ILLINOIS POLLUTION CONTROL BOARD
January 6, 1972

In the Matter of EFFLUENT CRITERIA	)))	#R 70-8
In the Matter of WATER QUALITY STANDARDS REVISIONS	))))	#R 71-14
In the Matter of WATER QUALITY STANDARDS REVISIONS FOR INTRASTATE WATERS (SWB-14)	)))))	#R 71-20

Opinion of the Board (by Mr. Currie):

Water quality standards prescribing the maximum permissible concentrations of various contaminants in the waters of the State were adopted by the Sanitary Water Board in 1967 and 1968. The implementation plans for these stream criteria, also made part of the regulations, provided enforceable effluent standards and timetables for their achievement with regard to biochemical oxygen demand and suspended solids in oxygen-demanding wastes. For most of the parameters included in the stream quality criteria, however, no effluent standards were provided except in the regulations applicable to waters within the Metropolitan Sanitary District of Greater Chicago (SWB-15). Allowable discharges elsewhere in the State were left to be determined by what was required to meet the criteria for stream quality outside the appropriate mixing zone and by unenforceable guidelines for effluent quality promulgated in Technical Release 20-22.

Determining discharge requirements on a case-by-case basis so as to tailor discharges to stream quality requirements is a very time-consuming procedure that creates a great deal of uncertainty. Recognizing the desirability of enforceable numerical standards applicable directly to effluents discharged, this Board in one of its first official actions, in October 1970, published for public hearing purposes a proposed set of effluent standards for possible adoption as a regulation, and extensive hearings were held (#R 70-8).

Because the standards proposed were taken directly from the existing criteria in TR 20-22 and from the effluent standards applicable in the Metropolitan Sanitary District, it was assumed that they represented effluent values that were readily achievable by available technology. In fact, however, they appear to have by and large been taken verbatim from the stream quality standards, and whether they could be practicably achieved was made difficult to determine by the fact that under the old regulations and criteria it was permissible to dilute effluents rather than treating them in order to meet the limits prescribed. A second proposal for more stringent standards issued in February, 1971 was based upon ORSANCO standards, which do not specifically forbid dilution either. This Board's proposal, on the other hand, required that the effluent standards be met without dilution, for reasons discussed below.

At the Board's request, the Institute for Environmental Quality then contracted with Drs. James Patterson and Roger Minear of the Illinois Institute of Technology to investigate the technology for reducing the contaminants listed. Their report is a comprehensive literature survey describing contaminant levels achieved in actual practice, together with methods employed to achieve them and the costs of doing so. We made this report widely available and held further hearings in which additional testimony was given as to the technical feasibility and economic reasonableness of various numerical standards.

On the basis of all the evidence received, which we have studied in great detail, we substantially revised the proposed standards and have published for final comments of a proposed final draft that we believed represented a degree of treatment readily attainable by standard available methods at reasonable cost. We held two more days of hearings in order to be sure we had not overlooked any important considerations because of the extensive changes we had made. On the basis of this additional testimony and comments we have made a few final changes and today adopt the amended regulations. Because of significant new proposals made at the most recent hearings, we have scheduled further hearings on portions of the proposed final draft dealing with permits, combined sewer overflows, and effluent standards for deoxygenating wastes, which will be held in conjunction with final hearings on a proposed final draft (#R 71-14) of additional water pollution regulations. See Board Newsletter #39 (Dec. 28, 1971).

There follows a section-by-section discussion of the new regulation.

104 Definitions. Most of these definitions are taken from those proposed in #R 71-14; those not relevant to the sections adopted are omitted for the time being. Several new or revised definitions suggested by the Agency have been included since publication of the proposed final draft to clarify our original intention. Perhaps the most significant definition is that of the term "effluent". Since the standards here adopted are based upon practicable treatment methods for industrial and domestic wastes, the definition makes clear that land runoff is not covered by these standards except when land disposal is used for the treatment of wastewater.

Stormwater pollution, while it may be very serious, is left to be taken care of by the statutory prohibition of water pollution or by future standards specifically designed for the problem. Discharges of industrial or domestic waste to storm sewers, however, must meet the effluent standards. See EPA v. City of Champaign, # 71-51C (Sept. 16, 1971), for a description of the problem. Similarly, while wastes from such mining-related processes as coal washing are covered by today's regulations, separate hearings (#R71-25) have been scheduled on standards for mine drainage, which is a type of land runoff posing very special and very serious problems. The Agency asked us to omit all references to the federal STORET system of classifying contaminants, on the ground that such references might limit choice of testing methods. We disagree. The STORET materials themselves are clear that alternative methods are allowed, and our Rule 105 expressly so states. The STORET reference serves only to aid in definition and to facilitate comparison of data collected by various persons. The definition of "dissolved" has been omitted at the Agency's request to leave the question, which is of little importance in these regulations, to standard testing procedures.

105 Analytical Testing. Testimony favoring prescription of the familiar Standard Methods as a guide for testing procedures was widespread and vehement. It was also clear from the testimony that Standard Methods is not complete in all respects. This fact plus the desire not to stifle the use of alternative methods that may be more economical and sufficiently accurate prompted the inclusion of the escape clause allowing resort to other generally accepted procedures. The Agency asked that only those alternative measures it specified should be allowed, but we cannot agree to give such decisive authority to one party to a controversy.

401 (a) Dilution. Removal of contaminants from wastewater is generally preferable to dilution to meet standards. Even if concentrations are diluted sufficiently to avoid immediate harm to those using the stream, excessive reliance on dilution rapidly exhausts the assimilative capacity of the water, especially if, as is often the case, the effluent standard is more lenient than the corresponding standard for stream quality. Thus in order to make room for future industry and population growth, as well as to keep the waters as clean as practicable rather than seeking merely marginal compliance with stream quality standards, it is desirable to require the employment of readily available treatment methods to reduce as much as practicable the total quantities of contaminants discharged to the waters before resorting to dilution either before or after discharge. See Opinion in #R 70-5, *Mercury Regulations, March 31, 1971; Application of Commonwealth* Edison Co. (Dresden #3), # 70-21, March 3, 1971.

On the basis of this policy the Board initially proposed that the effluent standards be met without any allowance for dilution. Although some industry spokesmen challenged this in principle, most acknowledged that intentional dilution in lieu of treatment should be forbidden. There was considerable controversy, however, over the possibility that the absolute ban on dilution might be construed to prohibit the mixing of several streams contaminated with different wastes before treatment. Recognizing that in many cases more effective treatment can be obtained by separate treatment of different waste streams at their source but that economics does not always permit such separate treatment, we published a revised dilution standard proposal in August that retained the general prohibition of dilution while leaving some room for engineering judgment as to the desirability of separating or combining waste streams for treatment. That revised proposal, which has generally met with acceptance, was retained in the proposed final draft and in today's regulation with the addition of one sentence making it clear that the provision for measurement after treatment does not undermine the general prohibition against dilution at any stage.

401 (b) Background Concentrations. Many questions were raised as to effluent requirements when water is taken from a source that already is high in contaminants, the argument often being made that it is unfair to "penalize" a user for contaminants placed in the water by someone upstream or naturally occurring in ground water supplies. Our initial effort to deal with this problem allowed such waters to be discharged provided that they had not been increased in concentration and provided that no violation of the water quality standards resulted. This was widely objected to as too tight, since most water uses cause some increase of concentration, if only through evaporation, and since any water taken from and returned to a stream whose quality exceeds standards will cause a violation. We have consequently rephrased the proposal to state the applicable policy without confining absolutes, much as we have done in the case of dilution. We are not prepared simply to allow credit for background concentrations, both because to do so would permit progressive deterioration of stream quality as one moves downstream, and because the evidence is that the types of treatment necessary to meet the proposed standards are principally limited by ultimate concentrations and not likely to be seriously affected by relatively low background levels. On the other hand, we do not wish to require expensive treatment processes to be installed simply to clean up what has been put into the water by upstream users or to remove traces of materials that it is not worth the cost of removing. As in the case of dilution, it seems best to leave the details to be worked out on a case-by-case basis in the light of a general principle stated in the regulations.

401 (c) Averaging. Our initial proposal was that all numerical effluent standards be met at all times. There was overwhelming testimony urging that averages be allowed in order to allow for the normal fluctuations inherent in any treatment process. We agree and have now provided for daily composite samples, since the treatment efficiencies on which the proposed standards are based are not likely to represent peak values, and since the standards are to be based upon actually attainable results. In order to prevent short-term discharges (slugs) significantly in excess of the standards while allowing natural variations, we have set a peak value five times the daily average. The daily average was suggested by several witnesses and is used by the Agency in TR 20-24. Since publication of the proposed final draft we have clarified the earlier reference to daily averages and specified that the rather lenient pH standard, as to which averaging makes little sense, must be met at all times.

402 Violation of Water Quality Standards. The numerical effluent standards adopted today are intended as basic requirements that should be met everywhere as representing ordinary good practice in keeping potentially harmful materials out of the waters. In some cases, because of the low volume of the receiving stream or the large quantities of treated wasted discharged, meeting these standards may not suffice to assure that the stream complies with water quality standards set on the basis of what is necessary to support various water uses. In such cases the very nature of water quality standards requires that additional measures be taken beyond those required by ordinary good practice to reduce further the discharge of contaminants to the stream. This would not be so if effluents were all required to be as clean as the receiving stream, but in recognition of economic hardship we have refrained from imposing such a requirement across the board. What additional measures are required can be determined only on the basis of more detailed consideration of each stream in accordance with the statutory requirement that different needs may dictate different standards. Rule 402 states the principle that discharges causing violations of the water quality standards are forbidden, as was the case under the earlier regulations, and states basic considerations for determining which of a number of contributors to an overloaded stream must take measures to abate the problem. At the Agency's request an additional sentence has been added to spell out the Agency's responsibility.

403 Offensive Discharges. This is a slightly modified version of the present prohibition on the discharge of nuisance materials to any waters, requiring the equivalent of primary treatment everywhere. A nuisance anywhere is unacceptable. The Agency's suggested language has been adopted.

404 Deoxygenating Wastes. This important section has been deferred pending further hearings on Institute suggestions.

405 Bacteria. Because of revised dates suggested by EPA, we have deferred this Rule pending resolution of related issues with respect to the same waste sources after the January hearings.

406 Nitrogen. The evidence is clear that for too long the oxygen demand exerted by ammonia in domestic wastes has been overlooked in the emphasis on reduction of five-day BOD. The State Water Survey has conclusively shown that reduction of ammonia from the larger sources feeding the Illinois River is necessary if existing standards for dissolved oxygen, essential to an adequate fish population, are to be met. This is exactly the sort of testimony that is required, as discussed in connection with Rule 402 above, in order to assure that the water quality standards are complied with. There was extensive testimony as to the availability of methods for reducing ammonia in effluents, and although several witnesses believed the technology was not sufficiently proven in actual operation, we are convinced that nitrification can be satisfactorily accomplished for a reasonable price by a second stage of biological treatment. The testimony of Edwin Barth and of Dr. Clair Sawyer, both of whom are intimately familiar with actual facilities for nitrification, is particularly effective on this point. The Metropolitan Sanitary District, which is principally affected by our proposal, is committed to employing nitrification. Although Dr. Sawyer's testimony establishes that an effluent of 2.5 mg/l can be achieved even in winter by constructing a large enough tank, we have accepted the Sanitary District's suggestion of a slightly relaxed winter standard in order to save costs in light of the Water Survey's assurance that such an effluent will not jeopardize oxygen levels in the Illinois River.

We do not in this record have sufficient information to enable us to set ammonia effluent standards for other waters, although the possibility of setting them on the basis of dilution ratios, as in the case of BOD, is worth exploring in future hearings. It is likely that ammonia reductions elsewhere will prove necessary in order to meet stream standards either for oxygen or for ammonia itself, which in relatively low concentrations may be toxic to fish. The Agency should of course consider such questions in passing on individual permit applications. But we think it appropriate not to delay adoption of the standards we know to be necessary in the Illinois River while determining what standards are necessary elsewhere.

Earlier drafts contained effluent standards for nitrates and for total nitrogen. That nitrates can pose a problem with respect to the safety of public water supplies is clear, and is recognized in existing water quality standards on the subject. Dr. Sawyer's testimony, as well as that of Mr. Barth, is convincing that the technology is available for denitrification by biological means at costs that appear reasonable where required. While the possibility of setting effluent standards for nitrates based upon dilution ratios is again an attractive one, the present regulation leaves that question for future resolution in order not to delay the adoption of other urgent provisions. Once again denitrification is now required wherever it is necessary to meet water quality standards.

407 Phosphorus. Despite continuing controversy, there is sufficient consensus implicating phosphorus as the controlling element in many cases of undesirable algal blooms to justify requiring the use of the readily available technology for reducing phosphorus in sewage effluents in appropriate cases. We did so with regard to Lake Michigan, where phosphorus is perhaps the most serious contaminant, in #R 70-6 (Jan. 6, 1971). Rules and Regulations SWB-11 recognized the need for phosphorus control in the Fox River basin by requiring that treatment plants in that area provide for phosphorus removal when treatment technology becomes practicable. There is no doubt of its practicability today. See North Shore Sanitary District v. EPA, PCB 71-36 (June 9, 1971), detailing the plans of that district to comply with the Lake Michigan regulation. The need for phosphorus control in the Fox basin was confirmed by testimony received in the present hearings and in a special Board meeting on the subject in November, 1970. The River and its tributary lakes are clogged with nuisance blooms of algae, and it is time to activate the requirements of SWB-11.

In general the evidence indicates that by and large phosphorus is a serious problem in lakes and other impoundments where particles have a significant residence time, but not in flowing Illinois streams apart from the Fox with its lake sources. We wrestled with the idea of requiring phosphorus reductions in all streams tributary to lakes or reservoirs, but today's regulation postpones that question for want of an adequate definition of the bodies of water that should be included. Again, the water quality standards proscribe nuisance algae blooms, and water quality standards for phosphorus have been proposed in #R 71-14. In individual cases a phosphorus removal requirement could be based on those provisions in the absence of a specific regulation.

408 Additional Contaminants. This important list contains specific effluent numbers for a large number of contaminants, based largely upon evidence as to what is achievable through standard treatment. A grace period is allowed for constructing the necessary facilities, in the case of existing waste sources. For new sources immediate compliance is required. We do not repeal the existing standards of SWB-15; to do so would leave a gap of some years during which no limits would apply.

A number of witnesses objected in principle to the establishment of any uniform state-wide standards, pointing to the statutory provision for different standards to meet different conditions as authority. We entirely agree that there are some situations in which the water available for dilution of an effluent in the receiving stream justifies a somewhat relaxed standard; if we did not, many of the levels in this table would be considerably tighter. We also agree, as has been shown above, that under some conditions of low flow or numerous waste sources, discharge requirements considerably stricter than those in the table will be necessary. But the fact that some different standards are required for different cases does not mean that there are no minimum standards that can be required to be met on a state-wide basis.

There is nothing new about uniform minimum requirements. The old Air Pollution Control Board, under a similar statutory direction, adopted state-wide particulate emission regulations that for most industrial sources were the same regardless of where the source was located, on the basis of the desirability of employing readily available technology to prevent local nuisances and the unnecessary exhaustion of assimilative capacity everywhere, and in order to further the established federal and state policy of preventing unnecessary degradation of clean air. We are now considering the adoption of more stringent measures, such as the outlawing of coal burning for residential use, in parts of the Chicago area in order to meet the air quality standards (#R 70-15). Similarly, in the field of water, existing state-wide regulations require not only primary treatment to prevent local nuisances but secondary treatment as well, and that requirement has been long accepted as representing the minimum acceptable treatment to avoid unnecessary degradation. What we are proposing today is a comparable requirement for a number of additional contaminants. As shown by the careful tabulation of Mr. Roy Weston, a prominent consulting engineer who testified for the Illinois Petroleum Council, the bulk of the values here proposed can be achieved by treatment whose capital cost is considerably less than that of secondary municipal sewage treatment, a cost that has long been accepted as a reasonable minimum without regard to the nature of the receiving stream.

A number of witnesses who argued for varying effluent standards on the basis of stream assimilative capacity agreed that there should be uniform effluent standards requiring the best available technology for removal of toxic materials, such as many on the list in this Rule, in order, for example, to avoid toxic concentrations at the point of discharge. The concept of a uniform minimum requirement was specifically endorsed by Mr. Weston in a paper submitted for the record.

"It is believed that effluent standards should be established utilizing the Pollution Abatement level of technology as a minimum. . . . This level of abatement could be called "Good Practice." As an illustration, 85 percent BOD removal for all municipal effluents could be established as a "Good Practice" level of pollutant abatement. . . . In a similar manner, a "Good Practice" minimum level of pollution abatement could be established for each specific pollutant. . . . In case "Good Practice" provides pollution abatement in excess of that required to meet established stream standards, regulatory agencies could rationalize that this condition fulfilled the enhancement requirements of modern law. . . . "Good Practice" should be established at the level of pollution abatement that will not create undue economic hardship and will satisfy most, but not all, pollution abatement requirements."

Particularly instructive are the observations of Dr. Wesley Pipes, Professor of Civil Engineering and of Biological Sciences at Northwestern University, who testified on behalf of Abbott Laboratories:

"Materials which function only as toxic agents should be eliminated from the water as much as possible. Barium, cadmium, lead, chromium, mercury, selenium, and silver are examples of materials which are not nutrients but toxic at high enough concentrations. I believe that these materials should be removed from wastewaters and recovered for re-use to the extent that recovery and re-use is ecologically sound. . . . this point is reached when the recovery and re-use activities create more of a pollution problem than the original waste. When this point is reached, the waste should then be diluted so that the concentration of the material is below the toxic concentration.

Materials which serve as nutrients are desirable at certain concentration ranges but produce detrimental effects at concentrations either above or below the desirable range. Included in this category are biodegradable organic matter, ammonia, nitrate, phosphate, copper, iron, and zinc. Cyanide and phenols are organic compounds which fit into this category in a slightly different manner than the rest since they are toxic to most organisms and nutrients for only a few. The objective of waste disposal for nutrient materials should be to get the elements back into circulation in living organisms. . . . The rate of disposal must be kept below the rate at which the materials can be utilized by the desired ecological community.

Materials which are inert dissolved solids can be allowed in relatively high concentrations in some ecosystems without injuring aquatic life. Total dissolved solids including sulfates and chlorides can cause osmotic pressure problems for aquatic life at high concentrations but the limit on these materials is usually set by some other water quality consideration. Removal of these materials from wastes is not considered to be economically justifiable at present and, except when present in extremely high concentrations, they are disposed of by dilution.

Parameters of gross pollution should be kept as low as possible. . . ."

"Ideally," Professor Pipes said, "effluent standards should be related to the desired water quality criteria"; but obtaining the necessary case-by-case information to determine what limits are needed would be an overwhelming administrative task; "the most appropriate questions to ask at this time" are rather "what can reasonably be achieved in terms of percent reductions and percent removals by presently available waste treatment processes. . . [and] how much does it cost to make use of these presently available processes?" Dr. Pipes presented a proposed regulation "intended to describe a 'base level of treatment' or the treatment which every industry and municipality in the State of Illinois should be required to provide as a matter of good housekeeping." Such uniform minimum requirements, he said, can be supported as "requiring people who are not doing that good a job to do what everybody else is paying for."

We believe the great weight of the testimony supports base-level uniform standards for the reasons given.

Mr. Wilbur Dodge of Caterpillar Tractor Co. presented a very attractive and carefully supported proposal for two sets of effluent standards, with somewhat more lenient values, still representing a good measure of treatment, for discharges to certain of the State's larger rivers where more water is available for dispersing effluent contaminants. After studying his numbers and other testimony, we significantly altered many of the figures in our initial proposal to make sure that we are not imposing an unreasonable cost on anyone. These modifications, in most cases, are sufficient to bring the statewide standard into line with the standard suggested by Mr. Dodge for the larger streams, leaving the question of stricter requirements on smaller streams to be worked out individually on the basis of stream needs. We have also accepted the essence of his proposal with respect to peaks and averages, while inserting a different conversion factor. Except for the case of chromium, as to which Mr. Dodge's position is based upon a difference of opinion over toxicity, this leaves only relatively minor discrepancies between his proposal and our regulation.

In earlier drafts of this table we described the relevant concentrations as those of "dissolved" materials in a number of cases. This was based upon a misunderstanding as to the tests prescribed in the federal STORET data system. We have been informed that in fact the federal system generally refers to the total amount of any contaminant present, whether dissolved or suspended; that it is important to reduce suspended as well as dissolved contaminants because upon dilution in the stream they may go into solution, as well as because of the possibility of direct injury to aquatic life or harmful depositions on the bed of the stream; and that the basic treatment processes contemplated by the proposed standards, namely, coagulation, sedimentation, and filtration, will readily allow removal of suspended as well as of dissolved contaminants to the levels described. We therefore substituted "total" for "dissolved" in the table in the proposed final draft and in the final regulation, except for the specific references to total dissolved solids and to dissolved as well as total iron.

A discussion of each contaminant in the table follows.

Arsenic. Our earlier proposed standard of 0.05 mg/l was derived from existing stream quality criteria for public water supplies. To require that effluents meet this standard would require that effluents, even to streams not designated for water supply use, be clean enough to drink. While both Dr. Patterson and Mr. Weston report that arsenic effluents have been known to be reduced as low as to 0.05 mg/l by standard methods of coagulation, sedimentation, and filtration at reasonable cost, the experience on which these results are based is rather meager and appears to be largely that of plants for treating water for drinking, rather than of facilities for treating the much higher concentrations that may well be found in certain industrial wastewaters. The difficulty of transferring results to higher influent concentrations in the case of arsenic is compounded by the fact that, in contrast to most metals in the table, effluent quality is said to be determined not so much by maximum solubility as by a relatively fixed percentage removal capability: Both Patterson and Weston report results principally in terms of 80-95% reduction. Weston gives the range of effluent concentrations achieved by standard processes as from 0.05 to 0.5 mg/l. Abbott Laboratories, the only industry testifying to a specific arsenic problem, said its present effluent was within the present 1.0 mg/l guideline of TR20-22 and expressed confidence that it could by more sophisticated treatment achieve an effluent of 0.25 mg/l, which is within the range suggested by Weston. Mr. Dodge, who stressed that stream dilution and standard treatment for water supply purposes should provide a good measure of protection on the larger rivers, suggested a standard of 0.4 mg/l for discharges to those waters. Abbott further suggested different standards for pentavalent and for the more dangerous trivalent arsenic, but for the reasons given by Dodge and the impracticability of distinguishing the two forms analytically we think a single standard will suffice.

On the basis of the foregoing evidence, we today adopt an effluent standard of 0.25 mg/l of total arsenic, which is well within the range of concentrations found by Patterson and Weston, close to that suggested by Dodge, and confirmed by the experience of Abbott, which is the most directly relevant to the issue before us. This level of arsenic, moreover, is below the water quality criterion for aquatic life, so that meeting it should assure protection on that score. If low dilution ratios on particular streams result in concentrations high enough to interfere with such other protected uses as stock watering (see Dodge), special abatement measures can be taken as required.

Barium. Barium is readily reduced by precipitation and filtration, according to Weston, to levels of 1 to 2 mg/l. Patterson testified that an effluent standard of 2.0 mg/l would leave ample leeway above theoretical solubility to allow for the vagaries of actual operation. There was no contrary evidence. With drinking water standards at 1.0 mg/l and aquatic life standards at 5.0, an effluent of 2.0 mg/l should pose few problems, and we here adopt that standard.

Boron. There is very little information as to the technology for controlling boron, for it has seldom presented problems. Patterson says small scale data indicate it can be distilled, but distillation is costly. The sole basis for boron water quality limits in the low parts-per-million range is to protect irrigated plants. We omit boron from today's regulation because any instances of interference with agriculture may be handled individually on the basis of water quality standards, in the absence of information as to available and inexpensive treatment methods.

Cadmium. This metal is highly toxic both to fish and to man, with water quality standards for both uses in the 0.01 mg/l range. It is on Pipes's list of elements that should be kept out of the water to the extent practicable. Dodge recommends an average effluent standard of 0.01 even for large rivers because of cadmium's extreme toxicity.

By precipitation and filtration, both Patterson and Weston report, effluents as low as 0.1 mg/l of cadmium have been achieved at low cost; Patterson gives 0.15 mg/l as a value that can be achieved with a reasonable margin of safety. Lower values still are attained by ion exchange, which is made economically attractive as an alternative by the high value of the material recovered. *While lower concentrations may be required on low-flow streams* to protect aquatic life, the present regulation incorporates 0.15 mg/l as a readily attainable level that should suffice in most cases as a base level of treatment.

Chloride. We initially proposed a chloride effluent standard of 250 mg/l, but this, together with sulfate and total dissolved solids, was the subject of a storm of criticism. It is clear that such a standard would impose the highest treatment costs of any here under consideration in order to do the least good. While such techniques as distillation, reverse osmosis, and electrodialysis are certainly feasible, Weston gives their cost as five to ten times that of the precipitation and filtration that are adequate to remove most of the contaminants in the table. Moreover, all these methods produce a brine residue that is itself a serious disposal problem. On the other side of the coin, these contaminants are by far the most innocuous on the list. Fish can generally tolerate up to 1000 mg/l of total dissolved solids, and the 250 figure for chloride is based on minor taste considerations. Given the extremely high cost of treatment and the probability that effluents in many cases will be significantly diluted in the stream, we here omit the chloride and sulfate standards, relying on a total dissolved solids standard of 3500 mg/l (see below for exact standard) to protect against the discharge of brines requiring heav dilution, and on the water quality criteria to afford protection in *other cases. This is particularly important in light of the overwhelm-*ing testimony that relatively innocuous dissolved solids often exceed the limits earlier proposed as a result of natural groundwater backgroun water conservation through recycling, and the addition of chemicals to reduce concentrations of more harmful contaminants.

Chromium. There is disagreement as to the toxicity of chromium. Traditional learning has been that hexavalent chromium is extremely toxic both to aquatic life and to man, and water quality criteria are 0.05mg/l for the hexavalent form. Trivalent chromium has been thought much less toxic, and its existing stream criteria are set at 1.0. Mr. Dodge suggests that the toxicity of hexavalent chromium has been much exaggerated and consequently proposes a much relaxed effluent standard of 1.0 for each form on small streams and 5.0 on large, in view of the costs of chromium reduction. Our initial proposals, based upon the water quality criteria, were 0.05 and 1.0 respectively.

McKee and Wolf's highly regarded treatise Water Quality Criteria, which contains a very extensive literature survey, supports Dodge to the extent of casting severe doubt as to the acute toxicity of hexavalent chromium in trace concentrations either to fish or to man. But McKee and Wolf seem to us to present solid evidence justifying a very low hexavalent chromium stream standard on the order of 0.05 mg/l for the protection of the small organisms on which fish feed and which therefore are indispensable to the maintenance of a satisfactory aquatic environment.

Hexavalent chromium, according to Patterson and to Weston, can be treated either by ion exchange, again with significant credit for product recovery, or by reduction to the trivalent form followed by precipitation and filtration. Weston reports actual reduction of trivalent effluents to a range of 0.06 mg/l to 4 mg/l; hexavalent by reduction, etc. to 0.7 - 1.0 mg/l; and hexavalent by ion exchange to 0.03 mg/l. Patterson described a system for reduction and precipitation in use at IBM as reducing total chromium to 0.06 mg/l starting with the hexavalent; Weston acknowledged that this type of unit was in common use in many locations. Despite Dodge's argument that chromium control is expensive, Weston's figures indicate costs for either precipitation or ion exchange comparable to those for standard treatment of other metals in the table. Allowing for some degree of variation in treatment efficiency and of in-stream dilution, we today adopt effluent standards of 1.0 mg/l for trivalent chromium and 0.3 for hexavalent. We note that Patterson testified that a total chromium standard of 0.3 would be safely achievable by standard reduction, precipitation, and filtration.

Copper. The 0.04 mg/l copper standard initially proposed was derived from water quality criteria for aquatic life. It was strenuously objected to as entirely too tight to be achieved. Patterson reports that by precipitation and filtration concentrations in the range of 0.1 to 0.3 have been achieved, and Weston says 0.5, for costs comparable to those for removal of other metals in the table. The Village of Sauget expects to be able to reach the range of 0.5 to 1.0 mg/l by lime treatment of a waste containing a large portion of industrial effluents. To go lower, Sauget testified, would require a sulfide precipitation system at 2 1/2 to 3 times the cost. Olin, which has been designing a lime system to reduce its copper discharges by 90 to 95%, expects an effluent that will meet a 1.0 standard, but says that to go any lower would require an expensive sulfide system and that the best even that system has so far consistently produced is an effluent of 0.7 mg/l.

While copper can harm fish at surprisingly low concentrations (McKee and Wolf recommend an aquatic water quality standard of 0.02), we have revised the effluent copper standard in light of the testimony to reflect what is clearly achievable by ordinary treatment means, believing that such treatment should suffice to avoid copper problems in the larger streams. When problems arise as a result of inadequate dilution, additional measures will be required. Today's regulation contains a copper limit of 1.0 mg/l.

Cyanide. Rules and Regulations SWB-5 forbade all detectable discharges of cyanide to the waters. There are companies that comply with this regulation by total recycling (see, e.g., EPA v. Container Stapling Corp., # 70-18 (March 3, 1971). But the standard was much objected to on the ground that it left the legality of a discharge to the vagaries of analytical accuracy. Today's regulation accepts the premise that there should be a numerical limit for cyanide as for all other contaminants.

The figure we earlier proposed for cyanide was 0.025 mg/l. There is no doubt in this record that it can be achieved; Patterson affirms that it can be done by chlorination, among other methods, and Weston says "zero" cyanide can be attained at a cost comparable to that of removing individual metals in the table. Several industrial witnesses representing firms with cyanide problems endorsed the 0.025 limit, raising serious questions as to the limit on discharges to sewers, which we have left for further consideration. Others suggested that an 0.05 standard should be adopted. We have adopted the 0.025 figure as supported by the great bulk of the evidence. Cyanide is of course a highly undesirable addition to water even in relatively low concentrations. Complex testimony by DuPont in the latest hearings asked that we redefine cyanide so as to exclude certain compounds such as ferrocyanide that are said to be hard to treat and relatively harmless. We think the testimony contains enough qualifications to make such a revision inadvisable.

Fluoride. Our initial proposal for a fluoride effluent standard was 1.0 mg/l. This was somewhat tighter than the water quality standards we later proposed (1.4) for both aquatic life and public water supply, and it posed problems for municipal treatment plants whose influent has been deliberately dosed with as much 1.0 mg/l of fluoride for dental purposes. Patterson reported that 1.0 mg/l was achievable only through relatively exotic and costly methods, such as ion exchange, and that 10.0 mg/l was a more appropriate standard to be achieved by ordinary precipitation. Weston and Dodge both said, however, that 1.0 was readily achievable, Weston specifying the use of alum at costs less than those for achieving most of the metals concentrations here proposed. The most specific information in the record came from Olin, which reports that its fertilizer works at Joliet consistently reduces fluoride concentrations by standard treatment from an influent of 15 mg/l to an effluent of 2.5, but that other ions present prevent reduction as low as 1.0.

We have accepted Olin's figure of 2.5 mg/l, in recognition of the difficulties encountered in going lower and of the likelihood of dilution in many instances to achieve the relatively lenient stream quality standards.

Iron. While iron's toxicity to man is low, excessive iron can cause a nuisance for domestic uses or undesirable bottom deposits. Patterson testified that dissolved iron can be taken out of solution by neutralizations and aeration, and total iron readily lowered by coagulation, sedimentation, and filtration. He gave values of 2.0 mg/l for total iron and 0.5 for dissolved. Weston adverted only to dissolved iron, affirming reductions to less than 0.3 mg/l for costs comparable to those for meeting other standards in this table. There was no challenge to this testimony. Dodge, while agreeing that iron was easy to remove and could cause a nuisance, accepted the 0.5 figure for dissolved but asked for 5.0 mg/l of total iron in the larger streams. Lacking evidence that this small relaxation would cause significant cost savings, we today set standards of 0.5 mg/l dissolved iron and 2.0 mg/l total.

Lead. Highly toxic, and with water quality criteria no higher than 0.1 mg/l, lead is generally conceded to be one of the contaminants that should be kept out of the water to the greatest extent practicable. Fortunately it is readily treatable, at costs lower than most other metals, to 0.1 mg/l by precipitation and filtration according to both Patterson and Weston, and Dodge approved the 0.1 standard for even the larger streams. It is here adopted. Testimony from IITRI that several battery manufacturers were not achieving such low levels we do not think outweighs the above evidence. Among other things the battery makers were not employing flocculants to aid in coagulation.

Manganese. The principal objection to manganese in water is that at rather low concentrations it causes taste and laundry problems in public supplies. The earlier proposed effluent standard of 0.05 mg/l was derived from existing water quality criteria for that use; the aquatic life requirements are considerably less stringent. While both Patterson and Weston report that an effluent of 0.05 mg/l can be achieved by various processes, one of which at least, according to Weston (lime precipitation), is not excessive in cost, there is specific testimony from the single large Illinois discharger of manganese that casts doubt on such a tight state-wide standard.

Carus Chemical Co., which manufactures manganese products, once discharged 400 mg/l of manganese to the Illinois River. By the use of lime it has reduced its effluent to the range of 5-10 mg/l and expects, when the bugs of the new system are worked out, to achieve 1.0 consistently. The company suggests, as is also noted in Patterson's report, that much of the experience upon which the 0.05 standard is based is that of plants treating to provide potable water, and that, as also in the case of arsenic, the transfer of results to wastewaters containing much higher influent concentrations may not be warranted. Carus does acknowledge that methods exist to go much further, such as greensand filtration or the addition of potassium permanganate followed by a filter, but at much greater costs.

Bearing in mind that additional measures such as just described may be necessary in some cases if water quality problems arise, we today adopt a manganese effluent standard of 1.0 mg/l as representing technology well within economic range and probably sufficient to protect water quality under most circumstances.

Mercury. This regulation has already been adopted, for reasons detailed in our opinion in #R70-5 (March 31, 1971). The original compliance date of April 25, 1971 (ten days after filing with the Secretary of State) is retained.

Nickel. Nickel, which we have proposed should be kept to 1.0 mg/l in streams for the protection of fish, can be readily removed to that level by economically reasonable precipitation and filtration; indeed Weston reports effluents as low as 0.1 mg/l. There was no contrary evidence, and Dodge suggested an effluent standard of 1.0 for all streams, which we here adopt.

Oil. The nuisance value of oil in a stream, together with its adverse effects on aquatic life, require that oil discharges be kept to a minimum. We initially proposed a standard of 10 mg/l, but the evidence suggests that 15 mg/l is a more assuredly achievable level by standard techniques such as skimming plus filtration, alum addition, or air flotation. Both the oil and steel industries indicated the standard could be met without particular difficulty, and 15 mg/l is the level of ready achievement mentioned by Patterson. Dodge, who first testified that his company's use of emulsified oils caused difficulty in maintaining an effluent of 15 mg/l consistently, ultimately proposed a standard of 15 mg/l for larger streams.

There was some controversy over whether the hexane soluble test here referred to is the best. Hexane solubility is the test utilized by the Metropolitan Sanitary District; it was endorsed by an oil industry representative; and it is the basis for the 15 mg/l standard supported by Patterson. There was testimony that the hexane test included such materials as edible animal and vegetable oils, waxes, and soaps, whose effect on the stream is different from that of petroleum and which tend to break down in ordinary sewage treatment. The City of Chicago questioned this testimony in part. In any event, because these materials are readily so treated and because they are undesirable additions to the stream if for no other reason than their oxygen demand, today's regulation retains the hexane soluble test. We have, at the Agency's request, allowed the use of alternative equivalent methods.

pH. Our initial proposal set effluent pH standards at stream quality levels, because neutralization, as Patterson affirmed, is feasible and commonly practiced by the use of rather inexpensive chemicals. But the testimony points out that a somewhat more relaxed standard will encourage the optimum pH in various processes for reducing other contaminants; that neutralization significantly increases the dissolved solids in the effluent; and that in many cases stream dilution will serve to avoid any harm to water users if the standard is somewhat relaxed. In view of those considerations and the attendant cost savings, which are said to be considerable, we today adopt a pH effluent range of 5 to 10, subject as always to stricter requirements where necessary to meet water quality criteria.

Phenol. The toxicity of phenols to aquatic life leads Dodge to recommend a phenol standard of 0.05 mg/l for the larger streams. We had proposed first 0.2 and later 0.1, which were based upon aquatic life standards; standards for public water supplies we proposed far lower. Patterson reports that by a combination of methods such as solvents, biological treatment, and chlorination or carbon adsorption an effluent of 0.1 mg/l can be achieved. The oil industry testified that 0.2 but not 0.1 was consistently achievable from biological oxidation tanks, and Monsanto, denying that levels lower than 5 to 8 mg/l can be attained with carbon absorption, testified that it was able to achieve 0.3 mg/l in its effluent and that to reach 0.1 would require chlorination at $1.25 per thousand gallons.

On the basis of this testimony it seems clear that the technology exists to reduce phenols to virtually any level--Patterson reported some extremely low levels--but that costs may begin to increase markedly below about 0.2 or 0.3 mg/l in actual practice. Consequently, and in light of the fact that relatively small dilution will reduce an effluent of that concentration to levels consistent with aquatic life requirements, we today adopt a general effluent standard for phenol of 0.3 mg/l. Tighter measures may prove necessary in individual cases to protect existing sources of public water supply.

Selenium. Selenium is an undesirable contaminant; it has been found to kill fish at concentrations of 2.0 mg/l, and water quality standards for public water supplies are far lower at 0.01. There was little testimony as to removal methods, as large-scale removal has apparently not been much practiced. There is bench scale experience with ion exchange, and theoretically it is said to be feasible to precipitate the element as selenate. No cost or effluent figures are available. Dodge recommends an effluent standard of 0.01 mg/l, which we had initially proposed.

Because of the toxicity of selenium, it seems desirable to adopt an effluent standard even in the absence of conclusive evidence as to removal technology, in order to protect legitimate water uses. Dodge testified that the very strict 0.01 standard was attainable. Since a somewhat higher level is acceptable for aquatic life, we today adopt a standard of 1.0, recognizing both that higher control may sometimes be necessary to protect public water supplies and that we may later discover in a variance proceeding more information as to treatability that may result in a reexamination of the standard.

Silver. Highly toxic, readily removable, and valuable enough to make ion exchange an attractive alternative to precipitation and filtration, silver should be kept out of the water to the extent practicable. Patterson and Weston, without contradiction, report field values of 0.1 mg/l by the use of ferric chloride for costs comparable to those required by other standards in this table. Water quality requirements are lower still, and we adopt as proposed an effluent standard of 0.1 mg/l.

Sulfate. No standard is adopted for reasons given in the discussion of chlorides, above.

Suspended Solids. Existing effluent standards do not make altogether clear whether inorganic suspended solids such as sand and grit must meet the limits for "suspended solids." The existing standards expressly speak of "deoxygenating wastes," indicating that they are based upon treatment needs and capabilities relating to domestic sewage and putrescible industrial wastes. There is a need to keep down other suspended solids too in order to prevent excessive turbidity and harmful bottom deposits, but the relevant numbers are not the same. Republic Steel testified that it meets the 5 mg/l standard by the use of tertiary filters but that for such relatively innocuous materials such expensive treatment should not be required. Deere & Co. said that by standard coagulation it could not meet the strictest solids standards. Dr. John Pfeffer, for the Institute, urged separate provision for inorganic or fixed solids and recommended a standard of 10 to 15 mg/l in order to protect against turbidity and bottom deposits. Our proposed final draft included on this recommendation a separate standard of 15 mg/l for inorganic suspended solids, changing the reference in regard to deoxygenating wastes to organic suspended solids. Our language was poorly chosen, as it unintentionally made much more lenient the standard for oxygen-demanding wastes. We have clarified the provision to make the 15 mg/l a test for total suspended solids from sources other than those discharging sewage or other oxygen-demanding wastes.

Total Dissolved Solids. As discussed in connection with chlorides above, the originally proposed effluent standard of 750 mg/l seems unreasonable. In order not to impose excessive costs without corresponding benefits we here adopt a standard of 3500 mg/l, which should be attainable without treatment except for truly brackish waters that are simply too strong to be discharged without causing stream damage. We agree with Dr. Pipes that within limits dilution is an appropriate answer for relatively innocuous dissolved solids. We have adopted the Agency's suggestion, in line with many other regulations, that in most cases, even within the 3500 limit, solids are not to be increased more than 750 mg/l above background, and Dr. Pipes's advice that 3500 is so high it should be met at all times to avoid harmful slugs.

Zinc. Aquatic life zinc standards are 1.0 mg/l; this level can readily be achieved in effluents without the necessity for undesirable mixing zones, by simple precipitation, according to the unchallenged evidence of Patterson and of Weston. Costs are as for other metals on the list. Indeed, if filtration is used, Weston reports values in the range of 0.1 to 0.3 mg/l, which is better than the required stream quality. We adopt as before, an effluent standard of 1.0 mg/l.

Total Metals. The originally proposed effluent standard for total metals was based on possible synergistic effects rather than on any evidence as to achievable concentrations, and we have no evidence to support it as economically or technically feasible. It is here omitted.

601 Systems Reliability. Paragraph (a) requiring protection against malfunctions is taken from the Agency's guidelines in TR 20-24, stating the important general principle as an enforceable regulation and leaving the details to the Agency. Such protective measures were endorsed by several industrial witnesses during our hearings.

Paragraph (b) is a modified version of present requirements relating to dikes and the like to prevent the escape of hazardous materials in the event of a spill. Our initial draft made the requirement of such measures absolute, and evidence suggests this is excessive for such reasons as the avoidance of fire hazards. The revised form requires reasonable measures to be taken but leaves the details to be worked out in individual cases for want of sufficient evidence support more precise guidelines.

Part IX: Permits. Those provisions are deferred pending hearings on an alternative Agency proposal.

Part X: Implementation Plan. This part requires the submission of programs for compliance by individual sources subject to new effluent limitations, by analogy to the practice of the old Air Pollution Control Board. This provision has been generally applauded. Schedules may be approved by the Agency only if they conform to the timetables specified in the regulations and if the program appears adequate to achieve compliance. Compliance programs must be submitted by July 1, 1972 for most of the contaminants for which standards are adopted today; the date for nitrogen, which has a much later compliance date, will be set after the January hearings along with program filing dates for BOD, suspended solids, and combined sewers. Interim compliance dates are similarly deferred.

Mr. Dumelle will file a separate opinion indicating certain differences with the numbers adopted.

O R D E R

1. The following new provisions are hereby added to the Rules and Regulations of the Illinois Pollution Control Board:

ILLINOIS POLLUTION CONTROL BOARD

RULES AND REGULATIONS

CHAPTER 4: WATER POLLUTION

PART I: INTRODUCTION

104 Definitions:

As used in this Chapter, the following terms shall have the meanings specified:

"Act" means the Illinois Environmental Protection Act;

"Agency" means the Illinois Environmental Protection Agency;

"Basin" means the area tributary to the designated body of water;

"Board" means the Illinois Pollution Control Board;

"Calumet River System" means the Calumet River, the Grand Calumet River, the Little Calumet River downstream from its confluence with the Grand Calumet, the Calumet-Sag Channel, and the Calumet Harbor Basin;

"Chicago River System" means the Chicago River and its Branches, the North Shore Channel, and the Chicago Sanitary and Ship Canal;

"Combined Sewer" means a sewer receiving both wastewater and land runoff;

"Construction" means commencement of on-site fabrication, erection, or installation of a treatment works, sewer, or wastewater source; or the reinstallation at a new site of any existing treatment works, sewer, or wastewater source;

"Effluent" means any wastewater discharged, directly or indirectly, to the waters of the State or to any storm sewer, and the runoff from land used for the disposition of wastewater or sludges, but does not otherwise include land runoff;

"Industrial Wastes" means any solid, liquid, or gaseous wastes resulting from any process or excess energy of industry, manufacturing, trade, or business or from the development, processing, or recovery, except for agricultural crop raising, of any natural resource;

"Land Runoff" means water reaching the waters of the State as runoff resulting from precipitation;

"New Source" means any wastewater source, the construction of which is commenced on or after the effective date of the applicable provisions of this Chapter;

"Other Wastes" means garbage, refuse, wood residues, sand, lime, cinders, ashes, offal, night soil, silt, oil, tar, dye stuffs, acids, chemicals and all other substances not sewage or industrial waste whose discharge would cause water pollution or a violation of the effluent or water quality standards;

"Person" means any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, estate, political subdivision, state agency, or any other legal entity, or their legal representative, agent or assigns;

"Sanitary Sewer" means a sewer that carries wastewater together with incidental land runoff;

"Sewage" means water-carried human and related wastes from any source together with associated land runoff;

"Sewer" means a pipe or conduit for carrying either wastewater or land runoff, or both;

"STORET" means the national water quality data system of the Federal Environmental Protection Agency;

"Storm Sewer" means a sewer intended to receive only land runoff;

"Treatment Works" means individually or collectively those constructions or devices, except sewers, used for collecting, pumping, treating, or disposing of wastewaters or for the recovery of by-products from such wastewater;

"Wastewater" means sewage, industrial waste, or other waste, or any combination of these, whether treated or untreated, plus any admixed land runoff;

"Wastewater Source" means any equipment, facility, or other point source of any type whatsoever which discharges wastewater, directly or indirectly (except through a sewer tributary to a treatment works), to the waters of the State;

"Waters" means 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, except that sewers and treatment works are not included except as specifically mentioned; provided, that nothing herein contained shall authorize the use of natural or otherwise protected waters as sewers or treatment works.

105 Analytical Testing.

All methods of sample collection, preservation, and analysis used in applying any of the rules and regulations in this Chapter shall be in accord with those prescribed in "Standard Methods for the Examination of Water and Waste Water," Thirteenth Edition, or with other generally accepted procedures.

PART II: WATER QUALITY CRITERIA
(to be published separately)

PART III: WATER USE DESIGNATIONS
(to be published separately)

PART IV: EFFLUENT STANDARDS

This Part prescribes the maximum concentrations of various contaminants that may be discharged to the waters of the State.

401 General Provisions.

(a) Dilution. Dilution of the effluent from a treatment works or from any wastewater source, is not acceptable as a method of treatment of wastes in order to meet the standards set forth in this part. Rather, it shall be the obligation of any person discharging contaminants of any kind to the waters of the state to provide the best degree of treatment of wastewater consistent with technological feasibility, economic reasonableness and sound engineering judgment. In making determinations as to what kind of treatment is the "best degree of treatment" within the meaning of this paragraph, any person shall consider the following:

(1) what degree of waste reduction can be achieved by process change, improved housekeeping, and recovery of individual waste components for reuse; and

(2) whether individual process wastewater streams should be segregated or combined.

In any case, measurement of contaminant concentrations to determine compliance with the effluent standards shall be made at the point immediately following the final treatment process and before mixture with other waters, unless another point is designated by the Agency in an individual permit, after consideration of the elements contained in this paragraph. If necessary the concentrations so measured shall be recomputed to exclude the effect of any dilution that is improper under this Rule.

(b) Background Concentrations. Because the effluent standards in this Part are based upon concentrations achievable with conventional treatment technology that is largely unaffected by ordinary levels of contaminants in intake water, they are absolute standards that must be met without subtracting background concentrations. However, it is not the intent of these regulations to require users to clean up contamination caused essentially by upstream sources or to require treatment when only traces of contaminants are added to the background. Compliance with the numerical effluent standards is therefore not required when effluent concentrations in excess of the standards result entirely from influent contamination, evaporation, and/or the incidental addition of traces of materials not utilized or produced in the activity that is the source of the waste.

(c) Averaging. Except as otherwise specifically provided in this Part, compliance with the numerical standards in this Part shall be determined on the basis of 24-hour composite samples. In addition, no contaminant shall at any time exceed five times the numerical standard prescribed in this Part.

402 Violation of Water Quality Standards.

In addition to the other requirements of this Part, no effluent shall, alone or in combination with other sources, cause a violation of any applicable water quality standard. When the Agency finds that a discharge that would comply with effluent standards contained in this Chapter would cause or is causing a violation of water quality standards, the Agency shall take appropriate action under Section 31 or Section 39 of the Act to require the discharge to meet whatever effluent limits are necessary to ensure compliance with the water quality standards. When such a violation is caused by the cumulative effect of more than one source, several sources may be joined in an enforcement or variance proceeding, and measures for necessary effluent reductions will be determined on the basis of technical feasibility, economic reasonableness, and fairness to all dischargers.

403 Offensive Discharges.

In addition to the other requirements of this Part, no effluent shall contain settleable solids, floating debris, visible oil, grease, scum, or sludge solids. Color, odor and turbidity must be reduced to below obvious levels.

404 Deoxygenating Wastes. (to be published separately)

405 Bacteria. (to be published separately)

406 Nitrogen.

Ammonia Nitrogen as N. (STORET number 00610). No effluent from any source which discharges to the Illinois River, the Chicago River System, or the Calumet River System, and whose untreated waste load is 50,000 or more population equivalents shall contain more than 2.5 mg/l of ammonia nitrogen as N during the months of April through October, or 4 mg/l at other times, after December 31, 1977.

407 Phosphorus. (STORET number 00665)

(a) No effluent discharged within the Lake Michigan Basin shall contain more than 1.0 mg/l of phosphorus as P after December 31, 1971 (R70-6, adopted Jan. 6, 1971).

(b) No effluent from any source which discharges within the Fox River Basin and whose untreated waste load is 1500 or more population equivalents shall contain more than 1.0 mg/l of phosphorus as P after December 31, 1973.

408 Additional Contaminants.

(a) The following levels of contaminants shall not be exceeded by any effluent:

CONSTITUENT	STORET NUMBER	CONCENTRATION (mg/l)
Arsenic (total)	01002	0.25
Barium (total)	01007	2.0
Cadmium (total)	01027	0.15
Chromium (total hexavalent)	01032	0.3
Chromium (total trivalent)	01033	1.0
Copper (total)	01042	1.0
Cyanide	00720	0.025
Fluoride (total)	00951	2.5
Iron (total)	01045	2.0
Iron (dissolved)	01046	0.5
Lead (total)	01051	0.1
Manganese (total)	01055	1.0
Mercury (total)	71900	0.0005
Nickel (total)	01067	1.0
Oil (hexane solubles or equivalent)	00550	15.0
pH	00400	range 5-10*
Phenols	32730	0.3
Selenium (total)	01145	1.0
Silver	01077	0.1
Zinc (total)	01092	1.0
Total Suspended Solids (from sources other than those covered by Rule 404)	00530	15.0

* The pH limitation is not subject to averaging and must be met at all times.

(b) Total Dissolved Solids (STORET number 00515) shall not be increased more than 750 mg/l above background concentration levels unless caused by recycling or other pollution abatement practices, and in no event shall exceed 3500 mg/l at any time.

(c) Compliance with the limitations of this Rule 408 shall be achieved by the following dates:

(i) with respect to mercury, by April 25, 1971;

(ii) with respect to all other specified contaminants,

(A) New sources shall comply on the effective date of this regulation;

(B) Existing sources shall comply by December 31, 1973.

PART V: MONITORING AND REPORTING
(to be published separately)

PART VI: PERFORMANCE CRITERIA

This part contains specific requirements and prohibitions concerning existing and potential sources of water pollution.

601 Systems Reliability.

(a) Malfunctions. All treatment works and associated facilities shall be so constructed and operated as to minimize violations of applicable standards during such contingencies as flooding, adverse weather, power failure, equipment failure, or maintenance, through such measures as multiple units, holding tanks, duplicate power sources, or such other measures as may be appropriate.

(b) Spills. All reasonable measures, including where appropriate the provision of catchment areas, relief vessels, or entrapment dikes, shall be taken to prevent any spillage of contaminants from causing water pollution.

602 Combined Sewers and Treatment Plant Bypasses.

(to be published separately)

PARTS VII - VIII
(to be published separately)

PART IX: PERMITS
(to be published separately)

PART X: IMPLEMENTATION PLAN
(other sections to be published separately)

1002 Project Completion Schedule.

(a) Any person who owns or operates any sewer treatment works or wastewater source that requires modification or additional controls to meet any applicable effluent standard contained within this Part shall file a Project Completion Schedule with the Agency. The Project Completion Schedule shall include a description of the wastewater source, the contaminants to be controlled, the additional controls or treatment required, and a time schedule for the project's completion which must meet the applicable deadlines. The approval by the Agency of a Project Completion Schedule contained therein shall constitute a defense to any enforcement action respecting the requirements whose compliance the program is designed to achieve.

(b) Project Completion Schedules shall be filed in accordance with the following timetable:

(i) For compliance with Rules 407 and 408, by July 1, 1972;

(additional dates to be published separately)

2. Final action on other portions of the proposed final draft of November 11, 1971 is hereby deferred pending further hearings as authorized December 27, 1971.

I, Christan Moffett, Clerk of the Pollution Control Board, certify that the Board adopted the above Opinion and Order this 6th day of January, 1972 by vote of 4-0.

Christan Moffett