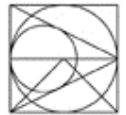




Woods Hardwick

Infrastructure LLP

Civil Engineering Consultants



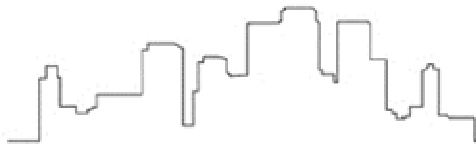
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Flood Risk Assessment

**For
Camp Road, Upper Heyford
Village Centre (North) and Associated Parking**

**March 2018
Rev B**

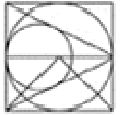
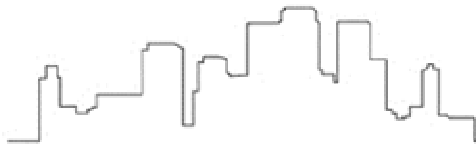


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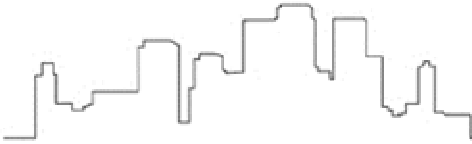
Appendices

Appendix A	Parcel Plan
Appendix B	Proposed drainage layout
Appendix C	Existing Microdrainage Calculations
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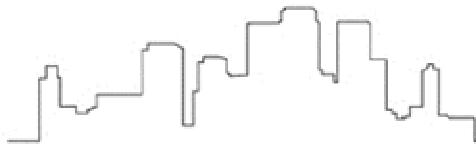
1.0 **Introduction**

- 1.1 Woods Hardwick Infrastructure LLP have been appointed by Dorchester Group to undertake a Flood Risk Assessment in respect of the Village Centre North and parking area proposals at the Upper Heyford development.
- 1.2 The wider development site comprises of approximately 76 hectares and has outline planning consent for residential and commercial use.
- 1.3 A Flood Risk Assessment was prepared and approved in support of the outline application. The report was produced by Waterman in October 2010.
- 1.4 The site is currently live and a number of development parcels have received reserved matters consent. These parcels have been supported by individual Flood Risk Assessment Compliance Notes to demonstrate that the detailed drainage design accords with those principles approved at the outline stage.
- 1.5 The purpose of this report is to support a new planning application in support of the development known as the Village Centre North and the Parking area to the west.
- 1.6 This report does not seek to undo the principles of the approved Flood Risk Assessment but to clarify them within a self-contained Flood Risk Assessment.
- 1.7 A copy of the parcel Plan is contained within **Appendix A**.



2.0 Overview of Approved FRA

- 2.1 The entire site is located within Flood Zone 1.
- 2.2 The FRA sets out a detailed approach to attenuation across the Upper Heyford site which comprises of areas identified for retention, areas for refurbishment and areas for redevelopment to provide new residential dwellings.
- 2.3 The Environment Agency (EA) has confirmed that areas identified solely for retention and refurbishment do not require attenuation of existing surface water discharge.
- 2.4 The fundamental principle of the FRA is that runoff from proposed areas of redevelopment should be attenuated to existing 1 in 100 year flows with a 30% allowance for climate change.
- 2.5 Attenuation is to be provided through the use of balancing ponds, permeable paving and attenuation tanks where necessary. Swales will be incorporated through the site where appropriate.
- 2.6 The FRA splits the development into four main catchment areas and provides a series of calculations for each.
- 2.7 The FRA also requires a 10% betterment of existing flows entering the eastern tributary of the Gallos Brook.



3.0 Existing Site

3.1 Site Description

- 3.1.1 The Village Centre North development is located to the north of Camp Road and consists of approximately 0.70 hectares of land for the development area and a 0.328 hectare dedicated parking area.
- 3.1.2 The Village Centre North area of the discharges into Outfall 1 via the “Eastern Drainage Diversion” network and the Parking area to the western discharges into Outfall 2 via the “Central Drainage Diversion” network.

3.2 Ground Conditions

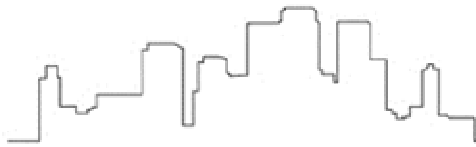
- 3.2.1 Extensive intrusive site investigations have been undertaken which covered the entire site.
- 3.2.2 The general ground conditions comprise of layers of silt and clay. This is underlain by weathered limestone bedrock at an average depth of 1.5m.

3.3 Hydrology

- 3.3.1 The wider site includes a number of watercourses and tributaries.
- 3.3.2 A tributary of the Gallos Brook runs to the east of the development.
- 3.3.4 There is anecdotal evidence of flooding associated with this tributary at the caravan park to the south of the proposed development parcel.
- 3.3.3 The Gallos Brook joins the River Ray approximately 11km to the south of the site. The River Cherwell is the nearest Main River and is some 1.2km to the west of the site.

4.0 Proposed Development

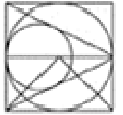
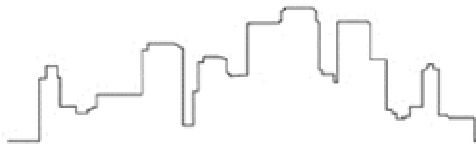
- 4.1 Refer to **Appendix B** for the proposed site layout.



5.0 Flood Risk Assessment

5.1 Background

- 5.1.1 The purpose of this section of the report is to identify the risk of flooding to and by the development.
- 5.1.2 Following the increased frequency of flooding during recent years, much work has been undertaken at a national level to assess the relationship between new development and flood risk. This work resulted in the publication of Planning Policy Statement 25 (PPS25) in early 2007 with an update being released in March 2010.
- 5.1.3 Alongside the release of the NPPF in March 2012 the TGNPPF was released serving as a flood risk based addendum to the national planning guidance. These documents replace PPS25; however, many of the principles set out in PPS25 remain relevant. The TGNPPF was withdrawn in late 2014 and replaced with the online Planning Practice Guidance (PPG) albeit much of the advice relating to flood risk remains unchanged
- 5.1.4 Table 1 of PPG: Flood Risk and Coastal Change seeks to define different flood risk Zones where: Zone 1 is considered to be low risk since it is outside of the area which is likely to suffer inundation from a 0.1% probability rainfall event; Zone 2 is considered to be medium risk lying between the 0.1% probability flood contour and the 1% or 100 year flood area; Zone 3 is divided into 2 categories with Zone 3A having a >1% annual probability of river flooding or a >0.5% probability of flooding from the sea and Zone 3B being the functional floodplain. This guidance reaffirms the guidance and categorisation included within PPS25.
- 5.1.5 The Environment Agency's (EA) flood map demonstrates that this site lies within Flood Zone 1 and is therefore at low risk.
- 5.1.6 Table 2 of the PPG: Flood Risk and Coastal Change seeks to classify the vulnerability of different land uses. The commercial buildings fall under the Less Vulnerable classification.
- 5.1.7 Finally Table 3 of the PPG: Flood Risk and Coastal Change brings Table 1 and 2 together to provide a matrix defining the level of Flood Risk Assessment required based on the flood zone and vulnerability class of a development.
- 5.1.8 Table 3 of the PPG: Flood Risk and Coastal Change therefore demonstrates that this land use is appropriate for the site given the flood zone and vulnerability class.



5.2 Risk of Flooding to the Development from Known Sources

5.2.1 Presented below is an analysis and summary of the potential for the site to flood from known sources.

Flooding from Rivers

5.2.2 The Environment Agency's (EA) flood map demonstrates that the site lies within Flood Zone 1.

Flooding from the Sea

5.2.3 Given the site's location some 100km inland there is considered to be no risk of flooding from this source.

Flooding from Land

5.2.4 The EA's surface water flood map demonstrates areas that are at risk of surface water flooding should there be an accumulation at ground level. The map demonstrates that the proposed development is not at risk of surface water flooding.

Flooding from Groundwater

5.2.5 The EA's groundwater flood risk maps demonstrate areas that are at risk of flooding from high groundwater. The site is noted as not at risk.

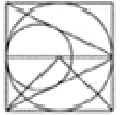
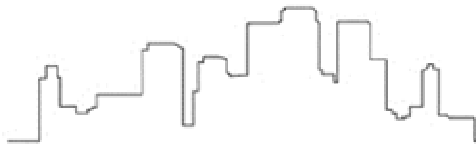
5.2.6 This is also confirmed on site and via ground water monitoring which noted ground water level some 1.2m below ground level.

Flooding from Sewers

5.2.7 There are no public sewers within the site and all sewers are currently privately owned. There are no reported incidents of flooding from these private sewers.

Flooding from Reservoirs, Canals and Other Artificial Sources

5.2.8 There are no man made features within the vicinity of the development site.



5.3 Risk of Flooding Caused by the Development

5.3.1 Presented below is a summary and analysis of the potential for the site to exacerbate the risk of flooding to third parties both upstream and downstream.

Encroachment onto Floodplain

5.3.2 The entirety of the site lies outside of the floodplain, there is therefore no risk of encroachment.

Impedance of Flood Flows

5.3.3 As the site lies outside of the flood plain there is no risk of the site impeding flood flows.

Contribution to Flood Flows by Development Drainage

5.3.4 The approved FRA produced in support of the outline condition states in Paragraph 3.20: "In accordance with PPS25, local policy and EA guidance the rate of surface water runoff from new development would be controlled so that it does not increase over the existing situation for the 1 in 100 year even, while taking climate change into account".

5.3.7 It is proposed to maintain the existing drainage regime of the site. This will require flows from the proposed development to be restricted to provide the level of improvement required by the EA.

5.3.8 It is proposed to maintain the existing catchments and watershed with the site.

5.3.9 Restriction of proposed surface water runoff and attenuation will ensure the risk to others, and within the development is mitigated.

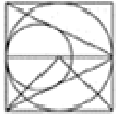
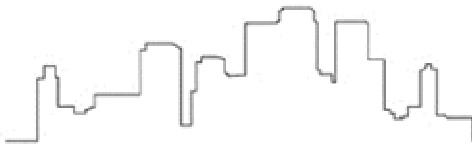
5.3.10 The detailed drainage strategy is described in more detail in **Section 6** of this report.

5.4 Climate Change

5.4.1 There is an increasing body of scientific evidence that suggests that the global climate is changing as a result of human activity. Past, present and future emissions of greenhouse gases are expected to cause significant climate change during this century.

5.4.2 The nature of climate change will vary: for the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall can be expected. These kinds of changes will have implications on river-flooding and also localised flash flooding.

5.4.3 The PPG requires developments to consider the potential impacts of climate change; as such this assessment makes a 30% allowance for climatic change.



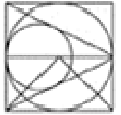
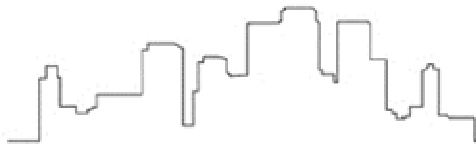
6. Surface Water Disposal

6.1 Principles

- 6.1.1 In addition to ensuring that the development is not at risk of flooding from external sources, it is also important to ensure that the scheme itself does not exacerbate flood risk for others or within the proposed development. It is therefore essential that the arrangements for storm water disposal are fully assessed to guarantee that the effects are mitigated and that there will be no impact on the existing land drainage regime.
- 6.1.2 All of the recent guidance on the arrangements for storm water disposal from new developments has encouraged the application of a hierarchy for surface water disposal. This has now been formalised in the Building Regulations Part H.
- 6.1.3 The first choice for surface water disposal which should be pursued is via infiltration and only where it has been determined that the ground conditions are not suitable should the second choice of disposal to a ditch or watercourse be considered. If there is no alternative the third and last choice of disposal to public sewer can be considered.

6.2 Discharge Strategy

- 6.2.1 Paragraph 3.20 of the FRA states: "In accordance with PPS25, local policy and EA guidance the rate of surface water runoff from new development would be controlled so that it does not increase over the existing situation for the 1 in 100 year event, while taking climate change into account".
- 6.2.2 Paragraph 3.21 requires a 10% betterment of residential parcel flows discharging to the east of the site (into outfall 1).
- 6.2.3 Soakaway tests have not been undertaken due to rock/ stone being encountered at 1.2m in borehole BHNSA 38 located to the south east of the Village Centre North area.
- 6.2.4 It is proposed to connect the Village Centre North network, attenuation and flow controls to the surrounding drainage network known as the Eastern Diversion at two locations and connect the western parking area to the Central Diversion.
- 6.2.5 Although this scheme is not residential, the Village Centre North catchment enters the existing system at the following heavily restricted rates to ensure the betterment created within the network as part of the previous phases is not affected:
- Manhole SE131 outflow is controlled by a 69mm orifice
 - Manhole SE137 outflow is controlled by a 79mm orifice
- 6.2.6 The existing Eastern Diversion network downstream then discharges into the existing watercourse to the east of the site which is a tributary of Gallos Brook.
- 6.2.7 An allowable discharge rate and anticipated catchment for the parking area has previously been incorporated into the Central Diversion design at a restricted rate by means of an 80mm orifice.
- 6.2.8 The existing Central Diversion network downstream then discharges into the existing ditch.



6.3 Attenuation Strategy

- 6.3.1 Both the Village Centre North commercial area and the western parking areas both contain attenuation in the form of underground tanks and oversized pipes.
- 6.3.2 Both the proposed underground storage tanks and oversized pipes will either be maintained by the Water Company or a management company.
- 6.3.3 Living roofs have been discounted as they are not in keeping with the strict urban planning requirements within a conservation area. Rain water harvesting has also been discounted due to ongoing maintenance issues.

7.0 Hydraulic Performance

7.1 Modelling

- 7.1.1 Two detailed Microdrainage models has been constructed to simulate the 1 in 100 year (plus climate change) storm for the full networks including the proposed development areas.
- 7.1.2 The proposed Microdrainage models for the entire of the Eastern Diversion and Central Diversion (see **Appendix D**) demonstrates that the proposed 1 in 100 year (plus climate change) does not result in flooding within this phase, does not increase flooding downstream and does not increase the discharge rate at the outfall from the development.
- 7.1.3 The existing Microdrainage models are contained within **Appendix C**.

7.2 Exceedance

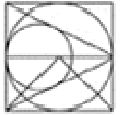
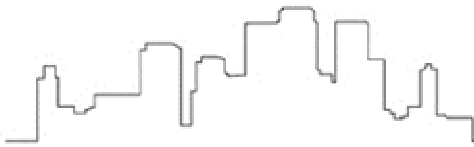
- 7.2.1 During storms in excess of the designated storm, there is the potential for the storage structures and drainage system to be overwhelmed, leading to flooding. External levels have been designed so that during these periods, flood water will be directed away from the proposed building entrances and into the roads, parking areas and soft landscaping areas.

7.3 Pollution prevention

- 7.3.1 It is noted that the Eastern Diversion and Central Diversion sewers pass through petrol interceptors before discharging offsite which meets the requirements of PPG3.
- 7.3.2 The western parking area is circa 3280m sq with circa 138 No. parking spaces and ultimately passes through the interceptor noted above in compliance with PPG3. Trapped gullies will provide an additional level of protection against contamination.

7.4 Maintenance

- 7.4.1 Private drainage serving multiple residential dwellings, commercial buildings or located within shared areas will be maintained by the maintenance company.
- 7.4.2 Adoptable drainage will be maintained by the water company.
- 7.4.3 SUDS features (such as storage tank) contributing to the overall drainage strategy will be maintained by the maintenance company.
- 7.4.4 Refer to “SUDS Maintenance Regime” report which covers this phase for further details. This document along with relevant designer’s risk assessments, calculations and drawings will be made available to the maintenance company.



8.0 Summary and Conclusions

- 8.1 This Flood Risk Assessment has been prepared in support of the planning application for the Village Centre North and the associated parking area to the west at the Camp Road, Upper Heyford Development.
- 8.2 This FRA has been produced maintaining the same principles as the approved FRA attached to the outline planning consent.
- 8.3 The scheme has been assessed and is deemed not to be at risk of flooding and is also located within Flood Zone 1.
- 8.4 The FRA requires surface water runoff from new development to be restricted to existing 1 in 100 year runoff rates, and flows attenuated including a 30% allowance for climate change.
- 8.5 Microdrainage models have been created and the results demonstrate:
- No on parcel flooding
 - The development does not increase flooding downstream
 - The development does not increase the discharge rate at the outfall
 - There is significant betterment to flood volumes created by the drainage installed as part of the overall development in comparison to the existing Upper Heyford drainage systems.

APPENDIX A

Parcel Plan

APPENDIX B

Proposed drainage layout

APPENDIX C

Existing Microdrainage Calculations

APPENDIX D

Proposed Microdrainage Calculations

Note:	The calculations include the entire network including existing areas upstream and areas downstream of this phase. The runs numbers which relate to the Village Centre South (in the order shown in the calculations) are:
<p data-bbox="290 862 609 891">Central diversion pipe ref</p> <p data-bbox="290 922 375 981">10.000 10.001</p> <p data-bbox="290 1012 614 1041">Eastern diversion pipe ref</p> <p data-bbox="290 1072 375 1160">31.000 32.000 31.001</p> <p data-bbox="290 1191 375 1249">35.000 35.001</p>	

APPENDIX E

Residual Flooding Masterplan