

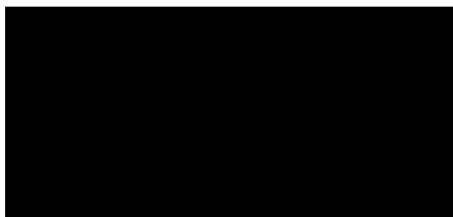


**POLICY SITE 6
FELPHAM, BOGNOR REGIS**

**Housing Application for
All Phases of Blake's Mead**

**SURFACE WATER ATTENUATION
DESIGN STATEMENT**

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Ref: AMc/**4180**

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The surface water attenuation system for the housing development follows the basic principals of the approved strategies set out in the Environmental Impact Assessment, the Flood Risk Assessment (FRA) and the Section 106 agreement.

The FRA was written in accordance with PPG 25 and approved at the outline planning stage. This report provided details of the fluvial floodplain for the Lidsey Rife, the Greenfield runoff rate and the indicative designs for the storm drainage including estimated volumes.

The storm water attenuation designs within the approved FRA were however incapable of implementation. The original FRA proposed a ditch running parallel with the Relief Road outfalling to the main east – west watercourse at a level of approximately 1.30m AOD, the development ditch would then overflow to the attenuation ponds, this system was approximately 2m deep from existing ground levels. This design takes no account of the levels required at the head of the system and for this ditch system to drain properties on zone A the ground level would need to be raised 2 – 2.5m. The fluvial floodplain level is 1.82m AOD, water levels within the watercourse are known to be variable and therefore the attenuation outfall would be submerged for significant periods of the year. This design also takes no account of the high groundwater levels encountered on site and from the data collected it would appear the ponds would experience groundwater infiltration. Pond A is shown to lie over the main east – west watercourse which is the main outfall for both the highway and development systems.

During the reserved matters approval process the Environment Agency requested that PPS 25 should be taken into account as this has replaced and updated PPG 25. The changes affected both the floodplain and attenuation required. The level of the fluvial floodplain rose from 1.82m to 2.00m AOD. PPG 25 required the development to be attenuated for the 1 in 100 year storm event whilst PPS 25 increases this to attenuate the 1 in 100 year + climate

change (30%) storm event. This in turn increases the attenuation from 6230m³ stated in the FRA to 9500m³ (50% increase). The Environment Agency have stated that as the original design would have had a submerged outfall the minimum outfall level from the attenuation should be 1.75m AOD which will provide an unrestricted outfall for the majority of storm events.

The proposed attenuation system for the total development follows the principals laid out in the outline consent and FRA but has had to be redesigned around the increased attenuation volume, the raising of the outfall level, the existing groundwater conditions and the need to retain the open space requirements of the Section 106 agreement. The original FRA had an attenuation pond area of 11,700m² whilst the proposals put forward extend to an area of 13,110m².

The development surface water runoff from roads and houses will discharge to the attenuation features via an adoptable piped drainage system maintained by Southern Water. The storm drainage generally runs from east to west before discharging to Ponds A -D which lay on both sides of the Relief Road. Ponds C & D lie to the north and are permanently wet ponds to provide further ecological benefits where as Ponds A & B are predominantly dry. Due to ground levels within Zone A an additional SUDS pond (Pond 1) to the eastern corner adjacent to the A257 roundabout has been introduced.

Based on discussions with Arun D.C. the storm water attenuation has been designed using the following agreed Greenfield runoff principals. Runoff from hard surfacing is 5 litres/sec/Ha and for gardens and soft landscaping 2.5 litres/sec/Ha. Impermeable areas on site have been assessed at being between 60 - 65% of the total area.

Ponds A - D:

Site area draining to pond:	24 Ha
Estimated impermeable area:	15 Ha
Gardens & open space	9 Ha (50% allowance)
Max. Discharge to mimic Greenfield Runoff	97.5l/sec

Attenuation pond design bed levels (m AOD):

Pond A	1.8m - 2.0m
Pond B	2.35 - 2.5m
Pond C & D	2.5m

Attenuation has been designed with a minimum level of 2.0m AOD

Micro Drainage Summary:

Storm Event	Critical Storm	Max. Depth	Volume	Time to peak	Drain down time
1 year	180 min winter	521mm	1225m ³	142 min	434 min
5 year	240 min winter	688mm	2235m ³	265 min	680 min
30 year	360 min winter	925mm	3825m ³	265 min	1090 min
100 year + 30%	480 min winter	1395mm	7600 m ³	470 min	1945 min

Pond depths and drain down times:

1 in 1 year event – Critical storm 180 min winter

	Time to attenuation start (min)	Time to peak (min)	Max depth (m)	Time to empty (min)
Pond A	16 min	146 min	521mm	434 min
Pond B	94 min	146 min	171mm	142 min
Pond C	122 min	146 min	21mm	54 min
Pond D	122 min	146 min	21mm	54 min

1 in 5 year event – Critical storm 240 min winter

	Time to attenuation start (min)	Time to peak (min)	Max depth (m)	Time to empty (min)
Pond A	16 min	265 min	688mm	680 min
Pond B	106 min	265 min	318mm	426 min
Pond C	126 min	265 min	168mm	320 min
Pond D	126 min	265 min	168mm	320 min

1 in 30 year event – Critical storm 360 min winter

	Time to attenuation start (min)	Time to peak (min)	Max depth (m)	Time to empty (min)
Pond A	18 min	342 min	927mm	1090 min
Pond B	134 min	342 min	812mm	832 min
Pond C	158 min	342 min	427mm	702 min
Pond D	158 min	342 min	427mm	702 min

1 in 100 year + 30% event – Critical storm 480 min winter

	Time to attenuation start (min)	Time to peak (min)	Max depth (m)	Time to empty (min)
Pond A	2 min	470 min	1395mm	1945 min
Pond B	136 min	470 min	1045mm	1664 min
Pond C	172 min	470 min	895mm	1540 min
Pond D	172 min	470 min	895mm	1540 min

Pond 1: - (Near A259 Roundabout)

Site area draining to pond:	1.5 Ha
Estimated impermeable area:	0.9 Ha
Gardens & open space	0.4 Ha (50% allowance)
Max. Discharge to mimic Greenfield Runoff	6l/sec

Micro Drainage Summary:

Attenuation has been designed with a minimum level of 2.5m AOD

Storm Event	Critical Storm	Depth	Volume	Drain down time
1 year	240 min winter	500mm	236m ³	630 min
30 year	480 min winter	1050mm	700m ³	1545 min
100 year + 30%	600 min winter	1300mm	1350 m ³	2450 min