

Limestone diversion well (Nelson Tank)

A typical diversion well consists of a cylinder of metal, concrete or other material 5-6 ft in diameter and 6-7 ft deep, but other sizes are also used. This "well" may be erected in or beside a stream or may be sunken into the ground by a stream. A pipe usually 8-10 inches in diameter, enters vertically down the center of the well and ends shortly above the bottom, which is usually of metal or metal-shielded concrete. Water is fed to the pipe from an upstream dam and intake, sufficient to keep the pipe full and provide a hydraulic head. The water flows up through the well and out an outlet notch in the top edge, from which it is conveyed back to the stream. The well is about half full, or less, of limestone gravel of a size determined by local conditions but usually about (2 cm) in nominal diameter.

The flowing water fluidizes this limestone bed, the acid in the water reacts with the limestone and is neutralized, and the churning action grinds the limestone to fine powder which in part reacts further with the acid and in part is carried into the stream to achieve further neutralization. Both the excess fine powder and any chemically-formed precipitate can be recovered through use of a downstream settling basin, but this is usually not necessary. In some cases, the top of the well is flared out to cause reduced water velocity and allow undissolved particles to sink back into the fluidized bed.

There are some major differences in the typical limestone diversion well and the Nelson Tank. Most concrete or metal diversion wells are square or rectangular shaped and often there are pockets of limestone that doesn't get dissolved. The Nelson Tank is very similar to a farm water tank shown below; however, its shape has been modified so that more circulation within the tank is possible. It is a round tank with a conical bottom, which has very few areas where limestone can collect. The tank is a durable-thick PVC that we anticipate holding up well to the acidity from the wet seals. In many cases extreme acidity tends to erode the concrete tanks. The Nelson Tank costs much less than the metal or concrete tanks/wells and are much easier to move, clean and maintain.



Farm tank



Nelson Tank

Note: The initial Nelson Tanks were paid for with WVDEP-AML monies.

We are not sure of the lifespan of the tank but sources in PA tell us that diversion wells, if maintained, can last for decades. The wells are very durable and most maintenance needs occur at the connection areas (i.e. parts associated with the nozzle etc.), which are typically a minor expense with parts readily available from local hardware stores. These may wear out in two-three years but could last longer depending on the type of materials used (i.e. steel connections instead of PVC). According to a PA Watershed Manager, diversion wells installed on 1987 projects in PA's Anthracite coal region were maintained for nearly 20 years.

Tim Craddock, NPS Coordinator
WV Dept. of Environmental Protection