ILLINOIS POLLUTION CONTROL BOARD
August 28, 1986

IN THE MATTER OF:	)	
	)	
A PLAN FOR PROTECTING	)	R86-8
ILLINOIS GROUNDWATER.	)	

REPORT OF THE BOARD (by R. C. Flemal):

The Board has been mandated to participate in a comprehensive review of groundwater protection in Illinois. The Board has further been mandated to publish its findings and conclusions regarding groundwater protection. This Report constitutes publication of said findings and conclusions.

The Board makes three principal findings:

(1) Groundwaters of the State constitute a major and valued resource which requires protection as a matter of assurance of public health and social and economic well-being.

(2) Water quality standards specific to the protection of groundwater should be promulgated.

(3) A separate program designed to reduce and prevent groundwater contamination should be authorized and implemented.

The Board reaches these principal findings based upon consideration of the voluminous record developed in this proceeding and upon the Board's experience and judgment. The bases for these principal findings, and the many subsidiary findings and conclusions of the Board in this matter, are developed in the body of this Report.

In summary, the principal subsidiary findings and conclusions, in the order in which they are developed, are that:

PUBLIC POLICY TOWARD GROUNDWATER:

-- groundwater protection must be based on a well-defined public policy.

-- the Board recommends adoption of the proposed policy statement of the Illinois State Water Plan Task Force, with minor modification.

-- resource groundwaters, including waters of both present and potential use, should be the primary focus of groundwater protection; consideration should be given to including degraded groundwaters in the definition of resource groundwaters.

-- present non-resource groundwaters should not be automatically excluded from protection, lest these find use at a latter date.

-- Illinois groundwater currently is, in the main, of high quality; however, there is increasing recognition of contamination.

-- groundwater protection is predicated on maintaining quality of a resource; hence, demonstration of contamination should not be a condition necessary to justify institution of programs to prevent groundwater contamination.

-- consideration of groundwater legislation by the U.S. Congress should not be reason for Illinois to delay progress in developing a State groundwater protection program.

-- groundwater protection programs must give consideration to whether the programs are directed to just groundwaters, or to the larger set including all underground waters.

-- groundwaters differ in many critical respects from surface waters, including water quality, rate of movement, direction of flow, accessibility, and use; these differences dictate differences in protection strategy.

-- the variety of compositions and uses of groundwater makes the objective of groundwater protection less readily identifiable than that for surface water protection; the groundwater objective is not likely to be the same as that for surface water.

-- remediation of groundwater contamination is likely to be difficult and expensive; accordingly, the primary long-term measures for protecting groundwater resources are those that prevent contamination.

-- classification of groundwaters designed to recognize the different characteristics and uses of groundwater is a useful management technique; its utility should not be dismissed.

-- identification of sensitive aquifers and recharge areas is an essential prelude to successful groundwater management; it is to these aquifers and areas that the prime focus of groundwater protection should be directed, at least initially.

-- groundwater monitoring needs to be expanded and the fiscal support necessary to accomplish the task needs to be provided.

-- groundwater monitoring should include at least representative statewide sampling of private, as well as public, wells.

-- groundwater monitoring should also include a focus on defining the extent of possible contamination from agricultural chemicals.

-- accessibility to existing groundwater monitoring data needs to be improved.

-- successful implementation of a groundwater protection program will require coordination of efforts not only among various State agencies, but also coordination between State and local government.

-- it is recommended that a lead State agency for groundwater protection be designated, and the programs necessary for this agency to carry out its charge be centralized within this agency; the Illinois Environmental Protection Agency is the most appropriate lead agency.

WATER QUALITY STANDARDS:

-- water quality standards functionally serve a multiplicity of purposes, including establishment of the level at which use is acceptable and definition of the minimum goal of protection; standards also are essential to the enforcement process.

-- existing ambient water quality standards are not ideally suited to the task of protecting groundwater.

-- ambient standards suitable to protection of groundwaters are likely to be significantly different from those designed to protect surface waters.

-- a single set of ambient groundwater standards may not be sufficient to protect the broad range of ambient groundwaters and the various uses to which these groundwaters are or may be put.

-- recommendations for the application of either "general use" or "drinking water" standards to groundwaters cannot be endorsed at this time; both recommendations contain aspects which might find merit during a consideration of groundwater-specific standards, but these aspects will need

to be given individual evaluation before their merits can be finally assessed.

-- non-degradation should be an essential component of the goal of groundwater protection; however, its sufficiency as a water quality standard is questionable.

-- groundwaters may not be amenable to a standard of protection at other than that of the highest potential use without risk of long-term or permanent loss of the highest use.

-- consideration must be given to what, if any, distinction should be made between groundwater standards applied to public versus private water supplies.

-- development of groundwater quality standards can usefully draw not only on the experiences of Illinois, but also on the experiences of other states; among such experiences are those of states which have developed multiple-tier standards for groundwater protection and management.

-- where they can be developed, numerical water quality standards are to be preferred over narrative standards.

-- in the absence of numerical standards for possibly hazardous substances in groundwater, it is prudent to consider such substances "guilty until proven innocent" with respect to their tolerable limits.

PREVENTIVE PROGRAMS:

-- assignment of authorities and responsibilities among various strata of local government and State government will be a most critical issue in the workability of any proposal which involves land-use control, land-use planning, and zoning.

-- the State will need to be willing to commit fiscal resources to obtain progress in any preventive program.

-- data necessary to implement many of the recommended preventive programs do not presently exist; additional efforts will be required.

-- the Agency's recommendations for prevention of groundwater contamination provide a positive starting point for development of actual proposals.

-- continued emphasis on waste reduction and reuse is an important element in reducing the potential for groundwater contamination.

-- full implementation of federal and State programs, exemplified by RCRA and banning of landfilling of liquid

wastes, constitutes a major step toward reducing the potential for groundwater contamination; thus full implementation should accordingly proceed as expeditiously as possible.

-- full implementation of existing and developing federal and State programs is a necessary, but not necessarily sufficient, step towards groundwater protection.

-- designation of possible sources of groundwater contamination into categories, such as primary and secondary sources, has utility in bringing focus to the types of activities which have potential for groundwater contamination; however, how such lists would be utilized in regulatory programs has to be better defined.

-- the Plan's two major recommendations for preventive programs, the set-back recommendation and the recharge area protection recommendation, have merit in concept; however additional development of both is needed before full evaluation of them is possible.

-- among major matters requiring additional development within both the set-back and recharge area protection recommendations are their scope of applicability, activities to be regulated, exception procedures, identification of priority efforts, and fiscal responsibilities.

-- among additional matters which require further development for the set-back recommendation is the appropriate set-back distance.

-- among additional matters which require further development for the recharge area protection recommendation is the method of delineation of recharge areas.

-- assurance of water supply is an appropriate provision of a groundwater protection program.

MISCELLANEOUS ITEMS:

-- a number of practices which have the potential for exacerbating groundwater pollution need to be taken under review; included are closing of abandoned wells, chemigation, regulation of closed-loop heating circuits and test borings, and underground injection of wastes.

-- consistency of State regulations with federal regulations should be weighed in evaluating the merits of any proposed State regulatory program.

-- control of non-point sources of groundwater contamination must be given consideration in any comprehensive groundwater protection program.

-- public education can be instrumental in reducing groundwater contamination and in reducing the negative impacts of contaminated groundwater; continued public education is to be encouraged.

-- quantity of groundwater is intimately related to many aspects of groundwater quality, and this role should be considered in any groundwater protection program.

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SECTION I:

INTRODUCTION

BOARD MANDATE

Public Act 83-1268, which was signed into law in August, 1984, amended the Environmental Protection Act ("Act") to provide for, among other matters, a three phase program for review of protection of groundwater in Illinois. Phase one consisted of preparation of a study of groundwater quality in the State. This duty was assigned to the Illinois Department of Natural Resources ("ENR") and completed in July, 1985, upon release of a report titled: "An Assessment of Ground-Water Quality and Hazardous Substance Activities in Illinois with Recommendation for a Statewide Monitoring Strategy". This report is presented in the record as Exhibit 35.

Phase two consisted of formulation under the direction of the Illinois Environmental Protection Agency ("Agency") of a groundwater protection plan. Phase two has also been completed and a report produced titled: "A Plan for Protecting Illinois Groundwater" ("Plan"). The phase two plan was submitted to the Governor, the Illinois General Assembly, and the Board in January, 1985. It is present in the record as Exhibit 1.

Phase three consists of a specific mandate to the Board:

> Following the completion of the groundwater quality study and the groundwater protection plan, the Pollution Control Board shall conduct public hearings on the results and recommendations as provided in Title VII of the Act. Upon conclusion of such hearings, the Board shall publish its findings and conclusions on the areas covered by the study and the plan and the testimony received. (Act, Section 13.1(d)).

HEARINGS

The Board has conducted seven days of hearings, held as follows:

April 30, 1986	Springfield, Illinois
May 14, 1986	Rockford, Illinois
May 15, 1986	Lisle, Illinois
May 28, 1986	Belleville, Illinois
June 16, 1986	Rock Island, Illinois
June 25 & 26, 1986	Champaign, Illinois

Notice of the hearings was published pursuant to the provisions of 35 Ill. Adm. Code 102.122. Additionally, notice of the hearings was mailed to over 850 individuals and organizations, based upon a list compiled by the Agency and augmented by requests for notification directed to the Board. The hearings were conducted pursuant to the Board's rules for Regulatory and other Nonadjudicative Hearings, as codified in 35 Ill. Adm. Code Subtitle A, Subpart D.

RECORD

During the hearings, the Board received sworn testimony from 39 individuals, including representatives of a broad spectrum of public, private, and individual perspectives. The stenographic record of the seven days of hearings aggregates 1540 pages. The record also contains 94 exhibits* ("Ex") and 8 public comments ("PC"), lists of which are appended hereto. The record is rich with insightful testimony and documents commensurate with the level of investigation and thought which has preceded and been occasioned by the Board's hearings. The Board extends its appreciation to the many individuals, and particularly to the Agency and ENR, for the excellent character of the record presented to the Board.

DEFINITIONS

In following sections the Board will introduce definitions pertinent to the specific matters under consideration. There are, however, several definitions essential to a general understanding of the present matter, and hence these are presented at the onset. The principal among these is the definition of groundwater**:

> "Groundwater": underground water contained in interconnected pores located below the water table in an unconfined aquifer or located in a confined aquifer.

A practical definition of groundwater is that it is underground water which occurs within the saturated zone. Other principal definitions include:

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* After the last of the scheduled hearings in this matter had been completed, the Board became aware of three documents whose value warrant their addition to the record. These documents are listed as Exhibits 92 to 94 on the appended Exhibits List.

** Also variously spelled as ground-water and ground water.

"Aquifer": underground rock or sediment in which the pore spaces are saturated with water and which is sufficiently permeable to transmit economic quantities of water to wells or springs.

"Confined Aquifer": an aquifer that is overlain by a confining bed. The confining bed has a significantly lower hydraulic conductivity than the aquifer.

"Saturated Zone": the zone of the earth's subsurface in which pore spaces are filled with water at a pressure greater than atmospheric.

"Unconfined Aquifer": an aquifer in which there are no confining beds between the saturated zone and the surface. There will be a water table in an unconfined aquifer.

"Underground Water": water located beneath the surface of the earth; underground water includes water in the saturated zone and in the unsaturated zone.

"Unsaturated Zone": the zone between the land surface and the water table. The pore spaces contain water at less than atmospheric pressure, as well as air and other gases. Saturated bodies, such as perched groundwater, may exist in the unsaturated zone.

"Water Table": the top of the saturated zone in an unconfined aquifer; pore water pressure is atmospheric.

The definitions as presented above are conventional definitions as used within the professions which deal with the phenomenon of underground water. They are also the definitions used within the course of the Board's hearings, and on the whole are consistent with definitions found in the Board's rules and regulations. It is noted, however, that there are occasional discrepancies between the conventional definitions and certain definitions which appear in present regulations. Specific note is made to the following two definitions, both of which occur in 35 Ill. Adm. Code 601.105:

"Confined Geologic Formations" are geologic water bearing formations protected against the entrance of contamination by other geologic formations.

"Ground Water" means all natural or artificially introduced waters found below the ground surface, including water from dug, drilled, bored or driven wells, infiltration lines, and springs.

The former of these two definitions offers confusion with the term "confined aquifer". The latter definition is not only inconsistent with the conventional definition of groundwater, but also appears to be inconsistent with use and definitions found elsewhere within Illinois statutes [Ill. Rev. Stat. ch. 111½, par. 1003] and the Board's regulations [35 Ill. Adm. Code 301.420]. In particular, the 601.105 definition appears to establish an identity between "ground water" and "underground water", whereas conventional use considers groundwater to be a subset of underground water (R. at 1531). Since these differences in definition appear to be the source of some confusion, the Board will propose to amend these definitions in the earliest appropriate regulatory proceeding.

SECTION II:

FOUNDATION FOR A GROUNDWATER PROTECTION PLAN

The Board believes that any institutional program must be founded on a clear and acceptable policy. Accordingly, in this section the Board proposes a Groundwater Protection Policy for the State which it believes provides the appropriate foundation. In this section the Board additionally discusses issues implicit to this policy, including the resource properties of groundwater, uses to which groundwater is applied, the current status of groundwater quality in Illinois, and the interrelationships between federal and State initiatives.

GROUNDWATER PROTECTION POLICY

The Board believes that the starting point for development of a groundwater protection plan must be a clear understanding of the State's policy toward groundwater protection. Such policy should express the will of the people of the State; it should be consistent with other State policies; it should concisely state the rationale for the policy; and it should be capable of serving as a standard of judgment for the appropriateness of specific proposed actions. The Board believes that the following Groundwater Protection Policy meets these conditions, and the Board recommends its adoption:

> **It is the policy of the State of Illinois to protect the groundwater resources of the State, as a natural and public resource. The State recognizes the essential and pervasive role of groundwater in the social and economic well-being of the people of Illinois, and its vital importance to the general health, safety, and welfare.**
>
> **It is further recognized as consistent with this policy that the groundwater resources of the State be utilized for beneficial and legitimate purposes; that unreasonable waste and degradation of the resources be prohibited; and that the underground water resource be managed to allow for maximum benefit of the people of the State of Illinois.**

The Board acknowledges the contribution of the Illinois State Water Plan Task Force (Ex. 20), from which this policy statement is borrowed freely and with only minor modification.

The Board believes that the proposed Groundwater Protection Policy embodies several critical concepts: that groundwaters constitute a major resource; that quality and quantity of the groundwater resource is intimately related to matters of public

health and social and economic well-being; and that effective management of the resource may be required for its continued beneficial utilization.

The magnitude of the groundwater resource in Illinois can in part be measured by the degree to which groundwater is presently used. Approximately 1.1 billion gallons per day are withdrawn (Ex. 80, p. 9). In perspective, this is equal to a withdrawal rate of approximately 1,700 cubic feet of water every second. As of 1980, 49 percent of the State's more than 11 million people used groundwater as their source of water (Ex. 3, p. 199), and significant portions of the economic sector, including industry and agriculture, drew upon groundwater. Further, groundwater is a major source of flow to surface waters, and thus is critical in maintaining the resource constituted by surface waters.

The Board finds that the high degree of human association with groundwater, principally because groundwater is a major source of water supply for human consumption, requires that groundwaters of the State be protected as a matter of assurance of public health. In this aspect, the Board finds that the proposed Groundwater Protection Policy is consistent with Article XI of the Constitution of the State of Illinois, which specifies that:

> The public policy of the State and the duty of each person is to provide and maintain a healthful environment for the benefit of this and future generations.

The Board finds the the proposed Groundwater Protection Policy is also consistent with Section 11(b) of the Illinois Environmental Protection Act, which specifies that:

> It is the purpose of this Title to restore, maintain, and enhance the purity of the waters of this State in order to protect health, welfare, property, and the quality of life...

The Board also finds that the groundwaters of the State constitute an economic resource of high value, and that this resource requires protection commensurate with its value.

The Board additionally finds that there is need for the development of a well-conceived, well-framed, comprehensive, and fully-supported program for groundwater protection at this time.

RESOURCE CHARACTERISTICS OF GROUNDWATERS

Because the justification for protecting groundwaters is that groundwaters constitute a valued resource upon which the citizenry of Illinois depends, the Board finds it appropriate to initially consider groundwaters classified on the basis of their

utility as a resource. Such consideration sets the framework for any program designed to protect groundwaters. This classification considers groundwaters as:

I) Resource Groundwaters
   A) Groundwaters Presently in Use
   B) Groundwaters of Potential Use
   C) Groundwaters of Restricted or Impaired Use due to other than Natural Conditions

II) Non-Resource Groundwaters
   A) Naturally Low-Quality Groundwaters
   B) Groundwaters of Limited Quantity and/or Extractability.

Resource Groundwaters. It is the resource groundwaters to which the bulk of commentary, both at hearing and within the submitted record, has been directed. Resource groundwaters are, at the minimum, those groundwaters which are presently being put to conventional use by reason of being of suitable quality, having local demand, and having been actually developed. Much of the record also indicates that resource groundwaters ought also to include those groundwaters which have the potential for being put to conventional use. This perspective is straightforward, in that it suggests that potential resources should be protected against the eventuality that at least some of them will find use in the future. The Board believes that this is a wholly correct perspective, and accordingly concludes that resource groundwaters should include groundwaters of potential use. Further, this perspective is already recognized in part in the Board's regulations which requires that groundwaters which have the potential for being a source for public and food processing supply shall be protected with standards appropriate to this use (see 35 Ill. Adm. Code 303.203 and p. IV-2 herein).

Somewhat less certain in the record is whether groundwaters which have lost their ability to serve as a resource ought to be considered as resource groundwaters. Groundwaters have probably most often reached this condition by virtue of having become contaminated beyond use. Other groundwaters, or perhaps more appropriately, the earth materials which contained such groundwaters, have lost their utility as sources of water due to overextraction. It is the Board's belief that such groundwaters should in fact continue to be considered as resource groundwaters. This belief is based on the observation that prior use implies that there are no natural impediments to use, and therefore human remedial actions or natural recovery processes may eventually return such groundwaters to a usable condition. Thus, the Board concludes that even a degraded source of groundwater may have a potential for future use, and that this potential ought to be protected as any body of groundwater with potential use should be protected. Furthermore, any contrary policy could serve as an inappropriate incentive to allow degradation of high quality groundwater.

The Board realizes that the definition of a resource groundwater as presented is a "soft" definition in that it includes aspects of subjective evaluation, as for example, what constitutes "potential" and what constitutes "conventional use". However, we believe that this definition is too central to the overall matter of groundwater protection to allow us to make a more extensive determination on the record presently before us. Rather, the Board finds that in whatever forum the State's groundwater protection plan proceeds hereafter, be it via Legislative initiative, rulemaking before the Board, or some other vehicle, that a central issue to be addressed is the definition of a resource groundwater.

Non-Resource Groundwaters. There are many waters within the groundwater system of the State wherein the current quality of the water is naturally unacceptable for most, if not all, conventional uses. These groundwaters are of poor quality due to natural processes associated with groundwater development and evolution which are beyond human control. They include, but are not necessarily limited to, saline brines encountered at depth in many portions of the State (R. at 702-3) and near the surface in some limited localities. The naturally low quality groundwaters may not at present be viewed as a resource for most conventional uses (R. at 697-8, 701-2, 1509; Ex. 41, p. 63).

Similarly, there are many groundwaters in the State which are non-resource groundwaters by virtue of existing in small quantity and/or being non-extractable (R. at 697). This condition stems from the fact that some earth materials have physical properties which allow them to contain only very limited amounts of waters (low porosity) and/or to transmit water only very slowly (low hydraulic conductivity). Thus, there may be little water available in these earth materials, or, if present, the water may not be free to migrate to a well or elsewhere to where it might be used.

Because of their property of being non-resource groundwaters, the rationale for protection of these groundwaters, if such rationale does exist, is expected to be different from that for resource groundwaters. The record in this proceeding does not provide much guidance on the matter of protection of non-resource groundwaters, and the Board will accordingly not at this time give the matter deliberation equal to that afforded resource groundwaters. However, the Board does wish to note that there are characteristics of the non-resource groundwaters which may warrant attention to them in any comprehensive groundwater protection program. Among these characteristics are that the non-resource groundwaters may be in contact with, or may through activities such as leakage or natural migration between aquifers be brought in contact with, resource groundwaters. As a consequence of this contact the resource groundwaters can experience unacceptable degradation. Moreover, history has repeatedly shown that today's non-resource becomes tomorrow's

valued resource. Further, it is the policy of the federal government and the State of Illinois to maintain the natural quality of all waters, used as resources or not, absent a showing of an overriding public interest to be served by allowing limited degradation (see 33 U.S.C. 1251, Ill. Rev. Stat. ch. 111½, par. 1011, and 35 Ill. Adm. Code 302.105). The Board therefore concludes that, while the greatest immediacy for action may lie with protection of the resource groundwaters as currently identified, a comprehensive groundwater plan will also need to give consideration to the appropriate management of non-resource groundwaters.

CURRENT GROUNDWATER USE

Domestic Water Supply. The largest single use of groundwater in Illinois is withdrawal by public water suppliers (Ex. 1, p. 44; Ex. 80, p. 31). Approximately 88 percent of the public water supply systems in Illinois use groundwater as a supply source, serving over five million people in 1,200 communities (Ex. 1, p. 3). This use consumes approximately one-half billion gallons per day (Ex. 1, p. 3; Ex. 35, p. 7) and constitutes 43 percent of the total groundwater withdrawal within the State (Ex. 80, p. 3). Much, but not all, of this withdrawal is for domestic use, since many public water suppliers also provide water for industrial and other non-domestic consumption.

An additional 11 percent of the total withdrawal is taken from private wells for domestic use (Ex. 80, p. 27, 31). Nearly 90 percent of the rural population of the State depends on groundwater as its water source (R. at 114). Collectively, public and domestic private groundwater withdrawals therefore constitute 54 percent of the total groundwater withdrawal use.

The proportion of public and domestic private water supply provided by groundwater varies in different parts of the State from zero to 100 percent (Ex. 80, tables 17 and 18). In the former category are locales where surface water is of sufficient availability and quantity to offer a preferable source. Salient among these areas is the region of northeastern Illinois, including Chicago, which is served by water withdrawn from Lake Michigan. Problems associated with both quantity and quality of groundwater in the northeastern region is currently prompting many communities to shift to Lake Michigan or other surface waters to meet their water needs.

In the remaining portion of the State, groundwater is generally the preferable source for public water supply systems if both surface and groundwaters are equally available. This is generally due to the lesser treatment costs and greater uniformity of quantity normally associated with groundwaters. However, surface and groundwaters are seldom equally available, and therefore choice is not always possible.

In contrast, there is seldom an option between surface and groundwater sources for private domestic water supplies due to the inherent expense associated with development and treatment of surface waters. Water supplies to homes located outside of the distribution limits of public water services are therefore almost exclusively drawn from groundwater. It is estimated that there are currently approximately 500,000 private water supply wells in the State (Ex. 1, p. 24; R. at 56).

Other Withdrawal Uses. The two principal additional withdrawal uses of groundwater in Illinois are supplies to agriculture (24 percent) and industry (21 percent)*. Irrigation is the largest agricultural use, accounting for approximately 18 percent of total annual groundwater withdrawals as of 1984 (Ex. 80, tables 15 and 17). Irrigation use has shown dramatic increases in recent years, with an estimated rise from 150,000 to 208,000 irrigated acres between 1980 and 1984 alone (Ex. 80, p. 7). The second largest agricultural use of groundwater is for livestock watering, which accounts for approximately 5 percent of total groundwater withdrawals.

Among industrial uses the largest individual use is manufacturing, which accounts for approximately 14 percent of total annual groundwater withdrawals. Mineral extraction accounts for 5 percent, electrical power generation for 1 percent, and miscellaneous industrial uses for 2 percent (Ex. 80, p. 16-31).

Fish and wildlife management accounts for approximately 1 percent of annual withdrawal use (Ex. 80, p. 31).

The matter of whether there is choice between surface and groundwater sources is often the same for agriculture and industry as it is for domestic users. That is, although in some instances choice may exist, often matters of quantity, quality, cost, and development dictate that groundwater is the only viable source.

Natural Discharge "Uses". In additional to withdrawal by man, natural discharges of groundwater constitute a significant facet of an overall picture of groundwater utility. While not conventionally considered a "use" of water, these discharges are a major contributor to the natural aqueous environment. Therefore, some consideration of the role they play is warranted and should be borne in mind in any planning for groundwater protection.

* Excluded from both of these figures is the groundwater provided these sectors by Public Water Systems.

Natural groundwater discharges are most obvious at the site of springs. However, natural groundwater discharges also occur into streams, lakes, and wetlands. As such, they contribute water to these environments, and in some cases and at some times are the dominant source of water added to the environment in question (Ex. 1, p. 3-4; Ex. 41, p. 4; Ex. 35, p. 67-9). Clearly, the quality of the groundwater resource therefore has ramifications on the quality of the environment into which the groundwaters discharge.

STATUS OF GROUNDWATER QUALITY

The status of groundwater quality in Illinois has been assessed and the results published by ENR in July, 1985, in "An Assessment of Ground-Water Quality and Hazardous Substance Activities in Illinois with Recommendations for a Statewise Monitoring Stragegy" (Ex. 35).

ENR found that most groundwater quality information existing at the time of its assessment (i.e., data from 1902 through 1983) consisted of data regarding such traditional parameters as alkalinity, hardness, total dissolved solids ("TDS"), and the major cations and anions. Data regarding the toxic substances of greatest concern today (e.g., synthetic organic compounds and heavy metals) were not "of sufficient number or spatial distribution to support any statewide ground-water quality assessment" (Ex. 35, p. 3).

Using data primarily generated since 1970, ENR prepared histograms for 21 selected parameters where there was sufficient data to do so (Ex. 35, Figures 29-33 and Appendix B). Additionally, mapping of elevated concentrations was undertaken. A limited number of such maps were presented in Exhibit 35 showing the location of elevated concentrations of TDS, nitrates, chlorides, barium, and total organic carbon ("TOC") (Figures 34-40). For both the histograms and the maps, data are subdivided into three general aquifer classifications: sand and gravel, shallow bedrock, and deep bedrock. This information clearly shows that, based on the relatively few and traditional parameters for which data was available, groundwater quality in Illinois is generally good (R. at 1401). With the exception of mercury*, concentrations of substances were generally far below their maximum concentration limits ("MCLs") for drinking water standards where MCLs have been established. For those parameters not having MCLs, the data also indicate

* Reportedly, the situation for mercury is an artifact of outdated analytical and record keeping procedures. The MCL was set lower than the previous "practical analytical detection limit" and "detection limits were frequently entered in the data base as actual concentrations" (Ex. 35, p. 57, 66).

generally good quality. For example, the median TDS concentrations for each of the three aquifer types were less than 500 mg/L, in comparison to the definition within UIC-RCRA waste disposal regulations that an "underground source of drinking water" is an aquifer with TDS concentrations less than 10,000 mg/L [35 Ill. Adm. Code 702.110]. In summary, as one ENR witness testified, "by and large... the quality in the ground is as good or better than the drinking water standards that have been set" (R. at 185).

An assessment of general groundwater quality in Illinois also appeared in one of the State Water Plan Task Force's publications. It was consistent with other information in the record cited above. In pertinent part that assessment was:

> "Overall the quality of underground water in Illinois remains good, despite the contamination potential of industries, urban areas, and modern agriculture. Incidences of serious degradation are few in number and of only local impact. However, regional changes have occurred in population centers, such as the Metropolitan Chicago and East St. Louis areas. (Ex. 20, p. 12)."

Nevertheless, there is information in the record showing there are wide areas of the State where such naturally occurring contaminants as barium and radium exceed drinking water standards (e.g., R. at 185-186) and there are scattered areas of contamination correlated with human activities such as waste disposal, storage tanks, and industrial activity. ENR witnesses testified that, although they have not conducted a comprehensive study to compile a statewide listing of contaminated groundwater areas and affected public water supply wells, they are aware of various sites in Illinois where human activities have resulted in contamination of groundwater (R. at. 172-186). ENR reports regarding studies of such problems in the Winnebago County area, where both private and public water supply wells were contaminated by organic compounds such as trichloroethylene ("TCE"), were submitted on the record (Ex. 18, Ex. 19). In this case, it was necessary to close down several public water supply wells (R. at 126) and to recommend against use of between 200 and 250 private water supply wells (R. at 415) due to contamination by synthetic organic compounds. Other witnesses referred to other areas of contamination such as southeast Chicago (R. at 233-4).

Agency testimony was placed on the record showing that there already are data conclusively showing groundwater contamination from human activity in various parts of Illinois, and that relevant ongoing studies are developing additional information. Preliminary results from ongoing studies have found at least trace levels of contamination by organic compounds in 29% of the public water supply wells tested (R. at 522). Many of these organic compounds present health risks, although not necessarily

at the levels at which they have been detected (R. at 522). In spite of these data, an accurate determination of the extent of contamination by organic compounds cannot be done. The 29% of wells showing presence of organic substances overemphasizes the number of occurrences in public water supply wells, since samples were selected based on the likelihood of contamination being present; it is estimated that the full population of public water supplies would show a rate of approximately 15 to 20% (R. at 855). Similarly, there is question as to whether occurrences at some of the low reported concentrations are due to contributions from adhesives, lubricants, and corrosion prohibiters used in well construction rather than from groundwater contamination (R. at 958-9). On the other hand, the sample contains no private and non-community wells, which, by virtue of their tendency to be shallow, are considered to be more susceptible to man-made contamination (R. at 420).

In balance, it therefore seems to the Board that substantial definition of the groundwater contamination problem is still required. While it may be appropriate to characterize the quality of most Illinois' groundwater as generally good, this is insufficient to justify a lack of action. There are many indications and trends which suggest that we may just be begining to understand of the scope of the problem.

Moreover, the Board believes that a groundwater protection program would be justified even if there were no demonstrated groundwater contamination in Illinois (which, of course, is not the case). This conclusion follows from the mandate of the Constitution of the State of Illinois, as noted on p. II-2, to "provide and maintain a healthful environment" and from the mandate of the Illinois Environmental Protection Act, as also noted on p. II-2, to "restore, maintain, and enhance the purity of the waters of this State". Given these public policies, it would be highly inappropriate to wait for contamination to occur before taking action; groundwater quality must, at the least, be maintained.

FEDERAL VERSUS STATE INITIATIVE.

Any program developed by the State must obviously take into consideration actions occurring at the federal level to the extent that these might circumscribe or impose direction on a State program. Congressional interest in groundwater protection is presently high (R. at 1060-90) and has achieved partial culmination in the groundwater provisions of the Safe Drinking Water Act Amendments of 1986. All indications are that development of federal programs will continue (R. at 1088). The Board also notes that Senator David Durenberger, member of the U.S. Senate Committee on Environment and Public Works and sponsor of the Safe Drinking Water Act Amendments of 1986, has indicated in the Congressional Record (S 6290, May 21, 1986) his desire to

recommend to the U.S. Senate a comprehensive groundwater protection program (see p. IV-15).

The principal question which states need to address at this time is whether the current federal activity should cause states to delay their own initiatives while awaiting more definitive exposition of the direction of federal programs. The concern is that federal programs might override state programs, thereby causing resources expended in the development of state programs to have been wasted.

The Board believes that the federal actions are not cause for the State to delay development of its own groundwater protection program. Illinois must not only reserve the right to promulgate its own regulations, but in fact is charged to do so by the citizenry and its representatives, whenever it is judged that there is a need to protect the health and welfare of the people of the State. The Board believes that the need for a groundwater protection program does currently exist, and that therefore the State must proceed on its own course of action with all due speed and deliberation. Moreover, there is good reason to believe that delay might restrict the ability of the State to accomodate to and benefit from possible federal programs, rather than the converse.

Recently, a report of the Environmental Law Institute indicated that there is strong reason to believe that states will continue to play the lead role in groundwater protection (Ex. 41, p. 29). Among reasons cited are:

1) A well developed system of statutory and common law already exists to govern the use and allocation of groundwater in each state, and states see it as their responsibility to continue using these authorities to protect the health and welfare of their citizens.

2) Groundwater hydrology, geology, and contamination vary from state to state, making the establishment of a uniform or comprehensive federal law impractical.

3) Many of the solutions proposed to protect groundwater from the threat of contamination require the exercise of land use controls, which states and local governments are in the best position to do. They have historically protected the health and welfare of their citizens by restricting and regulating the use of property under their "police power"; and they have the requisite intimate knowledge of the institutional and political forces affecting their land resources.

4) States are increasingly assuming administrative authority over the national pollution control laws that affect groundwater. (Ex. 41, p. 29).

Similar conclusions have been reached in a recent report of the Environment & Energy Study Institute ("EESI")*. EESI notes that most decisions affecting groundwater are necessarily local decisions. EESI's recommendation therefore flatly rejects any massive new federal program. Rather, EESI calls upon Congress to "establish a national goal" stressing prevention of contamination, while awarding states "real flexibility and authority" coupled with adequate financial and technical support.

If, indeed, the direction of federal initiative in groundwater protection is to be toward promoting state-level programs, Illinois will want to be prepared to take advantage of any special programs and resources made available from the federal government. This can be done most effectively if Illinois is aware of the directions it wishes to take and has developed the expertise necessary to qualify for and utilize the federal resources. Additionally, if the federal direction is toward promoting state "primacy" in groundwater protection, as has been the case in other recent federal environmental programs, Illinois would also want to be prepared to assume primacy at the earliest reasonable date.

* Text of the EESI document was not available to the Board as of the date of this Report. All characterization of the EESI document used herein has been drawn from a summary of the document published in Inside E.P.A., August 8, 1986, p. 13, of which the Board takes judicial notice.

SECTION III:

GENERAL ISSUES

One of the difficulties inherent in developing a groundwater protection plan is associated with recognizing the many variations which exist in the type of complex groundwater system which typifies the State of Illinois. It is only when these variations are recognized that focus on critical problems can properly be made. In this section the Board calls attention to some of the general issues which it concludes will have to be addressed before more specific recommendations regarding a groundwater protection plan can be successfully implemented.

Among these issues are: (1) whether protection should focus on just groundwaters, or whether underground waters in general should be included; (2) policy considerations which follow from consideration of the dissimilarities between surface waters and groundwaters; (3) the need for emphasizing prevention over remediation in groundwater protection; (4) the utility of groundwater classification; (5) the need to focus on sensitive areas; (6) the need for monitoring; and, (7) the need for coordination of State programs.

GROUNDWATER VERSUS UNDERGROUND WATER PROTECTION

The mandate of P.A. 83-1268, as well as most of the testimony in this proceeding and all of the recommendations for protection programs, focus on groundwater protection rather than on the broader issue of protection of all underground waters. The distinction is that groundwater refers only to water within the saturated zone, whereas underground refers to all subsurface waters, including water in both the saturated and unsaturated zones (see definitions, p. I-2).

Given the Board's mandate and the record presently before it, the Board is not prepared to determine which, if any, of its many findings and conclusions on the matter of groundwater protection would also apply to underground waters in general. It is clear in the record that processes and activities which occur in the unsaturated zone can have major impact on the quality and character of water in the saturated zone (R. at 1355-6; Ex. 49, p. 13). Furthermore, since all waters are presently protected under both federal and state law (e.g., via applicable water quality standards and anti- or non-degradation requirements), it would be inappropriate to retract that protection administratively.

Therefore, the Board does conclude that any action taken to protect groundwaters of the State should be taken with consideration as to whether the action is also appropriately and

necessarily applied to all underground waters, and in no case should the present level of protection of all underground waters be compromised.

DISSIMILARITIES BETWEEN SURFACE WATERS AND GROUNDWATERS

Much of the existing Illinois groundwater protection program, particularly in the realm of water quality standards, is an extension of and is derived from the State's surface water protection program. There are, in fact, many similarities between the two aqueous environments. However, there are also some critical dissimilarities which, if not recognized, may lead to incorrect perspectives being brought to bear on groundwaters. It is therefore useful to note some of these dissimilarities, and their consequences for groundwater protection.

Water Quality Variability. The State's groundwaters span a far broader range of variation in natural chemical quality than is normally encountered in its surface waters. At one extreme are groundwaters which have quality better than the criteria for potable water supply, and hence are drinkable without treatment, directly as withdrawn from the ground. These are among the most prized of groundwaters precisely for this reason. The principal concern for these waters from an environmental perspective is maintaining this prized quality.

At the opposite end of the spectrum are groundwaters which have higher concentrations of dissolved materials than does seawater. These waters have little present use and generally are considered to be wastes requiring special disposal when they are encountered, as occurs in some activities such as oil production. The present principal concern for these waters from an environmental perspective is preventing their introduction into other environments, particularly surface waters and high quality groundwaters.

Between the extremes is a range of naturally occurring water qualities. Some noteworthy groundwaters are those which are close to potable water quality, but exceed such standards for a limited number of parameters. Examples are the elevated barium, radium, and fluoride waters encountered in several areas of the State (Ex. 35, p. 45-78).

Rate of Movement. A second dissimilarity between surface waters and groundwaters is that groundwaters have substantially slower rates of movement. Accordingly, whereas ft/sec is often a convenient unit of velocity measurement for surface waters, velocities characteristic of groundwater flow in aquifers are best expressed in units of ft/day or ft/year (e.g., Ex. 18, p. 50; Ex. 49, p. 25, 99). In practical terms this translates into much longer times for groundwater to respond to alterations in quantity and quality. This may have positive ramifications, such

as providing a workable response time in the event that a pollutant is introduced into the ground. Slow rates of movement also mean that under some circumstances a contaminant may be expected to migrate only very limited distances over long periods of time.

The slow rate of groundwater movement also has some negative considerations, however. For example, flushing of a contaminant beyond an area of use may occur at such slow rates in groundwater that it may be unreasonable to expect that the use can be re-established in a reasonable time frame (R. at 1331-3). Also, the low rates of movement of groundwater mean that mixing occurs at much slower rates than is the case in surface waters. Therefore, mixing as a concept of environmental protection has less applicability with groundwater than with surface waters. However, the concept of a "mixing zone" is not necessarily inapplicable to groundwaters if it is expanded to include other various processes that may contribute to or attenuate contaminant transport (i.e., adsorption, desorption, precipitation, dissolution, ion exchange, biochemical reactions, and chemical transformations). Unfortunately, prediction of these processes is much more complex (Ex. 35, p. 29-31) than is prediction of mixing in surface waters (Ex. 49, p. 35, 99-100).

Further, the differing rates of movement may cause some management strategies suitable for surface water protection to be unsuitable when applied to groundwater. As a case in point, it is commonly technically feasible (other considerations aside), to upgrade the quality of surface waters to accommodate a desired "higher" use through actions by upstream users. In this circumstance a cost-effective and environmentally sound management strategy is to protect surface waters to the level demanded by current use and to subsequently upgrade the quality if and when the desire for a higher use arises. Illinois practices this strategy in its surface water program by requiring application of the General Use Standards, which provide for maintenance of aquatic habitat and recreational use, and then requiring application of Public and Food Processing Water Supply Standards if and when this higher use comes into effect. It is critical to note that this strategy can function only because stream water quality will respond rapidly to changes in upstream discharges.

In contrast, the slow rates of groundwater movement make the response time for alteration of groundwater quality generally much longer than for surface waters. Depending on specific conditions, the interval between changing an input for groundwater and a response at even a nearby well or discharge point may be years, decades, or even centuries or more (Ex. 41, p. 19), and complete flushing of contaminants will take even longer (R. at 1351-3). The strategy of protecting for some lower use and then upgrading if and when a need for higher use arises thus may not be practicable. If so, the only appropriate strategy may be to protect initially for the higher use. This

perspective underlies the position of the several witnesses who advocate a high standard of groundwater protection, either in terms of in-ground standards akin to the Public Water Supply Standards or to absolute non-degradation.

Lastly, the slow rates of groundwater movement often mean that the interval between introduction of a pollutant into the ground and recognition of the pollutant in a groundwater source may span a significant time, including years or even decades. As a consequence, much of the groundwater contamination being identified today may be the result of actions undertaken many years ago, and the actions of today (or lack thereof) may not be recognized for many years to come. This situation has significant implications for the legacy this generation will pass on to future generations, as well as practical implications in such matters as the ability to identify parties responsible or perhaps liable for the groundwater contamination.

Direction of Flow. In rivers and streams, water flow is from upstream to downstream. In most major standing bodies of waters more complex patterns of flow generally exist due to currents, but flow remains basically from the upstream inlet(s) to the downstream outlet. Surface water flow is thus often adequately addressed by viewing it as a directed one-dimensional phenomenon, which greatly simplifies matters such as tracking the source of a contaminant or determining the path that an introduced contaminant will take.

Conversely, groundwater flow is generally three-dimensional. That is, groundwaters may flow from a given point toward any direction in the horizontal plane, as well as move vertically, either upward and downward. The direction which will be taken is determined by the local hydraulic head, or driving force for the groundwater movement.

In very simple groundwater flow systems, the direction of groundwater flow at any point can generally be accurately estimated by a competent hydrogeologist without detailed analysis. However, complicated systems abound, and even seemingly simple systems often reveal themselves to be complicated due to heterogeneous soil properties, layering, or unusual boundary or internal conditions (Ex. 49, p. 31). In such cases, the only means to reasonably describe the associated groundwater movement is through computer solution of sophisticated mathematical equations, and then only after detailed hydrogeologic surveys have been conducted to provide the necessary data (Ex. 49, p. 31). Flow systems also change in response to actions such as fluctuations in recharge and variations in numbers of wells and amount of water withdrawn from wells. Furthermore, as noted with regard to rate of movement above, various processes which take place may contribute to or attenuate contaminant transport in flowing groundwaters.

Complex flow systems are very common in Illinois, particularly in the geologically complicated drift aquifers of the State. From the practical perspective, it is often impossible, without detailed investigation, to determine the path of groundwater flow and the movement of entrained contaminants; identification of the source of a groundwater contaminant is equally difficult (e.g., Ex. 18). This sets major constraints on the ability of regulatory and enforcement groups to carry out their charges.

Accessibility. Groundwaters, which are accessible only in wells or at points of surface seeps, are far less accessible than are surface waters. This observation, which on its face is so obvious that it seemingly might not require special notice, is nevertheless a critical facet to be considered in groundwater protection. It produces, among other matters, major restrictions on the ability to monitor or otherwise assess the quality of groundwaters, on the ability to determine the dynamic conditions that drive groundwater flow, and on the ability to apply remedial actions when a groundwater contamination problem is identified.

Water Uses. The major use of groundwater in Illinois, both in terms of quantity used and number of users, is for domestic consumption, including drinking; other major uses include withdrawals for agricultural and industrial use (see section II, herein). This balance of uses is significantly different from that for surface waters, where the principal uses include, in addition, direct recreational use (e.g., swimming), habitat for aquatic organisms, and, from a practical standpoint, disposal of wastewaters.

A significant facet of domestic consumption of groundwater is that most of the groundwater is not treated before use (R. at 536, 565). This is true of many public water supplies and the great majority of private water supplies; such treatment as is normally applied consists of processes such as as disinfection, fluoridation, and water-softening. This condition can exist because most groundwaters used for domestic consumption do not need treatment to comply with drinking water standards (R. at 739, 861). The opposite is true for surface waters, where treatment is the expected norm.

Ramifications for Protection Policy. The dissimilarities between surface and groundwaters, as noted above, have ramifications on the program which would most suitably protect Illinois groundwaters. Each of these ramifications is developed more fully in following sections. Among these are:

-- The variety of compositions and uses of groundwater makes the objective of groundwater protection less readily identifiable than that for surface water protection; the groundwater objective is not likely to be the same as that for surface water.

-- Standards suitable to protection of groundwaters may be significantly different from those designed to protect surface waters.

-- A single set of groundwater standards may not be sufficient to protect the broad range of ambient groundwaters and the various uses to which these groundwaters are or may be put.

-- Groundwaters may not be amenable to a standard of protection at other than that of the highest potential use without risk of long-term or permanent loss of the highest use.

-- Remediation of groundwater contamination is generally far more difficult and expensive than is remediation of surface water contamination.

-- An appropriate groundwater protection plan may strongly emphasize prevention over remediation.

-- Classification of groundwaters designed to recognize the different characteristics and uses of groundwater may be an essential management technique.

-- More extensive monitoring of groundwaters may be required than is practiced in surface water management if the full spectrum of groundwater quality conditions is to be recognized.

PREVENTION VERSUS REMEDIATION

A consensus throughout the materials before the Board is that remediation of groundwater contamination is a most difficult task. While there apparently have been some successful remedial efforts, remediation of groundwater contamination is generally concluded to be difficult, expensive, and require lengthy periods of time (R. at 524, 669-71, 858-9, 1350-1; Ex. 40, p. 8; Ex. 41, p. 19).

There are two general techniques for remedying groundwater contamination: containment and treatment. Both techniques are generally applicable only if the source or extent of contamination can be determined, a condition not always possible. The intent of containment is to retard the spread of contamination; approaches such as pumping wells to draw in contaminants and surface capping of contaminant sources to prevent rain from washing contaminants into groundwater may be employed. The long-term effectiveness of these approaches has not been demonstrated (Ex. 41, p. 21). Treatment usually involves pumping water from the contaminated aquifer and treating it at the surface. Treatment may alternatively be in situ by, for example, injection of microorganisms to degrade organic contaminants. Either type of treatment requires months or years of operation, and is costly (Ex. 41, p. 21).

Due to the inefficacy and difficulty of remediating groundwater contamination, there exists the additional consensus that in the realm of groundwater management there is a particular need to emphasize prevention programs over remediation programs (R. at 614, 619, 670; Ex. 40, p. 8), particularly where persistent toxic chemicals are involved (Ex. 1, p. 18). The Plan recognizes this need in its Recommendations section:

> In the long run, groundwater protection needs to be more prospective (prevention-oriented) to be truly effective since full restoration of groundwater quality can be very difficult and costly once contamination occurs. The EPA has found that Illinois is vulnerable with respect to this concern, and needs to take positive action to address this matter. (Ex. 1, p. 34).

In discussing its recommendations for a program of prevention of groundwater contamination, the Agency further noted:

> Essentially, the thrust of the entire program is that it is much more reasonable, it is cheaper, and it is certainly more safe to prevent groundwater contamination from reaching water supplies, from reaching aquifers, or any kind of groundwater that would render it unusable [than it is to remediate contaminated groundwater]. (R. at 525).

ENR also cited the need for prevention programs, noting prevention should be a goal of any groundwater plan:

> The only effective, long-term measures for protecting the Illinois groundwater resource are those that prevent contamination. Clean-up is expensive and seldom 100 percent effective. The State program should aim, therefore, to prevent any groundwater pollution, within economic and technical limits. (R. at 114; Ex. 22, p. 3).

Similar conclusions have been drawn on the national level. Noteworthy among these is the conclusion of the National Research Council's Committee on Ground Water Quality Protection:

> Programs that base coherent intergovernmental activities on protection of ground water as a resource appear to have a greater potential for long term success that those that focus on remedial action as has often been the case in other environmental protection programs. (Ex. 40, p. 9).

The Board strongly agrees with these perspectives, and hence with the need to stress contamination prevention in Illinois' groundwater protection program. As a generality, the Board believes that pollution prevention is preferable to pollution remediation irrespective of the environmental medium under consideration. However, in the realm of groundwater the need for prevention is particularly acute. Accordingly, the Board finds that a strong program for prevention of groundwater contamination is a necessary component of a groundwater protection program.

CLASSIFICATION OF GROUNDWATERS

General Principles. Classification of groundwaters consists of the systematic grouping of waters and/or the host earth materials in which the waters occur into classes based on common properties. Classification may be done simply for the purpose of clarifying the variety of conditions under which groundwater exists in nature, or for the more formal purpose of defining to which waters and/or host earth materials specific standards and regulations apply. An additional benefit of groundwater classification, whether done exterior to or within a regulatory program, is that it provides focus as to where limited state and local resources may be most effectively directed (Ex. 40, p. 80).

Classification of groundwaters in an informal sense has a long standing history and utility (R. at 903-5). The record is replete with examples of such. Groundwaters, among many examples of quality considerations, may be classified as brines if they possess unusually high salinities, as high-radium waters if the natural radium concentration is above a specified level, or as low-hardness waters if hardness is less than a specified value. Groundwaters may be further classified as being located in the "Deep Aquifer" or the "Shallow Aquifer", which generally relates to the depth of occurrence, but also has connotations of the stratigraphic units involved. Groundwaters are also regularly classified depending upon their being hosted in "Drift Aquifers" or "Bedrock Aquifers", a classification system based on the character of the host earth material. The Board has itself found it useful to call on a classification of groundwaters based on their resource properties, as presented in section II above, so as to bring focus to the policy basis of groundwater protection.

An issue before the State in the instant matter is whether classification should be carried to the more formal level wherein groundwaters are grouped toward the goal of providing differential standards and/or protection to the several groups.

Twenty-two states have either adopted or proposed some type of formal classification system (Ex. 28, p.13). The criteria involved in the classification systems has some diversity, including the following elements: types of use, degree of treatment required for use, salinity-quality levels,

vulnerability to contamination, importance of aquifers, and availability of other water supplies (Ex. 28, p. 13). A survey conducted by ENR (Ex. 52) found that twelve states classified groundwaters on the basis of TDS concentration, seven states classified on the basis of use designation, and one state on the combination of TDS concentration and use (R. at 772-3).

Application in Illinois. The only recommendation in the Plan regarding groundwater classification is the recommendation that the State not attempt formal classification of aquifers in terms of water quality at the present time. This perspective is based on the Agency's experience that such classification has inherent difficulties due to cross-connections between aquifers, variations in water quality and physical parameters within a single aquifer, direct observation problems, and absence of a positive reception by the public at the Agency's hearings (Ex. 1, p. 21; R. at 895-901).

The Agency's perspective may be correct. However, the Board concludes that it is premature to discard the concept of formal classification of groundwater in general. The record supports the determination that groundwater classification can have substantial utility, and that this utility should not be discarded without careful analysis of whether the potential gains outweigh the difficulty of implementation.

In subsequent sections of this Report, the Board develops the rationale for a two-fold groundwater protection program with provisions for both water quality standards development and a contamination prevention program. In both recommendations it is implicit that groundwaters be formally classified. With respect to the matter of water quality standards, the Board believes it necessary that a review of standards consider the broad spectrum of natural groundwater characteristics. This is not obviously accomplishable with a single set of numerical standards, and hence formal classification would seemingly be required to identify to which groundwaters specific standards would apply*.

* The Board notes that such classification does in fact presently exist in State regulations, wherein groundwaters classified as constituting a present or potential source of water for public or food processing water supply are identified as having specific standards applied to them which differ from those not in this classification category (see p. IV-2,3). The Board also notes that the existence of underground injection of wastes (see p. VI-5) constitutes a de facto classification of aquifers for disposal rather than for water supply, and that the Agency endorses the concept of classifying some groundwaters as "limited use" groundwaters due to impaired quality (R. at 905-11).

Similarly, the Board's recommendation for a contamination prevention program would logically seem to require differentiating among a variety of possible relationships between groundwater characteristics and land use activities. Hence, it would also seem to be necessary that there be identified classes to which particular preventive actions would be directed.

Much of the objection raised in the record to classifying Illinois groundwaters appears to be based on the premise that classification implies allowable degradation of groundwaters. As one witness noted: "The plan must have as its goal the non-degradation of Illinois groundwater; nothing less will do. Within this concept there is simply no room for classification of groundwater" (R. at 357). The Board disagrees with this premise. On the contrary, a properly defined classification system could assist a non-degradation policy by providing a framework for identification of ambient conditions.

The National Research Council ("NRC"), in its review of groundwater classification (Ex. 40), has reached conclusions similar to those of the Board. On the utility of classification the NRC's committee notes:

> A comprehensive classification system....can be an effective tool for optimizing ground water protection efforts. Maps prepared on the basis of a classification system can be used to guide activities such as the development of standards for water supply, land use management, source controls, and remedial action. By directing the location of potential sources of pollutants away from critical areas, classification can also reduce the cost and controversy associated with case-by-case siting of facilities. In addition, a mechanism for coordination between state and local governments is provided. (Ex. 40, p. 12)

The NRC committee's recommendation regarding classification is also similar to that of the Board:

> The committee recommends that states consider classifying their ground waters in conjunction with a mapping program that specifically identifies critical areas and resources for special protection. If data are not sufficient, they should be obtained to provide for classification and mapping in a phased approach. The lack of complete data should not necessarily preclude the development of a classification system. The classification criteria should be adopted through a public process. States with advanced protection programs may opt to give equal protection to all ambient waters of drinking quality. (Ex. 40, p. 12; emphasis added)

A further consideration on the matter of whether Illinois ought to formally classify its groundwaters follows from actions on the federal level. The United States Environmental Protection Agency ("USEPA") has been noted as advocating a three-fold classification of groundwaters based on their respective value and their vulnerability to contamination (Ex. 1, p. 16). At present, the USEPA only recommends use of this classification system. However, there are some indications that the USEPA may begin using it more formally and require states to use it in programs requiring federal/state coordination (R. at 902). Under the circumstances, Illinois may be well advised to have available the necessary data to so classify its groundwaters. The availability of special federal programs which require groundwater classification, as is the case with the groundwater demonstration program authorized under the Safe Drinking Water Act Amendments of 1986, may also be incentive for Illinois to undertake the effort of formal groundwater classification.

Illinois State Water Plan Task Force Proposal. The most specific groundwater classification proposal for Illinois presented in the record before the Board is the proposal of the Illinois State Water Plan Task Force. This proposal identifies four classes of groundwater based on use potential (Ex. 20, p. 1-3). The four classes are:

-- Domestic Use Underground Waters: Underground waters capable of being used directly for domestic use or food processing with no or minimum treatment. Minimum treatment shall include disinfection and fluoridation for public water supply use of underground water.

-- General Non-Domestic Use Underground Waters: Underground waters capable of being used for agricultural, industrial, recreational or any other legitimate beneficial non-domestic uses.

-- Limited Use Underground Waters: Underground waters whose naturally occurring characteristics render them generally unsuitable for withdrawal from the ground for domestic or general non-domestic use.

-- Imminent Surface Return Flow Underground Waters: Underground waters which are below the geomorphic flood plain and hydraulically connected to the surface waters within that plain.

Although the Board is not prepared to reach conclusions on the detailed merits of this proposal without review of the proposal in a proper regulatory forum, the Board does conclude that a classification system of this general type is consistent with, and would offer support to, the State Groundwater Policy proposed herein (p. II-1).

IDENTIFICATION OF SENSITIVE AQUIFERS AND RECHARGE AREAS

The issue of identification of sensitive* aquifers and recharge areas arises for several reasons. The principal of these are that there is no merit in undertaking groundwater protection efforts in areas where these efforts will not affect groundwater protection, and that the limit on available resources makes it imperative that efforts be concentrated in such a manner as to bring about the greatest amount of protection.

Based on these premises, it has been proposed, and the Board endorses, that groundwater protection, at least initially, be focused on groundwaters and recharge areas sensitive to contamination.

The Board concludes that research presently being conducted by ENR, in conjunction with other State agencies as appropriate, leading to the statewide identification and prioritization of critical recharge areas, would be of very great value in enabling such areas to eventually be protected. This research would hopefully result in as detailed an identification as reasonably possible of both the sensitive recharge areas and the aquifers involved and include mapping of them. A high priority is appropriately placed on completing this work as soon as possible. If limited resources mandate that less than a statewide effort takes place, at least some of the research undertaken should be directed towards the identification and mapping of the most sensitive areas (i.e., those aquifers which allow, because of their character, rapid flow of groundwater and contaminants).

MONITORING

Recommendation of the Plan. The Plan recommends continued and expanded efforts at monitoring of groundwater (Ex. 1, p. 30-1). The Board finds these efforts to be necessary. As the plan notes, the overall objectives of monitoring are to establish baseline groundwater quality and trends, identify problems, and develop future problem solving approaches (Ex. 1, p. 30). The Board concludes that meeting all of these objectives is essential to protection of groundwater. It may further be concluded that much of our present understanding of groundwater quality has derived from monitoring, and that all future understanding will

* The Board notes that this term is regularly used to refer to aquifers and/or recharge areas which have a high susceptibility to or potential for becoming contaminated. However, the term has not yet been defined to the degree which would be necessary in any regulatory or legislative program.

be critically dependent upon maintaining and expanding monitoring efforts.

The Agency has already instituted a program for monitoring of groundwater (R. at 23, 117), the major provisions of which involve monitoring all community* water supply wells for organic substances (Ex. 1, p. 49-51) over a four-year period, expansion of analytical facilities to allow detection of a broad range of possible pollutants, provision for follow-up monitoring, and identification of regional problem areas and specific known or suspected areas of groundwater contamination (Ex. 1, p. 30-1). Other State agencies, principally the research divisions of ENR, also conduct specialized groundwater monitoring. The Department of Public Health additionally monitors some non-community water supplies and private water supplies by request for bacterial and nitrate contamination. The Board commends these present efforts, as well as the continuing efforts of the responsible officials for improvement and expansion of their monitoring programs.

Scope of Monitoring. The Board concludes, however, that the scope of the present monitoring program requires expansion. In this regard, the studies and recommendations of ENR merit special attention. ENR points out that the Agency's present monitoring program should be more appropriately designed in order to meet the goal of establishing baseline groundwater quality and trends. At the least, private and non-community wells should be brought into the network, frequency of monitoring should be selectively adjusted to suit aquifer/well conditions, and data collection should be coordinated (R. at 123-7, 1236; Ex. 22, p. 6-7). Mr. Jeffery S. Brown, Environmental Manager of Velsicol Chemical Corporation, speaking on behalf of the Illinois Environmental Regulatory Group ("IERG"), was supportive of this aspect of ENR's recommendations when he noted that:

> The network of monitoring wells proposed on page 30 of the report [Plan] fails to recognize that public water supply wells are not representative of the geology or contaminant sources of Illinois. The network should be based on a statistically representative sample of Illinois' ground water resource rather than on the most convenient well. (R. at 1128-9; Ex. 65, p. 3; emphasis in original)

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* Community and non-community water supplies are varieties of public water supplies by definition in the Illinois Environmental Protection Act. The term "private water supply" is used herein as a water supply which is not a public water supply, as this latter term is defined in the Act (see p. IV-3,4). This is the sense in which the term "private water supply" is used in the Plan (R. at 1453), as well as apparently throughout the record in this proceeding.

The Board does not believe that present monitoring is conducted only on the basis of convenience of well location, as the above statement implies. However, the Board is particularly concerned that there is no present, systematic monitoring of private and non-community water supplies for critical potential contaminants. This raises several specters, including the possibility that the significant portion of the population which utilizes or is exposed to water from private and non-community water wells may not be subject to the hazard alert afforded by monitoring; that some portion of the population may actually be exposed to hazardous contaminants without their awareness or without the awareness of officials; and that significant groundwater resources may become contaminated, possibly beyond the availability of remedial measures, before the existence of the problem is recognized.

The Board is also concerned that private and non-community water supplies are often derived from shallower sources than are community water supplies. Under these circumstances, private and non-community water supplies run a greater risk of contamination due to activities originating at the ground surface (Ex. 1, p. 23). Thus, absence of data in the monitoring record from these supplies may lead to a significant underevaluation of, and reaction to, the problems of groundwater contamination.

The Board is aware of the magnitude of the fiscal resource which would be needed to integrate all of the approximately 500,000 private wells in Illinois into a fully comprehensive monitoring program. However, the Board believes that this fact need not require the exclusion of all private and non-community wells from the Agency's systematic monitoring program. Rather, it would seem that a useful program could be designed which would integrate data from both community and private and non-community water supplies. Such a program might, for example, include as regular members of the sampling group private and non-community wells selected for representative conditions, including types of local land use, geographic locale, recharge area, depth, source aquifer, and intended water use. Data from the regular members of the private and non-community sampling group might then be further augmented and checked by sampling of randomly selected members of the remaining population of private and non-community wells (R. at 374). The Board additionally suggests that monitoring efforts could have special focus on areas where potential contaminant sources are known to occur, and thereby enchance effective use of the limited monitoring resource.

An additional provision of a monitoring program which the Board concludes warrants further consideration is the recommendation of ENR (R. at 126) and other witnesses (R. at 335, 342, 372) that it be made mandatory that all wells be tested for a broad range of contaminants when first drilled and/or whenever

the well changes ownership*. This would appear to be a matter requiring action on the part of the General Assembly, and the Board refers it to that body for consideration. The Board would note that, among other matters, implementation of this recommendation would appear to require identification of the party or parties responsible for bearing the cost and undertaking the effort of collecting and analyzing the sample(s) and for interpreting resultant data.

Monitoring for Agricultural Chemicals. Concern about the possible presence of agricultural chemicals in Illinois groundwaters was commonly expressed during the hearings (e.g., R. at 329-37, 1262-8). Although the extent and significance of the levels of agricultural chemicals in groundwater is a subject of some debate, many witnesses believe that Illinois must conduct a monitoring program to better define agricultural chemical contamination. There is particular concern that the recognition of agricultural chemicals in groundwaters in many states (e.g., Exs. 41, 47, 85-88, 94) implies, given the high use of agricultural chemicals in Illinois, that Illinois groundwaters may be similarly contaminated.

At present, there is little demonstration of the presence of agricultural chemicals in Illinois groundwater. For the most part, the few studies that have been undertaken have indicated no significant contamination. However, the extent of monitoring has been neither large nor comprehensive. The first detailed study is currently being undertaken by the Illinois State Geological and Water Surveys. This study focuses on pesticide occurrences in soils and groundwaters in a region of Mason County. The purpose of the study is to determine whether widely used pesticides are leaking into groundwater in a region highly susceptible to such contamination. Unfortunately, results of this study were not available during the hearings or during the public comment period.

The Board commends the efforts of the Surveys, and supports continued efforts to better define the occurrences and extent of agricultural chemical contamination in groundwater. In this context, the Board notes the conclusion of the National Research Council's Committee on Ground Water Quality Protection that information on chemical usage patterns, chemical characteristics, and hydrologic conditions can be employed to minimize the cost of a monitoring program (Ex. 40, p. 122).

* Many lending institutions require testing for bacteria and nitrates as a condition for granting mortgages (R. at 412, 415). However, more extensive analyses are apparently not generally required.

Data Accessiblity. Concern has been expressed about the availability of monitoring data (R. at 125-7). Most of the data which presently exists is apparently available only in file-form, and cannot be machine retrieved or read. Consequently, data access is limited. The Illinois State Water Plan Task Force recommended:

> To most effectively address the issue of monitoring and managing Illinois underground resources, it is recommended than an expanded "real time" computer based analyses of already routinely collected underground water quality data, with adequate quality control be developed. Results from that effort would form the basis for interagency decisions in establishing additional data collection priorities. To address the multiple underground water quality data needs of state and local plannng agencies, a technical advisory committee representing interested State and Federal agencies should be established to periodically review the results of continuing data interpretations and modify monitoring recommendations to meet emerging needs and priorities. (Ex. 20, p. 6).

The difficulty with accessing existing water quality data was additionally emphasized during the hearings, when it was noted that requested monitoring data could not be provided by the Agency to the Board or the public in "anything short of a month without disturbing our existing operations or monitoring" (R. at 1473). On these bases, it appears clear that data accessibility requires improvement.

COORDINATION OF PROGRAMS

There is broad support throughout the record before the Board, including both the Agency through the Plan (p. 55) and ENR in its submissions to the record (R. at 115-6, 135-6; Ex. 22, Ex. 90, p. 3), that there be a coordination of efforts among State agencies responsible for groundwater protection as a necessary condition to effective groundwater management. Local governmental officials have also noted their uncertainty regarding the responsible State agency for various aspects of both present and proposed groundwater protection, and the need to coordinate with local agencies (R. at 406-7).

The Illinois State Water Plan Task Force also addressed this issue, noting:

> Illinois agencies currently regulate [a broad spectrum of potential sources of groundwater contamination]. The regulations, however, have been adopted for a variety of different purposes and at

different times by at least nine different agencies. Consequently, Illinois lacks the comprehensive approach to the protection of ground water quality needed for adequate control of all sources of ground water pollution. The present patchwork of miscellaneous statutes and regulations provides too many opportunities for gaps and overlaps in regulatory control. (Ex. 20, p. 8).

The Board concludes that the broad support for coordination of groundwater management efforts is evidence of its necessity. The Board therefore concludes that effective management of the State's groundwaters requires appointment of a lead agency to oversee and coordinate the State's groundwater management program; the lead agency would appear to most logically be the Illinois Environmental Protection Agency, which presently has the prime responsiblity for groundwater protection and which presently administers the most closely related programs. However, because groundwater management is a multifaceted and interdisciplinary field, the Board concludes that the lead agency should be prepared to draw upon the many perspectives and expertises present among the diverse agencies of both State and local governments.

Effective coordination by the lead agency would also appear to require, or at the minimum to be enhanced by, bringing appropriate programs under the administrative authority of the lead agency. Among candidates for grouping under the lead agency's direction are the well drilling and well closing oversight programs presently administered by the Department of Mines and Minerals, the private well oversight and monitoring programs presently administered by the Department of Public Health, and the Leaking Underground Storage Tank program presently administered by the State Fire Marshal.

SECTION IV:

WATER QUALITY STANDARDS

A principal issue in the record before the Board concerns the application of water quality standards to groundwater. In this section, the Board reviews existing standards, the several proposals which have been presented for alternative standards, and other matters related to application of standards to Illinois groundwaters.

EXISTING STANDARDS FOR GROUNDWATER PROTECTION

Overview. The State of Illinois presently has water quality standards which are directed to protection of groundwater, or which otherwise involve groundwater use. Additionally, certain federal standards are applicable to groundwater protection. The Illinois water quality standards are contained principally in two subtitles of 35 Ill. Adm. Code:

> Subtitle C, Water Pollution, Parts 300-312
> Subtitle F, Public Water Supplies, Parts 601-607

In the following, all citations to Subtitles, Parts, Subparts, and Sections ( ) are to 35 Ill. Adm. Code unless otherwise noted.

Water Pollution Standards (Subtitle C). The largest portion of existing groundwater protection regulations exists within the Pollution Control Board's Subtitle C, Rules and Regulations for Water Pollution. Within this subtitle underground waters are defined and are identified as being subject to two bodies of standards and to a general provision for non-degradation.

Underground waters and waters are defined respectively as follows:

> Underground Waters: Any waters of the State located beneath the surface of the earth. (301.420)
>
> Waters: All accumulations of water, surface and underground, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon the State of Illinois... (301.440)

The Illinois Environmental Protection Act also contains a definition of waters identical in substance to that of 301.440:

> "WATERS" means all accumulation of water, surface and underground, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon this

State. (Ill. Rev. Stat. ch. 111½, par. 1003, 3(oo)).

The two bodies of standards which are applicable to groundwaters are the General Use Standards contained in Subpart B of Part 302 and the Public and Food Processing Water Supply Standards contained in Subpart C of Part 302. Applicability of the two sets of standards to groundwater is determined by:

Section 303.201 General Use Waters

Except as otherwise specifically provided, all waters of the State must meet the general use standards of Subpart B of Part 302.

Section 303.203 Underground Waters

The underground waters of Illinois which are a present or a potential source of water for public or food processing supply shall meet the general use and public and food processing water supply standards of Subparts B and C, Part 203, except due to natural causes.

The Public and Food Processing Water Supply Standards, where applicable, are always cumulative with the General Use Standards. That is, they apply in addition to the General Use Standards. Their principal effect is to supply more restrictive or stringent limits for some of the General Use parameters, as well as to increase the number of parameters for which numerical standards exist.

303.203 determines that the cumulative General Use and Public and Food Processing Water Supply Standards are applicable to groundwaters* which are a present or a potential source of

* It has been noted (R. at 1441) that the definition of Public and Food Processing Water Supply found at 301.360 identifies such supplies as water withdrawn from surface water and fails to mention underground water. The 301.360 definition is asserted to be a cause of confusion and to allow a reading that Public and Food Processing Water Supply Standards are not to be applied to water withdrawn from underground waters even though that water may otherwise meet the criteria of a Public and Food Processing Water Supply (R. at 1441-9). The Board notes that such a reading would be clearly inconsistent with both 303.203 and the Board's expressed intentions at the time of adoption of the water quality standards (in R71-14, 3 PCB 755). So that this source of possible confusion may be corrected, the Board will propose to amend the definition of Public and Food Processing Water Supply found at 301.360 in the earliest appropriate regulatory proceeding.

water for potable use or for food processing, except where deviation is due to natural causes. It is significant to note that these standards apply in situ; that is, they are ambient water quality standards. They also apply irrespective of whether the waters are used by a public water supplier, a private water supplier, or only have the potential for being so used.

301.420, 301.440, and 303.201 also seemingly determine in combination that the General Use Standards apply to groundwaters of the State wherever these do not have present or potential use as water supplies. However, to the Board's knowledge this issue has not been specifically addressed in any judicial forum.

An additional provision of Subtitle C, Water Pollution, which applies to groundwaters, is the non-degradation provision. Specifically it states:

Section 302.105 Nondegradation

> Waters whose existing quality is better than the established standards at the date of their adoption will be maintained in their present high quality. Such waters will not be lowered in quality unless and until it is affirmatively demonstrated that such change will not interfere with or become injurious to any appropriate beneficial uses made of, or presently possible in, such waters and that such change is justifiable as a result of necessary economic or social development.

As is the case with the standards of Subpart B, the non-degradation provision applies to groundwaters because groundwaters are waters of the State, pursuant to 301.420 and 301.440. The Board notes that the federal term "anti-degradation" might more accurately describe 302.105 since, clearly, this section does not completely preclude degradation, but allows limited degradation after an adequate showing that it is necessary for important public purposes and only after appropriate public participation.

Public Water Supply Standards (Subtitle F). The Public Water Supply Standards of Subtitle F apply to public water supplies, except for those designated as non-community water supplies, irrespective of whether the source of the water is groundwater or surface water. A public water supply is defined in the Illinois Environmental Protection Act:

> "PUBLIC WATER SUPPLY" means all mains, pipes and structures through which water is obtained and distributed to the public, including wells and well structures, intakes and cribs, pumping stations, treatment plants, reservoirs, storage tanks and appurtenances, collectively or severally, actually

used or intended for use for the purpose of furnishing water for drinking or general domestic use and which serve at least 15 service connections or which regularly serve at least 25 persons at least 60 days per year. A public water supply is either a "community water supply" or a "non-community water supply". (Ill. Rev. Stat. ch. 111½, par. 1003, 3(u)).

Community and non-community water supplies are also defined in the Act:

> "COMMUNITY WATER SUPPLY" means a public water supply which serves or is intended to serve at least 15 service connections used by residents or regularly serves at least 25 residents. (Ill. Rev. Stat. ch. 111½, par. 1003, 3(rr)).
>
> "NON-COMMUNITY WATER SUPPLY" means a public water supply that is not a community water supply. The requirements of this Act shall not apply to non-community water supplies. (Ill. Rev. Stat. ch. 111½, par. 1003, 3(ss)).

Public Water Supply Standards are found in Part 604. They are applicable at each service connection ("point of distribution") of a Public Water Supply. As such, they are applicable to waters irrespective of source, including waters derived from either surface or groundwater sources. Their principal purpose is to assure that water delivered to a user by a Public Water Supply is consumable without additional treatment by the user. The standards do not apply to private water supplies, which are those which fail to meet the criteria in the definition of Public Water Supply (see footnote, p. III-13).

The Illinois Public Water Supply Standards have major foundation in federal law, particularly in the Safe Drinking Water Act ("SDWA") and its amendments. The Illinois standards are no less stringent than those of the SDWA, but may be more stringent in some particular provisions. It is anticipated that the 1986 amendments to the SDWA, which mandated promulgation of 83 maximum contaminant levels ("MCL") by the USEPA over the next three years, will significantly increase the number of parameters covered by the Public Water Supply Standards.

Other State Groundwater Regulations. The Board's regulations contain other groundwater pollution control provisions, principally those which control waste disposal found in Subtitle G. State regulations for hazardous waste are essentially identical with federal regulations required under the Resource Conservation and Recovery Act ("RCRA"). These include regulations for both interim and final status groundwater protection operating requirements. The intent of these is illustrated by Part 724 of Subtitle G, which specifies

groundwater quality standards to be met in the uppermost aquifer underlying a waste management area at and beyond the point of compliance. The standards, or constituent maximum concentration levels ("MCLs")* are identical to the Safe Drinking Water Act's currently effective interim drinking water standards for metals and organic pesticides. For constituents not having such standards, the concentration "must not exceed the background level of that constituent in the groundwater at the time that limit is specified in the permit" (724.194). The point of compliance is defined as being "a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer" (724.195). This effectively provides for a "mixing zone" or "zone of attenuation" directly underlying the waste management area.

As opposed to hazardous waste disposal sites, State regulations for sanitary landfills contain no provisions specific to the protection of groundwater quality other than a general prohibition against water pollution (807.313) and the requirement that information be submitted with the permit application sufficient to describe groundwater conditions, show that water pollution will not occur, and show that water quality standards will be complied with (807.316). On-site disposal of waste not listed as "hazardous" is exempted from even this narrative requirement since a permit is not necessary in such cases [Ill. Rev. Stat. ch. 111½, par. 1021(d)(i)].

Federal Standards. The federal government does not presently have generally applicable groundwater standards**. Rather, the principal areas where federal standards respecting groundwater come into play are with regard to public water supply standards promulgated under the SDWA and regulations to protect groundwater from contamination by land disposal of waste. State standards may be more stringent, but must at a minimum incorporate these federal standards. Furthermore, as is the case in Illinois, many states adopting water quality standards for surface waters as required under the Clean Water Act (22 USC 1313) have included standards for groundwater. After approval by the USEPA, these become federally enforceable standards.

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* Under the SDWA, the term used for drinking water standards is maximum contaminant level ("MCL"). The equivalent term under Illinois regulations is Maximum Acceptable Concentration ("MAC"). Additionally, health-based recommended standards under the SDWA are known as recommended maximum contaminant levels ("RMCL").

** As the Board has previously noted (p. II-9), there is impetus in Congress to develop groundwater protection legislation. It is possible that provisions for federal groundwater quality standards could be included.

The Board has previously adopted any new federal MCLs into the State regulations after hearings are held and an economic impact analysis is undertaken. Thus, the federal MCLs and the State Public Water Supply Standards are essentially coincident*. As is the case with the State's Public Water Supply Standards of Subtitle F, the federal public water supply standards do not apply to ambient groundwaters, but rather to finished waters as delivered to consumers.

Federal hazardous waste regulations, as noted above, are also essentially identical to those which have been adopted in Illinois. Land disposal of wastes not listed as hazardous is supposed to comply with criteria established under Subtitle D of RCRA. Those criteria essentially require compliance with drinking water standards in groundwater beyond the solid waste boundary. Although Illinois has yet to adopt these criteria, it will be required to do so for at least those facilities handling small quantity generator and household hazardous wastes no later than November, 1987, according to recent amendments to federal law. Additionally, these criteria are to be upgraded and it is expected that Illinois will be required to adopt the upgraded criteria by approximately September, 1989 (42 U.S. Code 6955).

RATIONALE FOR WATER QUALITY STANDARDS

Before discussing the various proposals present in the record for modification of the present water quality standards, the Board believes it instructive to first briefly review the rationale for water quality standards themselves. Opinions expressed at hearing are that the purpose of water quality standards is to set the measure of compliance (R. at 91) and to aid enforcement actions (R. at 851, 1416). While the Board acknowledges the utility of standards in the enforcement process, it concludes that water quality standards serve several additional and vital functions.

Certainly a very vital function of water quality standards is to define for a potential user the conditions under which use of a particular water is believed to be harmful. This probably is the principal perception of water quality standards held by the public.

A second major function of water quality standards is to provide a firm definition of the minimum expected level of protection. As the Board noted in 1972 when it adopted the water quality standards essentially in place today, "the standards represent not optimum water quality, but the worst we are

* The Board notes that it is currently considering the merits of adopting standards for two parameters not covered by federal MCLs. These are trihalomethanes (R85-12) and aluminum (R86-29).

prepared to tolerate if economic considerations so require" (in the matter of Water Quality Standards Revisions, R71-14, 3 PCB 765).

Another view is expressed in the State Water Quality Management Plan, which noted that "water quality standards are the numerical expression of the aspiration of the people of Illinois for their water resources" (Vol. 1, p. 54, 83).

Other important functions of water quality standards include providing greater clarity to environmental protection goals; serving as an alert mechanism for corrective action; serving as a goal for remedial action; providing guidance in devising permit conditions; and serving as a standard of judgment for management alternatives. Each of these additional functions can also actually provide environmental protection by clarifying what is expected of all individuals concerned, and hence sometimes obviate the need for enforcement. For example, design of new facilities can be guided to assure no violation of standards.

Lastly, the Board believes that specifically defined standards serve as the embodiment of an environmental protection philosophy. The Board believes that this is well illustrated in the instant proceeding wherein proponents of differing perspectives have regularly associated established classes of water quality standards with their philosophies.

For all of the above reasons, the Board concludes that clear and appropriate water quality standards serve an important environmental protection role. The Board further concludes that clear and appropriate water quality standards constitute a fundamental facet of any groundwater protection program.

RECOMMENDATIONS FOR GROUNDWATER STANDARDS

A substantial portion of the record before the Board addresses the issue of what water quality standards are most appropriately applied to the State's underground waters. There have been three principal recommendations, which may be generally characterized as: that present standards be replaced by "general use" standards; that present standards be replaced by "drinking water standards"; and that the standard be absolute non-degradation.

There is some confusion in the record concerning the terminology within which recommendations have been couched. This is particularly true with respect to proponents of the application of "general use" standards to groundwaters. In several cases, cross-examination showed that the user of this term was envisioning application of use-based standards to groundwater (R. at 604, 636, 870, 986), and not necessarily that the General Uses Standards as presently defined in Part 302 be applied to groundwater. The Plan's (Ex. 1, p. 29) recommendation

for groundwater standards is itself a recommendation for use-based standards (R. at 36, 604, 607) and not a recommendation for application of the Part 302 standards, a point not obviously appreciated by all witnesses nor in all submissions to the record. For these reasons, the Board will refer to such recommendations as recommendations for "general use" standards, enclosing the term in quotation marks.

A similar difficulty exists with proponents recommending application of "drinking water" standards, wherein there is evident confusion on the part of some witnesses concerning the distinction between the Public and Food Processing Water Supply Standards and the Public Water Supply Standards. In spite of their similarity in name, the two sets of standards differ substantially in concept and in some of their specific provisions.

In concept, the Public and Food Processing Water Supply Standards are intended to assure that a raw water source is of sufficient quality that it can be applied to domestic consumption or food processing use without extraordinary treatment; the standards are ambient water quality standards; with respect to groundwater, they apply in the ground at the point at which water is withdrawn or has the potential for being withdrawn for public or food processing use.

In contrast, the Public Water Supply Standards are intended to assure that a consumer of water is furnished a suitable product by the distributor irrespective of the level of treatment needed to bring the water to standard; the standards are finished water standards; the application point is within the distribution system. The two sets of standards also differ in some specifics, including the parameters which are specified and the numerical limits of the parameters. In general, but not exclusively, the parameters present in the Public Water Supply Standards are more numerous and have stricter limits than the Public and Food Processing Water Supply Standards.

Although many efforts were made at hearing to assure that witnesses were aware of these distinctions, it is not apparent that the efforts were always successful. It is therefore difficult for the Board to know whether a particular witness was conceiving of "drinking water" standards or even "potable water" standards as coincident with the concepts and specifics of Public and Food Processing Water Supply Standards, with the concepts and specifics of Public Water Supply Standards, with the concepts and specifics of a combination of the two, or none of the above.

Table 1 is provided to show how some aspects of the various recommendations differ. It does not necessarily recognize all the variations which the various proponents of alternate recommendations may have considered. Also included is the recommendation of the Board on the matter of groundwater quality standards and, for reference, the system of standards presently applicable to Illinois surface waters.

TABLE 1. PRESENT AND RECOMMENDED APPLICABILITY OF NUMERICAL WATER QUALITY STANDARDS TO GROUNDWATERS

	Ambient, exclusive of points of withdrawal for Public and Food Processing Water Supply	Point of withdrawal for Public and Food Processing Water Supply	Distribution point of Public Water Supply
Present Illinois Surface Water Standards	General Use[1]	Cumulative General Use and Public and Food Processing Water Supply	Public Water Supply
Present Illinois Underground Water Quality Standards	Cumulative[2] General Use and Public and Food Processing Water Supply	Cumulative General Use and Public and Food Processing Water Supply	Public Water Supply
Recommendation of "Use-Based" Standards	"General Use"	Public and Food Processing Water Supply[3]	Public Water Supply
Recommendation of "Drinking Water-Based" Standards	"Drinking Water"[4]	"Drinking Water"[4]	Public Water Supply
Recommendation of Non-degradation	Standards are equal to the natural water quality		Public Water Supply
Board Recommendation	Separate set(s) of standards specific to the protection of groundwaters		Public Water Supply

(1) In some special circumstances, standards other than General Use apply (i.e., Lake Michigan or Secondary Use Standards).

(2) Applicable only to underground waters which are a present or a potential source of water for Public and Food Processing Water Supply.

(3) In some recommendations "general use" rather than Public and Food Processing Water Supply Standards would apply.

(4) Applicable in different recommendations to groundwaters in general or only to "resource groundwaters".

Applicability of Surface Water Standards to Groundwater. The only specific endorsement in the record of which the Board is aware for application of the General Use Standards of Part 302 to groundwaters is that of the Illinois State Water Plan Task Force (Ex. 40, p. 4). Nevertheless, it is clear that some witnesses believed that this is a recommendation of the Plan. In general, this interpretation of the Plan was not received favorably (R. at 120-1; Ex. 22, p. 5). The Board itself therefore concludes that it is useful to lay out its position concerning General Use Standards because these are currently applicable to some groundwaters, and will remain so unless a regulatory revision is undertaken.

It is clear from both the record in the instant matter and from previous matters before the Board that standards for groundwater have been something of a stepchild in the general arena of water quality standards. That is, while substantial deliberation has gone into the development and refinement of surface water standards, in the past comparatively little attention has been focused on the special conditions encountered in groundwater. To some degree this is understandable, given changing perspectives on groundwater quality (Ex. 1, p. 11) and a growing awareness of a whole new generation of potential groundwater contaminants (Ex. 1, p. 18). A part of this new view of groundwater is the concern that standards promulgated for surface waters have been extended to groundwaters without sufficient consideration of the dissimilarities which exist between the two (R. at 119-20; Ex. 22, p. 5).

From the practical perspective, the dissimilarities between surface waters and groundwaters would suggest that the General Use Standards, in large part conditioned on protection of habitat for aquatic life and for recreational uses, may not be appropriate to groundwater protection. An example in point is 302.210 of the General Use Standards, which relates to substances toxic to aquatic life. It provides that waters shall not contain any substance toxic to aquatic life in concentrations exceeding one-tenth of the 96-hour median tolerance limit for native fish or essential fish organisms, with USEPA registered aquatic-use pesticides being excepted. A plain reading of this section, in combination with the provisions of 302.201 and 303.203, could lead to the conclusion that groundwaters are subject to this aquatic toxicity limit. It may, in fact, be appropriate that groundwaters be so subject given that some groundwaters discharge to surface waters (see p. II-6,7). However, it is possible that such a determination would be judged arbitrary and capricious given the questionable applicability of aquatic-life criteria to ambient groundwaters.

There are other, less obvious, examples of the questionable application of General Use Standards to groundwater. Several General Use parameters have more restrictive General Use limits than Public Water Supply limits. This generally exists because some substances have detrimental effects on aquatic life at significantly lower levels than those which produce an effect on humans. Copper is an example. Copper is toxic to certain elements of the aquatic food chain, and accordingly the General Use Standard is set at the relatively low level of 0.02 mg/L. Humans, however, are substantially more tolerant of copper, to the point where copper piping is commonly employed in water systems. The Public Water Supply Standard for copper is correspondingly 5.0 mg/L*, 250 times larger than the General Use Standard. This raises the question as to whether it is appropriate to protect groundwaters, which are generally considered to have the highest use in human consumption, with a copper standard based on toxicity to aquatic life. This question is not answered in the record currently before the Board, but the Board believes that this and similar questions are of sufficient importance that they should be answered.

The general aquatic life toxicity provision and the copper standard of the General Use Standards are but two illustrations of possible inappropriateness of the General Use Standards as applied to groundwaters. Other examples of questionable application may also exist. It is not our purpose to expand further upon these, but rather to note that their existence, even if only a possibility, recommends a thorough review of the applicability to groundwaters of standards which are of surface water derivation.

Although discussion of the inappropriateness of applying surface water standards to groundwater has focused on the General Use Standards, there may also be question as to whether the current Public and Food Processing Water Standards are appropriate for groundwater protection. Water withdrawn from surface waters for public and food processing purposes is always treated before use. This is not the case with water withdrawn for the same purpose from groundwater (R. at 120, 861). Nor is it necessarily reasonable to expect that all groundwater used for public and food processing can be feasibly treated. This is because the great majority of groundwater withdrawals are at family residences, where economics and maintenance needs may dictate that treatment beyond the most simple is infeasible.

The Board is not sure whether the implied presence of treatment with surface waters versus the implied absence of treatment with groundwaters render the present Public and Food Processing Water Supply Standards unsuitable for application to

* USEPA has recently proposed an RMCL of 1.3 mg/L, based on new data.

groundwaters. However, the Boards does conclude that this is a matter which should be addressed in a regulatory proceeding which focuses on groundwater quality standards.

"General Use" Standards. The principle behind applying "general use" standards to groundwaters is that it is best to protect a resource to the level where its uses are maintainable. Underlying this principle are the further beliefs that not all groundwaters are of equal utility to humans or the natural environment, and that application of a uniform most-restrictive set of standards would therefore be economically inefficient.

The Board finds merit in the perspective that groundwater uses should be maintained, and concludes that this is consistent with the proposed Groundwater Protection Policy presented in section II (p. II-1). However, the Board has some difficulty with how this principle is applied in some of the recommendations for application of "general use" standards to groundwater.

Among the several issues here is whether the "general use" recommendation is meant to apply standards which are capable of supporting some or even most uses, but which would be insufficient to support others. The Plan appears to take this interpretation:

> Existing Pollution Control Board regulations for water pollution control have the effect of designating most underground waters as drinking waters requiring compliance with drinking water standards in the ground. In contrast, the IEPA believes that drinking water standards should only apply at the point where water enters the distribution system to a public water supply and not in the ground. (Ex. 1, p. 29).*

The Plan goes on to acknowledge that water which meets "general use" standards might not meet drinking water standards (Ex. 1, p. 29), and specifically suggests that in this circumstance treatment "can be applied prior to distribution to achieve the drinking water standards" (Ex. 1, p. 29). The Board has difficulty with this interpretation. As the Board noted previously, there are characteristics of groundwater which

* The Board notes that the two references to "drinking water" standards in this passage illustrate the duality of use of this term as previously discussed. The first use in the passage would appear to equate "drinking water standards" to the Public and Food Processing Water Supply Standards, since it is these which apply to "most underground waters". The second use would appear to equate to the Public Water Supply Standards, since these apply in the distribution system, and not in the ground.

seemingly suggest that "groundwaters may not be amenable to a standard of protection at other than that of the highest potential use without risk of long-term or permanent loss of the highest use" (see p. III-6). Drinking use, in the Plan's interpretation, is certainly a higher use than "general use". Moreover, it is also the most common use of groundwater. The Board therefore does not and could not recommend that standards be applied to groundwater which would place limits on the ability of groundwater to be used both in its highest and most common capacity.

The concern about needing to add on treatment to upgrade from "general use" to drinking water standards was voiced by several witnesses (R. at 120, 317, 338, 358), illustrated by Ms. Olive Fenton:

> To me as a layman I read that if I turn on my tap water tomorrow morning and my water is polluted, then I have to worry about getting a very expensive water-treatment system to clean it up, because there is no provision under these goals to prevent the pollution from occurring before it reaches me. I do not think we should lower our water-quality standards from drinking water quality in either the public or private wells. (R. at 317-8).

The Board notes that there is no implication in the recommendation for applying "general use" standards to groundwater that groundwater would thereby be allowed to be "polluted", as the above passage might imply. However, as noted, the Plan does acknowledge (Ex 1, p. 29) that water which meets groundwater "general use" standards might not meet drinking water standards. In this case, treatment would be necessary.

The Board has difficulty with this provision of the Plan. The Plan's perspective perhaps is more appropriate for surface waters where treatment is an implied condition for use. But the same is not necessarily true for groundwaters, where the implied and generally existing condition is that treatment is not needed. Moreover, the Plan's implication is that treatment necessary to meet drinking water standards is available easily and as a matter of fact. The Board cannot accept, nor does the record support, this implication. Rather, the type of treatment necessary to remove the most serious of the potential contaminants would seem to be costly and perhaps beyond the reach of many community water supplies. Neither does the Plan appear to give consideration to the far more numerous private and non-community water supplies for which treatment may be even more economically unreasonable.

An even more fundamental difficulty with the Plan's perspective on treatment is the implication that the user should bear the burden of maintaining the use, rather than that the burden be borne by the contaminator. The Board is uncertain that

the Assurance of Water Supply recommendation (see p. V-20) would be sufficient to address this concern. Clearly, Assurance of Water Supply would impose a burden on the user to identify and provide proof of the source of contamination, a burden which the Board believes would be difficult and should not have be to borne by many separate users.

At issue further is whether application of groundwater "general use" standards would constitute or allow downgrading of water quality from that which is mandated under current Board regulations. The Board could not abide any proposal which would allow such downgrading without a very careful and extensive review pursuant to the provisions of the Board's non-degradation provision at 302.105. Further, the Board could not abide degradation of the groundwater resource to such an extent that the resource could no longer be viably used as a source of drinking water where the present and future use is for drinking water supply.

The Board can not determine whether the recommendation of groundwater "general use" standards as presented in the record is in fact a recommendation which would allow downgrading. That could only be determined by a provision-by-provision review of a specific proposal with the current Board regulations.

Given these uncertainties, the Board declines to endorse at this time the recommendation of the Plan that groundwater "general use" standards be adopted. Rather, the Board concludes that the appropriateness of any such adoption can be determined only in review of a specific proposal.

"Drinking Water" Standards. The most common recommendation in opposition to the Plan is the recommendation that "drinking water" standards be applied to groundwaters in general, or to some specific subset of groundwaters. The general conception is that groundwaters find their most common, highest, and most demanding use in serving as sources of drinking water. Thus, groundwaters ought to be protected for drinking water use.

ENR has been one of the principal proponents of this position. ENR believes that "drinking water" standards should be applied to all in situ groundwater in the State, except to those groundwater resources presently violating drinking water standards by either man-induced contamination or naturally occurring groundwater constitutents" (R. at 121). Upon cross-examination it was determined that representatives of ENR held the views that "drinking water" standards ought to be applied only to "resource groundwaters" (R. at 1531), and that "drinking water" standards were viewed as being coincident with the Public Water Supply Standards of Subtitle F (R. at 1522).

The Agency recommends against a broad application of "drinking water" standards to groundwaters (R. at 37, 871). In

part, this reflects a belief that the standards ought to be set consistent with the use to which the water is to be put. In part it also reflects a belief that "drinking water" standards, at least as manifest in Public Water Supply Standards, include some provisions which may not be appropriate for ambient water quality standards (R. at 38-9, 605). A somewhat similar perspective has been voiced by Senator David Durenburger in discussing on the floor of the U.S. Senate his sponsorship of the Safe Drinking Water Act Amendments of 1986:

> I want to say that we are especially sensitive to the relationship between the drinking water programs both by the Federal Goverment and among the several States.. In particular, we are concerned about the use of standards promulgated under the drinking water law as central elements of ground water protection programs developed by the States and as cleanup standards under the Federal Superfund program. Mr. President, I am one Senator who does not believe that the maximum contaminant levels established under the Safe Drinking Water Act are appropriate for use in either of these ways. Drinking water MCL's, as I have tried to make clear here today, are not simply health standards but include other factors, as well. Rather than use these standards developed in one context for a public health program, in an entirely different setting for resource-based decision in regard to ground water protection, it would be far better to simply develop ground water protection and correction standards directly. I hope soon to suggest a comprehensive ground water protection program to the Senate. (S. 6290, May 21, 1986).

The Board finds merits in Senator Durenberger's arguments, and would similarly conclude that it would be better to develop groundwater protection and correction standards directly. As the Senator's comment suggests, it is possible that federal directives may be forthcoming. However, the Board believes that it remains necessary for the State to undertake its own effort, and coordinate this with any federal actions as such may develop.

The Board also has at least one other reservation which it believes needs to be satisfied before "drinking water" standards can be broadly applied to groundwaters. The reservation is that for some non-drinking uses certain parameters are considered to require more stringent limits than the limits for drinking water. The example of boron, which must be carefully limited in irrigation water, but for which there is no limit in drinking water, has been cited in the record as an example (R. at 1357-8). Thus, it is possible that setting all parameters at "drinking water" levels might actually be adverse to some water uses.

In declining to recommend at this time that the State adopt "drinking water" standards as a general set of standards for groundwater, the Board does wish to emphasize that it is not excluding its own concurrence in the application of any precepts associated with "drinking water" standards to groundwaters or some subset of groundwaters. Rather, the Board believes that each precept requires the type of individual evaluation which can only be obtained within the framework of a regulatory proceeding in which groundwater-specific standards are considered.

In view of existing applicable water quality standards, applicable federal and State laws addressing anti-degradation, the fact that most groundwaters in Illinois appear to be of naturally good quality, and the fact that the predominant use of groundwater in Illinois is for drinking water supply, it is expected that standards very similar to the federal maximum contaminant levels would be major facets of any groundwater-specific water quality standards.

Non-Degradation. The recommendation of non-degradation as a basis for water quality standards is that standards ought to be determined by the status quo water quality or natural background, and that no deviation from this condition be permissible. This perspective was capsulized by Dr. Lou Marchi, speaking on behalf of the McHenry County Defenders (R. at 358):

> When I say non-degradation of groundwater, I mean very simply this: whatever the groundwater analysis was before man began to contaminate it, that should be our baseline standard. If at some future date there is a contaminant in that water that's beyond what was there originally, then this would not be acceptable.

The most compelling arguement for protecting all groundwater at natural quality is that this quality may be necessary to meet future needs. Non-degradation not only protects against the difficulty of accurately predicting future needs, but also against our lack of knowledge about safe levels of contamination.

Nevertheless, non-degradation as a water quality standard is noted in the record as presenting several practical difficulties. Among these are the difficulty of determining natural background conditions given the great variety which exists and uncertainty regarding past water quality conditions (R. at 450-3, 889-91). This is of major concern in the case of human-caused contamination where the contaminants also occur naturally. For synthetic contaminants the natural background level is zero.

There is the additional question of the appropriateness of non-degradation as a standard because non-degradation by itself fails to achieve several of the purposes of water quality

standards. Included is failure to identify the minimum quality acceptable for use. Non-degradation has also been cited as having limited utility in enforcement actions (R. at 1423-8).

On a more basic level, there is the perspective that a modern society, or perhaps any society, cannot assure absolute non-alteration of any environment with which it has contact (Ex. 41, p. 66). Several witnesses noted that absolute non-degradation might require prohibition of a great many activities, illustrated by road salting (R. at 1094), use of agricultural chemicals (R. at 1172-5, 1235, 1365), sewage treatment plants, coal mines, power plants, and landfills (R. at 1422), oil and gas production (Ex. 41, p. 66), and private septic systems. The Board notes that taken to its logical end, even the most mundane of human activities which involve contact with the ground or with waters which seep into the ground, could have some influence on groundwater quality and thus violate absolute non-degradation.

An alternative perspective on non-degradation, which may perhaps be better characterized as "anti-degradation", is that its best service is as a water quality goal rather than as a water quality standard. This is the perspective enunciated in the Plan (Ex. 1, p. 29), by ENR (R. at 121), and several witnesses. Ms. Joanna Hoelscher, speaking on behalf of Citizens for a Better Environment, expressed this perspective in noting:

> [Citizens for a Better Environment] recognizes that achieving a goal of no degradation is not always possible. However, the difficulty of determining groundwater movement, detecting contaminant loadings, and setting "safe" levels of contamination for drinking water and other uses, coupled with the diffuculty and high cost of clean-up, makes it imperative that we at least strive to do so. The emphasis must always be on preventing contamination to the maximum extent possible. (R. at 1251; Ex. 74, p. 3; emphasis in original).

ENR commented similarly, noting:

> We are talking in the ideal world as our goal of being non-degradation, and you have to recognize that as being the ultimate goal for a water plan. In reality, you have to consider uses, existing conditions, and all the rest in setting standards. (R. at 713).

> We think that non-degradation should be set as a goal, and what we recommend is that you then through proper siting and proper management practices try to achieve that goal. (R. at 716).

The Board finds that anti-degradation serves a most useful purpose as a water quality goal. The Board, in fact, recommends adoption of the groundwater policy as discussed in Section II herein, a provision of which is "that unreasonable waste and degradation of the resources be prohibited".

Summary Recommendation of the Board. The Board finds that existing groundwater quality standards, while they may provide adequate protection under most circumstances, are not ideally suited to their task. The Board therefore recommends that there be a comprehensive review of standards as they apply to groundwater. The Board further recommends that there be developed water quality standards specifically tailored to the needs of groundwater protection.

ADDITIONAL CONSIDERATIONS FOR GROUNDWATER STANDARDS

The comprehensive review of groundwater standards recommended herein is certain to bring into focus many considerations of the setting of groundwater standards not clearly delineated within the record before the Board. However, the record does contain information on some aspects of groundwater standards which would seem to merit consideration during the review process, and which have not been discussed in previous sections of this Report. In the following, the Board presents its overview of this information.

Narrative Versus Numerical Standards. Some discussion exists in the record as to whether groundwater standards should be narrative or numerical. The Board concludes that, in general, numerical standards are to be preferred. Where adequate information exists, it should be used to set specific numercial standards. Where a lesser degree of information exists, a suitable general methodology that can be used to determine specific numerical standards should be delineated. The greater specificity of numerical standards generally better serves the purposes of standards, including offering greater definition of of the expected level of protection and protection goals, and better serving as an alert mechanism for preventive and remedial actions. Enforcement action also tends to be more effective when citation to specific numerical limits can be made (R. at 1416). The Board further concludes that the State's experience with numerical standards for surface waters has on the whole been very favorable, and that this favorable experience warrants being carried over into groundwater standards.

The majority of states which employ narrative standards do so only for lower quality aquifers (R. at 776). However, some states, including Connecticut, have adopted generally applicable narrative standards, believing that "the use of narrative standards streamlines the regulatory process by eliminating public standard-setting procedures" (Ex. 40, p. 100). The Board

believes that "eliminating public standard-setting procedures", however expedient, is not only not meritorious, but would be contrary to law and policy if applied to Illinois.

Some states which favor narrative standards, including Connecticut, do provide numerical compliance limits in discharge permits (Ex. 40, p. 100). While the Board believes that some discretion on the part of permitting agencies is necessary in the permitting process, it also believes that the public forum of standard setting better serves both the public and the permittee.

Point of Application of Standards. It is necessary that the point of application of standards be clearly specified for any standards adopted. This is of particular significance with regard to potential sources of contaminants. For example, existing federal regulations for hazardous wastes and RCRA Subtitle D facilities specify both standards and precisely where those standards are to be met. If these standards differed in any substantial way from general Illinois water quality standards for ambient groundwater, it would be necessary to specify precisely how the transition from one set of standards to the other was to be made.

A major point with regard to where standards are to be applied is whether some type of "mixing zone" or "zone of attenuation" should be allowed in the vicinity of potential sources of contaminants. In the case of such point sources as landfills, such a concept is incorporated into both existing federal and Illinois regulations for hazardous wastes and federal criteria for Subtitle D facilities.

Preventive Action Limits/Notice Limits. Some states have found it appropriate to define a multiple tier of standards for groundwater (R. at 782-3, 1293-9; Ex. 52, Ex. 53; Ex. 75). In such systems, there exists a conventional set of standards plus at least one second set of standards having numerically lower limits. The conventional set consists of maximum allowable concentrations and serves most of the conventional purposes of standards, whereas the second set serves to trigger some action and/or to serve in a management capacity.

Wisconsin, which has adopted such a system, terms the second set of standards "preventive action limits" ("PALs"). The Wisconsin PALs are set variously at 10%, 20%, or 50% of the conventional standards, depending upon the properties of the individual substance. Wisconsin uses the PAL figures in several capacities, including setting design standards for facilities and in setting regulations (Ex. 40, p. 98). The PALs also serve to trigger regulatory response. Agencies responsible for groundwater protection are required by law to evaluate and take actions when monitoring determines that a PAL is exceeded; the actions may include prohibiting continuation of the activity that is the source of the problem (Ex. 40, p. 99).

Kansas also has a two-tiered standards system, with the second set of standards set at 1/100th of the conventional standards. The second set are termed Notice Levels, and their exceedence triggers notification of the well operator, either private or public, to the fact.

In both of the above noted multiple-tiered systems, the purpose of the second set of standards is to provide opportunity to react before conventional standards are exceeded. The reaction might be on the part of the responsible state agency, or on the part of the polluter, who might either establish a less drastic phased-in treatment/removal plan or demonstrate a specific alternate standard.

PALs and notice limits recognize that the ability to successfully react to groundwater contamination problems requires a degree of early warning not necessarily associated with contamination of other media, and that systematizing the process offers better guarantee of the early warning. The Board finds that there is merit in this perspective, and concludes that the comprehensive review of standards ought to give consideration to adoption of a preventive action/notice limit system of standards.

Public vs. Private Water Supplies. Testimony on the record indicates a high degree of concern by citizens and government officials that both public and private water supplies be included in any groundwater protection program (R. at 318, 329, 396). For example, Mike Bacon, Director of Environmental Health for the Winnebago County Health Department, testified that:

> The protection of groundwater is essential not only obviously for public water supplies but private water supplies as well. (R. at 397).

At issue here are at least three matters relating to the inclusion of private water supplies in the protection program. These are: Are private water supplies to be protected by ambient groundwater quality standards? Are private water supplies also to be covered by the Public Water Supply Standards? Are private water supplies to be afforded protection under whatever contamination prevention provisions are developed?

At present private water supplies are protected by ambient water quality standards, and the Board can see no justification for an alteration of this policy. As noted previously in this section (p. IV-2,3), the cumulative General Use and Public and Food Processing Water Supply Standards apply to all underground waters which have a present or potential use for potable water or for food processing water supply. This condition exists irrespective of whether the user is a public water supplier or a private water supplier, or, in fact, whether there is no user at all. Admittedly, the use of the word "Public" in the Public and

Food Processing Water Supply Standards has caused some confusion on the part of some individuals as to whether private water supplies are thereby included. The Board hopes that this exposition serves to rectify the confusion.

In contrast, the Public Water Supply Standards do not currently apply to private water supplies. As noted previously, they apply only to those "public water supplies" defined as being "community" water supplies by virtue of having 15 or more service connections or regularly serving at least 25 residents for at least 60 days per year (see p. IV-3,4). Public Water Supply Standards thus have no legal force and effect with regard to private wells, even though these may serve as drinking water supplies.

Making the Public Water Supply Standards applicable to private wells would constitute a major change in policy. Without a full review of the ramifications of such a major policy change, the Board is not prepared to offer a recommendation at this time. However, the Board does note that there are several obvious questions which would require addressal before an informed decision could be made. These include: Is the private well owner's legal right to protection from contamination of his groundwater supply adequately addressed by the existence and enforcement of ambient groundwater quality standards such as the cumulative General Use and Public and Food Processing Water Supply Standards? Can the State impose regulations on the use of water within private residences without causing an infringement of individual rights? What enforcement would be brought against a private well owner who continued to use waters which violated the Public Water Supply Standards?

Regarding the third issue related to private water supplies, the Board fully concurs with the recommendation of the Agency and the Plan that private water supplies be included in all programs designed to prevent groundwater contamination (see section V, following). In this context, the Board agrees with the perspectives of Agency Director Dr. Richard Carlson, who addressed the issue of protection of private wells during the November, 1985, Agency hearings. In so doing, he stated that there is "both a political need and an environmental need, (and) maybe a public health need" to address private well contamination problems (Ex. 9, p. 27-8).

Single Versus Multiple Standards. The Board has noted previously herein (p. III-2) the large range of natural variation encountered in the groundwaters of the state. Given this natural variation, there is some question as to whether single values of water quality parameters, or single sets of standards, can be appropriately applied to groundwater.

Zero Standards. In addressing the issue of how groundwater protection ought to consider contaminants for which no standard has been set, the Plan (Ex. 1, p. 22) notes:

> Perhaps the single most commonly heard statement at the public workshops held by the Agency around the State was that, in prescribing groundwater standards for man-made contaminants, the State should err on the side of public safety by adopting a "Zero Standard" for all contaminants for which no numerical standard has been otherwise established by the USEPA or the Pollution Control Board (PCB). The general consensus seemed to be that "zero" should be equated with the detection level of a given contaminant, and that the burden of proof of the validity of a given numerical standard other than zero should be on the polluter.

This position also finds support in the Board's record (R. at 613; Ex. 40). The Board itself finds merit in the position. When dealing with synthetic organic chemicals, a substantial number of which have been demonstrated to be, or are suspected of being, environmentally hazardous, and whose numbers are constantly being increased, the Board believes that a "guilty until proven innocent" posture constitutes a prudent policy.

Dr. Lou Marchi recommended extending the concept of zero standards to all synthetic chemicals, irrespective of whether there exists a basis for setting a standard above zero (R. at 390). This would be consistent with the current non-degradation regulation of 303.105.

The Board notes at least one difficulty with the concept of zero standards, which is that it has the potential for raising legal problems when an advancement in analytical procedures allows detection levels to drop. This difficulty may be partially addressed by defining "zero" as being the current level of detection.

SECTION V:

PREVENTIVE PROGRAMS

As previously discussed (p. III-6) there is a broad consensus, with which the Board is in agreement, that a successful groundwater protection program include provisions for prevention of groundwater contamination. However, there is disagreement as to precisely what provisions should be employed, as well as where and under what circumstances they should be employed. In this section the Board presents some general considerations which need to be undertaken and reviews the various recommendations presented in the record.

GENERAL CONSIDERATIONS

The Board believes that there are at least three fundamentally important issues whose resolution are the sine quo non of a successful program for the prevention of groundwater contamination. These issues are the matters of State versus local authority, availability of fiscal resources, and adequacy of the data base.

State Versus Local Authority. Many aspects of preventive programs require that controls be placed on land use. This can be done in several possible ways, including zoning, permitting, imposition of design and performance standards, or by some combination of these. Whatever method may be employed, the decision must be made as to who would be empowered with the responsibility for undertaking these efforts. While some matters, such as setting of performance standards, would appear to logically fall within the State's authority, and others might similarly be viewed as logically falling under local authority, there is a broad gray area wherein "turf battles" can surely be anticipated.

There are at least three ways in which the authority to impose land use control for the protection of groundwater might delegated. Full delegation of authority could be made to the State; full delegation of authority could be made to local government; or some system utilizing a mixture of authority could be used. While some mixture might, in the final analysis, prove to be more workable than either extreme, it is instructive to consider the extremes.

The initial possibility is that the State assume authority to impose land use controls. This option would help to ensure consistency and continuity in planning from the statewide perspective, and would free local governments from the burden of initiating and overseeing both the planning effort and implementation of any plans. The difficulty with this approach

is expected to be associated with unwillingness of local government to allow the State responsibility for performing such planning and implementation of land use controls resulting from the planning.

The Board notes that the issue here may very well be construed as imposition of State "zoning". The Plan itself notes:

> In its several communications with the general public, the Agency found a clear majority of persons in favor of some form of State zoning for the protection of groundwaters serving as drinking water supplies. There is no clear preference for one type of zoning over another, however. (Ex. 1, p. 20; emphasis in original).

While the Board does not dispute that State zoning could be advisable or necessary in this specific case, the Board is dubious about the implication that it will receive majority support. The previously unsuccessful track record of State zoning proposals would imply otherwise.

The second possibility is that local government be the principal authority in the planning effort, possibly with technical, administrative, and economic assistance from the State. This would allow localities to retain the authority for resolving issues within their jurisdictions. Whether local government has the legal authority to carry out such planning and to implement appropriate land use controls that may result from it are questions which cannot be conclusively answered by the record in this proceeding. Similarly, whether local government would have the ability, for example, to limit facility development in sensitive recharge areas, while simultaneously weighing proposals for development, is an issue of some doubt.

The Board notes that local government is itself heterogeneous, with several strata of government (e.g., special districts, municipalities, townships, counties) having overlapping jurisdictions. The Board would expect, and the record supports, that planning conflicts between these strata could be anticipated.

Availability of Fiscal Resources. Most of the recommendations for preventive programs will require substantial fiscal support to be effective. Included is the need to adequately fund the groups and agencies responsible for administering the programs, as well as the groups and agencies which will be needed to provide the data and expertise necessary to implement and support the programs.

As the National Research Council's ("NRC") Committee on Ground Water Quality Protection noted in its review of state and local groundwater protection strategies:

> All ground water protection programs reviewed by the committee indicated a lack of adequate funding, which constrained the development and implementation of a comprehensive ground water protection program. (Ex. 40, p. 10).

This is clearly a position in which Illinois should not wish to find itself.

Although the NRC report continues on to recommend that federal funding be increased to help state and local governments fully develop and implement their groundwater protection programs (Ex. 40, p. 10), it is uncertain that this recommendation will weigh heavily in the current era of cutbacks in federal spending. Similarly, it may be unrealistic to expect that financial resources will be found at the local level to fund very extensive programs. The vast majority of the resources that do exist at the local level are undoubtedly being used to maintain other essential local services already adversely affected by budget cuts.

Admittedly, resources are similarly tight at the State level. Hopefully, however, adequate funding for preventive programs is more likely to occur at the State level, where the broader focus of State government might recognize the necessity of protecting Illinois' groundwater resource. Such a broader focus hopefully would allow preventive programs to successfully vie for funding against other programs seeking State resources.

Groundwater protection programs also need not necessarily be in competition for general revenue funds for their complete support. Alternative funding mechanisms, including use of enforcement receipts and producer, user, and disposal fees should be considered.

Adequacy of the Data Base. Preventive programs which are not guided by an appropriate information base are certain to encounter difficulties of acceptance and implementation, and, ultimately to be less effective and efficient than they might otherwise be. At a minimum, data must include sufficient hydrogeological information to allow at least large scale aquifer mapping and determination of general groundwater flow patterns and quality. Groundwater uses and threats must also be catalogued and mapped. Utilizing this information, it is possible to identify those sensitive areas most in need of protection: areas of influence in the immediate vicinity of wells and aquifer recharge areas. Only then can appropriate regulatory mechanisms be put in place to protect groundwater through land use control, source control, or any combination of these two approaches (Ex. 92, p. 65-132).

Some significant progress has been made in establishing the necessary data base, particularly through the efforts of the Agency and ENR. Nevertheless, it is evident that at present the data base is inadequate to the task. Among actions which need to be continued or initiated are the monitoring and sensitive aquifer and recharge area delineation discussed in section III (p. III-12). Additionally, ENR needs to be supported in its capacity of gathering basic data on a broad range of groundwater matters. (Ex. 90, p. 4). At either the local or State level inventories of actual and possible groundwater contamination sources, past, present, and proposed, need to be developed. And, not the least, access to data has be improved.

RECOMMENDATIONS OF THE PLAN

Major Approaches. There exist two major approaches to the prevention of groundwater contamination: control of existing, potential, and actual contamination sources, and control of land use in sensitive areas. The former approach includes actions such as effectively managing wastes, reducing waste volumes, and actively enforcing existing regulations. The latter approach relies heavily on regulations and ordinances adopted by local, regional, and State authorities to protect the public health, safety, and welfare. These include regulations and ordinances adopted by local health agencies, zoning by-laws, and municipal ordinances, but may also include such items as public education, incentive programs (e.g., government purchase of development rights), and government acquisition of sensitive areas where practical (Ex. 40, p. 135-6).

The Plan recommends a dual course of action, in which a mixture of the control-of-sources and land-use-control approaches are employed.

Control of Contamination Sources. The Plan's recommendations for regulation of contamination sources are contained in parts four and five of the recommendations section (Ex. 1, p. 33-7). There are four principal elements:

1) Continued emphasis on managing wastes in an environmentally sound manner, with a prioritized order of:

   a) Waste reduction and reuse;
   b) Waste recycling and composting;
   c) Waste incineration with energy recovery;
   d) Landfilling.

2) Full implementation of the provisions of various existing or proposed programs, including:

a) Resource Conservation and Recovery Act (RCRA);
b) Hazardous and Solid Waste Amendments of 1984 (HSWA);
c) Leaking Underground Storage Tank program (LUST);
d) State ban on landfilling hazardous wastes and liquids;
e) Environmental Toxicology Act by the Illinois Department of Public Health; and
f) Continued operation of the Industrial Material Exchange Service by the Agency in cooperation with the State Chamber of Commerce.

3) Designation of potential groundwater contamination sources.

4) Enhancement of enforcement procedures for routine violations at sanitary landfills.

Land-Use Control. With regard to control of land uses in sensitive areas the Plan recommends legislation be developed and adopted for a statewide program including:

1) Establishment of minimum and maximum "set-back" zone requirements for protection of public water supply wells from primary and secondary sources and minimum requirements for private wells varying from 200 to 1,000 feet.

2) Establishment of recharge area protection planning out to a maximum of the "20-year capture zone" for public water supply wells.

3) Establishment of a provision requiring notification of the Agency by anyone proposing to site a new primary source of potential groundwater contamination.

4) Establishment of a requirement that anyone who causes contamination of any underground water source must assure replacement of that source "to applicable standards".

Each of the principal elements of the Plan's recommendations for regulation of contaminant sources and the control of land use is discussed more fully below.

MANAGEMENT OF WASTES

The record contains relatively little discussion of the Plan's recommendations for prioritizing management of wastes. The Board believes this to reflect that general agreement exists with these recommendations. The Board also notes that the

recommended prioritization scheme is essentially the same as that adopted as public policy in Section 2 of the Illinois Solid Waste Management Act passed by the General Assembly this year, House Bill 3548 Enrolled. The difficulty would appear to be with translating the prioritized list from policy into practice.

A similar conclusion has been reached by the National Research Council's ("NRC") Committee on Ground Water Quality Protection, which noted that the best long-term strategy for groundwater protection is to reduce and/or eliminate the sources of contamination; thus, waste reduction should have high priority in any groundwater protection program (Ex 40., p. 16). However, the NRC concludes that additional incentives and information are needed to accelerate and expand source reduction efforts. Recommendations of the NRC include state-level regulatory and economic incentives for source reduction by industry, government, commercial interests, and the public; educational programs devoted to dissemination of waste reduction information; and technology, and additional funding for the development of waste reduction technologies (Ex. 40, p. 17). The NRC further recommends that states and local entities consider strategies for reducing improper disposal of household and other small quantity hazardous wastes (Ex. 40, p. 17).

IMPLEMENTATION OF EXISTING PROGRAMS

The Plan gives considerable emphasis to the need to assure that authorized programs are fully implemented, including attainment of State administrative authority of federal programs (R. at 1432-3). The Board concurs in this observation. Existing federal and State regulations are intended to, or contain provisions for, addressing some of the potentially most serious sources of groundwater contamination, particularly hazardous wastes. The full implementation of these programs, therefore, is a major step forward in groundwater contamination prevention.

Progress can and will continue to be made on this issue via implementation of already mandated source control programs, including implementation of the state's policy that waste reduction and reuse are the highest priority for management of waste and landfilling the least desirable method; implementation of the State's ban on landfilling hazardous liquids and wastes; implementation of both Subtitles C and D of RCRA (including new requirements pertinent to hazardous wastes, the leaking underground storage tank program, and a permit program with appropriate regulatory criteria for Subtitle D facilities such as sanitary landfills and on-site industrial waste disposal facilities); implementation of the Environmental Toxicology Act; and continued operation of the industrial material exchange service.

Implementation of existing programs has not been and cannot be expected to be automatic. In particular, it is essential that adequate funding be available to allow their implementation. A case in point is the Agency's difficulty with fully carrying out its mandate to regulate landfills. The Agency's efforts have been by necessity directed to three hazardous waste landfills, while little attention has been paid to the other 272 solid waste landfills in the State, 60 of which accept special waste and all of which may accept small quantities of hazardous wastes (R. at 1407-36). According to one of these witnesses, even though solid waste landfills are likely to pose the same kind of risk to groundwater as do hazardous waste landfills, the Agency is not regulating them to the extent necessary now. The reason for this situation was described as lack of both resources and assigned priority (R. at 1435-6).

An issue raised in the record (R. at 1094-5, 1101-8, 1132-8, 1429-36; Ex. 40, 41; PC 6) is whether existing programs, assuming complete implementation, are by themselves sufficient to provide comprehensive prevention of groundwater contamination. One view, as expressed by the Illinois Environmental Regulatory Group ("IERG"), is that:

> There is insufficient evidence in the record to demonstrate any problem areas that cannot be addressed by proper implementation of the existing federal and state regulatory framework and, therefore, there is no justification for additional groundwater protection regulations or legislation. (PC 6, p. 1).

In spite of this perspective, the consensus appears to be that existing programs leave some regulatory gaps, and that therefore a State initiative may be necessary to address some or all of them. Examples of activities possibly requiring regulatory attention cited by representatives of IERG itself include road salting, sewer systems, septic tanks, pesticide runoff, and disposal of household wastes (R. at 1102). IERG also indicated the belief that this list is not necessarily inclusive (R. at 1137-8).

Other witnesses also cited examples of activities which possibly require additional regulatory attention. Citizens for a Better Environment cited deep-well injection of wastes (R. at 1258) and on-site storage, treatment, and disposal of wastes (R. at 1260-2). Mr. William Schubert, speaking on behalf of Waste Management of Illinois, Inc., added the examples of feed lots, crop lands, oil fields, brine ponds, and industrial facilities (R. at 956). Mr. Schubert additionally expressed the view that "98% of the non-natural groundwater contamination sources, impacting public supply wells, originate at points other than sanitary landfills" (R. at 956), a source generally viewed as a principal contributor to groundwater contamination.

DESIGNATION OF GROUNDWATER CONTAMINATION SOURCES

A major recommendation of the Plan is the recommendation that there be enacted legislation to define "potential groundwater contamination sources" (Ex. 1, p. 34). Such sources would consist of categories of facilities and/or activities which, by their operation, have the potential for leading to groundwater contamination. Examples provided by the Plan include landfills*, major industrial facilities, small business, and salt pile storage (Ex. 1, p. 34).

Specifically, the Plan recommends designation of two major categories, primary and secondary sources, of which landfills and major industrial facilites are cited as examples of possible primary sources and small businesses and salt pile storage areas are cited as examples of possible secondary sources. Primary sources are recommended to receive State monitoring of siting and compliance activities; secondary sources are recommended to require periodic reporting by local government (Ex. 1, p. 34).

At least one intended application of the list of primary sources is to have the proposed siting of any new primary source reported to the Agency, and subsequently to local government (Ex. 1, p. 36-7; see also following). However, the Plan provides no further elaboration on the regulatory programs which would be directed toward activities placed in either the primary or the secondary categories; neither does the Plan make recommendations for inclusion of specific activities in either category (R. at 526). This absence of further detail provided a fertile field for testimony and questioning during the Board's hearings.

The Board shares concern about the uncertainties of the source designation recommendation. The Board realizes that a exercise in designating sources would, by itself, allow better focus on the types of activities which can or do impact Illinois' groundwaters. Although this would certainly be meritorious, the Board is uncertain that it would be sufficient justification in light of the magnitude of the effort.

However, it would appear that source designating is also intended to be coupled with the recommendations for set-backs and recharge area protection (see following), although exactly how this coupling would occur has not been specified. Presumably,

* The Board notes that landfills currently are recognized as potential sources of groundwater contamination within both federal and State regulations. Additionally, the Board notes that a review of all Board waste disposal regulations, including landfilling, is currently being undertaken in a separate Board proceeding, R84-17.

the list of primary and secondary sources would identify which activities would be regulated in the set-back and/or recharge areas, and perhaps also the form that the regulation would take (i.e., prohibition, permitting, design standards, etc). ENR has asked that these matters be clarified (R. at 1515), and the Board agrees. The Board also notes that if coupling of preventive programs is indeed intended, then it will be necessary to give very close scrutiny to how individual activities are assigned, if at all, to either the primary or secondary category. Additionally, there will be the need to develop review and appeal procedures for individual designations and to define the forum in which the designations are made.

ENHANCEMENT OF ENFORCEMENT

The Plan's recommendation for the State to adopt an administrative citation enforcement mechanism appears, at least in part, to have been addressed. During the Spring 1986 legislative session, an administrative citation enforcement program passed both Houses as part of Senate Bill 2117, which is currently awaiting the Governor's action. This administrative citation program allows either the Agency, or a unit of local government subject to a delegation agreement with the Agency, to issue a citation to the owner or operator of a sanitary landfill for some types of violations. Examples include open burning, leachate movement beyond the landfill boundaries, uncovered refuse, failure to provide final cover, acceptance of wastes without necessary permits, and failure to submit required reports. If the person named in the citation fails to petition the Pollution Control Board for a review of the citation within 35 days of service, a $500 penalty is automatically imposed for each violation.

This new procedure is essentially a streamlined and simplified field enforcement or "ticketing" procedure. The purpose is to provide a new mechanism for enforcing sanitary landfill violations and encourage a higher rate of compliance for sanitary landfills. Normal enforcement actions are extremely costly and time consuming and generally actions against sanitary landfill operators have a lower priority relative to hazardous waste enforcement actions (R. at 1435). Thus, while any single sanitary landfill violation may not be one which has a major impact on groundwater, the Board believes that enhanced enforcement against them in aggregate could have major importance in preventing groundwater pollution.

SET-BACK PROVISION

The Plan's recommendation regarding well set-backs consists of establishing a zone around wellheads, both public and private, within which certain activities would be regulated (Ex. 1, p.

35). This proposal has several facets warranting individual discussion, including the merits of set-backs, defining the set-back distance, the types of activities which would be regulated, and matters of rights and authority.

Much of the difficulty that the Board has in reviewing the set-back recommendation is that the recommendation has been presented to the Board as a concept, rather than as a fully developed proposal or program. Conclusions and findings are therefore difficult to make on other than general matters. Accordingly, the Board principally offers its observations on matters which should be considered in a fully developed set-back proposal.

Merits of Set-Backs. The intent of establishing set-backs is to provide a minimum level of protection for well sites by restricting the occurrence of potentially polluting activities within a specified distance from a wellhead. The use of set-backs in groundwater protection has a precedent in the Illinois well code, which requires separation between wells and septic systems (Ex. 56).

Set-back restrictions constitute one possible facet of larger programs designed to provide wellhead protection. Wellhead protection is generally looked upon as the first line of action in preventing groundwater contamination using source controls. This situation is recognized in the Safe Drinking Water Act Amendments of 1986 which, in Section 1428, mandate that wellhead protection programs be developed by the state by 1989 (see following). A set back-program could be a cornerstone of Illinois' wellhead protection program.

Set-backs are not, however, without some conceptual difficulties. Among these are that set-backs tend to be arbitrary, in that they fail to recognize the individuality of the hydrologic conditions which exist around any well. An additional difficulty is that set-backs do not necessarily protect groundwater itself. Rather, should a spill occur at a properly set-back source, the existence of the set-back affords a greater time for the well operator to react than if the source was not set back (R. at 1398-401); the groundwater still becomes contaminated, however.

The Board is not certain whether these difficulties would constitute fatal flaws in any proposal for applying setbacks. The Board does note, however, that any proposers of set-back regulations should be cognizant of these possible difficulties.

Scope of Applicability. It has not been established within the Board's record whether the set-back provision is intended to apply to all water supply wells or to some subset of water supply wells. Clearly, this is a most important consideration yet to be undertaken. The Board believes that it would be necessary to

provide a strong defense for universal application of set-backs, given the substantial variation which exists in local conditions around wells and the susceptibility of different wells to contamination.

The recommendation that set-backs be applied to sensitive aquifers and recharge areas (see p. III-12) may be an appropriate approach to defining the conditions under which set-backs would be required. This clearly implies that sensitive aquifers and recharge areas would be defined previous to application of the set-back limits.

Set-Back Distance. One of the principal difficulties with a set-back provision is defining the appropriate set-back distance. The Agency has offered that the minimum set-back distance should be 200 to 400 feet (R. at 528). It has also offered that local conditions might warrant distances up to 1000 feet, with extension to the greater distances occasioned by a demonstration by local government that the greater distance is "reasonable, rational and necessary" (R. at 528).

Substantial testimony was received directed toward the appropriateness of 200 feet, 400 feet, 1000 feet, as well as other distances. The Board concludes that this testimony is reflective of the difficulty in establishing a single distance, or even several distances, which would afford the intended protection under all, or even most, conditions. As the record abundantly indicates, variation in local conditions, including geology, hydrology, and pumping rates, would seem to warrant a range of appropriate set-back distances. Moreover, absent a showing to the contrary, the Board is concerned that restriction of activities within a simple circumference around a wellhead could be judged to be an arbitrary application of regulations.

Given these conditions, the Board recommends to whomever may propose specific set-back regulations that due deliberation be given to the matter of defending the general applicability of any specific set-back distance(s). The Board moreover believes that it may be necessary to specify exception procedures, as the Plan recommends (Ex. 1, p. 35), which would allow for circumstances where a circular set-back area is inappropriate for local conditions.

Regulated Activities. The Board is not clear as to the specific activities proposed to be regulated in the set-back areas. Various activities have been cited in portions of the record as possible candidates, including, as examples, landfills and chemical storage facilities (R. at 1280). However, no specific list has been provided to the Board. Inasmuch as this is a most critical facet of any set-back program, and an issue which would be determinative of the success of any set-back program, the Board recommends that this issue be immediately addressed in any future forum.

As noted above, among the candidates for a list of excluded activities would be the list of primary and secondary sources proposed in the Plan. However, it would first be necessary to determine what sources are to be placed in each category, and subsequently to determine if the lists are compatible with the intentions of set-backs. Only then might a reasoned judgment be made as to whether primary and/or secondary sources are appropriately regulated within set-back areas. However this may proceed, the Board recommends that this matter be given serious consideration.

A related facet of the set-back provision which would require specific attention in any program is the form of regulation which would be imposed within set-back areas. In some portions of the record it would appear that prohibition is the assumed form of regulation (e.g., R. at 704). However, consideration has also been given by the Agency to the possibility of regulation via the imposition of design and/or performance standards (R. at 578).

Rights and Authorities. Substantial questions of rights and authorities must be addressed as part of any specific proposal for wellhead set-backs. Some of these are discussed in the Plan and in the Board's record, but the Board believes that considerable thought and discussion yet needs to be undertaken in this area. Among questions which need to be addressed are: Who would determine, and in what forum, the activities regulated in the set-back areas? What would be the disposition of existing facilities within set-back areas? Does well development or source development have priority in future planning? What role does local government play in determining the parameters of the set-backs, including set-back distances and regulated activities? What appeal recourses are to exist?

The Board also has concern that the setback provision not be used in ways not contemplated by the Plan. For example, some assurance would have to be provided that wells not be drilled in anticipation of and with the sole intention of forestalling or frustrating prospective facility siting. Similarly, should the Agency's recommendation of saleable waivers (R. at 568-9) be implemented, it may be necessary to provide assurance against unnecessary well drilling for speculative purposes.

Federal Programs. A development of potential importance to the State's development of a set-back provision is the recent amendment of the Safe Drinking Water Act to provide for state programs for the establishment of wellhead protection areas. It is too early to tell how this program will be implemented, but it has several potentially significant ramifications. To begin with, although the new law emphasizes state implementation it provides a new avenue for federal involvement in groundwater protection through the approval or disapproval of proposed state

programs. Secondly, the federal assistance for groundwater protection planning that may be obtained by states with approved programs, limited as it is, provides a source of funding where there previously was none.

This program is apparently applicable only to wellhead protection areas for public water supplies. That term is broadly defined in the statute as "the surface and subsurface areas surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward such water well or wellfield". The statute also requires USEPA to issue technical guidance for determining these areas within one year (Ex. 36; PC 5). However, by this definition, wellhead protection areas would apparently include within them set-back zones, and possibly also critical recharge areas, for public water supply wells.

RECHARGE AREA PROTECTION

One of the most controversial aspects of the Plan has been the recommendation for a recharge area protection program. The controversy has not so much been over the philosophical merits of the proposal, but rather with the many perceived difficulties associated with its development.

The Board has much the same difficulty in reviewing the recharge area protection recommendation as it has in reviewing the set-back recommendation. Namely, the recommendation has been presented to the Board as a concept, rather than as a fully developed proposal or program. As is the case with the set-back recommendation, the Board therefore principally offers its observations on matters which should be considered in a fully-developed recharge area protection proposal.

The Board also notes that many of the questions associated with recharge area protection are identical with the questions associated with the the set-back recommendation, including matters such as the activities which would be regulated and issues of rights and authorities.

In full, the Plan's recommendation for recharge area protection is:

> Establishment of Recharge Area Protection. In some situations, well site protection will probably not be adequate for the long-term protection of public water supplies. This stems from the fact that the water which replenishes the well may enter the ground many miles away. Thus, contamination could occur quite far from the well site and eventually be drawn into the well after years of travel underground.

The legislation should require local governments to start the development of "recharge area protection plans within two years after enactment of the program." Such plans should delineate, up to the 20-year capture zone, the geographic areas of primary protective concern (for example, see Figure 9). Within this context, the plan should establish control requirements for existing and new potential groundwater contaminations sources. If a sole source aquifer represents the groundwater use base, then the control requirements should address the entire 20-year area. If alternative supplies are readily available, then the control requirements should reflect a strategy for preventing, containing and remedying contamination from primary and secondary sources within the recharge area. The strategy should consist of the most cost-effective measures which are appropriate for the character of land uses within the recharge area, the susceptibility of the area to contamination and should ensure the continued availability of groundwater for public use.

The DENR and the IEPA should provide technical guidance regarding means for determining capture zones and addressing potential hazards associated with primary and secondary sources. An outreach program would greatly enhance these efforts and assist local governments. The program should include technical support and workshops.

These recharge or protection plans should be subject to a formal public hearing after proper notice and opportunity for citizen participation and review. Upon adoption by the local government, a copy of the plan should be filed with IEPA. If a complete plan has not been filed within four years from the enactment of the State legislation, the IEPA should conduct a "hazard assessment".

Such assessments should identify those primary and secondary sources which represent a hazard to the continued availability of groundwaters for public use given the susceptibility of the area to contamination. The IEPA should provide a copy of this assessment to the local government. If the IEPA finds that these hazards represent a significant risk, then the local government and the general public should be so notified.

Where the population of the community served is not more than 5,000, the IEPA may be requested to conduct a "hazard assessment", including an evaluation of the degree of protection provided by the Statewide set-

back requirements. The community should be authorized to use this assessment as the basis for their plan.

Owners of any primary or secondary sources, which have been aggrieved by a decision of the local government, should be authorized to contest the matter before the PCB. The PCB should only be empowered to review the record which was before the local government. Similarly, a third pary, with proper standing at the local level, should be able to appeal a decision to the PCB.

The legislation should require the IEPA to provide a comprehensive status report to the Governor and the General Assembly within five years after the legislation is enacted. Special attention should be given to the progress made by local governments to implement the program. Where IEPA assessments have been conducted due to tardy action by local governments, specific recommendations should be provided for future completion or protective requirements. (Ex. 1, p. 35-6).

Merits of Recharge Area Protection. Several witnesses expressed belief that recharge area protection is the most appropriate focus for groundwater protection. Illustrative of this perspective is that of Mr. Mike Bacon, Director of Environmental Health of the Winnebago County Health Department, who contrasted it with the set-back proposal:

> The concern about the distances in circumference around a public water supply well of 200, 400, or 1000 feet I think are questions that are difficult to answer adequately. And, as such, I think that probably the concept of recharge protection, particularly the idea of capture zones, probably is a more important way to look at a protection strategy related to land-use controls as opposed to some kind of magical circumference around public-drinking-water wells. (R. at 394).

Citizens for a Better Environment has expresed a similar view, noting:

> IEPA has proposed drawing a 200 to 400-foot circle around most public and private water supply wells in determining the area in which siting restrictions would apply. While this circular approach may be the easiest to implement in the short term, CBE believes that a time-related capture zone more realistically delineates the area of highest risk around a well. (R. at 1253).

The Board agrees with these assessments that the "capture zone" or recharge area of a well is the appropriate target area for groundwater protection. Focus on the recharge area eliminates much of the arbitrariness implicit in a specified set-back distance and more realistically identifies those surface areas from which groundwater contamination might derive.

Recharge Area Delineation. Implicit in developing recharge area protection is the ability to adequately identify recharge areas. At several places in the record there is raised the question of whether recharge areas can be sufficiently delineated (R. at 538, 620, 634-41, 1350). As Mr. Robert Layer, staff engineer for the McHenry County Department of Planning, noted: "In our county, I find it would be almost impossible to determine an area of recharge accurately and reasonably, if you are using it in a regulatory sense" (R. at 538).

ENR, for the most part, expressed a different perception. Included has been the conclusion that "defining the recharge area is a relatively simple task to do" (R. at 652) and the skills to develop appropriate maps exist (R. at 674-82).

Some of this disparity of view would appear to arise out of different perceptions of the degree of accuracy needed in recharge area delineation. From the planner's perspective there occurs questions of whether or not specific parcels of land might lie within or outside of a recharge area, or even whether portions of a specific parcel of land are within or outside of a recharge area. A matter which therefore needs to be addressed is that of the fineness with which recharge areas can be delineated, and whether this is, in fact, sufficient for regulatory purposes.

An additional matter associated with delineating recharge areas is the matter of how, and by whom, the recharge area is to be defined (and presumably defended if challenged). Several witnesses argued that local resources are not up to the task (see below). If true, consideration will therefore have to be given to the allocation of State resources, including personnel.

Sufficiency of Local Resources. Several witnesses questioned the ability of local governmental units to carry out the mandated recharge area protection plan (R. at 320, 403, 621, 660). The belief is that both local technical expertise and local financial resources are inadequate to the task, particularly in areas where groundwater flow is complicated and recharge areas are difficult to define.

Local Siting Review. The Plan recommends that the decision to site facilities within groundwater protection zones be made at the local level (Ex. 1, p. 58; R. at 542, 580-1). The Agency further recommends that there be some minimum criteria established by the State so that local governments (e.g., cities

or counties) can make consistent decisions (R. at 524). The Board finds merit in these concepts, but is concerned about the practicality of their application. Issues which need to be addressed and resolved include, among others, the forum in which the State would establish its minimum criteria; the local governmental unit responsible for the siting decision, particularly where jurisdictions overlap or where recharge occurs within another jurisdiction; the format of the local decision; State oversight, if any, of the local decision; and forums of appeal of both local and State decisions.

The Board notes that the State has some experience with a similar program in the local siting review of new regional pollution control facilities. The particulars of this process are found in the Illinois Environmental Protection Act, Section 39.2*. The Board notes that the high level of adjudicatory activity both before the Board and in State courts, the need to develop extensive case law, and the General Assembly's actions to several times amend Section 39.2, illustrates that local siting review is a difficult arena in which to frame legislation. Inasmuch as the Plan's proposal would expand local siting review to a substantially larger number of land uses than are presently covered under the definition of new regional pollution control facility, the framers of any such legislation should be cautious of the possibility of magnifying the types of problems perceived by environmentalists, site developers, local governments, and the courts, in legislation of the type found in Section 39.2. Under these circumstances, the Board believes that it would be premature to expand Section 39.2 beyond its current application (i.e., new regional pollution control facilities).

Definition of Jurisdiction. One of the most commonly perceived difficulties with the Plan's recharge area protection recommendation is that of authority and jurisdiction. As the Plan correctly points out, recharge areas may extend substantial distances beyond the location of any given well or well field. Distances of tens of miles are likely to commonly occur. Moreover, a single recharge area may serve a number of communities. As a consequence of these phenomena, it is expected that recharge areas will regularly extend beyond the present jurisdictional limits of local governmental units. This raises the issue of the degree of authority a well-owning unit or units of government would or should have over the siting of facilities in the jurisdiction of another governmental unit. Mr. Kevin Standbridge, county planner from Will County capsulized this point by noting:

* Also known as the S.B. 172 siting process.

> A number of communities within our jurisdiction have their capture fields outside of their municipal boundaries and beyond the mile and one half jurisdiction which they are allowed to plan for. My question is how do municipalities plan for recharge areas when it is beyond their legal jurisdiction? I would apply that to counties as well when we cross county boundaries. (R. at 540).

In response to Mr. Standbridge's query, the Agency responded that it looked to the Legislature to provide expanded authority for local governmental units (R. at 541-2). Mr. Standbridge in turn replied with skepticism that "county government is readv to give up land use regulation [to] a municipality purely on the basis of groundwater protection" (R. at 543). As this exchange manifests, these are clearly issues which remain to be resolved.

A contrasting view has been presented by the Illinois Environmental Regulatory Group ("IERG"), which believes that units of local government may have powers to protect their groundwater supplies under provisions of current law. An example cited by IERG is:

> Ill. Rev. Stat. Ch. 24 11-125-2 states in pertinent part "The jurisdiction of the city or village to prevent or punish any pollution or injury to the ... source of water... extends 20 miles beyond its corporate limts..." (emphasis added). This statue has in fact, been used, and the Illinois Supreme Count upheld a city ordinance which prohibited certain industrial operations eight miles out of the city limits in order to protect the public water supply from groundwater contamination. City of West Frankfort v. Fullop, 6 Ill. 2d 602 (1955). (PC 6, p. 13).

On the basis of this observation, in addition to review of other local authorization statutes cited in Exhibit 57, IERG concludes that it is necessay to "carefully consider the present authorities available to local governments before recommending the grant of any new extra-territorial powers by the legislature" (PC 6, p. 13).

Some skepticism has also been expressed about the ability of local governments to cooperate to the degree necessarv to limit facility siting in recharge areas remote from well sites (R. at 627-8, 633). One county official estimated that adequate cooperation was likely to be obtained from only 25% of the municipalities in his county (R. at 633). He further characterized the current zoning process as "zoning by crony" and indicated that it "is a rarity" to get beyond that level to where zoning takes into account such things as "compatibility with the physical aspects of the land" (R. at 636). In part, this mav be

due to what he termed the "tremendous pressure for economic development" (R. at 627-37); other witnesses have also expressed the belief that local interests may override broader, regional interests (R. at 430-1).

In addition to difficulties associated with governmental jurisdictional authorities, there is also a perceived difficulty on the part of site developers. These, it is believed, would commonly be faced with having to gain authorization from multiple local jurisdictions (R. at 580). This feature may provide sufficient discouragement so as to restrict otherwise valued development.

Scope of the Planning Mandate. The Board has some reservations concerning the recommendation that all communities relying on groundwater prepare recharge area plans within a short period following enactment of the proposed legislation. The number of such communities is large, estimated to be 1,200 (Ex. 1, p. 3). Given the scale such an effort would entail, the limitations on local resources, the limited ability of State resources to be parceled out to so many local units, and the many uncertainties involved in recharge area planning itself, it may be unrealistic to expect that the effort can be carried out within the suggested time frame. Additionally, caution should be exercised that the Agency's recommendation that it assume the planning duties of those communities who fail to meet the deadline not burden the Agency beyond its abilities to manage the task.

Given these circumstances, the Board believes that it might be meritorious for any legislation to give consideration to a phased-in approach to plan development. Many different phase-in approaches might be explored. One possibility which the Board believes may have utility would be to begin with a limited number of "demonstration" plans and programs. The experiences gained from these efforts could then be used to guide the larger number of efforts which might follow.

NOTIFICATION REQUIREMENTS

The Plan proposes that the siting of proposed new potential sources of groundwater contamination be subject to notification requirements. Specifically, the Plan recommends:

> Any person proposing to site a new primary source should be required to notify the IEPA in advance. If the source appears to impact the recharge area for a public water supply well, the IEPA should so notify the appropriate local government and determine the status of the protection plan. If an appropriate plan has not been adopted, then the IEPA should hold a public meeting in the affected area to advise the

general public regarding the nature of the situation, including the potential hazards of contamination.

Local governments should be required to notify the IEPA regarding actions to be taken with respect to primary sources which affect the capture zone established by an adopted plan. In addition, these governments should report, on an annual basis, regarding their actions relative to secondary sources which affect the capture zone established by an adopted plan. (Ex. 1, p. 36-7).

Clearly, this recommendation is conditioned upon several other recommendations of the Plan being in place. In particular, it would be necessary that the list of primary and secondary sources be developed and that local units of government have protection plans in place.

Aside from these uncertainties, there is question as to what the recommendation can be expected to accomplish. Unless coupled with some type of enforcement procedure, the Board believes that the recommendation may be perceived as a paper-shuffling exercise which would be given little attention. Additionally, the Board is uncertain as to what end is intended for the provision that the Agency "should hold a public meeting in the affected area to advise the general public".

ASSURANCE OF WATER SUPPLY

Assurance of water supply deals with the matter of replacing a water supply which has been lost due to contamination. The Plan recommends that:

The owner or operator of any facility or activity which adversely affects by pollution the water supply of any person who obtains all or part of a supply of water for domestic, agricultural, industrial or other legitimate beneficial use from an underground water source, should replace the water supply or provide treatment to applicable standards at the owner or operator's cost unless the owner has waived these rights. (Ex. 1, p. 37)

ENR has also endorsed the concept of assurance of supply (Ex. 90, p. 4), as has the Illinois Water Plan Task Force, which framed the concept in proposed regulatory language:

Right to Continued Supply of Unpolluted Water:

The owner or operator of any facility or activity which adversely affects by pollution the water supply of any person who obtains all or part of a supply of

water for domestic, agricultural, industrial or other legitimate beneficial use from an underground water source, shall replace the water supply or provide treatment to applicable standards at the owner or operator's cost unless

(a) the underground water source has been classified for limited use and the level of contamination does not adversely affect an existing use, or

(b) the underground water source has been classified for general non-domestic use, the water supply is being used for domestic use, and the level of contamination does not adversely affect domestic use. (Ex. 20, p. 4).

The Board finds that there is potential merit in these positions. Inasmuch as their implementation would appear to require action, at least in part, by the General Assembly, the Board recommends their review by that body. The Board does note that implementation of the Task Force proposal would require prior or concurrent definition of terms referred to in exceptions (a) and (b).

SUMMARY

The Board finds that a preventive program to protect groundwater from potential sources of contamination is an essential part of a groundwater protection plan. The Board further believes that the several proposals for groundwater contamination prevention as offered in the Plan provide a positive starting point for actual development of a contamination prevention program; as concepts they have merit and therefore warrant additional consideration. However, it is clear that substantial additional development of the major concepts, set-backs and recharge area protection, is necessary before either of these proposals can be considered to be viable. To the end of assisting their viability, the Board has offered such observations as it believes can provide guidance to the eventual framers of necessary legislation or regulatory proposals.

SECTION VI:

ADDITIONAL ISSUES

The record addresses a number of additional issues which fall outside the scope of the previous sections of this Report. This section presents those issues.

ABANDONED WELLS

It has been noted that a high potential for groundwater contamination may be presented by abandoned wells (Ex. 1, p. 61; R. at 1380). Abandoned wells which are not properly closed provide conduits for rapid transit of waters among and between subsurface geologic units. Accordingly, if a contaminant comes in contact with the well, it may rapidly pollute otherwise uncontaminated aquifers.

The Board shares concern regarding the contamination potential present in improperly closed abandoned wells. However, the record does not address whether improperly closed abandoned wells exist within the State, and it has been attested to by a representative of the Illinois Water Well Association that current regulations are adequate to protect against improperly closed wells if enforcement is provided (R. at 594). As the Plan (Ex. 1, p. 61) notes, the Department of Mines and Minerals ("DMM") is the State agency responsible for regulating abandoned wells, including oil, gas, and water wells.

CHEMIGATION

Mr. Gerry Paulson, representing the McHenry County Defenders, testified in favor of a prohibition on chemigation within Illinois (R. at 333-4, 339-40). Chemigation is the practice of injecting an agricultural chemical into irrigation waters. The problems perceived with chemigation are that, under some circumstances, the agricultural chemical can be caused to be drawn backward into the source of supply of the irrigation water, including groundwater, and thereby contaminate the source (R. at 233), and that the practice of chemigation increases the mobility of agricultural chemicals in soil systems and thereby makes them more of threat to groundwater (Ex. 47, p. 22-4). Later witnesses (R. at 1188-94,1218-21) expressed the belief that present regulations which control application of agricultural chemicals are sufficient to prevent these kinds of problems.

Based on the limited record and the absence of cross examination of either the initial witness or the later witnesses by one another, the Board is unable to offer guidance on the advisability of chemigation at this time. However, the Board does believe that chemigation, because it is a potential source

of groundwater contamination, should continue to be scrutinized and that the scrutiny consider whether the practice of chemigation is compatible with groundwater protection.

CITIZEN COMPLAINTS

Ms. Eleanor Bridgeman testified about difficulties encountered in receiving assistance with a groundwater problem (R. at 1010-3). The Board finds sympathy with this perspective, and deeply regrets that such circumstances do arise. The Board does believe that part of the problem articulated by the witness could be alleviated if the Plan's (Ex. 1, p. 55) and ENR's (Ex. 90, p. 3) recommendation for coordination of programs, including public response programs, were implemented. For this reason, as well as other reasons articulated previously (see p. III-16), the Board endorses this recommendation of the Plan and ENR.

CLOSED-LOOP HEAT CIRCUITS/TEST HOLES

One witness expressed the belief that closed-loop heat-exchange circuit wells present a contamination hazard because they can presently be developed outside the framework of the the well drillers code (R. at 294); a similar concern was expressed regarding test holes (R. at 298). In partial response, the Agency noted that closed-loop heat circuits are under investigation by the Agency's Division of Land Pollution Control, and that recommendations may be made based upon any findings of a pollution potential (R. at 295).

CONSISTENCY WITH FEDERAL REGULATIONS

Representatives of the Illinois Environmental Regulatory Group spoke for the need to assure that State groundwater protection regulations are consistent with federal regulations (R. at 1063, 1126). Consistency of regulations is a matter particularly and justifiably dear to the regulated community, lest they find themselves in the position of attempting to comply with conflicting regulations. The Board believes that State government should attempt at all times and wherever possible to eliminate conflicts between federal and State regulations; this continues to be an underpinning of the Board's philosophy as it carries out its mandate of developing regulations.

Consistency of federal and State regulations in the sphere of groundwater protection is of particular importance because the State's effort is being undertaken at a time when Congress has been actively considering groundwater legislation (R. at 1063, 1088-9; see also p. II-9). However, as the Board has previously articulated (p. II-10), this federal activity should not deter the State from proceeding on its own course with all due speed

and deliberation. At the same time, the Board believes that at all stages in the State process awareness should be kept of any possibly conflicting developments on the federal level. Further, the Board believes that awareness should be kept of any new federal regulations which possibly conflict with existing State regulations, and that proper address thereto be made.

NON-POINT SOURCE CONTAMINATION

Most of the program for the prevention of groundwater contamination, as presented in the Plan, is focused on control of point sources. In this regard, the Plan is similar to the majority of regulatory programs for the control of pollution in other media, where, by virtue of difficulty of implementation and other impediments, regulatory focus is strongly weighted toward point source control. Although the Board is well aware of the difficulties of effectively controlling non-point sources, the Board believes that control of non-point sources must not for this reason alone be dismissed from inclusion in a comprehensive groundwater protection program.

Many non-point source and "quasi-non-point" source activities and materials can and do contribute to groundwater contamination. The most commonly cited are application of agricultural and landscape chemicals. Other examples are salt applied to roadways, waste oils, road oils, brake lining materials, urban runoff, and synthetic organic chemicals used to clean septic systems (Ex. 40, p. 116).

The Board does not have sufficient information before it at present to evaluate whether programs directed to any of these or similar activities and materials is justified at this time. Rather, the Board recommends that the full arena of non-point source contaminants continue to experience scrutiny, including monitoring (see p. III-14), and that the State be prepared to develop appropriate regulations when and if such scrutiny indicates action is warranted.

PUBLIC EDUCATION

Several witnesses expressed a need for continued or expanded programs of public education on matters related to groundwater (R. at 335, 404, 617, 629, 1267). ENR suggests that it is particularly important that two groups be afforded greater educational opportunities: private well owners and local officials/regulators (Ex. 90, p. 3). Other witnesses have suggested public education respecting the hazards of agricultural chemicals (R. at 325). Additional recommendations were of a more general character, including efforts to educate on all issues related to groundwater (Ex. 1, p. 38; Ex. 90, p.3).

The Board applauds all efforts directed towards developing an educated and informed public. The Board further recommends that the responsible agencies continue past education efforts and continue to explore new and more effective methods of education.

QUANTITY

The Board notes that there is only minor mention of groundwater quantity issues in the record in this matter. Such mention does note that groundwater quantity is intrinsically related to quality (Ex. 1, p. 28); that there should be a guard against overuse of groundwater (Ex. 1, p. 60); that a statewide policy of water conservation is needed (R. at 617); that quantity issues are integral to a comprehensive groundwater protection program (R. at 684-5); and that the formulation of regional water districts might be needed "to maximize the use" of Illinois's underground water resources (Ex. 20, p. 6). The Board does not disagree with these generalized conclusions, but in the absence of more concrete proposals for groundwater quantity management, is unable to make a finding on the appropriate strategy for Illinois.

The Board notes that under the Water Use Act of 1983 (Public Act 83-700) there is an established order of priority for groundwater use when quantity is limited. The priority is that "natural wants" (e.g., for domestic drinking water) take precedence over "artificial wants" (e.g., industrial water supply).

RADIOACTIVE WASTE STORAGE SITES

Ms. Catherine Quigg, speaking on behalf of the Illinois Safe Energy Alliance, expressed concern that radioactive waste storage sites, with reference to the site at Morris, Illinois, present a particular hazard to groundwaters due to the hazardous nature of the substances stored (R. at 503-15). In spite of the conclusion of the Plan that "regulation of groundwater near nuclear facilities is the exclusive responsibility of the federal government" (Ex. 1, p. 56), it was attested that the Nuclear Regulatory Commission "regulates nuclear facilities and their discharges, but not the quality of groundwater under them" (R. at 504). It was further attested that the quality of groundwater under nuclear waste storage sites does fall under State jurisdiction (R. at 506, 514).

Given this uncertainty, the Board is unable to conclude on the matter of State jurisdiction based on the record before it. However, the Board does recommend that the Agency review the matter in light of the testimony given to the Board and its associated Exhibit 37. The Board further recommends, should State authority be identified, that the Agency evaluate the

record of monitoring and water quality at the General Electric Morris site and assure that it is consistent with the State policy and regulations regarding groundwater.

RIGHT-TO-KNOW

Several witnesses indicated support for community right-to-know legislation such as to improve information availability with respect to groundwater threats (R. at 617). The Agency has noted its support in principle (Ex. 1, p. 56).

UNDERGROUND INJECTION OF WASTES

Differing views of the advisability of underground injection of wastes have been presented during the course of the hearings. One perspective recommends the banning of all underground injection of wastes (R. at 369). The opposite perspective espouses some closely controlled types of underground injection, specifically Underground Injection Control ("UIC") program Class I wells*. However, even those who advocate underground injection do so with the view that it is not a panacea, but rather that it is a "viable disposal option" to be used under carefully controlled conditions after "all alternative disposal options for each candidate wastestream" have been "demonstrated to be technically, environmentally, or economically unacceptable" (R. at 1499; Ex. 89, p. 6-1).

The Board feels some measure of discomfiture with the very concept of underground injection of wastes. As we have noted previously (p. II-4,5), even those groundwaters which may be viewed as having no present resource use, as is the case with the brines which receive all of the present Class I underground injection of wastes in Illinois, might at a future date find a beneficial use. The Board would not wish for the present generation to preclude any such use on the part of a future generation. Further, the Board is concerned with the possibility that, however well conceived, any program of underground injection of wastes might allow contaminants to enter useful groundwaters.

The primary information available to the Board at this time regarding underground injection in Illinois is ENR's draft report (Ex. 89) and the testimony regarding it by one of the researchers involved in its preparation (R. at 1494-511). It is expected that a revised report will be available in late 1986 following completion of peer review.

* Class I wells include wells for the injection of municipal and both hazardous and nonhazardous industrial wastes below underground sources of drinking water.

The General Assembly has charged the Board with the responsibility of holding hearings on this report when it is finalized and officially submitted. Subsequently, the Board must publish its findings and conclusions and specifically determine whether there is a need to modify or eliminate any regulations pertaining to the UIC program [Environmental Protection Act, Section 6.2]. It would be appropriate at that time for the Board to also advise the General Assembly on broader issues of policy regarding the appropriateness of underground injection as a method of waste disposal. A related matter involves the State's general exclusion of liquid hazardous waste from disposal by land treatment and surface impoundments by January 1, 1987. It is still an unresolved question as to whether or not underground injection of wastes will be considered to fall within this provision of law. This issue is one of many related matters now under consideration by the Board in rulemaking proceeding R86-9. It would be premature of the Board to take a position on underground injection of wastes until such time as it has been able to thoroughly consider the matter in these upcoming and ongoing proceedings.

WELL DRILLING OVERSIGHT

Two members of the Illinois Well Drillers Association presented testimony (R. at 292-9, 591-7) on various aspects of regulatory oversight of well drillers. In general, the belief on their part is that the regulatory framework for oversight as it presently exists is adequate, but that enforcement may sometimes be lax (R. at 292) and lax enforcement allows for poor quality work (R. at 296, 597). Additionally, it was noted that the terminology "certified well driller" as referenced in the Plan (Ex. 1, p. 28) should appropriately be "licensed well driller" (R. at 595).

WETLANDS PROTECTION

Ms. Rita J. Renwick, speaking on behalf of the Audubon Society, noted that any plan which protects groundwater should give consideration to wetlands (R. at 616). Wetlands may not only be maintained by groundwater, but, as the Plan also notes, they may also be intimately related to groundwater storage and recharge (Ex. 1, p. 57). In some states where wetlands are viewed as having particular environmental significance, the Board notes that entire groundwater plans have been developed around wetland maintenance (Ex. 40, p. 149).

SECTION VII:

SUPPLEMENTAL STATEMENTS OF INDIVIDUAL BOARD MEMBERS

The main body of this Report contains consensus findings and conclusions of the Board. However, due to the great scope of issues which the Board was mandated to address in this proceeding, there were inevitably some issues which Board Members wished to address individually. Accordingly, in this section the Board presents supplemental statements of individual Board Members.

BY J. ANDERSON:

I have a few observations, drawn from experience, concerning the enormous challenge to the legislature and local governments to formulate, allocate, indeed to mandate, necessary intergovernmental decision making mechanisms, if a groundwater protection program emphasizing prevention (vs. remediation) is to be implemented.

I am referring to land use/zoning/siting decisions, and who is going to make them. The Agency, ENR and others considered that such decisions were a necessary component of groundwater protection. While environmental protection in general serves to constrain certain activities, the imposition of land use and zoning controls are of particular consequence when addressing groundwater management programs.

Defining goals and developing the technical information needed to identify the resource - aquifiers, recharge zones, etc.- are formidable enough tasks in terms of time and money.

But what combination of local governments, and what Agencies of the State, are going to participate in the decisions that actually restrict construction or other activities on land judged to be sensitive in terms of groundwater protection? Land use and zoning controls have historically been the province of the municipalities and counties, with the State playing little, if any, direct role in such decisions.

This record and the Agency Plan treat this subject only in very general terms.

In the Agency view, land use and local siting decisions should be made by local communities, "based upon minimum State criteria, monitoring, and inspection", (Agency Plan, p. 58). The local communities the Agency was thinking of were levels of government that are smaller than the counties, and could include townships, water commissions, municipalities..."It is a fairly broad spectrum of government". (R. 634)

Even if the legislature were to determine that such local authority would accrue only to the counties and municipalities, the implications regarding the state's role and intergovernmental cooperation are enormous when addressing a resource that a) knows no governmental boundaries b) will potentially involve the imposition of land use and zoning controls for a sizeable number of facilities or activities.

Exerpts from some questions and statements at hearing illustrate the problem:

"I think that the hearing body and the IEPA and other bodies should be aware of the fact that in common terms municipalities are a creature of the state. By that we mean that both counties and towns have powers granted and limited by statute; counties Chapter 34, cities Chapter 24, and never the twain shall meet.

Both are not identical." (Robert W. Layer, McHenry County Department of Planning, R. 629)

"... included that to point out that there is the possibility of cooperation between municipalities and counties to develop a common ground for finding where recharge areas are, and it is very definite that Woodstock is dependent upon the sand and gravel aquifer, the aquifer extends well beyond the boundaries of the City of Woodstock, and the recharge area, heaven knows where." (Id. R. 626)

The following are exerpts of questions by Mr. James E. Harrington, representing the Illinois Manufacturers Association and answers by Mr. Robert Clarke of the Agency. (R. 578-581)

Q. Well, for example, if there are two towns next to each other, one of which adopts one of these plans and includes a land use component, could it then prevent the other town from siting industrial facilities, chemical storage, or other facilities, within the recharge zone?

A. We feel that the legislation should cover the authorities to deal with recharge area management, an in some cases it may not prohibit the location of industry or any other operation within that recharge area. It may well restrict the methods of construction or operation appropriate to the protection level desired.

Q. Well, for example, if there is an existing industrial site, which is not presently in use, and somebody proposed to build a chemical distribution facility there, and you were at a point where these local plans were being developed, and somebody decides it may affect three different wells, in three different jurisdictions, would then the owner of that property be required to participate in the development of three separate plans before he knew what restrictions might apply to the property?

A. If that would be the case, I think he should be.

Q. And then he would have to await the decision of those three different public bodies and perhaps go from there to the IEPA for mediation of conflicts?

A. ...However, I do believe that there should be methods to arbitrate that kind of process.

Q. Well, the simpler example, one community which is strictly a bedroom community with residences, sees no benefit in having industry in any of the neighboring communities, so it adopts a plan that says no industry within the 20-year recharge zone which effectively blocks industrial development and its neighbor, how would that be arbitrated?

Both Mr. Clarke and Mr. Layer further put in perspective the importance of, and difficulties presented by, this subject:

MR. CLARKE: ...Therefore, it would be behoove all communities to be concerned with the neighboring communities if in fact their community has an influence upon their water supply of the adjacent community. (R. 582)

MR. LAYER:... This is a matter of hearings before the Legislature, and all this kind of business, this is a real can of worms. I would like to take off my shirt and expose to you the scars I bore for testifying before the Legislature fifteen years ago when statewide zoning was proposed. (R.627)

BY J. D. DUMELLE:

Illinois' fastest growing and second largest county, DuPage, has had since 1979 a program to map all of its 26,000 wells. The well locations are stepped off to a referenced corner of the property. If demolition of a structure or a site redevelopment occurs, the well can still be located with a metal detector and properly sealed to protect the aquifer from surface pollution inflow.

DuPage County received the impetus for this program after the surface floods of 1972. Tests on private wells showed that more than 75% of them were contaminated. The rapidity of appearance of the contamination meant that the contamination could only have come from direct connections to the aquifer (i.e., abandoned wells or improper casing grouting).

DuPage County has long recognized the potential hazards to groundwater quality from abandoned wells. At a minimum it would seem prudent to extend the DuPage County mapping of well locations state-wide, with appropriate re-inspections to make certain that abandonment of well has not occurred without proper permanent sealing.

Another matter of concern is the quality of water in private wells. As a minimum, each well, at the time of sale, ought be tested for the full spectrum of pollutants including organics. When houses are sold, it is common for the buyer to require a new land survey from the seller in order that encroachments upon the property are detected. A pollutant is an encroachment upon the well's quality and its detection might save lives.

Recharge areas are often vast in area. And since spills from tank trucks or railroad cars may occur anywhere within a recharge area it would seem difficult to know where these incidents would happen. Perhaps all that can be done is to alert emergency forces to a possible need to neutralize (when feasible) spilled material or to quickly pump it up.

Closed loop groundwater circuits may leak their refrigerant into the ground. A double-wall tube ought to be required similar to double-wall underground tanks and to leachate collection systems exterior to an inner landfill lining.

Underground injection of wastes may not be desirable. The New Madrid, MO, earthquakes of 1811 and 1812 may repeat at intensities in excess of 8.3 on the Richter scale. If this happens, faults may develop which could allow inter-aquifer transfer of these injected wastes to potable sources of water.

BY B. FORCADE:

Today's report is the culmination of a process designed to provide Illinois policy-makers with the best available information and recommendations on protecting groundwater. I support the conclusions and findings of the report. However, I also believe one of the report's primary findings, "a program...to reduce and prevent groundwater contamination," deserves additional comment.

Today's report advocates the creation of a major new regulatory and permitting program, under which the Environmental Protection Agency ("Agency") will have profound obligations. The program, at a minimum, would require permits for all potential major sources of groundwater contamination in all especially sensitive areas. If true groundwater protection is a goal in Illinois, such a program is the only method to achieve it. Unfortunately, there is inadequate information presently available to allow the Board to determine what type of activities might constitute a potential major source of groundwater contamination. In a similar vein, there is not enough information to determine what constitutes an especially sensitive area for protecting groundwater. Both questions are capable of resolution with sufficient time and resources. However, the nature of the questions indicate they will require substantially more time and resources than the usual pollution control problems we face.

Most of the pollution control problems faced by Illinois governmental agencies are not unique. For example, many states, as well as the United States Environmental Protection Agency, have sponsored research projects on methods to control particulate emissions from large industrial boilers. When Illinois attempts to address this problem, it can draw from the large body of existing knowledge to find out what is effective and how much it costs. No such large body of baseline information exists to assist Illinois agencies in defining those activities which constitute a potential major source of groundwater contamination. If Illinois intends to regulate sources, it must first define the activities of consequence to groundwater contamination. Presently, there are no good theories for developing such a definition. Similar problems exist when we try to define what constitutes an especially sensitive area for groundwater protection. The problem is exacerbated by the need for information on groundwater location, flows, and soil conditions in that specific area. Any legitimate effort to define a single aquifer protection area may require substantial research in the field. That work is expensive and Illinois has many, many aquifers. In my opinion, today's report does not convey with sufficient gravity the magnitude of any legitimate effort to really protect groundwater. Nor does it suggest costs or sources of financing.

Once Illinois agencies define those activities to be regulated and those areas to be protected, the technical problems diminish and the social policy problems arise. If this program is to be implemented, I feel certain questions must be answered by the policy-makers:

1. Is "no contamination above background levels" a legitimate goal for our present and potential drinking water supplies? For all aquifers? Present federal law requires it in certain cases for hazardous waste facilities.

2. Should all "potential major sources of groundwater contamination in a sensitive area" be required to make the same demonstration of no contamination as is presently required of hazardous waste landfills? Could Joe's gas station afford to make such a permit application? Could the aquifer withstand his failure to do so?

3. Should all presently pure waters receive protection as a potential future drinking water sources?

4. In view of the high cost or technical infeasibility of cleaning up contaminated groundwater, should potential contamination sources be excluded from regulatory controls under the standard test that control options are "technically infeasible or economically unreasonable" for that source?

While these questions are certainly not exhaustive, they indicate some of the problems any regulating agency must address if it attempts to implement a "program to reduce and prevent groundwater contamination." It has always been my opinion that agencies of government perform best when provided with clear policy guidance and adequate facts. I would have felt more comfortable with today's report if it had more clearly articulated its advocacy of a new regulatory program, focused on the specific policy questions on which guidance was requested from the policy-makers and detailed some of the informational deficiencies to regulation and the cost of filling that void.

My remarks should not be construed as a criticism of the conclusions of the report. Anyone who takes the time to review the record before the Board will be faced with one inescapable conclusion. Nearly all of the present state efforts to prevent groundwater contamination are focused on an extremely limited universe of potential sources, such as hazardous waste landfills, which are required to make profound showings that they will not cause environmental harm. While these sources represent a legitimate area of regulatory concern, there is no factual basis to conclude that they represent a substantial portion of the overall potential problem. In fact, the testimony before the Board indicates that landfills (hazardous and sanitary) represent a miniscule portion of the actual sources of historical contamination. In essence, from a statewide perspective, we spend virtually all of our time regulating a relatively small number of the sources of contamination. This should not be construed as an argument to reduce regulation of hazardous waste landfills but as an argument questioning the non-regulation of the majority of other sources.

In summary, I believe today's report makes a persuasive case that real groundwater protection must entail a preventive (i.e., permit) program applicable to all major potential sources of groundwater contamination in sensitive areas. However, if state policy-makers choose to adopt such a program, they should be aware that the cost to the state to develop such a program, and the cost to the regulated community to comply, could be quite high. This should be balanced against the economic cost to Illinois of the loss of such a valuable resource as groundwater.

BY. J. MARLIN:

Section 13(c) of the Act required the Board to adopt an underground injection control (UIC) program. The Board has implemented this requirement with rules adopted in 35 Ill. Adm. Code 702, 704 and 730. As noted in the Report (VI-5), there are differing views as to the adviseability of underground injection. The Board is anticipating a report from DENR on the UIC program. Also, it is not yet clear what impact the land disposal ban of Section 39(h) and R86-9 will have on the UIC program. However, as it presently stands, the UIC program is the

Illinois program most directly related to groundwater protection; yet, it is barely mentioned in the report. Among the points which should be mentioned are the following.

First, the UIC rules include an aquifer classification system. (Sections 704.103, 704.104, 704.123, 730.103 and 730.104). The rules provide for identification and mapping of "underground sources of drinking water" (USDW) by the Agency, with the possibility of downgrading ("exemption") by Board rulemaking.

Second, the UIC program includes an application of groundwater standards: the criterion for issuance of a UIC permit is a demonstration that injection fluid will not move into a USDW so as to cause a violation of USEPA primary drinking water standards in the USDW. (Section 704.122)

Third, the rules include technical standards for determining the "zone of influence" around an injection well. (Section 730.106)

BY J. THEODORE MEYER:

I concur in issuing this report but I am deeply concerned that the issue of the cost to implement this report was not adequately discussed. This is a report which is directed to the General Assembly. The principal function of the General Assembly is the allocation of available tax receipts among the many competing entities which received state's funds. Environmental concerns are chasing the same tax dollar as are education, public assistance, criminal justice, and numerous state agencies. At a time of fiscal restraint at the federal level as a result of the enactment of the Gramm-Rudman bill, and the improbability of the General Assembly raising taxes in the near future, it is unrealistic to assume the General Assembly will significantly increase the number of environmental programs. To present the General Assembly with a report which will solve the problem with no priorities or cost is doing a disservice to further protecting the environment. The General Assembly needs a list of priorities and how much programs will cost state and local government and the tax paying public.

APPENDIX:

EXHIBITS

1. "A Plan for Protecting Illinois Groundwater", Illinois Environmental Protection Agency, January, 1986.

2. "Underground Water in Illinois", Illinois Environmental Protection Agency, September, 1985.

3. "Illinois Ground-Water Resources", U.S. Geological Survey Water-Supply Paper 2275.

4. "Groundwater: How will we protect it?", Illinois Environmental Protection Agency, September, 1985.

5. "Groundwater: How will we protect it?", Illinois Environmental Protection Agency, November, 1985.

6. Summary of Results from Groundwater Protection Comment Forms, Illinois Environmental Protection Agency.

7. Transcript, Illinois Groundwater Protection Plan Hearing, November 20, 1985.

8. Transcript, Illinois Groundwater Protection Plan Hearing, November 18, 1985.

9. Transcript, Illinois Groundwater Protection Plan Hearing, November 20, 1985.

10. Resume of David S. Baker

11. Vita of Robert H. Gilkeson

12. Vita of Richard C. Berg

13. Resume of John M. Shafer

14. Resume of H. Allen Wehrmann

15. Illinois Department of Energy and Natural Resources, Ground Water Section, State Water Survey Division, Mission, May, 1986.

16. Selected List of Publications on Waste Disposal, June 1, 1985, Illinois State Geological Survey Division.

17. O'Hearn and Schock, "Design of a Statewide Ground-Water Monitoring Network for Illinois", Illinois Department of Energy and Natural Resources, State Water Survey Division, Ground Water Section, SWS Contract Report 354, December, 1984.

18. Wehrmann, "An Investigation of a Volatile Organic Chemical Plume in Northern Winnebago County, Illinois" Illinois Department of Energy and Natural Resources, State Water Survey Division, Ground Water Section, SWS Contract Report 346, August, 1984.

19. Gibb, et. al., "Hazardous Waste in Ogle and Winnebago Counties: Potential Risk Via Groundwater Due to Past and Present Activities", Illinois Department of Energy and Natural Resources, State Water Survey Division, Groundwater/Aquatic Chemistry Sections, SWS Contract Report 336, February, 1984.

20. "Strategy for the Protection of Underground Water in Illinois", Special Report No. 8 of the Illinois State Water Plan Task Force, Illinois Environmental Protection Agency, October, 1984.

21. Berg, et. al., "Potential for Contamination of Shallow Aquifers in Illinois", Illinois Department of Energy and Natural Resources, State Geological Survey Division, Circular 532, 1984.

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23. CBE Comments on the Illinois Environmental Agency's Plan for Protecting Illinois Groundwater and the Department of Energy and Natural Resource's Assessment of Ground-Water Quality and Hazardous Substance Activities in Illinois with Recommendations for a Statewide Monitoring Strategy, April 30, 1986.

24. "Water Resources, St. Louis Metropolitan Area, 1985", St. Louis Regional Commerce and Growth Association.

25. "Groundwater, Saving the Unseen Resource, Proposed Conclusions and Recommendations", The Conservation Foundation, November, 1985.

26. S.1836, 99th Congress, 1st Session, November 7, 1985.

27. Illinois Groundwater Law: The Rule of "Reasonable Use", Illinois Department of Transportation, Division of Water Resources, October 8, 1985.

28. "Overview of State Ground-Water Program Summaries", Volume 1, United States Environmental Protection Agency, Office of Ground-Water Protection, March, 1985.

29. "Overview of State Ground-Water Program Summaries", Volume 2, United States Environmental Proatection Agency, Office of Ground-Water Protection, March, 1985.

30. "Ground-Water Monitoring Strategy", United States Environmental Protection Agency, Office of Ground-Water Protection, December, 1985.

31. "Ground-Water Protection Strategy", United States Environmental Protection Agency, Office of Ground-Water Protection, August, 1984.

32. "Selected State and Territory Ground-Water Classification Systems", United States Environmental Protection Agency, Office of Ground-Water Protection, May, 1985.

33. Letter from Governor James R. Thompson to Richard Carlson, May 2, 1986.

34. Water Cycle Map

35. "An Assessment of Ground-Water Quality and Hazardous Substance Activities in Illinois with Recommendations for a Statewide Monitoring Strategy", Illinois Department of Energy and Natural Resources, State Water Survey Division, Ground Water Section, SWS Contract Report 367, July, 1985.

36. Text of amendments to Safe Drinking Water Act adopted.

37. Report on the hydrology and geology of General Electric's Morris Operation, Illinois Safe Energy Alliance, November 18, 1981, and attachment: Petition for Federal Environmental Impact Statement on General Electric's Morris Operation, August 29, 1985.

38. Robert W. Layer, "A Plan for Protecting Illinois Groundwater Commentary", McHenry County Department of Planning, May 15, 1986.

39. Letter from Lawrence B. Christmas, Executive Director, Northeastern Illinois Planning Commission with two (2) attachments.

40. Ground Water Quality Protection, State and Local Strategies, National Academy Press, Washington, D.C. 1986.

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43. Report to the Chairman, Subcommittee on Commerce, Transportation and Tourism, Committee on Energy and Commerce, House of Representatives, "Federal and State Efforts to Protect Ground Water", U.S. General Accounting Office, February 21, 1984.

44. "Groundwater: Saving the Unseen Resource", Report on Reports, Environment, January/February 1986.

45. "Protecting the Nation's Groundwater from Contamination", Report on Reports, Environment, May, 1985.

46. Association of State and Interstate Water Pollution Control Administrators, "Proceedings of the Technical Exchange Seminar on Groundwater Quality Management", October 23-24, 1984, Denver, Colorado.

47. "The Leaching Fields: A Nonpoint Threat to Groundwater", Assembly Office of Research, California Legislature, March 1985.

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51. "Protecting the Nation's Groundwater from Contamination", Volume II, Congress of the United States, Office of Technology Assessment, Washington, D.C.

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55. Kilner, et. al., "Aquifer Protection Planning in the North Eastern United States".

56. "Illinois Water Well Construction Code, Rules and Regulations", Illinois Department of Public Health, Environmental Health, May, 1978.

57. Forrest, et. al., Local Authorization Potentially Useful for Protection of Underground Waters, 1980.

58. Herzog, et. al., "Evolution and Adequacy of Ground Water Monitoring Networks at Hazardous Waste Disposal Facilities in Illinois", Illinois State Geological Survey.

59. Testimony in Response to "A Plan for Protecting Illinois Groundwater", June 16, 1986, Rock Island, Illinois. Presented by William Schubert, Waste Management of Illinois.

60. Photo of Sewer, submitted by Eleanor Bridgeman.

61. Hydrograph submitted by Eleanor Bridgeman.

62. Group Exhibit regarding Bridgeman's water problems.

63. Illinois Environmental Regulatory Group Membership List.

64. Testimony of Christopher Harris with two (2) attachments, June 25, 1986.

65. Testimony of Jeffrey S. Brown, June 25, 1986.

66. Savage, "Groundwater Protection: Working Without A Statute", Journal WPCF, Vol. 58, No. 5, pp. 340-342, May 1986.

67. State Programs for Groundwater Quality Management, Volumes One and Two, October 1985.

68. CAST, Report No. 103, "Agriculture and Groundwater Quality", Council for Agricultural Science and Technology, May 1985.

69. "Health Guidance Levels for Agricultural Chemicals in Groundwater", National Agricultural Chemicals Association, September 1985.

70. "Guidelines for Determining the Presence of Agricultural Chemical Residues in Groundwater", National Agricultural Chemicals Association, September 1985.

71. Felsot, "Survey for Pesticides in Groundwater Supplies in Illinois", Illinois Natural History Survey.

72. Reserved (Illinois Environmental Protection Agency standards regarding Registration of Chemicals). Not filed.

73. "An Assessment of the Applicability of the National Academy of Sciences' Study on Toxicity-Testing Needs for Agricultural Chemicals", National Agricultural Chemicals Association, March 8, 1985.

74. Testimony of Joanna Hoelscher, Citizens for a Better Environment, June 25, 1986.

75.(a) Wisconsin groundwater statute.

75.(b) Summary of 1983 Wisconsin groundwater act.

75.(c) 1983 Assembly Bill 595, Wisconsin Act 410, pp. 1755-1825.

75.(d) 1985 Assembly Bill 436, Wisconsin Act 206, pp. 1-2.

76. Ginsburg and Osborne, "Pesticides, Cities, and You", CBE Environmental Review, March/April 1984, pp. 9-10.

77. "Technical Considerations Relating to the Siting of New Regional Pollution Control Facilities", Illinois Department of Energy and Natural Resources, October 1, 1984.

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81. Map showing 918 Public Water Supply wells sampled 1984-86, U.S. Geological Survey.

82. Sheet showing IEPA "Preliminary Findings" of Sampling.

83. Volatile Halogenated Compounds Sheet.

84. Goodenkauf and Atkinson, "Occurrence of Volatile Organic Chemicals in Nebraska Groundwater", Groundwater, vol.24, no. 2, March-April 1986, pp. 231-233.

85. Article from the Iowa Department of Water, Air and Waste Management Newsletter, "Pesticides and industrial chemicals found in wells of 33 public water supplies".

86. Hallberg, "Nonpoint Source Contamination of Groundwater by Agricultural Chemicals", Iowa Geological Survey, December 12, 1985.

87. Hallberg, "Agricultural Chemicals and Groundwater Quality in Iowa: Status Report 1985", Cooperative Extension Service, Iowa State University, December 1985.

88. Kelley, "Synthetic Organic Compound Sampling Survey of Public Water Supplies", Iowa Department of Water, Air and Waste Management, April 1985.

89. Brower et. al., Final Draft Report, "Evaluation of Current Underground Injection of Industrial Waste in Illinois", Illinois Department of Energy and Natural Resources, March 1986.

90. "Recommendations for Developing a Comprehensive Program for Protecting Illinois' Groundwater Resources", Illinois Department of Energy and Natural Resources, June 25, 1986.

91. Data regarding constituent levels in Harvard, Illinois, wells.

92. DiNovo, and Martin, "Local Groundwater Protection, Midwest Region", American Planning Association, 1984.

93.(a) An Ordinance Amending the Comprehensive Plan for the Development of the City of Crystal Lake, McHenry County, Illinois, adopted March 3, 1976.

93.(b) An Ordinance Amending the Zoning Ordinance of the City of Crystal Lake, Illinois, adopted February 15, 1977.

94. "Pesticides in Groundwater: Background Document", United States Environmental Protection Agency, May, 1986.

PUBLIC COMMENTS

1. Comments of Betty Johnson, Chair, Hazardous Waste Committee of Winnebago County. Submitted June 11, 1986

2. Comments of Gerald A. Paulson, Executive Director, McHenry County Defenders (including two attachments). Submitted June 25, 1986.

3. Comments of Lawrence B. Christmas, Executive Director, Northeastern Illinois Planning Commission. Submitted June 30, 1986.

4. Comments of Joseph P. Linskey. Submitted July 10, 1986.

5. Feliciano, "Wellhead Protection: The New Federal Role in Groundwater Protection", Environmental and Natural Resources Policy Division, Congressional Research Service, June 20, 1986. Submitted by Robert Clarke, Illinois Environmental Protection Agency, July 10, 1986.

6. Comments of Illinois Environmental Regulatory Group. Submitted July 31, 1986.

7. Comments of Citizens for a Better Environment (including attachment). Submitted July 31, 1986.

8. Comments of Citizens for a Better Environment (including attachment). Submitted July 31, 1986.

This Report has been prepared in furtherance of the requirements imposed on the Board by Ill. Rev. Stat. ch. 111½, 1013.1(d) (1985). The adoption and release of this Report is intended to fulfill the responsibilities delegated to the Board as outlined in 1013.1(d).

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Report was adopted on the 28th day of August, 1986, by a vote of 6-0.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board