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Installing relief wells to mitigate excess pore water pressures is a common strategy for maintaining slope stability safety factors at dams and related structures. However, over time, there is potential for relief wells (in unconsolidated formations) to lose their effectiveness. These types of wells are prone to clogging due to fine soil particles and colloids (fines) being transported with the continual groundwater flow through the well screen. As a result, pore pressures can return unacceptable levels.

Redevelopment and replacement are typical solutions to well screen clogging, but these options often come at a high cost and may or may not stabilize pore pressures for the long term. An ongoing pilot study at an upstate New York dam is bringing together existing methodologies in new applications to offer an innovative and cost-effective approach to extend relief well life and effectiveness.

After installing three relief wells to control pore pressures beneath the operating power station, well screen clogging occurred and pressures increased. Well redevelopment employing conventional techniques provided only temporary success before unacceptable pressures returned. The accumulation of fines in the well pointed to a lack of sufficient gravel pack to provide formation stability and proper filtration. A solution was needed to control pore pressures while avoiding further mobilization of fines and potential piping development.

The pilot study's approach combined suspended particle counting technology and the installation of an inflatable packer-purge system in each relief well. After the particle counter detected and measured fines migrating into the wells under various flow conditions, three purging methods were employed to isolate the well screen and control well flow. All of the methods significantly reduced pore pressures in the formation outside the wells and increased flows entering the wells with no observed accumulation of fines. The pilot study demonstrates that intermittent flow intervals and natural pressure gradients can successfully mitigate well screen clogging and reduce pore pressures in foundation soils. The trial testing of an automated packer-purge system, in place since fall of 2016, will determine if this approach can successfully maintain the desired pore pressures, and thus foundation stability, in the long term.