NW/100261/F

COUCH Consulting Engineers
Civil & Structural

Flood Risk Assessment

Proposed Medical Centre
Kington
Herefordshire

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EXECUTIVE SUMMARY

The proposed development involves the construction of a 2 storey medical centre together with associated car parking facilities and access road on an area which is currently undeveloped.

The site covers an area of approximately 0.81ha and lies within Flood Zone 1 of the River Arrow which runs approximately 0.55km to the north af the site. The site lies adjacent to an unnamed tributary of the River Arrow, named the Kington Brook for the purposes of this report.

With the exception of a small section of the site which is not proposed to be built on the site lies within Flood Zone 1 of this watercourse.

The site's location in Flood Zone 1 does therefore mean that dry access and egress to and from the site is available at all times.

Following investigations and surveys it has been assumed that the existing site drains naturally to the Kington Brook and it is proposed that this discharge be formalised with a limited discharge equivalent to the existing Greenfield runoff rate with permission from the Environment Agency.

The praposals see an increase in impermeable area at the site. Therefore mitigation measures are proposed to include the attenuation up to the 1 in 100 year plus climate change event within the site.

A full site investigation survey is required to confirm ground conditians and to develop a drainage strategy for the site. Should soakaways prove to be infeasible, storage may be created beneath permeably paved parking bays underlain with an open graded aggregate sub-base.

In conclusion, there is a minimol risk of fluvial flooding to the proposed development site and, provided that mitigation measures contained within this report are implemented, there will be minimal risk of pluvial flooding caused by additional runoff.

1.0 INTRODUCTION

1.1 Terms of Reference

The proposed development includes the construction of a 2 storey medical centre together with associated car parking facilities and access road on an area which is currently undeveloped. A plan of the existing and proposed site layouts are shown in Appendices A and B.

The Environment Agency flood maps show the site to lie within Flood Zone 1 of the Kington Brook with a risk of 1 in 1000 year or greater risk of flooding.

The map indicates that the lowest parts of the site adjacent to the Kington Brook may potentially lie within Flood zones 2 and 3, with a chance of flooding of 1 in 100 up to 1 in 1000 year.

1.2 Scope of Work

The requirements for flood risk assessments are generally as set out in Annex 'E' of PPS25. The detail and complexity of the study required should be appropriate to the scale and potential impact of the development. For the purposes of this study, the following have been considered:-

- Site level information.

- Assessment of the lacal area.

- Assessment into the existing runoff characteristics and the potential impact the proposed development will have on the runoff.

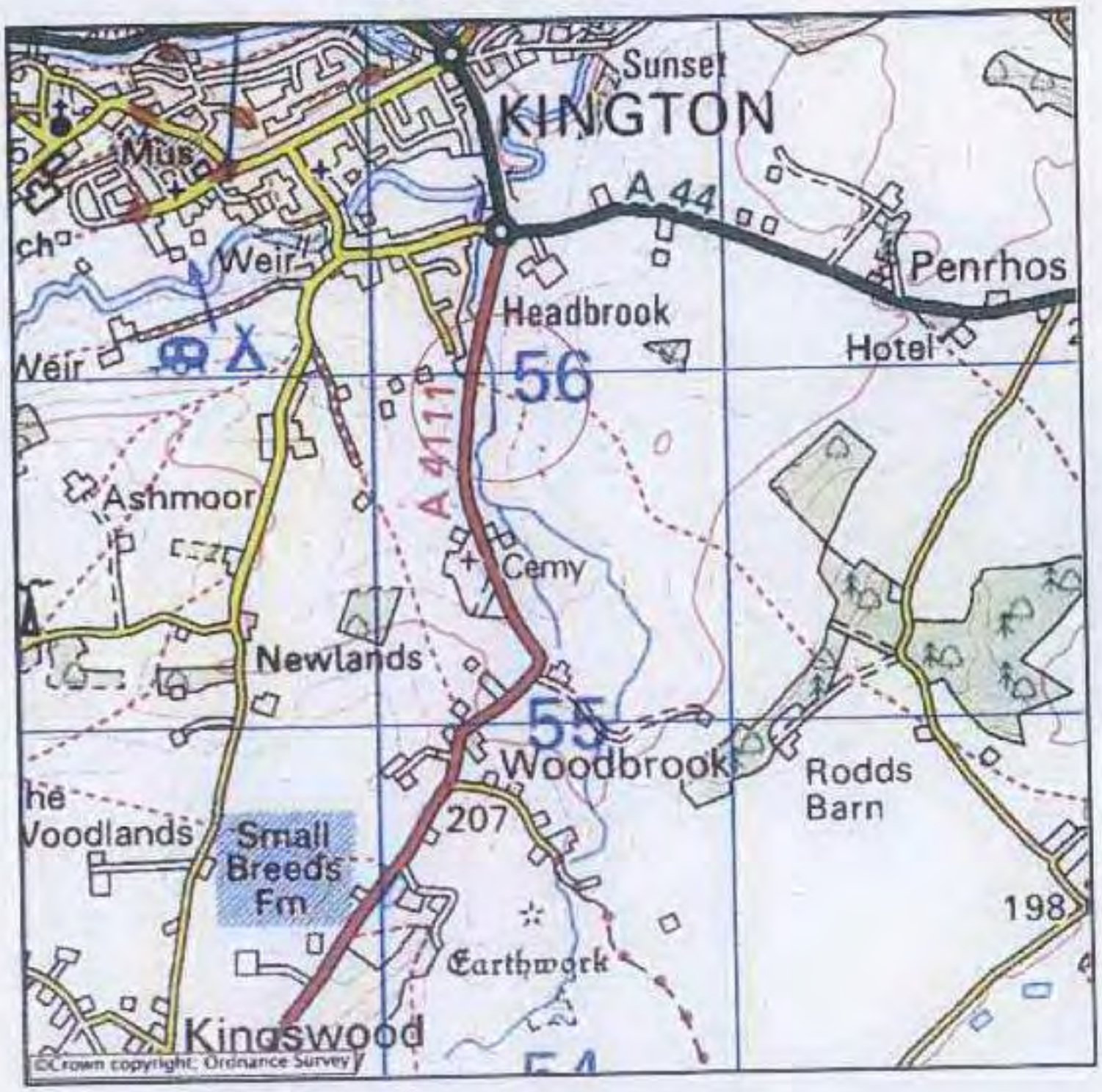
- Detail any flood mitigation works required.

Further guidance is also provided in the CIRIA Research Project 624 "Development and Flood Risk: Guidance for the Construction Industry".

2.0 DETAILS OF THE SITE

2.1 Site Location

Figure 1: Site Location Plan



Source: http://www.streetmap.co.uk

Ordnance Survey National Grid Reference: 330307E, 255865N

2.2 Site Description

The site lies to the east of the A4111 in Kington, Herefordshire and may be located by National Grid Reference 330307, 255801.

The site is currently laid to grass and is predominantly surrounded by fields/farmland. Ground levels within the site boundary vary from 163.62mAOD towards the south west of the site and 159.24mAOD at the north east of the site adjacent to the watercourse. The existing site levels are shown in Appendix A of this report. On inspection, the site is considered to be Greenfield. The existing site is not positively drained and looking at the fall of the site is understood to drain naturally to the adjacent watercourse.

An aerial photograph of the existing site is shown below in Figure 2. The development site covers a total area of approximately 0.81ha.

Figure 2: Aerial Photograph of the Site

Source: http://googleearth.com

The Kington Brook runs along the Eastern boundary of the site in a northerly direction and is a tributary of the River Arrow. The River Arrow is approximately 0.55km to the north of the site at its closest point.

Topographical survey data for the existing site was provided by the Client (Dwg no. 12627_PlanA – produced by Greenhatch Group) and is provided in Appendix A.

The proposed development includes the construction of a new two storey medical centre with associated parking facilities and access road. The proposed site plan is shown in Appendix B of this report.

The proposals are set to increase the amount of impermeable area on site and will therefore increase the surface water runoff from the site unless mitigating measures are undertaken.

3.0 INITIAL ASSESSMENT

3.1 Flood History

The Environment Agency has provided a specific flood zone map (Figure 3.0). The flood maps show the site to lie within Flood Zone 1, being the zone with a risk of 1 in 1000 year (0.1% AEP) or greater for river flooding.

Due to the small catchment size of the Kington Brook, the Environment Agency (Appendix C) and the Local Authority do not have any information on flood levels for this watercourse.

The map indicates that the lowest parts of the site adjacent to the Kington Brook may potentially lie within Flood zones 2 and 3, with a chance of flooding of 1 in 100 up to 1 in 1000 year.

Figure 3.0: Environment Agency Flood Zones Map

Source: www.environment-agency.gov.uk/subjects/flood/

3.2 Existing Surface Water and Foul Drainage

The site has no buildings or areas of hard standing requiring storm or foul water services and connections. Welsh Water has no records of sewers within the vicinity of the site (Appendix D).

3.3 Previous Studies

There are no known site specific flood studies for this site.

3.4 Possible Flooding Mechanisms

Table 1: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	Yes	The Environment Agency hold no records of the Kington Brook flooding, however the Braok runs adjacent to the site.
Tidal/Coastal	No	The site is not within close proximity of the sea
Pluvial (Urban Drainage)	Yes	The proposals will increase the impermeable orea on site and therefore potentially runoff from the site
Groundwater	No	No significantly depressed land adjacent to the watercourse level
Overland Flow	No	The site together with the surrounding land fall towards the Kington Brook. Overland flows will be intercepted by the Brook and the A4111.
Infrastructure Failure	No	No significant drainage infrastructure within the site

The primary source of flood risk is considered to be from the adjacent Kington Brook.

The site is undeveloped with no impermeable areas. The proposals include a number of permeable areas in the form of landscaping but the buildings and car parking will increase the impermeable areas thereby also increasing the run off from the site.

The site, together with the surrounding land falls towards the Kington Brook. The site is bounded by the Kington Brook and the A4111 on its higher side, overland flows will be intercepted by these features.

4.0 FLOOD RISK ASSESSMENT

4.1 The Kington Brook

The Kington Brook runs along the eastern boundary of the site and is a tributary of the River Arrow. The Environment Agency were unable to provide flood data for the Kington Brook (Appendix C).

4.2 Existing Drainage

The site is undeveloped and as such there are na foul or storm water sewers on the site. The site falls towards the Kington Brook, thus any surface water will flow directly into the brook (Appendix D).

4.3 Surface Water Runoff

The existing site is considered to be 100% permeable. The development will see approximately 37% of the total site area as impermeable. This will significantly increase the amount of runoff unless mitigated. This will be achieved by limiting peak discharge from the site to existing Greenfield runoff rates (Table 2).

Infiltration testing has been undertaken as part of the site investigation report carried out by STATS Ltd. Three soakaway tests were carried out and show that infiltration rates vary between 4.89 and 6.89 x 10^{-5}m/s. These results are generally typical of fine sands and silts however the strata has been classified as gravel.

The ground conditions and infiltration rates appear suitable from a geotechnical viewpoint. However the relatively shallow groundwater table will need to be accommodated with the design.

The IH 124 method (Micro Drainage WinDes) has been used to calculate existing runoff fram the site. The following table highlights the results and calculations are provided in Appendix E.

Table 2: Existing Greenfield Surface Water Runoff Rates

RETURN PERIOD	PEAK FLOW
1 in 1 year peak flow	1 l/s
1 in 30 year peak flow	2.5 l/s
1 in 100 year peak flow	3 l/s

Soakaway Assessment Based on Restricted Off-Site Discharge

The volume of soakaway for the site has been calculated for the 1 in 1 year, 1 in 30 year and 1 in 100 year plus climate change events. An overflow into the stream was included for all events, limited to the existing 1 in 100 year peak flow rate of 3l/s.

Appendix F contains calculations generated by Micro Drainage. (Refer to Table 3 for Summary of Attenuation Volumes.)

Table 3: Soakaway Volumes

Return Period	Volume to be Attenuated (m^3)
1 in 1 year	40
1 in 30 year	101
1 in 100 year	135
1 in 100 year Climate change	180

It is normal practice to ensure that the 1 in 30 year event is maintained below the ground or in ponds/tanks in the form of storage. The difference between the 1 in 100 year plus climate change and the 1 in 30 year events is permitted to flood the surface in a controlled manner provided there is no flooding to buildings and the flood volume is contained within the site boundary.

4.4 Overland Flows

The site, together with the surrounding land falls towards the Kingtan Brook. The site is bounded by the Kington Brook and the A4111 on its higher side, overland flows will be intercepted by these features.

4.5 Application of the Sequential Test

The proposed development lies within Flood Zone 1 of the Kington Brook according to the Environment Agency Flood Map. The map indicates that the lowest parts of the site adjacent to the Kingtan Brook may potentially lie within Flood Zones 2 and 3. As no development is taking place in these zones it can be said that the development lies within Flood Zone 1.

Table 4: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	✗	Exception Test required	✔
	Zone 3b	Exception Test required	✔	✗	✗	✗

Although the proposed use of the site is classed as 'more vulnerable' in accordance with Table D2, Annex D of PPS25 the site lies within Flood Zone 1 of the Kington Brook and River Arrow and is therefore considered acceptable development in this zone. The Sequential and Exception Tests are therefore not required.

5.0 FLOOD MITIGATION MEASURES

The purpose of this section of the report is to provide information for utilisation as part of the planning application for the proposed development site. The mitigation measures outlined below may be adopted to reduce the consequences of flooding to people and property within the proposed development.

5.1 Requirements of the Environment Agency

The Environment Agency, as part of its development control procedures, require the proposed surface water discharge to be restricted to Greenfield runoff rates.

5.2 Raising Floor/Land Levels

The proposed finished floor levels are between 2.4 and 3.4m greater than the adjacent water level of the Kington Brook. Levels to landscape and car park areas should be maintained as close to existing levels as possible in order to avoid possible flood compensation requirements.

5.3 Emergency Access & Egress

Given the site's location in Flood Zone 1 dry access and egress is available to and from the site at all times via the A4111.

5.4 Surface Water Runoff Attenuation

The proposed development increases the amount of impermeable area on site and therefore surface water runoff will increase. Infiltration testing indicates the use of soakaways is feasible from a geotechnical point of view. Calculations have been undertaken to assess the soakaway volume required to store this increase in runoff and are discussed in Section 4. It is proposed that surface water is disposed of via soakaways with an overflow into the Kington Brook.

Providing these measures are undertaken the flood risk from surface water runoff will be minimal.

5.5 Sustainable Drainage Systems (SUDS)

The Environment Agency requires SUDS techniques to provide attenuation due to the increase in storm water run off.

SUDS techniques are generally preferred, as they are able to reproduce the natural systems that determine surface water runoff volumes and rates and help to mimic the pre-development conditions.
It is recommended where practically possible, to implement the use of infiltration drainage to minimise any increase to positive surface water runoff. This will have the additional benefit of providing some attenuation and can also improve water quality and ground water recharge.

It is understood that drainage proposals for the site include a grey water recycling system for the Surgery building and a series of cascading ponds, providing storage for surface water run off. These would discharge surface water into a soakaways with an overflow into the Kington Brook.

Any surface water system from the car parking areas may require pollution control, such as treatment available within the permeable paving or petrol interceptor. These will be considered as part of the detailed design of the scheme.

6.0 CONCLUSIONS & RECOMMENDATIONS

This Flood Risk Assessment has been written in accordance with the requirements set out in PPS25 for the proposed construction of a new two storey medical centre with associated parking facilities and access road.

The proposed use is classed as "more vulnerable" according to PPS25 however following consultation with the Environment Agency regarding the Kington Brook the site has been shown to lie within Flood Zone 1. The site is therefore considered appropriate for development and the sequential and exception tests are therefore not required to be undertaken.

Given the sites location in Flood Zone 1 dry access and egress to and from the site is available at all times.

The proposed finished floor levels are between 2.4 and 3.4m greater than the adjacent water level of the Kington Brook. It is recommended that levels to landscape and car park areas should be maintained as close to existing levels as possible in order to avoid possible flood compensation requirements.

The proposals see an increase in impermeable area at the site thereby also increasing runoff. Mitigation measures proposed include the use of soakaways for the disposal af surface water runoff with an averflow inta the Kington Brook.

Providing the mitigation measures discussed in this report are implemented it is considered that this site will be acceptable to the Environment Agency.

7.0 REFERENCES

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2. CIRIA: *The SUDS Manual C697*, March 2007.

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