ILLINOIS POLLUTION CONTROL BOARD
October 6, 1988

IN THE MATTER OF:	)	
	)	
SITE-SPECIFIC EXCEPTION TO	)	
EFFLUENT STANDARDS FOR THE	)	R87-21
THE GREATER PEORIA SANITARY	)	
AND SEWAGE DISPOSAL DISTRICT	)	

OPINION AND ORDER OF THE BOARD (by R. C. Flemal):

This matter comes before the Board upon a Petition filed July 7, 1987, by the Greater Peoria Sanitary and Sewage Disposal District ("District"). The District requests that the Board adopt a site-specific rule and exception to the effluent standards for ammonia nitrogen contained at 35 Ill. Adm. Code 304.122(a) for the District's wastewater treatment plant located in Peoria, Illinois. The proposed exception would add a new section to 35 Ill. Adm. Code Part 304, Subpart B: Site Specific Rules and Exceptions not of General Applicability, as follows:

> Section 304.213 The Greater Peoria Sanitary and Sewage Disposal District Discharges
>
> This Section applies to the publicly owned wastewater treatment works operated by The Greater Peoria Sanitary and Sewage Disposal District. The treatment works is located in Peoria, Illinois, along the Illinois River, and discharges into that River at about River Mile 160.1. Such discharges shall not be subject to the effluent standards for ammonia nitrogen of 35 Ill. Adm. Code 304.122.

As discussed below, the Board today denies the relief requested by the District.

PROCEDURAL HISTORY

Public hearing was held on November 23, 1987, at the District's Administration and Lab Building, Peoria. In addition to the District, the hearing was attended and participated in by representatives of the Illinois Environmental Protection Agency ("Agency"), the Illinois Department of Energy and Natural Resources ("ENR"), and the Illinois Department of Conservation. A comment period was established by the Hearing Officer at hearing. Additional comment periods were subsequently established for reasons not germane to the instant discussion. Comments were filed by all those who participated in the hearing.

On January 11, 1988 the Agency filed its Recommendation and Brief ("Agency Brief") in opposition to the District's proposal, alleging in general that the proposal fails to adequately address and satisfy the statutory criteria of Section 27 of the Act, and that the evidence presented by the District is insufficient to support the relief requested.

ENR issued a "negative declaration" of economic impact in this matter on July 7, 1988. The Economic Technical Advisory Committee ("ETAC") concurred in that determination on July 22, 1988. However, on July 30, 1988 ENR, at ETAC's suggestion, filed comments (P.C. #5) to assist the Board in its evaluation of the economic issues involved in this docket.

BACKGROUND

The District is a municipal corporation organized pursuant to the "Sanitary District Act of 1917" (Ill. Rev. Stat. 1987, ch. 42, par. 298.99). The principal purposes of the District are to collect the domestic and industrial wastewaters of the District and convey them to a treatment facility for treatment in accordance with the laws and regulations of the State of Illinois and the United States Environmental Protection Agency ("USEPA").

The District serves an area of approximately 58.4 square miles and treats wastewaters from a sewer collection system of about 569 linear miles. The District owns and maintains about 343 miles of the tributary sewer collection system, representing about 60.3 percent of the total. The District's only treatment plant is located along the Illinois River in the City of Peoria, Peoria County, Illinois.

The District's treatment plant commenced operation in 1931. At that time the treatment processes consisted essentially of screening and grit removal, primary sedimentation, and biological treatment by the activated sludge process. Although some modifications had been made at the treatment plant during the intervening years, major modifications were not initiated until 1970 when the District authorized its engineering consultants to determine the degree of wastewater treatment needs in light of the deliberations by the then newly-formed Board concerning the adoption of effluent requirements and water quality standards.

Following promulgation of the current ammonia effluent regulations, the District received a State grant which partially supported funding for a renovation project with costs in excess of $48 million. The current treatment plant is designed to treat an average wastewater flow of 37 million gallons per day ("MGD") and a maximum flow of 60 MGD through the normal treatment process; during the period 1981 through 1986 the District treated

an average of 27 MGD. The normal treatment process includes screening and grit removal, primary sedimentation, activated sludge, rotating biological contactors, tertiary clarifiers, lined and unlined tertiary ponds, and chlorination. Sludge production is handled by anaerobic digestion with lagoons for drying and storage.

The flowing-full capacities of interceptors to the treatment plant is 154 MGD. The District contends that flows in excess of 60 MGD are adequately handled by holding facilities with provision for chlorination during overflow from them (Petition at 5[1]). All flows less than than 60 MGD and all flows retained in the holding facilities are routed through the normal treatment process.

The treated effluent of the District's treatment plant is discharged to the Illinois River pursuant to NPDES Permit No. IL00212288. The effluent enters the Peoria Pool of the Illinois River about 2 ½ miles upstream of the Peoria Lock and Dam; the LaGrange Pool extends downstream from the Peoria Lock and Dam for approximately 77 miles. On December 5, 1986, the Agency, at the District's request, designated a mixing zone on the Illinois River for the District's discharge[2].

REGULATORY FRAMEWORK

Ammonia effluent discharges from the District's wastewater treatment facility are currently regulated pursuant to 35 Ill. Adm. Code 304.122(a). That section reads in full:

> Section 304.122 Nitrogen (STORET number 00610)
>
> a) No effluent from any source which discharges to the Illinois River, the Des Plaines River downstream of its confluence with the Chicago River System or the Calumet River System, and

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[1] Citations to the District's Petition are to the numbered paragraphs contained therein consistent with presentation at hearing.

[2] A full description of the mixing zone occurs in Exhibit 7. In general, the designated mixing zone is confined to the western (discharge-side) 1/3 to 1/4 of the width of the Illinois River and extends from 250 feet upstream of the primary plant outfall (001) to 1700 feet downstream of the primary plant outfall. As Exhibit 7 notes: "All applicable water quality standards shall be met at any point along the boundary of the mixing zone and outside of the mixing zone".

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.

Other regulations relevant to the instant matter occur in the Board's effluent standards at 35 Ill. Adm. Code 304.105 and in the Board's water quality standards at 35 Ill. Adm. Code 302.210, 302.212(a), 302.212(b), and 302.212(c). In pertinent part these regulations specify:

Section 304.105 Violation of Water Quality Standards

... no effluent shall, alone or in combination with other sources, cause a violation of any applicable water quality standard. ...

* * * * *

Section 302.210 Substances Toxic to Aquatic Life

Any substance toxic to aquatic life shall not exceed one-tenth of the 96-hour median tolerance limit (96-hr. TL_m) for native fish or essential fish food organisms ...

* * * * *

Section 302.212 Ammonia Nitrogen and Un-ionized Ammonia

a) Ammonia nitrogen (as N: Storet Number 00610) shall in no case exceed 15 mg/l.

b) If ammonia nitrogen is less than 15 mg/l and greater than or equal to 1.5 mg/l, then un-ionized ammonia (as N) shall not exceed 0.04 mg/l.

c) Ammonia nitrogen concentrations of less than 1.5 mg/l are lawful regardless of un-ionized ammonia concentration.

The District contends that it has developed an operational plan that will permit it to discharge a treated effluent that will not violate a water quality standard of 1.5 mg/l of ammonia nitrogen outside of its mixing zone, consistent with 35 Ill. Adm. Code 302.212(c) and 302.102. The operational plan takes into consideration river flow rates, effluent flow rates, river temperature and effluent temperature, and the concentration of

ammonia nitrogen in the treated effluent. The District therefore does not seek relief from any water quality standard applicable to the Illinois River (Petition at 4, 31, 35).

TECHNICAL FEASIBILITY AND ECONOMIC REASONABLENESS

The District's current nitrification process was placed into operation in October 1979. The process consists primarily of 12 reinforced concrete tanks with seven rotating biological contactors ("RBC") per tank. Each contactor has a diameter of 11 feet and contains media, spread uniformly throughout a shaft of 25 feet. The system was designed specifically to remove ammonia nitrogen with some BOD and suspended solids polishing (Petition at 36(a), R. at 44). It is estimated that the units have a 20 year design life (R. at 49).

The District states that the nitrification process "has performed satisfactorily since it was placed in operation, and has been effective in reducing ammonia nitrogen concentrations as well as concentrations of biochemical oxygen demand" (Petition at 36(b)). The record further indicates that the District is currently having no problem meeting any of its effluent limitations (R. at 40). It was also stated that there has been substantial improvement in the quality of treatment and effluent which has "exceeded expectations" (R. at 20).

The District states that maintenance and operation of the RBC units is difficult at times and that replacement of units would be costly. The District points to variables such as air temperature, water temperature, BOD loading, abruptness of change in ammonia loadings, and thickness and character of the RBC biomass which can affect the efficiency of treatment through the RBC process. The District then claims that these variables coupled with expected increased loadings from a new Archer Daniels Midland facility locating to the District's service area, may make it difficult to meet the current ammonia nitrogen standard in the future (Petition at 36(b), R. at 46, 64). The Agency concludes that the general allegations of difficulty in maintaining and operating the RBC units does not justify shutting down the system (Agency Brief at 5).

The District also believes that it is economically unreasonable for it to be required to continue to meet the current ammonia nitrogen standard. In general, it is the cost of its current use of the RBC system for removal of ammonia nitrogen from its effluent which the District claims is unreasonable when balanced with the allegedly minor environmental impact of any increased ammonia nitrogen in its effluent.

The District identifies two savings which it alleges would accrue to it should its proposal be adopted: reduction in

operations and maintenance ("O&M") costs for the RBC units, and reduction in replacement costs for the RBC units.

Nevertheless, O&M cost savings which would be achieved should the Board adopt the District's proposed rule change are cloudy, partly because on-point data have not been entered into the record, and partly because of the speculative nature of future costs.

Among the figures which are agreed upon is that the District had expended an average of $81,960 per year in O&M for the RBC units over the period of the fiscal years 1983-1986 (Petition at 36(d)). However, granting of the requested relief would not allow this entire sum to be saved. One reason is that the principal individual element in the RBC's O&M is the cost of power, which the District estimates at 89% of the total O&M costs (Id.). The District has recently completed a project which has allowed it to generate some of its own power, and thereby to decrease its unit cost of power such as to realize an annual savings of $200,000[3] (Id.). Presumably, this overall reduction in power costs would be reflected in a decrease in the cost of operation of the power-intensive RBC units. While the record does not contain a figure specifically identified as the District's power costs prior to implementation of the new power system, it does indi ate that the District's power, heat, and light costs for 1987 were $1,053,000 (P.C. #5 at 7). A $200,000 decrease from this base is therefore a savings of 1/6 to 1/5 over prior costs. If the RBC units are assumed to have participated in this power savings in the same proportion as the District's operations as a whole, RBC annual power costs should be approximately $10,000 to $12,000 lower at present than during the 1983-1986 period, or approximately $71,000.

More critically, the District does not intend to completely remove the RBC units from service even if the requested relief is granted. Rather, the District intends to employ them on an as-needed basis for continued control of BOD and suspended solids (R. at 55). It is unclear as to how often the RBC units would be so used, although the District implies that this might be about one-third of the time (R. at 51). Thus, there would be a continuing RBC O&M cost. Again, the record does not identify what this cost would be. However, if it is roughly assumed that the RBC units would be operated at one-third time at one-third of

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[3] The Board notes that the $200,000 savings is at places in the record confusedly considered a savings generated from adoption of the instant proposal. However, District testimony clearly indicates that the $200,000 savings derives from an independent and already complete project (R. at 30-32), and its realization therefore is not dependent of the outcome of the instant matter.

the current cost, the RBC O&M costs would continue at a rate of approximately $27,000 per year and the O&M savings to be realized by the District under adoption of its proposal would be on the order of $54,000.

No figures are presented on the O&M costs of the District's proposed alternative ammonia control program. Nevertheless, any such costs would further offset any O&M gains the District would receive from discontinuing use of the RBC units for ammonia control.

On the matter of replacement costs, the District contends that it has annually budgeted $192,000 to replace defective RCB units, and that it wishes the Board to consider this an annual savings to be realized from adoption of its proposal. There is no indication, however, that the District has actually ever spent any replacement-cost monies[4]. Although it was estimated that replacement cost would be somewhere between $50,000 and $100,000 per unit (R. at 50), there is no data in the record on the actual cost of replacement of an RBC unit. Moreover, as noted earlier, each RBC unit has an expected operational life of twenty years, less than half of which has passed. Based upon this combination of conditions, the Board cannot reasonably conclude that the District's line item for RCB replacement constitutes a legitimate present cost nor a complete estimate of the savings which would accrue by virtue of adoption of the instant proposal.

As speculative as this analysis is, it is all that the Board can do based upon the record before it. Admittedly, some significant questions remain unanswered. For example, if the District must continue using the RBC units for ammonia control and therefore cannot use them solely for BOD and SS reduction, will it have to invest in added equipment for BOD and SS control? At what cost? Even if the RBC units are used solely for BOD and SS control, will they be sufficient to meet the District's perceived need to treat its expected stronger influents? Would not RBC units used for BOD and SS control require replacement the same as RBC units required for ammonia control?

The Agency, for its part, concludes:

> The District cannot be expected to predict the future: however, it should attempt to determine the

[4] Although two of the original 84 RBC units have apparently failed, the District has not replaced them. The failure of these two units has not caused effluent quality to measurably deterioriate, and presumably has therefore not necessitated replacement of the units.

impact upon treatment performance in ammonia reduction of additional RBCs being taken out of service as they malfunction. For instance, there has been no indication as to the ascertainable effect of the two units being taken out of service thus far. Elaborate statistical calculations, such as already proposed if relief were granted, may not be necessary. As long as the District is able to meet effluent limits, the most pragmatic route to take is simply to continue to operate the RBCs to maximize ammonia removal for the remaining life of the units. Then at whatever time that treatment efficiency is hindered by the loss of RBC capacity, the District could repetition the Board for a rule change. As the units age, the District would also have the option of building additional or alternative nitrification facilities. The District's proposal at this point in time is premature. (Agency Brief at 7).

ENVIRONMENTAL IMPACT

The reach of the Illinois River between the District's discharge point and the Peoria Lock and Dam is narrow and sinuous. The District maintains that the configuration of the river coupled with barge traffic, often congested because of proximity to the lock and dam, precludes any meaningful recreational activity on or in its waters. The District also asserts that there is also no public access to the river in this reach (Petition at 4).

The District further states that recreational fishing in the LaGrange Pool, except in the vicinity of the Peoria Lock and Dam, is mostly limited to backwater lakes and sloughs; that there are several sandy areas along the pool's shoreline, notably near the confluence of the Mackinaw River and several miles upstream of Havana, where people frequently congregate for outings, swimming,and water-skiing; that public access is generally limited to areas near Kingston Mines, Havana, and Beardstown, about 12, 28, and 70 miles downstream of the lock and dam; and that the principal activity on the Pool is commercial barge traffic (Petition at 4).

The Illinois Department of Conservation ("DOC") presented testimony that there is exceedingly heavy fishing in the channel proper, contrary to the District belief that fishing is limited to backwater areas. DOC maintains that this is especially true downstream from the Peoria Lock and Dam extending to a point close to Havana, Illinois (R. at 181). The DOC did not, however object to the proposal, provided that the ammonia nitrogen standard is not exceeded outside the mixing zone (P.C. #1).

The waters of the Illinois River are designated as general use waters and general use water quality standards apply. As noted above, the District does not seek relief from any water quality standards applicable to the Illinois River. The District asserts that the environmental impact of its discharge if the proposed regulatory relief were to be granted "will not differ from the environmental impact ... under current operations" (Petition at 4). The Agency maintains that any increased ammonia loadings to the River would necessarily result in some dissolved oxygen ("DO") depletion beyond the District's mixing zone (Agency Brief at 2). Violations of water quality standards involving DO continue to occur in the Illinois River (R. at 163).

The District presents extensive evidence from the principal authors of State Water Survey ("Survey") reports on water quality in the Illinois River and LaGrange Pool. In early studies conducted in 1965-67, the authors noted that:

> Analyses of the oxygen demand characteristics of the waters within the LaGrange Pool indicate that a significant nitrogenous demand exists at the upper end. The composition represents about 54 percent of the total oxygen demand.
>
> Dissolved Oxygen Resources and Waste Assimilative Capacity of the LaGrange Pool, Illinois River (1970), T.A. Butts, D.H. Schnepper and R.L. Evans. (Petitioner's Exh. 2 at 3)

Later studies noted that:

> Previous studies in the LaGrange Pool of the Waterway demonstrated the need for assessing both the carbonaceous oxygen demand and the nitrogenous oxygen demand, i.e. the microbial oxidation of ammonia-N and nitrite-N. For this study, the sum of these demands was considered the total dissolved biochemical oxygen demand upon the dissolved oxygen resources in the waterway. The bottom sediments also exert an oxygen demand...
>
> Oxygen depletion as a result of benthic activity is influenced by two factors in the study area: (1) biological extraction of dissolved BOD by attached zoological growth, and (2) biological stabilization of deposited sediments, referred to as sediment oxygen demand (SOD).
>
> Oxygen usage results from four factors: (1) dissolved carbonaceous BOD, (2) dissolved nitrogenous BOD, (3) benthic biological extraction and (4) sediment oxygen demand.

Water Quality Features of the Upper Illinois Waterway, (1975) Butts, Evans and Lin. (Petitioner's Exh. 3 at 13, 16, 39)

The District contends that the oxygen demand imposed upon the LaGrange Pool as cited in Petitioner's Exhibit 2, is representative solely of carbonaceous and nitrogenous demand and is not the total oxygen demand imposed on the waters of the pool. District testimony indicates that the other causes for oxygen depletion, as noted above, were subsequently examined. In 1979, SOD rates were measured in situ throughout the pool, and for the first time an attempt had been made to incorporate SODs into the DO balance of the LaGrange Pool (R. at 152, Petitioner's Exh. 4). As the June 1981 report of the 1979 study states:

> The relative influence of the three primary oxygen demand sinks - carbonaceous BOD, nitrogenous BOD, and sediment oxygen demand - on the DO resources of the pool were examined. For 7-day, 10-year low flow conditions at 30 C, using assumed CBODs and NBODs at 6.5 mg/l and 5.5 mg/l, respectively, in conjunction with measured SODs the relative impact of each oxygen demand component is as follows: CBOD, 56.5 percent; NBOD, 13.4 percent; SOD, 30.1 percent. Adding 6600 cfs diversion flow to the low flow base changed the relative influence thus: CBOD, 68.5 percent; NBOD, 11.2 percent, SOD, 20.3 percent.
>
> These values reflect pool averages only. At the beginning of the pool under 7-day, 10-year low flow conditions, the CBOD accounts for 65 to 72 percent of the oxygen usage while at the end it accounts for only 35 to 40 percent. In the meantime, the SOD fraction increases from about 15-20 percent to around 40 percent and the NBOD increases from about 15 percent to a little over 25 percent.
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> Water Quality Assessment and Waste Assimilative Analysis of the LaGrange Pool, Illinois River (June 1981), Butts, Roseboom, Hill, Lin, Beuscher, Twait and Evans. (Petitioner's Exh. 4 at 105)

The District presented further evidence of a 1984 study, partially funded by the District, entitled The Impact of Greater Peoria Sanitary District Ammonia Discharges on Illinois River Water Quality, principal author Thomas A. Butts (Petitioner's Exh. 5). The study concludes, inter alia:

1. The requirement that the GPSD meet a 2.5 mg/L ammonia effluent standard is unjustified and severely restrictive.

2. Ammonia-N loads in the range between those historically and presently discharged by the GPSD affect Illinois River D.O. resources very little.

3. A permissible increase in GPSD effluent ammonia concentration is limited to a maximum value dictated by toxicity and mixing zone standard requirements as set forth in IPCB Rules and Regulations. Id. at 135.

CONCLUSIONS

It is apparent that it has been and continues to be technically feasible for the District to meet the current ammonia nitrogen standard. That the District alludes that it may, at some time in the future, have difficulty meeting the limits, does not change this fact. The record does not indicate whether loadings to the District's plant have actually increased at this time, and thus the District's assertions about further loads are speculative at best.

The record on economic reasonableness is clouded by uncertainties. It should not be the Board's position to offer speculation in the face of these uncertainties. Rather, it is the responsiblity of the proponent to prove that compliance with the existing rule is economically unreasonable. Such presentation would necessarily include specific economic information directly applicable to the issues raised, upon which the Board can reasonably deliberate.

In attempting to sort out the observations on environmental impact, the Board must consider its charge to adopt regulations "to promote the purposes and provisions" of the Environmental Protection Act ("Act", Ill. Rev. Stat. 1987, ch. 111½, par, 1013(a)). One of the purposes expressly identified in the Act is to "restore, maintain and enhance the purity of the waters of this State in order to protect health, welfare, property, and the quality of life and to assure that no contaminants are discharged into the waters of the State" (Id. at 1011(b); emphasis added).

Pursuant thereto, the Board has adopted certain water quality standards. These standards serve multiple purposes, including defining minimum goals for the quality of polluted waters on the one hand, and maximum allowable ceiling on deterioration of higher quality waters on the other. In either case, the mandate of the Act to restore, maintain and enhance water quality requires that Illinois strive to go beyond the minimum cleanup goal of polluted waters, as well as to resist the temptation to pollute higher quality waters up to the maximum allowable limits.

In applying these principles to the instant matter, it is to be noted that the District's proposal has potential effect on two water quality parameters, DO and ammonia. As regards DO, it is uncontested that the violations of the DO standard caused by excessive oxygen demand, to which ammonia is a contributor, continue to occur downstream from the District's discharge. While the District contends that its contributions to this demand are small, the Board nevertheless considers the continued violations to represent a critical situation which requires all reasonable efforts to reverse. The Board cannot find that the District's present contribution to this effort is unreasonable.

It is further important to note that, although the District proposes to assure that no violations of the ammonia water quality standard itself will occur, it does propose an untried operating plan which would allow the standard to be consistently approached. The Board finds this a circumstance difficult to reconcile with the restore, maintain and enhance provision of the Act. Moreover, the District has presented no evidence that the plan can operate "close to the line" without actually and inadvertently causing the standard to be exceeded. The Board finds this circumstance also difficult to reconcile with prudent environmental management.

These perspectives on the District's proposal might have taken a different turn were not the District currently in possession of and operating a technically feasible and arguably economically reasonable ammonia removal facility. However, given the totality of the facts, it is neither prudent nor consistent with the Act at this time to allow an effective and functioning ammonia-removal system to be taken off-line.

In summary, uncertainties in the record on both economic and environmental matters preclude the Board from granting the requested relief at this time. However, the Board does note that the District is free to repetition for relief as the situation becomes clearer, should it wish to do so.

IT IS SO ORDERED.

The Petition for Site Specific Exception to the Effluent Standards filed by the Greater Peoria Sanitary and Sewage Disposal District is hereby denied and this proceeding is dismissed.

Section 41 of the Environmental Protection Act, Ill. Rev. Stat. 1987 ch. 111½ par. 1041, provides for appeal of final Orders of the Board within 35 days. The Rules of the Supreme Court of Illinois establish filing requirements.

I, Dorothy M. Gunn, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 6th day of October, 1988, by a vote of 7-0.

Dorothy M. Gunn

Dorothy M. Gunn, Clerk
Illinois Pollution Control Board