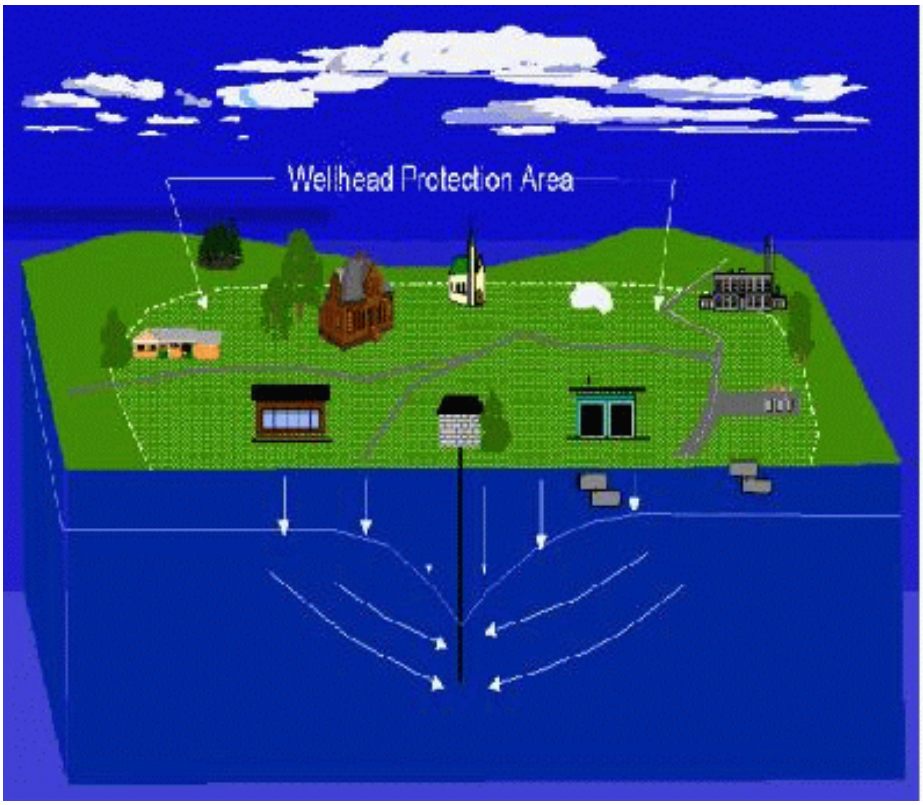
Ground Water Use, Value and Vulnerability as Factors in Setting Cleanup Goals

Issues/Options paper developed by the Cross-Program Ground Water Task Force
established under EPA's One Cleanup Program Initiative



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Introduction

Notice: It is very important to note that this paper has been prepared by EPA's Ground Water Task Force for informational purposes only. This paper does contain some discussion summarizing EPA's statutory authorities and regulations. However, this paper does not constitute an EPA statute or regulation and does not substitute for such authorities. In addition, the statements in this paper do not constitute official statements of EPA's views and are not binding on EPA or any party.

This options paper is being developed by EPA's Ground Water Task Force, a workgroup established under the "One Cleanup Program Initiative" of the Office of Solid Waste and Emergency Response (OSWER).[1] This Task Force is comprised of EPA and State regulatory officials, and was formed to:

- serve as the main technical / policy / communication / networking resource for OSWER on ground water issues;
- promote cross-program coordination and communication on technical and policy issues related to the cleanup of contaminated ground water;
- identify and prioritize and work to solve and/or provide guidance on ground water issues and projects that will benefit multiple programs; and
- assign subgroups to work on priority issues, and/or making recommendations to EPA senior management on the best course of actions for such issues.

In carrying out its purpose, Ground Water Task Force representatives discussed with Senior EPA and State managers a variety of implementation challenges cleanup programs face with respect to setting ground water cleanup goals.[2] One of those challenges, which was identified as a priority issue, is associated with differing perspectives on how ground water use, value and vulnerability (see Highlight Box on the following page) should influence site-specific ground water cleanup goals. The purpose of this paper is to promote dialogue by providing a brief background, followed by differing stakeholder points of view (based on written or anecdotal input) with respect to problems and/or challenges, and potential options for addressing these problems. Stakeholders include Federal and State regulatory officials, and members of the regulated community, as well as environmental and public interest groups.

These points of view do not necessarily represent the position of EPA and are provided to assist in framing the issues presented. The Ground Water Task Force recognizes that other problems and options may exist, and no decisions have been made at this point with respect to which option(s) the Agency may pursue. Readers are encouraged to provide their comments on the paper and to suggest solutions they believe the Agency should consider to address the problems

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[1] For more information concerning the EPA's One Cleanup Program, refer http://www.epa.gov/swerrims/onecleanupprogram/index.htm. For more information concerning the One Cleanup Program Ground Water Task Force, refer to http://gwtf.cluin.org/.

[2] Oral presentation and discussion on March 4, 2003 before the Cleanup Programs Council, an advisory group for the OSWER One Cleanup Program initiative.

Ground Water Use, Value and Vulnerability

(Definitions provided for the purpose of this paper)

Ground water use typically refers to the current use(s) and functions of ground water as well as future reasonably expected use(s). Ground water use can generally be divided into drinking water, ecological, agricultural, industrial/commercial uses or functions, and recreational. Drinking water uses include both public supply and individual (household or domestic) water systems. Ecological use commonly refers to ground water functions such as providing base flow to surface water to support habitat; ground water (most notably in karst settings) may also serve as an ecologic habitat in and of itself. Agricultural uses generally refers to crop irrigation and live-stock watering. Industrial/commercial uses refers to use in any industrial process, such as for cooling water in manufacturing, or commercial uses such as car wash facilities. Recreational uses generally pertains to impacts on surface water caused by ground water; however, ground water in karst settings can be used for recreational purposes such as cave diving. All of these uses and functions are considered "beneficial uses" of ground water. Furthermore, within a range of reasonably expected uses and functions, the maximum (or highest) beneficial ground water use refers to the use or function that warrants the most stringent ground water cleanup levels. (see Figure 1 reflecting ground water use in the United States.)

Ground water value is typically considered in three ways: for its current uses; for its future or reasonably expected uses; and for its intrinsic value. Current use value depends to a large part on need. Ground Water is more valuable where it is the only source of water, where it is less costly than treating and distributing surface water, or where it supports ecological habitat. Current use value can also consider the "costs" associated with impacts from contaminated ground water on surrounding media (e.g., underlying drinking water aquifers, overlying air - particularly indoor air, and adjacent surface water). Future or reasonably expected values refer to the value people place on ground water they expect to use in the future; the value will depend on the particular expected use or uses (e.g., drinking water, industrial, etc.). Society places an intrinsic value on ground water which is distinct from economic value. Intrinsic value refers to the value people place on just knowing clean ground water exists and will be available for future generations, irrespective of current or expected uses. While the value of ground water is often difficult to quantify, it will certainly increase as the expense of treating surface water increases, and as existing surface water and ground water supplies reach capacity with continuing development.

Ground water vulnerability refers to the relative ease with which a contaminant introduced into the environment can negatively impact ground water quality and/or quantity. Vulnerability depends to a large extent upon local conditions including, for example, hydrogeology, contaminant properties, size or volume of a release, and location of the source of contamination. Shallow ground water is generally more vulnerable than deep ground water. Private (domestic) water supplies can be particularly vulnerable because (1) they are generally shallower than public water supplies, (2) regulatory agencies generally require little or no monitoring or testing for these wells, and (3) homeowners may be unaware of contamination unless there is a taste or odor problem (EPA, 2003). Furthermore, vulnerability can change over time. For example, anthropogenic activities, such as mining or construction, can remove or alter protective overburden thus making underlying aquifers more vulnerable.

stated in this paper and/or other problems not mentioned herein. As conveyed in this document, any additional option submitted should describe the particular problem(s) it would address, as well associated advantages and disadvantages. These comments will be used in planning future activities of the Task Force and in developing recommendations for EPA senior managers on a course of action to address the issues raised in this paper.

Questions or comments concerning this paper should be directed to Ken Lovelace and sent via email to gwtf@emsus.com by July 31, 2004. Copies of this paper can be obtained from the Ground Water Task Force web site: http://gwtf.cluin.org/.

EPA recognizes that some stakeholders are concerned that raising issues addressed in this paper may generate pressures to change existing approaches, promote debates that slow down cleanup decisions, and ultimately affect the ability of regulatory programs to impose and achieve cleanup goals. However, the Task Force believes that avoiding these issues would not be responsive to other concerns raised during stakeholder meetings held by the Agency in 2003 concerning the goals of the One Cleanup Program initiative. Additional stakeholder meetings are planned specifically for this and other options papers developed by the Task Force. By including States on the Task Force and promoting public dialogue on these ground water issues, the Agency is attempting to fairly balance all of these concerns.

Background

Since the 1970s, EPA and States have enacted a number of laws and regulations (as well as supporting initiatives, guidance and policies) concerning both the protection as well as cleanup of contaminated ground water. To date, the most concise, cross-programmatic statements concerning EPA's ground water-related policies were provided in the document titled, "Protecting the Nation's Ground Water: EPA's Ground Water Strategy for the 1990's" (EPA, 1991). Several of the key principles, findings and recommendations are presented below.

Overall Goal:

- "The overall goal of EPA's ground water policy is to prevent adverse effects to human health and the environment and to protect the environmental integrity of the nation's ground water resources."

With respect to remediation:

- "Ground Water remediation activities must be prioritized to limit the risk of adverse effects to human health first, and then to restore currently used and reasonably expected sources of drinking water and ground water closely hydrogeologically connected to surface waters, whenever such restorations are practicable and attainable."

- "Given the costs and technical limitations associated with ground water cleanup, a framework

should be established that ensures the environment and public health benefit from each dollar spent is maximized. Thus in making remedial decisions, EPA must take a realistic approach to restoration [of contaminated ground water] based upon actual and reasonably expected uses of the resource as well as social and economic values."

With respect to Federal, State and Local responsibilities:

- "The primary responsibility for coordinating and implementing ground water protection programs has always been and should continue to be vested with the States. An effective ground water protection program should link Federal, State, and Local activities into a coherent and coordinated plan of action."

In the early 1990's, EPA encouraged States to institute Comprehensive Ground Water Protection Programs (EPA, 1992). The basic goal of the CSGWPP-partnership between the States and EPA is to achieve a more efficient, coherent, and comprehensive approach to the nation's ground water resources. More specific goals of an individual State CSGWPP are to consider ground water use, value, and vulnerability in setting priorities for both prevention and remediation.

EPA's cleanup programs fully supported CSGWPPs in their Directive titled, "The Role of CSGWPPs in EPA Remediation Programs" (EPA, 1997a). While relatively few States have pursued CSGWPPs (see http://www.epa.gov/safewater/csgwpp.html), many other States have over the years developed other approaches to designate ground waters based on use, value and vulnerability. Some of the many approaches, which are often used as factors in setting ground water cleanup goals, include:

$ formal state-wide (mapped) classification systems (see for example, Connecticut's system at http://www.dep.state.ct.us/wtr/wq/wqsinfo.htm), and ground water classification exception areas (see for example, New Jersey's provisions at http://www.state.nj.us/dep/srp/dl/ceaguid2.pdf);

$ non-degradation policies (e.g., Rhode Island, Maine, Wyoming) that recognize all ground water as source of drinking water;

$ States that presume as a starting point that all ground water is potential source of drinking water, but allow for site-specific variations of that classification (see for example, Michigan waiver provision available at http://www.michigan.gov/deq/0,1607,7-135-3311-58095--,00.html and their guidance on Ground Water Not In An Aquifer (GWNIAA) determinations available at http://www.deq.state.mi.us/documents/deq-wmd-swp-gwnia-ftp.pdf.

$ urban use designations as part of voluntary and brownfield cleanup bills (see for example Ohio's Urban Site Designations available at http://www.epa.state.oh.us/derr/pdf_doc_wpd/rule_10.pdf.)

$ ground water management zone approaches that recognize impairment (which allows for long-term responses like natural attenuation) without changing a ground water classification (see for example, Illinois' Ground Water Management Zones

(http://www.epa.state.il.us/land/regulatory-programs/permits-and-management/establishing-groundwater-management-zone.html) and California's Containment Zone Policy http://www.swrcb.ca.gov/plnspols/wqplans/res92-49.html); and,

- **$** Nebraska's approach to designating and classifying ground water, and their ground water remediation protocol available Title 118, Chapters 6, 7, and 8 and Appendix A. (available at http://www.deq.state.ne.us/RuleAndR.nsf/pages/118-TOC).

Later in the 1990s, Congress amended the Safe Drinking Water Act placing a new focus on assessing and protecting sources of drinking water (see EPA, 2003b). The basic elements of source water assessment and protection include: delineating areas of ground water and surface water that supply public drinking water systems; assessing those areas with respect to susceptibility of the drinking water sources to actual or potential sources of contamination; and, developing protection/management strategies and contingency plans. EPA anticipates that these delineated source water areas will help to focus both protection and remediation activities.

Regulations and supporting policy and guidance for the three federal cleanup programs (Superfund, RCRA Corrective Action, Underground Storage Tanks) address the role of ground water use, among other factors, in setting cleanup goals. For example, the Superfund Rules of Thumb for Remedy Selection (EPA, 1997b) provides regulatory references and guidance pertaining to selecting cleanup goals for ground water that is a either a current, potential, or not anticipated to be a source of drinking water. The Handbook of Ground Water Protection and Cleanup Policies for RCRA Corrective Action (EPA, 2002) addresses setting cleanup goals based on various designated uses of ground water. In approving protective corrective action plans for releases from underground storage tanks, 40 CFR 280.66 (http://www.epa.gov/swerust1/fedlaws/cfr.htm) specifies a number of factors to be considered. These include the hydrogeologic characteristics of the facility and the surrounding area, and the proximity, quality and current and future uses of surface water and ground water in the surrounding area.

Problem Statements

For the purpose of this options paper, the Ground Water Task Force developed generalized problem statements based on written and anecdotal information. However, the problem statements listed below do not necessarily represent the position of EPA. Rather, these problem statements attempt to capture the perspectives of various stakeholders such as Federal and State regulatory officials, and members of the regulated community, as well as environmental and public interest groups. Also, individual opinions can vary as much within these respective groups as between them. Furthermore, these problem statements are not listed in any order of importance or priority, and do not represent all possible points of view associated with the role of ground water use, value and vulnerability in setting cleanup goals.

1. There does not appear to be enough awareness by the general public, regulated community, and government officials pertaining to the various ground water functions, associated values and vulnerability of drinking water supplies to contamination. Adding to this problem is the lack of

awareness and understanding of how aquifers are connected to other aquifers and to surface water, as well as long-term aspects of contaminant migration. Furthermore, there is uncertainty with respect to how various contaminants (individually and cumulatively) affect public health and environmental quality.

2. There appears to be an increasing demand for reliance on exposure controls rather than cleaning up contaminated ground water. Decisions not to cleanup may be short-sighted with regard to increasing future demands for clean drinking water supplies.

3. There is a lack of agreement among stakeholders regarding methods to determine which ground waters are "reasonably expected" to be sources of drinking water, and how those decisions should influence cleanup objectives. For example, some programs require cleanup to drinking water standards only for ground water currently planned to be used as a drinking water supply rather than considering multi-generational long-term needs. Other programs require cleanup to drinking water standards for ground water that, in the view of some stakeholders, would never be used as drinking water supply due insufficient quantity and quality. A related problem is the lack of clear direction on determining appropriate levels or degree of cleanup for ground water not determined to be a reasonably expected source of drinking water.

4. Ground water cleanup activities and decisions are often not prioritized in a manner that would result in addressing the most pressing needs or maximizing the public health benefit of monies spent.

Options for Addressing Problems

The options listed below are intended to address one or more of the problems identified above. It is assumed that the statutory and regulatory framework for EPA cleanup programs will not change in the near future, so all options fall within the current framework for these programs. It is also assumed that training and outreach activities are an essential component of each option. Furthermore, in evaluating options, the Agency will take into account resource needs in terms of time, staff and dollars. A brief discussion of advantages and disadvantages is included for each option. A matrix table showing the problems addressed by each option is included as Table 1.

Option 1 - Develop a series of educational fact sheets and internet training seminars (targeted primarily to government officials and members of the regulated community) to raise awareness of ground water use, value and vulnerability, interconnection between ground water and surface water systems, and health impacts to contaminants most commonly found in ground water. This effort would include summaries of the findings from the upcoming 2004 Ground Water report to Congress.

Advantages: Would help to address problem #1. Would build on EPA's ground water

valuations studies conducted in the early 1990s. May also help address problem #2 by helping people understand implications of current trends in ground water cleanups.

Disadvantages: Wouldn't likely provide much benefit with respect to other identified problems.

Option 2 - Conduct research on the impacts on other developed nations that have resulted from either the presence or lack of strong ground water protection programs.

Advantages: Would help address problem #1. May also help address problem #2 by helping people understand implications of current trends in ground water cleanups.

Disadvantages: Would only provide information and would not in and of itself promote any direct changes.

Option 3 - Develop summaries of how individual EPA and State cleanup programs consider ground water use, value and vulnerability in setting cleanup goals (e.g., ground water classification and classification exception systems; ground water management zone type approaches, etc.). These summaries would be written with Internet links to more detailed resources. EPA would provide access to these summaries via its One Cleanup Program web site. This option could also involve low-cost internet training to raise awareness of the range of approaches being used by EPA and States.

***Advantages*:** This option would address, to various degrees, most of the identified problems. For example, providing access to these summaries could address problems 1 and 2 by raising awareness of EPA and State efforts to protect valuable ground water resources. Also, it could potentially lead to broader acceptance of successful approaches that respond to problems 3 and 4. In particular, it would highlight approaches used by States to distinguish between situations where a drinking water pathway should or should not be considered in site specific risk evaluations. Additionally, these summaries and the associated resource links would help ensure that interested stakeholders were more fully aware of the flexibilities within a particular program. Lastly, the training element of this option would increase the visibility and understanding of the various approaches being used.

Disadvantages: One of the key disadvantages of this option is keeping current the needed information. Another disadvantage is that it would highlight programmatic differences that may result in unwanted pressure on some programs to adopt changes to the way in which they currently set ground water cleanup goals.

Option 4 - Takes option 3 one step further by developing EPA policy memo that explains how EPA cleanup programs acknowledge the various approaches used by States in setting ground water cleanup

goals based on ground water use, value and vulnerability. For example, the policy statement would clarify how State ground water management zone policy could influence goals established under EPA's cleanup programs. Internet training could also be used to increase awareness and understanding of the policy statement.

Advantages: This option offers the same advantages as Options 3 with the added benefit of clarifying EPA's policies on the subject.

Disadvantages: This option is associated with same disadvantages posed by Options 3. An additional disadvantage would be a clear statement of policy on the subject may in some circumstances limit flexibility desired by some stakeholders.

Option 5 - Using information from Federal and State cleanup programs, develop a general framework that describes how to prioritize sites according to problem severity and ground water use, value and vulnerability. This framework would clearly describe how ground water use, value and vulnerability as well as specific problem magnitude (e.g. risk) can be used to prioritize sites and influence remedial decisions. This framework would describe how a prioritization system directed at site-specific ground water problems can work within statewide general classification systems and how, for example, ground water management zone policy could influence goals established under EPA's cleanup programs.

Advantages: This option would address many of the problems identified by encouraging consistency across programs, and by defining the key variables (use, value and vulnerability) that should be considered in remedial decisions.

Disadvantages: This option would be fairly resource intensive in terms of Federal and State staff and contractor support needed to develop the framework. The objective of this option would be similar in many ways to EPA's Office of Water initiative in the early 1990s to promote Comprehensive State Ground Water Protection Programs (CSGWPPs). Therefore, this option may be associated with many of the challenges realized in the CSGWPP initiative.

Option 6 - Use defined Source Water Assessment Program (SWAP) areas (required by the 1996 amendments to the Safe Drinking Water Act) to promote consistency in ground water cleanup decision making. The option would involve establishing a means that would encourage stakeholders to become more aware of and involved with various ground water cleanups taking place within or near an individual Source Water Assessment Area. The objective would be that cleanups could be selected to maximize efficiencies and benefits within a particular source water area.

***Advantages*:** Would specifically address most of the identified problems. States have completed their SWAP delineations. These areas, which include both ground and surface waters and ground water-surface water interaction, could be used to help address ground water cleanup and other ground water management related issues. This option could promote greater

consistency in cleanup goals, at least within source SWAP areas. Additionally, Source Water Assessments are based on a relatively new program that has significant public interest.

Disadvantages: Reluctance of States to release detailed SWAP information. Does not address private water supplies. Additionally, coordination among cleanup projects within a Source Water Area could be viewed by some as an additional hurdle that could cause delays.

Option 7 - Promote and provide funding assistance for regular meetings within an individual state or watershed that brings together the various programs and stakeholders involved with ground water cleanup and protection. One of the objectives of these meetings would be to help prioritize cleanup actions based on factors such as magnitude and extent of ground water contamination, as well as ground water use, value and vulnerability.

Advantages: Depending on the planning and agenda, these meetings could help address most of the stated problems. Topics could include, for example: trends in ground water uses, progress of ground water cleanups; coordination success stories; training on new technologies, guidance, policy, etc.

Disadvantages: As noted in the opening paragraph to these options, the ability to support and implement these meetings may be limited by available resources.

References

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Figure 1
Ground Water Use by States
(Solley et. al, 1998)

The Role of Ground Water Use, Value and Vulnerability (UVV) in Setting Cleanup Goals: Matrix of Options Addressing Identified Problems				
	Problem #1: Insufficient recognition of ground water UVV.	Problem #2: Trend toward exposure controls over cleanup.	Problem #3: Lack of agreement on identifying future ground water use decisions and how UVV should influence cleanups.	Problem #4: Ground water cleanup activities/decisions often not prioritized to maximize benefits.
Option #1: Fact sheets and education on ground water UVV.	3	1	1	1
Option #2: Research other countries' ground water programs.	2	2	1	1
Option #3: Summaries and education on how programs consider ground water UVV in setting goals.	2	2	3	3
Option #4: New policy and training on ground water UVV in setting cleanup goals.	1	3	3	3
Option #5: Create framework for prioritizing cleanups based on ground water UVV.	1	3	3	3
Option #6: Use SWAP areas to promote greater consistency in ground water cleanups.	1	3	3	3
Option #7: Promote ground water cleanup coordination meetings.	2	2	2	2

3 = Option provides significant contribution to resolution of problem.

2 = Option provides some help to resolution of problem.

1 = Option may provide help to address problem.