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Bacton Low Rise . Phase 2

Managing surface water

19 Sep 2016 . 2880 RPT Bacton SUDS [00]

90 Walcot Street . Bath BA1 5BG . 01225 444194
103 Timber Yard . Drysdale Street . London . N1 6ND. 020 7739 6939
www.momentumengineering.com

Background

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Authors
Michael Ward

Checked
R Heath

Issue History

Rev.	Date	Comments
0	27.09.16	Planning issue

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Background information

Introduction
The planning design process for Bacton Low Rise regeneration started in May 2012. The original planning application was submitted in November 2012 and gained planning approval in March 2013 (2012/6338/P).

Since the original application the need for smaller units has been requested as a change to the brief and Karkusevic Carson Architects have been employed by the London Borough of Camden to produce an MMA application to respond to this development.

This report on managing surface water supports the new MMA application.

Objectives
The following calculations and supporting information has been undertaken to ascertain if the principles of sustainable drainage systems set out in Annex F of Planning Policy Statement 25 can be met

This report examines the options available for surface water discharge and sets out the preferred strategy for doing so in a way that meets the requirements of the National planning policy framework NPFF (2012) by the use of a Sustainable Drainage System (SuDS). The objective of SuDS is to design housing developments which avoid, reduce and delay the discharge of rainfall to public sewers and watercourses so as to protect watercourses and reduce the risk of localized flooding, pollution and other environmental damage.

This report makes recommendations as to the preferred method of discharging surface water from the development site based on the best available information. The recommended option has been numerically analyzed to ensure that the requirements of Planning Policy Statement 25 can be met.

Climate change has been taken account of using the sensitivity ranges for peak rainfall intensity set out in Table B2 of Annex B of Planning Policy Statement 25. For residential development a 100 year timeframe is used. From Table B2 it can be seen that for this development a 30% increase in peak rainfall intensity needs to be applied to current rainfall rates to give the correct climate change values.

Site Information
The site is situated on land bounded by Haverstock Road and Wellesley Road, Gospel Oak, London NW5. The OS Grid Reference is TQ280852.

The site is occupied by blocks of seven storey flats.

The proposal is to demolish the existing buildings and construct 247 flats and 2 commercial units.

The following information and data has been used in appraising the surface water management requirements for the proposed development.

Site Characteristic	Before development	After development
Area of site	1 ha	
Man-made impermeable area	0.8 ha	0.7 ha
Percentage of site that is impermeable	80%	70%
Infiltration rate	Not applicable. See Clause 3.11 below	
Greenfield run-off rate	11.11 l/sec (based on IoH Report 124 metrology)	
Standard Percentage Run-off (SPR)	47%	
SAAR	641mm	
Is the site within a Source Protection Zone	No	

Assessment Criteria

The SuDS Manual C753 (CIRIA 2015) sets out requirements to meet the Hydraulic Control assessment criteria. These relate to the peak rate of run-off and the volume of run-off generated by the proposed development.

From the table above it can be seen that the proposed development results in a decrease in the man-made impermeable area. The SuDS Manual requires that the peak rate of run-off over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events.

The SuDS Manual indicates that peak rate of run-off calculations should be carried out for a range of storm durations up to and including the 6 hour storm. The peak rate of run-off for the storm event will then be the 'worst case' run-off rate for the range of storm durations. The climate change allowance should be added only to the post development calculations.

Using the runoff estimation methodology methods recommended by the SuDS Manual the peak rates of run-off have been calculated for both the pre and post development site conditions. The analysis is shown in Appendix 2 and the results are summarized in the table below.

Return Period (years)	**Peak Runoff (l/s)**	
	Pre-developed Site	**Post-developed Site**
1	119.1	135.5
100	353.6	402.2

Based on the requirements of the SuDS Manual if the post-development run-off rate exceeds the pre-developed rate then it is necessary to limit the discharge to the pre-development rate. This would give values of 119.1 l/s and 135.5 l/s for the 1 year and 100 year return periods respectfully.

In accordance with the London Plan 2016 the preferred solution would be to match the greenfield run-off rate but due to the spatial constraints of the site the required surface water storage facilities that would be needed cannot be accommodated on the site. The greenfield run-off and storage calculations are included in Appendix 3.

The London Plan Supplementary Planning Guidance (Sustainable Design and Construction) dated April 2014 states that if the greenfield run-off rate is not feasible then the rates should be minimized as far as possible to a permitted maximum rate of 50% of the site's (prior to re-development) surface water run-off at peak times.

A figure of 40 l/s is proposed to be the limiting discharge for the 1 year and 100 year return period events which represents 33% of the existing surface water run-off for the 1 in 1 year event and a 11% for the 1 in 100 year event. In order to achieve this discharge limit 226m3 of storage would be required to accommodate the water volume resulting from a 1 in 100 year storm (plus 30% allowance for climate change). The storage calculation is included in Appendix 3.

The SuDS Manual indicates that the post-development volume of run-off, allowing for climate change over the development lifetime, must be no greater than it would have been before the development. The additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques. If this cannot be satisfied then the post-development peak rate of run-off must be reduced to the limiting discharge.

The total volume of water discharging from the site from the 100 year 6 hour event (including for a 30% increase for climate change for the post-developed site) is summarized below for both the existing and proposed site conditions. As recommended in the document 'Preliminary Rainfall Run-off Management for Developments (EA/DEFRA W5-074/A)' run-off from impermeable surfaces has been taken as 100% and 0% for all permeable surfaces.

Site Condition	**Total Volume Discharged**
Pre-developed site	518.8 m^3
Post-developed site (including climate change)	590.1m^3
Difference	71.3m^3

In order to satisfy the allowable discharge rate it will be necessary to prevent the additional predicted volume of run-off from leaving the site by using infiltration or other SuDS techniques.

The primary methods of achieving this are outlined below along with a brief discussion of the appropriateness of each and the primary reasons why each method has been either included or discounted.

Soakaways
The preferred drainage solution for the surface water drainage would be to use soakaways but soakaways cannot be used as they need to be sited at least 5 metres from any building which due to the spatial restraints of the site is not possible. It should also be noted that the site is underlain by London Clay which is generally regarded as unsuitable for soakaways due to its impermeability.

Porous/pervious paving
Permeable paving is proposed to be used in areas that are not trafficked by the general public.

Rainwater harvesting
Site restraints preclude the use of rainwater harvesting.

Green roofs
It is proposed that green roofs will be incorporated where the pitch of the roof is suitable.

Other Surface Infiltration Techniques
Due to the spatial restraints of the site and the impermeable nature of the sub soil the use of shallow infiltration techniques such as infiltration ponds, trenches etc. has been discounted

In order to demonstrate that the limiting discharge rate can be achieved, the proposed SuDS technique has been analysed using the 1 in 100 year storm with an increase of 30% in rainfall intensity to account for climate change. In this situation the only method of attenuating peak flow is to incorporate a flow control device and on-line storage within the system. The volume of required storage and other design criteria have been calculated and the results are tabulated in the table below. The detailed calculation is included in Appendix 3.

Parameter	Value
Impermeable area discharging to system	0.7 ha
Critical storm duration	60 minutes
Maximum infiltration	Nil
Limiting discharge	40 l/s
Storage device used	Geocellular Units
Required storage volume	226m^3
Peak discharge from site (1yr including climate change)	135.5l/s
Peak discharge from site (100yr including climate change)	402.2l/s
Reduction of discharge from site (1yr including climate change)	70%
Peak discharge from site (100yr including climate change)	90%

From the results summarised in the table it can be seen that the proposed mitigation option of limiting the peak run-off to a value 40 l/s satisfies the requirements of the London Plan Supplementary Planning Guidance (Sustainable Design and Construction) dated April 2014.

Designing for Exceedance in Urban Drainage - Good Practice (CIRIA C635 – 2006) states that the flooding of property should not occur in the event of a drainage system failure (caused either by extreme rainfall or a lack of maintenance).

In the event of the drainage system failing or becoming blocked, the run-off from the site would normally flow overland. The resulting surface water would issue from the lowest point of the site at the south eastern corner of the site on to the footway and carriageway of Wellesley Road. When the results of the flow route analysis and low associated flow volumes are taken into consideration it is considered that in the event of the drainage system failure flood risk to off-site properties will not be significantly increased.

A range of typical SUDS components that can be used to improve the environmental impact of a development is listed in the table on the following page along with the relative benefits of each feature and the appropriateness to the subject site.

Although soakaways are unsuitable for this site it is possible to prevent the discharge from hardstanding areas for rainfall depth up to 5mm. Run-off from the hardstanding areas are to be drained by slot drains and gullies into the surface water drainage system. The slot drains and drainage system will be designed to easily cope with the flow resulting from a rainfall depth of 5mm.

SUDS Feature	Environmental benefits	Water quality improvement	Suitability for low permeability soils ($k<10^{-6}$)	Ground water recharge	Suitable for small confined sites	Site specific restrictions	Appropriate for subject site?
Wetlands	✓	✓	✓	×	×	Limited space	No
Retention ponds	✓	✓	✓	×	×	Limited space	No
Detention basins	✓	✓	✓	×	×	Limited space	No
Infiltration basins	✓	✓	×	✓	×	Limited space	No
Soakaways	✓	✓	×	✓	×	Limited space and unsuitable soils	No
Swales	✓	✓	✓	✓	×	Limited space	No
Filter strips	✓	✓	✓	✓	×	Limited space	No
Rainwater harvesting	×	✓	✓	✓	×	Limited space	No
Permeable paving	×	✓	✓	✓	✓	None	Yes
Green roofs	✓	✓	✓	×	✓	None	Yes
Underground storage	×	×	✓	×	✓	None	Yes

Maintenance

The drainage system will be designed to be self-cleansing and of low maintenance.

The new surface water drainage system will not be accepted for adoption by Thames Water as it is on private land. It is unlikely that these facilities will be adopted in the future, even if the appropriate legislation changes are passed by Parliament as the surface water sewers pass under the building.

It is recommended that all gullies and drainage channels be cleaned out at least twice a year.

It is recommended that the green roof is maintained in accordance with Table 12.5 of the Suds Manual.

Manholes and inspection chambers should be inspected every 6 months or whenever blockages occur.

Maintenance of the drainage system will be the responsibility of the Management Company.

Conclusions

Post development run off levels are greater than existing levels but a flow restriction within the demarcation manhole and on site storage will reduce the volume and rate of run-off to below existing levels as required by Planning Policy Statement 25.