

A Methodology for Optimisation of Water Containment Systems

Authors : Amir Hedjripour

Abstract : The required dewatering configuration for a contaminated sediment dam is discussed to meet no-spill criteria for a defined Average Recurrence Interval (ARI). There is an option for the sediment dam to pump the contaminated water to another storage facility before its capacity is exceeded. The system is subjected to a range of storm durations belonging to the design ARI with concurrent dewatering to the other storage facility. The model is set up in 1-minute time intervals and temporal patterns of storm events are used to de-segregate the total storm depth into partial durations. By running the model for selected storm durations, the maximum water volume in the dam is recorded as the critical volume, which indicates the required storage capacity for that storm duration. Runoff from upstream catchment and the direct rainfall over the dam open area are calculated by taking into account the time of concentration for the catchment. Total 99 different storm durations from 5 minutes to 72 hours were modelled together with five dewatering scenarios from 50 l/s to 500 l/s. The optimised dam/pump configuration is selected by plotting critical points for all cases and storage-dewatering envelopes. A simple economic analysis is also presented in the paper using Present-Value (PV) analysis to assist with the financial evaluation of each configuration and selection of the best alternative.

Keywords : contaminated water, optimisation, pump, sediment dam

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