

[SLIDE 1]Ground Water Classification and Response Requirements

Our discussion has now moved from the Phase II property assessment rule to the “ground water rule”, rule 3745-300-10 of the Ohio Administrative Code.

[SLIDE 2]The ground water rule is really best laid out in three categories: classification, urban setting designation, and response requirements.

[SLIDE 3]Requirement to Classify Ground Water.

First of all, we need to determine the VAP classification of our uppermost ground water zone, and each subsequent zone underlying this ground water zone that we believe is “in our VAP project”. By “in our VAP project”, I mean that you do not have to classify ground water to the center of the earth. You only need concern yourself with the classification of those zones that have been impacted by COCs in excess of UPUS. Ground water classification is important because it determines the response requirements that need to be met for that zone.

[SLIDE 4] It is important to note here that only ground water zones that exceed UPUS need to be classified. Ground water zones that meet UPUS – and even those zones that could potentially be impacted by COCs in excess of UPUS – do not need to be classified. This is a common misunderstanding.

In the simplest situation, this involves classification of only the uppermost ground water zone which exceeds UPUS. For the next lowest ground water zone which meets UPUS, you will have to make a demonstration that it will remain uncontaminated. In more complicated situations, you may have multiple ground water zones that require classification, based upon the subsurface stratigraphy of your site and the depth of ground water contamination. It is important to have an understanding of the use, likely yield and probable quality of zones deeper than your uppermost ground water zone. This is one more reason why the hydrostratigraphic site conceptual model is vitally important.

[SLIDE 5]Let’s review ground water classification under the VAP. **(SLIDE 48)** There is a handy flow chart in a TGC document that walks the CP through the process. Under the VAP, ground water is classified either as Critical Resource Ground Water, Class A Ground Water, or Class B Ground Water.

[SLIDE 6]Critical Resource Ground Water.

If the ground water zone that has been impacted by COCs in excess of UPUS meets one or more of the following criteria, it is classified as Critical Resource Ground Water:

- First, is ground water from that zone being used by a public water system, and is the zone located in a ground water source protection area for that public water system?
- **[SLIDE 7]** Second, is the ground water zone part of an unconsolidated zone that is capable of yielding – based upon a time weighted average over a 24-hour period – greater than 100 gallons per minute as determined by a pump test conducted in accordance with the Phase II Property Assessment rule?
- Third, is the ground water zone part of a consolidated zone that is part of a sole source aquifer?

If your ground water zone meets any of these three criteria, your contaminated ground water zone is classified as Critical Resource Ground Water. Critical Resource Ground Water has the most intensive response requirements, because, as the name suggests, ground water in these zones is recognized as an important resource.

Ohio Department of Natural Resources ground water resources maps may be useful in evaluating whether or not a zone contains Critical Resource Ground Water. This is particularly true in the case of the zone being an unconsolidated zone capable of yielding in excess of 100 gallons per minute. These maps can be used in lieu of performing a pumping test. However, if a contaminated ground water zone beneath a property is being used down-gradient by a municipal water supply, and the VAP property is situated within the ground water source protection area for that municipal supply, the contaminated ground water zone contains Critical Resource Ground Water, regardless of the yield of the zone.

Ground water source protection areas are not shown on ODNR ground water resources maps, so the ODNR ground water resources maps cannot be relied on solely for determining classification of a ground water zone. These maps are published on the Ohio EPA's web page.

The moral of the story here is: look carefully at the provisions of the rule. Do your research as to the location of sole source aquifers in the area. Also, research whether a public water supplier may be using ground water from a particular zone that is present beneath your property. Three "ifs" here:

- if ground water in this zone contains COCs in excess of UPUS, and

- if ground water from that zone is being used as part of a public water supply, and
- if that zone is situated within a ground water source protection area,

then you have Critical Resource Ground Water. Correct interpretation of Rule 10 is an essential element if you have a highly productive ground water zone beneath your property that has been impacted by COCs in excess of UPUS, regardless of whether the source areas are located on or off your particular property.

[SLIDE 8]Class A Ground Water.

A contaminated ground water zone that does not meet any of the criteria for Critical Resource Ground Water, but meets any of the following criteria is classified as Class A Ground Water:

First, is the zone that you are evaluating being used on property as a source of potable water, or by anyone within a one-half mile radius of your property. By anyone, the rules mean anyone – a public water supplier, twenty people, or a private drinking water well. Note here the distinction we drew above: if a public water supply is using the same ground water zone that is contaminated on your property within one-half mile but you are NOT within a ground water source protection area, an argument could be made that the ground water in that zone is Class A and not Critical Resource. This is particularly true if the contaminated zone is part of an unconsolidated zone that yields less than 100 gallons per minute, and the zone is not part of a consolidated sole source aquifer. This is a fine point, but one worth noting. Ground water within the contaminated zone is Class A if it does not meet any of the criteria for Critical Resource Ground Water, but it is being used for potable purposes either on property or within a one-half mile radius of the property boundary.

The second criteria for Class A ground water is whether the contaminated zone is capable of yielding greater than one tenth of a gallon per minute as determined by a yield evaluation conducted in accordance with the Phase II rule, and the ambient ground water quality in the zone is less than 3,000 milligrams per liter of total dissolved solids. Ambient ground water quality refers to the water quality minus any contaminants your site may have contributed.

These criteria are taken directly from Rule 10, although there are a couple of subtleties that should be pointed out. Determining potential use of ground water from your

contaminated zone within a one-half mile radius of the property boundary is pretty straightforward through the use of ODNR water well logs or other local authorities, such as the county health department. Or, you can use your own knowledge of the area and the property. With regard to the total dissolved solids content provision of the rule, it should be clarified that testing to show that TDS content is below 3,000 milligrams per liter is not a rule requirement. This can also be assumed. Testing for TDS content is only required to demonstrate that the concentration is greater than 3,000 milligrams per liter as part of a Class B Ground Water classification demonstration. The 3,000 milligram per liter TDS criteria should, like many other things in the VAP, be used as part of a weight-of-evidence demonstration, rather than relying upon this criterion solely.

[SLIDE 9] With regard to the yield requirement, ODNR ground water resources maps are – again – a good starting point. Further, while yield testing is always an option under the rule, a CP has the option to by-pass yield testing and assume that ground water within a contaminated zone is Class A, provided that he or she has evaluated and determined that the criteria for Critical Resource Ground Water do not apply to the ground water zone in question. Assuming that a contaminated ground water zone is Class A is often done when it is obvious based upon the CP's knowledge of the site and regional hydrogeology and best professional judgment. Such an assumption can eliminate the time and effort required to make a Class B Ground Water determination.

[SLIDE 10] Class B Ground Water.

Ground water that does not meet any of the criteria for either Critical Resource or Class A Ground water may be considered Class B ground water.

[SLIDE 11] However, there are two criteria listed in Rule 10 that can turn otherwise Class A Ground Water into Class B Ground Water. Let's review these.

[SLIDE 12] A ground water zone may be classified as Class B if:

- The zone being classified contains less than 3,000 milligrams per liter of TDS,
- AND is capable of yielding greater than one tenth of a gallon per minute but less than three gallons per minute as determined by a yield evaluation conducted in accordance with the Phase II rule.

[SLIDE 13] A second ground water zone must be present beneath the property for comparison. This zone must be a likely source of raw water for potable purposes both beneath the property and within a one mile radius of the property;

- AND this other ground water zone yields greater than three gallons per minute;
- AND this other ground water zone yields ground water at a rate that is at least twice that of the ground water zone we are attempting to classify.

All of these criteria must be met.

[SLIDE 14] It is important to note that there is an awful lot of yield testing going on to make this demonstration. Yield testing in accordance with the Phase II rule is a very technical and time-consuming exercise, and therefore is expensive. Further, yield testing is highly sensitive to temporal variations and heterogeneity of the subsurface stratigraphy. A strong word of caution: Do not embark upon this path unless there is – based upon your best professional judgment – ample benefit that will be derived from making a successful Class B demonstration at your particular property, and the benefits and risks have been thoroughly reviewed by the volunteer.

[SLIDE 15] A ground water zone may also be classified as Class B if:

- the zone being classified contains less than 3,000 milligrams per liter of TDS and is capable of yielding greater than one tenth of a gallon per minute but less than three gallons per minute as determined by a yield evaluation conducted in accordance with the Phase II rule;
- AND all parts of the ground water zone are wholly contained within 15 feet of the ground surface;
- AND the ground water zone is in an unconsolidated zone.

Demonstrating the fact that the zone is wholly situated within 15 feet of the ground surface will require a fair amount of documentation and exploration on the CP's part – namely drilling holes and installing wells, including wells that are not down-gradient of documented source areas - all in an attempt to demonstrate that the ground water zone in question is wholly contained within 15 feet of the ground surface.

[SLIDE 16] So, by rule, any ground water zone that does not meet the definition of Critical Resource or Class A Ground Water is Class B Ground Water. However, there are several things

to reiterate in conclusion before we wrap up our discussion of what Rule 10 says about classification:

- The ODNR has multiple resources (potable water well logs, oil and gas well logs, ground water resources maps) that are important screening tools to assist the CP in the classification process; however, these documents cannot be relied upon solely to make a classification of a ground water zone.
- Pay close attention to the provisions of rule 10; a ground water zone does not have to have a minimum yield of 100 gallons per minute to be considered Critical Resource Ground Water.
- **[SLIDE 17]** Once one has determined that he or she is not dealing with Critical Resource Ground Water, the CP may always assume that a ground water zone contains Class A Ground Water without yield testing, or an evaluation of TDS content.
- Yield testing in accordance with the Phase II rule is always required to make a Class B determination based on yield for a contaminated ground water zone.
- There is no requirement to evaluate ambient ground water quality for TDS content to demonstrate the concentration is below 3,000 milligrams per liter. However, such an assessment may be required as part of a weight-of-evidence demonstration that a particular saturated zone contains Class B ground water. Class B classification can be made without ever evaluating TDS content, relying upon the other provisions of Rule 10.

So, why all this discussion of classification? What's the point? Quite simply, ground water classification determines your point of compliance, and drives your response action obligations with respect to ground water under the VAP.

[SLIDE 18]A CP's response requirements for Critical Resource Ground Water and Class A Ground Water are dependent upon whether or not the property is within an Urban Setting Designation, or USD. A USD is essentially a way to verify that ground water is not being used for potable purposes near a property, as is the case in most urban areas in Ohio. The most common misconception about what a USD does for a property is that, if a property has a USD, clean-up of ground water is not needed. This is not the case. What a USD does is eliminate the potable use pathway off-property. It does not change response requirements on property, and it does not change off-property response requirements related to non-potable uses of the

ground water. You will still need to restrict ground water uses on property, and – if ground water on Property meets UPUS – the requirements to protect ground water meeting UPUS are unchanged by a USD.

[SLIDE 19] Another way to look at the impact of a USD is that it can change the ground water point of compliance down-gradient of the property based on the classification of the ground water zone. The point of compliance doesn't change for Class B ground water zones because the potable use pathway is already eliminated by definition of Class B. Class A ground water zones no longer need to meet UPUS at the property boundary or alternative point of compliance; in effect they have the same requirements as Class B. For Critical Resource ground water zones the point of compliance moves a half mile from the property or USD boundary, whichever is greater.

[SLIDE 20] How does a property receive a USD? First of all, only you as the CP may request a USD. There are threshold criteria that must be met in making an application to the Director for a USD. Rule 10 lists the threshold criteria that must be evaluated and met in order to submit a designation request to the Director for approval. These criteria are like the VAP eligibility requirements outlined in Rule 02 – these are mandatory criteria that must be met for a CP to request a USD. There is really nothing that can be done to work around these threshold criteria. Let's briefly review the threshold criteria.

The property for which the USD is sought must be located entirely within either:

- City(ies), or
- Township(s) with populations of twenty thousand or more residents in unincorporated areas, or
- The unincorporated portion of a township that has an average population density of 650 people per square mile in the unincorporated area, or
- **[SLIDE 21]** A former township that is entirely composed of municipal corporations, or
- An area that is completely surrounded by areas that are otherwise eligible as described above.

[SLIDE 22] The community in question must be served by a public water system, where the CP can demonstrate that 90 percent of the parcels within either the entire community or within a one-mile radius of the proposed USD area are connected or capable of being

connected to the public water supply. There is a TGC document that provides guidance on how to demonstrate achievement of this threshold criterion.

If it cannot be determined that 90 percent of the parcels are connected or capable of being connected to the public water supply, you can still get a USD, provided the unconnected parcels would not be affected by contamination coming from within the USD, or it would be impractical to install wells on those parcels.

Other threshold criteria are: the community water system is capable of meeting the future needs of the community; the property for which the USD is being sought cannot be located in a ground water source water protection area for a public water system; and

[SLIDE 23] there are no wells installed or used for potable purposes within one-half mile of the property for which the USD is being sought. There is a TGC document which provides guidance on this issue.

Additional threshold criteria must be met if your property is located over a good producing ground water zone; for example, a sole source aquifer or Critical Resource ground water. If that is the case, you will have to demonstrate that there is not a reasonable expectation that new potable wells will be installed within one-half mile of our property in the future. In some cases this can be easy, such as in the case of the City of Cleveland, where there are enforceable restrictions against the installation of potable water supply wells within the city limits. There are other provisions outlined in the rule that should be evaluated as threshold criteria by the CP, and I would refer you to the rule to review these provisions for yourself.

[SLIDE 24] Once a CP has satisfied these threshold criteria, it is time to make your request for a USD. The request is prepared by a CP, and submitted to the director of the Ohio EPA, who is the only person authorized to grant a USD request. The items which a CP must include in a USD request are outlined in Rule 10.

It is important to note that the granting of the USD request is not automatic based upon the satisfaction of the threshold criteria outlined the rule. The director reviews additional criteria related to the local and regional use of ground water, and the likelihood that contaminants from the USD could adversely impact the community water supply. The director may deny the USD request based on these and other considerations.

[SLIDE 25] After receipt of a complete USD request, the director of the Ohio EPA may request additional information from the CP, and may conduct direct consultation with the affected legislative authorities. Public notice inviting comment on the USD request is published in newspapers local to the requested designation. If the public expresses concern about the USD, the director may decide to hold a public information session to air the USD request with residents that may be affected by the USD. Following this consultation phase, the director may approve or deny the USD request. The USD applicant – your client – is responsible for bearing all Ohio EPA costs associated with evaluating the USD request, even if the request is ultimately denied.

The point of this discussion is to emphasize that whether or not a property has a USD directly affects response requirements, and a ground water zone's point of compliance. Behind all this, the CP must bear in mind that the USD serves only to eliminate the potable use pathway to off-property receptors.

[SLIDE 26] However, I would urge all CPs to realize that a USD – once granted by the director – is not an on-going get out of jail free card. If a CP intends to use a USD in support of an NFA letter, the CP must verify the validity of the USD prior to relying on it in the NFA letter. The criteria a CP must use to evaluate the validity of the USD are outlined in Rule 10.

[SLIDE 27] Further, all CPs should understand that once a USD request has been granted, the USD is not “forever”. USD boundaries are subject to periodic review. Area-wide USDs (those USDs covering large tracts of properties) are reviewed by the Ohio EPA on their 5-year anniversary and every 5 years after that to verify their validity. Upon review, the agency may eliminate or reduce the boundaries of a USD. Any changes to a USD will be public noticed and all CPs will be notified of the changes. Changes to the boundary of a USD could impact the validity of a CNS for properties relying on the USD, and it would not be able to be relied upon in future NFA letters. So, bear these two components in mind – a CP must first review the provisions of the rule if he or she intends to use a USD in support of an NFA letter. Second, no USD is forever. A program is in place to periodically verify the protectiveness of the USD for the potable use pathway off-property.

[SLIDE 28] Response Requirements: Rule 10 covers, in step-by-step detail, these response requirements based upon your particular situation.

[SLIDE 29] Response Requirements that apply to all ground water classifications.

In all cases, regardless of the classification of ground water in a contaminated zone beneath your property, the response requirements are to implement institutional or engineering controls that prevent human exposure on the property to ground water containing concentrations of COCs in excess of UPUS, or restore the ground water to meet UPUS. In other words, all ground water classifications must protect human exposure to contaminants in ground water ON the property.

[SLIDE 30] Off-Property Contamination.

If the contamination is due to source areas NOT located on your property, then these are your response requirements. As long as the volunteer was not involved in causing or contributing to the contamination on the VAP property, then the Volunteer is not responsible for evaluating or protecting off-property receptors when the source of the contamination originates off-property. But remember that all non-potable pathways for human health – such as volatilization to indoor air, construction/excavation worker exposure, etc. – are covered in Rule 7 and still apply on property.

There is one caveat to this. If contamination is due to off-property sources, and your ground water is Critical Resource or Class A, then the volunteer must still take steps to prevent COCs from source areas on the property to leach from soil to ground water at levels that would be reasonably anticipated to result in UPUS being exceeded at the point of compliance.

[SLIDE 31] Class A without a USD or Critical Resource with or without a USD.

In essence, for Class A and Critical Resource Ground Water without a USD, your point of compliance is your property boundary, with a few exceptions, if the volunteer chooses to demonstrate an alternative point of compliance. We will discuss these next.

- **[SLIDE 32]** If the down gradient boundary is adjacent to a transportation corridor, the compliance point is the distant edge of a transportation boundary.
- **[SLIDE 33]** If the VAP property is in close proximity to a surface water body, and there is no complete exposure pathway for potable use off-property, the surface water body is the compliance point.

- **[SLIDE 34]** If there is an activity and use limitation in an environmental covenant on the down gradient property, the point of compliance is the down gradient edge of the adjacent property.
- **[SLIDE 35]** If the property boundary bisects a landfill, the point of compliance is the down gradient edge of the lateral extent of the landfill.
- **[SLIDE 36]** Finally, if the ground water is Critical Resource and the property is in a USD, the point of compliance is the USD boundary or one-half mile from the property boundary, whichever is greater.

In lieu of remediating ground water so it meets UPUS, the CP and Volunteer usually put in place institutional controls that prevent the ingestion of contaminated ground water for potable purposes on-site. However, ground water must be remediated to the extent that it will not migrate off-site in excess of UPUS. This could be done through active remediation, engineering controls, or other means that meet applicable standards in accordance with Rule 15, the VAP remedy rule.

[SLIDE 37] If ground water has already migrated off-site in excess of UPUS and is expected to affect off-site wells used for potable purposes, the Volunteer must do one of the following:

- remediate off-site ground water contamination so that it meets UPUS, or
- provide an alternative supply or treatment of ground water until such time as concentrations of COCs no longer exceed UPUS.

[SLIDE 38] Critical Resource Ground Water Notification Requirements.

Extra requirements apply if Critical Resource ground water contamination has migrated off-site. The Volunteer must send certified mail written notifications to all owners of properties where ground water either has or is reasonably anticipated to exceed UPUS. An O&M plan must be put in place to implement response requirements that visually verify and research well log records to document the continued non-use of ground water in areas down-gradient of the VAP property. Should a CNS be issued, there are re-opener provisions that must be included in an O&M Plan in the event that off-property folks want to start using the ground water for potable purposes in areas where concentrations of COCs exceed UPUS as a result of source areas on the VAP property. This re-opener applies whether there is a USD or not. If there is a USD, this is

applicable when contaminants are above UPUS beyond the USD boundary OR ½ mile beyond the property, whichever is greater.

[SLIDE 39] Class B Ground Water and Class A Ground Water with A USD.

Class B ground water doesn't have any additional response requirements beyond those that apply to all ground water classifications. The same applies to Class A ground water when the property is located within a USD. In these cases, the point of compliance – assuming that you have eliminated on-site potable and non-potable exposure pathways related to the contaminated Class B ground water zone - is the nearest down-gradient non-potable receptor.

[SLIDE 40] Last Thoughts:

Now for some final thoughts about ground water in the VAP. Response requirements begin and end with the correct classification of each ground water zone. An incorrectly classified zone will have an incorrect response requirement. Particularly if we are dealing with Critical Resource Ground Water, early agency coordination often results in a smoother review of the NFA letter.

Too often CPs get bound up in the concept that the only exposure pathway for ground water is ingestion. In other words, no one is drinking the water; therefore I have no issues associated with exposure pathways to ground water. This is a common misconception. There are several pathways that involve non-consumption of ground water that could still result in the need for active remediation or some form of engineering control. These non-potable pathways – such as inhalation of volatiles from ground water to indoor air, discharge of contaminated ground water to surface water, and the protection of important ecological receptors – are covered in Rule 7.