

Guidance Document:
**Potential GWI Sources—
Determining Hydraulic
Connection Through
Water Quality Monitoring**

GWI-
WQM

August 2003



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**Potential GWI Sources—
Determining Hydraulic
Connection Through
Water Quality Monitoring**

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The Surface Water Treatment Rule

The federal Surface Water Treatment Rule (SWTR) regulations were promulgated in 1989 as part of the Safe Drinking Water Act Amendments. In 1993, the Washington State Board of Health adopted regulations (Part 6 of WAC 246-290) that are as stringent as the federal SWTR.

The federal SWTR affects all Group A public water systems that use:

- Surface water sources or
- Groundwater sources under the direct influence of surface water (GWI).

The SWTR is based on the assumption that all surface water and GWI sources are at risk of microbiological (bacteriological, viral, and protozoal) contamination, and that the pre-SWTR drinking water requirements were insufficient to protect against the risk of waterborne disease outbreaks.

For most affected systems, the SWTR requires both filtration and disinfection to control microbiological contamination and to provide adequate protection from waterborne disease-causing organisms such as *Giardia lamblia*.

Water systems are required to achieve at least 99.9% removal and/or inactivation of *Giardia lamblia* cysts and at least 99.99% removal and/or inactivation of viruses. To accomplish this, systems must filter (unless certain source quality and site-specific conditions are met), disinfect, and be operated by qualified personnel.

Definition of GWI Source

The SWTR defines **groundwater under the direct influence of surface water** as:

Any water beneath the surface of the ground with:

1. *Significant occurrence of insects or other macroorganisms, algae or large-diameter pathogens such as *Giardia lamblia*, or*
2. *Significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.*

Under the direct influence of surface water means that the groundwater source is located close enough to nearby surface water, such as a river, stream, lake, or pond, to receive direct surface water recharge. Since a portion of the groundwater source's recharge is from surface water, the groundwater source is considered at risk to contamination from microbial pathogens such as *Giardia lamblia*, which are not normally found in true groundwaters, but are often found in surface water.

Sources most likely to be under the direct influence of surface water are:

- Infiltration galleries and Ranney wells.
- Springs.
- Shallow wells located near surface water.

Definition of a potential GWI source

Potential GWI sources are defined as infiltration galleries, Ranney wells, and springs. Potential GWI sources also include wells that withdraw water from less than 50 feet below the ground surface and that are located within 200 feet of surface water (WAC 246-290-010). Other susceptible sources may be considered potential GWI sources based upon poor water quality, substandard construction, or public health concerns.

DOH Drinking Water staff, local health department staff, sanitary surveyors, and other field personnel often identify potential GWI sources while conducting field work. DOH also conducts records reviews to identify potential GWI sources. Once a source is identified as a potential GWI source, field confirmation is conducted to make sure the potential GWI source fits the regulatory definition. If the regulatory definition is appropriate, DOH designates the source as a potential GWI source.

Definition of associated surface water

All surface waters within 200 feet of the potential GWI source are identified as associated surface water and must be monitored. In general, surface water is defined as water open to the atmosphere and subject to surface runoff, including perennial (year-round) rivers, streams, and creeks as well as lakes, ponds, and wetlands. Intermittent streams and natural and man-made surface impoundments that receive runoff are also included in the definition of surface water. Isolated bodies of water that form in low-lying areas during the rainy season solely as a result of the water table rising to the surface are not considered surface water. If there is a question as to whether a particular body of water will be considered surface water in the context of this guidance, the deciding factor will be whether channelized drainage contributes water to the body; that is, a particular body of water will be considered surface water if channelized drainage contributes water to it.

Hydraulic connection to surface water

Hydraulic connection to surface water means that water provided by a well (through pumping) or a spring (through pumping or by gravity-flow) is actually coming from the nearby, associated surface water, and that the time it takes for the surface water to reach the potential GWI source is sufficiently short for pathogens to survive the trip. Any contamination present in the surface water can travel through the subsurface soil and emerge in water drawn from the well or spring. This is how *Giardia lamblia*, *Cryptosporidium*, viruses, and other microbial organisms contaminate what appear to be groundwater sources.

In general, the closer a groundwater source is to surface water, the greater the likelihood of a hydraulic connection. Because of the nearness of a potential GWI source to surface water, hydraulic connectivity must be evaluated. Water quality monitoring is a way to determine whether groundwater is hydraulically connected to surface water. This guidance document describes the general process and field methodology for determining hydraulic connectivity through water quality monitoring.

Water quality monitoring requires measurement of specific water quality parameters, including temperature and conductivity, at the potential GWI source and each associated body of surface water on a weekly basis for up to one full year. The data are analyzed for time trends and statistical correlation. The outcome of the statistical analysis will indicate whether a hydraulic connection with surface water likely exists.

If a hydraulic connection is determined to exist, the source will be designated as groundwater in hydraulic connection with surface water. This designation is an interim step in the GWI determination process and is not the same as a final designation of GWI. The difference between the two designations is the type and extent of treatment to be installed.

Sources that are designated groundwater in hydraulic connection must install disinfection that complies with WAC 246-290-451. In addition to installing disinfection, these sources must continue with the GWI determination process, the next step of which requires the collection of MPA samples (*See DOH Publication #331-231, Potential GWI Sources—Microscopic Particulate Analysis*). Required disinfection treatment must begin within 120 days after the source is designated groundwater in hydraulic connection.

If a hydraulic connection is determined not to exist, the source is no longer designated a potential GWI source. It is instead designated as groundwater and is subject to the groundwater source monitoring and treatment requirements. The source will remain noted as susceptible, however, and may be subject to additional regulatory requirements, including installation of disinfection treatment.

Water quality monitoring methodology

Purpose of monitoring

The WQM approach to determine hydraulic connectivity is designed to identify groundwater sources that need further evaluation of direct surface water influence. Baseline monitoring provides a record of seasonal changes in key physical, chemical, or biological parameters in both the groundwater source of supply (potential GWI source) and the nearby associated surface water (potential source of microbiological contamination). A graphical and statistical evaluation of WQM data determines whether a hydraulic connection exists between a groundwater source and nearby surface water. If the monitoring results indicate the existence of a direct hydraulic connection, further testing is required to determine whether the source is at risk to contamination by *Giardia lamblia* and/or *Cryptosporidium*.

Parameters to monitor

Temperature

Research has shown that water temperature is the most useful indicator of potential surface water influence. Temperature is simple to measure and requires relatively inexpensive equipment. All systems conducting water quality monitoring to determine hydraulic connectivity must monitor water temperature. Both the potential GWI source and the nearby surface waters must be monitored, since the goal is to find whether there are changes in groundwater characteristics that mimic surface water conditions.

To help identify changes in water temperature resulting from seasonal changes in air temperature, air temperature also must be monitored for all spring sources (and is recommended for all other sources) at the same time the source temperature measurements are made.

Conductivity

For some sources (such as springs and shallow wells), temperature variations may occur due to seasonal changes in ambient air conditions and may not be indicative of a hydraulic connection with nearby surface water. Thus, it is important that each system monitor at least one other parameter in addition to temperature. Conductivity is the next best indicator parameter and must be monitored at the same time as temperature. Both the potential GWI source and the nearby surface waters must be monitored.

pH and turbidity

Extenuating circumstances may exist for some sources, leading to the need to monitor a parameter other than conductivity. In such cases, pH and/or turbidity may be monitored, but only with prior approval from DOH.

Coliform bacteria

The presence of fecal coliform bacteria in source water indicates that recent fecal contamination has occurred and may indicate that the source is under the direct influence of surface water. Systems conducting WQM may collect coliform or heterotrophic plate count (HPC) samples from the source as an additional data set for use by DOH in evaluating whether a source is under the direct influence of surface water. The sample may initially be submitted to the lab as investigative. If total coliform

bacteria are present, the lab will automatically test for fecal coliform. It is important to understand that the absence of total coliform or fecal coliform bacteria does not preclude the possibility of direct surface water influence.

Rainfall events / Water levels

All systems conducting WQM must record information regarding precipitation (rainfall and snowfall) on the report forms. Systems may wish to purchase inexpensive rain gauges and record the amount of rain that has fallen since the previous sampling day. An alternative would be to locate a local rain gauge (such as the nearest National Weather Service site) for rainfall information if the gauge location is representative of the source site. Seasonal precipitation patterns over a number of years may be a worthwhile evaluation tool.

Systems are also encouraged to record information about stream flow, surface water levels, groundwater levels, and pumping activity. Of primary interest are relative changes in flow or levels over time. Stream flow information may be available from the Washington State Department of Ecology and the United States Geological Survey (USGS).

Monitoring frequencies and timeframes

Physical parameters

At a minimum, physical parameters (temperature, conductivity, pH, and turbidity) must be measured at least once a week, with measurements spaced at least 5 days apart. Systems that have the ability to collect samples more frequently are encouraged to do so (5 days per week is ideal). More frequent measurements enhance graphical and statistical detection of rapid and significant shifts in water characteristics (and more clearly show smooth, gradual changes) in both the surface source and potential GWI source. Water temperature should be measured at the same time of day each time it is measured.

The department recommends measuring stream flow, surface water levels, and groundwater levels at the same time as the physical parameters are measured. Concurrent pumping activity should also be recorded.

Bacteriological samples

The potential GWI source may be monitored for total and fecal coliforms, or HPC, on a monthly basis.

Sampling timeframe

After discussion with the purveyor, DOH will assign a date to begin water quality monitoring at the potential GWI source and associated surface water.

Monitoring equipment

Specifications

- Temperature measurements must be made with a digital thermometer and recorded to the nearest 0.1 degree Centigrade.

- Conductivity measurements must be made with a temperature-compensated conductivity meter with a digital readout; the meter must be able to measure conductivity to the nearest 1 micromho/centimeter over a range of 0 - 2000 μ mhos/cm.
- Systems approved to measure pH must use a pH meter with a digital readout that is able to measure pH to the nearest 0.1 pH units.
- Turbidity measurements must be made with a turbidimeter with a digital readout; the meter must be able to measure turbidity to the nearest 0.1 NTU (nephelometric turbidity units) over a range of 0 - 1000 NTUs.

Acceptable models

For systems that need to purchase monitoring equipment to conduct WQM, relatively inexpensive models are available. Although the more expensive instruments tend to be more accurate, the use of inexpensive equipment is acceptable for purposes of baseline monitoring because DOH is interested in the relative changes occurring over time more than absolute values. Since monitoring may be needed for only a short time period (12 months), it is not necessary for systems to purchase top-of-the-line instruments.

Acceptable water quality monitoring equipment is generally available from companies that sell products for environmental analysis such as Cole-Parmer in Vernon Hills, Illinois (1-800-323-4340), Whatman Scientific in Hillsboro, Oregon (1-800-942-8626) and the Hach Company in Loveland, Colorado (1-800-227-4224). Other providers of equipment may be found by searching the internet for environmental sampling equipment or similar topics.

Larger systems that have more accurate equipment on hand should measure temperature, conductivity, pH, and turbidity in accordance with the procedures outlined in the *Standard Methods for the Examination of Water and Wastewater*, American Water Works Association, 20th Edition (or later).

All instruments and meters must be properly maintained and calibrated in accordance with the manufacturer's instructions. The water system must keep records of maintenance and calibration on file (*see Record Keeping below*).

Monitoring locations

Potential GWI Source

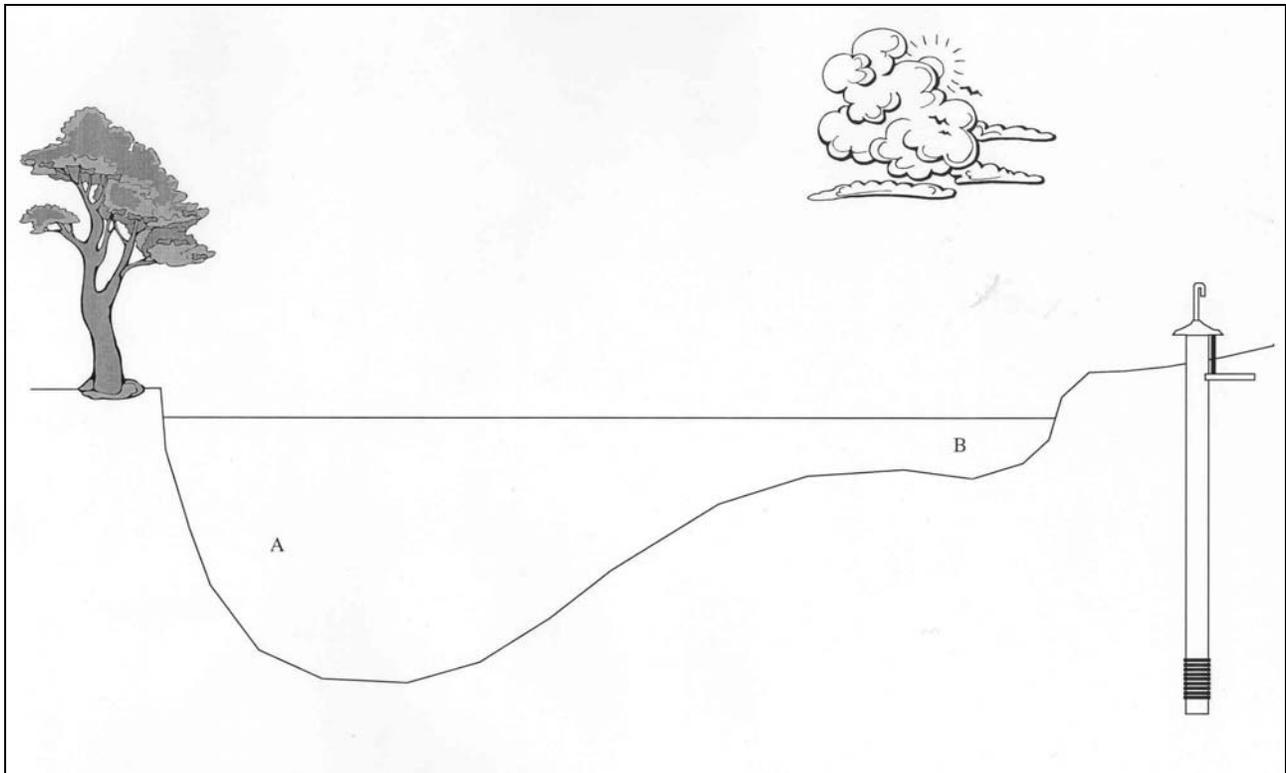
All potential GWI source water samples must be collected from the source (or as close to the source as practical) and prior to storage and treatment. Systems with multiple potential GWI sources must conduct monitoring independently for each source identified as a potential GWI by the department (as indicated in the notification letter).

Nearby surface water

Ideally, to obtain data optimally useful for indicating whether a source is in direct hydraulic connection with nearby surface water, samples from the surface waters should be collected from mid-channel at the shortest horizontal distance from the potential GWI source. The Department realizes that, for some systems, collecting a mid-channel sample at this location may be difficult. Thus, mid-channel samples may be collected from bridges, docks, or boats up to 1 mile upstream and up to 0.25 miles downstream of the ideal sampling location (provided that no tributaries enter between the sampling point selected and the ideal sampling point).

Samples should be collected to reflect mid-channel conditions, since this will be more indicative of the water that would likely be infiltrating to the groundwater. Systems should avoid taking samples from quiescent backwater eddies, slackwater areas, or stagnant areas because these samples likely do not reflect physical/chemical conditions of the bulk of the water in the river or stream.

In the illustration below, point A is ideal for sampling because it is most representative of the bulk of the water flowing in the stream or river. Point B, on the other hand, would not provide a representative sample



Systems with sources located near large surface water bodies (such as major rivers or reservoirs) may wish to contact the US Geological Survey (USGS) or the Washington State Department of Ecology for information regarding locations of surface water gauging/sampling stations in their vicinity and parameters monitored on a routine basis. Data from these agencies may be used to supplement source-specific monitoring results.

Systems with multiple nearby surface waters must monitor the required parameters at all surface waters within 200 feet of each potential GWI source.

Once groundwater and surface water sampling sites have been selected, these same locations must be used for all subsequent monitoring.

Measurement and sampling methods

Field measurements

Temperature, conductivity, pH, and turbidity must be measured in the field; samples are not to be collected and then sent to a laboratory for analysis. Coliform or HPC samples must be collected in the field and sent to a certified laboratory for analysis.

Groundwater sampling

All groundwater measurements should be made in a manner that reflects the characteristics of water coming from the aquifer (rather than from the well casing or borehole). In general, to ensure that samples collected for water quality monitoring reflect aquifer conditions, samples should be collected under flowing water conditions after the well has been purged for approximately 15-30 minutes (or a minimum of three casing and borehole volumes). For permanent, frequently used wells sampled after heavy use/peak demand periods, 15 minutes should be a sufficient purge time. For permanent wells that haven't been pumped recently or are sampled during low demand periods, a 30-minute purge is required.

Seasonal well sources should be sampled after they have been on-line and in use for at least two weeks. Samples should be collected for monitoring after the well has been purged for 30 minutes.

Surface water sampling

To collect samples from the surface water for purposes of measuring temperature and other parameters, a clean one-gallon container such as a bucket should be used. Rinse the container at least three times with the surface water, being careful not to stir up bottom sediments in the stream or pond. If the container is metal, fill it with water, remove it from the surface water and let the water sit in it for several minutes between successive rinses, so the container will be brought to the same temperature as the surface water. Samples should be collected from a depth of one foot or more.

Take all temperature, conductivity, pH, etc. measurements from within the middle of the container. After each set of measurements, discard the water in the container. Collect fresh samples of water and repeat the measurements until three successive surface water samples yield measurements that are the same or closely agree.

Coliform Samples

Bacteriological samples must be collected, transported, and analyzed in accordance with *Standard Methods for the Examination of Water and Wastewater*, American Water Works Association, 20th Edition (or later).

A certified laboratory must be used to analyze source bacteriological samples. Results must be expressed as counts/100 ml. Presence/absence results are not acceptable for source water samples. If the total coliform results are positive, the laboratory must analyze the samples for fecal coliforms and express fecal coliform results as counts/100 ml.

Record Keeping

The department has several forms that apply to the GWI determination process. The first two listed below will have been provided to you prior to beginning water quality monitoring effort. A copy of these records should be kept in your water system files.

- **Potential GWI Source Identification and Designation Form (DOH Form #331-189).** This form documents the criteria the department used to designate your potential GWI source.
- **GWI Determination Process - Purveyor's Choice (DOH Form #331-190).** This form documents the action the purveyor chose to take in determining whether a potential GWI source is GWI. This form documents that the water quality monitoring method was chosen to determine whether the potential GWI source is in hydraulic connection with surface water.

The following three forms apply specifically to the water quality monitoring effort. Copies are also to be kept in your water system files.

- **GWI Water Quality Monitoring Interview Documentation (DOH Form #331-191).** This form documents the water quality monitoring required and optional parameters for all potential GWI sources and associated surface waters. It includes checklist reference information about monitoring equipment, sampling frequency, technique, location, and reports.
- **GWI Water Quality Monitoring Confirmation (DOH Form 331-192).** This form is a formal acknowledgement by the purveyor regarding mandatory and optional water quality monitoring parameters. It lists the field equipment to be used and provides DOH with the water system data collector's contact information.
- **GWI Water Quality Monitoring Report Form (DOH Form 331-193).** This form is used to record weekly water quality monitoring data. It is to be completed (a line at a time) after each water quality monitoring parameter is measured in the field. It is to be submitted after six months of monitoring as part of the Preliminary WQM Report and after 12-months of monitoring as part of the Final WQM Report (see below).

Water Quality Monitoring Reports

Two water quality monitoring (WQM) reports are required to be submitted to DOH: a preliminary report providing water quality data after 6 months of weekly monitoring is completed; and a final report after 12 months of monitoring is completed.

Preliminary WQM Report

Systems must prepare a preliminary WQM report for review by DOH after 6 months of weekly monitoring has been completed. The purveyor must submit the preliminary report within 30 days of the end of the 6-month monitoring period. A fee for DOH review of the report will be billed at the current hourly rate for special reports.

The preliminary report contains general information about site conditions and sampling locations and specific water quality monitoring data derived as a result of the weekly measurements. The general information section requires a surficial (plan-view) map and an elevation profile (cross-section) diagram that are described in more detail below. Purveyors are encouraged to prepare the General Information portion of the report as a basis for discussion prior to meeting with DOH regarding the WQM strategy for your system. Copies of the water quality monitoring data must also be submitted as part of the preliminary WQM report. The data will be statistically analyzed to help determine whether the potential GWI source is in hydraulic connection with surface water.

General Information

The general information section of the preliminary WQM report must include the following minimum information:

Surficial (plan-view) map. Include a map to show the water system layout and general surface features that surround each potential GWI source. Indicate the locations of each potential GWI source, all surface waters within 200 feet of each potential GWI source, and the locations of the baseline monitoring points for each surface water. The map must include major roadways, any stormwater storage or collection facilities open to the atmosphere, and any potential sources of microbiological contamination within the 6-month time of travel for the potential GWI source (for example, onsite sewage absorption systems, sewer lines, dairy or livestock operations, etc.). The radius of the 6-month time of travel may be obtained from the source susceptibility assessment survey that was completed as part of the organic chemical waiver program. You should have a copy of the survey in your water system file. If you do not have a copy, contact your DOH Regional Office source monitoring staff.

Various types of maps may be used to meet this requirement, including USGS maps, county plat and planning maps, aerial photographs, and water system planning maps. The map scale should be at least four inches to the mile; it may be necessary to enlarge an existing map.

Elevation profile (cross-section) diagram. For each potential GWI source, create an elevation profile diagram (with a scale of no less than one inch equals 50 feet) that shows in cross section the elevations of the potential GWI source and nearby surface water with the following additional information:

Wells:

- Well depth
- Depth to top of first screened, perforated or open interval

- Surface seal depth (indicate type of seal, if known)
- Slope of the land in the vicinity of the well and associated surface water

This information may be obtained from well logs contained in your files, water system planning reports, or source susceptibility assessment surveys. If you cannot locate a well log, you may be able to obtain one from the individual who drilled your well or the regional office of the Washington Department of Ecology (1-360-407-6000).

Springs, infiltration galleries and Ranney wells:

- Depth of box or caisson
- Depth of buried collection laterals
- Surface seal type, depth, and extent
- Slope of the land in the vicinity of the source and associated surface water

This information may be found in files, as-built drawings, construction reports, or water system plans. If records are incomplete, provide the available information and your best estimate for the remaining information (indicate estimate on the diagram, as appropriate).

Nearby surface waters that may potentially affect the source:

- Elevation of normal pool
- Elevation of 100-year floodplain
- Elevation of lake bed, bottom of river channel, or streambed
- Approximate sampling point elevations
- Slope of the land surface between the source and the associated surface water

This information may be obtained from local floodplain maps or reports available in city and county offices.

Weekly water quality monitoring data

Systems must record weekly WQM data on DOH Form #331-193 (or equivalent format pre-approved by the department). Systems with multiple potential GWI sources must complete separate WQM report forms for each potential GWI source. Systems with multiple surface water bodies in the vicinity of their groundwater source must report data for each surface water body within 200 feet of the groundwater source.

The data are required to be graphically depicted and statistically analyzed using a statistical software application. Systems are encouraged to consult with DOH prior to submitting electronic files. Electronic data files are expected to be submitted on disk in either ASCII text or spreadsheet (Lotus, QuattroPro, Excel) format and must be precisely recorded in order that an electronic transfer can be performed. Data must be in a column-unique format with only one parameter in each column. Do not report values as < (less than) or > (greater than) since these are not numerical fields. Include full dates (mm/dd/yy format preferred) and the hour of collection. Put any text comments in the far right column only.

Final WQM Report

Systems must prepare a final WQM report for review by DOH after completing 12 months of weekly monitoring. The final report must be submitted to DOH within 30 days of the end of the 12-

month period. A fee for DOH review of the report will be billed at the current hourly rate for special reports.

The final report must contain copies of the first and second 6-month periods of water quality monitoring data report forms. The data are required to be graphically and statistically analyzed to help determine whether the potential GWI source is in hydraulic connection with surface water.

Outcome of Water Quality Monitoring Results

Four outcomes are possible after the collection and analysis of weekly water quality monitoring data:

Outcome 1. The Preliminary WQM Report with its analysis of six months of water quality data indicates a hydraulic connection **does not** exist between the potential GWI source and associated surface water. In this case, an additional six months of water quality monitoring is required. A designation of groundwater cannot be made based on only six months of water quality monitoring.

Outcome 2. The Preliminary WQM Report with its analysis of six months of water quality data indicates a hydraulic connection **does** exist between the potential GWI source and associated surface water. In this case, the source is designated groundwater in hydraulic connection with surface water and disinfection and the collection of MPA samples are required.

Outcome 3. The Final WQM Report with its analysis of 12 months of water quality data indicates a hydraulic connection **does not** exist between the potential GWI source and associated surface water. In this case, the source is designated groundwater. The collection of MPA samples is not required. Disinfection is not likely required at this point. Disinfection may be required in the future, however, depending on the upcoming federal Ground Water Rule.

Outcome 4. The Final WQM Report with its analysis of 12 months of water quality data indicates a hydraulic connection **does** exist between the potential GWI source and associated surface water. In this case, the source is designated groundwater in hydraulic connection with surface water and disinfection and the collection of MPA samples are required.

These four outcomes result in two possible designations:

- Designation of a source as groundwater
- Designation of a source as groundwater in hydraulic connection with surface water

Each of these designations is described in more detail below.

Designation of groundwater

When the Final WQM Report indicates the potential GWI source is not in hydraulic connection with surface water, it is designated groundwater. Disinfection is not required at this point. Disinfection may be required in the future, however, depending on the requirements of the upcoming federal Ground Water Rule. These sources are required to conduct source and distribution system monitoring as a groundwater source.

Designation of groundwater in hydraulic connection with surface water

If the Preliminary or Final WQM Report indicates that a hydraulic connection exists between the potential GWI source and associated surface water, disinfection and the collection of MPA samples are required. The system must retain the services of a professional engineer to assist in developing

an Action Plan (WAC 246-290-640(4)). The Action Plan clarifies the strategy and timing for disinfecting and for collecting the required MPA samples. The plan is to be submitted to the department within 90 days of being notified of the hydraulic connection designation.

Disinfection

A designation of groundwater in hydraulic connection with surface water triggers installation or upgrade of disinfection per WAC 246-290-451. The disinfection treatment must be completed within 120 days after the second MPA result is known (or after the first MPA result is known, if a second sample is not required).

Microscopic particulate analysis samples

In addition to installation of disinfection, MPA samples are required to be collected to look specifically for organisms that are typically found in surface water, such as algae, insect parts and *Giardia* cysts. This sample method and laboratory analysis will determine the relative risk of a source to biological indicators found in surface water. The timing of sample collection is based on any correlation detected from the WQM data and analysis. The MPA samples are analyzed and evaluated in accordance with the Environmental Protection Agency (EPA) *Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis*, EPA 910/9-92-029, October 1992. (See *DOH Publication #331-231, Potential GWI Sources—Microscopic Particulate Analysis*.)

Typically, a minimum of two MPA samples is required to be collected approximately six months apart, so this step of the determination process may require a year to complete. As few as one and as many as ten MPA samples may be required, depending on each sample result. As long as the source is in the process of collecting MPA samples, the GWI determination process is considered underway, and a final designation is not made until the MPA effort is completed.

MPA samples may be collected as soon as a hydraulic connection has been established and DOH has approved the Action Plan's MPA sampling plan.

Additional options for groundwater in hydraulic connection with surface water

When a source is designated groundwater in hydraulic connection with surface water, disinfection and MPA samples are not the only options available to mitigate the impact of surface water. A purveyor may choose to install treatment (disinfection and filtration) required for sources designated GWI or to reconstruct or replace the source.

Install treatment for a GWI source

A purveyor may choose to skip collection of MPA samples and proceed directly to compliance with the SWTR. If MPA samples are skipped and the source proceeds to SWTR compliance, the source is subject to all SWTR requirements. Compliance options provided under the SWTR include: (1) design a filtration system; (2) monitor for avoidance of filtration based on watershed protection and water quality parameters; or (3) consider a limited alternative to filtration if watershed control permits such an option. The decision to proceed to treatment in accordance with the SWTR may be based on a strong statistical correlation and response to surface water fluctuations as evidenced by the WQM effort. Other factors, such as timing to meet other facility treatment needs, may be factored into this decision.

Source reconstruction or replacement

If a facility construction problem is detected during the WQM effort, and it is feasible to reconstruct or replace the source so as to exclude surface water impacts and eliminate the regulatory definition of potential GWI, this may be the best option. The consulting engineer should work closely with DOH to develop a strategy for mitigation. Plans and specifications for improvements must be reviewed and approved by DOH prior to reconstruction or replacement of the source.

Upon completion and certification of reconstruction efforts or the replacement source (that result in the source no longer meeting the definition of a potential GWI source), the source is no longer in the GWI determination process.

If completion and certification of reconstruction efforts or the replacement source do not result in eliminating the applicability of the definition of potential GWI source, the system must repeat the WQM effort to determine whether the reconstruction effectively eliminated the hydraulic connection between groundwater and surface water.

Source monitoring requirements for sources in hydraulic connection

A source determined to be groundwater in hydraulic connection with surface water is required to be monitored as a groundwater source until a final designation is made regarding GWI status. Contact your regional office source monitoring staff for more information about source monitoring requirements.

For more information

Department of Health, Office of Drinking Water

- Donna Freier, GWI Program Lead, (360) 586-5179 or email donna.freier@doh.wa.gov
- Regional Office GWI Program contacts:
 - Eastern Regional Office, Jeff Johnson (509) 456-2797
 - Northwest Regional Office, Derek Pell (253) 395-6763
 - Southwest Regional Office, John Blacklaw (360) 664-8951
- Website: <http://www.doh.wa.gov/ehp/dw/>. Provides access to publications on *Cryptosporidium* and other contaminants, information on how to hire an engineer, and many other resources. Also includes links to other sites such as the federal Environmental Protection Agency (EPA) and the American Water Works Association (AWWA.)
- Toll-free number: 1-800-521-0323

US Environmental Protection Agency

Safe Drinking Water Hotline 1-800-426-4791