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Infiltration rate as a mean for the prediction of runoff in high-intensity rainfall environments

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The management of water on rehabilitated sites requires a thorough understanding of its water balance to achieve a high degree of structural and hydraulic stability. The determination of runoff is a crucial parameter as it not only informs about the success of specific strategies regarding infiltration into potentially environmentally harmful material but also serves as the basis for the design of e.g. storage basins for potentially contaminated waters or drains into adjacent creek systems. The extent of the occurrence of runoff further decides the possibilities for landform design and the prevention of mass transport and erosion off-site.

Very commonly runoff cannot be directly measured, but has to be derived from the water balance equation, where meteorological data are used to provide information regarding precipitation and evapo(-transpir-)ation. Soil moisture data are often not available which would are necessary to cater for the quantification of changes in the storage term. Deep drainage, where it may occur, can often only be estimated.

Under semi-arid climatic conditions with interspersed cyclonic events (e.g Northern Queensland, Australia) runoff plays a major role in the assessment of the hydrological situation. Short, high intensity rainfall events are typical for such environments resulting in partially high runoff coefficients, which are very much driven by the characteristic of the rain event. For such climatic conditions a different approach is used to approximate runoff. Instead of using the water balance parameters, runoff is quantified using the infiltration characteristic (sorptivity and hydraulic conductivity) into the

soil from on-site infiltration tests, in this case a cover which is designed to minimise the inflow of precipitation to deeper depths. The results are compared with data of the general water balance equation, i.e. soil moisture storage data and deep drainage data from a lysimeter and meteorological data (precipitation, evaporation). A generalised approach will be presented, which suggests the determination of a dynamic, event based runoff coefficient, which relies on high-resolution precipitation and soil infiltration information. It will be shown that this approach has advantages in conditions of limited availability of water balance data.