

## UDI Definition and Possible Causes

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A groundwater source that is Under the Direct Influence of surface water (UDI) is vulnerable to contamination by pathogens found in surface water. This vulnerability could be because the sub-surface formation is not sufficiently filtering water as the water percolates through the formation or because the groundwater collection infrastructure is poorly constructed and allows surface water to directly contaminate the groundwater. The Division of Drinking Water's protocol determines and classifies a groundwater source as UDI based on one or more of the following factors:

1. Physical evidence of source deficiencies that allow, or have the potential to allow, surface water contamination of the source
2. MPA sampling results indicating surface water influence:
  - a. One high-risk MPA sample result
  - b. Two *consecutive* moderate-risk MPA sample results
  - c. Inconclusive MPA sample results, such as alternating low-risk and moderate-risk results, along with other water quality data or observations of the source that indicate potential contamination by surface water
3. Water quality data indicating contamination by surface water, e.g., *E. coli* positive source sample results not caused by physical deficiencies, detection of *Cryptosporidium* or *Giardia* in the source water.

An MPA test (Item #2) consists of running the source water through a spiral-wound filter for a period of the time. Particles collected by the filter are extracted in a laboratory, examined under a microscope, and identified. Particles that are expected to be found only above ground or in surface water indicate a risk of surface water contamination. Such indicators include chlorophyll-bearing algae, parts of flying insects, plant debris, *Cryptosporidium*, *Giardia lamblia*, etc. Some of these indicators are not pathogens, but their presence in the source water means it is susceptible to contamination by pathogens found in surface water.

An MPA sample is rated as having a low, moderate, or high risk of UDI if the score is 0-9, 10-19, or 20 and above, respectively. When basing the classification of a groundwater source on MPA results, the Division protocol classifies a source as UDI if any MPA sample is high risk or if any two MPA samples are moderate risk or above.

The path that surface water takes as it flows to a groundwater source can and usually does vary with season and hydrogeological conditions. It is common for the flow path to be directly influenced by surface water under some conditions (such as during a high surface runoff during spring), but not to be directly influenced under others. So, a surface-water-influenced water source may have MPA sample results of various risk levels, depending on the timing of the sampling. A true groundwater source that is not under the direct influence of surface water will always have only low-risk MPA results.