

Deciding on Screen Length for Thinly Layered Aquifers

Introduction

Thinly layered sand and gravel strata separated by thick zones of silt and clay are common in alluvial basins and can be problematic when deciding upon the placement of well screen and blank casing. Some designers simply target the thin permeable beds with short (3- to 5-foot long) segments of well screen separated by very long segments of blank casing. The most common rationale for this approach is the cost savings from minimized use of well screen. However, overlooked are important considerations that are presented below.

Production Potential of Fine Sediments

Very fine sand, silt, and silty sediments can be troublesome if they are not properly stabilized with an appropriately graded filter pack. Consequently, many designers avoid them entirely and simply install blank casing within those depth intervals. Overlooked is the fact that fine sediments can yield significant production to a well. With careful planning and properly selected filter pack and screen a well can take full advantage of all water-bearing sediments and realize greater productivity.

Consolidation of Filter Pack

When a designer opts to install short segments of well screen within each thin aquifer and long (>40 feet) segments of blank casing within zones of silt, very fine sand, and clay the resulting as-built well design often mirrors the layout of a piano keyboard. While it is possible to manufacture short segments of louvered well screen or continuous wire-wrapped screen, this type of design may create problems during placement of the filter pack. When filter pack is placed in the annular space to envelope the well screen it is consolidated by swabbing to guard against voids in the pack. Raising and lowering a tight-fitting swab within the well moves water in and out through the screen, reconstitutes the filter pack, and allows it to settle without voids. If long sections of blank casing have been installed the swab may not be able to exert sufficient agitation to move the filter pack and effectively consolidate it. Voids can develop in the pack which cannot be amended by swabbing.

Caving Borehole

If the borehole caves in before all of the casing and well screen are installed, it may be necessary to remove the casing and screen and re-drill the hole before attempting to re-install. This would most certainly be the case if the design calls for short sections of screen that must precisely align with short segments of well screen. However, if the designer was liberal with the well screen and intended to install long lengths of screen that span several thinly bedded permeable zones, it might be possible to avoid having to pull out and re-drill. Naturally, this would be a difficult decision, but the option might be acceptable if the borehole is exceptionally deep (e.g. >1,000 feet).

Summary

Deciding the length of well screen for thinly bedded aquifers should always include some consideration of the potential downside effects of short segments of well screen.

About the Author

Robert Turnbull is the Chief Hydrogeologist of Roscoe Moss Company. In this capacity he provides technical support, as needed, to consultants, municipalities, and water districts to plan and design water supply wells. He can be contacted for such information or to answer inquiries regarding this technical memorandum via email at rturnbull@roscoemoss.com. His website is www.blhydro.com. The corporate website for Roscoe Moss Company is www.roscoemoss.com.