



Hampshire
County Council

Universal Services Directorate

Technical Guidance Note TG8-2 Drainage - Infiltration

Revision	Date of Issue	Amendment Description	Prepared By	Approved/ owned by
0	06/03/2023	Initial Publication	P McKenna	D Ryder

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1. Policy / Approach

- 1.1. This Technical Guidance Note is for the investigation, design, construction, maintenance and adoption of highway drainage infiltration systems (primarily ring soakaways but also including geocellular soakaways, infiltration trenches, basins, ponds, and swales). The information contained within this document expands upon the Notes for Guidance set out within the HCC Series 11 Highway Standard Details HCC11/D/070 and HCC11/D/080 and in addition incorporates guidance from a number of advisory and regulatory bodies. Refer also to the following Technical Guidance Notes:
- TG5 – Geotechnical Investigation, Testing and Design
 - TG6-4 – Permeable Paving
 - TG7 – Adoption of Structures
 - TG8-1 Drainage - General
- 1.2. The guidance documents targeted at Developers in relation to drainage design and adoption processes can be found at the following addresses:
- <https://www.hants.gov.uk/transport/developers/constructionstandards>
- <https://www.hants.gov.uk/transport/developers/technical-guidance>
- 1.3. New drainage infiltration infrastructure will incur Commuted Sums in accordance with Hampshire County Council's Commuted Sum Policy.
- <https://www.hants.gov.uk/transport/developers/commuted-sums>

2. Guidance

- 2.1. Feasibility assessment of the potential for highway infiltration drainage should be undertaken by referring to the following sources of information:
- British Geological Survey [GeoIndex Onshore](#)
 - Gov.uk [flood risk](#) mapping and [groundwater protection guidance](#)
 - Locations of special sites: <http://magic.defra.gov.uk/> (designations/land based designations)
- 2.2. Ground Investigation, soil sampling, description and testing should be in accordance with:
- BS 5930:2015+A1:2020 Code of Practice for Ground Investigations.
 - BS EN ISO 22282 parts 1- 5: 2012 Geotechnical Investigation and Testing – Geohydraulic Testing.
- 2.3. Infiltration (soakaway) testing and design should be in accordance with:
- BRE DG 365 Soakaway Design
 - To be taken at 10m intervals for long soakaway features
- 2.4. Design of infiltration systems should be in accordance with:
- BRE DG 365 Soakaway Design (and other references as above).
 - CIRIA C574 Engineering in Chalk (where dissolution features in chalk may require consideration).
 - CIRIA C737 Structural and Geotechnical Design of Modular Geocellular Drainage Systems (where geocellular designs are proposed).
 - DMRB LA113 Road Drainage and the Water Environment (where environmental risk assessment is merited i.e. heavily trafficked roads).
 - CIRIA C753 The SuDS Manual (with respect to infiltration trenches, basins and swales and environmental risk assessment of less heavily trafficked roads).
 - DMRB CD530 Design of Soakaways is a useful reference with respect to highway soakaway design.
 - DMRB CD531 Reservoir Pavements for Drainage Attenuation should be referred to for reservoir pavements utilising infiltration.
 - The Environment Agency's Approach to Groundwater Protection.
 - BS EN 752: 2017 Drain and Sewer Systems Outside Buildings – Sewer System Management.

- The Building Regulations 2010 Approved Document H – Drainage and Waste Disposal.
- 2.5. The relevant HCC adoptable standard soakaway designs are:
- D/070 - Soakaways – Type S2, S2(G), S2A, S2A(G), S2B and S2B(G)
 - D/080 - Rubble drain, terminal soakaway and linear ditch soakaway
- 2.6. Filter drains are detailed on Standard detail D/010
Refer to HCC's [Highway Construction Standard Details](#)

3. Technical Requirements

3.1. Desk Study

3.1.1. A Desk Study (or preliminary sources study as National Highways refer to it) shall be undertaken to assess whether infiltration drainage is feasible for each specific site and for each change in geology on larger sites. The desk study shall address the following elements:

Geology

3.1.2. Infiltration drainage is generally only feasible in sand, gravel and chalk geology.

3.1.3. Infiltration drainage is not feasible in clay geology such as the London Clay Formation or Lambeth Group.

3.1.4. Where sands and gravels are interbedded with or have an appreciable clay content infiltration drainage is unlikely to function, likewise in fine sands, cemented sands/sandstones or where such strata is too thin for sub surface infiltration.

3.1.5. In chalk and in accordance with CIRIA C574:

- In areas where dissolution features are known to be prevalent, soakaways should be avoided where at all possible but, if unavoidable, should be sited at least 20m away from any foundations.
- Where the chalk is of low density [*less than 1.55Mg/m³; determined from visual inspection and/or laboratory intact dry density testing of samples*], or its density is not known, soakaways should be sited at least 10m away from any foundations.
- Where the chalk is of medium density [*1.55-1.70Mg/m³*] (or higher), the closest part of the soakaway should be at least 5m away from any foundations.

The distances above are for foundations for structures, roads and railways.

Groundwater Protection

3.1.6. Highway infiltration drainage is not permissible within:

- Areas of high groundwater (a minimum of 1m unsaturated ground is required above seasonal high groundwater level). Seasonal high groundwater level should be ascertained from historic records or by groundwater monitoring over the winter period to determine the worst case conditions.
- Flood zones 2 or 3 (without a flood risk assessment).
- Groundwater Source Protection Zone (SPZ)1 (without detailed hydrogeological risk assessment) and not within SPZ2 for major

roads* (EA Position Statements C2, C4 & G13). *Major roads are not defined by the EA but LA113 considers roads with $\leq 50\,000$ AADT traffic flow as low risk.

- 50m of private water abstractions (EA Position Statement B3) or within 250m of environmentally sensitive sites.
- Areas of contamination (EA Position Statements G10 & G11).

3.1.7. Refer to TG8-1 Section 5 for further requirements regarding water quality.

3.2. Investigation

- 3.2.1. Infiltration testing is required where the desk study has indicated permeable soils may be present.
- 3.2.2. The testing should be undertaken in line with BRE DG 365 Soakaway design.
- 3.2.3. Investigation should be overseen by suitably experienced Geotechnical personnel.
- 3.2.4. An engineering log of the excavation describing the soils encountered (as per BS 5930) should be produced and included in the test report.
- 3.2.5. Excavation and testing should be undertaken at the location and depth of each proposed infiltration feature. For large area infiltration such as swales, ponds, basins or trenches, a series of tests within the proposed footprint should be undertaken.
- 3.2.6. BRE DG 365 requires 3 consecutive fills of the test pit with the lowest infiltration rate used for design.
- 3.2.7. Infiltration drainage will only be permitted where testing confirms that the subsoil will accept the volume of water to be expected.

3.3. Design

- 3.3.1. All systems must be designed in accordance with CDM, including maintainability. Refer to TG8-1 Section 4.3.
- 3.3.2. The designer shall provide calculations to show the anticipated run-off from each section of road (including the adjacent highway catchment) related to each proposed infiltration feature.
- 3.3.3. Infiltration features shall be able to cope with a 1 in 30 year storm + allowance for climate change (without flooding). Refer to TG8-1 with regard to assessment of the whole drainage system and exceedance routing (TG8-1 4.6.2 and 4.8).
- 3.3.4. Accessible and maintainable pre-treatment of runoff to remove sediments, debris and contaminants (as far as possible) prior to infiltration is essential (Refer to TG8-1 sections 4.12 and 5). A maintenance plan should be submitted with design proposals.

Infiltration soakaways

- 3.3.5. The design of soakaways (infiltration chambers and trenches) shall be in accordance with BRE DG365.
- 3.3.6. Infiltration chambers will be sized so as to half empty within 24 hours.
- 3.3.7. Soakaways should not be deeper than 4m from cover level. This is to reduce the risks associated with cleansing. Where chambers need to be deeper than 4m, the designer needs to ensure there is suitable access and space within the highway boundary for two jet vac size vehicles to park up close to the chamber to undertake maintenance. Prior written approval will be needed from HCC Asset Management for soakaways deeper than 4m.
- 3.3.8. Deep bore soakaways shall not be used. Use of boreholes or deep shafts as part of a soakaway system design require a departure from standards and would only be permitted following the completion of an appropriate groundwater risk assessment and consultation and agreement with the Environment Agency.
- 3.3.9. In line with a reduction of the granular chamber surround diameter from 1.0m to 0.5m a factor of safety of 2 shall be used for open chamber soakaway design.
- 3.3.10. Infiltration through the base of any soakaway chamber shall be **excluded** in outflow calculations (excluding the base in design assumes this will become clogged over time and unless suitable agreed upstream silt/contamination interception (pre-treatment) is provided in identifiable and accessible locations and with an acceptable maintenance plan then this design approach remains).
- 3.3.11. Any adoptable open chamber soakaway having a horizontal dimension greater than 1.5m shall be subject to a Technical Approval Procedure in accordance with Technical Guidance Note TG7 – Adoption of Structures. This applies to brick, pre-cast concrete ring and geocellular types.
- 3.3.12. The relevant rainfall ratio (r) for different locations in Hampshire shall be used. This is generally between 0.3-0.4 but with isolated areas above or below these values. Refer to Appendix A.
- 3.3.13. Soakaways shall also be positioned a minimum of 5m from the carriageway for new developments. However, where adjusting existing drainage systems within a constrained Highway Boundary, soakaways may be positioned such that the chamber (defined as where the chamber wall meets the concrete base) lies wholly outside the notional 45 degree load line from the channel line of the carriageway. Where this requirement cannot be met, additional measures will be required to protect the structural integrity of the road pavement e.g. thickening the pavement road base locally and/or substituting no-fines concrete for the granular surround on that side of the soakaway closest to the carriageway. Refer also to 3.1.5.

- 3.3.14. Spacing of soakaway chambers shall be such that there is at least 5m of undisturbed ground between them.
- 3.3.15. Where soil conditions dictate, generally in sands or silts where rapid clogging of the granular fill can be anticipated, the granular fill shall be surrounded by an appropriate geotextile (as per standard details suffix G as indicated in 2.5).
- 3.3.16. More than one gully may be connected to each soakaway but the normal maximum will be three.
- 3.3.17. All calculations regarding storage capacities, surface area of soakaways and commuted sums for maintenance shall be based on the volume of the open chamber only and will ignore the contribution of the granular surround. This is to provide a factor of safety, assuming the granular surround will become blocked with silt over time.
- 3.3.18. Storage capacities shall be measured from the base of the chamber to the invert of the lowest inlet pipe or pipes. Where linked soakaways are to be used the volume of connecting pipe work shall be excluded from the capacity calculations.
- 3.3.19. When bricks or concrete blocks are to be used for the construction of soakaway chambers these shall be laid in honeycomb construction in English Bond. The wall thickness shall be 225mm and the bricks or blocks shall be set in cement mortar. The walls of the soakaway shall be bedded on footings of concrete 530mm wide and not less than 150mm deep. The soakaway chamber may be square, rectangular or circular and the honeycomb effect shall be obtained by the vertical joints being made 25mm wide with no mortar.
- 3.3.20. Soakaway chambers shall be covered with a pre-cast concrete slab. The slab shall be at least 150mm thick, using C40 grade concrete and reinforced as appropriate to the dimensions of the slab. Within the slab shall be a hole 600mm by 600mm over which a shaft shall be built in brickwork or block work 225mm thick. The appropriate manhole cover and frame shall be bedded on the shaft.
- 3.3.21. Alternatively, the soakaway may be constructed of pre-cast perforated concrete rings having a minimum internal diameter of 1.05m, set upon an annular concrete base. In this case a taper section may be used to reduce the diameter of the soakaway. A brickwork shaft will be required on top of the taper section on which the manhole cover and frame will be bedded. The brickwork or block work above the cover slab or taper section shall not have open joints. In the majority of cases pipes running into the soakaway will be connected into the shaft. Perforated rings shall have not less than 27 perforations for each 900mm of depth. The space between the brickwork, block work or concrete and the face of the excavation shall be backfilled with approved gravel rejects or other approved material.

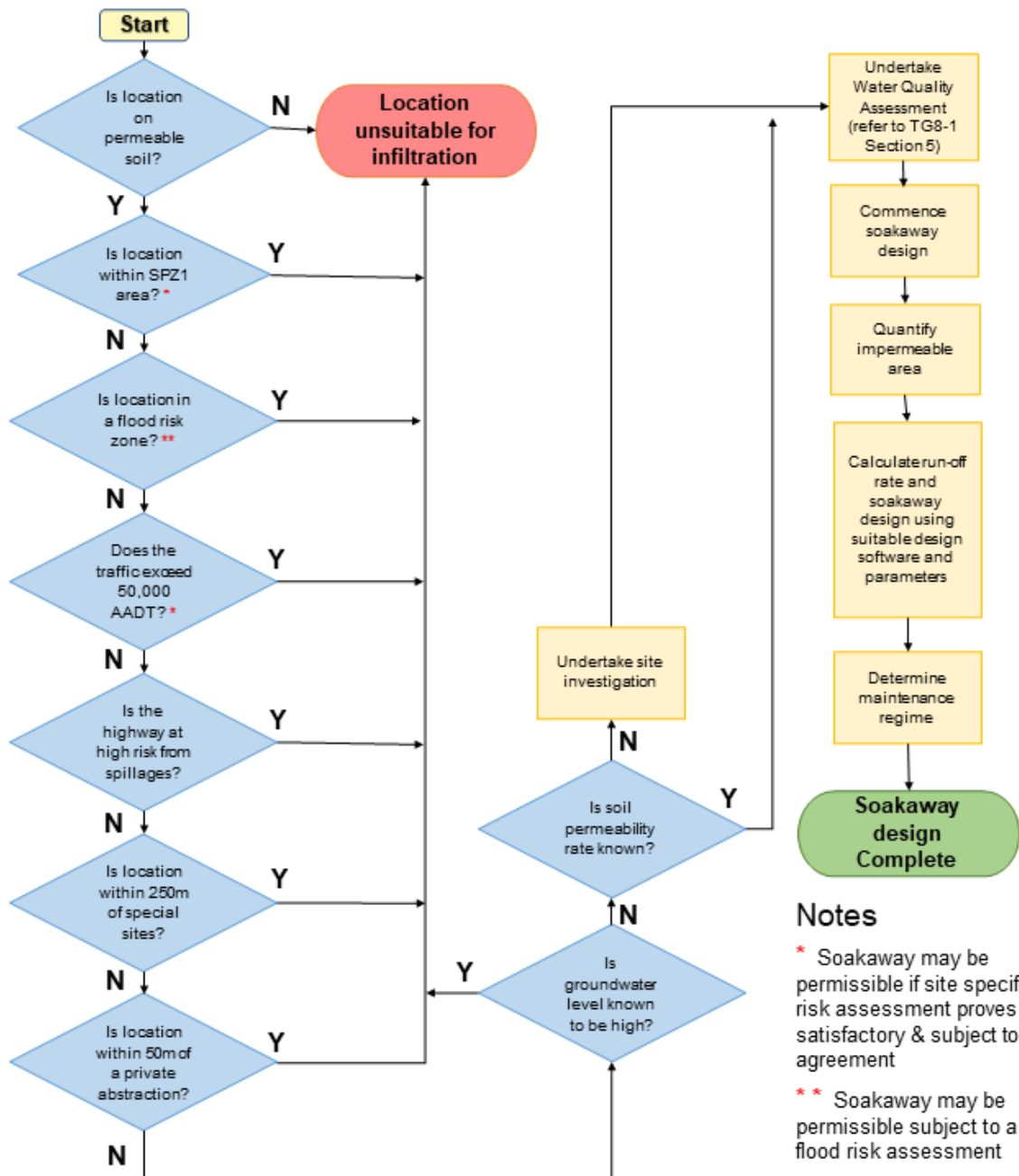
Geocellular infiltration systems

3.3.22. Refer to Section 7.5 in TG8-1

Other infiltration features

3.3.23. The design of other infiltration features (swales, ponds and basins) shall be in accordance with TG8-1 and CIRIA C753. Permeable pavements shall be in accordance with TG6-4.

3.4. Flow Process



Notes

* Soakaway may be permissible if site specific risk assessment proves satisfactory & subject to EA agreement

** Soakaway may be permissible subject to a flood risk assessment

4. Further Support

- 4.1. Should you have a specific query or feedback about any of the content of this Technical Guidance Note, please send an email to technical.guidance@hants.gov.uk with the start of the email title as “TG8.2 – “.
- 4.2. Should you have a query about applying this to your particular project, please contact:
- the Design Check Engineer dealing with your S278 or S38 application (if you are a Developer or Developer’s Consultant)
 - the Technical Guidance Note Specialist(s) (if you are a working within Hampshire County Council)

Appendix A – Rainfall Data for Hampshire - Ratio of M5-60minutes to M5-2 day rainfalls ($r \times 100$)

(Based on: Design and Analysis of Urban Storm Drainage, The Wallingford Procedure, Volume 3: Maps.)

