



ARKANSAS
Department of Environmental Quality

TO: Marcus C. Devine, Director
FROM: Ellen Carpenter, Legal Division Chief
DATE: July 12, 2005
SUBJECT: Ground Water Remediation Level Interim Policy and Technical Guidance

The Policy Review Committee (PRC) have reviewed the two documents referenced above and attached to this memo. The PRC recommends adoption of these documents on an Interim basis with a request that the Media Divisions implementing the documents collect certain information (identified below) in order to evaluate the Interim Policy over the next year. Each Media Division will collect this information over the twelve (12) months, beginning August 1, 2005, and then submit a summary of the information to the Chairperson of the Policy Review Committee.

We feel that the Interim Policy and associated Technical Guidance will provide the means to establish more consistent ground waster remediation levels across the Divisions and establish strong defensible criteria in the event the remediation levels are challenged.

Evaluation Information

- # of suspected & actual GW contamination events (projects) identified
- # suspected events positively confirmed vs # suspected events negatively confirmed
- average length of time GW investigation (start to Plume identification complete)
- # GW Strategies Proposed
 - # using MCLs as remediation goal
 - # using TI
 - # using institutional or engineering controls
 - # using risk management to establish remediation goals
 - # with identified surface water interface
- Summary of problems encountered using Interim Policy & / or Guidelines & how they were resolved
- Suggestions for improvement
- Training needs identified

Approved : _____ /s/ _____

July 13, 2005
Date

Attachments: Interim Ground Water Remediation Levels
Technical Guidance, Development of Ground Water Remediation Levels

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY
INTERIM POLICY
GROUND WATER REMEDIATION LEVELS

Background

The Divisions responsible for oversight of ground water remediation activities within the Department should use consistent methods for establishing ground water remediation levels regardless of the media Division having principal responsibility for the action.

Policy (INTERIM)

This policy shall apply to ground water remediation conducted under the jurisdiction of ADEQ. *The goal shall be to protect, enhance, and restore ground water conditions to the maximum beneficial use to the extent technically and economically feasible while maintaining conditions that are protective of human health and the environment.*

Until final regulations are promulgated by the Arkansas Pollution Control and Ecology Commission that are specific to the establishment of ground water remediation levels, such levels will be established on a case-by-case basis. The technical guidance for “**Development of Ground Water Remediation Levels**”, attached hereto, shall be utilized as the implementation tool to guide the development of ground water levels in a consistent manner.

The levels or goals for ground water remediation shall be established following:

1. Plume characterization,
2. Determination of source control measures / best management practices to be employed, and
3. Evaluation of risk to human health and the environment.

Consideration will be given to the current and reasonably anticipated future land use (ground water usage).

A proposed site remediation plan (including ground water levels / goals) shall be made available for a thirty (30) day public review and comment period. The proposed site remediation plan may be incorporated as part of a permit decision, enforcement agreement, or similar document. The content of the proposed remediation plan shall include the results of the site investigation, including the ground water plume characterization, identification and summary of source control measures, and the basis for the establishment of the proposed ground water remediation levels. In addition to the public notice typically required (publication in the newspaper of largest circulation in the county) for permitting decisions pursuant to APC&EC Reg. No. 8, a good faith effort shall be made to provide a direct notice to all land owners and tenants that own or lease property that is impacted by the groundwater contamination plume.

Divisions will require that the party responsible for the ground water contamination bear the responsibility and costs of all investigation, remedial feasibility studies, public participation, and remedial implementation when such parties can be identified.

TECHNICAL GUIDANCE

DEVELOPMENT OF GROUND WATER REMEDIATION LEVELS

I. Statement of Purpose

This document provides for the application of a consistent process for the establishment of ground water remediation levels or goals. ADEQ will utilize this process unless modified by the Director based on the best interest of the citizens of Arkansas. This document outlines the basic components ADEQ will require during the investigation and remediation of ground water contamination regardless of the source of the contamination.

II. Definitions

- **Best Management Practices (BMPs)** – Schedules of activities, prohibited activities, maintenance procedures and management practices that prevent or reduce pollution of waters of the state.
- **Ecological Hazard Quotient** – A quotient used to assess risk in which protective assumptions are used. Generally, the numerator is the reasonable worst-case constituent concentration at the point of exposure (e.g., Exposure Estimate), and the denominator is the no-adverse effects-based toxicity reference value (e.g., Effects Benchmark).
- **Engineering Controls** – Engineered structures, such as a clay cap, French drain, or slurry wall that is designed and installed to contain or minimize contaminated ground water migration.
- **Extent of Contamination** – The maximum horizontal and vertical limits of ground water pollution as defined by the concentration of chemical constituents above background concentrations.
- **Ground Water Contamination** – Pollution [as defined at A.C.A. § 8-4-102 (6)] of any waters of the state below the surface of the ground.
- **Hazard Index (HI)** – The sum of hazard quotients used in the evaluation of non-cancer human health risk.
- **Hazard Quotient (HQ)** – Non-cancer human health risk expression based on the calculated exposure of a single contaminant in a single medium divided by the reference dose.
- **Institutional Controls (IC)** – Non-engineered instruments, such as administrative and/or legal controls that minimize the potential for human exposures to contamination by limiting land or resource use.
- **Maximum Beneficial Ground Water Use** – The maximum (or highest) beneficial ground water, within the range of reasonably expected uses.
- **Maximum Contaminant Levels (MCLs)** – Federally promulgated and enforceable standards that set forth the maximum permissible level of a contaminant in water which delivered to any user of a public water system.
- **Maximum Contaminant Level Goals (MCLGs)** – Non-enforceable public health goals which establish the maximum level of a contaminant in drinking water at which no known or anticipated adverse human health effect would occur, and which allows for an adequate margin of safety.
- **Point of Compliance** – The point or boundary at which ground water should be monitored for quality and where ground water remediation levels are to be achieved. The vertical surface, extending downward to the

uppermost aquifer, located horizontally and, hydraulically down gradient of the contaminant source. (Note: Multiple points of compliance may be established when responding to complex or extensive ground water contamination events, e.g. when short-term protection goals or interim measures are incorporated into a remediation plan.)

- **Remediation Criteria** – All site specific response objectives including details of remediation, e.g. soil cleanup levels, institutional controls, engineering controls, surface water discharge requirements, ground water cleanup levels, etc.
- **Source Control** – Any remedial action, interim measure, or institutional control designed to prevent, eliminate, or contain the migration of pollution from its initial point of disposal or entry into the environment.

III. Process

1) The goal for the use of this guidance shall be to *protect, enhance, and restore* ground water conditions to the maximum beneficial use to the extent technically and economically feasible while maintaining conditions that are protective of human health and the environment. It is the policy of ADEQ that, until final regulations are promulgated by the Arkansas Pollution Control and Ecology Commission that are specific to the establishment of ground water cleanup standards, the cleanup levels or goals will be established on a case-by-case basis in a consistent manner. To this end, the process set forth below shall be utilized by ADEQ:

(a) Plume characterization

The ground water pollution (contamination) plume shall be fully characterized as to:

1. The extent of contamination,
2. The contamination source(s),
3. Ground water flow direction,
4. Ground water gradient,
5. Ground water velocities,
6. Hydrogeologic units or formations impacted, and
7. Hydrologic connectivity between units.

(b) Source Control Measures / Best Management Practices

Technological, chemical, or biological methods (or combinations thereof) must be implemented to control the continued migration of pollution from the source. The following hierarchy shall be utilized, to the extent practicable, when selecting appropriate source control measures / practices:

1. Removal (excavation),
2. Physical barriers
3. *In situ* treatment

(Note: All source control measures / best management practices must be implemented with appropriate and adequate follow-on monitoring to determine the effectiveness of the measures.)

(c) Ground Water Cleanup Strategy

The ground water remediation levels shall be established following:

1. Plume characterization,
2. Determination of source control measures / BMPs to be employed, and
3. Evaluation of risk to human health and the environment.

Consideration will be given to the current and reasonably anticipated future land use (including ground water usage).

The party implementing the response to a ground water contamination event shall prepare a proposed site remediation plan for ADEQ review. Following determination of technical adequacy by ADEQ, a proposed site remediation plan (including all remediation criteria to be applied to the site) shall be made available for public review and comment. Content of the proposed remediation plan shall include:

1. The results of the site investigation, including the ground water plume characterization,
2. Identification, and summary of source control measures / BMPs,
3. The basis for the establishment of the proposed remediation criteria, and
4. The minimum frequency for ADEQ monitoring of the progress and effectiveness of the remediation.

The proposed site remediation plan may be incorporated as a part of a permit decision, enforcement agreement, or other similar document. The public notice of the proposed site remediation plan shall follow the procedures typically required for ADEQ permitting actions (publication in the newspaper of largest circulation in the county). In addition, a good faith effort shall be made to provide a direct notice to all land owners and tenants that own or lease property that is impacted by the ground water contamination plume.

ADEQ shall consider all relevant comments submitted during the comment period, revise the remediation plan as appropriate, prepare a Response to Comments, and issue a final decision regarding the site remediation plan.

2) **Ground Water Remediation Criteria Establishment**

Remediation criteria for protection of human health should use existing regulatory standards (e.g., drinking water standards) when such are available and necessary to protect a current or reasonably anticipated future ground water use. Other factors that must be considered when developing site-specific ground water remediation criteria include:

- **Background Ground Water Quality** – the quality of the ground water in proximity to the site that is unaffected by the release.
- **Maximum Beneficial Ground Water Use** – within the range of reasonably expected uses, the maximum (or highest) beneficial ground water use warrants the most stringent ground water cleanup levels.
- **Ground Water Use Designation** – use designation as established by the Arkansas Soil and Water Conservation Commission and / or the APC&EC.
- **Actual Ground Water Use** – use(s) of ground water being employed in the immediate vicinity of the site or study area.
- **Maximum Contaminate Levels (MCLs) / Maximum Contaminate Level Goals (MCLGs)**
- **Ground Water Discharge to Surface Water**
- **Best Management Practices**
- **Technical Feasibility** – achievement of the proposed cleanup levels / goals practicable from an engineering perspective.
- **Human Health and Environmental Risk** – actual and potential relative risk to human health and ecosystems based on exposure pathway(s) and constituents available for exposure.
- **Point of Compliance**

3) **Acceptable Risk Range**

This guidance does not require the use of a specific risk assessment methodology. However, any risk assessment approach that is utilized must:

1. Identify the Constituents of Concern (CoCs);

2. Establish the toxicity of each CoC;
3. Identify and evaluate all potential and actual Exposure Pathways;
4. Identify all potential and actual Receptors (human health and ecological);
and
5. Evaluate the potential and actual effects or CoC exposures on each receptor.

Remediation levels for protection of human health should use existing regulatory standards (e.g., drinking water standards) when such are available and necessary to protect a current or reasonably anticipated future ground water use. If promulgated standards are not utilized for establishing the remediation criteria, a risk assessment will be conducted or utilized to evaluate and establish acceptable risk management-based remediation criteria.

In the absence of existing, promulgated standards or in cases where the designated use differs from the actual or reasonably anticipated use; the remediation standard may be based on an acceptable risk range. The acceptable risk range shall be based on protection of human health and the environment.

Remediation levels established for **human health** protection will be based on concentrations that represent an excess upper bound lifetime risk (for known or suspected carcinogens) between 10^{-4} and 10^{-6} . In addition, non-cancer risk shall be based on levels of contaminants that are equal to or below a HQ of 1; or, for sites with multiple contaminants, a HI equal to or below 1.

Remediation levels established for **ecological** protection will be based on concentrations that represent an ecological risk characterization above an ecological HQ ratio. Typically, a HQ or HI should be less than 0.25. This level is conservatively chosen to account for exposures due to background conditions (i.e., naturally occurring substances like metals and sources of regional pollution). If the HQ or HI is greater than 0.25, a more detailed ecological risk assessment may be needed to better define the potential risk, if any.

IV. Tracking and Monitoring

All remedies that establish ground water levels or goals above background quality shall be reviewed by the ADEQ Division overseeing the ground water remediation (at a minimum) once every five (5) years from the date of remedy implementation. The purpose of these reviews is to determine if remedy / ground water cleanup levels remain protective of human health and the environment. The review will also document the status of any IC required by the remedy selection.

All ICs that are implemented as part of a remedy selection will be recorded in a data base (to be established or identified). Until such time as an IC Tracking data base is established, each Division conducting or overseeing ground water remediation shall document, at a minimum, the following information:

- Site or Project Name
- Legal Description (including latitude / longitude coordinates)
- AFIN
- Constituents of Concern
- Type of IC Required
- Party responsible for maintaining the IC

V. Inter- / Intra-Agency Coordination

The establishment of ground water remediation levels or goals is a process that must be highly coordinated due to the layers of authorities and jurisdictional issues. All ADEQ Divisions charged with the oversight and / or response to issues of ground water contamination shall communicate and coordinate with the appropriate

ADEQ Division(s) and / or other State Agencies to insure that appropriate and legally defensible levels are established. Below is a summary to be used as a guide for proper coordination on ground water remediation levels issues:

- Arkansas Soil and Water Commission – Ground water use designation, non-point source issues.
- Arkansas Department of Health – Human-health exposures.
- ADEQ Water Division – Water quality, discharge criteria.
- ADEQ Hazardous Waste Division – Hazardous substance / hazardous waste issues, risk assessment / risk management assistance.
- ADEQ Regulated Storage Tank Division – Petroleum only ground water contamination issues.
- ADEQ Environmental Preservation Division – Review of all environmental projects (including remedy decisions).

