Flood Risk Assessment and SuDS Report March 2024

EAS

229 London Road, Wickford, Basildon BC

CBS Developments Ltd

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The content of this report is based on information available as of March 2024, the validity of the statements made may therefore vary over time as planning guidance / policies and the evidence base change.

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1 Introduction

1.1 EAS has been commissioned to provide a Flood Risk Assessment and SuDS report in order to inform a planning application for 4 dwellings on land at 229 London Road, Wickford, Basildon BC, SS12 0LG (hereafter referred to as 'the site').

1.2 At present the site comprises of open land with some outbuildings. The site location plan is included in **Appendix A** and the proposed development plans are in **Appendix B**.

1.3 The site is shown to be at a very low of a fluvial (river) flood event being located within Flood Zone 1 on the Flood Map for Planning. Flood Zone 1 is defined as having a less than 0.1% annual probability of river flooding.

1.4 Surface water flood risk is noted to be very low across the site, with an area of low risk in the centre and western portion of the site. The site is not at risk of reservoir flooding. This FRA details the risk and mitigation measures.

1.5 This FRA includes a SuDS Strategy to demonstrate compliance with national and local policy requirements.

1.6 The contents of this FRA are based on the advice set out in the National Planning Policy Framework (NPPF) last updated December 2023, Annex 3: Flood risk vulnerability classification, also from the NPPF and PPG 'Guidance for Flood Risk and Coastal Change', updated in August 2022.

1.7 This report is based on the Environment Agency flood maps, geology mapping, OS mapping, topographic survey, Strategic Flood Risk Assessment and local policy.

1.8 This document includes the following sections:

Section 2 – describes any relevant local and national planning policy;

Section 3 – provides a site description and background information

Section 4 – review any potential sources of flooding;

Section 5 – details the proposed drainage strategy; and

Section 6 – summarises and concludes the report.

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2 Policy Context

Introduction

2.1 This section sets out the policy context. This report is based on the advice set out in the National Planning Policy Framework (NPPF) last updated December 2023 and the Planning Practical Guidance (PPG) updated in August 2022.

2.2 Paragraph 173 footnote 59 of the NPPF states:

"A site-specific flood risk assessment should be provided for all developments in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

2.3 The flood zones are defined as:

- Flood Zone 1 - less than a 0.1% (1 in 1000) annual probability of river or tidal flooding.
- Flood Zone 2 - between a 0.1% and 1% (1 in 1000 and 1 in 100) annual probability of river flooding; or between a 0.1% and 0.5% (1 in 1000 and 1 in 200) annual probability of flooding from tidal sources.
- Flood Zone 3a- This zone comprises land assessed as having a 1% (1 in 100) or greater annual probability of river flooding; and for tidal flooding at least a 0.5% (1 in 200) annual probability of flooding from tidal sources.
- Flood Zone 3b - This zone comprises land where water has to flow or be stored in times of flood. This classification is usually classified as land which had a 3.33% (1 in 30) annual probability of flooding.

2.4 Paragraph 165 discusses the suitability of development location, particularly with regards to future risks induced by climate change:

"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere".

2.5 Paragraph 166 of the National Planning Policy Framework (NPPF) sets out how:

"Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards".

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2.6 Paragraphs 175 NPPF discusses the application of sustainable drainage systems:

"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) Take account of advice from the lead local flood authority;

b) Have appropriate proposed minimum operational standards;

c) Have maintenance arrangements in place to ensure an acceptable standard of operation of the lifetime of the development; and

d) Where possible, provide multifunctional benefits."

2.7 The site is shown to be located within the Flood Zone 1 on the Flood Map for Planning. Flood Zone 1 is defined as having a less than 0.1% annual probability of river flooding.

2.8 The EA Flood Map has been enclosed in Appendix C.

Local Policy

Basildon District Council Local Plan

2.9 The current Development Plan for Basildon Borough consists of the 2007 Saved Policies from the Basildon District Plan, adopted in 1998, as well as Saved Policies from the Essex and Southend-on-Sea Waste Local Plan (2001) and the recently adopted Essex Minerals Local Plan (2014). The Council is now preparing a new Local Plan to replace the policies in the 1998 document and set out an overall framework for the development of the Borough up to 2034.

Basildon Borough Council Strategic Flood Risk Assessment Level 1

2.10 This document was published by Basildon Borough Council in April 2018, to provide an overview of flood risk across the borough.

2.11 Figure 4.3 identifies historic flood incidents. None are noted within the vicinity of the site.

2.12 Figure 4.4 identifies areas susceptible to groundwater flood risk. The site is within an area of >= 25% <50% susceptibility to groundwater flooding.

2.13 Figure 4.5 identifies locations of recorded sewer flooding incidents. The local SS12 0 area has 2-3 incidents noted in the last 10 years on the DG5 record.

2.14 Figure 3.2 shows the site is located above a geology of London Clay Formation of silt, sand and gravel.

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3 Existing Site Assessment

Site Description

3.1 The site is located on land to the south of London Road, Wickford SS12 0LG. The site boundary covers an area of 0.287ha. A location plan is included in **Appendix A**. At present the site comprises of open land with some outbuildings in the north-eastern portion of the site.

3.2 The site is bounded by London Road to the north, residential dwellings to the east and west and agricultural land to the south.

3.3 The site is proposed as 4 detached dwellings. Access to the site is proposed onto London Road. The proposed development plans are in **Appendix B**.

Local Watercourses

3.4 This nearest watercourse is considered to be a main river by the Environment Agency. The River Crouch, an EA main river, is located approximately 300m north of the development site.

Site Levels

3.5 A topographical survey enclosed in **Appendix D** shows the site falls from south to north. Levels at the south-western corner are around 26.65mAOD and 24.40mAOD in the south-eastern corner. Levels at the north-western corner are around 20.52mAOD and 19.60mAOD in the north-eastern corner. This results in an average gradient of approximately 1:10 across the site.

Geology

3.6 The online British Geological Survey (BGS) mapping shows the site to be located in an area with a bedrock of London Clay Formation – Clay, Silt and Sand with no superficial deposits.

3.7 There are no nearby boreholes to refer to.

Existing Drainage

3.8 As the site is open space, it is anticipated that surface water runoff occurs naturally towards the northern boundary.

Sewers

3.9 Anglian Water mapping confirms the presence of a 150mm foul water sewer under London Road. The nearest manhole is manhole 9002 (CL: N/A, IL: N/A, depth to invert: 3.89m). The Anglian Water sewer mapping is in **Appendix E**.

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4 Potential Source of Flooding

Fluvial

4.1 A copy of the Environment Agency's Flood Map for Planning is enclosed in **Appendix C**.

4.2 The site is located entirely in Flood Zone 1. Land in Flood Zone 1 is considered to have an annual risk of flooding from a fluvial source of less than 0.1%.

4.3 As such, the risk of flooding from fluvial sources is considered very low.

Surface Water

4.4 Surface water flooding refers to flooding caused when the intensity of rainfall, particularly in urban areas, can create runoff which temporarily overwhelms the capacity of the local drainage systems or does not infiltrate into the ground. The water ponds on the ground and flows towards low-lying land. This source of flood risk is also known as 'pluvial'.

4.5 The EA long term risk maps (available on the GOV.UK website) show the site to be primarily at very low risk from surface water flooding. Very low risk means that this area has a chance of flooding of less than 0.1% each year. The northern site boundary is shown to be at risk of flooding in a high risk >3.3% annual exceedance probability (AEP) flood event, as described below.

4.6 Detailed GIS data available from Defra has been overlaid with the site layout to explore in more detail the likely areas of the site at risk of flooding and the likely flood depths. The EA long term risk maps and DEFRA data overlay are included in **Appendix F**.

4.7 Surface water flood data in the 0.1%-1%AEP, 1%-3.3%AEP and >3.3%AEP storm event has been overlaid with the proposed site layout and the proposed dwellings are not at risk of surface water flooding. However, in all scenarios, a flow path is present along the northern site boundary. This shows flood depths of up to 300mm in the car parking and road areas.

4.8 Reviewing the flood overlay with the topographical levels, this confirms site levels are lowest along the northern boundary. It is therefore anticipated that any surface water flooding, would remain along the northern boundary and not occur in the vicinity of the dwelling as indicated.

4.9 Despite the expectation being that the flooding will not impact upon the proposed dwellings, Section 5 of this report explores mitigation measures in any event as a factor of safety to protect future residents.

Artificial

4.10 The EA long term risk maps also display the risk from reservoirs. The site is shown not to be in a reservoir flood risk area.

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Groundwater

4.11 Figure 4.4 identifies areas susceptible to groundwater flood risk. The site is within an area of >= 25% <50% susceptibility to groundwater flooding.

4.12 It is therefore assumed that groundwater flooding is a negligible risk. However, as the information regarding groundwater flooding is sparce, to inform the future foundations and below ground drainage design, ground investigations will be required at a detailed design stage.

Sewer

4.13 Figure 4.5 identifies locations of recorded sewer flooding incidents. The local SS12 0 area has 2-3 incidents noted in the last 10 years on the DG5 record. As such, the risk of sewer flooding is considered negligible.

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5 Mitigation Measures

5.1 As noted in Section 4, the site is indicated to be at risk of surface water flooding. Despite the expectation being that flooding will not impact the proposed dwellings, mitigation measures are discussed below to help reduce the impact of flooding to the development. The below mitigation measures improve flood awareness and preparedness as well as the flood resilience.

5.2 The design level for surface water flooding is a 1%AEP+40% climate change event. However, as this mapping is unavailable, the flood depths have been based on the >0.1%AEP event. Depths of flooding of site are shown to be less than 300mm. Therefore, finished floor levels are proposed to be a minimum of 300mm above surrounding ground levels, to protect against this.

5.3 It is also recommended that should any fencing be provided along the northern site boundary that the fencing is of type that will allow the flow path to continue unimpeded; such as typical post and rail or picket fencing.

Flood Warnings

5.4 The site is not located near any Flood Warning or Alert areas. Warnings cannot be issued for surface water flooding; however such events are likely to correspond with heavy rainfall.

5.5 It is recommended that residents subscribe to the MET Office Weather Warnings, which can be found here: https://service.govdelivery.com/accounts/UKMETOFFICE/subscriber/new

5.6 Should a weather warning be received, occupiers and visitors on site should remain vigilant. Those on site that wish to leave should do so at the earliest opportunity if need be. However, should flooding occur, it would be advised to remain onsite until flooding recedes, and no attempt should be made to leave the site. Especially as safe refuge is available. This includes walking or driving through flood waters.

Flood Evacuation Plan

5.7 In addition to the flood warning, a site-specific evacuation plan is outlined below. In the event of a weather warning or early signs of surface water flooding, residents who wish to evacuate should do so at the earliest opportunity. The most efficient route away from the site is by travelling westward along London Road and then south along Gardiners Lane North, shown in Figure 5.1 below.

5.8 Flood depths along North Street are shown to remain primarily below 300mm in a low-risk scenario, with only minor areas of pooling above 300mm. As such, emergency access near the site can be granted along this route if required.

5.9 For pedestrians, it is recommended to travel southward across agricultural land.

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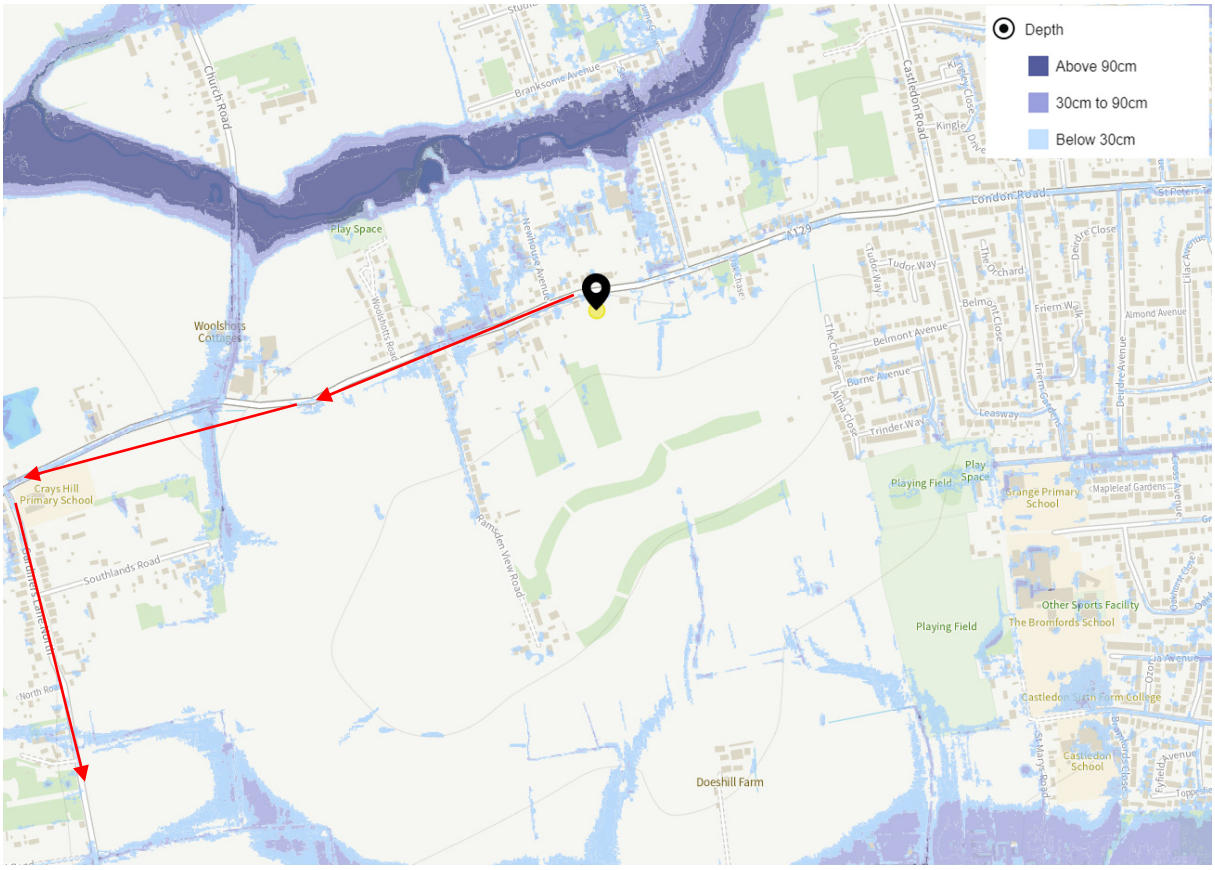

Figure 5.1: Surface water flood evacuation plan (red arrows)

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6 Proposed Drainage Stategy

Relevant SuDS Policy

6.1 SuDS mimic natural drainage patterns and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. SuDS design should meet the "four pillars" of SuDS of: water quantity, water quality, amenity and biodiversity, wherever possible.

6.2 In decreasing order of preference, the preferred means of disposal of surface water runoff is:

- Discharge to ground.
- Discharge to a surface water body.
- Discharge to a surface water sewer.
- Discharge to a combined sewer.

Site-Specific SuDS

6.3 The various SuDS methods need to be considered in relation to site-specific constraints. Several SuDS options are available to reduce or temporarily hold back the discharge of surface water runoff. Table 6.1 outlines the constraints and opportunities to each of the SUDS devices in accordance with the hierarchical approach outlined in The SuDS Manual CIRIA C753. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Not suitable due to pitch of residential roof	No
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	No suitable location on site for soakaways. Geology not considered suitable for infiltration.	No
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Lined permeable paving is proposed in driveway areas	Yes

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Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the Site by reusing water for non-potable uses e.g. toilet flushing, recycling processes.	Rainwater harvesting is proposed for each property	Yes
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Due to the site gradients, swales are not proposed	No
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Infiltration is not proposed	No
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from run-off from adjacent areas.	Infiltration is not proposed	No
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	Infiltration is not being proposed	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	No suitable location within development boundary for ponds and wetlands.	No
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Due to site gradients and constraints, attenuation storage will be required.	No
Raingardens	Rain gardens are relatively small depressions in the ground that can act as infiltration points for roof water and other 'clean' surface water.	Raingarden have not been proposed as rainwater harvesting is already proposed	No

Table 6.1 Site Specific SuDS

Consideration of SuDS Hierarchy

6.4 Following the discharge hierarchy:

- Infiltration is not deemed viable given the London Clay Formation bedrock;
- No watercourses or ditches are noted within the vicinity of the site. The nearest watercourse is the EA Main River, the River Crouch, located approximately 0.3km north of the development site;
- An Anglian Water sewer search shows no surface water sewers in the local area;
- It is therefore proposed to discharge to the Anglian Water foul sewer under London Road.

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Surface Water Drainage Design Parameters

6.5 Below are the parameters included as part of the drainage design to meet Basildon Borough Council standards:

- Climate Change Allowance – The 2050s/2070s 'Upper End' Climate Change allowance is 45% and shall be applied to the hydraulic drainage network design.
- Storm Events - The Hydraulic Model shall be run for a 1:2yr Storm Event, 1:30yr Storm Event, 1:30yr + 40% Climate Change Event, 1:100yr Storm Event and 1:100yr + 40% Climate Change Storm Event.
- Rainfall Data – FEH2022 Rainfall Data has been used in this assessment.
- CV (Coefficient of volumetric run-off) – The CV Value for Winter and Summer Storms has been set to 1.0 to represent 100% of runoff from impermeable areas entering the proposed drainage system.
- Time of Entry – a standard 5min time of entry is used.
- Pre-and Post Runoff Rates – The proposals seek to match the 1:2yr Greenfield Runoff Rate for all Storms up to and including the 1:100yr + 40% Climate Change Event.
- Half-Drain Time - All attenuation features shall be designed to have 50% capacity available 24 hours after a 1 in 30-year + 40%CC storm event.
- Attenuation Freeboard – for open water features, such as ponds, basins or swales, the maximum water level in the feature shall reach no more than 300mm to the top-of-bank.
- Consent for Outfall – As the proposed outfall is to a sewer, an S106 application will be sought post-planning.
- Exceedance Routes – In an exceedance event, flows shall be directed northward towards the site access. Exceedance flows would then flow onto London Road.
- Urban Creep - In line with para. 24.7.2 of the CIRIA SuDS Manual, a 10% urban creep allowance has been applied to roof areas, making the total contributing area at 44m^2.
- Surcharged Outfall – A surcharged level has been included in the drainage model, with the surcharge depth based on the size of the proposed sewer.

Pre-Development Runoff Rates and Discharge Volumes – Greenfield Sites

6.6 Greenfield runoff rates were estimated using the FEH method on the Causeway Flow software. The results of which are included in Appendix F. The proposed impermeable area of the site is 0.114ha (including a 10% Urban creep factor of 44m^2), the following greenfield runoff rates for a range of storm events have been scaled accordingly:

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1 in 2 year – 0.9 l/s

1 in 30 year – 2.4 l/s

1 in 100 year – 3.2 l/s

6.7 Causeway Flow Greenfield ReFH2 Method was used to calculate the 1:100yr 360min Storm Event Discharge Volume for 0.114ha. The results are included in **Appendix G** and show the existing discharge volume is 38m³.

Post Development Runoff Rate

6.8 The proposals seek to match the 1:2yr Greenfield Runoff Rate as closely as possible for all Storms up to and including the 1:100yr + 40% Climate Change Event. As per the Greenfield Runoff Rates calculated in paragraph 6.2 above, the maximum outfall rate is 0.9l/s.

6.9 In accordance with the C753 SuDS Manual which specifies the minimum orifice plate size from permeable paving as 20mm, the drainage has been modelled with a 20mm orifice plate restricting flows. This resulted in a modelled discharge rate of 1.0l/s in a 1:100yr + 40% Climate Change Event. As such, the maximum discharge rate is set at 1.0l/s.

Proposed SuDS Strategy

6.10 As outlined in Table 5.1 above, a number of SuDS Features shall be utilised to form the Surface Water Drainage Strategy in order to meet the 4 Pillars of SuDS.

Water Quantity –Permeable Paving, Attenuation Storage and Rainwater Harvesting;

Water Quality – Permeable Paving;

Biodiversity – Biodiversity benefits will be provided by the proposed landscaping.

Amenity – Rainwater Harvesting will provide amenity benefit to the site residents.

6.11 The proposed SuDS Layout is included in **Appendix H** and Causeway Flow Hydraulic Model Outputs are contained in **Appendix G**.

6.12 Rainwater harvesting shall be provided for the benefit of the site residents. For the management of surface water runoff, Permeable Paving and Attenuation Storage shall provide the required storage volumes for storms up to and including the 1 in 100 year + 40% Climate Change Event. Flows shall be restricted via a 20mm orifice plate and directed to the sewer under London Road.

6.13 Lined Permeable Paving, covering an area of 444m² shall have a minimum subbase of 550mm. The Attenuation Tank is sized at 0.99m deep with an area of 57.6m². The results are contained in **Appendix G** show a maximum storage volume of 47.3m³ in the Permeable Paving and a maximum storage volume of 54.2m³ in the Attenuation Tank. The maximum outfall rate for the 1:100yr + 40% Climate Change Event is 1.0 l/s.

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6.14 The hydraulic outputs show the half-drain down times in a 1 in 30year+40%CC storm event for each proposed attenuation feature, included in **Appendix I**. The longest half-drain-time for the Permeable Paving is 96mins and the half-drain time for the Attenuation Tank is 1240mins.

Long Term Storage

6.1 To calculate long term storge requirements, the pre-development discharge volume for the 1:100yr 360min storm has been calculated at 38m^3. The hydraulic calculations for the proposed surface water drainage network, contained in **Appendix G,** show that for a 1:100yr 360min storm, the discharge volume is 69.6m^3.

6.2 The two approaches for managing attenuation storage volumes from a development site, as outlined in the Susdrain technical note Fact Sheet (March 2014), require either runoff be limited to a greenfield runoff rate for a 2yr event up to a 100yr plus climate change event, or alternatively long-term storage should be provided with a discharge rate of 2l/s/ha (or infiltration). For small sites neither of these approaches are achievable, as it is not possible to restrict the runoff to this level (i.e. 0.1 l/s or below) without resulting in blockages at the orifice plate.

6.3 However, Policy S6 of the Non-Statutory Technical Guidance, states:

"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."

6.4 It is deemed that the proposed total runoff rate of 1.0 l/s for up to the 1:100yr + 40% climate change storm event will not adversely affect flood risk and therefore this requirement has been met.

Water Quality

6.5 The proposed drainage strategies are to meet the water quality requirements set out by Table 26.2 of the CIRIA SuDS Manual C753 which sets out the specific pollution hazard indices for residential roofs and low traffic roads in Table 6.2 below.

Land Use	Hazard Level	Pollution Hazard Indices		
		Suspended Solids	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways and low traffic roads	Low	0.5	0.4	0.4
Pollution Mitigation Required		0.5	0.4	0.4

Table 6.2 Land Use Pollution Hazard Ratings. Extracted from the CIRIA SuDS Manual C753 Simple Index Approach Tool.

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SuDS Component	Pollution Mitigation Indices		
	Suspended Solids	Metals	Hydrocarbons
Total Pollution Mitigation Provided: Permeable Subbase	0.7	0.6	0.7

Table 6.3 SuDS Pollution Mitigation Ratings. Extracted from the CIRIA SuDS Manual C753 Simple Index Approach Tool.

6.6 From Table 6.2 – 6.3 above, the permeable subbase will meet the required level of pollution mitigation is provided and exceeded for removing total suspended solids, metals and hydrocarbons from the surface water runoff.

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7 Maintenance of Devlopement Drainage

7.1 The maintenance of the SuDS features will be the responsibility of the site owners or an appointed maintenance company.

7.2 Regular inspections and maintenance should be carried out for each of these elements, particularly after periods of heavy rainfall. Maintenance tasks and frequencies for permeable paving and attenuation storage are detailed in the CIRIA SUDS Manual (C753) and have been summarised below in Table 7.1 and 7.2.

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid- summer, after autumn leaf fall, or as required based on site specific observations of clogging or manufacturer's recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds.	As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance of soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance of a hazard to the user.	As required
	Rehabilitation of surface and upper sub-surface.	As required (if infiltration performance is reduced as a result of significant clogging.)
Monitoring	Initial inspection	Monthly for 3 months after installation. 3 monthly, 48 hours after large storms.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action	Annually.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually

Table 7.1: Maintenance tasks for permeable paving (Source: CIRIA C753, The SuDS Manual)

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Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where if may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually or as required.
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank/crate system for sediment build-up and remove if necessary.	Every 5 years or as required.

Table 7.2: Maintenance tasks for cellular storage tank (Source: CIRIA C753, The SUDS Manual)

7.3 It is recommended that during the first 12 months of operation all SuDS and drainage features are visually inspected on a monthly basis to determine any seasonal patterns this includes all SuDS features, inspection chambers, inlets and outlets. This will determine whether or not the recommended service intervals set out by CIRIA in the figures above will be sufficient for maintenance beyond the first year.

7.4 After the first 12 months, the maintenance schedule should be designed to at least meet the requirements set out by CIRIA based on the outcome of the monitoring.

Manholes, Sewers and Inspection Chambers

7.5 All inspection chambers and manholes, including the orifice plate, should be inspected on a bi-annual basis with further visual checks carried out throughout the year, such as in November after the heaviest leaf-fall has occurred.

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7.6 Should a blockage occur at any time, it is advised to seek professional help to jet the drainage system to clean and clear the system.

Gutters and Downpipes

7.7 It is good practice to ensure that these are occasionally inspected to ensure they are in good order and free of leaves & debris. Once every 6 months should be sufficient.

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8 Conclusions

8.1 EAS has been commissioned to provide a Flood Risk Assessment and SuDS report in order to inform a planning application for 4 dwellings on land at 229 London Road, Wickford, Basildon BC, SS12 0LG.

8.2 The site lies with FZ1 and is noted to be at very low risk of flooding from all sources. Surface water flood risk is primarily at very low across the site, with an area of high risk along the northern site boundary. Flood depths are noted to a maximum depth of 300mm. Surface water flooding does not extend to the proposed buildings. FFLs are to be raised 300mm above surrounding ground levels. Further mitigation measures are described in the report.

8.3 The proposals seek to match the 1:2yr Greenfield Runoff Rate as closely as possible with a discharge rate of 1.0l/s for all Storms up to and including the 1:100yr + 40% Climate Change Event.

8.4 Rainwater harvesting shall be provided for the benefit of the site residents. For the management of surface water runoff, Permeable Paving and Attenuation Storage shall provide the required storage volumes for storms up to and including the 1 in 100 year + 40% Climate Change Event. Flows shall be restricted via a 20mm orifice plate and directed to the Anglian Water foul sewer under London Road.

8.5 Lined Permeable Paving, covering an area of 444m^2 shall have a minimum subbase of 550mm. The Attenuation Tank is sized at 0.99m deep with an area of 57.6m^2. The results show a maximum storage volume of 47.3m^3 in the Permeable Paving and a maximum storage volume of 54.2m^3 in the Attenuation Tank. The maximum outfall rate for the 1:100yr + 40% Climate Change Event is 1.0 l/s.

8.6 It is assumed that all elements of the proposed drainage system will remain private and the responsibility for maintenance will remain with a maintenance company set up by the developer. Maintenance tasks associated with permeable paving and an attenuation storage as set out by CIRIA have been detailed.

8.7 The site is at low risk of flooding and the proposals do not increase flood risk onsite or elsewhere. The proposed SuDS strategy effectively manages the surface water runoff associated with the proposed impermeable areas.

8.8 In conclusion, the proposals have been shown to be policy compliant on flood risk and SuDS grounds.

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Appendices

Appendix: A - Location Plan
Appendix: B – Proposed Site Plan
Appendix: C – EA Flood Map for Planning
Appendix: D – Topographical Survey
Appendix: E – Anglian Water Sewer Mapping
Appendix: F – Surface Water Flood Maps
Appendix: G – SuDS Drainage Calculations
Appendix: H – SuDS Drainage design
Appendix: I – Half-drain time calculations

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Appendix: A - Location Plan

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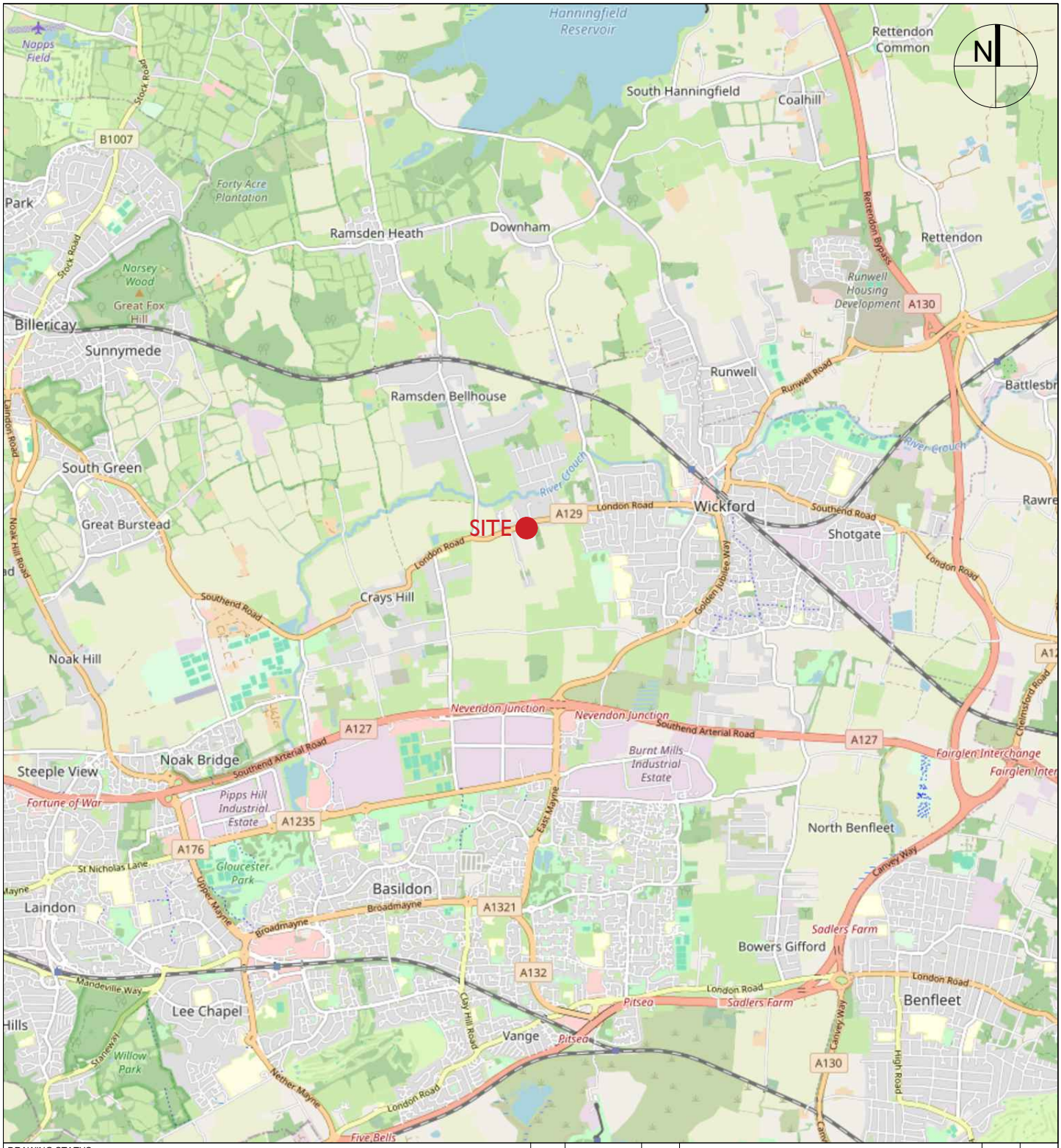

DRAWING STATUS:

FOR INFORMATION

REV	DATE	BY	DESCRIPTION	CKD	APP

PROJECT:

LAND WEST OF 227 LONDON ROAD,
WICKFORD, ESSEX

EAS

1ST Floor Millers House, Roydon Road, Stanstead Abbotts, SG12 8HN
Tel: 01920 871777
www.eastp.co.uk

TITLE:

LOCATION MAP

CLIENT:

CBS DEVELOPMENTS LTD

SCALE @ A3:	DESIGN-DRAWN:	DATE:
NTS	JM	12/03/2024

ARCHITECT:

ARCH2 LIMITED

PROJECT No:	DRAWING No:
4789	SK04

Appendix: B – Proposed Site Plan

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
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Proposed Site Plan

Scale 1:500 at A3

REV DESCRIPTION DATE

STATUS: PLANNING

Client: CBS Developments
Project: London Road Wickford
Title: Proposed Site Plan
Date Drawn: September 2023
Drawn by: AR
Scale: 1:500 @ A3
Drg No: SP001

scale (m) 1:500 0 5 10 15

Archtwo
| ARCHTWO LTD
38 THE GREEN, STOKE HAMMOND, BUCKINGHAMSHIRE, MK17 9BY
M: 07740429406 E: allan.arch2@gmail.com

Appendix: C – EA Flood Map for Planning

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
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Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**572970/193045**	**26 Feb 2024 22:04**

Your selected location is in flood zone 1, an area with a low probability of flooding.

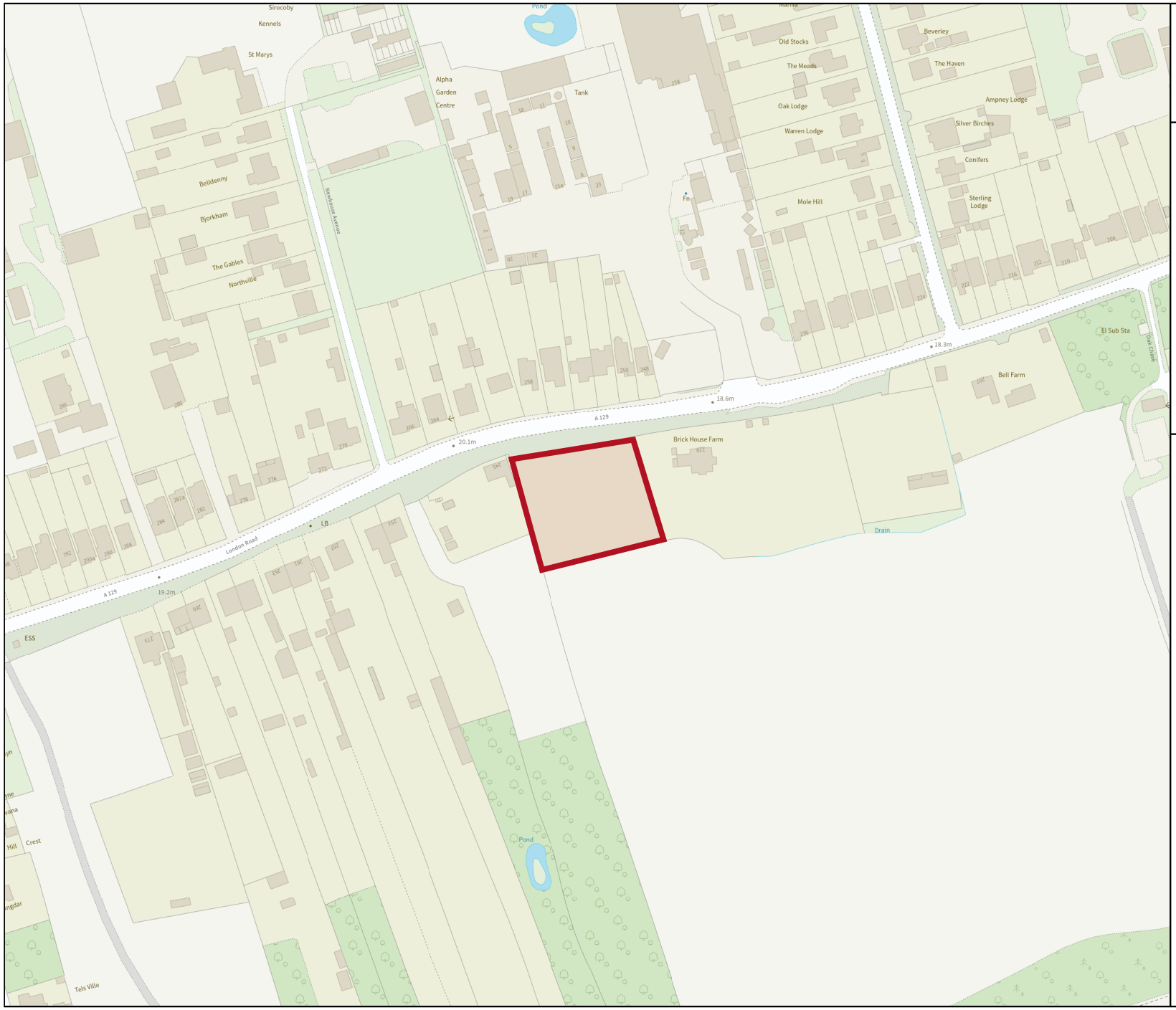
You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
572970/193045

Scale
1:2500

Created
26 Feb 2024 22:04

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix: D – Topographical Survey

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
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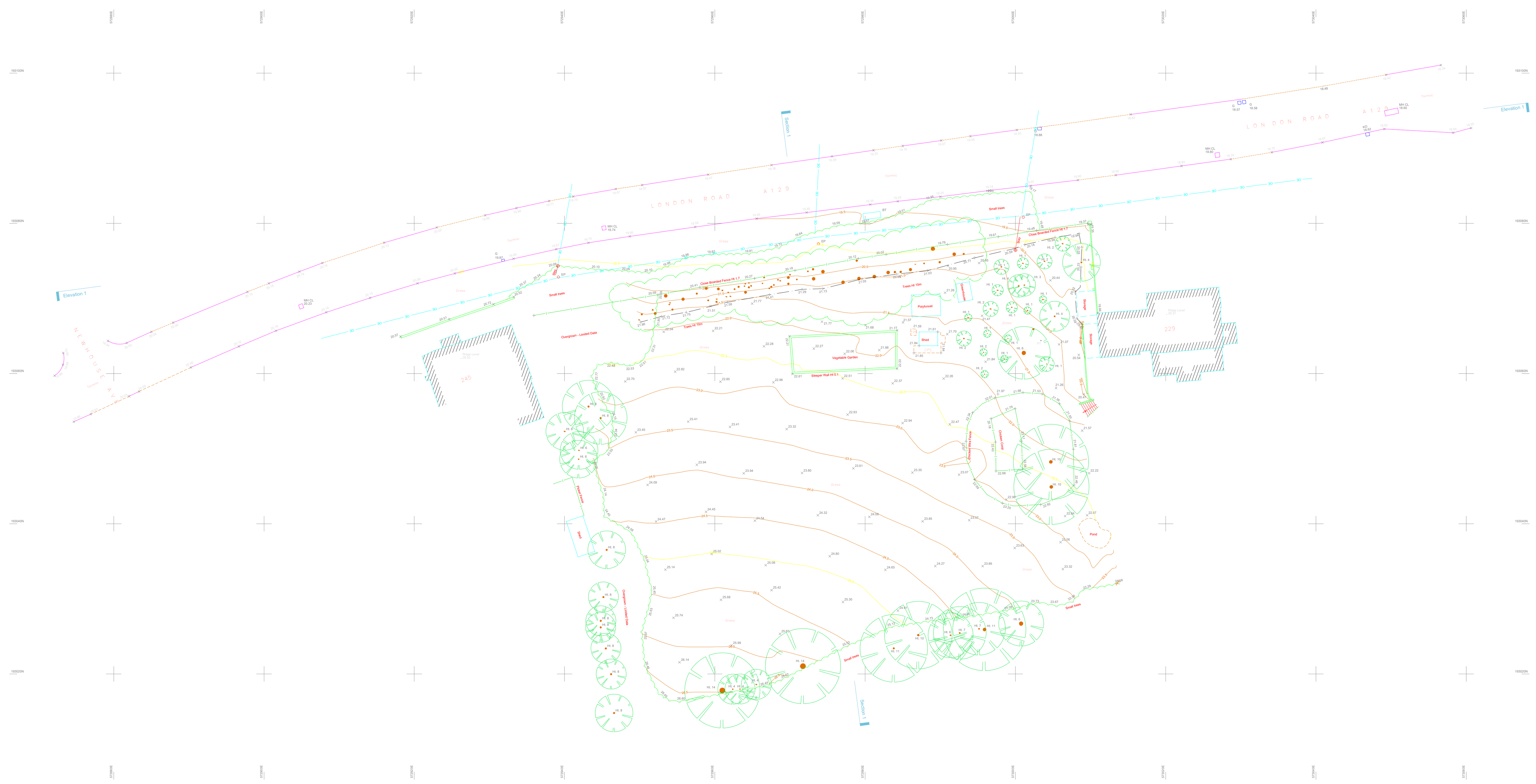

0.00m 125.00m 250.00m

NOTES
1. Levels : Ordnance Survey GNSS Datum (OSTN15).
2. Grid : Ordnance Survey National Grid based on GNSS Observations (OSTN15).
3. North Point indicative only.
4. Drainage pipe sizes are approximate as gauged from the surface.
5. Expert identification is advised for tree species.
6. Boundary detail may not represent the extent of legally conveyed ownership.
7. Survey carried out to client specification and in accordance with RICS publication: SURVEYS OF LAND, BUILDINGS & UTILITY SERVICES AT SCALES 1:500 & LARGER, 3rd EDITION.
8. Copyright of this survey, and all associated drawings and digital information, is owned by Bury Associates Limited. This information may not be sold on to a third party without prior permission of Bury Associates Limited and payment of the appropriate fee.
9. Internal door heights are evaluated on site, and are to be assumed as approximately 2.00m unless otherwise specified.

SURVEY FILES LINK

To view and access all survey files associated with this project please go to;

https://my3d.cloud/

Any additional data viewing systems (photogrammetry models, virtual tours, etc) will also be listed on this page. Login required.

KEY

TOPOGRAPHICAL FEATURES

AV	AIR VALVE	LVL	LEVEL
BA	BARRIER	MH	MANHOLE COVER
BB	BELISHA BEACON	MK	MARKER
BH	BORE HOLE	MKE	ELECTRIC MARKER
BKW	BRICK WALL	MKF	FIRE HYDRANT MARKER
BL	BOLLARD	MKG	GAS MARKER
BM	BENCH MARK	MKT	TELEPHONE MARKER
BS	BUS STOP	MKW	WATER MARKER
BT	BRITISH TELECOM COVER	NB	NOTICE BOARD
B/W	BARBED WIRE FENCE	NP	NAME PLATE
CB	CONTROL BOX	PB	POST BOX
C/B	CLOSE BOARDED FENCE	PP	PETROL PUMP
CCTV	CCTV CAMERA	P/R	POST & RAIL FENCE
CL	COVER LEVEL	PT	POST
C/L	CHAIN LINK FENCE	P/W	POST & WIRE FENCE
CP	CATCH PIT	RE	RODDING EYE
CPS	CONCRETE PAVING SLABS	RP	REFLECTOR POST
CTV	CABLE TELEVISION COVER	RS	ROAD SIGN
CW	CONCRETE WALL	RW	RETAINING WALL
DP	DOWN PIPE	SC	STOP COCK
EIC	ELECTRIC INSPECTION COVER	SIG	RAILWAY SIGNAL
EP	ELECTRIC POLE	SP	SIGN POST
ER	EARTH ROD	STW	STONE WALL
FB	FLOWER BED	SV	STOP VALVE
FH	FIRE HYDRANT	SW	SURFACE WATER
FL	FLOOR LEVEL	SY	STAY
FP	FLAG POLE	TAC	TACTILE PAVING
FW	FOUL WATER	TBM	TEMPORARY BENCH MARK
G	GULLY	TCB	TELEPHONE CALL BOX
GP	GATEPOST	TL	TRAFFIC LIGHT
GV	GAS VALVE	TM	TICKET MACHINE
H/R	HAND RAIL	TP	TELEPHONE POLE
HT	HEIGHT	TRP	TRIAL PIT
IC	INSPECTION COVER	UTL	UNABLE TO LIFT
IL	INVERT LEVEL	VT	VENT
I/R	IRON RAILING FENCE	WM	WATER METER
KO	KERB OUTLET	WO	WASH OUT
L/L	LARCH LAP FENCE	S28 47.044	SURVEY STATION
LP	LAMP POST		

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Blackpole East
Worcester
WR3 8SG

THE SURVEY ASSOCIATION

CLIENT
Lynford Estate Holdings
3 Hill Rise
Gerrards Cross
Buckinghamshire
SL9 9BN

PROJECT
Land Adjacent to 229 London Road
Wickford
SS12 0LG

TITLE
Topographical Survey

SCALE (@ A1)	SURVEYOR	DRAWN BY
1 : 500	JR	JR

DRAWING NUMBER	DATE
BA2400054_01	11/03/2024

Appendix: E – Anglian Water Sewer Mapping

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(c) Crown copyright and database rights 2024 Ordnance Survey 100022432 | Date: 21/03/24 | Scale: 1:500 | Map Centre: 572990,193047 | Data updated: 29/02/24 | Our Ref: 1427271 - 1 | Wastewater Plan A1

- 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)

james.cahuzac@eastp.co.uk
229 London Road

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	573027	193093	F	-	-	-
0101	573081	193104	F	-	-	-
1101	573139	193121	F	18.76	14.28	4.48
1102	573153	193118	F	-	-	-
8001	572817	193028	F	-	-	-
9001	572907	193070	F	-	-	-
9002	572947	193080	F	-	-	3.89

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: F – Surface Water Flood Maps

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
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EA Risk of Surface Water Flooding - Extent

Site Boundary

Key

Surface water

- Extent
- High risk
  More than 3.3% chance each year
- Medium risk
  Between 1% and 3.3% chance each year
- Low risk
  Between 0.1% and 1% chance each year
- Depth

Map details

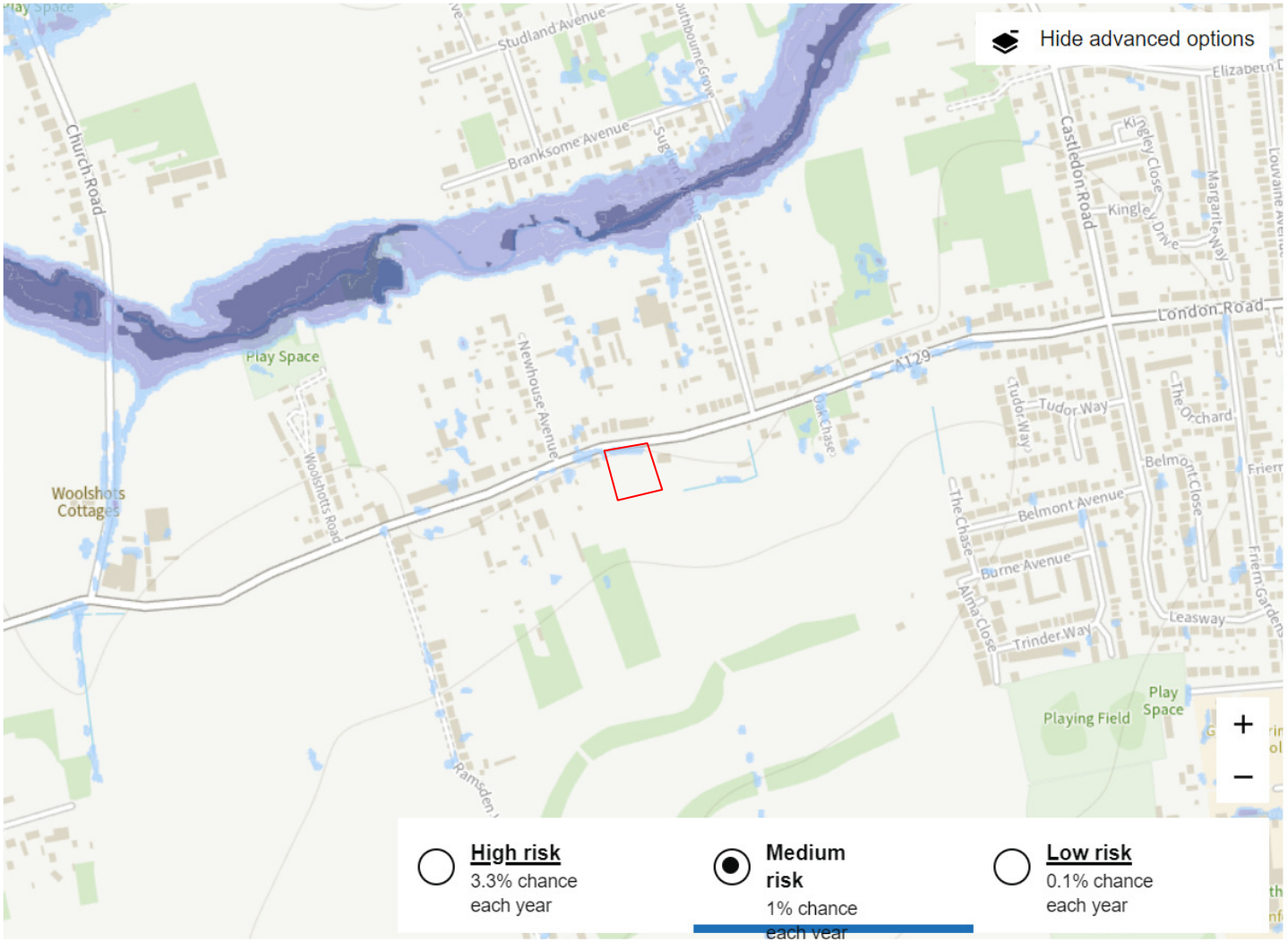
- [x] Show flooding
- [ ] Selected address
- 15m boundary

EA Risk of Surface Water Flooding – High Risk Flood Depths

Site Boundary

EA Risk of Surface Water Flooding – Medium Risk Flood Depths

Site Boundary



Key

Surface water

- ○ Extent
- ◉ Depth
  - Above 90cm
  - 30cm to 90cm
  - Below 30cm
- ○ Velocity

Rivers and the sea

- ○ Extent

Reservoirs

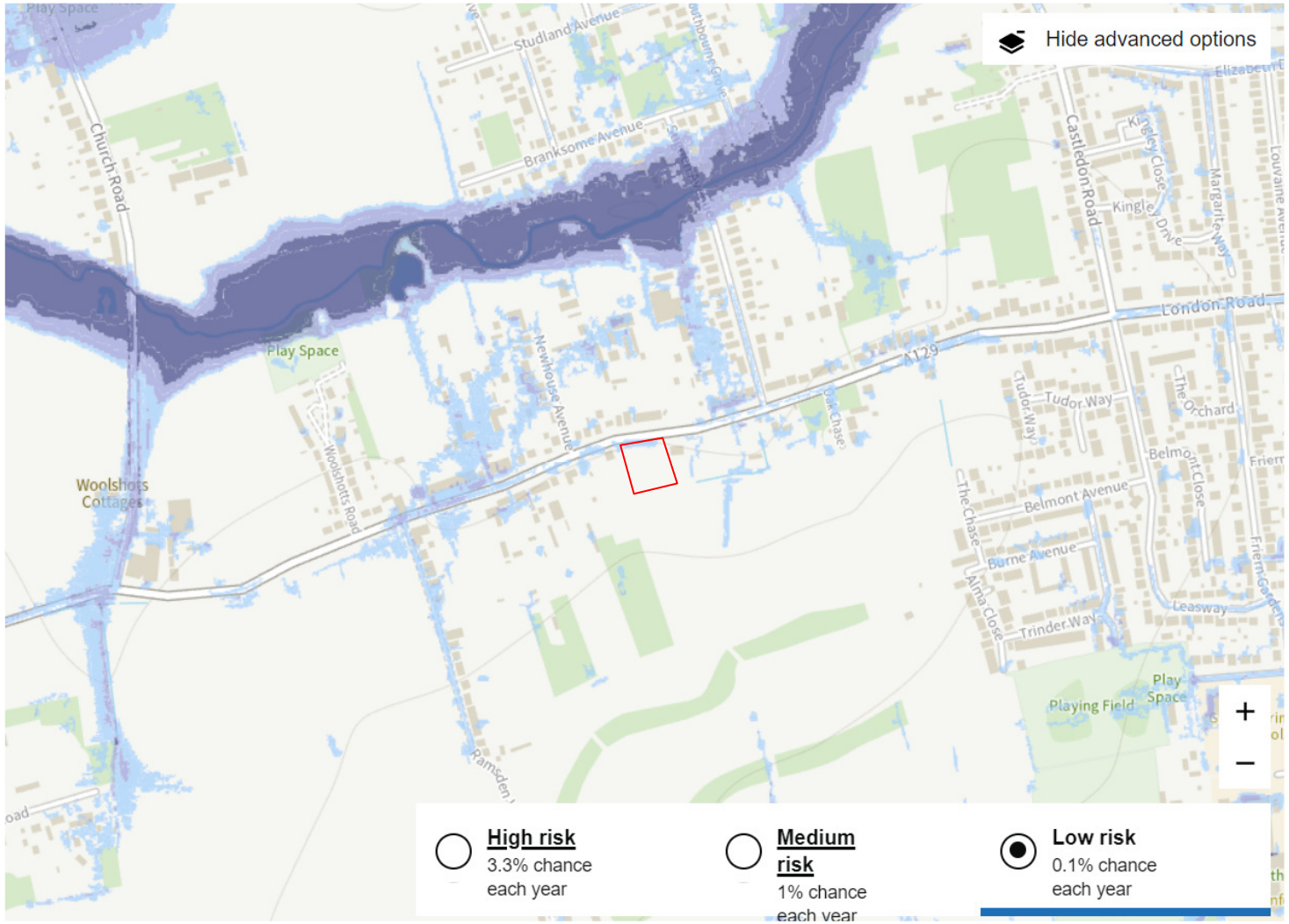
- ○ Extent

Map details

- ☑ Show flooding
- ☐ Selected address
- 15m boundary

EA Risk of Surface Water Flooding – Low Risk Flood Depths

Site Boundary



Key

Surface water

- ○ Extent
- ◉ Depth
  - Above 90cm
  - 30cm to 90cm
  - Below 30cm
- ○ Velocity

Rivers and the sea

- ○ Extent

Reservoirs

- ○ Extent

Map details

- ☑ Show flooding
- ☐ Selected address
- 15m boundary

N

KEY

SITE BOUNDARY (TOTAL SITE AREA 0.287ha)

<0.15m FLOOD DEPTH

0.15m–0.3m FLOOD DEPTH

LONDON ROAD A129

Tarmac

Grass

Small trees

Overgrown - Limited Data

Trees Ht 10m

Close Boarded Fence Ht 1.7

Post & Rail Fence

Chicken Wire Fence

Sleeper Wall Ht 0.4

Vegetable Garden

Polytunnel

Greenhouse

Storage

Shed

Chicken Coop

Pond

PT

Ridge Level 28.52

Ridge Level 26.57

245

229

MH CL 19.74

MH CL 18.80

BT

EP

Stay

G

Section 1

REV	DATE	BY	DESCRIPTION	CHK	APD
-	-	-	-	-	-

DRAWING STATUS:
FOR PLANNING

EAS
1st Floor Millers House, Rogden Road,
Stonehead Abbotts, Hertfordshire, SG12 8HN
Tel: 01920 871777
www.eastp.co.uk

CLIENT:
CBS DEVELOPMENTS LTD

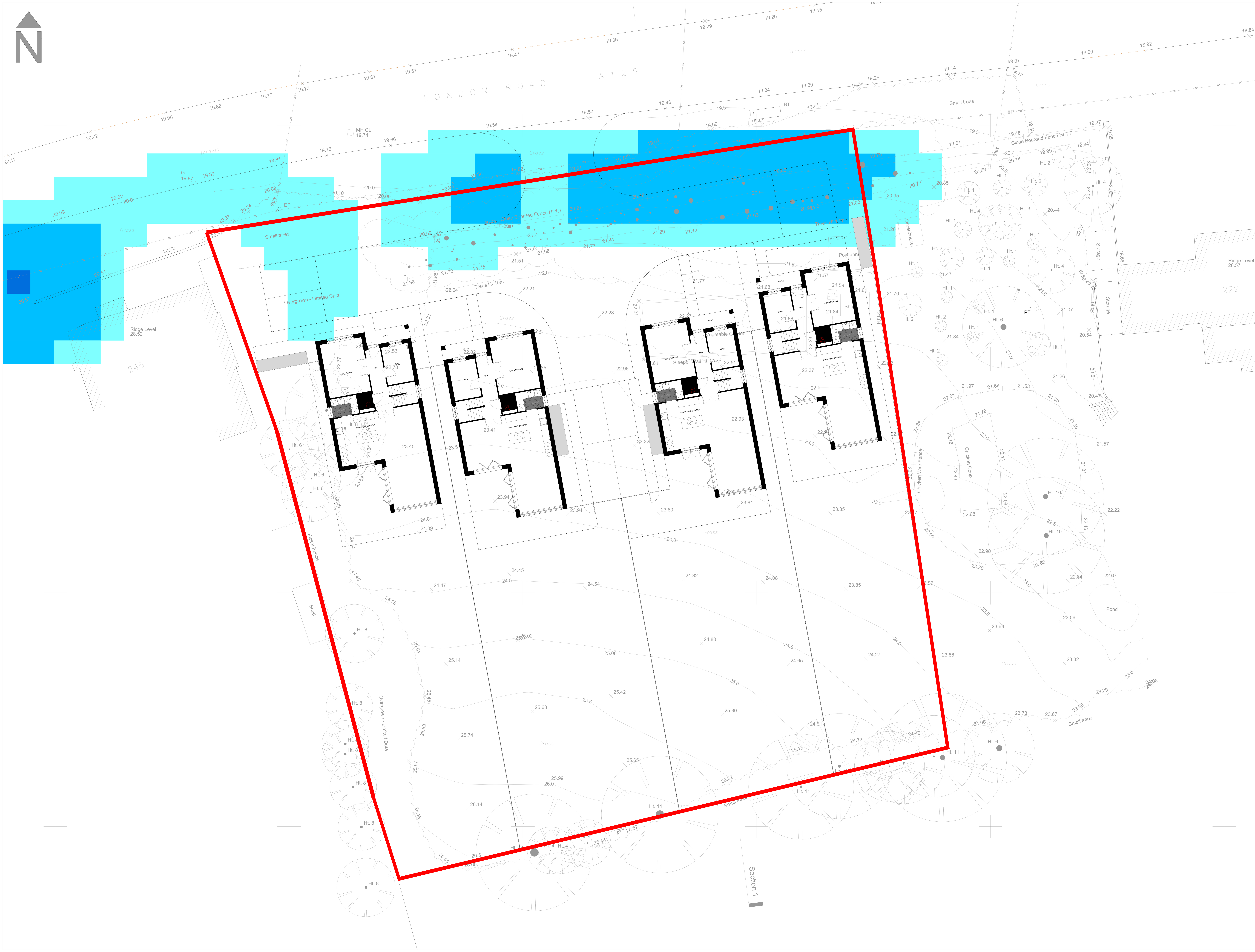
ARCHITECT:
ARCHTWO TLD

PROJECT:
229 LONDON ROAD
WICKFORD

TITLE:
0.1%AEP SURFACE WATER
FLOOD RISK

SCALE @ A3:	DESIGN+DRAWN:	DATE:
1:100	JC	27.03.2024

PROJECT No:	DRAWING No:
4789	SK01



KEY

(red line)	SITE BOUNDARY (TOTAL SITE AREA 0.287ha)
(light blue)	<0.15m FLOOD DEPTH
(mid blue)	0.15m–0.3m FLOOD DEPTH
(dark blue)	0.3m–0.6m FLOOD DEPTH

REV	DATE	BY	DESCRIPTION	CHK	APD
–	–	–	–	–	–

DRAWING STATUS: FOR PLANNING

EAS
1st Floor Millers House, Roydon Road,
Stanstead Abbotts, Hertfordshire, SG12 8HN
Tel: 01920 871777
www.eastp.co.uk

CLIENT: CBS DEVELOPMENTS LTD

ARCHITECT: ARCHTWO TLD

PROJECT: 229 LONDON ROAD WICKFORD

TITLE: 1%AEP SURFACE WATER FLOOD RISK

SCALE @ A0:	DESIGN-DRAWN:	DATE:
1:100	JC	27.03.2024

PROJECT No:	DRAWING No:
4789	SK02

KEY

SITE BOUNDARY (TOTAL SITE AREA 0.287ha)

<0.15m FLOOD DEPTH

0.15m–0.3m FLOOD DEPTH

LONDON ROAD A129

Trees Ht 10m

Overgrown - Limited Data

Close Boarded Fence Ht 1.7

Pickel Fence

Chicken Wire Fence

Sleeper Wall Ht 0.1

Small trees

Ridge Level 28.52

Ridge Level 26.57

Greenhouse

Shed

Chicken Coop

Pond

Storage

PT

Section 1

REV	DATE	BY	DESCRIPTION	CHK	APD
–	–	–	–	–	–

DRAWING STATUS:
FOR PLANNING

EAS
1st Floor Millers House, Roydon Road,
Stanstead Abbotts, Hertfordshire, SG12 8HN
Tel: 01920 871777
www.eastp.co.uk

CLIENT:
CBS DEVELOPMENTS LTD

ARCHITECT:
ARCHTWO TLD

PROJECT:
229 LONDON ROAD
WICKFORD

TITLE:
3.3%AEP SURFACE WATER
FLOOD RISK

SCALE @ A0:	DESIGN–DRAWN:	DATE:
1:100	JC	27.03.2024
PROJECT No:	DRAWING No:	
4789	SK03	

Appendix: G – SuDS Drainage Calculations

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
1st Floor Millers House, Roydon Road, Stanstead Abbotts, SG12 8HN. Tel 01920 871 777 e: contact@eastp.co.uk www.eastp.co.uk

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.600
CV	1.000	Preferred Cover Depth (m)	0.900
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP	5.00	20.000		10.367	74.759	1.050
Tank		20.000		27.166	74.759	1.800
MH17		20.500	1200	48.418	74.843	2.439
EX MH		19.740	1200	48.502	84.166	1.754

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PP	Tank	2.000	0.600	18.950	18.200	0.750	2.7	150	5.01	50.0
1.001	Tank	MH17	14.000	0.600	18.200	18.061	0.139	100.7	150	5.24	50.0
1.002	MH17	EX MH	7.500	0.600	18.061	17.986	0.075	100.0	150	5.36	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	6.218	109.9	0.0	0.900	1.650	0.000	0.0	0	0.000
1.001	1.001	17.7	0.0	1.650	2.289	0.000	0.0	0	0.000
1.002	1.005	17.8	0.0	2.289	1.604	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	2.000	2.7	150	Circular	20.000	18.950	0.900	20.000	18.200	1.650
1.001	14.000	100.7	150	Circular	20.000	18.200	1.650	20.500	18.061	2.289
1.002	7.500	100.0	150	Circular	20.500	18.061	2.289	19.740	17.986	1.604

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PP		Junction		Tank		Junction	
1.001	Tank		Junction		MH17	1200	Manhole	Adoptable
1.002	MH17	1200	Manhole	Adoptable	EX MH	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	100 year (l/s)	3.2
Summer CV	1.000	Additional Storage (m³/ha)	0.0	Check Discharge Volume	✓
Winter CV	1.000	Check Discharge Rate(s)	✓	100 year 360 minute (m³)	38
Analysis Speed	Normal	2 year (l/s)	0.9		
Skip Steady State	x	30 year (l/s)	2.4		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Betterment (%)	0
Greenfield Method	ReFH2	Q 2 year (l/s)	0.9
Region	England, Wales, NI	Q 30 year (l/s)	2.4
Include Baseflow	x	Q 100 year (l/s)	3.2
Positively Drained Area (ha)	0.114		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	ReFH2	Storm Duration (mins)	360
Region	England, Wales, NI	Betterment (%)	0
Include Baseflow	x	Runoff Volume (m^3)	38
Positively Drained Area (ha)	0.114		

Node Tank Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Diameter (m)	0.020
Downstream Link	1.001	Invert Level (m)	18.200	Discharge Coefficient	0.600

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	19.320	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	525	Depth (m)	0.550
Safety Factor	2.0	Width (m)	45.000	Inf Depth (m)	
Porosity	0.30	Length (m)	9.860		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	57.6	0.0	0.990	57.6	0.0	0.991	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP	76	18.975	0.025	6.6	0.0000	0.0000	OK
480 minute winter	Tank	400	18.610	0.410	2.7	22.4213	0.0000	SURCHARGED
60 minute winter	MH17	37	18.137	0.076	0.4	0.0860	0.0000	OK
15 minute summer	EX MH	1	18.136	0.150	0.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP	1.000	Tank	6.6	2.300	0.060	0.0195	
480 minute winter	Tank	Orifice	MH17	0.5				
60 minute winter	MH17	1.002	EX MH	0.4	0.027	0.022	0.0996	12.9

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	PP	360	19.160	0.210	7.2	0.0000	0.0000	SURCHARGED
360 minute winter	Tank	360	19.160	0.960	7.2	52.5039	0.0000	SURCHARGED
30 minute summer	MH17	22	18.138	0.077	0.6	0.0866	0.0000	OK
15 minute summer	EX MH	1	18.136	0.150	0.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	PP	1.000	Tank	7.2	2.187	0.066	0.0352	
360 minute winter	Tank	Orifice	MH17	0.8				
30 minute summer	MH17	1.002	EX MH	0.6	0.044	0.035	0.0999	30.4

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 98.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	PP	472	19.605	0.655	8.1	21.4954	0.0000	SURCHARGED
480 minute winter	Tank	472	19.605	1.405	13.9	54.2002	0.0000	SURCHARGED
15 minute winter	MH17	16	18.138	0.077	0.6	0.0866	0.0000	OK
15 minute summer	EX MH	1	18.136	0.150	0.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	PP	1.000	Tank	13.9	2.079	0.127	0.0352	
480 minute winter	Tank	Orifice	MH17	1.0				
15 minute winter	MH17	1.002	EX MH	0.7	0.046	0.037	0.0998	32.7

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	PP	472	19.552	0.602	7.5	14.5722	0.0000	SURCHARGED
480 minute winter	Tank	472	19.552	1.352	7.5	54.2002	0.0000	SURCHARGED
60 minute winter	MH17	27	18.137	0.076	0.8	0.0859	0.0000	OK
15 minute summer	EX MH	1	18.136	0.150	0.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	PP	1.000	Tank	7.5	2.079	0.068	0.0352	
480 minute winter	Tank	Orifice	MH17	1.0				
60 minute winter	MH17	1.002	EX MH	0.8	0.054	0.044	0.0995	45.1

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	PP	585	19.799	0.849	8.9	47.3436	0.0000	FLOOD RISK
600 minute winter	Tank	585	19.799	1.599	8.5	54.2002	0.0000	FLOOD RISK
120 minute summer	MH17	30	18.137	0.076	1.0	0.0859	0.0000	OK
15 minute summer	EX MH	1	18.136	0.150	0.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	PP	1.000	Tank	8.5	1.922	0.077	0.0352	
600 minute winter	Tank	Orifice	MH17	1.1				
120 minute summer	MH17	1.002	EX MH	1.0	0.070	0.056	0.0995	68.5

Appendix: H – SuDS Drainage design

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
1st Floor Millers House, Roydon Road, Stanstead Abbotts, SG12 8HN. Tel 01920 871 777 e: contact@eastp.co.uk www.eastp.co.uk

N

LONDON ROAD A129

EX MH9002
CL: 19.74mAOD
IL: 17.99mAOD

MH17
CL: 20.50mAOD
IL: 18.06mAOD

TANK
CL: 20.00mAOD
IL: 18.20mAOD

PP
CL: 20.00mAOD
IL: 18.95mAOD

MH2
CL: 22.30mAOD
IL: 21.66mAOD

MH3
CL: 22.30mAOD
IL: 21.60mAOD

MH7
CL: 22.50mAOD
IL: 21.70mAOD

MH8
CL: 22.30mAOD
IL: 21.60mAOD

MH13
CL: 22.30mAOD
IL: 21.60mAOD

MH12
CL: 22.30mAOD
IL: 21.70mAOD

MH15
CL: 21.50mAOD
IL: 20.86mAOD

MH16
CL: 21.50mAOD
IL: 20.80mAOD

MH6
CL: 23.00mAOD
IL: 21.95mAOD

MH11
CL: 23.00mAOD
IL: 21.95mAOD

MH14
CL: 23.00mAOD
IL: 21.95mAOD

MH1
CL: 24.00mAOD
IL: 22.95mAOD

MH5
CL: 23.80mAOD
IL: 22.67mAOD

MH9
CL: 23.70mAOD
IL: 22.65mAOD

MH10
CL: 23.70mAOD
IL: 22.57mAOD

MH4
CL: 23.80mAOD
IL: 22.75mAOD

MH CL
18.80

Close Boarded Fence Ht 1.7

Trees Ht 10m

Small trees

Overgrown - Limited Data

Polytunnel

Chicken Coop

Chicken Wire Fence

Pond

Shed

Picket Fence

Section 1

KEY

- SITE BOUNDARY (TOTAL SITE AREA 0.287ha)
- EXISTING BUILDING
- PROPOSED BUILDING
- PERMEABLE PAVING WITH MIN. 550mm SUB-BASE – VOLUME: 47.3m³
- PROPOSED GEO-CELLULAR STORAGE TANK (8.0m X 7.2m X 0.99m – VOLUME: 54.2m³)
- SURFACE WATER PIPE NETWORK
- SURFACE WATER MANHOLE
- PERMAVOID DIFFUSER UNIT
- RAINWATER DOWNPIPE
- 20mm ORIFICE PLATE WITH SUITABLE FILTER TO RESTRICT RUNOFF AT 1.0L/S
- FLOW ARROW
- EXISTING FOUL WATER MANHOLE

REV	DATE	BY	DESCRIPTION	CHK	APD
-	-	-	-	-	-

DRAWING STATUS:
FOR PLANNING

EAS
1st Floor Millers House, Roydon Road,
Stanstead Abbotts, Hertfordshire, SG12 8HN
Tel: 01920 871777
www.eastp.co.uk

CLIENT:
CBS DEVELOPMENTS LTD

ARCHITECT:
ARCHTWO TLD

PROJECT:
229 LONDON ROAD
WICKFORD

TITLE:
SUDS DRAINAGE STRATEGY

SCALE @ A3:	DESIGN / DRAWN:	DATE:
1:100	JC	27.03.2024
PROJECT No:	DRAWING No:	
4789	SK07	

Appendix: I – Half-drain time calculations

TRANSPORT PLANNING ■ HIGHWAYS AND DRAINAGE ■ FLOOD RISK
1st Floor Millers House, Roydon Road, Stanstead Abbotts, SG12 8HN. Tel 01920 871 777 e: contact@eastp.co.uk www.eastp.co.uk

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.600
CV	1.000	Preferred Cover Depth (m)	0.900
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP	5.00	20.000		10.367	74.759	1.050
Tank		20.000		27.166	74.759	1.800
MH17		20.500	1200	48.418	74.843	2.439
EX MH		19.740	1200	48.502	84.166	1.754

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PP	Tank	2.000	0.600	18.950	18.200	0.750	2.7	150	5.01	50.0
1.001	Tank	MH17	14.000	0.600	18.200	18.061	0.139	100.7	150	5.24	50.0
1.002	MH17	EX MH	7.500	0.600	18.061	17.986	0.075	100.0	150	5.36	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	6.218	109.9	0.0	0.900	1.650	0.000	0.0	0	0.000
1.001	1.001	17.7	0.0	1.650	2.289	0.000	0.0	0	0.000
1.002	1.005	17.8	0.0	2.289	1.604	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	2.000	2.7	150	Circular	20.000	18.950	0.900	20.000	18.200	1.650
1.001	14.000	100.7	150	Circular	20.000	18.200	1.650	20.500	18.061	2.289
1.002	7.500	100.0	150	Circular	20.500	18.061	2.289	19.740	17.986	1.604

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PP		Junction		Tank		Junction	
1.001	Tank		Junction		MH17	1200	Manhole	Adoptable
1.002	MH17	1200	Manhole	Adoptable	EX MH	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	100 year (l/s)	3.2
Summer CV	1.000	Additional Storage (m³/ha)	0.0	Check Discharge Volume	✓
Winter CV	1.000	Check Discharge Rate(s)	✓	100 year 360 minute (m³)	38
Analysis Speed	Normal	2 year (l/s)	0.9		
Skip Steady State	x	30 year (l/s)	2.4		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Betterment (%)	0
Greenfield Method	ReFH2	Q 2 year (l/s)	0.9
Region	England, Wales, NI	Q 30 year (l/s)	2.4
Include Baseflow	x	Q 100 year (l/s)	3.2
Positively Drained Area (ha)	0.114		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	ReFH2	Storm Duration (mins)	360
Region	England, Wales, NI	Betterment (%)	0
Include Baseflow	x	Runoff Volume (m³)	38
Positively Drained Area (ha)	0.114		

Node Tank Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Diameter (m)	0.020
Downstream Link	1.001	Invert Level (m)	18.200	Discharge Coefficient	0.600

Node PP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	19.320	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	96	Depth (m)	0.550
Safety Factor	2.0	Width (m)	45.000	Inf Depth (m)	
Porosity	0.30	Length (m)	9.860		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	18.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	1240

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	57.6	0.0	0.990	57.6	0.0	0.991	0.0	0.0

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	PP	472	19.605	0.655	8.1	21.4954	0.0000	SURCHARGED
480 minute winter	Tank	472	19.605	1.405	13.9	54.2002	0.0000	SURCHARGED
15 minute winter	MH17	16	18.138	0.077	0.6	0.0866	0.0000	OK
15 minute summer	EX MH	1	18.136	0.150	0.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	PP	1.000	Tank	13.9	2.079	0.127	0.0352	
480 minute winter	Tank	Orifice	MH17	1.0				
15 minute winter	MH17	1.002	EX MH	0.7	0.046	0.037	0.0998	32.7