Civil/Structural Engineers
Development Consultants
Project Managers

SURFACE AND FOUL WATER MANAGEMENT

MANOR ROAD, HATFIELD

FOR

CARING HOMES, ATKAR CORPORATION

OCTOBER 2016

REPORT REF: 2277/SW01

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5.0 SURFACE WATER MANAGEMENT

5.1 Existing Surface Water Drainage Infrastructure

The existing site is 4592m^2 and approximately 2396m^2 of this is impermeable, consisting of hard standing used for car parking, which is assumed to currently discharge surface water into an existing below ground trunk sewer. The site is currently made up of 52% impermeable area.

5.2 Existing Surface Water Runoff Regime

The site is brownfield in nature and therefore existing run-off rates should be assessed accordingly. In respect of Brownfield sites, the Interim Code of Practice for Sustainable Drainage Systems (July 2004) states that 'drainage proposals will be measured against the existing performance of the site'. The design of any future drainage system should therefore be based upon an assessment of the existing rate of runoff, taking account of the existing extent of impermeable surfaces and the capacity of the pipe system serving the impermeable catchment and drainage to the receiving system. The existing rate would then be taken forward and used as the basis for defining the 'limiting flow' for the purposes of designing any future storm water drainage and balancing system.

5.3 Assessment of Discharge Rate

The existing site discharge rate based on $Q=2.78 \times 50\ A_{imp}$ (0.24ha) has been calculated as being 33.4 l/s.

As the site is brownfield the Environment Agency would expect to see a reduction of 30% in peak discharge from the proposed development; this would give an allowable discharge rate of 23.4 l/s.

5.4 Consideration of SuDS Suitability

The Environment Agency require Sustainable Drainage (SuDS) techniques to be incorporated within new developments where possible.

Consideration should therefore be given to the use of the Sustainable Urban Drainage Systems. The following table gives commentary in relation to the suitability of sustainable Urban Drainage techniques for the proposed development.

As the site is within a Total Catchment SPZ, the EA may not accept the use of infiltration based SuDS techniques for this site; this potential restriction is intended to minimise the risk of contaminated surface water entering the underlying aquifer.

SUDS Technique	Commentary	Suitability
Green Roof	Green roofs are potentially suitable for the property; this would only be suitable if the roof is of flat construction.	Potential
Infiltration by Soakaway	It is potentially feasible to locate a soakaway a sufficient distance from any new or existing buildings subject to the suitability of ground conditions and EA confirmation.	Potential

Attenuation Tanks	It is potentially feasible to locate an attenuation tank a sufficient distance from any new or existing buildings subject to the suitability of ground conditions.	Potential
Rainwater Harvesting / Water Butt	Storage of roof runoff via the use of rainwater harvesting / water butts is potentially suitable for the properties.	Potential
Filter Strip	There is no suitable area within the site for filter strips.	No
Infiltration Trench / Filter trench	There is limited space to accommodate an infiltration/filter trench on site.	No
Swale	It is not viable or practical to accommodate swales on site as there are no extensive soft landscaped areas to accommodate these.	No
Bio-retention	It is not viable or practical to accommodate bio-retention on site as there are no extensive large open soft landscaped areas to accommodate these.	No
Permeable paving	The use of permeable paving can be considered to the car parking areas to control surface water. This will be subject to the ground investigation, verifying the suitability of the existing bearing strata and the depth to the water table and EA confirmation.	Yes subject to ground conditions
Geocellular / modular system	Potentially the site could accommodate a geocellular/modular system below ground beneath the proposed carpark subject to the ground investigation, verifying the suitability of the existing bearing strata, the depth to the water table and EA confirmation.	Potential
Sand Filter	There is no suitable area within the site for sand filters.	No
Infiltration basin	It is not viable or practical to accommodate infiltration basins on site as there are no extensive large open soft landscaped areas to accommodate these.	No
Detention Basin	It is not viable or practical to accommodate detention basins on site as there are no extensive large open soft landscaped areas to accommodate these.	No
Pond	It is not viable or practical to accommodate a pond on site as there are no extensive large open soft landscaped areas to accommodate this.	No
Stormwater Wetland	It is not viable or practical to accommodate stormwater wetland on site as there are no extensive large open soft landscaped areas to accommodate this.	No

The table above identifies potential for green roofs, soakaways, attenuation tanks, rainwater harvesting/water butts, geo-cellular and permeable paving to be suitable on site, subject to confirmation of ground conditions and EA approval. As previously mentioned, infiltration based techniques may not be suitable for use on this site, and therefore the most appropriate SuDS technique for this site is deemed to be an attenuation tank, discharging to existing surface water sewers.

5.5 Proposed Surface Water Drainage Strategy

The proposed develoment will provide a small increase in impermeable area of the site of 274m^2 from that of the exisitng site. A plan showing the impermeable areas of the proposed development, BJB drawing number SK001, is contained within Appendix C.

The impermeable area of the proposed development is approximately 2670m^2, resulting in a total surface water discharge rate of 37.1 l/s. In order to achieve the allowable discharge rate of 23.4 l/s, attenuation must be provided on site by the use of tanks.

5.6 Proposed Foul Water Drainage Strategy

The discharge loads for the proposed new residential development are based on the occupancy and use of the development as set out in the British Water Code of Practice: Flows and Loads 4 (BW COP: 18.11/13):

SOURCE OF WASTE						Flow litre / DAY		
Description	No of bedrooms	Occupancy	No	Reduction Factor	Reduced No	Daily Flow	TOTAL	
Care Home	75	1	75	0.8	60	350	21000	
Full-time staff			6			90	540	
Total load(s)							21540	litres/day
							21.5	m^3/day

Note: Occupancy figures are as set out in BW COP: 18.11/13.

Estimated foul flow based on a peak flow factor of 6 plus 10% (6DWF) =

Q_F = (21540 x 6 x 1.1) / (24 x 3600)

Q_F = 1.6 l/s

The estimated total foul discharge for the proposed development equates to 1.6 l/s. This represents the maximum peak flow for the new development proposed.

It is assumed that this foul flow can be discharged to an existing trunk sewer that serves the existing site adjacent to the site in question. However, this sewer should be checked and verified to ensure it has the capacity to accommodate this additional load.

6.0 SUMMARY AND CONCLUSIONS

BJB Consulting has prepared this Surface and Foul Water Management Report for the site off Manor Road, Hatfield. The report can be summarised as follows:

- The site is classified as Flood Zone 1 – land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

- The site is within a Groundwater Source Protection Zone (Total Catchment). The site is also within both a groundwater and surface water Nitrate Vulnerable Zone (NVZ) area.

- In order to achieve a reduction in surface water discharge rate of 30% from existing conditions, as required by the EA for brownfield sites, and an allowable discharge rate of 23.4 l/s, it is recommended that attenuation is provided on site (utilising tanks) to manage the discharge of surface water from the site.

- The estimated foul discharge from the development has been calculated as 1.6 l/s. It is assumed that this foul flow can be discharged to an existing trunk sewer that serves the site adjacent to the site in question. However, this sewer should be checked and verified to ensure it has the capacity to accommodate this additional load.

- All existing drainage systems, including main sewers, needs to be verified to confirm the type and location of the sewer, along with pipe sizes and outfall into the public sewers.

PREPARED BY	CHECKED BY	DATE	REVISION
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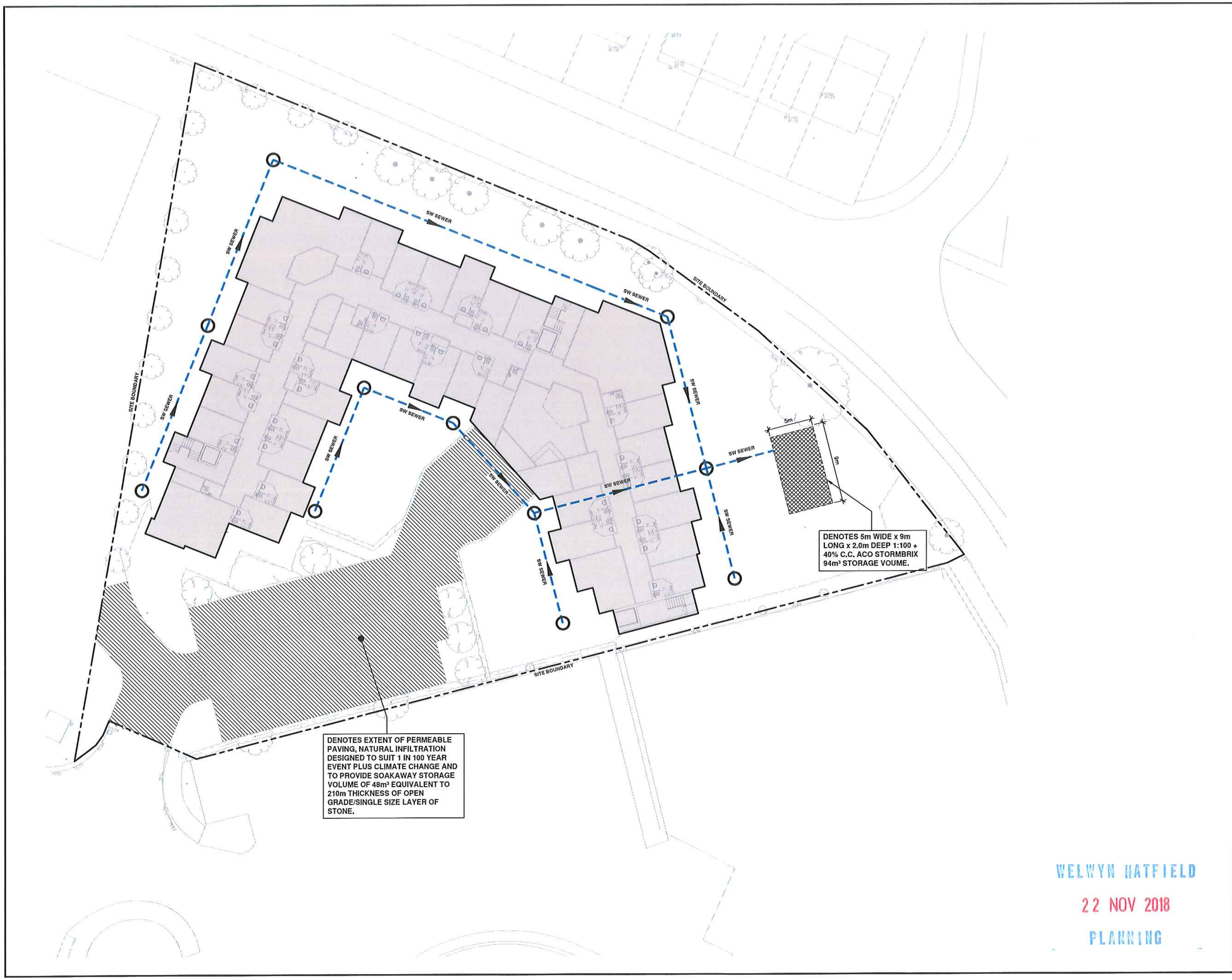

REV	DATE	AMENDMENT	BY

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PROJECT:

MANOR ROAD
HATFIELD

TITLE:

SURFACE WATER STRATEGY

DATE:	SCALE:	DRAWN:	MKJW
JULY 2017	1:X @ A1	CHECKED:	BJB
PROJECT No. 2277	DRG. No. SK601	REVISION. .	

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.03

Design rainfall intensity

Location of catchment area — London

Impermeable area drained to the system — $A = \mathbf{1459.0}\ m^2$

Return period — Period = **100** yr

Ratio 60 min to 2 day rainfall of 5 yr return period — r = **0.440**

5-year return period rainfall of 60 minutes duration — M5_60min = **20.0** mm

Increase of rainfall intensity due to global warming — $p_{climate} = \mathbf{40}$ %

Soakaway / infiltration trench details

Soakaway type — Rectangular

Minimum depth of pit (below incoming invert) — d = **2438** mm

Width of pit — w = **4500** mm

Length of pit — l = **9000** mm

Percentage free volume — $V_{free} = \mathbf{95}$ %

Soil infiltration rate — $f = \mathbf{32.2 \times 10^{-6}}$ m/s

Wetted area of pit 50% full — $a_{s50} = l \times d + w \times d = \mathbf{32918062}\ mm^2$

Table equations

Inflow (cl.3.3.1) — $I = M100 \times A$

Outflow (cl.3.3.2) — $O = a_{s50} \times f \times D$

Storage (cl.3.3.3) — $S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.39;	10.8;	1.92;	20.8;	30.38;	0.32;	30.06
10	0.54;	15.0;	1.99;	29.9;	43.63;	0.64;	43.00
15	0.65;	18.1;	2.01;	36.5;	53.23;	0.95;	52.27
30	0.82;	22.9;	2.02;	46.2;	67.34;	1.91;	65.44
60	1.00;	28.0;	1.99;	55.6;	81.13;	3.82;	77.32
120	1.19;	33.4;	1.94;	64.9;	94.71;	7.63;	87.07
240	1.39;	39.0;	1.90;	74.0;	108.03;	15.26;	92.77
360	1.53;	42.8;	1.87;	80.0;	116.71;	22.90;	93.82
600	1.70;	47.6;	1.83;	87.1;	127.04;	38.16;	88.88
1440	2.07;	58.1;	1.76;	101.9;	148.67;	91.58;	57.09

Required storage volume — $S_{req} = \mathbf{93.82}\ m^3$

Soakaway storage volume — $S_{act} = l \times d \times w \times V_{free} = \mathbf{93.82}\ m^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume — $t_{s50} = S_{req} \times 0.5 / (a_{s50} \times f)$ = 12hr 17min 37s

PASS - Soakaway discharge time less than or equal to 24 hours

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.03

Design rainfall intensity

Location of catchment area: London

Impermeable area drained to the system: A = **693.0** m^2

Return period: Period = **100** yr

Ratio 60 min to 2 day rainfall of 5 yr return period: r = **0.440**

5-year return period rainfall of 60 minutes duration: M5_60min = **20.0** mm

Increase of rainfall intensity due to global warming: $p_{climate}$ = **40** %

Soakaway / infiltration trench details

Soakaway type: Rectangular

Minimum depth of pit (below incoming invert): d = **209** mm

Width of pit: w = **26300** mm

Length of pit: l = **26300** mm

Percentage free volume: V_{free} = **33** %

Soil infiltration rate: f = **32.2×10^{-6}** m/s

Wetted area of pit 50% full: $a_{s50} = l \times d + w \times d$ = **11010092** mm^2

Table equations

Inflow (cl.3.3.1): $I = M100 \times A$

Outflow (cl.3.3.2): $O = a_{s50} \times f \times D$

Storage (cl.3.3.3): $S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.39;	10.8;	1.92;	20.8;	14.43;	0.11;	14.32
10	0.54;	15.0;	1.99;	29.9;	20.73;	0.21;	20.51
15	0.65;	18.1;	2.01;	36.5;	25.28;	0.32;	24.96
30	0.82;	22.9;	2.02;	46.2;	31.99;	0.64;	31.35
60	1.00;	28.0;	1.99;	55.6;	38.54;	1.28;	37.26
120	1.19;	33.4;	1.94;	64.9;	44.98;	2.55;	42.43
240	1.39;	39.0;	1.90;	74.0;	51.31;	5.11;	46.21
360	1.53;	42.8;	1.87;	80.0;	55.44;	7.66;	47.78
600	1.70;	47.6;	1.83;	87.1;	60.34;	12.76;	47.58
1440	2.07;	58.1;	1.76;	101.9;	70.61;	30.63;	39.98

Required storage volume: S_{req} = **47.78** m^3

Soakaway storage volume: $S_{act} = l \times d \times w \times V_{free}$ = **47.78** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume: $t_{s50} = S_{req} \times 0.5 / (a_{s50} \times f)$ = 18hr 43min 6s

PASS - Soakaway discharge time less than or equal to 24 hours