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Sponsored by EPA's Technology Innovation Office &
the Corrective Action Programs Branch in the
Office of Solid Waste

# Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action




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# Purpose of Session

- Introduction to the Handbook
- Describe background information, goals and key messages
- Describe user-friendly format
- Summarize key policies
- Describe next steps
- Provide time for Q&A

# Session Logistics



# Background

- Identified in RCRA Cleanup Reforms I
- Developed by EPA-HQ and Region III staff
- Predominantly based on May 1,1996 ANPR, and joint RCRA/CERCLA guidance
- Comment period (May 3-July 2, 2000); final posted 10/15/01 on CA web site (www.epa.gov/correctiveaction)

# Goals

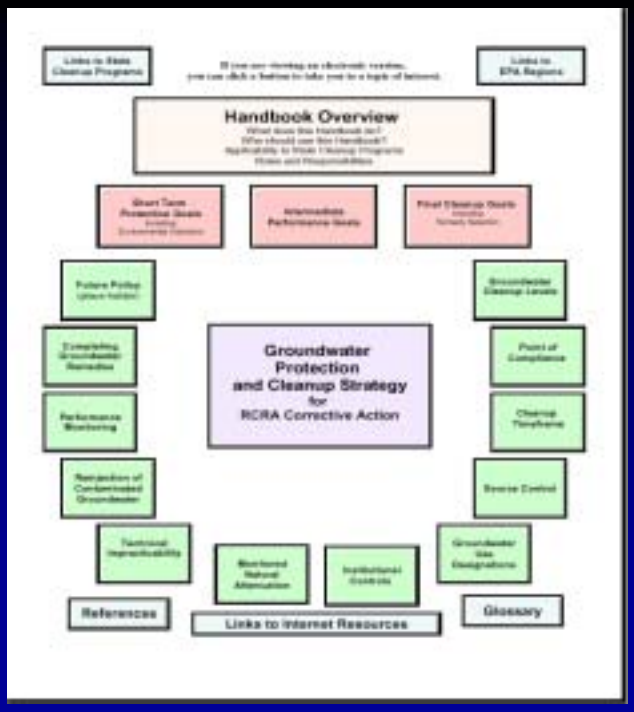
- Help meet reform objectives: faster, focused, more flexible cleanups and foster creative solutions by ...
  - Compiling, summarizing and clarifying key groundwater policies in one document, and thus...
  - Reducing time consuming uncertainties and confusion
  - Promote national dialogue on groundwater issues

# Key Messages

- Conveys importance of groundwater resources
- Promotes results-based, phased approach
- Highlights flexibility
- Conveys document is guidance, not rule
- Emphasizes states as primary implementers & decision makers

# Format

- Question/answer, plain language
- Includes rationale for each policy
- Includes glossary & extensive references
  - Over 50 references available via direct hyperlinks!
- Internet based with internal/external links
- Easy to update (keep “evergreen”) as policies evolve


Handbook Overview
Groundwater Protection and Cleanup Strategy for RCRA Corrective Action
References
Links to Internet Resources
Glossary

# Topics Addressed

- Overview
- Groundwater protection and cleanup strategy*
- Short-term protection goals
- Intermediate performance goals*
- Final cleanup goals
- Cleanup levels
- Point of compliance
- Cleanup timeframe
- Source control
- Groundwater use designations
- Institutional controls*
- Monitored natural attenuation
- Technical impracticability
- Reinjection of contaminated groundwater
- Performance monitoring
- Completing groundwater remedies
- References
- Internet resources
- Glossary

*reflects final version - new sections in response to comments

# Key Questions from Overview

- Who should use the Handbook?
- What are general roles and responsibilities?
- How do the policies apply to States?
- Where do the policies come from?
- How will I know the policies are current?



# Groundwater Protection and Cleanup Strategy

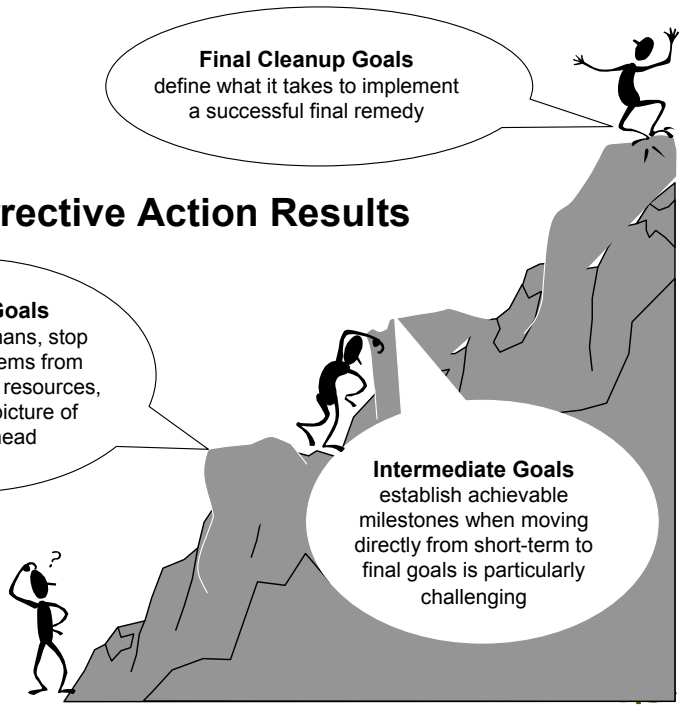
- Focus on priority sites
- Control short-term threats
- Prioritize actions within facilities
- Return usable groundwaters to maximum beneficial use
- Emphasize clear communication
  - **What, where, when, who, why and how**

# RCRA Corrective Action Results

**Final Cleanup Goals**
define what it takes to implement a successful final remedy

**Short-Term Goals**
control risks to humans, stop groundwater problems from getting bigger, focus resources, help give clearer picture of challenges ahead

**Intermediate Goals**
establish achievable milestones when moving directly from short-term to final goals is particularly challenging



# Short Term Protection Goals
## (Environmental Indicators)

- Ensure:
  - **Humans are not being exposed to unacceptable levels; and**
  - **Contaminated groundwater is not migrating above levels of concern**
- Other key messages:
  - **Who evaluates and determines**
  - **Discusses key exposure routes (e.g., air and groundwater/surface water)**
  - **Relationship to intermediate and final goals**

# Intermediate Performance Goals

- Demonstrate progress
- Facility specific
- EPA encourages intermediate goals to:
  - **Focus resources**
  - **Improve environmental conditions**
  - **Enhance performance of cleanups**
- Consistent with phased approaches
- Examples:  source control, off-site plumes

# Final Cleanup Goals



- Three threshold criteria:
  - **Protect human health and environment**
  - **Achieve “media cleanup objectives”**
  - **Controls sources to the extent practicable**
- Other key messages:
  - **Return usable groundwaters to maximum beneficial uses wherever practicable**
  - **Long-term containment where appropriate**
  - **Streamlined evaluations**

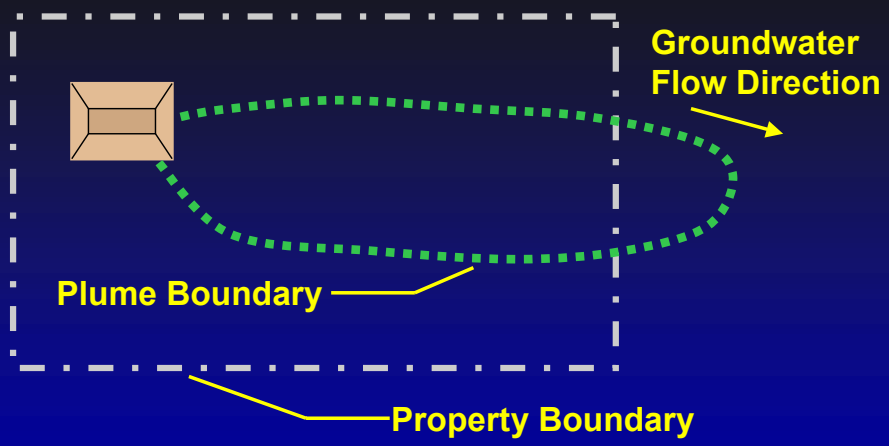
# Groundwater Cleanup Levels

- Chemical concentrations supporting facility-specific objectives
  - **Use existing cleanup standards when available and appropriate**
  - **Risk range ($10^{-4}$ to $10^{-6}$) and hazard quotient of one applies**
  - **Lower or higher could be appropriate**
  - **Consider gw use designation, exposures, and cross-media transfer (e.g., to surface water and air), and ecologic protection**

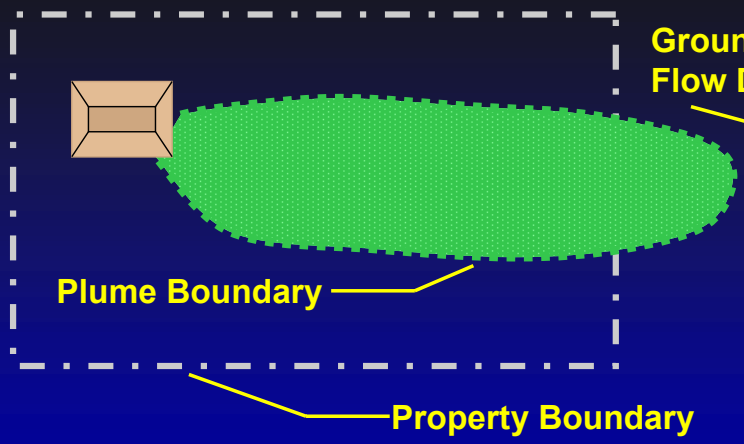


# Point of Compliance (POC)

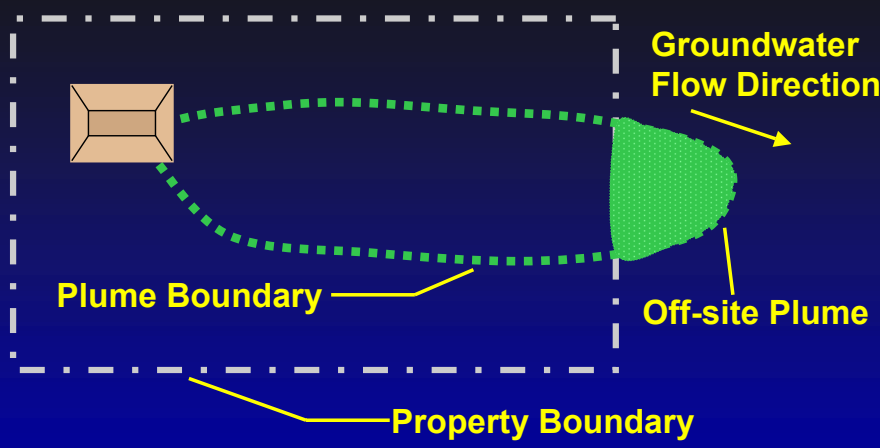
- Conveys general definition - location to measure and meet cleanup numbers
- Different POC options depending on goals, e.g.,
  - **Short term - plume boundary**
  - **Final - throughout the plume/unit boundary if goal involves returning groundwater to particular cleanup level**
  - **Intermediate - facility specific**




Plume boundary **point of compliance for short-term protection goal** associated with the Migration of Contaminated Groundwater Under Control environmental indicator. The heavy dashed line represents the point of compliance (i.e., boundary of the plume) defined by "contaminated" and "uncontaminated" monitoring wells.




Example groundwater **point of compliance for final cleanup goal** involving returning contaminated groundwater to its maximum beneficial use. The shaded area represents a throughout the plume/unit boundary point of compliance corresponding to the volume of contaminated groundwater that needs to achieve specific groundwater cleanup levels.




Example of a **point of compliance for an intermediate performance goal**. In this example, the point of compliance is considered to be throughout the portion of the contaminant plume that extends beyond the facility boundary.

# Cleanup Timeframe



- Facility-specific schedule for the groundwater remedy
  - **Time to construct remedy**
  - **Estimate of time needed to achieve cleanup levels at the POC**
- Should be reasonable given facility-specific conditions
  - **e.g., longer timeframes may be acceptable where groundwater is not currently being used for drinking water**

# Source Control



- Removal, treatment, or containment
  - **Source - reservoir for continued migration**
- Key element for most cleanups
  - **Threshold criterion for final remedies**
- Balance between treatment and containment
- Preference for treatment of “principal threats”
  - **Recognizes when treatment of principal threats may not be appropriate**

# Groundwater Use Designations

- Based on use, value and vulnerability
  - **state-wide system**
- Examples of factors to consider:
  - **Quantity, quality, and yield**
  - **Reasonably expected future use**
- Other key messages:
  - **Discourages current use as only factor**
  - **States generally define use**
  - **Many states designate all gw as drinking water**



# Institutional Controls (ICs)

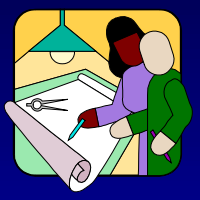
- Administrative controls
- Handbook defines general categories and examples of ICs
- Recommends ICs go through evaluation, selection, implementation and O&M stages
  - **Operation and Maintenance includes "monitoring"**
- Provides examples for contaminated groundwater
  - **well drilling prohibitions, easements to provide access to monitor gw or access to drilling, enforceable conditions in permits/orders, etc.**

# Monitored Natural Attenuation

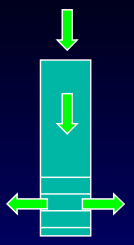
- Cleanup approach relying on natural processes and monitoring
- Policy identifies factors where MNA is likely candidate:
  - **Capable of achieving cleanup objectives**
  - **Degradation is dominant process**
  - **Remedy includes source control**
  - **Plumes are already stable or shrinking**
  - **Used in conjunction with active approaches or as a follow-up measure**

# Technical Impracticability (TI)

- Situations where achieving groundwater cleanup levels for a final remedy is not practicable from an "engineering perspective"
  - **Needs to be technically justified**
  - **Mere presence of NAPL not sufficient**
  - **Alternative remedial strategy**
  - **POC applies outside TI zone**
  - **Can be revisited if cleanup becomes "technically practicable" in future**



# Reinjection of Contaminated Groundwater



- Describes exemption to ban on injecting hazardous wastes into or above a drinking water aquifer
  - **Allows injection of groundwater contaminated with "hazardous wastes" back into aquifer**
  - **Must be treated to substantially reduce hazardous constituents either before injection or as a result of subsequent in-situ treatment**
  - **Part of a RCRA or Superfund cleanup**
- Coordination with State is important!

# Performance Monitoring

- Periodic measurement of chemical and/or physical parameters
  - **to evaluate whether facility is achieving particular goals**
- Type, location and frequency should be based on monitoring objectives and facility-specific factors
- Should continue for a specified time after facility achieves final cleanup goals



# Completing Groundwater Remedies




- Final Handbook recognizes three phases of completion
  - **implementing (i.e., construction is completed and remedy is operating) the remedy**
  - **achieving final cleanup goals with controls**
  - **fulfilling all cleanup obligations including long-term monitoring**

# Next Steps

- Promote continued open dialogue
- Update Handbook to reflect changes in policies and add new topics; e.g.,
  - **site characterization**
  - **groundwater / surface water interaction**
  - **groundwater to indoor air**

For additional information or questions, please call or e-mail:

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**tomassoni.guy@epa.gov**

Handbook, fact sheet, cover letter and FR notice available at:

**http://www.epa.gov/correctiveaction**

## Links to related resources