

APPENDIX E
GROUNDWATER MONITORING &
BOREHOLE LOCATION PLAN – WILSON BAILEY

24 March 2013

Your ref:
 Planning ref:
 Our ref: J11002/DB/c05

Mr J Jones
 Barratt David Wilson Homes Southampton
 Tollbar House
 Tollbar Way
 Hedge End
 Southampton
 Hampshire
 SO30 2UH

Dear Mr Jones,

RE: DENVILLES FARM SITE, HALLETT ROAD, HAVANT, HAMPSHIRE

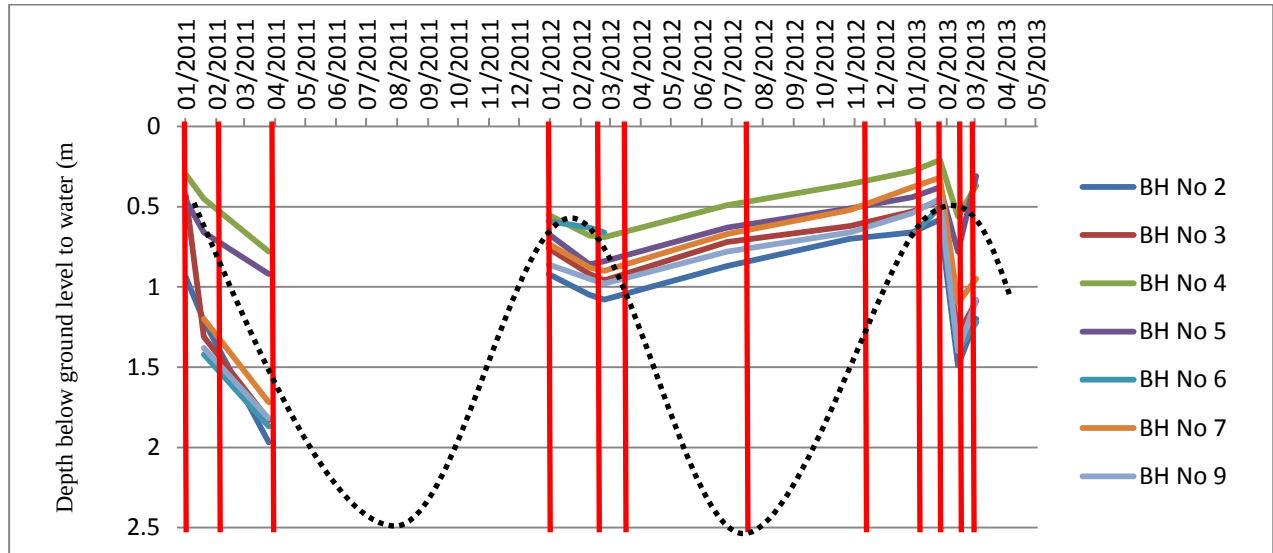
UPDATE ON GROUNDWATER LEVEL MONITORING CARRIED OUT TO DATE

Further to our meeting with the EA and Havant BC we returned to site to carry out an additional water monitoring visit and have rechecked our previously issued results; we are not able to find any error in our monitoring resulted dated 4 March 2013.

The updated results of the monitoring to date are detailed in the table below and indicated as depth below ground level in metres, together with a plot showing the data trends.

Date	BH No 2 (14.00 mOD)	BH No 3 (14.05 mOD)	BH No 4 (13.50 mOD)	BH No 5 (13.60 mOD)	BH No 6 (14.10 mOD)	BH No 7 (14.20 mOD)	BH No 9 (14.10 mOD)
21/01/2011	0.94	0.43	0.30	0.46	--	--	--
08/02/2011	1.21	1.31	0.45	0.66	1.42	1.20	1.38
14/04/2011	1.97	1.83	0.78	0.92	1.87	1.72	1.82
19/01/2012	0.92	0.76	0.55	0.67	0.59	0.73	0.86
29/02/2012	1.05	0.92	0.68	0.86	0.63	0.88	0.95
15/03/2012	1.08	0.96	0.69	0.84	0.66	0.90	0.98
16/07/2012	0.87	0.72	0.49	0.63	--	0.67	0.78
16/11/2012	0.70	0.62	0.36	0.51	--	0.52	0.66
17/01/2013	0.66	0.53	0.28	0.44	0.68	0.38	0.54
14/02/2013	0.58	0.46	0.21	0.38	0.50	0.32	0.45
04/03/2013	1.49	1.30	0.56	0.78	1.40	1.10	1.40
22/03/2013	1.20	1.09	0.37	0.31	1.22	0.95	1.08

Fig 1: Plot showing depth to ground water below ground level from Jan 2011 to March 2013.
(Red lines indicate actual timing of each monitoring visit, black dashed line indicates a typical seasonal variation)



From the above plot it is apparent that there is a general rising trend of groundwater during 2012, which is consistent with the unusually consistent heavy rainfall experienced throughout the year.

The summer rainfall has prevented the summer trough in water levels from occurring during 2012, although the peak levels during the winter of 2012 to 2013 are not shown to be significantly higher than those measured on site during previous winters. This considered to be due to the ability of the existing surface water drainage network to adequately drain the site, albeit causing surface water drainage issues further down-stream.

These results would therefore support the view that even during sustained periods of heavy rainfall the site does not become flooded.

New surface water attenuation features that are to be constructed as part of the revised surface water management scheme for the proposed development. These attenuation features would be expected to alleviate the off-site down-stream surface water management issues that have been highlighted by the Environment Agency.

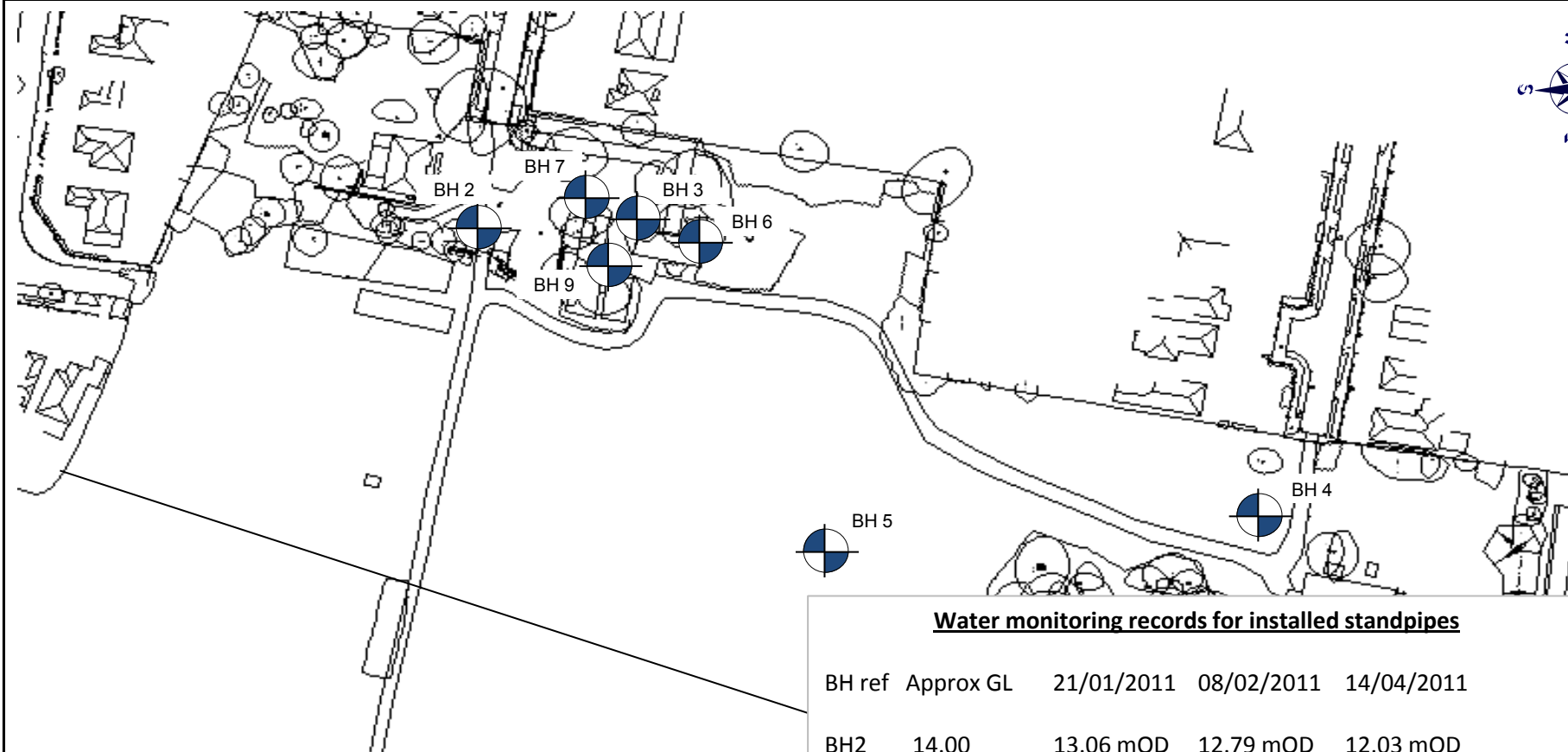
We trust that this letter provides a useful update to the existing monitoring data.

Yours sincerely
Wilson Bailey Partnership

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BSc MSc DIC FGS CGeol ARSM

Site Manor Farm, Denvilles

Client BDW Southampton



Water monitoring records for installed standpipes

BH ref	Approx GL	21/01/2011	08/02/2011	14/04/2011
BH2	14.00	13.06 mOD	12.79 mOD	12.03 mOD
BH3	14.05	13.62 mOD	12.74 mOD	12.22 mOD
BH4	13.50	13.20 mOD	13.05 mOD	12.72 mOD
BH5	13.60	13.14 mOD	12.94 mOD	12.68 mOD
BH6	14.10	--	12.68 mOD	12.23 mOD
BH7	14.20	--	13.00 mOD	12.48 mOD
BH9	14.10	--	12.72 mOD	12.28 mOD

Approximate Scale in metres

APPENDIX F
SUDS MANAGEMENT & MAINTENANCE PLAN

**PROPOSED RESIDENTIAL DEVELOPMENT
AT**

**MANOR FARM
DENVILLES
HAVANT
HAMPSHIRE**

**SUDS MANAGEMENT
&
MAINTENANCE PLAN**

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DOCUMENT CONTROL RECORD

Document Issue:

Rev	Issue Status	Prepared by	Checked by
A	Draft for comment	C.Pendle	A.McShane

1 Introduction

- 1.1 This document sets out the principles for the long term management and maintenance of the surface water Sustainable Urban Drainage Systems (SuDS) within the proposed development.
- 1.2 This management and maintenance plan has been put together using the latest technical SuDS guidance within the CIRIA Report C697 The SuDS Manual and other relevant guides.
- 1.3 The document is laid out in specific sections pertinent to SuDS type detailing:
- A description of the SuDS component and its use
 - Maintenance requirements and frequencies
 - Inspection requirements and frequencies
- 1.4 The activities listed are generic to SuDS types and represent the minimum maintenance and inspection requirements, however additional tasks or varied maintenance frequency may be instructed by the maintenance company for specific sites as required.

This may include:

- Measurement and recording of sediment levels
- Photographic recording of problem areas
- Increased frequency of litter removal in areas identified as litter hotspots
- Adjusted timescales of maintenance activities to minimise impact on wildlife (e.g. great crested newts, birds, voles, etc)
- The use of manual methods of maintenance to limit impact on wildlife habitat (e.g. management of emergent vegetation in ponds)

2 SuDS Layout & Design

- 2.1 The housing development sustainable urban drainage systems (SuDS) consists of cellular soakaways, permeable paved road / parking areas and infiltration / attenuation basins.
- 2.2 All SuDS structures are designed to accommodate 1 in 100year +30% climate change storm events

The surface water drainage strategy for the site will follow the principals as outlined below:

2.3 Residential Areas - Cellular Soakaways

Roof drainage will drain via traditional rainwater down pipes discharging to shallow cellular crate soakaways (rear of properties) or sub base of permeable block paving (front of properties).

Where feasible, high level overflows will connect the soakaways to the permeable block paving sub-base.

A catch pit manhole is to be installed upstream of soakaway unit to capture any silt any debris.

2.4 Driveways and Parking Courts - Permeable Block Paving with permeable sub-base

Parking courts will be constructed using a mixture of permeable block paving in the parking bays and tarmac surfacing on the running areas. Runoff from both areas will drain through the block paving to the permeable sub base below.

As runoff percolates through the structure, pollutants and contaminates are filtered out by the bedding layer providing an improvement in water quality.

2.5 Residential Access Road - Permeable Block Paving with permeable sub-base

The adoptable roads will drain via a permeable surface of either permeable block paving or permeable macadam. The sub base for both will be designed to attenuate the 1:100 year + 30% climate change event.

An overflow system consisting of collector cells located within the permeable paving sub-base will collect excess runoff discharging into an infiltration /attenuation ponds.

2.6 Attenuation Ponds

The two attenuation ponds are designed to collect excess runoff from the permeable paved road systems.

These ponds are to be unlined to allow for additional infiltration.

The outflow from the ponds will discharge into the existing Nore Farm stream at a maximum controlled rate of 28l /s (Greenfield Runoff rate QBar) via a flow control structure.

The control structure will be a brick built or precast concrete manhole ring control chamber containing a hydraulic vortex flow control device, i.e Hydrobrake or similar.

3 SUDs Management & Maintenance

3.1 Cellular Soakaways

- 3.1.1 The catch pit manhole upstream of the soakaway unit can be inspected and accessed for removal of silt/debris build up, as and when required.
The responsibility of inspecting the catch pit and identifying any soakaway areas that are not operating properly lies with the property owner.
Where a soakaway serves more than one property and catch pits are accessible, maintenance and repair responsibility lies with the management company.
Where a soakaway serves an individual property, maintenance and repair responsibility lies with the individual property owner.

3.2 Permeable Block Paving

- 3.2.1 To ensure the performance of the permeable paving, it is recommended that the following maintenance should be carried out as outlined below:
- 3.2.2 The maintenance of the pavement is to ensure the infiltration of the paving is not compromised. The following guidelines are offered as an initial regime, but maybe either increased or decreased depending on pavings local environment and any external contributing factors.
1. A visual inspection of the paving may be carried out on a regular basis.
This will confirm the effectiveness of the agitation maintenance due to variations between sites and allow any refinement of the regular agitation activity if necessary.
 2. The paving should be agitated (e.g. brushed, vacuumed, etc.) at least twice a year. This is to ensure no vegetation of any sort is allowed to grow and develop in the joints. Ideally, this activity should be carried out in the spring and autumn seasons.
 3. The paving should be inspected after any heavy precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
 4. For winter maintenance, the controlled use of de-icing may be used without causing significant detrimental effects towards the permeable pavements performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in the local ground.
 5. Where non-infiltration systems have been employed, the inspection of the outfalls should be undertaken initially on a twice-yearly basis.
 6. Weed growth – when sedimentation occurs in areas of permeable paving then there is the potential for weed growth, this will typically occur where there are overhanging trees or soft landscaping slopes down on to the paving or in areas which do not receive over run from vehicles particularly frequently. Weeds can be removed from the surface through the application of weed killers containing Glyphosate are the most suitable.

- 3.2.3 Glyphosate based weed killers are the most common for general-purpose use, they are most effective on grasses and perennial weeds with non-woody stems. Weeds should be sprayed when they are actively growing so that the Glyphosate will go down to the root and kill the weed completely.
- 3.2.4 Glyphosate will be neutralized upon contact with the ground, which makes it safe to plant in the area soon after treatment. It is available ready mixed or as a concentrate. With the ready mix you will pay a lot for the water that it is diluted with, but if you only have a small plot or if you don't have a safe chemical storage cupboard, then ready mix is the best option.
- Depending on the amount of usage and the environment the permeable pavement has received and been exposed to, the laying course material may require either cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. Should this occur, the uplifting and cleaning (or replacing, depending on the costings of the activity,) of the laying course may be considered. The laying course material, jointing and blocks may be reused, minimising costs.

3.3 Attenuation / Infiltration Pond

- 3.3.1 The attenuation / infiltration pond is designed as a mainly dry feature except during and immediately after storm events.
- 3.3.2 The basin will be grass seeded and will have side slope of 1:4 - 1:3.
- 3.3.3 Flows to and from the attenuation basin will be via a headwall.

MAINTENANCE REQUIREMENTS:

Maintenance Category	Maintenance Activity	Comments	Frequency
Routine Maintenance	Litter and debris removal.	Litter & debris to be removed prior to any grass cutting activity to minimise risk of shredding litter. Particular attention should be paid to inlet/outlet chamber, pipes and grilles (if in place).	Monthly.
	Grass cutting: landscaped areas, spillways & access routes.	Maintain to amenity grass specification. All cuttings to be removed from SUDS component.	Monthly (during growing season) or as required.
	Grass cutting: base & side slopes.	Manage meadow grass specification. All cuttings to be removed from SUDS component.	Half yearly (Spring before nesting season, and Autumn).
	Manage other vegetation and remove nuisance plants.	Weeding should be conducted by hand or use non-toxic and Biodegradable weedkiller. Invasive species should be removed in accordance with best practice.	Monthly (at implementation) then as required.
Infrequent Maintenance	Re-seed areas of poor vegetation growth. Prune & trim trees/shrubs and remove cuttings.		As required.
	Remove sediment from inlets, outlets, and control structures		Annually or as required.
Corrective Maintenance	Repair erosion or other damage by re-turfing or re-seeding.		As required.
	Remove sediment from base of structures.		As required.
	Re-level uneven surfaces and reinstate design levels.		As required.
	Repair / rehabilitation of inlets, outlets and overflows.		As required.

INSPECTION & FREQUENCY:

Inspection Activity	Comments	Frequency
Inspect inlets and outlets for blockages.		Monthly.
Inspect banksides, structures, pipework etc for evidence of physical damage.		Monthly.
Check control devices within chambers.	Includes cracking of seals on penstocks, testing Hydro-Brake by-pass door.	Half yearly.
Safety signage and safety equipment inspection.	Basins designed as dual purpose areas should have permanent safety signs in place. Where applicable safety equipment should be inspected to ensure it available and in good repair.	Monthly.