South West Cambridge: Land North of Barton Road

Flood Risk and Drainage Appraisal

On behalf of **North Barton Road Landowners Group (North BRLOG)**

Project Ref: 47115/001 | Rev:A | Date: February 2020

Registered Office: Buckingham Court Kingsmead Business Park, London Road, High Wycombe, Buckinghamshire, HP11 1JU
Office Address: 50/60 Station Road, Cambridge, CB1 2JH
T: +44 (0)1223 882 000 E: cambridge@peterbrett.com

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	Name	Position	Signature	Date
Prepared by:	Michael Hartley	Assistant Engineer	*M Hartley*	24.10.2019
Reviewed by:	Åsa Söderberg	Associate	*A Söderberg*	24.10.2019
Approved by:	Greg Callaghan	Director	*G Callaghan*	24.10.2019
For and on behalf of Stantec UK Limited				

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1 Introduction

1.1.1 Stantec (formerly Peter Brett Associates) has been appointed by North Barton Landowners Group for input to the Vision and Delivery document which will be used to promote a site, referred to as South West Cambridge: Land North of Barton Road, as a residential led development through the emerging Greater Cambridge Local Plan. The site of interest is located in west Cambridge and covers over 200 hectares.

1.1.2 The appraisal is a desk-based review of publicly available information, documents and reports, supplemented by consultation with stakeholders. This considers existing site conditions and the nature of existing flood risk constraints associated with fluvial, groundwater, tidal/coastal, reservoirs/impounded water features, surface water and sewer sources. The potential surface water drainage requirements are also reviewed on a broad scale.

1.1.3 Key stakeholders have been consulted to acquire site-specific information on flood risk and drainage, to confirm design criteria/principles that should be adopted for the purposes of informing the development of a surface water drainage strategy and the production of a future Flood Risk Assessment (FRA). The following stakeholders were consulted:

- Environment Agency (EA);
- Cambridgeshire County Council (CCC) (the Lead Local Flood Authority (LLFA));
- Anglian Water (AW);
- South Cambridgeshire District Council (SCDC).

1.1.4 The following documents are also relevant to the development and have been reviewed to inform the appraisal:

- National Planning Policy Framework (NPPF) dated February 2019 revised, issued by Ministry of Housing, Communities and Local Government, with reference to Section 14 ‘Meeting the challenge of climate change, flooding and coastal change;
- The NPPF Planning Practice Guidance (PPG) dated March 2014 (‘Flood Risk and Coastal Change’ section) and updated in February 2016 to incorporate the EA ‘Flood Risk Assessments: Climate Change Allowances’ guidance;
- South Cambridgeshire and Cambridge City Level 1 Strategic Flood Risk Assessment (Sept 2010);
- Cambridge Local Plan dated October 2018. The Local Plan makes reference to the following relevant policies:
    - Policy 31: Integrated water management and water cycle;
    - Policy 32: Flood Risk.
- South Cambridgeshire Local Plan dated September 2018. The Local Plan makes reference to the following relevant policies:
    - Policy CC/1: Mitigation and Adaption to Climate Change;
    - Policy CC/7: Water Quality;
    - Policy CC/8: Sustainable Drainage Systems, and
    - Policy CC/9: Managing Flood Risk.

1.1.5 Policy 31: Integrated water management and water cycle states that development will be permitted provided that:

- Surface water is managed close to its source and on the surface where reasonably practicable to do so.
- the feature that manage surface water are commensurate with the design of the development in terms of size, form and materials and make an active contribution to making places for people.
- surface water management features are multi-functional wherever possible in their land use.
- any flat roof is a green or brown roof that is acceptable in terms of its context in the historic environment of Cambridge.
- there is no discharge from the developed site for rainfall depths up to 5 mm of any rainfall event.
- the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with relevant guidance to minimise the risk of pollution.
- development adjacent to a water body actively seeks to enhance the water body in terms of its hydromorphology, biodiversity potential and setting.
- watercourses are not culverted and any opportunity to remove culverts is taken.
- all hard surfaces are permeable surfaces where reasonably practicable and having regard to groundwater protection.

1.1.6 Policy 32: Flood Risk states that development will be permitted providing it is demonstrated that:

- the peak rate of run-off over the lifetime of the development, allowing for climate change, is no greater for the developed site than it was for the undeveloped site.
- the post-development volume of run-off, allowing for climate change over the development lifetime, is no greater than it would have been for the undeveloped site. If this cannot be achieved, then the limiting discharge is 2 litre/s/ha for all events up to the 100-year return period event.
- the development is designed so that the flooding of property in and adjacent to the development would not occur for a 1 in 100 year event, plus an allowance for climate change d) the discharge locations have the capacity to receive all foul and surface water flows from the development, including discharge by infiltration, into water bodies and into sewers.
- there is a management and maintenance plan for the lifetime of the development.
- the destination of the discharge obeys the following priority order: 1) to ground via infiltration 2) to a water body 3) to a surface water sewer.

1.1.7 Policy CC/1 of the South Cambridgeshire Local Plan states that "*Planning permission will only be granted for proposals that demonstrate and embed the principles of climate change mitigation and adaptation into the development*".

1.1.8 Policy CC/7 states that in order to protect and enhance water quality, all development proposals must demonstrate:

- there are adequate water supply, sewerage and land drainage systems to serve the whole development.
- the quality of ground, surface or water bodies will not be harmed.
- Sustainable Drainage Systems (SuDS) will be incorporated.

1.1.9 Policy CC/8 states that development proposals will be required to demonstrate that:

- Drainage schemes comply with the SuDS Non-statutory technical standards for SuDS and the Cambridgeshire Flood and Water SPD.
- opportunities are taken to integrate SuDS, create amenity and enhance biodiversity.

- surface water is managed at source and on surface where viable.
- maximum use is made of low land take drainage measures.
- incorporate appropriate pollution control measures.
- Arrangements have been established for the whole life management and maintenance of surface water drainage systems.

1.1.10 Policy CC/9 mentions development will only be permitted where:

- the sequential and exception tests demonstrate the development is acceptable.
- Floor levels are 300mm above the 1 in 100 flood level plus an allowance for climate change.
- incorporate suitable flood protection / mitigation as appropriate. Prepare management and maintenance plans.
- there will be no increase to flood risk elsewhere and opportunities to reduce flood risk elsewhere are explored.

2 Existing Baseline Information

2.1 Site Location

2.1.1 The site is located in West Cambridge. The site extends to Madingley Road to the north to Barton Road to the south. The M11 motorway forms part of the western site boundary. Residential development and land owned by individual colleges of the University of Cambridge form the eastern boundary. The site consists of mainly agricultural land with buildings and associated infrastructure owned by University of Cambridge covering the northern part of the site. The total site area of approximately 223 hectares.

2.1.2 A location plan is enclosed in **Appendix A**.

2.2 Site Topography

2.2.1 LiDAR data show site levels range between 19m AOD in the north – west area of the site to 8.5m AOD adjacent to the eastern most boundary. The site generally falls to the south east although there are several areas which falls to the north in the northern part of the site. An existing catchment plan is enclosed in **Appendix B**.

2.3 Hydrological Context

2.3.1 The site is covered by a network of ordinary watercourses. An ordinary watercourse is defined as a river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.

2.3.2 The Bin Brook is a tributary of the River Cam in Cambridgeshire. It extends from Hardwick, a village to the west of Cambridge, to its confluence with the River Cam in the centre of Cambridge. The Bin Brook enters the site at the south-west boundary and is an awarded watercourse at this point managed by South Cambridgeshire District Council (see SCDC response and plan showing extent of awarded watercourse enclosed in **Appendix C**). The Bin Brook flows in a south-east direction across the south-west section of the site, it then runs parallel with the A603 Barton Road and becomes a “Main River” managed by the Environment Agency close to Stone Bridge. From a point close to Barton Road, south of Gough Way, the Bin Brooks flows north-west through the Gough Way residential area. It is partly culverted through this area, a 1500mm diameter surface water sewer is shown on the Anglian Water sewer plans in this location. Downstream of the Gough Way residential area it flows towards Clare Hall College and through the grounds of Robinson College and St John’s College in Cambridge before joining the River Cam north east of the site.

2.3.3 A flood relief channel operates in parallel with Bin Brook partly defining the south-east site boundary by flowing around the western and northern edges of the Gough Way area before re-joining Bin Brook. An EA pre-feasibility report on the Bin Brook dated October 2002 states the relief channel is a concrete channel for the majority of its length and an earth channel for the remainder. The report states the flood relief channel was designed to a 1 in 40-year standard. The feasibility report also noted that properties on Gough Way and a number of properties adjacent to the Bin Brook immediately up and downstream were flooded October 2001, as the capacity of the flood relief channel was insufficient to contain the volume of water flowing downstream.

2.3.4 Information provided by CCC shows a section of “ordinary” watercourse is culverted for a length of 700m (see plan enclosed in **Appendix D**). The culverted watercourse flows eastwards along a track, near the boundary between land owned by Jesus College and St John’s College and past a playing field, discharging to Bin Brook approximately 100m upstream of the crossing beneath Sylvester Road. CCC stated the Bin Brook is a designated

main river in this location, and also awarded to South Cambridgeshire District Council as the 3rd public drain.

2.3.5 There are further ordinary watercourses upstream of the Bin Brook in the south-west corner of the site. There is an ordinary watercourse which enters the site at the western boundary of the site between land owned by St John's College and University of Cambridge – West Cambridge. The aforementioned watercourse drains in an easterly direction before merging with Bin Book at the northern boundary of Corpus Christi College Sports Ground. OS Mapping shows there are additional "ordinary" watercourses within land owned by St John's College and University of Cambridge – West Cambridge and are culverted in several locations.

2.3.6 An old OS Map dating back to 1972-1973 sourced from old maps website shows the presence of a ditch (believed to be called Edwins Ditch draining north-east within the north east area of the site (see Figure 3 below). The aforementioned watercourse is not shown on current mapping which suggests it may have been infilled.

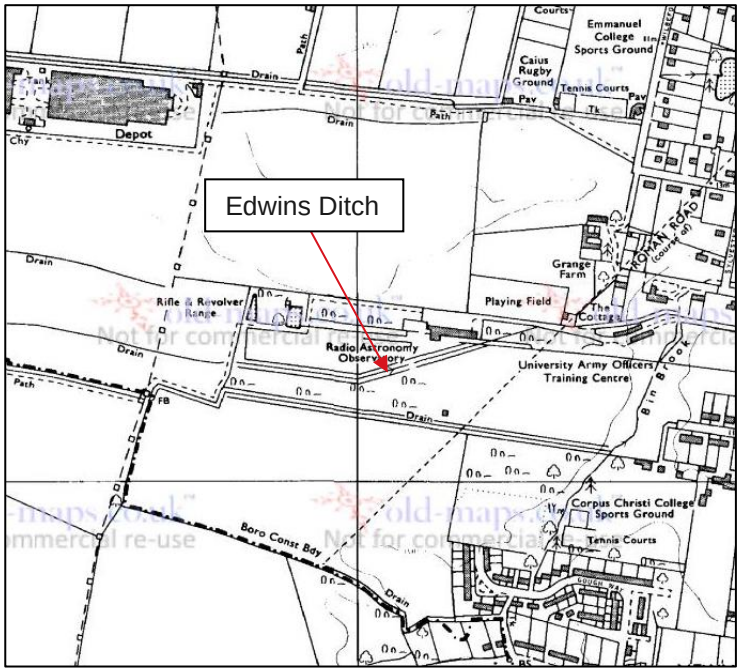

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Figure 1: Historical OS Map

2.3.7 There is a lake approximately 480m south-east of the site near to King's & Selwyn Colleges' Sports Ground.

2.3.8 There are no public sewers within the southern section of the site. There is a 225mm surface water sewer which runs along Cranmer Road and discharges into the Bin Brook in the eastern most area of the site. There are several foul and surface water sewers serving the existing buildings located within the northern part of the site. A copy of the sewer plans covering the site is enclosed in **Appendix E**.

2.4 Geological Context

2.4.1 The British Geological Survey (BGS) extracts show the site is underlain by the Gault Formation comprising mudstone. No superficial deposits are present. Geological information is enclosed in **Appendix F**.

2.4.2 The Soil Association Maps (see extract in **Appendix F**) show that the site is underlain wholly by soil type 411d (Hanslope). The permeability characteristics of soil type 411d is summarised in Table 1-1 below.

Table 2-1: Soil Association types found at site

Soil Type	Coverage	Description	BFIHOST
411d (Hanslope)	100% of site.	Slowly permeable calcareous clayey soils. Some slowly permeable non-calcareous clayey soils. Slight risk of water erosion.	0.34

2.4.3 The above suggests that infiltration is unlikely to be viable where underlain directly by soil type 411d, subject to infiltration testing. The effectiveness of infiltration will also be dictated by ground water levels at the site and therefore this is subject to further intrusive ground investigations which will be undertaken to support the site at the planning stage.

2.4.4 The Groundwater Source Protection Zone (GSPZ) maps show the site is not within a GSPZ. These maps show the risk of negative impact on water quality near an abstraction due to activities on or near the ground. The site is not underlain by a bedrock aquifer or superficial drift aquifer.

2.4.5 Ground Investigations will be undertaken to inform the future technical studies to support the planning application (once the site is allocated in the Local Plan), subject to onward planning and development strategy for the site. These will inform the proposed surface water drainage strategy (i.e. suitability of infiltration drainage and ground water levels) and inform the masterplan.

3 Assessment of Flood Risk

3.1 Fluvial Flooding

3.1.1 The Flood Map for Planning associated with the Site, available on the Government's website, is presented in Figure 2 below.

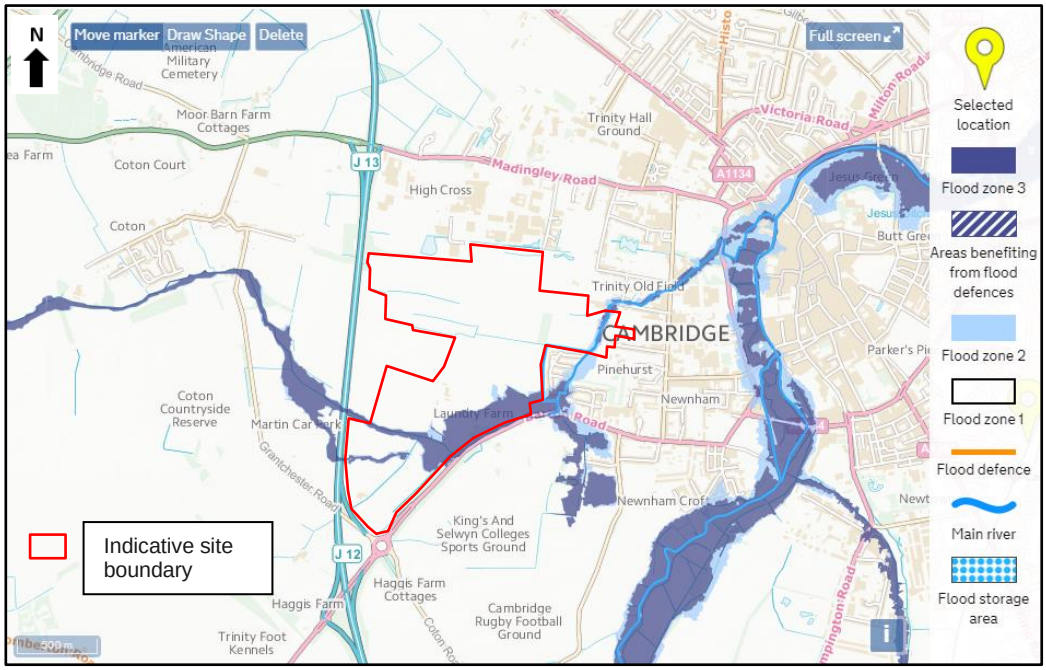

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Figure 2: Flood Map for Planning

3.1.2 The Flood Map shows a large portion of the site is located within Flood Zone 1, having a less than 1 in 1,000 annual probability (<0.1%) of fluvial or tidal flooding in any year. A part of the site is in Flood Zones 2 and 3, medium and high probability of flooding, mainly relating to the Bin Brook watercourse which bisects the western part of the site before running parallel to the southern site boundary.

3.1.3 The Flood Map for Planning does not map fluvial flood risk from minor watercourses. However, the "Risk of Flooding from Surface Water" map is considered a reasonable initial indicator of fluvial flood risk from minor watercourses, further details on the surface water flood risk is provided within this appraisal. EA data is enclosed in **Appendix G** although the data provided is incomplete.

3.2 Flood Risk from Reservoirs

3.2.1 The Risk of Flooding from Reservoirs map, see Figure 3 below, shows the risk of flooding in the event of a breach from reservoirs containing 25,000 (or above) cubic metres of water. The maps indicate that the site is not located within an area which is considered at risk in the event of reservoir breach.

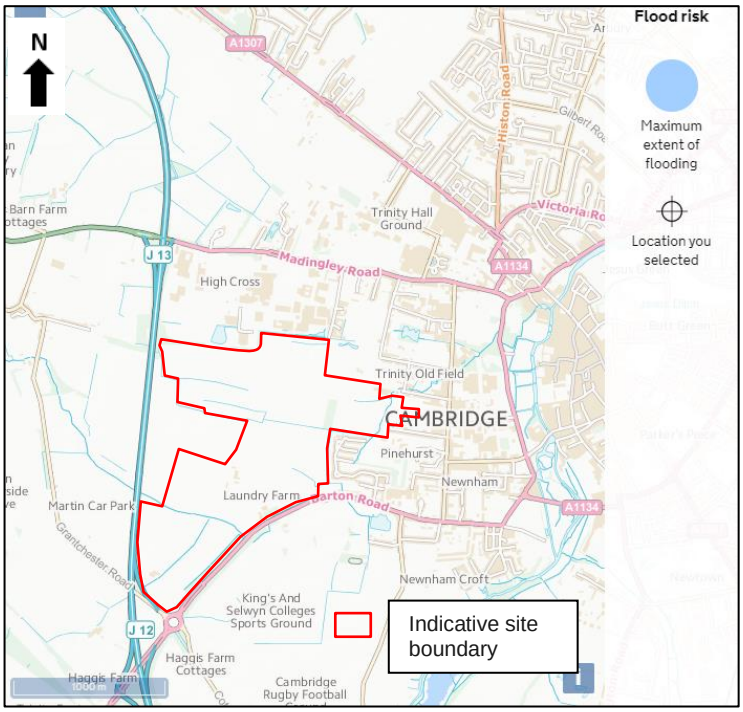

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Figure 3:Risk of Flooding from Reservoirs

3.3 Surface Water

3.3.1 The Risk of Flooding from Surface Water map available from the Government website, see Figure 4 below, shows areas that could potentially be susceptible to surface water flooding in an extreme rainfall event. Please note that the surface water flood maps show modelled information and not historical records.

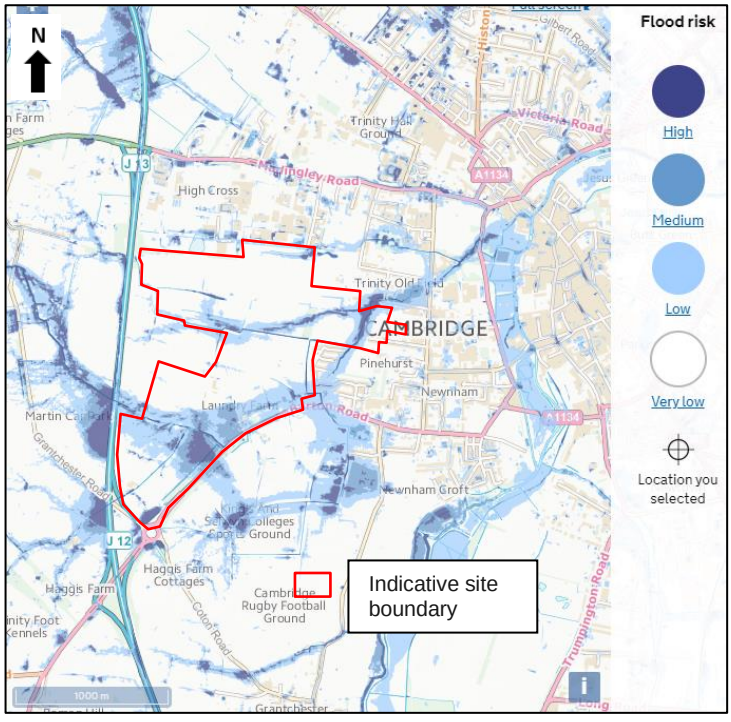

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Figure 4: Risk of Flooding from Surface Water

3.3.2 The definitions for each surface water flood risk category is defined in Table 3.1 below.

Table 3-1: Surface Water Flood Risk Categories

Risk of flooding	Probability
Very low	< 1 in 1000 (0.1%)
Low	1 in 1000 (0.1%) - 1 in 100 (1%).
Medium	1 in 100 (1%) - 1 in 30 (3.3%)
High	>1 in 30 (3.3%)

3.3.3 Figure 4 above shows the majority of the Site is at 'Very Low' risk of surface water flooding. However, there are areas shown to be at 'Low', 'Medium' and 'High' risk of surface water flooding as a result of depressions in the site topography and presence of onsite watercourses.

3.3.4 In the south west part of the site, there is an area of surface water flood risk, which is likely as a result of overland flow generated from the localised catchment area to the north/south and potentially from overflow associated with the Bin Brook watercourse and its tributaries which traverse the area.

3.3.5 There is a surface water flood risk (low, medium and high risk) associated with the Bin Brook watercourse and site topography along the south-east site boundary.

3.3.6 The other significant area of surface water flood risk area lies within the central part of the site due to due to water accumulating in low depression areas and overland flow routes. It is assumed at this locality that the watercourses are not explicitly modelled.

3.3.7 The 'High Risk' areas shown generally coincide with the alignment of existing watercourses located within the site, where watercourses merge and natural overland flow routes.

3.3.8 Consultation with the LLFA and appropriate investigations will be undertaken to assess the flood risk at the Site and to consider how the downstream flood risk could be reduced.

3.3.9 Appropriate easements and offsets to the existing watercourses at the site will be incorporated with the emerging masterplan for the site, in accordance with approving stakeholders.

3.3.10 SCDC require a 5m offset where the Bin Brook is designated as an 'Awarded watercourse'. The EA require an 8m offset where the Bin Brook is designated as an EA Main River. CCC confirmed the onsite 'ordinary watercourses' require a 5m offset.

3.4 Groundwater Flooding

3.4.1 Available BGS borehole records in the vicinity of the site were reviewed to provide initial information on potential groundwater levels at the site. A selection of these are presented in Table 3-2, which demonstrate that groundwater is present within the bedrock at the south-west corner of the site.

Table 3-2: BGS Borehole Records in the vicinity of the site

Borehole Reference	Location	Depth (m)	Level water struck at (m below ground level)	Geological classification of groundwater
TW45NW181	Within Jesus College owned land	3.2	Dry	Clay
TL45NW205 Dumpling Farm Grantchester	South-west corner of the Site	Unknown	Rest water level 2.4mbgl	Unknown
TL45NW139- Haggis Farm Cottages	South-west corner of site	43.3	Rest water level 2.4mbgl	Gault Formation

3.4.2 The above results show water levels within the bedrock could be within 3m below ground level (bgl). Further intrusive investigations would need to be undertaken to confirm this. Monitoring of groundwater levels, including variation of these levels through the seasons is recommended in conjunction with intrusive ground investigation to support of the Site at planning stage once the site is allocated in the Local Plan.

3.5 Sewer Flooding

3.5.1 AW have no records of flooding in the vicinity that can be attributed to capacity limitations in the public sewerage system (see response in **Appendix E**).

3.6 Historical Flooding

3.6.1 LLFA stated they have historic flood records in the south-east part of the site, extending from either side of the Bin Brook. A description of the flood extent is described within the LLFA's formal response contained within **Appendix D**.

3.6.2 LLFRA also have a record of the following flood investigations close to the site:

- Two properties along Barton Road in 2014, 10m from the site boundary;
- Three properties along Wilberforce Road and Madingley Road in 2012, approximately 500m from the site boundary.

3.6.3 The historical flood map included within the SFRA suggests multiple flood incidents have occurred near the south-east area of the site which concurs with LLFA's response (see map enclosed in **Appendix H**). The SFRA shows Barton Road in Cambridge flooded in 1978 due to the Bin Brook watercourse overtopping. In addition, SFRA records suggest Gough Way west of the site flooded due to Bin Brook surcharging (see 2.3.3 for further details).

3.7 Flood Risk Vulnerability Classification

3.7.1 NPPF PPG 'Flood Risk and Coastal Change' Table 2 identifies the 'Flood risk vulnerability classification' of a site, depending upon the proposed usage. This classification is subsequently applied to PPG Table 3 to determine whether:

- The proposed development is suitable for the flood zone in which it is located, and;
- Whether an Exception Test is required for the proposed development.

3.7.2 Table 3-3 highlights when an exception test is required, however the table does not show the application of the Sequential Test which guides development to be located in an area with the lowest risk of flooding hence areas in Flood Zone 1 should be considered in the first instance, then to Flood Zone 2, and then Zone 3. Priority should be given to guiding 'More Vulnerable development to Flood Zone 1 ahead of 'Less Vulnerable' and Water Compatible development.

Table 3-3: Flood Risk vulnerability and flood zone 'compatibility'

Vulnerability classification	Example uses	Flood Zone		
		1	2	3
More Vulnerable	• Residential care homes • Residential dwellings • Non–residential uses e.g. school	✓	✓	Exception Test required
Less Vulnerable	• Shops • Offices • General Industry	✓	✓	✓
Water Compatible	• Amenity Open Space • Outdoor Recreation Facilities	✓	✓	✓

Key: ✓ Development is appropriate

3.8 Climate Change

3.8.1 The EA confirmed they would only expect detailed modelling of Bin Brook to be undertaken as part of a Flood Risk Assessment if built development is proposed in close proximity to the extent of Flood Zone 3. The detailed modelling would be expected to include an assessment of the impact of climate change.

3.8.2 A 25% climate change allowance on peak river flow is anticipated, however this will need to be agreed with the Environment Agency.

3.8.3 With respect to anticipated changes in peak rainfall intensity due to climate change, CCC require a 20% increase in rainfall intensities to be used for design purposes to assess the impact on the surface water drainage network. A 40% increase in rainfall intensities should be used to assess the potential flood risk implications in the design rainfall event including whether there is any increased flood risk to third parties as a result of the development.

4 Surface Water Management

4.1 Surface Water Drainage Hierarchy

4.1.1 Regional and national planning policy will be taken into account going forward within the emerging drainage strategy for the site.

4.1.2 Planning policy requires that the effects of proposed development on flood risk elsewhere be considered, given that the addition of new impermeable surfaces will increase the amount of surface water runoff. Policy CC/8: Sustainable Drainage Systems of the Cambridge Local Plan Policy 31: Integrated water management and water cycle of the South Cambridgeshire Local Plan states that Sustainable drainage measures must be fully integrated within design to manage any surface water arising from development proposals.

4.1.3 Document H of the Building Regulations states that options for the disposal of surface water runoff should be considered in the following hierarchical order:

i. Into the ground (infiltration);

ii. To a surface water body (e.g. watercourse);

iii. To a surface water sewer, highway drain or other drainage system;

iv. To a combined sewer.

4.2 Existing Site Drainage

4.2.1 Based on information currently available, the site generally falls to the east to where the Bin Brook is located. The site appears to be divided into seven drainage catchments, principally defined by the indicative levels currently available and the on-site watercourse network. This is illustrated in the drawing enclosed in **Appendix B**.

4.3 Greenfield Runoff Rates

4.3.1 For the purpose of this assessment, the site had been considered as 100% greenfield with no infiltration. Intrusive ground investigations will be undertaken at the site in support of any future planning application once the site has been allocated in the Local Plan.

4.3.2 The greenfield runoff rate was estimated using the FEH Statistical method based on catchment descriptors for the site. BFIHOST values were checked using soil association plans. This method resulted in a QBAR (1 in 2.33 annual probability event) greenfield runoff rate of 2.5 l/s/ha.

4.3.3 Several drainage catchments are underlain by both soil types and therefore the proportion of each soil type was estimated in calculating the greenfield rate for that catchment.

4.3.4 Refer to **Appendix J** for the supporting Greenfield Runoff calculations.

5 Surface Water Drainage Strategy

5.1.1 At this stage it is anticipated the attenuation features proposed at the site will be widely dispersed throughout the development.

5.1.2 The design and the integration of the proposed SuDS features within the wider landscape strategy and proposals will be carefully considered as part of the master planning process and will themselves provide an element of Public Open Space (POS) use.

5.1.3 The site already has some established landscaping which is to be retained and enhanced where possible. Through the appropriate provision of SuDS to be incorporated within the wider landscape strategy for the site. There are existing water courses and land drains that could be integrated as part of the site's surface water drainage system, which will enhance the landscape. The SuDS proposals will therefore be designed to ensure they enhance and support the landscape proposals going forward.

5.1.4 The proposed SuDS seek to deliver long term mitigation by attenuating and treating the development generated surface water runoff and where possible provide betterment to the receiving watercourses including the Bin Brook. SuDS will be designed so they are integrated within the wider landscape proposals and will provide opportunities, where possible, to enhance biodiversity and recreation facilities.

5.1.5 As well as providing a drainage function, the SuDS will also form an important part of the project's biodiversity strategy. The proposed SuDS features will be designed so that they maximise opportunities for habitat creation.

5.1.6 The prevailing surface water strategy to be adopted is a network of positive drainage consisting of and not limited to:

- Green Roofs;
- Open cascading swales / rills;
- Attenuation Basins;
- Ponds;
- Wetlands;
- Porous Paving;
- Bio-retention areas; and
- Rainwater Harvesting.

5.1.7 Upstream on plot drainage solutions such as bio-retention planters, rainwater gardens and permeable paving could also provide pre-treatment for runoff from hard standing surfaces such a parking areas. Roof runoff where feasible will either drop directly into a piped drainage network, on plot rills, or rainwater gardens before discharging to the strategic attenuation areas.

5.1.8 Piped networks may still be utilised in areas based on the LLFA, Highways and Sewerage undertaker adoption requirements.

5.2 Attenuation Storage Requirements

5.2.1 The assumed percentage impermeable area for the residential areas is 60%. The Primary School development plot is assumed to have a percentage impermeable area of 40%. This will need to be reviewed as the development proposals progress.

5.2.2 WinDes Quick Storage Estimates (QSE) have been undertaken to provide an indication of the volume of storage that would likely be required on site to provide the necessary attenuation. This is for rainfall events up to the 1% (1 in 100) annual probability event plus, an additional allowance of 40% on rainfall intensity, which is to account for the potential impacts of climate change. The climate change allowance is based on the latest Environment Agency *Flood Risk Assessments: Climate Change Allowances* (February 2016).

5.2.3 The proposed final developable area for the future works is not yet known and therefore the amount of storage required for every 1ha of impermeable area has been calculated based on the site applicable greenfield Qbar runoff rates of 2.5 /s/ha. This equates to 1084m^3 per impermeable hectare.

5.2.4 An approximation of the total storage required for each catchment is shown in **Appendix K**. The calculations are only rough estimates which can only be used at this high-level stage.

5.2.5 Indicative locations of strategic attenuation basins for each catchment is shown in a Surface Water High Level Review Drawing enclosed in **Appendix I**. It is anticipated this storage will be more dispersed once a masterplan is progressed in the planning stages.

5.2.6 The maximum stored water depth to achieve a gravity outfall will also need to be confirmed at a later stage once full survey data is available of the local land drainage network.

5.2.7 The size of any proposed attenuation features will be affected by any groundworks that may take place as part of the development proposals.

5.3 Exceedance

5.3.1 To demonstrate that in an exceedance event any flooding does not negatively affect the development, flows up to the 1 in 100 (1%) annual probability plus climate change rainfall event will be managed onsite. Furthermore, the attenuation will be designed to accommodate surface water runoff with no flooding for all storms up to and including the 1 in 100 (1%) annual probability plus 40% climate change event.

5.4 Pollution Control

5.4.1 Appropriate pollution control measures must be included in the surface water drainage system to minimise the risk of contamination or pollution entering the receiving watercourse and aquifer from surface water runoff from the development. The drainage network will need to incorporate sufficient treatment stages to meet the water quality requirements of the CIRIA SuDS Manual, CCC SuDS Design Guidance and the Local Plan. A SuDS treatment plan should be applied for each catchment whereby runoff passes through a variety of SuDS techniques to control volumes of runoff and reduce pollution before discharge to a watercourse.

5.5 Adoption and Maintenance

5.5.1 It is assumed that the surface water infrastructure will be designed to adoptable standards and adopted either by Local Authority (CCC), Anglian Water, ICOSA or private management company. The upcoming release of Sewers for Adoption 8th Edition highlights a change in approach whereby sewerage companies including Anglian Water are open to adopting SuDS

features provided they meet expected design standards. South Cambridgeshire District Council will not generally adopt and / or maintain SuDS.

5.5.2 The Surface Water Drainage Guidance for Developers Document dated July 2019 provides outline guidance on how SuDS features should be designed.

6 Conclusions and Recommendations

6.1 Flood Risk

6.1.1 A large portion of the site is located within Flood Zone 1 of the “Flood Map for Planning”, which is appropriate for all types of development.

6.1.2 Flood Zones 2 and 3, medium and high probability of flooding are shown at the site but are mainly constrained to the channel associated with the Bin Brook. Modelling of the Bin Brook may be required if built development is proposed close to Flood Zone 3 as part of a future FRA.

6.1.3 The sequential approach is to be adopted at the site whereby development is located within lowest risk flood areas of the site where possible. Appropriate easements will be applied to the watercourses at the site to ensure they remain free from development and future maintenance access can be retained.

6.2 Surface Water Drainage

6.2.1 The work currently being undertaken has already resulted in several key issues and themes being identified, these are as follows:

- Sustainable Drainage Systems (SuDS) will be proposed throughout the development and will form a key part of the green infrastructure network. These will be designed to enhance the biodiversity opportunities within the development.
- Greenfield runoff from the site will be limited in accordance with the Lead Local Flood Authority (Cambridgeshire County Council) surface water drainage design requirements and provisional rates have been provided within this appraisal.
- There are existing water courses and land drains could be integrated as part of the site’s surface water drainage system, which could enhance the landscape.
- It is estimated attenuation storage in the order of 1084m^3 per impermeable hectare could be required to attenuate runoff prior to discharge.

6.3 Compliance with Local Planning Policy

6.3.1 The future masterplan will be designed to meet the relevant Local Planning Policy requirements contained within the Cambridge Local Plan and South Cambridgeshire Local Plan.

6.3.2 A NPPF compliant Flood Risk Assessment (FRA) and supporting Sustainable Surface Water Drainage Strategy will be provided in support of the site at planning.

Appendix A Location Plan

Rev	Description	Date

Notes:
This drawing is for information purposes only. It should not be relied upon for legal nor title purposes. Do NOT scale from this drawing or use in construction. Proper advice should be sought from relevant qualified entities regarding legal and construction issues. Any discrepancies should be immediately reported to the originator of the drawing.

Client:

North of Barton Road
Land Owners Group

South West Cambridge

Aerial Plan

Scale@A3:	Drawn:	Designed:	Approved:
1:5,000	CE		GH

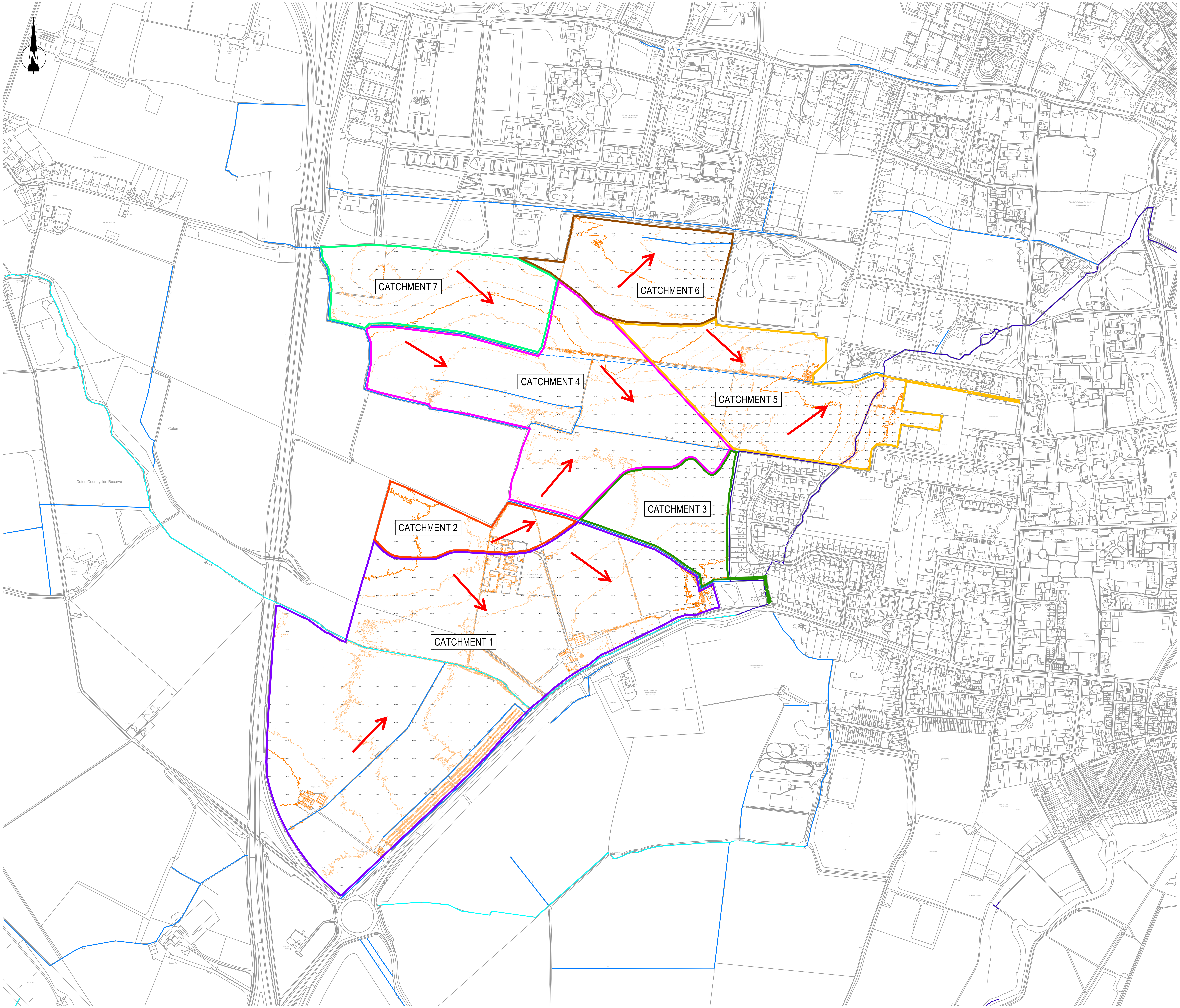
0 250 500 1000 Metres

Drawing Number:	Revision:	Date:
CAR001-003	-	21/08/2019

50 North Thirteenth Street, Central Milton Keynes, MK9 3BP
01908 666276 mail@davidlock.com **davidlock.com**

DAVID LOCK ASSOCIATES

Appendix B Existing Catchment Plan



NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN UNLESS NOTED OTHERWISE.
3. ALL COORDINATES ARE IN METRES RELATIVE TO ORDNANCE SURVEY NATIONAL GRID.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.
5. THIS DRAWING IS FOR SUPPORT AT LOCAL PLAN PROMOTION ONLY AND IS SUBJECT TO FURTHER DESIGN.
6. CATCHMENT AREAS ARE BASED ON EXISTING LIDAR DATA AND MAY BE SUBJECT TO CHANGE ONCE A TOPOGRAPHICAL SURVEY IS RECEIVED.

LEGEND

- MAJOR CONTOUR
- MINOR CONTOUR
- EA MAIN RIVER
- AWARDED WATERCOURSE
- ORDINARY WATERCOURSE
- CULVERTED EA MAIN RIVER
- CATCHMENT 1
- CATCHMENT 2
- CATCHMENT 3
- CATCHMENT 4
- CATCHMENT 5
- CATCHMENT 6
- CATCHMENT 7
- FLOW DIRECTION

Mark	Revision	Date	Drawn	Chkd	Appd

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status

PRELIMINARY

LAND NORTH OF BARTON ROAD,CAMBRIDGE

SURFACE WATER DRAINAGE AND EXISTING CATCHMENT PLAN

Client

NORTH BARTON LAND LANDOWNERS GROUP

Date of 1st Issue	Designed	Drawn
24.10.2019	MH	ECR
A1 Scale 1:5000	Checked ACS	Approved -

Drawing Number: 47115/2001/002 | Revision: P0

peterbrett now part of Stantec

peterbrett.com

CAMBRIDGE
Tel: 01223 882 000

Appendix C SCDC Records and Correspondence

Hartley, Michael

From: Patrick Matthews <Patrick.Matthews@scambs.gov.uk>
Sent: 09 October 2019 11:16
To: Hartley, Michael
Cc: Parsons Michael
Subject: RE: Request for Flood Data: Land South of St Neots Road, Hardwick, Cambs
Attachments: SKM18200330191009105 30.pdf

Hi Michael,

Please see enclosed copy of working drawing showing the location of the award drains in the locality. No digital maps due to IT glitch at moment.

The usual byelaw restrictions apply to the awards – i.e. 5-metre maintenance strip as well as consent to increase the rate or volume of flow in the awards.

On 21 October 2001, the brook caused flooding along the M11 at the intersection point. Additionally, the properties on the outskirts of Coton flooded on a number of occasions in the past (close to AW pumping station.

Immediately outside the SCDC area about 20 properties flooded on a number of occasions in Gough Way (EA main river at this point.

Hope this helps.

Kind regards

Pat

From: Hartley, Michael <michael.hartley@stantec.com>
Sent: 08 October 2019 16:00
To: Patrick Matthews <Patrick.Matthews@scambs.gov.uk>
Cc: Parsons Michael <Michael.Parsons@scambs.gov.uk>
Subject: RE: Request for Flood Data: Land South of St Neots Road, Hardwick, Cambs

Hi Pat,

I have just released that our enquiry was not sent directly to your email address for this site, only to the general drainage/flood risk South Cambridgeshire Council email address, apologises for that.

Please see attached enquiry which we submitted originally.

CCC have informed us Bin Brook is a designated main river in this location (where located east of the site), but and also awarded to South Cambridgeshire District Council as the 3rd public drain.

Kind regards,

Michael Hartley
Assistant Engineer

Direct: 01223802952
michael.hartley@stantec.com
Cambridge

Address: 3rd Floor, 50-60 Station Road, Cambridge, CB1 2JH
Main Tel: 01223 882000

PBA has joined the Stantec family, find out more at peterbrett.com.

From: Patrick Matthews <Patrick.Matthews@scambs.gov.uk>
Sent: 08 October 2019 15:47
To: Hartley, Michael <michael.hartley@stantec.com>
Cc: Parsons Michael <Michael.Parsons@scambs.gov.uk>
Subject: RE: Request for Flood Data: Land South of St Neots Road, Hardwick, Cambs

Hi Michael,

I don't appear to have a site plan for Barton. I am not clear on what you need. Please forward a plan of the area.

Kind regards

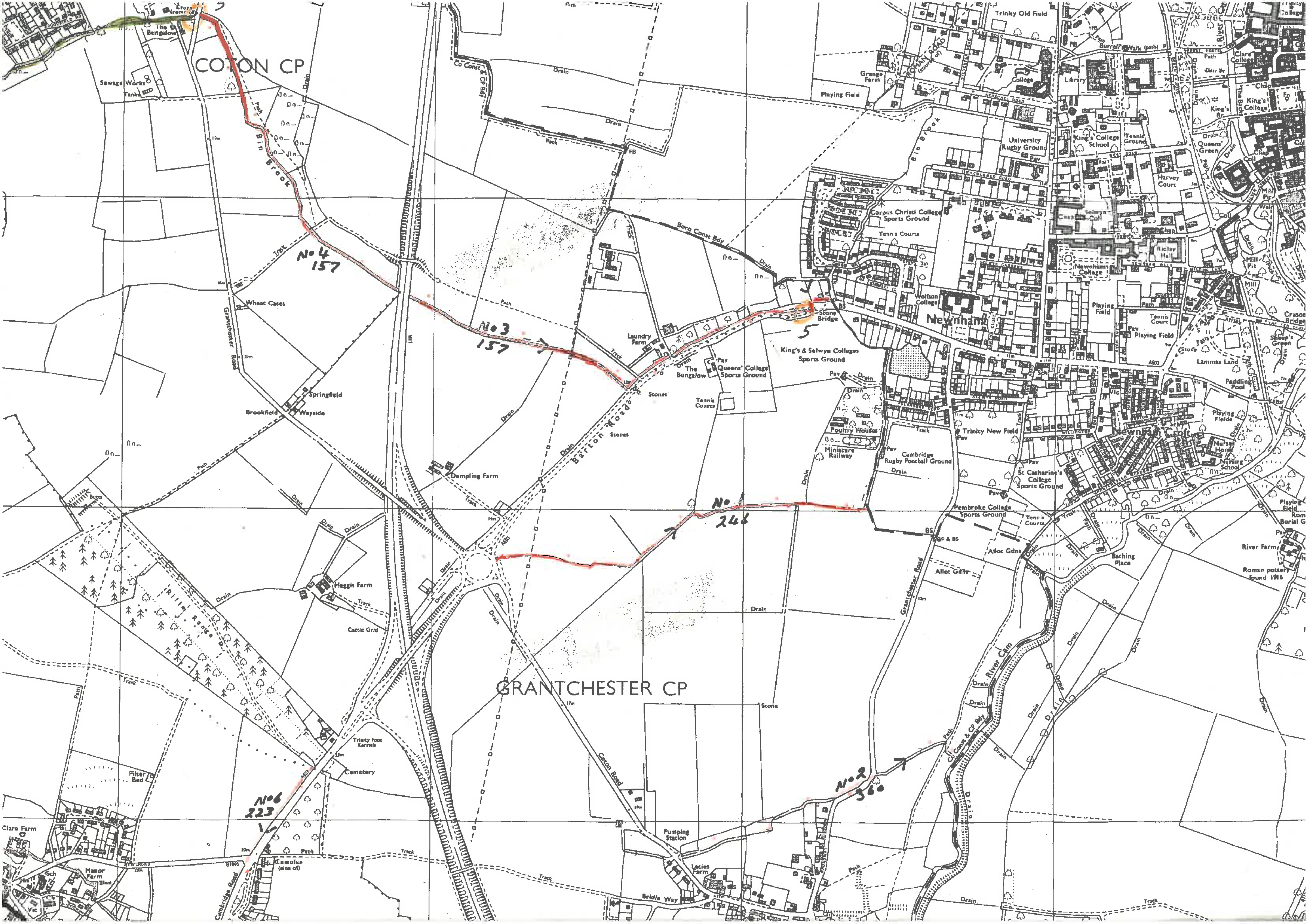
Pat

From: Hartley, Michael <michael.hartley@stantec.com>
Sent: 08 October 2019 09:07
To: Patrick Matthews <Patrick.Matthews@scambs.gov.uk>
Cc: Parsons Michael <Michael.Parsons@scambs.gov.uk>
Subject: RE: Request for Flood Data: Land South of St Neots Road, Hardwick, Cambs

Hi Patrick,

We would be grateful if you could provide a response to our information request for Land North of Barton, Cambridge today if possible? We are submitting the flood risk and drainage appraisal shortly.

Kind regards,



COTON CP
GRANTCHESTER CP
No 4
157
No 3
157
No 1
246
No 2
360
No 6
223
5
The Bungalow
Sewage Works
Tanks
Bin Brook
Grantchester Road
Wheat Cases
Springfield
Wayside
Brookfield
Laundry Farm
The Bungalow
Queens' College Sports Ground
Tennis Courts
Stones
Barton Road
Dumpling Farm
Haggis Farm
Cattle Grid
Rifle Range
Butts
Trinity Foot Kennels
Cemetery
Filter Bed
Clare Farm
Manor Farm
Cumulus (site of)
Coton Road
Pumping Station
Lacies Farm
Bridle Way
Stone
Drain
Track
Path
M11
A603
Co Const & CP Bdy
Boro Const Bdy
Playing Field
Grange Farm
Trinity Old Field
University Rugby Ground
Library
Corpus Christi College Sports Ground
Tennis Courts
Selwyn Coll
Ridley Hall
Newnham College
Wolfson College
Newnham
Stone Bridge
King's & Selwyn Colleges Sports Ground
Harvey Court
King's College School
King's College
Clare College
Queens' Green
Mill Pit
Playing Field
Tennis Court
Lammas Land
Sheep's Green
Paddling Pool
Playing Fields
Poultry Houses
Miniature Railway
Cambridge Rugby Football Ground
Trinity New Field
St Catharine's College Sports Ground
Pembroke College Sports Ground
Newnham Croft
Nurses Home
Nursing School
Allot Gdns
Bathing Place
River Farm
Roman pottery found 1916
River Cam
Grantchester Road

Appendix D CCC Records and Correspondence

Hartley, Michael

From: FR Planning <FR.Planning@cambridgeshire.gov.uk>
Sent: 12 September 2019 13:31
To: Hartley, Michael
Subject: RE: Request for Flood Data: Land North of Barton Road, Cambridge

Dear Michael,

Thank you for your request for data for the site at:

Location: Land North of Barton Road, Cambridge
Grid Reference: 542248E, 257560N

Please find below your requested information.

1. **Historic Flooding**
   Our records indicate an area of historic flooding in the South Eastern boundary of the site, extending from either side of the Bin Brook. The area within the site boundary extends approximately 200m North from the A603 and approximately 240m West from the proposed access off of the A603 and the Bin Brook.

   We also have record of the following flood investigations close to the site:
   - Two properties along Barton Road in 2014, 10m from the site boundary
   - Three properties along Wilberforce Road and Madingley Road in 2012, approximately 500m from the site boundary
2. **Flood Modelling**
   We do not hold flood modelling for the site and would direct you to the Environment Agency's Long term Flood Risk Map for a high level overview of surface water flood risk.
3. **Detailed Surface Water Flood Maps**
   Please refer to the Long term Flood Risk Map as above.

   From this map we note that there is an area of low to high surface water flood risk flowing across the southern boundary of the site, extending from Bourn Brook (largely synonymous with the area of flood zone three).

   We also note that there is a flow path of low to high surface water flood risk bisecting the centre of the site from west to east.
4. **Easements**
   The LLFA requests a 5m buffer strip from any ordinary watercourse to facilitate access for maintenance and inspection. For information on easements from main rivers please contact the Environment Agency, and for Awarded Watercourses please contact South Cambridgeshire District Council.
5. **Ordinary Watercourse Consent**
   We note there are several watercourses within the central area of the site boundary.
   One of these watercourses is culverted for a length of 700m. We assume this flows from West to East along a field boundary, between land owned by Jesus College and past a playing field, discharging to Bin Brook approximately 100m upstream of the crossing beneath Sylvester Road. Bin Brook is a designated main river in this location, and also awarded to South Cambridgeshire District Council as the 3rd public drain. This flows from West to East along the southern boundary, before flowing north along the eastern site boundary. Bin Brook is the main source of fluvial flood risk on the site.

Any changes made to an ordinary watercourse (above or below ground) which meet the below requirements will require ordinary watercourse consent.

- Impede/obstruct the flow of water in any way.
- Change the cross sectional profile of the watercourse e.g. bank protection works.
- Change the conveyance capacity of the watercourse.

Works greater than 1.2m from the watercourse in any direction (e.g. drilling a pipeline beneath) do not require consent.

Temporary watercourse consent is required if works are planned to involve any damming and/or over-pumping of the watercourse to create a dry working area, or any objects or materials that will be removed at a later date that interfere with or change the flow of water in a watercourse.

Application and payment for Ordinary watercourse consent can be made on our website. You can also upload the supporting documentation.

Any works to the awarded watercourses may require a byelaw consent from South Cambridgeshire District Council – contact Pat Matthews on patrick.matthews@scambs.gov.uk

Any works to a main river may require flood defence consent from the Environment Agency.

Cambridgeshire County Council has a surface water guidance document which is available to view here. This document was put together with input from developers and provides guidance on putting a drainage strategy together along with checklists and templates to help ensure you include sufficient information within your drainage strategies.

We also offer a pre-application service which enables you to discuss your drainage proposals with an LLFA Officer prior to submission of a formal application. This is a charged service, application may be made on our website here. If you would like any assistance deciding the type of pre-application you need, please do not hesitate to get in touch.

Kind regards,

Joanna Henry
Flood Risk Engineering Student
Email: FRPlanning@cambridgeshire.gov.uk
Phone: 01223 699166
Flood Risk & Biodiversity Team
Address: Place and Economy, Cambridgeshire County Council, Box No SH1315, Shire Hall, Cambridge, CB3 0AP

LATEST NEWS:

To aid planning submissions we have added a **new SuDS maintenance plan template** to our surface water guidance document. Click on the image above to view.

All issues relating to water on the highway or blocked gullies should be reported to Highways
via highways@cambridgeshire.gov.uk, the online reporting tool or 0345 045 5212.

From: Hartley, Michael [mailto:michael.hartley@stantec.com]
Sent: 11 September 2019 09:58
To: Flood and Water <Flood.andWater@cambridgeshire.gov.uk>
Subject: Request for Flood Data: Land North of Barton Road, Cambridge

Dear Sir/Madam

PBA, part of Stantec has been commissioned to undertake a Flood Risk and Drainage Appraisal at Land North of Barton Road, Cambridge (National Grid Ref: 542248E, 257560N). Nearest post code: CB23 7AU. A site location plan is attached.

A review of online Environment Agency mapping suggest that a large portion of the site falls within Flood Zone 1: Low Probability of flooding, although a portion of the land in the southern part of the site is within Flood Zone 3: High Probability of flooding due to the presence of the Bin Brook which traverses the site (see attached jpg). The Bin Brook crosses the western part of the site, runs along the southern boundary before turning northwards along the eastern boundary.

We would be grateful if you could provide the following information:

- Any records of previous flooding of the site;
- Modelled flood levels, depth and rate of flooding of the Bin Brook during the 1 in 20year, 1 in 100 year (and with climate change allowance if available) and 1 in 1000 year events.
- Detailed Surface Water flood map(s)

We are in consultation with other stakeholders such as Environment Agency and Anglian Water.

Thank you for your assistance. If you require any further information please contact myself on this contact email address. Please us know as soon as possible if there is a charge for this information so that we can raise the necessary payment.

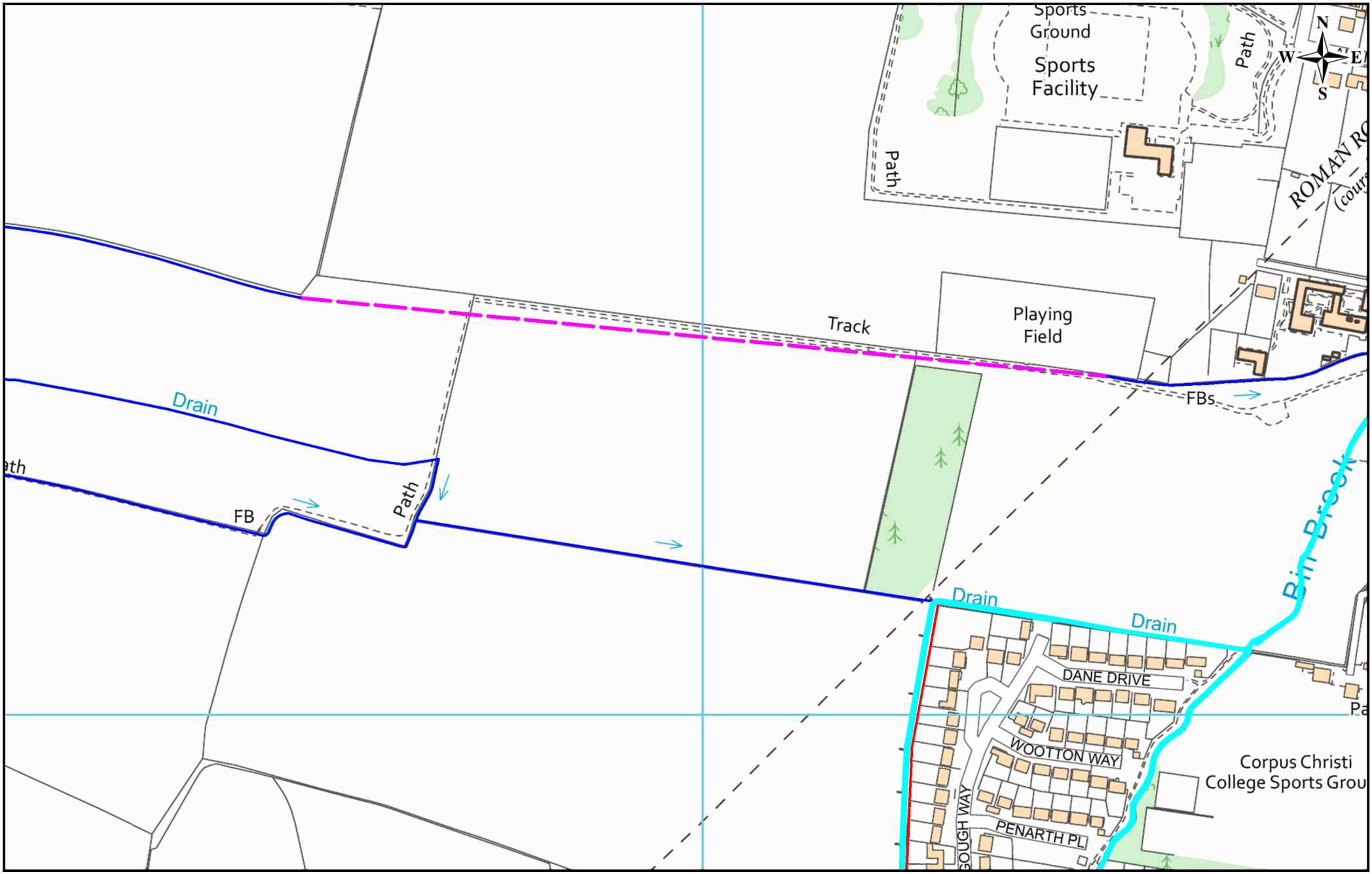
Kind regards,

Michael Hartley
Assistant Engineer

Direct: 01223802952
michael.hartley@stantec.com
Cambridge

Address: 3rd Floor, 50-60 Station Road, Cambridge, CB1 2JH
Main Tel: 01223 882000

Cambridgeshire County Council



Scale (at A4): 1:4340 Centred at: 542985,258243 Date: 03/10/2019 By: yd710