ILLINOIS POLLUTION CONTROL BOARD
December 21, 1971

In the Matter of )
)
) #R 71-14
WATER QUALITY STANDARDS REVISIONS )

Explanation of Proposed Final Draft (by Mr. Currie):

On May 12, 1971, we published a proposed Chapter IV of the Rules and Regulations of the Pollution Control Board, comprising a complete recodification and revision of all existing regulations respecting water pollution. Extensive hearings were held throughout the State, from June to October. Upon studying the transcripts and exhibits, we published a partial proposed final draft on November 11, including principally those provisions, many of them originally proposed in #R 70-8 and the subject of separate hearings last winter, respecting effluent standards, permits, and the control of storm overflows. The proposed final draft published today contains additional provisions considered at the hearings which, together with the November 11 draft, are intended to constitute a complete package of revised water pollution regulations. It is our intention that both today's draft and that of November 11 be adopted, as the subjects covered, while related, are not overlapping. This explanation relates to the draft published today, on which final hearings will be held and final comments accepted with final action expected in February.

In large part today's draft is simply a codification of existing water quality standards and associated provisions that are now scattered throughout a number of separate regulations that we inherited from the Sanitary Water Board. The new regulations, when adopted, will supersede the old except for determining violations alleged to have occurred prior to the effective date of the new regulations. A section-by-section discussion follows.

Rules 101-103 are standard statements of the Board's authority and policy, substantially as in present regulations, and a repealer of obsolete provisions. Rule 104 contains definitions in addition to those included in the November 11 draft; both sets will be included in the final regulations. None of these provisions, with the exception of certain definitions in the November 11 draft, has been substantially altered from the original May 12 proposal.

Part II is the heart of the water quality standards and constitutes an updated version of the criteria now found in regulations SWB-7 through SWB-15:

201 Mixing Zones. Existing standards by and large provide for "reasonable admixture" of effluents in a mixing zone that is not subject to the water quality standards. This is necessary unless effluent standards are to be as stringent as water quality standards, which in some cases (e.g., temperature, see #R 70-16, Mississippi Thermal Standards, November 15, 1971) would impose an unreasonable cost burden. At the same time, if the water quality standards are not to be undermined, the area within mixing zones must be kept relatively small.

Technical Release 20-22 of the Sanitary Water Board, long used as a guideline without the force of a regulation, provided that reasonable mixing would be deemed to occur within 600 feet from the point of discharge. We have held that this figure represents the understanding of the Sanitary Water Board in adopting the reasonable mixture standard, at least with regard to the larger rivers, and therefore have required that on the Illinois, Wabash, Ohio, and Mississippi Rivers the standards be met outside a zone 600 feet in its greatest dimension. See Application of Commonwealth Edison Co. (Dresden #3), # 70-21 (March 3, 1971); Mississippi Thermal Standards, # R 70-16, supra; Ohio-Wabash Thermal Standards, # R 71-12, June 28, 1971. On the other hand, we have expressed doubt that such a large mixing zone could have been intended on small streams, since a few 600-foot zones on such streams would undermine the stream quality standards altogether. See EPA v. City of Champaign, # 71-51C, September 16, 1971.

The May 12 draft incorporated the 600-foot standard across the board, but consideration of the Champaign case, just cited, suggests a more flexible test is desirable. The basic standard in the present draft, therefore, is expressed in terms of the principle that mixing zones must be kept very small in proportion to stream volume. Although the application of this principle must be determined on a case-by-case basis, this approach appears to be more responsive to the competing policy considerations underlying the mixing zone provisions than does any rigid size requirement. In response to other testimony received, the present draft alters the 600-foot linear zone--here preserved as a maximum--to a zone no larger than the area of a circle with 600-foot radius, by analogy to the Lake Michigan standard (#R 70-2, June 9, 1971), recognizing that in flowing streams the shape of a plume is likely to be long and thin in a downstream direction.

The earlier provision intended to prevent increasing the size of the mixing zone by multiplication of discharge points has been reworded to avoid unintended restrictions. The formerly rigid provision requiring a fixed proportion of the stream as a zone of passage for fish has been made more flexible in order to leave details to individual cases while preserving the principle that thermal or other pollution blocks must be avoided. This provision applies only to waters protected for aquatic life.

202 Stream Flows. This Rule provides that water quality standards are to be met at all times except extreme low flows. This provision is the equivalent of that in existing regulations. An exception is provided, as in the Ohio-Wabash and Mississippi thermal standards, for brief excursions of temperature that are not likely to be harmful and that are the result of natural conditions peculiar to temperature. It is recognized that it may be necessary in the future to provide some type of episode control at times of extreme low flow in order to avoid harm to aquatic populations.

203 General Standards. The proposed 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. Consequently general standards for water quality are set that will protect most uses except public water supply; more stringent standards are set for places where water is withdrawn for public supply; and more lenient standards are set for those streams classified for restricted use. The general standards are found in Rule 203 and their discussion follows. They are taken largely from existing criteria for aquatic life. Stream use designations are found in Part III.

203 (a) preserves the existing requirements for freedom from nuisance.

203 (b), as initially and presently proposed, retains the existing pH values for aquatic life.

203 (c) provides a phosphorus limit for reservoirs and lakes and for streams tributary to them. The evidence is strong that phosphorus above this level in relatively still water can give rise to obnoxious algae blooms. The evidence does not support the need for a phosphorus standard in other situations, and the proposal for such a standard is here omitted. So is the earlier proposal for an algae limit, which was too stringent to indicate the

presence of a nuisance. The evidence does not support any numerical standard for algae, and we rely upon the nuisance standard of 203 (a). We have not defined "reservoir" or "lake" for want of an adequate definition. This will have to be worked out on a case-by-case basis in light of the policy here expressed. Not every navigation dam will be held to create a lake for this purpose. Despite the uncertainty, it does not seem appropriate to postpone necessary regulation for lack of a perfect definition.

203 (d) repeats the May 12 proposal (6.0 mg/l for 16 hours and 5.0 minimum) for dissolved oxygen requirements for aquatic life. The present standard (5.0 and 4.0) is not optimum according to the Green Book of the National Technical Advisory Committee on Water Quality Criteria.

203 (e) retains existing radioactivity levels.

203 (f) lists a number of important contaminants as follows. "Dissolved" values have been changed to "total" for reasons given in the explanation of the proposed final draft of Nov. 11.

Ammonia Nitrogen. The present SWB-8 standard is 2.5 mg/l, which the Green Book (supra) says is acutely toxic to fish. The earlier 1.0 proposal was based upon a Minnesota standard. While the toxicity of ammonia is pH-dependent, the Green Book recommends a limit of 1.5 mg/l, and that is here proposed.

Arsenic. The May 12 proposed level of 1.0 mg/l was based upon existing SWB-8 standards and the recommendation of McKee and Wolf, Water Quality Criteria, which is a well-respected literature survey, for protection of aquatic life. It is preserved in today's draft.

Barium. The May 12 proposal, preserved here, of 5.0 mg/l for aquatic life was based upon existing SWB-8 standards and the recommendation of McKee and Wolf.

BOD. The May 12 draft proposed a stream standard of 7.0 for biochemical oxygen demand (5-day). This was intended to facilitate determination of the degree of treatment required of dischargers without resort to complex formulas for computing oxygen sag and recovery. The evidence is that the effect of a given level of BOD on a stream is too dependent upon reaeration rates to make any prescribed standard meaningful. We have omitted it in today's draft and will rely on the dilution ratios in the November 11 draft, together with proof of violation of dissolved oxygen levels by stream studies or otherwise, until more adequate proof is presented to support a BOD standard.

Boron. The May 12 and presently proposed level of 1.0 mg/l is based on evidence that higher levels can harm irrigated crops. While 100% irrigation is unlikely in Illinois, the uncontrolled discharge of large quantities of boron is clearly undesirable. We have proposed no effluent standard because of the lack of evidence as to treatment methods. The testimony suggests that compliance with a stream standard should not be very difficult.

Cadmium. The 0.05 value proposed on May 12 and today is the same as the present SWB-8 for aquatic life. McKee and Wolf suggest that an even lower value might be appropriate to protect some fish.

Chloride. Chlorides are tolerated by aquatic life in relatively high concentrations; Professor Lackey, a recognized expert in fish biology, testified that 500 mg/l would be a safe limit, and there was no substantial dispute. This value will also, according to the evidence, protect against any substantial problems in drinking water. The undesirability of an overly tight chloride standard is underlined by the high cost of chloride removal as well as the relatively innocuous nature of the material.

Chromium. There is a dispute in the evidence as to the toxicity of chromium. McKee and Wolf support the testimony that the toxicity of chromium toward fish and man has been exaggerated, but stress the toxicity of small amounts of hexavalent chromium to daphnia and other important fish foods. The values here proposed preserve the existing SWB-8 aquatic standards for hexavalent (0.05 mg/l) and trivalent (1.0) chromium since McKee and Wolf appear to justify the distinction with regard to effects on fish foods. The May 12 proposal was a single standard of 0.05.

Copper. Existing copper standards vary: SWB-8's is 0.04 mg/l, while SWB-12's (Mississippi River) is the same (0.02) as that proposed May 12 and today. This figure is based on McKee and Wolf's recommendation for fish and aquatic life. Important fish foods are readily killed by low concentrations of copper, and McKee and Wolf say 0.025 mg/l has been found to kill most fish in 8 hours in the presence of 1.0 mg/l of zinc.

Cyanide. The present SWB-8 standard of 0.025 mg/l, here proposed, is that recommended by Orsanco. Twice that concentration, say McKee and Wolf, has killed fish in a short time, while trout were found to survive 27 days at 0.02 mg/l. The May 12 draft proposed 0.01 based upon the fact that such a level could be achieved by filtration. But finding a safe level, not treatability, is the goal in setting water quality standards for general uses.

Fluoride. Fluoride can delay the hatching of fish eggs and has been reported by McKee and Wolf to kill trout at concentrations ranging from 2.3 to 7.2 mg/l. They recommend a standard of 1.5 mg/l. The figure of 1.4, here repeated from the May 12 draft, is in line with that recommendation and also should assure a potable supply.

Iron. The 1.0 mg/l standard proposed May 12 and today is taken from the existing SWB-8. McKee and Wolf make no firm recommendation but report that dogfish survived a week's exposure to 1 to 2 mg/l of iron. Other species are said to have shown a lower toxic threshold.

Lead. 0.1 mg/l, proposed May 12 and today, is the present SWB-8 aquatic standard and supported by McKee and Wolf's recommendation of 0.1, a level above which lead is lethal to some fish and begins to interfere with the breakdown of oxygen-demanding materials.

Manganese. There is no existing aquatic standard. The proposed 1.0 (May 12 and today) is based upon McKee and Wolf's report as to fish toxicity and should be easy to meet.

Nickel. There is no existing standard. McKee and Wolf report one study finding that stickelbacks die as low as 0.8 mg/l, but that others find nickel less toxic than iron or zinc. Today's proposal, like that of May 12, is 1.0 mg/l.

Phenols. There is conflicting evidence as to the harmful level of phenols. The limiting value, according to the Green Book, is that concentrations above 0.1 mg/l impart a bad taste to fish. The May 12 draft and today's propose 0.1 in place of the present SWB-8 standard of 0.2.

Selenium. No present aquatic standard exists, but McKee and Wolf say 2.0 mg/l kill goldfish in eight days. The May 12 proposal of 2.0 therefore seems too high, and 1.0 is here proposed in order to keep the water below the harmful level.

Silver. The present SWB-8 standard is 0.05 mg/l, but McKee and Wolf report lethal doses to some fish at levels an order of magnitude lower. Accordingly the May 12 and present drafts proposed 0.005 mg/l.

Sulfates. As in the case of chlorides, some limit seems desirable to protect stock watering and fish. Dr. Lackey suggested that 500 mg/l would afford adequate protection for fish; McKee and Wolf give the same figure for stock watering; and this level should avoid adverse effects on public water supplies as well according to McKee and Wolf.

Total Dissolved Solids. This proposed level of 1000 mg/l too is based largely on Dr. Lackey's testimony, confirmed by other witnesses and by McKee and Wolf, that aquatic life should not be harmed.

Zinc. 1.0 is the present SWB-8 aquatic standard and proposed May 12 and here. McKee and Wolf suggest that this is a safe level if the water is not particularly soft.

Additional chemicals were suggested by various witnesses for inclusion in the table, such as antimony, cobalt, and tin. We recognize the desirability of adding more parameters and will welcome specific suggestions for future additions, but codification of the present standards should not be delayed while new parameters are explored.

The May 12 draft contained a limit of 2.0 mg/l for the aggregate of toxic substances indicated by an asterisk in the above table. While the synergistic effect of various heavy metals or other toxics is a matter of considerable concern, we have no basis for setting any particualr number and therefore have omitted this provision from today's draft, leaving the question of synergism to be dealt with by general provisions such as paragraph (h) of Rule 203, below.

203 (g) tightens the bacterial limit from that designed for secondary contact to that described as safe for primary contact. This has the same effect as the May 12 draft, which provided a separate category of waters designated for primary contact but which designated all general waters for this use. Since disinfection is required of all relevant effluents, achieving the lower level should pose no great additional difficulty. Even if waters are not recommended for swimming because of other problems such as turbidity, barge traffic, or dangerous currents, they should not pose a health hazard to those who do use them.

203 (h) retains the present SWB-8 general provision that no substance shall be present in amounts representing a stated percentage of their toxic value to fish. This is most necessary because no regulation can possibly list all contaminants that are of concern.

The May 12 list of pesticides is omitted. It was obviously incomplete and seems better left to the general toxicity provisions of Rule 203 (h).

203 (i) has been amended to incorporate the newly adopted temperature standards for the Mississippi, Ohio, and Wabash Rivers and to preserve the existing maximum values for other streams (except to substitute 90° for 93 on the former industrial sector of the Illinois and lower Des Plaines), pending further evidence as to actual temperature.

The separate criterion for primary contact (formerly Rule 204) is omitted for reasons given under Rule 203 (g) above.

Rule 204 states standards for public water supplies. Agreeing with McKee and Wolf that the recommended Public Health Service standards for desirable drinking water are tighter than necessary as a regulatory matter with respect to such relatively innocuous materials as chloride, sulfate, and total dissolved solids in light of the difficulty of removing such materials from effluents, we have altered the May 12 proposal by omitting these parameters and by rewording the general statement in paragraph (a). Compliance with the general standards for these parameters should suffice. We have also reinstated in today's draft the provision that the public supply standards need be met only where water is withdrawn for public supply. This provision will assure that water is satisfactory wherever it is taken, without requiring expensive cleanups of effluents where the water is not used for public supply. The construction of new public supply intakes will in some cases therefore require additional treatment of effluents upstream.

Since general criteria apply to all waters designated for public supply, the present draft omits separate requirements for those parameters whose general standards are tight enough to protect public supplies: boron, chloride, chromium, copper, fluoride, mercury, silver, sulfate, total dissolved solids, and zinc. The remaining standards are based largely upon the 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 recommneds, the raw water must itself meet the standard to assure satisfactory finished water.

The proposed standards for barium, cadmium, lead, and selenium--together with chromium and silver, which are covered by general standards--are taken from the Public Health Service standards whose violation in finished water results in rejection of the supply. These are toxic materials not removed by ordinary

treatment of raw water. These numbers represent existing SWB-8 standards. For arsenic, the present standard, taken from the PHS rejection standard, is 0.05; we proposed May 12 and today to tighten this to 0.01, which the PHS gives as the level that should not be exceeded if better supplies are available. It seems reasonable to require that supplies be made to meet that recommended standard. The standard for nitrates and nitrites is an important one based upon health dangers to infants, and these ions are not removed by standard treatment.

Other existing SWB-8 standards preserved in today's list include carbon chloroform extract (CCE), a measure of objectionable organic material; iron, which like the additional parameter of manganese for which there has been no standard causes problems of taste and of laundry color; methylene blue active substances, which cause taste problems and indicate recent sewage pollution; and phenols, which also cause taste problems. Cyanide (SWB-8 prescribes the same value of 0.025 mg/l as for aquatic life) is reduced in the May and present drafts to 0.01 mg/l on the basis of the recommended PHS standard. The existing oil standard has been quantified. The other concentrations discussed in this paragraph are based on PHS standards. It is disputed the extent to which these parameters are reduced by ordinary treatment. The PHS says at least some of them are, and therefore implies that raw water need not meet such strict standards; the Green Book says otherwise, and for safety's sake these standards, mostly taken from present law, are here preserved.

As in the general standards, specific pesticide numbers are omitted. A new paragraph (c) is intended to guard against the presence of toxic substances for which numerical standards are not provided.

205 Restricted Use Standards. This Rule has been substantially revised to provide that aquatic life standards for various toxic materials need not be met since these waters are not protected for aquatic life. The standards are intended to assure against nuisance conditions, and, to protect other waters downstream, the water quality in restricted waters is required to meet the applicable effluent standards. The temperature standard has been modified in response to a suggestion from Commonwealth Edison Company, in order to avoid expensive cooling devices that are not necessary to the avoidance of nuisances or safety hazards.

206 Lake Michigan. Certain parameters taken from existing standards are preserved to require this high-quality lake to remain especially clean for esthetic and recreational purposes, in accordance with the important non-degradation policy. Similar provisions to protect other waters of unusually high quality have been omitted from the present draft for lack of evidence as to which waters are entitled to such protection. The Lake Michigan provisions establish the principle of special protection for

high-quality waters, and additional waters may be added in the future when the evidence so demands.

The Lake Michigan temperature standard recently adopted has been inserted in the present draft.

207 Underground Waters. Protection of groundwater is of paramount importance. The provision has been amended to make clear it does not protect natural brines or deal with the problem of deep-well disposal except to assure protection of present or potential water supplies.

208 Nondegradation. This preserves the present prohibition of unnecessary degradation of waters presently of better quality than that required by the standards, recognizing that the standards represent not optimum water quality but the worst we are prepared to tolerate if economic considerations so require.

Part III contains water use designations. All waters are designated for general use except those in the restricted category, which has here been broadened in response to testimony to include waters whose flow is too low to support aquatic life. This should relieve the burden of treatment beyond the effluent standards for discharges to intermittent streams. Such extra effort is difficult to justify when it will not result in a satisfactory aquatic life because of insufficient flow. We have also been urged to designate as restricted certain additional heavily industrial channels in the Chicago area. We find the evidence on this issue more conclusory than convincing, and retain the general classification in the present draft. The burden is on those seeking to abandon a waterway to demonstrate the economic unreasonableness of upgrading it to support aquatic life. We shall entertain such proof in the coming hearings.

Part IV, which contains effluent standards, was published as a proposed final draft November 11.

Part V imposes reporting requirements similar to those of present law (SWB-6). Small changes have been made to provide that expensive monitoring need not be done for contaminants not likely to be found in an effluent. Access for Agency testing is required.

Part VI. Sections dealing with breakdowns, spills, and overflows were published November 11. Rule 603 modifies the proposal respecting intake structures by limiting it to aquatic life sectors, since it is designed to protect aquatic life, and by specifying new sources only in order to avoid enormous backfitting costs. Rule 604 on new connections will be published separately on the basis of pending hearings.

Part VII contains minimum limits on discharges to sewers, designed to protect treatment works against harm that might cause violations of the effluent or water quality standards as well as the mercury limit already adopted. The cyanide sewer limit of SWB-5 is also included. Although it has been challenged, revision can await specific hearings in the future.

Part VIII incorporates existing requirements (SWB-19) for discharges of wastes from watercraft, with a new section requiring bilge or ballast discharges to meet general effluent standards. Special new provisions for better enforcement of the boating regulation are omitted for lack of adequate supporting evidence at present and may be considered separately in further hearings.

Part IX on permits and most of Part XI (compliance programs) were published November 11. Rule 1001 is the requirement of an annual status report from the Agency as proposed May 12. The extensive list of individual compliance dates, taken from existing regulations, is omitted here. In most cases those dates are past; for enforcement purposes the original regulations may be used, and the presently applicable dates are more concisely stated in the proposed Part IV as published November 11.

Further comments on the present draft are invited.