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This paper presents a groundwater management model, considering the interaction between a confined aquifer and an unlopped Water Distribution Network (WDN), conveying the groundwater into the Water Works distribution mains. The pumps are controlled by regulating the characteristic curves. The objective of the management is to minimize the total cost of pump operations over a multistep time horizon, while fulfilling a set of time-varying management constraints. Optimization in groundwater management and pressurized WDNs have been widely investigated in the literature. Problem formulations are often convex, hence global optimality can be attained by a wealth of algorithms. Among these, the Interior Point methods are extensively employed for practical applications, as they are capable of efficiently solving large-scale problems. Despite this, management models explicitly embedding both systems without simplifications are rare, and they usually involve heuristic techniques. The main limitation with heuristics is that neither optimality nor suboptimality bounds can be guaranteed. This paper extends the proof of convexity to mixed management models, enabling the use of Interior Point techniques to compute globally optimal management solutions. If convexity is not achieved, it is shown how suboptimal solutions can be computed, and how to bound their deviation from the optimality. Experimental results obtained by testing the methodology in a well field located nearby Copenhagen (DK), show that management solutions can consistently perform within the 99.9% of the true optimum. Furthermore it is shown how not considering the Water Distribution Network in optimization is likely to result in unfeasible management solutions.

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