



Solinst Water Flute

A Trusted Technology for High Quality Multilevel Groundwater Monitoring Since 1996

The Water Flute is a depth-discrete multilevel groundwater monitoring and head measurement system for use in overburden and bedrock groundwater assessments.

Water Flute System Installation

The Water Flute multilevel groundwater system is installed in open bedrock wells via eversion, in a similar process as a blank liner installation (Click [Here](#) for a basic installation overview or for a detailed installation PDF, [Click Here](#)). The Water Flute can also be installed in the overburden or unstable bedrock via sonic drilling.

The installation of a Water Flute is affected by the depth and diameter of the hole, the relative transmissivity of the hole, the depth to the water table, and the rate at which water can be supplied to fill the liner.

The system can be used for artesian situations with a heavy mud fill.

If the hole is too tight to allow the liner to push the water into the formation, the water can be pumped from beneath the liner using a pump tube emplaced in the hole before the liner installation.



Water Flute Sampling Intervals

15+ sampling intervals based on the borehole diameter

Sample Quality

High quality discrete groundwater samples are collected directly from the formation, as the Water Flute system is fully dialated against the borehole wall.

After purging water from the pumping system and screen, samples flow from the formation directly into the pumping system.

Sampling System

Gas driven pumping or peristaltic pumping.

Note: All system components are compatible with VOC and PFC Sampling!

Purge Ability

Easily purge all sample intervals at the same time.

Simultaneous purging allows for discrete samples to be collected while saving time spent in the field.

Each purge stroke pumps roughly 1 gallon of water.

Sample Volume

Large sample volume, generally 1 gallon per stroke.

Sealing the Borehole

The Water Flute seals the entire borehole from flow, except for the sampling intervals. In this way, the Water Flute prevents mobilization of contaminants in unsealed portions of the borehole and by matrix diffusion.

Additionally, because of the strong seal created between the Water Flute and a borehole wall, the systems can seal boreholes and collect water samples under artesian conditions and in karst environments.

Head Measurements

Manual water level measurements can be made or dedicated transducers can be installed downhole or at the surface. (See ACT System)

Borehole Depth, Size and Strength

Water Flute's can be installed in boreholes ranging from 4" to 30" plus in diameter

To date, Solinst Water Flute systems have been installed to 1,400 ft

Based on the geologic environment, liners can be constructed of very thin nylon to ballistic strength 840 denier nylon.

Installation, Removeability and Warranty

The Water Flute can be installed in open bedrock boreholes, and in overburden through sonic casing.

The system can be removed from a borehole, as the systems are installed with water inside the liner.

The Solinst Water Flute is covered under warranty and is also repairable.

Borehole and Multi-Screen Cased Wells

Water Flute systems are usually installed in uncased boreholes. Installations into multi-screened cased holes are also common. Varying borehole diameters are accommodated from 3-30 inches. The Water Flute can be installed through smaller casing into larger open holes below the casing, or into “telescoped” casing. The liner is completely heat welded without the use of any glues.

Once the liner is fully extended in the hole, the geometry looks like that in the example shown here.

Note: Due to the size of the large tubing and pumping hardware components of the system, the pump system is not everted into the borehole, but simply lowered as a tubing bundle following the liner to the bottom.

Sample Intervals

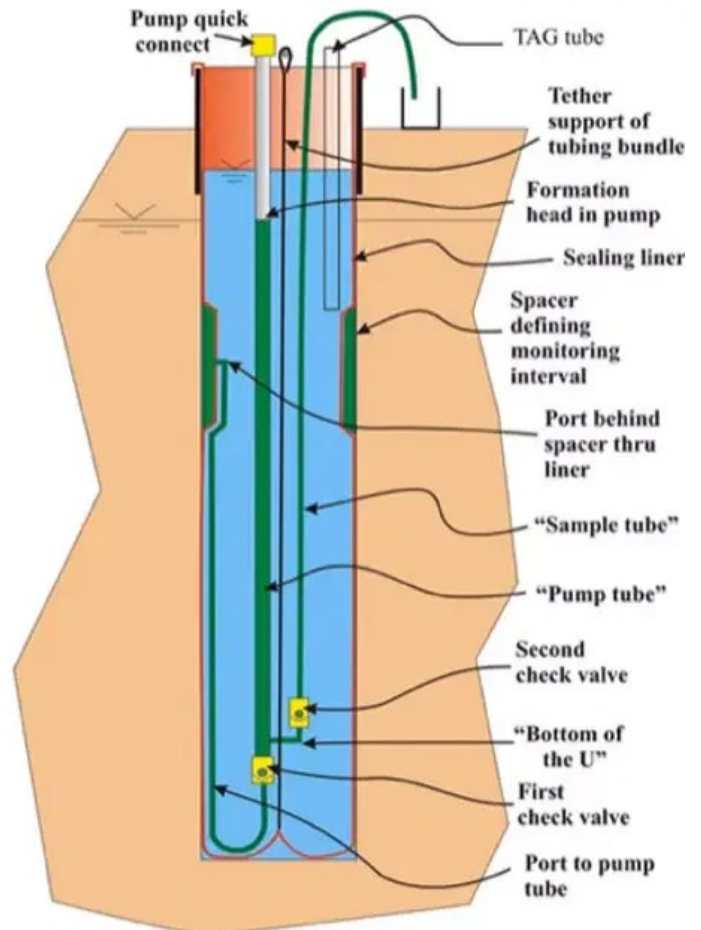
All samples collected from the Water Flute are drawn directly from the formation, without the potential for cross contamination or leakage as possible with packer based multi-level systems. The Water Flute is capable of up to 15 ports per borehole depending on the hole diameter from 4 inches to greater and all intervals can be sampled and purged simultaneously.

Sampling Groundwater Using Water Flute

After the Water Flute is installed, the formation water will flow from the formation into the screen, sample port, and up the tubing on the inside of the liner. The water then flows up through the first check valve and up both legs of the “U” shaped tubing (pump tube and sample tube) to a height equal to the head of the formation. The water level can then be measured in the pump tube from the surface prior to sampling with a **water level meter**.

To purge and sample the Water Flute, a gas pressure is applied to the pump tube at a pressure greater than the head of the formation. Once the pressure is applied, the first check valve closes, and the pressure forces the water to flow through the second check valve and to the surface through the sample tube. This process is repeated multiple times to both purge the system and collect samples.

[Click Here](#) for a detailed sampling procedure PDF file.



Water Flute Pump System
(single port system shown for clarity)

Head Measurements

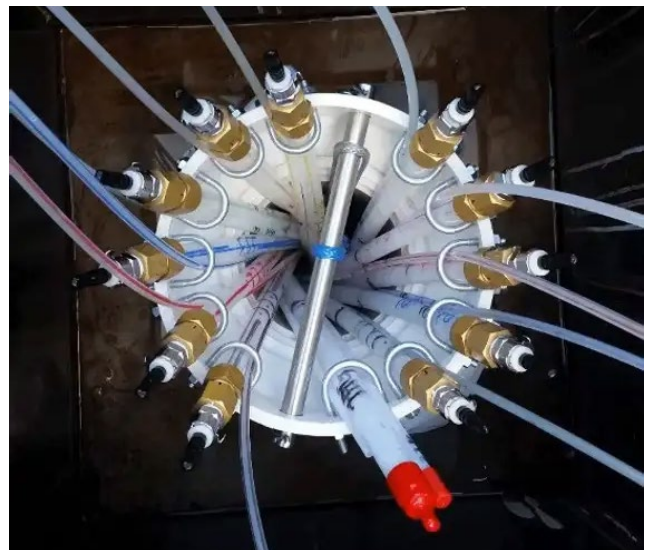
The water table depth at each port can be measured with a water level meter in the pump tube or, for continuous head measurements at each port, an air couple transducer (ACT) system or downhole pressure transducers can be used. Click [here](#) for more information on the ACT system.

Well Completion

There is no need for an exterior seal with grout, sand or bentonite. The liner seals the entire hole and the water is drawn directly from the formation. As such, there is no concern about the seal of granular materials in a slender annulus.

Warranty and Removability

The Water Flute system is fully warrantied and removable for other use of the borehole or easy abandonment by grouting the borehole.



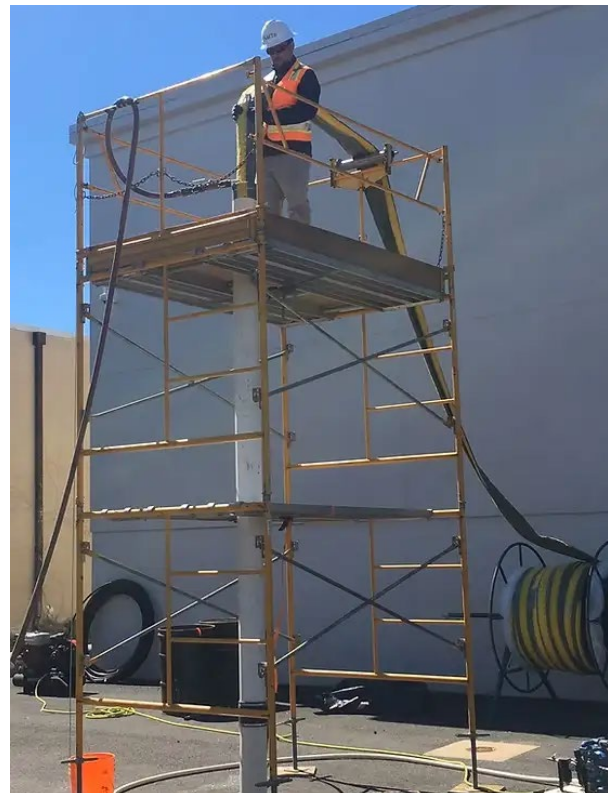
Our experience with Water Flute multilevel groundwater monitoring system now spans 21 years. Water Flute systems have been installed in 48 states in the U.S., and many foreign countries. More detailed descriptions and publications are available on our publications page.

Additional Uses for Water Flute

The Water Flute is well suited for detection of tracer arrivals in that the purge volumes are minimal and the sample is drawn directly from the formation. Because there is not an interior tubing bundle, a transparent liner version allows one to watch for the arrival of strongly dyed injections, such as potassium permanganate, using a borehole camera. That option requires a special polyester liner instead of the standard nylon liner.

A Solinst Flute method called a precise gradient measurement is available in order to measure vertical gradients within ~ 1mm between any two ports in the liner.

Because there is no field assembly and no annular sealing materials needed, and the system is fully removable by inversion from the borehole, the overall cost of the Water Flute system is often the least expensive multi-level sampling and head measurement option of the multi-level monitoring systems.



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