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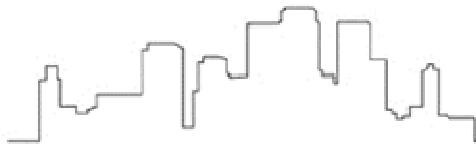
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Flood Risk Assessment Compliance

**For
Camp Road, Upper Heyford
Phase 5 (Parcel D6a)**

September 2016

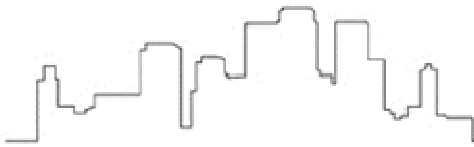


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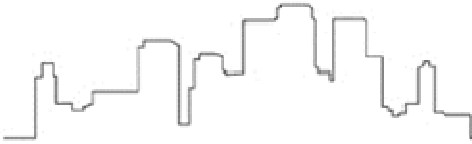
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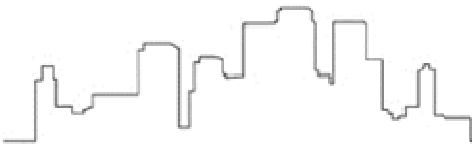
1.0 **Introduction**

- 1.1 This Flood Risk Assessment Compliance report has been prepared on behalf of the Dorchester Group in support of their Reserved Matters application for Parcel D6a (now referred to as Phase 5) of the redevelopment off Camp Road, Upper Heyford.
- 1.2 The purpose of this report is to demonstrate that the proposed drainage design for phase 5 complies with the approved Flood Risk Assessment (FRA) carried out by Waterman dated October 2010 (Ref C11234 ES 001).
- 1.3 Phase 5 is part of the Dorchester Group development located to the South of the whole site (refer to the Site Residential Parcel Plan given in **Appendix A**).
- 1.4 This report is intended to assist in the discharge of any planning conditions that requires the developer to demonstrate compliance with the approved FRA.



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 Proposed Development

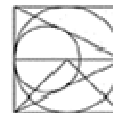
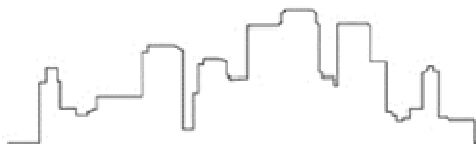
- 3.1 Phase 5 (parcel D6a) comprises 60 dwellings within 2.573 hectares of land. Refer to **Appendix B** for proposed layout.
- 3.2 Phases 5 is located within Catchment Area 2 as identified in the approved FRA figure 5.
- 3.3 The Indicative Surface Water Drainage Layout within the approved FRA suggests attenuation of surface water for Catchment 2 is provided by the use of attenuation tanks, permeable paving and oversized pipes. It is proposed that these phases will utilize attenuation tanks, oversized pipes and flow control devices upstream of and connecting to, the approved phase 4 network which in turn connects to the existing network leading to the existing outfall.

Discharge Strategy

- 3.4 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".
- 3.5 It is proposed to connect the phase 4 network via run 26.009 on the proposed calculations in accordance with the approved phase 4 FRA Compliance document.
- 3.6 The Phase 3, 4, 5, 5b and 6 system has been simulated as one complete network and have been reviewed as a whole.
- 3.7 The FRA prescribes the following existing 1 in 100 year runoff rates for use in calculations:

Existing 1 in 100yr	Greenfield runoff- 10.7 l/s/ha	Greenfield brownfield- 112.8 l/s/ha
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- 3.8 The purpose of this report is not to revisit the calculation of these rates. Further information on how these rates were derived can be found in the approved FRA.



3.9 Following detailed assessment of the topographical survey and site visits the following calculations can be derived. These replicate the information shown in the phase 4 FRAC.

The outfall into the existing system contains the flow from phases 3, 4, 5b, 5 and 6 therefore the other phase results are shown below for completeness.

Phase 4 (approved)		
	Area (m²)	1 in 100yr Discharge (l/s)
Existing Impermeable surfacing	16726	188.7 l/s

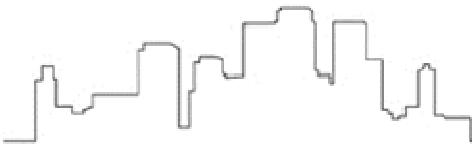
Phase 5b (approved)		
	Area (m²)	1 in 100yr Discharge (l/s)
Existing Impermeable surfacing	1116	12.6 l/s

Phase 5		
	Area (m²)	1 in 100yr Discharge (l/s)
Existing Impermeable surfacing	17946	202.4 l/s

Phase 3 south (as approved)		
	Area (m²)	1 in 100yr Discharge (l/s)
Existing Impermeable surfacing	9934	112.1 l/s

Phase 6 (subject to future FRA-C)		
	Area (m²)	1 in 100yr Discharge (l/s)
Existing Impermeable surfacing	6168	69.6 l/s

Total flow from phases 3, 4, 5b, 5 and 6	
	1 in 100yr Discharge (l/s)
Total allowable rate for proposed phases	585.4 l/s
Actual rate from phases into existing network (runs 21.020, 43.000 and 44.005 in the calculations)	116.8 + 4.5 + 91.3 = 212.6 l/s



Attenuation Strategy and SUDS elements

- 3.10 The parcels contain attenuation in the form of underground tanks and oversized pipes both within the application boundary, and within the client's ownership between the phase boundary and the proposed outfall location.
- 3.11 The oversized pipes are proposed for adoption by the Water Company.
- 3.12 The underground storage tanks will cater for the majority of the attenuation required and either be maintained by the Water Company or a management company as will the swale.
- 3.13 The final discharge into the existing system from the phases will be controlled using hydro-brake vortex controllers. There will also be intermediate hydro-brakes on phase 5 to maximise the efficiency of the storage network.
- 3.14 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 and integration into domestic plumbing.
- 3.15 The use of porous paving or other infiltration devices have been discounted due to the lack of infiltration within this area. This was confirmed via BRE complaint soakaway tests within the Phase 4/5 area on 13th May 2016 which were abandoned when the water did not drain away and was noted as standing at a fixed level for 2-6 hours.
- 3.16 It is noted that the approved treatments plan for the overall planning layout which dictates the road class and amount of porous paving per phase does not have any requirements for porous paving in the phase 3-5 area.

4.0 Hydraulic Performance

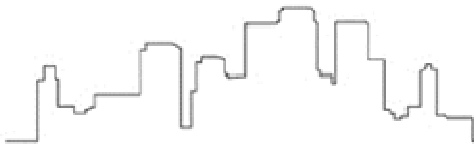
- 4.1 A detailed Microdrainage model has been constructed to simulate the 1 in 100 year (plus climate change) storm for the proposed systems.
- 4.2 The Microdrainage model (refer to **Appendix C**) demonstrates that the total proposed 1 in 100 year (plus climate change) discharge rate does not exceed 585.4 l/s at runs 21.020, 43.000 and 44.005.
- 4.4 The achieved discharge rates are significantly lower than the allowable discharge rates.

Exceedance

- 4.5 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. Indicative finished levels have been designed so that during these periods, flood water will be directed away from the proposed building entrances and into the roads and soft landscaping areas.
- 4.6 The primary phase 5 road falls to the south connecting to the phase 4 roads. For phase 4 exceedance information please refer to the approved FRA-C for that area.

Pollution prevention

- 4.6 As the parking areas are smaller than 800m sq, PPG3 states that trapped gullies will provide suitable protection against contamination.
- 4.7 It is noted that the off parcel sewer passes through a petrol interceptor before discharge into the existing watercourse which meets the requirements of PPG3.



Maintenance

- 4.8 Private drainage serving multiple dwellings or located within shared areas will be maintained by the maintenance company.
- 4.9 Adoptable drainage will be maintained by the water company.
- 4.10 SUDS features (such as storage tanks) contributing to the overall drainage strategy will be maintained by the maintenance company.
- 4.11 Refer to “SUDS Maintenance Regime” report dated May 2016 which covers Phases 4, 5b and 5 for further details. This document along with relevant designer’s risk assessments, calculations and drawings will be made available to the maintenance company.

5.0 Summary and Conclusions

- 5.1 This report has been prepared to allow discharge of any planning conditions which require evidence of compliance with the approved Waterman Flood Risk Assessment.
- 5.2 The FRA confirms no attenuation is required for areas being refurbished or retained.
- 5.3 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.
- 5.4 A Microdrainage model has been created and the results demonstrate a significant betterment in discharge rates.
- 5.5 The Microdrainage model also demonstrates no flooding during events up to and including a 1 in 100 year return period including a 30% allowance for climate change.

APPENDIX A

Residential Parcel Plan

APPENDIX B

Proposed levels and drainage layouts

APPENDIX C

Proposed Microdrainage Calculations- Central network

Note:

The calculations include the entire network including existing areas upstream and areas downstream of this phase. The runs numbers which relate to this phase (in the order shown in the calculations) are:

Pipe ref

29.002
29.003
30.000
31.000
30.001
30.002
29.004
29.005
32.000
33.000
32.001
32.002
29.006
29.007
29.008
29.009
35.000
35.001
36.000
35.002
35.003
35.004
29.010

APPENDIX D

Residual Flooding Masterplan