



Oaklands College & Land south of Sandpit Lane, St Albans

Sustainable Urban Drainage Strategy -
Oaklands College

October 2025




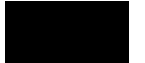





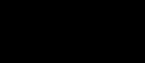
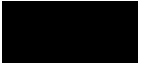



Oaklands College Masterplan

Sustainable Drainage Strategy

- 2240224-EWP-ZZ-XX-RP-C-00001

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1. Executive Summary

This Sustainable Drainage Strategy has been prepared on behalf of Oaklands College to support the hybrid planning application for the development of the Oaklands College Campus alone (the "Site"). This report assesses the method of existing surface water drainage and the ability to include sustainable drainage systems (SuDS) into the proposed development as far as feasible.

This report should be read in conjunction with JNP Group's Flood Risk Assessment (FRA) and Foul & Utilities Assessment covering the entire development and Sustainable Drainage Strategy covering the new residential development, Oaklands Blossom.

With the aim to be in accordance with the National standards for sustainable drainage systems (SuDS) and Hertfordshire County Council policy as far as feasible, it is the intention to incorporate SuDS into external landscaping with priority given to the top-most criteria of the drainage hierarchy.

Proposals comprise a series of detention basins subdividing proposed architectural and landscaping works supported by at-source conveyance SuDS; permeable paving, swales and rain gardens aimed to provide further enhanced amenity, biodiversity and water quality to the strategy. This strategy has been developed in close collaboration with the design team at an early stage in order to locate above-ground SuDS and reduce rates as far as feasible.

The total peak discharge from the site where connected to proposed SuDS considering the 1 in 100 year + 40% climate change event is 25.9 l/s. This provides a 99 % betterment to existing unrestricted rates and is within Greenfield QBar rates.

All surface water drainage serving proposals are to be drained by gravity to proposed SuDS and the existing surface water drainage network, with separate foul and surface water networks to be provided, in accordance with Part H of the Building Regulations. Where existing surface water connections are shown connected to foul water drainage within portions of major development, these have been re-routed to the proposed drainage network. Where minor works are proposed or areas to remain as existing, the drainage arrangement is to remain as existing.

As the majority of the site's surface water flows is proposed to connect to existing surface water drainage, ultimately discharging to watercourse, the Sewer Authority has not been contacted. However, as a new connection to watercourse is envisaged required, a Land Drainage Consent application will be required in consultation with the Lead Local Flood Authority. Considering the significant rate betterment achieved as part of the proposed works, the site's impact to the existing watercourse profile is envisaged to be improved.

2. Introduction

This Sustainable Drainage Strategy has been prepared on behalf of Oaklands College to support the hybrid planning application for the development of the Oaklands College Campus alone. This report assesses the method of existing surface water drainage and the ability to include sustainable drainage systems (SuDS) into the proposed development as far as feasible.

This report should be read in conjunction with JNP Group's Flood Risk Assessment (FRA) and Foul & Utilities Assessment covering the entire development and Sustainable Drainage Strategy covering the new residential development.

This report has been prepared in accordance with the GOV.UK National standards for sustainable drainage systems (SuDS), the CIRIA SuDS Manual C753 and the Hertfordshire County Council (HCC) planning policy as far as feasible.

3. Site Context

3.1 Site Location

The site is located within the administrative boundary of HCC who also hold the responsibility of Lead Local Flood Authority (LLFA).

The site lies to the east of St Albans, Hertfordshire. Along the north-east and eastern boundaries, the site is bordered mainly by working open land and woodland, a commercial and residential estate bounds the southern and south-west boundaries of the site over the A1057, woodland to the west and a newly constructed residential development to the north-west.

The total area of land within the Site area amounts to approximately 130.80 hectares (Ha). Its postcode address is AL4 0JA and is approximately centred at OS grid reference 528890 E 181271 N.

This total Site area is divided into:

- ~1.49 Ha which is HCC Highway Land
- ~23.38 Ha apportioned for a new residential development located to the north-west of the site (Oaklands Blossom)
- ~45.01 Ha apportioned to the College site

The remaining area of land (60.92 ha) are within the ownership of Oaklands College, but do not form part of the Site.

Only the College site is discussed within this Sustainable Drainage Strategy. Documentation produced by JNP Group should be referenced for the Oaklands Blossom Sustainable Drainage Strategy as well as the site wide Flood Risk Assessment.

Refer to **Figure 1** for the site location and purple hatched area denoting the new residential development.

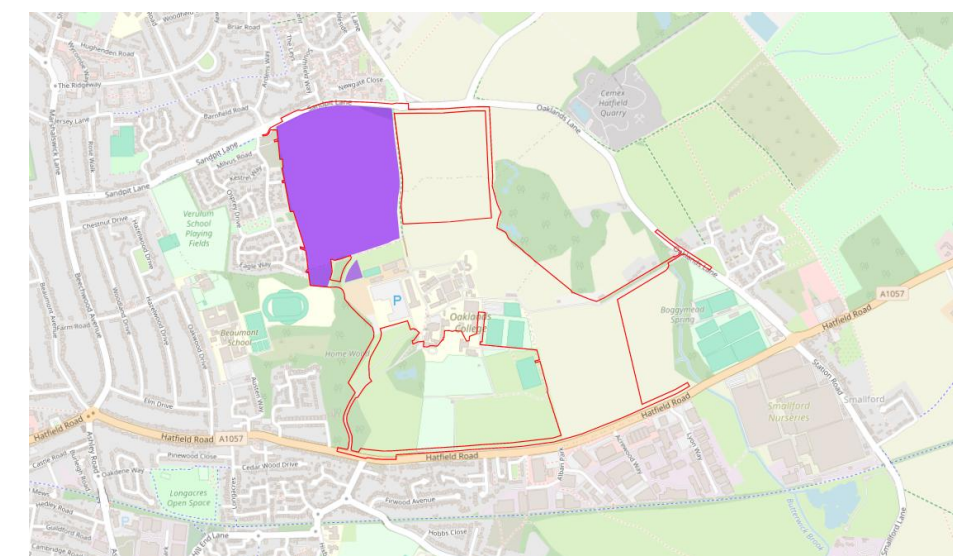


Figure 1: Site location

3.2 Existing Development

The existing development comprises open land and various educational facilities including teaching building, sports, construction and animal / equestrian centres, a discovery building, health clinic, and other supporting buildings, parking and games pitches.

See Figure 2 for an aerial visual of the existing development from its south-western corner.



Figure 2: Aerial photo of existing site

3.3 Existing Catchments

Of the remaining site area, much of the existing open land and buildings are to remain as existing and as such are to remain draining as existing and not included in this assessment. As such, for the purposes of this assessment, only the areas within the Development Boundary are considered. See **Figure 4** for reference.

The majority of the existing College site within the Development Boundary (IMP area 41,822m²) drains unrestricted, much of this connected to the Boggymead Brook to the south-east of the site. However, several connections to the site's foul water drainage are noted in addition to some potential soakaway locations which are not clear whether in use or discontinued.

The remaining western and central areas of the existing College site (IMP area 981m²) have been recently part-developed between 2020 and 2024 in accordance with the approved Drainage Strategy prepared by Sweco (ref: 669669-MLM-ZZ-XX-RP-C-0001 Rev 03, dated 25th August 2020) with a restricted discharge to the existing surface water drainage network. See **Figure 3** for reference of the approved catchment areas serving the previous Sweco Drainage Strategy, with only the Teaching Building, Immersion Lab, Homestead and associated parking, Construction Centre and Sports Pavilion developed to date. The large central and north-eastern portions of the site remaining in their pre-developed state. Where the Development Boundary encompasses portions of this attenuated drainage, a separate catchment has been provided for comparison.

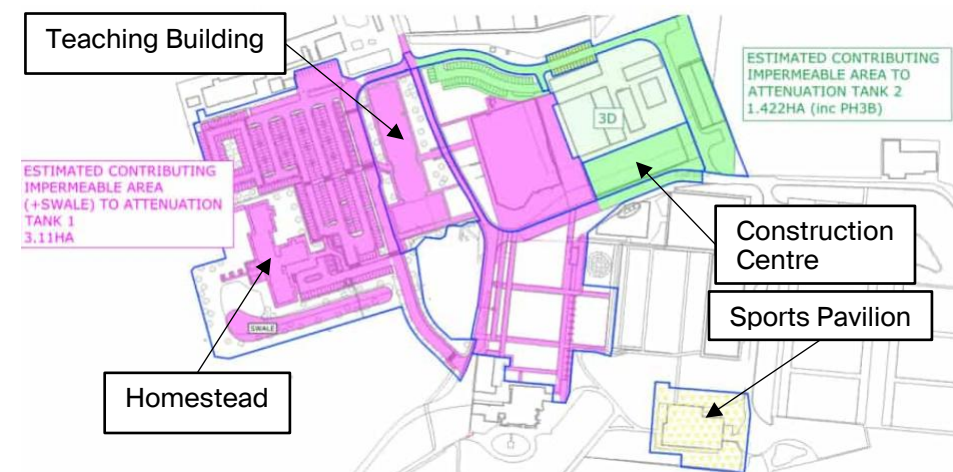


Figure 3: Estimated catchment area within Sweco strategy

Particular to the existing courtyard serving the rear of the existing Refectory and Mansion House (IMP area 4,552m²) where only minor landscaping works are proposed with no amendments to the existing building envelopes / drainage arrangement facing it, also including the East Drive remaining as existing, a separate catchment again has been provided as it is to remain draining unrestricted as existing.

Remaining areas within the Development Boundary comprise an area designated for the diverted Public Right of Way bounding the College site as well as the new pump / cycle track which due to their minor footprint relative to its surrounding landscaping is proposed to drain to adjacent landscaping via their permeable surface or filter drains, swales or similar where impermeable, subject to detailed design.

Consideration has been made to ensure the drainage serving the portions of the site remaining as existing are not severed as part of proposals, acting independently with separate connections to the wider network. In some cases this will require re-routing of drainage to support proposals and capacity assessment within the following design stages, but offers no material change to their overall arrangement and attenuation storage where applicable.

Table 1: Existing area take-off

Area designation	Existing impermeable area (m ²)
Area draining unrestricted to watercourse / sewer	41,822
Area draining unrestricted where minor works are proposed	4,552
Area draining to existing attenuation tanks	981
Total	47,355

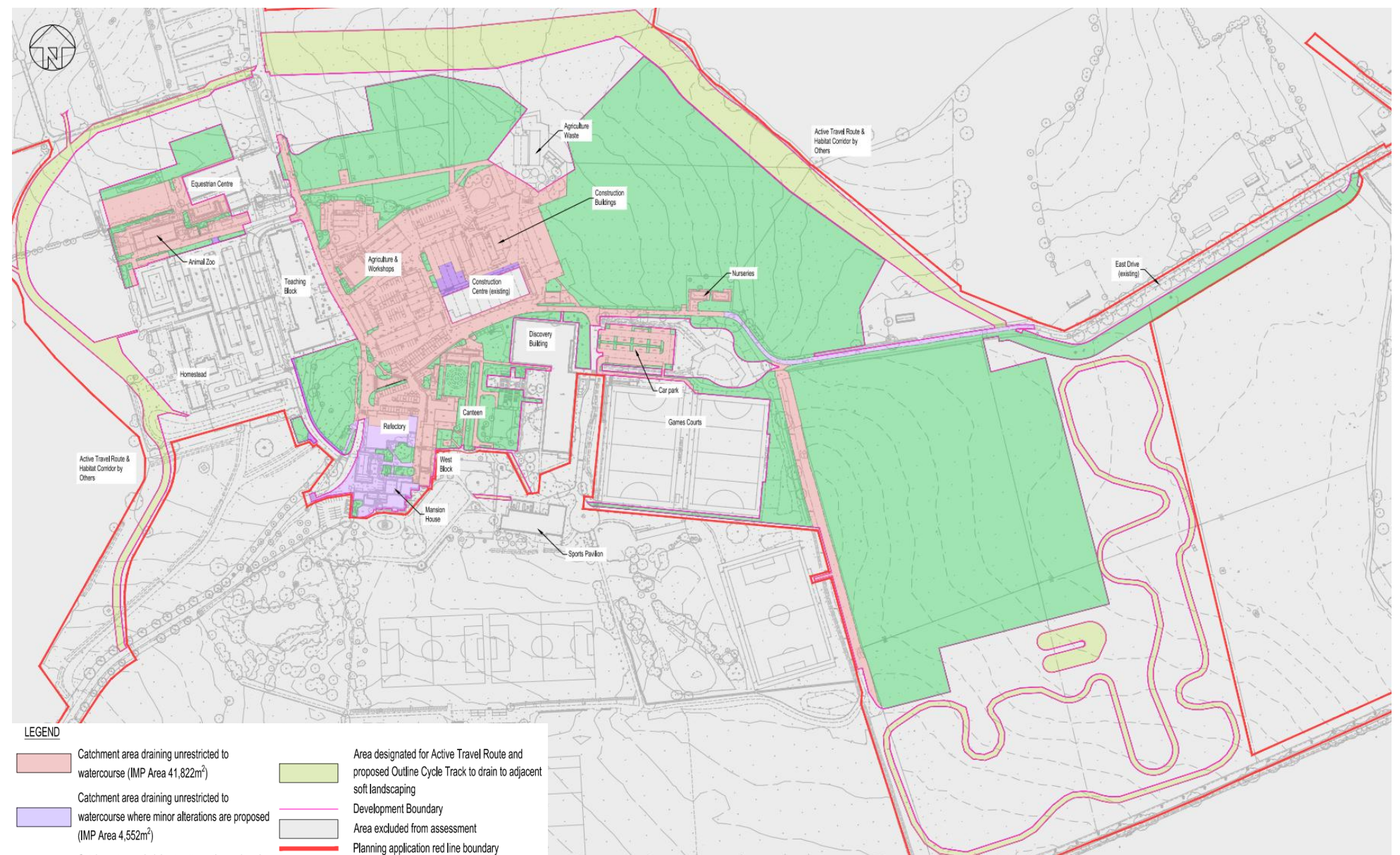


Figure 4: Existing catchment areas within the Development Boundary

3.4 Existing Site Topography

A topographic survey of the site has been completed incrementally by Survey Solutions, the latest update in May 2025 can be found in **Appendix A** of this report.

The site is relatively terraced with an overall slope in a south-easterly direction. The land falls from the highest point of ~88 AOD in the south-west corner to about ~75m AOD along Boggymead Spring on the SE boundary.

3.5 Underlying Site Geology and Hydrology

3.5.1 Geology

The British Geological Survey (BGS) maps present the site to be underlain by the Lowestoft Formation (Diamicton) - Chalky till, with outwash Sands and Gravels, Silts and Clays, atop the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated) - Chalk.

A number of ground investigations have been carried out across the site over multiple years. These comprising:

- A Site Investigation by RSK in 2008 covering the central built portion of the Oaklands College
- A Phase 2 Geo-environmental Assessment by MLM in 2018 covering the western portion of the site where now sits the Homestead and Teaching Building as well as buildings to the furthest eastern extent of the College site
- A Phase 3 Geo-environmental Assessment by MLM in 2021 covering portions of the central built site where now sits the Construction Centre and Sports Pavilion

Through review of the above ground investigations completed, ground conditions are shown to vary subject to location, relating to the central site ground make-up as presented within the initial RSK 2008 survey:

- **Topsoil / Made Ground:** grassed and woody deposits between 0.2m below ground level (BGL) to 1.2mBGL / hardstanding to 0.9mBGL
- **Lowestoft Formation Glacial Till:** Soft to firm silty Clay with lenses of Flint, Chalk Gravel and Sand and Gravel between 0.7mBGL to 2.87mBGL
- **Kesgrave Formation Glacial Sand and Gravel:** Medium dense Flint Sand and Gravel with occasional lenses of Clay to 4mBGL
- This underlain by the **Lewes Nodular Chalk Formation and Seaford Chalk Formation**

Within the western portion of the site investigated by MLM in 2018, the Lowestoft Formation underlying the Homestead / Teaching Building area is shown to comprise an interbedded upper stiff gravelly, sandy Clay layer (1.4mBGL to 6.1mBGL) and lower silty Gravel and Sand layer (1.8mBGL to 5.2mBGL), the base Clay layer unproven. The furthest eastern portion of the site underlain by Sand to 4mBGL atop Clay to an unproven depth.

Within the central portion of the site investigated by MLM in 2021, the Lowestoft Formation underlying the Construction Centre again presented interbedded upper and lower layers of gravelly, sandy Clay and Sand and Gravel between 0.9mBGL to 11.1mBGL. The Lewes Nodular Chalk Formation and Seaford Chalk Formation located below.

3.5.2 Hydrology

Natural England MAGIC maps presents the north-west and central built portion of the College site to be located within a Source Protection Zone (SPZ) 3, the south-eastern portion of the site elevated at SPZ 2. The Lewes Nodular Chalk Formation and Seaford Chalk Formation Bedrock denoted as a Principal aquifer, whilst the site Superficial Deposits are shown to be Secondary (undifferentiated).

The RSK 2008 report details that groundwater was not encountered at the time of the investigation although the results of subsequent monitoring visits present the north-west and Mansion House courtyard area to be generally at 2.00mBGL and 3.76mBGL depths with the north-east corner (PH9) of the site having observed results of between 0.29mBGL and 0.45mBGL depths.

The MLM 2018 monitoring results detailed groundwater underlying the western Homestead / Teaching Building between 0.6mBGL and 1.4mBGL in the upper Clay layer and 7.0mBGL in the Lowestoft Formation. The furthest eastern portion of the site (WS07 & WS10) presenting near surface at depths of 0.56mBGL to 1.54mBGL in the Lowestoft Formation.

The MLM 2021 monitoring results detailed groundwater underlying the Construction Centre to be between 5.36mBGL to 7.85mBGL in the Lowestoft Formation.

All groundwater encountered is understood to be perched, this resultant of subsurface water (mainly generated by rainfall) percolating slowly downward and / or held by beds or lens of low-permeability material, i.e. Clay. The groundwater table not encountered and considered to be at depth within the Lewes Nodular Chalk Formation and Seaford Chalk Formation.

The potential for groundwater contamination was also noted within reports and should be investigated further.

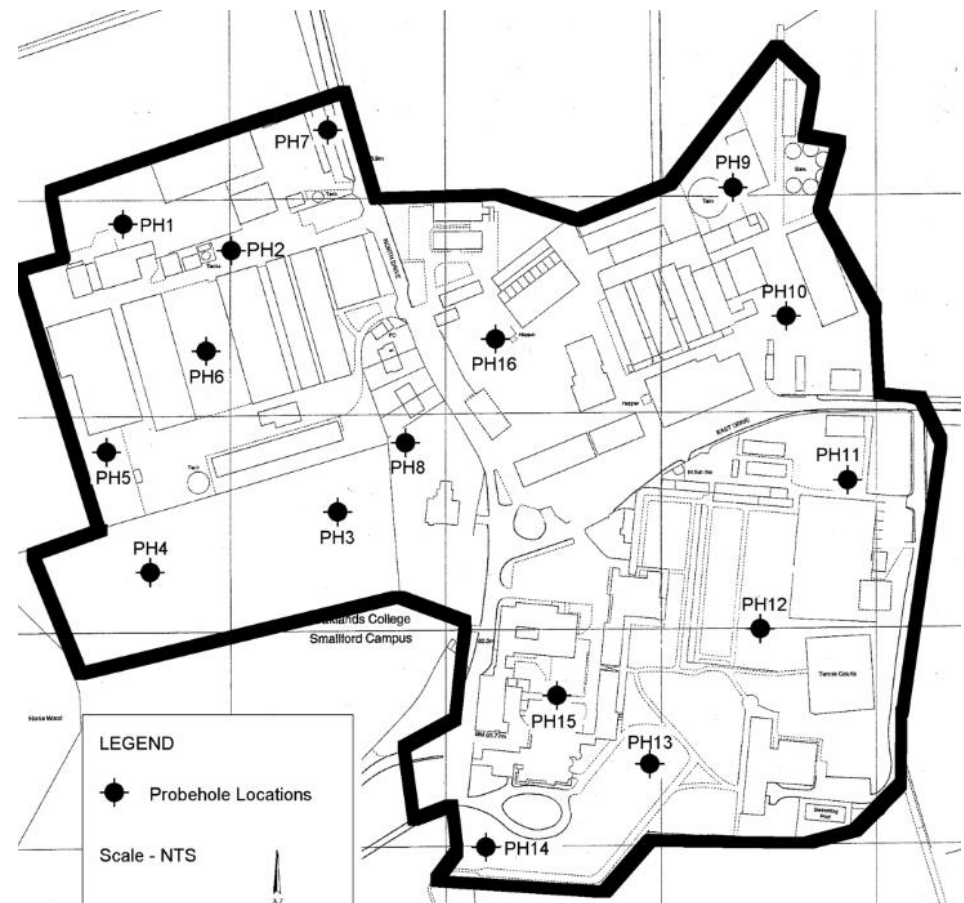


Figure 5: Mapped borehole locations of the Site Investigation by RSK in 2008

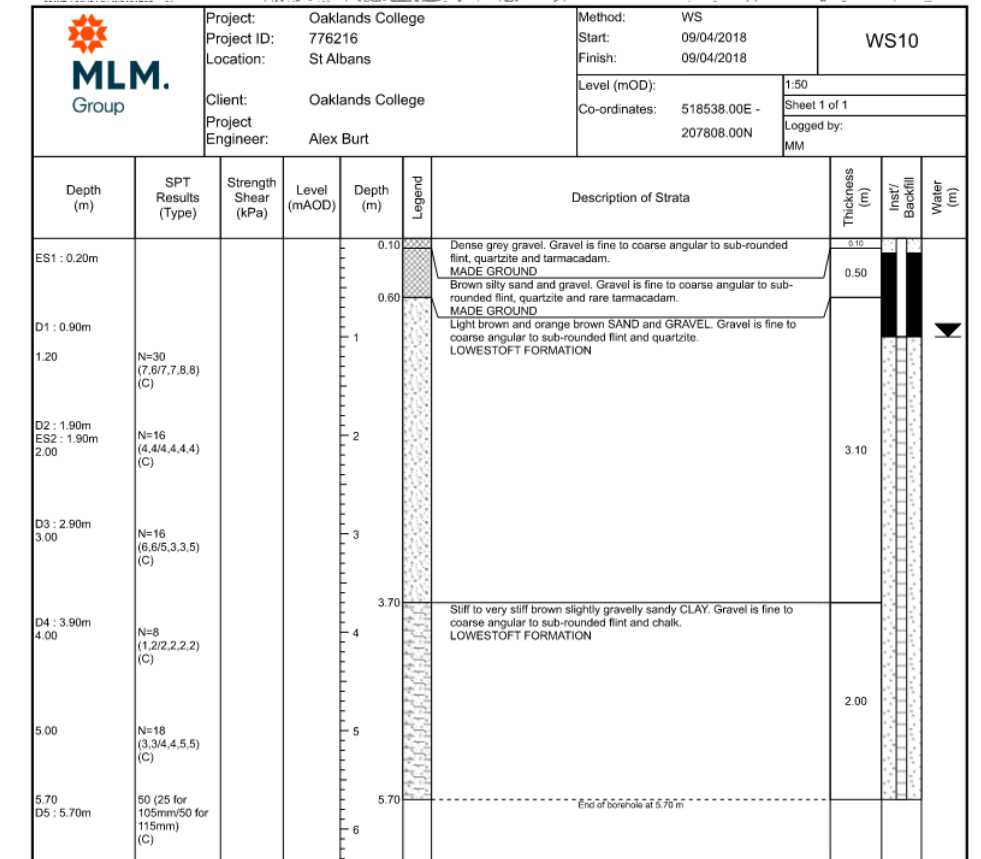
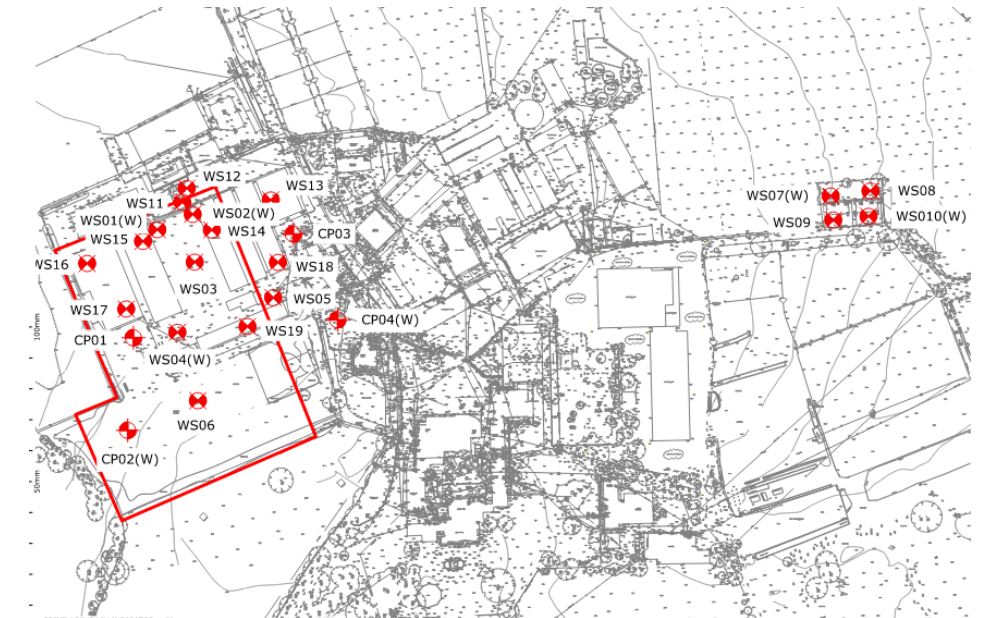


Figure 6: Borehole WS10 and mapped location of the Phase 2 Geo-environmental Assessment by MLM 2018 showcasing shallow groundwater within the eastern portion of the site

4. Pre-application Advice

As Lead Local Flood Authority (LLFA), Hertfordshire County Council (HCC) were approached for comment on the proposed development.

A meeting was held with the LLFA on the 13th March 2025 with a supplementary meeting held on the 18th June 2025 to discuss both flood risk and sustainable drainage.

In relation to flood risk, although this element is being completed by JNP, the existing risk of surface water flooding through the centre of the site impacts the sustainable drainage strategy to which the following comments were raised:

- JNP Group to reconfirm sequential testing to cover all sources of flooding
- Modelling of the surface water flow paths bounding the new residential and College site as well as through the College site to be modelled, the methodology to be agreed with HCC. Further survey investigation as required.

See JNP Group documentation for site-wide flood risk assessment and **Figure 7** for the existing baseline surface water flood model results showcasing the flow path through the College site.



Figure 7: JNP Group 0.1% AEP depth existing baseline surface water flood model results

In relation to SuDS serving the College site:

- As the College is a Brownfield site with elements under a previously agreed planning application, the direction for SuDS for the additional College elements should:

A Fully re-model the previous consultant drainage strategy to the latest design parameters (higher FEH Rainfall Data and Cv values of 1.0 to contain the 100yr + 40% storm event) using as-built information, followed by adding in the additional areas of the current proposed site into this network.

- The previous Sweco drainage strategy design was based on older FSR Rainfall Data and Cv values of 0.75 and 0.84 to contain the 100yr + 20% storm event which is no longer acceptable to the LLFA.
- The LLFA officer also expressed potential liability concerns with this strategy as were Elliott Wood to re-model the existing

strategy based on as-built information, this may not be exactly what is on site

B The elements of the drainage strategy and buildings that have been constructed and currently discharge to the attenuation tank and flow control can be left as is and all new elements of current proposals would need to be completely separated via a new network discharging at Greenfield QBar.

Option B considered to be the more practicable option over full re-modelling of previous consultancy information and allow clear distinction between designs. The ability to achieve Greenfield QBar rates subject to further design development.

- The redevelopment of the New Refectory is not needed to be restricted in rate alongside remaining proposals as long as works do not change / increase the existing footprint, but can include changes to the existing roofs.
- Storage SuDS are required to be located outside existing / proposed development surface water flow routes (JNP model to present envisaged alleviation / redirection to existing surface water flood risk to what is shown currently.
- SuDS proposals need to maximise source control SuDS i.e. permeable paving, rain gardens, tree pits, swales, etc. as much as possible prior to connecting to a end of line pond or geocellular crated feature. HCC would object to an end of line system alone.
- SuDS proposals to use a coefficient of volumetric runoff (Cv) of 1.0, latest FEH rainfall data and ensure catchments are clearly labelled and modelled correctly.
- Preference not to have borehole soakaways considering the risk to below geology.
- The new standards for Sustainable Drainage Systems (SuDS) to be followed.
 - All drainage strategies must now provide appropriate evidence addressing water quality, amenity, and biodiversity.
 - Allowance should be made for planting within SuDS features where it affects storage capacity.
- The Simple Index Approach remains an acceptable method for assessing water quality.
- Exceedance areas for basins should be appropriately managed and indicated.
- Crate storage is acceptable if other SuDS measures are maximised across the site – such as permeable paving, basins, rain gardens, etc.

5. Existing Drainage

5.1 Public Sewers

Thames Water is the principal sewerage provider for the area. A copy of the Thames Water asset maps is included in **Appendix B**, an extract in **Figure 8**.

Asset maps show 2no. public trunk sewers in vicinity to the Development Boundary as follows:

- A 457mm diameter trunk combined water sewer located to the east of the site adjacent to the Boggymead Brook, running in a north-south direction. No invert levels are shown within asset plans. However, CCTV survey completed by Survey Solutions (undated) presents depths at intersection with the College Eastern Drive to be 4.49mBGL. No further invert levels recorded.
- A 525mm diameter trunk combined water sewer located adjacent to the above 457mm diameter sewer, running in a north-south direction. No invert levels are shown within asset plans. However, CCTV survey completed by Survey Solutions (undated) presents depths at intersection with the College Eastern Drive to be 4.38mBGL.

It is expected from review of CCTV survey that all foul water drainage, together with portions of surface water drainage generated by the College site are directed to the 457mm diameter trunk sewer.

Remaining surface water drainage is presented within CCTV survey to connect to the Boggymead Brook.

No separate public surface or foul water sewers are present in vicinity to the Development Boundary.

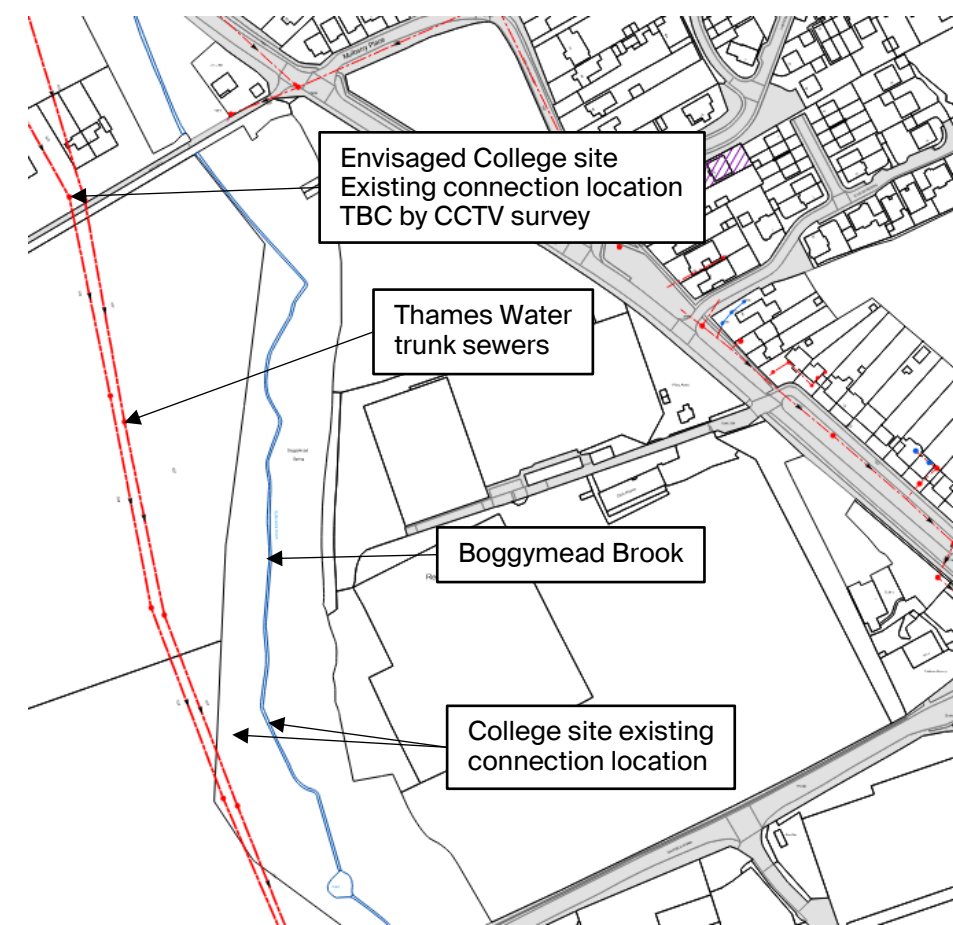


Figure 8: Extract from Thames Water asset maps - Sewerage

5.2 Private Drainage Network

A CCTV survey covering the majority of the College site's below-ground drainage was conducted by Survey Solutions as part of a wider topographic and utilities survey, the survey is undated. Further unknown origin topographic & utilities survey was also completed previously, the survey again is undated.

As-built information of the Homestead, Teaching Building, Construction Centre, Immersion Lab and Sports Pavilion were also been provided to inform assessment.

Survey Solutions topographic and utilities survey of the College site and as-built information used for reference can be found in **Appendix A**.

Surveys indicate:

- Drainage serving the existing site's pre-2020 works arrangement comprising a gravity network up to the point of connection with the public sewer / watercourse to the east of the site.
 - Foul water drainage, together with portions of surface water catchment are directed unrestricted via a traditional pipe network to the trunk combined water sewer to the east of the site via a 225mm diameter drain.
 - Remaining surface water catchments are directed unrestricted via a traditional pipe network to the Boggymead Brook via a split 225mm diameter and 300mm diameter drain. Potential soakaway locations are indicated within CCTV survey however, require confirmation on site and are not envisaged to be functional, i.e. backing up and entering the positive drainage arrangement to watercourse.
- Drainage serving the Homestead, Teaching Building and Immersion Lab are presented to drain via a existing permeable paving, swale / detention basin and attenuation tank to existing drainage at a restricted rate of 18 l/s via a southerly route of the Mansion House (300mm diameter final connection).
- Drainage serving the Construction Centre is presented to drain via a traditional pipe network and attenuation tank to existing drainage at a restricted rate of 2.2 l/s (225mm diameter final connection).
- Drainage serving the Sports Pavilion is presented to drain via a traditional pipe network and attenuation tank to an existing pond in locality at a restricted rate of 18.1 l/s (225mm diameter final connection).

Although an all-encompassing CCTV survey of the entire College site is not available at this stage, the combination of CCTV survey and as-built information is considered to present a relatively accurate picture of the existing drainage arrangement.

It is however, recommended that a CCTV survey be completed to inform proposed connections to the existing drainage network up to the point of connection with the watercourse and public sewer to ensure levels, diameters vertical and horizontal alignments and the condition is understood. This to inform capacity assessment and any remedial works required to accommodate.

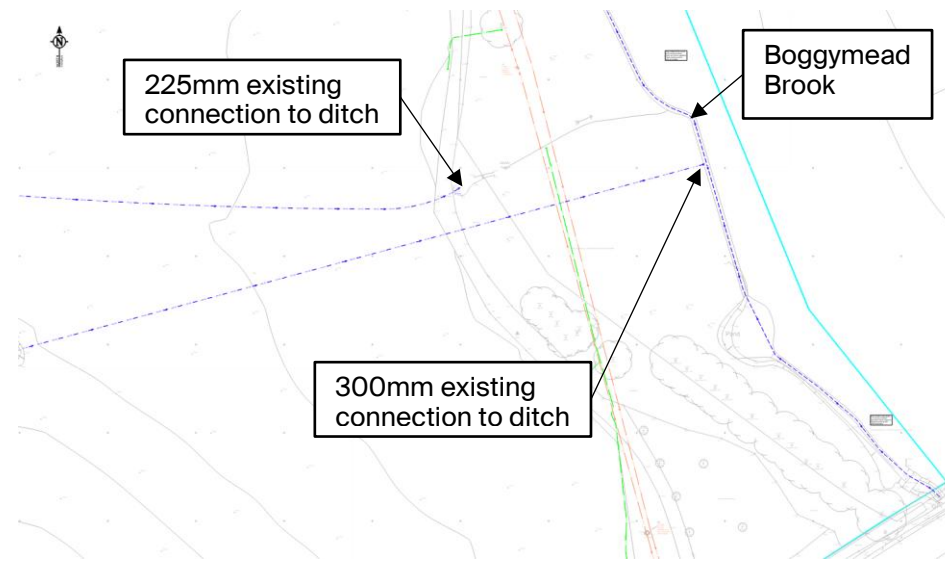


Figure 9: Extract from Survey Solutions topographic and utilities survey presenting the site's final connection to the Boggymead Brook

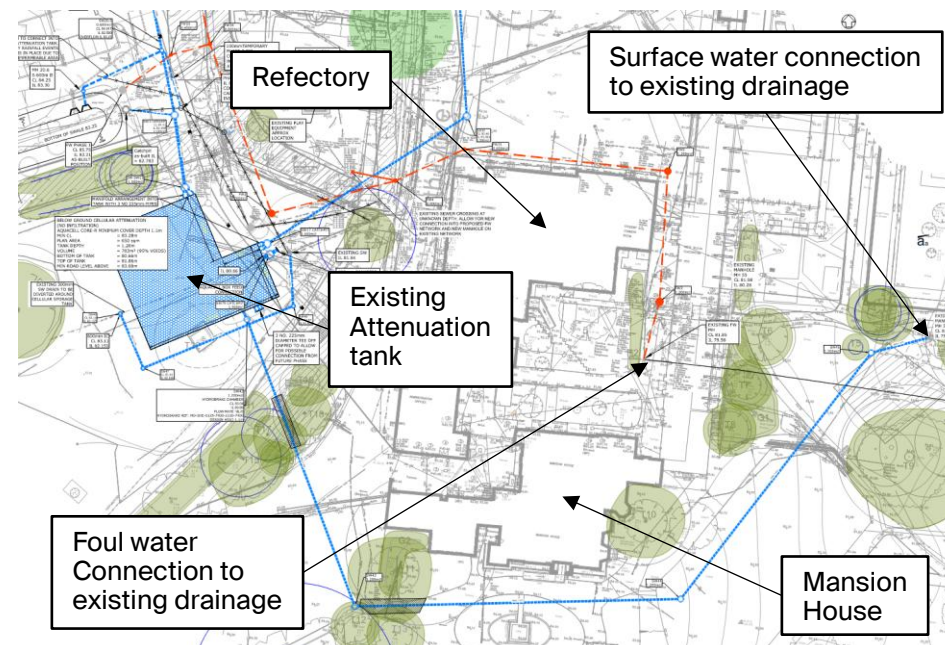


Figure 10: Extract from MLM Group as-built information serving the Homestead and Teaching Buildings presenting end of line attenuation tank and swale and connection to existing surface water drainage

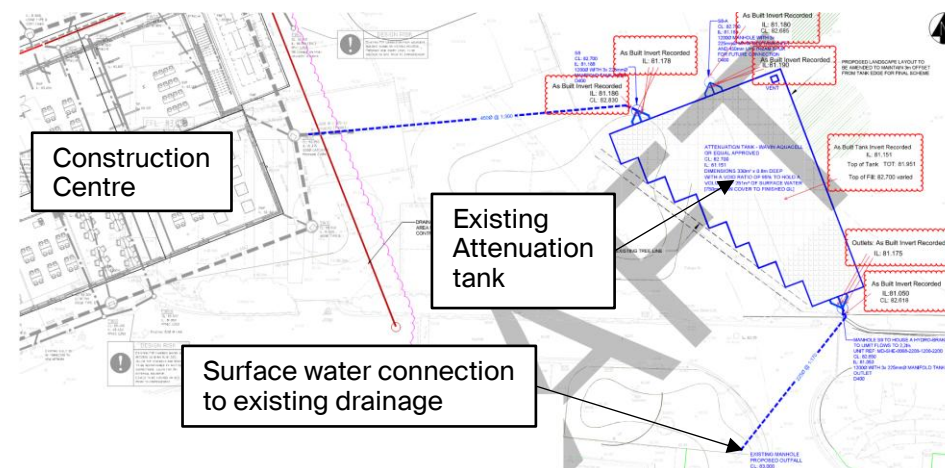


Figure 11: Extract from MLM Group as-built information serving the Homestead and Teaching Buildings presenting end of line attenuation tank and swale and connection to existing surface water drainage

5.3 Existing Surface Water Run-off Rates

As noted in **Section 3.3**, as much of the existing open land and buildings within the application red line boundary are to remain as existing and as such to remain draining as existing, only the areas within the Development Boundary have been considered in this assessment.

For comparison with development proposals, only the existing unrestricted runoff rates from the site's 41,822m² impermeable area where major works are to take place has been outlined within **Table 1**, calculated using the Modified Rational Method and are set out in **Table 2** below. These rates are based on annual max rainfall intensities for a storm duration of 15 mins using the Wallingford Procedure.

$$Q = 2.78C.i.A$$

Where Q = Existing peak runoff (l/s), C = non-dimensional runoff coefficient comprising; C_v (volumetric runoff coefficient) of 1.0 and C_r (routing coefficient) of 1.3, i = FEH rainfall intensity for grid reference 518264,207801 and A = total catchment area being drained.

Considering the interlinked nature of the existing drainage arrangement between un-assessed and assessed areas of the College site and likelihood that existing drainage cannot accommodate unrestricted flows up to the 100yr + 40% storm event, an assessment based on pipe diameters is not thought a more accurate method of calculation for this site.

The 4,552m² outlined within **Table 1** where minor works are to take place with proposals indicating an increase in landscaped area, i.e. reduced external impermeable area, has not been calculated as rates are expected to remain the same / attain a minor betterment to existing unrestricted rates.

Relating to the 981m² area outlined within **Table 1** directed to attenuated areas in the existing case, a proportioned rate has not been developed, the restricted rate as presented within as-built information as discussed in **Section 5.2** and as presented in **Appendix A**.

Table 2: Existing surface water runoff rates

Storm event	Rainfall Intensity, i (mm/hr)	Existing brownfield runoff rate (l/s)
1 in 2-year	30.0	453.4
1 in 30-year	82.3	1244.2
1 in 100-year	104.1	1573.7
1 in 100-year + 40%	145.8	2203.2

Note that FEH data cannot be used to generate 1 in 1 year rainfall profiles.

6. Proposed Development

6.1 Development Description

The hybrid planning application development proposals are described as follows in relation to the College site and divided between full and outline submission:

Full planning application for the construction of homes (use class C3); new local centre and community facility (use classes E(a to f) and F); a children's home (use class C2); demolition and renovation of existing college buildings; construction of new college buildings (use class F1.); the creation of Active Travel Routes including footpaths for walking, cycling and equestrian activities; removal and planting of trees; along with the laying out of green infrastructure (including publicly accessible open space) and habitat creation; drainage infrastructure, earthworks, new means of access and alterations to existing access points.

Outline planning application (access only, all other matters reserved) for the construction new homes (use class C3); new extra care home dwellings (use class C2); land for the construction of a new primary school (use class F.1); demolition and renovation of existing college buildings; construction of new college buildings (use class F1.); the construction of new sports facilities and pitches; the creation of Active Travel Routes including footpaths for walking, cycling and equestrian activities; removal and planting of trees; new energy centre; new recycling facilities; new car parking facilities; along with the laying out of green infrastructure and habitat creation; drainage infrastructure, earthworks, pedestrian and cycle routes, alterations to existing access points.

The phasing of the development is indicative allowing different phases to commence at different times and independently (severable) from each other. The outline phases will be the subject of parameter plans and design codes".

This report outlines Sustainable Drainage Strategy covering the Oaklands College redevelopment only and should be read in conjunction with JNP Group's Flood Risk Assessment (FRA) and Foul & Utilities Assessment covering the entire development and Sustainable Drainage Strategy covering the new residential development.

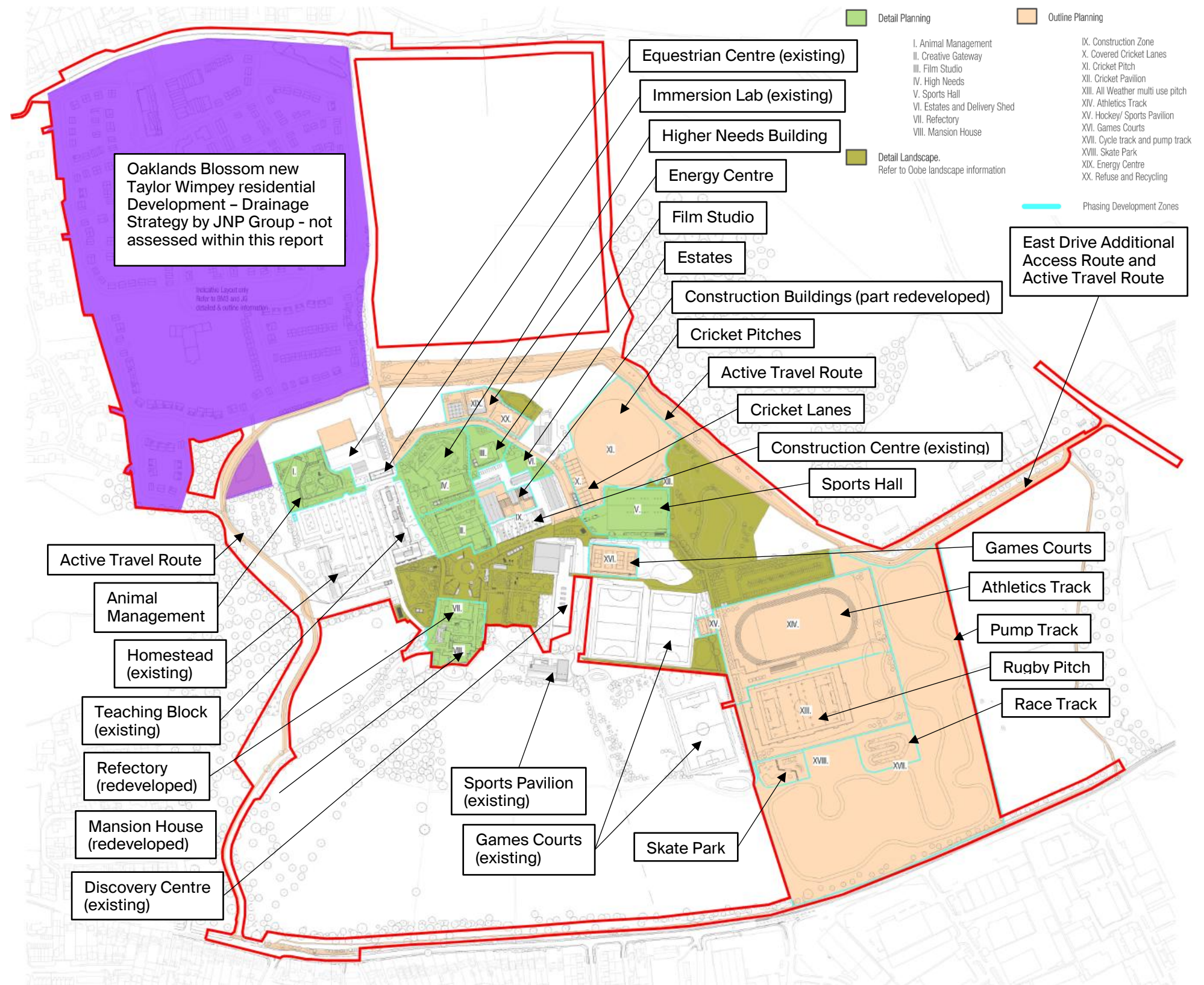


Figure 12: Proposed development outline vs full application

6.2 Proposed Catchments

As noted in **Section 3.3**, as much of the existing open land and buildings within the application red line boundary are to remain as existing and as such to remain draining as existing, only the areas within the Development Boundary have been considered in this assessment.

Of this Development Boundary, to offer direct comparison with that presented within **Table 1**, separate catchments have been provided in **Table 3** where:

- Minor alterations to landscaping are proposed in proximity to the Mansion House and rear of the Refectory, also where the East Drive is to remain draining unrestricted as existing,
- Existing drainage is directed to attenuation tanks sized in accordance with the approved Drainage Strategy prepared by Sweco (ref: 669669-MLM-ZZ-XX-RP-C-0001 Rev 03, dated 25th August 2020) with a restricted discharge to the existing surface water drainage network

See areas are indicated in **Figure 13** with comparison presented in **Figure 4**.

The remaining catchment area takes into account the major development proposals, this separated into 4no. distinct catchments which are to be directed to independent end of line detention basins (via at-source SuDS as far as feasible) and swale. Catchments A, B and C directed to detention basins are proposed to connect to the existing surface water drainage network, Catchment D requiring a new connection to the Boggymead Brook.

A PIMP factor of 100% is taken for all impermeable areas, with a reduced 30% taken for all positively drained landscaped spaces (i.e. the rugby pitch, cricket pitch, equestrian menage and the athletics green).

Table 3: Proposed area take-off

Area designation	Proposed impermeable area (m ²)
Catchment Area A draining to Detention Basin 01 & 02	50,210
Catchment Area B draining to Detention Basin 03	8,927
Catchment Area C draining to Detention Basin 04	25,418
Catchment Area D draining to Swale	2,476
Catchment area to remain draining to existing drainage unrestricted where minor alterations are proposed	4,175
Catchment area draining to existing attenuation tank via existing drainage	1,087
Total	92,293

Considering the existing impermeable area outlined in **Table 1** for the area draining unrestricted where minor works are proposed, resultant of an increase in landscaping, a net loss of 377m² is achieved and although the area is proposed to remain draining unrestricted as existing, would be expected to provide a betterment to current unrestricted flows off-site.

Considering the catchment draining to existing attenuation tanks, a minor increase in catchment of 106m² is required. The additional area, comprising the new Cycle Store shown in **Figure 13** to the west of the Refectory, falls naturally toward the existing access road and cannot practically be directed elsewhere. The area is therefore proposed to be collected by the existing access road gullies connecting to the attenuation tank.

Considering a large portion of the proposed drained catchment directed to attenuation tanks as presented within the Sweco Drainage Strategy (**Figure**

3) was never constructed / connected, this negligible increase in catchment is not considered to pose an increased risk of flooding and considered accommodatable within existing attenuation. However, were existing gullies unable to be accommodate the increase, runoff would drain overland to the proposed drainage arrangement, and be directed to either existing unrestricted drainage or to the proposed SuDS strategy draining at Greenfield QBar and have very little impact to calculation and off-site rates.

As noted in **Section 3.3**, remaining areas within the Development Boundary comprising the diverted Public Right of Way bounding the College site and the new pump / cycle track are proposed to drain to adjacent landscaping their permeable surface or filter drains, swales or similar where impermeable, subject to detailed design and not discussed further in this report.

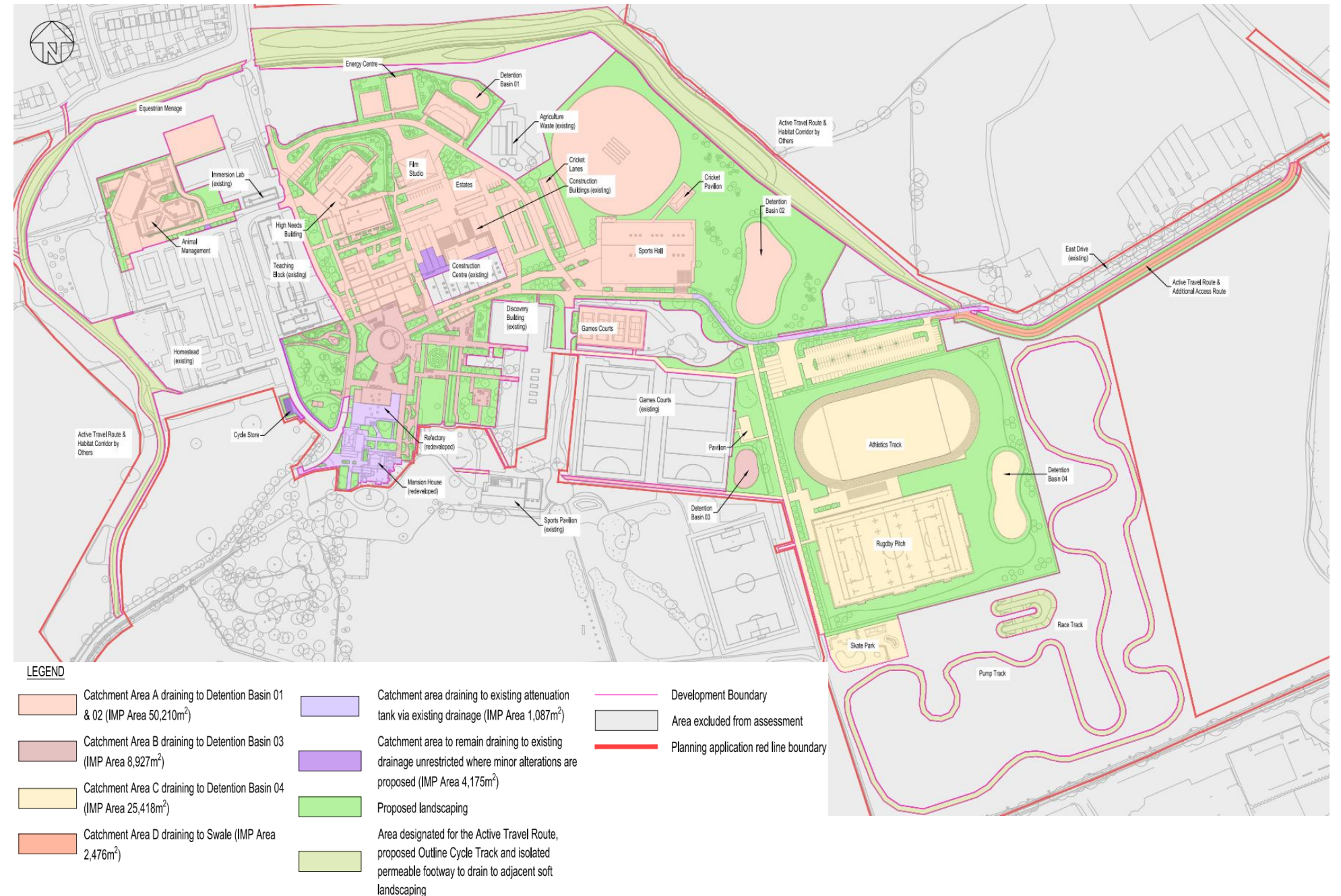


Figure 13: Proposed catchment areas within the Development Boundary

7. Proposed SuDS Strategy

This section sets out the principles of the surface water drainage strategy for the site and evaluates the methods for discharge, treatment, and attenuation.

The following sections of this report should be read in conjunction with drainage strategy drawings and calculations within **Appendix C** and **D**, and the accompanying HCC Sustainable Drainage Proforma within **Appendix E**.

The surface water drainage system has been designed such that there is no flooding on site for the 1 in 30-year storm event, and all flows for the 1 in 100-year storm event plus an appropriate allowance for climate change will be contained safely within the site boundary (where feasible to do so) with no breach of building thresholds.

All calculations consider the *Climate change allowance note for Hertfordshire* with allowance for 40%. Considering the proposed development is a College, any urban creep in impermeable area is considered to require further planning application and as such, this percentage has been set to 0%.

All surface water drainage serving ground floor and above is proposed to be drained by gravity, with separate foul and surface water networks to be provided, in accordance with Part H of the Building Regulations.

7.1 Local Policies

The proposed sustainable drainage strategy uses a series of techniques to manage surface water run-off as close to the source as possible. Managing surface water in this manner provides water quality improvements, reduces future maintenance requirements and enhances amenity value for end users.

The following documents have been reviewed during preparation of this SuDS strategy:

- National Planning Policy Framework (NPPF), 2024
- National Planning Practice Guidance (PPG), 2022
- National standards for sustainable drainage systems (SuDS), 2025
- St Albans City & District Council (SACDC) Local Plan Review, 1994
- St Albans City & District Council (SACDC) Draft Local Plan 2024–2041, 2024
- Hertfordshire County Council (HCC) Local Flood Risk Management Strategy 2, 2019
- Hertfordshire County Council (HCC) LLFA Summary Guidance for developers – Management of Surface Water Drainage, 2021
- Sandridge Parish Neighbourhood Plan 2019 – 2036, 2020

7.2 Greenfield Runoff Rates

The HR Wallingford online tool has been used to calculate the greenfield runoff rates for the site's impermeable area draining to proposed SuDS using FEH Rainfall data – see **Table 4**. A total of 87,031m² considering Catchment Areas A, B, C and D from **Table 3**.

Table 4: Greenfield runoff rates

Storm event	Greenfield runoff rates (l/s/ha)	Greenfield runoff rates (l/s)
1 in 2-year	2.6	22.6
QBar	3	26.1
1 in 30-year	6.9	60.1
1 in 100-year	9.6	83.5

In accordance with HCC guidance and following pre-application meeting, Greenfield QBar rates are to be targeted as part of proposals.

7.3 Evaluation of Appropriate SuDS Techniques

The following drainage hierarchy has been considered and appraised which aligns with that presented within the National standards for sustainable drainage systems:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer.

Appraising the use of rainwater reuse

Rainwater re-use techniques for irrigation purposes is to be explored with the design team through the design stages. The addition of water butts to be included where beneficial.

Appraising the use of infiltration techniques

The ability to discharge surface water via infiltration has been assessed against the multiple site investigations completed across the existing development as outlined within **Section 3.5**.

Although the Sands & Gravels noted within below-ground strata offers the potential to discharge via infiltration, consideration for the groundwater levels found on site are required to be taken into account in line with best practice, allowing for a minimum of 1m between base of SuDS feature and highest predicted groundwater level.

Considering the existing and proposed site layout, natural topographic falls from west to east, the requirement to target Greenfield QBar rates and preference for SuDS to be located above-ground as far as feasible, although at-source SuDS are proposed to be included, this will not be sufficient to reduce rates down to Greenfield QBar and large end of line attenuation structures will be required along the eastern periphery of the site.

Considering the very shallow ground water levels found on the site's eastern periphery where the Lowestoft Formation Sands and Gravels are near surface (PH9 - 0.29mBGL to 0.45mBGL and WS07 & WS10 0.56mBGL to 1.54mBGL), infiltration is deemed unfeasible. Although not surveyed, it is envisaged that groundwater levels would remain similarly heightened as topographic levels fall closer to the Boggymead Brook.

At this stage the SuDS strategy has therefore been developed based on a lined system to mitigate the impact of groundwater seepage with discharge off-site.

The feasibility of infiltration as a practical method of discharge for isolated locations of permeable paving and rain gardens is recommended to be investigated with further BRE infiltration testing. However, considering the variable ground conditions across the site with the presence of Clay lenses, it is envisaged that testing would be required in a number of locations to inform the strategy with rates expected to vary with location.

It should also be noted that infiltration was previously discounted for the previously consented scheme on grounds of medium to high risk of swallow holes considering the below Chalk layer.

Appraising attenuation in green infrastructure

Multiple raingardens are proposed throughout the College site where development allows with the aim to provide multiple benefits of at-source capture where feasible. Rain gardens have typically been sited where permeable paving is unable to be introduced as a consequence of envisaged

traffic flows and utilities. However, in a number of locations, rain gardens are also sited adjacent to existing roof and hardstanding areas where limited works are proposed to capture flows in biodiverse landscaping rather than traditional gully drainage as is in the existing case.

A portion of the main circular route along the northern periphery of the College site and along the East Drive Public Right of Way and additional access route is to also be directed to attenuation features via a swale where land is available to do so. This forming a shallow 1:3 sloped ditch with wet-tolerant planting to be developed with the design team.

The landscape proposals will provide a net gain in biodiversity compared to the baseline, with the landscaping tailored to provide enhancement in biodiversity alongside amenity uses through diversity in plant species, including the use of species with a known value to wildlife and range in flowering periods and diversity in the structure of planting to create different habitat conditions.

Although discounted at this stage, the feasibility of including green roofs where proposed roof areas offer favourable conditions is recommended to be explored through the design process.

Appraising attenuation in tanks or sealed water features

Working closely with the design team, below-ground attenuation tanks have been avoided in lieu of more favourable above-ground lined detention basins with connection to existing drainage in proximity.

Permeable paving has also been proposed across the College site to provide water quality benefits prior to connection to the wider drainage network. At this stage, considering the topographic variation and presence of the surface water flood risk route through the centre of the site, all permeable paving proposed is for conveyance only. The ability for permeable paving to act as storage components in order to reduce end of line attenuation to be explored through detailed design.

Appraising discharge direct to a watercourse

The existing College site drains the majority of its surface water via 2no. connections to the Boggymead Brook. It is proposed to retain these final points of connection with all proposed sustainable drainage directed to existing upstream drainage. The re-use of existing drainage and any remedial works required is to be confirmed through detailed design stages.

A single new point of connection to the Boggymead Brook is envisaged required at this stage and is subject to approval with the LLFA via Land Drainage Consent. The formation of the new outfall to watercourse is to be discussed with the LLFA, proposed at this stage to consist of a simple sandbag headwall located within the existing bankside.

Where existing surface water drainage is shown to connect to foul / combined water drainage with ultimate connection to the Thames Water trunk combined water sewer, these are proposed to be redirected as far as feasible to the proposed surface water drainage network and end of line SuDS features where major works are taking place. Further investigation is recommended to take place through detailed design to ensure all connections in targeted areas are re-routed. Where minor works are proposed, the existing combined water drainage arrangement is to remain as existing.

Appraising controlled discharge to a surface water sewer or drain

As presented in Section 5.1, there are no surface water sewers in proximity to the site, the site being bounded on all sides by public combined water sewers.

Appraising controlled discharge to a combined sewer

Not required considering re-use of existing connections to watercourse.

7.4 Summary of SuDS Techniques & Strategy

In line with the drainage hierarchy, **Table 5** details the sustainable drainage systems (SuDS) techniques that have been considered suitable together with supporting rationale.

Table 5: SuDS evaluation

SuDS technique	Included?	Comment
Rainwater reuse	Y	Rainwater re-use techniques for irrigation purposes is to be explored with the design team through the design stages. The addition of water butts to be included where beneficial.
Infiltration devices	N	Not feasible due to a combination of shallow groundwater levels within the Lowestoft Formation and proposed SuDS location / level requirements
Attenuation in green infrastructure (i.e. green roofs, rain gardens etc.)	Y	The inclusion of rain gardens and swales to act as at-source SuDS providing multiple benefits is proposed where proposed landscaping allows and impermeable catchments can be directed toward them
Attenuation in tanks or sealed water features	Y	Lined detention basins and permeable paving are proposed to restrict flows prior to discharge to the existing surface water drainage network.
Rainwater discharge direct to a watercourse	Y	Proposal to connect to existing surface water drainage with existing connection to the Boggymead Brook
Controlled rainwater discharge to a surface water sewer or drain	N	There are no surface water sewers in proximity to the site.
Controlled rainwater discharge to a combined sewer	N	Not required considering connection to existing surface water drainage with existing connection to the Boggymead Brook

7.5 Proposed SuDS Features

7.5.1 Permeable Paving

Permeable paving is proposed as far as feasible across the Development Boundary where proposed surfaces, structural loading and existing / proposed utilities allow. These areas mainly comprise proposed pedestrian footways and congregation areas. However, the introduction of a permeable paving sub-base extends to the menage, games courts / pitches and athletics track subject to specialist design.

Subject to further infiltration testing, all permeable paving comprises an impermeably lined 4/20mm coarse graded aggregate sub-base construction (30% voids) beneath the proposed surface. At this stage, permeable paving is proposed for conveyance only and as such no storage volume has been associated. The ability to temporarily store water at source via orifice control to reduce end of line storage to be explored through the design stages.

A total area of ~52,395m² is currently proposed, the depth varying across the site subject to the catchment directed to it and surface slope. Considering used for conveyance only, not all permeable paving has been hydraulically modelled. However, where modelled a depth of between 175mm to 375mm is proposed, a similar depth to extend across the site subject to hydraulic and structural necessities through design development.

Permeable paving provides treatment of surface water run-off through filtration, adsorption, bioretention and sedimentation, alleviating the need for further treatment where able to be accommodated.

7.5.2 Rain Gardens

Rain gardens are proposed in a number of locations across the site to provide enhanced biodiversity and habitat creation and treatment prior to connection to the wider drainage network, these currently totalling ~2,100m².

As these products are proprietary systems and similarly proposed for conveyance only, no volume allowance has been associated at this stage. Subject to design development, it is envisaged that these systems are to comprise a 4/20 crushed stone drainage layer with perforated pipe along the entire length, a sandy loam and vegetated 100mm freeboard layer placed atop with geotextile liner between. Subject to further infiltration testing, all rain gardens are to accommodate an impermeable liner. The ability to temporarily store water at source via orifice control to reduce end of line storage to be explored through the design stages.

7.5.3 Dry Swales

A dry swale is proposed along the northern boundary of the circular roadway to capture run-off, provide at-source treatment and convey flows to the wider drainage network.

This swale is formed of a 2m top width while maintaining a 0.5m base width and 1:3 side slopes and is hydraulically modelled with a Mannings n number of 0.03.

An additional dry swale is proposed adjacent to the proposed diverted Public Right of Way and additional access road along East Drive, this restricted at source via a hydro-brake to a peak discharge rate of 0.7 l/s. This swale is formed of a 3.5m top width while maintaining a 0.5m base width and 1:3 side slopes and is hydraulically modelled with a Mannings n number of 0.03.

Intermediary orifice controlled check dams at regular intervals along the length of each swale to provide additional storage to the northern swale and accommodate the existing site slope along the southern swale has not been modelled at this stage and is to be developed through detailed design. The requirement for vehicle restraint to be confirmed through detailed design.

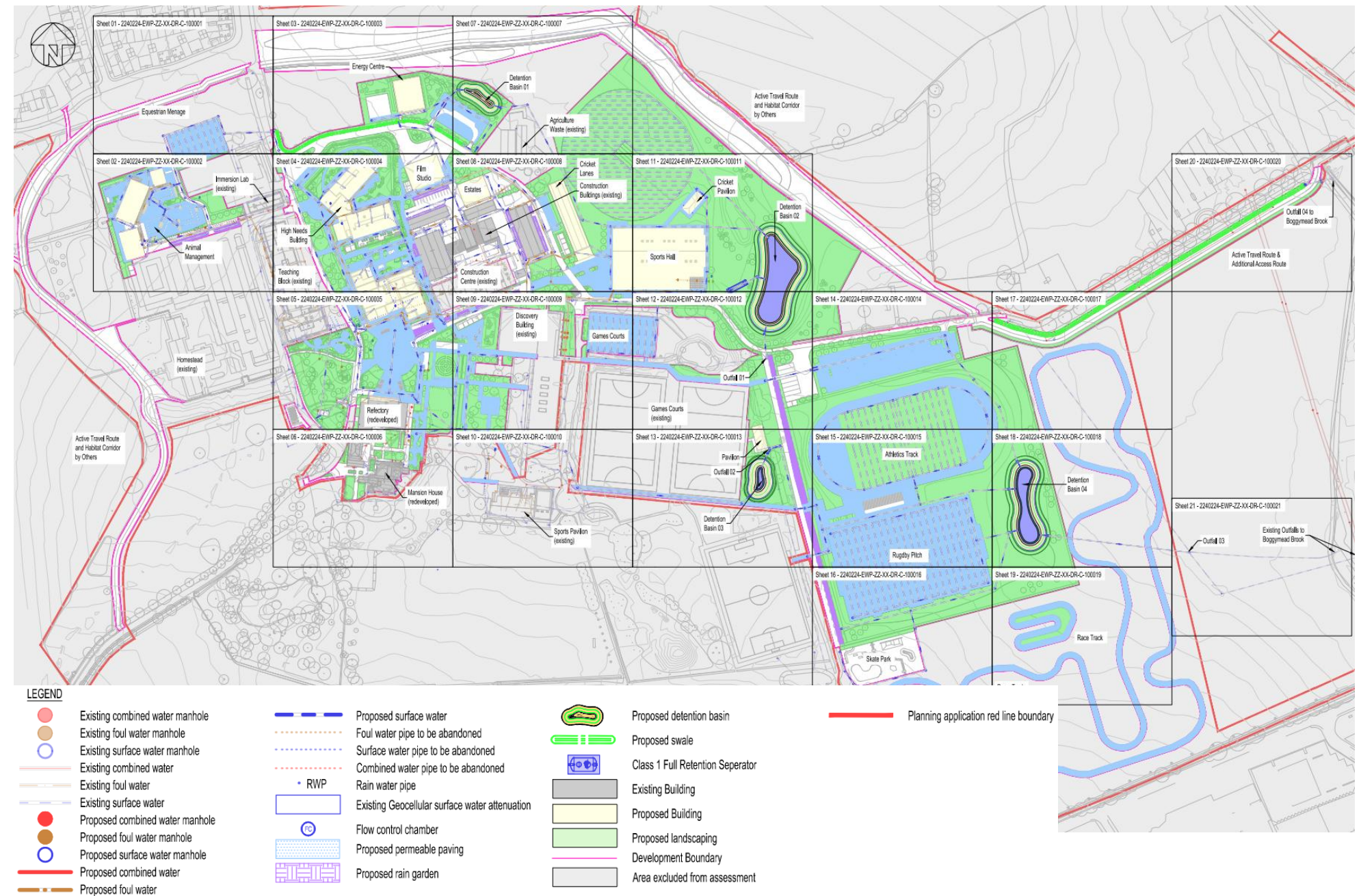


Figure 14: Proposed drainage strategy within the Development Boundary

7.5.4 Detention Basins

4no. detention basins located to the north-east and east of the College site are proposed to allow a gravity connection and provide the necessary attenuation required to meet Greenfield QBar rates.

Detention basins vary in depth and plan area subject to their location and topographic level.

All ponds are proposed to be lined and formed with side slopes of 1:3, a maintenance strip of between 1.5m to 3m at its top and a 1.5m marginal bench at base prior to 400mm depth allowance beneath for a planted permanent water level. The earthworks required to form basins to be developed through design stages. Further benched levels to be considered.

These planted detention basins aim to provide biodiversity and habitat creation and a secondary form of treatment prior to connection to the existing surface water drainage network.

All ponds are sized to accommodate the 100yr + 40% storm event with a 300mm freeboard. A Hydro-brake control proposed to restrict flows to Greenfield QBar rates. See **Table 6** for basin volumes and proposed discharge rates downstream of Hydro-brake controls.

See **Figure 14** and **Appendix C** for locations and further parameters and **Appendix D** for supporting calculation.

Table 6: Detention Basin Parameters

Reference	Volume of storage (inc. freeboard) (m ³)	Peak Discharge rate (l/s)
Detention Basin 01	646	5.1
Detention Basin 02	5,211	15.0
Detention Basin 03	990	2.7
Detention Basin 04	2,694	7.5

7.5.5 End of Line Storage SuDS Half Drain Down Time

All end of line detention basins and swale have been designed to achieve Greenfield QBar rates. As a result, a half drain down time of 1440 minutes is shown achievable for the 30yr storm event. However, not achievable up to the 100yr + 40% design storm event.

In accordance with recommendations made by HCC during pre-application meeting, where this is the case, a sensitivity check of the 100yr + 40% storm event followed by a peak 30yr storm event has been assessed and is accommodatable within end of line detention basin and swale freeboards. A resultant minor increase in flow rate is noted considering the increased head on the proposed Hydro-brake. However, this is considered to offer no increase in flood risk off-site.

7.6 Summary of Proposed Surface Water Discharge Rates

A comparison of the proposed runoff rates considering Catchments A, B, C and D has been made against the existing unrestricted brownfield rates listed in **Table 2** and a % betterment indicated for each storm event. Detention Basin 01 has no off-site contribution as it connects to Detention Basin 02.

Table 7: Comparison of existing and proposed surface water runoff rates

Storm event	Existing runoff rates (l/s)	Proposed runoff rates (l/s)	Percentage improvement over existing rates
1 in 2-year	453.4	24.8	95%
1 in 30-year	1244.2	25.3	98%
1 in 100-year	1573.7	25.5	98%
1 in 100-year + 40% CC	2203.2	25.9	99%

The proposed rates therefore meet the Greenfield QBar rate proportional to the total drained catchment area of 87,031m² as presented in **Table 4**.

7.7 Exceedance Routes

While all storage SuDS have been designed to accommodate surface water runoff up to the 100 year + 40% climate change event, 2D analysis has been performed to determine where any flooding would occur within the proposed network up to the 100 year + 40% climate change event in addition to consideration of an event exceeding this, i.e. in the event of blockage or extreme weather event.

By proposing large-scale at-source SuDS as far as feasible as opposed to traditional gully / piped systems, it is considered that the majority of flows should be able to enter the drainage network without causing issues of localised backing up. Where traditional drainage is required, along the circular link road for instance, flows would follow the natural topographic surface away from existing / proposed buildings and toward proposed SuDS and the wider landscaping.

In the unlikely event that the proposed SuDS system is inundated or in the case

of temporary blockage, rainwater would either back up and re-enter the drainage network at a lower topographic level or pond in areas of landscaping prior to re-entry.

In the event of exceedance of proposed detention basins, adjacent landscaping is to form a localised depression in the detention basin maintenance strip to direct flows to adjacent landscaping.

It is therefore considered that proposals pose a low risk on and off-site.

Regarding the surface water flow path passing through the centre of the site, no additional risk is posed to existing or proposed buildings, proposals of flood mitigation in relation to the Refectory to use flood barriers as referred to within JNP Group's FRA.

Considering Detention Basin 03 is located in proximity to the surface water flow path over the existing games courts, levels of the maintenance strip are proposed to be raised 300mm above existing levels so not to impact. A similar consideration to be explored to the proposed swale serving the East Drive additional access route and Public Right of Way with potential requirement for it to be part piped along its length to minimise impact to the existing flow path.

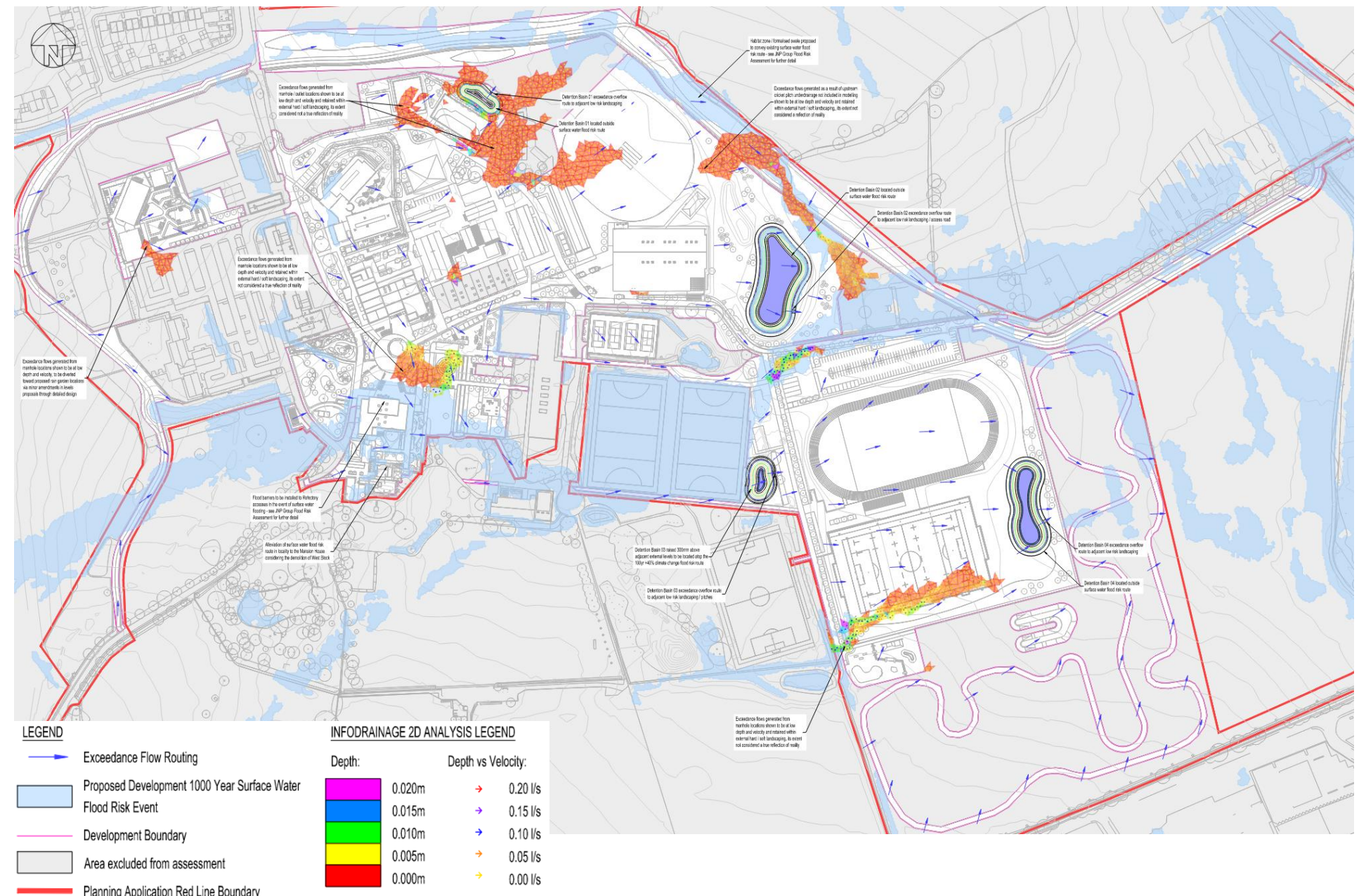


Figure 15: Proposed exceedance routing strategy within the Development Boundary with JNP Group's 1% +40% climate change surface water flow path

7.8 Temporary Drainage for the Construction Phase

Temporary drainage requirements for the construction phase will require early contractor input to detail how surface water will be managed during construction. It is recommended that this be set as a pre-commencement condition to be obtained in advance of works starting on site.

7.9 Pollution Prevention and Surface Water Treatment

Pollution control and treatment has been developed in line with the recommendations and guidance within the CIRIA SuDS Manual C753.

The Simple Index Approach has been used to evaluate the site's pollution hazards and proposed mitigation. The Simple Index Approach assigns pollution indices to different land use classifications and mitigation indices to SuDS elements. Depending on whether surface water is being discharged to the ground or to surface waters, the mitigation indices can be used to provide a total mitigation index which is equal to or higher than the pollution hazard index.

The below ground drainage network ultimately discharges to a watercourse.

Pollution hazard indices for land usage have been evaluated in accordance with the CIRIA SuDS Manual – refer to **Table 8**, land use hazards between non-residential roofs to the equivalent of commercial yards in proximity to the proposed film studio to the north of the site.

Table 8: Pollution hazard indices for various land uses (taken from the SuDS Manual Table 26.2)

Land use	Total suspended solids (TSS)	Metals	Hydrocarbons
Non-residential roofs	0.3	0.2 (up to 0.8 if potential for metals to leach from roof)	0.05
Low traffic roads / car parks (<300 traffic movements per day)	0.5	0.4	0.4
Roads and car parks with frequent change, commercial yard and delivery areas	0.7	0.6	0.7

Mitigation indices for the proposed SuDS solutions discharging to surface waters are shown in **Table 9**.

Table 9: SuDS mitigation indices for discharge to surface waters (taken from the SuDS Manual Table 26.3)

SuDS component	TSS	Metals	Hydrocarbons
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Proprietary Treatment – Class 1 Retention Separator	0.8	0.6	0.9

Assessing the above tables in relation to the Development Boundary proposals:

- Where permeable paving is proposed (in majority footways and congregation areas), sufficient mitigation is achieved.

- Where rain gardens are proposed to serve impermeable hardstanding and roofs in proximity, sufficient mitigation is achieved. The benefit of connection to the downstream detention basing providing a further mitigation.
- Where impermeable carriageway falls toward proposed swales (considered to be a low traffic route only serving the College site), sufficient mitigation is achieved. The addition of further downstream mitigation provided for the northern circular roadway via detention basin.
- In relation to the film studio parking area and the coach parking area where permeable surfaces are not achievable, the inclusion a Class 1 full retention separator is required to achieve sufficient mitigation. This provided upstream of Detention Basin 01 and 04 connected to.
- Where remaining impermeable roadways and hardstanding are unable to be captured initially by at-source SuDS, gullies and channel drains would provide an element of pollution mitigation, but as this is not considered sufficient, a further Class 1 full retention separator is proposed upstream of Detention Basin 02.

It is therefore considered that sufficient mitigation is provided where development is proposed.

8. Operation and Maintenance Requirements

During the construction phase of the development, the responsibility for the maintenance of SuDS lies with the developer. Post-construction, all proposed drainage within the site is to be private (i.e. does not lie on public land) therefore all SuDS will be maintained by the site owner for the lifetime of the development.

The drainage system should be regularly inspected and maintained to ensure that it is kept clear of silt and debris. Permanent inspection records should be kept by the site owner or management company, recording any previous issues and future work to be carried out.

There are three categories of maintenance activities, as follows:

- Regular maintenance (including inspections and monitoring)
- Occasional maintenance
- Remedial maintenance

The sections below summarise the proposed schedule of maintenance for each SuDS element in accordance with the SuDS Manual.

Rain gardens

The general performance of rain gardens is listed below.

- Peak flow reduction: Good
- Volume reduction: Medium
- Water quality treatment: Medium
- Amenity potential: Good
- Biodiversity potential: Good

Maintenance requirements for rain gardens are listed in **Table 10**.

Table 10: Rain garden maintenance schedule

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal	Monthly
	Grass cutting – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
Occasional maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible	Annually
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required	Annually, or if bare soil is exposed over 10% or more of the filter strip area
Remedial actions	Repair erosion or other damage by re-turfing or reseed	As required.
	Re-level uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.

	Remove build up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required.
	Remove and dispose of oils or petrol residues using safe standard practices	As required.
Monitoring	Inspect filter strip surface to identify evidence of erosion, compaction, ponding, sedimentation, and contamination (e.g. oils)	Half yearly.
	Check flow spreader and filter strip surface for even gradients	Half yearly.
	Inspect gravel diaphragm trench upstream of filter strip for clogging	Half yearly.
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly.

Swales

The general performance of swales is listed below.

- Peak flow reduction: Medium
- Volume reduction: Medium
- Water quality treatment: Good
- Amenity potential: Medium/Good
- Biodiversity potential: Medium

Maintenance requirements for swales are listed in **Table 11**.

Table 11: Swale maintenance schedule

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter and debris removal	
	Grass cutting – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
Occasional maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter, and cut back adjacent vegetation where possible	Annually
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required	Annually, or if bare soil is exposed over 10% or more of the filter strip area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required.
	Re-level uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.

	Remove build up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required.
	Remove and dispose of oils or petrol residues using safe standard practices	As required.
Monitoring	Inspect filter strip surface to identify evidence of erosion, compaction, ponding, sedimentation and contamination (eg oils)	Half yearly
	Check flow spreader and filter strip surface for even gradients	Half yearly
	Inspect gravel diaphragm trench upstream of filter strip for clogging	Half yearly
	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Detention basin

The general performance of a detention basin is listed below.

- Peak flow reduction: Good
- Volume reduction: Poor if not infiltrating, Good if infiltrating
- Water quality treatment: Medium if not infiltrating, Good if infiltrating
- Amenity potential: Good
- Biodiversity potential: Medium if not infiltrating, Good if infiltrating

Maintenance requirements for detention basins are listed in **Table 12**.

Table 12: Detention basin maintenance schedule

Maintenance schedule	Required action	Frequency
Regular maintenance	Litter removal.	As required
	Grass cutting – public areas.	Monthly (during growing season)
	Grass cutting – meadow grass.	Half yearly (spring, before nesting season, and autumn)
	Inspect vegetation to basin edge and remove nuisance plants (for first 3 years).	Monthly (at start, then as required)
	Tidy all dead growth before start of growing season.	Annually
Occasional maintenance	Remove sediment from the main body when basin volume is reduced by 20%.	>25 years (usually).
Remedial actions	Repair of erosion or other damage.	As required.
	Repair/rehabilitation of inlets, outlets and overflows.	As required.
Monitoring	Inspect structures for evidence of poor operation.	Monthly/after large storms.
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly/after large storms.

	Inspect silt accumulation rates and establish appropriate removal, frequencies.	Half yearly.
	Check penstocks and other mechanical devices.	Half yearly.

Pervious paving

The general performance of pervious paving is listed below.

- Peak flow reduction: Good
- Volume reduction: Good
- Water quality treatment: Good
- Amenity potential: Poor
- Biodiversity potential: Poor

Maintenance requirements for pervious paving are listed in **Table 13**.

Table 13: Pervious paving maintenance schedule

Maintenance schedule	Required action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' 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 or soil slip, has been raised to within 50 mm 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 or a hazard to users.	As required.
	Rehabilitation of surface and upper sub-structure.	As required (if infiltration performance is reduced as a result of significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	3-monthly, 48 h after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface and chambers (where may cause risks to performance)	Monthly
	Inspection of manholes, silt traps and catchpits to assess silt accumulation	Monthly (and after large storms)
	Removal of accumulated silt from silt trap and catchpit sumps	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents	As required
	Cleaning/jetting of pipework if silt/debris is building up in system	As required
Monitoring	Inspect/check all inlets, outlets, and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms

NOTE: Manhole covers can be heavy and suitable lifting equipment/procedures should be used. Where possible, personnel should not enter manholes to carry out maintenance.

Gullies and linear drains

Inspection and removal of debris from silt trap every 3 months, preferably after leaf fall in the autumn. (Timeframe can be adjusted to suit actual site conditions.) Charge water trap where necessary.

Pumping stations

Pumping stations are to be maintained in accordance with the pump supplier/maintenance company requirements and in accordance with British Standards (BS EN 12056-4), i.e. inspections every quarter.

Unusual / unresolved problems

If the drainage system is still holding water following cleaning with a jetter, or the jetting of the system removes excessive amounts of debris this may indicate greater issues within the system. A CCTV survey is likely to be required and further advice should be sought from a drainage engineer.

The following are specific indicators which may trigger intervention:

- Witnessing waterlogged areas / standing or stagnant water / poorly drained areas, indicative of a blockage
- Removal of fallen leaves and debris particularly in autumn months
- Significant storm events are typically classed as MET Office weather alert Amber and above.

9. Conclusions

This Sustainable Drainage Strategy has been prepared on behalf of Oaklands College to support the hybrid planning application for the development of the Oaklands College.

With the aim to be in accordance with the National standards for sustainable drainage systems (SuDS) and Hertfordshire County Council SuDS policy as far as feasible, it is the intention to incorporate SuDS into external landscaping with priority given to the top-most criteria of the drainage hierarchy.

Proposals comprise a series of detention basins subdividing proposed architectural and landscaping works supported by at-source conveyance SuDS; permeable paving, swales and rain gardens aimed to provide further enhanced amenity, biodiversity and water quality to the strategy. This strategy has been developed in close collaboration with the design team at an early stage in order to locate above-ground SuDS and reduce rates as far as feasible.

The total peak discharge from the site where connected to proposed SuDS considering the 1 in 100 year + 40% climate change event is 25.9 l/s. This provides a 99 % betterment to existing unrestricted rates and is within Greenfield QBar rates.

All surface water drainage serving proposals are to be drained by gravity to proposed SuDS and the existing surface water drainage network, with separate foul and surface water networks to be provided, in accordance with Part H of the Building Regulations. Where existing surface water connections are shown connected to foul water drainage within portions of major development, these have been re-routed to the proposed drainage network. Where minor works are proposed or areas to remain as existing, the drainage arrangement is to remain as existing.

As connection of surface water flows is proposed to connect to existing surface water drainage, ultimately discharging to watercourse, the Sewer Authority has not been contacted. However, as a new connection to watercourse is envisaged required, a Land Drainage Consent application will be required in consultation with the Lead Local Flood Authority. Considering the significant rate betterment achieved as part of the proposed works, the site's impact to the existing watercourse profile is envisaged to be improved

In conclusion, it is considered that there are no SUDS related reasons why the development should not be supported by SACDC, HCC and other statutory bodies.

Appendices

Appendix A: Site Survey

Service	Symbol	Color	Line Style
ST	ST	Red	Solid
AC	AC	Blue	Solid
GC	GC	Green	Solid
UT	UT	Yellow	Solid
OT	OT	Purple	Solid
FC	FC	Orange	Solid
GC	GC	Green	Solid
UT	UT	Yellow	Solid
OT	OT	Purple	Solid
FC	FC	Orange	Solid

DETECTION METHOD
IN ACCORDANCE WITH PAS 128:2014 SURVEY TYPE B

Drainage Survey
All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber shapes and service data recorded from ground level. All connections from GPs, Outlets, Drains, VPs, RE's and manholes have been proven wherever possible using suitable connections (AC) and/or sonde instrumentation where applicable. Where these methods have proved unsuccessful then assumed (AR) straight line connections will be shown.

Utility Cable Survey
All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber shapes and service data recorded from ground level. Pipework has been traced, accessed and collected for planned crossing. Change panel, including manhole covers not located by topographical survey, may be taken from CCTV change and will be shown as indicative only.

Electricity
Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Telecoms
BT cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Due to current laws and legislation protecting all BT apparatus, cabling can only be located remotely. We therefore compare all our telecom findings against record information to produce the final service layout. In some instances, where high amount of cable ducts are present, we may only be able to identify a linear centre peak signal rather than identifying all the individual ducts. For further information regarding Telecoms apparatus, please contact Openreach directly.

Cable TV & Coax
Cable TV and Coax cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Fibre Optic
Fibre optic cables will have been predominantly located using GPR methodology. This is due to the materials used within fibre optic cabling. In some rare instances, tracer cabling or conductive non fibre optic cabling will be present within some or all ducting. When this is the case, both EML and GPR methodology will be combined to identify service network and achieve greater quality levels.

Lighting
LC, TS and/or Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Water Inc, Fuel Pipes and Hot Water Pipes
GASCO and/or WMMV pipe work will have been attempted and located using both EML & GPR methodology with electronically derived depths shown for the former and depths to crown levels shown for the latter. When the Gas/Water pipe work is constructed using conductive materials, then we are able to employ multiple geophysical techniques to identify service networks and achieve greater quality levels. Where a non conductive material is used, GPR methodology will be employed to locate and plot the final service layout.

Ground Penetrating Radar
GPR methodology is used to identify and locate all non metallic, non conductive piping and cabling. We also employ GPR to obtain a greater accuracy levels on EML located services. The GPR has a greater accuracy rate on pipe or service diameter upward of 600mm. GPR, as size increments increase, so does the chance of detection. The GPR can produce varying results and as such, would not be used as an independent utility surveying instrument.

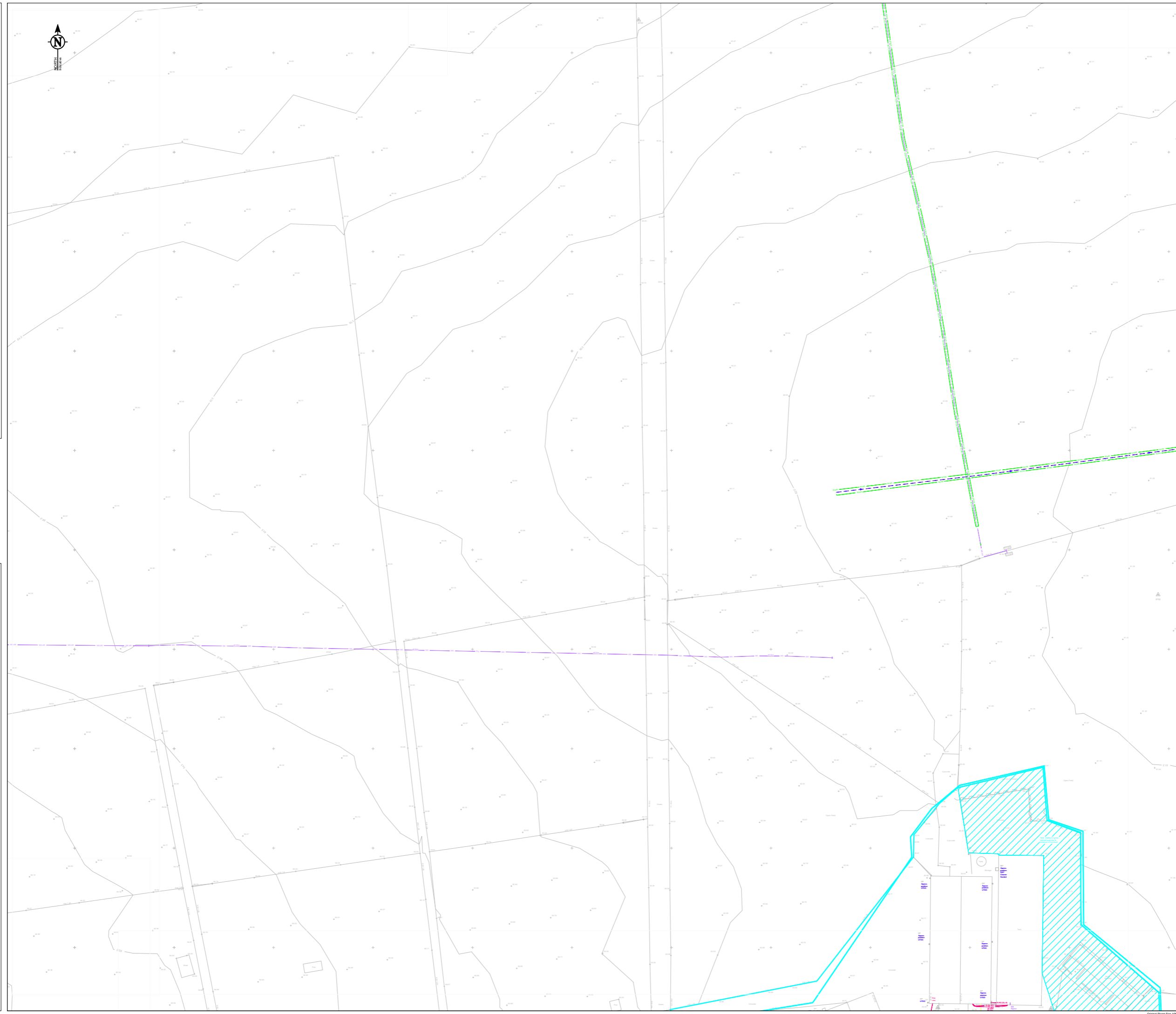
Unidentified Traces
All UT's will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Every effort has been made to identify the service but in this instance, it is not achievable. We recommend excavation work to determine identify and depth where applicable.

Scanning (G-C)
Scanning has been identified on site with a potential of an undetectable service present.

Assumed Routes & Telecoms Heating etc. Data
Assumed routes (AR) are shown if there is evidence that a service exists but we are unable to trace it whilst on site. The surveyor will attempt to locate various manholes/manholes (service evidence) etc. around site area to successfully determine an assumed route between these points. If there is little evidence on site but they believe a service is still present, then a common sense approach to an assumed route shall be employed.

Taken from records (TFR) are service routes that are taken from STAT record plans to previous survey information and overlaid onto our drawings.

SURVEY RECOMMENDATIONS



UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

ST	Street	ST	Street
AC	Asbestos Cement	GC	Gas
GC	Gas	UT	Unidentified Trace
UT	Unidentified Trace	OT	Optical Fibre
FC	Fibre Optic	LC	Lighting Cable
GC	Gas	TS	Telecoms
UT	Unidentified Trace	Sec	Secondary
OT	Optical Fibre	AR	Assumed Route
FC	Fibre Optic	TFR	Taken From Records
GC	Gas	SC	Scanning
UT	Unidentified Trace	AR	Assumed Route
OT	Optical Fibre	TFR	Taken From Records
FC	Fibre Optic	SC	Scanning

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out for verification of positions, depths and identification.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative tracing methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are affected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature. GPR depths to the top of a feature and drainage depth shown to invert, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records where available.

All services, drainage and utility routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are shown ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres, unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

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Do not scale from this drawing.

GENERAL SYNOPSIS

This survey has been carried out in accordance with PAS 128:2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specifications for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of UG-GI from Oaklands College. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL/DWG DRAWING INFORMATION

SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
GPS	Survey Stations	
COLLATED		
NO		

GENERAL SITE CONDITIONS

ADDITIONAL INFORMATION	EFFECT ON SURVEY RESULTS
Good	

DESKTOP UTILITY RECORDS (PAS 128:2014 SURVEY TYPE D)

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	NO	
WATER MAIN	NO	
GAS MAIN	PUBLIC	CHRYST GAS
TELECOM	PUBLIC	BRITISH TELECOMS
CABLE TV	NO	
ELECTRICITY	NO	
CO. PIPES	NO	
OTHER	NO	

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS
LAND SURVEYS
BUILDING SURVEYS
UNDERGROUND SURVEYS
SITE INVESTIGATIONS
MONITORING

0845 040 5969
survey-solutions.co.uk

PREPARE BEFORE COMMENCEMENT
PREPARE BEFORE COMMENCEMENT
PREPARE BEFORE COMMENCEMENT

PROJECT TITLE
OAKLANDS COLLEGE,
ST ALBANS

DRAWING DETAIL
UTILITIES AND DRAINAGE COMPOSITE DRAWING
SHEET 11 OF 28

CLIENT
OAKLANDS COLLEGE

SURVEYOR
SURVEY DATE
CHECKED BY
APPROVED BY

SCALE
1:250

ISSUE DATE

Original Sheet Size A1

