Rebuttal Biodiversity Evidence of Oliver Ramm, RammSanderson Ecology Ltd.

Land off Leconfield Road, Nanpantan, Loughborough

Appeal against the refusal of Outline Planning Permission for a residential development with associated infrastructure for up to 30no. dwellings, including detail of associated point of access. All other matters (landscaping, scale, layout and appearance) reserved.

On Behalf of Bowbridge Homes (Nanpantan) Ltd.

PINS ref: APP/X2410/W/22/3304644 LPA ref: P/20/2199/2

13th March 2023

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1 INTRODUCTION

1.1 I have reviewed the biodiversity Proof of Evidence provided by Ms. Justine Walsh of Heatons Ltd on behalf of Charnwood Borough Council and provide this rebuttal in order to respond to a number of points raised in that Proof.

1.2 Several of the points raised by Ms Walsh are matters not previously raised by the Council.

1.3 I deal with each topic raised as per Ms Walsh's evidence numbering for ease of reference and comparison. I have sought only to respond to those points where I consider that a written response would assist the Inspector. The fact I do not respond to every point in Ms Walsh's proof should not be taken as an indication that I agree with those points.

1.4 Much is made by Ms Walsh of inaccuracies of plans and widths of buffers. However, it should be noted that the plans referred to and measured off by Ms Walsh were superseded by updated plans submitted during the application process. Ms Walsh does not appear to have been aware of those updated plans, nor our V3 BIA Metric, in preparing her proof, which negate the mainstay of the points she makes in relation to the alleged inaccuracy of plans and measurements. I set out the full details of these points in the following sections.

1.5 As to Ms Walsh's evidence in respect of badger, this is not an issue that has been raised by the Council prior to the submission of proofs. Whilst it is not appropriate to discuss the specific location of badger setts in the public domain, the buffer zone proposed in the appeal site is sufficient in order for any active setts in the vicinity to be retained without direct impact. Should a licence be required to affect a sett, this can be readily dealt with as a condition.

2 LOSS OF PRIORITY (SEMI NATURAL) HABITAT

2.1 In reference to Section 4 of Ms Walsh's Evidence, a small and insignificant amount of acid grassland is considered to be present within the appeal site as addressed in my Proof of Evidence. Ms Walsh states this is priority habitat, i.e., Lowland Dry Acid Grassland, and by extension irreplaceable habitat within the meaning of the NPPF definition. I disagree. The acid component of the grassland on this site does not meet the Priority Habitat criteria, and for that reason, it has been classified in accordance with the Defra Metric 3.1, which uses the UK HAB habitat classification system as 'Other Acid Grassland'. The acid grassland on the Appeal site is small in area; much smaller that the Leicestershire BAP minimum qualifying requirement of 1Ha, and only contains 2 indicator species of this habitat type when assessed against Leicestershire's site selection criteria. It is erroneous to call this a Priority Habitat, or an Irreplaceable Habitat.

2.2 The amount by which this grassland type is offset in the BIA Metric, is commensurate and proportionate to that which is being lost. The amount of acid grassland on the Appeal site is agreed as being small. We have assessed this to constitute 0.0218 of a hectare. It is disproportionate to create 1Ha of acid grassland in order to offset for the loss of such as small area of this habitat type.

2.3 The Officer's Report & Officers Extras Report include statements from CBC's Senior Ecologist who refers to this habitat type as small and not significant in value. I agree with the Council's ecological officer on this point, and it was not a disputed matter previously.

2.4 Paragraph 5.12 of my Proof of Evidence refers to the Officers Report [CD 3.1] and the clear agreement on the baseline value of the existing habitats on the site. From Ms Walsh's evidence, it appears that she disagrees with both the Council, and the Appellant on this point. At paragraph 5.13 of my evidence, I quote from the Officers Extras Report [CD.3.2] which clearly states the following:

> *"Charnwood's Senior Ecologist is of the view that the BIA does take into account the acid grassland and that as the area of grassland is relatively small, its value is not great. While retention and restoration of the site would be preferable from a singular ecological perspective, the loss of ecological value is not 'significant' or 'demonstrable' in terms of the NPPF to justify refusal and appropriate measures can be put in place to ensure adequate compensation of any habitat that would be lost that is based on the agreed baseline assessment of the site in the BIA (December 2021) and further details which could be secured through reserved matters, conditions and Section 106"*

2.5 Ms Walsh further disputes the agreed baseline by suggesting that the scrub habitats along the western site boundary should be reclassified as broadleaved semi-natural woodland as they are connected to Burleigh Wood. The scrub is to be retained, regardless of whether it is classified as scrub, or as part of the connected woodland. Changing this classification would have no material effect on the outcome of the assessment However, as explained above, the baseline was agreed with CBC's Senior Ecologist.

2.6 It appears that Ms Walsh is making this change in order to infer that an adverse impact will occur to the ancient woodland. However, the mapping provided at Drawings 1 and 2 of her evidence are based on plans that have since been superseded. To be clear, there will be no loss of ancient woodland as a result of the appeal scheme. A more than adequate buffer has been designed into the proposals to mitigate impacts, and to help protect the woodland from informal walking routes and access points into the woodland. In so doing, the buffer will act to support a management objective of the Loughborough University Woodland Management Plan [Objective 3.1, in Table 7 of CD.5.2.14].

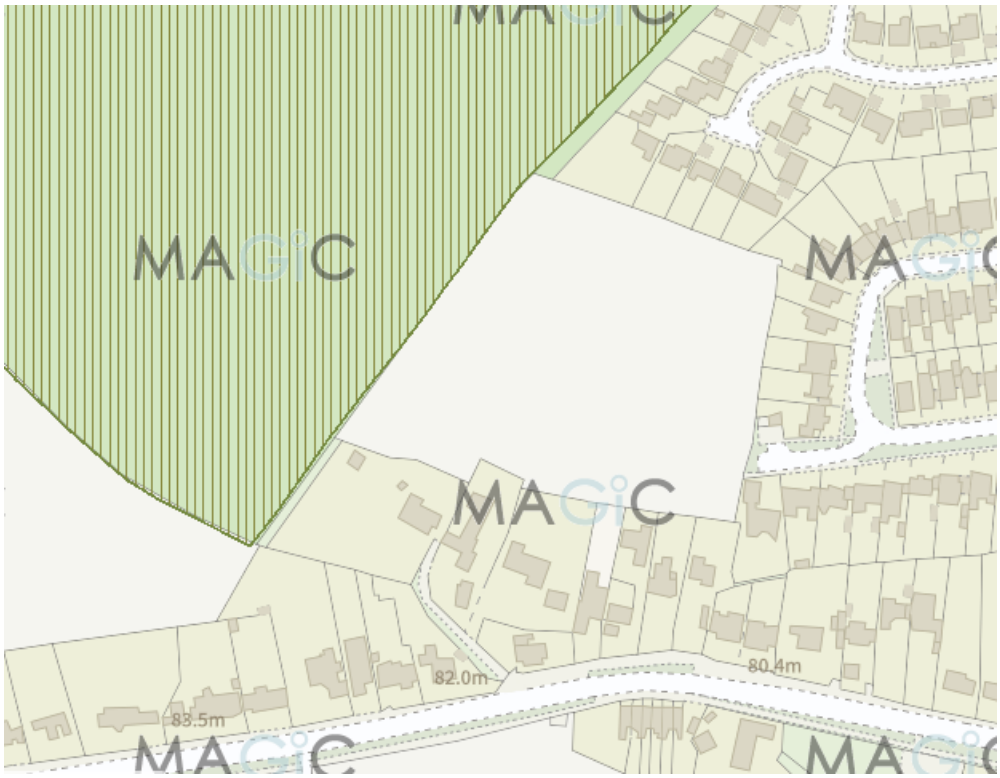
2.7 Ms Walsh also makes refence to indirect impacts such as recreational impacts from walking, jogging, nutrient enrichment from dog fouling, and bird predation from domestic cats. The degree of change from the existing baseline, to that resulting from the addition of up to 30 further dwellings is not considered to be significant, however mitigation and control measures could be incorporated into the CEMP if required, and secured by condition.

2.8 In Paragraph 5.23 of Ms Walsh's evidence reference is made to Parameter Plan n1249_010A [CD.1.6] and Illustrative Layout Plan n1249_007E [CD.1.5]. Whilst these two plans formed part of the application, they were later superseded by Parameter Plan n1249_010B [CD.2.5] and Illustrative Layout Plan n1249_007F [CD.2.4] on 26th August 2021 that were submitted to the planning officer [CD.8.8] by Carl Stott of nineteen47 Ltd on behalf of the Appellant. At Paragraphs 5.25 and 5.33, Ms Walsh again refers to the old, now superseded plans.

2.9 The revised Parameter Plan is clearly labelled to show a 15m buffer where no ground works will be permitted, and a further 5m buffer. Clearly this exceeds the stated minimum buffer width requirement for Ancient Woodland, as set out by Natural England of 15m.

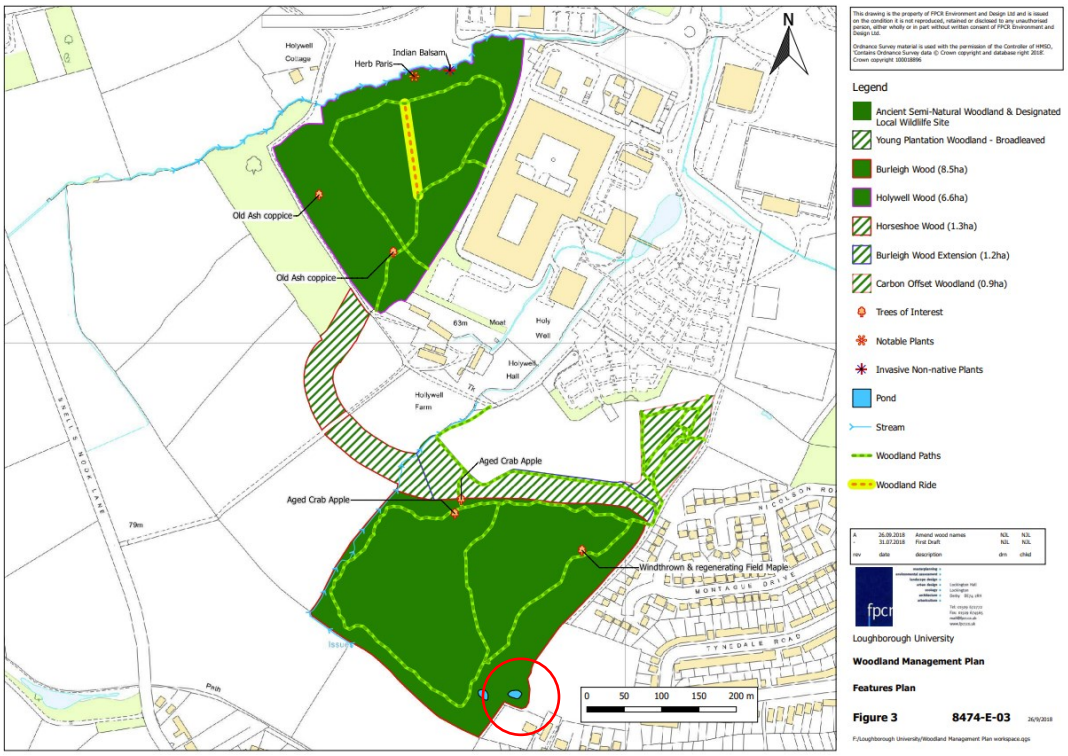
3 EXTENT OF BURLEIGH WOOD & BUFFER

3.1 To demonstrate the differences between Ms Walsh's Drawings, and the actual situation, it is necessary to have regard to the Natural England Inventory of Ancient Woodlands, a GIS dataset held on the publicly available www.magic.defra.gov.uk website. An extract is provided below, with the layer showing the Ancient Woodland inventory (vertical green line hatching). A full page extract is also included at Appendix 1 of this document.

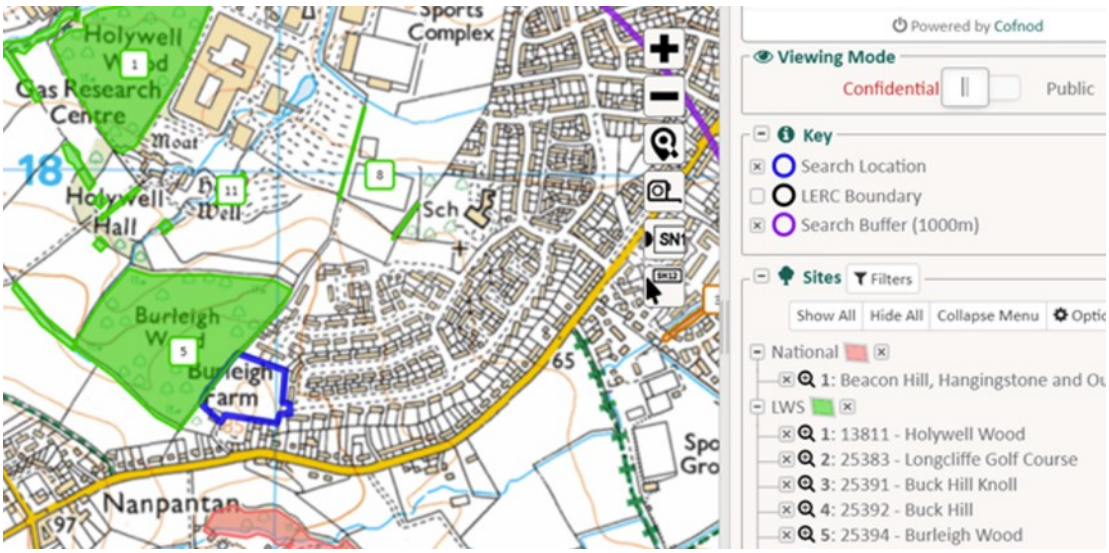


3.2 This clearly shows that the extent of Burleigh Wood Ancient Woodland follows the line of the Appeal site boundary and does not extend into the site.

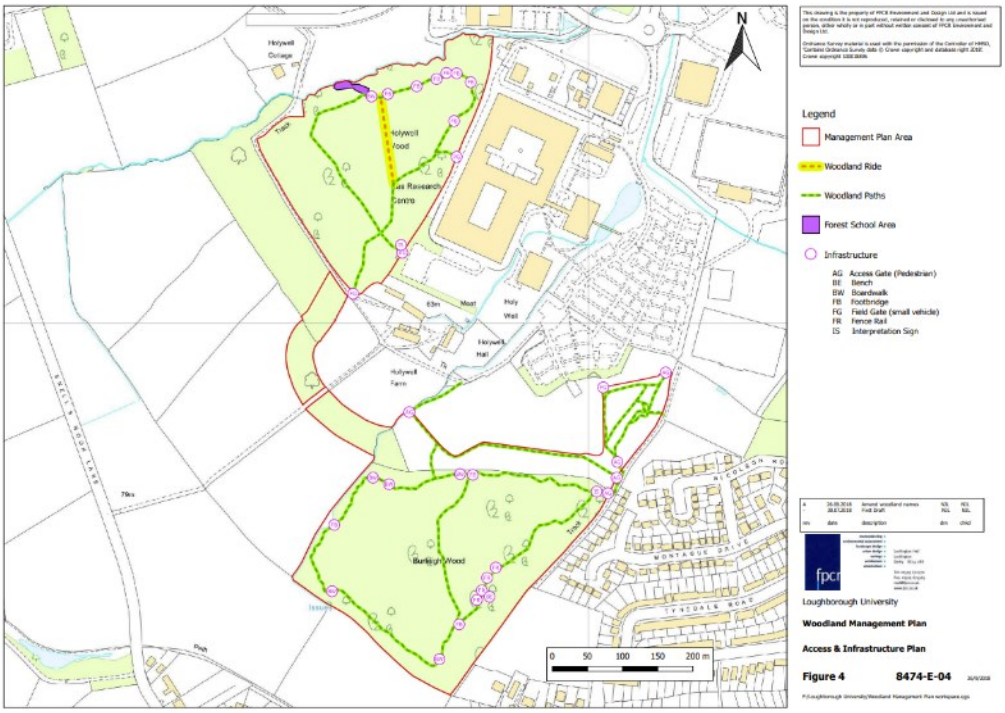
3.3 Whilst the Loughborough University Management Plan for Burleigh and Holywell Woods includes plans that show an area within the Appeal site that extends Burleigh Wood slightly into the site, this is not to be confused with the extents of ancient woodland, as per the Natural England database extent shown above. An extract from the management plan is given below (Figure 3 of CD.5.2.14) showing the extents of the woodland. It is considered a mapping error within the management plan, to show the extent of ancient woodland (in the key) as the same as the extent of Burleigh Wood, and the LWS citation. This also shows a pond on the site boundary which is not present.



3.4 It is further noted that the extents of the Local Wildlife Site citation, as shown in the extract from the Leicestershire Environmental Records Centre database below, also follows the appeal site boundary, rather than the boundary given in the woodland management plan.



3.5 The next plan in the woodland management plan [Figure 4 of CD.5.2.14], shows the extent of the management area, which is inconsistent with Figure 3 of CD.5.2.14. An extract is provided below:



3.6 However, this is also inconsistent, as management actions have been taking place beyond the boundary of the woodland, inside the Appeal Site. The photograph below, shows 'dead-hedging' taking place inside the Appeal Site boundary, and in close proximity to a badger sett:

3.7 The extent of the buffer zone from Burleigh Wood has been called into question by Ms Walsh. Her Drawings 1 & 2, as described in the previous section, are based on plans which have since been superseded.

3.8 To support this rebuttal proof, we have remeasured the buffer zone on the CAD version of the indicative layout drawing provided at CD.2.4, and enclose the extract below, which clearly shows the buffer zone to be a minimum width of 22.05m at the northern end, and a maximum width of almost 50m (49.92m) at the southern end of the buffer.

3.9 In any case, the extent of the buffer at the southern end of the Appeal Site extends to c.50m, and is therefore far in excess of the requirements, regardless of which edge line of woodland is used.

3.10 It is also worth noting here that the Officer's Report stated their confidence that the assessments and proposals provided supporting information to a policy compliant application.

3.11 In conclusion on this matter, the plans and evidence provided by Ms Walsh are based on plans which have since been superseded, making conclusions drawn from them inaccurate. The Woodland Management Plan, although a useful document, contains inconsistencies in its mapping, which is not helpful in this case. The information provided above seeks to clearly provide an accurate overview for the Inspector to make an informed decision on this point.

3.12 As a postscript to this section, Ms Walsh's Drawing 3 is referred to regarding an appropriate buffer location in Section 5 of her evidence; however, Drawing 3 is a "typical walking route plan". It is not clear from this Drawing as to what is inferred by it. If it is a walking route for the residents of the proposed development, it is not circular. Or, if it is a supposition of the existing scenario, it is also not circular and omits the clearly visible 'desire lines'; informal pathways as depicted on the aerial image background to Drawing 3, which continue directly into the woodland through the appeal site from Leconfield Road. It is mentioned earlier in this document that such access points are in contravention of the management objectives of Burleigh Wood, they are also damaging to native ground flora and disturbing to the woodland fauna.

4 HYDROLOGICAL IMPACTS

4.1 No concerns with hydrological impacts were raised in the officer's report or the LPA's Statement of Case. The first time this has been mentioned as an issue is in the council's proof.

4.2 In light of the above, we did not understand hydrological issues to be in dispute until we received the Council's proofs.

4.3 Following receipt of the LPA's proof, we have commissioned an assessment of hydrological impacts on the woodland / LWS.

4.4 The Hydrological Assessment is included at Appendix 2 of this Rebuttal Proof.

5 COMMENTS ON APPENIX 4 – BNG UPDATE

5.1 Amendments to the BIA were made iteratively in response to comments received from CBC until such time as they were content with the baseline assessment. This was provided in the Warwickshire Metric, at the CBC Senior Ecologist's request. Since the commencement of the appeal process, the revised strategy of providing a combined on and off-site BNG strategy has been developed. The latest version of our BIA, is V3, which was submitted with my statement of case, and subsequently appended to my Proof of Evidence.

5.2 Ms Walsh has overridden the baseline position, which CBC's Senior Ecologist was in agreement with, as confirmed in the statement of common ground and Officer's Report. This baseline has since been used by ourselves, in the production of the combined on & off-site scheme of habitat retention, creation, and offsetting, which delivers ample biodiversity net gain.

5.3 In so doing, she has supplied her own version of a BIA metric for the Appeal site, not supported by a condition assessment based field survey. Below I provide a table of the features Ms Walsh has changed, and set out my comments on the changes.

Tab of Metric	Habitat	Change by Ms Walsh	OR Comment on this Change
A-1 Site Habitat Baseline	Grassland – Other Lowland Acid Grassland	Stated a change to strategic significance.	No change – our V3 metric already has this as of high strategic significance. Also, by not changing this habitat type to Priority Habitat, as per her evidence text, she undermines her argument that this is priority/irreplaceable habitat.
A-1 Site Habitat Baseline	Grassland – other neutral grassland.	Stated change to moderate condition, unsupported by field survey, and a change of strategic significance.	No change to strategic significance – our V3 metric already has this as of high strategic significance. Condition assessment survey showed this habitat to not meet criteria 1 which is a 'must pass' to achieve moderate condition. Changing the condition of this habitat from poor to moderate over inflates the baseline value of the site. Changing this back to poor condition, still results in a 34.99% net gain with all other elements of the metric remaining as per their assessment (this is not to infer agreement with all other elements).

Tab of Metric	Habitat	Change by Ms Walsh	OR Comment on this Change
A-1 Site Habitat Baseline & A-3 Site Habitat Enhancement	Grassland – other neutral grassland. (component of existing field to be retained & enhanced).	Changed condition to moderate and that therefore, no enhancement is taking place. This claim is not substantiated by a condition assessment botanical survey.	No change to strategic significance – our V3 metric already has this as of high strategic significance. Condition assessment survey showed this habitat to not meet criteria 1 which is a 'must pass' to achieve moderate condition. Changing the condition of this habitat from poor to moderate over inflates the baseline value of the site. Also, removing the enhancement component (a management plan would take the condition from poor to moderate over its term), reduces the amount of net gain achieved on site.
A-1 Site Habitat Baseline	Heathland and shrub – mixed scrub	Condition assessment states moderate condition.	Concede this point – this is a minor error in dropdown list selection with a baseline value of 1.16 unit difference.
A-1 Site Habitat Baseline	Sparsely vegetated land – ruderal/ephemeral	Change to strategic significance	No change to strategic significance – our V3 metric already has this as of high strategic significance.
A-1 Site Habitat Baseline	Urban – urban tree	Change to moderate condition and strategic significance.	No change– our V3 metric already has this as of high strategic significance and moderate condition.

Tab of Metric	Habitat	Change by Ms Walsh	OR Comment on this Change
A-2 Site Habitat Creation	All	Delay to start time by 1 year.	Delaying all of the on-site habitat creation, even the building of houses and roads (developed land, sealed surface) for 1 year is not supported by any evidence or rationale and has the effect of artificially skewing the results negatively. This kind of delay, as set out at p43 of the BNG User Guide, (para 4.51) states "this function should be applied if there will be a **significant** delay in the creation of a habitat relative to any losses of on-site habitats. For example, to account for delays due to phased developments and developments that temporarily require parts of the development site for construction purposes". This is not the case at the appeal site. The construction programme is currently unclear and will be developed as an RMA comes forward.

5.4 Ms Walsh's version of the metric amends the baseline habitat value from 9.55 units to 16.59, and infers a reduction in the effect of on site habitat creation and enhancement measures, making the proposed scheme of on and off-site mitigation, compensation and offsetting unable to achieve the significant net gain demonstrated in our V3 Metric.

5.5 As demonstrated above, the majority of amendments made by Ms Walsh are either already in our V3 metric, or not valid, with the exception of one point which is conceded due to a minor data entry error.

5.6 **With the above-mentioned point conceded, the offsetting scheme, still delivers a significant net gain of 37.52% in habitat terms and 117.62% in hedgerow terms.**

5.7 Regarding Paragraph 3.5 of Ms Walsh's evidence, the area of offset acid grassland commensurate with the amount being lost.

5.8 Regarding Paragraph 3.6 a Habitat Management and Monitoring Plan, as set out in the draft S106 agreement, should be conditioned. The outline set of actions as set out in the EcIA are not the same as a full HMMP and were provided as an outline set of principles at this outline planning stage to demonstrate that in principle, the impacts can be mitigated, and a significant net gain provided.

6 LIKELY IMPACTS ON PROTECTED SPECIES

6.1 Regarding badgers specific discussion as to sett locations and extents of buffers from them need to be outside of the public domain due to potential for their persecution.

6.2 Management activities along the woodland edge and site boundary have likely disturbed badger, as disturbance to ground, driving of stakes etc, has taken place in close proximity to setts. Recommended that the next iteration of the management plan takes more seriously its legal compliance and management actions in regards to the badger population in Burleigh Wood, protects badgers from dogs off the lead, and existing recreational use in the woodland, or the colony will likely be lost from the Wood, as a consequence of its management alone.

6.3 Sett entrances were noted in the vicinity during our field surveys, and inside Burleigh Wood, but majority are disused.

6.4 Detailed assessment & monitoring will accompany a reserved matters application and any required mitigation can be dealt with via conditions.

6.5 The buffer is sufficiently wide to retain any existing sett entrances, whether active or not, without need for licence. Any minor encroachment of built form (such as road construction), into a 30m radius buffer from the nearest active badger sett, following the aforementioned monitoring, can be dealt with via a precautionary method of working, rather than closing the sett under licence, provided no new sett entrances are created further into the appeal site. An ecological clerk of works on site to ensure adherence to the working methodology.

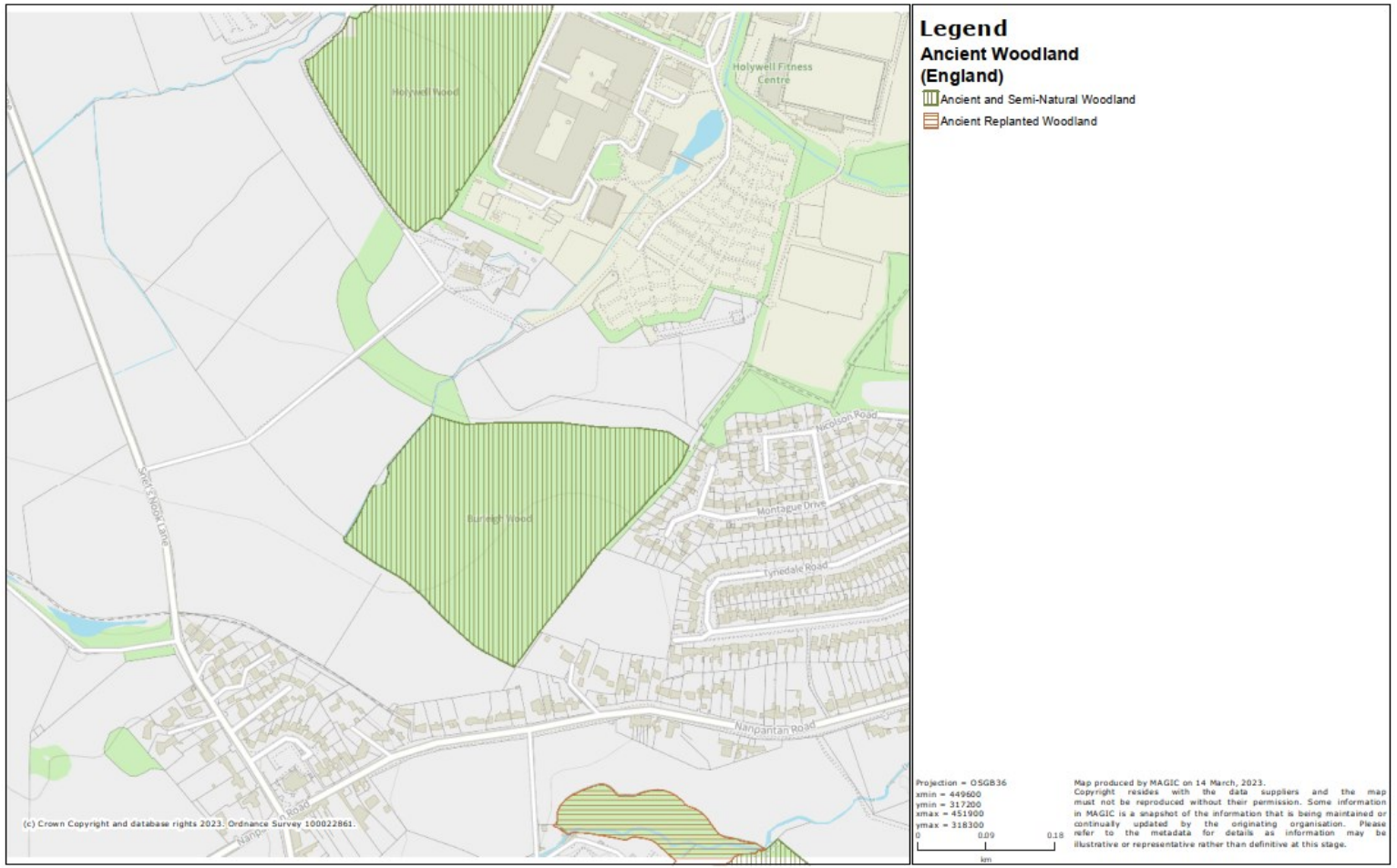
6.6 Regarding bats, it was considered disproportionate to conduct transect surveys on a site of this size. It is a given that bats will be present in Burleigh Woods and potentially roosting in off-site buildings. They are likely to use the site as a foraging resource, especially the perimeter vegetation; however, given the degree to which these habitats are being retained, the protection of the woodland edge via the buffer zone, will maintain this resource.

6.7 Further details regarding lighting, planting and bat boxes are provided in the CEMP which can be updated and secured via condition if so required.

APPENDIX 1: EXTENT OF ANCIENT WOODLAND

MAGIC

Extent of Burleigh Wood Ancient Woodland



APPENDIX 2: HYDROLOGICAL REPORT: ADC INFRASTRUCTURE

HYDROLOGICAL ASSESSMENT

LAND AT LECONFIELD ROAD, NANPANTAN

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tel. 0115 941 4817, www.ADCinfrastructure.com

DOCUMENT CONTROL

project number: ADC1905 report reference: ADC1905-RP-C				
version	date	author	reviewer	comments
1	13/03/2023	Richard Winn		Draft
2	14/03/2023	Alice Kirsz	Richard Winn	First issue
3	14/03/2023	Alice Kirsz	Richard Winn	Updated to comments

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APPENDICES

1.0 INTRODUCTION

1.1 Bowbridge Homes have commissioned ADC Infrastructure Limited to produce a Hydrological Assessment in support of a planning application for the proposed residential development at land off Leconfield Road, Nanpantan, Loughborough.

1.2 The Local Planning Authority (LPA) is Charnwood Borough Council. The Hydrological Assessment has been requested in the LPA's Biodiversity Proof of Evidence.

1.3 A Flood Risk Assessment and Drainage Strategy (FRA&DS), reference ADC1905-RP-B version 5, dated 12 August 2021, was undertaken by ADC Infrastructure to support the outline planning application (reference P/20/2199/2). The FRA&DS was approved by Leicestershire County Council Lead Local Flood Authority at the outline application stage.

1.4 The following text has been taken from the LPA's Biodiversity Proof of Evidence (Core Document CD.4.3.4) and details the requirements of the Hydrological Assessment:

- A sustainable urban drainage scheme is proposed for the north-eastern corner of the site, yet no hydrology report has been submitted with regards to potential impacts on the ancient woodland.

- It is unclear if the change in the site's ground levels and the incorporation of the drainage scheme will result in a hydrological impact on the ancient woodland, either by reducing the level of surface water-run-off entering the wood, or through alteration to horizontal groundwater flows.

- The likely effect of the development by this impact pathway on Burleigh Wood Ancient Woodland has not been determined by the appellant.

1.5 Based on the above comments this Hydrological Assessment considers the hydrological impact on the woodland from the proposed development via an assessment of the predicted surface water flows for both the existing and post development scenarios. Details of the groundwater conditions based on information from the ground investigation are also provided.

2.0 SITE DESCRIPTION

2.1 The site is located to the north east of Nanpantan, off Leconfield Road, and is surrounded to the north, south and east by existing residential development. Burleigh Wood borders the site in the west. The site location is shown in Figure 1.

Figure 1: The site location with the red line boundary shown.

Topography

2.2 The topography of the site is detailed in the FRA&DS and is described as comprising the crest of a hill in the centre of the site with levels falling towards the northeast and southwest corners.

2.3 The topographical survey of the site (Survey Hub, 2018) shows the high point in the centre towards the southern boundary at a level of 87.65m AOD. The low point in the northeast has a level of 78.0m AOD and the low point in the southwest has a level of 83.91m AOD.

2.4 Publicly available LiDAR datasets for the site and the surrounding area have been obtained. An extracted digital elevation model taken from the available GOV LiDAR datasets can be found in Figure 2 overleaf.

2.5 The LiDAR contours demonstrate that western areas of the site slope down towards the western boundary. Beyond the site's western boundary, within the woodland, from approximately the mid point of the boundary heading north, the ground profile within the woodland is shown to rise

heading westwards. The low point to the south west of the site is shown to be approximately 83m AOD.

Figure 2: LiDAR map showing the elevation (m AOD) for the site and the surrounding area.

Existing drainage

2.6 There are no records of any formal drainage infrastructure on the site and the topographical survey does not show any above ground drainage features on the site. As such it is considered that rainfall on the site is discharged via a combination of evaporation, overland flow following the sites topography and soakage into the sites subsoil.

Ground conditions

2.7 A Phase II Exploratory Investigation Report, September 2020 (Core Document CD.2.25) has been undertaken for the site by GeoDyne Geotechnical & Environmental Consultants. The underlying ground conditions are described as follows:

Topsoil and locally Made Ground topsoil was encountered across the site to depths of between 0.20m and 0.30m below existing ground level (begl) and generally comprised silty clayey, locally slightly gravelly TOPSOIL. The Made Ground topsoil included inclusions of red brick and crystalline rock. Subsoil was locally encountered to depths of between 0.40m and 0.60m begl and generally comprised clayey SILT / silty CLAY / gravelly, locally silty SAND.

Underlying the Topsoil and Subsoil where encountered, Natural Strata considered representative of the weathered Tarporley Siltstone Formation was encountered in the southwest and northeast

of the site. The strata comprised stiff to very stiff silty CLAY with pockets and bands of clayey silt / silt. With depth the Clay graded into a Mudstone.

In the centre of the site and forming a ridge, strata considered representative of the weathered Swithland Formation was encountered. The strata was variable but initially comprised gravelly CLAY / clayey gravelly SAND / sandy GRAVEL on the slopes of the ridge overlying at depths of 1.40m to 1.50m highly weathered strong crystalline rock META-MUDSTONE recovered as cobbles and boulders in a sandy matrix. On the top of the ridge the Meta-Mudstone was encountered at depths of 0.30m to 0.50m bgl.

2.8 Eight window sampling boreholes and eight trial pits were undertaken on site as part of the ground investigation. Groundwater was not encountered in the ground investigation excavations at the site. However, water was encountered in two gas monitoring wells (WS1 and WS2) in the southwest during the monitoring programme at depths ranging between 1.50m and 1.90m below ground level (bgl).

2.9 WS1 found clay from a depth of 0.3m to 2.0m bgl and WS2 found clay from 1.5m to 1.8m bgl, therefore the groundwater encountered was in the underlying clay, and is anticipated to be isolated locations of perched groundwater. A plan of the exploratory holes taken from the ground investigation report appendix IV is shown below.

Figure 3: Ground investigation exploratory hole location plan.

2.10 TP2 in the southwest, below the 0.25m topsoil layer, encountered clay subsoils grading to the siltstone formation. TP4 in the west encountered a sand layer below the topsoil to a depth bgl of 0.6m, below which the clay becoming mudstone and siltstone was encountered.

2.11 The results of the ground investigation show the site to comprise clay subsoils at relatively shallow depths around the perimeter of the site where the lowest levels are encountered. The high point in the centre of the site has a shallow layer of more permeable subsoil, but is underlain by impermeable siltstone/mudstone.

3.0 EXISTING SITE HYDROLOGICAL CONDITIONS

3.1 When precipitation falls upon a catchment it will drain via a number of varied mechanisms, this is dependent upon the nature of the precipitation and the soil type, land use and topography of the catchment. The precipitation will either infiltrate and recharge groundwater, be lost back into the atmosphere through evaporation and evapotranspiration or generate surface runoff.

Groundwater

3.2 Groundwater is a fundamental mechanism within the hydrological cycle and is the water that is present within saturated zones beneath the land surface; the upper surface of the saturated zone is referred to as the water table.

3.3 Natural groundwater recharge occurs as precipitation falls upon the land surface, infiltrates into soils, and moves through porous voids to the water table. Natural recharge also can occur as surface-water leakage from rivers, streams, lakes, and wetlands.

3.4 The outputs of the Phase II Exploratory Investigation Report demonstrate that the site is underlain by a silty/clayey top soil and clay subsoil grading into a mudstone bedrock. The high point/ridge towards the centre of the site is shown to comprise a varied layer of clay/sand/gravel below the topsoil. However, similarly to the rest of the site, the underlying bedrock is shown to comprise mudstone, Given the geological composition of the bedrock and surrounding soils infiltration capacities onsite are deemed to be limited.

3.5 Since the natural infiltration capacity of the site is limited the influence that the site will have upon the recharging of groundwater and soils within the surrounding catchment has too been determined to be minimal. In the west of the site adjacent to the woodland the soils and underlying deposits are shown to be impermeable at relatively shallow depths, therefore the passage of any groundwater flows is considered to be limited and restricted only to localised areas in close proximity to the boundary.

Evaporation and evapotranspiration

3.6 Evaporation is a form of vaporization that occurs on the surface of a liquid as it phases to a gas. Transpiration is the water movement from soils to the atmosphere via plants. Evapotranspiration is the sum of all processes by which water moves from the land surface to the atmosphere by evaporation and transpiration.

3.7 The existing site is generally covered with rough grassland with occasional semi-mature trees. A degree of evapotranspiration will occur naturally onsite from the existing vegetation, however the volume of water drained by this mechanism is deemed to be relatively low.

Overland flow

3.8 Overland flow is defined as water that flows over the land surface; this may occur due to the presence of saturated ground or impervious surfaces. The slope or gradient of a site will also dictate the rate of overland flow, with steeper sites generating a higher overland flow rate due to less opportunity for rainfall to pond on the ground surface.

3.9 Given the above analysis of ground conditions onsite combined with the limited volumes of surface water discharge provided by evapotranspiration, overland flow is considered to be a

significant drainage mechanism for onsite surface water due to the impermeable ground conditions and sloping ground profile.

3.10 Figure 4 below demonstrates existing flow paths onsite.

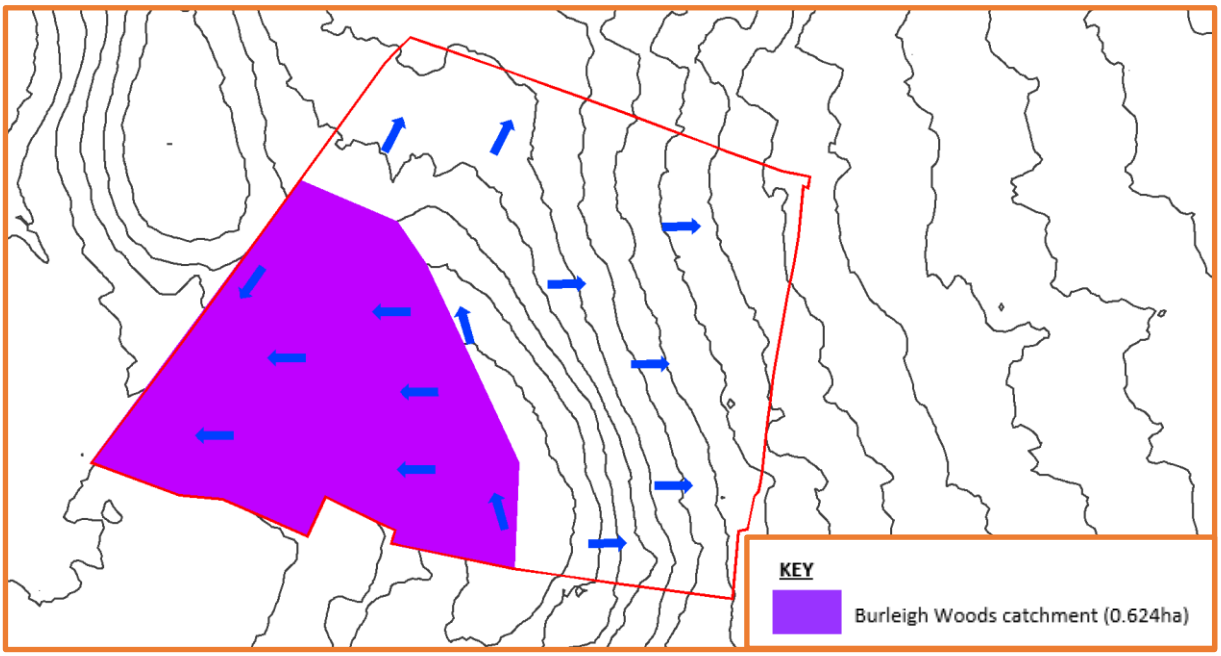

Figure 4: Existing flow paths onsite.

3.11 The existing flow paths onsite are shown to follow the natural topography of the site; which declines in all directions from the site's peak which extends from a central region within the site to the site's southern boundary. In the west of the site the flows are predicted to route in a south-westerly direction and discharge into the woodland. Ground level levels begin to incline again once within the woodland, so any surface water flows from the site will not impact the majority of the woodland.

3.12 Figure 4 also demonstrates an outline estimate of the existing catchment onsite draining to Burleigh Woods in the west; this has been based upon the existing site topography. The existing catchment area draining from the site to Burleigh Woods is approximately 0.624ha.

3.13 A greenfield runoff calculation has been conducted within Microdrainage (industry standard drainage design software) based upon the existing site area predicted to drain to Burleigh Woods, see **Appendix A**. Greenfield runoff is the peak rate of runoff for a specific return period due to rainfall falling on a given area of vegetated land. The calculation results demonstrate that the QBAR rate, which is equivalent to the average annual flood event, for the existing catchment predicted to drain via overland flow to Burleigh Woods is 2.7l/s, this is equivalent to 0.0027m^3/s, so is a relatively low figure and demonstrates the small catchment area that drains to the south west.

4.0 PROPOSED DEVELOPMENT HYDROLOGICAL CONDITIONS

4.1 The proposed development will see an increase in impermeable areas onsite, which in turn will increase the volume of surface water runoff across the ground. A drainage strategy based upon sustainable drainage principles has been outlined within the FRA&DS report produced by ADC Infrastructure submitted as part of the outline planning application. The drainage strategy mitigates against the increase in flows onsite for up to the design storm event.

4.2 Surface water flows onsite are to drain from the proposed areas of hardstanding to a gravity conveyed surface water sewer which is to discharge into a basin located within the north-eastern site corner.

4.3 The LPA has requested an assessment of the hydrological impact the new development and installation of a surface water drainage system through the site will have upon the adjacent Burleigh Woods.

4.4 Figure 5 below demonstrates the existing area within the site draining to Burleigh Woods based upon the site's topography, and the area within this which is to be impermeably surfaced as part of the development proposals.

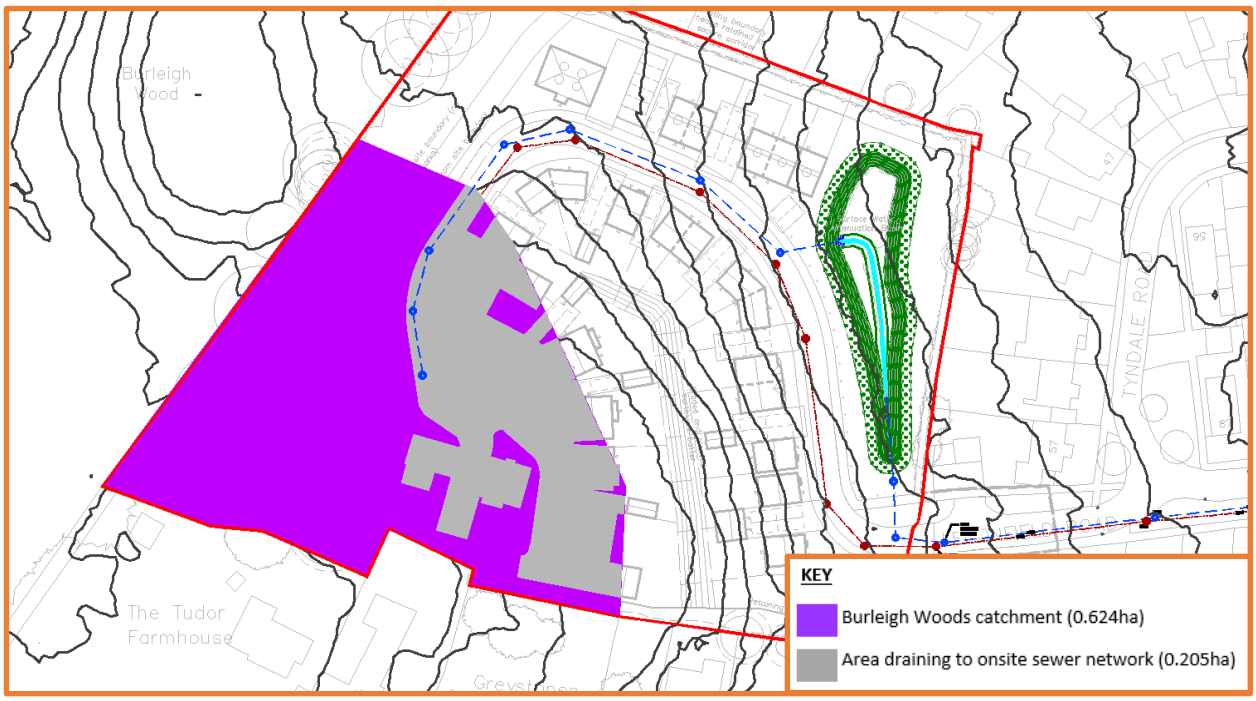

Figure 5: Burleigh Woods catchment alongside sewer network catchment

4.5 The purple shaded area in the west of the site without any grey shading demonstrates the wide margin of open space that will be retained as grassland. This open space area will retain the same drainage characteristics as existing, and as such any rainfall on this area will either infiltrate into the underlying ground or drain via overland flow to the south-west. The maintenance of the potential for infiltration into the sites subsoil along the western boundary, as per existing pre-development conditions, will ensure that groundwater conditions along the boundary of the site and hence adjacent woodland area will remain the same.

4.6 The proposed impermeable surfaced areas (e.g. roofs, driveways and roads) will drain to a positive drainage network which discharges to the SuDS basin in the north-east.

4.7 Figure 5 above demonstrates that the area to be diverted to the onsite sewer network is approximately 0.205ha. A greenfield runoff calculation has been conducted within Microdrainage based upon this area, see **Appendix B**. The outputs demonstrate that the QBAR rate for the diverted catchment area is 0.9l/s, this is equivalent to 0.0009m^3/s. The flow rate of 0.9l/s is considered a very low flow rate and would be the amount of water effectively diverted away from the woodland area as a result of the proposals, rather than draining to the woodland.

4.8 Figure 6 below shows the predicted route for overland surface water flows for the post development scenario. The development proposals comprise a wide-open space area in the west of the site which will be grassland, this mimics existing conditions. Therefore, the route and direction of any overland surface water flows within these extents will be the same as existing. Subsequently the location at which any overland flows might discharge to the woodland area will also reflect existing conditions.

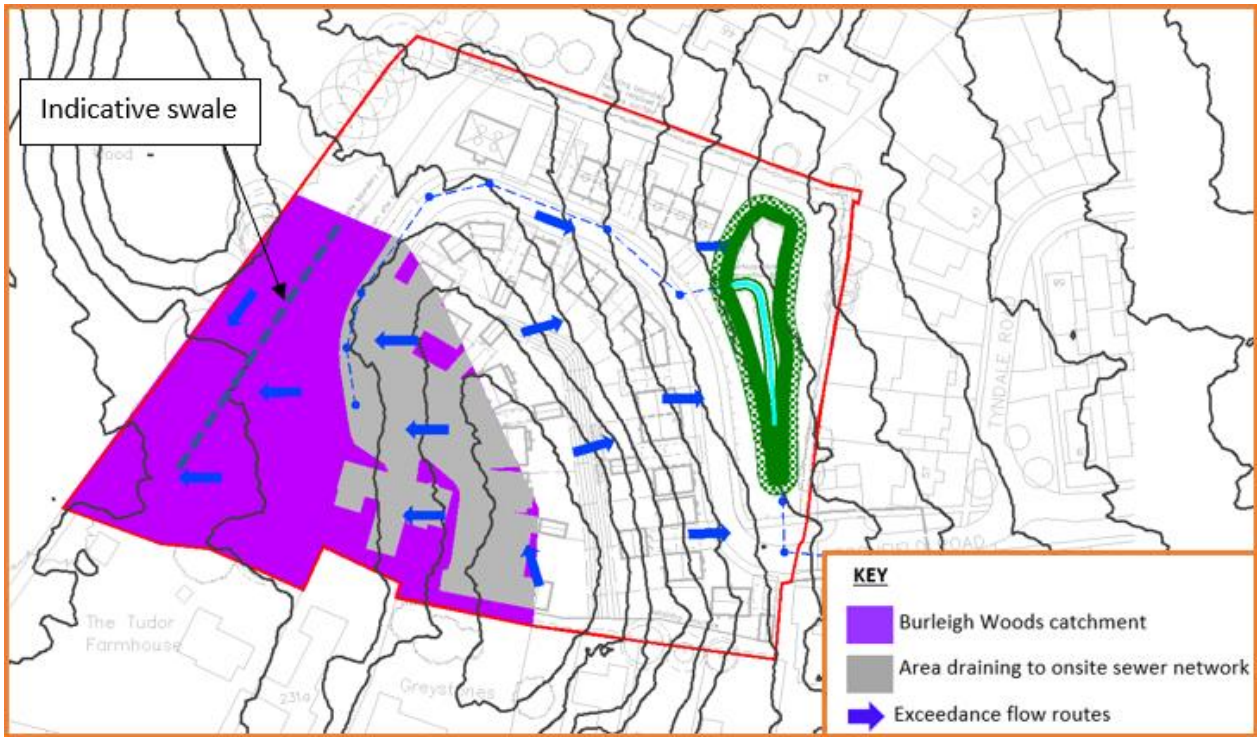

Figure 6: Exceedance plan alongside indicative swale drainage route.

4.9 Furthermore, the proposed onsite earthworks are to retain existing topographical patterns where practical, therefore in extreme storm events exceedance flows from the proposed areas of hardstanding within the site's south-western extents, beyond the capacity of the proposed onsite sewer network, will continue to flow towards the woodland. The creation of impermeable areas will tend to increase the likelihood of overland flow being generated during extreme storm events, therefore overland flow to the woodland area may be increased during these instances of heavy rainfall events.

4.10 To further enhance the connectivity of the adjacent woodland with exceedance flows from the south-western extents of the site it is proposed that a swale is to be located through the open space area parallel to the site's western boundary, an indicative route is demonstrated within Figure 6 above.

4.11 A swale is a shallow, flat bottomed, vegetated open channel designed to convey and treat surface water runoff. The swale will also remove any potential contaminants within the flow of water, provide a drainage route for any water in the upper topsoil layers, and present a positive route for flows directed towards the woodland area in the southwest, which is the location where the majority of overland surface water flows are shown to leave the site. The swale has the potential to achieve a minor increase in the surface water flows discharge to the woodland in the southwest.

4.12 Given the above it is considered that the proposed development will have a negligible impact upon the hydrological aspects of the adjacent woodland. However, the potential introduction of a swale can provide mitigation to reinforce the connectivity of the overland flow route from open space areas in the west to the woodland beyond the boundary.

5.0 CONCLUSIONS

5.1 This Hydrological Assessment is provided in response to the LPA's Biodiversity Proof of Evidence which requires an assessment of the hydrological impact on the woodland in the west from the proposed development.

5.2 The hydrological assessment assesses the existing pre development and post development hydrological conditions at the site in relation to surface water and groundwater. Ground conditions and groundwater information is obtained from the Phase II Exploratory Investigation Report.

5.3 The topography of the site shows the high point in the centre towards the southern boundary with the ground profile sloping towards the boundaries in the north, east and west. Therefore a portion of the site is shown to slope towards the western boundary which borders the woodland.

5.4 The ground investigation shows the site to comprise clay subsoils at relatively shallow depths around the perimeter of the site where the lowest levels are encountered. The high point in the centre of the site has a shallow layer of more permeable subsoil, but is underlain by impermeable siltstone/mudstone. Groundwater was not encountered during the ground investigation, but was recorded in the subsequent monitoring at two locations towards the south and west within the clay layers.

5.5 The impermeable nature of the underlying soils, particularly in lower lying areas which are found along the western boundary, limits the infiltration capacity and likelihood of groundwater flows. The passage of any groundwater flows are considered to be limited and restricted only to localised areas in close proximity to the boundary. A wide margin of open space will be retained in the west and will be undeveloped, therefore localised groundwater conditions are considered to be the same for pre and post development scenarios.

5.6 The predicted surface water flow routes in the west of the site are shown to route towards the south west. The topography of the site in the west will be the same pre and post development, therefore the route and direction of any overland surface water flows in the west of the site will be retained, thereby not affecting the location at which any overland flows might discharge to the woodland area. Similarly, the retention of the open space in the west will maintain the same ground conditions for generation of overland surface water flows. The new impermeable areas in the south of the site will have a minimal effect on the catchment area that drains to the woodland, however the potential increase in exceedance flows during extreme rainfall events and provision of a swale within the open space area are considered to mitigate this effect.

5.7 In summary it is considered that the proposed development will have a negligible impact upon the hydrological aspects of the adjacent woodland.

APPENDIX A

GREENFIELD RUNOFF RATES - EXISTING PRE DEVELOPMENT CATCHMENT

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 700 Urban 0.000
Area (ha) 0.624 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural 2.7
QBAR Urban 2.7

Q100 years 7.0

Q1 year 2.3
Q30 years 5.4
Q100 years 7.0

APPENDIX B

GREENFIELD RUNOFF RATES – POST DEVELOPMENT CATCHMENT

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 700 Urban 0.000
Area (ha) 0.205 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural 0.9
QBAR Urban 0.9

Q100 years 2.3

Q1 year 0.7
Q30 years 1.8
Q100 years 2.3