

9.5 RADON

BRE Report BR211 (2015 Edition) indicates that radon protection measures are not required for new dwellings at the site. Information from Landmark confirms that the site is in an area where less than 1% of homes are estimated to be above the action level, and that radon protection measures are therefore not required.

10 GEOTECHNICAL TESTING

10.1 GENERAL

A total of five samples of natural soil were delivered to a suitably accredited laboratory with a schedule of geotechnical testing drawn up by Calabrian.

The geotechnical laboratory test results are presented in Appendix F.

10.2 ATTERBERG LIMITS

The plasticity indices of five samples of cohesive soil have been determined; results are summarised below.

Soil type	Range of Plasticity Indices* (Average)	Shrinkability
Cohesive Glacial Deposits	14 to 30 (23)	Medium

* Modified where appropriate in accordance with revised Chapter 4.2 of the NHBC Standards (April 2003).

Note. The term Shrinkability is equivalent to the term Volume Change Potential used in Chapter 4.2.

For the purposes of foundation design, it is recommended that all cohesive soils be regarded as being of medium shrinkability.

10.3 SOLUBLE SULPHATE AND PH

In accordance with BRE Special Digest 1:2005, this site has been classified as greenfield with a mobile groundwater regime.

It is envisaged foundations will extend to depths of about 1m into natural strata and samples taken from this depth range have been submitted for pH and water-soluble sulphate (2:1 soil/water extract).

The concentrations of sulphate in the aqueous natural soil extracts of five samples were determined.

The highest water-soluble sulphate concentration and the lowest pH value for each soil type analysed are shown in the Table below.

Soil type	Lowest pH values	Highest Soluble Sulphate Concentration (mg/l)
Cohesive Glacial Deposits	7.0	210

pH values were all above 5.5, therefore concentrations of chloride and nitrate are considered insignificant.

In accordance with Tables C1 and C2 of SD1, sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-1.

10.4 UNDRAINED SHEAR STRENGTH TESTING

Hand Shear Vane Testing

Hand shear vane testing was undertaken from larger blocks of excavated. The undrained shear ranged from 58kPa to 100kPa.

10.5 SOAKAWAY TESTS

In accordance with CIRIA C753, The SuDS Manual soakaway tests were carried out at two borehole locations in general accordance with BS EN ISO 22282-2². Infiltration rates were calculated using the method detailed in BRE365.

Infiltration Rates

Tests were undertaken with the borehole monitoring wells of WS102 and WS105 using the falling head (variable head) test method. Water was rapidly injected into each well up to a level of 1m below ground level.

In each case over the following five hours the water level did not fall more than 20mm. Given these extremely slow head reductions infiltration rates for the low permeability soils could not be calculated.

Copies of the *insitu* test are presented in Appendix I.

The guidance within BRE365 and CIRIA C753 states the following:

- *'falling head tests should be repeated three times'*. Given that the water level did not fall at all it would be impossible to repeat the test three times over a single or subsequent days.
- *"The soakaway should discharge from full to half-volume within 24 hours in readiness for subsequent storm inflow."* Evidently, the test conducted on site could not achieve half full volume within 24 hours and the soakaway would be ineffective.
- *"Groundwater should not rise to the level of 1m below the base of the soakaway during annual variations in the water table."* Groundwater has been recorded within the monitoring wells across the site at around 1.2m depth well above the base of any potential permanent soakaway.

Due to very slow infiltration rates recorded on site and more importantly shallow groundwater soakaways will not provide a suitable drainage solution for the discharge of surface water run-off at the site and therefore there may be a need for surface water balancing.

² BS EN ISO 22282-2:2012 *Geotechnical investigation and testing. Geohydraulic testing Water permeability tests in a borehole using open systems.*