



Groundwater Under the Direct Influence of Surface Water Determination Process — Frequently Asked Questions Updated May 2023

What is Groundwater Under the Direct Influence (GWUDI)?

The federal rule defines Groundwater Under the Direct Influence of Surface Water (GWUDI) as:

Any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*, or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions. (40 CFR 141 definition)

GWUDI basically means that the groundwater source is located close enough to nearby surface water, such as a river or lake, 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 of contamination from pathogens such as *Giardia lamblia*, *Cryptosporidium*, and viruses, which are not normally found in true groundwaters.

How are public water systems determined to be potentially under the influence of surface water?

Oregon Administrative Rule (OAR) 333-061-0032 (7) requires that all groundwater sources (except wells using only a handpump) must be evaluated for the potential of surface water influence if the source is in proximity (less than 500 feet) to perennial or intermittent surface water and meets one of the hydrogeologic setting-surface water setback criteria identified in paragraph (A) and either paragraph (B) or (C) below. Hydrogeologic setting is identified by the source water assessment or some other hydrogeologic study approved by OHA-Drinking Water Services (DWS).

(A) The groundwater source draws water from:

- (i) A sand aquifer and is within 75 feet of surface water;
- (ii) A sand and gravel aquifer and is within 100 feet of surface water;
- (iii) A coarse sand, gravel, and boulder aquifer and is within 200 feet of surface water;

- (iv) A fractured bedrock aquifer or layered volcanic aquifer and is within 500 feet of surface water; or
 - (v) Greater distances if geologic conditions or historical monitoring data indicate additional risk at the source; and
- (B) There is a history of microbiological contamination in the source (e.g., water system is using a treatment system to disinfect the source water, detections of total coliform or *E. coli*); or
- (C) The source water assessment or some other hydrogeologic study approved by DWS determines the source is highly sensitive as a result of aquifer characteristics (e.g., unconfined or fractured bedrock aquifer), vadose zone characteristics (e.g., soil permeability), monitoring history (e.g., confirmed *E. coli* or repeated detections of total coliform in the source) or well construction (e.g., casing seal unknown, inappropriate casing seal material, inadequate grout seal or depth).

What does Oregon require if a groundwater source has been determined to be susceptible to surface water?

If the groundwater source meets one of the previously referenced distance criteria and either has a source water bacteria problem or the source has been determined to be highly sensitive, then the water system will have to evaluate the source water (prior to any treatment) monthly for the presence of *E. coli*.

Because the analysis of water for *Giardia lamblia* or *Cryptosporidium* is complex and costly, EPA has indicated that monitoring source water for coliform bacteria may serve as a useful surrogate for the other pathogens. The process for using coliform bacteria as a surrogate requires that the water system perform raw water coliform testing monthly at the source for a period of up to 12 months for year-round systems and during the months of operation for seasonal systems. The samples used for the evaluation process need to be marked as Assessment (see [Laboratory Lists and Reporting Information web page](#) and the links there to [Microbiological Analysis \(Coliform\) Laboratory Form](#) [available in Word or PDF]).

If any of the “Assessment” samples test positive for *E. coli*, the water system needs to collect five additional samples from the source within 24 hours. The five additional samples must be marked as Confirmation. If any of the “Confirmation” samples are also *E. coli* positive, the sample result is considered confirmed and the water system is required to implement corrective action, which may include the installation of interim treatment for the 4-log inactivation of viruses before or at the first customer. In addition to performing corrective action, the water system will be required to collect samples for Microscopic Particulate Analysis (MPA). A water system also can be required to move

on to the MPA if 33% or more of the “Assessment” samples test positive for total coliform.

Note: Public water systems that are required to evaluate their source(s) for direct influence of surface water may submit the results of a Hydrogeologic Assessment to demonstrate that the water system is not potentially under the direct influence of surface water (see OAR 333-061-0032(7)(c)(A-D) for additional information).

What happens if the source water results indicate that MPAs are required?

Source water that has been confirmed positive for *E. coli* or has 33% or more of its monthly assessment samples test positive for total coliform indicates that the water system may be at risk from *Giardia lamblia* and *Cryptosporidium*. The method currently used in Oregon to determine whether a water system is under the influence of surface water is to conduct an MPA on the source water prior to any treatment.

The purpose of the MPA is to evaluate the source water for the occurrence of surface water organisms in general, e.g., diatoms and other algae, and generate a relative risk factor for pathogenic organisms.

To determine whether the system is GWUDI, a minimum of two MPAs need to be performed on the raw source water within 24 months of the *E. coli* positive date. The MPA samples must be collected during the high-risk periods of the year, as determined by DWS, when the source is at the highest risk for surface water influence. The MPA samples must be collected a minimum of 30 days apart or at other time periods specified by DWS, and they are scored according to Table 10, “Modified Scoring of Microscopic Particulate Analysis” (see OAR 333-061-0032(7)(h)). The MPA scores are then used to classify the source groundwater or GWUDI. For more information on how sources are classified as groundwater or GWUDI, see OAR 333-061-0032(7)(i).

Which laboratories conduct the MPA analysis and how much does it cost?

The approximate equipment rental and analytical cost ranges from \$250–400 per sample event (shipping not included). Only a few labs in the region have the ability to do the MPA analysis. DWS maintains a partial list of labs that perform the testing and rent the sampling apparatus — see [Laboratories that Provide MPAs](#). Currently, laboratories do not need to be certified by Oregon; they only need to conduct the MPAs according to EPA’s consensus method. (see link to the list of laboratories at the end of this document)

What happens if the MPA risk scoring indicates that the source water is under the influence of surface water?

Public water systems that use groundwater under the direct influence of surface water as a source of their drinking water must comply with the federal Surface Water Treatment Rule and the Long Term Enhanced Surface Water Treatment Rule (LT1 and LT2). Compliance with these rules generally requires a minimum of 3-log treatment (removal and/or inactivation) for *Giardia lamblia* and 2-log removal of *Cryptosporidium* (see OAR 333-061-0032 for detailed information regarding treatment options). Following is a list of surface water treatment options for GWUDI systems:

Removal/Filtration

- Cartridge/Bag (contact Drinking Water Services for a list of approved filters)
- Slow Sand
- Membrane
- Conventional/Direct
- Riverbank

Inactivation/Disinfection

- UV
- Chlorine Dioxide
- Ozone
- Chlorine (treatment credit for *Giardia lamblia* and viruses only)

What other compliance options are available besides surface water treatment?

If the water system does not want to install or upgrade their existing treatment system, they have several other options available depending on the situation. For wells that are constructed into a confined aquifer and have been determined to be potentially under the influence of surface water as a result of well construction deficiencies (identified in a well evaluation, source water assessment, and/or sanitary survey), the water system may choose to reconstruct the source. If the water system chooses this option, they will need to do so according to DWS construction standards (see OAR 333-061-0050).

Water systems can also choose to develop an alternate source of water by abandoning the surface water influenced well and constructing a new well away (>500 feet) from the surface water source or into a confined aquifer.

Finally, if another water system that has been approved by Oregon is in proximity, the water system may connect to that system and disconnect their surface water influenced well.

How are new wells screened by Drinking Water Services for the potential to be under the influence of surface water?

New water systems or existing water systems that plan on installing a new well are required to go through the plan review process. Plan review requirements are listed on the [DWS website](#) (see Plan Review link at the end of this document). Groundwater systems need to submit a Well Site Plan (see Part 2 of the Plan Review Requirements) to the Regional Plan Review Engineer. The information listed in the application is used to determine whether a water system needs to be evaluated for GWUDI.

After the Plan Review Engineer has processed the application, a *Well Evaluation Request* form is sent to the Regional Hydrogeologist for evaluation. The form will indicate whether a surface water source is located within 500 feet of the well.

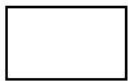
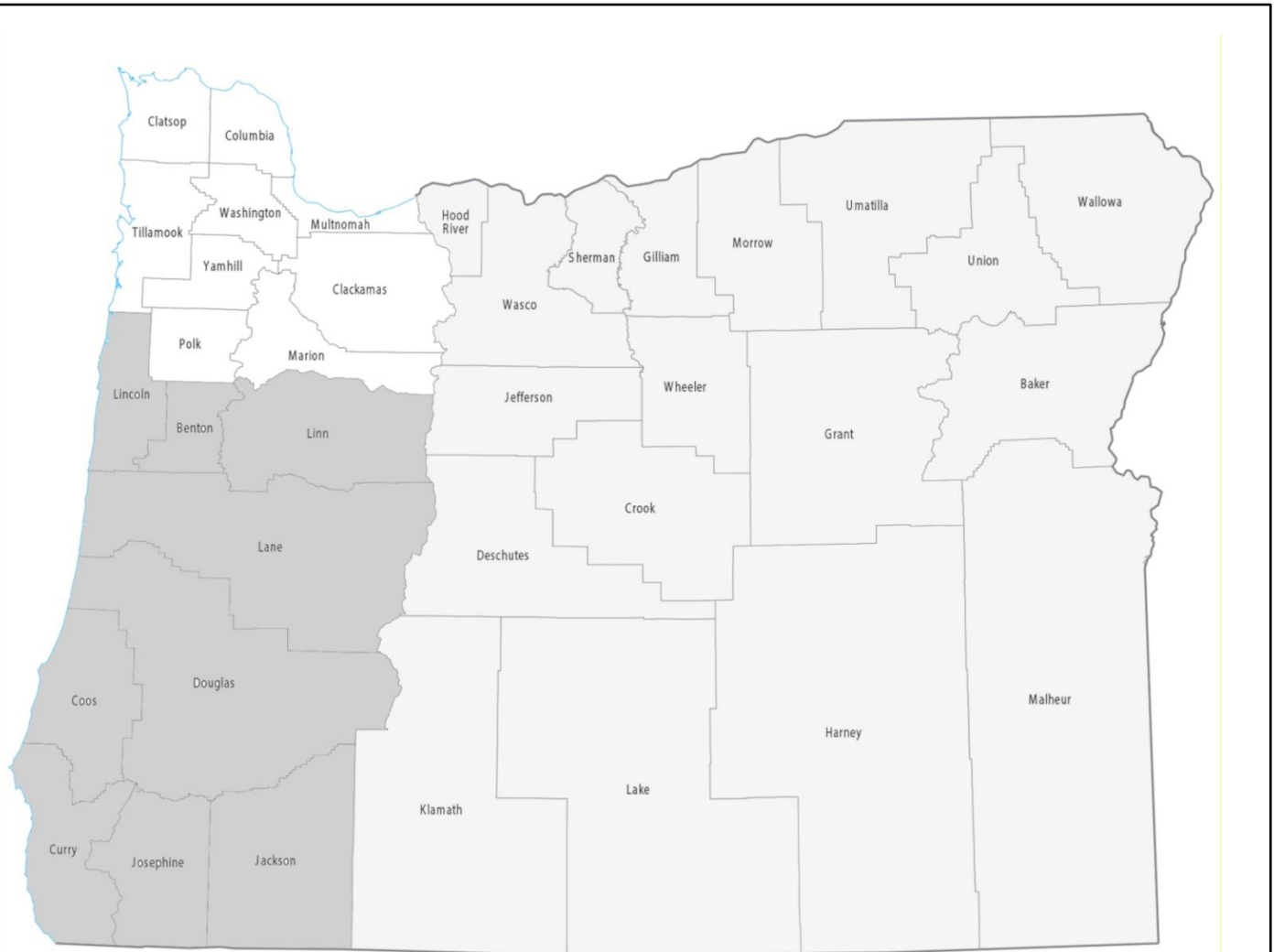
If the well construction review process determines that the well has a potential to be GWUDI, then the water system will be required to evaluate their source water as discussed previously in this document.

How does a person determine whether a water system has already been evaluated for GWUDI?

To determine whether a system has been evaluated for GWUDI, check the [Data Online](#) web page for the water system and the source in question (see Data Online link at the end of this document). Within Data Online, click Water System Search and enter a name or PWS number to find a system. Once the water system has been selected, click on the [Groundwater/GWUDI Source Details](#) link located toward the bottom of the page. The link will contain information on the water source type (GW-Groundwater, GU-Groundwater Under Direct Influence, or SW-Surface Water). In addition to the source type, the link also contains information about the source (i.e., Sensitivity Analysis Data) and monitoring history (i.e., Monthly Assessment Monitoring Data).

If the information listed in the [Groundwater/GWUDI Source Details](#) section appears incomplete, incorrect, or the date listed for Data Last Updated is prior to 2010, please contact the Regional Hydrogeologist for your area (see map on the following page).

Regional Geologist County Assignments



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Supporting Links for the Determination of GWUDI

Oregon Administrative Rules for Public Water Systems

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/RULES/Pages/rules.aspx>

Groundwater Under the Direct Influence of Surface Water Resource Page

- <https://www.oregon.gov/oha/ph/HealthyEnvironments/DrinkingWater/SourceWater/Pages/gwudi.aspx>

Determination of GWUDI Flow Chart

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/SOURCEWATER/Documents/gwudi/GWUDIFlowChart.pdf>

GWUDI Fact Sheet for Water Systems

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/SOURCEWATER/Documents/gwudi/gwudi-fact-sheet.pdf>

Microscopic Particulate Analysis (MPA) Fact Sheet

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/SOURCEWATER/Documents/gwudi/mpa-fact-sheet.pdf>

List of Laboratories that Perform MPA Analysis

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/SOURCEWATER/Documents/gwudi/MPA-Lab-List.pdf>

EPA Consensus Method for Determining GWUDI Utilizing MPA

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/SOURCEWATER/Documents/gwudi/GWUDIMPAMethodology.pdf>

Laboratory Lists and Reporting Information (Laboratory Reporting Forms)

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/MONITORING/Pages/labs.aspx>

Plan Review

- <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/PLANREVIEW/Pages/index.aspx>

Data Online

- <https://yourwater.oregon.gov/>