SMALLFORD WORKS

PINS Ref: APP/B/1930/W/20/3260479

Appeal under section 78 of the Town and Country Planning Act 1990

PROOF OF EVIDENCE OF KARL PITMAN ON DRAINAGE MATTERS

on behalf of the Appellant, Stackbourne Ltd

February 2021

Introduction

1. This proof of evidence has been prepared by Karl Pitman (of Pitman Associates) to address comments made by Hertfordshire County Council, in their role as the Lead Local Flood Authority (LLFA), on the surface water drainage strategy proposed by the Appellant in this scheme.

2. Karl Pitman has a first-class honours degree in Civil Engineering, is a Chartered Engineer and member of the Chartered Institution of Water and Environmental Management. Karl has more than 30 years of experience in detailed drainage design and assessment. His expertise in sustainable drainage systems has been recognised through his appointment to the Design Council's panel of Built Environment Experts.

3. Pitman Associates Ltd is a civil engineering consultancy set up in 2011 to provide flooding and drainage services to building developers and civil engineering contractors. The busines also provides advice to clients and design teams on delivering sustainable civil engineering infrastructure.

Background

4. An Outline Drainage Strategy report was prepared by RMA Environmental Limited (dated 28th August 2019) and submitted with the outline planning application. This proposed the management of surface runoff in an attenuation basin and underground geo-cellular storage with a discharge to Butterwick Brook to the south-west of the site.

5. A revised Outline Drainage Strategy report was subsequently prepared by RMA Environmental Limited (dated 1st May 2020) and submitted to the LLFA following their objection letter of 4th February 2020. This revised outline drainage strategy proposed connecting surface runoff to a ditch along the eastern boundary of the site. The peak discharge rate from the proposed development was significantly less than existing runoff rates for the site (refer to Table 3.1 of the revised Outline Drainage Strategy report; Appendix A). The proposed surface water drainage strategy therefore provided a significant betterment in runoff rates when compared with existing runoff rates at the site.

6. A further objection letter was received from the LLFA (dated 2nd June 2020). Further details on drainage, in the form of a Drainage Strategy Addendum, were submitted to the LLFA on 30th June 2020 and the LLFA responded with further comments in a letter dated 21st August 2020 (refer to Appendix B).

7. This proof of evidence responds specifically to the four related comments made in the LLFA's letter of 21st August 2020, which are summarised as follows:

1. **Identification of a suitable discharge mechanism**: The LLFA letter states that they "*visited the site on the 12th August 2020 and investigated the stream on the eastern site boundary. At present we are of the view that this ditch has no onward connection to any existing watercourse and serves only as a highway ditch to manage road run-off".* The letter goes on to state that "*it should be noted that agreement from the owner of the ditch would still be required for a modified connection from any surface water management system for the site".*

2. **Clarification of any connectivity from the identified ditch to an existing ordinary watercourse or main river**: The latest LLFA letter states that "*there is no visible outfall from the* (eastern boundary) *ditch, it is not clear where the water goes once the proposed development discharges here. In order to ascertain that this is a suitable discharge location for the development we require evidence to confirm a visible connection from the ditch to a watercourse….".*

3. **Clarification of the overall capacity in the system and its ability to meet the national Non-Statutory Technical Standards for surface water drainage from new development**: The LLFA letter acknowledges "*that the applicant intends to apply for outline planning permission, therefore confirmation of the attenuation volume required to achieve the discharge rate being proposed and evidence that this can be provided within the site is sufficient at this stage".* The LLFA also states that *"the use of underground storage is not considered to be a preferred SuDS approach and should only be used when other options have been discounted as not being viable".*

4. **Modification of the drainage system to remove the overreliance on below ground SuDS features**: The latest LLFA letter acknowledges *"the revision of the strategy to achieve the greenfield Qbar rate of 4.4 l/s as the peak that the proposed development would discharge, however we would expect to see a greater use of above ground features on this site".* They further state that "*the proposed drainage strategy has an overreliance on a tank-based approach and does not utilise above ground SuDS features within the development such as the use of permeable paving and driveways to decentralise the risk across the site, as the LLFA we would expect to see this reflected in the final drainage strategy".*

Relevant Policy & Guidance

8. The most pertinent policy and guidance documents for this appeal are the Non-Statutory Technical Standards for Sustainable Drainage Systems (Defra, 2015) and the LLFA document 'Summary Guidance for Developers – Management of Surface Water Drainage'. The requirements of the latter are generally addressed in the LLFA's letter to RMA dated 21st August 2020.

9. The key requirements of the Technical Standards as applied to pre-developed sites can be summarised as follows:

   - the peak runoff rate from the developed site must be as close as reasonably practicable to the greenfield runoff rate … but should never exceed the rate of discharge from the development prior to redevelopment for a given event;

   - 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;

   - 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;

   - 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; and

   - 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.

Analysis

10. The following subsection responds to the individual comments made by the LLFA in their letter dated 21st August 2020.

<u>Comment 1: Identification of a suitable discharge mechanism</u>

11. Additional information on drainage was submitted to the LFFA on 19th January 2021 in the form of a drainage survey of the ditch along the eastern site boundary (refer to Appendix C). This additional information

demonstrates that this ditch is connected to the River Colne (which is designated by the Environment Agency as a main river). The point at which the ditch connects to the main river is immediately north of St Marks Close after the ditch is culverted under the North Orbital Road. This therefore provides the necessary clarification regarding the connectivity of the ditch to a main river.

12. Inspection of the land ownership plans (refer to Appendix D) in the vicinity of the site indicates the ditch lies partially in the ownership of the appellant, who therefore has riparian rights, including the right to discharge.

13. Paragraphs 11 and 12 above prove that the proposed development has a suitable discharge mechanism and that the point made in Comment 1 in the LLFA letter has been addressed.

Comment 2: Clarification of any connectivity from the identified ditch to an existing ordinary watercourse or main river, and observations on existing drainage

14. The drainage survey submitted on 19th January 2021 proves that the ditch along the site's eastern boundary connects to the River Colne to the south of the application site and therefore connectivity has been demonstrated.

15. We note that some remedial works are required to provide appropriate structures for the existing outfalls to the ditch. We also note that modifications (including the possible removal of screens) to the inlets to the culverts are required to complete the works approved under application 5/02/2112. We do not consider these an impediment to delivery of a suitable sustainable drainage system to serve the proposed development.

Comment 3: Clarification of the overall capacity in the system and its ability to meet the national Non-Statutory Technical Standards for surface water drainage from new development

16. The required volume of attenuation for the proposed development has been estimated using the industry-standard Micro-Drainage software to be approximately 2,400 m^3.

17. It is proposed to provide the majority (approximately 2,200 m^3) of this volume in at least three large surface features. The depth of water retained in each surface feature would be limited to approximately 1 m. Assuming an average depth of 0.75 m, this results in a total footprint of approximately 2933 m^2, i.e. approximately 9% of the total site area. Each of the three surface features would be designed as either a dry basin or a pond. The design would be in full accordance with the guidance provided in the latest version of the SuDS Manual published by the Construction Industry Research and Information Association.

18. The remaining volume (approximately 200 m^3) would be provided within the voids of the sub-base material beneath permeable paving. On the understanding that approximately 200 parking spaces will be provided, all of which will be constructed with a permeable surface overlying a granular bedding material of least 300 mm depth, the volume of storage provided in the voids of the granular material beneath the parking spaces would be in excess of 200 m^3.

19. The detailed design of the drainage system will ensure the four pillars of sustainable drainage systems are delivered:
    - flow attenuation;
    - water quality;
    - biodiversity enhancement; and
    - amenity benefit.

20. The matters in the last two bullet points in 19. above will be delivered through careful detailing of landscaping features and planting. The requirement to provide water treatment will be delivered by ensuring that all runoff from impermeable areas passes through at least two SuDS features. This will ensure that the water treatment indices set out in the SuDS Manual will be met.

21. Other SuDS feature will be incorporated within the design of the drainage system:
    - where practicable, runoff from roofs will be directed to rain gardens, the outflow from which will be conveyed to the adoptable drainage system;

    - where practicable, runoff from roads will discharge directly to the attenuation basins/ponds via filter strips; and

    - where practicable, runoff from roads and other paved areas will be directed to tree pits, prior to discharge to the main conveyance system.

22. The drainage system will be designed in collaboration with the project's ecologist and landscape architect. The industry-standard Micro-Drainage software suite (System 1) will be used to demonstrate its compliance with the Technical Standards.

<u>Comment 4: Modification of the drainage system to remove the overreliance on below ground SuDS features</u>

23. See response to Comment 3 above.

Conclusions

24. The surface water drainage system can be designed to conform fully with the requirements of the relevant technical standards, guidance notes and planning policy. The system will reduce the risk of contamination to water supplies and should also reduce the risk of flooding within and beyond the boundary of the site.

25. It is my opinion the above response fully addresses the four points in the LLFA's letter of 21 August 2020.

APPENIDX A – OUTLINE DRAINAGE STRATEGY REPORT

(NB – Subsequent to submission of the above report, further information has established that the ditch referred to in paragraph 3.10 of the report has confirmed that the ditch is partially within the ownership of the developer.)

APPENIDX B – LETTER FROM HERTFORDSHIRE COUNCIL LEAD LOCAL FLOOD AUTHORITY 21ST AUGUST 2021

APPENDIX C – SURVEY OF DRAINAGE DITCH

APPENDIX D – LAND OWNERSHIP PLANS

OUTLINE DRAINAGE STRATEGY

Proposed Residential Development

Smallford Works
Smallford Lane
St Albans
Hertfordshire

Prepared for:
Stackbourne Limited

1st May 2020

Project Number:
RMA-C1722c

RMA ENVIRONMENTAL

environmental planning consultancy

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1 INTRODUCTION

Background

1.1 RMA Environmental Limited was commissioned by Carter Jonas on behalf of Stackbourne Limited to prepare a Drainage Strategy for an outline planning application for a proposed residential development on land at Smallford Works on Smallford Lane in Smallford, near St Albans, Hertfordshire.

1.2 This report has been prepared in accordance with the CIRIA Report C753 'The SUDS Manual', Defra's "*Non-statutory technical standards for sustainable drainage systems*", the Hertfordshire County Council Local Plan and Hertfordshire County Council SuDS Guidance and Policies.

Site Location and Land Use

1.3 The site comprises a parcel of land currently used for mixed industrial operations and, as such, is essentially 100% impermeable, covered by hardstanding and associated buildings. It extends to an area of approximately 3.35 hectares (ha) and is located at National Grid Reference TL 19755 06870 (refer to Figure 1.1).

1.4 The site is located to the south of Smallford and is surrounded by the following land uses:

- Butterwick Brook flows in a southerly direction parallel to the western boundary of the site and a pond lies adjacent to the brook directly north of the site;
- commercial buildings are located to the north of the site beyond the pond;
- Smallford Lane forms the eastern boundary, beyond which lies agricultural land;
- the village of Sleapshyde lies to the south-east of the site; and
- agricultural land is located to the south and west of the site.

1.5 Access to the site is via Smallford Lane to the south-east of the site. Further details on site topography, geology and hydrology are set out in Section 2.

Proposed Development

1.6 The proposed development comprises up to 100 residential dwellings, open space and landscaping (refer to the illustrative layout at Appendix A). Vehicular access will be gained via Smallford Lane to the east of the site, currently being implemented under a prior planning permission (Ref: 5/2002/2112).

Consultation

1.7 Following submission of the outline application, comments were received from Hertfordshire County Council's Flood and Water Project Officer. This report has been updated to include further information with the aim of addressing the concerns raised which include:

- the discharge rate from the site (refer to paragraphs 3.19 to 3.22);
- demonstrate an appropriate SuDS management train (refer to paragraphs 3.35 to 3.36);
- further information regarding the point of connection for the site (refer to paragraphs 3.9 to 3.11); and
- confirmation of the drainage strategy (refer to Section 3).

1.8 A consultation enquiry was sent to Hertfordshire County Council Highways Team with regard to maintaining the existing connection to the ditch and agreement of suitable discharge rates. However, no response was received at the time of updating this report.

2 BASELINE ENVIRONMENTAL CONDITIONS

Topography

2.1 A site-specific topographic survey indicates that the majority of the site slopes in a south-westerly direction although the southern part of the site slopes in a south-easterly direction (refer to Appendix B).

2.2 The areas of highest elevation are located in the north-western corner at approximately 73.86 metres Above Ordnance Datum (mAOD). The area of lowest elevation is in the south-eastern corner (leading onto Smallford Lane) where levels are 72.03 mAOD.

Hydrology

2.3 The application site is located on the eastern bank of Butterwick Brook, a 'main river'[1], which flows in a southerly direction into Ellen Brook and eventually into the River Colne approximately 1 km to the south.

2.4 A large pond (approximately 1.7 hectares in surface area) is located to the north of the site and is hydraulically linked to the Butterwick Brook by a small drain.

2.5 A ditch is located parallel to Smallford Lane along the eastern boundary of the site (refer to Appendix C).

2.6 There are no other significant watercourses or water bodies within the surrounding area.

2.7 A Phase 1 Geo-Environmental Assessment has been undertaken by EAME (2019) and is submitted as a separate document to support the planning application. The Phase 1 report included anecdotal information that the '*northern half of the site discharges to a soakaway located near to the northern boundary whilst the southern half of the estate discharges in a southerly direction into an unidentified ditch'.* Evidence was also observed of hydrocarbon contamination on the site, including within the site's drainage system.

Geology and Hydrogeology

2.8 As reported by the British Geological Survey (BGS) online Geology of Britain Viewer, the majority of the site is underlain by the superficial geology of the Lowestoft Formation, comprising Diamicton. The superficial deposits of the Kesgrave Catchment subgroup comprising sand and gravel underlie the western portion of the site.

2.9 The EA classify the Lowestoft Formation as Undifferentiated Secondary Aquifer; these are defined as areas where "*it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type*".

[1] Main river is defined by the EA as any watercourse that contributes significantly to the hydrology of a catchment.

2.10 The Kesgrave Catchment Subgroup is classified as Secondary A Aquifer by the EA; these are defined as "*permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*".

2.11 As reported by BGS, the site is underlain by the bedrock geology of the Lewes Nodular Chalk Formation and Seaford Chalk Formation, comprising solely of chalk.

2.12 The EA classify the bedrock geology as Principal Aquifer; these are defined as "*layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale*."

2.13 The site is located within a groundwater Source Protection Zone (SPZ); these are classified by the EA to protect groundwater abstractions (normally for drinking water supply). The site lies within the Outer Zone (Zone 2) of the SPZ which means it lies within a 400 day travel time to the protected groundwater abstraction.

2.14 The Phase 1 Geo-Environmental Assessment stated that a site investigation in 1998 indicated that *'groundwater was encountered at depths between 0.95 m and 2.7 m below ground level'*.

Other Sources of Flood Risk

2.15 An FRA by Arcadis (2019) submitted with the planning application provides information on the existing and potential flood risk from all sources.

3 DRAINAGE ASSESSMENT

Introduction

3.1 The NPPF states that those proposing development are responsible for drainage designs which reduce flood risk to the development and elsewhere, potentially through the use of Sustainable Drainage Systems (SuDS). Surface water arising from a developed site should, as far as is practicable, be managed to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere.

3.2 This drainage strategy has been prepared in accordance with Defra's *"Non-statutory technical standards for sustainable drainage systems"* (March 2015) and the SuDS Manual[2] to ensure that the proposed development does not increase flood risk to the site or elsewhere and where practicable reduces flood risk over the lifetime of the development.

3.3 Peak rainfall intensity is expected to increase as a result of climate change and, as such, storage calculations have included a 40% increase in rainfall depths in accordance with current climate change guidance.

3.4 The Lead Local Flood Authority (LLFA), Hertfordshire County Council, provides information and guidance on surface water drainage, as published within the draft 'Lead Local Flood Authority SuDS Policy Statement'[3]. With regard to surface water runoff rates, the report states the following:

"*SuDS Policy 3: Previously developed sites should aim to discharge at the original pre-development greenfield rate for the whole site area where possible. If not, a significant reduction in the current rate of discharge should be achieved and evidence provided as to why greenfield rates are not viable*."

3.5 It should be noted that this report presents an outline strategy for managing surface water in accordance with current policy and will be refined through detailed design, which could be controlled by a suitably worded planning condition.

Discharge Method

3.6 The reported hydrological characteristics of the site and anecdotal information suggests that infiltration may be feasible; however, the site is located within an area of high sensitivity with respect to groundwater resources, i.e. within a groundwater SPZ and overlying a Principal Aquifer.

[2] The SuDS Manual (C753), CIRIA, 2015
[3] Lead Local Flood Authority SuDS Policy Statement: Meeting Sustainable Drainage System Standards in Hertfordshire (2017)

3.7 The Phase 1 Geo-Environmental Assessment states that the '*potential for contamination to have arisen at the site, because of historic use is MODERATE to HIGH'*. Therefore, infiltration-based SuDS are considered to be unfeasible due to the high sensitivity of the groundwater resource and the risk of contamination on the site. In their consultation response to the planning application, the EA have stated that infiltration-based SuDS are unlikely to be acceptable due to concerns about contamination of the underlying aquifer.

3.8 Only limited site investigation has been undertaken at the site in the past, principally due to access and safety issues associated with it being a busy operational site. More extensive site investigation is proposed to better define the contamination status through a site-wide investigation at the detailed design stage (including soakaway tests).

3.9 On the assumption that infiltration techniques are considered to be unfeasible (as a result of poor infiltration rates and/or contamination risk), the outline drainage strategy has been based on providing storage for the 1 in 100 year storm including a 40% allowance for climate change, with a discharge to the ditch along the eastern boundary of the site. It is proposed to maintain the existing connection to the ditch identified by the drainage survey (refer to Appendix C).

3.10 It is understood that the riparian owner of this section of ditch is Hertfordshire County Council. A consultation request was sent to Hertfordshire County Council Highways Team with regard to maintaining the existing connection to the ditch and appropriate discharge rates; however, no response was received at the time of updating this report.

3.11 Drainage from the new access arrangement for the application site has been consented (Hertfordshire County Council planning reference: 5/02/2112-FULL) and recently implemented which includes a connection to the ditch along the eastern boundary. It is therefore anticipated that connection to this ditch for the remainder of the site would be acceptable, subject to agreement of a suitable discharge rate.

Existing Runoff Arrangements

3.12 At present, the site is considered to be 100% impermeable. The impermeable area of the site will decrease post-development as a result of the introduction of green open spaces and residential gardens.

3.13 A drainage survey was undertaken in March 2020 which indicates that the majority of the surface water manholes within the site are soakaways; however, these soakaways were observed to be contaminated with oil. An outfall is present in the south-western corner of the site into the ditch along the eastern boundary of the site (refer to Appendix C). The gullies along the northern boundary of the site are assumed to discharge to the north of the site but no outfalls were physically observed as this area is heavily overgrown.

3.14 Area A, which comprises the area of the proposed road, is estimated to cover an area of approximately 0.44 ha. Area B, which comprises the proposed dwellings and driveways, is estimated to cover an area of approximately 2.91 ha.

3.15 A small section of the access road has not been included within the drainage calculations (approximately 0.02 ha) as this section of road has extant planning permission and has been implemented (Hertfordshire County Council planning reference: 5/02/2112-FULL).

3.16 Greenfield runoff rates for the site (3.35 ha) have been estimated using the UK Sustainable Drainage Greenfield Runoff Estimation Tool. The calculation record is included in Appendix D and the results are summarised as follows:

- 1 in 1 year – 2.2 l/s/ha
- 1 in 30 years – 6.0 l/s/ha
- 1 in 100 years – 8.3 l/s/ha

Proposed Runoff Rates

Area A

3.17 The proposed road within the development will introduce impermeable areas to the site which have been estimated as 0.44 ha. This impermeable area has been used to calculate the equivalent greenfield runoff rates for the built footprint of the proposed road using the UK Sustainable Drainage Greenfield Runoff Estimation Tool. The calculation record is included in Appendix D and the results are summarised as follows:

- Qbar – 1.1 l/s
- 1 in 1 year – 1.0 l/s
- 1 in 30 years – 2.6 l/s
- 1 in 100 years – 3.7 l/s

Area B

3.18 The proposed dwellings and driveways will introduce impermeable areas to the site which have been estimated as 1.24 ha. This impermeable area has been used to calculate the equivalent greenfield runoff rates for the built footprint of the proposed road using the UK Sustainable Drainage Greenfield Runoff Estimation Tool. The calculation record is included in Appendix D and the results are summarised as follows:

- Qbar – 3.2 l/s
- 1 in 1 year – 2.7 l/s
- 1 in 30 years – 7.4 l/s
- 1 in 100 years – 10.3 l/s

3.19 It is therefore proposed to attenuate to the greenfield 1 in 100 year runoff rate (3.7 l/s and 10.3 l/s for Areas A and B, respectively) for all events up to and including the 1 in 100 year plus climate change rainfall event.

3.20 In order to estimate the proposed betterment when compared to the existing situation, the existing runoff rates for the site have been estimated using the Modified Rational Method as defined by the Wallingford Procedure, using an existing impermeable area of 3.35 ha and a critical storm duration of 30 minutes. The reductions in the peak runoff rates for key return period events are presented in Table 3.1.

Table 3.1: Reduction in Peak Runoff Rates

Return Period (Years)	Existing Runoff Rates (l/s)	Proposed Runoff Rates (l/s)	Reduction in Runoff Rates
1	79.2	14.0	82.3%
30	526.4	14.0	97.3%
100	803.7	14.0	98.3%
100 plus 40% Climate Change (CC)	1125.2	14.0	98.8%

3.21 The proposed drainage strategy will therefore provide a significant betterment on the existing runoff rates of 79.2 l/s for the 1 in 1 year event (82.3% reduction) and 1125.2 l/s for the 100 year plus 40% CC event (98.8% reduction).

Storage Estimate

Area A

3.22 A storage estimate has been undertaken using MicroDrainage to inform the outline drainage strategy; the results are included in Appendix D. This estimates that an attenuation volume of 298.4 m^3 is required in order to limit the runoff rate to a maximum rate of 3.7 l/s for all events up to and including the 1 in 100 year storm plus 40% (refer to Appendix D).

Area B

3.23 The impermeable area for the proposed development is increased by 10% to account for urban creep over the lifetime of the development and an impermeable area of 1.36 ha is used to estimate the attenuation storage required.

3.24 A quick storage estimate has been undertaken using Micro Drainage to inform the outline drainage strategy; the results are included in Appendix D. This estimates that an attenuation volume of between 902 m^3 and 1163 m^3 is required in order to limit the runoff rate to 10.3 l/s for the 1 in 100 year storm plus 40% allowance for climate change.

SuDS Selection

3.25 Given that the site lies in an SPZ and has a medium to high contamination risk, SuDS options are relatively limited.

3.26 Infiltration-based SuDS techniques are considered to be unviable, based on the current knowledge of site conditions. This is validated by the consultation response provided by the EA for the planning application, which states that infiltration-based SuDS would not be acceptable due to concerns over contamination risk.

3.27 Due to the significant contamination constraints and the need for remediation at the site, it is necessary to provide a certain quantum of new development in order for the proposals to be economically viable. A remediation strategy for known contaminants in the site is currently unknown, with a proposed condition securing this at the detailed design stage. The final drainage strategy will be required to account for the remediation strategy, which may result in a divergence from what is currently proposed. The selection of appropriate SuDS techniques for the site has therefore involved consideration of contamination constraints, a post-development betterment in runoff rates, improvements in water quality and the provision of landscape, ecology and amenity benefits.

3.28 Table 3.2 provides an overview of the feasibility of a range of SuDS techniques which are considered in accordance with the SuDS Hierarchy in order to identify the most appropriate for the proposed development. Further details are provided for the techniques which are considered to be feasible.

Table 3.2: Type of SuDS Components

Technique	Description	Suitability for Proposals	Feasibility
Rainwater Harvesting Systems	Rainwater is collected from the roof of a building or from other paved surfaces in tanks for use within the development.	The use of this technique will be investigated at the detailed design stage.	**Potentially Feasible**
Green roofs	A planted soil layer is constructed on the roof of a building and water is stored within the soil layer and absorbed by vegetation.	Limited value for runoff attenuation for extreme return periods and is not considered to be commercially viable for this development.	**Not Feasible**
Infiltration systems	These systems collect and store runoff allowing it to infiltrate into the ground.	Infiltration techniques are unfeasible due to the high sensitivity of groundwater resources and known contamination status of the site.	**Not Feasible**
Filter Strips	Runoff from an impermeable area is allowed to flow across a grassed or heavily vegetated area to promote sedimentation and filtration.	Do not provide any attenuation benefits, only treatment and would be considered at the detailed design stage.	**Potentially Feasible**
Filter Drains	Runoff is temporarily stored below the surface in a shallow trench filled with clean stone, providing attenuation, conveyance and filtration.	Normally used for the drainage of hardstanding areas. They could be used to collect and treat runoff and would be considered at the detailed design stage.	**Potentially Feasible**
Swales	A vegetated channel is used to convey and treat runoff (via filtration). It can be used as attenuation space with discharge to the ground (via infiltration) or to a watercourse or sewer.	Feasible for storing and treating surface water.	**Feasible**

Technique	Description	Suitability for Proposals	Feasibility
Bioretention Systems (Rain Gardens)	A shallow landscaped depression allows runoff to pond temporarily on the surface before filtering through vegetation and underlying soils prior to collection or infiltration.	Could be used within open space to provide treatment and would be considered at the detailed design stage.	**Potentially Feasible**
Pervious Pavements	Runoff is allowed to soak through structural paving. Water can be stored in a porous sub-base and either collected or allowed to infiltrate.	Permeable paving could be used to benefit the private car parking areas and driveways with positive outfall or parts of the road that is not adopted. The use of this technique will be investigated at the detailed design stage.	**Potentially Feasible**
Attenuation Basins	Landscaped depressions that are normally dry except during and following rainfall, designed to attenuate runoff and, where vegetated, provide treatment.	Can be used to attenuate runoff and can be accommodated within the site.	**Feasible**
Ponds and Wetlands	Depressions designed to temporarily store surface water above permanently wet pools that permit settlement of suspended solids and biological removal of pollutants.	Could be used to attenuate runoff as an alternative to a basin. The use of this technique will be investigated at the detailed design stage.	**Potentially Feasible**
Attenuation Storage Tanks	Structures that create a below-ground void space for the temporary storage of surface water before controlled release or use (rainwater harvesting).	Could be used to attenuate runoff if additional storage is required.	**Feasible**

Outline Drainage Strategy

Area A

3.29 The estimated attenuation volume of 298.4 m^3 could be provided in the form of an attenuation basin in the south-eastern corner of the site (refer to Figure 3.1). The attenuation basin has a top of bank plan area of approximately 397 m^2 with a depth of 1 m and side slopes of 1 in 3. It is recommended that a margin is kept clear of obstacles from the top of the banks in order to allow access for maintenance of the attenuation basin during its lifetime.

Area B

3.30 The maximum attenuation volume of 1,163 m^3 can be provided in the form of geo-cellular storage under the driveways within the site (refer to Figure 3.1). It is assumed that finished levels within the site will be designed to ensure that all surface water runoff can drain via gravity in a south-easterly direction towards the proposed outfall.

3.31 The geo-cellular storage has a total plan area of 3993 m^2 and depths ranging between 300 mm and 400 mm with a void space of 95%. The geo-cellular storage will be overlain by a 200 mm deep granular sub-base.

3.32 Other features, such as bio-retention areas, rain gardens, permeable paving and swales could be considered at the detailed design stage to offset storage from the attenuation basin and geo-cellular storage, provide further water quality treatment and encourage infiltration and evapotranspiration losses.

3.33 The completed Hertfordshire County Council Developer's Checklist for the outline drainage strategy is included in Appendix E.

Water Quality Requirement

3.34 One of the guiding principles of SuDS is the appropriate management of water quality and the use of pollution prevention techniques to improve the quality of runoff from developed sites. The SuDS Manual recommends the use of a management train whereby a series of consecutive treatment stages are employed to remove pollutants from runoff.

3.35 The recommended number of treatment stages is dependent on the type of development and sensitivity of the discharge receptor and the mitigation indices of proposed SuDS features. The runoff served by the surface water drainage strategy will come from the roofs, access road, driveways and parking areas. In this instance, mitigation with an index or combined indices of more than 0.5 for Total Suspended Solids (TSS), 0.4 for metals and 0.4 for hydrocarbons is acceptable. The granular sub-base overlying the geo-cellular storage and the attenuation basin will meet the water quality requirements required for the proposed development. The granular material will be similar to the level of treatment provided by permeable paving.

Designing for Exceedance Events

3.36 If the proposed drainage system becomes blocked or an event above the design event occurs, then exceedance flows would be routed along the road network towards the south-eastern corner of the site and into the ditch along the eastern boundary of the site (refer to Figure 3.2). This would mimic what would occur naturally on the site in its existing condition and would ensure that the proposed dwellings are safe during an exceedance event.

Long Term Maintenance of SuDS

3.37 Where SuDS features serve more than one property, it would be the responsibility of the developer to either maintain the SuDS features themselves or to negotiate with and secure the agreement of a third party to maintain the sustainable drainage system.

3.38 The maintenance requirements for the SuDS features proposed for use in the outline drainage strategy are detailed in the SuDS Manual and would be carried out accordingly (refer to Appendix F).

4 CONCLUSIONS

4.1 This Drainage Strategy has been prepared in accordance with current planning policy and CIRIA Report C697 'The SUDS Manual'.

4.2 A review of the feasibility of a variety of SuDS techniques has been undertaken to identify those that are suitable at the application site. Given that the site lies in an SPZ and has a medium to high contamination risk, SuDS options are relatively limited.

4.3 Infiltration-based SuDS techniques are considered to be unviable, based on the current knowledge of site conditions. This is validated by the consultation response provided by the EA for the planning application, which states that infiltration-based SuDS would not be acceptable due to concerns over contamination risk.

4.4 Due to the significant contamination constraints and the need for remediation at the site, it is necessary to provide a certain quantum of new development in order for the proposals to be economically viable. A remediation strategy for known contaminants in the site is currently unknown, with a proposed condition securing this at the detailed design stage. The final drainage strategy will be required to account for the remediation strategy, which may result in a divergence from what is currently proposed. The selection of appropriate SuDS techniques for the site has therefore involved consideration of contamination constraints, a post-development betterment in runoff rates, improvements in water quality and the provision of landscape, ecology and amenity benefits.

4.5 As infiltration techniques are considered to be unfeasible (for the reasons described above), then the outline drainage strategy will provide storage for the 1 in 100 year storm including a 40% allowance for climate change, with a discharge to ditch along the eastern boundary of the site via an existing connection.

4.6 The estimated attenuation volume of 298.4 m^3 for Area A could be provided in the form of an attenuation basin in the south-eastern corner of the site. The attenuation basin has a top of bank plan area of approximately 397 m^2 with a depth of 1 m and side slopes of 1 in 3. It is recommended that a margin is kept clear of obstacles from the top of the banks in order to allow access for maintenance of the attenuation basin during its lifetime.

4.7 The maximum attenuation volume of 1163 m^3 for Area B can be provided in the form of geo-cellular storage under the driveways within the site. The geo-cellular storage has depths ranging between 300 mm and 400 mm with a void space of 95%. The geo-cellular storage will be overlain by a 200 mm deep granular sub-base. It is assumed that finished levels within the site will be designed to ensure that all surface water runoff can drain via gravity in a south-easterly direction towards the proposed outfall.

4.8 It is proposed to attenuate to the greenfield 1 in 100 year runoff rate (3.7 l/s and 10.3 l/s for Areas A and B, respectively) for all events up to and including the 1 in 100 year plus climate change rainfall event. This will provide a significant betterment on the existing runoff rates of 79.2 l/s for the 1 in 1 year event (82.3% reduction) and 1125.2 l/s for the 100 year event plus 40% CC event (98.8% reduction).

4.9 Other features, such as bio-retention areas, rain gardens, permeable paving and swales could be considered at the detailed design stage to offset storage from the attenuation basin and geo-cellular storage, provide further water quality treatment and encourage infiltration and evapotranspiration losses.

4.10 The proposed drainage strategy is considered feasible and would ensure that surface water runoff rates for the proposed development would be limited to the greenfield 1 in 100 year rate for the operational lifetime of the development. The exact implementation of the drainage strategy within the proposed development could be controlled by planning condition.

Figures

N

Smallford Nurseries

STATION ROAD

SPRINGFIELD ROAD

WILKIN'S GREEN LA

Wilkin's Green

Alban Way

Path

Path

Path

Path

Path

Drain

PW

LYON WAY

Industrial Estate

Depot

Butterwick Brook

Iss

Sleapshyde

PH

Sleapshyde Farm

Drain

SMALLFORD LANE

SLEAPSHYDE LANE

SLEAPSHYDE LA

Smallford

Drain

NORTH ORBITAL ROAD

72m

SLEAPCROSS GARDENS

SLEAPCROSS GARDENS

A414

A414

72m

Smallford

Smallford Farm

Drain

Drain

Sleapshyde

Path

Path

FB

FB

Drain

71m

Mobile Home Park

FB

Sports Ground

ST MARKS CL

Path

Path

School

Pav

Key

Red Line Boundary

Figure 3.1: **Site Location Plan**

Client: **Stackbourne Limited**

Project: **Smallford Works**

Project No.: **C1722c**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	RM	13/06/2019	1:5,000@A3

N

Geo-cellular Storage

Accommodating 140 m3 of attenuation volume (assuming a plan area of 490 m2 and a crate depth of 300 mm with void space of 95%).

Geo-cellular Storage

Accommodating 198 m3 of attenuation volume (assuming a plan area of 695 m2 and a crate depth of 300 mm with void space of 95%).

Geo-cellular Storage

Accommodating 137 m3 of attenuation volume (assuming a plan area of 481 m2 and a crate depth of 300 mm with void space of 95%).

Geo-cellular Storage

Accommodating 93 m3 of attenuation volume (assuming a plan area of 327 m2 and a crate depth of 300 mm with void space of 95%).

Geo-cellular Storage

Accommodating 128 m3 of attenuation volume (assuming a plan area of 450 m2 and a crate depth of 300 mm with void space of 95%).

Geo-cellular Storage

Accommodating 91 m3 of attenuation volume (assuming a plan area of 240 m2 and a crate depth of 400 mm with void space of 95%).

Geo-cellular Storage

Accommodating 105 m3 of attenuation volume (assuming a plan area of 370 m2 and a crate depth of 300 mm with void space of 95%).

Geo-cellular Storage

Accommodating 128 m3 of attenuation volume (assuming a plan area of 450 m2 and a crate depth of 300 mm with void space of 95%).

Discharge will be to the ditch to the east of the site via na existing connection.

Geo-cellular Storage

Accommodating 1163 m3 of total attenuation volume to limit discharge to 10.3 l/s (1 in 100 year rate) for all events up to and including the 1 in 100 year event inclusive of 40% for climate change.

The geo-cellular storage is overlain by a 200 mm deep granular sub-base.

Attenuation Basin with 298.4 m3 of storage for road drainage. The basin will have an average depth of 1 m and side slopes of 1 in 3. Red dotted line denotes a 6 m access margin for maintenance.

This attenuation storage is required to limit discharge to a maximum rate of 3.7 l/s (1 in 100 year rate), with storage providing up to and including the 1 in 100 year event inclusive of 40% for climate change.

Geo-cellular Storage

Accommodating 143 m3 of attenuation volume (assuming a plan area of 490 m2 and a crate depth of 300 mm with void space of 95%).

Key

- Red Line Boundary
- Attenuation Basin
- Geo-cellular Storage

Figure 3.1: **Outline Drainage Plan**

Client: **Stackbourne Limited**

Project: **Smallford Works**

Project No.: **C1722c**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	RM	30/04/2020	1:1,000@A3

N

Key

- Red Line Boundary
- Attenuation Basin
- Geo-cellular Storage
- Surface Water Flow Route

Figure 3.2: **Surface Water Flow Paths in an Exceedance Event**

Client: **Stackbourne Limited**

Project: **Smallford Works**

Project No.: **C1722c**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	RM	30/04/2020	1:1,000@A3

Appendix A: Proposed Development Layout

LEGEND

- Existing Buildings
- Proposed Buildings
- Existing tree planting/green cover (shown indicatively)
- Proposed tree planting - Refer to Landscape Architect's design/specification
- Proposed grassed amenity area - Refer to Landscape Architect's design/specification
- Proposed turfed garden area - Refer to Landscape Architect's design/specification
- Proposed Retention Pond - Refer to Outline Drainage Plans for design/specification
- Vehicular tarmac to main vehicular roads - Refer to Landscape Architect's design/specification
- Permeable paving to secondary vehicular roads and shared surface areas - Refer to Landscape Architect's design/specification
- Allocated parking spaces with permeable paving
- Integrated garage within residential units
- Unallocated parking spaces with permeable paving
- Refuse/cycle sheds with planter above
- Storage/cycle sheds

02-006-00 ACCOMMODATION SCHEDULE

UNIT TYPE	BUILDING TYPE	QUANTITY	AREA
1 Bed Unit			
	APARTMENT	8	480
		8	**480 m²**
2 Bed Unit			
	SEMI DETACHED HOUSE	8	816
	TERRACE HOUSE	18	1,692
		26	**2,508 m²**
3 Bed Unit			
	DETACHED HOUSE	16	2,208
	END TERRACED HOUSE	8	864
	SEMI-DETACHED HOUSE	20	2,320
	TERRACED HOUSE	12	1,308
		56	**6,700 m²**
4 Bed Unit			
	INTEGRATED GARAGE	10	1,760
		10	**1,760 m²**
		100	**11,448 m²**

Block Plan
1:500

Areas and apartment numbers have been calculated in accordance with the RICS/ISVA code of Measuring Practice (6th edition, 2015) using the stated options NIA, GIA, GEA (ground floor GEA excludes external cycle and refuse stores) and IPMS International Property Measurement Standard (1st edition 2014) and it's stated option GIFA. Any decisions to be made on the basis of these predications, whether as to project viability, pre-letting, lease agreements, conveyances and the like, should make due allowance for fluctuations arising from the following: design development, accurate site survey, site levels and site dimensions, construction method and building tolerances, Local Authority and Statutory consents.

Key Plan / Scale Bar
LEGEND
1 Bed Unit
2 Bed Unit
3 Bed Unit
4 Bed Unit
OS Site Boundary

Rev	Issue Date	Checked	Status	Reason for Issue
A	05/11/2019	GC	A2	Issued for Listed Building Consent

Rev	Issue Date	Checked	Status	Reason for Issue

Client
Stackbourne Ltd.
Stackbourne Ltd, Merritt House, Hill Avenue, Amersham, Bucks, HP6 5BQ

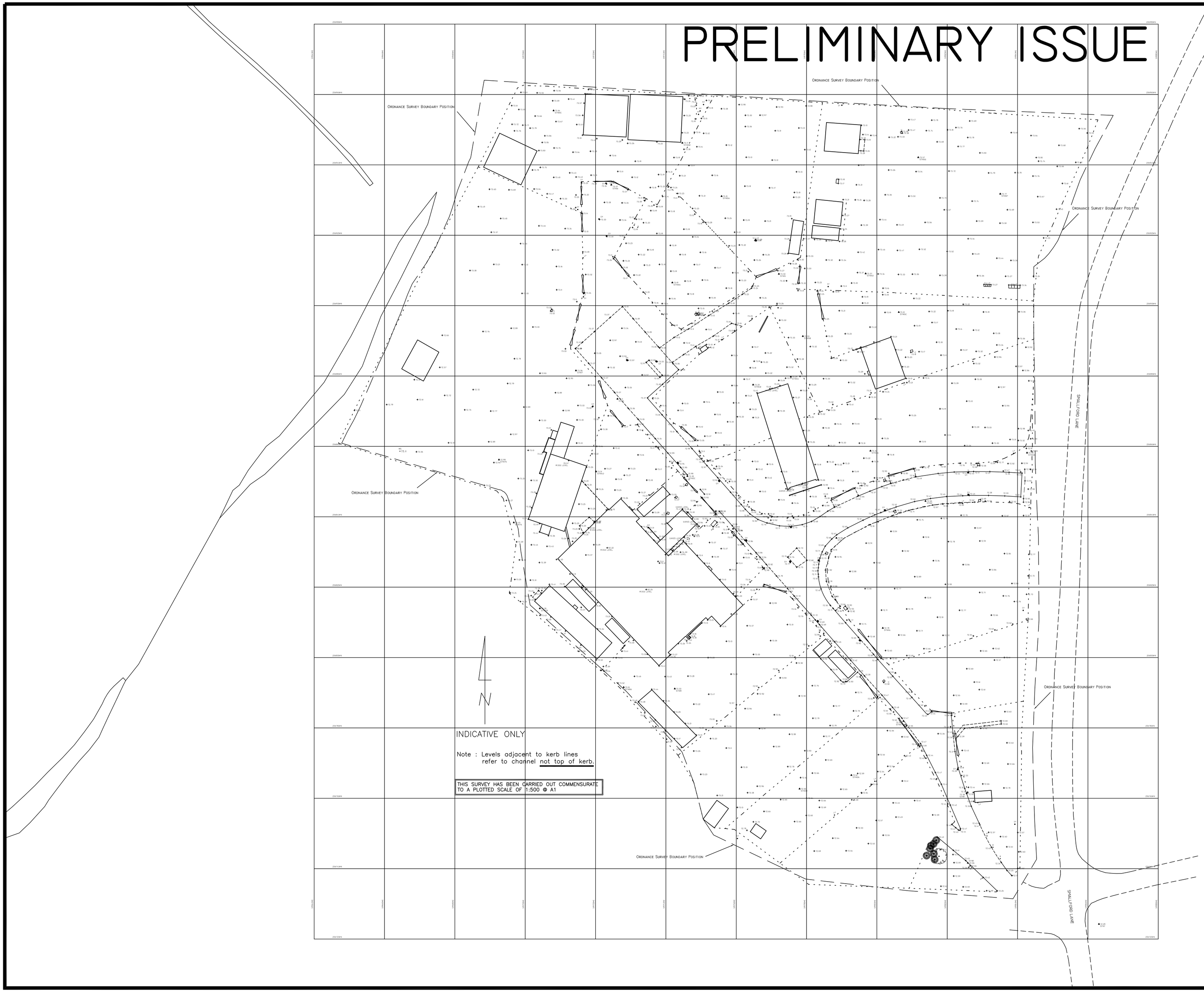
Project Title
Smallford Works
Smallford Works, Smallford Lane, St Albans, Hertfordshire AL4 0SA UK

Drawing Title
Block Plan
Status Code
A2
Drawing Purpose
For Planning

Scale
1:500 @A1, 50%@A3
Project No.
17206
Drawn by
North
Drawing Number
project originator zone level type role
17206 - TUR - 00 - 00 - DR - A
drawing number
02200
rev
A
Originator
TURNER
30 Stamford Street
South Bank Central
London SE1 9LQ
T +44 (0)20 3950 1575
www.turner.studio

Appendix B: Topographical Survey

PRELIMINARY ISSUE



DRG NO: PP/3012/SMALLFORD/2014/P1

LEGEND

A	Area
CATV	Cable TV service cover
CF	Cellar Flap
CP	Coal Plate
E	Electricity Supply
FH	Fire Hydrant
IC	Inspection Chamber
KL	Lowered Kerb for Access
LP	Lamp Post
MH	Manhole
NP	Road Name Plate
PL	Pavement Light
RS	Road Sign
STN	Survey Station
T	BT service Box
TCB	Telephone Call Box
TL	Traffic Lights
TP	Telegraph Pole
UP	Step Arrow
DN	Ramp Arrow

(D) Dead or (P) Pollarded Tree

Deciduous Tree (Individually shown)

Evergreen Tree (Individually shown)

Trees (Deciduous) - Part of a group of trees

3012Smallford2014-P1.dwg

STATION CO-ORDINATES

STATION	TYPE	EASTING	NORTHING	LEVEL

BENCH MARK INFORMATION:
ALL LEVELS IN METRES TO ORDNANCE SURVEY DATUM AND BASED ON BENCH MARK:
GPS OBSERVATIONS DIRECTLY ADJUSTED TO THE ORDNANCE SURVEY'S ACTIVE NETWORK

REV	DRG. AMENDMENTS	BY	DATE

STACKBOURNE LTD

C/O MOULT WALKER

SMALLFORD WORKS
SMALLFORD
HERTFORDSHIRE

PROSPAPLANS LIMITED Operating to ISO9001:2000
CHARTERED LAND SURVEYORS
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E: INFO@PROSPAPLANS.COM
W: WWW.PROSPAPLANS.COM
RICS Regulated by RICS

SCALE: 1:500

DATE: JULY 2014

DRAWN BY:	CHECKED BY:

DRG NO: PP/3012/SMALLFORD/2014/P1


INDICATIVE ONLY
Note : Levels adjacent to kerb lines refer to channel not top of kerb.
THIS SURVEY HAS BEEN CARRIED OUT COMMENSURATE TO A PLOTTED SCALE OF 1:500 @ A1
RICS
Regulated by RICS
Any discrepancies should be reported immediately.
Drawing Title
Smallford Works
Smallford
Hertfordshire
Drawn RW
Date FEB 2015
Checked rw
Passed
Job No.
3012
Drg No.
01
Ref.
A
Drawing Status
Topgraphical Survey
Scales 1:1250@ A1
PROSPAPLANS
LIMITED Chartered Land Surveyors
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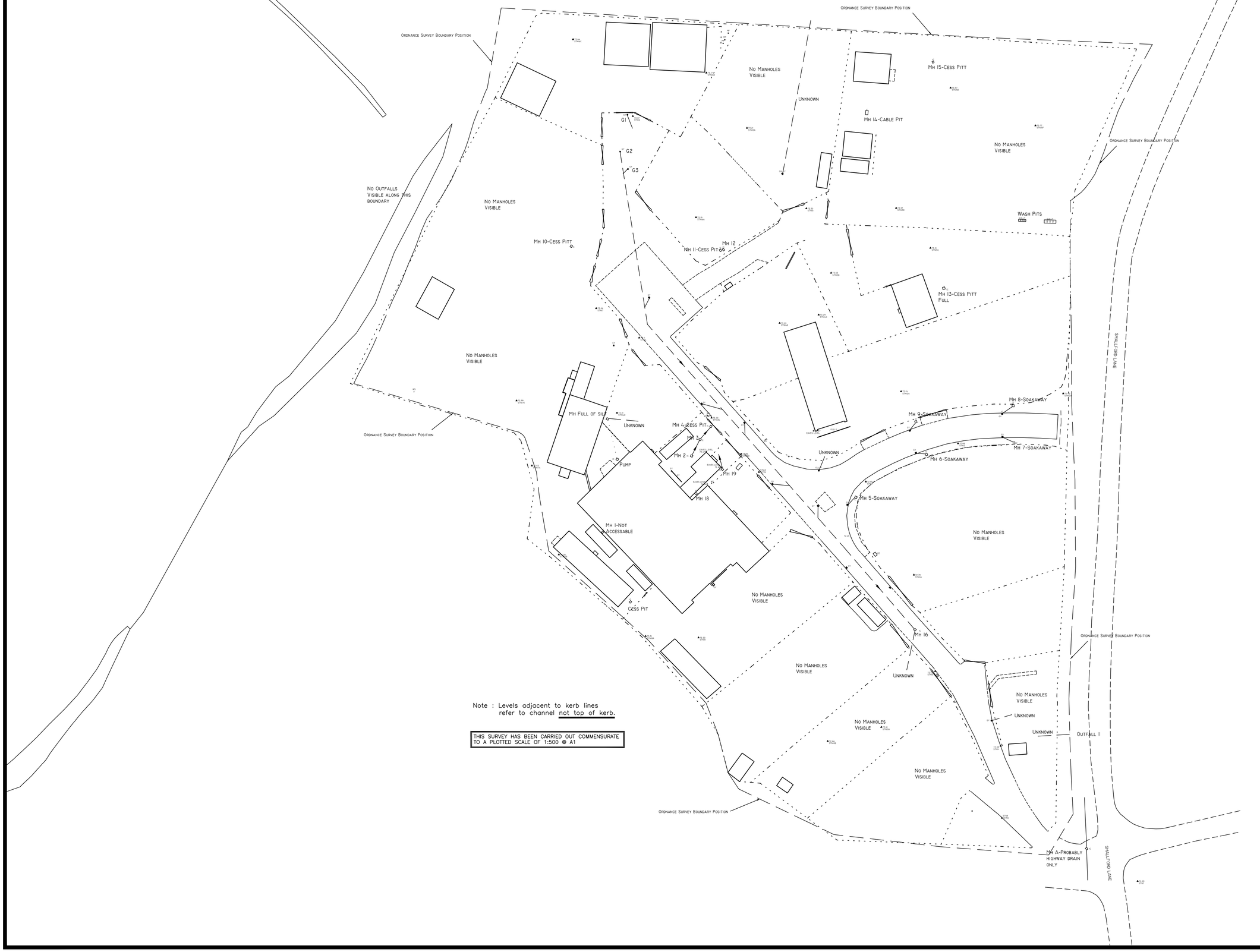
Appendix C: Drainage Survey

PRELIMINARY ISSUE



Note : Levels adjacent to kerb lines refer to channel not top of kerb.

THIS SURVEY HAS BEEN CARRIED OUT COMMENSURATE TO A PLOTTED SCALE OF 1:500 @ A1

DRG NO: PP/3012/SMALLFORD/2014/P1

LEGEND

A	Area
CATV	Cable TV service cover
CF	Cellar Flap
CP	Coal Plate
E	Electricity Supply
FH	Fire Hydrant
IC	Inspection Chamber
KL	Lowered Kerb for Access
LP	Lamp Post
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NP	Road Name Plate
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T	BT service Box
TCB	Telephone Call Box
TL	Traffic Lights
TP	Telegraph Pole
Up	Step Arrow
Dn	Ramp Arrow

(D) Dead or (P) Pollarded Tree

Deciduous Tree (individually shown)

Evergreen Tree (individually shown)

Trees (Deciduous) - Part of a group of trees

3012Smallford2014–P1.dwg

STATION CO-ORDINATES

STATION	TYPE	EASTING	NORTHING	LEVEL

BENCH MARK INFORMATION:
ALL LEVELS IN METRES TO ORDNANCE SURVEY DATUM AND BASED ON BENCH MARK:
GPS OBSERVATIONS DIRECTLY ADJUSTED TO THE ORDNANCE SURVEY'S ACTIVE NETWORK

REV	DRG. AMENDMENTS	BY	DATE

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SCALE: 1:500

DATE: JULY 2014

DRAWN BY:	CHECKED BY:

DRG NO: PP/3012/SMALLFORD/2014/P1

Appendix D:
Surface Water Drainage Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Rosie Tutton
Site name:	Smallford Works
Site location:	St Albans

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.74746° N
Longitude:	0.26649° W
Reference:	415525548
Date:	Apr 23 2020 15:27

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 0.44

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.529
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics

	Default	Edited
SAAR (mm):	661	661
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):		1.14
1 in 1 year (l/s):		0.97
1 in 30 years (l/s):		2.63
1 in 100 year (l/s):		3.65
1 in 200 years (l/s):		4.27

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	71.934	0.684	3.7	185.1	O K
30 min Summer	71.996	0.746	3.7	206.3	Flood Risk
60 min Summer	72.058	0.808	3.7	227.9	Flood Risk
120 min Summer	72.112	0.862	3.7	247.4	Flood Risk
180 min Summer	72.135	0.885	3.7	256.1	Flood Risk
240 min Summer	72.145	0.895	3.7	259.9	Flood Risk
360 min Summer	72.147	0.897	3.7	260.4	Flood Risk
480 min Summer	72.135	0.885	3.7	256.0	Flood Risk
600 min Summer	72.117	0.867	3.7	249.3	Flood Risk
720 min Summer	72.100	0.850	3.7	243.0	Flood Risk
960 min Summer	72.068	0.818	3.7	231.7	Flood Risk
1440 min Summer	72.012	0.762	3.7	211.7	Flood Risk
2160 min Summer	71.933	0.683	3.7	184.8	O K
2880 min Summer	71.846	0.596	3.7	156.8	O K
4320 min Summer	71.685	0.435	3.7	108.3	O K
5760 min Summer	71.563	0.313	3.7	74.7	O K
7200 min Summer	71.478	0.228	3.7	52.6	O K
8640 min Summer	71.421	0.171	3.5	38.7	O K
10080 min Summer	71.385	0.135	3.3	30.1	O K
15 min Winter	72.000	0.750	3.7	207.6	Flood Risk
30 min Winter	72.068	0.818	3.7	231.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	227.769	0.0	185.7	19
30 min Summer	128.269	0.0	208.9	34
60 min Summer	72.235	0.0	237.6	64
120 min Summer	40.679	0.0	267.6	122
180 min Summer	29.073	0.0	286.9	182
240 min Summer	22.909	0.0	301.4	242
360 min Summer	16.373	0.0	323.1	362
480 min Summer	12.901	0.0	339.5	480
600 min Summer	10.724	0.0	352.7	562
720 min Summer	9.220	0.0	363.8	614
960 min Summer	7.274	0.0	382.6	740
1440 min Summer	5.207	0.0	410.3	998
2160 min Summer	3.727	0.0	442.4	1424
2880 min Summer	2.940	0.0	465.3	1816
4320 min Summer	2.095	0.0	496.8	2548
5760 min Summer	1.647	0.0	521.5	3224
7200 min Summer	1.366	0.0	540.8	3888
8640 min Summer	1.173	0.0	557.0	4576
10080 min Summer	1.031	0.0	570.9	5240
15 min Winter	227.769	0.0	207.7	19
30 min Winter	128.269	0.0	233.4	33

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	72.136	0.886	3.7	256.3	Flood Risk
120 min Winter	72.196	0.946	3.7	279.3	Flood Risk
180 min Winter	72.224	0.974	3.7	290.1	Flood Risk
240 min Winter	72.238	0.988	3.7	295.6	Flood Risk
360 min Winter	72.245	0.995	3.7	298.4	Flood Risk
480 min Winter	72.238	0.988	3.7	295.6	Flood Risk
600 min Winter	72.224	0.974	3.7	290.0	Flood Risk
720 min Winter	72.205	0.955	3.7	282.7	Flood Risk
960 min Winter	72.167	0.917	3.7	267.9	Flood Risk
1440 min Winter	72.097	0.847	3.7	242.0	Flood Risk
2160 min Winter	71.990	0.740	3.7	204.0	Flood Risk
2880 min Winter	71.868	0.618	3.7	163.5	O K
4320 min Winter	71.623	0.373	3.7	90.9	O K
5760 min Winter	71.467	0.217	3.6	50.0	O K
7200 min Winter	71.386	0.136	3.3	30.5	O K
8640 min Winter	71.355	0.105	3.0	23.3	O K
10080 min Winter	71.342	0.092	2.7	20.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	72.235	0.0	266.1	62
120 min Winter	40.679	0.0	299.8	122
180 min Winter	29.073	0.0	321.4	180
240 min Winter	22.909	0.0	337.6	238
360 min Winter	16.373	0.0	361.9	352
480 min Winter	12.901	0.0	380.2	464
600 min Winter	10.724	0.0	394.9	574
720 min Winter	9.220	0.0	407.4	678
960 min Winter	7.274	0.0	428.3	770
1440 min Winter	5.207	0.0	459.0	1080
2160 min Winter	3.727	0.0	495.5	1536
2880 min Winter	2.940	0.0	521.1	1988
4320 min Winter	2.095	0.0	556.6	2640
5760 min Winter	1.647	0.0	584.1	3280
7200 min Winter	1.366	0.0	605.7	3888
8640 min Winter	1.173	0.0	623.9	4416
10080 min Winter	1.031	0.0	639.5	5144

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 519650 206850 TL 19650 06850
C (1km)	-0.029
D1 (1km)	0.305
D2 (1km)	0.309
D3 (1km)	0.297
E (1km)	0.324
F (1km)	2.453
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.440

Time (mins) From:	To:	Area (ha)
0	4	0.440

Model Details

Storage is Online Cover Level (m) 72.250

Tank or Pond Structure

Invert Level (m) 71.250

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	213.2	1.000	396.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0091-3700-1000-3700
Design Head (m)	1.000
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	91
Invert Level (m)	71.250
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.7
Flush-Flo™	0.299	3.7
Kick-Flo®	0.631	3.0
Mean Flow over Head Range	-	3.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	1.200	4.0	3.000	6.2	7.000	9.2
0.200	3.6	1.400	4.3	3.500	6.6	7.500	9.5
0.300	3.7	1.600	4.6	4.000	7.1	8.000	9.8
0.400	3.6	1.800	4.9	4.500	7.5	8.500	10.1
0.500	3.5	2.000	5.1	5.000	7.8	9.000	10.4
0.600	3.2	2.200	5.3	5.500	8.2	9.500	10.6
0.800	3.3	2.400	5.6	6.000	8.6		
1.000	3.7	2.600	5.8	6.500	8.9		

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Rosie Tutton
Site name:	
Site location:	

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.74765° N
Longitude:	0.26644° W
Reference:	30903831
Date:	Apr 29 2020 18:05

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 1.24

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.529
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics

	Default	Edited
SAAR (mm):	661	661
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

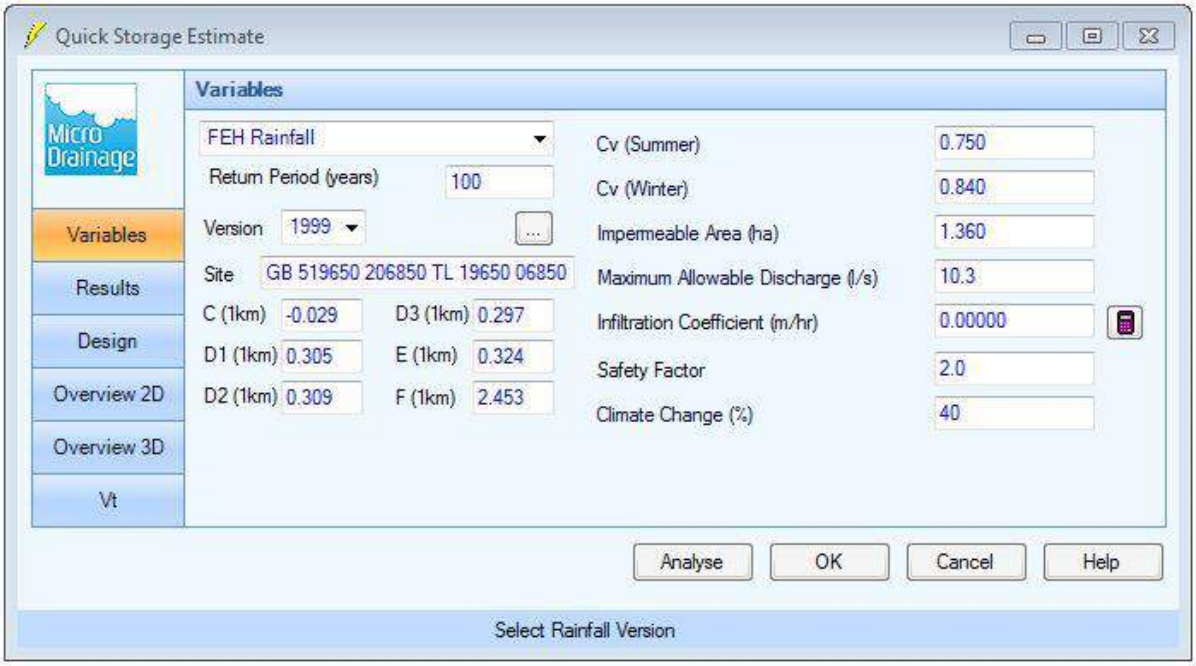
Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

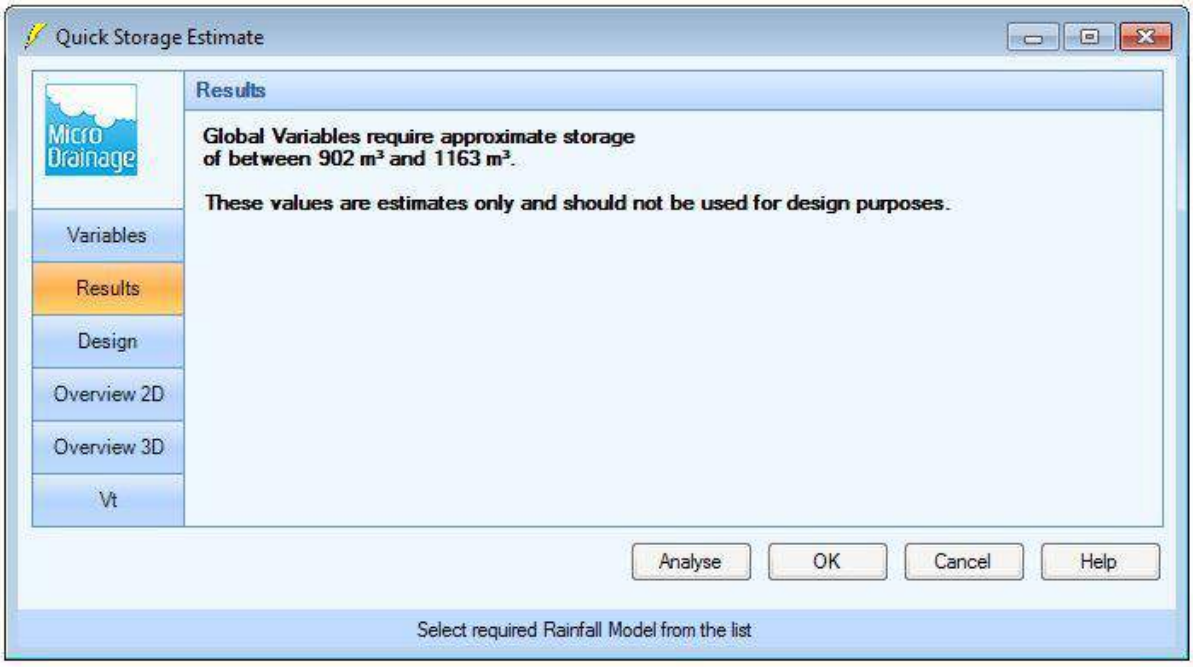
(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):		3.22
1 in 1 year (l/s):		2.74
1 in 30 years (l/s):		7.41
1 in 100 year (l/s):		10.27
1 in 200 years (l/s):		12.05


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FEH Rainfall
Return Period (years) 100
Version 1999
Site GB 519650 206850 TL 19650 06850
C (1km) -0.029
D3 (1km) 0.297
D1 (1km) 0.305
E (1km) 0.324
D2 (1km) 0.309
F (1km) 2.453
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 1.360
Maximum Allowable Discharge (l/s) 10.3
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Select Rainfall Version


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage
of between 902 m³ and 1163 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list

Appendix E: Hertfordshire County Council's Developer Checklist

Developer's checklist

To assist you in delivering an adequate surface water drainage assessment/FRA we have provided you with a checklist below. This has been broken into sections in relation to the type of planning permission you are applying to the LPA for. The level of assessment should be considered depending on the scale, proportion and nature of the development.

Outline Planning Application

Whilst we recognise that outline planning applications do not require full details of the proposed development (i.e. layout, access etc.), to manage drainage it is imperative that this is established prior to the layout being developed. We therefore require the following from the applicant;

■ Statement of compliance with the NPPF and NPPG policies, LPA local plan policies and HCC SuDS Guidance and Policies

■ Anecdotal information on existing flood risk with reference to most up to date data and information

■ Location of any ordinary watercourses including any which may be un-mapped

■ Establish location/extent of any existing and potential flood risk from all sources including existing overland flow routes, groundwater, flooding from ordinary watercourses referring to the national EA fluvial (River) and surface water flood maps

■ Evidence of ground conditions/ underlying geology and permeability including BRE Digest infiltration tests

■ An outline drainage strategy which includes a commitment to providing appropriate SuDS in line with the non -statutory national standards, industry best practice and HCC Guidance for SuDS.

■ Detailed calculations of existing surface water storage volumes and flows

■ Initial post development calculations/ modelling in relation to surface water are to be carried out for all rainfall events up to and including the 1 in 100 year including an allowance for climate change

■ All calculations/ modelling in relation to fluvial flood risk (from any watercourse) are to be carried out for all flood events up to and including the 1 in 100 year + 20% (increase in flows) climate change event.

■ Topographical survey to metres AOD

■ Evidence that if the applicant is proposing to discharge to the local sewer network, they have confirmation from the relevant water company that they have the capacity to take the proposed volumes and run-off rates.

■ Identify opportunities to improve flood risk directly by the development site or contribution to local flood risk schemes where appropriate.

■ Details of required maintenance of any SuDS features and structures and who will be adopting these features for the lifetime of the development.

Full Planning Application

☐ All of the above under Outline Planning application, plus;

☐ Full detailed drainage plan including location of SuDS measures, pipe runs and discharge points, informal flooding (no flooding to occur below and including the 1 in 30 Year rainfall return period)

☐ Detailed modelled outputs of flood extents and flow paths for a range of return periods up to the 1 in 100 year + climate change event.

☐ Exceedance flow paths for surface water for events greater than the 1 in 100 year + climate change event

☐ Depths and flow paths of all sources of flooding and the expected return period

☐ Full details of any required mitigation/ management measures of any identified source of flooding

☐ Detailed drainage calculations for all rainfall return periods up to and including the 1 in 100 year + climate change event including pre-development greenfield run-off

Appendix F:
SuDS Maintenance Schedule

Table F1: Attenuation Basin Operation and Maintenance Requirements

Schedule	Required Action	Frequency
Regular maintenance	Litter, debris and trash removal.	Monthly.
	Grass cutting – for landscaped areas, spillways and access routes.	Monthly (during growing season), or as required.
	Grass cutting – meadow grass in and around basin.	Half yearly (spring before nesting season and Autumn).
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
	Tidy all dead growth before start of growing season.	Annually.
	Remove sediment from inlets, outlets and forebay.	Annually (or as required).
	Manage wetland plants in outlet pool – where provided.	Annually.
Occasional maintenance	Re-seed areas of poor vegetation growth.	Annually, or as required.
	Prune and trim trees and remove cuttings.	2 years, or as required.
	Remove sediment from pre-treatment system when 50% full.	As required.
	Remove sediment from micropools if volume reduced by >25%.	3 – 10 years, or as required.
Remedial actions	Repair of erosion or other damage by re-seeding or re-turfing.	As required.
	Realignment of rip-rap.	As required.
	Repair/rehabilitation of inlets, outlets and overflows.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.
Monitoring	Inspect inlets, outlets and overflows for blockages and clear if required.	Monthly.
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly.
	Inspect inlets and and pre-treatment systems for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.
	Check penstocks and other mechanical devices.	Half yearly.

Table F2: Geocellular Storage Operation and Maintenance Requirements

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 it may cause risks to performance).	Monthly
	For systems where rainfall infiltrates into 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 forebays.	Annually or as required
Remedial Actions	Repair/rehabilitate inlets, outlets, 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 of sediment build-up and remove if necessary	Every 5 years or as required

Director of Environment & Infrastructure:
Mark Kemp

Hertfordshire

Rob Murdock
RMA Environmental Limited,
Suite 4,
Swallow Court,
Devonshire Gate,
Tiverton,
EX16 7EJ

Lead Local Flood Authority
Post Point CHN 215
Hertfordshire County Council
County Hall, Pegs Lane
HERTFORD SG13 8DN

Contact Lilly Varnham
Email FRMConsultations@hertfordshire.gov.uk

Date 21 August 2020

RE: Preapp/2020/SADC/03 - Smallford Works, Smallford Lane, Smallford, St Albans

Dear Rob,

Following our site visit on 12 August 2020 at Smallford Works, Smallford Lane, Smallford, St Albans, AL4 0SA, I am writing to provide written advice in respect of the proposed surface water management approach for this development.

We have reviewed the information submitted in support of a Surface Water Advisory Service enquiry for the site at Smallford Works, Smallford Lane, Smallford, St Albans, Hertfordshire, Al4 0SA for the redevelopment of the site including demolition of the existing buildings to provide up to 100 residential units.

We have reviewed the following information as part of this Surface Water Advisory Service request:

- RMA/LC1722_2 – Smallford Works – Drainage Strategy Addendum Dated: 30th June 2020
- Greenfield Runoff Rate Estimation Tool Whole Site Ref: 1207649166 Dated: Jun 29 2020
- Basin Qbar 3 BASINQBAR.SRCX DATED: 19 Jun 2020
- Geocell Eastern GEOCELLEASTERN.SRCX Dated: 29 Jun 2020
- Geocell Village Green GEOCELLVILLAGEGREEN.SRXC Dated: 29 Jun 2020
- Outline Drainage Plan Project no: C1722c Dated: 29 Jun 2020

At present, the information submitted as part of the pre-application Surface Water Advisory Service review does not provide a suitable basis for assessment to be made of the flood risks arising from the proposed development. For the surface water drainage strategy to provide a suitable basis for assessment, please see the comments below on the information that will need to be included and the matters that will need to be resolved within the Flood Risk Assessment/Surface Water Drainage Strategy for the site. The four key areas of concern are as follows:

1. Identification of a suitable discharge mechanism.
2. Clarification of any connectivity from the identified ditch to an existing ordinary watercourse or main river.
3. Clarification of the overall capacity in the system and its ability to meet the national Non-Statutory Technical Standards for surface water drainage from new development.
4. Modification of the drainage system to remove the overreliance on below ground SuDS features.

We have provided some explanatory notes in relation to the points set out above which are as follows:

1. The drainage addendum states that the site currently has an existing connection via a 100mm diameter pipe to the ditch at the front of the site and bordering Smallford Lane. We visited the site on the 12th August 2020 and investigated the ditch on the eastern site boundary. At present we are of the view that this ditch has no onward connection to any existing watercourse and serves only as a highway ditch to manage road run-off. As such it is currently not a suitable discharge location as it is not clear how any water entering the ditch is discharged therefore it is likely to just accumulate until full and then could flood the road. We understand that drainage for the revised access arrangement for this site relies on drainage to this ditch and we are assuming that this was agreed as part of a S278 highways agreement, however, this consent does not constitute an agreement for a connection for a surface water discharge from a new residential development.

   If the applicant can prove that there is a connection from this ditch to an existing watercourse then this position may change. However, it should be noted that agreement from the owner of the ditch would still be required for a modified connection from any surface water management system for the site. If this is in fact a highways ditch, then that consent to connect, and discharge would need to be obtained from the Highway Authority.

2. There is no visible outfall from the ditch, it is not clear where the water goes once the proposed development discharges here. In order to ascertain that this is a suitable discharge location for the development we require evidence to confirm a visible connection from the ditch to a watercourse or confirmation of infiltration through the base of the ditch at a suitable rate to manage any surface water discharge from the site.

   The existing outfalls currently connected to the ditch from the new drainage for the highway appear to just be pipes protruding from the sides of the ditch with no constructed headwalls and remain exposed protruding into the ditch. The culverted section under the access road has grills installed at what appears to be the outlets. This will eventually result in blockage and poses an unnecessary risk to the operation of any flow within the ditch and will pose a risk that the channel will become blocked and flood in a storm event. There is no visible culvert underneath the existing bus stop which is situated in the ditch. It may be that the ditch would fill and overflow around the bus stop where there is a manhole structure. It is not clear what this manhole structure is, nor that there is a visible discharge location beyond

this point. We could not locate any culverts under the existing access road behind the bus stop.

In order to make an accurate assessment of the flood risks arising from the development the applicant must demonstrate that there is an outfall from the ditch, to ascertain a suitable discharge location. If this can be proven we would advise that there are improvements required to the connections from the road, the culverts and the banks of this ditch if permission is given by the owner for any connection from the site.

3. We acknowledge that the applicant intends to apply for outline planning permission, therefore confirmation of the attenuation volume required to achieve the discharge rate being proposed and evidence that this can be provided within the site is sufficient at this stage. However, we have some comments based on the indicated approach of predominantly using underground cellular storage as the main means of attenuation along with a final pond/basin. The use of underground storage is not considered to be a preferred SuDS approach and should only be used when other options have been discounted as not being viable. The applicant should explore the use of on surface storage and conveyance of surface water and should consider decentralising surface water storage to spread any residual risk of failure away from one or two large underground features. It should also be noted that collection of surface water into a predominantly piped system and storage in underground features does not provide any treatment and this would be a problem particularly for any road run-off that would need to have appropriate treatment before entering any watercourse or soakaway.

   Confirmation of storage volumes to be provided to achieve the agreed run-off rates are suitable for the outline application but it should be accompanied with a commitment to explore on-surface storage and conveyance as part of the next stage of detailed design. Once completed this would then require appropriate modelling to demonstrate the feasibility of the scheme. An approach which spreads the storage around the site and implements appropriate source control measures would enable any residual storage features to be smaller and would allow for a significant reduction in the size and capacity of any underground cellular storage.

4. We acknowledge the revision of the strategy to achieve the greenfield Qbar rate of 4.4. l/s as the peak that the proposed development would discharge, however we would expect to see a greater use of above ground features on this site. We understand the applicant has stated that they will address the potential for above ground features at the detailed design stage *to offset the volume of storage provided in the basin and geocells such as (bioretention areas, rain gardens, tree pits),* however these have not been included on the outline drainage plan, nor in the submitted drainage addendum. The proposed drainage design has an overreliance on a tank-based approach and does not utilise above ground SuDS features within the development such as the use of permeable paving and driveways to decentralise the risk across the site, as the LLFA we would expect to see this reflected in the final drainage strategy.

Further advice on what the LLFA expects to be included within the surface water drainage report to support a planning application can be found in our Developers Guide and Checklist on the surface water drainage webpage on the HCC website the reference is included below.

https://www.hertfordshire.gov.uk/services/recycling-waste-and-environment/water/surface-water-drainage/

If you would like us to review any additional pre-application information in response to the above required information before going through the formal process via the LPA, this will be subject to the £110+VAT hourly rate.

Please note

Any advice given by Flood Risk Officers for pre-application enquiries does not constitute a formal response or decision with regards to future planning consents. This decision is the responsibility of the relevant local planning authority.

Any views or opinions expressed are given in good faith, and to the best of ability, without prejudice to the formal consideration of any planning application, which will be subject to public consultation and ultimately decided by the relevant local planning authority. The Flood Risk Management Team cannot guarantee that new issues will not be raised following submission of a planning application and consultation upon it.

You should be aware that officers cannot give guarantees about the final formal decision that will be made on your planning or related applications. However, the advice note will be taken into account by the Flood Risk Management Team in consideration of any future related formal planning application, subject to the provision that circumstances, and information may change or come to light that could alter the response.

It should be noted that the consideration given to pre-application advice may decline over time where more up to date data, new information and any change to industry best practice and national policy may occur.

Yours sincerely,

Lilly Varnham

Landscape / SuDS Officer
Environmental Resource Planning

Smallford

Depot

Smiths Crescent

SLEAPSHYDE LANE

Smiths Crescent

Mh B
72.120

Ditch level
71.330

Gully
71.006
150mm

No Outfall located-possibly buried

DP: 1
70.947

DP: 2
70.703

SMALLFORD LANE

71.9m

DP: 3
70.727

LB

Sleapshyde

DP: 4
70.702

71.6m

DP: 5
70.418

72.4m

DP: 6
70.498

Inlet,1
70.498
225mm

SLEAPCROSS GARDENS

A 414

A 414

DP: 7
70.427

Outfall 1
70.290
225mm

TCB

Inlet 2
68.476
225mm

DP: 8
68.520

DP: 9
68.722

Outfall 2
68.386
225mm

DP: 10
70.312

Inlet 3
70.197
300mm

DP: 11
70.296

Outfall 3
69.962
300mm

DP: 12
69.999

Inlet 4
69.575
750mm

DP: 13
70.029

NORTH ORBITAL ROAD

Inlet 5 (Bed)
Pipes not visible

Outfall 4
69.384
750mm

Outfall 5 (Twin)
69.666 (Bed)
375mm
Buried

DP: 14
69.881

Outfall 6
69.394 (Bed)
Buried

Inlet 6
69.441 (Bed)
Buried

DP: 15
68.672

DP: 16 (River)
68.497

Colney Heath
Community Park

Foot Bridge

Foot Bridge

69.5m

Drain

El Sub Sta

ST MARKS

CLOSE

Butterwick Brook

Well

Path (um)

Posts

(Telecommunication)

Track

The Paddocks

Mobile Home
Park

Survey Legend

- Ditch Point Level
- Manhole
- Gully
- Inlet / Outlet
- Ditch Line
- Piped Ditch
- Piped Ditch (Assumed Route)
- Comment

Dene-Tech Services Ltd
Unit 10 Lymington Barn
Lymington Bottom Road
Medstead Alton
Hants
GU34 5EW (01420) 562569

DENE-TECH

Client

RMA Environmental
Suite 4
Swallow Court,
Devonshire Gate
Tiverton EX16 7EJ

Project title

DT6939
Smallford Works
Nr St Albans

Drawing title

Smallford Works
Ditch Survey Layout

Scale: 1:1000	Drawn	Checked	Authorised	A1
	SM: Dene-Tech	RN: Dene-Tech	AP: Dene-Tech	
	Date: Sep 2020	Date: Sep 2020	Date: Sep 2020	

Drawing Number: DT6939/SWDS/001

Rev

These are the notes referred to on the following official copy

The electronic official copy of the title plan follows this message.

Please note that this is the only official copy we will issue. We will not issue a paper official copy.

This official copy was delivered electronically and when printed will not be to scale. You can obtain a paper official copy by ordering one from HM Land Registry.

There is an/are application(s) pending in HM Land Registry and if we have only completed the mapping work for a pending application affecting the title concerned, such as a transfer of part:

- additional colour or other references, for example 'numbered 1', may appear on the title plan (or be referred to in the certificate of inspection in form CI), but may not yet be mentioned in the register
- colour or other references may also have been amended or removed from the title plan (or not be referred to in form CI), but this may not be reflected in the register at this stage.

This official copy is issued on 01 February 2021 shows the state of this title plan on 22 September 2020 at 10:14:00. It is admissible in evidence to the same extent as the original (s.67 Land Registration Act 2002). This title plan shows the general position, not the exact line, of the boundaries. It may be subject to distortions in scale. Measurements scaled from this plan may not match measurements between the same points on the ground.
This title is dealt with by the HM Land Registry, Leicester Office .

HM Land Registry
Official copy of title plan

Title number **HD131971**
Ordnance Survey map reference **TL1906NE**
Scale **1:1250 enlarged from 1:2500**
Administrative area **Hertfordshire : St Albans**