

Seasonal Recharge and Groundwater Storage in a Below Drainage Mine-pool

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Abstract: Seasonal recharge and groundwater storage characteristics were determined for a below drainage mine-pool complex in western Pennsylvania. The mine-pool generates three discharges that are among the largest pollution sources in the Blacklick Creek watershed. The Pennsylvania Dept. of Environmental Protection is planning to control the discharges in a combined treatment facility. The mine-pool includes three individual, but hydrologically connected, flooded and abandoned underground coal mines. Mine-pool recharge was found to be seasonally dependent, typically ranging from a low of about 1.9 L/Ha-min in late summer through fall to about 4.7 L/Ha-min in spring. This information was used in developing a management plan that reduces mine-pool hydraulic head by controlled pumping, and eliminates existing pollutional discharges to the receiving stream. Weir and transducer measurements were collected at existing mine decant points for over 18 months and analyzed to provide expected monthly pumping, storage and treatment requirements. A full record of reliable discharge could not be acquired for one subpool. Recharge properties were estimated for this subpool based on geologic and mining conditions, and behavior of adjacent subpools. The mine-pool is at long term steady state conditions, and the discharge rate is considered equivalent to the recharge rate. The management plan includes a provision to reduce mine-pool head and maintain sufficient in-mine storage to capture 30 days of peak seasonal recharge. The two principal mines in the complex require hydraulic head reduction of about 9.8 and 15.5 meters to provide 30 day storage of 190 and 511 million liters, respectively. The management plan also includes disposal of treatment sludge by injection into the mine-pool at locations that are unlikely to recirculate to mine water extraction pumps. Pump specifications and a conventional chemical treatment plant will be designed to accommodate seasonal variation in mine-pool hydrology.

Additional Key Words: stage storage, design flow, sludge disposal.

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