

Soil & Water Conservation Society of Metro Halifax ('SWCSMH')

(a volunteer scientific stakeholder-group)

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Ref.: WAB01-03 (5 pages + 4-page appendix = 9 pages total)
To: Chairman Dr. Wayne Stobo and Members,
Halifax/Halifax County Watershed Advisory Board (WAB), HRM
From: S. M. Mandaville (Professional Lake Manage.), Chairman & Exec. Director
Date: February 28, 2001
Subject: Beaver Pond, Kinsac..... insufficient background data and some significant data errors Project in relation to the Halifax Golf & Country Club; HRM application #DA-F&S/FEN-005-96-02/19

The WAB, by a 4-page memorandum dated Oct. 24/96, made several recommendations, as part of its mandate, to the HRM Council/Community Councils. I will only quote extracts as appropriate here when they have a direct relevance to Beaver Pond. I am herewith including as Appendix WAB01-03-A the chemical sampling of Beaver Pond conducted by Jacques Whitford Environment Limited, their Project No. 11933. There are inconsistencies with the data which I will try my level best to explain. I am providing cross-references since this is a formal recorded submission, and it is professional and ethical to provide rationale where relevant rather than relying on unsubstantiated opinions!

Recommendations to my colleagues on the WAB: I feel the baseline data, relating especially to the basic trophic parameters, TP, TN, Ch-a, and SD, is insufficient and may not reflect the true condition of Beaver Lake for future comparisons. Hence, I herewith plead that HRM request the proponent to conduct monthly sampling throughout the year and bi-weekly during the summer months for a minimum period of 12 months prior to any planned new development in the local watershed. Since there is reliable consultant's data from 1997 on the RCAP parameters, I suggest that, in order to keep the costs down, it is sufficient to include the following four (4) parameters only, namely Total Phosphorus (TP), Chlorophyll a (Ch-a), Total Nitrogen (TN), and Secchi disk (SD). In lakes/ponds with high flushing rates and/or with significant amounts of macrophytes and/or filamentous algae, the Ch-a may not be a reliable indicator of lake productivity. Further in cases and at times, a lake/pond could be nitrogen limited rather than the typical phosphorus limitation! In such cases, TN may be a better indicator of the trophic status

than TP as far as the limiting nutrient concept is concerned. Further, TP should be measured to one µg/l (microgram/litre) accuracy!!

Select observations on the data submitted to the HRM by the proponent:

1. The WAB had recommended, “A baseline study of Beaver Pond should be conducted involving water quality parameters and characterization of the species of benthos present which could act as indicator species of environmental degradation.”
 - 1.1. **The proponents did NOT have the benthic surveys carried out contrary to the recommendations of the WAB.**

2. The normal eutrophication related parameters, **TP, TN, Cha and SD** were measured only seasonally when possible, during the months of February, May, August and November of 1997. **They did NOT conduct monthly sampling for the trophic parameters either which was in contradiction to the WAB’s focused recommendations.**
 - 2.1. It is not unreasonable in the least to ask for monthly sampling for the trophic parameters. Several world-class, and I emphasize here as world-class peer-consensus international and national reports always recommended frequent sampling of atleast the trophic parameters.

3. A leading peer-consensus world-class report I refer to frequently is the OECD-Organisation for Economic Cooperation and Development Final Report (Vollenweider and Kerekes, 1982). This report was the culmination of approximately 20 years of leading eutrophication research headed by Dr. Richard Vollenweider of Environment Canada. **Dr. Vollenweider of Burlington, Ontario is just only one of three Canadians to have ever received the coveted Naumann-Thienemann Medal, the highest international award in Limnology (i.e., the science of freshwaters).** The other two who received the said Medal are Prof. Dr. Noel J. Hynes of the University of Waterloo, and Prof. Dr. Dave Schindler of the University of Alberta.
 - 3.1. **I herewith quote from the aforementioned OECD Final Report as, “..... Infrequent sampling usually gives a distorted picture of the average lake concentration which have short-term variability and it is inadequate for the determination of peak values of chlorophyll-a and daily primary production.”**

The consultants' choice of sampling only four times for the trophic parameters of a lake or a pond is insufficient especially where one would expect a variable nutrient load as a result of significant future development(s), for e.g., a major expansion to a golf course, or even a major residential development, whether serviced or unserved. In addition, since this was for a baseline survey, it is important to have a comprehensive data base.

4. Other Government handbooks with similar or even more stringent recommendations have been listed under the References here.
5. Though, I am pleased with the RCAP sampling frequency; the consultants conducted them for the months of February, May and November, 1997. This was more than the WAB requested for. Generally, RCAP data does not vary appreciably to be of a major concern based on archival data bases (*cf.* <http://www.chebucto.ns.ca/Science/SWCS/DATA/dataindx.html>)
6. **Problems with the total phosphorus (TP) data of the consultants for three (3) of the four (4) sampling dates in 1997:** As you can observe from the Appendix WAB01-03-A, the TP data was reported as **<0.1 mg/l**, which is of little relevance for any limnological study. TP in freshwaters (lakes, rivers) is always reported to the accuracy of at least one (1) µg/l (microgram/litre), not in mg/l (milligram/litre). Some labs do report TP in mg/l, for e.g., the QEII Environmental Chemistry Lab, but their level of accuracy is 0.001 mg/l, i.e., 1 µg/l. **Any limnologist would/should be familiar with these aspects anyway.**
 - 6.1. As a further example, if you look at any and all data collected under the supervision of Dr. Joe Kerekes, now Scientist-Emeritus of the Canadian Wildlife Service, Environment Canada-Atlantic in Dartmouth, you can see he reported TP in the National Park lakes in µg/l (micrograms/litre) even going as far back as the early 1970s (for example, Kerekes, 1975; Beauchamp and Kerekes, 1989).
 - 6.2. My own limnology group (SWCSMH)'s sampling since early 1990 never had such data problems either. Our TP values were always reported in µg/l (micrograms/litre) from day #1!!

7. *Trophic classifications based exclusively on one parameter alone, in this case on Chlorophyll-a, as the consultants seem to have done, will be somewhat unsubstantiated on a limnological basis as elucidated below:*

7.1. **Once again I quote from the OECD Final Report (Vollenweider and Kerekes, 1982) as, “..... In this system a certain arbitrariness is unavoidable, and the danger exists that the respective categorization is rigidly applied. To avoid this, judgment about allocation of a given lake to a trophic category should not be based on only one or two parameters but on the total information. The advantage of a fixed boundary system is its easy application by managers and technical personnel with only limited limnological training. In particular, it is apt to prevent gross misuse of the trophic terminology, which has often happened in the past.”**

7.2. Using the OECD (Vollenweider and Kerekes, 1982) Fixed Boundary classification system, and this was applied in numerous Federal, Provincial and other studies in Canada: based on mean Ch-a, Beaver Pond would be oligotrophic as claimed by the consultants as well; but based on mean SD reading, it would be eutrophic; and based on mean TP, it could be classified anywhere from ultra-oligotrophic to highly eutrophic. A value of TP reported as <0.1 mg/l as the consultants did (or <100 µg/l) could mean anywhere from 0 to 99 µg/l which would imply a conclusion as aforementioned. The pond has somewhat high colour, hence, while SD readings may not be totally reliable for trophic analyses, nevertheless it is my group (SWCMH)’s experience that with frequent sampling, even in more dystrophic lakes than Beaver Pond, the Secchi readings do give reasonable values (*cf.*

<http://www.chebucto.ns.ca/Science/SWCS/DATA/dataindx.html>).

References:

- Beauchamp, S.T., and Kerekes, J. 1989. Effects of acidity and DOC on phytoplankton community structure and production in three acid lakes (Nova Scotia). In *Water, Air, and Soil Pollution*. 46:323-333.
- Kerekes, J. 1975. Phosphorus supply in undisturbed lakes in Kejimikujik National Park, Nova Scotia (Canada). In *Verh. Internat. Verein. Limnol.* 19:349-357.
- Olem, H. and Flock, G. eds. 1990. *Lake and Reservoir Restoration Guidance Manual*. 2nd edition. EPA 440/4-90-006. Prep. by N. Am. Lake Manage. Soc. for U.S.E.P.A. 326 p.

- Vollenweider, R.A., and Kerekes, J. [OECD] 1982. Eutrophication of waters. Monitoring, assessment and control. OECD Cooperative programme on monitoring of inland waters (Eutrophication control), Environment Directorate, OECD, Paris. 154p.
- Wedepohl, R.E., Knauer, D.R., Wolbert, G.B., Olem, H., Garrison, P.J., and Kepford, K. 1990. Monitoring Lake and Reservoir Restoration. EPA 440/4-90-007. Prep. by N. Am. Lake Manage. Soc. for U.S.E.P.A. 142 p.

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- Note: This is also being copied to Ms. Catriona Moir principally because of her sophisticated title being Manager, Ecosystems Risk Management, NSDoE&L. Senior professional staff of HRM have pointed out to me on numerous occasions over the last decade that 'inland water quality' is the prime responsibility of the NSDoE&L and not of HRM! The traditional function of municipalities is maintenance of sewers, roads, sidewalks, road salting, drainage into watercourses without treatment, tree maintenance, traffic signals, etc., and not (r) not in scientific scrutiny/investigations!
 - **Traditional university education in municipal engineering does NOT include the 'sciences'** since most professional civil engineers are not formally trained in Limnology and/or in Marine Biology!
- ⇒ Protection of our sensitive ecosystems, both freshwater as well as marine, may be achieved by means of professional engineers and theoretical/applied scientists working together; further that professional engineers at all levels (municipal, provincial as well as federal) should be directed by **scientists** when ecosystems are threatened/endangered.