

Groundwater Response Questions Regarding Risk Reduction Rule Standard 3

Q. What response options are available under Standard 3 of the Chapter 335 Risk Reduction Rule (RRR) for addressing a contaminant plume within a current or potential source of drinking water?

A. To be a current or potential source of drinking water under Standard 3 of the RRR, groundwater must have a total dissolved solids content of less than or equal to 10,000 milligrams per liter and be sufficiently permeable to yield at least 150 gallons per day to a pumping well.

RRR Standard 3 requires a standard pollution cleanup approach to be used unless the agency approves one of the four alternative approaches described below for responding to contaminated groundwater within a current or potential drinking water supply. These are:

- Standard Approach (Pollution Cleanup) - The standard approach at §335.563(h)(2) requires the contaminant concentrations to be reduced to the cleanup levels throughout the plume of affected groundwater. This approach must be used unless the agency approves one of the alternative approaches described below. Additional details of the standard approach are provided in subsequent questions.
- Modified Cleanup Levels (Pollution Cleanup) - The standard approach may, with approval, be combined with modified cleanup levels which have been determined using non-standard exposure factors provided the requirements of §335.563(e) are satisfied. Use of a non-standard exposure factor will require the concurrence of the appropriate level of TNRCC management, typically the Executive Director, so that consistency can be developed in the rejection and approval of such requests. Demonstration of the appropriateness of using alternate exposure factors to determine groundwater cleanup levels under RRR Standard 3 is possible but may be time-consuming, resource intensive, and difficult to adequately defend. Under this approach the contaminant concentrations must be reduced to the modified cleanup levels throughout the plume of affected groundwater. Upon completion of the remediation, the groundwater must be suitable for human ingestion based upon the approved, modified exposure factor(s). Additional details of the modified cleanup level approach are provided in subsequent questions.
- Waste Control Unit (Exposure Prevention) - When wastes are left in place and appropriate control measures are installed, the agency may under §335.563(h)(2)(~~B~~) approve the exclusion of the area underlying the source area from the requirement to restore the groundwater to the cleanup levels.
- Technical Impracticability (Exposure Prevention) - With adequate documentation, the agency may under §335.563(h)(3)(B) and (4) determine that restoration to the cleanup levels is technically impracticable. The agency may require any alternative measures or cleanup levels necessary to protect human health and the environment.

- Alternate Concentration Limits - The term alternate concentration limit (ACL) has two meanings depending upon the regulatory citation.

As provided by §335.563(h)(2)(A), when ACLs have been approved under §335.160(b) in a permit issued by the Commission for a hazardous waste management facility, these concentrations may be used as cleanup levels. An ACL is defined in §335.160(b) as an alternate cleanup level which can be established for a contaminant provided that contaminant will not pose a substantial present or potential hazard to human health or the environment. When ACL is used in the context of §335.563(h)(2)(A), contaminant concentrations must be reduced to the ACLs throughout the groundwater plume. Upon completion of remediation, the groundwater is suitable for human ingestion based upon the applicable land use. This approach is only available for permitted hazardous waste management facilities.

As provided by §335.563(h)(2)(C), the agency may authorize an exposure prevention approach we will refer to as an ACL zone. For each contaminant an ACL zone consists of an ACL and a health-protective cleanup level (e.g., Standard 2 MSC). The ACL must not be exceeded at the point of compliance within the groundwater source area. The health-protective cleanup levels must not be exceeded at the point of exposure located at the boundary of the ACL zone. ACLs are established such that health-protective cleanup levels will not be exceeded at the point of exposure. Also, the person must demonstrate that institutional or legal controls will effectively prevent use of the contaminated groundwater within the ACL zone. Additional details of the §335.563(h)(2)(C) ACL approach are provided in subsequent questions.

Q. Can an institutional control be used to eliminate exposure to a contaminant plume within a current or potential source of drinking water under RRR Standard 3 and thereby remove the requirement to restore groundwater to the cleanup levels?

A. "No" an institutional control may not be used under RRR Standard 3 as an entire response action for a contaminant plume within a current or potential source of drinking water. An institutional control is only part of an adequate response and must be combined with either exposure prevention or pollution cleanup measures. Further discussion of this question is divided into two parts because institutional controls are used for different purposes under the pollution cleanup versus exposure prevention groundwater response approaches.

Under the standard approach described at §335.563(h)(2), the responsible person must remediate the groundwater such that cleanup levels are achieved throughout the plume of contaminated groundwater. After completion of the response action and approval of the final report, the person must place a deed recordation in the county records. The deed recordation must describe any institutional or legal controls placed on the future use of the property. As pertains to groundwater under the standard approach, the primary purpose of deed recordation is to specify the protective future land use of the site. Deed recordation under the standard approach is not used to prevent all exposure to and use of groundwater. Rather deed recordation serves as a reminder that the groundwater must be used in accordance with the particular land use (i.e., residential or

commercial/industrial) the response action was based upon. This description of the use of deed recordation also applies to both the circumstance under the standard approach where higher cleanup levels are approved based upon alternate exposure factors and when ACLs are authorized under §335.563(h)(2)(A). These modified cleanup levels must be based upon and protective for human ingestion of the groundwater. Therefore, deed recordation is not being provided to prevent all human exposure but rather to prevent unprotective human exposure.

Under the ACL approach described at §335.563(h)(2)(C) an institutional control is a vital component of an exposure prevention response to contaminated groundwater. This institutional control is not a remedy in and of itself. It is only part of a remedy. In order to use an ACL exposure prevention response, the responsible person must demonstrate, in addition to other requirements, that institutional or legal controls will effectively prevent exposure to and use of the contaminated groundwater. Further details of and requirements for an ACL approach are discussed in other questions.

In conclusion, none of the groundwater response approaches available under RRR Standard 3 allow an institutional control to be used by itself as a response action for contaminated groundwater. An institutional control must be used as a part of a pollution cleanup or exposure prevention remedy.

Q. What does alternate concentration limit (ACL) and ACL zone mean in the context of §335.563(h)(2)(C) under RRR Standard 3?

A. §335.563(h)(2)(C) specifies that for an ACL approach the extent of plume remediation will be determined in a manner consistent with §335.160(b). EPA in the 1987 interim final *Alternate Concentration Limit Guidance* stated that to establish an ACL two points must be defined: the point of compliance (POC) and the point of exposure (POE). The POC for a hazardous waste unit as defined at §335.161 "is a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying regulated units." The POC is defined more generally for non-hazardous waste sites subject to RRR Standard 3 as being within the groundwater source area.

EPA states in the ACL guidance document that the POE "is the point at which it is assumed a potential receptor can come into contact, either now or in the future, with the contaminated ground water." Also, "the ground-water quality at the POE must be protective of that receptor." The ACL must not be exceeded at the POC. The allowable ACL values are determined based upon attaining the health-protective cleanup levels at the POE. The area between the POC and the POE is referred to as the ACL zone. In other words, the cleanup levels must not be exceeded at the POE. Higher concentrations than cleanup levels may remain within an approved ACL zone, but the cleanup levels must be attained at the downgradient boundary of the ACL zone (i.e., the POE). Thus, an ACL zone is the extent of a groundwater zone where exposure is prevented. Exposure to groundwater within the ACL zone must be prevented. The groundwater exiting the ACL zone must have contaminant concentrations below the cleanup levels.

Q. Are there any restrictions or limitations on the use of the §335.563(h)(2)(C) ACL

approach under RRR Standard 3 as a response action for a contaminant plume within a current or potential source of drinking water?

A. Yes, there are at least four restrictions limiting the use of ACLs under §335.563(h)(2)(C).

- First, a determination must be made, taking into consideration the potential adverse effects on groundwater quality and surface water quality listed in §335.160(b), whether an ACL approach should be approved for a site. The responsible person does not have an affirmative right to establish an ACL. The ACL must be proposed in the corrective measure study and requires the agency's approval.
- Second, an ACL/ACL zone may only be approved for commercial/industrial land use, not residential land use.
- Third, approval of an ACL zone under RRR Standard 3 cannot authorize expansion of the groundwater plume. If the plume is not steady state, then action must be taken to prevent contaminants above the cleanup levels from migrating beyond the point of exposure.
- Fourth, authorization of an ACL requires that an institutional or legal control be used to effectively prevent use of the contaminated groundwater. This requires the written consent of the landowner. For takings considerations, the agency will not approve an institutional or legal control, and hence a response action, without the affected landowner's written consent.

Q. How are cleanup levels determined under RRR Standard 3 for groundwater which is a current or potential drinking water supply?

A. For groundwater under RRR Standard 3, §335.563(h) requires maximum contaminant levels (MCLs) to be used as cleanup levels if they are available. If MCLs are not available, then risk-based cleanup levels are determined in accordance with §335.563(b) through (e) based upon human ingestion of the groundwater. According to the TNRCC guidance document *Implementation of the Existing Risk Reduction Rules*, commonly known as the Consistency Document, these risk-based groundwater cleanup levels for the standard approach under RRR Standard 3 are the same as and based upon the RRR Standard 2 medium specific concentrations (MSCs). The RRR Standard 2 groundwater MSCs for residential (i.e., GW-Res) and industrial (i.e., GW-Ind) land uses are presented as an attachment to the aforementioned guidance document in a table titled *Updated Examples of Standard No. 2, Appendix II Medium Specific Concentrations*. The referenced guidance document with attached table is available on the TNRCC's web site at www.tnrcc.state.tx.us/permitting/rrr.htm. If a constituent is not listed on this table and does not have an MCL, then the person should contact the TNRCC's Toxicology and Risk Assessment group in the Office of Permitting to obtain a chemical-specific cleanup level for the constituent in question. In short, to determine groundwater cleanup levels under RRR Standard 3, use MCLs or published Standard 2 MSCs if they are available, otherwise use the cleanup levels obtained from the agency.

Q. Is there any limitation on the use of RRR Standard 3 to guide a response action for a contaminant plume within a current or potential source of drinking water?

A. Yes. The RRR requires a deed certification or recordation under Standard 2 or 3, respectively, for either residential or commercial/industrial land use, to be filed upon the completion of a response action. This applies to the extent of both on-site and off-site properties which are remediated to Standard 2 or 3 levels, but not Standard 1 levels. A Standard 2 or 3 cleanup level or action will only be considered acceptable by the agency if the person obtains the written consent from the landowner for the institutional control. This policy requirement also applies to the institutional or legal control required as part of either of the ACL approaches. If written consent for deed certification or recordation cannot be obtained for Standard 2 or 3, respectively, then the person will be required to proceed under Standard 1 which requires restoration of environmental media to background levels. Deed recordation is not required for Standard 1.

Q. What land use must be assumed under RRR Standard 3 when determining risk-based cleanup levels for groundwater which is a current or potential drinking water supply?

A. §335.563(e) specifies that the standard exposure factors set forth in Table 1 (following §335.553) for residential use of a facility must be used when determining media cleanup levels unless a person can demonstrate that a different land use (e.g., commercial/industrial) is more appropriate. The demonstration that a land use other than residential is more appropriate must be based upon:

- the historical, current, and probable future land use, and
- the effectiveness of institutional or legal controls placed on the future use of the land.

Thus, for both on-site and off-site properties with contaminated groundwater, in order for groundwater cleanup levels to be based upon commercial/industrial rather than residential land use, the person must provide documentation of the landowner's consent to file an effective institutional control (e.g., deed recordation) which records the protective future commercial/industrial use of the land. The deed recordation does not have to be filed until completion of the response action. Moreover, the risk-based cleanup levels, whether for residential or commercial/industrial land use, must be based upon the default exposure factors in Table 1 unless, as discussed in a subsequent question, site-specific data warrant deviation from the standard exposure factors.

Q. How does a person demonstrate that alternate exposure factors may be used under RRR Standard 3 when determining cleanup levels for groundwater which is a current or potential drinking water supply?

A. The demonstration of the appropriateness of using alternate exposure factors to determine groundwater cleanup levels under RRR Standard 3 is possible but may be time-consuming and resource intensive. Such a demonstration could only apply to a contaminant which does not have an MCL. §335.563(e) specifies that the standard exposure factors set forth in Table 1 (following

§335.553) shall be used to determine media risk-based cleanup levels unless site-specific data warrant deviation from the standard exposure factors. "Site-specific", as used here, means data collected from observations and measurements at a site which more accurately represents exposure conditions at that site than the default exposure factors. Alternative literature-based values for exposure factors cannot be used as site-specific values. Under what circumstances is it appropriate under RRR Standard 3 to derive higher groundwater cleanup levels based on alternate exposure factors and site-specific data?

- Without the specific concurrence of agency management, all potential future uses of a property within its applicable land use category must be maintained. In other words, if a residential land use assumption is used to determine cleanup levels for a property, then that property must be protective for all potential future, residential uses. Likewise, if cleanup levels are determined based on commercial/industrial land use, then the property must be protective for all potential future commercial/industrial uses. The agency has the authority under RRR Standard 3 to authorize the use of site-specific exposure factors and is requiring the appropriate level of TNRCC management concurrence, typically the Executive Director, before approving any such request.
- The RRR states in §335.553(b)(2) that "The person shall prepare a baseline risk assessment report which describes the potential adverse effects under both current and future conditions caused by the release of contaminants in the absence of any actions to control or mitigate the release." Based on this requirement, Section V of the TNRCC guidance *Implementation of the Existing Risk Reduction Rules* states:

Therefore, because the risk assessment must reflect site conditions absent any controls, the presence of engineering (e.g., fences, caps, groundwater extraction systems) controls, or institutional (e.g., deed restrictions, personnel protective equipment (PPE) etc.) controls should **NOT** be allowed as justification for ruling out exposure scenarios or pathways.

Thus, persons cannot use engineering or institutional controls to screen out exposure pathways. A person must demonstrate based upon the collection of site-specific data that alternative exposure factors are more appropriate for a particular property than the default exposure factors in Table 1.

- According to §335.563(h), cleanup levels determined when MCLs are not available must be based upon human ingestion of the water. Thus, a person cannot assume that an institutional control or company policy prevents ingestion of the groundwater and therefore base the cleanup level on the groundwater-to-air exposure pathway. This is modified somewhat in the case of an ACL zone authorized under §335.563(h)(2)(C). For this exposure prevention approach, cleanup levels could be based upon the groundwater-to-air exposure pathway within the ACL zone. At the point of exposure, the groundwater cleanup levels would be based upon MCLs, if available, or, if not, human ingestion of the water.

- There are no fate and transport assumptions used in the equation for calculating groundwater cleanup levels. This is in contrast to other pathways (e.g., soil inhalation) where fate and transport calculations are used in the determination of cleanup levels. Therefore, there is less flexibility in the determination of cleanup levels for groundwater ingestion than for other exposure pathways.
- The specific parameters incorporated into the equation for calculating groundwater cleanup levels are listed below along with the related concerns about and, where appropriate, process for adoption of alternate values for exposure parameters.
 - Oral toxicity factor. The oral toxicity factor is an established value for each contaminant and there would be no basis for using a different value for Standard 2 versus Standard 3 or from site to site.
 - Water ingestion rate. For groundwater ingestion rate and body weight a scientifically defensible site-specific study would be required which documents that alternate values rather than the default values for these exposure parameters are more appropriate for that particular site. Such a study would be expensive, difficult to conduct, and subject to valid criticism unless very carefully designed.
 - Body weight. See response for water ingestion rate.
 - Exposure duration. Without the specific concurrence of the Executive Director, all potential future uses of a property within its applicable land use category must be maintained. While there may be current site-specific conditions which could warrant use of an alternate value for the exposure frequency and/or exposure duration factors, such alternative values would not be protective for all reasonably anticipated future uses within a particular land use category (e.g., commercial/industrial). To use an alternative exposure factor, the person must explain why it is in the public's best interest to limit the future use of a property to only some of the potential uses within a land use category. The person must also describe how unprotective future uses within a particular land use category will be prevented. For example, a person may be able to demonstrate that current workers at a particular commercial/industrial property do not work at the site for the default values of 250 days/year and 25 years. To support any request for alternative values of a shorter duration, the person must demonstrate, assuming that the property will be sold, how future workers will be prevented from being exposed to the site longer than the proposed alternative exposure factors. In summary, without the Executive Director's approval of alternative values, the person must use the default exposure duration and exposure frequency values to determine groundwater cleanup levels.

- Exposure frequency. See response for exposure duration.
- Averaging time. The averaging time for carcinogens is established at 70 years. The averaging time for noncarcinogens (systemic toxicants) is established at 30 years for residential land use and 25 years for commercial/industrial land use. These values may not be modified for carcinogens, but would be modified to equate with any modifications of exposure duration for noncarcinogens.
- Hazard quotient or risk level. For carcinogens, a cancer risk level of 1×10^{-6} shall be used to establish groundwater cleanup levels for individual contaminants. For noncarcinogens, the hazard quotient shall not exceed one for any individual contaminant. The specific criteria outlined in §335.563(d) which would allow the agency to consider a higher (i.e., less conservative) risk goal are limited to technical feasibility issues such as technical limitations, effectiveness, practicability, or other relevant features of available remedies. Cost is not a factor when determining the level of protection to be provided to human health and the environment. And under no circumstance shall the cumulative risk from all contaminants in groundwater exceed 10^{-4} or the hazard index of 1.
- In summary, modification of the values for water ingestion rate, body weight, exposure duration, and exposure frequency which are used to determine groundwater cleanup levels may be authorized for a particular site if adequately justified. This would require the concurrence of the appropriate level of TNRCC management, typically the Executive Director so that consistency can be developed in the rejection and approval of such requests. The agency expects, in view of the nature of the required information, that such alternative exposure factors may be difficult to adequately defend.

During the document review process some questions were brought forth that I'd like to clarify now.

1. A person expressed the belief than an exposure prevention approach could not be used for the groundwater below a waste control unit if that groundwater is "drinking water". This is not correct. This provision is expressed in 335.563(h)(2) and is not limited to a particular kind of groundwater.

2. Also a reader thought that there was no provision under the RRR to conclude that it is technically impracticabile to restore a current or potential source of drinking water to the health-based levels. This is also not correct. This provision is provided in 335.563(h)(3). The executive director has the flexibility to determine that the restoration of groundwater to health-based limits is not necessary if either the groundwater is not a current or potential source of drinking water or restoration of the groundwater is technically impracticable. Thus, technical impracticability demonstrations are not limited to poor quality groundwaters.

3. Another question is "Can a person file for technical impracticability with no landowner consent under Remedy Standard 1?" No. A person cannot use a claim of technical impracticability under Remedy Standard 1. This standard requires materials above background concentrations to be removed and/or decontaminated. If a person cannot meet the background requirement, then they will have to switch to Remedy Standard 2 or 3 but could not seek technical impracticability under Standard 1.

4. When you use "Executive Director" in this document, do you mean the "Executive Director"? Yes.