Summary

In recent years, new and creative solutions have been developed for geotechnical design, and the calculation methods have been improved. Yet, the characterization and reduction of uncertainties still is an area where improvements are greatly needed. It is well accepted that uncertainties in geotechnical engineering design mostly arise from the evaluation of design soil properties, such as undrained shear strength and effective stress friction angle. Because of the natural processes, all soil properties in situ will vary spatially. Soils may also have an inherent variability. Testing methods will also cause variability in the measurements. Statistics and probability are useful tools to quantify the uncertainties of a soil parameter and make it possible to account for them in a rational and consistent manner.

However, statistical and probabilistic approaches are rarely used in practice to establish the design soil parameters. Perhaps this is due to a practice that no one questions any more, or perhaps the restricted use of statistical methods reflects that often there are not enough data available to actually implement statistical methods with confidence. On the other hand, even when enough data are available, the selection and application of the most suitable statistical tool(s) can represent a challenge.

This report looks into the application of the statistical techniques to the results of laboratory and in-situ soil testing data, including regression analysis, geostatistics and the first order, second moment approach. The objective of this report is to guide the relatively new user on how to use the statistical approaches and how to choose suitable treatments of soil variables based on available laboratory and/or in-situ data.