

Frequently asked questions about Water FLUTE systems

1. *Are the number of ports (sampling intervals) limited by the hole diameter?* Yes. The typical number of ports that can be installed in a liner are 6, 10, 15, and 20 in borehole diameters of 4", 5", 6", and 8" respectively. Custom designs allow more ports.
2. *Does it make any difference if the casing is a "stick up" above the surface or in a vault?* No, we often install in subsurface vaults. The vault dimensions required are at "[Water FLUTE vault size.](#)"
3. *How does the sampling system work?* See the [sampling procedure](#).
4. *What is the "trio"?* The trio is the combination of: 1)the sealing the hole with a [blank liner](#), 2)measuring the flow paths in the entire hole while installing the blank liner, and 3)the subsequent installation of a Water FLUTE multi level system in place of the blank liner.
5. *Are Water FLUTES only temporary sampling systems and how long do they last?* The majority of the Water FLUTE systems installed are still in use. –some more than 10 years.
6. *Can a Water FLUTE system be installed in an unstable hole (e.g., sediments)?* Yes. The installation is often in a multi screened casing. However, installations through sonic casing have also been done.
7. *What is the deepest Water FLUTE installation?* 1000 ft in Canada. Deeper is quite feasible.
8. *How many Water FLUTES have been installed?* Over 400 since 2003 when the name Water FLUTE was first used. However many more FLUTE multi level systems have been installed for measurements in the vadose and saturated region.
9. *Why is a Water FLUTE different from other multi level systems?* 1) The liner seals the entire hole instead of discrete packers or grout. 2) The liner is only 20 mils thick and therefore the entire hole volume is available for the sampling system with its unique characteristics. 3) The eversion installation procedure is gentle, supporting of the borehole, and allows removal by inversion of the liner. Those are the primary differences, but there are many more differences depending upon which systems are being compared.
10. *Can one use transducers with a Water FLUTE for measuring the head history at the several ports?* Yes. The transducers are installed in the system and do not interfere with either the sampling procedure or the manual water level measurement for each port. Nor does the transducer use limit the number of ports available in a particular borehole diameter. The new ACT (air coupled transducer) design allows the transducers to be located at the surface for access for repair or reuse.
11. *Can one measure the head for each port as well as draw a sample?* Yes. One can use a slender tag line to measure the head at each port or use a pressure transducer for each port, or both simultaneously, allowing a check of the transducer calibration.

12. *Are the Water FLUTES removable?* Yes. Dozens of Water FLUTES have been removed. It usually takes a day. Deep wells and many ports may take longer. Being removable for repair makes the warranty realistic.
13. *Can anyone install a Water FLUTE?* No. Only FLUTE personnel should install or remove a Water FLUTE or those specifically trained by FLUTE.
14. *How long does it take to install a Water FLUTE?* Typically one to two Water FLUTES can be installed in a day. If a short scaffold is needed for a shallow water table and a weighted mud is to be emplaced, the installation may take two days.
15. *Do drillers install Water FLUTES?* No. But a driller must be present in some States.
16. *What equipment is needed to install a Water FLUTE?* A compressor, generator and water tank are usually supplied by the customer unless near (<300 mi.) a FLUTE office. FLUTE offices are in Albuquerque, NM and Warminster, PA. For multiple installations, FLUTE may provide all of the equipment at normal rental rates. Any additional special equipment is provided as rented equipment and is sent to the site from FLUTE.
17. *Is a driller required for a Water FLUTE installation?* Generally a driller's services are not needed. However, in at least New Jersey, regulations require that a driller be present for a Water FLUTE installation.
18. *Does FLUTE obtain well permits?* No. FLUTE does not obtain well permits, variances or other regulatory documentation. That is usually done by a driller or environmental contractor.
19. *Does the EPA approve of Water FLUTE use?* The EPA is a major customer for Water FLUTES and other FLUTE technologies. Water FLUTES are in place at many superfund sites.
20. *Are there juried journal articles describing Water FLUTE use?* Yes. See the [GWMR journal paper](#) on Water FLUTE use.
21. *Is Water FLUTE technology accepted by the regulators?* Yes. The EPA, NJ DEP, and many other states have approved the use of Water FLUTE technology. Ask us for examples in your state.
22. *Does FLUTE sell a lockable wellhead cover for the exposed surface casing?* Yes, it protects the entire FLUTE wellhead surface hardware and transducer cables.
23. *What is the total cost of a Water FLUTE system?* Provide FLUTE with the site location, hole depths and diameters, number of ports for each hole, and water table (if known) and a detailed quote including labor, rental equipment, travel costs, shipping and FLUTE liners will be provided.
24. *Can Water FLUTES be installed in artesian wells?* Yes, Water FLUTES have been installed in boreholes with more than 30 ft above the ground surface. A weighted mud or grout fill will be needed to obtain the liner pressure required to seal the hole.
25. *How can the excess head required in a liner be obtained for a very shallow water table (<6 ft)?* A weighted mud (Bentonite and barite slurry) is used to displace the water in the

liner, from the bottom up, inside the liner via a tube provided in the tubing bundle. The liner is still removable.

26. *Does FLUTE select the sampling intervals based upon a FLUTE conductivity profile?* No, but the transmissivity profile performed by FLUTE using the blank liner is sometimes the primary basis for selection of the sampling intervals for a Water FLUTE.
27. *Are Water FLUTE samples acceptable to the regulators as quantitative assessments of water quality?* Yes.
28. *Are FLUTE systems warranted?* Yes. Ask for this publication from info@flut.com.
29. *How do Water FLUTE systems compare to alternative methods?* Call us for explicit questions. A FLUTE document “comparisons” is available for general guidelines in comparison of multi level systems.
30. *Can Water FLUTES be installed in freezing conditions?* Yes. They often are, but we prefer more mild weather.
31. *Is there any other supplier of flexible liner systems?* No. FLUTE is the sole source and our methods are well patented, but we are interested in potential foreign fabrications sites and the licensing of installers.
32. *How much does a Water FLUTE system cost?* See [Water FLUTE prices](#) for the price of the basic system. There are additional expenses for labor and travel. Ask for a complete quote.
33. *Should a borehole be developed before installing a Water FLUTE?* Yes.
34. *How soon after the specification of the sampling intervals can a Water FLUTE be installed?* Depending upon the fabrication queue, and the fielding schedule, two weeks is usually the minimum time. However the delivery of many liners takes longer for them to all reach the site. They should usually all be installed in one campaign to reduce fielding expenses.
35. *Is the Water FLUTE used outside the USA?* Yes, there are many installations in Canada and Puerto Rico with some in Denmark and Germany. FLUTE now has a Brazilian distributor, [Clean](#). And an Australian distributor [Matrix Drilling](#) FLUTE is interested in other foreign distributor applications.
36. *How can one tell if a liner is leaking?* Monitor the water level in the liner. The excess head in the liner is a continuous leak check.
37. *Are the liners affected by the contaminants?* Most contaminants (e.g., TCE) do not affect the liner. Remediation injections of potassium permanganate require the use of a polyester liner instead of a nylon liner. Those are available as a special order.
38. *Do the liners leach any contaminants?* FLUTE liners leach trace levels of toluene (20-70ppb) in the sample water for a short while (e.g., ~3 months on average). Arsenic is also included in the coating to prevent mildew per a military specification. However, arsenic free liners are available at a small additional cost. The standard purge procedure removes most of these compounds.

39. *Are Water FLUTes free of Poly-fluorinated Compounds (PFC)?* Yes all the components in the Water FLUTE system (liners, tubing, spacers) have been lab tested as free of PFCs. However, a polypropylene check ball is used instead of Teflon for such measurements. Not even the PVDF tubing contains PFCs. However, other tubing can be used.
40. *Do the liners perturb the sample water by absorption?* The sampling interval, defined by the spacer, is isolated from the liner by a diffusion barrier that prevents contact with the ground water at the spacer. The purge process (~4 gallons) further removes any potentially affected water and the sample is usually drawn from more than 10 ft from the liner in fractured rock. The sampling system, since 2002, is entirely of PVDF tubing which is far less absorptive than the typical LDPE tubing used for sampling. In the special case of a very large vertical gradient, the tubing in the sleeves may be nylon which is well purged by the sampling procedure. Nylon is still much less absorptive than LDPE tubing.
41. *Is a less expensive version of a Water FLUTE system available?* Yes. The Shallow Water FLUTE system of use with water tables of less than 25 ft is much less expensive, but somewhat less convenient to sample, but with most of the advantages of the Water FLUTE (same liner seal, spacer designs, PVDF tubing, and removable).