Regulating Pollution Sources under a Differential Ground-Water Protection Strategy

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I. Introduction

For many years economists have lobbied long and hard for site-specific environmental controls, arguing that national uniform standards create significant inefficiencies. Even when uniform standards are successful at maximizing net social benefits for average national conditions, they are overly stringent at some sites and inadequately protective at others.

The fact that most environmental protection regulations are of the national uniform variety indicates the weight of the arguments used against tailored regulatory schemes. Tailored standards are considered difficult and costly to administer, politically unpalatable to the extent that they appear to offer more protection to some constituencies than to others, and inequitable in that they impose different regulatory burdens on similar polluters. Despite these drawbacks, the Environmental Protection Agency (EPA) and the Congress have tried, in separate actions, to institute mechanisms for differential protection for the nation's ground-water resources. In this paper I describe and compare EPA's Ground-Water Protection Strategy and the ground-water provisions contained in the Safe Drinking Water Act Amendments of 1986 in terms of their ability to target environmental pollution controls according to resource value.

II. EPA's Ground-Water Protection Strategy

In August 1984, the Environmental Protection Agency (EPA) issued the Ground-Water Protection Strategy. A principal motivation behind the Strategy is to provide a mechanism to increase net social benefits by accounting for the site-specific nature of the benefit-cost tradeoffs inherent to ground-water protection (see, for example, Raucher 1985 and 1986). The goal of the Strategy is to push regulatory programs that are managed at the federal level (such as those directing clean-up of Superfund sites, or setting standards for operating hazardous waste disposal facilities) to establish tiered protection.

Differential protection under the Strategy is based upon a classification scheme under which the stringencies of regulatory requirements are tailored according to ground-water class. EPA's Strategy consists of three classes: Class I "special" ground-waters, Class II "current and potential sources of drinking water," and Class III "not potential sources of drinking water." Baseline levels of protection, roughly equivalent to current national uniform requirements, will be afforded by standards for Class II groundwaters. More stringent standards will apply where the regulated activity occurs over Class I waters, and less stringent requirements where they occur above Class III areas.

EPA currently is in the process of developing "Guidelines" to implement ground-water classification. These Guidelines specify key definitional terms that delineate ground-water classes. Below we describe how these Guidelines (and the classification system as

a whole) will differentiate ground-water according to resource value and risk management (of human health).

III. Defining Ground-Water Classes

The classification system reflects a balance between the inefficiency of uniform national standards and the impracticality of implementing site-specific standards for every activity with a potential to contaminate ground-water. The value of the classification system depends on its ability to focus on those characteristics that most aptly characterize social welfare losses associated with potential contamination.

Class I, or "special" groundwaters must be "vulnearable" and either "irreplaceable" or "ecologically-vital." The latter two concepts reflect irreversibility and the value of the resource; that is, the social losses associated with tainting the water. Vulnerability reflects the probability that such a loss will be incurred. Thus, Class I groundwaters will be afforded protection consistent with the high probability-high consequence nature of their potential contamination.

Vulnerability is specified by physical measures of local hydrogeology (such as depth to groundwater) and meteorology (notably, levels of precipitation). Irreplaceability pertains to the use of the resource to supply water to a substantial populaton for whom there is no economically viable alternative supply. The Agency is considering a user population of 2500 people as constituting a substantial population. The irreplacability component will be measured by the cost per household of tapping and delivering water of comparable quality and quantity from the best alternative

sources(s) (e.g., a nearby river or a new well-field). A threshold based on the cost per household of the alternate supply, measured as a percentage of median local income, will be established as a proxy for a socially acceptable cost of potable water. This metric clearly is distinct from a willingness to pay concept. This is because willingness to pay for water is elusive to measure and, ultimately, would be bounded only by the cost of relocating whole communities. The more politically palatable alternative is to afford extra protection to sources of water that would be "unusually" expensive to replace. Irreplaceability also accounts for binding institutional constraints that would preclude potential replacement water sources from consideration. The ecologically vital concept pertains to the direct linkage of the ground-water system to preserving unique ecosystems (e.g., critical habitat for an endangered species). This is intended to capture high value waters that are not directly linked to human consumption.

At the other end of the resource value spectrum are Class III ground-waters. These ground-waters are considered to be of low value because they are not used as a source of drinking water and are of such low quality that it is considered uneconomic to treat them to drinking water quality. Thus, they are "not potential sources of drinking water" (nor are they likely to be tapped for other beneficial uses). If these waters are hydrologically isolated so as not to flow into other, more valuable aquifer systems, then there is little value in averting additional (or cleaning-up existing) contamination. "Treatability" is defined by an economic measure similar to that used for defining irreplaceability in Class I;

that is, beyond a certain treatment cost threshold the water is unlikely to be considered viable as a potable supply. Class III areas represent locations over which it is most prudent to locate hazardous waste disposal facilities and other activities that have contamination potential. By establishing less stringent regulatory standards for facilities over Class III waters, financial incentives are created for firms to locate in such areas.

The vast majority of the nation's ground-waters, probably eighty to ninety percent, are expected to fall into the Class II category. Class II is defined as current and potential sources of drinking water, which is everything that does not fit within the explicit criteria for either Class I or Class III. Activities over Class II waters will be regulated according to current national uniform standards.

IV. Efficiency Gains Under the Ground-Water Classification Regime

It is difficult to predict the magnitude of increased social net benefits that may accrue due to the classification scheme EPA is about to propose. Specific classification criteria are under review and continue to be the subject of internal debate across EPA program areas. And, the development of regulatory management strategies (i.e., the stringency of regulations) for each program and ground-water class is only in the early stages of development.

An important aspect of the "Ground-Water Classification Guidelines" is that implementation is based on classifying activities rather than ground-waters per se. That is, EPA is not mapping out areas of the country based on the class of underlying aquifers.

Instead, classification is linked to sites and activities that require a federal EPA permit (e.g., a hazardous waste disposal facility governed by RCRA rules) or are managed by EPA (e.g., remedial action at a Superfund site). States also may apply the classification scheme to activities under their jurisdication. Classification is based on evaluating the resource within a review area that generally will be defined by a two mile radius surrounding the facility.

This facility-based approach to ground-water classification severely limits EPA's ability to provide comprehensive management under the differential protection doctrine of the Strategy. It does not address many types of activities that are known to contaminate ground-waters, including agricultural (and nonagricultural) uses of pesticides and fertilizers, and petroleum-product storage tanks. These activities will continue to be regulated by national uniform standards.

V. The Safe Drinking Water Act Amendments of 1986

The Safe Drinking Water Act Amendments of 1986 (the Act), signed into law on June 19, 1986, provide an alternative means of setting priorities for ground-water protection. Unlike EPA's Strategy, which is facility-based, the ground-water provisions of the Amendments are water supply-based. That is, the Wellhead Protection Areas (SDWA Section 1428) and Sole Source Aquifer Demonstration (SDWA Section 1427) programs are intended to focus groundwater protection management efforts on points of use (rather than on certain types of potential sources of contamination).

In the Wellhead Protection (WHP) Areas program, the Act requires states to develop programs that protect areas around wells that supply public drinking water systems from contamination that could have an adverse affect on human health. This entails defining the surface and subsurface areas through which contaminants are likley to move towards and reach a well or well field. Delineation of these areas is left to the states, with technical guidance provided by EPA.

Within each WHP area, states are required to identify all potential anthropogenic sources of contaminants that could pose health risks. States also are required to develop management plans to protect WHP areas from these potential sources of contamination. These plans are subject to EPA approval, but states are provided considerable flexibility in that the plans need not entail regulatory programs. States also may develop management plans that vary across WHP areas within their jurisdiction. States also have the discretion to identify areas of significant ground-water recharge, but not necessarily contiguous to a well or well field, in defining a wellhead protection area. These provisions will enable states to set priorities and tailor management regimes across their water supply areas.

The Sole Source Aquifer Demonstration Program is designed to identify Critical Aquifer Protection Areas (CAPAs) and develop comprehensive management plans to prevent degradation in such areas. CAPAs must be portions of designated "sole source aquifers," and are to include consideraton of vulnerability, user population size, and

the benefits and costs of ground-water protection. Comprehensive management plans are to be developed that will protect human health, the environment, and ground-water resources. As in the WHP area program, management plans must be submitted to EPA for approval.

VI. Protection Under a Point-of-Use Regime

Both the WHP and CAPA programs are designed to focus attention on protecting ground-water resources that are tapped for human consumption. These mechanisms to differentiate ground-waters allow flexibility to establish more refined hierarchies within the broad category of drinking water supplies. How (or, whether) states choose to capitalize on these opportunities will crystalize in the coming years.

The point-of-use orientation of the Act's ground-water provisions provides an interesting contrast to facility-specific focus of EPA's Strategy. As noted above, the approach embodied in the Strategy's ground-water classification "Guidelines" omits several sources of potential contamination. However, it does afford special protection to ecologically-vital ground-waters (these generally are not used for drinking water supply). Hence, it is more comprehensive in its coverage of ground-waters than are the Act's provisions.

However, the WHP and CAPA programs will be more comprehensive in their coverage of potential sources of contamination. These programs will enable state and local jurisdictions to establish land use restrictions and other control measures that will regulate agricultural activities and other diverse sources of ground-water

contamination. These programs may also enable ground-water quality to be assured at the point-of-use (e.g., through treatment of the drinking water) rather than at all the sources of potential contamination. There is a growing body of evidence that drinking water treatment often is the cost-effective solution to human health risk reduction in ground-water contamination settings.

VII. Opportunities for Efficiency Gains

Both the Strategy and the Act's ground-water provisions provide mechanisms for differential protection of the nation's ground-water resources. The approaches differ in their orientation, but both afford an opportunity to improve social welfare through environmental management that is tiered and targeted according to measures of resource value. Neither mechanism will be perfect in their ability to establish regulatory regimes ideally suited for each individual site, but they both provide a giant stride forward from traditional national uniform standards. Resource economists should be alert to capitalize on the opportunities to promote efficiency gains that implementation of the Strategy and the Act can provide.

REFERENCES

Raucher, Robert. "The Economics of Alternative Strategies for Reducing Risk Posed By Ground-Water Contamination." Presented at the Southern Natural Resource Economics Committee Meeting, Muscle Shoals, Alabama, October 1985.

Raucher, Robert. "The Benefits and Costs of Policies Related to Ground-Water Contamination." Land Economics, 62 (1986): 33-45.

U.S. Environmental Protection Agency. The Ground-Water Protection Strategy. Washington, D.C., August 1984.

U.S. Environmental Protection Agency. Guidelines for Ground-Water Classification Under the EPA Ground-Water Protection Strategy (draft). Washington, D.C., February 1986.