AECOM

Calculating Greenfield Runoff Rates for the requirements of the Integrated Water Management Strategy (IMWS)

Proposed developments within the Old Kent Road Area Action Plan (APP) area will need to demonstrate compliance with the draft policy AAP 11 relating to sustainable drainage. This requires developments within the AAP Area to ensure post-development runoff rates do not exceed the equivalent site Greenfield Runoff Rates (GRR) for all storm events up to the 1 in 100 year (with climate change allowance).

Applications for planning permission for proposed developments within the AAP must include drainage strategies which demonstrate how this policy requirement will be met. The Integrated Water Management Strategy (IWMS) developed as an evidence base to the AAP has set out an offset approach to be adopted where it is demonstrated that meeting GRR is not feasible.

In order to ensure the effective delivery of this policy (and the offset approach where needed), site specific GRR must be calculated in an acceptable way as required by the London Borough of Southwark's (LBS) Lead Local Flood Authority (LLFA).

This note clarifies how the GRR should be calculated for each development site. It should be read in conjunction with the LLFAs "Southwark Drainage Strategy form" which sets out the LLFA's wider expectations for acceptable drainage strategies and in particular, the use of SuDS, as well Southwark's Strategic Flood Risk Assessment, including Appendix H (Developers' Guide for Surface Water Management), available online.[1]

General requirements

- Greenfield Runoff Rates (GRR) must be calculated specifically for the site size and location within the AAP;
- GRR should be calculated and provided for the following return periods:
  - 1 in 1 year;
  - 1 in 30 year; and
  - 1 in 100 year.

Acceptable calculation methods for GRR

- LBS's LLFA accepts the use of either of the following methods for calculating runoff rates:
  - The Institute of Hydrology report No. 124 method (IH124); or
  - Methods as set out within the Flood Estimation Handbook (FEH).
- For FEH, either the FEH statistical equation[2] or the ReFH2 (Revitalised Flood Hydrograph 2) plot scale equation[3] can be used
- If using Microdrainage to calculate the GRR, ensure that only the IH124 or one of the acceptable FEH methods are used;

[1] London Borough of Southwark Strategic Flood Risk Assessment (2017): www.southwark.gov.uk/environment/flood-risk-management/strategic-flood-risk-assessment-sfra
[2] As updated - Improving the FEH statistical procedures for flood frequency estimation, Science Report: SC050050 Kjeldsen et al. (2008))
[3] CEH (2015)

- Irrespective of method used, the urbanisation factor[4] applied (URBEXT in FEH, and URBAN in IH124) should be set to zero in order to calculate a pre-developed GRR. It is not acceptable to account for current urbanisation when calculating the GRR.

Input parameters

Site Area to calculate GRR

- The GRR should be calculated for the area defined by the red line boundary irrespective of the proposed areas of permeable land use. The only exceptions[5] are:
  - Area of existing adopted roads which will not be changed from a drainage perspective post-development; and
  - Extensive areas of green space which will not be part of, nor connected to the proposed drainage system;

Rainfall

- Whether using FEH or IH124, the Standard Average Annual Rainfall (SAAR) value across the OKR AAP area varies between 599mm and 603mm. The relevant value for the site can be obtained from the FEH web service, the online UK SUDs estimation tool[6] or from within Microdrainage. Given the lack of variance across the AAP Area, it is acceptable to use an average SAAR of 601mm in place of a site specific value.

Growth Curve Factors

- Both IH124 and the FEH statistical methods use the same hydrological region[7] which defines the growth curve factors for each return period event. Growth curve factors are used to extrapolate the calculated mean annual flood (QBar) runoff rate to higher intensity, but less frequent rainfall events.
- The AAP area falls within the same hydrological region (region 6) and hence the growth curve factors used for each return period event should not vary between sites when using the IH124 and FEH Statistical methods (see Appendix A for values).
- If using the ReFH2 method, specific runoff values are generated by the tool for each site and each rainfall event required and the user determines the input data used to generate the estimates on a case by case basis.

Soil Type

- If using the IH124 method, it is acceptable to use either the WRAP[8] SOIL classifications or the HOST[9] classes. HOST classes can only be extracted from the FEH CD-ROM or as a paid data

[4] An urbanisation factor is an adjustment parameter used to represent the influence of impermeable hardstanding on the rate and volume of runoff within a hydrological catchment
[5] Any exclusion from the calculated site area must be fully justified
[6] http://www.uksuds.com/drainage-tools-members/greenfield-runoff-rate-tool.html
[7] Defined in the Flood Studies research
[8] Winter Rainfall Acceptance Potential

set from the University of Cranfield LandIS. Whilst WRAP SOIL classifications can be identified via both the UK SUDS estimation tool on line or Microdrainage, due to the scale of the original WRAP mapping, it is advised that these values are drawn from the online UK SUDS estimation tool for consistency across the AAP area.

- Of the five SOIL classifications, the majority of the AAP area has class 4 (clayey, or loamy over clayey soils with an impermeable layer at shallow depth); however, a small area to the south of the AAP, in the vicinity of Commercial Way and Peckham Park Road has class 2 (very permeable soils with shallow ground-water).

Indicative GRR for different parts of the AAP

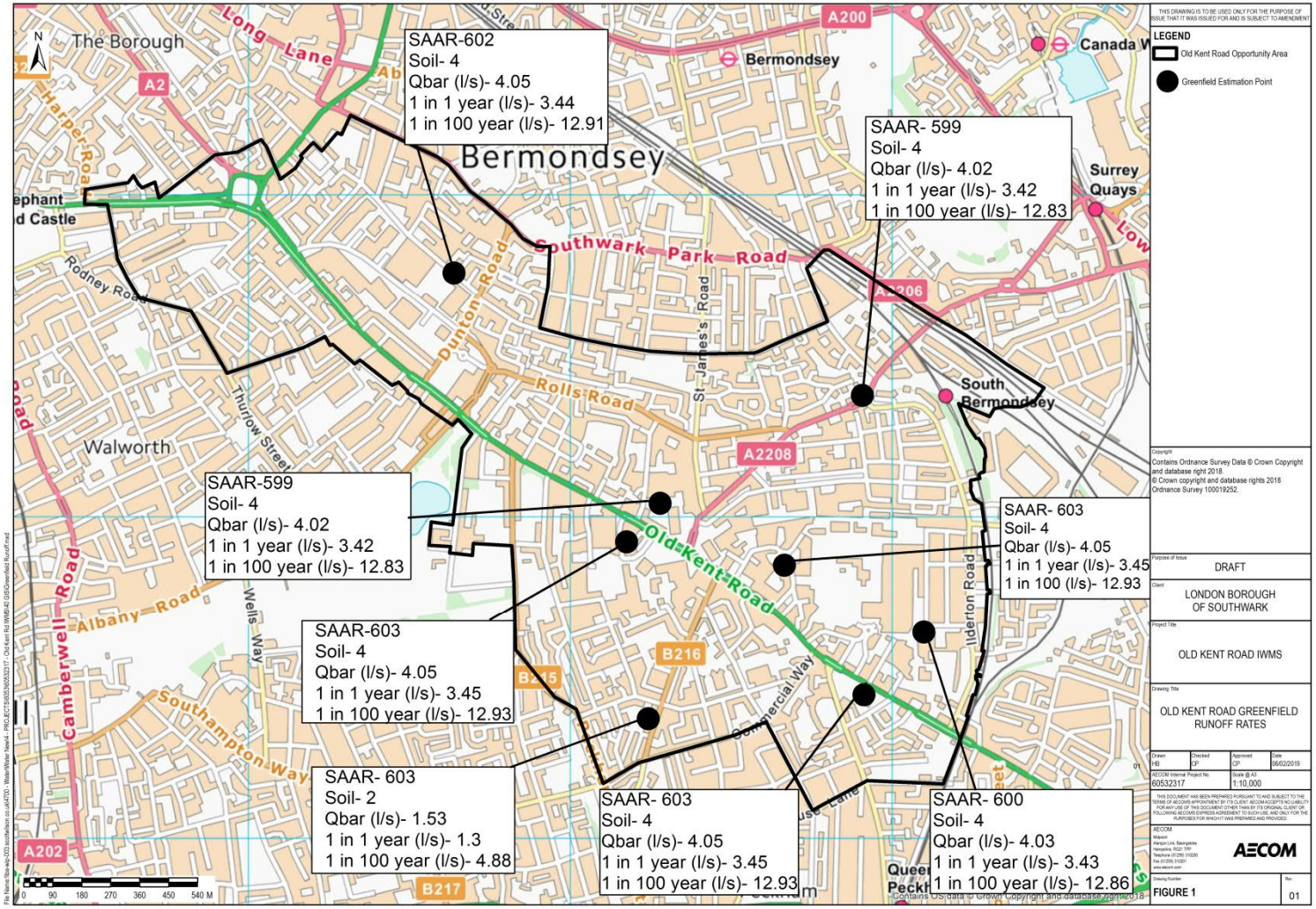
The UK SUDS online tool has been used to demonstrate the indicative Qbar, and also the 1 in 1 year GRR (litres per second per hectare) for different parts of the AAP (where SOIL type and SAAR vary) (see figure 1).

The IH124 method (using WRAP SOIL classification) has been used. The values derived can be scaled up per hectare to give an indication of the target GRRs that each drainage strategy proposal should be using as a starting point for calculating attenuation requirements.

In using this indicative map, it should be noted that the acceptable GRR value will vary slightly depending on whether IH124 or FEH has been used as part of the drainage strategy, and in the former case, whether WRAP SOIL or HOST soil types have been used. It should be noted that LBS LLFA does not accept that the commonly quoted minimum discharge rate per outfall is 5/l/s as control solutions are available to achieve lower discharge rates.

[9] Hydrology of Soil Type

Figure 1 – Indicative QBar, 1 in 1 year, and 1 in 100 year GRR per hectare for different locations within the Old Kent Road AAP area (IH124 method)[10]



[10] GRR and QBar in litres per second per hectare and WRAP SOIL classifications used for calculations

Appendix A: Growth Curve factors for the Old Kent Road AAP (use in FEH statistical and IH124 methods)

Return Period	Factor
1 in 1 (100 % AEP)	0.85
1 in 30 (3.33% AEP)	1.95
1 in 100 (1% AEP)	2.48
1 in 200 (0.5% AEP)	2.84