Ohio Department of Natural Resources
Division of Soil and Water Resources
Fact Sheet

Fact Sheet 93–7

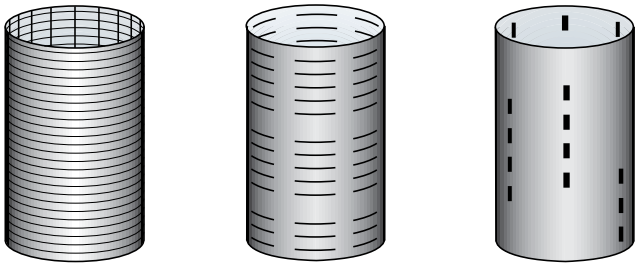
Well Screens and Development Techniques

A well screen is a filtering device that allows ground water from unconsolidated and semiconsolidated aquifers to enter the well, while at the same time keeping the majority of sand and gravel out of the well and out of the pump. A screen also supports the aquifer material and prevents the borehole from collapsing. A well developed in a porous but consolidated aquifer such as a sandstone or limestone does not need a screen.

Types of Screens

Screens used by drillers in Ohio include continuous slot screens, slotted PVC screens, and slotted or perforated pipe screens.

Continuous slot screens are often the best choice for use in unconsolidated sand and gravel aquifers. They are constructed by winding and attaching a triangular strand of wire or PVC around a set of vertical rods. The triangular design is used with the flat face towards the aquifer and the triangular face towards the pump. This design allows small particles to pass completely



Continuous Slot | Machine Slotted | Perforated

through the screen without becoming wedged in and clogging the screen. Well screens are classified by the width of the opening in inches. For example, a number 10 slot screen has openings .010 inches wide.

Slotted PVC screens are constructed by machine cutting slots into PVC pipe. Advantages of using slotted PVC screens are ease of installation, corrosion resistance, and relatively lower cost. The biggest disadvantage is they often have less than half the open area of a continuous slot screen and therefore are not as efficient.

Slotted or perforated pipe screens are constructed by cutting or drilling slots or holes in the bottom joint of steel casing. Although this method is often used by drillers in Ohio, it is also very inefficient. Problems associated with perforated pipe occur due to the low percentage of open screen area with the openings rarely being small enough to hold back fine sand. While perforated pipe is initially the least expensive option, it will, over time reduce the life of both your pump and well.

Selecting the Proper Slot Size

Once the need for a screen has been established, it is necessary to select the proper slot size. This slot size is determined by examining and analyzing the cuttings recovered from the borehole. A slot size is then selected which allows water to freely enter the well while holding back the majority of the aquifer material. If the slot size is too large, sand will pass through the screen along with the water, go through the pump and enter the distribution lines. This not only is a nuisance, it will also cause excessive wear on the pump, thus shortening the life of the pump. If the slot size is too small, water will not freely enter the well which can erroneously give the impression that the well is running dry. This condition also makes the pump work harder, shortening it's effective lifetime.

Filter Packs

Filter packs are well sorted gravels or coarse sands placed into the borehole surrounding the screened interval. This "packed" zone separates the screen from the natural aquifer material and increases the effective borehole diameter. The filter pack should extend several feet above the top of the screen to allow for settling during development. The screen slot size is selected to retain approximately 90% of the filter pack material after development. The use of a filter pack generally

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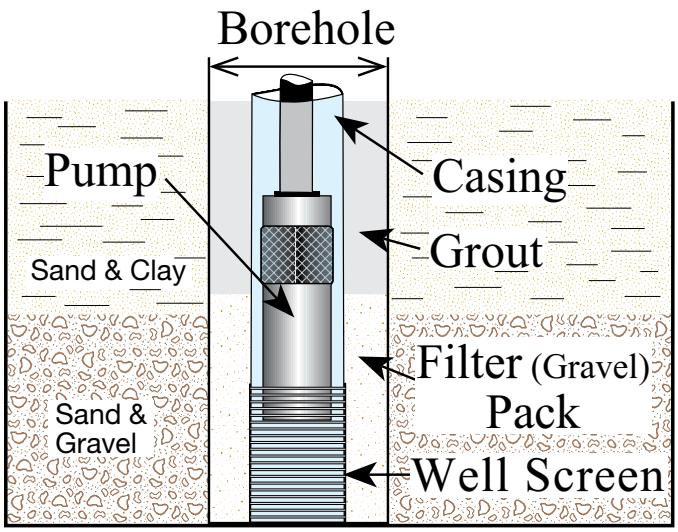
allows the use of a larger slot size which translates into a more efficient and longer lasting well.

Setting Well Screens

Setting the screen in the well can differ depending on the type of drilling rig performing the task. The most common way of setting well screens that can be done by both cable tool and rotary drillers is the pull-back method. This method involves driving or lowering the casing through the aquifer and to the bottom of the hole. The screen is fully lowered inside the casing and then the casing is pulled back to expose the screen to the aquifer. A riser pipe is often attached to the top of

Filter Pack and Related Structures



the screen to prevent the screen from slipping out of the casing by pulling the casing back too far. Rotary drillers can also set the casing and the screen as a single unit. The screen is welded or threaded to the casing and the casing is slowly lowered into the hole with casing centralizers attached every 20 to 40 feet to keep the casing and screen centered in the borehole. The metal composition of the casing and screen should be the same to prevent galvanic corrosion.

Developing Well Screens

Wells are developed to repair any damage done to the aquifer while drilling and to remove clay, silt, and sand from the immediate vicinity of the borehole. The three most common methods used are overpumping, surging, and jetting.

Overpumping consists of pumping the well at a higher rate than the normal everyday pumping rate. While this procedure is sometimes effective in producing a sand free well, often only the uppermost section of the screened interval is developed leaving the majority of the screen undeveloped and underutilized.

Surging involves the mechanical action of a plunger within the casing to force water into the casing and then back through the screen and into the aquifer. Because of the possibility of pushing the fine materials back into the formation, surging should start slowly, and the fine materials should be removed often. Since flow goes both ways through the screen, the well development is more efficient than with simply overpumping a well.

Development through jetting involves the use of a special jetting tool with two to four equally spaced openings or nozzles. A high pressure pump or compressor forces water or air down the pipe, out the nozzles, through the screen and into the formation. The nozzles start at the base of the screen and are slowly worked to the top of the screen and then back down again until each foot of screen has been worked several times. Although time consuming, this development technique is often superior to overpumping or mechanical surging.

Wells that are properly screened and developed are more efficient, last longer, have fewer problems, and are easier to clean out than wells without screens. Screened wells will cost a little more but the extra expense is worth it over the life of the well.

For more information on well screens and development techniques contact:

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