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Groundwater Quality Standards (GQS)

Since the inception of the Illinois Environmental Protection Act (Act) (415 ILCS 5) in 1970, it has been the policy of the State of Illinois to restore, protect, and enhance the groundwater of the State as a natural and public resource. Groundwater has an essential and pervasive role in the social and economic well-being of Illinois, and it is vitally important to general health, safety, and welfare. Groundwater resources should be utilized for beneficial and legitimate purposes; waste and degradation of the resource should be prevented; and the underground water resource should be managed to allow for maximum benefit of the State. Groundwater used as drinking water is one of the highest beneficial uses of the groundwater resource. The **Illinois Groundwater Protection Act (IGPA)** (415 ILCS 55) defines "Resource groundwater" as groundwater that is presently being or in the future capable of being put to beneficial use by reason of being of suitable quality (415 ILCS 55/3(j)).

The IGPA included Sections 11 and 12(a). Section 11 describes part of the purpose of Title III, as follows:

“...assure that no contaminants are discharged into waters without being given the degree of treatment or control necessary to prevent pollution.”

Section 11(b) of the 2005 Act includes the same purpose statement. Water pollution was defined in Section 3(a) of the 1970 version of the Act the same as it is to this day. Moreover, Section 12(a) of the 1970 version of the Act includes the following:

“No person shall: (a) cause, threaten or allow the discharge of contaminants into the environment in any State so as to cause or tend to cause water pollution in Illinois, either alone or in combination with matter from other sources, or so as to violate regulations or standards adopted by the Pollution Control Board under this Act.” (Emphasis added)

The term “threat” in Section 12(a) of the Act established Illinois’ original narrative nondegradation standard. The Board’s final order and opinion, for 35 Ill. Adm. Code: Subtitle C, indicated that:

“...Standards are applicable to groundwaters that are a present or are a potential source of 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 they are used by a public water supplier, a private water supplier, or have the potential for being so used. (Emphasis added).

Additionally, the Board’s opinion, in regard to *Water Quality Standards Revisions* (#R71-14), and *Water Quality Standards for Intrastate Waters* (SWB-14) (#R71-20) indicated the following:

“203 General Standards. Today’s revision is based upon the principle that all waters should be protected against nuisances and against health hazards to those near them; that all waters naturally capable of supporting aquatic life, with the exception of a few highly industrialized streams consisting primarily of effluents in the Chicago area, should be protected to support such life; and that waters that are used for public water supply should be clean enough that ordinary treatment processes will assure their potability...”

“...Since general criteria apply to all waters designated for public water supply, the present regulation omits separate requirements for those parameters whose general standards are tight enough to protect public water supplies: boron, chromium, copper, fluoride, mercury, silver and zinc. The remaining standards are based largely upon Public Health Service standards, as amplified by the Green Book and by McKee and Wolf. While the PHS explicitly states that its standards are intended to prescribe the quality of finished rather than of raw water, it is clear from the evidence that many of the metals and other contaminants here listed are not substantially affected by ordinary water supply treatment, and therefore, as the Green Book recommends, the raw water must itself meet the standard to assure satisfactory finished water.” (Emphasis added)

The phrase “ordinary treatment processes”, emphasized in the Board’s opinion above, is one of the keys to understanding Illinois’ nondegradation requirements for groundwater. First, it is important to note that there is a significant difference between what is considered ordinary treatment processes for surface water versus groundwater sources of drinking water. All CWS using surface water apply coagulation, sedimentation, filtration, disinfection, and treatment for taste and odor. Private drinking water systems do not use surface water as a source of drinking water, due to the inherent vulnerability of surface water resources to contamination and the associated cost for treating such water. A private drinking water system is defined as a system that serves an owner occupied single family dwelling (415 ILCS 55/9(a)). Secondly, there is a significant difference between what is considered ordinary treatment processes for a small CWS using groundwater versus a private drinking water system well. The small CWS using groundwater has more treatment infrastructure resources available than the owner of a private well. Lastly, a private well owner typically only has to chlorinate his or her well to use the groundwater for potable uses. Thus, this defines the lowest common denominator of what ordinary treatment processes means to the protection of Class I: Potable Resource Groundwater. In other words, the Act and Board regulations prohibit a person for causing, threatening or allowing contamination of potable resource groundwater above what is not removed by ordinary treatment processes in a private drinking

water system well. For example, a plume of tritium at a concentration above background or naturally occurring levels, moving toward a private drinking water system well, is considered a threat to diminishing the existing Class I groundwater resource, since tritium cannot be removed by advanced treatment processes let alone ordinary treatment processes. This diminishment of resource groundwater (415 ILCS 55/3(j)) may lead to preclusion of the use of the well if the private well owner chooses not to use it (e.g., suitability) due to the contamination.

The Illinois Supreme Court also determined the following in *Central Illinois Public Service Company v. Pollution Control Board*, 116 Ill.2d 397:

The Board, at the outset, disagrees with CIPS' interpretation of the definition of water pollution in the Act. The Board argues that the Act treats water as a resource, and that pollution occurs whenever contamination is likely to render water unusable. Under the Board's interpretation there is no need to show that harm *will* occur, only that harm *would* occur if the contaminated water were to be used. Since the Board is charged with administering the Environmental Protection Act, its interpretation of the statute is entitled to deference. (*Massa v. Department of Registration & Education* (1987), 116 Ill.2d 376, 107 Ill. Dec. 661, 507 N.E.2d 814; *Illinois Consolidated Telephone Co. v. Illinois Commerce Com.* (1983), 95 Ill.2d 142, 152, 69 Ill. Dec. 78, 447 N.E.2d 295.) Under the Board's view any contamination which prevents the State's water resources from being usable would constitute pollution, thus allowing the Board to protect those resources from necessary diminishment. CIPS' interpretation, on the other hand would mean that water rendered unusable would not be polluted so long as use of the water ceased subsequent to contamination. We find the Board's interpretation preferable to CIPS' interpretation, especially considering the deference we must accord to the Board.

Public Act 85-863 (effective on September 24, 1987) created the IGPA and also amended portions of the Act. The IGPA required the Illinois EPA to develop and the Board to adopt comprehensive groundwater-quality standards. These groundwater quality standards (35 Ill. Adm. Code 620) became effective in 1991, and replaced the groundwater quality standards of 35 Ill. Adm. Code 302.208 and 35 Ill. Adm. Code 302.303. Under, 35 Ill. Adm. Code 620 the Board classified groundwater into one of the four following classes:

- Class I: Potable Resource Groundwater (saturated geologic materials with a hydraulic conductivity of greater than or equal to 10^{-4} centimeters per second (cm/sec)) includes current and future uses of drinking water (35 Ill. Adm. Code 620.210), and includes domestic, industrial, agricultural and other legitimate and beneficial uses (Board Final Opinion and Order R89-14(b), 1991);
- Class II: General Resource Groundwaters (saturated geologic materials with a hydraulic conductivity of less than 10^{-4} cm/sec) are quality-limited, quantity-limited, or both, it is necessary that the standards that apply to these waters reflect this range of possible attributes;

- Class III: Special Resource Groundwaters are demonstrably unique (e.g., irreplaceable sources of groundwater) that are vital for a particularly sensitive ecological system or groundwater that contributes to a dedicated nature preserve that are suitable for application of a water quality standard more stringent than the otherwise applicable water quality standard; and
- Class IV: Other Groundwater is within a zone of attenuation as provided in 35 Ill. Adm. Code 811 and 814, within a point of compliance as provided in 35 Ill. Adm. Code 724, that naturally contain more than 10,000 mg/L of total dissolved solids; which has been designated by the Board as an exempt aquifer pursuant to 35 Ill. Adm. Code 730.104; or which underlies a potential primary or secondary source, in which contaminants may be present from a release, if the owner or operator of such source notifies the Agency in writing.

For further detail on groundwater quality standards see: <http://www.ipcb.state.il.us/>.

Narrative Nondegradation Standard

The Board's GWQS include the following narrative nondegradation standard that applies in Class I and III resource groundwater:

Section 620.301 General Prohibition Against Use Impairment of Resource Groundwater

- a) No person shall cause, threaten or allow the release of **any contaminant** to a resource groundwater such that:
- 1) Treatment or additional treatment is necessary to continue an existing use or to assure a potential use of such groundwater; or
 - 2) An existing or potential use of such groundwater is precluded.
(Emphasis added)

Groundwater's must meet the standards (except due to natural causes) appropriate to the groundwater's class as listed below and the nondegradation provisions enforceable under Section 12(a) of the Act:

Groundwater Quality Standards for Class I: Potable Resource Groundwater

Inorganic Chemical Constituents

Constituent	Units	Standard
Antimony	mg/L	0.006
Arsenic	mg/L	0.05

Barium	mg/L	2.0
Beryllium	mg/L	0.004
Boron	mg/L	2.0
Cadmium	mg/L	0.005
Chloride	mg/L	200.0
Chromium	mg/L	0.1
Cobalt	mg/L	1.0
Copper	mg/L	0.65
Cyanide	mg/L	0.2
Fluoride	mg/L	4.0
Iron	mg/L	5.0
Lead	mg/L	0.0075
Manganese	mg/L	0.15
Mercury	mg/L	0.002
Nickel	mg/L	0.1
Nitrate as N	mg/L	10.0
Radium-226	pCi/l	20.0
Radium-228	pCi/l	20.0
Selenium	mg/L	0.05
Silver	mg/L	0.05
Sulfate	mg/L	400.0
Thallium	mg/L	0.002
Total Dissolved Solids (TDS)	mg/L	1,200
Zinc	mg/L	5.0

Organic Chemical Constituents

Constituent	Standard (mg/L)
Alachlor*	0.002
Aldicarb	0.003
Atrazine	0.003
Benzene*	0.005
Benzo(a)pyrene*	0.0002
Carbofuran	0.04
Carbon Tetrachloride*	0.005
Chlordane*	0.002
Dalapon	0.2
Dichloromethane*	0.005
Di(2-ethylhexyl)phthalate*	0.006
Dinoseb	0.007
Endothall	0.1
Endrin	0.002

Ethylene Dibromide*	0.00005
Heptachlor*	0.0004
Heptachlor Epoxide*	0.0002
Hexachlorocyclopentadiene	0.05
Lindane (Gamma-Hexachlorocyclohexane)	0.0002
2,4-D	0.07
ortho-Dichlorobenzene	0.6
para-Dichlorobenzene	0.075
1,2-Dibromo-3-Chloropropane*	0.0002
1,2-Dichloroethane*	0.005
1,1-Dichloroethylene	0.007
cis-1,2-Dichloroethylene	0.07
trans-1,2-Dichloroethylene	0.1
1,2-Dichloropropane*	0.005
Ethylbenzene	0.7
Methoxychlor	0.04
Methyl Tertiary-Butyl Ether	0.07
Monochlorobenzene	0.1
Pentachlorophenol*	0.001
Phenols	0.1
Picloram	0.5
Polychlorinated Biphenyls(PCBs)(as decachloro- biphenyl)*	0.0005
Simazine	0.004
Styrene	0.1
2,4,5-TP (Silvex)	0.05
Tetrachloroethylene*	0.005
Toluene	1.0
Toxaphene*	0.003
1,1,1-Trichloroethane	0.2
1,1,2-Trichloroethane	0.005
1,2,4-Trichlorobenzene	0.07
Trichloroethylene*	0.005
Vinyl Chloride*	0.002
Xylenes	10.0

*Denotes a carcinogen.

Complex Organic Chemical Mixtures (constituents of gasoline, diesel fuel, or heating fuel must not be exceeded in Class I groundwater)

Constituent	Standard (mg/L)
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Benzene*	0.005
BETX	11.705

*Denotes a carcinogen.

pH

Except due to natural causes, a pH range of 6.5 - 9.0 units must not be exceeded in Class I groundwater.

Beta Particle and Photon Radioactivity

- 1) Except due to natural causes, the average annual concentration of beta particle and photon radioactivity from man-made radionuclides shall not exceed a dose equivalent to the total body organ greater than 4 mrem/year in Class I groundwater. If two or more radionuclides are present, the sum of their dose equivalent to the total body, or to any internal organ shall not exceed 4 mrem/year in Class I groundwater except due to natural causes.
- 2) Except for the radionuclides listed below, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalent must be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data in accordance with the procedure set forth in NCRP Report Number 22.
- 3) Except due to natural causes, the average annual concentration assumed to produce a total body or organ dose of 4 mrem/year of the following chemical constituents shall not be exceeded in Class I groundwater:

Constituent	Critical Organ	Standard (pCi/L)
Tritium	Total body	20,000.0
Strontium-90	Bone marrow	8.0

Groundwater Management Zone

Within any class of groundwater, a groundwater management zone may be established as a three dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site: That is subject to a corrective action process approved by the Agency; or for which the owner or operator undertakes an adequate corrective action in a timely and appropriate manner.