

COMPUTER MODELING

Dewatering Simulations (Mine and Ground Water)

RNL Design - Wellington A. Webb Municipal Office Building

The proposed \$132 million Wellington A. Webb Municipal Office Building for the City and County of Denver was to incorporate a three-level underground parking garage. With a local water table of approximately 10 feet from ground level, dewatering was required, both for construction and for the permanent facility.

Martin and Wood carried out a dewatering analysis and provided a dewatering system layout design for the permanent structure and to assist in the design of the progressive temporary construction dewatering system. Martin and Wood conducted aquifer testing to develop aquifer characteristics that were then incorporated into a ground water flow model simulation to predict construction dewatering inflow rates, permanent system inflow rates, and to test and refine the conceptual designs that were ultimately consolidated into the final permanent system design.

During construction dewatering several small local areas of higher inflows were identified and incorporated into the model which was then able to match accurately the total inflows for the entire excavation. The model was allowed to run to essentially steady-state conditions to predict the longer-term permanent

system flows for use in designing the pumping system that would ultimately maintain the garage in a dewatered state.



Photo courtesy of Kelly R. Wood

Commercial Office Building

When the construction dewatering system for a large commercial office building located adjacent to Cherry Creek began experiencing problems, Martin and Wood personnel provided assistance with design compatibility and system efficiency improvement.

Through the course of this work, it became apparent that the permanent underground parking garage dewatering design that had been contemplated by others was potentially inadequate. The excavation, extending down some 30 feet into the unconsolidated sands and gravels of the Cherry Creek alluvium, required considerably more dewatering flows than had been anticipated. Martin and Wood personnel subsequently re-evaluated the design and proposed changes and improvements. Martin and Wood personnel constructed and utilized a numerical ground water flow simulation of the excavation to analyze a

variety of drain system configurations and sizes. Inflow and garage flooding rates under system failure scenarios were developed to aid in the design of the backup pumps that would act as a fail-safe in case the primary pumping system should fail. Significant conservative safety factors were applied to the final design determined to offer the greatest levels of protection.

The system was constructed as per Martin and Wood's design and ultimately given a rare opportunity for validation. During construction, at a point where the garage structure was complete up to ground level, a power failure knocked out the primary dewatering pumps before the backup system had been completely installed. The inflow rates during the ensuing flooding of the lower garage levels matched the modeled predictions within one percent.

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