

"I brought you into a fertile land to eat its fruit and rich produce. But you came and defiled my land and made my inheritance detestable."

..... Jeremiah 2:7 (New International Version,  
New York International Bible Society, 1978)

### **Soil & Water Conservation Society of Metro Halifax (SWCSMH)**

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**Ref.:** wrmp02  
(11pg. & Exhibits wrmp02-I-to-II, and wrmp02-IV-to-V; Grand total= 33 pages)

**To:** Wayne Stobo PhD  
Chairman, Halifax/Halifax Watershed Advisory Board (WAB), HRM

**From:** S. M. Mandaville B.E., Post-Grad Dip. Professional Lake Manage.  
Chairman and Scientific Director

**Date:** February 04, 2003

**Subject:** **Our principal recommendations/comments re the Draft report, HRM Water Resource Management Study (WRMS), by Dillon, Inc., dated December 2002**

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We herewith convey **strong compliments** to Dillon, Inc., for their superb Draft report on the HRM's WRMS. We are especially delighted that our specialty, biological monitoring, was given prominence in line with our written 11-page submission to the HRM dated November 05, 2000 as well as per our verbal request during the February 2000 board meeting when the board was commenting on the original Terms-of-Reference of the Study.

Four relevant exhibit packages (wrmp02-I, wrmp02-II, wrmp02-IV, and wrmp02-V) accompany this submission as rationale. Our web URLs cited below are case-sensitive and will not work if the case is altered, i.e., the upper and lower cases have to be entered so in one's web browser.

There are eight (8) Focused Points here, numbered I to VIII; only I to V are our recommendations as additions into the WRMS Report; VI to VIII inclusive are critiques of the relevant narratives in the WRMS Report.

Due to the somewhat scientific nature of this submission, it may be advisable to send a copy of this whole package to HRM as well as to Dillon, Inc., and thank you.

Kindly pardon any typos/grammar.

## **Focused Point #I: (cf. Exhibit wrmp02-I):**

We herewith request inclusion of the superb [Storm Drainage Works Approval Policy](#) (SDWAP) of the NS Dept. of the Environment & Labour (NSDEL) as an appendix since it was not even alluded to in the Draft report. It was signed off by the Deputy Minister on December 10, 2002 and we are including it here as our Exhibit wrmp02-I (also *cf.*

<http://lakes.chebucto.org/DOE/sdwap.html>)!

We feel the said SDWAP will mitigate many problems that have occurred in the past when zero limnology was applied in medium to larger residential projects. Small development projects will have minimal long term impacts.

## **Focused Point #II: See Section 4.2.5 titled, “Performance Measures Policies”, page 4-23 of the Dillon, Inc.’s Draft report (also cf. Exhibit wrmp02-II):**

As an exciting ‘lead example’, we request for the incorporation of the recommendation made by the H/HC WAB dated July 04, 2000 on lakes within the Western Commons (*cf.* Exhibit wrmp02-II).

The H/HC WAB’s recce’ states, “A maximum allowable mean yearly Chlorophyll *a* (Ch *a*) level should be set for each lake as the “lake carrying capacities”. These values should be set at 30% maximum over the pre-development yearly mean Ch *a*.”

Rationale: The recce of the H/HC WAB was generally derived from the world-class peer-consensus 18-country 15-year leading eutrophication research of the Organization for Economic Cooperation and Development-OECD (<http://lakes.chebucto.org/TPMODELS/OECD/oecd.html>) which was indeed headed by a Canadian limnologist, Dr. Richard Vollenweider, now retired from Environment Canada. Dr. Vollenweider is only one of four Canadians since 1942 to have ever received the top international medal in limnology, the coveted **Naumann-Thienemann Medal** (<http://lakes.chebucto.org/PEOPLE/naumann.html>).

The recce’ given by the H/HC WAB allows for natural variation as well as ensures the lakes are preserved in their recent states. If anything, the increased UV radiation

as a result of global warming is expected to reduce the Chlorophyll *a* levels over longer (multiple decadal) periods since UV rays are strong photoinhibitors!

**The said recce' of the H/HC WAB is especially applicable where one is desirous of maintaining the lakes in their recent trophic/biological state. In cases where it is not important to maintain lakes in their 'recent biological state', then a higher figure than 30% could be used though too high a figure such as 100% may defeat the purpose, in most cases.**

Further, to set such a lake carrying capacity, no extensive predictive modelling would be required prior to setting the levels; all one needs is a one-two year field sampling as stated in Appendix 1 of the H/HC WAB's recce (*cf.* Appendix wrmp02-II).

We herewith cite a relevant extract from the said world-class 18-country peer-consensus OECD research in support of this methodology (<http://lakes.chebucto.org/TPMODELS/OECD/management.html#lake-management>):

Excessive supply of phosphorus in water is the cause of eutrophication, yet phosphorus in itself does not interfere with the normal use of water. The trophic responses caused by the nutrient enrichment such as high algal biomass, dense growth of macrophytes, reduced transparency, and reduced hypolimnetic or oxygen concentrations under ice cover are symptoms of eutrophication which do interfere with normal use of the water. Therefore, water management should consider water quality objectives in terms of trophic response objectives, with regard to the intended use of the water.

These objectives may vary considerably between different regions, depending on local conditions and on the expectation of the population concerning water quality. Depending on the intended use (e.g., drinking water, industrial water, power plant cooling water, recreation, multiple use, etc.), the stringency of objectives could be set at various levels, considering algal biomass (chlorophyll *a*) as a trophic response indicator, i.e.:

- a. Mean algal biomass (annual, ice-free season, summer) to be kept below a certain level;
- b. Mean annual peak algal biomass to be kept below a certain level;
- c. Exceptional (highest possible) annual peak biomass to be kept below a certain level.

## **Focused Point #III: Filter Strips below storm sewer outfalls:**

We recommend a narrative requiring a 'filter strip' below the outlet of storm sewer or ditch prior to drainage into lakes or rivers. The width of the filter strip should be derived from the following regression developed under sponsorship of the USDA; it should also be noted that all concentrated flows from the outlet of storm sewers and ditches be converted to sheet flows prior to discharge into the filter strips wherever possible by the use of level spreaders; if not, the filter strip may not be effective on a long-term time basis since the water will channelize over time.

A "Standard Filter" is defined as a particular length of site capable of trapping 953 kg. of sediment per year (US Dept. of Agriculture, SCS, 1977):

$$\text{Filter (m)} = (16.16 + 17.69 \text{ Soil-K} + 1.34 \text{ Slope}\%) * \frac{31 \text{ RCN}}{6900 - 69 \text{ RCN}}$$

where Filter is the slope distance needed for filtering out the sediment, soil-K is the soil erodability index from the USLS equation, and RCN is the Runoff Curve Number from the SCS Engineering Handbook. The ratio of actual filter distance to the standard filter distance times 953 kilograms equals the yearly sediment trapped.

The values for the various parameters are easily ascertained from the tables widely available in Nova Scotia, and the soil-K factors have been reported by the Shubenacadie-Stewiacke River Basin Board during the late 1970s.

Panuska, J.C., and Schilling, J.G. 1993. Consequences of Selecting Incorrect Hydrologic Parameters When Using the Walker Pond Size and P8 Urban Catchment Models. *Lake and Reserv. Manage.* 8(1):73-76.

Truitt, P.G. 1978. Prediction and control of soil erosion from land development. Tech. Rpt. #5, Shubenacadie-Stewiacke River Basin Board. iv, 70, ill.

US Dept. of Agriculture, SCS. 1977. Handout on Erosion Control. Env. Servs. Div.

US Dept. of Agriculture, SCS. 1986. Urban hydrology for small watersheds-Technical Release No. 55 (Sec. Ed.). 160p.

Wilson, L.G. 1967. Sediment Removal from Flood Water by Grass Filtration. *Tans. ASAE.*

Wischmeier, W.H. 1964. New developments in estimating water erosion. Proc. 29th Annual Meeting, Soil Conserv. Soc. Am., Ankeny, IA.

Wischmeier, W.H. 1976. Use and misuse of the Universal Soil Loss Equation. *J. Soil and Water Cons.* 31:5-9.

Wischmeier, W.H., and Smith, D.D. 1965. Predicting Rainfall-Erosion losses from cropland east of the Rocky Mountains. *Agr. Handbook No. 282*, US Dept. Ag., Washington, DC.

**Focused Point #IV: (cf. Exhibit wrmp02-IV -and- [http://lakes.chebucto.org/TPMODELS/NOTES/minneapolis\\_lawn-fertilizer.html](http://lakes.chebucto.org/TPMODELS/NOTES/minneapolis_lawn-fertilizer.html)):**

**We herewith request a recommendation that HRM consider banning application of lawn fertilizers in line with the aggressive leadership taken recently by the Minneapolis City Council! We also understand that other municipalities in the State of Minnesota are planning to follow Minneapolis's leadership.**

Rationale: While some may espouse the so-called stewardship practices, e.g., the \$120,000 (or so) demonstration project at First Lake, Lower Sackville, which was spearheaded by Sheppard *et al.*, nonetheless such a *modus operandi* is easier said than done. The said demonstration project was inconclusive as far as the TP export values were concerned.

Such stewardship projects as at First Lake have also been extensively reported elsewhere in the United States but none have proven that they made any tangible difference to the downstream lakes. We are cognizant of this fact since we are a North American based scientific limnology society and we have wide scientific contacts.

Kindly peruse the enclosed Exhibit wrmp02-IV which shows how the City of Minneapolis is banning all lawn fertilizers.

**But they do give exceptions where needed. Of significant interest to the Steering Committee and to Dillon, Inc., should be pages 954 and 955 of the said Exhibit wrmp02-IV.**

## **Focused point #V: Increased setback distances for onsite disposal beds in new subdivisions (cf. Exhibit wrmp02-V):**

We recommend increased setback distances for onsite disposal systems from, especially lakes. The setback distances should be increased from the NSDEL's base value of 30.5m to 100m in order to protect our sensitive lakes over a period of 50 years and perhaps over 100 years. For fairness, this should apply only to new lots to be created and not to existing approved lots (cf. H/HC WAB's Policy dated February 07, 2001 exemplified in Exhibit wrmp02-V).

Rationale: It has been reported in varied literature that even properly functioning disposal systems export phosphorus via groundwater plumes and via underground macropores to lakes.

100m setback distances from streams may not be required due to the intermediate ecosystem functions, whereas, since many of the lakes in HRM fall in the ultraoligotrophy-to-mesotrophy range, they are lot more sensitive to even minor increments of TP (total phosphorus). Eutrophic lakes, being robust, can actually assimilate more TP without any visible symptoms but we have very few eutrophic lakes in HRM most of them being shallow ponds.

Kindly study the Exhibit wrmp02-V and various correspondences as well as the policy recommended by the H/HC WAB, and especially the **letter from His Worship, Mayor Peter Kelly to the H/HC WAB dated May 01, 2001 wherein he stated that the WRMS would address this issue! As far as we can fathom, this was not addressed.**

Exhibit wrmp02-V also includes an email from Engineering Scientist, David Pask PEng, the actual developer/inventor of the contour beds, to the effect that he supports increased setback distances; he was responding to our email-inquiry which is also included there.

One can also peruse the conclusions of a 1999 MASc in Civil Engineering thesis of hydrogeologist, Steve Sauveur, at DalTech which also states that NSDEL's setback distance of 30.5m is insufficient. That disposal bed in Fall River he alludes to was a contour bed and not that aged, but there was evidence of significant migration of phosphorus at 22m from the bed (75 times greater than background levels), and it was anticipated that the TP levels would still be significant after 30.5 metres.

## **Focused Point #VI: *cf.* Section 9.4, page 9-7 of the Draft Dillon report- Ontario Lake Capacity Models:**

The Ontario Lake Capacity Model is not the only model available notwithstanding what the Draft report stated. There are other models in North America which are all peer-reviewed as well as used extensively, some more so!

We have carried out, perhaps, one of the most extensive Predictive TP/Ch a modelling in all of Canada, and have modelled nine hundred and thirty five (935) lakes/ponds within HRM and its overlapping watersheds in the adjoining municipalities to date (there are approx. 1,300 lakes/ponds over 1 ha in size in HRM).

**We found that the Ontario model(s) cannot be applied blindly in each and every case.** We have liberally used other widely published models and they include the aforementioned 18-country peer consensus OECD models (Vollenweider, 1968; Vollenweider, 1976; and Vollenweider and Kerekes, 1982), and several other models published by the massive USEPA as well as by the USDA, too lengthy to list here! Incidentally both Dr. Richard Vollenweider as well as Dr. Joe Kerekes are now Scientists-Emeritus with Environment Canada.

## **Focused Point #VII: So-called Oil-Grit Separators- *cf.* pages 8-12, D-10, and D-11 of the Dillon Inc.'s Draft report (also *cf.* <http://lakes.chebucto.org/SWT/swt.html>)**

**The widely used proprietary devices, *Stormceptor* and the CDS units CANNOT be classified as Oil-Grit Separators. Considerable independent research by university/Government institutes as well as by research consultants worldwide show that these devices are more than simple oil-grit separators; they are superb as “pre-treatment devices” and are viable replacements for ponds prior to final polishing by “artificial wetlands”.**

**In cases where their performance has not been satisfactory, the primary problem could have been maintenance. We further understand that HRM has no maintenance policy per the manufacturer's handbooks for these devices whether they are in public rights-of-way or in private properties; in the latter case the HRM is not ensuring proper maintenance by private owners by means of regulatory inspections!**

Rationale: For *Stormceptors* kindly see our web page, <http://lakes.chebucto.org/SWT/stormceptor.html>; for the CDS devices, see <http://lakes.chebucto.org/SWT/cds.html>; and for the locally new Vortechincs, see <http://lakes.chebucto.org/SWT/vinc.html>. These URLs in turn will lead one to many other independent as well as industry links and Government awards that they were recipient of, especially in the USA!

We have also included an independent comparison carried out by research consultants, Herr and Harper, for the City of Orlando, for the City of Winter Haven, and for the City of Atlantic Beach during 1998-99. You can view their conclusions in our web link (<http://lakes.chebucto.org/SWT/swt.html#gross>). You will see that each of those devices are different and have pros and cons. It is not ethical to group them all together.

Further, notwithstanding what Dillon, Inc., stated in Appendix-D, Section 3.7, page D-10, we understand that the CDS units are indeed capable of treating much larger areas than the 5 ha mentioned; it appears as if Dillon, Inc., obtained this figure from the technical manual for the *Stormceptor* but it does not seem to apply to the CDS units. The CDS units were developed in Australia, and a leading scientific-cum-engineering research institute, CRC for Catchment Hydrology and the CRC for Freshwater Ecology, Monash University, Victoria, Australia recommends the CDS units along with an artificial wetland (see the figure on next page).

We also understand that the CDS unit has been used even in open channel applications in large subdivisions in various parts of the USA, and more so in

Australia (see the email we received from Walt Stein P.E., Manager of Project Development for CDS, USA in our web page, <http://lakes.chebucto.org/SWT/cds.html>; we have considerable faith in Mr. Stein's professionalism since he does not make any false claims and gives the pros and cons).

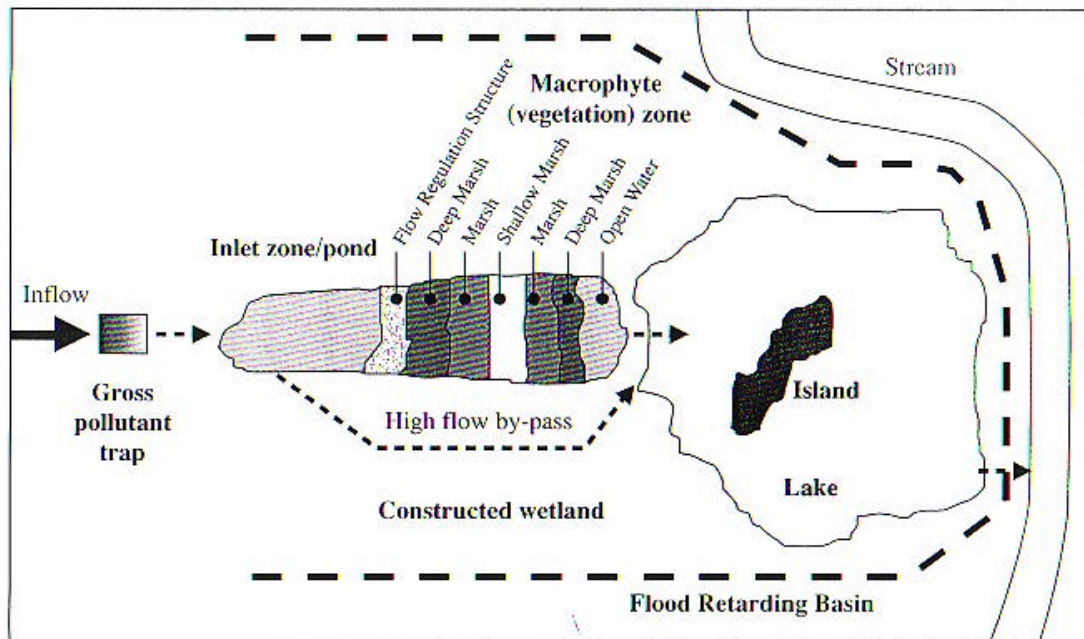


Figure 1: Modular elements in an integrated stormwater management system

The Gross pollutant trap in the above figure is a CDS device, and for further info see the entire handbook which can be downloaded from <http://www.catchment.crc.org.au/pdfs/industry199807.pdf> (we had also donated a copy of the original handbook to the Environmental Services group at the HRM a year or two ago).

## **Focused Point #VIII: Biological monitoring- cf. Section 9.5, pages 9-9 to 9-10, and 9-18 to 9-19 of the Dillon Inc.'s Draft report:**

**We herewith point out that Dillon, Inc., are incorrect in stating that there is no existing practice of biological monitoring in HRM (see the first sentence of page 9-18). Perhaps they mean such monitoring carried out under the mandate of HRM in which case they are correct.**

Indeed, there have been several programs in HRM carried out not only by our scientific limnology society but also by others including by local biology departments at universities, and here we allude to benthic macroinvertebrate studies of lakes and streams.

We have also carried out some advanced phycology inclusive of rare analysis of live diatom species based on a state-of-the-art manual from the London Museum of Nature, UK, in addition to the usual studies in phycology of our lakes inclusive of cell counting. Local universities have also carried out some exciting studies of epiphytic diatoms of lakes and other phycology reports by young and up and coming brilliant biologists several of whom have attained respectable positions all over North America (we are aware of several of them)!

Perhaps Dillon, Inc., did not carry out an extensive search of the local literature and libraries since they may not specialize in, especially, biological limnology themselves though we are not totally sure of the reasons.

Nevertheless, more can be done and we strongly support if HRM gets involved in this often neglected biological limnology domain, but we are not totally clear on why that would be municipal responsibility anyway since normally it is a provincial and federal responsibility.

**We beg to disagree where Dillon, Inc., state that multivariate predictive models are unilaterally superior to multimetric models in the case of zoobenthos (see page 9-19 of their report).** This very argument has been the basis of not one but numerous international discussions at leading scientific conferences and there has been no consensus. We will be happy to provide you further details if you are interested since this critique will get unwieldy to go into extensive scientific rationale in this submission.

**In actual reality per extensive peer-reviewed literature and per our international discussions since 1997, we conclude that both multimetric as well as multivariate models have their strong as well as weak points, and if time permits, it is preferable to use both!**

Further, notwithstanding what Dillon, Inc., stated in Section 9.5 of their report, multimetrics are extensively used in Canada and not just in the USA. In the USA, multimetrics are indeed a necessity and are more or less mandated by Government regulation and promoted extensively by their massive USEPA as well as by several State regulatory agencies!

Even in Canada, many leading Professors teach multimetrics to their undergraduate as well as graduate students; one of the leading professors who promotes them is Prof. Dr. Gerrie Mackie PhD of the large biology department at the University of Guelph, Ontario. Prof. Dr. Gerrie Mackie has written a comprehensive textbook in limnology published by Kendall/Hunt in year 2001 and it is the first ever recent-years' limnology textbook written by a professor in Canada (the last one was in the 1930s or so). He reports extensively on multimetrics in the said textbook.

Notwithstanding, the field work is similar no matter which system one uses; it is also advisable to identify to the lowest possible taxon one is capable of and/or preferably utilize the services of recognised systematists. We ourselves use some reputed systematists as and when needed for our Reference Collections as 'self-critiques'!

Thank you and we are sincerely excited about the leadership which we expect HRM will (hopefully) be taking in the near future and thus be a shining beacon to all of Atlantic Canada! It only takes one municipality on the Atlantic Coast of our beloved Canada to show leadership and everyone else will fall in line!

Cc: .... several parties .....

**Encl.:** Exhibit wrmp02-I (pages marked as wrmp02-I-1 to wrmp02-I-5)

Exhibit wrmp02-II (pages marked as wrmp02-II-1 to wrmp02-II-4)

Exhibit wrmp02-IV (pages marked as wrmp02-IV-1 to wrmp02-IV-6)

Exhibit wrmp02-V (pages marked as wrmp02-V-1 to wrmp02-V-7)