

On the Importance of Spatial Correlation in Stochastic Precipitation Records Used in Water Supply Modeling

Matthew C. Carney¹

Natural Resources Consulting Engineers, Inc., Fort Collins, Colorado

Marijan Babić

Civil Engineering Institute of Croatia, Zagreb, Croatia

Woldezion Mesghinna

Natural Resources Consulting Engineers, Inc., Fort Collins, Colorado

Abstract. This paper discusses the importance of accounting for spatial correlation in stochastically generated precipitation records used in water supply modeling studies. It is demonstrated that a failure to reproduce the spatial correlations among stochastic precipitation records in large watersheds leads to an under-estimation of the variance of basin-wide precipitation volumes and consequently an over-estimation of water supply reliability. This in turn can lead to under-estimation of the active storage requirements for proposed reservoirs and, ultimately, water supply infrastructure that fails to deliver the design water demands at the expected reliability level.

A proposed improvement to one commonly used stochastic weather generator is presented and tested on a case study in Eritrea, East Africa. The results obtained using the modified stochastic model are presented and discussed.

¹ Natural Resources Consulting Engineers, Inc.
131 Lincoln Avenue, Suite 300, Fort Collins, CO 80524
Tel: (970) 224-1851, e-mail: mcarney@nrce.com