Title 118 - NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITYCONTROL

Appendix A - GROUND WATER REMEDIAL ACTION PROTOCOL

Procedures for Determining Needed Action for Point Source
Ground Water Pollution Occurrences

## Part I. IMMEDIATE ACTION

### Step 1. Initial Review

An initial review will be performed to determine whether immediate action is needed, and if so, what actions are required. The amount of time spent for this review may range from a field decision requiring only minutes to a more involved office decision taking a few days. The review will be based on as many of the items addressed in Steps 6 and 7 as possible.

The determination as to whether immediate action is needed will be based upon the following two factors:

1) Existence or likelihood of an imminent and substantial threat to the public health and welfare or the environment

a) imminent - a short time span (i.e., less than 90 days)
b) substantial - a significant impact on the public or environment (e.g., human illness or death, serious financial loss, severe ecological damage)

2) Significantly increasing difficulty of cleanup if action is delayed (e.g., if action delayed, cleanup costs increase by one or two orders of magnitude).

The type and extent of immediate action to be taken will, at a minimum, satisfy the following:

1) eliminate imminence or substantiality of threat

2) result in significantly less cleanup difficulty than if action delayed.

If the need for immediate action is apparent or if the need cannot be readily determined, proceed to Step 2 and work in conjunction with Department's Emergency Response Plan. If at a later time it becomes apparent that immediate action is not needed, proceed to Step 4.

In some cases, it may be obvious that immediate action will not be necessary due to the nature of the pollution occurrence (e.g., developed over many years, moving slowly). If no immediate action is necessary, proceed to Step 4.

### Step 2. Implementation of Immediate Actions

Immediate actions may include cleanup to at least an initial level, stabilization or containment, monitoring, shutdown/ termination of facility/activity, or any combination of measures. These actions will be carried out by the responsible party.

Proceed to Step 3.

**Step 3. Evaluation of Immediate Actions**

After immediate action has been taken, a determination will be made as to whether or not it successfully met the requirements of Steps 1 and 2.

If requirements were not met, return to Steps 1 and 2 for reassessment.

If requirements were met, proceed to Step 4.

**Step 4. No Immediate Threat Present**

Immediate action is not now needed, but additional measures for complete and permanent resolution of the problem may be required. Further assessment is necessary to determine the need for any final remedial action.

Proceed to Part II, Step 5.

## Part II. FINAL REMEDIAL ACTION

Note: If at any time during the Part II assessment an immediate threat is identified, return to Step 1 (Part I).

**Step 5. Preliminary Assessment**

A preliminary assessment will be undertaken to evaluate the possible threat of contamination to ground water. This assessment is to involve a review of existing information and require the collection of minimal or no field data. If it can be determined from this preliminary assessment that there is no threat of ground water contamination, proceed to Step 11. If ground water contamination is possible or likely, proceed to Step 6.

Note: In certain pollution occurrences where the ground water is not or could not be used as drinking water (RAC-3, as described in Step 8), an abbreviated site assessment (Steps 6 and 7) may be appropriate.

Enough information must be collected for the Department to determine if the occurrence fits into the RAC-3 category.

**Step 6. Initial Site Assessment**

If not already known, the Department will identify, if possible, the source(s) of contamination and the responsible party (or parties). The Department will notify the responsible party after the determination has been made.

If ground water contamination is possible or likely, an initial site assessment will be made by the responsible party to define the extent of contamination. This may involve test holes to determine if contaminants have reached ground water or, if not, how close they are (see Attachment A). If this initial assessment reveals that there is no threat of ground water contamination, proceed to Step 11; otherwise proceed to Step 7.

Before this or any subsequent assessments are started, the responsible party should discuss their plans with the Department to make sure they understand what information must be collected. In some cases where ground water contamination is immediately evident, it is acceptable to combine Steps 6 and 7.

Note: Initial and Detailed Site Assessments will be performed by the Department in the case of chemigation accidents in accordance with Neb. Rev. Stat. § 46-1101 et seq.

**Step 7. Detailed Site Assessment**

A detailed site assessment will now be performed through examination of all pertinent factors (see Attachment B). For ground water or soil (potential ground water) contamination occurrences, various items considered may include:

soil characteristics - texture, permeability, thickness, chemical/physical properties of materials from the land surface to the water table

hydrogeologic characteristics - depth to ground water, direction and rate of ground water flow, permeability, transmissivity, aquifer interconnections, perched ground water, recharge area and rate

contaminant characteristics - toxicity, health risks, concentration, amount, mobility, areal extent, source characterization

site characteristics - climate information, topography, accessibility proximity to supply well and its recharge area or cone of influence, land use

background water quality and use - background levels of conventional parameters and additional contaminants of concern, existing or potential use

background soil quality or use - background levels of conventional parameters and additional contaminants of concern, existing or potential use of soil

The detailed site assessment will be presented to the Department by the responsible party. The Department may, at any time, request additional information.

**Step 8. Define Preliminary Cleanup Levels and Review Proposed Remedial Actions**

Most ground water in the principal aquifer (closest underlying major aquifer) is of drinkable quality and is used by nearly all Nebraskans as drinking water. Water of drinking water quality is usually suitable for all other beneficial uses. For these reasons, protecting ground water for drinking water use is most important and normally protects it for all uses. A remedial action class (RAC) is defined for pollution occurrences in three types of ground water (or overlying soils) depending on the degree (or potential) of use of the ground water as drinking water. The extent of remedial action recommended will differ depending on the RAC of the contaminated (or likely to be contaminated) ground water. (Note that the RAC assigned will be determined from the condition of the ground water prior to the pollution occurrence. The Department will do this based on information submitted by the responsible party in the detailed site assessment and other available information.) Below are definitions of the three RAC categories followed by some further explanation.

RAC-1. This category includes ground waters of Class GA and a portion of Class GB, a 500-foot radius (or greater, if determined necessary by the Department) around all private drinking water supply wells. In addition, RAC-1 shall be automatically assigned anytime a public or private drinking water supply well has been polluted. RAC-1 shall receive the most extensive remedial action measures.

RAC-2. This category includes ground waters of Class GB (except for the portion of Class GB placed in RAC-1) and Class GC(R).

RAC-3. This category includes, but is not limited to, ground waters of Class GC (except for Class GC(R) which was placed in RAC-2). RAC-3 shall receive the least extensive remedial action measures.

The RAC categories are not intended to represent a ground water classification system but rather a pollution occurrence ranking scheme. It gives the Department a method to determine the importance of remedial action based on the use of the ground water. For instance RAC-1 is the category of highest rank; it represents that ground water actually being used for drinking water and that ground water intended to be used in a public drinking water supply. Therefore, RAC-1 occurrences will normally receive the most extensive remedial action measures.

RAC-2 occurrences involve ground water not now directly used as drinking water but having a reasonable potential to be used in the future. The potential for use exists if the ground water is located in a highly populated area or is part of a regional, high-yielding aquifer or if otherwise justified. The RAC-2 category also includes ground water with prior contamination that may be easily or cost-effectively treated to drinking water quality.

Pollution occurrences will be of lowest importance, RAC-3, if the ground water involved is not used, or likely to be used, as drinking water. Generally remedial action measures will be least extensive for this category since the future use of ground water for drinking is improbable. Justification for assigning occurrences to RAC-3 will be based on a combination of several different reasons. One reason for unusability is poor natural qualitywhich makes the ground water unfit for human consumption. Insufficient yield is another reason the ground water may not be used for drinking. A third reason is historical contamination that occurred prior to the pollution event currently being investigated (see NRS § 81-1505(2)(d)). This past contamination may have rendered ground water unsuitable for drinking and uneconomical to treat. Past and present intensive land use is also a reason why ground water could be unusable as drinking water. This includes areas of concentrated industrial development or densely populated areas where ground water is likely to be contaminated or will not be used as drinking water.

The ranking of some occurrences as RAC-3 does not mean there will be places in the State where wholesale contamination of ground water will be allowed. Departmental authority through its various programs to control practices or discharges that may contaminate ground water will still be in effect. RAC-3 occurrences will be given a lower priority and less staff effort by the Department than RAC-1 or RAC-2 occurrences.

RACs were developed primarily for use with the principal aquifer--the ground water commonly used for drinking. They will also be adapted for use with both deeper and perched ground water. When doing so, interconnections with overlying or underlying ground water of different quality will be considered.

Some contamination threats may occur in which the use potential of the ground water would be RAC-1 or RAC-2, but the soil, geology, and other site-specific characteristics are such that ground water contamination is virtually impossible. After an appropriate assessment, the occurrence may be downgraded to RAC-3.

In every ground water contamination occurrence, certain minimum requirements will be imposed upon the responsible party, depending on the RAC. In RAC-1, cleanup of readily removable contaminants (e.g., free product) will be required. Additional cleanup and/or mitigation will also be required. If additional cleanup is not required, the remaining contaminated ground water will be managed and monitored to prevent any further damage.

In RAC-2, cleanup of readily removable contaminants (e.g., free product) will be required. If additional cleanup is not required, the remaining contaminated ground water will be managed and monitored to prevent any further damage.

In RAC-3, cleanup of readily removable contaminants (e.g., free product) will be required. Monitoring may also be necessary.

In addition to the minimum requirements listed above, RAC-1 and RAC-2 occurrences are potentially subject to additional cleanup requirements. No further cleanup will be required for RAC-3 occurrences based on drinking water usage. In certain cases, other permits from the Department may be required (e.g., UIC, NPDES).

The Department will set a preliminary cleanup level for additional cleanup required in RAC-1 and RAC-2 occurrences. The idealistic goal of the Department for any ground water cleanup is restoration - returning the ground water to its quality before contamination (background levels). Most (if not all) of the time these levels are impractical, unattainable, and (in some cases) unmeasurable. Therefore, the preliminary cleanup level will be based on the level necessary to maintain a drinking water use, although a preliminary cleanup level set at the background level may be considered in some cases. If a Department or EPA ground water/drinking water standard exists for the contaminant, it will be the level used. If there is no established standard, EPA's Ambient Water Quality Criteria, Health Advisories, and other documents will be used to set the preliminary cleanup level. The level will be set at the concentration which is estimated to result in a 1 in a 1,000,000 (10-6) excess cancer risk over a lifetime, at the concentration which is expected to result in no adverse health effect for longer-term or lifetime exposure, or the laboratory detection limit (if higher and within an acceptable range). If appropriate EPA data is nonexistent, data found in the literature will be used to determine the preliminary cleanup level. If sufficient information regarding acceptable levels is not found, the preliminary cleanup level will be set at background or the acceptable laboratory detection limit.

Sometimes the background level of a contaminant (as reported by the responsible party and approved by the Department) may be higher than what would be proposed as the preliminary cleanup level in the preceding paragraph. In these situations the background level will be used as the preliminary cleanup level.

In a few cases ground water cleanup based on drinking water use may not be sufficient to maintain other beneficial uses. For these unusual instances, preliminary cleanup levels will be based on the level needed to maintain the uses other than drinking water. This may necessitate cleanup even in RAC-3 occurrences. Although the ground water in RAC-3 areas is not used as drinking water, it may serve other important uses (e.g., irrigation, industrial). It may also be necessary to set cleanup levels which protect streams and lakes from a contaminated ground water discharge that would violate surface water standards. Finally, the proximity to RAC-1 or RAC-2 areas, the likelihood of slow but eventual migration to these areas, and the cumulative effects of a series of contamination events must be considered when setting the preliminary cleanup level for RAC-3.

After the responsible party is notified of the preliminary cleanup level, they have the right to agree or propose an alternate level. If a different cleanup level is proposed, it must be based on technological and economic analyses completed by the responsible party.

The technological analysis will determine if technologies exist to clean up the ground water to the preliminary cleanup level. If technologies do exist, the various methods will be reported, including the contribution of cleanup processes which occur naturally. If cleanup to the preliminary level is not technologically possible, the responsible party should report what level of cleanup is attainable. As part of this analysis, the technological feasibility of various mitigative actions (e.g., supplying new sources of water and point-of-use treatment) should be investigated.

In their economic analysis, the responsible party must examine the economics of cleaning up to the preliminary level. If it is impossible to reach the preliminary cleanup level, the responsible party will report what level of cleanup is economically possible. The economic feasibility of mitigation instead of cleanup should also be analyzed.

If cleanup to the preliminary level is not attainable based on the foregoing analyses, the responsible party will report what portion of the ground water will remain contaminated following a lesser degree of cleanup. Given the technological considerations of cleanup, the appropriate calculations should be used in an attempt to define the three-dimensional boundary of the contamination plume under different remedial action scenarios (including no cleanup). The contamination plume, in this case, is defined as ground water where the concentrations of identified contaminants exceed their preliminary cleanup levels. For every cleanup scenario assessed, the economic impacts are to be defined. The relationship of the contaminated ground water boundary to existing users and discharge points of ground water should be described.

Justification for an alternate cleanup level, a contamination maintenance program, a mitigation plan, or a combination of these will be submitted to the Department. The Department will consider the information contained in the justification on a case-by-case basis and establish a proposed final cleanup level or action. The level may be the same as the Department's preliminary cleanup level, the same as the responsible party's alternate cleanup level, or some other level.

The time frame for required action (including cleanup) will be the period of potential exposure to the contamination in the absence of any remedial action or 20 years, whichever is less. On a case-by-case basis, a longer period of time may be allowed if adequately justified by the responsible party.

The Department's decision on the remedial action necessary, including the proposed final cleanup level, will be placed on public notice. Any person may submit written comments on the proposed action or may request a hearing.

Following the Department's final decision (including changes made as a result of a hearing), a workplan for performance of the final remedial action will be prepared by the responsible party except in chemigation accidents in accordance with Neb. Rev. Stat. § 46-1101 et seq. The workplan is subject to the Department's approval.

Proceed to Step 9.

**Step 9. Implementation and Review of Remedial Actions**

The remedial actions specified in the workplan are to be implemented by the responsible party. The responsible party will keep the Department apprised of their cleanup efforts, and the Department will

periodically review the effectiveness of the remedial actions. If the long-term needs of protecting the public health and welfare and the environment have not been, or are not being, satisfied or if additional remedial action is necessary, reassess the situation in Steps 7 and 8.

Any request by the responsible party to modify the required final remedial action during the implementation process must be accompanied by additional justification as described in Step 8. The Department will review the information, and if a change is appropriate, a public notice will be issued.

If the remedial action needs have been satisfied, proceed to Step 10.

**Step 10. Final Review**

A final review will be performed by the Department to determine the need for any ongoing actions. These may include long-term monitoring to insure cleanup levels are stabilized and maintained, periodic sampling of nearby supply wells, maintenance of installed structures, and annual case review. If acceptable cleanup levels were never reached, ongoing monitoring or maintenance may be necessary to insure other ground water does not become contaminated. Such ongoing actions should be continued until ground water contamination is no longer a concern.

If ground water is no longer threatened by contamination, proceed to Step 11.

**Step 11. Situation of No Threat to Ground Water Quality**

The situation does not pose a threat to ground water quality. However, if other health, safety, or environmental concerns exist, they should be addressed by the appropriate Departmental procedures.

Note: A flow diagram depicting the steps of the protocol and major decision points is given in Figure 1.

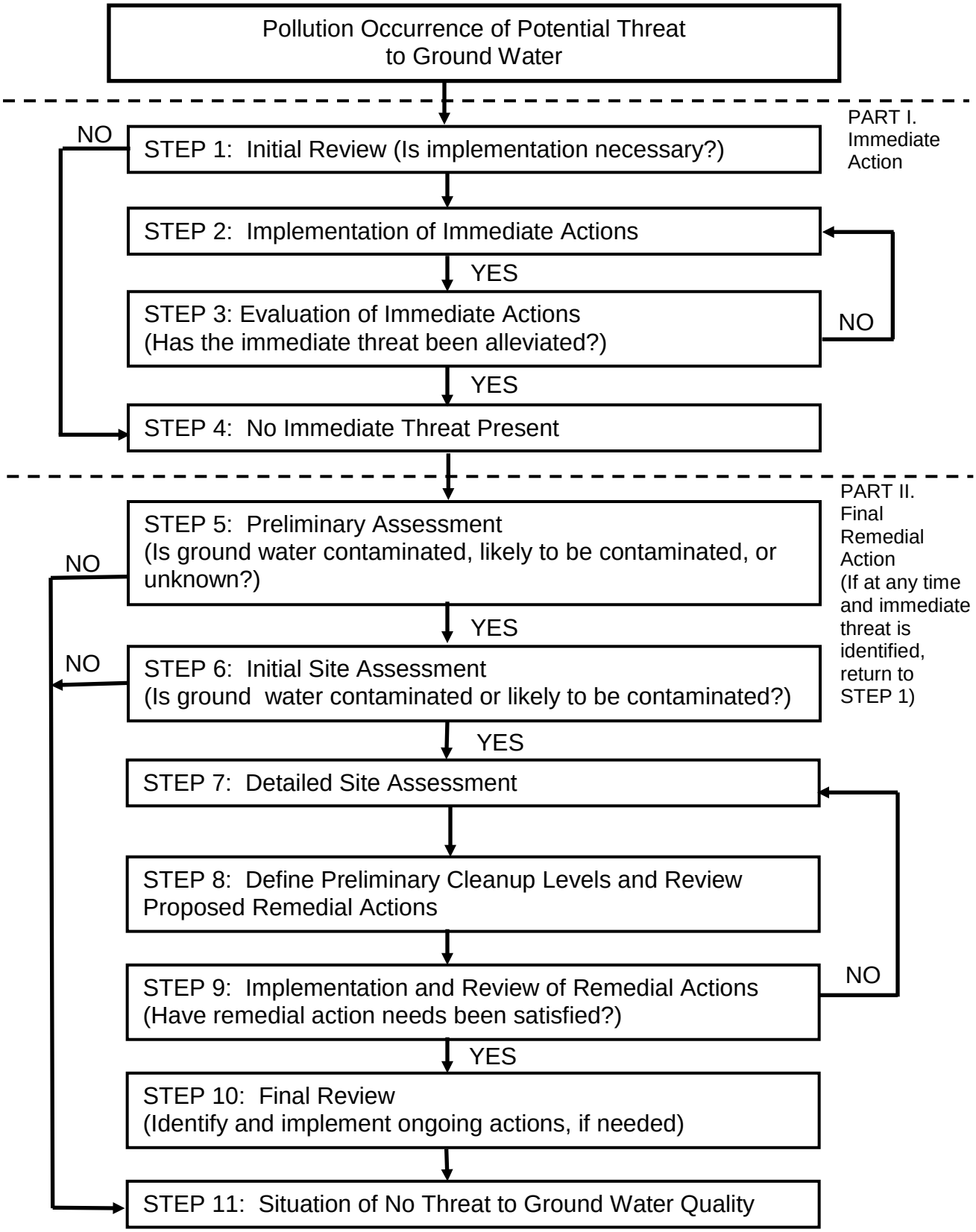


Figure 1. Flow diagram depicting protocol steps.