

**Flood Risk Assessment
and SuDS Report
July 2024**



**Temple Dinsley Estate
Preston
Hitchin**

The Door PHC Ltd

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

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1 Introduction

- 1.1 EAS has been commissioned to provide a Flood Risk Assessment and SuDS report to inform a planning application for the proposed development at Temple Dinsley, Preston, Hitchin SG4 7RT (hereafter referred to as 'the site').
- 1.2 At present, the site within the red-line boundary comprises of the grounds of a former day and boarding school including a number of existing buildings, access roads and amenity areas. A site location plan map is included in **Appendix A** and the development plans are included in **Appendix B**.
- 1.3 The site is located in Flood Zone 1, which is defined as having less than 0.1% annual probability of river flooding.
- 1.4 The site is mainly at very low risk of surface water flooding, with areas of low, medium and high risk of surface water flooding to the north of the site. There is no risk of reservoir flooding.
- 1.5 This FRA includes a SuDS Strategy to demonstrate compliance with national and local policy requirements.
- 1.6 The contents of this FRA are based on the advice set out in the National Planning Policy Framework (NPPF) published in December 2023, Annex 3: Flood risk vulnerability classification, also from the NPPF and PPG 'Guidance for Flood Risk and Coastal Change', updated in August 2022.
- 1.7 This report is based on the Environment Agency flood maps, geology mapping, OS mapping, topographic survey, Strategic Flood Risk Assessment and local policy.
- 1.8 This document includes the following sections:
 - Section 2 – describes any relevant local and national planning policy;
 - Section 3 – provides a site description and background information
 - Section 4 – review any potential sources of flooding;
 - Section 5 – details the proposed drainage strategy;
 - Section 6 – outlines the maintenance and management plan; and
 - Section 7 – summarises and concludes the report.

2 Policy Context

Introduction

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

2.2 Paragraph 173 footnote 59 of the NPPF states:

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

2.3 The flood zones are defined as:

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

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

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

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

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

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

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

- a) Take account of advice from the lead local flood authority;*
- b) Have appropriate proposed minimum operational standards;*
- c) Have maintenance arrangements in place to ensure an acceptable standard of operation of the lifetime of the development; and*
- d) Where possible, provide multifunctional benefits.*

- 2.7 The site is shown to be at a low risk of a fluvial (river) flood event, being located within the Flood Zone 1 on the Flood Map for Planning. Flood Zone 1 is defined as having less than 0.1% annual probability of river flooding. The EA Flood Map has been enclosed in **Appendix C**.

North Hertfordshire Local Plan 2011-2031

- 2.8 Adopted in November 2022, the North Hertfordshire Local Plan outlines the strategies for ensuring sustainable growth within the district, providing a better quality of life for its' residents. The policies relevant to flood risk and sustainable drainage are shown below.

- 2.9 Policy NE7: Reducing Flood Risk

Planning permission for development proposals will be granted provided that (as applicable):

- a) Development is located outside of medium and high-risk flood areas (flood zone 2 and 3) and other areas affected by other sources of flooding where possible;*
- b) Where (a) is not possible, application of the sequential and exception tests is demonstrated where development is proposed in areas of flood risk using the Strategic Flood Risk Assessment (SFRA) and Environment Agency flood maps;*
- c) A FRA has been prepared in accordance with national guidance that considers the lifetime of the development, climate change impacts and safe access and egress; North Hertfordshire Local Plan 2011-2031 159*
- d) It will be located, designed and laid out to ensure the risk of flooding is reduced whilst not increasing flood risk elsewhere;*
- e) The impact of any residual flood risk will be minimised through flood resistant, resilient design and construction;*
- f) Any flood protection and mitigation measures necessary will not cause harm to nature conservation, heritage assets, and/ or landscape and recreation and, where possible, will have a positive impact in these respects; and*
- g) Overland flow routes and functional floodplain areas are protected from all development other than that which is “water compatible” and this must be designed and constructed to remain operational and safe for users during flood events, resulting in no net loss of flood plain storage and not impeding water flows or increasing flood risk elsewhere.*

2.10 Policy NE8: Sustainable Drainage Systems

Planning permission for development will be granted provided that:

- a) The most appropriate sustainable drainage solution is used taking into account technical, viability and design issues to reduce the risk of surface water flooding, enhance biodiversity, water quality and provide amenity benefits;*
- b) It aims to mimic the natural drainage patterns and processes as far as possible; and*
- c) Drainage solutions follow the SuDS hierarchy.*

North Hertfordshire District Council Strategic Flood Risk Assessment (Sep 2016)

- 2.11 The North Hertfordshire SFRA was updated in 2016 as a result of improved accuracy of mapping information following the 2008 document.
- 2.12 Appendix E shows the site is located in Flood Zone 1 and is outside the extents of the 20yr, 100yr+CC and 1000yr modelled fluvial events.

Hertfordshire Interactive Flood Risk Management Viewer

- 2.13 Hertfordshire provides an interactive mapping website, which displays the difference sources of flood risk across Hertfordshire County. The result of this mapping in relation to the proposed site is outlined below.
- 2.14 The nearest Ordinary Watercourse is located 2.0km to the east of the site.
- 2.15 Areas of surface water flooding are present in from the centre and west of the site in the 3.33%, 1% and 0.1% annual exceedance probability (AEP) events, with depths up to 900mm. This is associated with a hazard rating of mainly between 0.5-0.75 with some areas with a rating of 0.75-1.25 and 1.25-2.0.
- 2.16 The site is shown as not being within a Surface Water Management Plan Hotspot.
- 2.17 The site is not shown to be susceptible to groundwater flooding.
- 2.18 The site is shown to be located in Flood Zone 1.
- 2.19 The Hertfordshire Level 1 Strategic Flood Risk Assessment Map 7 shows the site to be at very low risk of flooding from groundwater.

3 Existing Site Assessment

Site Description

- 3.1 The site is located at Temple Dinsley, Preston, Hitchin SG4 7RT (TL 18213 24826). The location plan is included in **Appendix A**.
- 3.2 The site covers an area of approximately 277,945m², consisting of five existing school buildings along with amenity areas, with an associated access road.
- 3.3 The proposed development includes the conversion of the main school building and teaching block to flatted residential buildings. The other existing buildings to the north of the main building are to be demolished as part of the proposals and replaced with further residential dwellings. Two smaller existing buildings to the north east and south east of the main building are also to be converted to residential dwellings.
- 3.4 The proposal comprises the redevelopment of the old Princess Helena Boarding School to a residential scheme. Accordingly, the existing main building and teaching block will be converted into 43 apartments, formed of 12 x one-bedroom, 25 x two-bedroom, 5 x three-bedroom and 1 x four-bedroom units.
- 3.5 Further to this, it is also proposed that 22 houses will be provided in five residential blocks (Edwin, Violet, Sadleir, Ithel and Templar), located around the main building and teaching block. These will offer 2 x two-bedroom, 14 x three-bedroom and 6 x four-bedroom units.
- 3.6 Four detached houses, located away from the main building and teaching block are also proposed, with 2 x three-bedroom houses (Tank House and Pump House) located in the south of the site, and 2 x five-bedroom houses (Summer House and Harwood House) located in the north of the site.
- 3.7 The proposed development plans are included in **Appendix B**.

Local Watercourses

- 3.8 There are not any watercourses within the immediate vicinity of the site. The nearest watercourse is the Ippollitts Brook located approximately 2.0km east of the site.
- 3.9 The Ippollitts Brook is not considered a Main River by the Environmental Agency.

Site Levels

- 3.10 A topographical survey is enclosed in **Appendix D**. Levels to the southern side of the site are generally quite flat however, there is a slight fall from south to north. The highest levels at the site are found along the southern boundary and rise to 147.83mAOD.

- 3.11 Towards the centre of the site the gradient begins to increase with levels beginning to fall more steeply from both the southwest and southeast towards the centre of the site. Levels then fall from the centre of the site towards the northern boundary. Levels reach lows of 125.52mAOD at the centre of the northern boundary of the site.

Geology

- 3.12 With reference to the British Geological Survey online mapping (www.bgs.ac.uk), the site is located within an area with a bedrock of Lewes Nodular Chalk Formation and Seaford Chalk Formation – chalk. Given the size of the site the geology varies across the site, the majority of the site is shown to have superficial deposits of Clay with Flints Formation – Clay, Silt, Sand and Gravel with some areas of the site shown to have superficial deposits of Lowestoft Formation – Diamicton.
- 3.13 The nearest borehole records Ref. TL12SE63 indicates a geology of stiff orange brown clay to a depth of 6.0m below ground level followed by firm chalk with flint to a depth of 92.0m. The groundwater rest level is shown to be 70.5m below ground level.
- 3.14 The DEFRA Magic Map shows the site is located within Source Protection Zone III – Total Catchment.
- 3.15 The DEFRA Magic Map shows the site is located in an area with a Principal bedrock aquifer and Secondary (undifferentiated) superficial drift aquifer.
- 3.16 The DEFRA Magic Map shows the site is located in mainly a low groundwater vulnerability area with some areas of the site located in a medium to high groundwater vulnerability are. The entirety of the site is shown have a soluble rock risk.

Sewer Records

- 3.17 Anglian Water sewer records are enclosed in **Appendix E**. There are no surface water sewers located within the vicinity of the site. There is a foul water sewer to the west of the site located within School Lane. The sewer continues north, entering Preston Road before heading north east.

Existing Drainage

- 3.18 A site visit was undertaken in order to gather information on the existing drainage system at the site. The site visit found an existing surface water drainage system serves the main building along with the smaller buildings to the north of the main building.
- 3.19 The existing drainage system directs surface water runoff from the existing buildings to a ditch located towards the north of the site at an unrestricted rate. The ditch does not appear to continue onwards from the site as such, it is assumed surface water runoff is held within the ditch as it infiltrates to the ground.

4 Potential Source of Flooding

Fluvial

- 4.1 A copy of the Environment Agency's Flood Map for Planning is enclosed in **Appendix C**.
- 4.2 The site is located in Flood Zone 1. Flood Zone 1 is defined as having less than 0.1% annual probability of river flooding.
- 4.3 The risk of fluvial flooding is considered low.

Surface Water

- 4.4 Surface water flooding refers to flooding caused when the intensity of rainfall, particularly in urban areas, can create runoff which temporarily overwhelms the capacity of the local drainage systems or does not infiltrate into the ground. The water ponds on the ground and flows towards low-lying land. This source of flood risk is also known as 'pluvial'.
- 4.5 The EA long term risk maps (available on the GOV.UK website) show the site is at low, medium and high risk of surface water flooding towards the north of the site. The EA long term risk maps are included in **Appendix F**.
- 4.6 A high-risk scenario indicates a greater than 3.3% annual probability of surface water flooding, i.e., the most frequently occurring scenario. The medium risk scenarios indicate an annual probability of surface water flooding between 3.3% and 1%. The low-risk scenario indicates an annual probability of surface water flooding between 1% and 0.1%, (i.e. the least frequent but worst-case scenario). In all these scenarios, the area of flooding has a depth mainly below 300mm however, there are also areas shown to have depths of 300mm-900mm particularly within the low risk scenario.
- 4.7 The EA long term risk map also shows the surface water flooding forms part of a surface water flow path. The flow path originates within the site to the south and west of the site and flows in a northerly direction before leaving the site and continuing north.
- 4.8 A plan showing the available Defra surface water flooding data for a 0.1% annual event probability storm, analysed in QGIS and overlaid with the topographical survey and proposed development layout, is included in **Appendix F**. The Defra surface water overlay shows the predicted depths of flooding at 150mm intervals, which is more precise than the EA long term flood risk maps. Surface water flooding is shown across the area of proposed development, with depths from 0mm-900mm.
- 4.9 To manage the surface water flood risk at the site it is proposed to take a strategy of altering ground levels around the site to re-route the existing surface water flow path around the proposed buildings and existing buildings that are to remain, whilst ensuring flood volumes are adequately maintained. The design of the ground levels will need to be informed by a site-specific

surface water flood model, which is to be undertaken. As such, details of the required changes to the ground levels will be confirmed once the detailed flood model has been completed.

- 4.10 Further mitigation measures such as raising the finished floor level of the proposed buildings, potentially relocating proposed buildings if necessary and utilising flood resilient construction methods may also be required. As the existing buildings to remain are Grade II listed altering floor levels and utilising flood resilient construction methods may not be viable but could be explored, again if necessary.
- 4.11 A detailed section on mitigation measures will be included within the report once site specific surface water flood model data has been received.

Reservoir

- 4.12 The EA long term risk maps also display the risk from reservoirs. The site is shown to not be in a reservoir flood risk area, therefore the risk of reservoir flooding is low.

Groundwater

- 4.13 Based on Hertfordshire's interactive mapping, the site is not susceptible to groundwater flooding. The Hertfordshire Level 1 SFRA indicates a low risk.

5 Proposed Drainage Strategy

Relevant SuDS Policy

- 5.1 SuDS mimic natural drainage patterns and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. SuDS design should meet the “four pillars” of SuDS of: water quantity, water quality, amenity and biodiversity, wherever possible.
- 5.2 In decreasing order of preference, the preferred means of disposal of surface water runoff is:
- Discharge to ground.
 - Discharge to a surface water body.
 - Discharge to a surface water sewer.
 - Discharge to a combined sewer.

Site Specific SuDS

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

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Not suitable due to pitch of residential roof.	No
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Infiltration is not viable at the site.	No
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Lined Permeable paving is proposed.	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.	Not proposed at this stage. Some water saving features could be incorporated into the design by an M & E Engineer .	Possibly
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	No suitable location onsite.	No
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	No suitable location onsite.	No
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from run-off from adjacent areas.	No suitable location onsite.	No
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	Infiltration features not viable at the site.	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	No suitable location onsite.	No
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Underground cellular storage tanks have been included within the proposed drainage system.	Yes
Raingardens	Rain gardens are relatively small depressions in the ground that can act as infiltration points for roof water and other 'clean' surface water.	Raingardens have been included within the proposals .	Yes

Table 5.1 Site Specific SuDS

Consideration of SuDS Hierarchy

- 5.4 Given the bedrock geology of Chalk at the site infiltration testing to BRE 365 standards was carried out the site to confirm if infiltration would be viable at the site. WDE consulting visited the site in June 2024 in order to carry out the infiltration testing. The testing consisted of two trial pits, one 3.0m in depth the other 3.1m in depth. The trial pits were dug as deep as possible in an attempt to enter the chalk strata and obtain the best rates.
- 5.5 Both trial pits failed the test with infiltration rates of below 1×10^{-6} m/s recorded. As such, infiltration is not considered viable at the site. An attenuation-based strategy has therefore been proposed with a restricted outfall to an existing ditch located to the north of the site, mimicking the existing drainage layout.

5.6 A report of the WDE infiltration testing is included at **Appendix G**.

Surface Water Drainage Parameters

5.7 The following best practice design parameters have been considered:

- The local 2070s 'Upper End' Climate Change allowance is 40% and has been applied to the hydraulic drainage network design.
- The Hydraulic Model has been for a 1:2yr Storm Event, 1:30yr Storm Event, 1:30yr + 40% Climate Change Event, 1:100yr Storm Event and 1:100yr + 40% Climate Change Storm Event.
- FEH22 rainfall data has been used.
- The CV Value for Winter and Summer storms has been set to 1.0.
- A 5min time of entry has been used.
- Total proposed impermeable area: 6084m². With 10% urban creep allowance applied to the roof area, the impermeable area to be allowed for is: 6214m². Urban Creep has not been applied to any of the Listed buildings that are to remain.
- Half-Drain Time – In line with Hertfordshire's LLFA Guidelines, lined devices (tanks and lined ponds, lined permeable paving) to half-drain within 48hrs (2880mins).
- Exceedance Routes – Exceedance routes shall be demonstrated.
- Surcharged Outfall - The drainage calculations has been modelled to include a surcharged outfall to the watercourse.
- Pre-and Post Runoff Rates – The proposals seek to offer a significant reduction on existing runoff rates.
- CIRIA's Susdrain Fact Sheet and SC030219 (Rainfall Runoff Management for Developments) sets out how post-development volumes that exceed pre-development volumes should be managed. As the post development discharge volume for a 1 in 100yr 360min Storm exceeds that of the Greenfield 1 in 100yr 360min Storm, the discharge from the site for all storms up to and including the 1 in 100yr + Climate Change Event has been discharged at a rate that does not adversely affect flood risk. This is in line with Policy S5 & S6 of the Non-Statutory Technical Guidance

Pre-Development Runoff Rates and Discharge Volumes

5.8 The site currently consists of approximately 0.99ha of impermeable area. Of this area, 0.33ha is to be developed as part of the proposals and therefore managed via the proposed drainage system, the remaining impermeable area is proposed to remain unchanged and continue using the existing drainage strategy (inclusive of the main buildings and some of the access roads). From observation surface water runoff from the site currently outfalls unrestricted and untreated

to a ditch located to the north of the site. No attenuation or treatment features serve the existing site.

- 5.9 In order to calculate the existing runoff rates, a 'dummy' existing drainage network, based on information from the topographical survey, has been modelled for a range of storm events using Causeway Flow. The runoff rates results are contained in **Appendix H** and include the brownfield runoff volume for a 1:100yr 360min Storm Event.
- 5.10 The output shows the existing runoff from the impermeable area that is to be redeveloped (excluding the main building and access roads to be retained) is 74.8 l/s for a 1 in 100 year plus 40% climate change storm, with the runoff volume for a 1:100yr 360min Storm Event shown to be 202.3m³

Post Development Runoff Rate

- 5.11 Greenfield runoff rates were estimated using the FEH method on the Causeway Flow software. The results of which are included in **Appendix I**. The proposed impermeable area of the site is 0.61ha, the following greenfield runoff rates for a range of storm events have been scaled accordingly:
- 1 in 1 year – 0.7 l/s/ha – 0.43 l/s
 - 1 in 2 year – 0.8 l/s/ha – 0.49 l/s
 - 1 in 30 year – 2.2 l/s/ha – 1.3 l/s
 - 1 in 100 year – 2.9 l/s/ha – 1.8 l/s
- 5.12 Causeway Flow Greenfield ReFH2 Method was used to calculate the 1:100yr 360min Storm Event Discharge Volume for 1ha. The results are included in **Appendix I** and show a discharge volume of 35m³ per hectare.
- 5.13 The proposals seek to match the 1 in 1 year Greenfield Runoff Rate for all storms up to and including the 1:100yr + 40% Climate Change Event. However, as per the Greenfield Runoff Rates calculated in paragraph 5.11 above, the 1 in 1 year greenfield runoff rate for the proposed impermeable area is 0.41 l/s. Restricting runoff from the site to this low of an outfall rate will very likely result in blockages. Also, restricting the runoff to such a low outfall rate results in storage devices within the drainage strategy having half drain times of over 2880 minutes.
- 5.14 As such, it is proposed to restrict outfall from the site to a maximum of 2.9 l/s. The existing runoff rate for an equivalent storm is 74.8 l/s as such this offers over a 96% reduction on existing maximum outfall rates from the site.

Proposed SuDS Strategy

- 5.15 As the external of the existing main building is to remain unchanged with only proposed changes to the internals of the building, the existing drainage system serving this building and the associated hardstanding's will also remain and will continue to collect and direct surface water runoff from the building to the ditch located to the north of the site. Other existing impermeable areas at the site that are proposed to remain unchanged such as part of the access road will also continue to drain as they do within the existing arrangement.
- 5.16 As outlined in Table 5.1 above, a number of SuDS Features shall be utilised to form the Surface Water Drainage Strategy in order to meet the 4 Pillars of SuDS.
- Water Quantity – Cellular Storage tank, Permeable Paving, Raingarden Planters and potentially Rainwater Harvesting Butts;
 - Water Quality – Permeable Paving.
 - Biodiversity – Raingarden Planters and existing basins at the site are proposed to remain.
 - Amenity – Raingarden Planters and existing basins at the site are proposed to remain.
- 5.17 It can be seen it is proposed to utilise a number of SuDS features with the proposed drainage strategy in order to adequately manage surface water runoff from the development. The proposed new access road and parking areas are to utilise a lined permeable paving construction. The sections of permeable paving have been split into two separate sections.
- 5.18 This will allow surface water runoff to permeate through the surface of the car and into the sub-base where it is stored. The outfall from each permeable paving section will be restricted via an orifice plate. The first section of permeable paving is the larger of the two located just south of the second section of permeable paving will be restricted to a maximum outfall rate of 1.4 l/s, with the second section of permeable paving restricted to 0.5 l/s.
- 5.19 Both sections of permeable paving will then outfall directly to an existing ditch located to the north of the site.
- 5.20 The surface water runoff from the roof areas of the proposed buildings along with the roof area from the other smaller existing building to remain is to be collected via a new proposed surface water network and directed to a cellular storage crate located towards the north of the site.
- 5.21 The new proposed access road to the east of the proposed buildings is too steep for permeable paving to work effectively, as such this section of the access road is to utilise a typical impermeable construction. The runoff from this section of the access road is to be collected via a series of road gulleys and directed to the cellular storage tank to the north of the site.
- 5.22 Surface water runoff from the development will be stored within the cellular storage crate before discharging to the existing ditch at the north of the site via the existing connection at a restricted rate of 1.0 l/s via a hydrobrake. Along with the flows from the proposed sections of permeable paving this brings the total maximum runoff rate from the site to 2.9 l/s.

- 5.23 Causeway Flow was used to estimate the size required for each of the proposed SuDS devices to ensure adequate attenuation has been provided for rainfall events up to and including a 1 in 100 year plus 40% climate change storm. Causeway Flow estimated permeable paving section 1 requires a minimum sub-base depth of 554mm whilst section 2 of permeable paving requires a minimum sub-base depth of 575mm. Causeway Flow also estimated the tank would need to be sized at 10.0m x 12.0m x 1.98m deep in order to provide adequate attenuation.
- 5.24 Causeway Flow also estimated the half drain time of each of the three storage devices. The first section of permeable paving achieves a half drain time of 2700 minutes, the second section achieves a half drain time of 2595 minutes with the tank achieving a half drain time of 2415 minutes.
- 5.25 The Causeway Flow hydraulic calculations have been included in **Appendix J** with the proposed drainage layout for the attenuation-based strategy included at **Appendix K**.
- 5.26 There are four other existing smaller buildings at the site proposed to be converted to residential use. These buildings are located at various points of the site, two to the very south of the site with two to the very north of the site. As these buildings are existing and will be located within a very similar if not the same footprint surface water runoff from these areas have not been included within the main proposed drainage system.
- 5.27 Unlined permeable paving will be used within the construction of the driveways of each of these dwellings. Runoff from these proposed dwellings will be directed to the permeable paving and be allowed to slowly infiltrate to the ground naturally. In the event the permeable driveways overflows surface water runoff would runoff to the large greenfield areas surrounding each of the dwellings and continue to infiltrate to the ground.

Exceedance Event

- 5.28 The proposed surface water drainage strategy is designed to accommodate a 1:100yr + 40% Climate Change Storm Event. In the unlikely event that an exceedance event occurs, the majority of flood waters would flow in a northerly direction towards the existing ditch at the north of the site. An Exceedance Route Plan is included in **Appendix L**.

Water Quality

- 5.29 Relating to runoff from low-trafficked roads: CIRIA 763 SuDS Manual Table 26.2 shows Low-Traffic Roads have a Pollution Hazard Level of LOW with pollution indices of TSS of 0.5, Metals 0.4 and Hydrocarbons 0.4. Although the majority of low-traffic roads within the area of the site to be redeveloped are anticipated to comprise lined permeable paving there are some areas that are to utilise typical impermeable construction
- 5.30 Therefore, in order to provide adequate water quality for Surface water run-off from these sections of low traffic roads a downstream defender has also been proposed. Downstream

defenders provide mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. The indices of various types of downstream defender have also been listed below.

Model	Downstream Defender® Select Mitigation Indices ^{(a)(b)}		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons (Oils)
Vortex	0.3	0.2	0.2
Vortex Plus	0.5	0.4	0.5
Advanced Vortex	0.5	0.4	0.5

Notes:

(a) All mitigation indices supplied by Hydro International Ltd are calculated using the methods laid out in the British Water How To Guide: Applying the CIRIA SuDS Manual Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. The Advanced Vortex and Vortex Plus models have also been independently verified by the WRc, with the WRc Performance Declaration available on request.

(b) Mitigation Indices quoted for the Downstream Defender® Select are valid when the unit is designed according to the Treatment Flow Rate (see Table 3).

SuDS Mitigation Indices for Downstream Defender® Select

- 5.31 The runoff from the section of permeable paving will not pass through the downstream defender however, the permeable paving itself will provide sufficient water quality mitigation indices. Permeable Paving alone provides mitigation for TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from low-traffic-road areas is more than sufficiently mitigated by use of Permeable Paving and Downstream Defender.
- 5.32 Relating to runoff from Residential Roofs: CIRIA 763 SuDS Manual Table 26.2 shows residential roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Residential Roofs have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. As such, this will also be adequately managed by the proposed Downstream Defender.

6 Maintenance of Development Drainage

- 6.1 The maintenance of both the existing and proposed SuDS features will remain the responsibility of the site owner.
- 6.2 Regular inspections and maintenance should be carried out for each of these elements, particularly after periods of heavy rainfall. Maintenance tasks and frequencies for permeable paving and raingarden planters are detailed in the CIRIA SUDS Manual (C753) and have been summarised in Table 6.1-6.2 below.

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

Table 6.1: Maintenance tasks for permeable paving (Source: CIRIA C753, The SUDS Manual)

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary. Check operation of underdrains by inspection of flows after rain. Assess plants for disease infection, poor growth, invasive species etc and replace as necessary. Inspect inlets and outlets for blockage.	Quarterly. Annually. Quarterly. Quarterly.
Regular Maintenance	Remove litter and surface debris and weeds. Replace any plants, to maintain planting density. Remove sediment, litter and debris build-up from around inlets or from forebays.	Quarterly (or more frequently for tidiness or aesthetic reasons). As required. Quarterly or biannually.
Occasional Maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required. Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch.	As required. As required.
Remedial Actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years.

Table 6.2: Maintenance tasks and frequencies for Bioretention Systems (i.e. Rain Garden Planters) (The SUDS Manual C753, CIRIA)

- 6.3 Inspection chambers and manhole covers should be lifted each year to remove visible debris and check for blockages. It is suggested that this is undertaken every November after the heaviest leaf-fall has occurred.
- 6.4 Any control chambers/orifice plate filters should be regularly inspected (every 4 months) and cleared of silt and debris if necessary.
- 6.5 Should a blockage occur at any time, it is advised to seek professional help to jet the drainage system to clean and clear the system.

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

7 Conclusions

- 7.1 EAS has been commissioned to provide a Flood Risk Assessment and SuDS report to inform a planning application for the proposed development at Temple Dinsley, Preston, Hitchin SG4 7RT.
- 7.2 The site covers an area of approximately 277,945m², consisting of a former boarding school with a number of associated buildings across the site along with various access roads and large amenity areas.
- 7.3 The proposal comprises the redevelopment of the old Princess Helena Boarding School to a residential scheme. The existing main building and teaching block will be converted into 43 apartments, it is also proposed that 22 houses will be provided in five new residential blocks located around the existing main building and teaching block. Four detached houses, located away from the main building and teaching block are also proposed

Flood Risk

- 7.4 The site is located within Flood Zone 1 on the EA Flood Map for planning and is deemed at low risk from, groundwater, sewer and reservoir flooding.
- 7.5 The EA long term risk maps (available on the GOV.UK website) show the site is at low, medium and high risk of surface water flooding towards the north of the site. In all these scenarios, the area of flooding has a depth mainly below 300mm however, there are also areas shown to have depths of 300mm-900mm particularly within the low-risk scenario.
- 7.6 The EA long term risk map also shows the surface water flooding forms part of a surface water flow path. The flow path originates within the site to the south and west of the site and flows in a northerly direction before leaving the site and continuing north.
- 7.7 The main source of mitigation for the surface water flood risk at the site will be to alter ground levels around the site to re-route the existing surface water flow path around the proposed buildings and existing buildings that are to remain, whilst ensuring flood volumes are adequately maintained.
- 7.8 The design of the ground levels will need to be informed by site-specific surface water flood modelling, which is yet to be undertaken. As such details of the required changes to the ground levels will be confirmed once the detailed flood model has been completed.
- 7.9 Further mitigation measures such as raising the finished floor level of the proposed buildings, possibly relocating proposed buildings if necessary and utilising flood resilient construction methods may also be required.

SuDS Strategy

- 7.10 As the exterior of the main existing building is to remain unchanged, it is proposed to continue utilising the existing drainage system it is currently served by.
- 7.11 Given the bedrock geology of Chalk at the site infiltration testing to BRE 365 standards was carried out the site to confirm if infiltration would be viable at the site. However, the testing failed confirming infiltration rates at the site of greater than 1×10^{-6} m/s resulting in infiltration not being viable
- 7.12 An attenuation-based strategy has therefore been proposed. The attenuation-based strategy uses a combination of raingarden planters, lined permeable paving and below ground cellular storage tanks in order to provide the required attenuation at the site whilst meeting the four pillars of SuDS.
- 7.13 The outfall from the proposed drainage system is to discharge to an existing ditch located to the north of the site, replicating the existing arrangement. The outfall is proposed to be restricted to a maximum of 2.9 l/s for all rainfall events up to and including a 1 in 100 year + 40% climate change storm. This offers a 96% reduction on existing runoff rates for the same storm event.
- 7.14 The site owner/appointed management company will be responsible for maintaining all components of the existing and proposed drainage system including the raingarden planters permeable paving and cellular storage tank.
- 7.15 In conclusion, this FRA will be required to be updated following site-specific surface water flood modelling and mitigation measures. A policy compliant SuDS layout has been proposed, which will reduce the amount of surface water runoff generated by the site.

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Appendix: A - Location Plans

Appendix: B – Development Site Plans



Site Area : 277945 sq.m
(27.8 ha)

Buildings and Structures on site:

1. Main Building

2. Teaching Block

3. Edwin

4. Violet

5. Saddleir

6. Ithel

7. Templar

8. Summer House

9. Harwood House

10. Tank House
11. Pump House

12. Lodge Gate

13. Belvedere

14. Ice House

15. Piggery

16. Park Wall

17. Paved Rose garden

18. Herbaceous Garden

19. Small Herbaceous Garden

20. Rose Garden
21. Magnolia Steps

22. Cricket Pitch

23. North Tennis Court

24. Village Gate

25. Walled Parking Garden

26. Existing Parking

27. Visitor Parking

28. Summer House Plantation

29. East Tennis Court

30. Pergola Garden
31. Permissive Path



DO NOT SCALE OFF THIS DRAWING
DO NOT SUBSTITUTE ANY OF THE PRODUCTS
OR MATERIALS.

1. This is a planning drawing and is intended for this use only; it must not be used for construction.
2. All dimensions are in MM and should be checked on site prior to commencement of work; do not scale off this drawing.
3. This drawing is to be read in conjunction with all other relevant information.
3.Discrepancies between drawings and information to be referred to Architect without delay.



P04	Adjusted to LEA comments	09.05.24
P03	Updated to latest landscape	08.05.24
P02	Layout updates	03.05.24
P01	Initial Issue	24.04.24
Revision	Description	Date

0 m

50 m

100 m

KAY PILSBURY THOMAS ARCHITECTS

SCABAL

TUDIO

DESIGN

ARCHITECTS

HONEYLANDS RADWINTER SAFFRON WALDEN ESSEX

CB10 2TJ 01799 599208 | info@kpt.co.uk | kpt.co.uk

Client
The Door UK Ltd

Project
Temple Dinsley
Preston, Hitchin, Hertfordshire,
SG4 7RT

Drawing title
Proposed Site Plan

Purpose of issue
Planning

Job no.	Status	Scale @ A0
641	S0	1:1000

Drawn by	Checked by
DC	DC

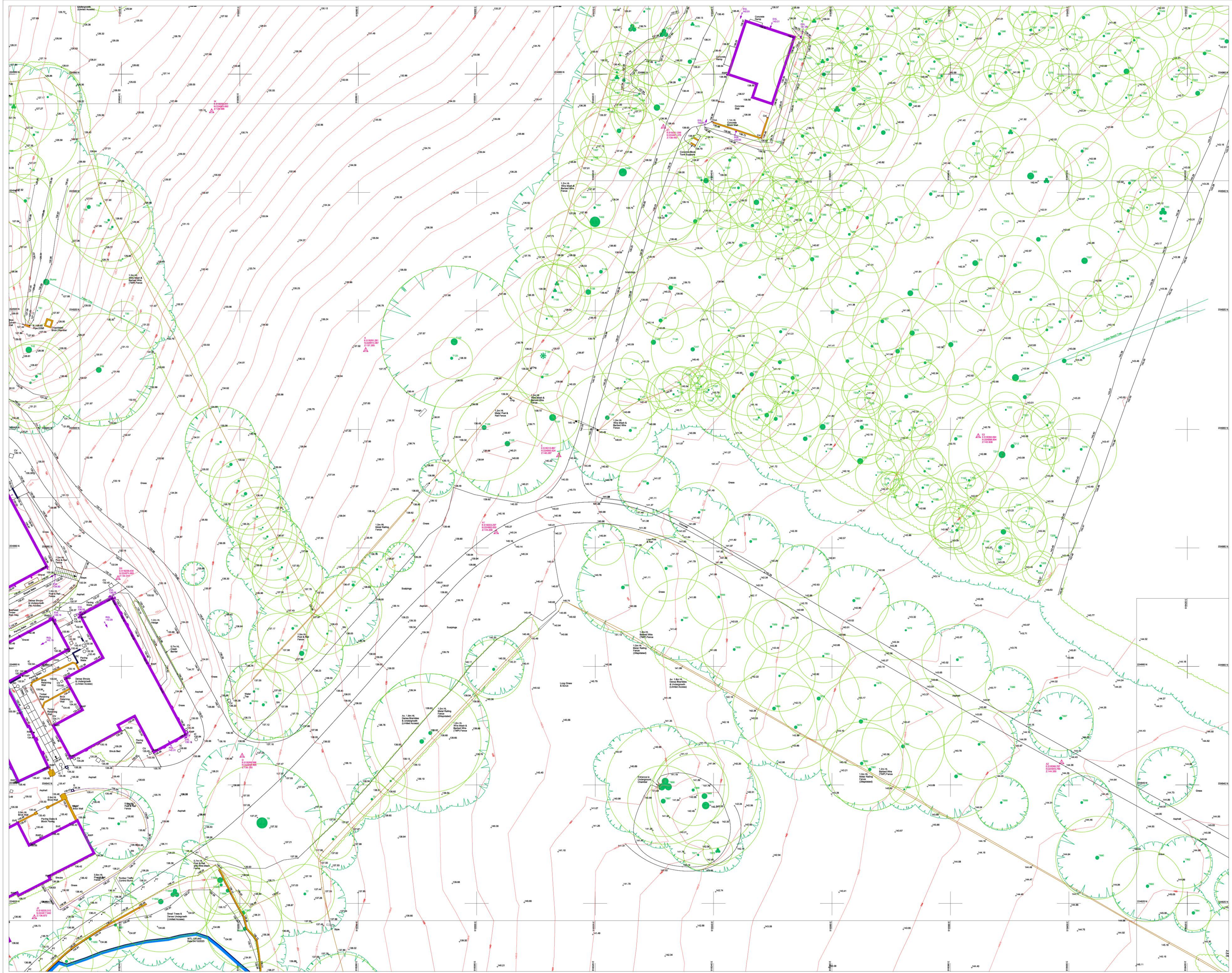
Date	Revision
28.03.24	P04

Drawing number
641-KS-03-XX-DR-A-10002

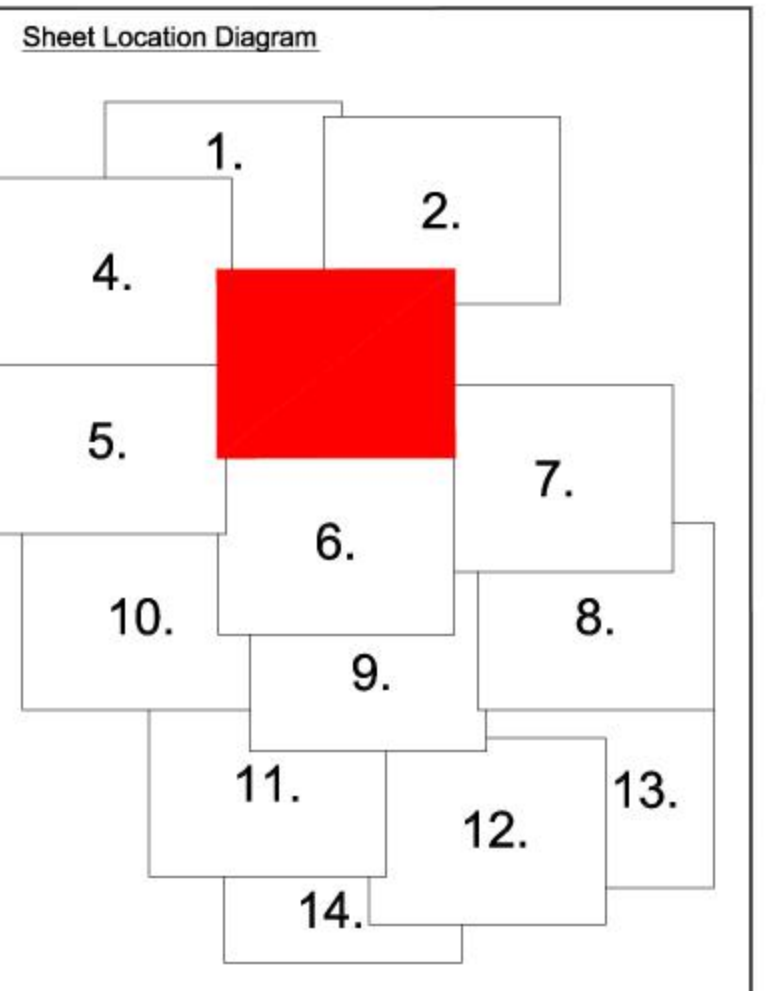
Appendix: C – EA Flood Map for Planning



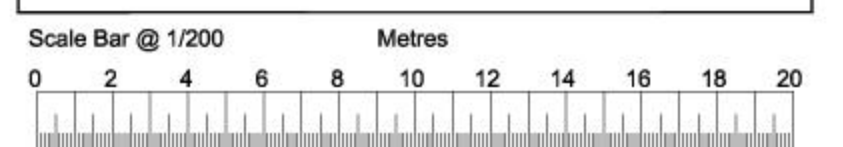
Appendix: D – Topographical Survey



For tree schedule please refer to:
Drawing Sheet: (15) Tree Schedule 1-200 @ A0
Excel file: 5549(C) Trees Shedule.xlsx



General Abbreviations		LEGEND	
AA	Air Vortex	MB	Mobile Barrier
AB	Abutment	MC	Mobile Cover
BS	Base	MS	Mobile Surface
CB	Control Box	PC	Pressure Control
CC	Control Cable	PS	Pressure Switch
CD	Control Drum	PSL	Pressure Switch Limit
CE	Control Element	PSM	Pressure Switch Module
CH	Control Head	PSN	Pressure Switch Nozzle
CI	Control Interface	PSO	Pressure Switch Outlet
CL	Control Line	PSR	Pressure Switch Receiver
CM	Control Module	PSU	Pressure Switch Unit
CS	Control Switch	PSV	Pressure Switch Valve
CT	Control Terminal	PSW	Pressure Switch Wire
DC	Direct Current	PSX	Pressure Switch X
DD	Direct Drive	PSY	Pressure Switch Y
ED	Electric Drive	PSZ	Pressure Switch Z
EE	Electric Element	PSA	Pressure Switch A
EL	Electric Line	PSB	Pressure Switch B
EM	Electric Module	PSC	Pressure Switch C
EP	Electric Port	PSD	Pressure Switch D
ES	Electric Switch	PSE	Pressure Switch E
ET	Electric Terminal	PSF	Pressure Switch F
EV	Electric Valve	PSG	Pressure Switch G
FW	Flow Warning	PSH	Pressure Switch H
GA	Gas Air	PSI	Pressure Switch I
GB	Gas Bar	PSJ	Pressure Switch J
GC	Gas Control	PSK	Pressure Switch K
GD	Gas Drive	PSL	Pressure Switch L
GE	Gas Element	PSM	Pressure Switch M
GF	Gas Flow	PSN	Pressure Switch N
GG	Gas Gas	PSO	Pressure Switch O
GH	Gas Head	PSR	Pressure Switch R
GI	Gas Interface	PSQ	Pressure Switch Q
GJ	Gas Junction	PSR	Pressure Switch R
GK	Gas K	PSU	Pressure Switch U
GL	Gas Line	PSV	Pressure Switch V
GM	Gas Module	PSW	Pressure Switch W
GN	Gas Nozzle	PSX	Pressure Switch X
GO	Gas Outlet	PSY	Pressure Switch Y
GP	Gas Port	PSZ	Pressure Switch Z
GQ	Gas Port	PSA	Pressure Switch A
GR	Gas Receiver	PSB	Pressure Switch B
GS	Gas Switch	PSC	Pressure Switch C
GT	Gas Terminal	PSD	Pressure Switch D
GV	Gas Valve	PSE	Pressure Switch E
GW	Gas Wire	PSF	Pressure Switch F
GX	Gas X	PSG	Pressure Switch G
GY	Gas Y	PSH	Pressure Switch H
GA	Gas A	PSI	Pressure Switch I
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GC	Gas C	PSK	Pressure Switch K
GD	Gas D	PSL	Pressure Switch L
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GF	Gas F	PSN	Pressure Switch N
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GH	Gas H	PSR	Pressure Switch R
GI	Gas I	PSQ	Pressure Switch Q
GJ	Gas J	PSR	Pressure Switch R
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GR	Gas R	PSB	Pressure Switch B
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GT	Gas T	PSD	Pressure Switch D
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GW	Gas W	PSF	Pressure Switch F
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GC	Gas C	PSK	Pressure Switch K
GD	Gas D	PSL	Pressure Switch L
GE	Gas E	PSM	Pressure Switch M
GF	Gas F	PSN	Pressure Switch N
GG	Gas G	PSO	Pressure Switch O
GH	Gas H	PSR	Pressure Switch R
GI	Gas I	PSQ	Pressure Switch Q
GJ	Gas J	PSR	Pressure Switch R
GK	Gas K	PSU	Pressure Switch U
GL	Gas L	PSV	Pressure Switch V
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GP	Gas P	PSZ	Pressure Switch Z
GQ	Gas Q	PSA	Pressure Switch A
GR	Gas R	PSB	Pressure Switch B
GS	Gas S	PSC	Pressure Switch C
GT	Gas T	PSD	Pressure Switch D
GV	Gas V	PSE	Pressure Switch E
GW	Gas W	PSF	Pressure Switch F
GX	Gas X	PSG	Pressure Switch G
GY	Gas Y	PSH	Pressure Switch H
GA	Gas A	PSI	Pressure Switch I
GB	Gas B	PSJ	Pressure Switch J
GC	Gas C	PSK	Pressure Switch K
GD	Gas D	PSL	Pressure Switch L
GE	Gas E	PSM	Pressure Switch M
GF	Gas F	PSN	Pressure Switch N
GG	Gas G	PSO	Pressure Switch O
GH	Gas H	PSR	Pressure Switch R
GI	Gas I	PSQ	Pressure Switch Q
GJ	Gas J	PSR	Pressure Switch R
GK	Gas K	PSU	Pressure Switch U
GL	Gas L	PSV	Pressure Switch V
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GS	Gas S	PSC	Pressure Switch C
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GV	Gas V	PSE	Pressure Switch E
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GP	Gas P	PSZ	Pressure Switch Z
GQ	Gas Q	PSA	Pressure Switch A
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GE	Gas E	PSM	Pressure Switch M
GF	Gas F	PSN	Pressure Switch N
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GH	Gas H	PSR	Pressure Switch R
GI	Gas I	PSQ	Pressure Switch Q
GJ	Gas J	PSR	Pressure Switch R
GK	Gas K	PSU	Pressure Switch U
GL	Gas L	PSV	Pressure Switch V
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GN	Gas N	PSX	Pressure Switch X
GO	Gas O	PSY	Pressure Switch Y
GP	Gas P	PSZ	Pressure Switch Z
GQ	Gas Q	PSA	Pressure Switch A
GR	Gas R	PSB	Pressure Switch B
GS	Gas S	PSC	Pressure Switch C
GT	Gas T	PSD	Pressure Switch D
GV	Gas V	PSE	Pressure Switch E
GW	Gas W	PSF	Pressure Switch F
GX	Gas X	PSG	Pressure Switch G
GY	Gas Y	PSH	Pressure Switch H
GA	Gas A	PSI	Pressure Switch I
GB	Gas B	PSJ	Pressure Switch J
GC	Gas C	PSK	Pressure Switch K
GD	Gas D	PSL	Pressure Switch L
GE	Gas E	PSM	Pressure Switch M
GF	Gas F	PSN	Pressure Switch N
GG	Gas G	PSO	Pressure Switch O
GH	Gas H	PSR	Pressure Switch R
GI	Gas I	PSQ	Pressure Switch Q
GJ	Gas J	PSR	Pressure Switch R
GK	Gas K	PSU	Pressure Switch U
GL	Gas L	PSV	Pressure Switch V
GM	Gas M	PSW	Pressure Switch W
GN	Gas N	PSX	Pressure Switch X
GO	Gas O	PSY	Pressure Switch Y
GP	Gas P	PSZ	Pressure Switch Z
GQ	Gas Q	PSA	Pressure Switch A
GR	Gas R	PSB	Pressure Switch B
GS	Gas S	PSC	Pressure Switch C
GT	Gas T	PSD	Pressure Switch D
GV	Gas V	PSE	Pressure Switch E
GW	Gas W	PSF	Pressure Switch F
GX	Gas X	PSG	Pressure Switch G
GY	Gas Y	PSH	Pressure Switch H
GA	Gas A	PSI	Pressure Switch I
GB	Gas B	PSJ	Pressure Switch J
GC	Gas C	PSK	Pressure Switch K
GD	Gas D	PSL</	



C	08.10.2023	Previously overgrown areas have been surveyed and added to drawing.
B	04.07.2023	Additional areas surveyed and added
A	12.07.2023	Additional areas surveyed "Summerhouse Plantation Walk"
Orig.	09.07.2023	Original survey "Storage Sheds Yard" and site control established.
Rev.	Date	Revisions

Notes:

The accuracy and detail shown in this drawing is dependent on the original specification.
However, Surveyor U.S. should be consulted before use of scales other than those stated.

This drawing provides preliminary plan and description of boundaries on the ground at the time the survey was undertaken and in no way implies legal title or boundary ownership.

When boundary lineages are added to the survey drawing and are taken from local knowledge or information supplied by the owner, the surveyor assumes no responsibility of warranty quality and title. They are provided based on opinion and do not imply a legal contract.

Detail required outside of all boundaries with no permission for access or public right of way will be surveyed by remote measurement where possible. The accuracy is relative. This also applies to the use of any instrument that is not a surveying instrument.

See dimensions and species have been recorded as accurately as possible, but defoliation a tree specialist should be consulted.

Underground drawing and information shown has been measured within the chamber available. The accuracy and details of postpaid time periods of the chamber are relative. Whilst every effort has been made to correctly identify the information the user should satisfy themselves of the completeness and accuracy before undertaking any works especially in critical areas.

All care has been taken in the preparation of this drawing any discrepancies found should be reported to the Surveyor General immediately.

Plan co-ordinates relate to a local survey grid coincident with OS National Grid using OSTN15 transformation at Control Station A. Scale factor 1.00 applied.

Level Datum:

All levels relate to OS Newlyn datum using geoid model OSGM15 at Control Station A



28 Cadogan Road, Bury St Edmunds, IP33 2QJ
Tel: 01284 850255
Email: info@sunshinesurvey.co.uk
Web: www.sunshinesurvey.co.uk

Project Title:
**TEMPLE DINSLEY ESTATE, PRESTON, HITCHIN
 SG4 7RT**

Client:	SCABAL
Description:	

TOPOGRAPHICAL SURVEY				(Sheet 3 of 14)
Date	08.10.2023	Scale	1/200 @ A0	
Job No.	005540C	Surveyor	G. E. T. E.	

Doc No.	GTC0090	Conveyor	G.E. & T.E
Proj No.	31001	Drawn	G.E. & T.E

