

THE THREAT TO NYC'S DRINKING WATER FROM PHOSPHORUS POLLUTION

The NYC watershed supplies 9 million people, over half of NYS with drinking water of such high quality that 90% does not need filtering. This 2,000 square-mile watershed extends both east and west of the Hudson (EOH and WOH).

The EOH Croton Watershed, a vital component of NYC's water supply, supplies 10% of NYC's needs. However, in times of drought it supplies close to 30%.

Ill-planned development in the Croton watershed has resulted in the need to filter the water. Originally estimated at \$800 million, the cost of the filtration plant presently being built has sky-rocketed to over \$3 billion. For obvious reasons, NYC wants to protect its remaining watershed, the Catskill/Delaware, from a similar fate.

75% of NYC's watersheds is forested. When an area gets developed for housing or for a mall, for example, the trees are cut down and mostly replaced by impervious surface. This means that phosphorus, the pollutant of major concern, that was previously held in place by the forest tree roots and soils, is now released and free to enter streams, ponds, wetlands, lakes and reservoirs where it acts as a fertilizer and promotes unwanted growth.

Under NYS Department of Environmental Conservation (DEC), a developer has to mitigate any phosphorus increase and return phosphorus export to the pre-existing levels to the "maximum extent practicable" (MEP). Of course, the higher the pre-development level, the easier it is to return to it. As explained in the following memo, that is why developers prefer to use the results for forests in Northern Virginia rather than the lower results that apply to local forests.

The following memo written by James Bacon, Esq., explains precisely how the phosphorus export coefficient for EOH forests were derived. In calculating by how much the phosphorus in each reservoir had to be reduced, the Total Maximum Daily Loads (TMDLs) for phosphorus for nine out of 10 Croton Reservoirs were based on these coefficients. These TMDLs have been approved by the US Environmental Protection Agency (EPA) in 2002 and this approval has never been rescinded.

THE CROTON WATERSHED

The Croton Watershed is located approximately 40 miles north of New York City and is approximately 300 square miles and comprised of 12 reservoirs¹ and two controlled lakes in the Counties of Putnam, Westchester and a small area of Fairfield County, Connecticut.

¹ The Croton reservoirs are the Amawalk, New Croton, Muscoot, Cross River, Titicus, Diverting, West Branch, Middle Branch, East Branch, Croton Falls, Bog Brook and Boyd's Corners.

In the last 50 years, the Croton has been subjected to suburbanization with the construction of 60 waste water treatment plants and countless miles of impervious surfaces made up of roads, an Interstate Highway, shopping centers, village centers and residential developments.

According to New York City Department of Environmental Protection's (NYCDEP) latest watershed report, (July 2009), many of the Croton's reservoirs violate state water quality standards (15-20 micrograms of phosphorus per liter - $\mu\text{g/l}$)² and all are phosphorus-impaired.³ Eight reservoirs require significant reductions of phosphorus in order to meet their TMDLs, i.e. over 3,000 lbs. of reduction required for the Muscoot.⁴

The NYC watershed is mostly forested, and the Croton portion is no exception. Consequently, in assessing baseline data prior to the development of forested areas, municipalities must use accurate pre-development export coefficients (ECs) reflecting local conditions to ensure that post development loadings do not increase existing phosphorus exports.

PHOSPHORUS LOADING FROM FORESTS

In 1992, the New York State Department of Environmental Conservation (NYSDEC) published "Reducing Impacts from Stormwater Runoff from New Development," which advised practitioners to use a figure of 0.10 in stormwater modeling as an EC from forested areas. That EC was not derived from New York forests, but was based upon studies in Northern Virginia and the Pacific Northwest.⁵

IN 1996, NYCDEP published a report reviewing 199 studies on ECs from land uses in the U.S. and Canada, including New York and Connecticut.⁶

Forty-nine of those studies involved pollutant exports from forested areas with 11 from New York and Connecticut. Based upon those 11 studies and its own testing, NYCDEP determined that 0.05 kilograms per hectare per year⁷ (kg/ha/yr or 0.0446 lbs/acre/yr) was the appropriate export coefficient for Croton Watershed forests.⁸

² "NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION 2008 WATERSHED WATER QUALITY ANNUAL REPORT" (July 2009) at pg. 148. (Available at http://nyc.gov/html/dep/pdf/2008_watershed_water_quality_annual_report.pdf).

³ See 2008 303(d) List of Impaired Waters at http://www.dec.ny.gov/docs/water_pdf/303dlist08.pdf.

⁴ For example, Amawalk:122 lbs; Croton Falls, 1,980; Diverting, 1,452; East Branch, 993; Middle Branch 204; Muscoot, 3,103; New Croton 2,431; Titicus, 140. ("Croton Watershed Phase II Phosphorus TMDL Implementation Plan," (January 14, 2009), NYSDEC available at: http://www.dec.ny.gov/docs/water_pdf/jan09crotontmdl.pdf.

⁵ See DEC publication "Reducing the Impact of Stormwater Runoff from New Development" (1992) pgs. 21 and 39 - forest data from "Northern Virginia."

⁶ "Methodology for Calculating Phase I Total Maximum Daily Loads (TMDLs) of Phosphorus for New York City Drinking Water Reservoirs" (June 1996), pages 15-19.

⁷ A hectare is 2.4 acres. To convert kg/ha/yr to lbs/yr divide the kg/yr by 1.12.

⁸ "Forested lands contribute the lowest amount of phosphorus from a watershed. The amount of runoff and attendant phosphorus loading depends upon the dominant species of tree and the maturity of the vegetation...The East-of Hudson watersheds are primarily forest and urban, and underlain by igneous and

Significantly, that EC is less than half the 0.10 lbs/acre/yr export coefficient NYSDEC had recommended in their 1992 report.

DEP and DEC utilized .0446 lbs/acre/yr for each of the TMDLs adopted for the Croton,⁹ and these TMDLs and their supporting studies were accepted by EPA. The Phase II TMDLs, based on the foregoing export coefficients, were approved by EPA in October 2000. This approval remains in force (see page 2 reference #10 below, NYSDEC March 2002 Interim Report).

The accuracy of the .0446 EC was verified by three years of study NYCDEP conducted for the review of the Crossroads Ventures hotel/conference center/golf course proposed for Belleayre Mountain in the Catskills. There, from 2001-2003, NYCDEP found a 3-year average phosphorus export level¹⁰ of 0.053 kg/ha/yr (or 0.046 lbs/acre/yr).¹¹

metamorphic rocks. Because of the increased phosphorus content of sedimentary rocks as compared to other rock types (Dillon and Kirschner, 1976), a slightly higher export coefficient may be appropriate for West-of Hudson watersheds (Table 3). DEP has chosen to use 0.05 kg/ha/yr (the NY and CT average) for the East-of-Hudson watershed.” (Pages 12, 14).

⁹ NYCDEP: “METHODODOLOGY FOR CALCULATING PHASE II TMDLS OF PHOSPHORUS FOR NYC DRINKING WATER RESERVOIRS” (March 1999) (pgs. 1-33).

NYCDEP: “DEVELOPMENT OF A WATER QUALITY GUIDANCE VALUE FOR PHASE II TMDLS IN THE NYC RESERVOIRS” (March 1999) (pgs. 1-53).

NYCDEP: “PROPOSED PHASE II PHOSPHORUS TMDL CALCULATIONS, FACT SHEETS FOR THE CROTON SYSTEM” (March 1999).

NYSDEC: “PHASE II PHOSPHORUS TMDLS FOR RESERVOIRS IN THE NYC WATER SUPPLY WATERSHED.” (June 2000).

NYSDEC and NYCDEP: “NONPOINT SOURCE IMPLEMENTATION OF THE PHASE II TMDLS” (April (2001).

NYSDEC: “INTERIM REPORT NONPOINT SOURCE IMPLEMENTATION OF THE PHASE II TMDLS IN THE NYC WATERSHED” (March 2002).

¹⁰ See Appendix C1, page 14 of the Belleayre Crossroads DEIS, 1/12/2004 by EA Engineering, P.C. – <http://www.nyc.gov/html/dep/pdf/belleayre/appendixc1.pdf>

¹¹ The slightly higher level above the 0.0446 lbs/acre/yr) for the East of Hudson watershed was expected given the Croton’s metamorphic and igneous rock-based soils and mature forests.