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FLOOD RISK ASSESSMENT

Tudor Centre extension, Hillingdon Hospital, Pield Heath Road, Uxbridge UB8 3NN

Prepared for: The Hillingdon Hospitals NHS Foundation Trust

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Document History

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Hertfordshire | Oxfordshire | Cambridgeshire | Bristol
postbox@glanvillegroup.com | www.glanvillegroup.com

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Appendices

1.0 Introduction

1.1 This Flood Risk Assessment and Drainage Strategy has been prepared by Glanville Consultants on behalf of The Hillingdon Hospitals – NHS Foundation Trust, Mace Ltd, in support of a planning application for the proposed extension of the Tudor Centre at Hillingdon Hospital, Uxbridge, UB8 3NN.

1.2 The purpose of this document is to assess the existing level of flood risk to the site and its surroundings within the context of the development proposals and to demonstrate a suitable drainage strategy for the disposal of surface water.

1.3 This assessment has been prepared in accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG) to the NPPF. It has also been prepared with reference to West London Strategic Flood Risk Assessment (West London SFRA).

1.4 This assessment was undertaken with reference to information provided and/or published by the following bodies:

- Ordnance Survey;
- British Geological Survey;
- London Borough of Hillingdon; and
- Environment Agency.

1.5 This report concludes that the site is not at an unacceptable risk of flooding and can be developed safely without increasing flood risk elsewhere, and that the development proposals comply with relevant planning policy concerning flood risk. The report demonstrates that suitable provision for the disposal of surface water from the proposed development is capable of being provided.

2.0 Site Description & Development Proposals

Site Location & Description

2.1 The site is located in Hillingdon, approximately 2km to the south-east of Uxbridge, and comprises part of the Hillingdon Hospital campus. The location of the site is shown on a plan included in Appendix A. The approximate centre of the site is located at Ordnance Survey National Grid reference TQ 06844 81678.

Development proposals

2.2 The proposals comprise the demolition and extension of the rear portion of the Tudor Centre located adjacent to the southern boundary of the Hillingdon Hospital campus, in order to create a new hub for medical education and training services within the Trust. The proposed extension will involve a footprint area of 320.6m^2, which results in an increase of approximately 268m^2 from the existing footprint of the building to be demolished. The proposed development also involves the construction of new footways around the building. Access to the site would be via the existing access roads from Royal Lane to the west and from Cobham Green Road to the east. A plan showing the proposed site layout is provided in Appendix B.

Existing Watercourse

2.3 The closest watercourse designated as a main river by the Environment Agency (EA) is the River Pinn located approximately 670m west of the site. The closest surface water feature is an ordinary watercourse that flows westwards, located along the northern side of the existing access road to the north of the existing building, towards the confluence with the River Pinn.

Topographical Survey

2.4 A topographical survey undertaken by Land Utility Group (ref. DAT / 9.0, dated January 2021) indicates that the existing Tudor Centre site generally falls from a high point of approximately 38.09m AOD in the south-eastern corner, to a low point of approximately 36.22m AOD to the north-western side of the site, adjacent to the existing access road. The topographical survey indicates that the site falls slightly in a north-westerly direction following the natural ground slope towards the ordinary watercourse. The topographical survey is included in Appendix C.

Geological Characteristics

2.5 Geological records published by the British Geological Survey (BGS) indicate the entire site is likely to be underlain by bedrock geology comprising clay, silt and sand from the London Clay Formation, as well as superficial deposits comprising sand and gravel from the Boyn Hill Gravel Member. Extracts from BGS mapping are included in Appendix D.

2.6 Soilscape mapping provided by Cranfield University on behalf of DEFRA shows that the site of the proposed development falls entirely on HOST soil class 22, which is described as "Loamy soils with naturally high groundwater". An extract from Cranfield University "Soilscapes" website is included in Appendix D.

Existing Drainage Regime

2.7 A site drainage survey shows a network of both foul and surface water drains currently serving the former Tudor Centre clinic. Surface water drains and manholes are located around the former Tudor Centre, whereby run-off from the roof area of the building is currently collected and discharged at an unrestricted rate into the watercourse located along the northern side of the access road. Surface water run-off from the existing access road, along the northern façade of the building, currently discharges into the watercourse via gullies.

2.8 Foul water drains and manholes are also currently situated around the existing building, whereby sewage from the building is currently collected and conveyed north towards the existing foul drainage network that currently serves the Hillingdon Hospital campus. The site drainage survey is included in Appendix E.

Groundwater Vulnerability

2.9 The EA defines Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The SPZs mapping indicates that the site is not located within an SPZ. However, Inner Zone (Zone 1) and Outer Zone (Zone 2) are located adjacent to the north of the site.

2.10 A Nitrate Vulnerable Zone (NVZ) is a conservative designation for areas of land that drain to nitrate polluted waters or waters which could become polluted by nitrates. The NVZs mapping indicates that the site is not located within a Surface Water NVZ.

2.11 The EA defines Drinking Water Safeguard Zones (SgZs) for water sources used for public drinking water supply. SgZs are catchment areas that influence the water quality for their respective Drinking Water Protected Area (Surface Water), which are at risk of failing the drinking water protection objectives. The site is located within a SgZ (Surface Water).

2.12 The bedrock Aquifer Designation Map published by the EA indicates that the bedrock underlying the site is classed as an Unproductive Strata. Unproductive Aquifers are geological strata with low permeability that have negligible significance for water supply or river base flow.

2.13 The superficial Aquifer Designation Map published by the EA indicates that the superficial drift of the site is classed as a Secondary A Aquifer. Secondary A Aquifers are permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers.

3.0 Planning Policy and Guidance

3.1 Set out below is a summary of the national and local planning policy and guidance relating to flood risk and surface water management that are relevant to the development proposals.

National

3.2 At a national level, the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG) to the NPPF ensure flood risk is taken into account at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development towards areas at lowest flood risk. The NPPF retains a risk based approach to the planning process and defines four Flood Zones to be used as the basis for applying the sequential test to consider a development in terms of Flood Risk Vulnerability Classifications, which define the type of development that is considered appropriate within each zone.

3.3 The NPPF establishes the Flood Zones as the starting point for assessment with the overarching aim to steer new development to areas with the lowest probability of flooding. The Flood Zones are defined as follows:

- Flood Zone 1 (Low Probability) comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
- Flood Zone 2 (Medium Probability) comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
- Flood Zone 3a (High Probability) comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Flood Zone 3b (The Functional Floodplain) comprises land where water has to flow or be stored in times of flood.

Local Policy and Guidance

West London Strategic Flood Risk Assessment (SFRA) Level 1[1]

3.4 The West London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow have commissioned the production of a joint Level 1 SFRA. The overarching aim of this SFRA is to provide the evidence base for ensuring development is steered away from areas identified most at risk from various flood sources, reducing the risk of flooding to its residents and buildings.

3.5 The purpose of this Level 1 SFRA is to provide a strategic overview of all forms of flood risk throughout the study area, now and in the future. This document and associated mapping delivered as part of the SFRA, will be used as an evidence base by the Boroughs to inform the preparation of Local Plans, including the application of the sequential test to future site allocations.

[1] http://westlondonsfra.london/

London Borough of Hillingdon Local Plan – 16 January 2020

3.6 Policy DMEI 10 (Water Management, Efficiency and Quality) states that "Applications for all new build developments (not conversions, change of use, or refurbishment) are required to include a drainage assessment demonstrating that appropriate sustainable drainage systems (SuDS) have been incorporated in accordance with the London Plan Hierarchy (Policy 5.13: Sustainable drainage)."

3.7 In addition, Policy DMEI 10 states that "All major new build developments, as well as minor developments in Critical Drainage Areas or an area identified at risk from surface water flooding must be designed to reduce surface water run-off rates to no higher than the pre-development greenfield run-off rate in a 1:100 year storm scenario, plus an appropriate allowance for climate change for the worst storm duration. The assessment is required regardless of the changes in impermeable areas and the fact that a site has an existing high run-off rate will not constitute justification."

4.0 Sources of Potential Flooding

4.1 Flood risk to the site has been considered from all likely sources of flooding, as defined in the NPPF and the Planning Practice Guidance to the NPPF. These include tidal, artificial sources (reservoir), fluvial, surface water, sewer and groundwater. The following paragraphs consider flood risk to the site from all of these sources.

Tidal

4.2 Given that there is no tidally influenced watercourse on or within the vicinity of the site, tidal flooding is not an issue that would prevent the development of the site.

Fluvial

4.3 The EA publishes its Flood Map for Planning on the GOV.UK website which shows the maximum extent of fluvial flooding. The mapping indicates that the site is located entirely within Flood Zone 1, beyond the limits of the 1 in 1,000 year fluvial flood event (<0.1%). It is therefore considered that the risk of fluvial flooding to the development is very low. An extract from the GOV.UK mapping is included within Appendix F.

Surface Water

4.4 The EA publishes a Flood Risk from Surface Water map on the GOV.UK website which indicates the predicted risk of surface water flooding in the event that rainwater does not drain away through normal drainage systems or soak into the ground. The mapping indicates that most of the site is at 'very low' risk of surface water flooding, with an annual probability of flooding of less than 1:1,000, with the northern side of the site, along the existing access road, located at 'low' (between 1:100 and 1:1,000 annual probability) and 'medium' (between 1:30 and 1:100 annual probability) risks of surface water flooding, associated with the ordinary watercourse potentially spilling onto the site. An extract from the GOV.UK surface water flood map is included within Appendix G.

Reservoir

4.5 The Environment Agency (EA) publishes indicative mapping on the GOV.UK website which shows the maximum extent of reservoir flooding in the unlikely event that a reservoir should fail. The mapping indicates that the entire site is located outside of a reservoir flood risk area. Therefore, reservoir flooding is not considered to be an issue that would prevent the development of the site for its intended end use.

Sewer

4.6 The West London SFRA includes data provided by Thames Water's historical sewer flooding dataset. The West London SFRA indicates that no sewer flood incidents have been recorded within the Hillingdon Hospital campus. Therefore, sewer flooding is not considered to be an issue that would prevent the development of the site for its intended end use.

Groundwater

4.7 The West London SFRA states that the majority of the sub-region is underlain by Thames Group (also referred to as London Clay) bedrock, a composition of silty clay/mudstone, sandy silts and sandy clayey silts of marine origin, which corresponds with a geological unit with a low hydraulic conductivity, where water does not easily move through it.

4.8 The West London SFRA provides an Areas Susceptible to Groundwater Flooding map (AStGWf), from the EA, which is based on some information from the BGS maps and information on superficial deposits. The data was produced to annotate indicative Flood Risk Areas for PFRA studies and allows the LLFAs to determine whether they may be at risk of flooding from groundwater. The AStGWf map indicates that the risk of groundwater flooding at the site is more than 25% but less than 50% (i.e. >=25% <50%).

4.9 The data shows the proportion of each 1km grid-square for which geological and hydrogeological conditions indicate that groundwater might emerge, it does not show the likelihood of groundwater flooding occurring, nor does it take account of the chance of flooding from groundwater rebound. This dataset covers a large area of land and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

4.10 Furthermore, there is no anecdotal evidence to suggest that groundwater flooding has occurred on the site. It is therefore concluded that the risk of groundwater flooding is very low and is not considered to be an issue that would prevent the development of the site for its intended end use.

Historic Flooding

4.11 The West London SFRA includes historical flood records and indicates that no historical flood incidents have been recorded within Hillingdon Hospital campus.

Summary

4.12 With the exception of surface water flooding, the site is considered to be at very low risk from all sources of flooding examined.

5.0 Flood Risk Assessment

Fluvial

5.1 The NPPF encourages a sequential, risk-based approach to determine the suitability of land for development. This document advises that the development of sites within Flood Zone 1 should be given preference where available.

5.2 Table 2 of the Planning Practice Guidance to the NPPF categorises different types of development into five flood risk vulnerability classifications:

- Essential Infrastructure;
- Highly Vulnerable;
- More Vulnerable;
- Less Vulnerable; and
- Water Compatible Development.

5.3 The NPPF classifies hospitals, as well as non-residential use for health services, nurseries and educational establishments as being 'More Vulnerable'. Table 3 of the PPG states that 'More Vulnerable' development is compatible with Flood Zones 1 and 2.

5.4 As discussed in Section 4 of this report, the entire site is located within Flood Zone 1. Table 3 of the PPG states that all uses are appropriate for Flood Zone 1. Therefore, the proposed development use is compatible with the flood zone of the site and developing the site for its intended purpose is considered appropriate in terms of flood risk. As such, no mitigation measures are required for fluvial flooding, and the Sequential Test and Exception Test are not required to be applied to this development.

Surface Water

5.5 The risk of surface water flooding to the northern side of the site, along the existing access road, is at 'low' (between 1:100 and 1:1,000 annual probability) and 'medium' (between 1:30 and 1:100 annual probability) risk of surface water flooding, associated with excess from the ordinary watercourse.

5.6 The West London Strategic Flood Risk Assessment (SFRA) adopts a definition for Flood Zone 3a as land within EA modelled surface water flood risk extents predicted for up to and including 1 in 100 year return period events. The SFRA states that potential development must still align to the PPG's Flood Risk Vulnerability and Flood Zone Compatibility table through not increasing the development's vulnerability. The applicant must submit evidence to demonstrate the application of the Sequential Test and the passing on the Exception Test as appropriate in those parts of the site classified as Flood Zone 3a.

5.7 As shown before, the northern side of the site, associated with the existing access road, is located within 'medium' risk of surface water flooding, which corresponds in turn to Flood Zone 3a. However, the existing building is located outside any surface water flood risk area. In addition, the proposed development will not involve any change in the current flood risk vulnerability use of the site. As such, the Sequential Test and Exception Test should not be applied to this development.

Climate Change Allowance

5.8 The West London Strategic Flood Risk Assessment indicates that there are no climate change scenarios available for the Risk of Surface Water Flood Map, applicants should therefore apply the correct climate change allowance for peak rainfall intensity to any assessment of surface water flood risk using the latest guidance. Otherwise, the six West London boroughs consider that without any other higher confidence data; the 1% annual probability extent is considered to represent the current likely risk; and the 0.1% annual probability extent represents the potential climate change adjusted impact of current risk.

AECOM Flood Risk Modelling

5.9 As requested by the LLFA and as part of a separate study, AECOM was appointed in October 2021 to undertake a 1D-2D hydraulic model for the unnamed Ordinary Watercourse immediately south of Hillingdon Hospital and north of the Tudor Centre to demonstrate flood risk in the baseline and proposed development scenarios within Hillingdon Hospital campus. The proposed model scenario included minor changes to represent the new masterplan layout of the campus, including the new hospital ward to the west and the extension of two existing culverts to facilitate the widening of the road which will be used as a blue light access route for emergency vehicles. Results for the draft proposed modelling showed that there was no increase to flood risk outside of the Hillingdon Hospital campus as a result of the proposed works.

5.10 The model was run for the 1 in 100 year and 1 in 100 year with climate change events and, as required by the EA's updated Guidance on Climate Change (July 2021) for more vulnerable developments, peak flows were increased by 21% associated with the '2080s Central' allowance. The resultant flood extent shown in Appendix H indicates that the Tudor Centre is located entirely outside of both the 1 in 100 year and 1 in 100 year+21%CC flood extent.

5.11 It should be noted that the watercourse currently flows underneath the Woodlands Centre and is partially culverted at the upstream side of the Tudor Centre location. As such, the hydraulic model outputs suggest that during extreme flood events, exceedances would spill out the riverbanks before reaching the Woodlands Centre, approximately 53m upstream of the Tudor Centre location, due mainly to the reduced conveyance capacity of the culverts. Flood waters would then spread across the existing car parking court between the Woodlands Centre and the Maternity building and then westward, with no detrimental effect on the Tudor Centre. Figure 1 illustrates this flood behavior during extreme flood events.

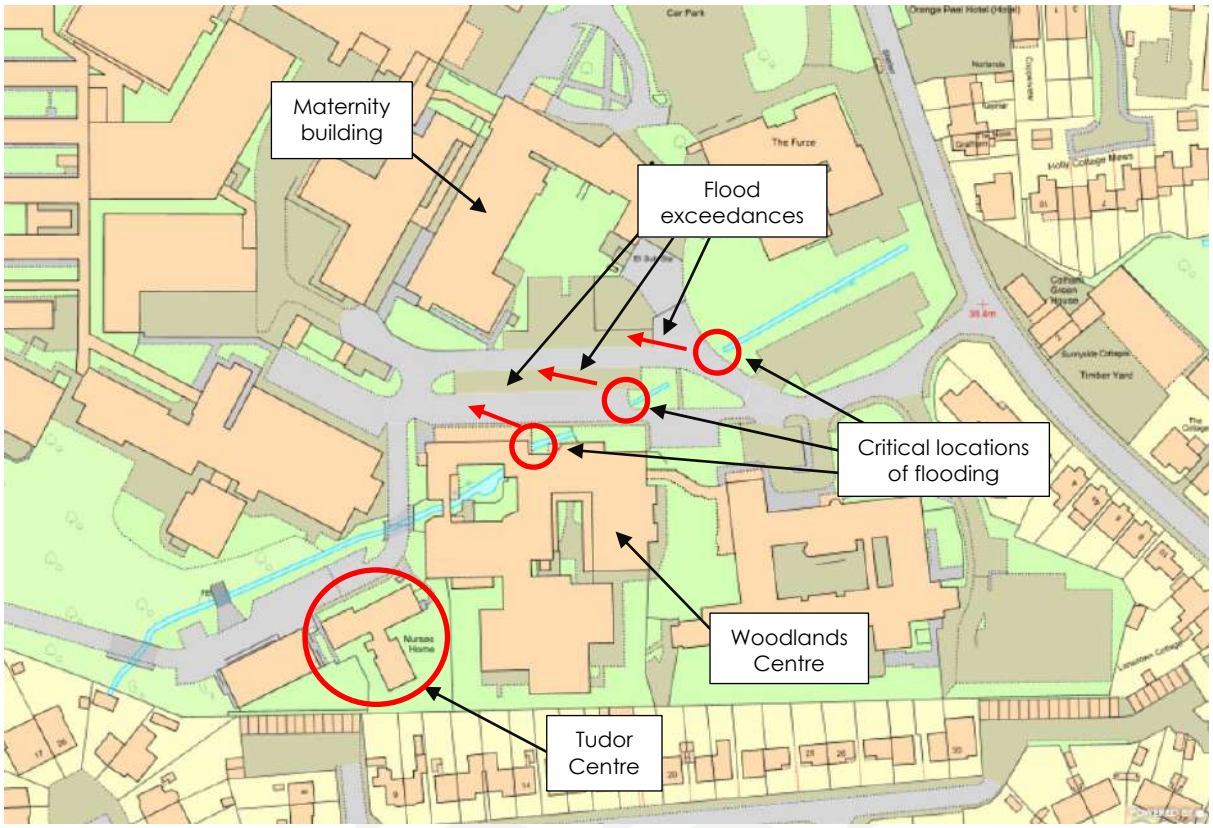


Figure 1: Flood Exceedance Route

Finished Floor Level

5.12 The AECOM Flood Risk Modelling suggests that the Tudor Centre would not be affected by the 1 in 100 year+21%CC flood event. However, the Surface Water Flood Risk map from the West London Strategic Flood Risk Assessment shows the access road along the northern façade of the building at 'low' (between 1:100 and 1:1,000 annual probability) risk of surface water flooding, with maximum flood depths between 0.3m and 0.6m.

5.13 Through assessment of the topographic survey, a maximum flood level of 36.7m AOD to the north of the building would appear to represent a robust assessment of potential surface water flood risk when considering appropriate mitigation measures. As shown previously, the West London Strategic Flood Risk Assessment states the 0.1% AEP flood event represents the potential climate change adjusted impact of current risk. As such, it is proposed to establish the finished floor level (FFL) at a minimum of **37.00m AOD** on the north side of the building. Whilst the FFL on the south side of the building will be set at 36.90m AOD, the external works will include raised approaches to thresholds set at 37.00m AOD in the form of permanent ramps at all entrances. The FFL and defended thresholds will be established 0.3m above the maximum likely surface water flood level within that location.

5.14 Furthermore, the proposed surface water drainage strategy will offer protection against surface water flooding by providing a positive drainage system, which will intercept overland flows generated within the site. The drainage strategy will be designed to ensure that no flooding takes place up to and including the design rainfall event (1 in 100 year return period), with additional capacity within the system to allow for the potential future effects of climate change.

5.15 Therefore, after introducing an effective drainage strategy within the site, surface water flooding will not be an issue that would prevent or constrain the development of the site to any significant extent.

Flood Storage Compensation

5.16 The West London Strategic Flood Risk Assessment states that if permissible development decreases the volume of fluvial floodplain or surface water flood area, flood storage compensation needs to be provided. The compensatory storage provided must equal or exceed the storage lost to ensure there will be no net loss of flood storage. Where developments are proposed within Flood Zone 3a (surface water), floodplain compensation must account for predicted flood depths for the 1 in 30 year and 1 in 100 year RoFSW mapping or depths predicted by site specific modelling.

5.17 As shown in section 2, the proposed development involves the demolition and extension of the rear portion of the Tudor Centre. According to the AECOM Flood Risk Modelling and West London Strategic Flood Risk Assessment, the extension would be located within an area free of surface water flooding. In addition, existing ground levels will not be raised to facilitate construction of the new extension or external works to ensure there is no reduction in floodplain storage. As such, flood storage compensation is not necessary for the proposed development.

Safe Access Arrangements

5.18 The West London Strategic Flood Risk Assessment states that Flood Warning and Emergency Plans need to feature measures to manage flood risk before, during, and after a flood, reducing the potential human impact of any flood event and making developments as resilient to flooding as possible. Adequate flood warning procedures for people accessing the development and information regarding safe access and egress points across the site, ensuring that they remain so during flooding, as well as suitable evacuation plans that consider the impact of climate change, should be considered as key requirements for planning permission.

5.19 Safe access and egress from a development is required to enable the evacuation of people in a flood event, provide the emergency services with access to the development during times of flooding and enable flood defence authorities to carry out any necessary duties during periods of flooding.

5.20 Access and egress to and from the site would ordinarily be along the existing access road to the west towards Royal Lane. However, during flood events this route may become partly inaccessible in areas indicated as ‘high’, ‘medium’ and ‘low’ risk of surface water flooding on the EA fluvial flood risk map.

5.21 The AECOM Flood Risk Modelling indicates that flood depths along the access road would range from zero to a maximum of 0.3m during the 1 in 100 year plus climate change event. According to the criteria set out within Flood Risks to People Methodology (FD2321/TR1) and the Framework and Guidance for Assessing and Managing Flood Risk for New Development (FD2320/TR2), the access road is likely to be affected by flooding that is considered to be ‘Low Hazard’ and ‘Danger for Some’. As such safe access and egress should be possible for the general public and emergency services, with due care advised for children, elderly and infirm during this event.

5.22 Since the proposed development site is part of the Hillingdon Hospital campus and its facilities, the proposed development would follow the same approach as the current campus in terms of flood evacuation procedures and suitable arrangements well before flooding occurs.

5.23 A Flood Warning and Evacuation Plan will be prepared and submitted in a separate document for the Tudor Centre development site in accordance with West London Strategic Flood Risk Assessment, if required.

5.24 It should be noted that safe refuge will be provided within the building with the finished floor level raised above the relevant flood level, following a similar approach to other previously accepted applications on the campus, including ref. 76613/APP/2022/37, ref. 4058/APP/2020/1003 and ref. 4058/APP/2019/3286.

Other Sources

5.25 A review of sources of potential flooding in Section 4 of this assessment has concluded that there is a very low risk to the proposed development from all other sources of flooding examined. As such, no mitigation measures are necessary.

6.0 Surface Water Drainage

6.1 The PPG recommends that priority should be given to the use of Sustainable Drainage Systems (SuDS) as they are designed to control surface water run-off where it falls and mimic natural drainage characteristics as closely as possible. Source control techniques will be incorporated into the drainage strategy to ensure that surface water run-off is managed as close to source as possible. Sustainable drainage systems (SuDS) also provide opportunities for the following:

- Reducing the causes and impacts of flooding;
- Removing pollutants from urban run-off at source; and
- Combining water management and green space with benefits for amenity, recreation and wildlife.

6.2 SuDS encompass a wide range of drainage techniques intended to minimise the rate of discharge, volume and environmental impact of run-off and include:

- pervious pavements;
- swales and basins;
- green roofs and rainwater reuse;
- infiltration trenches and filter drains; and
- ponds and wetlands.

6.3 The Building Regulations part H3 stipulates that rainwater from roofs and paved areas is carried away from surface to discharge to one of the following, listed in order of priority:

a) An adequate soakaway or some other adequate infiltration system; where that is not practical;
b) A watercourse; or, where that is not practical
c) A sewer.

6.4 Infiltration based techniques are the preferable sustainable option to manage surface water run-off. However, due to the impermeable nature of the soil within the site (see Section 2) infiltration is not considered to be a feasible method of disposal for surface water. Furthermore, given the density of existing hospital buildings there are very limited areas where soakaways could be located when considering the stand-off distances required by building regulations. Due to the presence of drainage sewers currently serving the Hillingdon Hospital campus, it is therefore proposed that run-off is detained on site and released at a restricted rate to the existing surface water drainage network which discharges to the watercourse to the north of the site.

Proposed Surface Water Drainage Strategy

6.5 The proposed strategy strives to utilise sustainable drainage techniques in accordance with the guidance described in CIRIA document C753 'The SuDs Manual' (2015) to accommodate run-off from all rainfall events up to and including the 1 in 100 year event, with a 40% allowance for climate change.

6.6 It is proposed that surface water run-off from the roof of the proposed extension, as well as the new tanked footways, should be managed by using an 'offline' geo-cellular storage tank, located within the existing access road to the north of the Tudor Centre, for attenuation storage prior discharging into the existing surface water drain located to the north of the site, which currently serves the Tudor Centre as well as the Old Creche building, and then into the watercourse to the north of the site. For the purposes of modelling, Polypipe Permavoid system PVPP150 (708mm x 354mm x 150mm deep) with 95% void ratio has been used to dimension the storage tank.

6.7 The geo-cellular storage tank would be subjected to load pressures due to the weight of the vehicles with a shallow cover. Therefore, a geo-cellular structural system with appropriate load bearing capacity is recommended as a surface water runoff storage medium. Permavoid system, provided by Polypipe[2], is a geo-cellular interlocking system designed for shallow groundwater storage or infiltration, to be used in place of traditional sub-base. The system has an exceptionally high compressive and tensile strength and bending resistance with a proprietary jointing system to create a horizontal structural 'raft' within the pavement that is ideal for the shallow attenuation of surface water.

6.8 Polypipe states that in order to provide a suitable structural design, a 400 mm of minimum pavement thickness (CBR>5%) is recommended for 60 tonnes loading situation, in relation to main roads and frequent HGV's.

6.9 Due to the narrow nature of the area, as well as the presence of multiple existing trees and drains at the rear of the site and around the building, the existing access road to the north of the Tudor Centre has been determined to be the preferred location for the proposed geo-cellular storage tank.

6.10 The drainage survey shown in Appendix E indicates that roof water from the Tudor Centre, including the rear side, is currently collected and managed by two separate surface water drainage systems established along the eastern and western side of the building. The western surface water drainage system intercepts roof water from approximately 50% of the Tudor Centre and the Old Creche building to the west. The eastern surface water drainage system currently intercepts roof water from the other half of the Tudor Centre and surface water run-off from other parts of the Hillingdon Hospital campus, including the Woodlands Centre to the east.

6.11 The proposed development would involve the demolition of part of the existing drains that currently serve the rear section of the building to be demolished. However, it is proposed to reuse the western drains, currently serving to the Tudor Centre, to convey roof water from the new extension towards the watercourse to the north.

6.12 The West London Strategic Flood Risk Assessment suggests that development on current brownfield sites should aim to achieve greenfield run-off rates where practical. Greenfield run-off rates have been calculated for the area of the site to be developed and in accordance with the methodology provided in DEFRA document "Interim Code of Practice for Sustainable Drainage Systems" (ICoPS) (July 2004). Results show a very low value related to the mean annual flood flow from the site (i.e. QBAR) of approximately 0.1l/s for the hardstanding area and roof areas of the site.

[2] https://www.polypipe.com/civils-and-infrastructure/permavoid-85150

6.13 The Modified Rational Method establishes that the existing discharge rate from the western surface water drainage system is approximately 6.9l/s. This peak flow rate is based on the 50% of the roof area of the Tudor Centre and Old Creche building, including the rear section to be demolished, covering a total roof area of 356m^2. A calculation to establish the existing discharge rate is provided in Appendix I.

6.14 Due to space constraints within the development site, an approximate 60% reduction in existing run-off rate will be applied to the proposed surface water drainage strategy, reducing the outflow from the proposed development site to 2.8l/s. The maximum discharge rate from the development area would be restricted to 2.8l/s.

6.15 Results from InfoDrainage show that an 'offline' geo-cellular storage tank with base area of 74.9m^2 (i.e. 4.6m wide x 16.3m long) and 0.6m deep would be capable of managing run-off from the roof area of the proposed extension during the 1:100 year+40%CC rainfall event. The storage tank will also manage run-off from existing areas, including part of the Tudor Centre and Old Creche roof areas. The storage tank was shown to reach a maximum flood depth of 1.2m and a maximum volume of approximately 43.3m^3, associated with the critical storm duration of 240 min (winter). These results suggest that the maximum water level associated with a 1:100 year+40%CC rainfall event would exceed the maximum storage capacity of the new storage tank, but would still be contained within the drainage system without reaching the surface.

6.16 The design utilises a Hydro-Brake vortex flow control, in order to attenuate surface water run-off from the proposed development. Hydro-Brake Optimum® is a very robust low maintenance solution as it has no moving parts, nor does it require power – operating solely due to the flow of water through the unit. This flow control is accepted by a number of the UK Water Companies, Environment Agency and many Lead Local Flood Authorities (LLFA) for its accuracy of flow control and low maintenance requirements. To achieve the required outflow rates, as well as reduced the blockage risk, the unit selected has a 73mm orifice size (CHE-0073-2800-1200-2800), but as it is located within a chamber with a sump, this dimension is not likely to give rise to any undue maintenance burden.

6.17 Attenuated outflow rates from the proposed development site will be restricted to the practicable minimum value of 2.8l/s and discharged into the watercourse to the north of the site.

Summary

6.18 As a result of the development, flood risk and flows will be reduced on-site and elsewhere.

6.19 The proposed surface water drainage strategy accords with Building Regulations Part H where discharging run-off by attenuation to the existing surface water drainage system, which currently serves the Hillingdon Hospital campus, as well as the adjacent watercourse to the north, is the most appropriate drainage solution.

6.20 All new surface water drainage infrastructure will be designed in accordance with Sewers for Adoption, Building Regulations and best practice where appropriate.

6.21 Refer to Appendix J for the full hydraulic calculations for the surface water drainage strategy.

6.22 The proposed drainage strategy for the disposal of surface water is presented in Appendix K.

6.23 A Drainage Assessment Form for the development as required by London Borough of Hillingdon is presented in Appendix L.

Pollution Control

6.24 Pollution control measures are designed to minimise the transmittal of any pollutants collected by run-off flowing over impermeable areas.

6.25 The SuDS Manual indicates that surface water run-off from commercial or industrial roofs has a low hazard potential. Sediment sumps or catch pits should also be included within the design immediately upstream of the go-cellular storage tank and outflow control, which thereby improves the quality of run-off to surface waters.

Maintenance

6.26 All of the proposed SuDS will be the responsibility of and maintained by the management company who deal with the current site and remainder of the hospital campus.

6.27 Table 1 provides a summary of the maintenance activities required to manage the drainage features within the development.

Table 1: SuDS Maintenance Schedule

Drainage Feature	Inspection and Maintenance	Frequency
Flow control structure (Hydro-Brake or similar)*	Inspect and remove any sediment / debris.	Annually
	Inspect flows controls and repair as necessary.	Occasional (as required)
Geo-cellular storage tank*	Ensure inlets and pre-treatment structures are clear and free of debris.	Annually
Hardstanding areas	Sweep regularly to prevent silt being washed off the surface.	Frequently
Conventional pipe network	Inspect and remove any sediment / debris or root ingress.	Monthly or as required
Manholes and catchpits	Inspect manholes and for any signs of blockages. Clean, jet and empty as required	Annually or as required
	Check, clean and empty catchpits as required to remove debris and sediment	

*Refer to manufacturer's guidance for specific maintenance instructions.

Site-Wide Drainage Masterplan

6.28 A site-wide drainage strategy for the wider campus is currently being developed, and will be submitted under a separate application, which should provide a level of betterment over the existing situation. AECOM has provided the following summary of the wider drainage strategy.

"The proposed development site has been split up into six main drainage catchments based upon the existing site topography. Surface water runoff attenuation features will be provided to serve each catchment. This surface water attenuation strategy assumes that infiltration is not suitable for the site based on the existing geology.

The storage volume requirements have been calculated based on the estimation of the impermeable areas within each drainage catchment based on the masterplan and topographical survey. The attenuation volumes have been calculated using Microdrainage Source Control based on the limiting run off to the equivalent Brownfield Run off Rates, subject to a 80% betterment. The development proposes to discharge surface water runoff at the Brownfield runoff rates (Qbar) using complex runoff control devices downstream of the storage in wetlands retention ponds or underground geocellular storage before ultimately discharging to either the existing watercourse or existing surface water connections on Royal Lane. It is worth noting that green roofs, permeable pavement, swales, bioretention planters, wetlands retention ponds and underground geocellular storage have been considered in this drainage strategy. Detailed surface water modelling will be required as part of the detailed design and the inclusion of other possible SuDS methods will be considered as part of this detailed design phase.

It should be noted that hydraulic modelling has been performed for a 1 in 100-year flood event and volumes have been factored to accommodate an increase in rainfall intensity of 40% over the lifetime of the development due to the effects of climate change."

6.29 The drainage proposals to the Tudor Centre will not prejudice the delivery of the site-wide drainage strategy.

7.0 Summary and Conclusion

Summary

7.1 This Flood Risk Assessment and Drainage Strategy has been prepared by Glanville Consultants on behalf of The Hillingdon Hospitals – NHS Foundation Trust, Mace Ltd, in support of a planning application for the proposed extension of the Tudor Centre at Hillingdon Hospital, Uxbridge, UB8 3NN.

7.2 This assessment has been prepared in accordance with the requirements of National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), flood risk and drainage guidance and with reference to the relevant Strategic Flood Risk Assessments.

7.3 The site is located entirely within Flood Zone 1, beyond the limits of the 1 in 1,000 year fluvial flood event (<0.1%), which is land at the lowest risk of fluvial flooding. With the exception of surface water flooding, the proposed development site is considered to be at very low risk from all sources.

7.4 As requested by the LLFA and as part of a separate study, AECOM was appointed in October 2021 to undertake a 1D-2D hydraulic model for the unnamed Ordinary Watercourse immediately south of Hillingdon Hospital and north of the Tudor Centre to demonstrate flood risk in the baseline and proposed development scenarios within Hillingdon Hospital campus. The model indicates that the Tudor Centre is located entirely outside of the 1 in 100 year flood extent, including climate change allowance.

7.5 However, the West London Strategic Flood Risk Assessment shows maximum surface water flood depths between 0.3m and 0.6m along the existing access road along the northern façade of the building, associated with 'low' risk of surface water flooding. A robust maximum flood level of 36.7m AOD has been established as applicable to the development site.

7.6 The finished floor level (FFL) on the northern side of the proposed extension will be therefore established at a minimum of 37.00m AOD. Whilst the FFL on the south side of the building will be set at 36.90m AOD, the external works will include raised approaches to thresholds set at 37.00m AOD in the form of permanent ramps at all entrances. The FFL and defended thresholds will be established 0.3m above the maximum likely surface water flood level within that location. Therefore, this permanent flood resistance measure will avoid the ingress of flood water into the building and the consequent fabric damages.

7.7 A Flood Warning and Evacuation Plan will be developed and submitted in a separate document for the proposed development at Hillingdon Hospital in accordance with West London Strategic Flood Risk Assessment, if required.

7.8 The proposed surface water drainage strategy utilises sustainable drainage techniques. Roof water of the proposed extension, as well as run-off from the new tanked footways, should be managed by using a geo-cellular storage tank, located within the existing access road to the north of the Tudor Centre, for attenuation storage prior discharging into the existing surface water drain located to the north of the site, which currently serves the Tudor Centre as well as the Old Creche building, and then into the watercourse to the north of the site. The storage tank will also manage run-off from existing areas, including part of the Tudor Centre and Old Creche roof areas.

7.9 The proposed development would involve the demolition of some of the existing drains that currently serve the rear section of the building to be demolished. However, it is proposed to reuse the western drains, currently serving to the Tudor Centre, to convey roof water from the new extension towards the watercourse to the north.

7.10 The proposed surface water drainage scheme will provide storage for the 1 in 100 year plus 40% climate change event without flooding from surface water.

7.11 A maintenance plan has been proposed in order to ensure the proposed drainage features are maintained in perpetuity in accordance with the appropriate guidance and standards.

7.12 This report demonstrates that flood risk will not increase either on-site or elsewhere as a result of the development.

7.13 It should be noted that a site wide drainage strategy for the wider campus is currently being developed, and will be submitted under a separate application, which should provide a level of betterment over the existing situation. The drainage proposals to the Tudor Centre will not prejudice the delivery of the site-wide drainage strategy.

Conclusion

7.14 In conclusion, this report has demonstrated that the proposed development:

- is in accordance with the National Planning Policy Framework;
- will not be at an unacceptable risk from fluvial flooding or other sources;
- will not increase flood risk elsewhere; and
- will employ a surface water drainage strategy based on the principles of sustainable drainage.

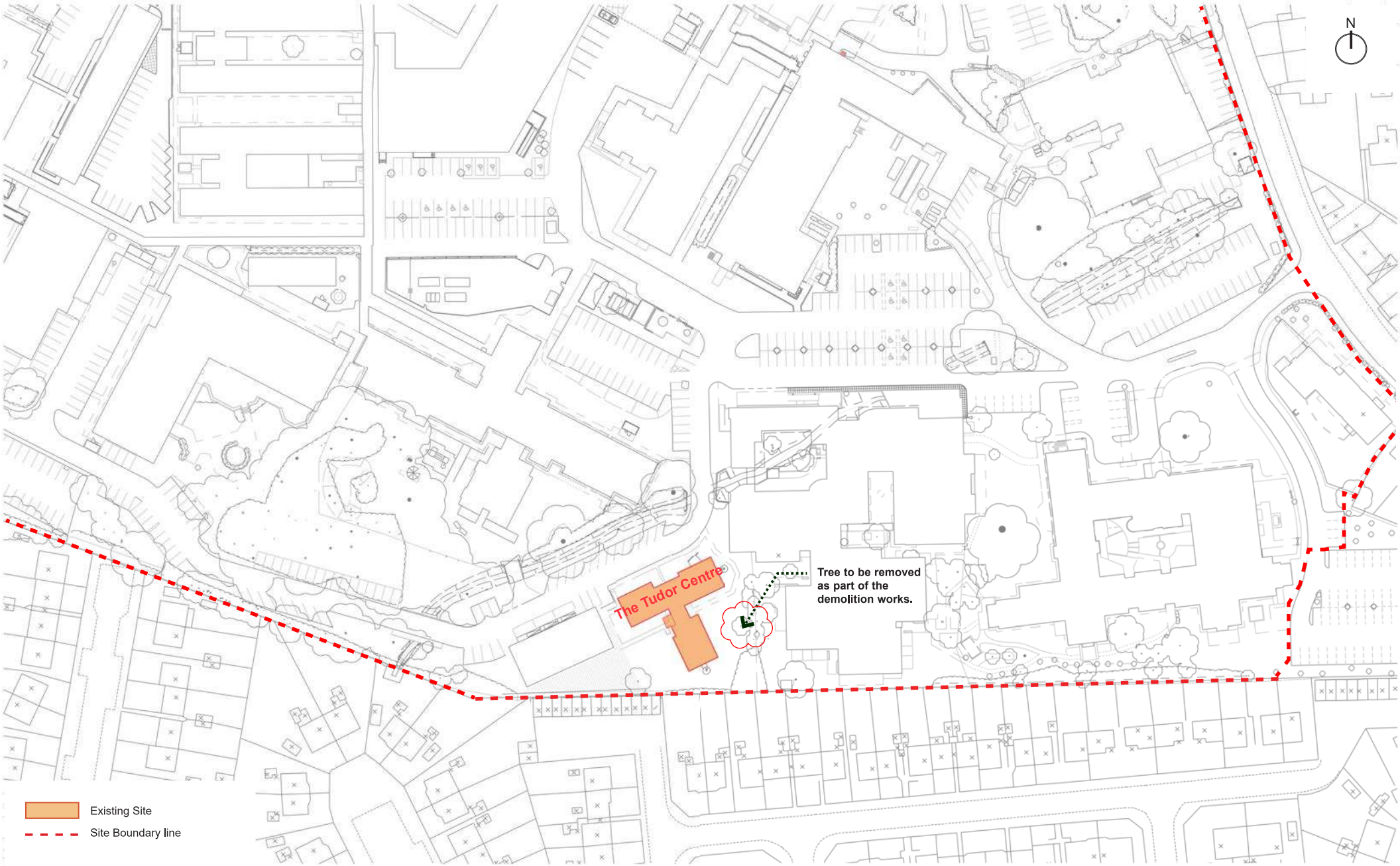
7.15 Therefore, the proposals are considered to fully comply with National, Regional and Local planning policy in respect of flood risk and surface water drainage.

Appendices

Appendix A

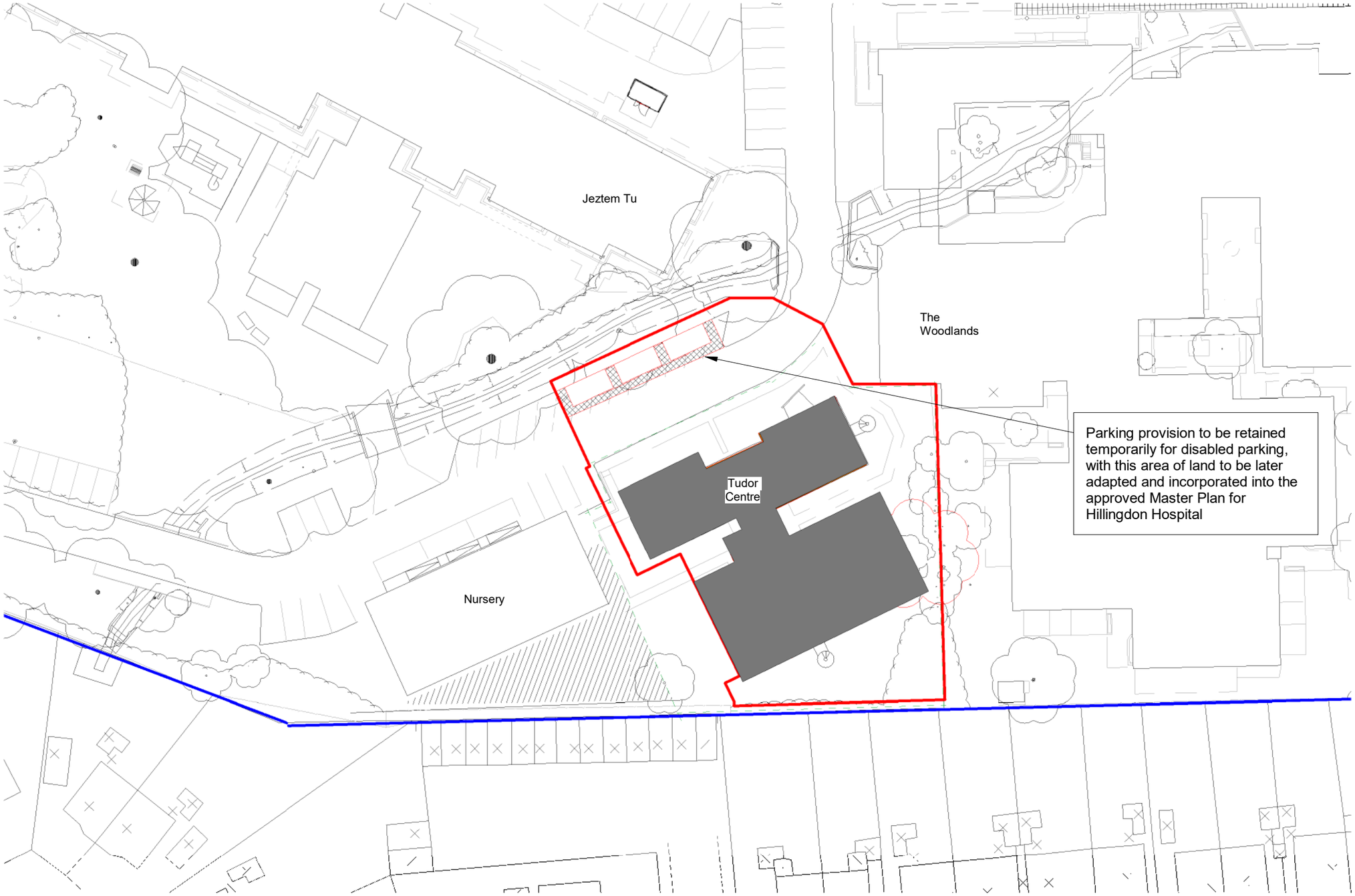
Location Plan

1.1 Site - Existing



Appendix B

Site Proposals



Planning Application Boundary Legend

- Site Boundary For Planning
- Hospital Boundary

1 / 0104 **Proposed Site Plan - Disabled Parking Spaces and New Site Boundary**

1 : 500

N

5M 20M 50M

Scale 1:500

Disclaimer:
Do not scale off this drawing; All dimension to be checked on site; All dimension are indicated in millimetres unless otherwise stated; Refer to Drawing Issue Sheet for purpose of issue; If in doubt ask. © Llewelyn Davies Weeks

INDEX	MODIFICATION	DATE
P01	Stage 3 Issue	24-05-2024
P02	4x Splayed Disabled Parking amended to 3x Parallel Disabled Parking	09-08-2024

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ARCHITECTS
Llewelyn Davies

CLIENT
Hillingdon Hospital Extension NHS Trust

PROJECT NAME
Tudor Centre Extension

PROJECT NUMBER: LD30-1041-01
PROJECT STAGE: Stage 3

DRAWING TITLE
Proposed Site Plan

DRAWING NUMBER: THHTCP2-LDW-ZZ-ZZ-D-A-0104
INDEX: -P02

DATE: 29/04/2024
SCALE: 1 : 500@A3

LLEWELYN DAVIES
The Rookery | 3rd Floor | 2 Dyott Street | London | WC1A 1DE
T +44(0)20 7907 7900 | www.ldavies.com

- Gabion Wall (900hx600w)
- Gabion Wall (450hx600w)
- Indicative Paving Slabs (Seating)
- Gabion (Height/Width to suit)
- Bound Gravel - Sudstech - Lily - A4
- Bound Gravel - Sudstech - Devon - A3
- Grass Edge
- Hedges
- Silk Tussel
- New Trees
- Existing Trees
- Meadow Grasses
- Existing Finishes to be Reinstated Post Drainage Install

Planning Application Boundary Legend

- Site Boundary for Planning
- Hospital Boundary

1M 5M 10M 20M

Scale 1:200

1 / 0130 **Level 0 Proposed - New Landscape**

1 : 200

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INDEX	MODIFICATION	DATE
P01	Stage 3 Issue	24-05-2024
P02	Value Engineering Proposal	07-08-2024
P03	Dogwood as before and removed gravel	15-08-2024

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ARCHITECTS
Llewelyn Davies

CLIENT
Hillingdon Hospital Extension NHS Trust

PROJECT NAME
Tudor Centre Extension

PROJECT NUMBER: LD30-1041-01
PROJECT STAGE: Stage 3

DRAWING TITLE
Level 0 Proposed - New Landscape

DRAWING NUMBER: THHTCP2-LDW-ZZ-00-D-A-0130
INDEX: -P03

DATE: 29/04/2024
SCALE: As indicated@A3

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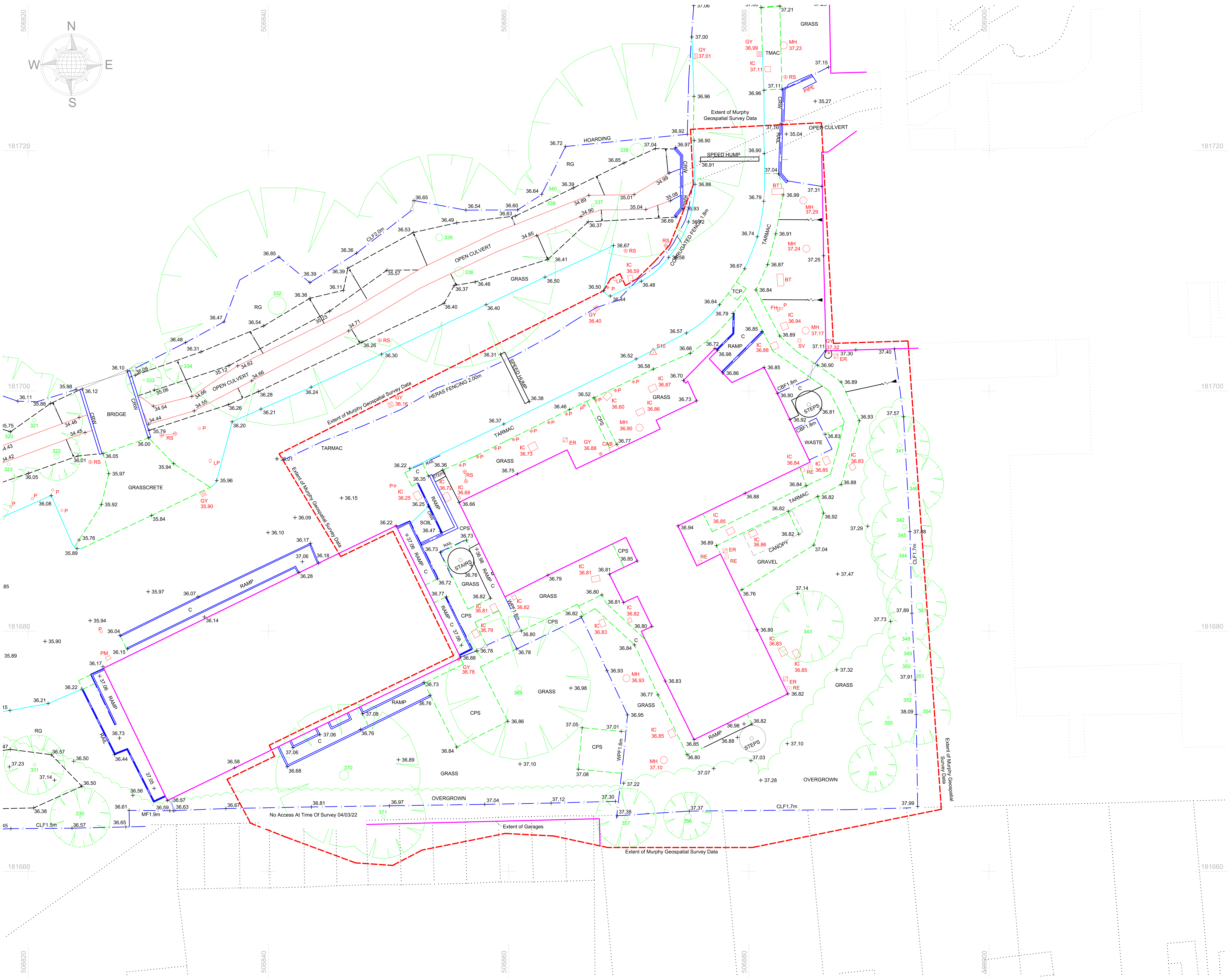
Appendix C

Topographical Survey



LEGEND

Air-Con Unit (ACU)	Hand Rail	Sky Light
Barrier	Hedge	Slope Bottom
Beam Line	Hoarding	Slope Top
Bench	Kerb Bottom	Slot Drain
Bin	Kerb Drop	Speed Bump
Bollard Illuminated	Kerb Top	Steel Cladding
Bollard	Lake	Steel Structure
Bridge	Land Drain	Step Line
Building Facade	Lift	Surface Change
Building	Opening - Slab	Tank
Bus Stop Shelter	Overhang	Telephone Box (TB)
Cable Trough	Overhead Cables	Ticket Machine(TVM)
Canopy	Parapet	Toilet
Ceiling Line	Partition	Top of Fence Line
Centre Line	Parking Meter (PM)	Top of Wall Line
Column	Pipe Line	Track
Column Bottom Line	Platform Train/Tram	Traffic Ctrl Box(TCB)
Column Top Line	Plinth	Tree Drip Line
Concrete Base/Slab	Pond	Tree Line
Contour Major	Post-box	Trial Pit
Contour Minor	Rail	Vegetation Line
Cycle Lane	Ramp	Vent
Ditch	Red Line Dashed	Verge Line
Door	Red Line Solid	Wall Line
Duct	Red Line Double	Window
Electric Box (EBOX)	River Edge	Window Glazing
Fence	Road Edge	White Line Dashed
Fixture	Road Scar Line	White Line Double
Flowerbed	Road Text	White Line Solid
Footpath	Roof	Yellow Line Dashed
Grating	Sanitary	Yellow Line Double
Grid Line	Service	Yellow Line Solid

Topographic Point Features

AV Air Valve	IC 12.24 Inspection Cover	RS Road Sign
APEX 12.24 Apex Building	ICTV 12.24 IC - CATV	RE Rodding Eye
BL 12.24 Bed Level	ICC 12.24 IC - Comms	SA 12.24 Sector Antenna
BB Belisha Beacon	ICE 12.24 IC - Electric	SIGN Sign (General)
B Bollard	ICR 12.24 IC - Round	SOF 12.24 Soffit Level
BOLT 12.24 Bolt	ICT 12.24 IC - Telecom	12.24 Spot Height
BH 12.24 Borehole	ICTC 12.24 IC - Traffic	SC Stop Cock
Bush	IL 12.24 Invert Level	TP Telegraph Pole
CP CCTV Camera Pole	LP Lamp Post	T12.24 Top of Fence Level
CE 12.24 Ceiling Elevation	MH 12.24 Manhole	T12.24 Top of Tree Level
DP 12.24 Dipole	MHF 12.24 MH - Foul	T12.24 Top of Wall Level
EAVE 12.24 Eave	MH 12.24 MH - Round	TL Traffic Light
EP Electrical Pole	MHS 12.24 MH - Surface Water	Tree (TX.XX SX.XX) T=Trunk Radius(m) S=Spread Radius(m)
FH Fire Hydrant	MK 12.24 Marker Post	Tree Coniferous
FL 12.24 Floor Level	MW 12.24 Microwave Dish	Tree Deciduous
GM Gas Meter	DP Pipe - Down	TT Tree Trunk
GV Gas Valve	POLE Pole	V Valve General
Gate	POST Post	WL 12.24 Water Level
G 12.24 Gully		WM Water Meter
G 12.24 Gully Round		WV Water Valve

Special Features

DATUM 12.24 Datum Point	ID E=XXXX.XXX N=YYYY.YYY H=ZZZ.ZZZ Survey Station
Photo Point	
Panoramic Photo Point	ID E=XXXX.XXX N=YYYY.YYY H=ZZZ.ZZZ Scan Target

Fence Types

B/W	Barbed Wire	C/L	Chain Link	O/B	Open Boarded
C/B	Close Boarded	H	Heras	P/W	Post and Wire
C/I	Corrugated Iron	I/R	Iron Railings	P/R	Post and Rail

Murphy Geospatial Disclaimer

All reasonable endeavours have been used to capture the required data in the survey to the agreed standards of accuracy. Where features have been obstructed due to a lack of access, the areas will be annotated as '**UTS**' (Unable To Survey). The Company shall not be liable for any damages or consequential losses arising from the reliance on survey information beyond its specified scale and accuracy, or survey information used for purposes other than that stated in the Contract of Works.

Any concerns with the survey should be raised with Murphy Geospatial, who will endeavour to promptly provide a remedy. The Client shall not seek recourse through any third party until such time as Murphy Geospatial have had the opportunity to redress any concerns raised.

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Notes

This survey originates from client supplied digital data produced by Land Utility Group, drawing 'DAT / 9.0', dated January 2021.

The original survey has been amended within the red dashed boundary using Murphy Geospatial survey data.

Revisions

Rev	Description	Surveyed by	Drawn by	Checked by
A	First Issue	AF - 04/03/22	EE - 11/03/22	TMD - 15/03/22

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UK Head Office
39-41 North Road
London
N7 9DP
Phone: (+44) 0203 598 3775
Email: info@murphygs.com

London Manchester Glasgow Belfast Cork Kildare

Client	Northmores
Project	THH The Tudor Centre
Site Address	Tudor Centre, Hillingdon Hospital Uxbridge, UB8 3PY
Description	Topographical Survey
Survey Grid	Localised OSGB36(15) - Scale Factor 1.0
Survey Datum	GNSS - Ordnance Datum Newlyn (ODN)
RICS Band	Band E
Drawing Scale	1:200 @ A2
Drawing Number	MGS46140-T

Appendix D

Geological Mapping and Soilscape Mapping

KEY

Approximate site location

Bedrock Geology

London Clay Formation - Clay, Silt and Sand

Superficial Geology

Boyn Hill Gravel Member - Sand and Gravel

Soilscapes Map

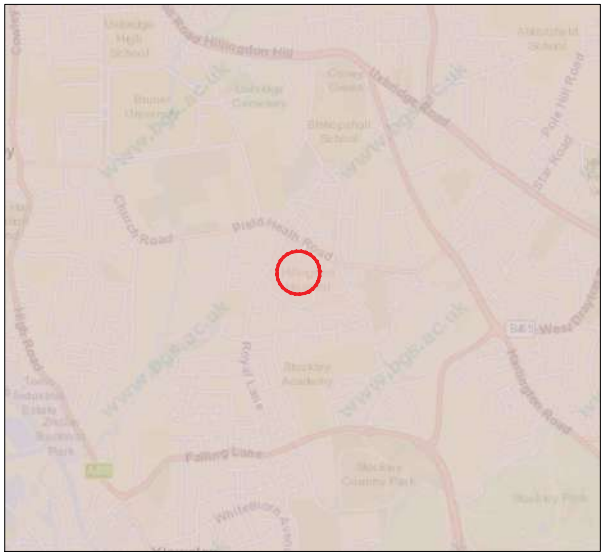
Slowly permeable seasonally wet acid loamy and clayey soils

Loamy soils with naturally high groundwater

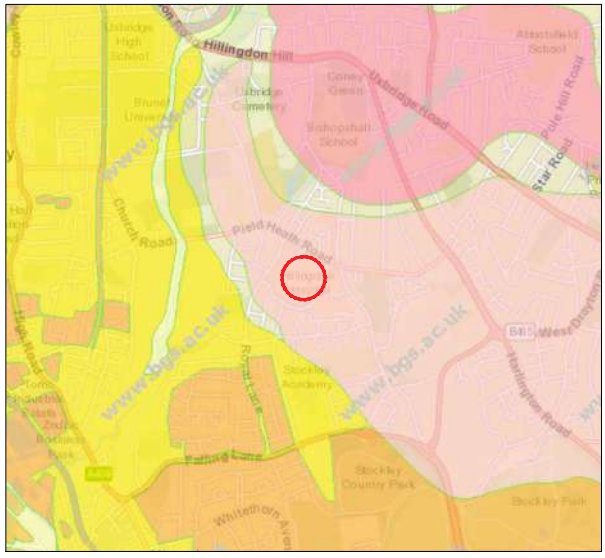
NOTES

1. This drawing is to be read in conjunction with all other documents and specifications
2. Dimensions not to be scaled from drawing

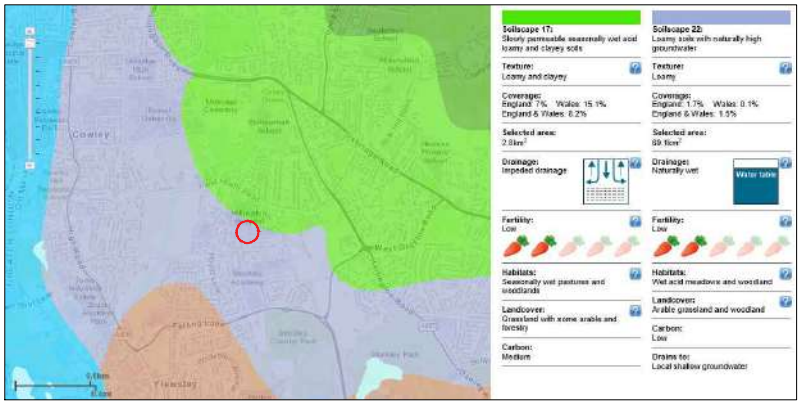
Bedrock Geology



Superficial Geology



Soilscapes Map_Cranfield University



Glanville
Cornerstone House
62 Foxhall Road, Didcot
Oxon, OX11 7AD
Tel: (01235) 515550 Fax: (01235) 817799
postbox@glanvillegroup.com www.glanvillegroup.com

Project :	Tudor Centre extension, Hillingdon Hospital, Pield Heath Road, Uxbridge UB8 3NN		
Title :	British Geological Survey & Soilscapes Mapping Extract		
Project Engineer : A. Quigley	Scale : NTS	Drawing No. 8230573 - SK01	Rev -
Project Director : K. Rayner	Date : September 2023		

Appendix E

Drainage Survey

DETECTION SURVEY REPORT

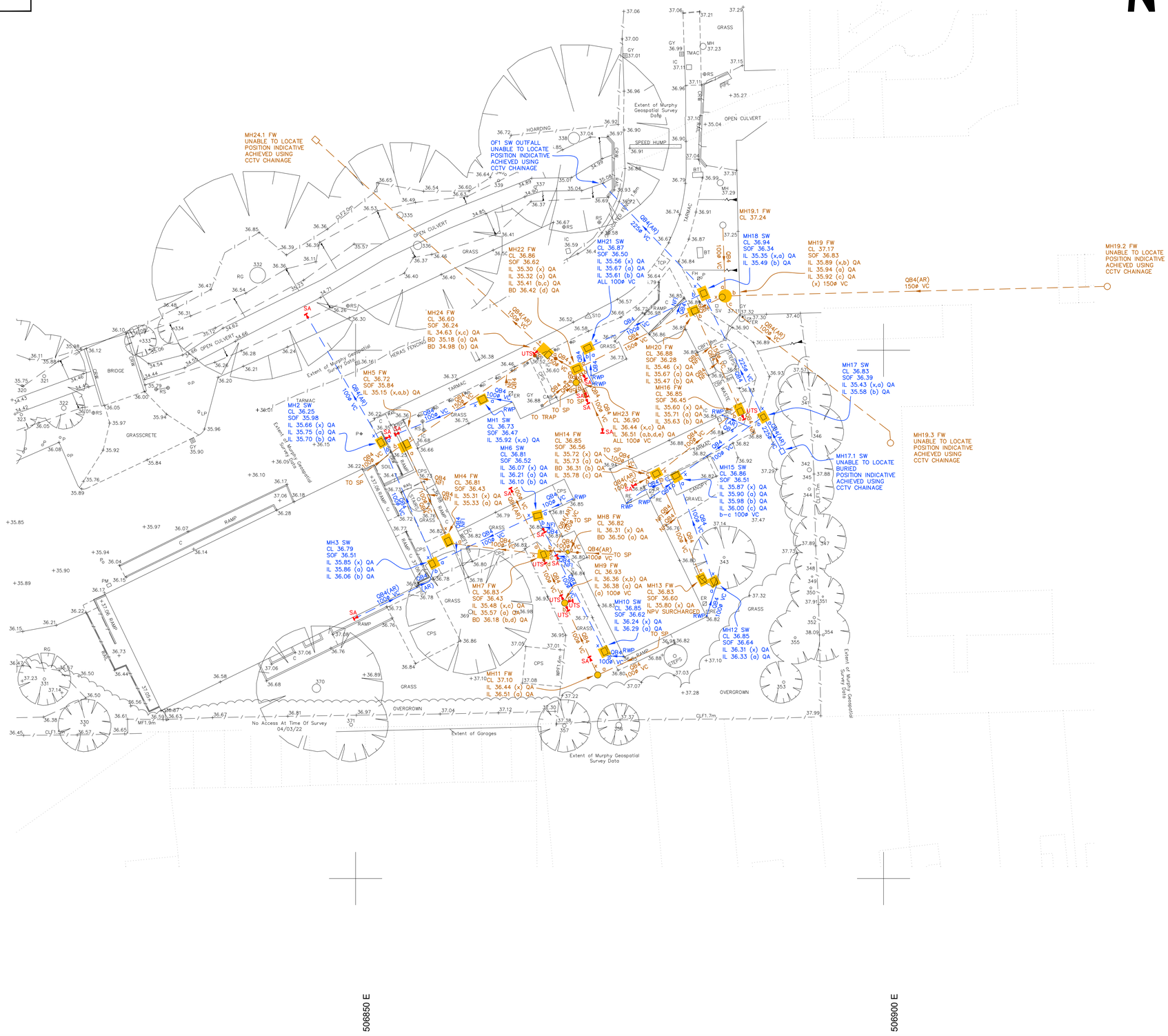
CONNECTIVITY SURVEY

All drainage connectivity was carried out in accordance with PAS 128:2014 (Publicly Available Specification from BSI). Quality levels are determined by the detection methodology. Please refer to PAS 128:2014 Quality Level Guide for details.

CCTV SURVEY

All drainage was lifted with pipe sizes and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. Where a saddle connection is present the position has been achieved by CCTV chainage unless stated as an assumed connection (ACP). Drains / sewers between manholes are assumed to be straight, If the drain / sewer has been CCTV surveyed, saddle connections and line deviations are indicative and not positioned via Ground penetrating radar (GPR) or Electromagnetic locator (EML). Internal Manholes / Inspection covers are positioned indicatively from CCTV Chainage. All sub surface drainage positions should be cross checked in critical areas by EML, GPR survey or hand dug trial holes.
Attempts have been made to carry out CCTV surveys of all sewers across the entire drainage system at Hillingdon Hospital, Uxbridge. As pre-cleaning via high pressure water jetting has not taken place, surveys may have been abandoned due to a build up of silt/debris and any other obstruction/obstacle. In other cases, structural defects within the system may prevent completion of CCTV surveys between assets.

Information regarding the drainage system has been added to the drawing. For all information regarding the CCTV survey, please refer to 32453 CCTV Report.



Notes :

1. DRAINAGE INFORMATION ADDED TO TOPOGRAPHICAL SURVEY PRODUCED BY MURPHY GEOSPATIAL. JOB No. MGS46140-T. DATE MARCH 2022. NO SITE VERIFICATION CARRIED OUT BY MK SURVEYS UNLESS SPECIFIC TO DRAINAGE.
2. DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTIFY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE FUTURE PROPOSAL.
3. ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS, WITH ROUTES / CONNECTIVITY OBTAINED USING ACOUSTIC METHODS ONLY. THESE ARE TO BE CONSIDERED ASSUMED AND SHOULD BE INVESTIGATED FURTHER IN CRITICAL AREAS. KINKS AND DEVIATIONS ARE INDICATIVE AND UNLESS SPECIFIED HAVE NOT BEEN ACCURATELY POSITIONED VIA ELECTROMAGNETIC LOCATOR (EML), GROUND PENETRATING RADAR (GPR). ALL SUB SURFACE DRAINAGE POSITIONS SHOULD BE CROSS CHECKED IN CRITICAL AREAS BY EML OR GPR SURVEY OR HAND DIG TRIAL HOLES.
4. CONNECTIONS FROM RAIN WATER PIPES, GULLIES, KERB OUTLETS, SOIL PIPES ETC SHOULD BE TREATED AS ASSUMED ONLY, UNLESS PROVEN WITH A CCTV SURVEY.
5. SURVEY TO BE READ IN CONJUNCTION WITH 32453 CCTV REPORT.

DRAINAGE KEY

ABBREVIATIONS

(AG)	ABOVE GROUND	OU	OUTFALL
(AR)	ASSUMED ROUTE	PF	PITCH FIBRE
BD	BACKDROP LEVEL	PP	POLYPROPYLENE
Bd	BASE DEPTH	POW	PIPE ON WALL
BK	BRICK	PT	P-TRAP
BL	BASE LEVEL	PTG	PIPE TO GROUND
CI	CAST IRON	PTS	PIPE TO SURFACE
CL	COVER LEVEL	PVC	POLYVINYL CHLORIDE
CO	CONCRETE	PVC-U	ULTRA RIB (PVC)
CU	CULVERT	(R)	ROUTE FROM RECORDS
CP	CATCHPIT	RE	RODDING EYE
CWL	CROWN LEVEL	RM	RISING MAIN
CW	COMBINED WATER	RWP	RAIN WATER PIPE
DCH	DRAINAGE CHANNEL	Sd	SILT DEPTH
DI	DUCTILE IRON	SL	SILT LEVEL
FD	FILTER DRAIN	SO	SOAKAWAY
FW	FOUL WATER	SOF	SOFFIT OF BISCUIT
GY	GULLY	SP	SOIL PIPE
IC	INSPECTION COVER	SVP	SOIL VENT PIPE
Id	INVERT DEPTH	SW	SURFACE WATER
IL	INVERT LEVEL	TOW	TOP OF WALL
INT	INTERCEPTOR	TW	TRADE EFFLUENT WATER
IT	INLET	UTL	UNABLE TO LOCATE
KO	KERB OUTLET	UTR	UNABLE TO RAISE
LH	LAMP HOLE	UTS	UNABLE TO SURVEY
MH	MANHOLE	VC	VITRIFIED CLAY
NPV	NO PIPES VISIBLE	VP	VENT PIPE
OL	OUTLET	WL	WATER LEVEL

LEGEND

COMBINED SEWER
FOUL WATER SEWER
SURFACE WATER SEWER
TRADE EFFLUENT SEWER
UNIDENTIFIED SEWER
RISING MAIN
MANHOLE
UNDERGROUND CHAMBER
P-TRAP
BACK DROP (EXTERNAL)
BACK DROP (INTERNAL)
SURVEY ABANDONED
UNABLE TO CCTV SURVEY
CAPPED RUN
ELECTRONICALLY DERIVED DEPTH

PAS 128:2022 Quality Level Guide

Quality Level		Description	Accuracy
QB4	(QL-B4)	A utility is expected to exist but cannot be detected - (AR), (R), (VI)	Undefined
QB3 QB3P	(QL-B3) (QL-B3P)	Horizontal location only using one geophysical technique. No depth information - NDI.	+/- 500mm Horizontal Undefined Vertical
QB2 QB2P	(QL-B2) (QL-B2P)	Horizontal and vertical location only using one geophysical technique.	+/- 250mm or +/- 40% of depth whichever is greater
QB1 QB1P	(QL-B1) (QB-1P)	Horizontal and vertical location only using two geophysical techniques.	+/- 150mm or +/- 15% of depth whichever is greater
QA	(QL-A)	Service verified in an open excavation, inside an inspection chamber / draw pit, or at the point the service enters / exits the ground.	+/- 50mm Horizontal +/- 50mm Vertical

Revision	Description	Surv. by	Check. by	Appr. by	Date

0m 2 4 6 8 10 12 14 16 18 20 22

Drainage and CCTV Survey

The Hillingdon Hosptals NHS Foundation Trust

Hillingdon Hospital
Pield Heath Road
Uxbridge, London
UB8 3NN

Scale:	Sheet Size:	Sheet Number:	Date:
1:200	A1	1	April 2023

Project Number:	Rev:	Surveyed by:	Checked by:	Approved by:
32453	-	BC	MW	MW

mksurveys
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Head Office: Milton Keynes t: 01908 565561 e: mail@mksurveys.co.uk

Appendix F

Fluvial Flood Risk Mapping

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**506873/181690**	**4 Sep 2023 11:44**

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

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

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

Notes

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

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

Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
506873/181690

Scale
1:2500

Created
4 Sep 2023 11:44

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

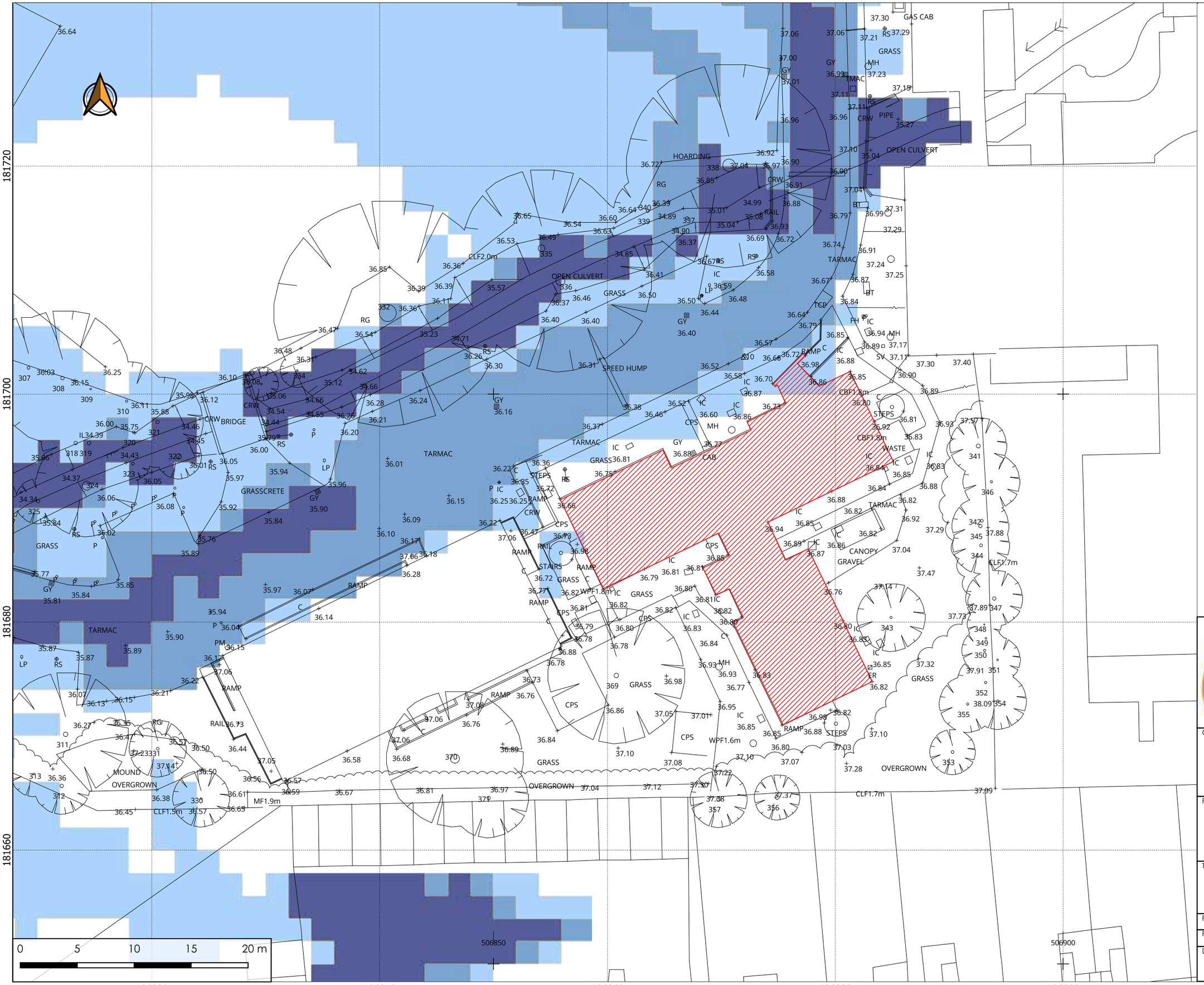
0 20 40 60m

Appendix G

Surface Water Flood Risk Mapping

506820 506840 506860 506880 506900

181720 181700 181680 181660



Glanville
Cornerstone House
62 Foxhall Road, Didcot
Oxon, OX11 7AD
Tel: (01235) 515550 Fax: (01235) 817799
postbox@glanvillegroup.com www.glanvillegroup.com

Client:
The Hillingdon Hospitals – NHS Foundation Trust
Mace Ltd

Project:
Tudor Centre extension
Hillingdon Hospital, Pield Heath Road, Uxbridge UB8 3NN

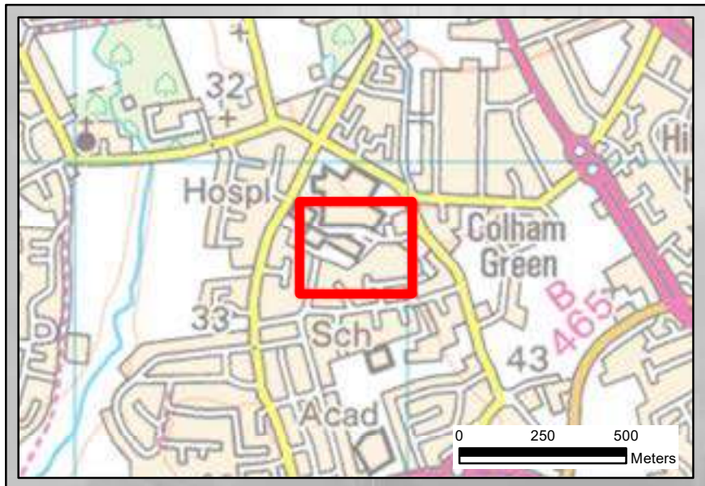
Title:
EA Surface Water Flood Risk Map

Project Engineer:	AQ	Scale:	1:300@A3
Project Director:	KR	Date:	04/09/2023

Drawing No:
8230573 - SK02

Appendix H

AECOM's Flood Risk Modelling Outputs



N

0 25 50 100 150 200 m

1:1,000 @ A3

AECOM

PROJECT

Hillingdon Hospital
Flood Risk Assessment

CLIENT

Hillingdon Hospital

CONSULTANT

AECOM Limited
1 New York Street
Manchester, M1 4HD
www.aecom.com

LEGEND

- Site Area
- OS Mastermap

LIDAR DTM

Ground level (mAOD)

High : 39

Low : 33

Baseline 1% AEP Depths

Depth (m)

- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- >0.5

NOTES

1: All levels shown are results of draft unapproved model, subject to review by LLFA

ISSUE PURPOSE

DRAFT

PROJECT NUMBER

60642181

FIGURE TITLE

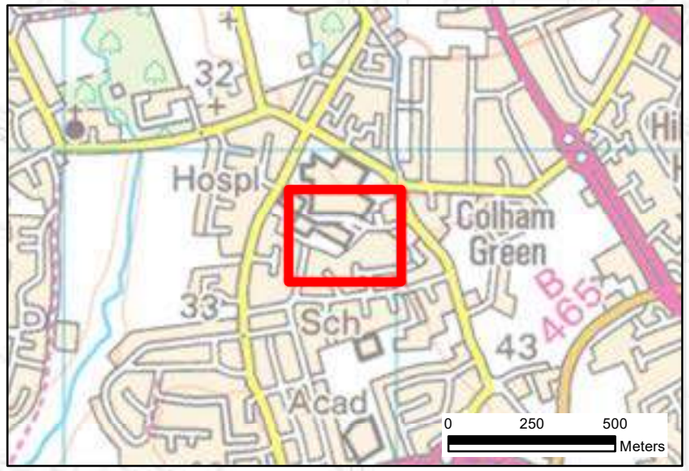
Hillingdon Hospital
1% AEP
Baseline maximum flood depth

FIGURE NUMBER

Figure 1

Revision: 0 Drawn: XX Checked: XX Approved: XX Date: 2021-10-27

Filename: \\ukmcr2pfpsw0011\DATA\Projects\WATER\60642181_Hillingdon Hospital\900_CAD_GIS\920_GIS\920_2_mxds & WORs\Modelling\Copy_of_Hillingdon_Modelling_results_3.mxd



N

1:1,000 @ A3

0 25 50 100 150 200 m

AECOM

PROJECT

Hillingdon Hospital
Flood Risk Assessment

CLIENT

Hillingdon Hospital

CONSULTANT

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1 New York Street
Manchester, M1 4HD
www.aecom.com

LEGEND

- Site Area

Max Baseline 1% AEP Level Water Level (mAOD)

- 0 - 35.8
- 35.8 - 36
- 36 - 36.2
- 36.2 - 36.4
- 36.4 - 36.6
- 36.6 - 36.8
- >36.8

NOTES

1: All levels shown are results of draft unapproved model, subject to review by LLFA

ISSUE PURPOSE

DRAFT

PROJECT NUMBER

60642181

FIGURE TITLE

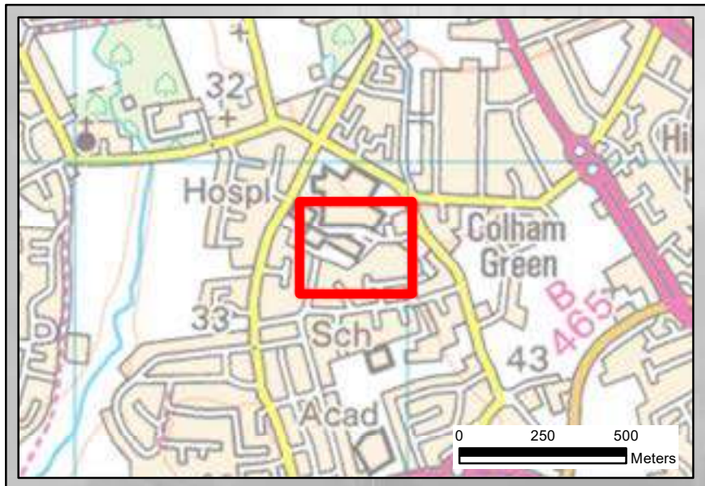
Hillingdon Hospital
1% AEP
Baseline maximum flood levels

FIGURE NUMBER

Figure 2

Revision: 0 Drawn: XX Checked: XX Approved: XX Date: 2021-10-27

Filename: \\ukmcr2pfpsw0011\DATA\Projects\WATER\60642181_Hillingdon Hospital\900_CAD_GIS\920_GIS\920_2_mxds & WORs\Modelling\Copy_of_Hillingdon_Modelling_results_3.mxd



N

1:1,000 @ A3

0 25 50 100 150 200 m

AECOM

PROJECT

Hillingdon Hospital
Flood Risk Assessment

CLIENT

Hillingdon Hospital

CONSULTANT

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1 New York Street
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LEGEND

- Site Area
- OS Mastermap

LIDAR DTM

Ground level (mAOD)

High : 39

Low : 33

Baseline 1% AEP + CC21% Depth

Depth (m)

- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- >0.5

NOTES

1: All levels shown are results of draft unapproved model, subject to review by LLFA
2: Model inflows have been uplifted by 21% Central Climate Change allowance

ISSUE PURPOSE

DRAFT

PROJECT NUMBER

60642181

FIGURE TITLE

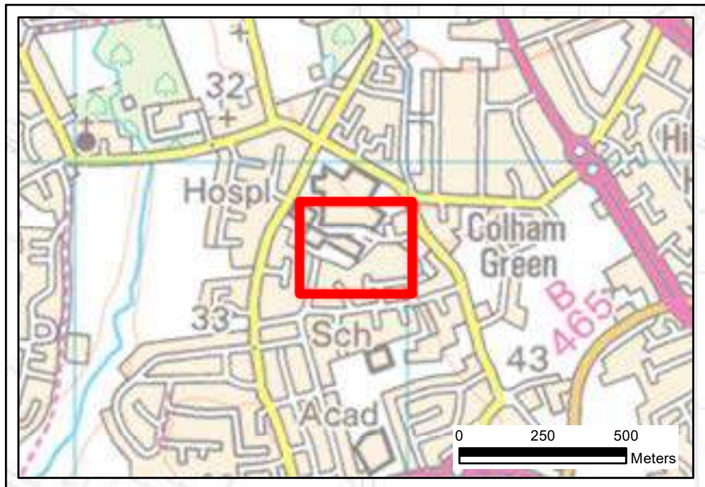
Hillingdon Hospital
1% AEP + 21% Climate Change
Baseline maximum flood depth

FIGURE NUMBER

Figure 3

Revision: 0 Drawn: XX Checked: XX Approved: XX Date: 2021-10-27

Filename: \\ukmcr2pfpsw001\DATA\Projects\WATER\60642181_Hillingdon Hospital\900_CAD_GIS\920_GIS\920_2_mxds & WORs\Modelling\Copy_of_Hillingdon_Modelling_results_3.mxd



AECOM

PROJECT

Hillingdon Hospital
Flood Risk Assessment

CLIENT

Hillingdon Hospital

CONSULTANT

AECOM Limited
1 New York Street
Manchester, M1 4HD
www.aecom.com

LEGEND

Site Area

Max Baseline 1% AEP +CC21% Level

Water Level (mAOD)

- 0 - 35.8
- 35.8 - 36
- 36 - 36.2
- 36.2 - 36.4
- 36.4 - 36.6
- 36.6 - 36.8
- >36.8

NOTES

1: All levels shown are results of draft unapproved model, subject to review by LLFA
2: Model inflows have been uplifted by 21% Central Climate Change allowance

ISSUE PURPOSE

DRAFT

PROJECT NUMBER

60642181

FIGURE TITLE

Hillingdon Hospital
1% AEP + 21% Climate Change
Baseline maximum flood level

FIGURE NUMBER

Figure 4

Revision: 0 Drawn: XX Checked: XX Approved: XX Date: 2021-10-27

Filename: \\ukmcr2pfpsw0011\DATA\Projects\WATER\60642181_Hillingdon Hospital\900_CAD_GIS\920_GIS\920_2_mxds & WORs\Modelling\Copy_of_Hillingdon_Modelling_results_3.mxd

Appendix I

Existing Run-off Rates

NOTES

1. This drawing to be read in conjunction with all other drawings and specifications.
2. Dimensions not to be scaled for construction purposes.
3. Topographical survey from Murphy Geospatial (ref: MGS46140-T; date: March 2022).
4. Drainage survey from MkSurveys (ref: 32453, date: April 2023).
5. This drawing is indicative and not intended for construction.

KEY

Existing surface water drains

Existing foul water drains

Existing hardstanding area served by the western surface water drainage system: 356m²

Rev.	Description	Date	By	Chkd
P2	Road excluded	30/08/2024	AQ	KR
P1	Issue 1	28/08/2024	AQ	KR

Glanville
Survey > Plan > Engineer

Civil Engineering
Structural Engineering
Transport Planning
Highways Engineering
Building Surveying
Geomatics

Hertfordshire | Oxfordshire | Cambridgeshire | Bristol

Client : The Hillingdon Hospitals - NHS Foundation Trust Mace Ltd

Project : Tudor Centre extension Hillingdon Hospital, Pield Heath Road Uxbridge UB8 3NN

Title : Existing Hardstanding Areas

Engineer : A. Quigley
Date : August 2024
Director : K. Rayner
Scale : 1:200@A3
Status : PLANNING

Drawing No. 8240494 - 100
Rev P2

Calculations

Glanville

Job Title:	TUDOR CENTRE EXTENSION	Job No:	8240494
Date:	30/08/2024		
Member/Location:	HILLINGDON HOSPITAL, UXBRIDGE	Sheet No:	1
Engineer:	A. QUIGLEY	Checked/Approved:	K. RAWER
Revision:			

Existing Discharge Rate

Ref.

Impermeable area $A \approx 356 m^2 = 0.0356 ha$ — Based on Arch. layout

Discharge Rate $Q = 3.61 C_v i A$, — Modified Rational Method

where C_v = volumetric runoff coefficient

$C_v = 1.0$

i = rainfall intensity = 54 mm/hr — Building Regs. ~~7B~~ Fig 2.

A = contributing area = 0.0356 ha

Therefore $Q = 3.61 \times 1 \times 54 * 0.356$

$Q = \underline{6.9 \text{ l/s}}$

Appendix J

InfoDrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	0.085	Urban	0.000
SAAR (mm)	673	Region Number	Region 6

Results l/s

QBAR Rural	0.1
QBAR Urban	0.1
Q100 years	0.5
Q1 year	0.1
Q30 years	0.3
Q100 years	0.5

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Catchment Area

Type : Catchment Area

Area (ha)	0.008

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Catchment Area (1)

Type : Catchment Area

Area (ha)	0.008

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Catchment Area (2)

Type : Catchment Area

Area (ha)	0.008

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Catchment Area (3)

Type : Catchment Area

Area (ha)	0.008

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Catchment Area (4)

Type : Catchment Area

Area (ha)	0.012

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Catchment Area (5)

Type : Catchment Area

Area (ha)	0.005

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Catchment Area (6)

Type : Catchment Area

Area (ha)	0.017

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Catchment Area (7)

Type : Catchment Area

Area (ha)	0.018

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.950
Time of Concentration (mins)	5
Percentage Impervious (%)	100

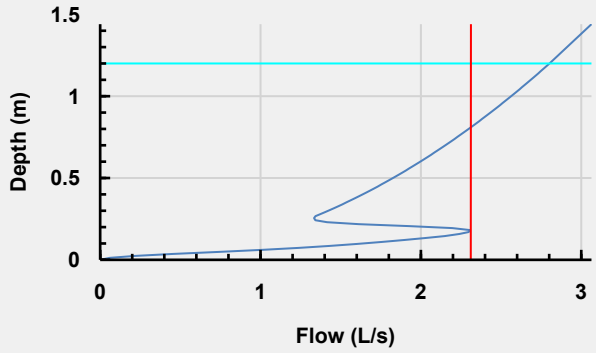
Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Junctions Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)	Invert Level (m)	Chamber Shape	Diameter (m)
Headwall	Simple Junction	506846.671	181703.804					
S10	Manhole	506850.575	181695.547	36.185	1.270	34.915	Circular	1.350
S9	Manhole	506851.808	181690.983	36.240	1.300	34.940	Circular	1.200
S8	Manhole	506857.255	181679.792	36.790	1.790	35.000	Circular	1.200
S7	Manhole	506862.418	181678.011	36.800	1.770	35.030	Circular	0.600
S6	Manhole	506867.470	181668.202	36.840	1.330	35.510	Circular	0.450
S5	Manhole	506871.220	181666.894	37.205	1.655	35.550	Circular	0.450
S4	Manhole	506878.479	181670.434	36.855	1.220	35.635	Circular	0.450
S3	Manhole	506892.763	181677.701	36.855	0.970	35.885	Circular	0.450
S2	Manhole	506892.722	181683.426	36.855	0.875	35.980	Circular	0.450
S1	Manhole	506890.282	181688.443	36.855	0.735	36.120	Circular	0.450
E MH 16J	Manhole	506867.197	181684.411	36.785	0.675	36.110	Rectangular	
E MH 1J	Manhole	506861.988	181695.371	36.810	0.930	35.880	Rectangular	

Name	Diameter (m)	Width (m)	
Headwall			
S10			None
S9			None
S8			None
S7			None
S6			None
S5			None
S4			None
S3			None
S2			None
S1			None
E MH 16J	0.750	0.675	None
E MH 1J	0.750	0.675	None

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by:	Checked by:	Approved By:
	A. Quigley		
Report Details: Type: Junctions Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
S10	Outlet	Pipe (9)	Hydro-Brake®
	Invert Level (m)	34.915	
	Design Depth (m)	1.200	
	Design Flow (L/s)	2.8	
	Objective	Minimise Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0073-2800-1200-2800	
			
S9	Outlet	Pipe (8)	Free Discharge
S8	Outlet	Pipe (7)	Free Discharge
S7	Outlet	Pipe (6)	Free Discharge
S6	Outlet	Pipe (5)	Free Discharge
S5	Outlet	Pipe (4)	Free Discharge
S4	Outlet	Pipe (3)	Free Discharge
S3	Outlet	Pipe (2)	Free Discharge
S2	Outlet	Pipe (1)	Free Discharge
S1	Outlet	Pipe	Free Discharge
E MH 16J	Outlet	Pipe (10)	Free Discharge
E MH 1J	Outlet	Pipe (11)	Free Discharge

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	36.165
Depth (m)	0.600
Base Level (m)	34.925
Number of Crates Long	23
Number of Crates Wide	13
Number of Crates High	4
Porosity (%)	95
Crate Length (m)	0.708
Crate Width (m)	0.354
Crate Height (m)	0.15
Total Volume (m^3)	43.355

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
Headwall		Diameter / Length: 1.200	{1} Pipe (9)	Pipe	34.850	Diam/Width:225	Simple Junction
E:506846.671 N:181703.804							
							Not Applicable
S10	36.185 34.915	Diameter / Length: 1.350	{1} Pipe (8) {2} Pipe (14)	Pipe Pipe	34.915 34.915	Diam/Width:225 Diam/Width:225	Manhole
E:506850.575 N:181695.547	1.270						
			{a} Pipe (9)	Pipe	34.915	Diam/Width:225	Not Applicable
S9	36.240 34.940	Diameter / Length: 1.200	{1} Pipe (7) {2} Pipe (11)	Pipe Pipe	34.940 34.940	Diam/Width:225 Diam/Width:100	Manhole
E:506851.808 N:181690.983	1.300						
			{a} Pipe (8)	Pipe	34.940	Diam/Width:225	Not Applicable
S8	36.790 35.000	Diameter / Length: 1.200	{1} Pipe (6) {2} Pipe (10)	Pipe Pipe	35.000 35.000	Diam/Width:225 Diam/Width:100	Manhole
E:506857.255 N:181679.792	1.790						
			{a} Pipe (7)	Pipe	35.000	Diam/Width:225	Not Applicable
S7	36.800 35.030	Diameter / Length: 0.600	{1} Pipe (5)	Pipe	35.105	Diam/Width:150	Manhole
E:506862.418 N:181678.011	1.770						
			{a} Pipe (6)	Pipe	35.030	Diam/Width:225	Not Applicable

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
S6	36.840 35.510	Diameter / Length: 0.450	{1} Pipe (4)	Pipe	35.510	Diam/Width:150	Manhole
E:506867.470 N:181668.202	1.330		{a} Pipe (5)	Pipe	35.510	Diam/Width:150	Not Applicable
S5	37.205 35.550	Diameter / Length: 0.450	{1} Pipe (3)	Pipe	35.550	Diam/Width:150	Manhole
E:506871.220 N:181666.894	1.655		{a} Pipe (4)	Pipe	35.550	Diam/Width:150	Not Applicable
S4	36.855 35.635	Diameter / Length: 0.450	{1} Pipe (2)	Pipe	35.635	Diam/Width:100	Manhole
E:506878.479 N:181670.434	1.220		{a} Pipe (3)	Pipe	35.635	Diam/Width:150	Not Applicable
S3	36.855 35.885	Diameter / Length: 0.450	{1} Pipe (1)	Pipe	35.885	Diam/Width:100	Manhole
E:506892.763 N:181677.701	0.970		{a} Pipe (2)	Pipe	35.885	Diam/Width:100	Not Applicable
S2	36.855 35.980	Diameter / Length: 0.450	{1} Pipe	Pipe	35.980	Diam/Width:100	Manhole
E:506892.722 N:181683.426	0.875		{a} Pipe (1)	Pipe	35.980	Diam/Width:100	Not Applicable

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
S1	36.855 36.120	Diameter / Length: 0.450					Manhole
E:506890.282 N:181688.443	0.735		{a} Pipe	Pipe	36.120	Diam/Width:100	Not Applicable
E MH 16J	36.785 36.110	Diameter / Length: 0.750					Manhole
E:506867.197 N:181684.411	0.675	Width: 0.675	{a} Pipe (10)	Pipe	36.110	Diam/Width:100	Not Applicable
E MH 1J	36.810 35.880	Diameter / Length: 0.750					Manhole
E:506861.988 N:181695.371	0.930	Width: 0.675	{a} Pipe (11)	Pipe	35.880	Diam/Width:100	Not Applicable

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	S1		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (1)	S3		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (2)	S6		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (3)	S7		Time of Concentration	0.008	100	0	100	0.008
Catchment Area (4)	E MH 16J		Time of Concentration	0.012	100	0	100	0.012
Catchment Area (5)	E MH 1J		Time of Concentration	0.005	100	0	100	0.005
Catchment Area (6)	S8		Time of Concentration	0.017	100	0	100	0.017
Catchment Area (7)	S4		Time of Concentration	0.018	100	0	100	0.018
TOTAL		**0.0**		**0.085**				**0.085**

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
Headwall	Free Discharge		

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Headwall	FEH: 100 years: +40 %: 240 mins: Winter		34.850	34.888	0.038	2.8			2.8	50.920	OK
S10	FEH: 100 years: +40 %: 240 mins: Winter	36.185	34.915	36.123	1.208	12.8	1.729	0.000	2.8	94.308	Flood Risk
S9	FEH: 100 years: +40 %: 240 mins: Winter	36.240	34.940	36.123	1.183	13.0	1.338	0.000	12.8	74.862	Flood Risk
S8	FEH: 100 years: +40 %: 240 mins: Winter	36.790	35.000	36.124	1.124	12.3	1.271	0.000	12.1	70.741	Surcharged
S7	FEH: 100 years: +40 %: 240 mins: Winter	36.800	35.030	36.124	1.094	7.9	0.310	0.000	7.7	45.033	Surcharged
S6	FEH: 100 years: +40 %: 240 mins: Winter	36.840	35.510	36.125	0.615	6.6	0.098	0.000	6.6	38.017	Surcharged
S5	FEH: 100 years: +40 %: 240 mins: Winter	37.205	35.550	36.125	0.575	5.4	0.091	0.000	5.4	30.770	Surcharged
S4	FEH: 100 years: +40 %: 240 mins: Winter	36.855	35.635	36.125	0.490	5.4	0.078	0.000	5.4	30.774	Surcharged
S3	FEH: 100 years: +40 %: 15 mins: Summer	36.855	35.885	36.181	0.296	9.1	0.047	0.000	9.4	5.779	Surcharged
S2	FEH: 100 years: +40 %: 15 mins: Winter	36.855	35.980	36.228	0.248	4.4	0.039	0.000	5.6	3.051	Surcharged
S1	FEH: 100 years: +40 %: 15 mins: Winter	36.855	36.120	36.254	0.134	6.4	0.021	0.000	4.4	3.044	Surcharged
E MH 16J	FEH: 100 years: +40 %: 15 mins: Summer	36.785	36.110	36.161	0.051	10.1	0.026	0.000	10.0	4.473	OK
E MH 1J	FEH: 100 years: +40 %: 240 mins: Winter	36.810	35.880	36.123	0.243	0.9	0.123	0.000	0.8	4.897	Surcharged

Project:	Date:		
8240494 - Tudor Centre extension Hillingdon Hospital, Pield Heath Road, Uxbridge Surface Water Drainage Strategy	28/08/2024		
	Designed by: A. Quigley	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Glanville Group Cornerstone House, 62 Foxhall Road Didcot, Oxfordshire OX11 7AD		

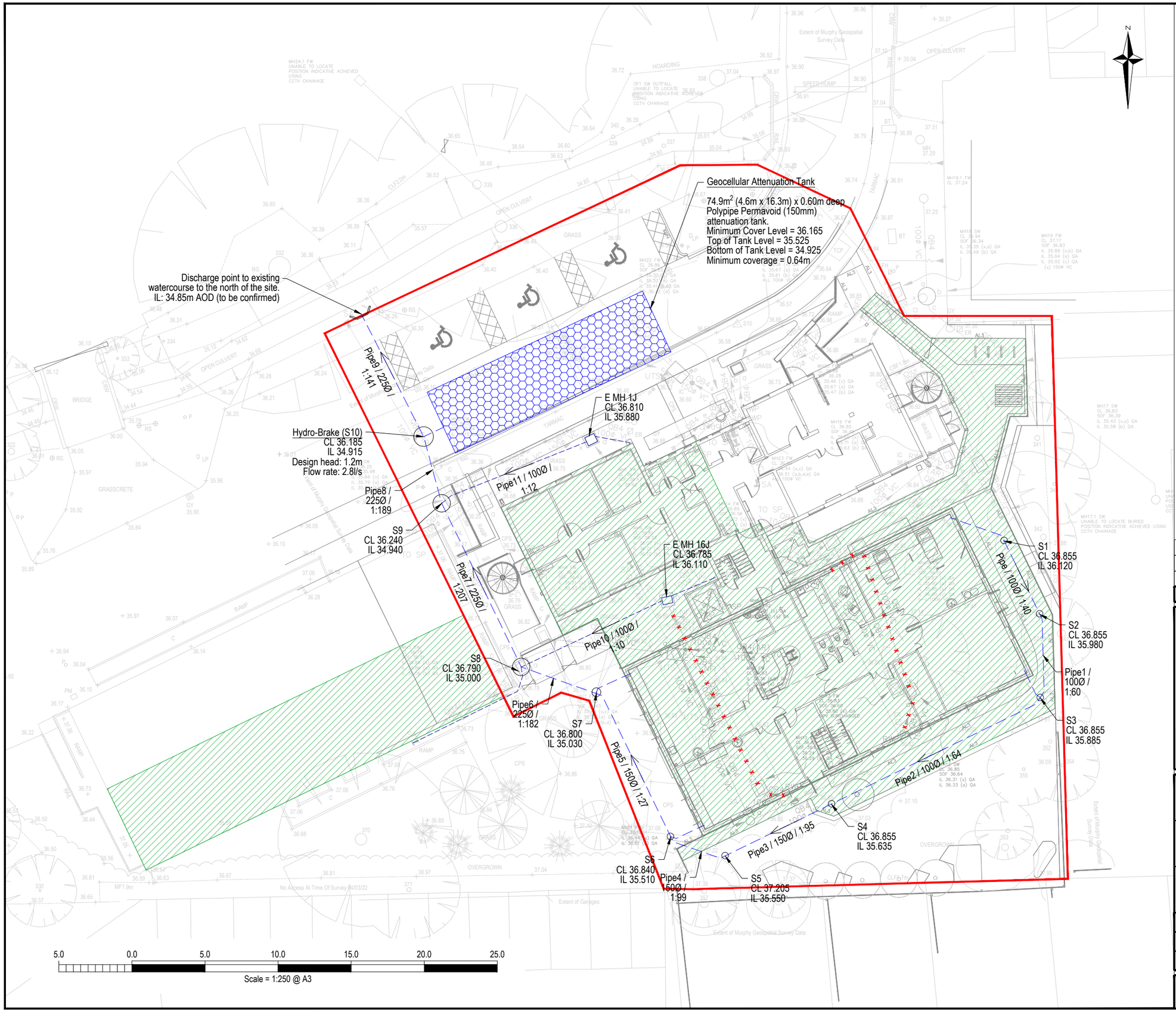
Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Avg. Depth (m)	Max. Resident Volume (m³)	Max. Outflow (L/s)	Percentage Available (%)	Status
Cellular Storage	FEH: 100 years: +40 %: 240 mins: Winter	36.123	36.123	36.123	1.198	1.198	1.198	43.309	1.8	0.106	OK


Headwall
Cellular Storage
S10
E MH 1J
Pipe (11)
S9
Catchment Area (5)
Catchment Area (4)
E MH 16J
Pipe (7)
Pipe (10)
S8
Pipe (6)
S7
Catchment Area (6)
Pipe (5)
S6
Pipe (4)
S5
Catchment Area (3)
Catchment Area (2)
S4
Pipe (3)
Catchment Area (7)
S1
Pipe
S2
Catchment Area
Catchment Area (1)
Pipe (1)
S3
Pipe (2)
OPEN CULVERT
GRASS
TARMAC
RAMP
OVERGROWN
No Access At Time Of Survey 04/03/22
Extent of Garages
Extent of Murphy Geospatial Survey Data

Appendix K

Proposed Surface Water Drainage Strategy



NOTES

1. This drawing to be read in conjunction with all other drawings and specifications.
2. Dimensions not to be scaled for construction purposes.
3. Topographical survey from Murphy Geospatial (ref: MGS46140-T; March 2022).
4. Drainage survey from MkSurveys (ref: 32453, April 2023).
5. This drawing is indicative and not intended for construction.
6. SuDS sizing based on MicroDrainage calculations.
7. All works within root protection areas to be agreed with Arboriculturist.

KEY

- Existing surface water drain to be retained
- Existing surface water drain to be demolished
- Proposed surface water drain
- Hardstanding area to be managed by the SuDS system: 846m²
- Geo-cellular Storage Tank:
  Area: 74.9m² (16.3m x 4.6m)
  Depth: 0.6m - 4No. Permavoid units
  Min. CL: 36.165m AOD
  IL: 34.925m AOD.
  Max. Water level: 36.123m AOD
  Max. Volume: 43.3m³
- Outflow control:
  Hydro-Brake Optimum®
  Model: CHE-0073-2800-1200-2800
  ØOrifice: 73mm

Rev.	Description	Date	By	Chkd
P3	Minor changes	04/09/2024	AQ	KR
P2	Road excluded	30/08/2024	AQ	KR
P1	Issue 1	28/08/2024	AQ	KR

Glanville
Survey > Plan > Engineer

Civil Engineering | Highways Engineering | Structural Engineering | Building Surveying | Transport Planning | Geomatics

Hertfordshire | Oxfordshire | Cambridgeshire | Bristol

Client : The Hillingdon Hospitals - NHS Foundation Trust Mace Ltd

Project : Tudor Centre extension
Hillingdon Hospital, Pield Heath Road
Uxbridge UB8 3NN

Title : Surface Water Drainage Strategy

Engineer : A. Quigley
Date : September 2024
Director : K. Rayner
Scale : 1:250@A3
Status : PLANNING

Drawing No. 8240494 - 101
Rev P3

Appendix L

London Borough of Hillingdon Drainage Assessment Form

The London Sustainable Drainage Proforma

Introduction

This proforma is intended to accompany a drainage strategy prepared for a planning application where required by national or local planning policy. It should be used to summarise the key outputs from the strategy to allow assessing officers at the Lead Local Flood Authority (LLFA) to quickly assess compliance with sustainable drainage (SuDS) planning

The proforma is divided into 4 sections, which are intended to be used as follows:

1. Site and project information - Provide summary details of the development, site and drainage
2. Proposed discharge arrangement – Summarise site ground conditions to determine potential for infiltration. Select a surface water discharge method (or mix of methods) following the hierarchical approach set out in the London Plan.
3. Drainage strategy – Prioritise SuDS measures that manage runoff as close to source as possible and contribute to the four main pillars of SuDS; amenity, biodiversity, water quality and water quantity.
4. Supporting information – Provide cross references to the page or section of the drainage strategy report where the detailed information to support each element can be found. This may be more than one reference for each

Policy

Drainage strategies for developments in the London Borough of Hillingdon need to comply with the following policies on SuDS:

1. London Borough of Hillingdon Local Plan policies EM 6 and DMEI 10
2. London Plan policy 5.13 and draft New London Plan policy SI13
3. The National Planning Policy Framework (NPPF)

Technical Guidance

- Post-development surface water discharge rate should be limited to greenfield runoff rates. Proposals for higher discharge rates should be agreed with the LLFA ahead of submission of the Planning Application. Clear evidence should be provided with the Planning Application to show why greenfield rates cannot be achieved.
- Greenfield runoff rate is the runoff rate from a site in its natural state, prior to any development. This should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS Manual.
- Attenuation storage volumes required to reduce post-development discharge rates to greenfield rates should be calculated using one of the runoff estimation methods set out in Table 24.1 of CIRIA C753 The SuDS Manual.
- 'CC' refers to climate change allowance from the current Environment Agency guidance.
- An operation and maintenance strategy for proposed SuDS measures should be submitted with the Planning Application and include the details set out in section 32.2 of CIRIA C753 The SuDS Manual. The manual should be site-specific and not directly reproduce parts of The SuDS Manual.
- Other useful sources of guidance are:
  - London Borough of Hillingdon sustainable drainage requirements
  - The London Plan Sustainable Design and Construction SPG
  - DEFRA non-statutory technical standards for sustainable drainage
  - Environment Agency climate change guidance
  - CIRIA C753 The SuDS Manual

GREATERLONDONAUTHORITY

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Tudor Centre extension
Address & post code	Hillingdon Hospital, Pield Heath Road, Uxbridge UB8 3NN
OS Grid ref. (Easting, Northing)	E 506870
	N 181692
LPA reference (if applicable)	
Brief description of proposed work	The proposals comprise the demolition and extension of the rear portion of the Tudor Centre located adjacent to the southern boundary of the Hillingdon Hospital campus, in order to create a new hub for medical education and training services within the Trust.
Total site Area	1,777 m^2
Total existing impervious area	356 m^2
Total proposed impervious area	846 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	The site is largely at very low risk, but adjacent to the north to low and medium risk areas. The site is outside of any CDA.
Existing drainage connection type and location	Surface water discharges directly into the adjacent watercourse to the north of the site.
Designer Name	Adrian Quigley
Designer Position	Civil Engineer
Designer Company	Glanville Group

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Boyn Hill Gravel Member - sand and gravel	
Bedrock geology classification	London Clay Formation - sand, silt and clay	
Site infiltration rate	n/a	m/s
Depth to groundwater level	n/a	m below ground level
Is infiltration feasible?	No	

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	Y	Y
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	Existing outfall
Has the owner/regulator of the discharge location been consulted?	Yes

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.1			
1 in 1	0.1	4.1	9.1	2.3
1 in 30	0.3	10.0	24.1	2.3
1 in 100	0.5	12.9	33.5	2.3
1 in 100 + CC			43.3	2.8
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Hydro-Brake		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^3)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	74.90		42.70
Total	74.90	**0**	42.70

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Please see the report
Drainage hierarchy (2b)	Please see section 6 of the report
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Please see the report
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Please see the report
Proposed SuDS measures & specifications (3b)	Please see the report
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix B
Detailed drainage design drawings, including exceedance flow routes	Please see the report
Detailed landscaping plans	Appendix B
Maintenance strategy	TBC
Demonstration of how the proposed SuDS measures improve:	Please see section 6 of the report
a) water quality of the runoff?	Please see the report
b) biodiversity?	Please see the report
c) amenity?	Please see the report

Hertfordshire | Oxfordshire | Cambridgeshire | Bristol

postbox@glanvillegroup.com | www.glanvillegroup.com

Survey > Plan > Engineer

Glanville Consultants Ltd, Registered office: 3 Grovelands Business Centre, Boundary Way, Hemel Hempstead, Hertfordshire, HP2 7TE