Woods Hardwick
Infrastructure LLP
Civil Engineering Consultants

15-17 Goldington Road
Bedford MK40 3NH
United Kingdom
T. +44 (0) 1234 268862
F. +44 (0) 1234 353034
mail@woodshardwick.com
www.woodshardwick.com

16871

Flood Risk Assessment Compliance

For
Camp Road, Upper Heyford
Phases 4, 5b and 5 (Parcels D3a, D4a and D6a)

July 2015

16871/B4

Contents

Appendices

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 Parcels D3a and D6a (now referred to as Phases 4 and 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 phases 4 and 5 comply with the approved Flood Risk Assessment (FRA) carried out by Waterman dated October 2010 (Ref C11234 ES 001).

1.3 Phases 4 and 5 are 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 4 (parcel D3a) comprises 77 dwellings within 3.496 hectares of land.

3.2 Phase 5b (parcel D4a) comprises 10 dwellings within 0.268 hectares of land.

3.3 Phase 5 (parcel D6a) comprises 60 dwellings within 2.573 hectares of land. Refer to **Appendix B** for proposed layouts.

3.4 Phases 4, 5b and 5 are located within Catchment Area 2 as identified in the approved FRA figure 5.

3.5 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 the existing network which leads to the existing outfall. A swale is also incorporated into phase 4.

Discharge Strategy

3.6 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".

3.7 It is proposed to connect the new network, attenuation and flow controls serving the phases to the existing "central" network upstream of runs 1.028 and 1.032 on the proposed calculations and carry out some replacement works and maintenance on the downstream runs. The existing system conveys both existing and new development flows to the central outfall.

3.8 The simulated network includes runs for future phases, however no catchment areas or attenuation for these elements are included as part of this Compliance note. Future Compliance notes will cover these future phases. It is noted that the design has been carried out in consideration of all future flows.

3.9 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

3.10 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.

3.11 Following detailed assessment of the topographical survey and site visits the following calculations can be derived:

Phase 4		
	Area (m^2)	**1 in 100yr Discharge (l/s)**
Existing Impermeable surfacing	16726	188.7 l/s

Phase 5b		
	Area (m^2)	**1 in 100yr Discharge (l/s)**
Existing Impermeable surfacing	1116	12.6 l/s

Phase 5		
	Area (m^2)	**1 in 100yr Discharge (l/s)**
Existing Impermeable surfacing	17946	202.4 l/s

One of the outfalls 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 3 has been approved previously and phase 6 is a future phase subject to change:

Phase 3 south (as approved)		
	Area (m^2)	**1 in 100yr Discharge (l/s)**
Existing Impermeable surfacing	9934	112.1 l/s

Phase 6 (subject to future FRA-C)		
	Area (m^2)	**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 20.018, 37.000 and 38.005 in the calculations)	108.4 + 30.3 + 109.4 = 248.1 l/s

Attenuation Strategy

3.12 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.

3.13 The oversized pipes are proposed for adoption by the Water Company.

3.14 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.

3.15 The final discharge into the existing system from the parcels will be controlled using hydro-brake vortex controllers. There will also be intermediate hydro-brakes to maximise the efficiency of the storage network.

3.16 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.

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 run 20.018, 37.000 and 38.005.

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.

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.

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.

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 these phases (in the order shown in the calculations) are:

Pipe ref	Phase	Parcel
19.000	5b	D4a
19.001	5b	D4a
25.000	4	D3a
20.008	4	D3a
20.009	4	D3a
26.000	5	D6a
26.001	5	D6a
26.002	5	D6a
27.000	5	D6a
27.001	5	D6a
28.000	5	D6a
27.002	5	D6a
26.003	5	D6a
26.004	5	D6a
29.000	5	D6a
29.001	5	D6a
29.002	5	D6a
26.005	5	D6a
26.006	5	D6a
26.007	5	D6a
26.008	5	D6a
31.000	5	D6a
31.001	5	D6a
31.002	5	D6a
31.003	5	D6a
31.004	5	D6a
26.009	5	D6a
20.010	4	D3a
20.011	4	D3a
33.000	5b	D4a

Pipe ref	Phase	Parcel
33.001	5b	D4a
33.002	5b	D4a
33.003	5b	D4a
20.012	4	D3a
34.000	4	D3a
20.013	4	D3a
35.000	4	D3a
20.014	4	D3a
20.015	4	D3a
20.016	4	D3a
36.000	4	D3a
20.017	4	D3a
20.018	4	D3a
37.000	4	D3a
38.000	4	D3a
38.001	4	D3a
38.002	4	D3a
38.003	4	D3a
39.000	4	D3a
40.000	4	D3a
40.001	4	D3a
40.002	4	D3a
39.001	4	D3a
39.002	4	D3a
39.003	4	D3a
39.004	4	D3a
39.005	4	D3a
38.004	4	D3a
38.005	4	D3a