SuDS Drainage Report

July 2019

EAS

Foster Street Farm
Foster Street
Harlow

Document History

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1 Introduction

1.1 This SuDS Drainage report has been prepared in support of a full planning application for the development of 10 residential dwellings with associated parking at Foster Street Farm, Foster Street, Harlow, CM17 9HS. A location plan is enclosed in **Appendix A.**

1.2 Planning permission has previously been granted at the site in July 2018 for 9 residential dwellings (PL/EPFL1327/18). This report supports the revised submission for 10 residential dwellings. Development proposals are enclosed in **Appendix B**.

1.3 The site is less than 1 hectare and is located wholly in Flood Zone 1 and as such as Flood Risk Assessment is not required. However, this report has been prepared to consider the proposed surface water drainage for the site and look at other risks of flooding such as from surface water.

1.4 The contents of this FRA and drainage report are based on the advice set out in The National Planning Policy Framework (NPPF) and the Technical Guidance to the NPPF, published in July 2018 and the Planning Practice Guidance (PPG), published March 2014.

1.5 The contents of this document are as follows:

Section 2 describes relevant policy;

Section 3 describes site description, including site levels, proximity to watercourses etc.;

Section 4 describes potential sources of flooding and any mitigation measures required;

Section 5 describes the existing site hydrology;

Section 6 outlines a surface water drainage strategy;

Section 7 provides a summary and conclusions.

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2 Policy Context

Introduction

2.1 This section sets out the policy context. The contents of this FRA are based on the advice set out in The National Planning Policy Framework (NPPF) published in July 2018 and the Planning Practice Guidance (PPG), published March 2014.

National Planning Policy Framework

2.2 Paragraph 065 of the NPPF defines each Flood Zone along with appropriate land use and FRA requirements. The flood risk zones are defined as:

- Flood Zone 1- This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river flooding (<0.1%)
- Flood Zone 2- This zone comprises land assessed as having between a 1 in a 100 and 1 in 1,000 annual probability of river flooding.
- Flood Zone 3a- This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), and for tidal flooding at least a 0.5% 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.

2.3 Paragraph 155 discusses the suitability of development location, particularly with regard 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".

2.4 Paragraph 156 of the National Planning Policy Framework (NPPF) states:

"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".

2.5 Paragraphs 165 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:

- *Take account of advice from the lead local flood authority;*
- *Have appropriate proposed minimum operational standards;*
- *Have maintenance arrangements in place to ensure an acceptable standard of operation of the lifetime of the development; and*

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- *Where possible, provide multifunctional benefits."*

2.6 The Flood Map for Planning shows the site to be located entirely in Flood Zone 1, at 'low' risk of flooding from fluvial sources. The EA Flood Map has been enclosed in **Appendix C**. This is considered to be an area with less than 1 in 1000 annual chance of flooding.

Epping Forest District Local Plan

2.7 Epping Forest District Councils Local Plan Submission Version 2017 has recently been submitted for adoption. Although not yet adopted relevant policies have been considered for the purpose of this report. The following policies relate to flood risk:

- Policy DM15 Managing and Reducing Flood Risk
- Policy DM16 Sustainable Drainage Systems
- Policy DM17 Protecting and Enhancing Watercourses and Flood Defences

2.8 Epping Forest District Council is in the process of updating their local plan for the district, which will provide planning policy aims up until 2033 and replace the existing Local Plan. The Local Plan Alterations report, adopted July 2006, is the relevant policy document until the Core Strategy has been published, and the following policies relate to flood risk:

2.9 Policy U2A: Development in Flood Risk Areas, sets out the local policy with regards to flooding. New development should be steered towards low risk areas, and not increase the risk of flooding to others.

2.10 Policy U3A: Sustainable Urban Drainage Systems, highlights the importance of disposing of surface water runoff in a sustainable manner. The methods outlined within this report follow this guidance and ensure the runoff from the proposed development does not cause a flood risk elsewhere.

Epping Forest District Council SFRA Update (2015)

2.11 A Strategic Flood Risk Assessment (SFRA) was published by Epping Forest District Council and Harlow Council in April 2011, to inform development control in the local area. The SFRA was updated in 2015. The SFRA reviews all types of flooding in the local area, and draws from all available sources including the Environment Agency, the Council flood incident database, and Thames Water. As such it provides essential evidence of existing flooding and drainage issues.

2.12 The SFRA states that "care should be taken in the use of infiltration drainage systems in areas where the permeable strata are geographically limited as their use may contribute to groundwater flooding nearby".

2.13 EFDC expects all new development to show a reduction in the flood risk onsite and, where appropriate, elsewhere in the catchment. All development should aspire to achieve greenfield runoff rates from the site up to the 1% AEP plus climate change.

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3 Existing Site Assesment

Site Description

3.1 This SuDS statement has been prepared in support of a full application for the development of 10 residential dwellings at Foster Street Farm, Foster Street, Harlow, CM17 9HS.

3.2 The site covers an area of 0.56 hectares and currently consists of several disused barns, storage containers and sheds.

3.3 There are existing residential properties located to the east and west of the site. There is an electricity substation located immediately outside the south western perimeter of the site. The M11 is located approximately 500m west of the site. The site is approximately 5km east from Harlow Town centre.

3.4 Planning permission has previously been granted at the site in July 2018 for 9 residential dwellings (PL/EPFL1327/18). Permission is now being sought for 10 residential dwellings.

3.5 Proposed development plans are included in Appendix B.

Local Watercourses

3.6 There are several ditches running parallel to Foster Street as well as several field drains approximately 340m south west of the site which flow into Shonks Brook 1km south west of the site.

3.7 A ditch is also located along the northern perimeter of the site.

3.8 There are no other watercourses of EA Main Rivers located nearby.

Site Levels

3.9 A topographical survey enclosed in Appendix D. The survey shows the site is relatively flat falling at around 96m AOD. Levels along the northern perimeter fall to around 96.1m AOD compared to around 96.8m AOD in the southern area of the site.

Geology

3.10 The online British Geological Survey (BGS) mapping shows to have a geology of London Clay Formation - Clay, Silt And Sand with superficial deposits of Lowestoft Formation - Diamicton.

Sewer Records

3.11 Given the rural location of the site, it is unlike there are any public sewers within the vicinity.

Existing Layout and Drainage

3.12 Rainwater downpipes are indicated on several outbuildings on the topographical survey. It is assumed these buildings drain unrestricted to ground. As the site falls towards the north, it is likely surface water runoff enters the ditch, again unrestricted.

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4 Potential Sources of Flooding

Fluvial

4.1 A copy of the Environment Agency's Flood Map is enclosed in **Appendix C.** The mapping shows the whole site to be located in Flood Zone 1, at 'Low' risk of flooding from fluvial or tidal sources. Areas in Flood Zone 1 have a less than 1 in 1000 probability of flooding each year.

4.2 The risk from fluvial flooding can deemed low.

Surface Water

4.3 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'.

4.4 Figure 4.1 below an extract from the EA surface water flood map provided on the GOV.UK website, shows much of the site is at 'very low' risk of surface water flooding. This means annually there is a less than 0.1% chance of flooding. There is a minor area along the north eastern perimeter of the site shown to be at high risk of surface water flooding. In in south eastern corner of the site, there is an area shown to be at medium risk of surface water flooding.

4.5 In a low risk scenario, meaning each year this area has a chance of flooding between 0.1% and 1%, the depth of surface water flooding is shown to be below 300mm in the south eastern corner and along the north eastern boundary. There is a very small area of surface water flooding shown to be between 300mm and 900mm along the perimeter of the existing barn which is likely to be caused by pooling of surface water.

4.6 Plot 10 appears to be at risk of surface water flooding and therefore the finished floor level should be a minimum of 300mm above the surrounding ground levels.

Figure 4.1: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=548649&northing=209002

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Groundwater

4.7 Borehole records available on the BGS website indicates two boreholes approximately 200m south east of the site (ID: 539516 and ID: 539480) at 27m deep and 22m deep respectively, both encountered groundwater 3.7m bgl.

4.8 The EA groundwater mapping located in MAGIC Maps (available at: http://magic.defra.gov.uk/MagicMap.aspx) shows the site is not located in a Source Protection Zone or located above a designated aquifer. Moreover, the site is not located within a groundwater vulnerability zone.

4.9 Given the above, the risk from groundwater is considered to be low.

Artificial

4.10 The EA Flood Map for Planning shows the site is not at risk of flooding from artificial sources therefore the risk from artificial sources can be deemed low.

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5 Drainage Strategy

Pre-development Run Off Rate

5.1 Greenfield runoff rates were estimated using the ICP SUDS method on the WINDES Micro Drainage software. The total impermeable area of the site is 0.29 hectares including 10% urban creep applied to all roof areas. The runoff rates for 1 hectare has been estimated and scaled to the total impermeable site area for the 1 in 1 year, 1 in 30 year and 1 in 100-year events.

- 1 in 100 year – 9.1 l/s/ha =2.63 l/s
- 1 in 30 year – 6.4l/s/ha = 1.85 l/s
- 1 in 1 year –2.4 l/s/ha = 0.696 l/s
- QBAR Rural – 2.8l/s/ha = 0.812 l/s

5.2 The WINDES calculations can be viewed in **Appendix E.**

Relevant SuDS Policy

5.3 SUDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, these features can improve water quality and provide biodiversity and amenity benefits.

5.4 The SUDS management train incorporates a hierarchy of techniques and considers all three SUDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefits. In decreasing order of preference:

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

5.5 The philosophy of SuDS is to replicate as closely as possible the natural drainage from a site predevelopment and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:

- Reducing runoff rates, thus reducing the flood risk downstream;
- Reducing pollutant concentrations, thus protecting the quality of the receiving water body;
- Groundwater recharge;
- Contributing to the enhanced amenity and aesthetic value of development areas; and
- Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Site Specific SuDS

5.6 The various SUDS methods have been considered in relation to site-specific constraints. Table 5.1 outlines the constraints and opportunities to each of the SUDS devices in

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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.	Unlikely to be suitable given the pitch of roofs of residential dwellings	No
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	With a geology of London Clay, infiltration is unlikely to be viable	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.	With a geology of London Clay, infiltration is unlikely to be viable. Lined Permeable paving has however been proposed on all footways, access road and parking area.	Yes
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 features such as waterbutts could be incorporated into the development.	Potentially
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Spatial constraints on site mean swales are not feasible.	No
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (which are designed to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	With a geology of London Clay, infiltration is unlikely to be viable	No
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	Not applied at this site- infiltration not deemed appropriate.	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	Not appropriate due to spatial constraints on site	No
Attenuation Underground (end of pipe treatment	Oversized pipes or geo-cellular tanks designed to store water below ground level.	The required attenuation storage has been provided by lined permeable paving therefore underground attenuation is not required.	No

Table 5.1: Site-Specific Sustainable Drainage Techniques

5.7 Infiltration is unlikely to be viable at the site given its geology of London Clay therefore an attenuation strategy has been proposed. This is in line with the surface water drainage strategy which was granted permission is July 2018 in which the site proposed to outfall at a rate of 5.0 l/s to a ditch along the northern perimeter of the site.

5.8 The rear patio and foot path areas are proposed not to be formally drained due to the minor area in which they cover and will drain directly to the adjacent garden area.

Proposed SuDs Strategy

5.9 It is proposed that the surface water discharge from the site will be restricted to 5.0 l/s as the 1 in 1-year greenfield run off rate of 0.696 l/s is very low and would likely result in blockages.

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5.10 As outlined in Table 1 the proposed drainage strategy will be based on lined permeable paving to provide attenuation with a restricted outfall via orifice plates and a Hydrobrake. All roof area calculations are inclusive of 10% urban creep.

The proposed SuDs layout is enclosed in **Appendix F** and the WINDES calculations are enclosed in **Appendix G**.

Permeable Paving Area 1

5.11 133.4m^2 of roof area and 24m^2 of hardstanding will be directed to 642.93m^2 of lined permeable paving. WINDES MicroDrainage was used to estimate the sub-base depth required for the permeable paving in order to provide adequate attenuation for surface water runoff for rainfall events up to and including a 1 in 100yr +40%CC storm. WINDES estimated that whilst restricting the outfall from the sub-base of the permeable area to 1.1 l/s via a 22mm orifice plate the sub-base would require a minimum depth of 356mm.

Permeable Paving Area 2

5.12 133.66m^2 of roof area and 24m^2 of hardstanding will be directed to 256.16m^2 of lined permeable paving. WINDES MicroDrainage was used to estimate the sub-base depth required for the permeable paving in order to provide adequate attenuation for surface water runoff for rainfall events up to and including a 1 in 100yr +40%CC storm. WINDES estimated that whilst restricting the outfall from the sub-base of the permeable area to 0.9 l/s via a 22mm orifice plate the sub-base would require a minimum depth of 404mm.

Permeable Paving Area 3

5.13 152.82m^2 of roof area and 25m^2 of hardstanding will be directed to 522.14m^2 of lined permeable paving. WINDES MicroDrainage was used to estimate the sub-base depth required for the permeable paving in order to provide adequate attenuation for surface water runoff for rainfall events up to and including a 1 in 100yr +40%CC storm. WINDES estimated that whilst restricting the outfall from the sub-base of the permeable area to 1.1 l/s via a 22mm orifice plate the sub-base would require a minimum depth of 176mm.

Permeable Paving Area 4

5.14 133.66m^2 of roof area and 24m^2 of hardstanding will be directed to 253.67m^2 of lined permeable paving. WINDES MicroDrainage was used to estimate the sub-base depth required for the permeable paving in order to provide adequate attenuation for surface water runoff for rainfall events up to and including a 1 in 100yr +40%CC storm. WINDES estimated that whilst restricting the outfall from the sub-base of the permeable area to 1.1l/s via a 22mm orifice plate the sub-base would require a minimum depth of 196mm.

Permeable Paving Area 5

5.15 152.85m^2 of roof area and 24m2 of hardstanding will be directed to 409m^2 of lined permeable paving. WINDES MicroDrainage was used to estimate the sub-base depth required for the permeable paving in order to provide adequate attenuation for surface water runoff for rainfall events up to and including a 1 in 100yr +40%CC storm. WINDES estimated that whilst restricting the outfall from the sub-base of the permeable area to 0.9l/s via a 22mm orifice plate the sub-base would require a minimum depth of 189mm.

5.16 The surface water will then be directed to a ditch located along the northern perimeter of the site via a new precast concrete headwall at a restricted outfall rate of 5.0 l/s for all events up to and including the 100 year plus 40% climate change event via a control chamber containing

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a 103mm Hydrobrake. It will be necessary for a flap value to the installed on the outfall pipe to prevent the backing up of water within the pipe network should water levels be high in the ditch.

5.17 A catchpit is proposed at each of the rainwater downpipes from the roof areas in order to collect any silt before the outfalls to the permeable paving sub-base.

5.18 The following typical construction would be expected for the permeable paving (based on guidance from Marshalls for the popular Priora Paving system):

- 80mm paving course
- 50mm laying course (generally a 6mm aggregate)
- 80mm layer of perforated Asphalt Concrete (DBM)
- A calculated depth of course grade aggregate (generally 250mm – 350mm of a 30mm aggregate)
- An additional sub-base / capping layer if required

5.19 The depth of the course graded aggregate layer will be designed to meet both structural and attenuation requirements, while also considering the groundwater level below the site.

5.20 Unlike other attenuation systems, the pollutants carried within the surface water run-off are filtered out as they pass through the course grade aggregate and sub-base. Once trapped they are then broken down over time; figures from the Construction Industry Research and Information Association have shown that 60-95% of suspended solids and 70-90% of hydrocarbons are removed by permeable pavements; as such no further filtration of pollutants will be required.

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6 Maintenance of Development Drainage Drainage Strategy

6.1 The maintenance of the SuDS features will remain private. It is recommended a maintenance company be appointed to manage the drainage features.

6.2 Regular inspections and maintenance should be carried out for each of these elements, particularly after periods of heavy rainfall. Maintenance tasks and frequency are detailed in the CIRIA SUDS Manual (C753), and have been summarised below in Table 6.1.

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. • Removal of weeds.	• As required. • 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. • Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance of a hazard to the user. • Rehabilitation of surface and upper sub-surface.	• As required • As required • As required (if infiltration performance is reduced as a result of significant clogging.)
Monitoring	• Initial inspection • Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. • Inspect silt accumulation rates and establish appropriate brushing frequencies. • Monitor inspection chambers.	• Monthly for 3 months after installation. 3 monthly, 48 hours after large storms. • Annually. • Annually.

Table 7.1: Maintenance tasks for permeable paving (Source: CIRIA C697, The SUDS Manual)

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7 Summary and Conclusion

7.1 This SuDS Drainage report has been prepared in support of a full planning application for the development of 10 residential dwellings with associated parking at Foster Street Farm, Foster Street, Harlow, CM17 9HS.

7.2 Planning permission has previously been granted at the site in July 2018 for 9 residential dwellings (PL/EPFL1327/18). This report supports the revised submission for 10 residential dwellings.

7.3 The EA Flood Map for Planning provided on the GOV.UK website, indicates that the site is located within Flood Zone 1, at low risk of flooding form fluvial sources.

7.4 The EA surface water flood map provided on the GOV.UK website, shows much of the site is at 'very low' risk of surface water flooding, this means annually there is a less than 0.1% chance of flooding. In the south eastern corner of the site, there is a small area shown to be at medium risk of surface water flooding and to mitigate against the risk of flooding it is proposed that Plot 10 should have a finished floor a minimum of 300mm above the surrounding ground levels.

7.5 An attenuation strategy has been proposed to manage surface water run off at the site utilising permeable paving. It is proposed the final runoff rate from the site will be restricted to 5.0 l/s for all events up to and including the 100 year plus 40% climate change event via a hydrobrake. A new pre-cast concrete headwall with a flap-valve on the outfall pipe will be provided to the ditch which forms the northern site boundary.

7.6 Greenfield run off rates were considered to be too low, which would cause blockages within the pipe network. Previous planning permission was granted using an outfall rate of 5.0 l/s therefore this outfall rate has been applied.

7.7 The proposed drainage features are to remain private and the responsibility of a dedicated management company. Maintenance tasks associated with the lined permeable paving have been included in this report.

7.8 We believe that the development proposals comply with the guidance provided by the NPPF and local policies, and that no reason exists to object to the proposals in terms of flood risk or drainage.

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Appendix: A - Location Plan

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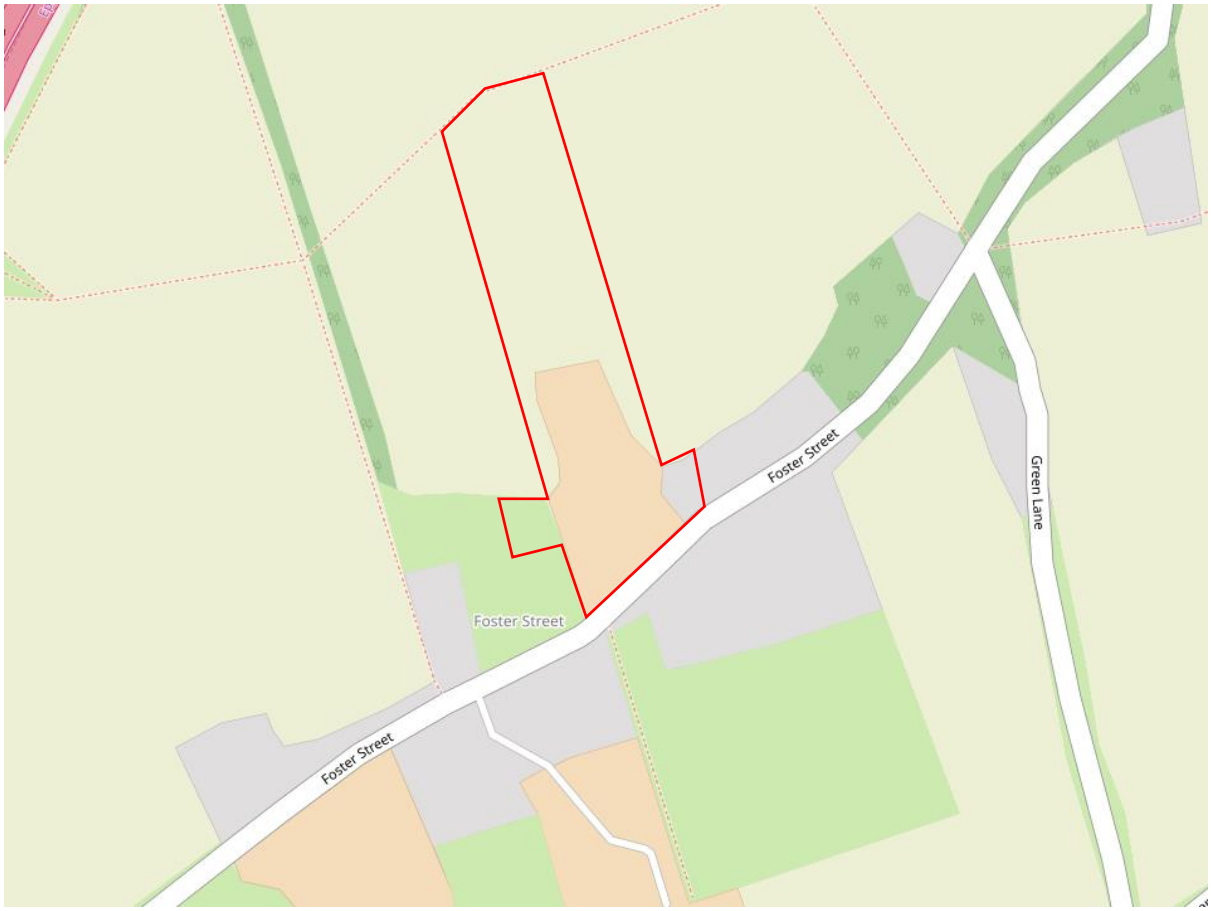

Site Location

Source: ©OpenStreetMap contributors

Appendix: B – Development Proposals

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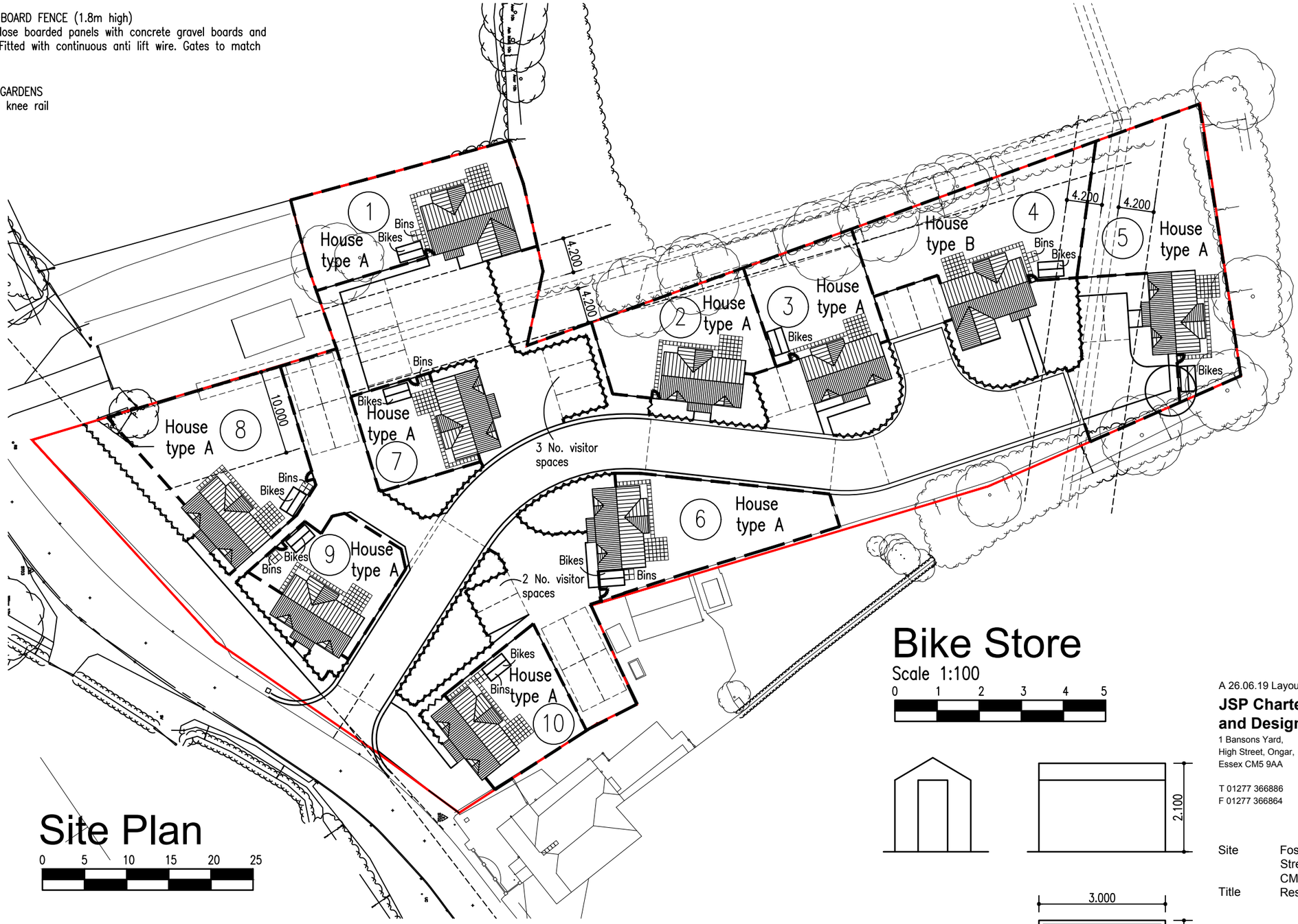
K E Y

PATHS AND PATIOS
600x600 concrete paving slabs

CLOSE BOARD FENCE (1.8m high)
1.5m close boarded panels with concrete gravel boards and posts. Fitted with continuous anti lift wire. Gates to match

FRONT GARDENS
600mm knee rail

N



Site Plan
0 5 10 15 20 25

Bike Store
Scale 1:100
0 1 2 3 4 5

A 26.06.19 Layout amended

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Local Authority BUILDING CONTROL Partner

Site	Foster Street Farm, Foster Street, Hastingwood CM17 9HS
Title	Residential Development
Drawing	Proposed Site Plan
Scale	1:500 @ A3
Date	Dec 2018
Number	2356.2 A