towards the outfall in south-eastern corner of the study site and away from Diseworth in the first instance.

5.15 Further information on the drainage approach is provided within the accompanying SDS by BWB Consulting (reference: EMG2-BWB-ZZ-T-CD-0001_SDS).

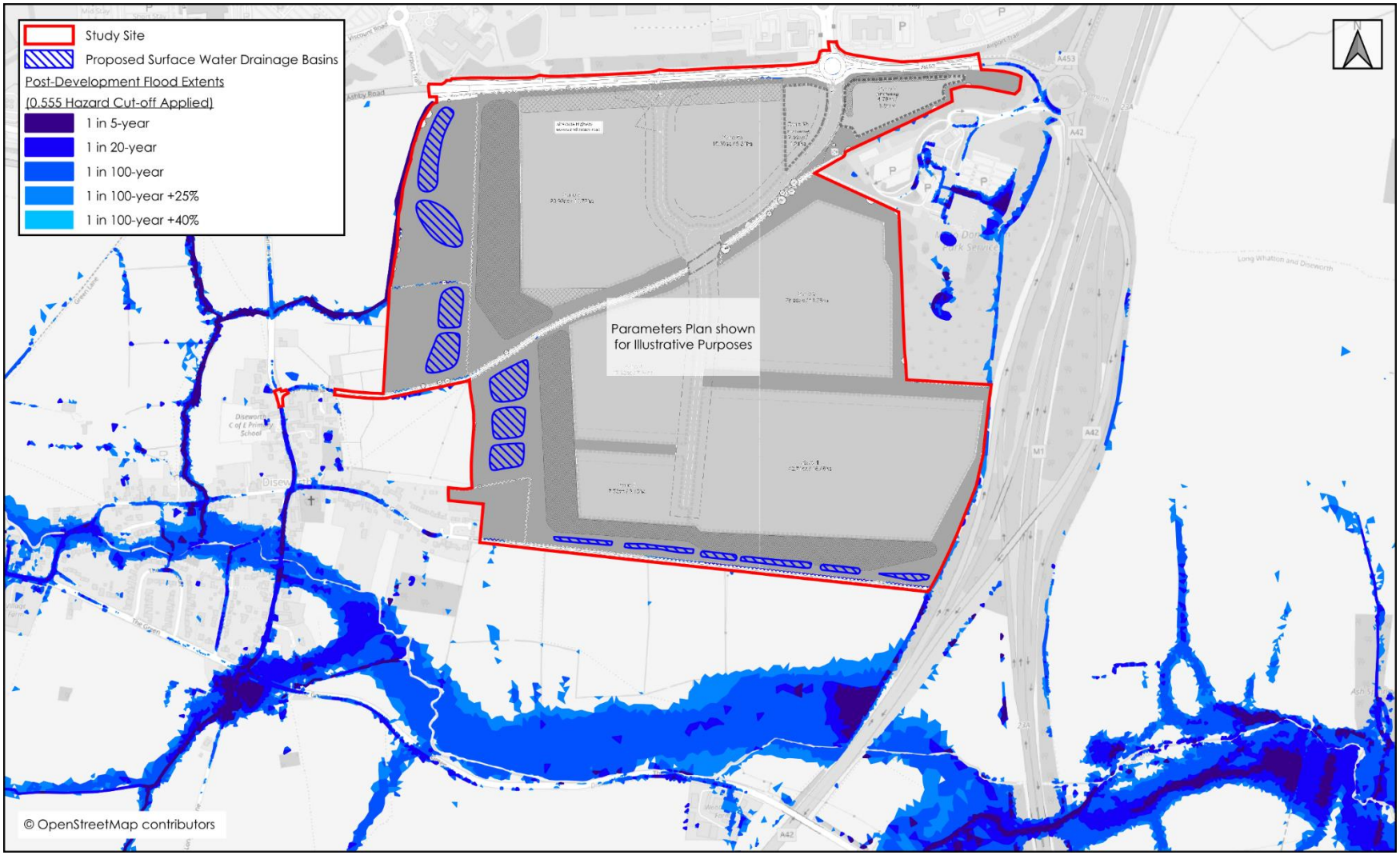


Figure 5.1: Post-Development Conditions Modelled Floodplain Extents

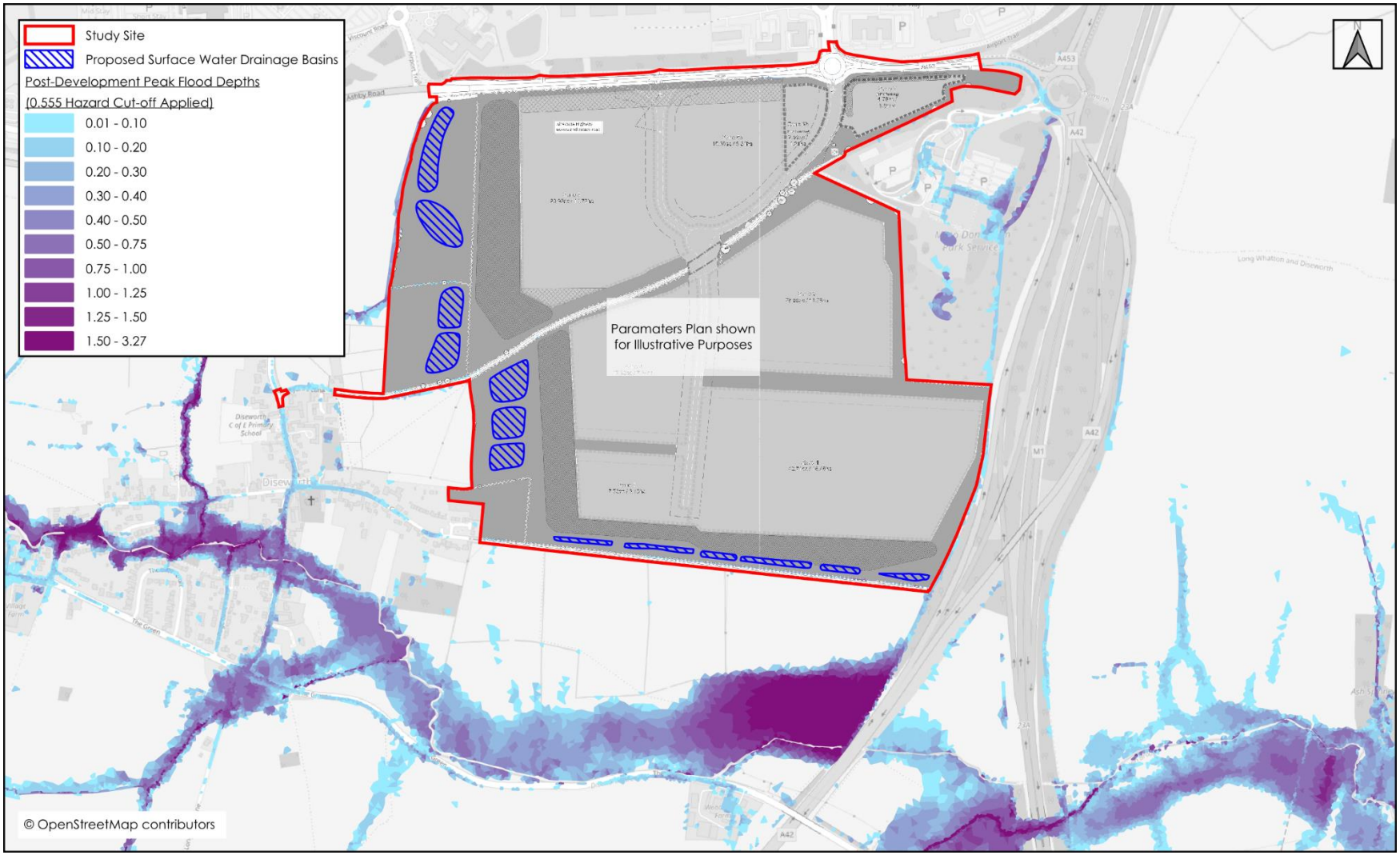


Figure 5.2: Post-Development Conditions 1 in 100-year +40% Modelled Peak Flood Depths

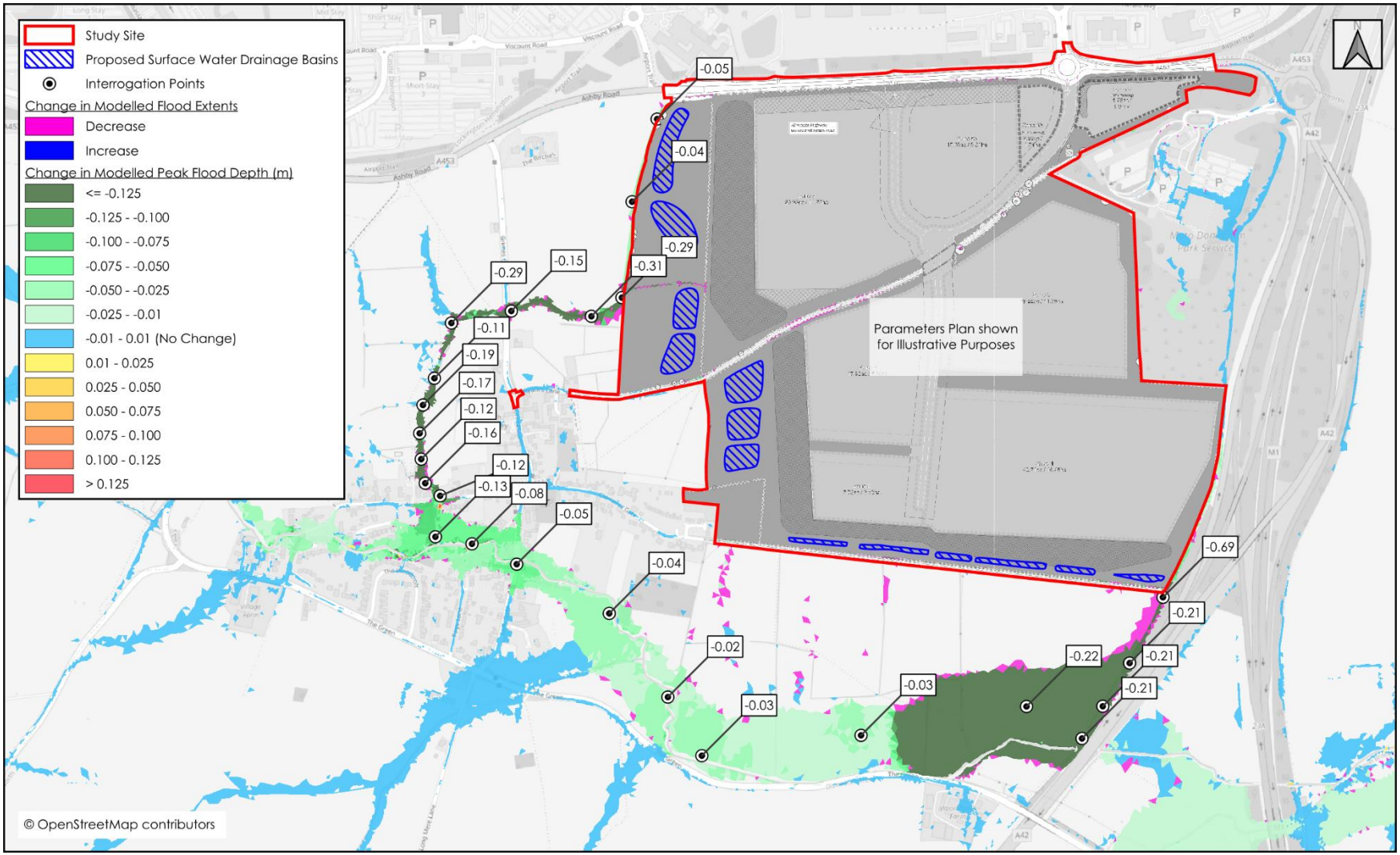


Figure 5.3: Change in Flood Depths Due to Development 1 in 100-year +40% Storm Event

5.16 The Highway Improvements associated with creating a new access from the A453 and creating a new pedestrian crossing will increase the impermeable area draining into the A453 highway drainage. At this stage, it is expected that this will be accommodated within the existing drainage infrastructure through the addition of new surface water storage infrastructure constructed in the location of the works. This will allow the additional runoff to be stored at the location it is generated and drain into the downstream drainage network when capacity is available. This approach will allow the downstream drainage network to be retained and will ensure that pass-on flows are retained at the existing rate.

Land Drainage

5.17 As reported in **Section 4**, anecdotal evidence from the local residents has identified that runoff towards properties on Clements Gate, Long Holden and Langley Close (to the south-west of the study site), has been observed historically. The EMG2 Main Site built development is proposed on areas of the study site that would not contribute to these flow pathways. However, to help manage the surface water runoff from the landscaped areas, drainage features, such as filter drains or similar, are proposed on the south-western boundary to help intercept and direct runoff from the landscaped areas away from the village.

5.18 The potential to encounter groundwater should be considered during the construction phase of the development, particularly during the excavations and reprofiling of the site. It is recommended that groundwater levels are monitored during the construction phase and where groundwater is encountered, appropriate dewatering and land drainage measures are employed.

5.19 It is recommended that appropriate land drainage is incorporated around the study site, such as at the base of any large landscape bunds and earthwork batters, to intercept surface water runoff and any groundwater that may emerge.

Safe Access and Egress

5.20 Access and egress for the EMG2 Main Site via Ashby Road (A453) is shown to be at low risk from surface water on the carriageway during the 1 in 100-year +40% event post-development. Post-development hazard mapping for the 1 in 100-year +40% event at the site is shown in **Figure 5.4**. During this event, there is predominantly a low flood hazard along most of the road's length past the study site. Therefore, safe access and egress is considered achievable.

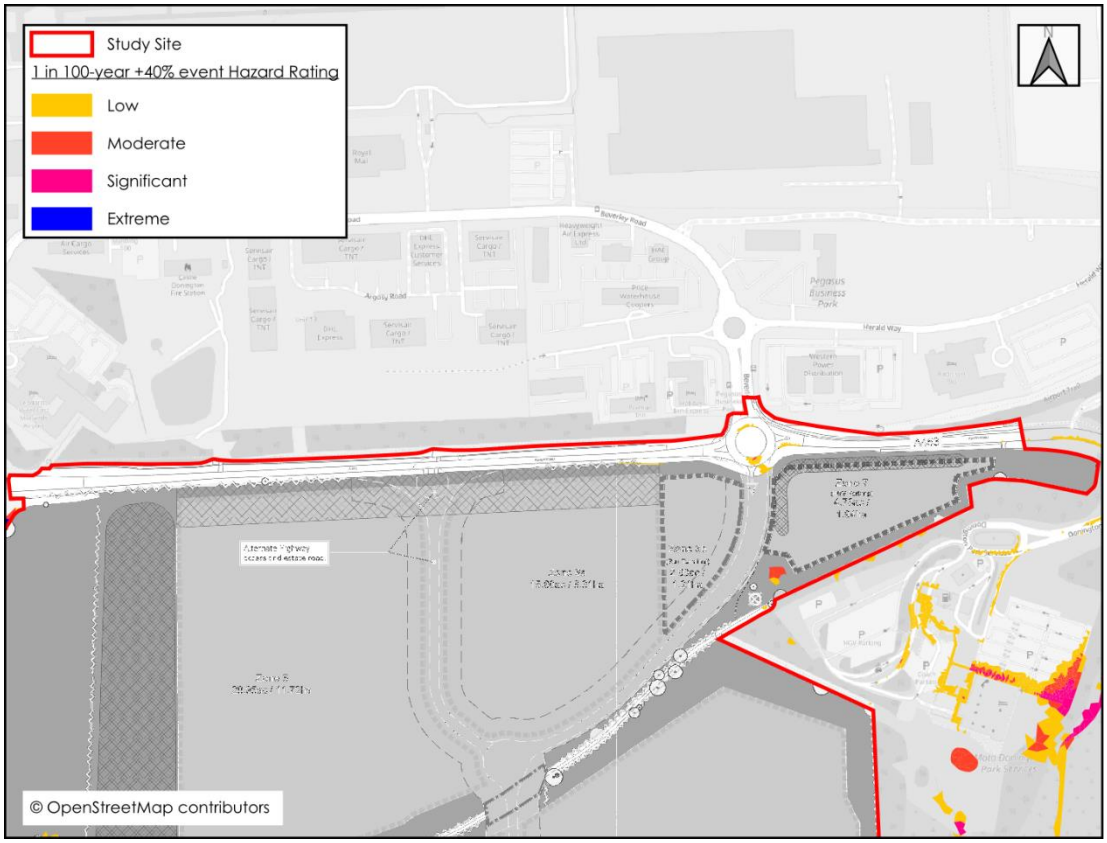


Figure 5.4: Post-development Conditions 1 in 100-year +40% Hazard Rating

Foul Water Drainage Strategy

5.21 Foul water will be drained from the development separately to surface water.

5.22 There will be early and ongoing consultation with Severn Trent Water to confirm the most appropriate point of discharge for foul drainage and to allow time for any necessary infrastructure improvements to be implemented.

5.23 Further information on the drainage approach is provided within the accompanying SDS by BWB Consulting (reference: EMG2-BWB-ZZ-T-CD-0001_SDS).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 This Flood Risk Assessment (FRA) has been prepared in accordance with the requirements set out in the National Policy Statement for National Networks (NPSNN). It has been produced on behalf of SEGRO (Properties) Ltd in respect of a Development Consent Order (DCO) for the proposed East Midlands Gateway Phase 2 (EMG2) and the East Midlands Gateway Rail Freight Interchange Material Change Order (MCO).

6.2 The DCO and MCO comprises a number of elements which, due to their geographical locations, are covered by three individual assessments of flood risk. This FRA focuses on the 'EMG2 Works' and the 'Highway Works' located within the immediate vicinity of the EMG2 Main Site – referred to as the study site within the report.

6.3 This report demonstrates that the proposed development is not at significant flood risk subject to the recommended flood mitigation strategies being implemented. Moreover, the development will not increase flood risk to the wider catchment area subject to suitable management of surface water runoff.

6.4 The identified risks and mitigation measures are summarised within **Table 6.1**:

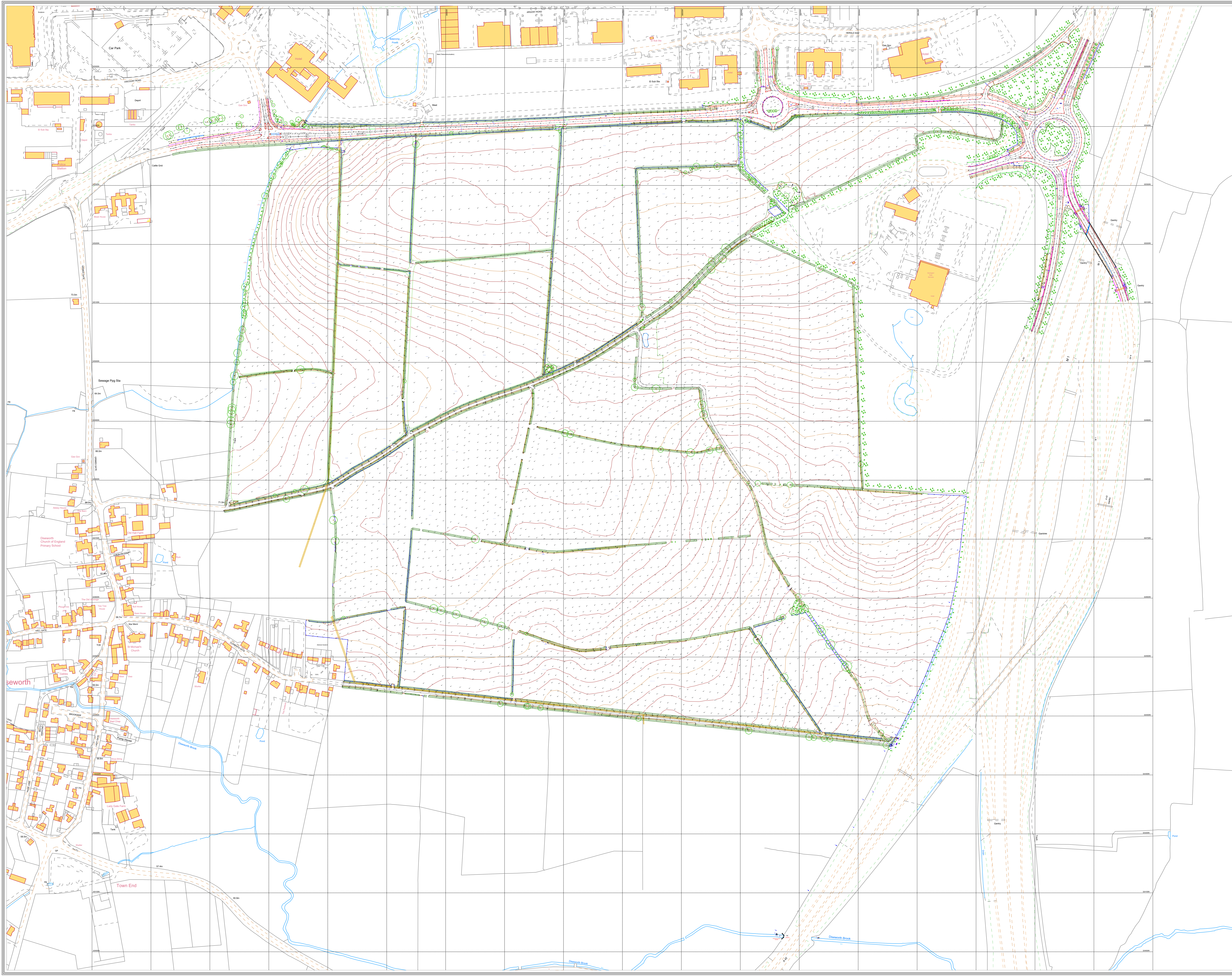
Table 6.1: Summary of Flood Risk Assessment

Flood Source	Risk & Proposed Mitigation Measures
Fluvial	The study site is shown to be located entirely within Flood Zone 1, which is land at a low risk of fluvial flooding. This has been confirmed through detailed hydraulic modelling.
Pluvial	The hydraulic model has identified the potential for surface water overland flow pathways to form within the study site under the baseline conditions; these flow towards the Hall Brook and the Diseworth Brook. The flow routes are relatively shallow and originate from within the study site itself. There are no significant overland flow pathways passing through the study site from upstream third-party land. The proposed development aims to address this minor flood risk through the implementation of a surface water drainage strategy. Surface water runoff will be stored within a combination of above ground SuDS features and on-plot below ground storage tanks, or similar. These will be designed to accommodate the 1 in 100-year storm with a 25% uplift to reflect future climate change. Additionally, the storage will be designed to contain the larger 1 in 100-year +40% climate change storm event within their freeboard. Ground levels in the EMG2 Main Site development will be profiled to encourage pluvial runoff and overland flows to flow away from the built development towards the nearest drainage feature. The proposed road infrastructure or landscaped corridors should be used to provide drainage exceedance (overland flood flow) routes through the built development and towards the swales and basins. In the event that the capacity of the swales and basins are overwhelmed, exceedance flows should be directed towards the south-eastern corner of the study site and away from Diseworth in the first instance.

Flood Source	Risk & Proposed Mitigation Measures
	To help manage the surface water runoff from the landscaped areas drainage features, such as filter drains or similar, are proposed on the south-western boundary to help intercept and direct runoff from the landscaped areas away from Diseworth.
Other flood risk sources	The EMG2 Main Site development is considered to be at a low risk from sewers, groundwater, and reservoirs and large waterbodies. However, there is a risk that groundwater could be encountered during the construction phase due to the proposed reprofiling. This risk should be considered in the design of the earthworks and drainage strategies. It is recommended that groundwater levels are monitored during the construction phase and where groundwater is encountered, appropriate dewatering and land drainage measures are employed. It is recommended that appropriate land drainage is incorporated around the site, such as at the base of any large landscape bunds and earthwork batters, to manage surface water runoff and any groundwater.
Impact of the Development	The existing EMG2 Main Site is essentially wholly greenfield in nature. Storm water currently drains through a combination of very limited infiltration into the soils and surface water runoff to the local watercourses. The proposed development will introduce large areas of impermeable surfaces which will lead to an increase in surface water runoff. The potential impact this could have on downstream flood risk will be mitigated through implementation of a surface water drainage strategy. The drainage strategy will be designed to intercept and store rainwater falling on the development, before discharging it to the local watercourse, at a rate equivalent to a 39% reduction to the greenfield (pre-development) 1 in 1-year runoff rate. Additionally, the drainage strategy seeks to direct all surface water runoff from the development to an outfall located downstream of Diseworth, thus reducing the volume and rate of surface water runoff directed towards the village. This arrangement will provide a marginal reduction downstream flood risk.
This summary should be read in conjunction with BWB's full report. It reflects an assessment of the study site based on information received by BWB at the time of production.	

APPENDICES

Appendix 1: Topographical Survey



N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
D1	446495.174	325438.125	87.825
D2	446600.470	325437.555	88.372
D3	446736.974	325433.074	88.162
D4	446866.060	325436.925	86.081
D5	446878.948	325372.322	85.201
D6	446947.221	325448.280	84.444
GH2	446101.602	325402.684	84.812
GH3	445856.595	325399.844	81.922
N2	446987.475	325220.991	83.873
R1	445582.903	325381.661	75.930
R2	445469.850	325374.391	79.274
SA1	446415.699	325424.224	87.303

OS Note:

Some services may have been omitted due to parked vehicles. The Ordnance Survey tile is to be used as a guide only.

OS Buildings — *Surveyed Buildings*

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigation Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

Buildings; Wall; Kerb line; Line marking; Drop kerb; Centre line; Top of bank

Overhead Cable; Concrete edge; Tarmac edge; Grass verge; Canopy/Overhang; Verge; Bottom of bank

1 / 100.000 — Station and Name / Station Level

Tree / Bush / Sapling

Area of Undergrowth

Woodland

R: Ridge Level
E: Eaves Level
F: Flat Roof Level
Gate

Fence types:
I\W Interwoven
I\R Iron Railings
W\M Wire Mesh
P\R Post & Rail
P\W Post & Wire
C\L Chain Link
W\P Wooden Panels
C\B Close Boarded
S\P Steel Palisade

IC	Inspection chamber	Bo	Bollard
PInv	Pipe invert	IB	Illuminated bollard
Gy	Gully	Bin	Rubbish bin
Bg	Back gully	Vp	Vent pipe
Dp	Down pipe	Grl	Ground light
Pipe	Pipe above ground	Lbox	Letter box
MH	Manhole	Stmp	Tree Stump
WL	Water level	Sty	Stile
Fl	Flood light	IFL	Internal floor level
Lp	Lamp post	THL	Threshold level
Tp	Telegraph post	Sp	Sign post
Ep	Electricity post	TH	Trialhole
Tl	Traffic light	BH	Borehole
Bus	Bus stop	ELC	Electric
Sv	Stop valve	BT	British Telecom
St	Stop tap	C'box	Control box
Er	Earth rod	TT	Tactile
Wm	Water meter	BP	Brick paved
Gas	Gas valve	CPS	Concrete paving slabs
Av	Air valve	CVR	Cover
ICU	Unidentified inspection	R/wall	Retaining wall
Wo	Wash out	TWL	Top of Wall Level
Re	Rodding eye	TCL	Tree canopy level
BB	Belisha beacon	G:	Girth
CTV	Cable tv	MG	Multi girth
Mkr	Marker post	IC	Inspection chamber
Gmkr	Gas marker post	CL:	Cover level
So	Soffit	IL:	Invert level
Fh	Fire hydrant	UTR	Unable to raise

Rev	Date	Description	Drawn	Q. Ref.
1	30.08.22	Additional survey	TC	GH14669

greenhatch group

Topographical Surveys
Site Engineering
Utility / CCTV Surveys
Measured Building Surveys
3D Laser Scanning
Revit & BIM Models

Rowan House
Duffield Road
Little Eaton
Derby
DE21 5DR
Tel (01332) 830044 Fax (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

St Albans
Unit B, The Courtyard
Alban Park
St Albans
Hertfordshire
AL4 0LA
t. (01727) 854481

Newcastle
24 Riverside Studios
Amethyst Road
Newcastle Bus. Park
Newcastle-U-Tyne
NE4 7YL
t. (01912) 736391

London
27, Cornwall Terrace Mews
Regents Park
London
NW1 5LL
t. (02072) 241806

CLIENT
SEGRO PLC

PROJECT
EMG Phase 2 (Freeport)
Hyam's Lane, Diseworth
Derby, DE74 2QD

TITLE
Topographical Survey

SCALE	DATE
A0@ 1: 2000	19.04.22
DRAWN	QUALITY REF
JM	GH13710

Level datum	See note
Grid orientation	See note
Job number	34529A

Drawing No.	Rev.
34529A_T	1

Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

Appendix 2: Parameters Plan

Parameters Plan

Scale 1:2,500

Key

- EMG2 DCO order limits
- Land not in order limits within which existing telecom mast retained
- Development Area - Zones 1-7
  Including car parking, service yards, buildings, amenity building's, on plot landscaping, roads, paths utilities and infrastructure
- No Building Area
  No buildings in this zone
- Zone 1 and 2 boundary
- Estate Road and zone boundary
- Limits of deviation - Estate Road
- Landscape corridor between development zones with limits of deviation
- Area for development signage for upto 4 signs
  Sign Board - max size (including supporting frame) 7.5m High x 18.3m, Wide x 1.3m Deep
  Totem Sign - max size (including supporting frame) 15.5m High x 4.0m, Wide x 4.0m Deep
- Community Park
- Point of restriction to Hyam's Lane and Long Holden -No public access for motor traffic east of this point
- Hyam's Lane retained and improved west of point of restriction. East of point of restriction to be converted to shared use cycle track.
- 74.10m — Fixed spot heights in metres above ordnance datum, identified along the ridge-line of each length of strategic mitigation mounding +/- 0.5m.
- 74.10m / 75.40m — Between any two consecutive spot heights marked on the ridge, the height of the bund at its ridge will be no lower than the lower of the two spot heights and no higher than the higher of the two spot heights.
- Open Land/Landscaping area to include substation, retained vegetation, mitigation mounding, proposed planting, paths, attenuation & SUDs, retaining walls, retained agricultural land, publicly accessible landscape space and other applicable features.
- Areas within which strategic mitigation mounding is to be provided
- Existing Hedgerow Retained
- Area within which estate road will cross Hyams Lane
- Trees to be retained

DRAFT

50m SCALE 1:2500

- Dimensions are in millimeters, unless stated otherwise.
- Scaling of this drawing is not recommended.
- It is the recipients responsibility to print this document to the correct scale.
- All relevant drawings and specifications should be read in conjunction with this drawing.

EMG 2 Main Site - Development Schedule

Development Zone	Number of Units erected pursuant to the DCO	Maximum amount of floorspace to be erected pursuant to the DCO per zone (m^2)	Finished floor level (in metres above ordnance datum) (Allowable deviation +/- 1.5m)	Maximum Ridge Height (in metres above ordnance datum)
Zone 1	1 to 2	75,000	67.250	91.250
Zone 2	1 to 4	20,000	70.600	88.600
Zone 3	1 to 4	60,000	79.400	103.400
Zone 4	1 to 2	45,000	76.050	94.050
Zone 5	1 to 4	75,000	84.200	102.200
Zone 6	1 to 4	40,000	88.000	106.000
Zone 7	1 to 4	5,000	89.500	96.500
Maximum Total Floor Space*		**300,000**		

* This total floor space is the maximum floor space (excluding mezzanine space) that will be developed across Zones 1-7 notwithstanding that the maximum floor space stated for each Zone combined would exceed this figure i.e. it is the overall floor space cap for Zones 1-7 excluding mezzanine floor space. In addition to this total floor space figure, up to 200,000 sqm of floor space can be provided in the form of mezzanine floor space to units within the development.

Note: Maximum Buildings heights are fixed by the maximum ridge height in metres above ordnance datum compared to the finished floor levels. The finished floor levels shown in the table above can vary 1.5m up or down. For example, if the finished floor levels are constructed at the level shown in the table without variation the maximum building heights in Zones 2, 4, 5 and 6 would be 18m and in zones 1 and 3 would be 24m being the difference between the maximum ridge height specified in the fifth column of the table and the finished floor level in the fourth column of the table.

In addition to the limits set out in the schedule above the following units and floor space are permitted

Bus terminal and office within Zone 6	1-2	500	
HGV parking and amenity building within Zone 7	1-2	500	

Please Note:

- The Maximum ridge height specified excludes any associated fire escape stairwells or key clamp roof top handrails etc.

- all areas specified are gross internal areas (GIA) unless otherwise stated.

Rev	Date	Details of issue / revision	Drw	Rev
P11	19.06.25	Titleblock amended	LM	MS
P10	30.05.25	Minor amendments to key and plan	LM	MS
P9	30.05.25	Minor amendments to key and plan	LM	MS
P8	28.05.25	Country Park boundary added	LM	MS
P7	20.05.25	Boundary and schedule amended	LM	MS
P6	12.05.25	Schedule updated	LM	MS
P5	25.04.25	Signage area amended to north of zone 7	LM	MS
P4	15.04.25	Levels, tree retention and plot boundaries updated	LM	MS
P3	28.01.25	Title block changes	LM	MS
P2	28.01.25	Minor amendments to key and plan	LM	MS

ISSUES & REVISIONS

SEGRO

THE EAST MIDLANDS GATEWAY PHASE 2 AND HIGHWAY ORDER 202[ ]

Drawing Title

PARAMETERS PLAN EMG2 MAIN SITE AND COMMUNITY PARK

Scale	1:2500	Drawn	LM
Size	A1	Reviewed	MS

Regulation	Document
5(2) (o)	DCO 2.5

Drawing Status

CONSULTATION DRAFT

Drawing No.	Revision
EMG2-UMC-SI-01-DR-A-0088	P11

Appendix 3: NPPF Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classifications (recreated from the NPPF Planning Practice Guidance)

Vulnerability Classification	Description
Essential infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood. • Wind turbines. • Solar farms.
Highly Vulnerable	• Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'.)
More Vulnerable	• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place. • Car parks.
Water-Compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Flood Zone Compatibility (recreated from the NPPF Planning Practice Guidance)

Flood Zone	Vulnerability Classification				
	Essential infrastructure	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**	**Water Compatible**
Flood Zone 1 (Low Probability)	Development is appropriate	Development is appropriate	Development is appropriate	Development is appropriate	Development is appropriate
Flood Zone 2 (Medium Probability)	Development is appropriate	To be deemed appropriate an exception test is required to demonstrate: • The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk • the sustainability benefits of the development to the community outweigh the flood risk.	Development is appropriate	Development is appropriate	Development is appropriate
Flood Zone 3a (High Probability)	To be deemed appropriate an exception test is required to demonstrate: • The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk the sustainability benefits of the development to the community outweigh the flood risk. Additionally, essential infrastructure should be designed and constructed to remain operational and safe in times of flood.	Development should not be permitted	To be deemed appropriate an exception test is required to demonstrate: • The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk • the sustainability benefits of the development to the community outweigh the flood risk.	Development is appropriate	Development is appropriate

Flood Zone	Vulnerability Classification				
	Essential infrastructure	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**	**Water Compatible**
Flood Zone 3b (The Functional Floodplain)	To be deemed appropriate an exception test is required to demonstrate: • The development will be safe for its life time without increasing flood risk elsewhere, and where possible reduce overall flood risk • the sustainability benefits of the development to the community outweigh the flood risk. Additionally, development should be designed and constructed to: • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows and not increase flood risk elsewhere.	Development should not be permitted	Development should not be permitted	Development should not be permitted	Development is appropriate if designed and constructed to: • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows and not increase flood risk elsewhere.

Appendix 4: LLFA Correspondence

From: [redacted]
Sent: 04 April 2022 17:36
To: [redacted]
Subject: RE: 220500 EMG2 - Telephone call 31/03/22

Follow Up Flag: Follow up
Flag Status: Completed

This email originated from outside of our organisation. Please exercise caution with content, links and attachments.

Many thanks,

I've got back in touch with ARCADIS so you should hear something shortly. If not, please get in touch and I'm happy to raise this on your behalf.

Many thanks

[redacted]

From: [redacted]
Sent: 04 April 2022 17:28
To: [redacted]
Subject: RE: 220500 EMG2 - Telephone call 31/03/22

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

[redacted]

Further to your call, the statement below has been updated where highlighted.

Regards

[redacted]

From: [redacted]
Sent: 31 March 2022 16:49
To: [redacted]
Subject: RE: 220500 EMG2 - Telephone call 31/03/22

[redacted]

Thank you for the call today, it was very useful to talk things through. I have summarised our key discussion points below:

- A hydraulic model of the Diseworth Brook is available and you will ask Simon at Arcadis to contact me to provide a copy for our use.

- The Hall Brook flows down the western boundary of our site, but this is not the main source of flood risk to the village.

- Ideally you would like to see discharge rates from our site to the Hall Brook minimised as far as practicable, and you would not be against diverting all runoff from our site further to the east, bypassing the village entirely. The feasibility of this aspiration is subject to a number of assessments

and design stages, but is something that we are targeting. The discharge rate must not exceed the greenfield rate.

- The flood risk issues in Diseworth are to receive relief through property level protection and natural flood risk management. No flood alleviation options include this site.

- It will be necessary to provide a standoff from the watercourse top of bank to any development. The default in Leicestershire is a 5m standoff from top of bank. Consideration should be made on how the standoff will be accessed, to allow the ongoing maintenance of the watercourse by the riparian owner.

- Due to the proximity of the airport and the risk of bird strike, we will not be able to offer wetlands, basins, or ponds as surface water storage features. All surface water storage will need to be located underground.

- You are happy to be reconsulted and kept up to date with the development and drainage strategy as it progresses.

Thanks again for your time and your help.

Kind regards

[redacted]
Associate Director | Flood Risk & Water Environment | BWB Consulting Limited

[redacted]

From:
Sent: 22 March 2022 16:57
To: [redacted]>
Subject: 220500 EMG2 - Request for Information

[redacted]

I have been passed your details by my colleague Matthew Day who you have previously assisted on the Diseworth Brook.

We have been asked to start investigations at the second phase of the East Midlands Gateway development site, located next to East Midlands Airport and the village of Diseworth – a location plan is attached for reference. I understand that Leicestershire have a hydraulic model of the Diseworth Brook which would provide coverage of this site. Would it be possible to request a copy of the model?

The site itself appears to be at a low flood risk, but we are aware of the downstream issues in Diseworth and so we think it may be useful to obtain the model to help our assessment. It would also be useful to understand if there are any local requirements relating to drainage and/or flood risk for this site. I have also put in an enquiry to the general LLFA email address (see below).

Once we have collated the available data and appraised the baseline conditions at the site, we think it would be useful to have a meeting to discuss the future development and the approach to drainage. Would you be the best person to talk to about this, or would it be one of your colleagues?

Kind regards

[redacted]
Associate Director | Flood Risk & Water Environment | BWB Consulting Limited

[redacted]

From: [redacted]
Sent: 22 March 2022 16:38
To: [redacted]
Subject: 220500 EMG2 - Request for Information

Dear Sir, Madam

We are undertaking a study of flood risk within the vicinity of East Midlands Airport and the village of Diseworth in Leicestershire. A site location plan is attached.

To aid our assessment please could I also ask for any relevant information relating to Flood Risk that you may hold. A list of potential information is provided below:

- Hydraulic model data of the Diseworth Brook and the Hall Brook
- Any available data on historical flood events (photos, wrack marks, etc.)
- Any available hydrometric data of recorded flows or water levels within the area
- Details of any potential flood alleviation works that may be planned in the local catchment
- Details of any sensitive flooding receptors that may be present within the study area or on the downstream river channels.
- Monitoring records for the catchment.
- Water quality data for the catchment.
- Abstractions on the watercourses.
- Waterbody catchment objectives/mitigation measures for the catchment.
- All available WFD data including fish, macrophytes, invertebrates, water quality and hydromorphological data for the catchment.
- Details of any sensitive waterbody receptors that may be present in the local area or on the downstream river channels.

Please note that this list is not exhaustive, therefore please let us know of any other relevant information that we may need to consider.

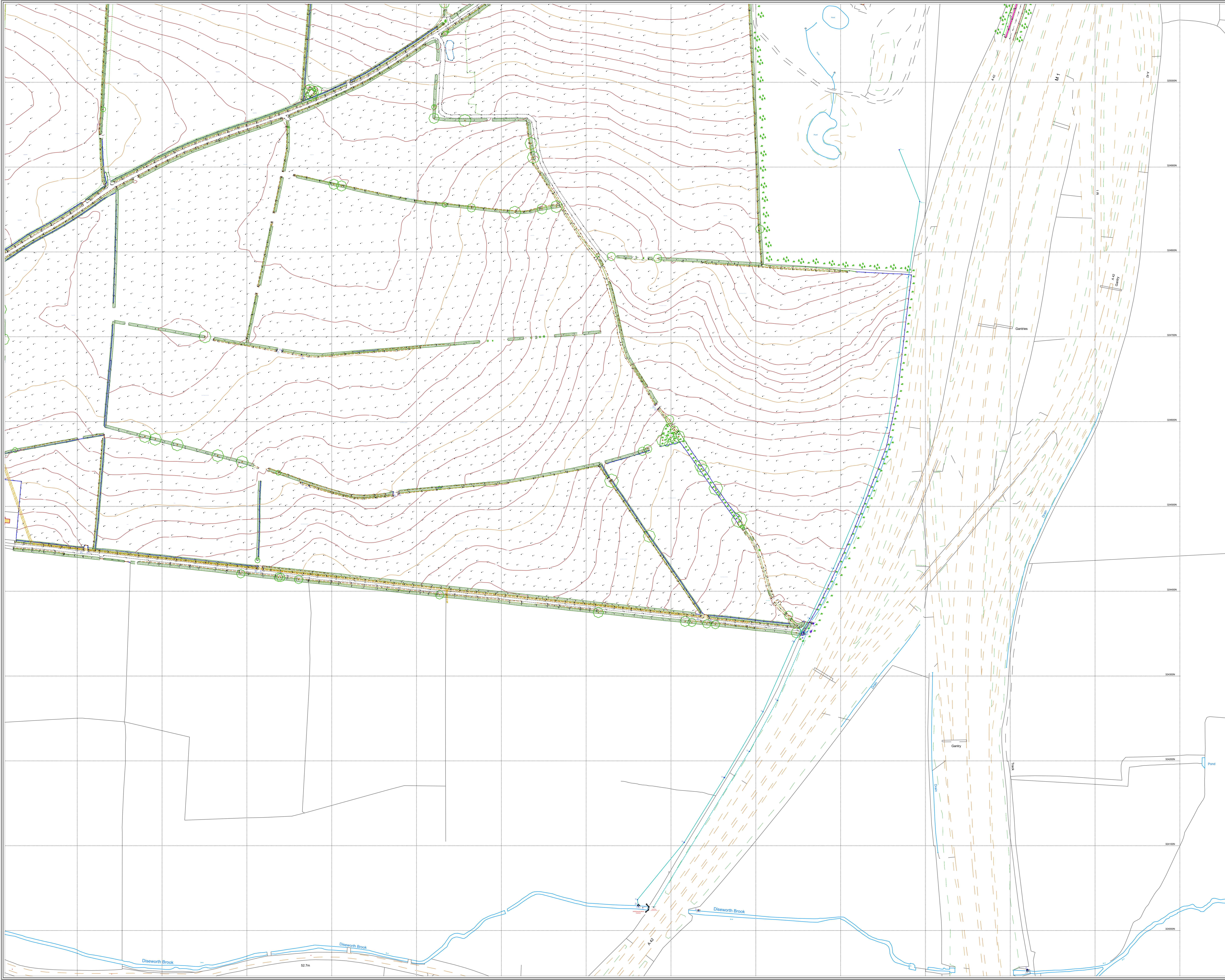
Please let me know if you need any more information to help you answer this query.

Kind regards

[redacted]
Associate Director | Flood Risk & Water Environment | BWB Consulting Limited

[redacted]

Appendix 5: CCTV Survey



N

CCTV KEY

- Surface Water
- Assumed Surface Water
- Foul Water
- Assumed Foul Water
- Combined Water
- Assumed Combined Water

ABBREVIATIONS

B	Sewer broken at this point
BJ	Broken joint
CC	Circumferential crack
CCJ	Circumferential crack on joint
CIPR	Cured in place repair
CIPP	Cured in place pipe
CM	Multiple cracks
CMJ	Cracks multiple on joint
CN	Connection
CUD	Loss of vision (silt)
CUW	Camera underwater
CUZ	Loss of vision (Camera under water)
CW	Combined water
CXD	Connection defective
CXI	Connection intruding
DC	Diameter of pipe changes
DEC	Settled desposits hard or compacted
DEE	Encrustation scale light
DEEJ	Encrustation light at joint
DEF	Debris foulings
DER	Debris rubble
DES	Debris silt
DEX	Othersettled deposits
DEZ	Other attached deposits
FC	Fracture circumferential
FCJ	Fracture circumferential on joint
FL	Fracture longitudinal
FM, FMJ	Fracture multiple
FW	Foul water
GY	Gully
H	Hole
HJ	Hole at joint
HPWJ	High pressure water jetting
IR	Infiltration running
IS	Infiltration seeping
JD	Joint displaced medium
JN	Junction
JXD	Junction defective
LD	Line down
LL	Line left
LR	Line right
LU	Line up
NCA	No camera access
MH	Manhole
OJ	Open joint medium
OBP	Obstruction (external pipe or cable)
REM	General observation at this point with explaination
RFJ	Roots fine at joint
RMJ	Roots mass at joint
RE	Rodding eye
RT	Root tap
SW	Surface Water
SA	Survey Abandoned
UTL	Unable to locate
UTR	Unable to raise
UTS	Unable to survey
WL	Water level
XP	Collapse to pipe

DISCLAIMER

Whilst every effort has been taken in the preparation of this drawing, the original land marks/apparatus configuration may have been altered since the survey/drawing was produced. The user shall make further enquiries and investigations to satisfy himself as to the accuracy of this drawing and position of the apparatus. The exact positions of the apparatus should be verified by the use of suitable detection devices and safe digging practices in accordance with HSG47, further advice on the location of apparatus should be recommended by the owner. No representation is made by Greenhatch Group, its agents or servants as to the accuracy, completeness, and sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the users responsibility to ensure that the information on the location of apparatus is provided to all persons (either direct labour or contractors) working in proximity to the apparatus.

Rev	Date	Description	Drawn	Q. Ref.

greenhatch group

Topographical Surveys · Site Engineering · Utility / CCTV Surveys · Measured Building Surveys · 3D Laser Scanning · Revit & BIM Models

Rowan House
Duffield Road
Little Eaton
Derby
DE21 5DR
Tel (01332) 830044 Fax (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

St Albans: Unit B, The Courtyard, Alban Park, St Albans, Hertfordshire, AL4 0LA, t. (01727) 854481
Newcastle: 24 Riverside Studios, Amethyst Road, Newcastle Bus. Park, Newcastle-U-Tyne, NE4 7YL, t. (01912) 736391
Poland: ul. Panewnicka 91, 40-761 Katowice, Poland, t. 0048 32 202 2292, www.greenhatch.pl

CLIENT
SEGRO PLC

PROJECT
EMG Phase 2(Freeport)
Hyam's Lane, Diseworth
Derby, DE74 2QD

TITLE
CCTV Survey

SCALE	DATE
A1@ 1: 2000	14/09/2022
DRAWN	QUALITY REF
AB	SB

Level datum	Drawing supplied by client
Grid orientation	Drawing supplied by client
Job number	34529A

Drawing No.	Rev.
34529A_CCTV	0

Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.
All dimensions should be checked on site prior to design and construction.
Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

CCTV Drainage Survey

East Midlands Gateway, Longholden.

CCTV DRAINAGE SURVEY REPORT

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Table of Contents

Project Name	Project Number	Project Date
site	1	30/08/2022

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Project Information

Project Name	Project Number	Project Date
site	1	30/08/2022

Client

Company: Greenhatch Group
Contact: Adam Sneddon
Department: Associate Director
Street: Rowan House, Duffield Road
Town or City: Little Eaton, Derby
Post Code: DE21 5DR
Phone: 01332 830044
Email: utilities@greenhatch-group.co.uk

Site

Contact: Adam Sneddon
Department: Associate Director
Street: East Midlands Gateway
Town or City: Longholden
Phone: 01332 830044
Email: utilities@greenhatch-group.co.uk

Contractor

Company: Sewer Surveys UK Ltd
Contact: Andrew Froggatt/ Simon Bennett
Department: Directors
Street: 14B Orgreave Close
Town or City: Sheffield
Post Code: S13 9NP
Phone: 0114 251 3481
Mobile: 07837 768649/07808 220160
Email: info@sewersurveysuk.co.uk

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH01X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	06/09/22	15:16	1	No Rain Or Snow	Not Specified	MH01X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	1

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH01
Road:	Long Holden (Off)	**Inspected Length:**	89.73 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	89.73 m	**Downstream Node NAMS Ref**	MH02
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:777

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m					
MH01					
0.00	MH	Start node, manhole, reference: MH01	00:04:32		
0.00	WL	Water level 0 % height/diameter	00:04:38		
16.50	REM	General remark: GENERAL PHOTO	00:05:04	_393a61b3-f6db-40ee-b008-51	
89.73	MHF	Finish node type, manhole	00:14:17		
MH02					
Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH01X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
1	Downstream	MH01X	1	

_393a61b3-f6db-40ee-b008-516be3f87a8c.jpg, 00:05:04, 16.50 m
General remark, GENERAL PHOTO

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH02X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
2	1	06/09/22	15:16	1	No Rain Or Snow	Not Specified	MH02X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	2

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH02
Road:	Long Holden (Off)	**Inspected Length:**	90.35 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	90.35 m	**Downstream Node NAMS Ref**	MH03
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	450 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments: WRONG SIZE ON RECORDING
Recommendations:

Scale: 1:783	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH02						
	0.00	MH	Start node, manhole, reference: MH02	00:00:08		
	0.00	WL	Water level 0 % height/diameter	00:00:14	_3791dc5 5-d929-46 18-bb2e-0	
	90.35	MHF	Finish node type, manhole	00:12:10		
MH03 Depth: m						

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH02X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
2	Downstream	MH02X	1	

_3791dc55-d929-4618-bb2e-0e758fedf0dd.jpg, 00:00:14, 0.00 m
Water level 0 % height/diameter

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH04X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
3	1	06/09/22	15:16	1	No Rain Or Snow	Not Specified	MH04X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	3

Town or Village:		**Inspection Direction:**	Upstream	**Upstream Node NAMS Re**	MH04
Road:	Long Holden (Off)	**Inspected Length:**	89.04 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	89.04 m	**Downstream Node NAMS Ref**	MH01
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:771

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m					
MH01					
0.00	MH	Start node, manhole, reference: MH04	00:00:08		
0.00	WL	Water level 0 % height/diameter	00:00:16		
1.64	CN	Connection at 06 o´clock, dia 350 mm: BACKDROP	00:01:16		
30.07	GP	General Condition photograph	00:05:17	_65dd77e6-3518-4ae3-b96e-6	
89.04	MHF	Finish node type, manhole	00:12:26		
MH04					
Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH04X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
3	Upstream	MH04X	1	

_65dd77e6-3518-4ae3-b96e-6d0e2b6ca48d.jpg, 00:05:17, 30.07 m
General Condition photograph

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH05X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
4	1	06/09/22	15:17	1	No Rain Or Snow	Not Specified	MH05X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	4

Town or Village:		**Inspection Direction:**	Upstream	**Upstream Node NAMS Re**	MH05
Road:	Long Holden (Off)	**Inspected Length:**	65.09 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	65.09 m	**Downstream Node NAMS Ref**	MH04
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:564

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH04					
0.00	MH	Start node, manhole, reference: MH05	00:00:13		
0.00	WL	Water level 0 % height/diameter	00:00:18		
31.36	GP	General Condition photograph	00:05:20	_9bc4a41 2-f72a-40b c-90e6-bc	
65.09	MHF	Finish node type, manhole	00:09:52		
MH05 Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH05X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
4	Upstream	MH05X	1	

_9bc4a412-f72a-40bc-90e6-bc7fabc42619.jpg, 00:05:20, 31.36 m
General Condition photograph

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH03X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
5	1	06/09/22	15:17	1	No Rain Or Snow	Not Specified	MH03X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	5

Town or Village:		**Inspection Direction:**	Upstream	**Upstream Node NAMS Re**	MH03
Road:	Long Holden (Off)	**Inspected Length:**	87.86 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	87.86 m	**Downstream Node NAMS Ref**	MH06
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:761

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m					
MH06					
0.00	MH	Start node, manhole, reference: MH03	00:00:14		
0.90	WL	Water level 0 % height/diameter	00:00:18		
30.52	GP	General Condition photograph	00:03:47	_f72338c4-c7ce-444e-ab20-4d	
87.86	MHF	Finish node type, manhole	00:10:07		
MH03					
Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH03X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
5	Upstream	MH03X	1	

_f72338c4-c7ce-444e-ab20-4d2f6b493fe3.jpg, 00:03:47, 30.52 m
General Condition photograph

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH06X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
6	1	06/09/22	15:17	1	No Rain Or Snow	Not Specified	MH06X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	6

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH06
Road:	Long Holden (Off)	**Inspected Length:**	90.10 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	90.10 m	**Downstream Node NAMS Ref**	MH07
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:781

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH06					
0.00	MH	Start node, manhole, reference: MH06	00:00:07		
0.00	WL	Water level 0 % height/diameter	00:00:11		
41.93	GP	General Condition photograph	00:05:50		
90.10	MHF	Finish node type, manhole	00:10:51		
MH07 Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH07X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
7	1	06/09/22	15:17	1	No Rain Or Snow	Not Specified	MH07X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	7

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH07
Road:	Long Holden (Off)	**Inspected Length:**	65.27 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	65.27 m	**Downstream Node NAMS Ref**	MH08
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:566

Depth: m
MH07

Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH07	00:00:41		
0.01	WL	Water level 5 % height/diameter	00:00:43		
15.15	GP	General Condition photograph	00:02:51	_47d42bd8-e68a-4e2a-90c6-4	
32.95	GP	General Condition photograph	00:05:07	_30785355-44ad-45cd-aeeb-8	
54.13	GP	General Condition photograph	00:07:36	_68d97c09-de87-401e-bf68-54	
65.27	MHF	Finish node type, manhole	00:09:09		

MH08
Depth: m

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH07X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
7	Downstream	MH07X	1	

_47d42bd8-e68a-4e2a-90c6-400fcb21c963.jpg, 00:02:51, 15.15 m
General Condition photograph

_30785355-44ad-45cd-aeeb-84b5ac5cf1b2.jpg, 00:05:07, 32.95 m
General Condition photograph

_68d97c09-de87-401e-bf68-5477b2e16760.jpg, 00:07:36, 54.13 m
General Condition photograph

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH08X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
8	1	06/09/22	15:17	Not Specified	No Rain Or Snow	Not Specified	MH08X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	8

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH08
Road:	Long Holden (Off)	**Inspected Length:**	33.60 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	33.60 m	**Downstream Node NAMS Ref**	MH09
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:291

Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH08	00:00:03		
0.01	WL	Water level 5 % height/diameter	00:00:05		
15.33	GP	General Condition photograph	00:02:21	_e4bb61a4-ab0a-467d-93a4-6	
33.60	MHF	Finish node type, manhole	00:05:02		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Sewer Surveys UK Ltd
14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH08X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
8	Downstream	MH08X		

_e4bb61a4-ab0a-467d-93a4-65bbdad6d939.jpg, 00:02:21, 15.33 m
General Condition photograph

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH09X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
9	1	06/09/22	15:17	Not Specified	No Rain Or Snow	Not Specified	MH09X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	9

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH09
Road:	Long Holden (Off)	**Inspected Length:**	90.25 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	90.25 m	**Downstream Node NAMS Ref**	MH10
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:782

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m					
MH09					
0.00	MH	Start node, manhole, reference: MH09	00:00:00		
0.01	WL	Water level 5 % height/diameter	00:00:00		
15.66	GP	General Condition photograph	00:03:03	_390ca381-15d0-418f-a45c-e2	
32.66	GP	General Condition photograph	00:05:45	_96ce8c79-5e2d-478d-bf0e-58d	
90.25	MHF	Finish node type, manhole	00:11:14		
MH10					
Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH09X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
9	Downstream	MH09X		

_390ca381-15d0-418f-a45c-e2b560419aa3.jpg, 00:03:03, 15.66 m
General Condition photograph

_96ce8c79-5e2d-478d-bf0e-58d48171529f.jpg, 00:05:45, 32.66 m
General Condition photograph

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Section Inspection - 06/09/2022 - MH11X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
10	1	06/09/22	15:17	Not Specified	No Rain Or Snow	Not Specified	MH11X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	10

Town or Village:		**Inspection Direction:**	Upstream	**Upstream Node NAMS Re**	MH11
Road:	Long Holden (Off)	**Inspected Length:**	89.59 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	89.59 m	**Downstream Node NAMS Ref**	MH12
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:776

Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH11	00:00:19		
0.00	WL	Water level 0 % height/diameter	00:00:23		
20.03	GP	General Condition photograph	00:02:44	_c52f416b-4ec1-4efa-af89-8528	
50.15	GP	General Condition photograph	00:05:17	_612b8f39-a50e-4149-ade1-68	
89.59	MHF	Finish node type, manhole	00:08:35		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH11X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
10	Upstream	MH11X		

_c52f416b-4ec1-4efa-af89-8528181f16d6.jpg, 00:02:44, 20.03 m
General Condition photograph

_612b8f39-a50e-4149-ade1-68436daa23fc.jpg, 00:05:17, 50.15 m
General Condition photograph

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Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH10X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
11	1	06/09/22	15:18	Not Specified	No Rain Or Snow	Not Specified	MH10X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	11

Town or Village:		**Inspection Direction:**	Upstream	**Upstream Node NAMS Re**	MH10
Road:	Long Holden (Off)	**Inspected Length:**	89.68 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	89.68 m	**Downstream Node NAMS Ref**	MH11
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: **1:777**

Position [m]	Code	Observation	MPEG	Photo	Grade
0.00	MH	Start node, manhole, reference: MH10	00:00:09		
0.00	WL	Water level 0 % height/diameter	00:00:13		
21.16	GP	General Condition photograph	00:02:40	_b9f9db0a-aa81-41f0-8fe2-300d	
49.57	GP	General Condition photograph	00:05:13	_6d3894c7-fb04-44b7-aa8c-0f8	
89.68	MHF	Finish node type, manhole	00:09:08		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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Section Pictures - 06/09/2022 - MH10X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
11	Upstream	MH10X		

_b9f9db0a-aa81-41f0-8fe2-300d445328ad.jpg, 00:02:40, 21.16 m
General Condition photograph

_6d3894c7-fb04-44b7-aa8c-0f877416d629.jpg, 00:05:13, 49.57 m
General Condition photograph

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info@sewersurveysuk.co.uk

Section Inspection - 06/09/2022 - MH12X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
12	1	06/09/22	15:18	Not Specified	No Rain Or Snow	Not Specified	MH12X

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	12

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH12
Road:	Long Holden (Off)	**Inspected Length:**	86.73 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	86.73 m	**Downstream Node NAMS Ref**	MH13
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:751

Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m					
MH12					
0.00	MH	Start node, manhole, reference: MH12	00:00:07		
0.00	WL	Water level 0 % height/diameter	00:00:11		
24.64	GP	General Condition photograph	00:02:50	_03a2ace7-3884-44ee-9bcc-2	
60.31	GP	General Condition photograph	00:05:21	_f22a16c7-2dd7-4872-a5fb-448	
86.73	MHF	Finish node type, manhole	00:08:03		
MH13					
Depth: m					

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

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Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 06/09/2022 - MH12X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
12	Downstream	MH12X		

_03a2ace7-3884-44ee-9bcc-249d12e54f09.jpg, 00:02:50, 24.64 m
General Condition photograph

_f22a16c7-2dd7-4872-a5fb-448f33d4f7f3.jpg, 00:05:21, 60.31 m
General Condition photograph

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Section Inspection - 31/08/2022

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
13	1	31/08/22	14:56	Not Specified	No Rain Or Snow	Not Specified	Not Specified

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	13

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	MH13
Road:	Long Holden (Off)	**Inspected Length:**	5.60 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	5.60 m	**Downstream Node NAMS Ref**	OUTLET1
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	375 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50	Position [m]		Code	Observation	MPEG	Photo	Grade
	0.00		MH	Start node, manhole, reference: MH13	00:00:06		
	0.01		WL	Water level 0 % height/diameter	00:00:11		
	0.90	S1	DES	Settled deposits fine 5 % cross-sectional area loss, Start	00:01:28		
	3.08	F1	DES	Settled deposits fine 5 % cross-sectional area loss, Finish	00:02:15		1
	5.12		JDM	Joint displaced medium	00:03:01	_59d4ae3c-aae6-4fce-aa25-b8	1
	5.60		OFF	Finish node type, outfall	00:03:53		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
1	1.0	0.2	1.0	1.0	1	0.0	0.0	0.0	1.0

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Pictures - 31/08/2022

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
13	Downstream			

_59d4ae3c-aae6-4fce-aa25-b87ad489547b.jpg, 00:03:01, 5.12 m
Joint displaced medium

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Section Inspection - 01/09/2022

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
14	1	01/09/22	8:22	Not Specified	No Rain Or Snow	Not Specified	Not Specified

Operator	Vehicle	Camera	Preset Length	Legal Status	NAMS ID
SBY	YR67 VYO	Forward View	Not Specified	Not Specified	14

Town or Village:		**Inspection Direction:**	Downstream	**Upstream Node NAMS Re**	INLET
Road:	Long Holden (Off)	**Inspected Length:**	3.24 m	**Upstream Pipe Depth:**	
Location:		**Total Length:**	3.24 m	**Downstream Node NAMS Ref**	MH14
Surface Type:		**Joint Length:**	2.50 m	**Downstream Pipe Depth:**	

Use:	Surface water	**Pipe Shape:**	C
Type of Pipe:		**Dia/Height:**	525 mm
Flow Control:		**Pipe Material:**	Concrete
Year Constructed:	Not Specified	**Lining Type:**	No Lining
Inspection Purpose:	Routine inspection of condition	**Lining Material:**	No Lining

Comments:
Recommendations:

Scale: 1:50

Position [m]		Code	Observation	MPEG	Photo	Grade
0.00		OC	Start node, other special chamber, reference: INLET	00:00:07		
0.90		WL	Water level 5 % height/diameter	00:00:14		
0.91	S1	DES	Settled deposits fine 5 % cross-sectional area loss, Start	00:00:27		
3.24	F1	DES	Settled deposits fine 5 % cross-sectional area loss, Finish	00:01:30		1
3.24		MHF	Finish node type, manhole	00:01:58		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	**STR Peak**	**STR Mean**	**STR Total**	**STR Grade**	**SER No. Def**	**SER Peak**	**SER Mean**	**SER Total**	**SER Grade**
0	0.0	0.0	0.0	1.0	1	0.0	0.0	0.0	1.0

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14B Orgreave Close, Sheffield
Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Section Profile

Project Name	Project Number	Project Date
site	1	30/08/2022

C, 375 mm

Section	Upstream Node NAMS Ref	Downstream Node NAMS Ref	Date	Road	Pipe Material	Total Length	Inspected Length
1	MH01	MH02	06/09/2022	LONG HOLDEN (OFF)	Concrete	89.73 m	89.73 m
3	MH04	MH01	06/09/2022	LONG HOLDEN (OFF)	Concrete	89.04 m	89.04 m
4	MH05	MH04	06/09/2022	LONG HOLDEN (OFF)	Concrete	65.09 m	65.09 m
5	MH03	MH06	06/09/2022	LONG HOLDEN (OFF)	Concrete	87.86 m	87.86 m
6	MH06	MH07	06/09/2022	LONG HOLDEN (OFF)	Concrete	90.10 m	90.10 m
7	MH07	MH08	06/09/2022	LONG HOLDEN (OFF)	Concrete	65.27 m	65.27 m
8	MH08	MH09	06/09/2022	LONG HOLDEN (OFF)	Concrete	33.60 m	33.60 m
9	MH09	MH10	06/09/2022	LONG HOLDEN (OFF)	Concrete	90.25 m	90.25 m
10	MH11	MH12	06/09/2022	LONG HOLDEN (OFF)	Concrete	89.59 m	89.59 m
11	MH10	MH11	06/09/2022	LONG HOLDEN (OFF)	Concrete	89.68 m	89.68 m
12	MH12	MH13	06/09/2022	LONG HOLDEN (OFF)	Concrete	86.73 m	86.73 m
13	MH13	OUTLET1	31/08/2022	LONG HOLDEN (OFF)	Concrete	5.60 m	5.60 m

Total: 12 Inspections x C 375 mm = 882.54 m Total Length and 882.54 m Inspected Length

C, 450 mm

Section	Upstream Node NAMS Ref	Downstream Node NAMS Ref	Date	Road	Pipe Material	Total Length	Inspected Length
2	MH02	MH03	06/09/2022	LONG HOLDEN (OFF)	Concrete	90.35 m	90.35 m

Total: 1 Inspection x C 450 mm = 90.35 m Total Length and 90.35 m Inspected Length

C, 525 mm

Section	Upstream Node NAMS Ref	Downstream Node NAMS Ref	Date	Road	Pipe Material	Total Length	Inspected Length
14	INLET	MH14	01/09/2022	LONG HOLDEN (OFF)	Concrete	3.24 m	3.24 m

Total: 1 Inspection x C 525 mm = 3.24 m Total Length and 3.24 m Inspected Length

Total: 14 Inspections = 976.13 m Total Length and 976.13 m Inspected Length

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Tel. 0114 251 3481
info@sewersurveysuk.co.uk

Scoring Summary

Project Name	Project Number	Project Date
site	1	30/08/2022

Structural Defects

Section	PLR	Grade	Description
All inspected pipes are in an acceptable structural condition (< grade 3).			

Service / Operational Condition

Section	PLR	Grade	Description
All inspected pipes are in an acceptable service condition (< grade 3).			

Abandoned Surveys

Section	PLR	Description
All inspections complete, none are abandoned.		

Information

These scoring summaries are based on the SRM grading from the WRc.

Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH01	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 30/08/22
Manufacturer:		Grating:

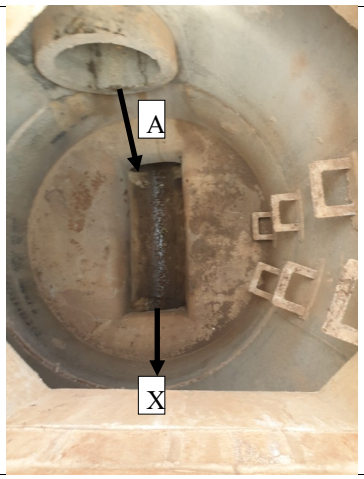
COVER	Shape: DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 4	Depth: 600	Size:600/600	Vermin:	
CHAMBER	Soffit Type:/	No. of Step Irons: 6	No. of Ladders:	No. of Landings:		
Size: 1200/1200	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A	MH04		C	375				CO		1.49	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	X	MH02		C	375				CO		2.67	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH02	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 30/08/22
Manufacturer:		Grating:

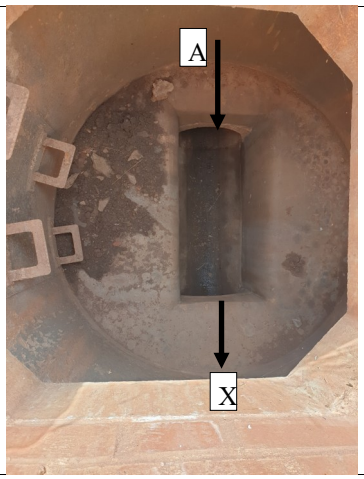
COVER	Shape: DT	Hinged: /	Lockable: /	Duty: M	Size:620/620	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 5	Depth: 680	Size:600/600	Vermin:	
CHAMBER	Soffit Type:/	No. of Step Irons: 5	No. of Ladders:	No. of Landings:		
Size: 1200/1200	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH01		C	375				CO		2.20	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH03		C	375				CO		2.26	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH03	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 30/08/22
Manufacturer:		Grating:

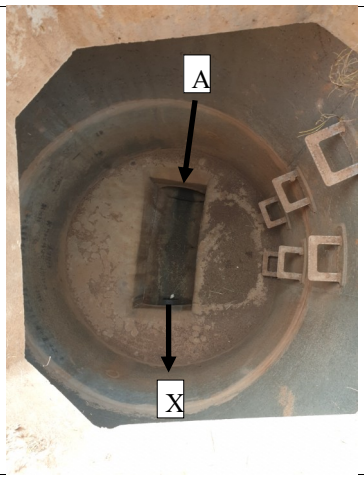
COVER	Shape: DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 2	Depth: 450	Size:600/600	Vermin:	
CHAMBER	Soffit Type:/	No. of Step Irons: 7	No. of Ladders:	No. of Landings:		
Size: 1200/1200	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH02		C	375				CO		2.70	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH06		C	375				CO		2.73	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH06	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 30/08/22
Manufacturer:		Grating:

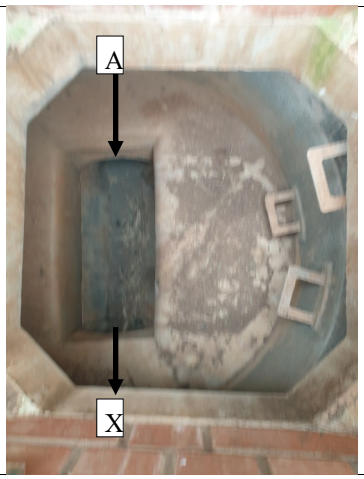
COVER	Shape: DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 2	Depth: 450	Size:600/600	Vermin:	
CHAMBER	Soffit Type:/	No. of Step Irons: 3	No. of Ladders:	No. of Landings:		
Size: 1200/1200	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH03		C	375				CO		1.73	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH07		C	375				CO		1.75	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Job Number:				Survey By: SBY
Grid Ref:	Node Number: MH07			Cover Level:
Location: East Midlands Gateway				
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 30/08/22
Manufacturer:				Grating:

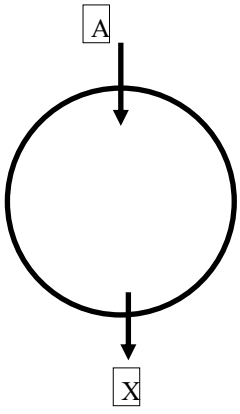
COVER	Shape: DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 2	Depth: 480	Size:600/600	Vermin:	
CHAMBER	Soffit Type:/	No. of Step Irons: 3	No. of Ladders:	No. of Landings:		
Size: 1350/1350	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH06		C	375				CO		2.46	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH08		C	375				CO		2.48	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



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Location: East Midlands Gateway					
Year Laid: Z	Status: PU	Function: SW	Node Type: MH		Survey Date: 31/08/22
Manufacturer:					Grating:

COVER	Shape: DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 2	Depth: 470	Size:600/600	Vermin:	
CHAMBER	Soffit Type:/	No. of Step Irons: 3	No. of Ladders:	No. of Landings:		
Size: 1350/1350	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A	MH07		C	375				CO		1.74	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	X	MH09		C	375				CO		1.77	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:

Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH09	Cover Level:
Location: East Midlands Gateway		

Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 31/08/22
Manufacturer:				Grating:

COVER	Shape: SQ	Hinged: /	Lockable: /	Duty: M	Size:620/620	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 4	Depth: 640	Size:610/610	Vermin:	
CHAMBER	Soffit Type:SL	No. of Step Irons: 4	No. of Ladders:	No. of Landings:		

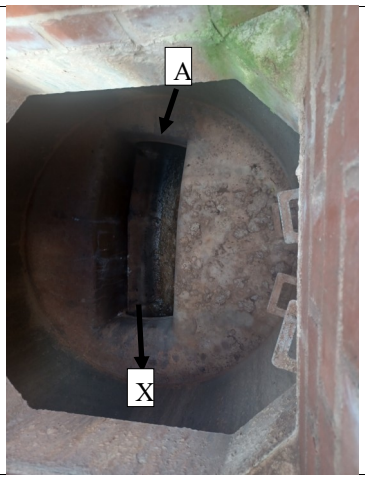
Size: 1350/1350	Const'n Code: CO	Depth of Flow: 5	Depth of Silt:	H of S:

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH8		C	375				CO		2.15	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH10		C	375				CO		1.77	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH10	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 31/08/22
Manufacturer:		Grating:

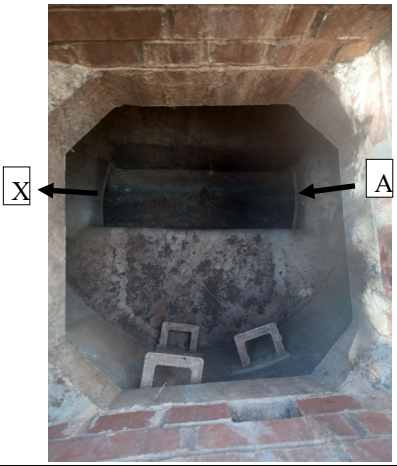
COVER	Shape: SQ	Hinged: /	Lockable: /	Duty: H	Size:620/620	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 5	Depth:	Size:610/610	Vermin:	
CHAMBER	Soffit Type:SL	No. of Step Irons:3	No. of Ladders:	No. of Landings:		
Size: 1350/1350	Const'n Code: CO	Depth of Flow: 5	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A	MH9		C	375				CO		1.99	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	X	MH11		C	375				CO		2.01	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH11	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 31/08/22
Manufacturer:		Grating:

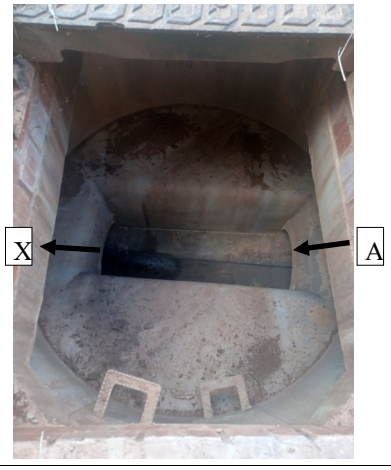
COVER	Shape:SQx2	Hinged: /	Lockable: /	Duty: H	Size:690/690	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 2	Depth: 480	Size:1300/750	Vermin:	
CHAMBER	Soffit Type:SL	No. of Step Irons:2	No. of Ladders:	No. of Landings:		
Size: 1350/1350	Const'n Code: CO	Depth of Flow: 5	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH10		C	375				CO		1.53	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH12		C	375				CO		1.55	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH12	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 31/08/22
Manufacturer:		Grating:

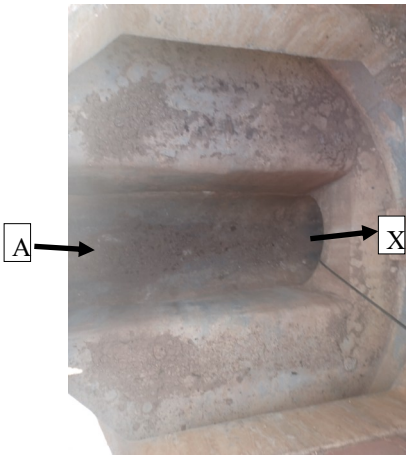
COVER	Shape:SQ	Hinged: /	Lockable: /	Duty: H	Size:750/750	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 1	Depth:430	Size:760/760	Vermin:	
CHAMBER	Soffit Type:SL	No. of Step Irons:1	No. of Ladders:	No. of Landings:		
Size: 1350/1350	Const'n Code: CO	Depth of Flow: 5	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH11		C	375				CO		1.15	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH13		C	375				CO		1.18	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Job Number:					Survey By: SBY
Grid Ref:		Node Number: MH13			Cover Level:
Location: East Midlands Gateway					
Year Laid: Z	Status: PU	Function: SW	Node Type: MH		Survey Date: 31/08/22
Manufacturer:					Grating:

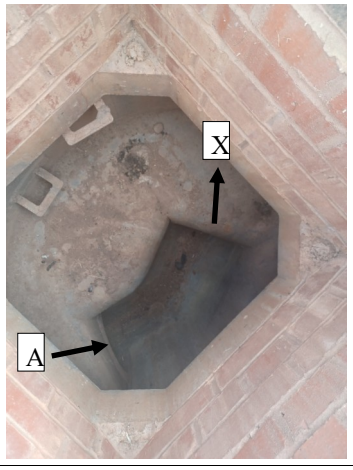
COVER	Shape:SQ	Hinged: /	Lockable: /	Duty: H	Size:620/620	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 5	Depth:700	Size:630/630	Vermin:	
CHAMBER	Soffit Type:SL	No. of Step Irons:	No. of Ladders:	No. of Landings:		
Size: 1350/1350	Const'n Code: CO	Depth of Flow: 5	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size		Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A	MH12		C	375			CO		1.71	
	B										
	C										
	D										
	E										
	F										
OUTGOING PIPES	X	Outfall		C	375			CO		1.74	
	Y										

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH14	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 31/08/22
Manufacturer:		Grating:

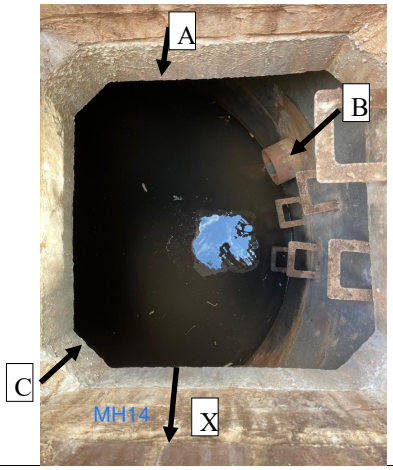
COVER	Shape:DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 3	Depth:540	Size:600/600	Vermin:	
CHAMBER	Soffit Type:	No. of Step Irons:6	No. of Ladders:	No. of Landings:		
Size: 2100/2100	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	Inlet1		C	525				CO		1.77	
	B	Unknown		C	150				VC		1.46	
	C	Inlet1		C	525				CO		1.67	
	D											
	E											
	F											
OUTGOING PIPES	**X**	Unknown		C	700				CO		1.93	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks: Catchpit overall depth 2.20



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH15	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 31/08/22
Manufacturer:		Grating:

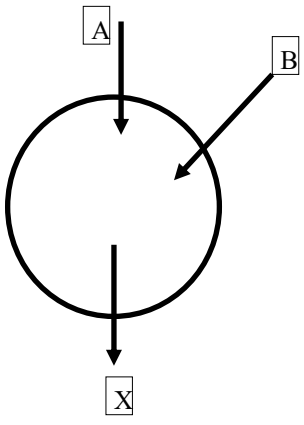
COVER	Shape:DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 1	Depth:370	Size:600/600	Vermin:	
CHAMBER	Soffit Type:	No. of Step Irons:5	No. of Ladders:	No. of Landings:		
Size: 2100/2100	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	**A**	MH14		C	525				CO		1.98	
	B	Unknown		C	150				CO		1.75	
	C											
	D											
	E											
	F											
OUTGOING PIPES	**X**	MH16		C	700				CO		2.00	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: MH16	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: MH	Survey Date: 01/09/22
Manufacturer:		Grating:

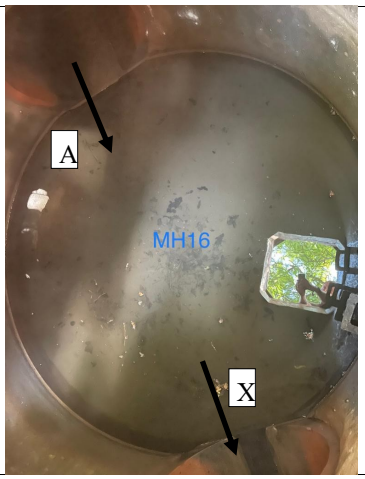
COVER	Shape:DT	Hinged: /	Lockable: /	Duty: M	Size:610/610	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses: 2	Depth:450	Size:600/600	Vermin:	
CHAMBER	Soffit Type:	No. of Step Irons:5	No. of Ladders:	No. of Landings:		
Size: 2100/2100	Const'n Code: CO	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size			Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A	MH15		C	700				CO		1.98	
	B											
	C											
	D											
	E											
	F											
OUTGOING PIPES	X	Brook		C	700				CO		2.20	
	Y											

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks: Overall depth 2.32



Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: Inlet	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: Inlet	Survey Date: 01/09/22
Manufacturer:		Grating:

COVER	Shape:	Hinged: /	Lockable: /	Duty:	Size:	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses:	Depth:	Size:		Vermin:
CHAMBER	Soffit Type:	No. of Step Irons:	No. of Ladders:	No. of Landings:		
Size:	Const'n Code:	Depth of Flow:	Depth of Silt:	H of S:		

	Pipe	U/S D/S node Reference		Shape	Pipe Size		Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A										
	B										
	C										
	D										
	E										
	F										
OUTGOING PIPES	X			C	525			CO			
	Y										

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:

Sewer Surveys UK LTD

Job Number:		Survey By: SBY
Grid Ref:	Node Number: Outlet1	Cover Level:
Location: East Midlands Gateway		
Year Laid: Z	Status: PU	Function: SW	Node Type: Outlet	Survey Date: 01/09/22
Manufacturer:		Grating:

COVER	Shape:	Hinged: /	Lockable: /	Duty:	Size:	Toxic atmos:
SHAFT	Side Entry: /	Regulating Courses:	Depth:	Size:		Vermin:
CHAMBER	Soffit Type:	No. of Step Irons:	No. of Ladders:	No. of Landings:		
Size:	Const'n Code:	Depth of Flow:	Depth of Silt:	H of S:		

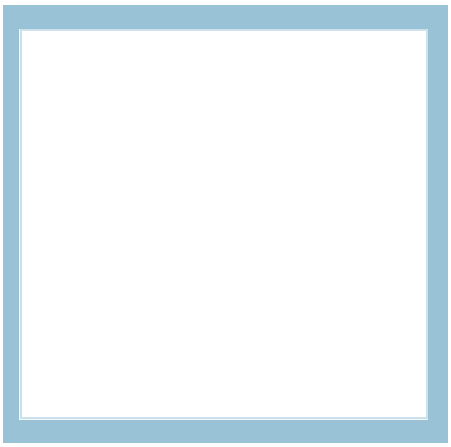
	Pipe	U/S D/S node Reference		Shape	Pipe Size		Backdrop Diameter	Pipe Material	Lining Material	Depth from Cover (M)	Invert Level (M)
INCOMING PIPES	A										
	B										
	C										
	D										
	E										
	F										
OUTGOING PIPES	X	mMH13		C	375			CO		1.22	
	Y										

CONDITION INFORMATION Enter Y if attention required. Use Remarks to clarify

Cover		Irons/Ladders		Shaft		Chamber		Benching		Other	

Remarks:

Sewer Surveys UK LTD



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Appendix 6: Hydraulic Modelling Report

ENVIRONMENT

SEGRO (Properties) Ltd
East Midlands Gateway Phase 2 (EMG2)
Hydraulic Model Summary Report

January 2025

Document Number:	EMG2-BWB-ZZ-XX-RP-YE-0002_HMR
BWB Reference:	220500_HMR

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	14/01/25	S2	Craig Crowe BSc (Hons) MSc GradCIWEM	Robin Green BSc (Hons)	Robin Green BSc (Hons)

Notice

1. INTRODUCTION

1.1 This report has been prepared to summarise a hydraulic modelling exercise undertaken to inform a Flood Risk Assessment (FRA) of the Main Site proposed second phase of the East Midlands Gateway Phase 2 (EMG2) DCO development – referred to as the study site within this report.

1.2 This report summarises the hydraulic model made available for this study by the Lead Local Flood Authority (LLFA), it details the updates made to the model to improve its representation at the study site, and it outlines how the proposed development has been represented within the model. The findings of the modelling exercise will be discussed within the overarching Flood Risk Assessment (FRA).

Situational Context

1.3 The study site is located to the west of Junction 23A of the M1, the A42, and Donnington Park Services. A location plan is included within **Figure 1.1**.

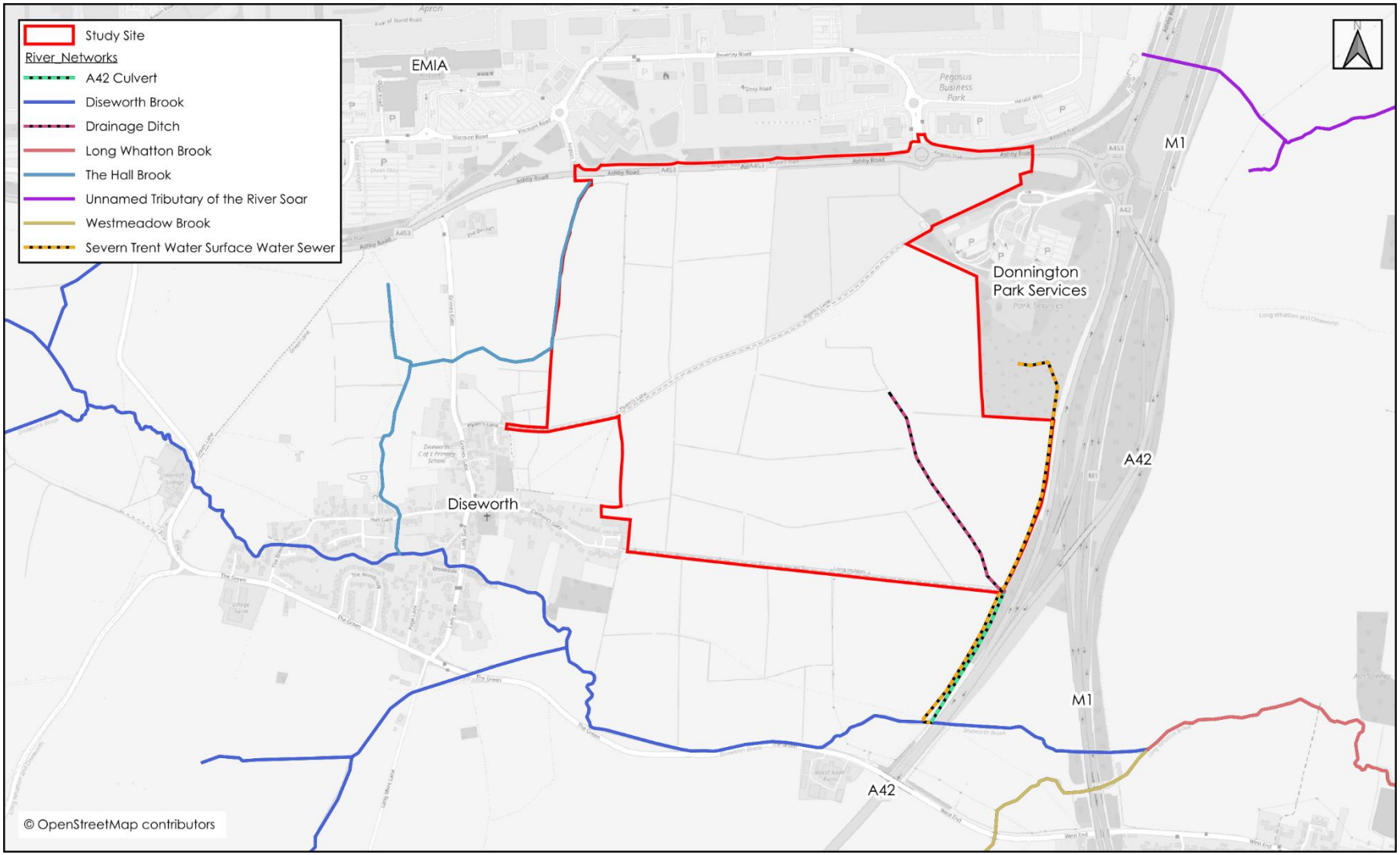

Figure 1.1: Site Location Plan

1.4 The A453 (Ashby Road) is located on the northern boundary, with the East Midlands International Airport (EMIA) and Phase 1 of the East Midlands Gateway development located beyond. The Hall Brook and agriculture fields/pasture are located on the study site's western boundary. The village of Diseworth is located off the south-western corner. An access track and footpath are located on the southern boundary with agriculture fields/pasture located beyond.

1.5 The study site is primarily comprised of agriculture fields and pasture. A public byway, known as Hyam's Lane, bisects the study site from south west to north east. There are several drainage channels present on the field boundaries which direct runoff from the land south of Hyam's Lane to a relatively short length of minor watercourse located in the south-eastern corner of the study site. This watercourse exits the study site via a piped connection (500mm diameter) which outfalls to larger pipe system (525mm to a 700mm diameter) which runs alongside the A42 and outfalls to the Diseworth Brook beneath the A42 road bridge. The on-site channels have been observed to be seasonally dry; therefore, their main purpose is likely to be limited to draining surface water runoff from the fields.

1.6 A public surface water sewer is also present in the east of the study site. This runs in parallel to piped watercourse between the Donnington Services and the Diseworth Brook, outfalling just upstream of the A42 culvert.

1.7 The Hall Brook, an ordinary watercourse, outfalls from the EMIA and flows alongside the western boundary of the study site for approximately 450m, before diverting to the west and then to the south to enter the village of Diseworth. The potential contributing flows from the airport to the Hall Brook are understood to be restricted and controlled by the airport's drainage systems. A maximum discharge rate of 1.50m^3/s is reported to occur in summer events[1]. In winter events the outflow is reportedly reduced due to pumping operations and increased storage times to aerate the surface water and remove pollutants. The remainder of the watercourse's catchment is predominately rural, and this includes a proportion of the study site roughly comprised of land located to the north of Hyam's Lane.

1.8 The Diseworth Brook, an ordinary watercourse, drains a largely rural catchment to the west of Diseworth. The brook flows from west to east through Diseworth, where it is joined by the Hall Brook. Downstream of Diseworth, the brook passes beneath the A42 and M1 road embankments where it joins the Long Whatton Brook. The Long Whatton Brook continues to flow towards the east where it joins the River Soar.

1.9 The nearest main river to the site is the River Soar, which is located approximately 2.5km to the east. The entire study site is located within Flood Zone 1 according to the EA Flood Map for Planning, which is defined as land at a low probability of flooding from rivers or seas.

[1] URS, 2014. Diseworth and Long Whatton Catchment Study. Leicestershire County Council

Available Data

1.10 The Environment Agency (EA) have confirmed that they hold no relevant flood data or hydraulic model in the area.

1.11 Leicestershire County Council (LCC) LLFA were able to provide a copy of their integrated Diseworth and Long Whatton catchment hydraulic model to inform this assessment.

2. THE DISEWORTH AND LONG WHATTON MODEL OVERVIEW

2.1 It is reported that in 2020 Arcadis Consulting (UK) Limited were commissioned by LCC to evaluate the flood mechanisms throughout the Diseworth and Long Whatton catchment, which included assessment of the EMIA surface water management system. This study included the development of a detailed 1D-2D hydraulic model of the catchment to provide enhanced resolution and confidence in the prediction of flood depths, extents, and mechanisms. LCC have provided a copy of the 2020 model for use in this assessment.

2.2 The model is provided within InfoWorks ICM (Integrated Catchment Modelling) software. This is able to represent fluvial system, overland flows, and subsurface drainage networks within a fully integrated 1D-2D environment.

2.3 A summary of the modelling approach is provided within the forthcoming section. Full details are available in the Arcadis 2020 modelling report[2].

Overview of the Model Hydrology

2.4 The model uses a combination of inflow hydrographs to account for the runoff entering the model domain from the Westmeadow Brook catchment, and the direct application of rainfall on to the Diseworth and Long Whatton catchments (i.e.: the 1D-2D model domain). The differing hydrological approaches in the catchments are illustrated within **Figure 2.1**.

2.5 This Westmeadow Brook is a tributary of the Long Whatton Brook and this catchment is omitted from the 1D-2D model domain. It is reported that the Westmeadow Brook inflow hydrographs were derived from a standalone 2D direct rainfall model, as this was found to be more conservative than hydrographs generated by the Revitalised Flood hydrograph hydrological rainfall-runoff model (ReFH2).

2.6 The direct rainfall profiles are applied to the 1D-2D model domain, including the EMIA drainage sub-catchments. Storm profiles were derived from Flood Estimation Handbook (FEH) design profiles. It is reported that an analysis of critical duration was undertaken for storm events between 60 and 2880 minutes, and that the 60-minute summer storm was found to represent the greatest flood risk within the catchment. This duration was verified against observed historical events in the catchment, and subsequently adopted as the critical duration for the hydrological events.

2.7 The model includes hydrological boundaries for the following return period storm events: 1 in 5, 1 in 20, 1 in 50, 1 in 75, and 1 in 100-year.

[2] https://www.lwdpc.org.uk/uploads/long-whatton-diseworth-flood-risk-mitigation-resilience-report-final.pdf

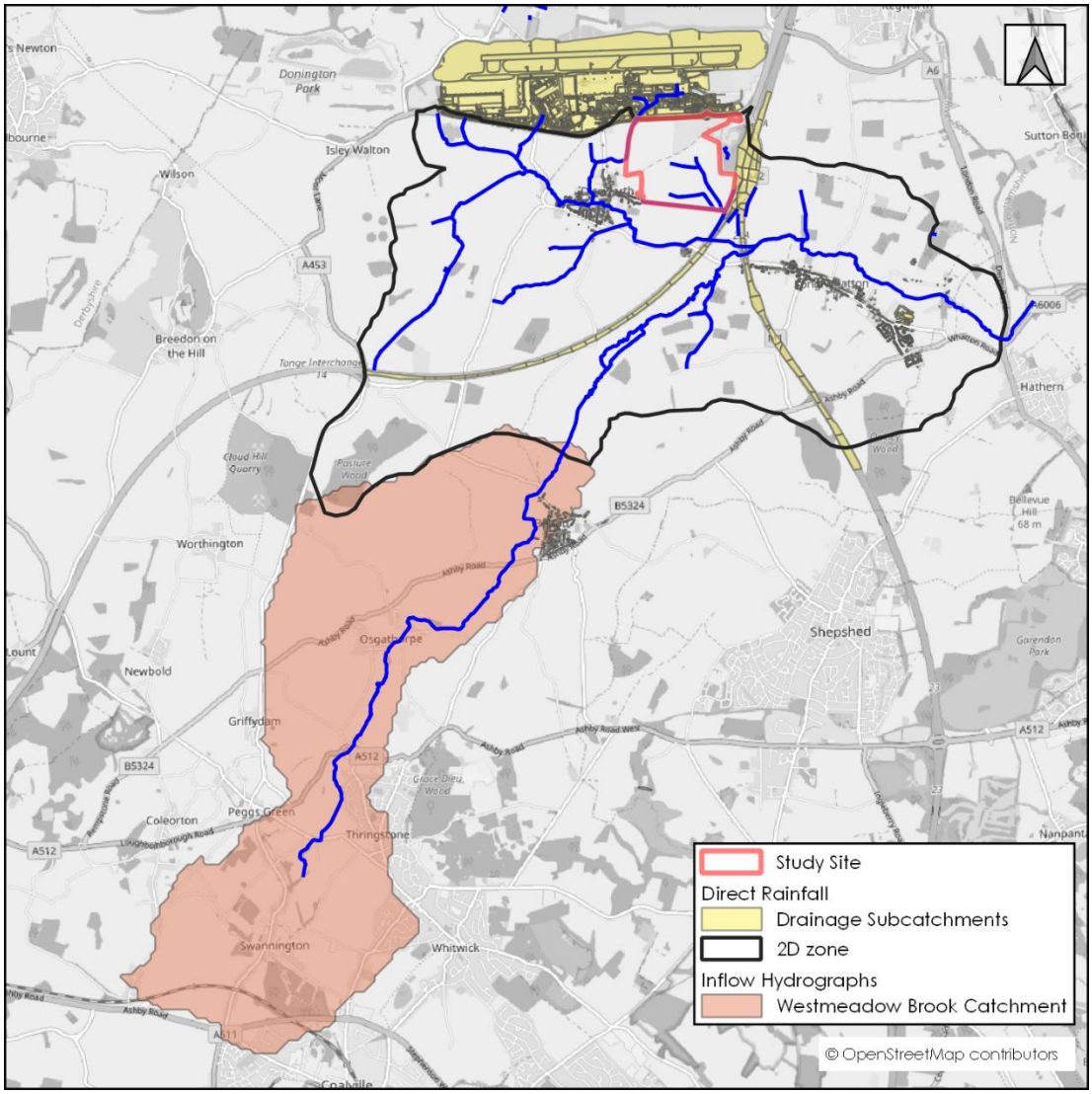

Figure 2.1: Hydrological Approaches

Overview of Hydraulic Model Geometry

2.8 It is reported that a watercourse survey was undertaken in 2018 to inform the hydraulic model. This included sections through the primary channels and details of the on-line hydraulic structures. This allowed the construction of a detailed 1D model environment. Minor channels were modelled within the 2D environment using 'mesh zones' to enhance their topographical detail where necessary.

2.9 Public sewers based upon data provided by Severn Trent Water (STW), including surface water and combined systems, are represented in the model. Building outlines from Ordnance Survey (OS) MasterMap data form sub-catchments which allocate property roof runoff and foul water flow from the household to the appropriate sewer networks.

2.10 A representation of the road drainage system (excluding the M1 and A42) is also included, based on gully data location information provided by LCC.

2.11 It is reported that no engineering drawings of the M1 and A42 were available. Therefore, the associated drainage is represented using sub-catchments based upon the carriageway gradients.

2.12 The surface water drainage network for the EMIA is included in the model. This reportedly based upon engineering drawings provided by EMIA.

2.13 The 2D topographical elevations are informed by LiDAR Digital Terrain Model (DTM) data flown in 2018. OS MasterMap data is used to define land type, infiltration rates, roughness and topographical detail.

Modelled Representation at the Study Site

2.14 The study site is located entirely within the 2D direct rainfall model domain, this is illustrated within **Figure 2.2**. Therefore, the potential flood risk from the surface water runoff can be fully assessed.

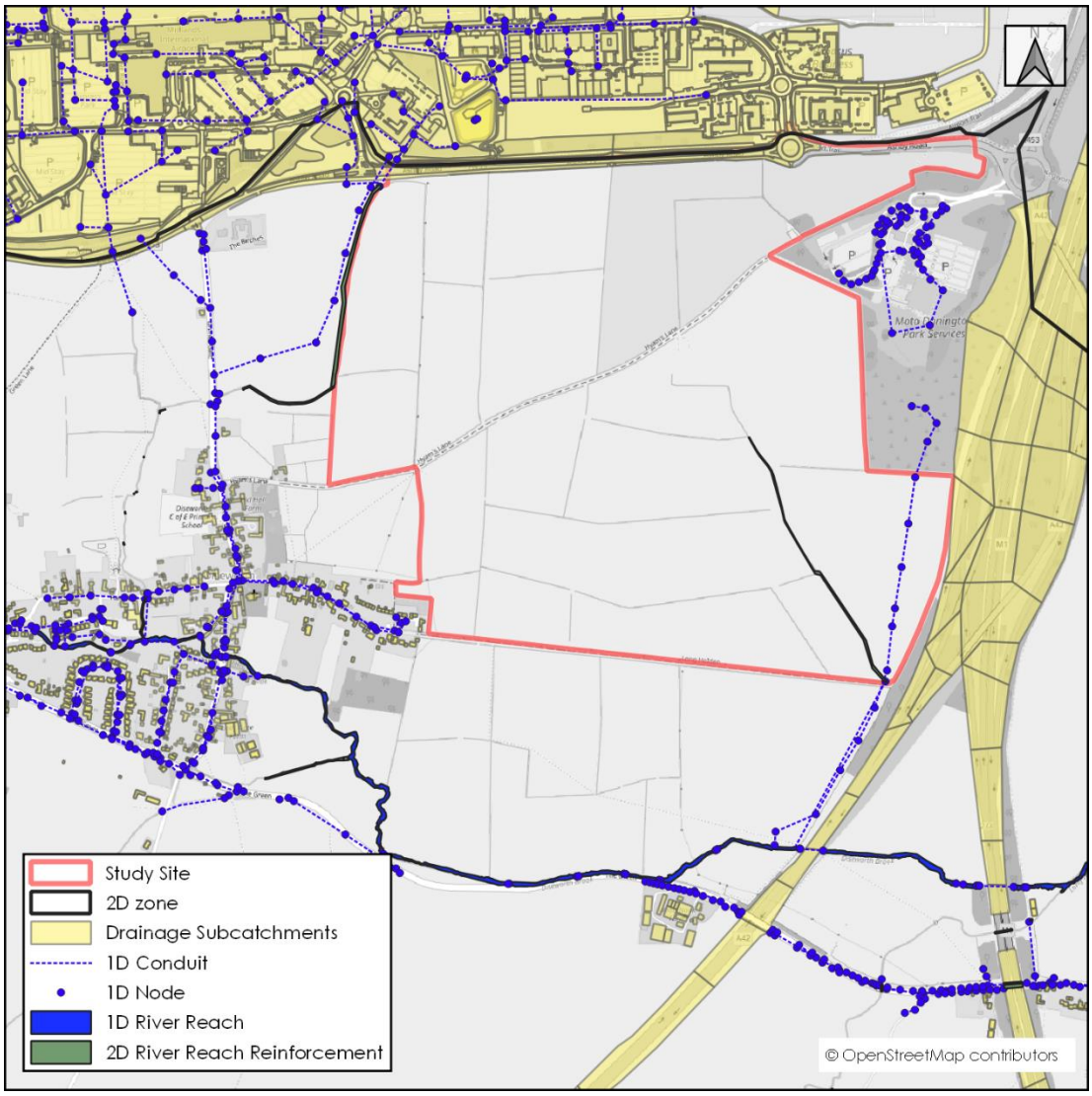

Figure 2.2: Hydraulic Model at the Study Site

2.15 The minor channels around the study site are captured in the 2D mesh, but a number of culverts and boundary ditches are omitted. The representation of the site in the model could be improved through the addition of these site-specific details.

2.16 The Hall Brook and the outfall from the EIMA on the western boundary are included in the model, allowing these potential sources of flood risk to be assessed.

2.17 The drainage networks from the adjacent Donnington Park services, and the public sewer and piped watercourse connection to the Diseworth Brook on the eastern boundary are represented in the model. However, the public sewer and pipe data is understood to be largely interpolated in this location. Model accuracy could be improved through detailed survey of these features.

2.18 There is shown to be no significant overland flows or flooding entering the study site from outside sources.

2.19 The downstream model boundary is located approximately 4.3km downstream of the study site, and 5.3km downstream of Diseworth. This is significantly removed from the area of interest and given the influence of the intervening hydraulic structures (A42 and M1), it gives confidence that the model results will not be influenced significantly by the downstream boundary.

2.20 Upon review, the model is considered suitable for use in this assessment. However, the following items will be updated using the available surveys:

- representation of the on-site ditches and culverts - using the topographical survey of the site
- the public sewer on the eastern site boundary – using CCTV survey
- the piped watercourse connection to the Diseworth Brook on the eastern boundary – using CCTV survey
- Creation of 1 in 100-year +25% and +40% climate change storm hydrological boundaries.
- Creation of a 1 in 100-year +60% fluvial inflow for the Weastmeadow Brook.

3. SITE-SPECIFIC UPDATES MADE TO THE HYDRAULIC MODEL

Hydrology

3.1 The hydrological approach has been retained from the model as provided with the exception of the below:

- Derision of a 1 in 100-year +60% climate change fluvial inflow was derived from the 1 in 100-year hydrograph for comparison against the 1 in 100-yeat +40% rainfall event.
- Creation of a 1 in 1000-year rainfall event.

3.2 As discussed, previous analysis work undertaken by Arcadis Consulting (UK) Limited identified that the 60-minute storm was the critical event in the wider catchment. To verify that the 60-minute storm is also critical for the study site, a series of 1 in 100-year storm events were simulated, at 60, 120, 180, 360-minute durations, under winter and summer conditions. Peak flood depths in and around the study site are compared within **Table 3.1**, with interrogation locations illustrated within **Figure 3.1**.

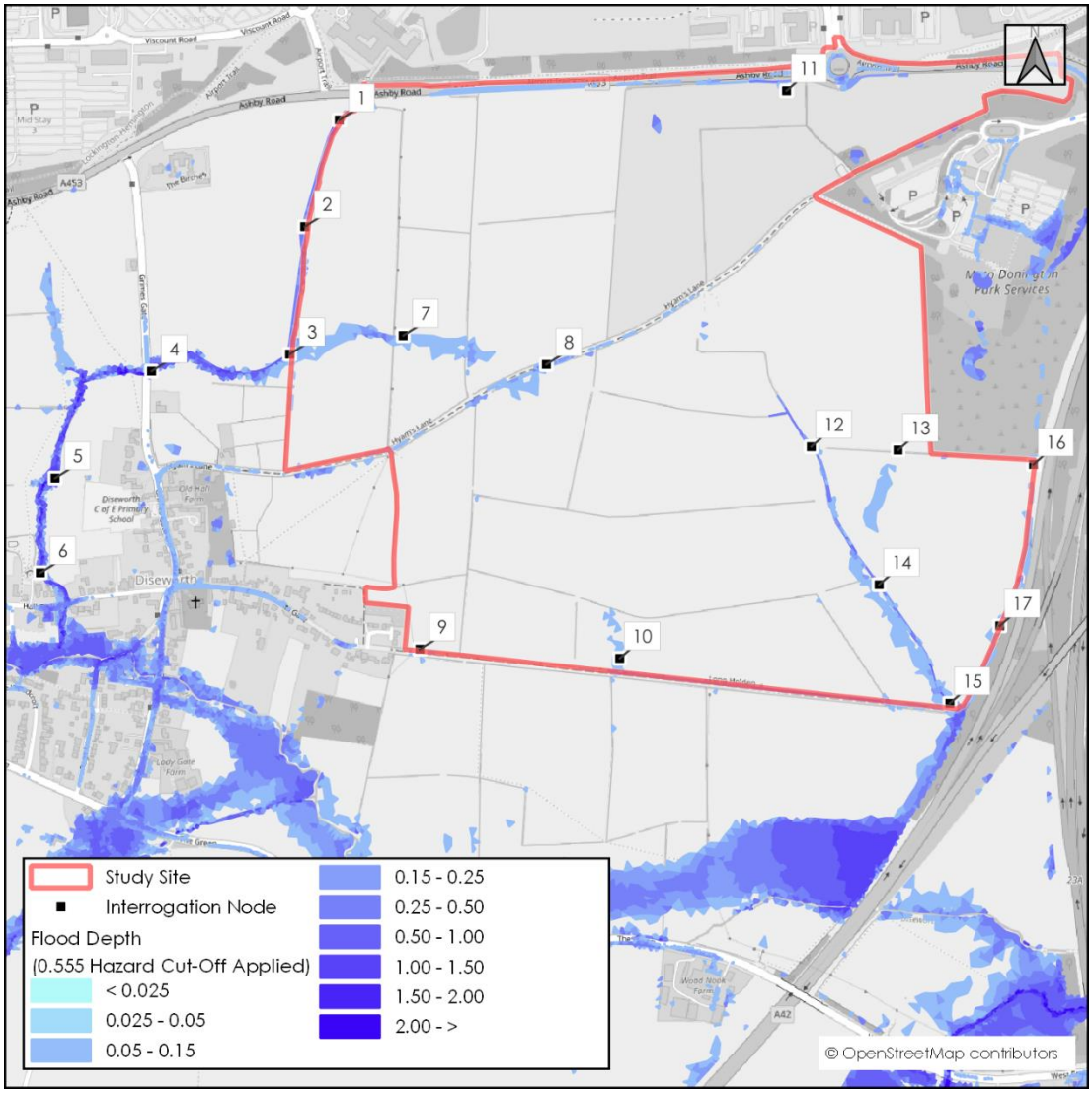

Figure 3.1: Storm Duration & Seasonality Sensitivity Tests - Node Locations

Table 3.1: Storm Duration & Seasonality Sensitivity Tests – Depth Comparison

ID	1 in 100-year return Period Storm | Peak Flood Depths (m)							
	60-min		120-min		180-min		360-min	
	winter	summer	winter	summer	winter	summer	winter	summer
1	0.88	0.90	0.82	0.86	0.82	0.83	0.84	0.83
2	0.21	0.23	0.17	0.20	0.16	0.17	0.16	0.16
3	0.65	0.67	0.55	0.60	0.49	0.54	0.34	0.40
4	2.24	2.27	0.37	1.96	0.31	0.36	0.21	0.24
5	2.06	2.08	1.89	1.95	1.78	1.87	1.59	1.67
6	1.62	1.64	1.44	1.51	1.29	1.41	1.02	1.12
7	0.20	0.20	0.16	0.17	0.13	0.15	0.07	0.10
8	0.10	0.11	0.07	0.08	0.05	0.07	-	-
9	0.04	0.05	0.03	0.04	-	0.03	-	-
10	0.06	0.07	0.04	0.05	0.04	0.04	-	-
11	0.03	0.04	-	0.03	-	-	-	-
12	0.42	0.45	0.32	0.37	0.26	0.31	0.11	0.18
13	0.04	0.05	0.03	0.04	0.03	0.03	-	-
14	0.20	0.21	0.14	0.17	0.11	0.14	0.05	0.08
15	1.03	1.04	0.95	0.98	0.89	0.94	0.58	0.81
16	0.05	0.06	0.04	0.04	0.04	0.04	0.03	0.03
17	0.07	0.07	0.05	0.06	0.04	0.05	-	0.03

3.3 This comparison confirms that the 60-minute summer storm is the critical event for the study site, correlating with the previous Arcadis study's conclusion. Therefore, this season and duration were adopted in all further analysis.

3.4 To inform the assessment for future climate change new hydrological storm events were created by applying 25% and 40% uplifts to the 1 in 100-year storm profile. Typically, only a 25% uplift would need to be considered for a less vulnerable development in this location. However, given the permanent changes that the development will make to

the topography in the site, it was also considered appropriate to assess a more precautionary allowance.

Rainfall Version

3.5 Leicestershire's adopted ICM model uses storm profiles derived from the FEH99 dataset, whereas the latest available dataset is FEH22. A comparison of the design storm depths at the 60 minute critical duration event can be made between the two datasets in **Figure 3.2** and **Figure 3.3**. This shows that FEH22 generates greater flood depths at events up to a 1 in 50-year storm, but that FEH99 generates greater depths at events in larger events. While FEH22 is based on a much larger record of real-world rainfall data and is the more reliable dataset, as the FEH99 data returns a more precautionary result at the larger events, and specifically the design storm (see **Figure 3.4**), it has been retained for the purpose of this study.

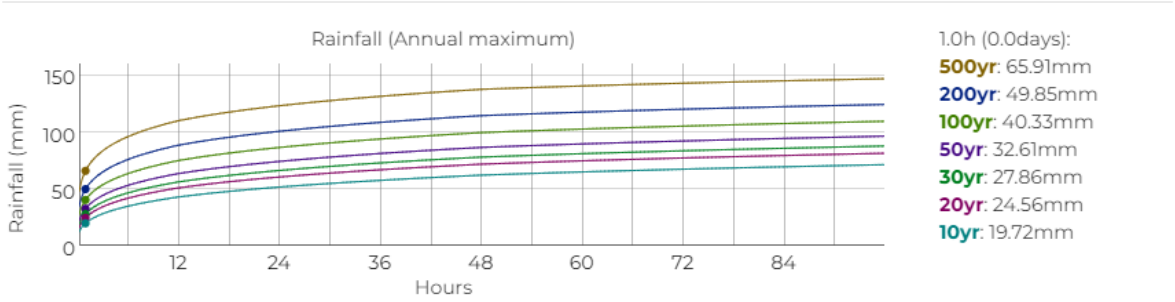

Figure 3.2: FEH99 Rainfall Data

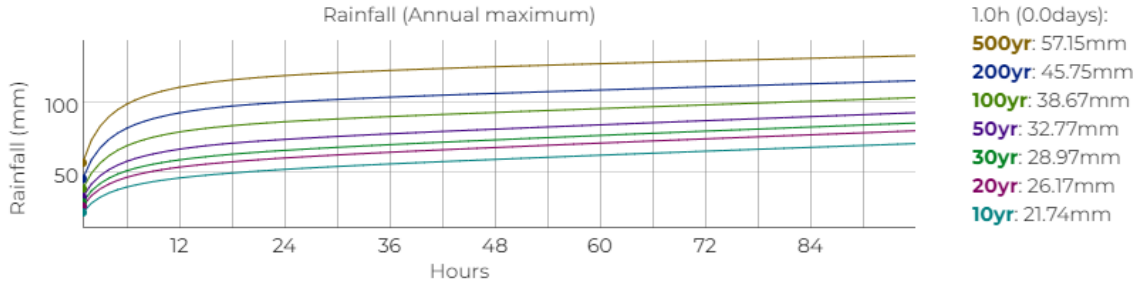

Figure 3.3: FEH22 Rainfall Data

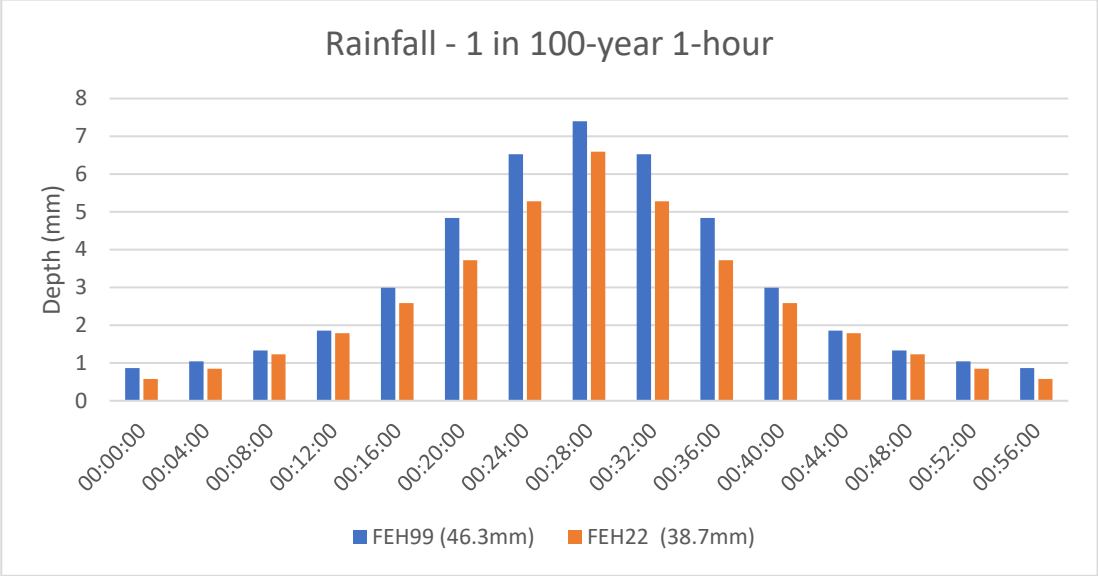

Figure 3.4: FEH99 & FEH22 1 in 100-year 1-hour storm comparison

Hydraulic Model Geometry

3.6 To improve the accuracy of the hydraulic model within the study site a number of alterations were made which are summarised below and illustrated within **Figure 3.5**. These were made using data extracted from a site-specific topographical survey (ref: 34529A_T_REV1) and a CCTV survey of the local drainage infrastructure (ref: 34529A_CCTV_REV1).

- The minor ditches/watercourses in the south of study site were reinforced using mesh level zones derived from surveyed channel invert levels, and break lines to reinforce the surveyed bank levels.
- On-site culverts were added to the model from the topographical survey.
- The alignment, manhole locations, pipe sizes, and inverts of the public surface water sewer in the east (running between the Donnington Services and the Diseworth Brook) were corrected.
- The alignment, manhole locations, pipe sizes, and inverts of the piped watercourse running between the on-site minor watercourse and the Diseworth Brook was corrected.

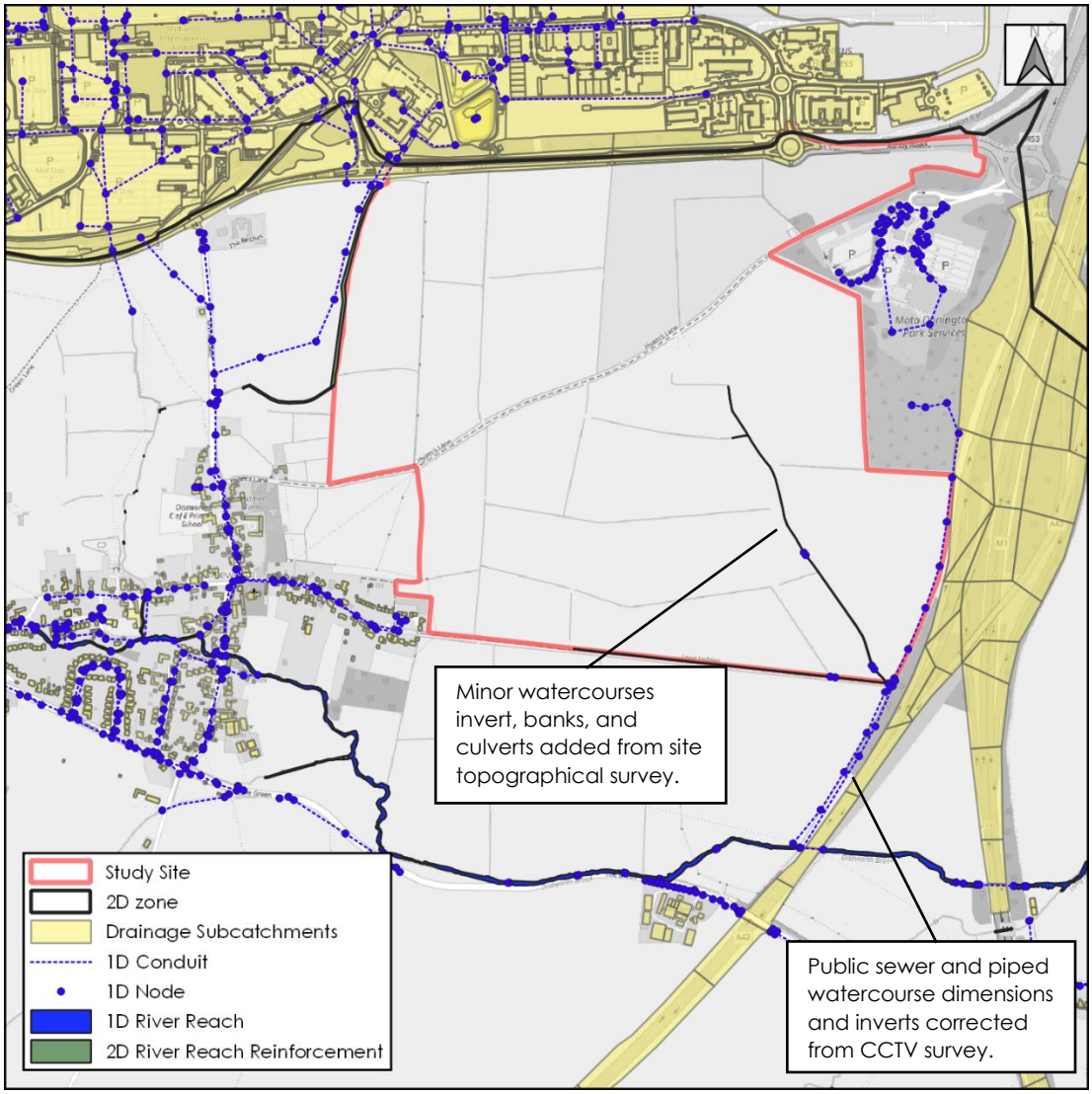

Figure 3.5: BWB Site-Specific Alterations

3.7 Additionally, it was necessary to make some minor schematisation corrections in the wider model. While these are removed from the study site, and do not influence the results at the study site, the updates were necessary to allow the model geometry to be validated in the latest version of the software and a series of stable simulation to be performed. The amendments included:

- Minor re-schematisation at the M1 culvert inlet on the Diseworth Brook (reach SK46238904.1& SK46238901.1), as follows: void polygon amended to allow the river reach to be connected to the 2D mesh. Polygons derived from OS mapping amended to be aligned with river reach and to prevent overly small triangles. Section line remade to remove Manning's n of 0.0001, and better reflect in channel conditions.
- Roughness zone MM17095! (Diseworth Brook channel between the A42 and the M1) increased from 0.0001 to 0.035 to better reflect the channel roughness.
- Reach SK45243402.1 (between Diseworth and the A42) re-schematised to improve stability, as follows: roughness zone value increased from 0.0001 to 0.035; section 5767 extended 3m over left bank using LiDAR; section 5688 extended 1m over both

banks using LiDAR; section 5566 extended 4m over left bank using LiDAR; section 5174 extended 2m over left bank using LiDAR; connecting banks redrawn to follow top of bank as shown on LiDAR rather than OS MasterMap.

- Reach SK44245701.1 (upstream of Diseworth) re-schematised to improve stability, as follows: river channel roughness zone amended from 0.0001 to 0.035; section 6992 extended a total of 8m over both banks using LiDAR; section 6883 extended a total of 5m over both banks using LiDAR; bank lines amended to avoid low lying areas as it previously followed the channel bed in places.
- Reach SK44247408.1 (upstream of Diseworth) schematisation corrected, as follows: sections 6574-6468, 6574 extended over RB; and bank position amended to follow top of bank. Previously the river reach cut a meander in the channel.
- MM17323! & MM17336! mesh zones - lower limit set to 56.2mAOD to capture Lady Gate bridge deck.
- Reaches SK44249401.1, SK44246602.1, SK45240403.1, SK44249404.1 (within Diseworth) amended to follow river banks as shown in LiDAR rather than OS MasterMap data. Roughness zone updated from 0.0001 to 0.035 to better reflect the channel conditions.
- Pipe SK46244001!.1 (surface water sewer outfall to the Diseworth Brook) connected to nearest 1D node rather than outfalling to the 2D domain next to river.
- Bank lines and river reach boundaries regenerated to link with 2020 LiDAR mesh.
- Terrain sensitive meshing was enabled to increase the resolution of the mesh in areas that have a large variation in height, without increasing the number of elements in relatively flat areas.
- The original LiDAR DTM was not supplied with the hydraulic model, so the latest composite dataset (2020) was downloaded from the EA. This was used when re-generating the 2D mesh.

3.8 The majority of the model was left unchanged from the data received from the LLFA.

4. MODEL STABILITY & LIMITATIONS

Stability

4.1 All simulations reported no significant loss of volume, and a review of flow and stage hydrographs did not identify any significant fluctuations or unrealistic flow patterns that could affect the assessment of flood risk at the study site.

4.2 The original model included two errors, and a number of warnings. Following the minor amendments, the model reported zero errors and a reduced number of warnings.

4.3 The majority of the warnings are associated with insignificant aspects of the modelling software. For example, a large proportion relate to result interrogation points falling outside of the model domain - these will not affect the results.

4.4 The remaining warnings generally relate to the sub-surface drainage network in the wider model, such as where the interpolated pipe soffit exceeds ground level, or similar. This is symptom and limitation of the quality of the public sewer datasets used in the wider catchment. As previously reported, the pipe network in and around the study site has been updated from a CCTV survey to ensure that the results at the study site are reliable.

Limitations

4.5 The following limitations have been identified in the original Arcadis model report; these will not affect the assessment of flood risk at the study site:

i. All property roofs in Long Whatton and Diseworth have been assumed to be connected to the nearby appropriate system.

ii. M1 and A42 drainage connections have been assumed – All paved areas and cutting slopes have been assumed to effectively drain to the relevant watercourse / land drainage channel. This is considered a conservative approach.

iii. The highway drainage system in Long Whatton and Diseworth has been based on manually digitised locations and interpolated connectivity. Some gullies may have been omitted, reducing the capacity to discharge surface water into the public sewers. Any restrictions due to hydraulic capacity or blockages within the connecting lateral pipes (i.e.: between the gullies and public sewers) are omitted.

iv. Sedimentation within most pipes has been assumed based on gradient and pipe diameter, to ensure a conservative representation of likely capacity. Sediment has been included in all pipes with a gradient less than 1 in 100, scaled up to 20% of pipe height for pipes with a gradient of 1 in 10 or higher.

v. It has been assumed that design rainfall falls consistently over the entire catchment.

vi. 1D sub catchments have been used to represent runoff from the M1/A42 and EMIA instead of the 2D Mesh.

vii. The runoff model roughness and infiltration rates are simplified and based on the downstream catchment characteristics.

4.6 Additionally, the following limitations have been observed by BWB in the review of the model:

viii. Model represents channel conditions at the time of survey (2018). The modelling exercise has made use of the available data at the time of construction and simulation.

ix. A 2020 LiDAR DTM was used for the model topography which was current at the time of undertaking the model updates.

x. No hydrometric data or recorded flood levels were available to allow for a detailed calibration exercise. However, the flood predictions have been verified within Diseworth and Long Whatton against observed events.

xi. The out of bank topography has derived from LiDAR which has limited accuracy (+/- 0.15m). However, this is considered to be sufficient for the purpose of this exercise.

xii. The bare earth DTM does not include for the presence of minor walls or other structures. Buildings have been modelled with a 150mm uplift and highways have been lowered by 100mm to better represent these potential barriers / conveyance routes.

xiii. A cut-off to the result data has been applied to remove very shallow and slow-moving water and highlight overland flow routes.

xiv. While the peak river flow and peak rainfall climate change allowances are not directly comparable with respect to their percentages they are considered to be directly related with respect to the appropriate epoch as stipulated by the EA's climate change guidance for peak river flow[3] and peak rainfall[4].

[3] https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow
[4] https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

5. BASELINE HYDRAULIC MODEL RESULTS

5.1 For the purpose of informing the Flood Risk Assessment, the following return period events were performed using a 60-minute summer storm event:

- 1 in 5-year (20% Annual Exceedance Probability (AEP))
- 1 in 20-Year (5.0% AEP)
- 1 in 100-Year (1.0% AEP)
- 1 in 100-Year (1.0% AEP) +25% Rainfall & 28% Fluvial Climate Change Allowance
- 1 in 100-Year (1.0% AEP) +40% Rainfall & 60% Fluvial Climate Change Allowance
- 1 in 1000-Year (0.1% AEP)

5.2 It was not considered necessary to simulate any additional events below the 1 in 100-year storm due to the very limited flooding predicted in and around the study site.

5.3 Due to the nature of direct rainfall modelling the entire model domain will appear as 'wet' during a simulation. Therefore, it is necessary to apply a cut-off to the data to identify key areas of flooding and overland flow routes. In the national Risk of Flooding from Surface Water (RoFSW) mapping, the EA adopt a cut-off based upon a hazard rating, where data below a hazard value of 0.575 are removed. For the purpose of this assessment a lower value of 0.555 has been applied to the model results to remove very shallow and slow-moving water.

5.4 Modelled outlines are presented within **Figure 5.1** for reference. Peak depths and the flood hazard ratings have been mapped and are appended to the FRA.

5.5 The hydraulic modelling has shown that the Hall Brook floodplain is contained to its channel next to the study site, confirming that the study site is at a low fluvial flood risk. Additionally, the local sewer network and the EMIA drainage does not affect the study site.

5.6 The modelling identifies that in the 1 in 100-year event and above, there is the potential for surface water overland flow pathways to form over the study site. However, these are relatively shallow and of a low flood hazard. For example, at the design event (the 1 in 100-year +40% event) the overland flows are generally between 0.03 to 0.15m deep. Greater depths and hazards only occur within low-lying areas such as the drainage channels and minor watercourse. Importantly, the overland flow pathways are shown to predominately originate from within the site itself. There are no significant overland flow pathways passing through the site from upstream third-party land.

5.7 The findings of the modelling are discussed within the FRA.

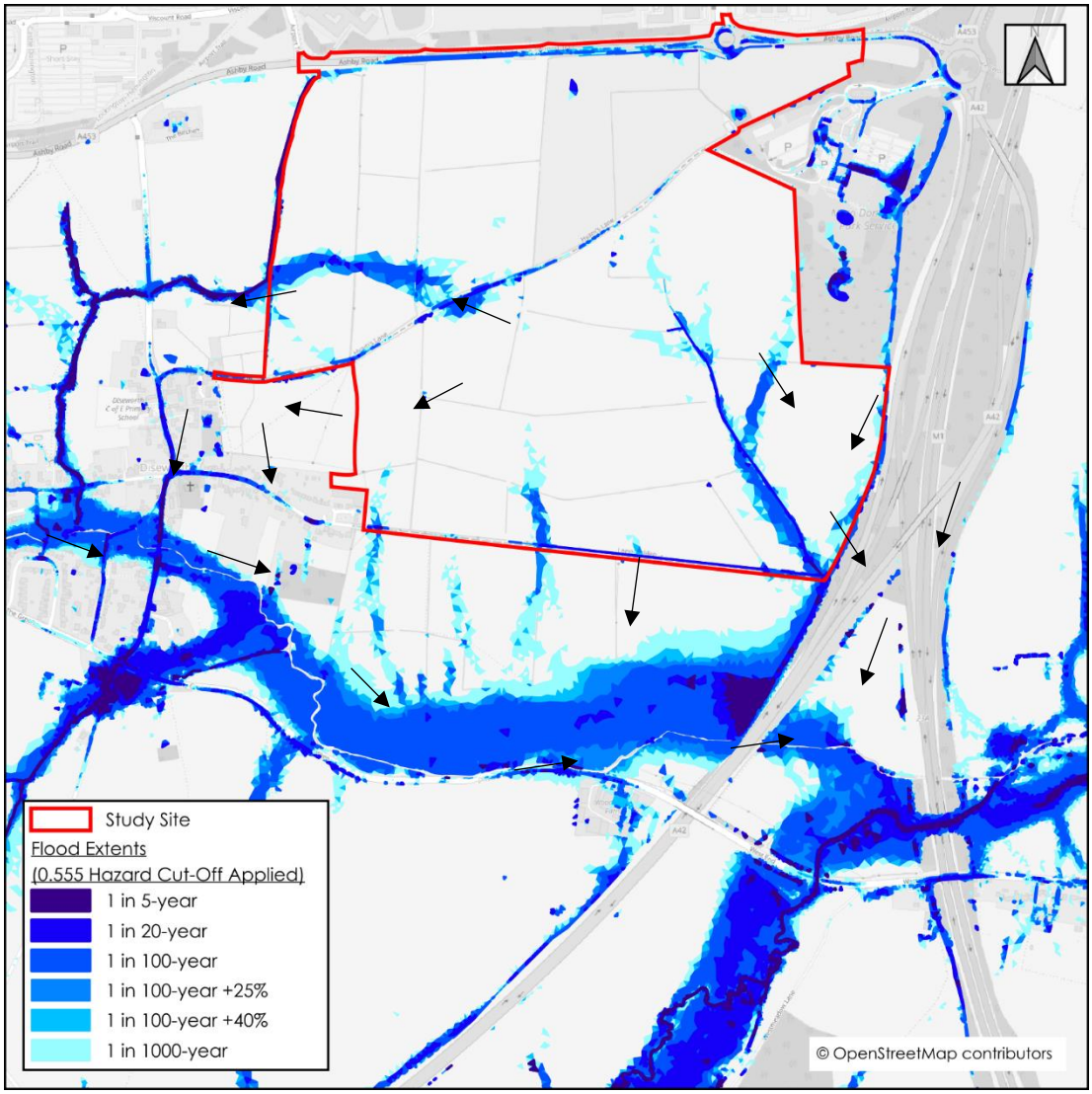

Figure 5.1: Baseline Modelled Flood Outlines

6. ASSESSING THE IMPACT OF THE PROPOSED DEVELOPMENT

Philosophy

6.1 The proposed development aims to address the minor flood risk posed by the shallow surface water overland flows routes that can occur in the baseline conditions through the implementation of a surface water drainage strategy. The drainage strategy will be designed to intercept and store rainwater falling on the development before releasing it to the downstream watercourse.

6.2 In addition to managing the minor flood risk present in the site, the drainage strategy will include an attenuated surface water discharge rate, limiting the discharge rate from the development to the annual average runoff rate (QBAR). Under typical rainfall events this will mimic the existing runoff rate, but in larger storm events this will represent a reduction, thereby offering downstream betterment.

6.3 The excess surface water runoff will be stored within a combination of on-plot below ground storage tanks and above ground SuDS features that will be designed to accommodate the 1 in 100-year storm with a 25% uplift to reflect future climate change. The larger 1 in 100-year +40% climate change storm event will be contained within the freeboard of the surface water storage components. As a precautionary approach, the impact of the development up to the 1 in 100-year+40% storm has been assessed within this study.

6.4 Additionally, the drainage strategy seeks to direct all surface water runoff from the development to the minor watercourse in the southern-eastern corner of the site, thus reducing the volume and rate of surface water runoff directed towards the Hall Brook and the existing downstream flood risk issues in Diseworth.

Hydraulic Model Representation

6.5 To represent the influence of the proposed drainage strategy for the purpose of assessing the developments impact on off-site flood risk, the development's drainage sub-catchment was added to the hydraulic model. Rain falling on this area was replaced with a constant outflow to the A42 culvert in the south-east of the study site. The flow rate discharging from the sub-catchment was set to the equivalent QBAR 114.3l/s. This is illustrated within **Figure 6.1**.

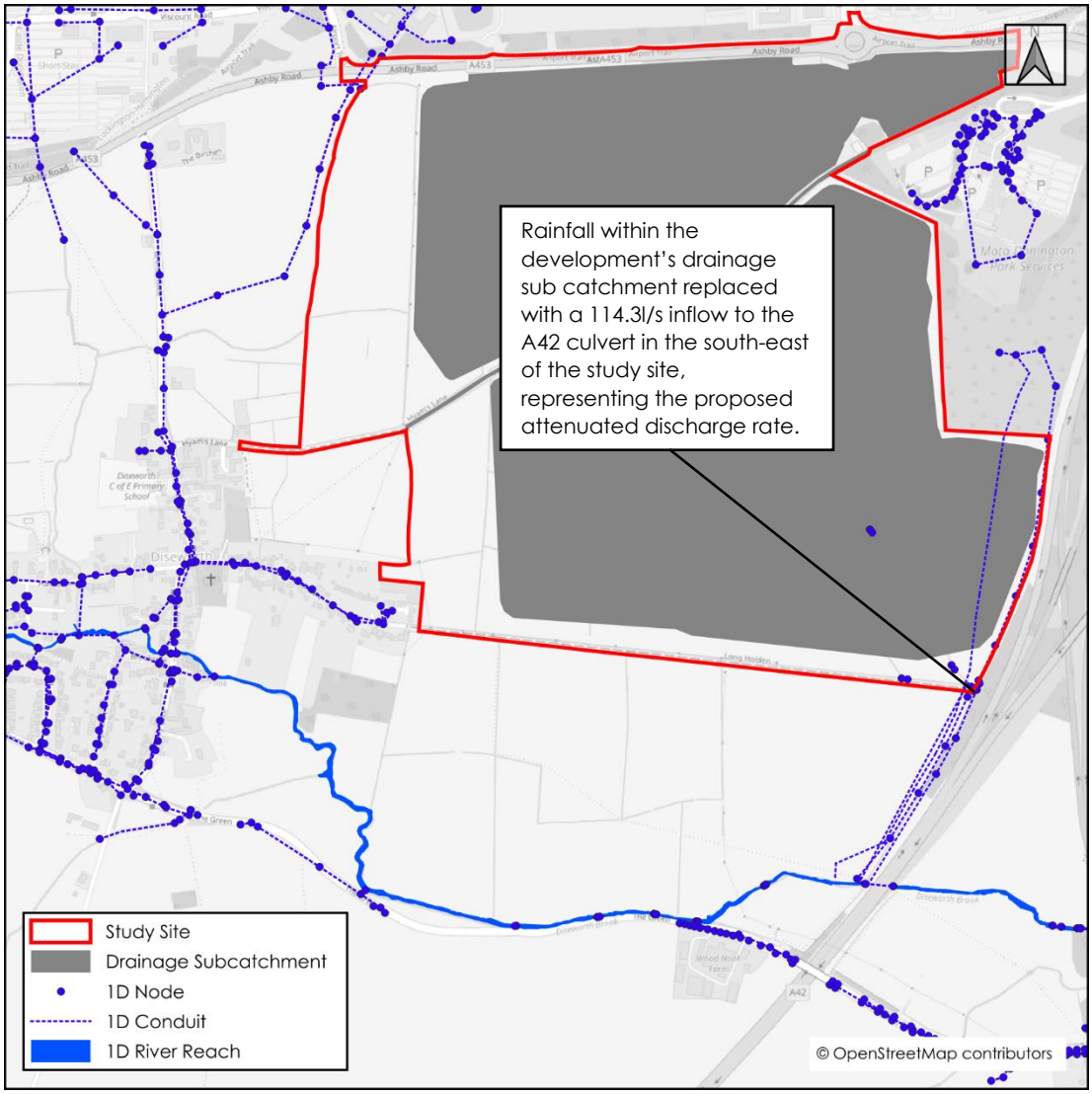

Figure 6.1: Model Modifications to Represent Proposed Development Drainage

Hydraulic Model Results

6.6 For the purpose of informing the FRA, the following return period events were performed using a 60-minute summer storm event:

- 1 in 5-year (20% Annual Exceedance Probability (AEP))
- 1 in 20-Year (5.0% AEP)
- 1 in 100-Year (1.0% AEP)
- 1 in 100-Year (1.0% AEP) +25% Rainfall & 28% Fluvial Climate Change Allowance
- 1 in 100-Year (1.0% AEP) +40% Rainfall & 60% Fluvial Climate Change Allowance

6.7 Modelled outlines are presented within **Figure 6.2** for reference.

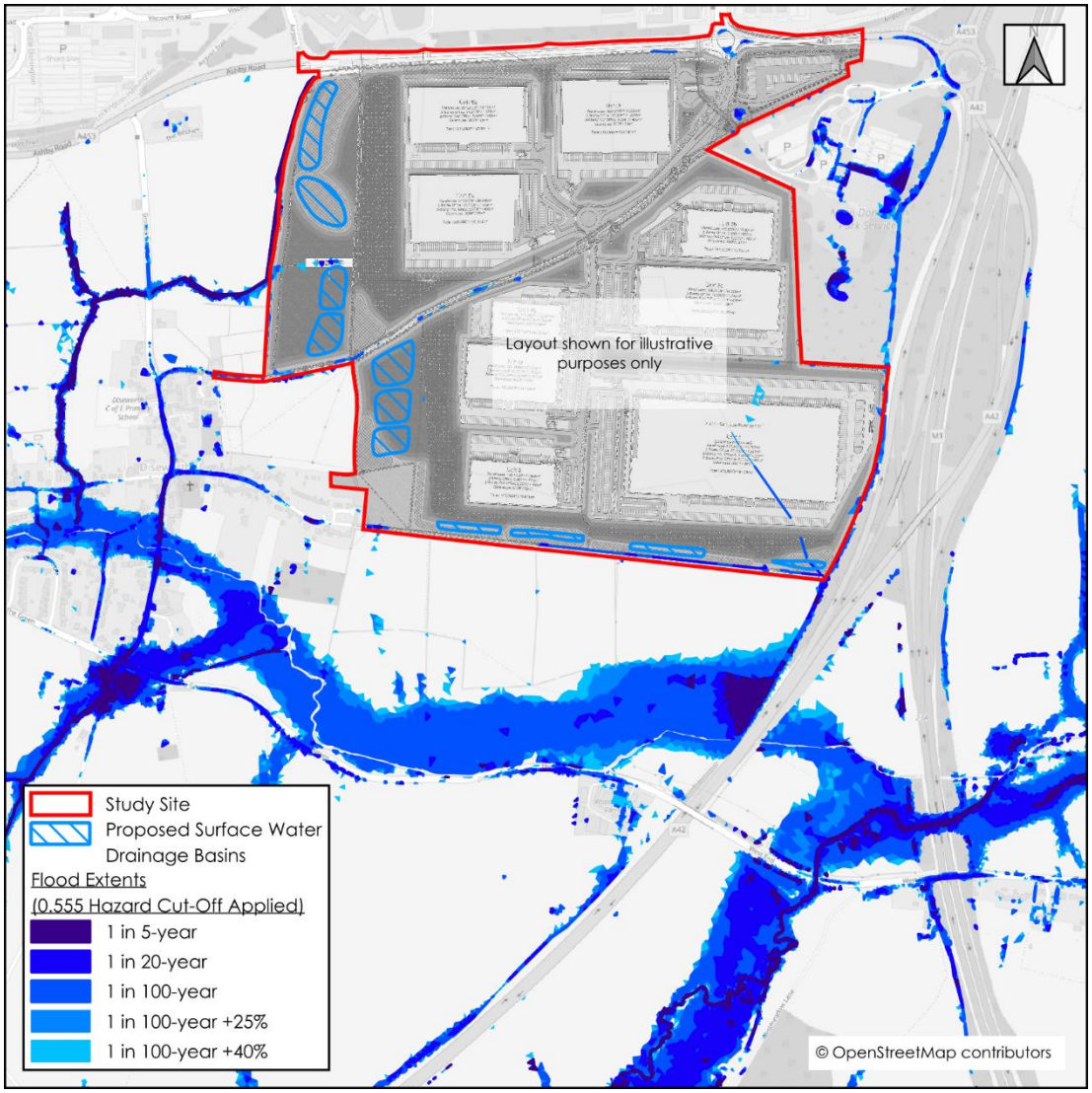

Figure 6.2: Post-Development Illustrative Modelled Outlines

6.8 Peak flood depths were compared against the equivalent baseline scenario to identify changes to flood risk outside of the development area. This analysis has been mapped and is appended to the FRA, where the findings are also discussed in detail. For ease of reference and as an example, the analysis from the return periods outlined above are included in **Figure 6.3** to **Figure 6.7**.

6.9 The analysis identifies that the development will offer a marginal reduction downstream flood risk. This is most evident on the Hall Brook through Diseworth because runoff from the development area is now directed away from the Hall Brook, and into the Diseworth Brook upstream of the A42 embankment because surface water runoff from the development area is now limited to QBAR. This is illustrative of the impacts at all of the modelled events, although the magnitude of the betterment reduces at lesser storm events.

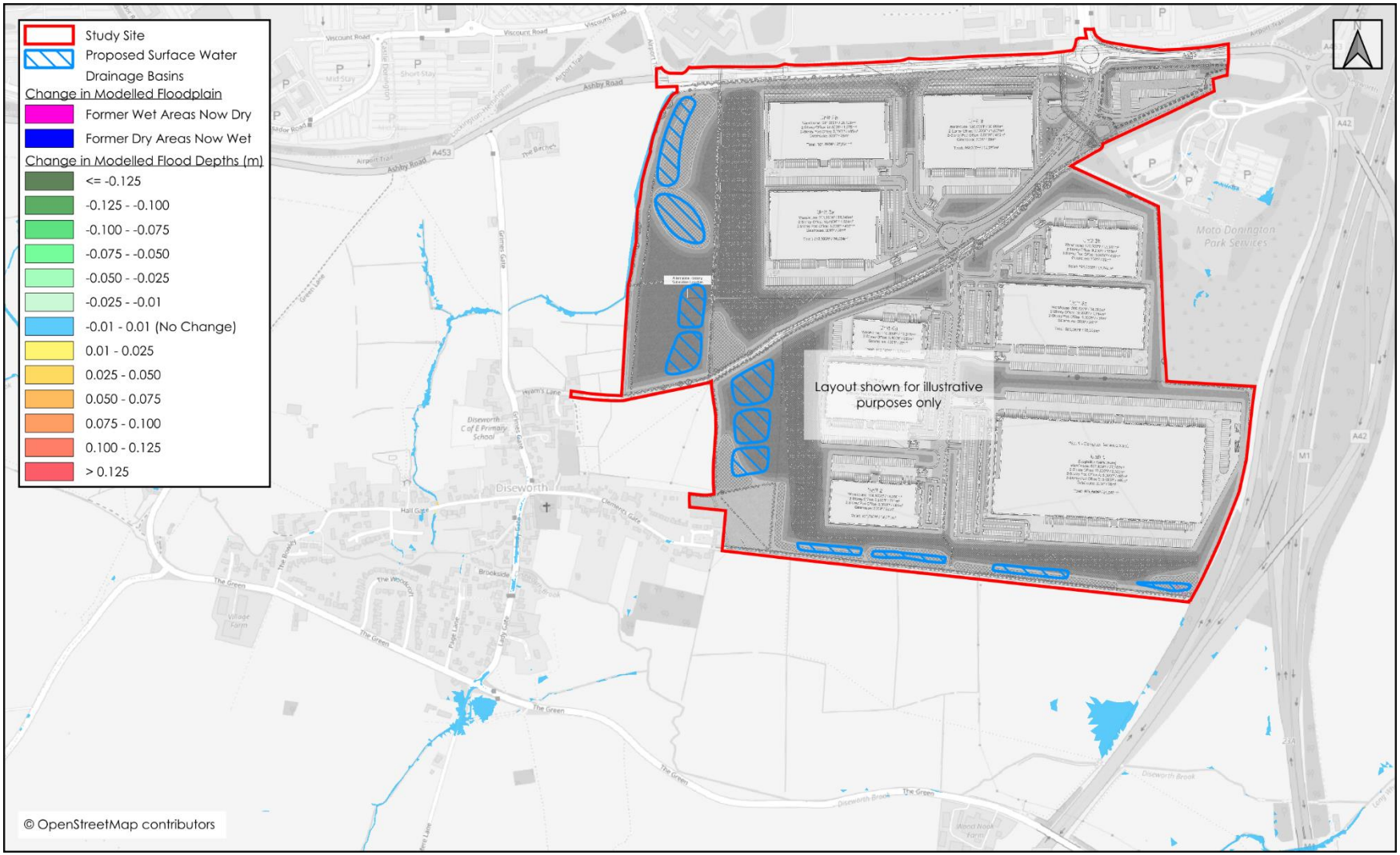

Figure 6.3: Change in Flood Depths Due to Development | 1 in 5-year Storm Event

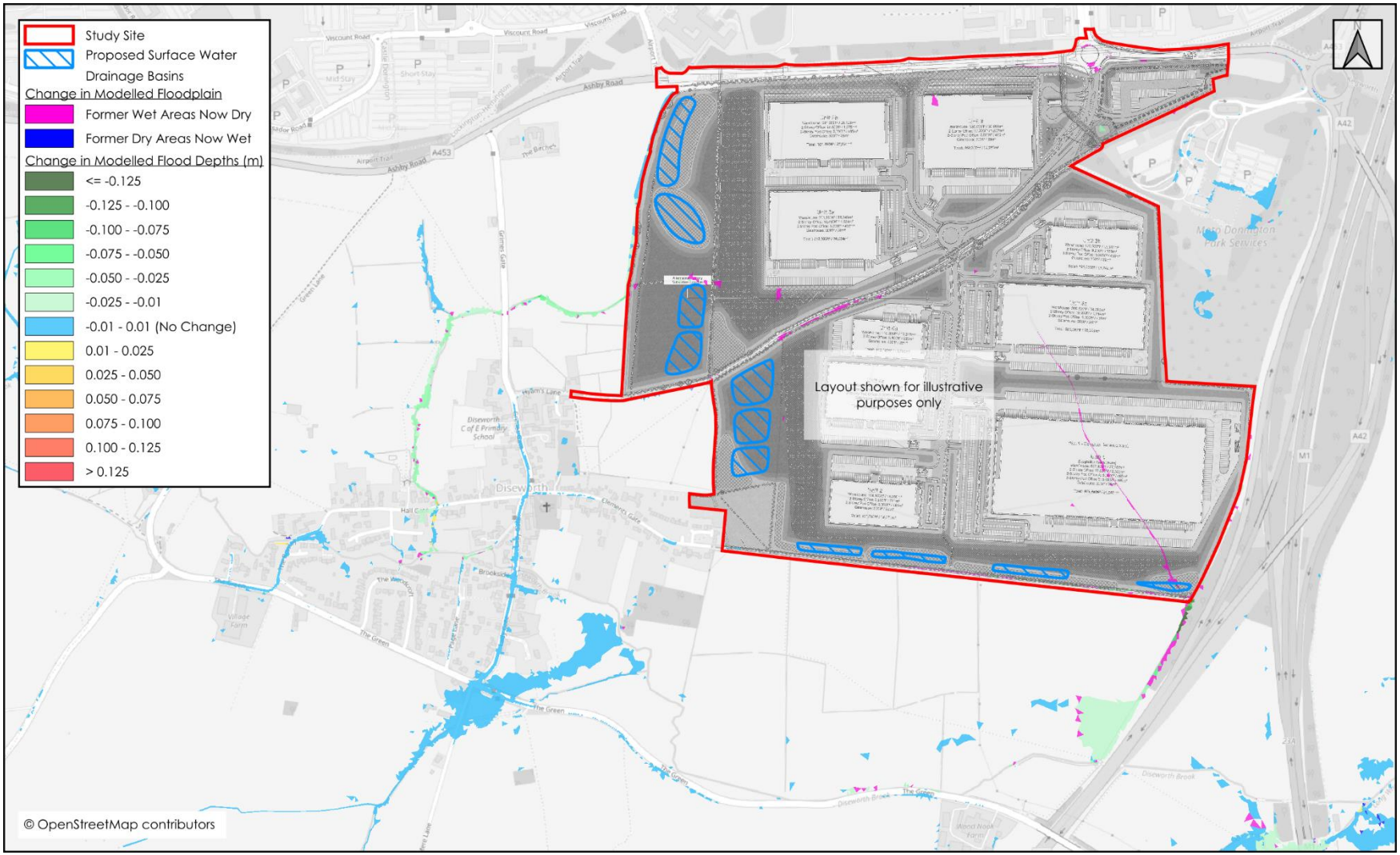

Figure 6.4: Change in Flood Depths Due to Development | 1 in 20-year Storm Event

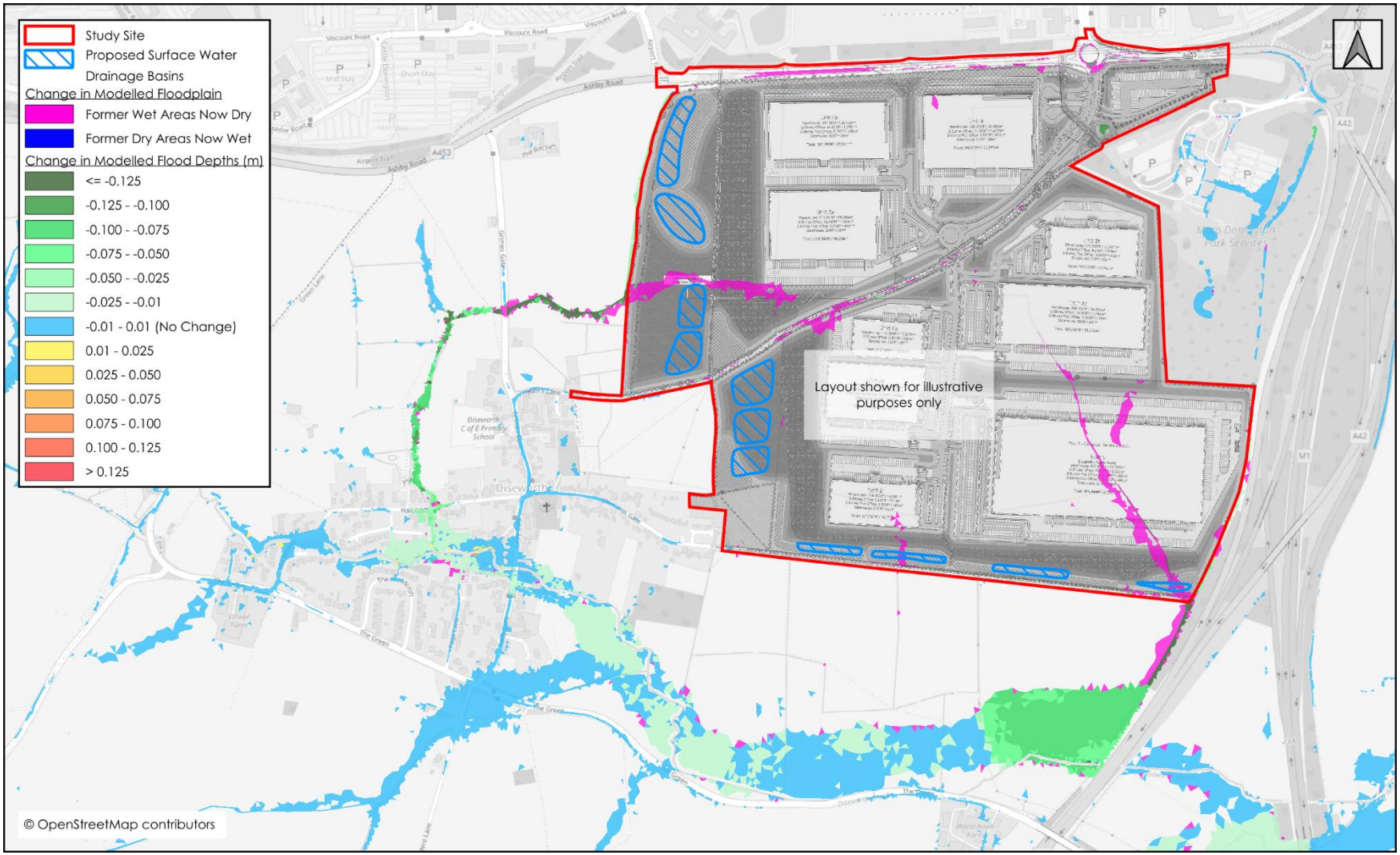

Figure 6.5: Change in Flood Depths Due to Development | 1 in 100-year Storm Event

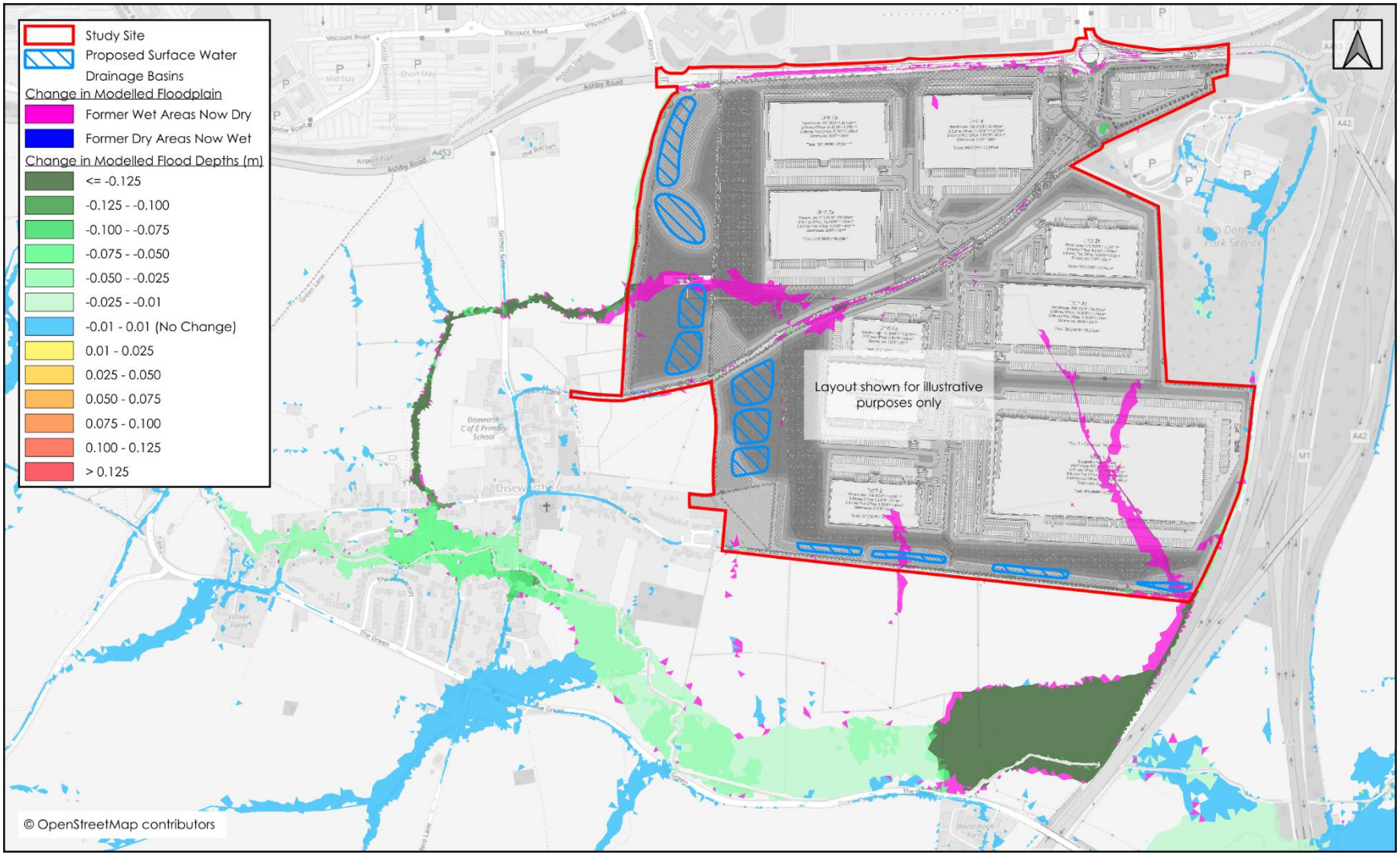

Figure 6.6: Change in Flood Depths Due to Development | 1 in 100-year +25% Storm Event

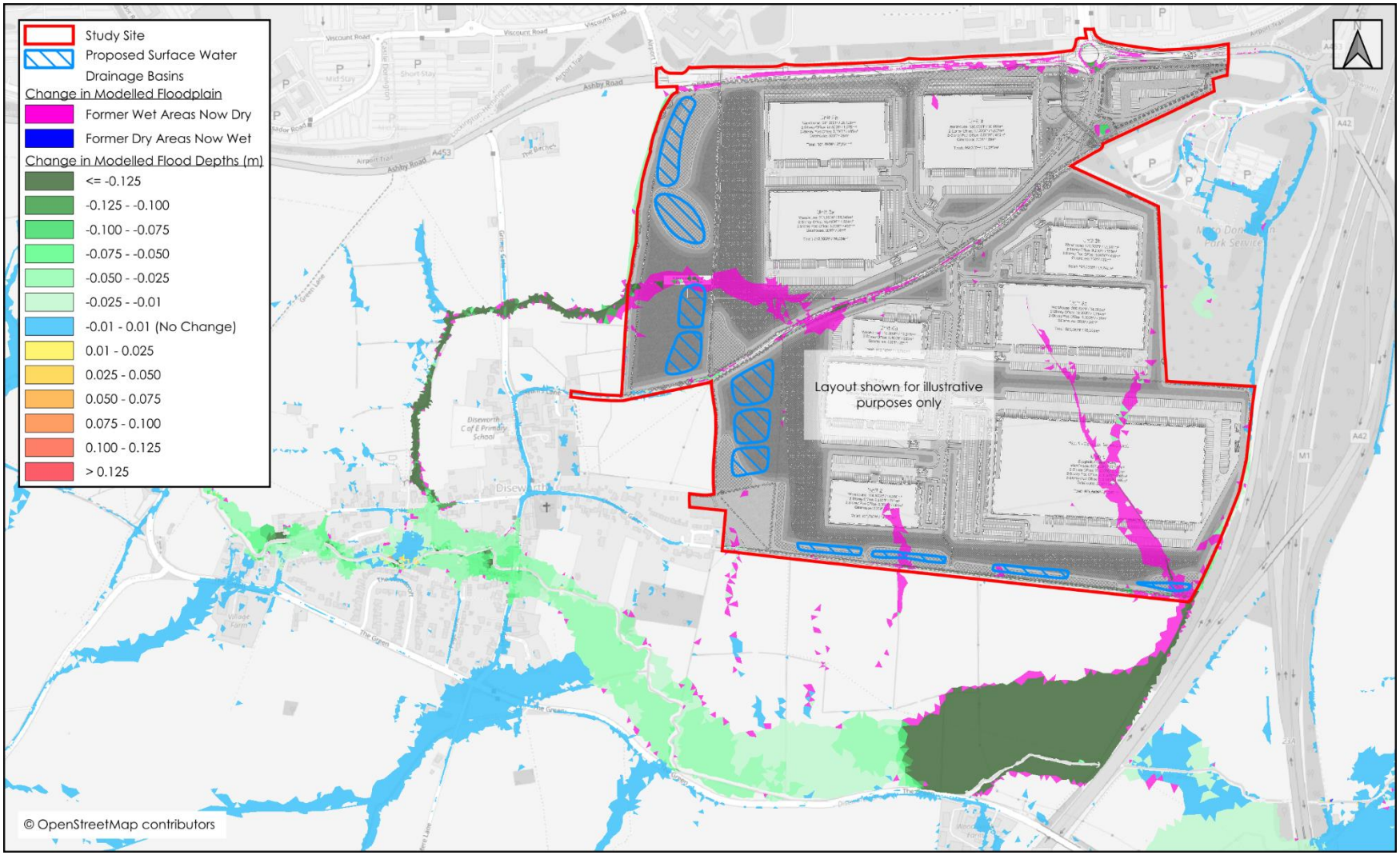

Figure 6.7: Change in Flood Depths Due to Development | 1 in 100-year +40% Storm Event

7. SUMMARY

Summary

7.1 LCC LLFA have provided a copy of their Diseworth and Long Whatton catchment hydraulic model for use in this assessment. This combines watercourses, sewers, and drainage networks into a single integrated model. The model provides complete coverage of the study site.

7.2 The model was updated to include additional site specific detail including the addition of the minor watercourses and associated culverts in the southeast of the site, and the correction on the location, size, and inverts of the public surface water sewer and pipe watercourse present in the east of the site. A number of amendments were also made in the wider model to correct unrealistic roughness values and improve channel schematisation. However, the model largely remains unchanged from that received from LCC.

7.3 The hydraulic modelling has shown that the Hall Brook floodplain is contained to its channel next to the study site, confirming that the development is at a low fluvial flood risk. Additionally, the local sewer network and the EMIA drainage is shown to not affect the site.

7.4 The modelling has identified that in the 1 in 100-year storm event and above, there is the potential for surface water overland flow pathways to form over the study site. However, even at the 1 in 100-year +40% event these are relatively shallow and of a low flood hazard. Importantly, the overland flow pathways are shown to be predominately originate from within the site itself. There are no significant overland flow pathways passing through the site from upstream third-party land.

7.5 The proposed development aims to address the minor flood risk posed by the shallow surface water overland flows routes that can occur in the baseline conditions through the implementation of a surface water drainage strategy. The drainage strategy will be designed to intercept and store rainwater falling on the development, before discharging it to the local watercourse at the equivalent QBAR rate. Additionally, the drainage strategy seeks to direct all surface water runoff from the development to the minor watercourse in the southern-eastern corner of the site, thus reducing the volume and rate of surface water runoff directed towards the Hall Brook and the existing downstream flood risk issues in Diseworth.

7.6 A comparison between the baseline and post-development conditions has identified that the proposed scheme would offer a reduction downstream flood risk. This is most evident on the Hall Brook through Diseworth and on the Diseworth Brook upstream of the A42 embankment.

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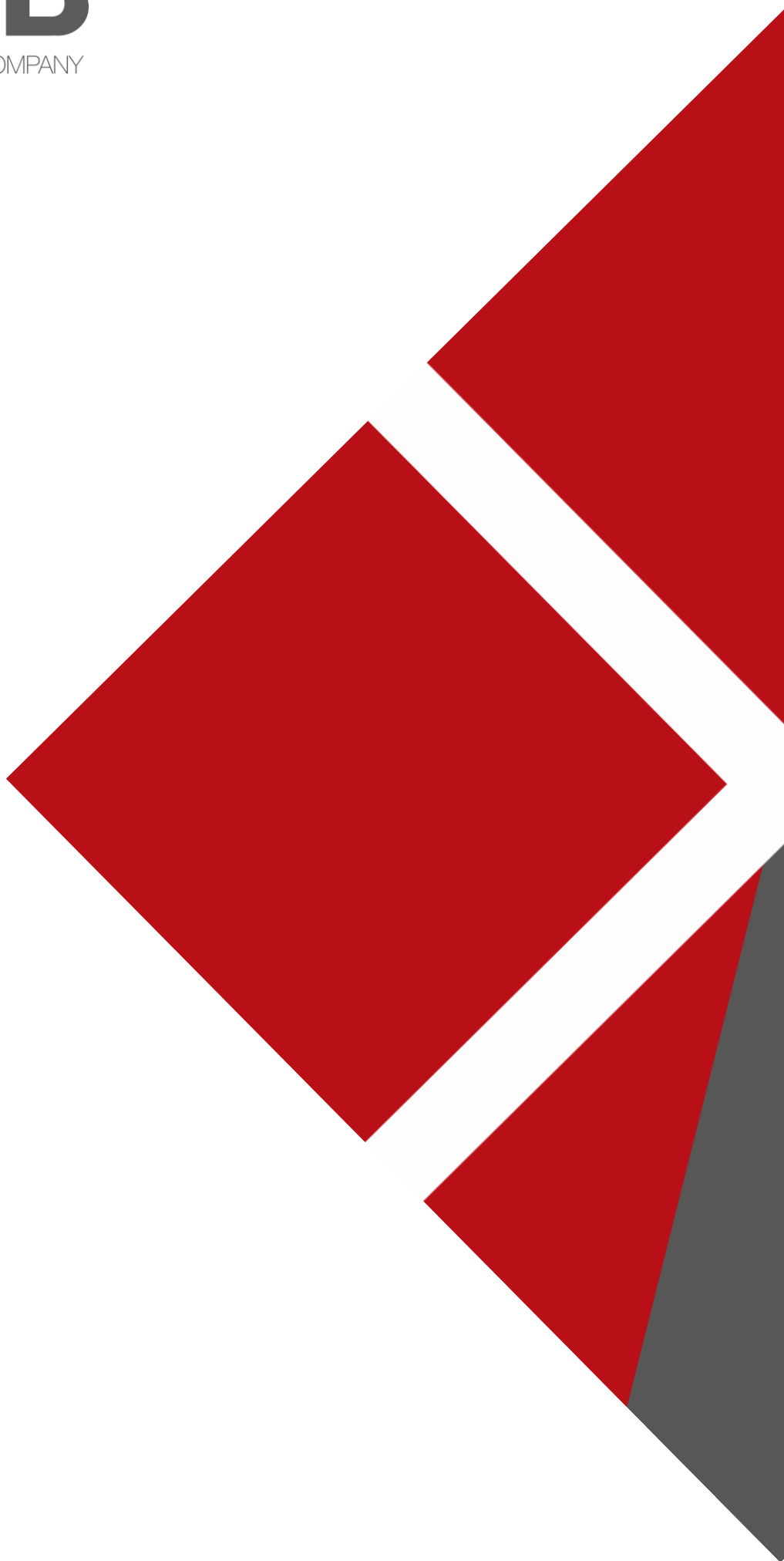

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