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MCDONALDS, HAVERHILL

Flood Risk Assessment and Drainage Strategy – Revision B – Vol. 1 of 3

MCDONALD'S, HAVERHILL
Flood Risk Assessment and Drainage Strategy

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Reference: GGB/VL/P22-2590/06 Rev B

Date: July 2022

MCDONALDS, HAVERHILL
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Flood Risk Assessment and Drainage Strategy
Revision B

Contents

Figures

Appendices

Plans

8342-SA-8333-P004 B	Site Layout Plan
13102/100	Topographic Survey
2590/02/001C	Foul and Surface Water Drainage Strategy

Registration of Amendments

Revision	Amendment Details	Revision Prepared By	Revision Approved By
Rev A 01/08/2022	Revised following design team comments	GGB	GS
Rev B 03/08/22	Revised with new surface water drainage strategy	GGB	GS

1.0 INTRODUCTION

Brief

1.1 Create Consulting Engineers Ltd were instructed by Mr. James Archibald on behalf of McDonald's Restaurants Ltd, to undertake a Flood Risk Assessment (FRA) and drainage strategy to inform a restaurant development at McDonald's, Haverhill.

Project Context

1.2 The Site comprises a parcel of Greenfield land, as shown in Figure 1.1. The Site has outline planning permission, in line with the wider Baynham Meikle FRA (Appendix G) and this reserved matters application covers a McDonald's restaurant and associated access and infrastructure. Architect's Layouts showing the proposed scheme are included on Drawing 8342-SA-8333-P004 B.

Planning Policy Context

1.3 The potential consequences of inappropriate development in a flood risk area for occupiers, either of the development or elsewhere, pose significant risks in terms of personal safety and damage to property.

National Policy

1.4 The National Planning Policy Framework[1] (updated 2021) includes Government policy on development and flood risk stating that:

> *167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
> *a) Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
> *b) The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
> *c) It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
> *d) Any residual risk can be safely managed; and*

[1] Ministry of Housing, Communities & Local Government., 2021. *National Planning Policy Framework (NPPF)*. [Online]. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed August, 2022].

e) *Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

1.5 The Planning Practice Guidance to the NPPF[2] (updated August 2021) requires that at the planning stage, the developer should prepare and submit an appropriate FRA to demonstrate how flood risk from all sources of flooding to the development itself and flood risk to others will be managed now and when taking climate change into account.

1.6 To comply with the NPPF a FRA must be submitted for planning applications for developments within flood zones 2 and 3 (medium or high risk of fluvial or tidal flooding) and for all developments located in Flood Zone 1 (low risk) which are 1 hectare or greater; which has been identified by the Environment Agency as having critical drainage problems; identified in a strategic flood risk assessment as being at increased flood risk in future; or that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

1.7 An FRA should be appropriate to the scale, nature and location of the development and should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

1.8 An assessment of surface water and drainage is also required as part of the FRA in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

1.9 The Planning Practice Guidance (substantially revised in March 2015 in relation to drainage) requires that sustainable drainage systems should be considered and included where practicable, in line with DEFRA Technical Standards[3].

1.10 The Technical Standards are therefore a key reference document and should be used in the formulation of the surface water drainage strategy for a scheme of this nature. The standards include the following requirements:

"Flood risk outside the development

S1 *Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g., the sea or a large estuary) the peak flow control standards (**S2** and **S3** below) and volume control technical standards (**S4** and **S6** below) need not apply.*

[2] Ministry of Housing, Communities & Local Government., 2021. *Planning Practice Guidance (PPG) - Flood Risk and Coastal Change*. [Online]. Available at: http://planningguidance.planningportal.gov.uk/ [Accessed August, 2022].

[3] Department for Environment and Rural Affairs (DEFRA)., 2015. *Sustainable drainage systems: non-statutory technical standards*. [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf [Accessed August, 2022].

Peak flow control

S2 *For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.*

S3 *For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.*

Volume control

S4 *Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.*

S5 *Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.*

S6 *Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with* ***S4*** *or* ***S5*** *above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.*

Flood risk within the development

S7 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 30 year rainfall event.*

S8 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.*

S9 *The design of the Site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.*

Structural Integrity

S10 *Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirements for reasonable levels of maintenance.*

S11 *The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.*

Designing for Maintenance Considerations

S12 *Pumping should only be used to facilitate drainage for those parts of the Site where it is not reasonably practicable to drain water by gravity.*

Construction

S13 *The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.*

S14 *Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed."*

County Council Policy

1.11 Suffolk County Council act as Lead Local Flood Authority (LLFA) for the area and are a statutory consultee for all major developments, which includes the following:

- The winning and working of minerals or the use of land for mineral-working deposits;
- Waste development;
- The provision of dwelling houses where the number of dwelling houses to be provided is 10 or more; or the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the number of dwelling houses to be provided is 10 or more;

- The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; and
- Development carried out on a site having an area of one hectare or more.

1.12 The LLFA have produced a Strategic Flood Risk Assessment[4], a local SUDS guidance document[5], and interim guidance[6] which includes construction standards and provide assistance to developers in creating sustainable drainage systems on their sites as well as the LLFA's consenting policy and various protocols. Suffolk County Council also provide guidance within their Preliminary Flood Risk Assessment (PFRA)[7] and Flood Risk Management Strategy[8] on development and flood risk.

District Council Planning Policy

1.13 The Site sits on the boundary of West Suffolk Council and Braintree District Council. West Suffolk Council is the lead authority for the outline development.

1.14 The Braintree District Council Local Plan[9] states what their policy on flooding risk and surface water drainage is in LPP 74

Flooding Risk and Surface Water Drainage

Where development must be located in an area of higher flood risk, it must be designed to be flood resilient and resistant and safe for its users for the lifetime of the development, taking climate change and the vulnerability of the residents into account.

New development shall be located on Flood Zone 1 or areas with the lowest probability of flooding, taking climate change into account, and will not increase flood risk elsewhere. Any proposals for new development (except water compatible uses) within Flood Zones 2 and 3a will be required to provide sufficient evidence for the Council to assess whether the requirements of the sequential test and exception test have been satisfied, taking climate change into account. Where development must be located in an area of higher flood risk, it must be designed to be flood resilient and resistant and safe for its users for the lifetime of the development, taking climate change and the vulnerability of any residents into account.
For developments within Flood Zones 2 and 3, and for developments elsewhere involving sites of 1ha or more, development proposals must be accompanied by a site specific Flood Risk

[4] Forest Heath District Council Strategic Flood Risk Assessment Level 2 (Accessed August, 2022) https://www.westsuffolk.gov.uk/planning/Planning_Policies/upload/5003-BM01397-BMR-05-SFRA-Level2-Oct-2011-compressed.pdf
[5] Sustainable Drainage Systems (SuDS) a Local Design Guide 2018 (Accessed August, 2022) https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/
[6] Suffolk County Council 2022 Appendix A to the Suffolk Flood Risk Management Strategy Outline Planning Applications Interim Guidance https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/guidance-on-development-and-flood-risk/ (Accessed August, 2022)
[7] Suffolk County Council Preliminary Flood Risk Assessment (Accessed August, 2022) https://www.suffolk.gov.uk/assets/Roads-and-transport/Flooding-and-drainage/SUFFOLK-PFRA-REPORT-FINAL.pdf
[8] Suffolk County Council Flood Risk Management Strategy (Accessed August, 2022) http://www.greensuffolk.org/flooding/flood-risk-management-strategy/
[9] Braintree District Council Local Plan (Accessed August, 2022) https://www.braintree.gov.uk/directory-record/1062214/local-plan-section-1-2-text-adopted-25th-july-2022

Assessment which meet the requirements of the NPPF and Planning Practice Guidance. Flood Risk Assessments submitted must take into account an assessment of flood risk across the life of the development taking climate change into account by using the most up to date allowances available.

For all developments (excluding minor developments and change of use) proposed in Flood Zone 2 or 3, a Flood Warning and Evacuation Plan should be prepared.

For developments located in areas at risk of fluvial flooding, safe access/egress must be provided for new development as follows in order of preference:

a. Safe dry route for people and vehicles
b. Safe dry route for people
c. If a. is not possible a route for people where the flood hazard is low and should not cause risk to people
d. If a-c is not possible planning permission will not usually be granted.

All new development in Flood Zones 2 and 3 should not adversely affect flood routing and thereby increase flood risk elsewhere.

1.15 West Suffolk Council is the district council for Haverhill. Their Joint Development Management Policies Document[10] describes the relevant policy for 'Flooding and Sustainable Drainage'.

Policy DM6: Flooding and Sustainable Drainage Proposals for all new development will be required to submit schemes appropriate to the scale of the proposal detailing how on-site drainage will be managed so as not to cause or exacerbate flooding elsewhere. Examples include rainwater harvesting and greywater recycling, and run-off and water management such as Sustainable Urban Drainage Systems (SUDS) or other natural drainage systems.

Climate Change

1.16 Climate change has important implications for the assessment and management of flood risk. The NPPF requires that climate change is considered when making an assessment of flood risk posed to future development.

1.17 Climate change has the potential to affect all identified sources of flooding at the Site. The likely impacts of climate change include increased severity of rainfall events as well as wetter winters leading to higher groundwater levels and increased frequency and severity of surface water flooding.

[10] West Suffolk Joint Development Management Policies Document 2015 (Accessed August, 2022) https://www.westsuffolk.gov.uk/planning/Planning_Policies/local_plans/upload/JDMPD-FINAL-for-website-error-amended.pdf

1.18 The influence of climate change on rainfall intensity has been taken into account by the surface water drainage strategy outlined in Chapter 6 as an inclusion of 40% has been made for climate change for all rainfall events up to and including the 1 in 100 year event in accordance with NPPF requirements, and 'Flood Risk Assessments: Climate Change Allowances'[11].

Objectives

1.19 The following specific objectives were set by Create Consulting Engineers Ltd after a review of the available data:

- To assess the suitability of the scheme in relation to all sources of flooding;
- To assess the flood risk posed by the scheme once it is complete and operational;
- To suggest mitigation measures in order to reduce any residual risks to acceptable levels.

Constraints and Limitations

1.20 The copyright of this report is vested in Create Consulting Engineers Ltd and the Client, McDonald's Restaurants Ltd. The Client, or their appointed representatives, may copy the report for purposes in connection with the development described herein. It shall not be copied by any other party or used for any other purposes without the written consent of Create Consulting Engineers Ltd or the Client.

1.21 Create Consulting Engineers Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

1.22 The Flood Risk Assessment addresses the flood risk posed to and from the proposed development, the extent of which is shown by the Site boundary, as indicated on the attached drawings.

1.23 This report has been undertaken with the assumption that the Site will be developed in accordance with the above proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the Site.

1.24 Create Consulting Engineers Ltd has endeavoured to assess all information provided to them during this appraisal. The report summarises information from a number of external sources and cannot offer any guarantees or warranties for the completeness or accuracy or

[11] Environment Agency., 2021. *Flood Risk Assessments: Climate Change Allowances*. [Online]. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances [Accessed August, 2022].

information relied upon. Information from third parties has not been verified by Create Consulting Engineers Ltd unless otherwise stated in this report.

1.25 The revised Construction (Design and Management) Regulations 2015[12] (CDM Regulations) came into force in April 2015 to update certain duties on all parties involved in a construction project, including those promoting the development. One of the designer's responsibilities is to ensure that the client organisation, in this instance McDonald's Restaurants Ltd, is made aware of their duties under the CDM Regulations. Further information on the CDM Regulations is provided in the client guide and is available online. It has been assumed for the purposes of this assessment that the lead designer will be responsible for advising the Client.

1.26 The approach to this FRA follows the ethos of the CDM Regulation, inasmuch as during the assessment process the proposed development is considered and any foreseeable associated health and safety flood risks are identified. It is then considered how these flood risk can be eliminated, or mitigations identified to reduce or control them. The outcome of this assessment process is presented in this report. While preparing this FRA no other noteworthy or unique health and safety risk have been identified.

[12] Health and Safety Executive., 2015. *Construction (Design and Management) Regulations.* [Online]. Available at: http://www.hse.gov.uk/pubns/indg411.pdf [Accessed August, 2022].

2.0 SOURCES OF INFORMATION

2.1 The information contained in this report is based on a review of existing information and consultation with interested parties.

Records Review

2.2 Key reports and websites reviewed as part of this study are listed in Table 2.1 below.

Document/Website	Author/Publisher	Date
Fluvial/Tidal Flood Maps, Groundwater Mapping – https://flood-warning-information.service.gov.uk/long-term-flood-risk/map	Environment Agency (EA)	Accessed August, 2022
Surface Water and Reservoir Flood Mapping – Data.gov.uk	GOV.UK	Accessed August, 2022
BGS GeoIndex – Geology and borehole records - www.bgs.ac.uk/geoindex	British Geological Survey	Accessed August, 2022
Architect layout plans (Drawings 8342-SA-8333-P004 B.)	Architect	April 2022
Existing Site Layout (Topographic Survey) Drawing: 13102-100	Surveyor	June, 2021
AW asset plans (included as Appendix A) and Pre-Planning Enquiry Report (included as Appendix B)	Anglian Water	March 2022,
Infiltration testing Data (Appendix C)	Create Consulting Engineers Ltd	April, 2022
Suffolk County Council Preliminary Flood Risk Assessment (PFRA)	Suffolk County Council	2011
Suffolk County Council Flood Risk Management Strategy	Suffolk County Council	2016
Suffolk Surface Water Drainage (SuDS) Guidance, Standards and Information Appendix A to the Suffolk Flood Risk Management Strategy	Suffolk Flood Risk Management Partnership	2018
Appendix A to the Suffolk Flood Risk Management Strategy Outline Planning Applications Interim Guidance	Suffolk County Council	2022

Table 2.1: Key Information Sources

Consultation

2.3 The agencies and individuals consulted as part of this exercise to obtain records or seek input to the proposals as part of this FRA are listed in Table 2.2 and key records are included in the appendices.

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
Anglian Water Developer Services Team	Request for Asset Plans	Asset plans were requested in order to inform the foul and surface water drainage strategies. The asset plans (Appendix A), dated 24, March 2022 show foul and surface water assets in the vicinity of the Site. A 150mm VC foul water sewer runs north through open fields from Phoenix Road, approximately 55m to the west of the site before joining with a 300 to 375mm sewer, flowing east within Helions Bumpstead Road. A second 150mm VC foul sewer flows northeast within the eastern verge of Bumpstead Road approximately 40m from the eastern site boundary. A 300 to 375mm VC surface water sewer runs next to the western foul sewer, connecting to a 400 to 1200mm CO surface sewer running within Helions Bumpstead Road. A second 150mm VC surface water sewer is shown flowing northwest within the verge of Bumpstead Road alongside the foul sewer. A 280mm MDPE/PE80 potable water main is also shown running within the southern verge of Phoenix Road. This crosses to the northern verge of Bumpstead Road at the roundabout and runs to the northeast, crossing the site entrance.
	Request for Pre-planning report	A Pre-Planning Assessment Report (included in Appendix B) was received on 29th March 2022 This notes that capacity exists within the surrounding foul sewer network to accommodate flows from the proposed development, however capacity in the receiving wastewater treatment works (WWTW) will need to be increased before the development can connect. Further detail can be found in Section 6.0 below.

Table 2.2: List of Parties Consulted

Site Walkover

2.4 A site walkover was undertaken by Create Consulting Engineers Ltd on the 29th May 2022. A visual examination of the Site as well as an assessment its hydrological context within the surrounding area was carried out.

Site Investigation

2.5 A site investigation was carried out on the 28th to 29th of May 2022 by Create Consulting Engineers Ltd under the instruction of the client. This involved soakage testing within four machine excavated trial pits excavated to a maximum depth of 2.0m bgl across the Site as well as two boreholes and seven further geological testing trial pits.

2.6 The results of these investigations are discussed in Chapter 3 and included in full in Appendix C.

3.0 SITE SETTING

Site Location

3.1 The Site lies to the south of Haverhill town centre, Suffolk, approximately 25.0 km southeast of Cambridge, at Ordnance Survey grid reference 567617E, 244321N. The Site lies within the administrative area of West Suffolk Council (WSC) and consists of Brownfield land with its boundary shown on the attached drawings.

3.2 The Haverhill Vision 2031[13] document describes the development of Haverhill going forwards:

> *In recent years, there has been much private house building, especially on the western side of the town nearest to Cambridge. In 2011, Haverhill had 10,640 households. The strategy for growth provides for at least 4,260 new homes in Haverhill by 2031, over and above those already identified in the Local Plan or being built at the moment which could provide a population of around 35,000.*

Description of Site and Surroundings

3.3 The Site comprises approximately 0.66 ha of agricultural land, with Helion Bumpstead Road to the northern boundary, Bumpstead road to the eastern boundary and Phoenix Road to the southern boundary.

3.4 The Site is irregularly shaped and is formed mainly of undeveloped land with no built structures.

3.5 The Topographic Survey, included with this report on Drawing 100, summarises elevations in the area of the Site. The Site generally falls to the northeast. Levels generally fall from 76.5 mAOD in the southwest area of the site to 74.9 mAOD in the northeast.

Geological/Hydrological Setting

Underlying Geology

3.6 British Geological Survey (BGS) mapping (1:50,000 scale)[14] (Figure 3.1) identifies bedrock geology at the Site to comprise Undifferentiated Chalk deposits comprising the Lewes Nodular and Seaford Formations. This is characterised by the BGS as composed of hard to very hard nodular chalks and hardgrounds (which resist scratching by fingernail) with interbedded soft to medium hard chalks (some grainy) and marls; some griotte chalks. The softer chalks

[13] Haverhill Vision 2031 https://www.westsuffolk.gov.uk/planning/Planning_Policies/local_plans/upload/HH-Vision_2015v8-hi-res-compressed.pdf

[14] British Geological Survey (BGS) Onshore GeoIndex., 2022. *DiGMapGB-50 Bedrock Geology and Superficial Deposits*. [Online]. Available at: www.bgs.ac.uk/geoindex [Accessed August, 2022].

become more abundant towards the top. Nodular chalks are typically lumpy and iron-stained (usually marking sponges). Brash is rough and flaggy or rubbly and tends to be dirty. First regular seams of nodular flint, some large, commence near the base and continue throughout.

3.7 Superficial deposits across the majority of the Site (Figure 3.2) comprise the Lowestoft Formation (Sands and Gravels) which is neighboured by Lowestoft Formation (Diamicton) deposits to the south and north. This is characterised by the BGS as The Lowestoft Formation forms an extensive sheet of chalky till, together with outwash sands and gravels, silts and clays. The till is characterised by its chalk and flint content. The carbonate content of the till matrix is about 30%, and tills within the underlying Happisburgh Formation have less than 20%.

3.8 Proximate BGS borehole records[15] include TL64SE6 located approximately 800 m west of the Site, this recorded Made Ground to 0.3 m below ground level (bgl) and Quaternary Boulder Clay 0.30 to 25 mbgl. This was underlain by Cretaceous Chalk to 80 mbgl. However, this borehole is in the Diamicton and not in the Sand and Gravels, therefore it is likely to have a different permeability.

3.9 On the basis of available geological maps and historic borehole records for nearby Sites, the ground conditions of the area are anticipated to comprise the stratigraphy summarised in Table 3.1.

Stratum	Approximate Thickness	Generalised Description	EA hydrogeological classification
Made Ground/Top Soil	0.3mbgl	Made Ground/Topsoil	Unproductive Strata (Non-Aquifer)
Quaternary Boulder Clay	0.3-25mbgl	Chalky boulder Clay with intersected bands of clay, stone and chalk	Unproductive Strata (Non-Aquifer)
Cretaceous Chalk	25-80mbgl	White chalk with abundant Flint horizons	Principal Aquifer

Table 3.1: Anticipated Stratigraphy

3.10 Ground investigation conducted by Create Consulting Engineers in March, 2022 (Appendix C) has provided shallow geological information for eleven trial pits, dug within the Site to depths up to 2.0 mbgl. Identified geological groups include Made Ground (soft to firm brown grey to grey slightly sandy gravelly clay to firm brown grey silty gravelly clay) found to depths ranging between 0.10 and 2.4 mbgl, further detailed stratigraphic depth information is provided in Appendix C and Table 3.2 below.

[15] British Geological Survey (BGS) Onshore GeoIndex., 2022. *Borehole records*. [Online]. Available at: www.bgs.ac.uk/geoindex [Accessed August, 2022].

3.11 Infiltration testing in accordance with BRE365 standards was conducted by Create Consulting Engineers, as part of the Site investigation detailed above in March, 2022 (Appendix C). This included four trial pits for which calculated design infiltration rates can be found in Table 3.2 below.

Trial Pit Reference	Test Strata	Test Depth (mbgl)	Design Infiltration Rate (m/s)
TP08	**MADE GROUND** Firm dark grey to grey brown silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. 0.40m - with occasional subrounded flint and chalk cobbles 1.20m - becoming grey mottled dark grey 1.60m - becoming grey brown	2.0	Fail
TP09	**MADE GROUND** Firm brown grey silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. 0.30m - becoming grey to grey brown 0.70m - becoming light grey brown 1.40m - with occasional dark grey mottling	2.0	Fail
TP10	**MADE GROUND** Firm brown grey silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material.	0.8	Fail
TP11	**MADE GROUND** Firm brown grey silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With occasional fragments of brick and organic material..	1.0	Fail

Table 3.2: Observed Lowest Infiltration Rates, full details included in Appendix C.

Surface Watercourses

3.12 The nearest watercourse to The Site is a tributary of the Stour Brook located approximately 200m to the south, as shown on Figure 3.3.

Water Quality

3.13 The EA's river quality maps[16] indicate that the water quality in the Stour Brook downstream of the Site, which is the receiving watercourse for runoff from the Site, has "moderate" ecological and "Good" Chemical quality in 2015.

3.14 According to the Defra Magic website[17], the Site is within a medium priority surface water Nitrate Vulnerable Zone (NVZ). NVZ guidance states that an NVZ 'is designated where land drains and contributes to the nitrate found in "polluted" waters'. It defines polluted waters as:

- Surface or ground waters that contain at least 50mg per litre (mg/l) nitrate;
- Surface or ground waters that are likely to contain at least 50mg/l nitrate if no action is taken; and
- Waters which are eutrophic, or are likely to become eutrophic if no action is taken;

3.15 The DEFRA guidance states that water is eutrophic if:

> "it contains levels of nitrogen compounds that cause excessive plant growth resulting in "an undesirable disturbance to the balance of organisms present in the water and to the quality of the water".

Groundwater

3.16 The site is underlain by a Principal bedrock aquifer[18] defined by the Environment Agency as:

> *'geology that exhibits high permeability and/or provides a high level of water storage. They may support water supply and/or river base flow on a strategic scale'.*

3.17 The Site lies within Groundwater Source Protection Zone 3 (total catchment)[19], as shown on Figure 3.4 and identified by the online Environment Agency mapping (EA website, accessed August, 2022). This is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source (such as wells, boreholes and springs).

3.18 Groundwater was not identified within any proximate boreholes provided by the BGS online mapping service[7].

[16] Environment Agency (EA)., 2022. *Catchment Data Search*, [Online]. Available at: https://environment.data.gov.uk/catchment-planning/ [Accessed August, 2022].

[17] Department for Environment and Rural Affairs (DEFRA) Magic Website., 2017. [Online]. *Nitrate Vulnerable Zones (NVZ) – Combined (Final Designations).* Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed August, 2022].

[18] Department for Environment and Rural Affairs (DEFRA) Magic Website., 2010. [Online]. *Environment Agency Aquifer Designation Data.* Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed August, 2022].

[19] Department for Environment and Rural Affairs (DEFRA) Magic Website., 2019. [Online]. *Environment Agency Source Protection Zones (Merged.* Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed August, 2022].

3.19 Groundwater was encountered as part of site investigation works conducted by Create Consulting Engineers in May, 2022 in trial pits TP01 and TP03 at 0.95m bgl, TP04 and TP10 at 0.8m bgl and TP07 at 1.5 and 1.7m bgl. This is recorded as localised perched groundwater due to dry layers beneath strikes and overriding clay geology.

3.20 Mapping provided by the BGS[20] shows no surface water abstraction points within 500m of the Site.

Artificial Water Bodies

3.21 The nearest water body to the Site is Meldham Washland located approximately 500m, northeast.

Public Sewers and Water Supply Mains

3.22 Anglian Water (AW) are the statutory sewerage undertaker for the area and responsible for the operation and maintenance of public sewers serving Haverhill.

3.23 Foul sewers present in the immediate vicinity of the Site are shown within sewerage asset mapping provided by AW (Appendix A) and comprise:

- A 150 mm diameter gravity foul sewer network serving development between phoenix and Bumpstead Road. This flows to the north to AW manhole 5201.
- A 300mm to 375mm surface water sewer follows the line of the foul sewer to the west of the site from Phoenix Road and flowing east through Helions Bumpstead Road.

3.24 AW are also the potable water supplier for the area, asset plans contained within Appendix A, indicate that water supply assets are generally located within the service corridors of the roads in close proximity to the Site, including Bumpstead Road to the east.

- Beneath the western footway of Bumpstead Road, recorded as having a 280mm diameter medium-density polyethylene pipe running south to north.

Existing Site Drainage

3.25 It is understood that there is no formal drainage network serving the Site, therefore it is assumed that at present rainfall either infiltrates or runs off overland.

3.26 It is noted that a gravel filled filter drain is present within the site providing flow transmission from west to east through the site. This follows the eastern and southern site boundaries and

[20] British Geological Survey (BGS) Onshore GeoIndex., 2022. *WellMaster hydrogeological database.* [Online]. Available at: https://www.bgs.ac.uk/products/hydrogeology/WellMaster.html [Accessed August, 2022].

will need to be retained as part of the final development, potentially culverted under any proposed access way leading from Bumpstead Road.

3.27 It is assumed that at present rainfall either infiltrates or runs off overland towards the existing filter drain, with levels shown by the topo to fall generally towards the northeast.

3.28 There is also an existing highway drain following Bumpstead road and Phoenix Road to the southern and eastern site boundaries. This is located adjacent to the roadways at the base of the existing bank along these site boundaries.

4.0 SCHEME DESCRIPTION

The Scheme

4.1 The Site has outline planning permission, in line with the wider Baynham Meikle FRA (Appendix G) and this reserved matters application covers a McDonald's restaurant and associated access and infrastructure. Architect's Layouts showing the proposed scheme are included on Drawing 8342-SA-8333-P004 B.

Proposed Land Use Vulnerability Classification

4.2 The development is proposed to include a restaurants which is defined as a 'less vulnerable' use according to the NPPF.

4.3 Given the proposed land use classification and the location of the Site within Flood Zone 1 (as noted in Chapter 5 below), the Sequential and Exception Tests will not need to be undertaken for the purposes of the proposed development.

5.0 FLOOD RISK ASSESSMENT

Scope of Work

5.1 The scope of this FRA was refined to meet the brief outlined in Chapter 1 of this report and considers the following:

- Flood risk to the development from all sources;
- Potential for the design, construction and operation of the Site to increase the risk of flooding to neighbouring properties;
- Any necessary mitigation measures to mitigate identified potential flood risks;
- Climate change;
- Residual flood risks.

5.2 The approach is consistent with the NPPF[1] and its associated Technical Guidance[2] along with the requirements of local planning policy.

Flood Risk to the Proposed Development

Flood Risk from Fluvial/Tidal Sources

5.3 EA flood mapping[21], as shown on Figure 5.1, indicates that the Site is located within Flood Zone 1. Flood Zone 1 is defined as areas with a 'low' probability of inundation defined as having a less than 1 in 1,000 annual probability of river (fluvial) or sea (tidal) flooding (<0.1%).

5.4 The Site is therefore considered to be at a low risk of fluvial/tidal flooding, therefore this source is not considered further in this report.

Flood Risk from Surface Water

5.5 The EA Surface Water Flood Mapping[22], as shown on Figure 5.2, suggest that the majority of the Site is primarily at a 'very low' risk of surface water flooding from extreme rainfall, which is defined as having a less than 1 in 1000 (≤0.1%) probability of flooding. An area of the site towards the northeast however, is shown to be subject to a surface water flood risk between 'High' to 'low' which is defined as having between a 1 in 30 (3.3%) and 1 in 1000 (0.1%) chance of flooding. This is associated with falls in topography across the site to this area.

[21] Environment Agency., 2022. *Flood Map for Planning (Rivers and Sea) - Flood Zone 2 and Flood Zone 3. [Online]. Available at:* https://data.gov.uk/dataset/cf494c44-05cd-4060-a029-35937970c9c6/flood-map-for-planning-rivers-and-sea-flood-zone-2 [Accessed August, 2022]

[22] Environment Agency., 2022. *Risk of Flooding from Surface Water Extent: 3.3 percent annual chance, 1 percent annual chance and 0.1 percent annual chance.* [Online]. *Available at:* https://data.gov.uk/dataset/95ea1c96-f3dd-4f92-b41f-ef21603a2802/risk-of-flooding-from-surface-water-extent-3-3-percent-annual-chance [Accessed August, 2022].

5.6 The flood mapping also closely follows the route of the existing filter drain, described in section 3.0 above. Flood depths across the majority of the site remain below 150 mm for both the 'High' (Figure 5.3) and 'Medium' (Figure 5.4) risk events. However, in the 'Low' risk scenario, a small portion of the south central and northeast of the site reaches depths between 300 mm to 600 mm (Figure 5.5).

5.7 Surface Water flood risk modelling and mapping has been undertaken as part of the SFRA, for the 1 in 100-year event with an inclusion for 40% climate change. The results of which show the climate change extent closely matches, with slight increases, the current 1 in 100-year flood risk extent provided by the EA.

5.8 Given the nature of the proposed development and the fact the building will be placed away from primary flow routes, it is considered that the risk from surface water flooding is generally low.

5.9 Flooding from surface water remains a residual risk due to the potential for rainfall to exceed the design standard of the proposed drainage system and the effects of climate change on the frequency and severity of rainfall events, appropriate mitigation measures are therefore included in Table 7.1 of this report.

Flood Risk from Groundwater

5.10 Strategic scale Flood Risk Assessments prepared by Forest Heath District Council (SFRA[4]) and Suffolk County Council (PFRA[6]) show no record of groundwater flooding affecting the Site or surrounding area.

5.11 Evidence of localised perched groundwater was however observed within trial pits dug as part of site investigation works conducted for the purposes of this application in May 2022 as noted in section 3.0 above and within Appendix C.

5.12 Therefore, the risk of groundwater flooding in this location is considered to be low to moderate. Appropriate mitigation measures are therefore included in Table 7.1 of this report.

5.13 The effect of climate change on groundwater flooding is also currently uncertain. Milder wetter winters may increase the scale and frequency of flooding however, warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months. This is considered as part of the residual risk identified above and appropriate mitigation measures are included in Table 7.1 of this report.

Flood Risk from Artificial Water bodies

5.14 The nearest artificial waterbody to the site is a Meldham Washland located approximately 500m, northeast.

5.15 The Site is also not in an area at risk from flooding during a reservoir breach event, therefore flooding from this source is not considered a significant risk and will not be considered further in this report.

Flood Risk from Public Sewers

5.16 The SFRA shows no record of sewer flooding affecting the site or the immediate area. The risk of sewer flooding is therefore considered to be low.

5.17 Sewer flooding from blockage of private site and building drainage as well as the AW network is, however, a residual risk managed by the design of the Site drainage and regular inspection and maintenance of the public and private sewer network. The flood risk associated with this source may also increase over time due to the effects of climate change. Appropriate mitigation measures are therefore included in Table 7.1 of this report.

Flood Risk from Water Mains

5.18 Flood risk from this source is considered to be a residual risk with no existing mains shown within the supplied AW asset plans (Appendix A) crossing the site or within the immediate area. The main threat therefore will be from damage to newly constructed internal pipe work during the construction phase or as a result of any future individual property building works. Appropriate mitigation measures are discussed in Table 7.1 below.

Flood History

5.19 A review of the SFRA and PFRA confirms these documents hold no records of flooding affecting the site itself.

5.20 Flood investigation records provided by Suffolk County Council[24] identify two separate incidences of surface water flooding affecting the wider area of Haverhill at Falconer Road and Sturmer Road (August, 2020 and August, 2021), approximately 0.8km to the north east of the site. These events were due to heavy rainfall in excess of the capacity of the nearby drainage network.

Flood Risk Summary

5.21 In summary, the risk of flooding from all sources is generally considered to be low however, a number of mitigation measures are recommended in Table 7.1 to address and manage the residual risks from these forms of flooding.

[24] Flood Investigation records (Accessed August, 2022) https://www.suffolk.gov.uk/assets/Roads-and-transport/Flooding-and-drainage/Section-19s/Section-19-Report-Sturmer-Road-Haverhill.pdf

6.0 FOUL AND SURFACE WATER DRAINAGE AND FLOOD RISK FROM THE DEVELOPMENT

Existing Foul Water Drainage

6.1 As the Site is currently greenfield in nature there is no existing foul water drainage present.

Proposed Foul Water Drainage Strategy

6.2 Foul water from the Site will be designed to drain via gravity to the western boundary, to a connection with manhole 5201 at 567542E, 244288N. The foul water drainage proposals are included on Drawing 2590/02/001C appended to this report.

6.3 The report also notes that the receiving foul treatment works currently does not have capacity to receive flows from the proposed development however, AW are obligated to accept the foul flows from developments with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should the planning authority grant planning permission.

Existing Surface Water Drainage

6.4 Calculations included in Appendix D estimate the current Greenfield runoff rates equivalent to the existing site area and the proposed impermeable area from the Site as shown in Table 6.1.

Rainfall Event	Whole Site (l/s)	Impermeable Area of Proposed Site (l/s)
Q 1 year	1.5	1.1
Q 30 year	4.0	2.8
Q 100 year	5.8	4.0

Table 6.1: Equivalent Greenfield Runoff Rates from the Site for Various Rainfall Events.

6.5 As noted in Chapter 3.0 the Site is currently free draining, with a single gravel filled filter drain to the southern and eastern site boundaries which transfers flows from the west.

Proposed Surface Water Drainage Strategy

6.6 The following provides a summary of the proposed method of management and disposal of surface water runoff from the McDonalds Site:

- Surface water flows will be attenuated using SUDS such that flows from the Site are restricted (with an allowance for an increase in rainfall intensity of 40% due to climate change) prior to a restricted discharge into an existing public surface water sewer to the west of the site.

- As part of the initial design process sustainable drainage methods have been included where practicable, to provide the required attenuation in accordance with the SUDS hierarchy (see Table 4.1).
- There is little potential for Infiltration forms of SUDS (i.e., soakaways) to be viable as shown by the infiltration testing data (Appendix C). On the basis that infiltration systems are not viable the following forms of SUDS are proposed, as shown on Drawing 2590/02/001C:
  - All surface water runoff from external hard surfacing will drain via kerb offlets to a narrow grassed filter strip before passing into a filter drain where possible.
  - Building drainage will discharge directly to a proposed attenuation tank, outlined below.
  - A piped drainage network will collect flows from the filter drains and discharge at a restricted rate to the existing public surface water sewer network to the west of the site, at manhole 5252.
  - A flow control (Hydrobrake or similar) will be installed prior to discharge and will restrict flows to the equivalent greenfield run off rate of 1.1l/s for all events up to and including the 1 in 100 year plus 40% climate change event.
  - A cellular attenuation tank will be included to store excess runoff, positioned within the central parking area.
  - A secondary filter drain is also included prior to outflow from the Hydrobrake to provide a further level of water quality treatment to meet the relevant mitigation index requirements as detailed below.
- Flow calculations included in Appendix E indicate that, an attenuation tank with 355 m^3 of storage is required. The calculations assume a maximum tank depth of 1.2m with a surface area of 320.0 m^2. This allows for drainage from the Site to reach the tank with an appropriate level cover.
- The 1.1 l/s restricting flow rate is equivalent to the 1 in 1 year greenfield runoff rate for the measured proposed impermeable area within the site (0.453 ha) as shown on Layout Drawings 8342-SA-8333-P004 B (i.e. the Site area excluding public open space and tree belts etc.), as shown by the calculations included in Appendix C.
- Anglian Water have been consulted regarding capacity within the existing surface water network to accept flows from the proposed development. Anglian Water can confirm, within the received Pre-Planning Enquiry Report (Appendix B) that capacity exists within the receiving network and that connection will not produce a downstream impact.
- The existing filter drain running to the south and eastern boundaries of the site will be retained and culverted under the proposed entrance way to maintain through flow from east to southwest through the site. This feature will also be diverted to avoid clashes with proposed drainage as shown on the proposed drainage strategy drawing 2590/02/001C. Existing highway drainage will also be maintained to retain existing through flows from northeast to southwest along the site boundaries.

6.7 A summary of the potential SUDS options which led to the above drainage strategy is included in Table 6.2.

SUDS Option	Suitability/Included in the Scheme?	Comments
Rainwater Harvesting	*	Not included in the client and architect design proposal at present.
Green Roofs/Brown Roofs/Blue Roofs	X	Not suitable for use within the scheme due to design of roof.
Soakaways and porous paving	X	Based on our understanding of the ground conditions (appendix C) it is assumed that the underlying geology beneath the developed part of the Site is not suitable for infiltration systems such as this.
Porous paving (treatment/storage)	*	Not included in the client and architect design proposal at present.
Filter Strips	✓	All external surfaces will drain via a narrow filter strip.
Filter Drains	✓	All external surfaces and roof areas will be passed through one or two sets of filter drains.
Swales	*X*	Space constraints on site mean these are not suitable for use.
Attenuation Ponds (above ground storage)	*X*	Space constraints on site mean these are not suitable for use.
Below ground storage in cellular systems	✓	An cellular attenuation tank of 355 m^3 (320 m^2) is included within the scheme.
Flow control devices	✓	The peak flow rates will be managed by a simple flow control (as shown in Appendix E). This will restrict flows to 1.1l/s This flow control also takes into account the 40% inclusion for climate change.

Table 6.2: SUDS Options

Key:

✓ *Suitable for use and included in the scheme*

* *Possibly suitable for use – not included in the client and architect design proposal at present – should be considered further as part of the detailed design*

X *Unlikely to be suitable for use*

Pollution Control Measures

6.8 As part of the SUDS management train suitable pollution measures must be included to ensure infiltrating water quality meets acceptable standards as set out within Chapter 26 of the SUDS Manual.

6.9 Pollution control requirements are determined by the using the Simple Index Approach as detailed in the CIRIA SuDS Manual.

6.10 Suitable pollution hazard indices are allocated for the proposed land uses. The indices range from 0 (no pollution hazard for this contaminant type) to 1 (high pollution hazard for this contaminant type).

6.11 From the designated mitigation indices a total SuDS mitigation index is calculated for each of suspended solids, metals and hydrocarbons using:

Total SuDS mitigation index = mitigation index $_1$ + 0.5(mitigation index $_2$)

Where:

Mitigation index $_n$ = mitigation index for component n

6.12 To deliver adequate treatment the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

Total SuDS mitigation index ≥ pollution hazard index

6.13 For McDonalds the SuDS pollution indices are detailed in Table 6.3.

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

Table 6.3: Calculated Pollution Indices for the Site

6.14 All external impermeable areas will drain via a narrow filter strip and then two stages of filter drains whilst roof areas will drain via a filter drain. These provide total mitigation indices that equal or exceed those required for the Site in all cases (Table 6.4).

SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Filter Drain	0.4	0.4	0.4
Total mitigation index external areas:	0.8	0.8	0.9
Total mitigation index roofs:	0.4	0.4	0.5

Table 6.4: Indicative SuDS mitigation indices

6.15 It should be noted that SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the CIRIA SuDS Manual. It is appreciated the filter strips are narrower than the ideal design but given the combined SuDS management train provides indices in excess of those required it is noted this will likely take account of the reduced filter strip design.

Exceedance Flow Routes

6.16 Exceedance flow routes are shown on Figure 6.1, these may be adapted to suit any proposed changes to the Site layout as the design progresses in line with the following principles:

- Surcharged flows from the drive-through, roads, parking bays and roof areas will be contained within roadways and channelled towards the filter strips and filter drains and areas of open space;
- External ground levels will be profiled such that no ponding occurs against buildings, with flows directed as above;

Management and Maintenance of Drainage Assets

6.17 The site drainage will be managed by a private management company as part of the proprietors ongoing management duties for the site.

6.18 Further detail regarding the exact management and maintenance procedures required will be provided as part of any reserved matters submission once a management company has been instructed and a scope agreed. This will however, follow the principles set out in Tables 6.5 and 6.6 below:

Maintenance Schedule	Required Actions	Typical Frequency
Attenuation Storage Tanks (Geo-cellular storage)		
Regular Maintenance Remedial Actions	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates in to the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal fore-bays	Annually or as required
	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
	Clear perforated pipework of blockages	As required
Filter Drains		
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly, or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Maintenance Schedule	Required Actions	Typical Frequency
	Replacement of permeable surfacing, manhole components, silt traps and cellular soakaways should failure occur.	As required
Filter Strips:		
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drainstrip surface, access chambers and pre-treatment devices	Monthly, or as required
	Inspect filter strip surface, and inlets / outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Conduct appropriate vegetation/grass maintenance throughout the growing season. Clear perforated pipework of blockages	As required Throughout the growing season, as required
Other General:		
Regular Maintenance	Inspect rainwater gutter channels, inlets and outlets for blockages and clear as required.	Monthly for first year then annually thereafter
	Inspect gully drains, channel drains and inspection chambers (including silt traps) for siltation/blockage.	Monthly for first year then annually thereafter
	Inspect for sediment and debris in manhole bases and any blockage of soakaway chamber and geocellular storage.	Bimonthly for first six months then every six months thereafter
	Remove litter and debris from swale. Carry out periodic mowing of grassed surface and inspect for silt accumulation to determine appropriate removal frequency.	Monthly or as required (and through growing season for swales)
	Remove any sediment and debris from base of chambers and cellular storage.	As required, based on inspections
Occasional Maintenance Remedial Actions	Remove sediment from any affected articles including silt traps and soakaways (most likely via jetting).	As required
	Clear any pipe blockages with appropriate equipment	As required
	Repair any damage arising from various inspections (by approved engineer where required)	As required
	Replacement of permeable surfacing, manhole components, silt traps and cellular soakaways should failure occur.	As required

Table 6.5: Outline SUDS Management and Maintenance Requirements for McDonalds

Flood Risk from the Development

6.19 As the development of the Site will introduce hard surfacing, the runoff characteristics will be significantly altered. Therefore, an assessment of the proposed surface and foul water drainage scheme is required to ensure the scheme does not increase flood risk to the surrounding area.

6.20 The following sections provide a drainage assessment of the scheme and appropriate mitigation measures are presented in Table 7.1

Effects on the Public Foul Sewer Network

6.21 As the Site will now produce foul water flows AW have been consulted to confirm there will be no detriment to the surrounding foul water network as a result of the scheme.

6.22 AW have confirmed that the receiving foul network can accommodate flows from the proposed development without producing any downstream detriment. However, the existing WWTW currently does not have capacity to treat flows from the development. Anglian Water are however, obligated to accept the foul flows from development with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should the planning authority grant planning permission. Therefore, the impacts to the local area are considered to be negligible.

Effects on Nearby Watercourses

6.23 As the majority of the Site is free draining, it is assumed that under current conditions, any surface water will currently pond or runoff to the existing filter drain during extreme rainfall events. Following development, the surface water drainage strategy set out above ensures that sufficient sustainable drainage systems will be included to make sure that there are no significant changes in surface water runoff from the Site compared to the existing situation (for all rainfall events up to the 1 in 100 year rainfall event including an allowance for climate change). Calculations in Appendix F confirm this.

6.24 For all events beyond the 1 in 100 year plus climate change rainfall event, the situation will be no worse than existing, as long as a consideration of exceedance flows is made as part of the detailed drainage design to ensure that any excess surface water runoff would continue to overflow away from the existing and proposed residential properties.

6.25 AW have confirmed that the receiving foul network can accommodate flows from the proposed development without producing any downstream detriment.

7.0 MITIGATION MEASURES

7.1 Flood Risk Mitigation measures are proposed in Table 7.1 in order to both mitigate flood risk posed to the development and to ensure the development poses no risk to the surrounding area.

Type of Flooding (Source)	Issue	Mitigation Measures	Justification	Residual Risk *
Flooding from proposed water mains (proposed internal water supply system).	A residual risk of flooding associated with internal water supply and distribution systems may result in flooding of dwellings.	• Routine inspection of the Site and public water supply and distribution system by the Site owner and AW.	Will ensure the residual risk is minimised for the lifetime of the development.	Low
Sewer flooding from existing public and private drainage (foul and surface water).	Blockages or surcharges in the Site drainage or the public sewer network in the Site vicinity may result in flooding of the Site.	• Confirm capacity is available in the public sewer network, section 106 to be submitted once a contractor has been appointed and planning granted; • Flood flow routes have been considered and should be maintained through appropriate construction in line with the as designed site levels. • Ensure routine inspection and maintenance of both the on-site and offsite drainage systems by the Site management and AW; • A management plan for the maintenance of drainage assets has been prepared as part of this FRA (table 6.5). This should ensure routine inspection and maintenance of both the foul and surface water drainage systems by the Site management and/or any adopting body and AW;	In the event of foul and surface water flooding occurring, these measures will ensure the effects of flooding to external areas and dwellings will be minimised.	Low
	A residual risk of flooding associated with the blockage/surcharge or failure of existing foul and surface water drainage networks remains.		Will ensure the risk of flooding is minimised as far as possible including as part of the detailed design stage	
Flooding from perched/shallow groundwater	Perched or Shallow groundwater may be present or may affect the site in the future during periods of prolonged extreme rainfall, due to the increasing effects of climate change (for rainfall above the design event). This may result in flooding of the internal building in extreme cases.	• Waterproofing of substructures and any below ground services as part of the construction phase. • Carry out de-watering as necessary through the construction phase. • Where surface and foul water drainage networks are to be placed within any water bearing strata, they should be constructed such that water ingress cannot occur. • Consider weighting of attenuation tanks, as required, to minimise flotation risks	Will ensure the risk of flooding and moisture ingress is minimised.	Low
Flooding from surface water runoff – overland flow / ponding	Risk of flooding from rainfall events in exceedance of the site drainage design and by run-off from surrounding areas, may result in on-site property flooding.	• Existing site drainage including filter drain and highway drainage will be maintained and culverted/diverted where necessary to retain existing through flows along the site boundaries. • No buildings will be proposed in the areas at risk of surface water flooding;	Will ensure flood risk from this source is minimised for the lifetime of the development and as	Low

Type of Flooding (Source)	Issue	Mitigation Measures	Justification	Residual Risk *
		• The detailed design of the development has made an allowance for flow routing from rainfall events in exceedance of the drainage design capacity (i.e. the 100 year plus 40% climate change) in accordance with best practice guidance, as per the presented site levels;	updated modelling becomes available, whilst also ensuring no downstream impacts arise.	
Increased flood risk to surrounding and downstream properties and land as a result of the increased impermeable area associated with the scheme.	The scheme will change surface water run-off rates and patterns which may increase risk of flooding to neighbouring land or property, most notably due to the increase in runoff volume.	• Sustainable drainage systems and surface water attenuation have been included to ensure the risk of flooding to the surrounding area is minimised whilst no flooding of properties occurs during the design 1 in 100-year surface water flood plus 40% climate change event. Associated with this is the restriction of flows to the equivalent 1 in 1-year greenfield runoff rate for all impermeable areas, as outlined in Chapter 5. • The detailed design of the development has made an allowance for flow routing from rainfall events in exceedance of the drainage design capacity (i.e. the 100 year plus 40% climate change) in accordance with best practice guidance, as per the presented site levels. • External areas have also been profiled so as any runoff will be directed away from buildings, into roadways and open space. • Maintenance plans and schedules have been compiled for all sustainable drainage systems in the scheme. These ensure routine inspection and maintenance of both the foul and surface water drainage systems and will be targeted towards all responsible parties including site owners, adopting authorities and private management companies. These measures will ensure the effective operation of all drainage assets for the lifetime of the development. • Appropriate maintenance of downstream sewers by AW and of any downstream culverts by the respective riparian owners.	C	Low
	The development of the Site will increase foul water flows in the local network.	• Routine inspection and maintenance of both the foul water drainage systems private owners, management companies and the adopting authority. • Confirm capacity is available in the public sewer network, section 106 to be submitted once a contractor has been appointed and planning granted;		
	The introduction of new water mains to supply the development has the potential to increase the residual risk of bursts associated with these structures	• Appropriate easements will be maintained around all proposed water mains and placed, where possible, within main service corridors beneath roadways. This will ensure that any flood waters are contained within kerb lines and channelled towards attenuation basins as per the above flow routing requirements.		

Table 7.1. Mitigation Measures

*Following adoption of the mitigation measures

8.0 RESIDUAL FLOOD RISKS AND IMPACTS TO SURROUNDING AREAS

Residual Risks

8.1 A number of residual risks have been identified, associated with locally perched groundwater, public sewers, site drainage and water supply pipes and intense rainfall.

8.2 As long as the measures included in Table 7.1 above are implemented and the public sewer networks, site drainage/water supply infrastructure are regularly inspected by maintained by AW and site management respectively then the residual risk will be minimised.

Impact on Flood Risk of Surrounding Areas

8.3 Given the low flood risk present on site and the drainage strategy proposed, it is considered that the development of the Site will not increase the risk of flooding in other areas, surrounding the Site, assuming the measures proposed in Table 7.1 are implemented.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Based on our understanding of the Site setting and the development proposals, it is considered that the risk of flooding from all sources is generally low, and the development can be operated safely and without significantly increasing flood risk elsewhere. However, a number of residual risks have been identified, associated with perched groundwater, public sewers, site drainage and water supply pipes and intense rainfall. Appropriate mitigation measures have been provided in Table 7.1 to address and manage the residual risk from these forms of flooding.

9.2 We recommend that the assessment of residual risks should be reviewed by site owners as new flood risk information becomes available, and the flood risk associated with adjacent sewers may also increase over time in the area due to climate change.

10.0 REFERENCES

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v. Forest Heath District Council (2011) *Strategic Flood Risk Assessment Level 2*

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FIGURES

Figure 1.1: Site Location Plan

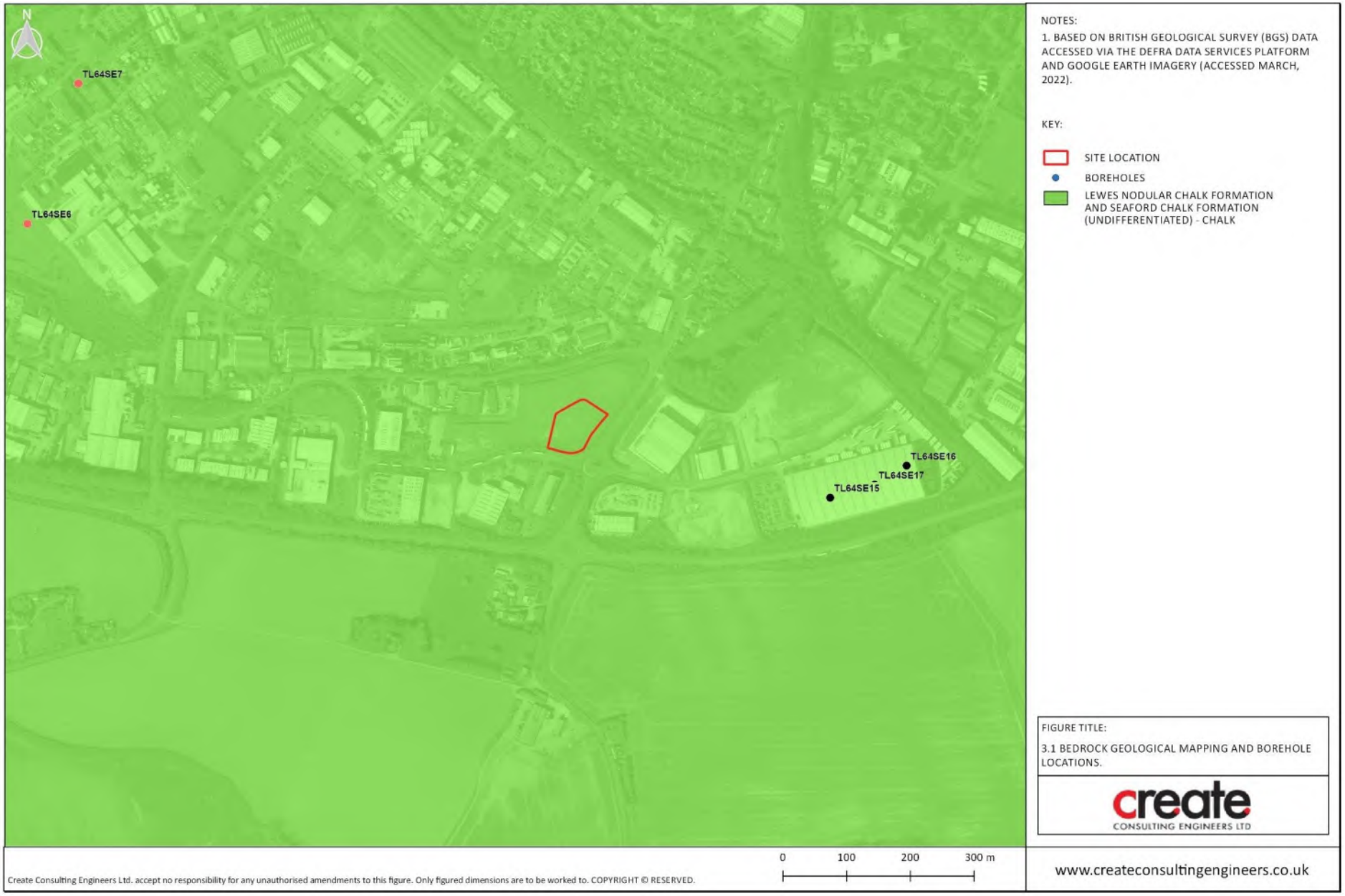


Figure 3.1: British Geological Survey Bedrock Geology Mapping Extract (1:50,000 scale)

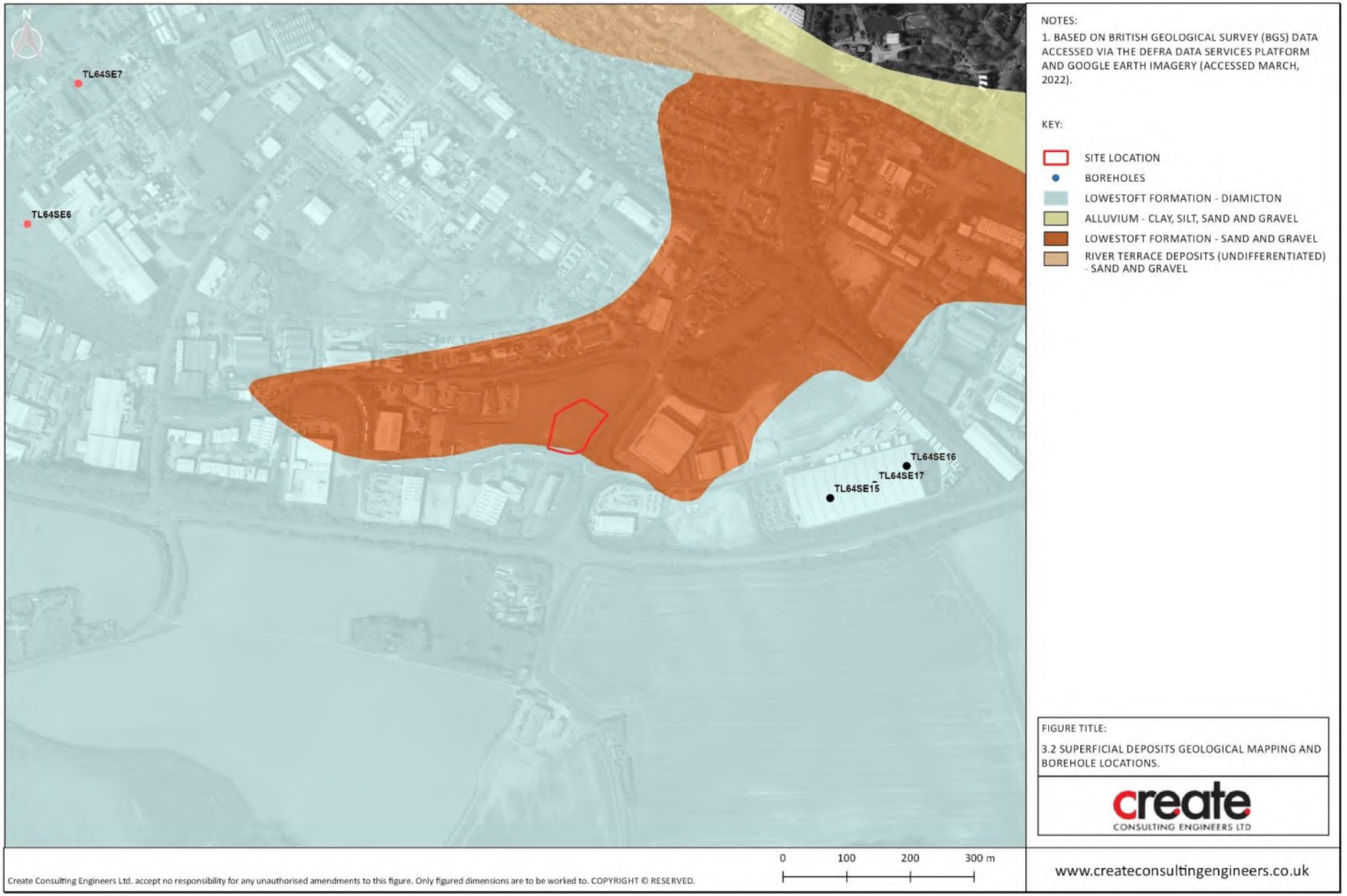


Figure 3.2: British Geological Survey Superficial Geology Mapping Extract (1:50,000 scale)

Figure 3.3: Identified Local Watercourse Map

Figure 3.4: Source Protection Zone

Figure 5.1: Environment Agency Fluvial/Tidal Flood Map

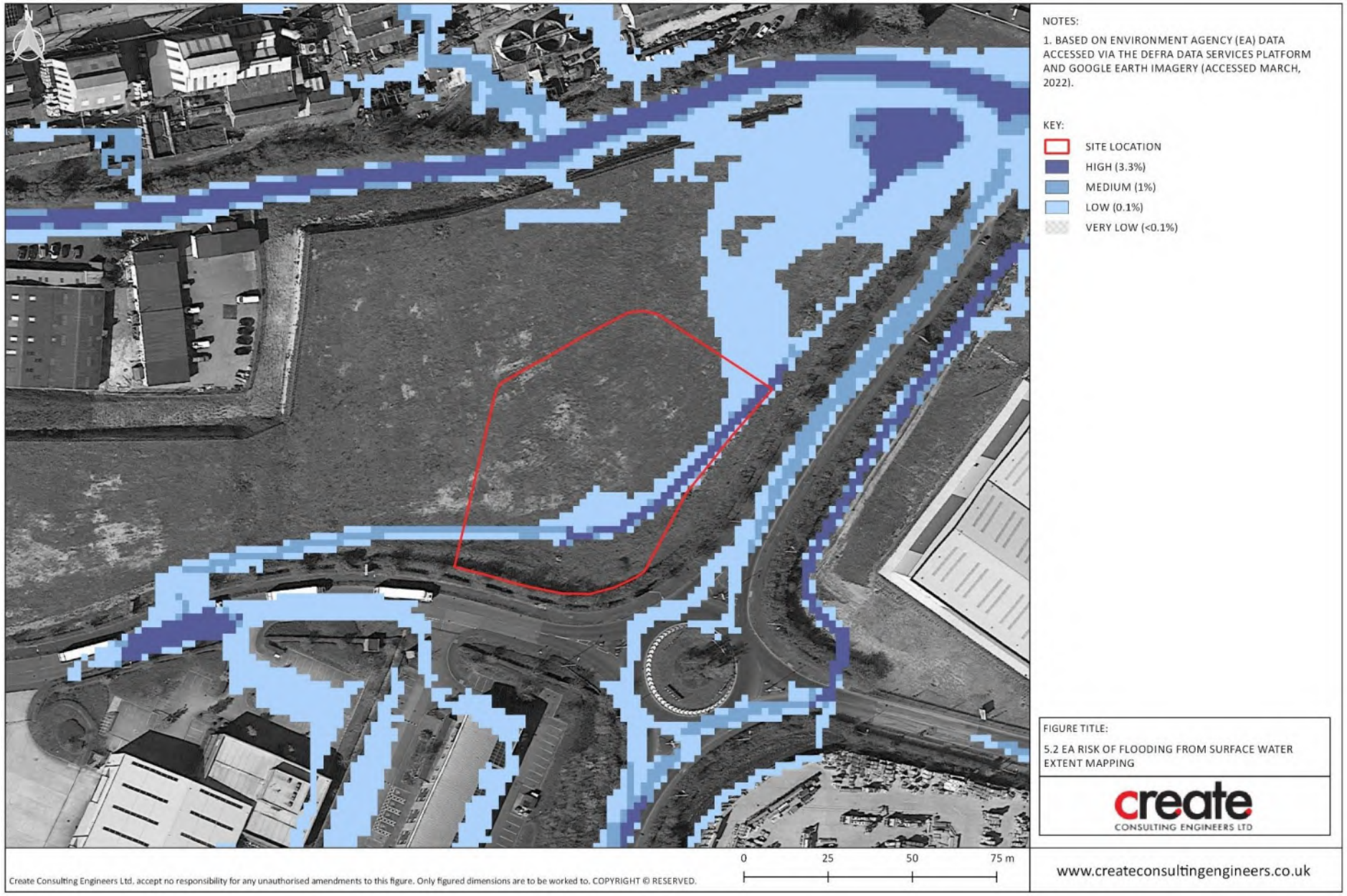


Figure 5.2: Environment Agency Surface Water Flood Risk Map

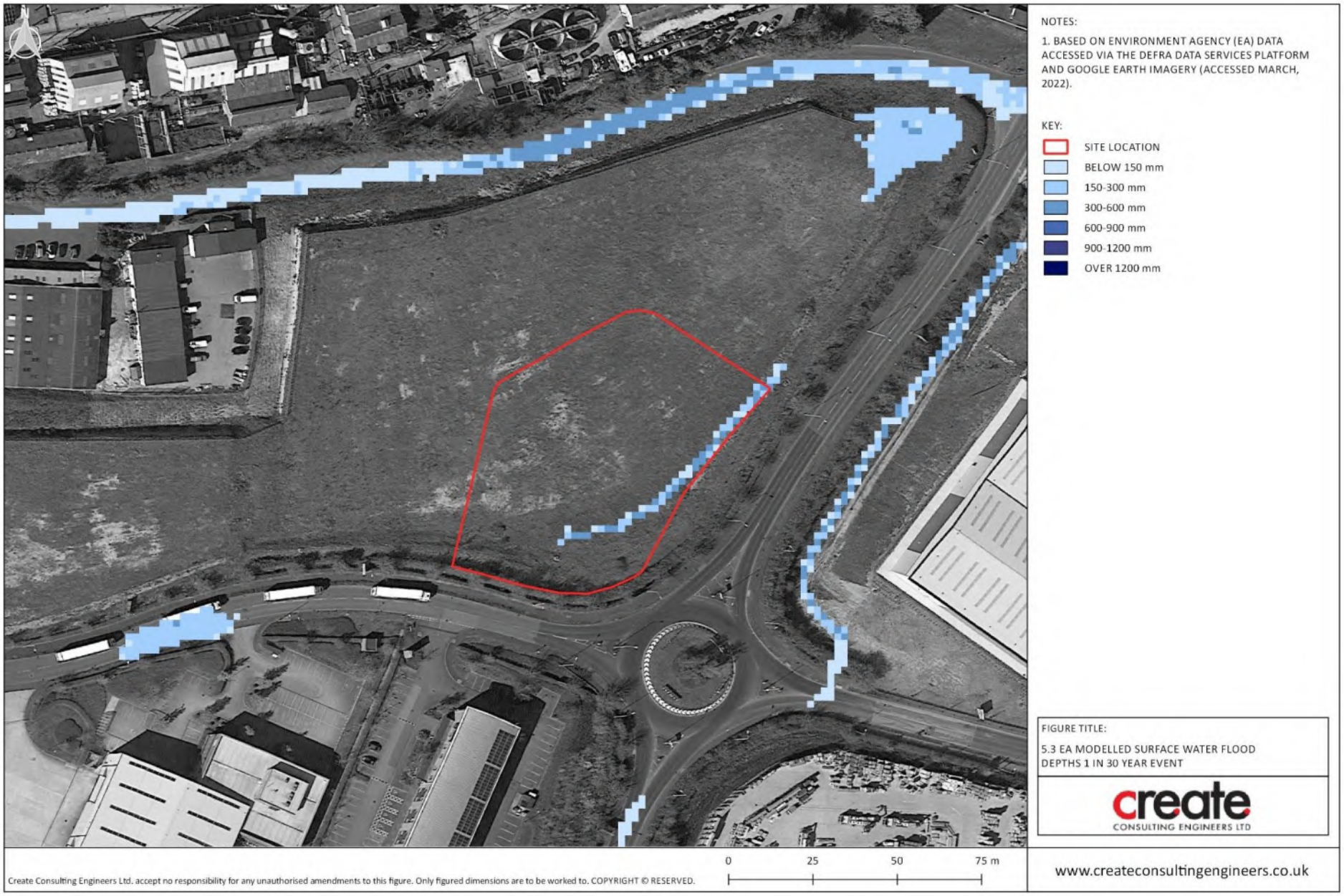


Figure 5.3: Environment Agency Surface Water Flood Depth Map 3.3% Event

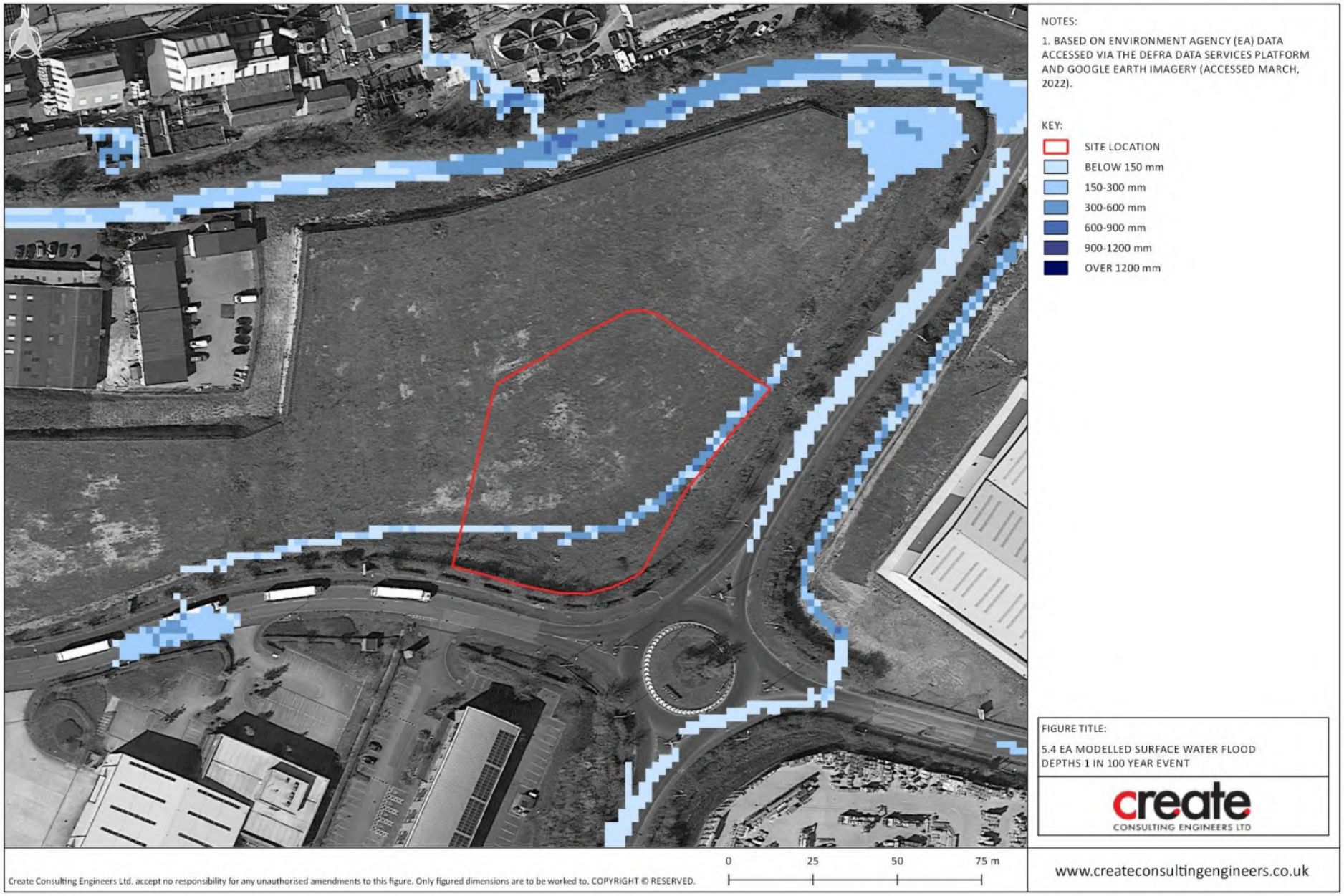


Figure 5.4: Environment Agency Surface Water Flood Depth Map 1% Event

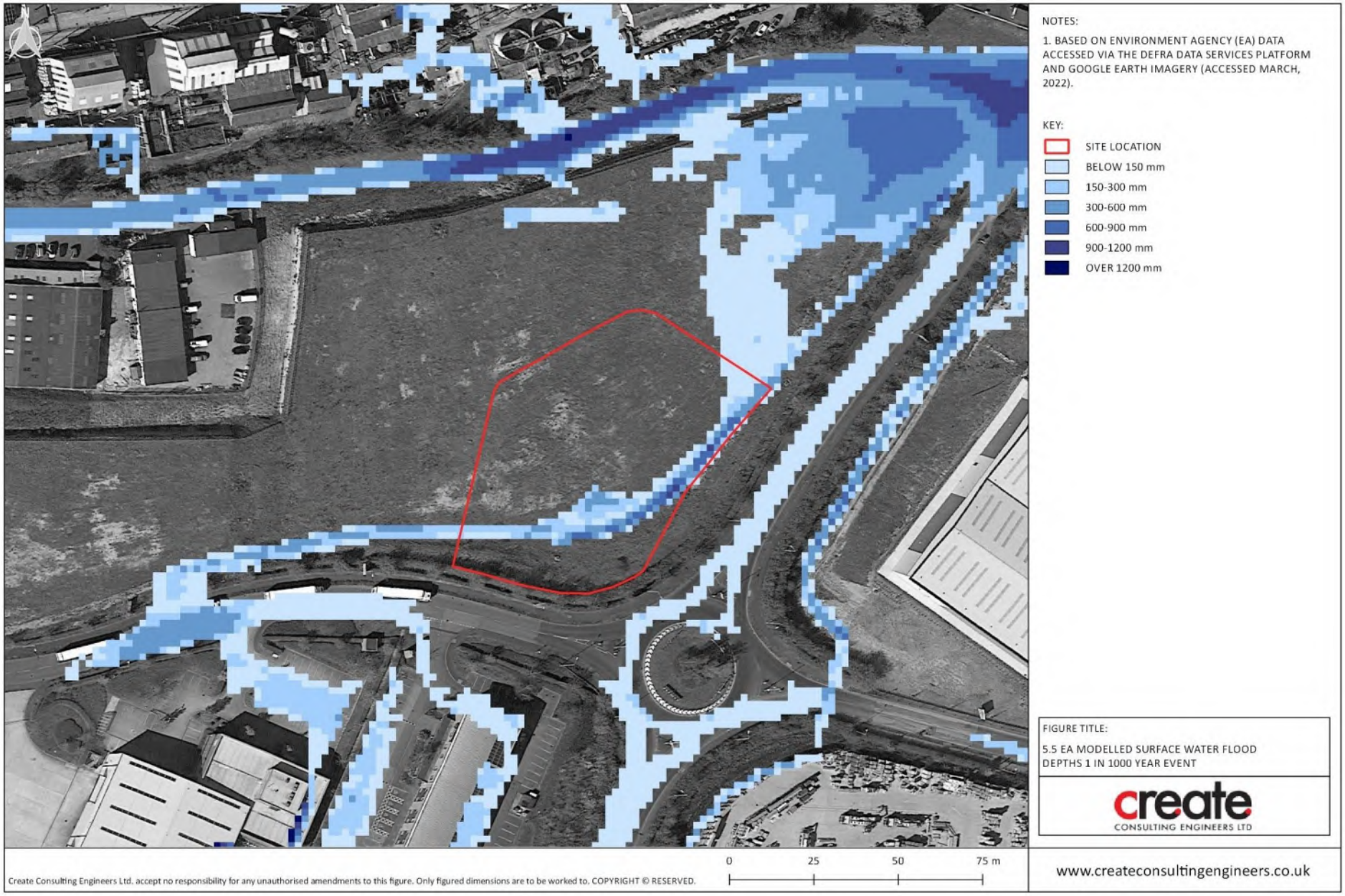


Figure 5.5: Environment Agency Surface Water Flood Depth Map 0.1% Event

Figure 5.6: Environment Agency Reservoir Breach Risk Map

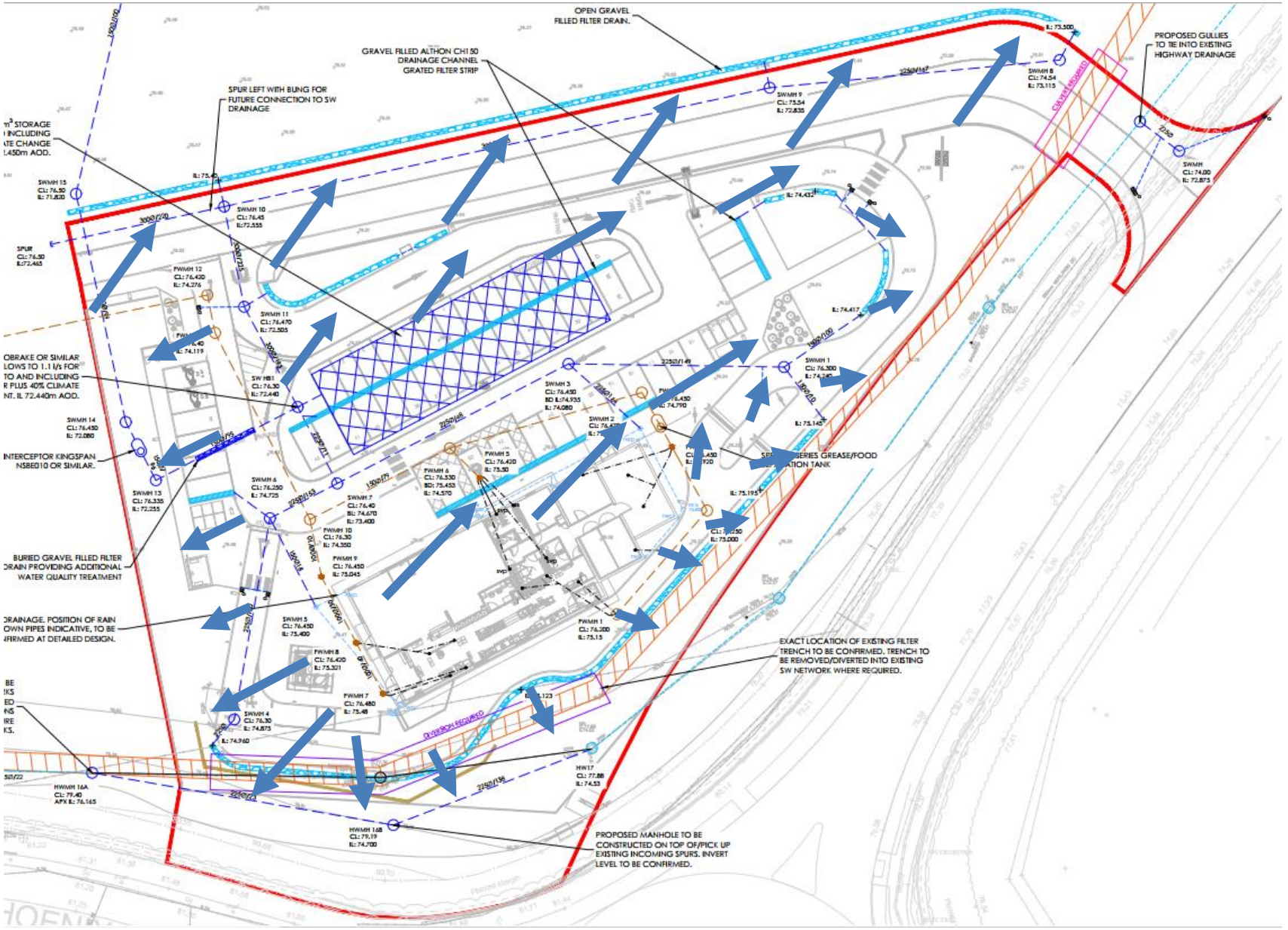
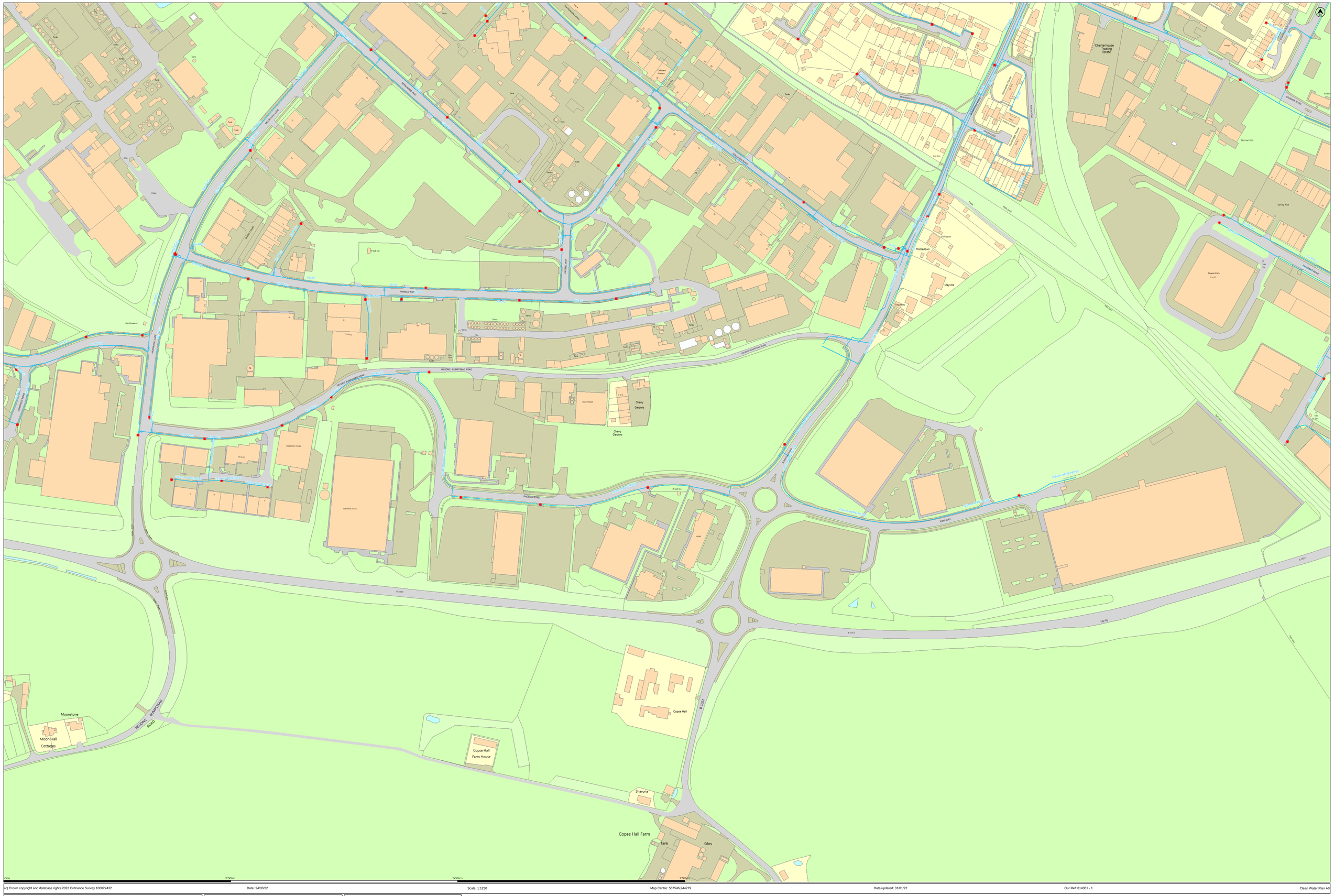


Figure 6.1 Indicative Exceedance Flow Routes

Source: Drawing 2590/02/001C by Create Consulting Engineers Ltd

APPENDICES

APPENDIX A



(c) Crown copyright and database rights 2022 Ordnance Survey 100022432 | Date: 24/03/22 | Scale: 1:1250 | Map Centre: 567546,244279 | Data updated: 31/01/22 | Our Ref: 814361 - 1 | Clean Water Plan A0

Potable Water — Fitting
Raw Water — RAW
Decommissioned Water — Hydrant

claire.seymour@createconsultingengineers.co.uk
McDonalds Haverhill

love every drop
anglianwater

Date: 24/03/22

Scale: 1:1250

Map Centre: 567546,244279

Data updated: 31/01/22

Our Ref: 814361 - 2

Wastewater Plan A0

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

claire.seymour@createconsultingengineers.co.uk

McDonalds Haverhill

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
4612	567437	244697	C	-	-	-
4712	567448	244711	C	-	-	-
4714	567451	244711	C	-	-	-
0200	568076	244277	F	-	-	-
0201	567029	244296	F	-	80.04	-
0202	567076	244296	F	-	79.29	-
0206	567040	244248	F	-	-	-
0207	567013	244252	F	-	-	-
0210	567037	244249	F	-	-	-
0401	567066	244480	F	-	85.99	-
0402	567098	244468	F	-	84.92	-
0701	568001	244763	F	-	59.76	-
0702	568084	244728	F	-	60	-
1301	567130	244318	F	-	78.34	-
1302	567159	244336	F	-	77.78	-
1303	567187	244337	F	-	76.19	-
1401	567136	244459	F	-	83.54	-
1402	567156	244459	F	-	83.12	-
1601	568186	244676	F	-	60.34	-
1701	567166	244753	F	-	-	-
1701	568107	244718	F	-	60.13	-
1702	567197	244727	F	-	-	-
1702	568146	244700	F	-	60.29	-
1704	568189	244705	F	-	-	-
2212	568240	244289	F	-	-	-
2301	567208	244353	F	-	75.92	-
2301	568266	244360	F	-	-	-
2302	567292	244358	F	-	74.85	-
2302	568265	244302	F	-	-	-
2401	567218	244436	F	-	-	-
2402	567290	244433	F	-	-	-
2501	568257	244568	F	-	-	-
2502	568218	244591	F	-	-	-
2600	567276	244683	F	-	-	-
2601	568229	244652	F	-	-	-
2602	568243	244645	F	-	60.54	-
2603	568236	244626	F	-	-	-
2604	568243	244640	F	-	-	-
2605	568211	244694	F	-	-	-
2700	568210	244739	F	-	-	-
2701	568214	244737	F	-	-	-
2702	568221	244732	F	-	-	-
3301	567375	244357	F	-	73.69	-
3401	567367	244431	F	-	-	-
3402	567361	244418	F	-	-	-
3601	567395	244653	F	-	-	-
3602	567354	244689	F	-	-	-
3603	567306	244632	F	-	-	-
3604	567313	244650	F	-	-	-
3701	567309	244734	F	-	-	-
3705	567364	244752	F	-	-	-
3706	567352	244738	F	-	-	-
3707	567342	244725	F	-	-	-
3708	567336	244720	F	-	-	-
3709	567396	244746	F	-	-	-
3710	567396	244734	F	-	-	-
3711	567386	244729	F	-	-	-
3712	567390	244701	F	-	-	-
4301	567486	244352	F	-	71.04	-
4401	567434	244429	F	-	-	-
4402	567468	244428	F	-	-	-
4501	567481	244562	F	-	82.79	-
4601	567442	244604	F	-	-	-
4602	567462	244692	F	-	-	-
4603	567456	244684	F	-	-	-
4604	567447	244691	F	-	-	-
4605	567449	244674	F	-	-	-
4606	567449	244676	F	-	-	-
4607	567455	244683	F	-	-	-
4608	567456	244682	F	-	-	-
4609	567455	244679	F	-	-	-
4610	567449	244688	F	-	-	-
4611	567445	244691	F	-	-	-
4613	567427	244681	F	-	-	-
4614	567427	244685	F	-	-	-
4701	567448	244724	F	-	79.14	-
4702	567410	244752	F	-	-	-
4704	567418	244727	F	-	-	-
4705	567408	244725	F	-	-	-
4706	567433	244717	F	-	-	-
5200	567520	244231	F	78.5	73.435	5.065
5201	567531	244289	F	75.15	71.897	3.253
5301	567590	244367	F	70.9	69.283	1.617
5302	567559	244352	F	72.3	70.47	1.83
5303	567564	244364	F	71.3	69.69	1.61
5304	567531	244348	F	73	70.706	2.294
5401	567542	244438	F	-	-	-
5601	567522	244669	F	-	78.54	-
5602	567549	244649	F	-	78.3	-
5603	567593	244615	F	-	80.67	-
5604	567593	244615	F	-	77.91	-
5605	567513	244603	F	-	80.68	-
5701	567555	244759	F	-	-	-
6200	567695	244238	F	-	-	-
6201	567698	244255	F	-	-	-
6301	567618	244382	F	-	-	-
6302	567630	244379	F	-	69.1	-
6303	567696	244398	F	-	68.65	-
6400	567695	244472	F	-	-	-
649A	567367	244633	F	-	-	-
649B	567370	244636	F	-	-	-
649C	567384	244654	F	-	-	-
649D	567363	244628	F	-	-	-
649E	567358	244624	F	-	-	-
6501	567666	244559	F	-	76.06	-
6601	567631	244698	F	-	-	-
7100	567756	244192	F	-	-	-
7101	567727	244198	F	-	-	-
7200	567727	244221	F	-	-	-
7201	567703	244253	F	-	-	-
7202	567726	244282	F	-	-	-
7203	567727	244212	F	-	-	-
7204	567712	244217	F	-	-	-
7301	567771	244393	F	-	67.73	-
7302	567775	244356	F	-	-	-
7303	567766	244384	F	-	-	-
7306	567733	244309	F	-	-	-
7307	567759	244351	F	-	-	-
7401	567784	244423	F	-	67.41	-
7402	567778	244490	F	-	69.46	-
7403	567785	244411	F	-	-	-
7404	567788	244416	F	-	-	-
7405	567794	244419	F	-	-	-
7501	567740	244506	F	-	70.75	-
7601	567702	244649	F	-	-	-
7602	567772	244607	F	-	-	-
8100	567854	244195	F	-	-	-
8101	567825	244188	F	-	-	-
8201	566824	244297	F	-	84.41	-
8302	566852	244383	F	-	84.39	-
8303	566840	244339	F	-	83.86	-
8304	566896	244374	F	-	-	-
8401	566864	244414	F	-	84.92	-
8401	567804	244478	F	-	66.93	-
8402	566825	244437	F	-	85.64	-
8407	567844	244477	F	-	-	-
8501	567829	244571	F	-	69.85	-
8502	567844	244561	F	-	66.33	-
8503	567847	244558	F	-	68.18	-
8504	567836	244532	F	-	-	-
8505	567850	244555	F	-	-	-
8506	567845	244547	F	-	-	-
8601	567889	244653	F	-	64.64	-
8602	567882	244645	F	-	65.7	-
8603	567883	244642	F	-	65.68	-
8604	567874	244621	F	-	66.91	-
8605	567850	244617	F	-	67.73	-
8606	567881	244627	F	-	-	-
8607	567880	244623	F	-	-	-
8608	567883	244618	F	-	-	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
8609	567888	244616	F	-	-	-
8610	567893	244614	F	-	-	-
8611	567899	244611	F	-	-	-
8701	567832	244726	F	-	68.32	-
8702	567878	244708	F	-	65.85	-
8703	567886	244727	F	-	64.01	-
9200	567945	244217	F	-	-	-
9303	566948	244340	F	-	-	-
9304	566941	244308	F	-	-	-
9305	566959	244305	F	-	-	-
9306	566978	244303	F	-	-	-
9500	567938	244566	F	-	-	-
9501	567924	244569	F	-	-	-
9502	567915	244573	F	-	-	-
9601	567947	244605	F	-	-	-
9602	567939	244690	F	-	-	-
9603	567905	244608	F	-	-	-
9604	567905	244648	F	-	-	-
9605	567912	244645	F	-	-	-
9606	567917	244645	F	-	-	-
9607	567924	244642	F	-	-	-
9608	567930	244639	F	-	-	-
9609	567939	244640	F	-	-	-
9611	567995	244644	F	-	-	-
9701	567910	244700	F	-	62.57	-
9702	567915	244703	F	-	62.31	-
9703	567927	244730	F	-	61.01	-
9707	567919	244713	F	-	-	-
0209	567042	244246	S	-	-	-
0251	567029	244295	S	-	80.66	-
0252	567050	244287	S	-	82.64	-
0253	567078	244293	S	-	79.68	-
0254	567001	244291	S	-	85.19	-
0258	567012	244250	S	-	-	-
0259	567015	244274	S	-	-	-
0451	567022	244496	S	-	88.69	-
0452	567097	244465	S	-	85.17	-
0551	567004	244503	S	-	88.99	-
0551	568053	244583	S	-	-	-
0552	567046	244544	S	-	91.29	-
0552	568056	244585	S	-	63.37	-
0553	567047	244574	S	-	92.61	-
0554	567067	244575	S	-	92.35	-
0651	567095	244609	S	-	93.42	-
0651	568024	244600	S	-	-	-
0652	568098	244676	S	-	-	-
0751	568089	244737	S	-	-	-
1251	567101	244296	S	-	80.19	-
1352	567155	244319	S	-	78	-
1353	567180	244335	S	-	76.89	-
1354	567170	244391	S	-	-	-
1356	567156	244304	S	-	-	-
1357	567186	244349	S	-	-	-
1451	567159	244453	S	-	82.8	-
1551	568154	244527	S	-	-	-
1552	568102	244556	S	-	-	-
1651	567109	244630	S	-	-	-
1651	568103	244670	S	-	61.36	-
1652	567138	244662	S	-	-	-
1652	568104	244686	S	-	-	-
1653	567163	244692	S	-	-	-
1752	567165	244756	S	-	-	-
1752	568106	244705	S	-	60.68	-
1753	568177	244762	S	-	-	-
2351	567234	244351	S	-	-	-
2351	568270	244358	S	-	-	-
2352	567235	244353	S	-	-	-
2353	568244	244313	S	-	-	-
2354	568248	244320	S	-	-	-
2451	567219	244452	S	-	-	-
2451	568205	244497	S	-	-	-
2452	567218	244439	S	-	-	-
2452	568262	244465	S	-	-	-
2453	567291	244436	S	-	-	-
2551	568259	244570	S	-	-	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
6551	567665	244563	S	-	76.41	-
6651	567645	244692	S	-	-	-
6751	567632	244701	S	-	-	-
6752	567671	244746	S	-	72.39	-
6753	567695	244749	S	-	71.81	-
7150	567779	244186	S	-	-	-
7151	567725	244197	S	-	-	-
7250	567724	244220	S	-	-	-
7251	567701	244253	S	-	-	-
7252	567724	244283	S	-	-	-
7253	567725	244211	S	-	-	-
7254	567710	244216	S	-	-	-
7351	567775	244381	S	-	-	-
7352	567723	244393	S	-	-	-
7353	567724	244390	S	-	-	-
7354	567776	244378	S	-	-	-
7355	567771	244357	S	-	-	-
7356	567784	244393	S	-	-	-
7357	567778	244397	S	-	-	-
7358	567730	244309	S	-	-	-
7359	567758	244352	S	-	-	-
7451	567776	244493	S	-	69.83	-
7453	567792	244411	S	-	-	-
7551	567740	244509	S	-	71.11	-
7651	567705	244651	S	-	-	-
7652	567772	244610	S	-	-	-
7653	567786	244664	S	-	71.99	-
7751	567703	244760	S	-	70.25	-
8150	567836	244188	S	-	-	-
8151	567811	244185	S	-	-	-
8251	566822	244299	S	-	85.22	-
8351	566834	244331	S	-	84.86	-
8352	566843	244370	S	-	84.55	-
8451	567801	244482	S	-	67.82	-
8452	567828	244420	S	-	-	-
8454	567830	244418	S	-	-	-
8455	567887	244463	S	-	-	-
8456	567801	244406	S	-	-	-
8551	567838	244570	S	-	70.28	-
8651	567815	244653	S	-	59.27	-
8652	567849	244644	S	-	67.4	-
8653	567882	244636	S	-	66.82	-
8654	567876	244630	S	-	67.07	-
8655	567893	244655	S	-	65.5	-
8751	567812	244738	S	-	67.57	-
8752	567876	244713	S	-	66.35	-
8753	567881	244725	S	-	66.13	-
9250	567908	244206	S	-	-	-
9251	566979	244285	S	-	-	-
9252	566980	244299	S	-	-	-
9351	566910	244397	S	-	83.4	-
9352	566936	244305	S	-	-	-
9353	566978	244329	S	-	81.8	-
9354	566978	244382	S	-	82.4	-
9355	566973	244393	S	-	82.57	-
9451	566988	244448	S	-	85.35	-
9451	567927	244493	S	-	-	-
9452	566979	244422	S	-	84.56	-
9452	567935	244493	S	-	-	-
9551	567950	244578	S	-	-	-
9552	567996	244578	S	-	-	-
9553	567965	244551	S	-	-	-
9554	567956	244533	S	-	-	-
9555	567999	244573	S	-	-	-
9556	567970	244549	S	-	-	-
9650	566936	244681	S	-	-	-
9651	566932	244686	S	-	-	-
9651	567948	244629	S	-	-	-
9652	566925	244695	S	-	-	-
9652	567940	244697	S	-	-	-
9653	566916	244673	S	-	-	-
9654	566920	244668	S	-	-	-
9655	566909	244682	S	-	-	-
9656	566901	244692	S	-	-	-
9750	566920	244702	S	-	-	-
9751	567917	244712	S	-	-	-
9752	567920	244721	S	-	62.1	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX B

Pre-Planning Assessment Report

McDonald's at Haverhill

InFlow Reference: PPE-0143773

Assessment Type: Used Water

Report published: 29/03/2022

Thank you for submitting a pre-planning enquiry.

This has been produced for Create Consulting Engineers Ltd.

Your reference number is **PPE-0143773**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

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Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	**No. Of units**
Restaurants and cafes	1

The anticipated residential build rate is:

Year	Y1
Build rate	1

Development type: Greenfield

Planning application status: Unknown

Site grid reference number: TL6763344281

The comments contained within this report relate to the public water mains and sewers indicated on our records.

Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that there are no public water mains/public sewers or other assets owned by Anglian Water within the boundary of your development site. However, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Haverhill Water Recycling Centre, which currently does have capacity to treat the flows from your development site.

Anglian Water are obligated to accept the foul flows from your development with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should the planning authority grant planning permission.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 150mm diameter sewer at manhole 5201 at National Grid Reference NGR TL6752944291. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

In principle, your proposed method of surface water disposal is acceptable to Anglian Water. It is our understanding that the evidence to confirm compliance with the surface water hierarchy is not available. Once the evidence has been confirmed, then a connection point may be made to manhole 5252 at NGR TL 67532 44287 at you proposed discharge rate 1l/s. Please note that Anglian Water do not adopt flow control devices rated below 2l/s. Our assessment has been based on development flows connecting to the nearest surface water sewer of the same size or greater pipe diameter. It is your responsibility to provide the evidence to confirm that all alternative methods of surface water disposal have been explored and these will be required before your connection can be agreed. This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse. Anglian Water's surface water policy follows the Surface Water hierarchy, outlined in Part H of the Building Regulations. Should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required. You are therefore advised to update Anglian Water with the key supporting evidence at your earliest convenience.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an Infrastructure charge for each new property connecting to the public water and sewerage network that benefits from Full planning permission. The infrastructure charge replaces the zonal charge as previously identified.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991.

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

• The Infrastructure Charge is based on the cost of any reinforcement and upgrades to our existing network ("Network Reinforcements"), whether designed to address strategic or local capacity issues. For more information on our Infrastructure Charge, please see the 'Useful Information' section of this report.

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage).

The Water Recyling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 573.00	0	£0.00

Please note that you should also budget for infrastructure charges on non-household premises where applicable and these will be calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge and the relevant multiplier will be applied to the figures set out in our 2022-23 Developer Charging Arrangements to arrive at the amount payable. Details of the relevant multiplier for each fitting can be found on our website.

Section 4 - Map of Proposed Point of Connection(s)

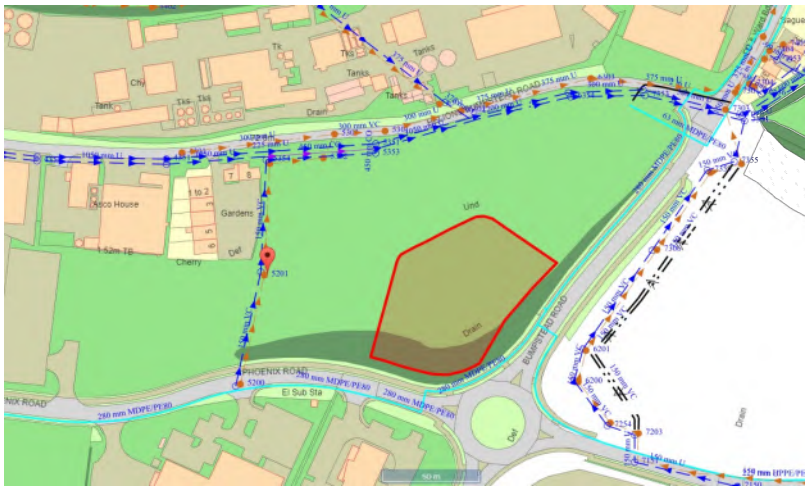

Figure 1:Showing your water recycling foul point of connection

Figure 2:Showing your water recycling surface water point of connection

Section 5 - Useful information

Water Industry Act – Key used water sections

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content.

Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid from the date issued and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s). Our pre-planning reports are valid for 12 months, however please note Anglian Water cannot reserve capacity and available capacity in our network can be reduced at any time due to increased requirements from existing businesses and houses as well as from new housing and new commercial developments.

APPENDIX C

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Borehole Log

Borehole No. **BH01**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567641.04 N244276.04	Hole Type BH
Location: Haverhill		Level: 76.52m aOD	Scale 1:50
Client: McDonald's Restaurants Ltd		Date: 28/03/2022	Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.15	76.37		Soft becoming firm brown grey to grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
		0.80	D					Firm becoming firm to stiff grey brown silty gravelly clay. Gravel is subangular to subrounded fine to coarse chalk and subangular fine to coarse flint. With occasional fragments of brick and organic material. MADE GROUND.
		1.00	SPT	N=11 (1,1/2,2,3,4)				
		1.20	D					*1.20m - ...becoming gravelly to very gravelly*
		1.60 - 2.00	U					
		2.00	SPT	N=8 (2,1/2,2,2,2)				*2.00m - ...becoming soft to firm and light brown grey*
		2.40	D					
		2.60	ES					*2.70m - ...becoming firm to stiff*
		3.00 - 3.45	D					*3.00m - ...becoming dark brown*
		3.00	SPT	N=23 (3,4/6,5,6,6)				
		3.60 - 3.85	U		3.40	73.12		Very stiff light brown to brown silty gravelly CLAY. Gravel is subangular to rounded fine to coarse chalk and occasional subrounded fine to medium flint. LOWESTOFT FORMATION.
		4.00 - 4.40	D					
		4.00	SPT	N=38 (3,6/8,10,11,9)				
		4.50	D		4.40	72.12		Stiff very sandy CLAY. LOWESTOFT FORMATION.
					4.60	71.92		Structureless CHALK recovered as firm white to cream mottled SILT with ferruginous staining. POSSIBLE INCLUSION OF UNDIFFERENTIATED CHALK.
		5.00 - 5.45	D		4.90	71.62		
		5.00	SPT	N=39 (3,6/8,10,10,11)				Very stiff orange brown sandy CLAY. LOWESTOFT FORMATION.
		5.65 - 6.00	D		5.65	70.87		Stiff very sandy CLAY. With rare subrounded medium flint gravel. LOWESTOFT FORMATION.
		6.00	SPT	50 (18,16/50 for 150mm)				
					6.30	70.22		End of Borehole at 6.30m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH01 terminated at 6.30m, SPT refusal
2. No groundwater encountered
3. Standpipe installed to 6.00m

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Borehole Log

Borehole No. **BH02**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567641.30 N244267.74	Hole Type BH
Location: Haverhill		Level: 76.47m aOD	Scale 1:50
Client: McDonald's Restaurants Ltd		Date: 28/03/2022	Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	76.42		Soft becoming firm brown grey to grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
	▼	0.50	ES					Firm grey to grey brown silty gravelly clay. With occasional organic fragments and fragments of brick. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. MADE GROUND.
		1.00 - 1.45	D					*0.90m - ...becoming dark grey*
		1.00	SPT	N=13 (1,2/3,3,3,4)				
		1.70	D					*1.60m - ...becoming brown mottled grey brown*
		2.00 - 2.45	D					*2.00m - ...becoming grey to dark grey*
	▼	2.00	SPT	N=8 (1,2/2,2,1,3)				*2.40m - ...becoming light brown mottled brown*
		2.80	ES					*2.60m - ...becoming dark grey mottled black. Chalk gravel absent*
		3.00	SPT	N=23 (2,2/5,6,6,6)				*2.95m - ...fragment of metal*
		3.10 - 3.45	D		3.10	73.37		Stiff light brown to brown silty gravelly CLAY. Gravel is subangular to rounded fine to coarse chalk and occasional subrounded fine to medium flint. LOWESTOFT FORMATION.
		3.60 - 4.00	U					
		4.00 - 4.30	D		3.90	72.57		Firm to stiff orange to orange brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse flint.
		4.00	SPT	N=12 (2,2/3,2,3,4)				
		4.60 - 5.00	D		4.60	71.87		Orange slightly clayey very sandy SILT. LOWESTOFT FORMATION.
		5.00	SPT	N=26 (4,6/6,6,6,8)	5.00	71.47		Stiff orange mottled light brown sandy CLAY. With rare carbonaceous specs. LOWESTOFT FORMATION.
					5.50	70.97		Stiff slightly gravelly very sandy CLAY. Gravel is angular to subrounded fine to coarse flint. LOWESTOFT FORMATION.
		5.70 - 5.90	D					
		6.00	SPT	N=46 (10,20/24,6,6,10)				
					6.45	70.02		End of Borehole at 6.45m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH02 halted at 6.45m, target depth
2. Groundwater seepages at 0.70m and 2.30m
3. Standpipe installed to 6.00m

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Trial Pit Log

Trial Pit No. **TP01**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567615.87 N244292.90 Level: 76.53m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 0.30 Depth: 1.00 (0.30)	Scale 1:10
Client: McDonald's Restaurants Ltd			Logged TB

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.15	76.53		Soft becoming firm brown grey to grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
	▼				1.00	76.38		Firm becoming firm to stiff grey brown silty gravelly clay. Gravel is subangular to subrounded fine to coarse chalk and subangular fine to coarse flint. With occasional fragments of brick and organic material. MADE GROUND.
								End of Trial Pit at 1.00m

1

2

Remarks
1. TP01 halted at 1.00m. Target depth
2. Perched groundwater at 0.95m
3. Trial pit backfilled with arisings to surface

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP02**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567592.92 N244302.07 Level: 76.52m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 0.30 Depth: 1.00 (0.30)	Scale 1:10
Client: McDonald's Restaurants Ltd			Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	76.52		Soft becoming firm brown grey to grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
		0.30	ES					Firm becoming firm to stiff grey brown silty gravelly clay. Gravel is subangular to subrounded fine to coarse chalk and subangular fine to coarse flint. MADE GROUND.
					1.00	76.42		End of Trial Pit at 1.00m

1

2

Remarks
1. TP02 halted at 1.00m. Target depth
2. No groundwater encountered
3. Trial pit backfilled with arisings to surface

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP03**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567616.12 N244308.46 Level: 76.51m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 0.30 Depth: 1.00 (0.30)	Scale 1:10
Client: McDonald's Restaurants Ltd			Logged TB

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	76.51		Soft becoming firm brown grey to grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
		0.20	ES					Firm becoming firm to stiff grey brown silty gravelly clay. Gravel is subangular to subrounded fine to coarse chalk and subangular fine to coarse flint. With occasional fragments of brick. MADE GROUND.
	▼				1.00	76.41		End of Trial Pit at 1.00m

1

2

Remarks
1. TP03 halted at 1.00m. Target depth
2. Perched groundwater at 0.95m
3. Trial pit backfilled with arisings to surface

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP04**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567666.76 N244309.71 Level: 75.80m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 0.30 Depth: 0.80 (0.30)	Scale 1:10
Client: McDonald's Restaurants Ltd			Logged TB

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	▼				0.05	75.80		Soft becoming firm brown grey to grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
		0.40	ES					Firm becoming firm to stiff grey brown silty gravelly clay. Gravel is subangular to subrounded fine to coarse chalk and subangular fine to coarse flint. With rare fragments of brick. MADE GROUND.
	▽				1.00	75.75		End of Trial Pit at 0.80m

1

2

Remarks
1. TP04 halted at 1.00m. Target depth
2. Perched groundwater at 0.80m, rising to 0.10m in 24 hours
3. Trial pit backfilled with arisings to surface

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP05**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567643.46 N244270.61 Level: 76.54m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.50	Scale 1:10
Client: McDonald's Restaurants Ltd		Depth: 1.50 (0.45)	Logged TB

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	76.54		Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
								Firm grey brown silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk with occasional subrounded fine to coarse flint. MADE GROUND.
								0.40m - ...becoming grey to dark grey
					1.50	76.49		End of Trial Pit at 1.50m

1

2

Remarks
1. TP05 halted at 1.50m. Target depth
2. No groundwater encountered
3. Trial pit backfilled with arisings to surface

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP06**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567622.00 N244252.52 Level: 76.53m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.50 Depth: 1.90 0.45	Scale 1:10
Client: McDonald's Restaurants Ltd			Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With rootlets. MADE GROUND.
					0.15	76.53		Firm grey brown silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk with occasional subrounded fine to coarse flint. MADE GROUND.
								0.40m - ...becoming grey to dark grey
		0.50 - 1.00	B					
								1.30m - ...with organic fragments
								1.60m - ...becoming brown grey. Organic fragments absent
					1.90	76.38		End of Trial Pit at 1.90m

1

2

Remarks
1. TP06 halted at 1.90m. Target depth
2. No groundwater encountered
3. Trial pit backfilled with arisings to surface

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP07**

Sheet 1 of 2

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567641.77 N244319.04 Level: 76.30m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.50	Scale 1:10
Client: McDonald's Restaurants Ltd		Depth: 2.40 / 0.45	Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	76.30		Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With traces of brick and rootlets. MADE GROUND.
		0.50 - 1.00	B					Firm dark grey to grey brown silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. MADE GROUND.
	▼							
	▼							

1

2

Remarks
1. TP07 halted at 2.40m, target depth
2. Perched groundwater seepages at 1.50m and 1.70m
3. Trial pit backfilled with arisings upon completion

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP07**

Sheet 2 of 2

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567641.77 N244319.04 Level: 76.30m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.50	Scale 1:10
Client: McDonald's Restaurants Ltd		Depth: 2.40 / 0.45	Logged TB

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Firm dark grey to grey brown silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. MADE GROUND.
					2.40	76.20		End of Trial Pit at 2.40m

3

4

Remarks
1. TP07 halted at 2.40m, target depth
2. Perched groundwater seepages at 1.50m and 1.70m
3. Trial pit backfilled with arisings upon completion

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP08**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567613.70 N244280.90 Level: 76.53m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.50	Scale 1:10
Client: McDonald's Restaurants Ltd		Depth: 2.00 / 0.45	Logged TB

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	76.53		Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With traces of brick and rootlets. MADE GROUND.
								Firm dark grey to grey brown silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. MADE GROUND.
								0.40m - ...with occasional subrounded flint and chalk cobbles
								1.20m - ...becoming grey mottled dark grey
								1.60m - ...becoming grey brown
					2.00	76.48		End of Trial Pit at 2.00m

1

2

Remarks
1. TP08 halted at 2.00m. Target depth
2. No groundwater encountered
3. Trial pit backfilled with gravel to 1.00m and arisings to surface
4. Infiltration testing carried out between 1.00m and 2.00m

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP09**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567644.00 N244283.05 Level: 76.52m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.50	Scale 1:10
Client: McDonald's Restaurants Ltd		Depth: 2.00 / 0.45	Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	76.52		Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With traces of brick and rootlets. MADE GROUND.
								Firm brown grey silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. MADE GROUND.
								0.30m - ...becoming grey to grey brown
		0.50 - 1.00	B					
								0.70m - ...becoming light grey brown
								1.40m - ...with occasional dark grey mottling
					2.00	76.47		End of Trial Pit at 2.00m

1

2

Remarks
1. TP09 halted at 2.00m. Target depth
2. No groundwater encountered
3. Trial pit backfilled with gravel to 1.00m and arisings to surface
4. Infiltration testing carried out between 1.00m and 2.00m

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP10**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567616.63 N244299.89 Level: 76.53m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.40 Depth: 0.80 / 0.45	Scale 1:10
Client: McDonald's Restaurants Ltd			Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	76.53		Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With traces of brick and rootlets. MADE GROUND.
		0.40 - 0.80	B					Firm brown grey silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With traces of brick and organic material. MADE GROUND.
	▼				0.80	76.48		End of Trial Pit at 0.80m

1

2

Remarks
1. TP10 halted at 0.80m. Target depth
2. Perched groundwater at 0.80m
3. Trial pit backfilled with gravel to 0.40m and arisings to surface
4. Infiltration testing carried out between 0.40m and 0.80m

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP11**

Sheet 1 of 1

Project: McDonalds MD	Project No: P22-2590	Co-ords: E567649.24 N244305.43 Level: 76.24m AoD	Date 29/03/2022
Location: Haverhill		Dimensions (m): 1.40	Scale 1:10
Client: McDonald's Restaurants Ltd		Depth: 1.00 / 0.45	Logged TB

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	76.24		Soft brown grey slightly sandy gravelly clay. Gravel is angular to subrounded fine to coarse flint and chalk. With traces of brick and rootlets. MADE GROUND.
								Firm brown grey silty gravelly clay. Gravel is angular to subrounded fine to coarse chalk and subrounded fine to coarse flint. With occasional fragments of brick and organic material. MADE GROUND.
					1.00	76.19		End of Trial Pit at 1.00m

1

2

Remarks
1. TP11 halted at 1.00m. Target depth
2. No groundwater encountered
3. Trial pit backfilled with gravel to 0.50m and arisings to surface
4. Infiltration testing carried out between 0.50m and 1.00m

Stability : Stable

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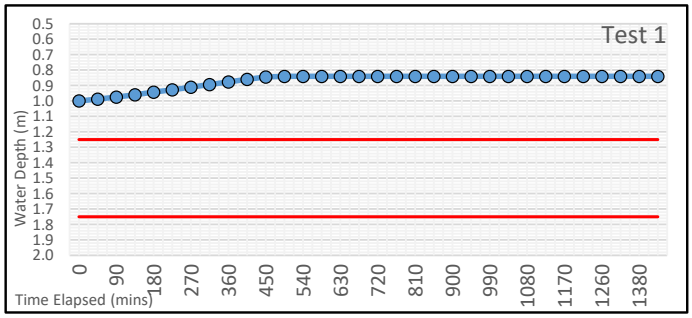
Location	TP08

Site:	Haverhill MD
Client:	McDonald's Restaurants Ltd
Job No:	P22-2590

Co-ordinates	567613.7 E 244280.9 N
Elevation	76.53 m
Date	29/03/2022

Trial Pit Dimensions (m)	
Length	1.50
Width	0.45
Depth	2.00
Test volume (m^3)	0.68
Effective Depth	1.00

Soil type at test level	MADE GROUND (Silty gravelly CLAY)		
Groundwater	No	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m³)	0.14
A_{S50} (m²)	2.63
t_{p75-25} (mins)	N/A
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**TEST FAIL**

Time (mins)	Test 1	Test 2	Test 3
0	1.00	-	-
45	0.99	-	-
90	0.98	-	-
135	0.96	-	-
180	0.94	-	-
225	0.93	-	-
270	0.91	-	-
315	0.89	-	-
360	0.88	-	-
405	0.86	-	-
450	0.84	-	-
495	0.84	-	-
540	0.84	-	-
585	0.84	-	-
630	0.84	-	-
675	0.84	-	-
720	0.84	-	-
765	0.84	-	-
810	0.84	-	-
855	0.84	-	-
900	0.84	-	-
945	0.84	-	-
990	0.84	-	-
1035	0.84	-	-
1080	0.84	-	-
1125	0.84	-	-
1170	0.84	-	-
1215	0.84	-	-
1260	0.84	-	-
1320	0.84	-	-
1380	0.84	-	-
1440	0.84	-	-

Remarks

1 Soakage testing carried out between 1.0m and 2.0m
2 Datalogger number 825023
3 Test 1 carried out on 29/03/2022
4 Test failed due to insufficient drainage in 24 hour period

Analysis by:	TB
Checked by:	AW

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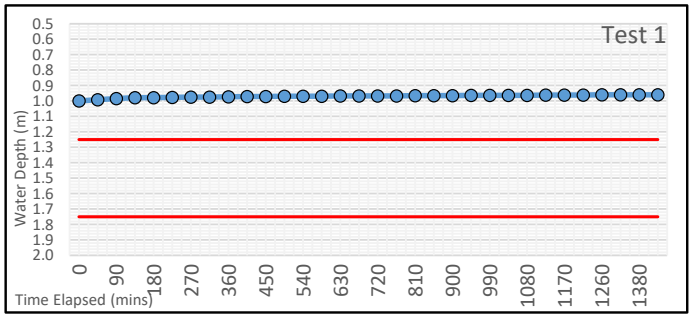
Location	TP09

Site:	Haverhill MD
Client:	McDonald's Restaurants Ltd
Job No:	P22-2590

Co-ordinates	567644.0 E 244283.0 N
Elevation	76.52 m
Date	29/03/2022

Trial Pit Dimensions (m)	
Length	1.50
Width	0.45
Depth	2.00
Test volume (m^3)	0.68
Effective Depth	1.00

Soil type at test level	MADE GROUND (Silty gravelly CLAY)		
Groundwater	No	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} **(m^3)**	0.14
A_{S50} **(m^2)**	2.63
t_{p75-25} **(mins)**	**N/A**
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**TEST FAIL**

Time (mins)	Test 1	Test 2	Test 3
0	1.00	-	-
45	0.99	-	-
90	0.98	-	-
135	0.98	-	-
180	0.98	-	-
225	0.98	-	-
270	0.98	-	-
315	0.97	-	-
360	0.97	-	-
405	0.97	-	-
450	0.97	-	-
495	0.97	-	-
540	0.97	-	-
585	0.97	-	-
630	0.97	-	-
675	0.97	-	-
720	0.97	-	-
765	0.97	-	-
810	0.97	-	-
855	0.97	-	-
900	0.96	-	-
945	0.96	-	-
990	0.96	-	-
1035	0.96	-	-
1080	0.96	-	-
1125	0.96	-	-
1170	0.96	-	-
1215	0.96	-	-
1260	0.96	-	-
1320	0.96	-	-
1380	0.96	-	-
1440	0.96	-	-

Remarks

1 Soakage testing carried out between 1.0m and 2.0m
2 Datalogger number 823575
3 Test 1 carried out on 29/03/2022
4 Test failed due to insufficient drainage in 24 hour period

Analysis by:	TB
Checked by:	AW

create
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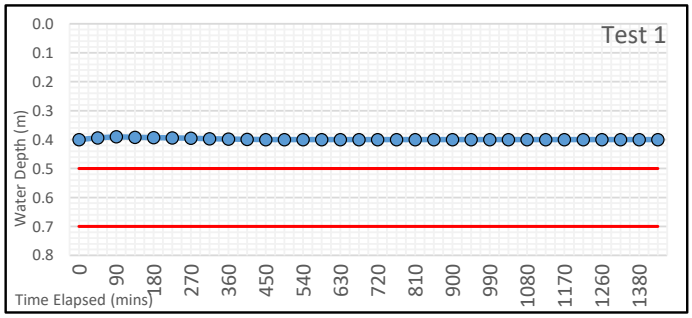
Location	TP10

Site:	Haverhill MD
Client:	McDonald's Restaurants Ltd
Job No:	P22-2590

Co-ordinates	567616.6 E 244299.9 N
Elevation	76.53 m
Date	29/03/2022

Trial Pit Dimensions (m)	
Length	1.40
Width	0.45
Depth	0.80
Test volume (m^3)	0.25
Effective Depth	0.40

Soil type at test level	MADE GROUND (Silty gravelly CLAY)		
Groundwater	Perched groundwater at 0.80m	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} **(m^3)**	0.05
A_{S50} **(m^2)**	1.37
t_{p75-25} **(mins)**	**N/A**
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**TEST FAIL**

Time (mins)	Test 1	Test 2	Test 3
0	0.40	-	-
45	0.39	-	-
90	0.39	-	-
135	0.39	-	-
180	0.39	-	-
225	0.39	-	-
270	0.40	-	-
315	0.40	-	-
360	0.40	-	-
405	0.40	-	-
450	0.40	-	-
495	0.40	-	-
540	0.40	-	-
585	0.40	-	-
630	0.40	-	-
675	0.40	-	-
720	0.40	-	-
765	0.40	-	-
810	0.40	-	-
855	0.40	-	-
900	0.40	-	-
945	0.40	-	-
990	0.40	-	-
1035	0.40	-	-
1080	0.40	-	-
1125	0.40	-	-
1170	0.40	-	-
1215	0.40	-	-
1260	0.40	-	-
1320	0.40	-	-
1380	0.40	-	-
1440	0.40	-	-

Remarks

1 Soakage testing carried out between 0.4m and 0.8m
2 Datalogger number 823254
3 Test 1 carried out on 29/03/2022
4 Test failed due to insufficient drainage in 24 hour period

Analysis by:	TB
Checked by:	AW

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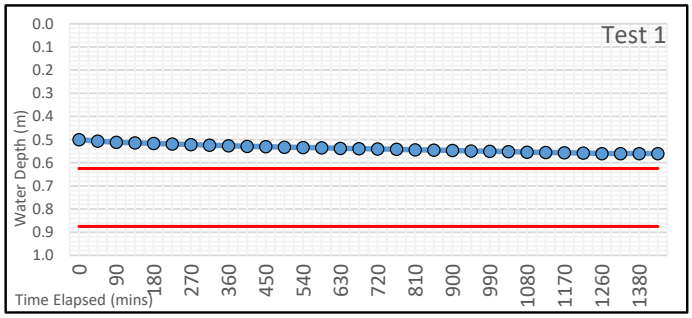
Location	TP11

Site:	Haverhill MD
Client:	McDonald's Restaurants Ltd
Job No:	P22-2590

Co-ordinates	567649.2 E 244305.4 N
Elevation	76.24 m
Date	29/03/2022

Trial Pit Dimensions (m)	
Length	1.40
Width	0.45
Depth	1.00
Test volume (m^3)	0.32
Effective Depth	0.50

Soil type at test level	MADE GROUND (Silty gravelly CLAY)		
Groundwater	No	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.06
A_{S50} (m^2)	1.56
t_{p75-25} (mins)	N/A
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**TEST FAIL**

Time (mins)	Test 1	Test 2	Test 3
0	0.50	-	-
45	0.51	-	-
90	0.51	-	-
135	0.51	-	-
180	0.52	-	-
225	0.52	-	-
270	0.52	-	-
315	0.52	-	-
360	0.53	-	-
405	0.53	-	-
450	0.53	-	-
495	0.53	-	-
540	0.53	-	-
585	0.54	-	-
630	0.54	-	-
675	0.54	-	-
720	0.54	-	-
765	0.54	-	-
810	0.54	-	-
855	0.55	-	-
900	0.55	-	-
945	0.55	-	-
990	0.55	-	-
1035	0.55	-	-
1080	0.55	-	-
1125	0.56	-	-
1170	0.56	-	-
1215	0.56	-	-
1260	0.56	-	-
1320	0.56	-	-
1380	0.56	-	-
1440	0.56	-	-

Remarks

1 Soakage testing carried out between 0.5m and 1.0m
2 Datalogger number 823254
3 Test 1 carried out on 29/03/2022
4 Test failed due to insufficient drainage in 24 hour period

Analysis by:	TB
Checked by:	AW

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