

Calculations



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|---------------------------------------|---|---|---------|------------------|-------|
| Job Title | | Southwest London SFRA Level 2 Site Assessments | | Job no. 60471781 | |
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| Introduction | These calculations have been undertaken to estimate the existing peak runoff rates from the development sites considered within the Level 2 Strategic Flood Risk Assessment. Target peak runoff rates have then been provided based on national and regional planning policy requirements and best practice guidance. The calculations presented herein have been undertaken in accordance with the methods and recommendations set out in Chapter 24 of the SuDS Manual (CIRIA C753, 2015). | | | | |
| Selection of Runoff Estimation Method | There are several methods that can be used for estimating peak runoff rates, these can broadly be separated into the following two categories: a) Methods for estimating runoff from greenfield sites; and, b) Methods for estimating runoff from previously developed sites. Table 24.1 of the SuDS Manual provides a summary of the methods available and details of when they should be utilised. For these calculations, the Institute of Hydrology 124 (IH124) runoff estimation method (Marshall and Bayliss, 1994) has been used incorporating recommendations within Section 24.5 of the SuDS Manual for using this method for previously developed sites. | | | | |
| IH124 Methodology | The flood frequency (flows for different return period events) estimation procedure consists of three stages: 1) Estimate the Q _{BAR} (mean annual flood); 2) Select an appropriate growth curve; and, 3) Evaluate the full flood frequency curve. 1) Estimate the Q_{BAR} (mean annual flood): The IH124 equation for Q _{BAR} is given in Equation 24.3 of the SuDS Manual (CIRIA C753, 2015). <div><div>EQ. 24.3</div><div>IH124: Catchment descriptor equation $Q_{BAR(rural)} = 0.00108 \text{ AREA}^{0.89} \times \text{SAAR}^{1.17} \times \text{SOIL}^{2.17}$<p>where:</p><p>Q_{BAR(rural)} = mean annual flood (a return period in the region of 2.3 years)</p><p>AREA = area of the catchment in km²</p><p>SAAR = Standard Average Annual Rainfall for the period 1941–1970 in mm</p><p>SOIL = soil index, which is a value found from the FSR soil maps or the WRAP map of the Wallingford procedure, and represents an estimate of the proportion of runoff from the catchment surface*</p><p>Where the site is less than 50 ha, the formula should be applied for 50 ha and the result factored based on the ratio of the actual site area and the applied area (50 ha).</p></div></div> The input parameters for Equation 24.3 have been attained from the following sources / methods: AREA - All of the sites assessed are less than 50 hectares in size therefore a value of 0.5km ² (50ha) has been used for AREA and the Q _{BAR} value has been linearly factored for the site area. | | | | |
| | | | | | Cont. |

SAAR - Standard Average Annual Rainfall - This value for each of the development sites has been attained from the maps within the MicroDrainage Source Control software.

SOIL - In accordance with the recommendations in Section 24.5 of the SuDS Manual; for previously developed sites the SOIL value for Flood Studies Report (FSR) Soil Type 5 has been used. Soil Type 5 refers to soil with a very low permeability such as solid rock and is therefore an appropriate representation of previously developed land. The value used within these calculations from the FSR (NERC, 1975) is 0.53.

2) Select an appropriate growth curve

QBAR can be factored by the UK FSR growth curves (NERC, 1997) for return periods less than 2 years and NERC (1993) for all other return periods to obtain peak flow estimates for required return periods.

These regional growth curves are constant throughout a region and are given in Table 24.2 of the SuDS Manual.

TABLE 24.2 UK and Ireland growth curve factors (after NERC, 1993)

| Hydrometric area | Return period | | | | | | | | |
|------------------|-------------------|------|------|------|------|-----------------|------|------|------|
| | 1 ¹ | 2 | 5 | 10 | 25 | 30 ² | 50 | 100 | 500 |
| 1 | 0.85 | 0.90 | 1.20 | 1.45 | 1.81 | 1.99 | 2.12 | 2.48 | 3.25 |
| 2 | 0.87 | 0.91 | 1.11 | 1.42 | 1.81 | 1.99 | 2.17 | 2.63 | 3.45 |
| 3 | 0.86 | 0.94 | 1.25 | 1.45 | 1.70 | 1.75 | 1.90 | 2.08 | 2.73 |
| 9 | 0.88 | 0.93 | 1.21 | 1.42 | 1.71 | 1.80 | 1.94 | 2.18 | 2.86 |
| 10 | 0.87 | 0.93 | 1.19 | 1.38 | 1.64 | 1.70 | 1.85 | 2.08 | 2.73 |
| 4 | 0.83 | 0.89 | 1.23 | 1.49 | 1.87 | 1.99 | 2.20 | 2.57 | 3.62 |
| 5 | 0.87 | 0.89 | 1.29 | 1.65 | 2.25 | 2.55 | 2.83 | 3.56 | 5.02 |
| 6/7 | 0.85 | 0.88 | 1.28 | 1.62 | 2.14 | 2.40 | 2.62 | 3.19 | 4.49 |
| 8 | 0.78 | 0.88 | 1.23 | 1.49 | 1.84 | 1.98 | 2.12 | 2.42 | 3.41 |
| Ireland | 0.83 ² | 0.95 | 1.20 | 1.37 | 1.60 | 1.65 | 1.77 | 1.96 | 2.40 |

3) Evaluate the full flood frequency curve

The peak flow rates for each return period can then be estimated as the product of Q_{BAR} and the relevant growth factor.

The SuDS Manual and the Non-Statutory Technical Standards for SuDS (Defra, 2015) recommend that the rate of runoff does not increase following development for the 1 in 1 year and 1 in 100 year events. The existing peak runoff rates from the development sites have been estimated for Q_{BAR} , $Q(1)$, $Q(30)$ and $Q(100)$.

Target Post Development Runoff Rates

Greenfield Runoff Rates:

In accordance with the SuDS Manual, the peak greenfield runoff rate for each development site has been estimated as 2 litres per second per hectare.

London Plan :

The London Plan has a policy requirement that all development “aims to achieve greenfield runoff rates” to ensure that runoff from development sites is reduced as much as possible. In meeting this policy requirement, the Sustainable design and Construction Supporting Planning Guidance (2014) document provides further detail and guidance on managing runoff. It states that there is a minimum expectation to deliver 50% attenuation of a site’s (prior to re-development) surface water runoff at peak times. It also states that “on previously developed sites, runoff rates should not be more than three times the calculated greenfield rate”.

Minimum Realistic Design Discharge Rate

Where target post development runoff rates have been calculated to be less than 5 litres per second, a value of 5 litres per second has been specified as it is widely considered unrealistic to design drainage systems which discharge at rates lower than this without risk of frequent blockage.

| Site ID | Site Name | Site Area | SOIL | SAAR | Institute of Hydrology 124 Method | | | | Greenfield (2 l/s/ha) | Sustainable Design and Construction SPG target | |
|---------|---|-----------|------|------|-----------------------------------|-------|-------|--------|--------------------------|---|------------|
| | | | | | QBAR (IH124) | Q(1) | Q(30) | Q(100) | | 50% Q(1) | 50% Q(100) |
| (-) | (-) | (m2) | (-) | (mm) | (l/s) | (l/s) | (l/s) | (l/s) | (l/s) | (l/s) | (l/s) |
| 1 | Battersea Power Station and Goods Yard, Kirtling Street, SW8 | 161,302 | 0.53 | 600 | 84.4 | 71.7 | 202.5 | 269.2 | 32.3 | 35.9 | 134.6 |
| 2 | Depot, Kirtling Street, SW8 | 2,198 | 0.53 | 600 | 1.1 | 1.0 | 2.8 | 3.7 | 5.0 | 5.0 | 5.0 |
| 3 | Former Petrol Filling Station, 2 Battersea Park Road, SW8 | 956 | 0.53 | 600 | 0.5 | 0.4 | 1.2 | 1.6 | 5.0 | 5.0 | 5.0 |
| 4 | Battersea Gasholders, Prince of Wales Drive, SW8 | 21,758 | 0.53 | 600 | 11.4 | 9.7 | 27.3 | 36.3 | 5.0 | 5.0 | 18.2 |
| 5 | Marco Polo House, 346 Queenstown Road, SW8 | 12,723 | 0.53 | 600 | 6.7 | 5.7 | 16.0 | 21.2 | 5.0 | 5.0 | 10.6 |
| 8 | Warehouse, 88 Kirtling Street, SW8 | 5,116 | 0.53 | 600 | 2.7 | 2.3 | 6.4 | 8.5 | 5.0 | 5.0 | 5.0 |
| 9 | Tideway Industrial Estate, Kirtling Street, SW8 | 18,961 | 0.53 | 600 | 9.9 | 8.4 | 23.8 | 31.6 | 5.0 | 5.0 | 15.8 |
| 11 | Cable and Wireless, Ballymore Site 6, Unit 2a, Battersea Park Road, SW8 | 3,426 | 0.53 | 600 | 1.8 | 1.5 | 4.3 | 5.7 | 5.0 | 5.0 | 5.0 |
| 12 | Market Towers, Nine Elms, SW8 | 8,438 | 0.53 | 600 | 4.4 | 3.8 | 10.6 | 14.1 | 5.0 | 5.0 | 7.0 |
| 13 | Booker Cash and carry, 41-49 Nine Elms Lane, SW8 | 4,189 | 0.53 | 600 | 2.2 | 1.9 | 5.3 | 7.0 | 5.0 | 5.0 | 5.0 |
| 14 | Sleaford Street, SW8 | 5,108 | 0.53 | 600 | 2.7 | 2.3 | 6.4 | 8.5 | 5.0 | 5.0 | 5.0 |
| 15 | US Embassy, SW8 | 21,501 | 0.53 | 600 | 11.2 | 9.6 | 27.0 | 35.9 | 5.0 | 5.0 | 17.9 |
| 16 | Main Site, Ballymore, Ponton Road, SW8 | 57,069 | 0.53 | 600 | 29.9 | 25.4 | 71.7 | 95.2 | 11.4 | 12.7 | 47.6 |
| 17 | Securicor site, 80 Kirtling Street, SW8 | 4,636 | 0.53 | 600 | 2.4 | 2.1 | 5.8 | 7.7 | 5.0 | 5.0 | 5.0 |
| 18 | Royal Mail Group Site, Ponton Road, SW8 | 54,289 | 0.53 | 600 | 28.4 | 24.1 | 68.2 | 90.6 | 10.9 | 12.1 | 45.3 |
| 19 | Christies Auctioneers Depot, Ponton Road, SW8 | 10,716 | 0.53 | 600 | 5.6 | 4.8 | 13.5 | 17.9 | 5.0 | 5.0 | 8.9 |
| 20 | Government Car and dispatch agency, Ponton Road, SW8 | 8,290 | 0.53 | 600 | 4.3 | 3.7 | 10.4 | 13.8 | 5.0 | 5.0 | 6.9 |
| 21 | Metropolitan Police Warehouse Garage, Ponton Road, SW8 | 5,520 | 0.53 | 600 | 2.9 | 2.5 | 6.9 | 9.2 | 5.0 | 5.0 | 5.0 |
| 23 | Brooks Court, Kirtling Street, SW8 | 1,764 | 0.53 | 600 | 0.9 | 0.8 | 2.2 | 2.9 | 5.0 | 5.0 | 5.0 |
| 24 | 49-59 Battersea Park Road, SW8 | 3,164 | 0.53 | 600 | 1.7 | 1.4 | 4.0 | 5.3 | 5.0 | 5.0 | 5.0 |
| 25 | Dairy Crest Milk Distribution Depot, 55 Sleaford Street, SW8 | 4,188 | 0.53 | 600 | 2.2 | 1.9 | 5.3 | 7.0 | 5.0 | 5.0 | 5.0 |
| 26 | Tidbury Court, Stewarts Road, SW8 | 1,004 | 0.53 | 600 | 0.5 | 0.4 | 1.3 | 1.7 | 5.0 | 5.0 | 5.0 |
| 27 | New Covent Garden Market, Main Market Area, Nine Elms, SW8 | 180,727 | 0.53 | 600 | 94.6 | 80.4 | 226.9 | 301.6 | 36.1 | 40.2 | 150.8 |
| 28 | New Covent Garden Market, Flower Market, Nine Elms, SW8 | 40,086 | 0.53 | 600 | 21.0 | 17.8 | 50.3 | 66.9 | 8.0 | 8.9 | 33.5 |
| 29 | New Covent Garden Market, Entrance Site, Nine Elms Lane, SW8 | 18,356 | 0.53 | 600 | 9.6 | 8.2 | 23.0 | 30.6 | 5.0 | 5.0 | 15.3 |
| 30 | Patcham Terrace and St Mary's School, SW8 (2.1.30) - Updated SSAD Site | 18,156 | 0.53 | 600 | 9.5 | 8.1 | 22.8 | 30.3 | 5.0 | 5.0 | 15.2 |
| 34 | Wandsworth Business Village, Buckhold Road/Broomhill Road, SW18 | 8,700 | 0.53 | 600 | 4.6 | 3.9 | 10.9 | 14.5 | 5.0 | 5.0 | 7.3 |
| 36 | Ram Brewery/Capital Studios/Former Dexion/Duvall site, Ram Street/Armoury Way SW18 (3.1.3) - Updated SSAD Site | 33,578 | 0.53 | 600 | 17.6 | 14.9 | 42.2 | 56.0 | 6.7 | 7.5 | 28.0 |
| 37 | Southside Shopping Centre (northern end), Wandsworth High Street, SW18 | 45,342 | 0.53 | 600 | 23.7 | 20.2 | 56.9 | 75.7 | 9.1 | 10.1 | 37.8 |
| 40 | Causeway Island including land to the east, SW18 | 5,402 | 0.53 | 600 | 2.8 | 2.4 | 6.8 | 9.0 | 5.0 | 5.0 | 5.0 |
| 41 | Hunts Trucks and adjoining Gasholder, Armoury Way, SW18 | 26,463 | 0.53 | 600 | 13.8 | 11.8 | 33.2 | 44.2 | 5.3 | 5.9 | 22.1 |
| 42 | Keltbray site, Wentworth House and adjacent land at Dormay Street, SW18 | 3,928 | 0.53 | 600 | 2.1 | 1.7 | 4.9 | 6.6 | 5.0 | 5.0 | 5.0 |
| 43 | Wandsworth Riverside Quarter Point Pleasant, SW18 | 21,462 | 0.53 | 600 | 11.2 | 9.5 | 26.9 | 35.8 | 5.0 | 5.0 | 17.9 |
| 44 | 3-4 Osiers Road, SW18 | 4,578 | 0.53 | 600 | 2.4 | 2.0 | 5.7 | 7.6 | 5.0 | 5.0 | 5.0 |
| 45 | 9, 11 and 19 Osiers Road, SW18 | 3,885 | 0.53 | 600 | 2.0 | 1.7 | 4.9 | 6.5 | 5.0 | 5.0 | 5.0 |
| 47 | Linton Fuels site, Osiers Road, SW18 | 3,364 | 0.53 | 600 | 1.8 | 1.5 | 4.2 | 5.6 | 5.0 | 5.0 | 5.0 |
| 48 | Feather's Wharf, The Causeway, SW18 | 7,885 | 0.53 | 600 | 4.1 | 3.5 | 9.9 | 13.2 | 5.0 | 5.0 | 6.6 |
| 49 | Land at the Causeway, SW18 | 10,211 | 0.53 | 600 | 5.3 | 4.5 | 12.8 | 17.0 | 5.0 | 5.0 | 8.5 |
| 52 | Homebase, Swandon Way, SW18 | 9,632 | 0.53 | 600 | 5.0 | 4.3 | 12.1 | 16.1 | 5.0 | 5.0 | 8.0 |
| 53 | B & Q, Smugglers Way, SW18 | 14,189 | 0.53 | 600 | 7.4 | 6.3 | 17.8 | 23.7 | 5.0 | 5.0 | 11.8 |
| 54 | McDonalds, Swandon Way, SW18 | 3,382 | 0.53 | 600 | 1.8 | 1.5 | 4.2 | 5.6 | 5.0 | 5.0 | 5.0 |
| 55 | Mercedes Benz and Bemco, Bridgend Road, SW18 | 5,819 | 0.53 | 600 | 3.0 | 2.6 | 7.3 | 9.7 | 5.0 | 5.0 | 5.0 |
| 56 | Wandsworth Bridge Roundabout, SW18 | 7,037 | 0.53 | 600 | 3.7 | 3.1 | 8.8 | 11.7 | 5.0 | 5.0 | 5.9 |
| 57 | Wandsworth Bus Garage, Jews Row, SW18 | 5,957 | 0.53 | 600 | 3.1 | 2.6 | 7.5 | 9.9 | 5.0 | 5.0 | 5.0 |
| 61 | Clapham Junction Station Approach, SW11 | 33,873 | 0.53 | 600 | 17.7 | 15.1 | 42.5 | 56.5 | 6.8 | 7.5 | 28.3 |
| 62 | Land on the corner of Grant Road and Falcon Road, SW11 | 9,015 | 0.53 | 600 | 4.7 | 4.0 | 11.3 | 15.0 | 5.0 | 5.0 | 7.5 |
| 64A | St Peter with St Paul Church & Community Centre, Plough Road, SW11 (4.1.7) - New SSAD Site | 2,709 | 0.53 | 600 | 1.4 | 1.2 | 3.4 | 4.5 | 5.0 | 5.0 | 5.0 |

| Site ID | Site Name | Site Area | SOIL | SAAR | Institute of Hydrology 124 Method | | | | Greenfield (2 l/s/ha) | Sustainable Design and Construction SPG target | |
|---------|---|-----------|------|------|-----------------------------------|-------|-------|--------|--------------------------|---|------------|
| | | | | | QBAR (IH124) | Q(1) | Q(30) | Q(100) | | 50% Q(1) | 50% Q(100) |
| (-) | (-) | (m2) | (-) | (mm) | (l/s) | (l/s) | (l/s) | (l/s) | (l/s) | (l/s) | (l/s) |
| 64B | Winstanley & York Road Estates, SW11 (4.1.8) - New SSAD Site | 158,741 | 0.53 | 600 | 83.1 | 70.6 | 199.3 | 264.9 | 31.7 | 35.3 | 132.5 |
| 82 | Putney Hospital, Lower Richmond Road, SW15 (6.4) | 4,941 | 0.53 | 600 | 2.6 | 2.2 | 6.2 | 8.2 | 5.0 | 5.0 | 5.0 |
| 90 | Army Forms Depot (Westfield House), 30 Knaresborough Drive, SW18 | 9,657 | 0.53 | 600 | 5.1 | 4.3 | 12.1 | 16.1 | 5.0 | 5.0 | 8.1 |
| 93 | Council Depot, Eltringham Street, SW11 | 7,208 | 0.53 | 600 | 3.8 | 3.2 | 9.1 | 12.0 | 5.0 | 5.0 | 6.0 |
| 96 | Cappagh waste recycling facility, The Willows, Riverside Way, SW17 | 5,720 | 0.53 | 600 | 3.0 | 2.5 | 7.2 | 9.5 | 5.0 | 5.0 | 5.0 |
| 97 | Gypsy and Traveller site, Trewint Street, SW18 | 2,259 | 0.53 | 600 | 1.2 | 1.0 | 2.8 | 3.8 | 5.0 | 5.0 | 5.0 |
| 99A | 313 Battersea Park Road, SW11 (9.12) - New SSAD Site | 3,028 | 0.53 | 600 | 1.6 | 1.3 | 3.8 | 5.1 | 5.0 | 5.0 | 5.0 |
| 99B | 259-311 Battersea Park Road, SW11 (9.13) - New SSAD Site | 11,768 | 0.53 | 600 | 6.2 | 5.2 | 14.8 | 19.6 | 5.0 | 5.0 | 9.8 |
| 99C | Former Elsley School, Elsley Road, SW11 | 3,350 | 0.53 | 600 | 1.8 | 1.5 | 4.2 | 5.6 | 5.0 | 5.0 | 5.0 |
| 99D | Atheldene, Garratt Lane, SW18 (9.15) - New SSAD Site | 25,116 | 0.53 | 600 | 13.1 | 11.2 | 31.5 | 41.9 | 5.0 | 5.6 | 21.0 |
| 100 | Ransomes Wharf Former Domus Tiles sites, Parkgate Road/Elcho Street, SW11 | 6,369 | 0.53 | 600 | 3.3 | 2.8 | 8.0 | 10.6 | 5.0 | 5.0 | 5.3 |
| 101 | 12-18 Radstock Street, SW11 | 896 | 0.53 | 600 | 0.5 | 0.4 | 1.1 | 1.5 | 5.0 | 5.0 | 5.0 |
| 102 | 110 York Road, Battersea (Former Prices Candles factory), SW11 | 7,894 | 0.53 | 600 | 4.1 | 3.5 | 9.9 | 13.2 | 5.0 | 5.0 | 6.6 |
| 103 | Dovercourt site, York Road, SW11 | 11,872 | 0.53 | 600 | 6.2 | 5.3 | 14.9 | 19.8 | 5.0 | 5.0 | 9.9 |
| 104 | Homebase, York Road, SW11 | 8,127 | 0.53 | 600 | 4.3 | 3.6 | 10.2 | 13.6 | 5.0 | 5.0 | 6.8 |
| 105 | 12-14 Lombard Road, SW11 | 2,279 | 0.53 | 600 | 1.2 | 1.0 | 2.9 | 3.8 | 5.0 | 5.0 | 5.0 |
| 106 | 41-47 Chatfield Road, SW11 | 3,140 | 0.53 | 600 | 1.6 | 1.4 | 3.9 | 5.2 | 5.0 | 5.0 | 5.0 |
| 107 | 8-40 Chatfield Road, SW11 | 973 | 0.53 | 600 | 0.5 | 0.4 | 1.2 | 1.6 | 5.0 | 5.0 | 5.0 |
| 108 | Gartons Industrial Estate, Gartons Way, SW11 | 3,560 | 0.53 | 600 | 1.9 | 1.6 | 4.5 | 5.9 | 5.0 | 5.0 | 5.0 |
| 109 | York Road Business Centre, Yelverton Road, SW11 | 6,993 | 0.53 | 600 | 3.7 | 3.1 | 8.8 | 11.7 | 5.0 | 5.0 | 5.8 |
| 109A | 208-214 York Road & 4 Chatfield Road, SW11 (10.10) - New SSAD Site | 2,085 | 0.53 | 600 | 1.1 | 0.9 | 2.6 | 3.5 | 5.0 | 5.0 | 5.0 |
| 6 | Cringle Dock, Nine Elms, SW8. | 11,300 | 0.53 | 600 | 5.9 | 5.0 | 14.2 | 18.9 | 5.0 | 5.0 | 9.4 |
| 7 | Kirtling Wharf, Nine Elms, SW8. | 6,900 | 0.53 | 600 | 3.6 | 3.1 | 8.7 | 11.5 | 5.0 | 5.0 | 5.8 |
| 10.11 | 36 Lombard Road, SW11 | 3,000 | 0.53 | 600 | 1.6 | 1.3 | 3.8 | 5.0 | 5.0 | 5.0 | 5.0 |
| 10.12 | 37 Lombard Road (Travis Perkins), SW11 | 6,100 | 0.53 | 600 | 3.2 | 2.7 | 7.7 | 10.2 | 5.0 | 5.0 | 5.1 |
| 10.13 | 19 Lombard Road, 80 Gwynne Road, SW11 | 3,000 | 0.53 | 600 | 1.6 | 1.3 | 3.8 | 5.0 | 5.0 | 5.0 | 5.0 |
| 10.14 | 58-70 York Road (The Chopper Public House), SW11 | 800 | 0.53 | 600 | 0.4 | 0.4 | 1.0 | 1.3 | 5.0 | 5.0 | 5.0 |
| 10.15 | Plantation Wharf, Gartons Way, York Place, SW11 | 18,100 | 0.53 | 600 | 9.5 | 8.0 | 22.7 | 30.2 | 5.0 | 5.0 | 15.1 |
| 10.16 | Travelodge Hotel, 200 York Road | 2,500 | 0.53 | 600 | 1.3 | 1.1 | 3.1 | 4.2 | 5.0 | 5.0 | 5.0 |