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STATE OF ILLINOIS
Pollution Control Board

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

INTERIM PHOSPHORUS EFFLUENT STANDARD, PROPOSED 35 Ill. Adm. Code 304.123 (g-k)	))))	R2004-026 Rulemaking – Water

PC#15

NOTICE OF FILING

PLEASE TAKE NOTICE that the Environmental Law & Policy Center, Prairie Rivers Network and Sierra Club have filed the attached POST-HEARING COMMENTS OF ENVIRONMENTAL LAW & POLICY CENTER, PRAIRIE RIVERS NETWORK AND SIERRA CLUB and POST-HEARING COMMENTS OF BETH WENTZEL IN SUPPORT OF THE ILLINOIS EPA RULE MAKING PROPOSAL.

Albert F. Ettinger (Reg. No. 3125045)
Counsel for Environmental Law & Policy Center, Prairie Rivers Network, and Sierra Club

DATED: December 21, 2004

Environmental Law & Policy Center
35 East Wacker Drive, Suite 1300
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STATE OF ILLINOIS
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POST-HEARING COMMENTS OF ENVIRONMENTAL LAW & POLICY CENTER, PRAIRIE RIVERS NETWORK AND SIERRA CLUB IN SUPPORT OF THE ILLINOIS EPA RULE MAKING PROPOSAL

The testimony and comments in the record demonstrate that that the Board should adopt an interim rule that will generally require monthly average permit limits of 1 mg/L total phosphorus for new or expanded discharges by major dischargers. No one has seriously attempted to dispute the showing made in the record by the Illinois Environmental Protection Agency ("IEPA") and clean water advocates that:

- phosphorus discharges are injuring Illinois rivers, lakes and streams, and
- establishing a rule that generally requires a 1mg/L phosphorus limit on new and increased discharges is a reasonable and affordable step that would serve to reduce the extent to which the problem gets worse during the next four years during which numeric nutrient water quality standards are developed and adopted.

There have been basically two objections that have been made to the proposal. First, it has been said that there are a lot of other things we should be doing to control phosphorus. This is absolutely true and completely irrelevant. The fact that we should also do other things does not show that we should not begin to control new or increased discharges of phosphorus now.

The other objections are based on the idea that the IEPA proposal is not based on "sound science" and that no limit should be placed on any dischargers until a "scientifically sound" demonstration has been made that new or increased phosphorus loadings will cause impairments. (See Written Testimony of James Daugherty p. 3 and Testimony of Richard Lanyon p. 20.) In fact, the IEPA phosphorus effluent standard proposal is very "scientifically sound" in the relevant sense and these objections are based on a fundamental misunderstanding of the purpose and goal of the Part 304 Subpart A: General Effluent Standards and the basic theory of the 1972 Clean Water Act.

What follows is a brief discussion of the facts and law relating to the two basic objections that have been made to the proposal and a few comments on the wording of the Agency proposal and the substitute language proposed by Prairie Rivers, Sierra Club and ELPC. Also filed with these comments are post-hearing comments of Beth Wentzel, which elaborate on her hearing testimony and make certain corrections to the hearing record.

I. The proposed effluent rule should be adopted because it will significantly reduce the extent to which Illinois waters are degraded while numeric phosphorus standards are developed.

No one involved in this proceeding claims that the proposed effluent limit will solve the problem caused by phosphorus pollution in Illinois waters and downstream waters. Certainly, Governor Blagojevich in his June 30, 2004 statement (see Exhibit 7 to the Testimony of Richard Lanyon) makes clear that "new limits on phosphorus discharges for most new and expanding wastewater treatment plants" is just one of a number of steps that should be taken immediately to control nutrient pollution, including making efforts to reduce farm runoff.

Further, it is generally expected that in the future effluent limits will be needed on existing point source discharges of phosphorus and that, in many cases, those limits will probably be well below the modest 1 mg/L restriction to be established for new and existing discharges under the Agency proposal. See Comment of Professor Walter K. Dodds. In fact, many dischargers already have to meet effluent limits far lower than those proposed for new or increased discharges by the proposed rule. See Pre-filed Testimony of Beth Wentzel; Additional Comments of Beth Wentzel (attached); Water Environment & Technology, "Las Vegas Wins with Team Approach," Vol. 16 No. 12 (December 2004) pp.64-68 (Ex. 1)

However, the fact that more needs to be done to control phosphorus pollution both now and in the future is not a basis for failing to do something that clearly should be done.

Moreover, while we agree that phosphorus loadings from agriculture need to be reduced, it should be noted that as to phosphorus, point sources may be the biggest the part of the problem for many waters. In David, M.B and Gentry L.E., *Anthropogenic Inputs of Nitrogen and Phosphorus and Riverine Export for Illinois, USA*, J. Environ. Qual. 29:494-508(2000) (a hearing exhibit identified at Tr. 95), University of Illinois scholars estimate that "47% of the total P loads in Illinois rivers were from sewerage for 1980 through 1997" and that "estimates of the sewerage effluent contribution to river export were 70% for the Illinois River." p.501. Still further, there is reason to believe that point source discharges of phosphorus are actually more harmful to the environment than other loadings. As stated in the Minnesota Pollution Control Agency, *Detailed Assessment of Phosphorus Sources to Minnesota Watersheds*, "Phosphorus from point sources may be more bio-available, impacting surface water quality more than a similar amount of nonpoint source phosphorus that enters the same surface water." (Exhibit 1 to the Testimony of Richard Lanyon at p. ii)

II. The proposed effluent limit on new and increased discharges is sound as a matter of science, law and policy.

The argument that the proposal should not be adopted because it is not scientifically sound is based on a fundamental confusion between the role of effluent rules and water quality standards. Water quality standards must be based on a "sound scientific rationale" and must protect the "most sensitive use" of the water body (40 CFR 131.11). For this reason, testimony regarding treatment costs, administrative convenience and other economic factors is not relevant to setting water quality standards.

Effluent standards are a very different animal from water quality standards and are based on practical considerations of environmental prudence, permit writing and wastewater treatment. Over 30 years ago, in In the Matter of Effluent Criteria Nos. R70-8 1972, Ill. Env. LEXIS 154 (January 6, 1972), the proceeding that established many of the current effluent limits in Part 304, the Board explained:

> 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, the 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, (p. 1)

The Board added:

> 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 waste water 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 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. (pp.10-11)

For these reasons and subject to the requirement that permits must not cause a violation of water quality standards (see 35 Ill. Adm. Code 304.105), Illinois has adopted numerous effluent limits in part 304. These limits are not "scientific" in the sense that they have been tailored through precise scientific studies to prevent all possible impairments and to only prohibit pollution that will cause impairments, but that is not their purpose. Like rules prohibiting smoking while operating gasoline pumps, the effluent rules require ordinary good practice to lessen the chance of a known evil occurring. These effluent rules are scientific insofar as science is not opposed to common sense.

Illinois currently has effluent limits for discharges of phosphorus to lakes and to all waters in the Lake Michigan Basin. See 35 Ill. Adm. Code Section 304.123(a), (b). Illinois would have such limits for discharges to rivers and streams but for the bygone belief that phosphorus discharged to rivers and streams did not affect the environment, a view that is thoroughly refuted by the testimony of Professor Lemke and as well as the current literature. Phosphorus discharges to rivers and streams injure the receiving waters as well as waters miles downstream including side channel lakes to the Illinois River. (R04-26 Transcript p. 23)

Further, it is contrary to the most basic principles of the Clean Water Act and the Illinois Environmental Protection Act to argue that the state should only limit pollution to the extent that it can be scientifically proven that allowing more pollution will cause environmental damage. Congress in passing the 1972 Clean Water Act rejected the earlier federal approach of "focusing on the tolerable effects rather than the preventable causes of pollution." Environmental Protection Agency v. California ex rel. State Water Resources Control Board, 426 U.S. 200, 202

(1976). Under the Clean Water Act all discharges are suspect. Indeed, they were to be eliminated many years ago. 33 U.S.C. 1251(a)(1).

It is also clear under Illinois law that there is no "right to pollute." Peabody Coal Co. v. Pollution Control Board, 36 Ill. App. 3d 5, 344 N.E. 2d 279, 288-89 (5th Dist. 1976). Under the Environmental Protection Act the burden is on the one who would discharge pollutants to prove that the discharge will comply with the Act. 415 ILCS5/39(a). Moreover, persons wishing a permit for a new or increased discharge, the parties to which the IEPA's proposed phosphorus effluent rule applies, must submit an application showing that the new pollution will not harm the environment and is necessary in light of the available treatment alternatives. 35 Ill. Adm. Code 302.105(f). The notion that there can only be limits on pollution to the extent that it has been scientifically demonstrated that more pollution to the receiving water will cause impairments is at odds with the law and sound public policy.

III. The Board should adopt the ELPC/Prairie Rivers/Sierra proposed language or other clear language consistent with the law.

In the Memorandum and Testimony of Environmental Law and Policy Center, Prairie Rivers Network and Sierra Club, filed October 15, 2004, language was proposed to correct certain drafting, legal and technical problems that were present in the original language offered by the IEPA to the Board. We believe that that language offered in October is sound and should be adopted by the Board for the reasons given in October.

It is our understanding, however, that the IEPA may itself offer revised language for its effluent proposal. Naturally, the Board should consider the proposed new Agency language and adopt that language to the extent that the Board finds that it is superior to the language we submitted. Any remaining drafting issues can be addressed on First Notice.

CONCLUSION

The Board should approve an interim phosphorus effluent rule generally requiring a limit of 1 mg/L total phosphorus for all new or increased discharges.

Albert F. Ettinger
Counsel for Environmental Law & Policy Center, Prairie Rivers Network, and Sierra Club

DATED: December 21, 2004

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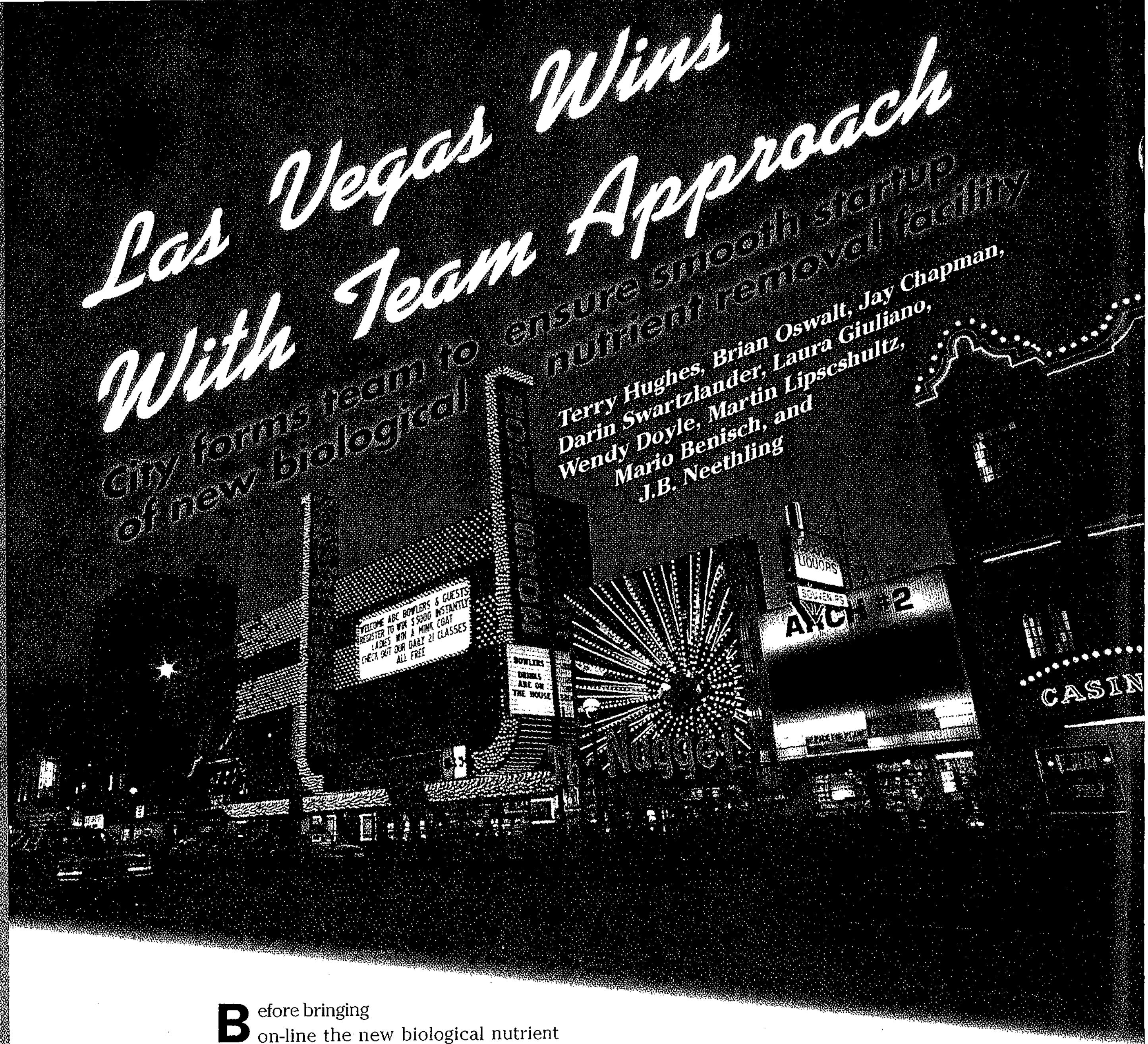
Exhibit 1

Las Vegas Wins With Team Approach

City forms team to ensure smooth startup of new biological nutrient removal facility

Terry Hughes, Brian Oswalt, Jay Chapman, Darin Swartzlander, Laura Giuliano, Wendy Doyle, Martin Lipscshultz, Mario Benisch, and J.B. Neethling



Before bringing on-line the new biological nutrient removal (BNR) facilities at its wastewater treatment plant (WWTP), the City of Las Vegas decided to form a special team of employees to coordinate startup activities, oversee the initial operation of the complex treatment process, monitor performance, and meet startup goals. After quickly bringing the plant up to speed, the team began collecting crucial data that was used soon thereafter to optimize the facility's

Figure 1. City of Las Vegas Wastewater Treatment Plant Liquid Treatment showing Parallel Treatment Trains

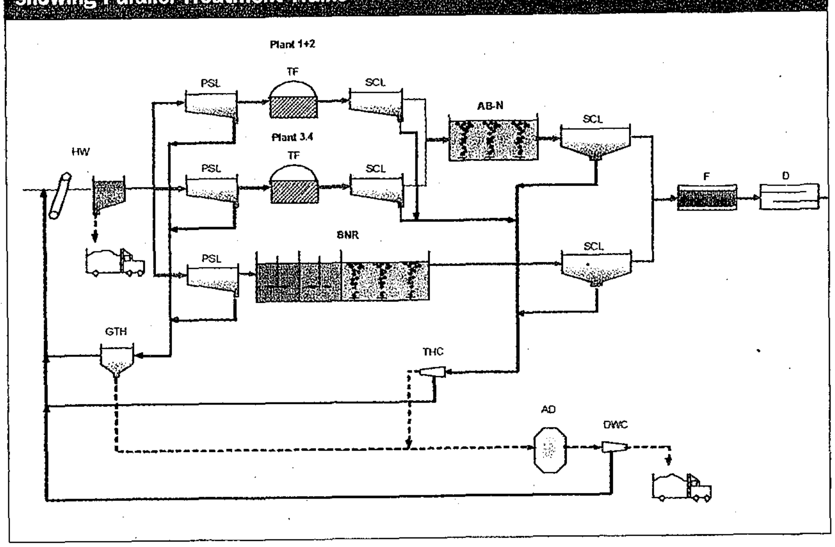


Table 1. Permit Requirements at 91 mgd (344,000-m³/d) for Plant Effluent After Filtration

	Units	Ammonia	Total phosphorus
Summer (March – October)			
Mass limit	lb/d (kg/d)	366 (166)	126 (57)
Concentration	mg/L	0.48	0.17
Winter (November-March)			
Mass limit	lb/d (kg/d)	427 (194)	126 (57)
Concentration	mg/L	0.56	0.17
BNR goal	mg/L	<0.2	<0.5

BNR = biological nutrient removal.

performance. Much of the credit for the successful effort can be attributed to the city's vision. The startup process followed the plant's business plan and involved employees in decision-making. The payoff came in the form of employee support for the project and only minor problems as processes came on-line. Overall, the project has been a huge success, creating a sense of pride for all members involved.

By pursuing the team approach, the city wanted to avoid the kinds of problems it encountered when it began operating its nitrification facility in 1994. At that time, the city's WWTP experienced disinfection upsets caused by incomplete nitrification. With the team in place, the city hoped to prevent major problems from occurring during the startup of the BNR facility and ensure that optimized processes would run efficiently with minimal chemical costs.

The startup team consisted of plant employees from the operations, maintenance, laboratory, management, and electrical groups. The plant designer and an operations specialist also helped the startup team by providing training and phone consultation before startup. The team met weekly to discuss problems, review progress, evaluate performance data, and determine process adjustments. Once the treatment process met permit requirements, the team's focus shifted to optimizing plant performance.

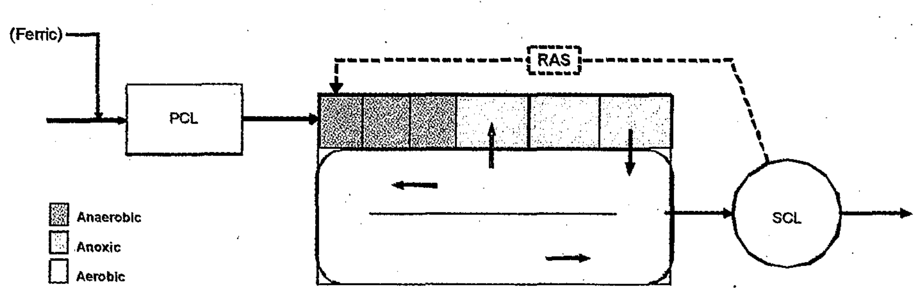
Existing Plant, New Process

The 30-mgd (114,000-m³/d) BNR facility began operating in May 2003, accounting for roughly one-third of the treatment capacity of the city's 91-mgd (344,000-m³/d) advanced WWTP. The older portion of the treatment plant consists of trickling filters, nitrifying activated sludge, and effluent filtration. Effluent from the BNR process is combined with effluent from the older portion of the plant before filtration (see Figure 1, p. 64). Because the plant discharges into the Las Vegas Wash, which ultimately flows into Lake Mead and the Colorado River, its effluent must meet strict permit mass limits for ammonia and total phosphorus (see Table 1, above). As flows to the plant increase over time, the allowable concentration of ammonia and phosphorus in the effluent decreases.

The BNR facility consists of four 7.5-mgd (28,400-m³/d) trains, each of which comprises three anaerobic zones, three anoxic zones, and a complete mixed aerobic zone. Designed with fine-bubble aeration, the aerobic zone is configured much like a racetrack, with mixers moving liquid around the basin. Primary clarification includes the option to add ferric chloride in low doses to control odors as needed. Since startup, the BNR process has been operated in the so-called A2O mode — that is, BNR occurs as the wastewater flows through anaerobic, anoxic, and oxic zones (see Figure 2, below). However, the process can be modified to include other process options if desired.

From May 2003 through March 2004, influent entering the BNR process had an average ammonia concentration of 24 mg/L. Nitrification was complete, as ammonia levels in the effluent were on average below 0.1 mg/L during the entire period. Total phosphorus concentrations averaged 5.7 mg/L in the influent and 0.51 mg/L in the effluent. Although this performance was considered acceptable in general, the BNR facility posted much lower average

Figure 2. Process Layout of BNR Train



BNR = biological nutrient removal.

phosphorus concentrations as the process stabilized and operations were optimized during the first year. Additionally, conventional effluent quality measures such as biochemical oxygen demand (BOD) and total suspended solids (TSS) were well below permitted limits.

Starting Up, Setting Goals

The startup team set out to meet the following goals:

- Meet permit levels 100% of the time.
- Achieve biological phosphorus removal and ensure that effluent from the BNR process has a phosphorus concentration of no more than 0.5 mg/L.
- Ensure that effluent from the entire plant has a phosphorus concentration of no more than 0.2 mg/L after filtration to meet the 126 lb/d (57 kg/d) phosphorus limit.
- Gain a thorough understanding of the facility's performance and the factors affecting its operation.
- Optimize the amount of chemicals used for filtration.
- Minimize operator anxiety during startup and operation.

In preparation for startup, the team visited another nearby BNR facility to learn more about key operational criteria and parameters that influence BNR operation. A detailed plan was developed to describe how the startup would proceed, beginning with the seeding from the existing nitrification process and continuing through the initial process loading, and then followed by a gradual increase in the process loading to develop the biomass to initial operating setpoints.

A key component of the startup plan was a detailed sampling plan that included a complete daily characterization of influent, effluent, and individual zones within the aeration basin. Analyses included measures of organic materials, such as BOD, chemical oxygen demand (COD), flocculated and filtered COD (ffCOD), and volatile fatty acid (VFA); TSS and volatile suspended solids; and nutrients, including ammonia, nitrate, total Kjeldahl nitrogen, total phosphorus, and orthophosphate. The intensive sampling provided clear direction to the startup team, helping its members understand the factors that keep the treatment process stable and identify potential approaches for optimizing the process.

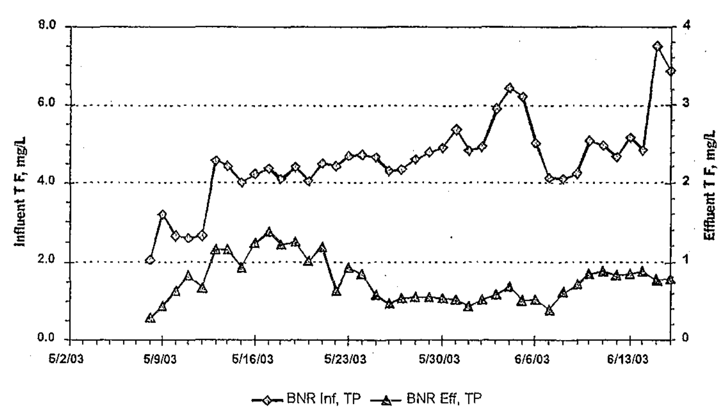
Intensive sampling routines were reduced once the process stabilized. A key indicator of biological phosphorus removal activity is the orthophosphate concentration in the anaerobic zone. Although influent VFA samples provide key information regarding enhanced biological phosphorus removal (EBPR), the analysis was quite time-consuming. In the end, the team eliminated VFA sample analysis after establishing a correlation between ffCOD and VFA and using ffCOD as a surrogate parameter.

Startup Performance

Two trains of the BNR process were seeded with waste activated sludge from the plant's existing nitrification activated sludge process, and EBPR was evident in samples within 2 weeks. Concentrations of total phosphorus in the effluent were reduced to below 1 mg/L within approximately 20 days following startup on May 5, 2003 (see Figure 3, below). Ferric chloride initially was added to the influent in the primary clarifier to lower the concentration of total phosphorus. However, within 2 weeks the team was able to reduce the amount of ferric chloride it was adding from 40 to 7 mg/L. Nitrification also started immediately, and concentrations of total oxidized nitrogen were reduced to below 10 mg/L within a week.

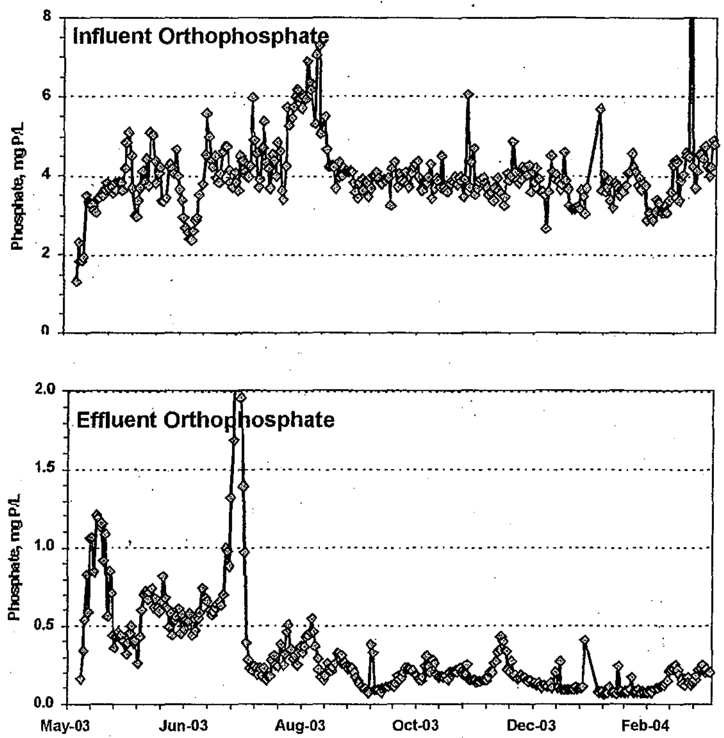
The growth and development of phosphorus-accumulating organisms (PAOs) during the startup were clearly documented by measuring the concentrations of orthophosphate in the BNR facility's anaerobic, anoxic, and aerobic basins. After 10 days, phosphorus release was evident in the anaerobic zone, and, during the next week, the orthophosphate concentration slowly increased in the anox-

Figure 3. Startup Total Phosphorus (TP) in and out of the BNR Process



BNR = biological nutrient removal.

Figure 4. BNR Influent and Effluent Orthophosphate Concentrations During the First Year



BNR = biological nutrient removal.

ic zones, reaching its highest level on May 19. At the same time that the sampling was documenting the uptake and release of phosphorus, concentrations of orthophosphate in the effluent began to decrease. The data indicated that the PAO population needed 2 weeks to develop sufficiently before it could have a measurable effect on phosphorus levels in the effluent. These results demonstrate that monitoring concentrations of orthophosphate in the anaerobic zone provides needed information about process startup and the development of the PAO population.

Overcoming an Initial Upset

Since the BNR facilities began operating, the process has performed successfully during the summer permit period, meeting requirements 100% of the time. However, the facility experienced a process upset during the first summer, and some mechanical failures forced the team to add ferric chloride to polish the effluent in order to meet the permit limit for phosphorus.

After startup, the BNR process stabilized and produced low concentrations of orthophosphate in the effluent. During June and the beginning of July 2003, the concentration of orthophosphate in the effluent hovered around 0.5 mg/L. Although EBPR was relatively stable, the orthophosphate concentrations would not decrease below this value. Following a process upset that began around July 20, however, phosphorus removal deteriorated significantly, and effluent orthophosphate concentrations reached 3 mg/L (see Figure 4, left). The upset occurred over the span of only a few days, but the system recovered just as quickly. The process team reviewed operating data in search of clues to the cause of the upset.

During the upset, orthophosphate concentrations increased sharply and then declined shortly thereafter to a new low, stable level. Concentrations of ammonia and total oxidized nitrogen changed little. These results indicate that the upset likely was not the result of a toxic event, because the more sensitive nitrifying organisms also would have been affected by a toxic compound. Although a PAO-specific inhibitor in the wastewater could have caused the upset, the available data do not support this conclusion. An insufficient supply of suitable organic substrate in the influent — for example, VFA or other soluble BOD — might have caused a process performance change. However, the operating data showed no change in the available ffCOD during the upset period. BOD and COD also showed no change at this time.

The team also investigated the possibility of a secondary release of phosphorus and reduced phosphorus uptake. The team postulated that the upset could have resulted from too much phosphorus release in the anaerobic zone combined with insufficient time or low uptake rates in the aerobic zone. Orthophosphate data from the aerobic zone and effluent samples from the BNR process supported this theory. The data indicate that orthophosphate concentrations in effluent from the aeration basin were consistently below the orthophosphate levels in effluent from the secondary clarifier. This observation led to concerns that anaerobic conditions were developing in the secondary clarifier, causing phosphorus release. Measurements of return activated sludge found that nitrate concentrations were typically between 2 and 5 mg/L.

To address the potential phosphorus release in the secondary clarifier, dissolved oxygen (DO) was increased in the aeration basin from approximately 2.0 to 2.5 mg/L. This change coincided with the timing of the EBPR process recovery. More significantly, orthophosphate levels in the effluent dropped to about 0.2 mg/L after the change. Although it remains unclear whether the increase in DO improved the uptake of phosphorus, the authors speculate that higher levels of DO increased the rate at which phosphorus was removed and thereby improved effluent quality.

After this event, process performance improved and orthophosphate levels in the effluent decreased to approximately 0.2 mg/L. Since then, levels have declined even further. In April 2004, the average orthophosphate concentration for BNR process effluent was 0.11 mg/L. In the first half of May 2004, this level fell to 0.06 mg/L. Since then, the average orthophosphate concentration has been below 0.1 mg/L for extended periods of time, and it has been as low as 0.02 mg/L. However, occasional swings in the level of orthophosphate in the effluent continue to occur.

Phosphorus Uptake in the Anoxic Zone

PAOs can remove phosphorus in anoxic zones. However, in a WWTP that has fixed basin volumes but experiences variable flows and loads, maintaining true anoxic conditions in the anoxic zone proves nearly impossible. During periods of low loadings, excessive aeration can return surplus DO to the anoxic basin via the return of the mixed liquor. During periods of high organic loadings, denitrification can be completed in the first anoxic zone, creating anaerobic conditions in the second and third zones.

Data from the Las Vegas BNR process show that although nitrate concentrations in the first anoxic zone are still relatively high (2 to 4 mg N/L), denitrification is complete by the third anoxic zone with nitrate concentrations typically near zero. However, most of the phosphorus uptake occurs in the first anoxic zone. Dilution from the flow of recycled mixed liquor reduces phosphorus concentrations by about 40%, and data illustrate an approximate 60% reduction in orthophosphate concentration. The orthophosphate concentration then remains essentially the same after the first anoxic zone, with only 2 to 4 mg N/L nitrate available for uptake. Generally, one would expect potentially 4 to 8 mg P/L to be removed in the anoxic zone.

Drawing Conclusions

The following conclusions regarding operating procedures can be drawn from the startup of the Las Vegas BNR facility:

- Solids retention time and DO control are critical to maintaining stable operation. DO appears to be important for phosphorus uptake and for avoiding secondary release of phosphorus.
- Two important reactions occur in the anoxic zone. Sufficient nitrate is required to initiate the uptake of phosphorus. Insufficient nitrate levels cause anaerobic conditions in the anoxic basin and could lead to the undesirable release of phosphate.
- Significant effort was required to collect and analyze samples during the first year of operation. Samples were collected to generate a full profile for phosphorus and nitrogen each day. As the year progressed, sampling and analysis requirements were reduced, first for nitrogen samples and then for phosphorus samples toward the end of the year. These profiles now are generated once a week, and this data proves extremely useful in troubleshooting process performance.

By communicating results from the laboratory and sharing field observations, the startup team provided an effective means of managing the plant's operation. During team meetings, participants were able to provide effective feedback, address changes in plant performance, and plan and take corrective action.

On the whole, the team approach helped ensure that many of the initial goals were met. The BNR facility met its effluent mass loading permit requirements at all times. Although the plant initially did not meet its operational objective of 0.5 mg/L of effluent phosphorus, following optimization, the facility is now achieving this goal. Having set out to gain an understanding of how the process performs and what factors affect its operations, the team accomplished these tasks by collecting the necessary data. The team succeeded in optimizing chemical usage at the facility, greatly decreasing the dose of ferric chloride used for odor control. And perhaps most importantly, the team was able to minimize operator anxiety during startup and operation by sharing responsibilities. Although dealing with new challenges always causes a certain amount of stress, the team overall functioned well.

Terry Hughes *is the plant operations and maintenance superintendent,* ***Brian Oswalt*** *is a plant operator II,* ***Jay Chapman*** *is a plant operator II,* ***Darin Swartzlander*** *is a plant operator II,* ***Laura Giuliano*** *is a chemist,* ***Wendy Doyle*** *is a chemist, and* ***Martin Lipscshultz*** *is a biologist for the City of Las Vegas.* ***Mario Benisch*** *is a project engineer in the Portland (Ore.) office of HDR Engineering Inc. (Omaha, Neb.).* ***J.B. Neethling****, PhD., P.E., is HDR's technical director of wastewater and is located in the company's Folsom, Calif., office.*

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Post-Hearing Comments of Beth Wentzel

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Code 304.123(g-k)	)	
	)	

POST-HEARING COMMENTS OF BETH WENTZEL, PRAIRIE RIVERS NETWORK

The following comments correct, clarify, and provide additional information regarding some of the discussion during my testimony on October 25.

Costs of achieving 1.0 mg/L TP will be less than those estimated for achieving 0.5 mg/L TP and 3.0 mg/L TN and less than those estimated for achieving 0.2 mg/L TP.

P. 40 of the hearing transcript includes discussion about costs of achieving 1.0 mg/L total phosphorus (TP) and costs of achieving other standards, specifically achieving a limit of 0.2 mg/L TP or 0.5 mg/L total P and 3.0 mg/l total nitrogen (TN). Mr. Daugherty asked if the costs would be similar for meeting 0.5 mg/L TP and meeting 1.0 mg/L, after I had commented that similar technologies might be used. The technologies employed to meet 1.0 mg/L can, and in many cases do, achieve limits as low as 0.5 mg/L. However, upon further review of the Zenz report, it appears likely that the report assumed additional processes that would not be necessary to meet 1.0 mg/L TP.

Specifically, section 3.7 of the Zenz report states that plants will generally include filtration to remove insoluble P and N, chemical addition to enhance P removal, and supplemental methanol addition to enhance denitrification. An anoxic zone following the aerobic zone would also be necessary to achieve denitrification. To achieve 1.0 mg/L TP, however, neither filtration, nor methanol addition, nor denitrification would be necessary (Kang, et al., 2001). Chemical addition for phosphorus would be optional, and if chemical addition is chosen, less of the chemical would be necessary and less sludge would be produced. The Zenz report does not state which processes were assumed necessary in the development of the cost figures, but if they are consistent with the conclusions in section 3.7, these costs are significantly greater than those necessary to meet 1.0 mg/L.

As mentioned in my testimony, additional processes are necessary to meet much lower levels such as those reported by Hook, et al. The significant difference between the method tested at the Syracuse WWTP for meeting limits less than 0.2 mg/L TP but greater than 0.02 mg/L TP, and the technologies necessary meeting a limit of 1.0 mg/L TP is use of the ACTIFLO high rate flocculated settling (HRFS) technology. This separate, three-tank system with microsand and polymer injection and microsand recovery process is described on the third page of the Hook paper. Such a system would not be necessary for meeting 1.0 mg/L TP.

New tanks may not be necessary to incorporate phosphorus removal into treatment plants during expansions.

P. 32 of the transcript includes the discussion regarding additional tanks to accommodate biological phosphorus removal. In some situations where biological phosphorus removal will be incorporated into plants as they are expanded, existing tanks can be used to provide the anaerobic zone necessary to promote growth of phosphorus-accumulating organisms. The engineering design for the City of Salem WWTP expansion is a good example of this type of efficiency in adding biological phosphorus reduction at the time of expansion. The City needed to build new, larger secondary clarifiers to treat the proposed increased flow. It is planning to use one of the old tanks previously used as a clarifier as the anaerobic tank. Therefore, the City will not need to build a new tank to serve as the anaerobic chamber.

Technologies installed in accordance with this rule would not likely need to be removed to meet lower limits in accordance with more stringent nutrient standards.

P. 45 of the transcript includes a question of whether or not significant modifications would be required if, following nutrient standards development, more stringent limits are imposed. As mentioned at the hearing and described in the Kang paper, the biological and/or chemical system employed to meet 1.0 mg/L can still be used as a first step in meeting much lower limits.

The decisions and processes described in the Hook paper further support this claim. Note that the Syracuse plant agreed to meet increasingly stringent limits over a 15-year period. The study suggests that each new limit will be met by adding a process to the system, not by removing an old process and substituting a new one. The filtration systems being studied to achieve the limit of 0.02 are not being studied for their capacity to remove all of the phosphorus in a single step. They are being considered for the incremental removal possible following two processes – a first step to remove to 0.6 mg/L and the ACTIFLO system to remove to 0.12 mg/L. Even given a 15-year planning period with known limits over that time, the study suggests that the engineers envision adding incremental upgrades over time rather than removing and replacing previous systems.

Other papers provide examples of systems meeting lower TP concentrations by adding filtration to a biological or chemical system or by optimizing performance of the biological system. In Kalispell, Montana, they have found that with filtration added to a biological process, they are able to achieve a long term average concentration of 0.11 mg/L TP (Water Environment Federation, 2004). At the Clark County Sanitary District, Las Vegas, they have found that by optimizing a biological process and adding filtration, plant effluent has averaged 0.16 mg/L (Buhr, et al., 1999). In Wisconsin, some municipalities have achieved effluent concentrations consistently around and below 0.5

mg/L TP through optimized biological processes even without filtration or regular chemical addition. (Stinson and Larson, 2003). Other experts have stated that "[biological phosphorus removal] with chemical polishing is the most cost-effective way of achieving effluent phosphorus concentrations of less than 0.1 mg/L." (Barnard and Scruggs, 2003) This suggests that optimizing systems designed to meet 1.0 mg/L TP and adding chemical precipitation and/or filtration where necessary, should be the most effective way to meet much lower limits.

Additional permittees in Illinois currently have limits of 1.0 mg/L TP.

Prior to developing prefiled testimony, I submitted a request to IEPA for a list of all permittees that have phosphorus limits in their permits. I received the list on October 27, which confirmed that the 14 municipal wastewater treatment plants I identified all have permit limits of 1.0 mg/L as a monthly average and 2.0 mg/L as a daily maximum. Additionally, four facilities that are not municipal wastewater treatment plants were listed. U.S. Fed Penitentiary-Marion, DOI-Crab Orchard Refuge STP, and Southern IL Univ-Edwardsville all have permit limits of 1.0 mg/L as a monthly average and 2.0 mg/L as a daily maximum. Baxter Healthcare-Round Lake has a permit limit of 1.0 mg/L as a daily maximum, according to IEPA's list.

The following are corrections and clarifications to the October 25 hearing transcript for the portion of the hearing during which I testified.

P. 33, line 4 should state, "engineering plan," rather than "engineering plant."

P. 33, line 13 should state, "for the report" rather than "per the report."

P. 35, line 17 should state, "consultants and their communities, their clients," rather than "consultants in their communities, their clients."

On P. 35, line 24, I incorrectly suggested that all of these communities are rapidly growing. The City of DuQuoin is not experiencing rapid growth.

P. 38, line 14 should state, "there typically is an increase" rather than "there typically isn't an increase."

P. 39, lines 1 – 3 should state, "... aeration that is necessary in reducing some other pollutant parameters, such as BOD, which would reduce costs."

On P. 39, line16, we were discussing a report by Dr. Zenz, not Dr. Lemke.

On P. 39, line 24, the correct operational costs as reported in the paper referenced is $90 "per million gallons treated", not "per liter gallons treated."

P. 40, line 9 should state "the Zenz report" rather than "the NPDES report."

P. 40, line 12 should state “efficiencies” rather than “deficiencies.”

P. 41, line 1 should state “parameters” rather than “perimeters.” The discussion above further clarifies this section.

References

Barnard, James L. and Caroline E. Scruggs. 2003. Biological Phosphorus Removal. Water Environment & Technology. February, 2003.

Buhr, Heinrich O., Mary C. Lee, Eric G. Leveque, Walter S. Johnson, and William Shepard. 1999. Biological Phosphorus Wins. Water Environment & Technology. March, 1999.

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Stinson, Troy W. and Troy A. Larson. 2003. Biological Phosphorus Removal – Optimizing System Performance. Water Environment & Technology. July, 2003.

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CERTIFICATE OF SERVICE

I, Albert F. Ettinger, certify that on December 21, 2004, I filed the attached POST-HEARING COMMENTS OF ENVIRONMENTAL LAW & POLICY CENTER, PRAIRIE RIVERS NETWORK AND SIERRA CLUB and POST-HEARING COMMENTS OF BETH WENTZEL IN SUPPORT OF THE ILLINOIS EPA RULE MAKING PROPOSAL. An original and 9 copies was filed, on recycled paper, with the Illinois Pollution Control Board, James R. Thompson Center, 100 West Randolph, Suite 11-500, Chicago, IL 60601, and copies were served via United States Mail to those individuals on the included service list.

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