# EVALUATION AND QUANTITATIVE ESTIMATION OF THE EFFECT OF SURFACE SEALING ON DISCHARGE

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The additional quantity of surface runoff released by surface sealing in torrent catchments and their receiving water systems presents a not to underestimate factor in discharge events. The aim of current survey is to analyse the present discharge from potential settlement fields and to find the effects of surface sealing on runoff during heavy rainfall events in the upper Austrian Salzkammergut valley.
In the process of sealing there is not only an increment of water charge but also a rapid concentration of surface runoff in the river systems. The local channel system or sewage network is not able to lead away the upcoming peaks because they are often charged to capacity by natural discharge. Triggered by the degradation of surface runoff in the catchments the underlying settlements and values are endangered by overflow and debris. In the course of the study there has been developed a calculation tool to decide the additional water appearance which can be used by members of the Forest-technical Service for torrent and avalanche control.

## PROCEDURE AND METHOD

In the area of the Salzkammergut valley about 80 reference-points of potential settlement surfaces were recorded by a standardized method described by Markart et al. (2004). At this investigation the bio-, geo- and hydro environment of each reference field were appraised in order to define the spectrum of different surface states. Most of the reference points were set on grassland surfaces which are supposed to be the favoured settlement fields. The property and structure of soil is one of the most important elements to describe and to classify the runoff attributes of each surface. It should be taken into consideration that the soil development strongly depends on the substratum and the former land use. A manual which describes the most important types of surfaces was created. At seven selected locations heavy rain simulations were carried out to validate the runoff properties of these surfaces. The plots were located on characteristic surfaces even distributed over the investigation area. Some of the experiments were held on soil-vegetation units which are known as critical areas. The results of the rain simulations could be transferred to the other reference points which were described. Due to the knowledge regarding the heavy rain attempts and the specified reference-points the expert can easily assess the hydrological properties of each surface in the working area.

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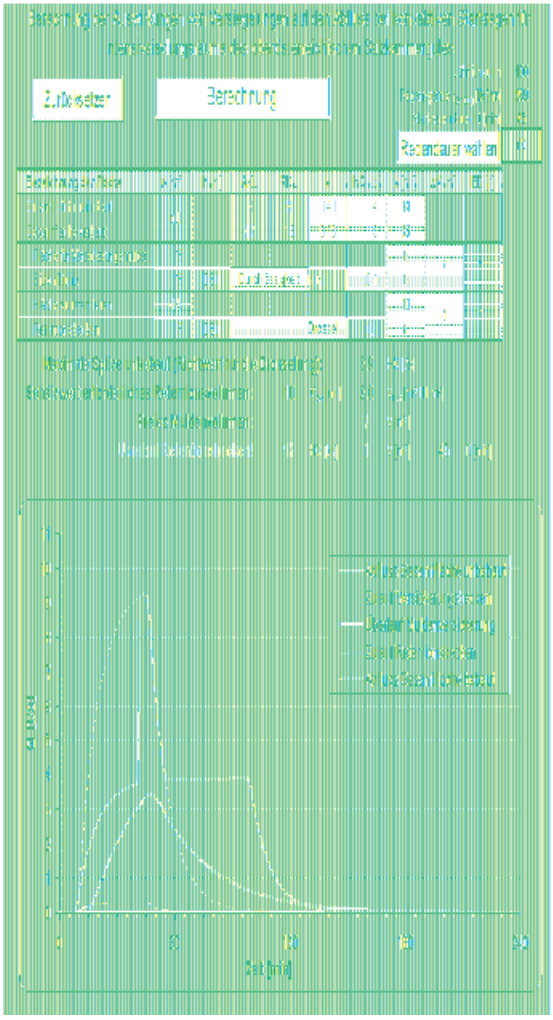
## USE IN PRACTICE

A simple to operate MS-Excel based Script was created to calculate the effect of surface sealing on discharge. Therefore the current state of the surface has to be appointed according to the prepared manual. The user has to define a runoff coefficient and a roughness-class. To calculate the appearance of water from sealed areas, the user is forced to define the runoff coefficient from the modified surface. A new runoff coefficient can be composed alternatively by valuation of the different kind and proportion of sealing. The used precipitation input is specified for several annualises by the heavy rain analysis from upper Austria, but the precipitation input can be optionally defined itself. The possibility to choose different arrangements is included (retention in combination with controlled outlet, seepage with or without reservoir) to attenuate the discharge peak from sealed surfaces.

**Fig. 1**: Example to calculate the discharge from a sealed surface with effects of arrangements




## LITERATURE

G. Markart, B. Kohl, B. Sotier, T. Schauer, G. Bunza und R. Stern: Provisorische Geländeanleitung zur Abschätzung des Oberflächenabflussbeiwertes auf alpinen Boden-/Vegetationseinheiten bei konvektiven Starkregen (Version 1.0); BFW-Dokumentation, Schriftenreihe des Bundesamtes und Forschungszentrums für Wald, Wien, 2004.

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