Technical Manuscript Review Form

Title NUTRIENT CONTROL DESIGN MANUAL: STATE OF TECHNOLOGY REPORT (DRAFT)	**Author(s)** THE CADMUS GROUP
Date Review Requested 9/19/08 / **Date Review Required** —	**Project Officer/Organization/Address** GEORGE T. MOORE, TASK ORDER MANAGER
Type of Publication/Audience TECHNICAL DOCUMENT / ENGINEERING/ GENERAL ENVIRONMENTAL	**Reviewer/Organization/Address** OHIO WATER ENVIRONMENT ASSOCIATION 870 N. HIGH STREET WORTHINGTON, OH 43085
Review Coordinator (e.g., PO, TIM, Supervisor)	

You are asked to review and comment on the attached manuscript. Feel free to make notations on the manuscript as well as in the comments section below, particularly regarding your recommendations for revisions. If you are unable to review the manuscript by the required date, please return it now. Your suggestions for alternate or additional reviewers will be welcomed.

SUMMARY RATING			RECOMMENDATIONS
Please rate the manuscript as follows:	**Satisfactory**	**Unsatisfactory**	
Content & Scope	☒	☐	G (1) ☐ Acceptable as is
Organization & Presentation	☒	☐	G (2) ☒ Acceptable after minor revisions
Quality of data & validity of analytical techniques	☒	☐	G (3) ☐ Acceptable after major revisions
Soundness of Conclusions	☐	☒	G (4) ☐ Not acceptable
Editorial Quality	☒	☐	If you have checked either 3 or 4, please specifically state reason(s) in the comments space below.
Other (specify) SEE COMMENTS	☐	☐	
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Comments:

SEE ATTACHED COMMENTS FROM DALE E. KOCAREK

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MEMORANDUM

Subject: USEPA Nutrient Control Manual, State of Technology (DRAFT)
OWEA Review Comments

To: President Dianne Sumego
Past President Phil Anderson
President Elect Mark Livengood
Publications Chair, Cindy Jacobsen
Utility Committee Chair, Doug Clark
Other Executive Committee Members

By: Dale E. Kocarek, P.E., BCEE
OWEA Vice President
Government Affairs Committee/Technical Review Subcommittee

Date: September 17, 2008
Revised September 19, 2008

I have provided a review of the *Nutrient Control Design Manual, State of Technology Review (DRAFT).*

Overall, I found the document to present a good overview of the technologies in the marketplace; however, I have the following comments:

1. Since the control of Total Nitrogen (TN) is completely dependent upon the successful conversion of ammonia-nitrogen to nitrate-nitrogen, I would like to see more emphasis on the removal of ammonia-nitrogen as a first essential step on the road to implementation of strategies to control TN (e.g., such as DO zone control and the implementation of the Modified Ludzk-Ettinger process and others). Given that more and more communities will be imposed with NPDES limits to control Total Nitrogen in the future, it is imperative that they take all necessary steps and measures to ensure that they remove ammonia-nitrogen to advanced levels. Not all technologies are equal in their ability to convert ammonia-nitrogen. I feel that this needs to be emphasized more. An overwhelming majority of discussion is on TN and TP removal.

2. With regard to the removal of ammonia-nitrogen, it is essential to note that most NPDES permit limits in the State of Ohio require an effluent concentration of 1.0 mg/l or less. This is a difficult limit to achieve for anything but "suspended growth" technologies such as activated sludge, extended aeration, or membrane bioreactor. By contrast, it is difficult and uneconomical for most fixed film processes to provide reductions of ammonia-nitrogen below 2-3 mg/l due to a

reduction of conversion rates at lower substrate concentrations (e.g., Monod kinetics).

3. I like the discussion on small communities and sustainability. These are important subjects at the present time, and will be recurring themes in the future. Unfortunately, I do not believe that low tech options such as recirculating sand filters and constructed wetlands are effective in the removal of ammonia-nitrogen much below 3 mg/l. Yes, these technologies are often economical for small installations, but they—like many other fixed film processes—are flawed in their ability to remove ammonia-nitrogen.

4. Since the end user of this document will likely be consulting engineers, I would like to see a table, which argues effluent limits for ammonia-nitrogen, TN, and TP, against technologies, which may be used to meet these limits.

5. I would like to see more discussion on the strategic combining of technologies to create low cost effective systems for the removal of these constituents. A good example for a small, low-tech community may be: (1) Dual Powered High Rate Aerated Lagoons for BOD and TSS removal, followed by (2) Recirculating Sand Filters for ammonia-nitrogen removal, followed by (3) Constructed wetlands for nitrate and TP removal. Most of the low-tech systems cannot accomplish all that is needed; it is possible that the combination of technologies may. Unless there can be a cost effective way to meet the water quality needs of communities, many of our water quality needs will continue to go unmet for decades to come.

6. It is important to acknowledge that effluent filtration is essential in order to meet a TP limit of less than 0.5 mg/l, due to the influence of particulate phosphorus. This is a natural driver for the "MBR" process since membranes provide filtration necessary to achieve this very low limit. For limits of 1.0 mg/l and higher, effluent filtration is not needed, but deep clarifiers (with depths of 16 feet and greater) may be.

7. I could not locate any discussion on the Membrane Bioreactor (MBR) process. While it is a suspended growth system, the MBR has a number of potential advantages including the ability to be easily modified to provide advanced removals of TN and TP.

8. I have never heard any knowledgeable authority claim that bio-P removal can achieve lower than 1.5-2.0 mg/l TP. Since many NPDES permits require limits at 1.0 mg/l or below, it is imperative that back-up chemical feed facilities be strongly considered. Back-up facilities are suggested on page 48, but no minimum recommendation is made. The need for back-up facilities can not be emphasized strongly enough.