UNITED STATES OF AMERICA
BEFORE THE
DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
November 13, 2002

Federal Consistency Appeal
by Millennium Pipeline Company
From an Objection by the
New York Department of State

COMMENTS OF THE NEW YORK STATE ATTORNEY GENERAL CONCERNING ADVERSE ENVIRONMENTAL IMPACTS OF THE PROPOSED MILLENNIUM PIPELINE ROUTE ON THE NEW YORK CITY DRINKING WATER WATERSHED

I. INTRODUCTION

These comments are submitted by New York State Attorney General Eliot Spitzer to the National Oceanic and Atmospheric Administration concerning the proposed Millennium Pipeline Project. The Attorney General is supportive of efforts that will increase the supply of natural gas to the New York City Metropolitan area. The Attorney General has also encouraged improvements to the flexibility of the regional energy supply system that are reflected by this project. These important consumer and energy policy goals can be achieved while protecting other fundamental priorities, including our environment. With this in mind, these comments address significant adverse impacts that a portion of the proposed pipeline route will likely have on the quality of the drinking water supplied by the New Croton Reservoir, which is part of the New York City Watershed ("Watershed").[1]

The Millennium Pipeline would be constructed on a presently undisturbed and vegetated 2.5 to 3.1 mile stretch of the Watershed's New Croton Reservoir basin, along and within a steep and rugged portion of a Consolidated Edison power line right-of-way. Along this stretch, the pipeline would travel within one mile of the reservoir itself and would cross several streams. The construction of the pipeline itself, as well as any operational errors, could have serious

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[1] Assistant Attorney General James M. Tierney serves in the position of New York City Watershed Inspector General within the Attorney General's Office. This position was created pursuant to the 1997 New York City Memorandum of Agreement ("1997 MOA") and a Gubernatorial Executive Order. The 1997 MOA established and funded a comprehensive program to protect the drinking water that is supplied to over 9 million people from the Watershed. The Inspector General position provides the Attorney General's Office with heightened responsibilities concerning the protection of the Watershed's drinking water supply.

negative impacts on the New York City Water Supply. The New Croton Reservoir serves as a direct drinking water source for some 900,000 persons on an average daily basis and as the drinking water source for over 2 million individuals under emergency and drought planning scenarios. Importantly, the New Croton is an *unfiltered* drinking water supply for the vast majority of its consumers; this means that the only treatment that water drawn from this reservoir receives before it reaches the tap is disinfection through chlorination.

These circumstances make the New Croton Reservoir highly sensitive to the impacts of polluted runoff, nutrient loading, erosion and sedimentation that are associated with land clearing, soil disturbance, excavation in wetlands and water bodies, and heavy equipment construction. For the reasons that follow, we recommend that the Millennium Pipeline be placed along an alternate pathway that avoids the Watershed and its New Croton Reservoir drainage basin. We note that the proposed pipeline route has been altered on at least 12 other occasions in response to public comments.[2] Given the extensive and costly efforts presently underway to improve the quality of the highly stressed New Croton Reservoir, including the purchase of land to prevent development, moving the pipeline out of the reservoir basin is reasonable and appropriate. We cannot rely on mitigation measures to reliably and adequately avoid the foreseeable and significant adverse impacts to the drinking water that are posed by the pipeline project. Should the Millennium Pipeline remain in the Watershed, we request that heightened, site-specific, mitigation measures be developed to address polluted runoff and damage to existing natural resources that protect water quality.

II. ENVIRONMENTAL AND REGULATORY SETTING OF THE PROJECT

The terrain covered by the Watershed portion of the proposed pipeline route is "often very rugged with hard crystalline or microcrystalline bedrock at the surface."[3] These attributes would likely require "that most of the trenching for pipeline installation would have to be accomplished by blasting open a trench."[4] Blasting would also be required "to create level workspace along the construction right-of-way."[5] Our comparison of the U.S.G.S. map with a detailed map of the Watershed indicates that the proposed route extends through 2.5 to 3.1 miles of the Watershed's New Croton Reservoir basin. The SDEIS indicated that due to the rugged terrain in this area "a construction right-of-way that is greater than 75 feet wide might be required for two-tone construction and rock storage."[6] This, in addition to the blasting that is necessary to create level

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[2] SDEIS at ES-7.

[3] SDEIS at 6-11

[4] Id.

[5] Id.

[6] SDEIS at 6-15.

work staging areas, "could increase the land requirements for the construction right-of-way by about 33 percent."[7] Thus, the average width of the cleared construction right-of-way within the Watershed will be approximately 75 to 100 feet.[8] By way of comparison, the width of two roadway lanes of an interstate highway is 24 feet.

The portion of the Watershed that would be affected by pipeline construction is almost entirely vegetated. The creation of this construction right-of-way would result in the removal of roughly 20 to 25 acres of vegetation within the Watershed. The stumps and roots that stabilize soils would be grubbed. The generally thin existing soils would be further disturbed by blasting, stockpiling, or compressed by the operation of heavy machinery. The pipeline trench within the Watershed would extend through at least two wetlands, various streams, and the 33-acre Teatown Lake, which is part of the 700 acre Teatown Lake Reservation. This entire area is generally drained by Bailey Brook, which flows directly into a portion of the New Croton Reservoir that is classified by the New York State Department of Environmental Conservation ("State DEC") as an "AA" surface water.[9] Thus, by virtue of DEC classification, the New Croton Reservoir must be maintained at a pristine quality that allows it to serve as a direct source of unfiltered drinking water.

The construction of the pipeline and the disturbance of the soil would likely result in significant discharges of phosphorus, now bound in the soil, to the New Croton. EPA has determined that erosion and sedimentation from construction sites are a major source of phosphorus and sediment loadings that cause the impairment of water bodies.[10] This discharge would have a major detrimental impact because the New Croton Reservoir already has excessive amounts of phosphorus. The New Croton Reservoir has been listed as "impaired" by phosphorus by State DEC on its 1998 list of impaired water bodies pursuant to Section 303(d) of the Federal Clean Water Act. As a result, it is subject to heightened protection criteria for phosphorus that were developed pursuant to the Clean Water Act -- known as the "total maximum daily load" ("TMDL") criteria. EPA has officially determined that the New Croton Reservoir has phosphorus levels in excess of those required to meet water quality standards pursuant to the Clean Water Act and has formally acted to reduce the targeted phosphorus level in the New Croton Reservoir by 25%.[11] This means that significant efforts are needed to *substantially reduce* pollutant loadings of phosphorus into the New Croton Reservoir that originate from

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[7] Id.

[8] Id.

[9] See 6 NYCRR § 864.6 Table I, Items No. 82 and 83.

[10] See Attachment 1, 64 Fed. Reg. 68722, 68728 to 68731 (December 8, 1999).

[11] See Attachment 2, October 2000 letters from Jeanne Fox, Regional Administrator for EPA Region 2 to John Cahill, Commissioner of State DEC.

surface runoff.

In practical terms, phosphorus pollution in the New Croton Reservoir is so severe that the New York City Department of Environmental Protection ("City DEP") has generally shut down this reservoir, or substantially blended its waters with waters from the Catskill portion of the Watershed, for two to four months a year during the growing season. Water is drawn from the New Croton directly into the drinking water distribution system.

The high amounts of sediment and colloidal particles washed by storm water from construction sites also serve as a conduit for the transport of pathogens in drinking water, and create taste and color problems. These particles also interfere with the effectiveness of chlorination -- making it more likely that pathogens will reach water consumers.[12] The construction disturbance associated with the current pipeline route is located within the "60 day travel time" for precipitation landing on this site to flow to a drinking water faucet. This "60 day" area has been designated by City DEP and includes the entire drainage basin of the New Croton Reservoir. A development project within the 60 day travel time area raises special concerns because 60 days is generally viewed as the life span for many pathogens (disease-causing microbes) in fresh water. Public health professionals view this portion of an unfiltered drinking water supply as one that must be treated with heightened sensitivity.

Because the pipeline route is near the water intake structure of this terminal reservoir, construction related impacts could be particularly severe. A project of this sort would, under situations where federal pre-emption did not apply, have to obtain prior approval by City DEP of a detailed, engineered, and site-specific "storm water pollution prevention plan" to address phosphorus and sedimentation issues prior to the initiation of any construction.[13]

III. PHOSPHORUS SENSITIVITY OF THE NEW CROTON RESERVOIR

As noted above, phosphorus pollution already injures the purity of water in the New Croton Reservoir and is at levels that exceed recognized environmental thresholds. The "limiting nutrient" in the New Croton Reservoir is phosphorus which, if allowed to increase, would

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[12] National Research Council, "Watershed Management For Potable Water Supply: Assessing New York City's Approach" at 15, 123 and 126 (1999 Prepublication Copy) (hereafter "NRC Watershed Report"). This peer-reviewed book was prepared by a working group of the National Research Council, whose members were selected for their special expertise and drawn from the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine. The report exhaustively reviews the New York City Watershed program and the applicable scientific literature.

[13] See 15 Rules of the City of New York "RCNY" §18-39(b) and (c).

promote an increase in biological life during the warm weather growing season.[14] In other words, phosphorus levels control the extent to which plant life can grow in the New Croton.[15] Excessive phosphorus levels result in "eutrophic" conditions, characterized by algae blooms and limited water transparency in the warmer weather.[16]

Algae blooms trigger an adverse "chain reaction" on water quality. Over time, the individual algae die off, and while the bloom itself continues in the surface waters, the dead algae will fall to the bottom of the reservoir's water column. As it descends, the dead plant material is consumed by an expanding population of bacteria and other animal life. A rapid decline in the levels of dissolved oxygen in the water ensues because the increased population of algae consuming bacteria also consume oxygen as they respire, or breathe. As the levels of oxygen decrease, the water may become almost completely deprived of dissolved oxygen, and an anaerobic (low oxygen) condition will result.

This anaerobic environment causes serious problems when the water is to be used as a drinking water supply. Generally, drinking water is drawn from the bottom of a reservoir, since this water is less likely to contain algae. While this practice can avoid the algal mats, it is more likely to draw the anaerobic water that results from an algae bloom. Anaerobic water contains bacteria that generate serious odor and taste problems as well as color. In addition, anaerobic conditions cause contaminants such as iron, manganese, hydrogen sulfide and even additional phosphorus to be released from reservoir bottom sediments into the water, further deteriorating the quality of the water.[17]

Eutrophic water conditions triggered by excess phosphorus also result in increased levels of organic carbon in the water.[18] Chlorine is used to disinfect water from New York City reservoirs prior to distribution to consumers. The chlorine-based disinfection of waters that are high in organic carbon results in the formation of a class of chemicals known as "disinfection

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[14] NRC Watershed Report at 5 and 123.

[15] City DEP, "Development of a Water Quality Guidance Value for Phase II Total Maximum Daily Loads (TMDLs) in the New York City Reservoirs" (March 1999) at 1, 7 (hereafter "DEP Report"). See also, U.S. EPA and U.S. Department of Agriculture, "Clean Water Action Plan" (Feb. 14, 1998) at 56 ("Excessive nutrient loadings will . . . result in excessive growth of macrophytes or phytoplankton and potentially harmful algal blooms . . . leading to oxygen declines, imbalance of aquatic species, public health risks, and a general decline of the aquatic resource.").

[16] NRC Watershed Report at 79.

[17] NRC Watershed Report at 123; DEP Report at 7.

[18] NRC Watershed Report at 79.

byproducts" -- chemicals that are suspected of being carcinogenic and of increasing the risk of early term miscarriages.[19]

Typically, the concentration of phosphorus within the New Croton Reservoir ranges between 16 and 18 ug/L (parts per billion) during the growing season, with the average phosphorus levels for 1992 through 1996 being 17.2 ug/L for the entire reservoir.[20] Even at this normal level, the New Croton suffers from algae blooms, anoxia (low dissolved oxygen), poor taste, increased color and other problems associated with serious eutrophication – requiring the reservoir's use to be limited or suspended during significant portions of the growing season.[21]

For example, during the six year period from 1990 through 1995, the New Croton reservoir had a minimum of 54 "algal events"[22] which resulted in the reservoir being shut down for an average of 16% of the time; several of the suspensions lasted as long as 4 months.[23] During this 6-year period, the reservoir aqueduct was closed off 11 separate times, for a total of 299 days. City DEP has attempted to keep the reservoir (and hence, the Croton portion of the Watershed) online by significantly reducing its flow and blending New Croton water with Catskill water.

Even when algae blooms induced by excessive phosphorus are not severe enough to warrant a complete shutdown of the water supply, higher than normal algae levels can nevertheless impair drinking water disinfection. Higher levels of sediments and organic materials found in eutrophic waters transport microbes, which may become embedded in these materials, and operate to protect the microbes from being destroyed by chlorine disinfection.[24]

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[19] NRC Watershed Report at 2, 5-6, 76-77, 123. According to EPA, certain disinfection byproducts have been shown to be carcinogenic in animal studies. Others have caused adverse reproductive or developmental effects in laboratory animals. EPA also cited a study that suggested an association between early term miscarriage and exposure to drinking water with elevated levels of the disinfection byproduct trihalomethane. 63 Fed. Reg. 69389, 69394 (Dec. 16, 1998) ("Disinfectants and Disinfection Byproducts; Final Rule").

[20] City DEP, "Proposed Phase II Phosphorus TMDL Calculations for the New Croton Reservoir" (March 1999) at 16-17.

[21] DEP Report at 22-25.

[22] DEP Report at 22.

[23] Id.

[24] NRC Watershed Report at 15, 126.

IV. SPECIFIC COMMENTS

A. Conflicts with the Watershed Protection Program

The three volume 1997 Watershed MOA[25] created a partnership among local, state and federal governments and environmental organizations to address comprehensively the Watershed's drinking water quality at an overall cost well in excess of $1 billion, and growing. For example, over $320 million in City and State funds have been set aside for the acquisition of Watershed lands so as to preserve these lands in a natural state -- to protect water quality and serve as natural barriers to pollution sources. Westchester County has announced its own $50 million program to purchase lands, including Watershed properties. (Some 85% of the residents of Westchester County receive their water from the Watershed). The portion of the Watershed traversed by the pipeline route is in an area of the Croton portion of the Watershed that has been prioritized by City DEP for acquisition or permanent preservation through conservation easements. The disruption of vegetated Watershed areas associated with pipeline construction would be inconsistent with this land acquisition/preservation effort.

Moreover, all waste water treatment plants in the Watershed are being upgraded to tertiary treatment with micro-filtration (or equivalent technology), at a cost that is now estimated to exceed $200 million. The purpose of these upgrades is to reduce levels of phosphorus, suspended solids and pathogens in the drinking water. Similarly, Westchester County, in conjunction with City DEP, is now studying a plan to completely divert the flow of two major sewage treatment plants located in Yorktown and New Castle to locations completely outside of the Watershed, at a cost in excess of $25 million. The effluent from these plants presently ends up in the New Croton Reservoir. The City of New York has also provided Westchester County with $38 million to help address pollutant loadings into the Watershed from such things as failing septic systems and storm water runoff. Thus, the risk of additional phosphorus and suspended solid loadings from the proposed pipeline also is contrary to these, and other, water quality protection efforts.

B. Polluted Runoff and TMDL Consistency

FERC recognizes that "[m]any stages of pipeline construction, including vegetation clearing, grading, topsoil segregation, open trenching, and backfilling destabilize the soil material and make it susceptible to water and wind erosion."[26] FERC further has stated that with respect to surface waters, the "[c]learing and grading of stream banks, blasting, in-stream trenching, trench dewatering, and backfilling could result in modification of aquatic habitat, increased sedimentation, turbidity, decreased dissolved oxygen concentrations, stream warming, releases of

[25] See New York City Water Supply System, http://www.ci.nyc.ny.us/html/dep/html/agreement.html.

[26] SDEIS at 5-4.

chemical and nutrient pollutants from sediments, and introduction of chemical contamination, such as fuel and lubricants." [27] We agree with these statements.

Nowhere in its various environmental assessments, however, did FERC assess these concerns in the context of the Watershed and the particular sensitivities of the New Croton Reservoir. There is very little site specific information concerning such basic matters as slopes and soil types that would allow for specific comments on necessary erosion control measures necessary in the Watershed. Rather, FERC makes reference to three guidance documents that it views as adequately addressing these concerns: (i) Millennium Pipeline Company, L.P. Environmental Construction Standards, July 1999; (ii) FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (December 1994); and (iii) FERC's Wetland and Waterbody Construction and Mitigation Procedures (Undated). These documents, however, contain only a brief description of a few limited erosion control devices. In our opinion, these guidelines are completely inadequate for use in an area as sensitive as the New Croton Reservoir basin. If construction is to occur in the Watershed, state-of-the-art engineering and mitigation measures should be employed.

For example, erosion control guidelines referenced by FERC contain no mention of the development of an engineered plan for the movement through, and treatment of, storm water within the pipeline construction site during storms of intensities that are frequent in Westchester County (i.e., 6.2 inches is the ten-year 24 hour storm, 3.4 inches is the two-year 24 hour storm, 2.8 inches is the one-year 24 hour storm).[28] There is little information concerning the effective management of turbid water drawn from de-watered streams, except to recommend that such waters be pumped into the woods. There is no mention of construction phasing to limit the amount of total disturbed area at any one time; nothing concerning the effective use of long-term sedimentation basins during construction in sensitive areas; nothing on effective methods to deal with the increased force, velocity and erosive action of storm waters flowing down steep slopes; nothing with respect to phosphorus removal; and nothing concerning the engineered diversion of storm water flows from up-slope areas away from disturbed areas. In fact, it does not appear that soil characteristics are required to be assessed, a particular problem in the "60 day" travel area of the Watershed because small colloidal or clay particles that become suspended will remain suspended in the water for 6 to 9 months – meaning that they will likely come out of a faucet. In addition, information concerning the problem of re-establishing vegetation on bedrock surfaces exposed by pipeline construction in the Watershed is cursory and inadequate, especially given that the terrain in this area is often steep and rugged.

Soil compaction by heavy equipment in the pipeline construction area, along with the potential for large areas of exposed bedrock, will reduce the perviousness (space between soil

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[27] SDEIS at 5-8 to 5-9.

[28] Northeast Regional Climate Center, "Atlas of Precipitation for the Northeastern United States and Southeastern Canada" (a.k.a. RR93-5) (September 1993).

particles into which water flows) of this area to a dramatic extent over existing vegetated conditions. This will cause storm water flow, velocity and erosion levels to substantially increase because pervious surfaces retain and filter storm water. Moreover, erosion will increase as the construction area becomes devoid of vegetation that anchors soil in place. This is especially so, given the often steep slopes in the pipeline route through the Watershed. The various guidelines identified in the SDEIS do not describe how increased storm water flow from increased imperviousness will be addressed, both during and after construction. It is our opinion that this is a serious adverse impact that will likely continue well after the completion of pipeline construction.

On many recent occasions, construction sites in the Croton Watershed have resulted in the discharge of substantial amounts of highly turbid waters into various reservoirs, including the New Croton Reservoir. For example, a highway project along the Taconic Parkway in Yorktown, conducted a few miles from the New Croton Reservoir, has resulted in numerous discharges of sediment laden water that turned an entire section of the reservoir brown. This occurred despite the fact that the 50 acre project had been the subject of a detailed "storm water pollution prevention plan" ("SPPP") that was reviewed by City DEP under far more stringent design criteria than are contemplated here. Our experience with the repeat failure of storm water controls in the Watershed is a major reason why we would prefer that any pipeline construction be routed outside of the Watershed. At a minimum, a detailed, fully engineered, and site specific SPPP should be developed and reviewed before any construction in the Watershed is initiated. This plan should include a detailed description of short- and long-term maintenance and monitoring procedures. Appropriate state-of-the-art erosion control techniques, such as those developed by the Center for Watershed Protection, also should be employed in the SPPP.

C. <u>Wetland and Water Body Protection</u>

Pipeline construction within the Watershed will cause the disturbance of a number of significant wetlands, wetland buffer areas and streams. Wetlands provide flood control, wildlife habitat, and improved drinking water quality by accumulating and retaining nutrients, trapping sediments, removing and transforming human and animal wastes, and degrading certain pollutants. Any disturbance to wetlands or their adjacent areas within the Watershed is highly disfavored. Though not described in the environmental review documents, the United States Army Corps of Engineers has issued highly restrictive wetland protection general permits that are specific to the Croton section of the Watershed.

Moreover, recent national scientific studies have recognized that the restoration or re-creation of disturbed wetlands are often unsuccessful. Given the importance of wetlands, extensive efforts have been made throughout the Watershed to re-direct development away from wetlands. As discussed above, the construction in and de-watering of wetlands and streams present another serious potential for discharges of turbid water into the New Croton Reservoir. Adverse impacts from construction in wetlands is another reason for our preference that the pipeline be routed to an area outside of the Watershed.

The excavation of a trench and installation of a pipeline on the bottom of the 33 acre Teatown Lake clearly should be avoided if at all possible. Teatown Lake empties into the New Croton. Such construction will inevitably result in the discharge of substantial levels of turbid waters into the lake, and probably the reservoir. It is hard to see how this activity could be undertaken without violating New York State Water Quality Standards with respect to turbidity and total suspended solids.[29]

D. Risk Reduction: The Iroquois Pipeline

Given the sensitivity of the New Croton Reservoir, a key goal of public officials involved in drinking water protection is risk reduction to protect the public health. A protocol termed the "multi-barrier" approach, includes: "selecting the highest-quality source water, practicing watershed management, using the best available treatment technologies, maintaining a clean distribution system, practicing thorough monitoring and accurate data analysis, having well-trained operators, and maintaining operating equipment."[30] The EPA, the National Research Council, and the American Water Works Association have all strongly endorsed this approach.[31] As noted above, unlike almost all other drinking water supplies in the Nation, the drinking water drawn from the New Croton is not filtered before delivery to the vast majority of its users. Accordingly, this water supply is particularly sensitive and significantly different from most other drinking water reservoirs.

Another reason to be risk averse is that we have seen good faith efforts at mitigating the adverse environmental impacts of construction projects in the Watershed fail on repeated occasions, sometimes dramatically. That is why, in general, we strongly prefer that major projects, such as the Millennium Pipeline, be placed outside of the Watershed.

Prior experience with another major pipeline project is instructive. In 1991, the Iroquois Pipeline Operating Company installed a major natural gas pipeline from Canada, through portions of New York and Connecticut and into Long Island. The pipeline installation resulted in

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[29] See 6 NYCRR § 703.2.

[30] NRC Watershed Report at 97.

[31] See, e.g., NRC Report at 97-98; American Water Works Association, "Source Water Protection Statement of Principles," AWWA Mainstream (1997); "State Source Water Assessment and Protection Programs Guidance" – Draft Guidance (EPA 816-R-97-007)(Office of Water). Charles Perrow, author of the classic book about high risk systems, "Normal Accidents," has an apt name for the theory of multiple barriers of protection: "defense in depth." Perrow notes that "nothing is perfect; every part of every system, industrial or not, is liable to failure," thus providing the fundamental rationale for the multiple barrier approach. C. Perrow, "Normal Accidents," Basic Books, 1984 at 40, 43.

extensive and serious violations of the Federal Clean Water Act due to the placement of fill in wetlands, the sedimentation of waters, and the failure to install required erosion control equipment throughout long portions of the construction pathway. These violations resulted in the pipeline company pleading guilty to four felony violations of the Federal Clean Water Act and four corporate officers pleading guilty to misdemeanor environmental charges. Beyond having to undertake extensive remedial measures within the pipeline's route, the company was required to pay fines and penalties in the amount of $22 million. See U.S. v. Iroquois Pipeline Operating Co., Plea Agreement, 96-CR-166 (N.D.N.Y. May 23, 1996).

We emphasize that this office has no reason to believe that the sponsors of the Millennium Pipeline will act in an irresponsible or unlawful manner. However, the problems associated with the Iroquois Pipeline provide further justification for our position that removal of the Millennium Pipeline from the highly sensitive New Croton Reservoir basin is in keeping with sound environmental practice. This is particularly so given the steep and rugged Watershed terrain that would have to be traversed if the pipeline is approved.

V. CONCLUSION

For the above stated reasons the New York State Attorney General requests that the Millennium Pipeline be located in a manner that avoids the New York City Watershed altogether.

Respectfully submitted,

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federal register

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Part II

Environmental Protection Agency

40 CFR Parts 9, 122, 123, and 124

National Pollutant Discharge Elimination System—Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Final Rule

Report to Congress on the Phase II Storm Water Regulations; Notice

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9, 122, 123, and 124

[FRL—6470–8]

RIN 2040–AC82

National Pollutant Discharge Elimination System—Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Today's regulations (Phase II) expand the existing National Pollutant Discharge Elimination System (NPDES) storm water program (Phase I) to address storm water discharges from small municipal separate storm sewer systems (MS4s) (those serving less than 100,000 persons) and construction sites that disturb one to five acres. Although these sources are automatically designated by today's rule, the rule allows for the exclusion of certain sources from the national program based on a demonstration of the lack of impact on water quality, as well as the inclusion of others based on a higher likelihood of localized adverse impact on water quality. Today's regulations also exclude from the NPDES program storm water discharges from industrial facilities that have "no exposure" of industrial activities or materials to storm water. Finally, today's rule extends from August 7, 2001 until March 10, 2003 the deadline by which certain industrial facilities owned by small MS4s must obtain coverage under an NPDES permit. This rule establishes a cost-effective, flexible approach for reducing environmental harm by storm water discharges from many point sources of storm water that are currently unregulated.

EPA believes that the implementation of the six minimum measures identified for small MS4s should significantly reduce pollutants in urban storm water compared to existing levels in a cost-effective manner. Similarly, EPA believes that implementation of Best Management Practices (BMP) controls at small construction sites will also result in a significant reduction in pollutant discharges and an improvement in surface water quality. EPA believes this rule will result in monetized financial, recreational and health benefits, as well as benefits that EPA has been unable to monetize. Expected benefits include reduced scouring and erosion of streambeds, improved aesthetic quality of waters, reduced eutrophication of aquatic systems, benefit to wildlife and endangered and threatened species, tourism benefits, biodiversity benefits and reduced costs for siting reservoirs. In addition, the costs of industrial storm water controls will decrease due to the exclusion of storm water discharges from facilities where there is "no exposure" of storm water to industrial activities and materials.

DATES: This regulation is effective on February 7, 2000. The incorporation by reference of the rainfall erosivity factor publication listed in the rule is approved by the Director of the Federal Register as of February 7, 2000. For judicial review purposes, this final rule is promulgated as of 1:00 p.m. Eastern Standard Time, on December 22, 1999 as provided in 40 CFR 23.2.

ADDRESSES: The complete administrative record for the final rule and the ICR have been established under docket numbers W–97–12 (rule) and W–97–15 (ICR), and includes supporting documentation as well as printed, paper versions of electronic comments. Copies of information in the record are available upon request. A reasonable fee may be charged for copying. The record is available for inspection and copying from 9 a.m. to 4 p.m., Monday through Friday, excluding legal holidays, at the Water Docket, EPA, East Tower Basement, 401 M Street, SW, Washington, DC. For access to docket materials, please call 202/260–3027 to schedule an appointment.

FOR FURTHER INFORMATION CONTACT: George Utting, Office of Wastewater Management, Environmental Protection Agency, Mail Code 4203, 401 M Street, SW, Washington, DC 20460; (202) 260–5816; sw2@epa.gov.

SUPPLEMENTARY INFORMATION: Entities potentially regulated by this action include:

Category	Examples of regulated entities
Federal, State, Tribal, and Local Governments.	Operators of small separate storm sewer systems, industrial facilities that discharge storm water associated with industrial activity or construction activity disturbing 1 to 5 acres.
Industry	Operators of industrial facilities that discharge storm water associated with industrial activity.
Construction Activity.	Operators of construction activity disturbing 1 to 5 acres.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your facility or company is regulated by this action, you should carefully examine the applicability criteria in §§ 122.26(b), 122.31, 122.32, and 123.35 of the final rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding FOR FURTHER INFORMATION CONTACT section.

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including heavy metals, toxics, oil and grease, solvents, nutrients, viruses and bacteria into receiving waterbodies. The NURP study, discussed earlier, found that pollutant levels from illicit discharges were high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health. The study noted particular problems with illicit discharges of sanitary wastes, which can be directly linked to high bacterial counts in receiving waters and can be dangerous to public health.

Because illicit discharges to MS4s can create severe widespread contamination and water quality problems, several municipalities and urban counties performed studies to identify and eliminate such discharges. In Michigan, the Ann Arbor and Ypsilanti water quality projects inspected 660 businesses, homes, and other buildings and identified 14 percent of the buildings as having improper storm sewer drain connections. The program assessment revealed that, on average, 60 percent of automobile-related businesses, including service stations, automobile dealerships, car washes, body shops, and light industrial facilities, had illicit connections to storm sewer drains. The program assessment also showed that a majority of the illicit discharges to the storm sewer system resulted from improper plumbing and connections, which had been approved by the municipality when installed (Washtenaw County Statutory Drainage Board. 1987. Huron River Pollution Abatement Program).

In addition, an inspection of urban storm water outfalls draining into Inner Grays, Washington, indicated that 32 percent of these outfalls had dry weather flows. Of these flows, 21 percent were determined to have pollutant levels higher than the pollutant levels expected in typical urban storm water runoff characterized in the NURP study (U.S. EPA. 1993. *Investigation of Inappropriate Pollutant Entries Into Storm Drainage Systems—A User's Guide.* EPA 600/R–92/238. Office of Research and Development. Washington, DC). That same document reports a study in Toronto, Canada, that found that 59 percent of outfalls from the MS4 had dry-weather flows. Chemical tests revealed that 14 percent of these dry-weather flows were determined to be grossly polluted.

Inflows from aging sanitary sewer collection systems are one of the most serious illicit discharge-related problems. Sanitary sewer systems frequently develop leaks and cracks, resulting in discharges of pollutants to receiving waters through separate storm sewers. These pollutants include sanitary waste and materials from sewer main construction (e.g., asbestos cement, brick, cast iron, vitrified clay). Municipalities have long recognized the reverse problem of storm water infiltration into sanitary sewer collection systems; this type of infiltration often disrupts the operation of the municipal sewage treatment plant.

The improper disposal of materials is another illicit discharge-related problem that can result in contaminated discharges from separate storm sewer systems in two ways. First, materials may be disposed of directly in a catch basin or other storm water conveyance. Second, materials disposed of on the ground may either drain directly to a storm sewer or be washed into a storm sewer during a storm event. Improper disposal of materials to street catch basins and other storm sewer inlets often occurs when people mistakenly believe that disposal to such areas is an environmentally sound practice. Part of the confusion may occur because some areas are served by combined sewer systems, which are part of the sanitary sewer collection system, and people assume that materials discharged to a catch basin will reach a municipal sewage treatment plant. Materials that are commonly disposed of improperly include used motor oil; household toxic materials; radiator fluids; and litter, such as disposable cups, cans, and fast-food packages. EPA believes that there has been increasing success in addressing these problems through initiatives such as storm drain stenciling and recycling programs, including household hazardous waste special collection days.

Programs that reduce illicit discharges to separate storm sewers have improved water quality in several municipalities. For example, Michigan's Huron River Pollution Abatement Program found the elimination of illicit connections caused a measurable improvement in the water quality of the Washtenaw County storm sewers and the Huron River (Washtenaw County Statutory Drainage Board, 1987). In addition, an illicit detection and remediation program in Houston, Texas, has significantly improved the water quality of Buffalo Bayou. Houston estimated that illicit flows from 132 sources had a flow rate as high as 500 gal/min. Sources of the illicit discharges included broken and plugged sanitary sewer lines, illicit connections from sanitary lines to storm sewer lines, and floor drain connections (Glanton, T., M.T. Garrett, and B. Goloby. 1992. The Illicit Connection: Is It the Problem? *Wat. Env. Tech.* 4(9):63–8).

3. Construction Site Runoff

Storm water discharges generated during construction activities can cause an array of physical, chemical, and biological water quality impacts. Specifically, the biological, chemical, and physical integrity of the waters may become severely compromised. Water quality impairment results, in part, because a number of pollutants are preferentially absorbed onto mineral or organic particles found in fine sediment. The interconnected process of erosion (detachment of the soil particles), sediment transport, and delivery is the primary pathway for introducing key pollutants, such as nutrients (particularly phosphorus), metals, and organic compounds into aquatic systems (Novotny, V. and G. Chesters. 1989. "Delivery of Sediment and Pollutants from Nonpoint Sources: A Water Quality Perspective." *Journal of Soil and Water Conservation*, 44(6):568–76). Estimates indicate that 80 percent of the phosphorus and 73 percent of the Kjeldahl nitrogen in streams is associated with eroded sediment (U.S. Department of Agriculture. 1989. "The Second RCA Appraisal, Soil, Water and Related Resources on Nonfederal Land in the United States, Analysis of Condition and Trends." Cited in Fennessey, L.A.J., and A.R. Jarrett. 1994. "The Dirt in a Hole: a Review of Sedimentation Basins for Urban Areas and Construction Sites." *Journal of Soil and Water Conservation*, 49(4):317–23).

In watersheds experiencing intensive construction activity, the localized impacts of water quality may be severe because of high pollutant loads, primarily sediments. Siltation is the largest cause of impaired water quality in rivers and the third largest cause of impaired water quality in lakes (U.S. EPA, 1998). The 1996 305(b) report also found that construction site discharges were a source of pollution in: 6 percent of impaired rivers; 11 percent of impaired lakes, ponds, and reservoirs; and 11 percent of impaired estuaries. Introduction of coarse sediment (coarse sand or larger) or a large amount of fine sediment is also a concern because of the potential of filling lakes and reservoirs (along with the associated remediation costs for dredging), as well as clogging stream channels (e.g., Paterson, R.G., M.I. Luger, E.J. Burby, E.J. Kaiser, H.R. Malcolm, and A.C. Beard. 1993. "Costs and Benefits of Urban Erosion and Sediment Control: North Carolina Experience." *Environmental Management* 17(2):167–78). Large inputs of coarse sediment into stream channels initially will reduce stream depth and minimize habitat complexity by filling in pools (U.S. EPA. 1991. *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska.* EPA 910/9–91–001. Seattle, WA). In addition, studies have shown that stream reaches affected by construction activities often extend well downstream of the construction site. For example, between 4.8 and 5.6 kilometers of stream below construction sites in the Patuxent River watershed were observed to be impacted by sediment inputs (Fox, H.L. 1974. "Effects of Urbanization on the Patuxent River, with Special Emphasis on Sediment Transport, Storage, and Migration." Ph.D. dissertation. Johns Hopkins University, Baltimore, MD. As Cited in Klein, R.D. 1979. "Urbanization and Stream Quality Impairment." *Water Resources Bulletin* 15(4): 948–63).

A primary concern at most construction sites is the erosion and transport process related to fine sediment because rain splash, rills (i.e., a channel small enough to be removed by normal agricultural practices and typically less than 1-foot deep), and sheetwash encourage the detachment and transport of this material to waterbodies (Storm Water Quality Task Force. 1993. *California Storm Water Best Management Practice Handbooks—Construction Activity.* Oakland, CA: Blue Print Service). Construction sites also can generate other pollutants associated with onsite wastes, such as sanitary wastes or concrete truck washout.

Although streams and rivers naturally carry sediment loads, erosion from construction sites and runoff from developed areas can elevate these loads to levels well above those in undisturbed watersheds. It is generally acknowledged that erosion rates from construction sites are much greater than from almost any other land use (Novotny, V. and H. Olem. 1994. *Water Quality: Prevention, Identification, and Management of Diffuse Pollution.* New York: Van Nostrand Reinhold). Results from both field studies and erosion models indicate that erosion rates from construction sites are typically an order of magnitude larger than row crops and several orders of magnitude greater than rates from well-vegetated areas, such as forests or pastures (USDA. 1970. "Controlling Erosion on Construction Sites." *Agriculture Information Bulletin,* Washington, DC; Meyer, L.D., W.H. Wischmeier, and W.H. Daniel. 1971. "Erosion, Runoff and Revegetation of Denuded Construction Sites." *Transactions of the ASAE* 14(1):138–41; Owen, O.S. 1975. *Natural Resource Conservation.* New York: MacMillan. As cited in Paterson, et al., 1993).

A recent review of the efficiency of sediment basins indicated that inflows from 12 construction sites had a mean TSS concentration of about 4,500 mg/L (Brown, W.E. 1997. "The Limits of Settling." Technical Note No. 83. *Watershed Protection Techniques* 2(3)). In Virginia, suspended sediment concentrations from housing construction sites were measured at 500–3,000 mg/L, or about 40 times larger than the concentrations from already-developed urban areas (Kuo, C.Y. 1976. "Evaluation of Sediment Yields Due to Urban Development." Bulletin No. 98. Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, Blacksburg, VA).

Similar impacts from storm water runoff have been reported in a number of other studies. For example, Daniel, et al., monitored three residential construction sites in southeastern Wisconsin and determined that annual sediment yields were more than 19 times the yields from agricultural areas (Daniel, T.C., D. McGuire, D. Stoffel, and B. Miller. 1979. "Sediment and Nutrient Yield from Residential Construction Sites" *Journal of Environmental Quality* 8(3):304–08). Daniel, et al., identified total storm runoff, followed by peak storm runoff, as the most influential factors controlling the sediment loadings from residential construction sites. Daniel, et al., also found that suspended sediment concentrations were 15,000–20,000 mg/L in moderate events and up to 60,000 mg/L in larger events.

Wolman and Schick (Wolman, M.G. and A.P. Schick. 1967. "Effects of Construction on Fluvial Sediment, Urban and Suburban Areas of Maryland." *Water Resources Research* 3(2): 451–64) studied the impacts of development on fluvial systems in Maryland and determined that sediment yields in areas undergoing construction were 1.5 to 75 times greater than detected in natural or agricultural catchments. The authors summarize the potential impacts of construction on sediment yields by stating that "the equivalent of many decades of natural or even agricultural erosion may take place during a single year from areas cleared for construction" (Wolman and Schick, 1967).

A number of studies have examined the effects of road construction on erosion rates and sediment yields. A highway construction project in West Virginia disturbed only 4.2 percent of a 4.72-square-mile basin, but resulted in a three-fold increase in suspended sediment yields (Downs, S.C. and D.H. Appel. 1986. *Progress Report on the Effects of Highway Construction on Suspended-Sediment Discharge in the Coal River and Trace Fork, West Virginia,* 1975–81. USGS Water Resources Investigations Report 84–4275. Charlestown, WV). During the largest storm event, it was estimated that 80 percent of the sediment in the stream originated from the construction site. As is often the case, the increase in suspended sediment load could not be detected further downstream, where the drainage area was more than 50 times larger (269 square miles).

Another study evaluated the effect of 290 acres of highway construction on watersheds ranging in size from 5 to 38 square miles. Suspended sediment loads in the smallest watershed increased by 250 percent, and the estimated sediment yield from the construction area was 37 tons/acre during a 2-year period (Hainly, R.A. 1980. *The Effects of Highway Construction on Sediment Discharge into Blockhouse Creek and Stream Valley Run, Pennsylvania.* USGS Water Resources Investigations Report 80–68. Harrisburg, PA). A more recent study in Hawaii showed that highway construction increased suspended sediment loads by 56 to 76 percent in three small (1 to 4 square mile) basins (Hill, B.R. 1996. *Streamflow and Suspended-Sediment Loads Before and During Highway Construction, North Halawa, Haiku, and Kamooalii Drainage Basins, Oahu, Hawaii, 1983–91.* USGS Water Resources Investigations Report 96–4259. Honolulu, HI). A 1970 study determined that sediment yields from construction areas can be as much as 500 times the levels detected in rural areas (National Association of Counties Research Foundation. 1970. *Urban Soil Erosion and Sediment Control.* Water Pollution Control Research Series, Program #15030 DTL. Federal Water Quality Administration, U.S. Department of Interior. Washington, DC)

Yorke and Herb (Yorke, T.H., and W.J. Herb. 1978. *Effects of Urbanization on Streamflow and Sediment Transport in the Rock Creek and Anacostia River Basins, Montgomery County, Maryland, 1962–74.* USGS Professional Paper 1003, Washington, DC) evaluated nine subbasins in the Maryland portion of the Anacostia watershed for more than a decade in an effort to define the impacts of changing land use/land cover on sediment in runoff. Average annual suspended sediment yields for construction sites ranged from 7 to 100 tons/acre. Storm water discharges from construction sites that occur when the land area is disturbed (and prior to surface stabilization) can significantly impact designated uses. Examples of designated uses include public water supply, recreation, and propagation of fish and wildlife. The siltation process described previously can threaten all three designated uses by (1) depositing high concentrations of pollutants in public water supplies; (2) decreasing the depth of a waterbody, which can reduce the volume of a reservoir or result in limited use of a water body by boaters, swimmers, and other recreational enthusiasts; and (3) directly impairing the habitat of fish and other aquatic species, which can limit their ability to reproduce.

Excess sediment can cause a number of other problems for waterbodies. It is associated with increased turbidity and reduced light penetration in the water column, as well as more long-term effects associated with habitat destruction and increased difficulty in filtering drinking water. Numerous studies have examined the effect that excess sediment has on aquatic ecosystems. For example, sediment from road construction activity in Northern Virginia reduced aquatic insect and fish communities by up to 85 percent and 40 percent, respectively (Reed, J.R. 1997. "Stream Community Responses to Road Construction Sediments." Bulletin No. 97. Virginia Water Resources Research Center, Virginia Polytechnic Institute, Blacksburg, VA. As cited in Klein, R.D. 1990. *A Survey of Quality of Erosion and Sediment Control and Storm Water Management in the Chesapeake Bay Watershed.* Annapolis, MD: Chesapeake Bay Foundation). Other studies have shown that fine sediment (fine sand or smaller) adversely affects aquatic ecosystems by reducing light penetration, impeding sight-feeding, smothering benthic organisms, abrading gills and other sensitive structures, reducing habitat by clogging interstitial spaces within a streambed, and reducing the intergravel dissolved oxygen by reducing the permeability of the bed material (Everest, F.H., J.C. Beschta, K.V. Scrivener, J.R. Koski, J.R. Sedell, and C.J. Cederholm. 1987. "Fine Sediment and Salmonid Production: A Paradox." *Streamside Management: Forestry and Fishery Interactions,* Contract No. 57, Institute of Forest Resources, University of Washington, Seattle, WA). For example, 4.8 and 5.6 kilometers of stream below construction sites in the Patuxent River watershed in Maryland were found to have fine sediment amounts 15 times greater than normal (Fox, 1974. As cited in Klein, 1979). Benthic organisms in the streambed can be smothered by sediment deposits, causing changes in aquatic flora and fauna, such as fish species composition (Wolman and Schick, 1967). In addition, the primary cause of coral reef degradation in coastal areas is attributed to land disturbances and dredging activities due to urban development (Rogers, C.S. 1990. "Responses of Coral Reefs and Reef Organizations to Sedimentation." *Marine Ecology Progress Series,* 62:185–202).

EPA believes that the water quality impact from small construction sites is as high as or higher than the impact from larger sites on a per acre basis. The concentration of pollutants in the runoff from smaller sites is similar to the concentrations in the runoff from larger sites. The proportion of sediment that makes it from the construction site to surface waters is likely the same for larger and smaller construction sites in urban areas because the runoff from either site is usually delivered directly to the storm drain network where there is no opportunity for the sediment to be filtered out.

The expected contribution of total sediment yields from small sites depends, in part, on the extent to which erosion and sedimentation controls are being applied. Because current storm water regulations are more likely to require erosion and sedimentation controls on larger sites in urban areas, smaller construction sites that lack such programs are likely to contribute a disproportionate amount of the total sediment from construction activities (MacDonald, L.H. 1997. *Technical Justification for Regulating Construction Sites 1–5 Acres in Size.* Unpublished report submitted to U.S. EPA, Washington, DC). Smaller construction sites are less likely to have an effective plan to control erosion and sedimentation, are less likely to properly implement and maintain their plans, and are less likely to be inspected (Brown, W. and D. Caraco. 1997. *Controlling Storm Water Runoff Discharges from Small Construction Sites: A National Review.* Submitted to Office of Wastewater Management, U.S. EPA, Washington, DC., by the Center for Watershed Protection, Silver Spring, MD). The proportion of sediment that makes it from the construction site to surface waters is likely the same for larger and smaller construction sites in urban areas because the runoff from either site is usually delivered directly to the storm drain network, where there is no opportunity for the sediment to be filtered out.

To confirm its belief that sediment yields from small sites are as high as or higher than the 20 to 150 tons/acre/year measured from larger sites, EPA gave a grant to the Dane County, Wisconsin Land Conservation Department, in cooperation with the USGS, to evaluate sediment runoff from two small construction sites. The first was a 0.34 acre residential lot and the second was a 1.72 acre commercial office development. Runoff from the sites was channeled to a single discharge point for monitoring. Each site was monitored before, during, and after construction.

The Dane County study found that total solids concentrations from these small sites are similar to total solids concentrations from larger construction sites. Results show that for both of the study sites, total solids and suspended solids concentrations were significantly higher during construction than either before or after construction. For example, preconstruction total solids concentrations averaged 642 mg/L during the period when ryegrass was established, active construction total solids concentrations averaged 2,788 mg/L, and post-construction total solids concentrations averaged 132 mg/L (on a pollutant load basis, this equaled 7.4 lbs preconstruction, 35 lbs during construction, and 0.6 lbs post-construction for total solids). While this site was not properly stabilized before construction, after construction was complete and the site was stabilized, post-construction concentrations were more than 20 times less than during construction. The results were even more dramatic for the commercial site. The commercial site had one preconstruction event, which resulted in total solids concentrations of 138 mg/L, while active construction averaged more than 15,000 mg/L and post-construction averaged only 200 mg/L (on a pollutant load basis, this equaled 0.3 lbs preconstruction, 490 lbs during construction, and 13.4 lbs post-construction for total solids). The active construction period resulted in more than 75 times more sediment than either before or after construction (Owens, D.W., P. Jopke, D.W. Hall, J. Balousek and A. Roa. 1999. "Soil Erosion from Small Construction Sites." Draft USGS Fact Sheet. USGS and Dane County Land Conservation Department, WI). The total solids concentrations from these small sites in Wisconsin are similar to total solids concentrations from larger construction sites. For example, a study evaluating the effects of highway construction in West Virginia found that a small storm produced a sediment concentration of 7,520 mg/L (Downs and Appel, 1986).

One important aspect of small construction sites is the number of small sites relative to larger construction sites and total land area within the watershed. Brown and Caraco surveyed 219 local jurisdictions to assess erosion and sediment control (ESC) programs. Seventy respondents provided data on the number of ESC permits for construction sites smaller than 5 acres. In 27 cases (38 percent of the respondents), more than three-quarters of the permits were for sites smaller than 5 acres; in another 18 cases (26 percent), more than half of the permits were for sites smaller than 5 acres.

In addition, data on the total acreage disturbed by smaller construction sites have been collected recently in two States (MacDonald, 1997). The most recent and complete data set is the listing of the disturbed area for each of the 3,831 construction sites permitted in North Carolina for 1994–1995 and 1995–1996. Nearly 61 percent of the sites that were 1 acre or larger were between 1.0 and 4.9 acres in size. This proportion was consistent between years. Data showed that this range of sites accounted for 18 percent of the total area disturbed by construction. The values showed very little variation between the 2 years of data. The total disturbed area for all sites over this 2-year period was nearly 33,000 acres, or about 0.1 percent of the total area of North Carolina.

EPA estimates that construction sites disturbing greater than 5 acres disturb 2.1-million acres of land (78.1 percent of the total) while sites disturbing between 1 and 5 acres of land disturb 0.5-million acres of land (19.4 percent). The remaining sites on less than 1 acres of land disturb 0.07-million acres of land (only 2.5 percent of the total). Given the high erosion rates associated with most construction sites, small construction sites can be a significant source of water quality impairment, particularly in small watersheds that are undergoing rapid development. Exempting sites under 1 acre will exclude only about 2.5 percent of acreage from program coverage, but will exclude a far higher number of sites, approximately 25 percent.

Several studies have determined that the most effective construction runoff control programs rely on local plan review and field enforcement (Paterson, R. G. 1994. "Construction Practices: the Good, the Bad, and the Ugly." *Watershed Protection Techniques* 1(3)). In his review, Paterson suggests that, given the critical importance of field implementation of erosion and sediment control programs and the apparent shortcomings that exist, much more focus should be given to plan implementation.

Several commenters disputed the data presented in the proposed rule for storm water discharges from smaller construction sites. One commenter stated that EPA has not adequately explained the basis for permitting construction activity down to 1 disturbed acre. Another commenter stated that EPA did not present sufficient data on water quality impacts from construction sites disturbing less than 5 acres.

EPA believes that the data presented above sufficiently support nationwide designation of storm water discharges from construction activity disturbing more than 1 acre. Based on total disturbed land area within a watershed, the cumulative effects of numerous small construction sites can have impacts similar to those of larger sites in a particular area. In addition, waivers for storm water discharges from smaller construction activity will exclude sites not expected to impair water quality. EPA will continue to collect water quality data on construction site storm water runoff.

C. Statutory Background

In 1972, Congress enacted the CWA to prohibit the discharge of any pollutant to waters of the United States from a point source unless the discharge is authorized by an NPDES permit. Congress added CWA section 402(p) in 1987 to require implementation of a comprehensive program for addressing storm water discharges. Section 402(p)(1) required EPA or NPDES-authorized States or Tribes to issue NPDES permits for the following five classes of storm water discharges composed entirely of storm water ("storm water discharges") specifically listed under section 402(p)(2):

(A) a discharge subject to an NPDES permit before February 4, 1987

(B) a discharge associated with industrial activity

(C) a discharge from a municipal separate storm sewer system serving a population of 250,000 or more

(D) a discharge from a municipal separate storm sewer system serving a population of 100,000 or more but less than 250,000

(E) a discharge that an NPDES permitting authority determines to be contributing to a violation of a water quality standard or a significant contributor of pollutants to the waters of the United States.

Section 402(p)(3)(A) requires storm water discharges associated with industrial activity to meet all applicable provisions of section 402 and section 301 of the CWA, including technology-based requirements and any more stringent requirements necessary to meet water quality standards. Section 402(p)(3)(B) establishes NPDES permit standards for discharges from municipal separate storm sewer systems, or MS4s. NPDES permits for discharges from MS4s (1) may be issued on a system or jurisdiction-wide basis, (2) must include a requirement to effectively prohibit non-storm water discharges into the storm sewers, and (3) must require controls to reduce pollutant discharges to the maximum extent practicable, including best management practices, and other provisions as the Administrator or the States determine to be appropriate for the control of such pollutants. At this time, EPA determines that water quality-based controls, implemented through the iterative processes described today are appropriate for the control of such pollutants and will result in reasonable further progress towards attainment of water quality standards. See sections II.L and II.H.3 of the preamble.

In CWA section 402(p)(4), Congress established statutory deadlines for the initial steps in implementing the NPDES program for storm water discharges. This section required development of NPDES permit application regulations, submission of NPDES permit applications, issuance of NPDES permits for sources identified in section 402(p)(2), and compliance with NPDES permit conditions. In addition, this section required industrial facilities and large MS4s to submit NPDES permit applications for storm water discharges by February 4, 1990. Medium MS4s were to submit NPDES permit applications by February 4, 1992. EPA and authorized NPDES States were prohibited from requiring an NPDES permit for any other storm water discharges until October 1, 1994.

Section 402(p)(5) required EPA to conduct certain studies and submit a report to Congress. This requirement is discussed in the following section.

Section 402(p)(6) requires EPA, in consultation with States and local officials, to issue regulations for the designation of additional storm water discharges to be regulated to protect water quality. It also requires EPA to extend the existing storm water program to regulate newly designated sources. At a minimum, the extension must establish (1) priorities, (2) requirements for State storm water management programs, and (3) expeditious deadlines. Section 402(p)(6) specifies that the program may include performance standards, guidelines, guidance, and management practices and treatment requirements, as

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OCT 7 2000

Mr. John P. Cahill
Commissioner
New York State Department
of Environmental Conservation
50 Wolf Road
Albany, New York 12233-3500

Dear Mr. Cahill

On June 29, 2000, the New York State Department of Environmental Conservation (NYSDEC) submitted Phase II Total Maximum Daily Loads (TMDLs) for phosphorus for the nineteen (19) reservoirs, in the New York City water supply watershed, for review under Section 303(d) of the Clean Water Act (CWA). The nineteen New York City drinking water reservoirs have been listed as high priority waters on New York State's CWA Section 1994, 1996 and 1998 303(d) lists. These waters have been listed as "impaired", "stressed", or "threatened" and potentially not achieving an applicable water quality standard, specifically the narrative standard for nutrients at 6 NYCRR §703.2. The primary pollutant of concern is phosphorus.

EPA has reviewed the nineteen (19) Phase II TMDLs for phosphorus and has determined that they are consistent with CWA Section 303(d), and implementing regulations under 40 CFR §130.7 (1998), and are, therefore, approved. The Phase II TMDLs for phosphorus, which supercede the Phase I TMDLs approved by the U.S. Environmental Protection Agency (EPA) on April 2, 1997 and June 26, 2000, must be incorporated into the appropriate State Water Quality Management Plan. EPA's support document for this approval is enclosed.

The Phase II TMDLs submitted to EPA for review are the result of ongoing work, undertaken by the New York City Department of Environmental Protection (NYCDEP), through a workgroup comprised of the NYSDEC, the New York State Department of Health, and EPA. The development of Phase II TMDLs involved the reevaluation of the phosphorus guidance value and several enhancements in the water quality data and models. Based on the technical report and recommendations of the NYCDEP, the NYSDEC applied a phosphorus endpoint (i.e., water quality standards interpretation) of 15 $\mu g/L$ to all source water reservoirs in the Croton and Catskill-Delaware systems. These include four (4) of the twelve (12) reservoirs in the Croton system and three (3) of the seven (7) reservoirs in the Catskill-Delaware system.

Analyses conducted as part of the development of Phase II TMDLs indicate that nine (9) of the nineteen (19) reservoirs are water quality-limited and require reductions. For the majority of these reservoirs, further reductions are needed in nonpoint source loadings. Although it is not required under CWA Section 303(d) and implementing regulations, NYSDEC has provided an implementation plan to reduce nonpoint source loadings of phosphorus and achieve the load allocations. This plan, which will be further addressed in a separate letter, is based on the requirements under the New York City Watershed Memorandum of Agreement (MOA) and EPA's 1997 Filtration Avoidance Determination (FAD).

Ten (10) reservoirs are not water quality-limited and, therefore, do not require TMDL-driven reductions. However, regardless of the status of the reservoir, all nineteen Phase II TMDLs include waste load allocations which require significant load reductions for point sources consistent with the New York City Watershed Rules and Regulations. Furthermore, the ten reservoirs are subject to the requirements of the MOA and FAD which include numerous programs to reduce nonpoint source phosphorus loadings.

Under the FAD, NYCDEP is continuing to develop multi-tier water quality models which include terrestrial and reservoir (eutrophication) models. These models will be a valuable tool for reevaluating the Phase II TMDLs and phosphorus endpoint, and, where necessary, revising allocations. EPA recommends that NYSDEC, working collaboratively with NYCDEP, develop a workplan for the continued development of eutrophication models and their application to evaluating and revising, as necessary, TMDLs for phosphorus.

Sincerely,

Jeanne M. Fox
Regional Administrator

Enclosure

cc: R. Tramontano, NYSDOH
J. Miele, NYCDEP
W. Harding, WPPC

REVIEW of TMDLS for PHOSPHORUS for 19 NEW YORK CITY DRINKING WATER RESERVOIRS

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements of TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations. When the information listed below uses the verb "must", this denotes information that is required for EPA to review the elements of the TMDL required by the CWA and regulation.

I. Background Information: Description of Waterbody, Pollutant of Concern and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyl a and phosphorus loadings for excess algae.

Background Information

The TMDLs under review are Phase II TMDLs for phosphorus for all 19 New York City drinking water reservoirs. Phase I TMDLs for eight water quality-limited reservoirs were approved by EPA on April 2, 1997. Of the remaining 11 reservoirs, the model did not calibrate for the Amawalk Reservoir, therefore, a Phase I TMDL was neither developed nor submitted to EPA for this reservoir. Phase I TMDL analyses for the remaining ten reservoirs indicated that the critical loads were not exceeded. At that time, EPA took no action with regard to these ten Phase I TMDLs. EPA considered these ten TMDLs to be submitted by NYSDEC for informational purposes only, pursuant to CWA §303(d)(3).

The Phase I TMDLs were challenged as part of a lawsuit brought by the Natural Resources Defense Council against EPA (See NRDC v. Fox, 94 Civ. 8424 (PKL)(S.D. N.Y.)). On May 2, 2000, the district court granted EPA's motion to dismiss all but one remaining claim in the lawsuit. The Court's ruling upheld EPA's decision to approve the eight Phase I NYC drinking water reservoir TMDLs, deferring to the Agency's discretion regarding the interpretation of the various required elements of TMDLs. However, with regard to the ten Phase I TMDLs EPA had taken no action on, the Court found "that the Clean Water Act unambiguously requires agency action on any proposed TMDLs submitted for WQLSs included on a State's § 303(d) list." As a result of this ruling, the Court ordered EPA to approve or disapprove the TMDLs for the ten reservoirs that were not water quality limited. On June 26, 2000, EPA approved the TMDLs for the remaining ten reservoirs.

The Phase II TMDLs approved under this action will supercede all the Phase TMDLs previously approved by EPA on April 2, 1997 and June 26, 2000.

Highlights of Phase II TMDLs vs. Phase I TMDLs

The watershed model used in the Croton watershed has been revised to account for phosphorus retention by large lakes and ponds in the watershed (termed the "Nested Reckhow Model").
A more sophisticated watershed model, the Generalized Watershed Loading Function (GWLF) model has been applied to the Catskill-Delaware System. In Phase I, the Rechkow model was applied to the Croton and Catskill-Delaware Systems.
In Phase II, four consecutive years (1993-1996) have been modeled. This period contains both unusually wet conditions and drought conditions. In addition, this data set is more comprehensive due to increased sampling in the reservoirs and wastewater treatment plants. In Phase I, one year (1993) was modeled for all reservoirs.
The phosphorus endpoint has been set to 15 $\mu g/L$ for all source water reservoirs.

The Phase II TMDLs and the calculated existing loads are generally higher than the Phase I TMDLs and existing loads, particularly for the Catskill-Delaware System reservoirs. The New York State Department of Environmental Conservation (NYSDEC) explained the basis for these differences in its TMDL submittal (p.14) and response to comments. For the Croton reservoirs, the slightly higher loads are due to additional monitoring data used to refine the water budget and calculate the reservoir residence time. As explained in NYSDEC's submittal, higher outflow rates for the modeling period resulted in shorter residence times (more rapid flushing) and higher allowable phosphorus loads. The higher Phase II TMDL loads for the Catskill-Delaware reservoirs are related to differences in the nonpoint source model, GWLF, compared to the Reckhow Model. This difference is explained in NYCDEP's Phase II TMDL reservoir reports for the Catskill-Delaware reservoirs (Appendices A and B). While Reckhow predicts annual average loading rates, GWLF is precipitation-driven and, therefore, accounts for inter-annual variability in phosphorus loadings. The GWLF model predicts phosphorus loads to the reservoir during both baseflow and storm conditions. The storm-driven phosphorus loads in GWLF include a large particulate fraction. Much of the particulate fraction settles out in the reservoir and is generally not available for algal growth. The Vollenweider model, used to calculate the critical load to meet the applicable phosphorus endpoint, was adjusted to account for the large particulate load. Therefore, in the Catskill-Delaware System, both the TMDL and the existing load are proportionately higher than in Phase I because of the particulate phosphorus load. Although the TMDLs are higher, they are calculated to meet the applicable phosphorus endpoint of either 15 or 20 μg/L. For both the Croton and Catskill-Delaware Systems, the reductions required in nonpoint sources under Phase II TMDLs are similar to or greater than those required under Phase I.

Listing Status

The 1994, 1996, and 1998 NYSDEC 303(d) listing status for all the reservoirs is as follows:

use impaired: water supply
severity of use impairment: stressed or threatened
pollutant: nutrients (phosphorus)
priority ranking for TMDL development: high

The following reservoirs within the Croton and Catskill-Delaware System are listed:

Reservoirs in the Croton River System

1. Boyd's Corner Reservoir
2. West Branch Reservoir*
3. Cross River Reservoir
4. Titicus Reservoir
5. Bog Brook Reservoir
6. Middle Branch Reservoir
7. Croton Falls Reservoir
8. East Branch Reservoir
9. Diverting Reservoir
10. Muscoot Reservoir
11. New Croton Reservoir
12. Amawalk Reservoir

Reservoirs in the Catskill-Delaware River System

13. Neversink Reservoir
14. Pepacton Reservoir
15. Roundout Reservoir
16. Cannonsville Reservoir
17. Schoharie Reservoir
18. Ashokan Reservoir
19. Kensico Reservoir

* The West Branch Reservoir is in the Croton System, but the major source of its water supply is from the Delaware Aqueduct, with minor and approximately equal amounts from its own watershed and Boyds Corner Reservoir.

Land use and background information for each watershed are provided in the individual reports prepared by the New York City Department of Environmental Conservation (NYCDEP, 1999).

II. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

The 19 reservoirs in the New York City Watershed are classified by NYSDEC as either Class AA or Class A. One of the best uses of the Class AA waters is as a source of unfiltered water supply for drinking. One of the best uses of the Class A waters is as a source of filtered water supply for drinking.

The Phase II TMDLs have been developed for the pollutant of concern, phosphorus. In Phase I, the TMDLs were based upon the NYSDEC guidance value of 20 μg/L. This guidance value, which is based on aesthetic effects for primary and secondary contact recreation, represents NYSDEC's interpretation of its narrative criterion for phosphorus found at 6 NYCRR §703.2. The guidance value of 20 μg/L corresponds to a mesotrophic status. This value represents a transition between a eutrophic to a mesotrophic lake or reservoir. Achieving the 20 μg/L should reduce in-reservoir impacts associated with eutrophication, which will improve the quality of the reservoirs and the drinking water supply.

As part of the Phase II TMDL development, EPA recommended that the phosphorus guidance value be reevalutated with respect to the drinking water uses of the reservoir. The EPA, NYSDEC, and NYCDEP agreed to work together to evaluate reservoir-specific phosphorus values for the reservoirs. Initially, the workgroup focused on developing a link between ambient phosphorus concentrations; algal growth and trihalomethane (THM) formation potential. The workgroup was unable to develop a quantitative relationship between phosphorus concentrations and THM formation which could be used to develop a THM-based phosphorus criterion. Subsequently, the workgroup investigated the relationship between phosphorus and chlorophyll a levels and other water quality variables (e.g., incidence of algal blooms, incidences of blue-green algae, color, odor, THM precursors) that negatively impact the quality of drinking water. Based on evaluation of all water quality data for the reservoirs and using a weight-of-evidence approach, NYCDEP made a recommendation to apply a phosphorus value of 15 μg/L to the source water reservoirs. NYCDEP defines source water reservoirs as "those bodies of water which are capable of receiving surface runoff, and are located just prior to initial disinfection." Seven of the nineteen reservoirs are considered source water reservoirs. They include: Kensico, Rondout, Ashokan and West Branch Reservoirs in the Catskill-Delaware System; and the New Croton, Croton Falls, and Cross River Reservoirs in the Croton System. The supporting information for the development of the phosphorus value is contained in *Development of a Water Quality Guidance Value for Phase II Total Maximum Daily Loads (TMDLs) in the New York City Reservoirs* (including cover letter, NYCDEP, March 1999) and in NYSDEC's TMDL submittal. The remaining twelve reservoirs are not a direct source of drinking water. As described in the State's submittal, data and analyses are not available to establish an adequate link between upstream water quality and water quality in downstream reservoirs. This link may be established using mechanistic models which would consider many factors such as distance to downstream reservoirs, phosphorus uptake, settling, algal die-off, etc. Accordingly, the State has determined that the phosphorus guidance value of 20 μg/L will be used as the basis of Phase II TMDLs for the twelve upstream reservoirs.

With regard to the State's antidegradation policy, EPA notes that NYSDEC adopted a September 9, 1985 State antidegradation policy and implementation procedures, as set forth in a Organization and Delegation Memorandum 85-40, which was approved by EPA on September 30, 1985. Consistent with the federally-approved policy and procedures, the State should carefully examine any action which would result in an increase in phosphorus loadings. Such an action should only be allowed if it met the stringent requirements of the antidegradation review.

III. Ambient Data and Pollutant Sources

Ambient data and pollutant sources are identified for each reservoir in the individual TMDL reservoir reports prepared by NYCDEP (1999). The TMDL reservoir reports provide a summary of data on land use, point source phosphorus loadings, nonpoint source phosphorus loading from each land use category (e.g., urban, septic, forest, etc.) within the reservoir watershed, the reservoir hydraulic characteristics, and ambient phosphorus concentrations during the growing season for the period 1992-1996. The NYCDEP maintains a comprehensive monitoring program for the reservoirs. Five (New Croton, Kensico, West Branch, Rondout, and Ashokan) of the seven terminal reservoirs are monitored semi-monthly and the remaining reservoirs are monitored monthly. Each reservoir is sampled at the dam, mid-lake and at any major inflows or aqueducts. Samples are taken from at least two depths (photic and hypolimnetic) at each site.

Land use data was derived from classification of Landstat TM scenes. Land uses within each watershed were generalized into four categories: agriculture/open space, urban, forest and water. If data were available, the agricultural land use category was further broken down into subcategories (e.g., corn).

IV. TMDL Development

A. Model Development/Loading Capacity

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 CFR § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 CFR § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

The Phase II TMDLs analyses have been conducted by NYCDEP through a workgroup comprised of NYSDEC, the New York State Department of Health (NYSDOH) and EPA. A complete description of the methodology used in developing the TMDLs is contained in *Methodology for Calculating Phase II Total Maximum Daily Loads (TMDLs) of Phosphorus for New York City Drinking Water Reservoirs* (NYCDEP, March 1999).

The Phase II TMDLs are developed to address phosphorus. In lakes and reservoirs, phosphorus is typically the limiting nutrient. Excess inputs of phosphorus result in eutrophication, which is mainly associated with algal blooms and low dissolved oxygen levels in the hypolimnion, taste, odor and color problems. By reducing the input of phosphorus, the impacts associated with eutrophication are reduced and the water quality standards are attained.

The development of Phase II TMDLs includes the following steps:

1. Determining the Current Phosphorus Load: The current phosphorus load is calculated

using NYCDEP monitoring data for reservoir phosphorus concentrations and the Vollenweider equation. The Vollenweider equation relates phosphorus concentrations to phosphorus loads by incorporating areal phosphorus load, mean depth, residence time and surface area. The equation provides a mass balance of phosphorus which reflects the mass of phosphorus stored in the lake as a result of inputs and losses due to flushing and sedimentation. The current annual phosphorus load is calculated for each year (1992-1996) by taking the geometric mean of all available phosphorus concentration data for the growing season (May through October) and using the Vollenweider equation. The annual phosphorus loads are averaged over the five-year period to reduce the effects of varying hydrology.

2. Determining the Critical Phosphorus Load: The critical phosphorus load is the load that is predicted to result in an in-reservoir concentration equal to the applicable ambient phosphorus endpoint of 15 μg/L or 20 μg/L, applied to the growing season. The critical load is calculated on an annual basis and averaged over the time period 1992-1996.

3. Determining The Reservoir Status: To determine whether the reservoir is water quality limited, the current and critical phosphorus loads are compared. If the current load exceeds the critical load, the reservoir is water quality-limited and reductions are needed to meet the applicable phosphorus endpoint.

4. Modeling Point and Nonpoint Sources of Phosphorus: The total phosphorus load entering a reservoir is the sum of the point source loads, nonpoint source loads and upstream reservoir loads. NYCDEP conducts sampling for all point source discharges. Wastewater treatment plants owned by NYC are sampled weekly and non-City plants are sampled bimonthly. Annual wastewater treatment plant phosphorus loads are calculated using monitored phosphorus concentrations (flow-weighted) and observed flows. Upstream reservoirs are treated as point sources to downstream reservoirs (no losses of phosphorus along connecting tributaries).

For the East-of-Hudson reservoirs, the Reckhow Land Use Model (also used for Phase I TMDLs) was used to estimate the load of phosphorus entering the reservoir from each land use category. The model utilizes export coefficients to determine the average annual loads from a particular type of land use within each reservoir's watershed and includes the phosphorus load delivered during both baseflow and storm events. The modeling approach incorporates phosphorus retention in drainage basins with upstream sub-basins containing large water bodies (i.e., lakes > 40 ha). Watershed phosphorus loads to the lake are calculated separately using Reckhow. Fifty percent (50%) of this load is assumed to be carried to the receiving reservoir. This assumption is based upon phosphorus bioavailability and phosphorus cycling studies conducted in the Cannonsville Reservoir (*Phosphorus Availability and P-Cycling in Cannonsville Reservoir, Lake and Reservoir Management, 1998).* The NYCDEP terms this approach a "Nested Reckhow Model." The Reckhow Model has been successfully applied (adequately calibrated) to the NYC reservoirs using different data sets in 1992, 1996 for Phase I TMDLs, and in 1999 for the Phase II TMDLs.

For the West-of-Hudson reservoirs, the time variable watershed model Generalized

Watershed Loading Function (GWLF) was used. This model was applied to the Catskill-Delaware System as part of the more comprehensive modeling/monitoring effort being conducted under the Filtration Avoidance Determination (FAD). The GWLF model consists of a hydrodynamic and water quality component and is driven by observed data on precipitation and air temperature. The input variables include: precipitation, air temperature, land use, soil type, topography, and point source phosphorus loads. The GWLF model predicts both spatial and temporal (seasonal) variability.

The models (Reckhow and GWLF) were compared to reservoir monitoring data to determine whether the reservoir is adequately modeled (i.e. calibrated). The criteria for determining whether each reservoir is adequately modeled are summarized in NYCDEP's methodology document (1999). Application of the criteria indicates that all reservoirs have been adequately calibrated.

5. <u>Determining the TMDL</u>: The TMDL = ΣWLA + Σ LA + MOS. The TMDL is set to the critical load for the basin which will result in meeting the applicable phosphorus endpoint. WLAs for point sources are calculated assuming the effluent standards given in the NYC Watershed Rules and Regulations (January 1997) and the maximum permitted flow in the SPDES permit. An overall LA for all nonpoint sources is determined as follows: Σ LA = TMDL-MOS-ΣWLA. The difference between the critical load and the current load yields the total load reduction required or the load still available in the basin.

Using the above approach, nine reservoirs exceed the critical load and, therefore, require load reductions. Ten reservoirs do not exceed their critical load and therefore, no further reductions are needed. Table 1 shows the existing load, the phosphorus endpoint used as the basis for the TMDLs, the resulting TMDLs/WLA/LAs, and the margin of safety (MOS) for each reservoir. Reservoirs that are shaded are water quality limited and require reductions; unshaded reservoirs are not water quality limited and do not require TMDL driven reductions. However, TMDLs in downstream reservoirs may drive further reductions in upstream waterbodies regardless of their status. Further discussion on each TMDL component (WLA, LA, MOS) is provided under the next subsections.

The TMDLs are established in units of kg/yr (averaged over the growing season), but can be converted to lbs/day by multiplying kg/yr by 0.006. The use of annual loads, versus daily loads, is the accepted method for expressing nutrient loads in reservoirs and lakes. This is supported by EPA guidance such as *The Lake Restoration Guidance Manual* (EPA 440/4-90-006, p.71, 74) and *Technical Guidance Manual for Performing Waste Load Allocations, Book IV, Lakes and Impoundments, Chapter 2 Eutrophication* (EPA 440/4-84-019, p. 3-8). It is also consistent with the regulatory TMDL definition under 40 CFR § 130.2 (i), which states "...TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure." Because reservoirs store phosphorus in the water column and sediment, water quality responses are related to the total nutrient loading that occurs over the year or growing season. For this reason, water and phosphorus budgets for reservoirs and lakes are generally calculated on an annual or seasonal basis.

The *critical condition* for developing TMDLs for phosphorus in these reservoirs occurs during the growing season. Therefore, the TMDL is based on the geometric mean of phosphorus during the growing season when conditions are optimum for algal growth.

a. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

The summed WLAs for existing point sources are shown in Table 1. In the TMDL submittal, the NYSDEC provided the individual WLAs for each point source discharging to the reservoir.

Regardless of the reservoir status (i.e., water quality-limited vs. not water quality-limited), the WLAs are calculated based on the reductions that will be achieved through the NYC Watershed Rules and Regulations which establish effluent limits for point sources. The effluent limits are based on the permitted (design) flow of the facility:

SPDES Permitted Total Flow (GPD)	Total Phosphorus Effluent Limit (mg/L)
≤50,000	1.0
>50,000 and < 500,000	0.5
≥500,000	0.2

Certain reservoirs (e.g. Titicus) do not have any point source dischargers and, therefore, the WLA is zero.

b. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 CFR § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments. Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

The load allocations in Table 1 represent aggregate loads including upstream reservoir loads and nonpoint sources (e.g. urban and agricultural runoff). The individual reservoir reports (Table 4.2 of each report; NYCDEP, 1999) identify estimated loads from each land use category (e.g. urban, forest) and upstream reservoirs. Similarly, the NYSDEC TMDL submittal identifies the upstream loads where they are a significant load to the total reservoir load.

c. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between effluent limitations and water quality. CWA 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set-aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set-aside for the MOS must be identified.

The TMDLs rely on both implicit and explicit approaches for the MOS. The explicit MOS ranges from 10 to 20%. A baseline MOS of 10% is applied to account for general uncertainty. An additional factor was added to reflect phosphorus variability in each reservoir. The formula for calculating the additional MOS is provided in the Phase II methodology (p. 27-28; NYCDEP, 1999). In addition, NYSDEC's TMDL submittal (p. 15) identified several conservative assumptions which comprise the implicit MOS, including:

Use of maximum permitted flow vs. actual flow for sewage treatment plants (the maximum permitted flow is higher than the actual flow currently being discharged).

The assumption that phosphorus loads from upstream reservoirs are treated as point sources with no net loss of phosphorus as the water travels to downstream reservoirs. This is a conservative assumption, because as a general matter, a portion of the phosphorus is particulate and settles out to the sediment as it travels to the downstream reservoir.

The TMDL calculations are based on total phosphorus. This is a conservative calculation because only a portion (generally dissolved or soluble reactive phosphorus) is available for algal growth.

EPA concludes that the State used a reasonable approach to determine the margin of safety.

d. <u>Seasonal Variation</u>
The statute and regulations require that a TMDL be established with seasonal variations. The method chosen for including seasonal variations in the TMDL must be described. CWA 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1).

The Phase II TMDLs are based on the Vollenweider equation, a steady-state equation which calculates annual nutrient loadings on a seasonal basis (growing season of May through October). The TMDLs are based on the geometric mean of phosphorus during the growing season, when phosphorus levels are most closely related to algal levels. The phosphorus endpoint (15 or 20 μg/L) is applied as a growing season average.

This analysis is consistent with EPA guidance (EPA 440/4-90-006, p. 71, 73), specifically, "Eutrophication models are geared to predicting average water quality conditions over a growing season or year" (p.73). The documents also state that since lakes store nutrients in their water columns and bottom sediments, water quality responses are related to the total nutrient loading that occurs over a year or growing season. Therefore, the TMDLs adequately considered seasonal variation.

In conclusion, EPA's review of the phosphorus TMDLs indicates that the State, using available data and existing models, has established TMDLs at a level necessary to achieve water quality standards.

V. <u>Monitoring Plan for TMDLs Developed Under the Phased Approach</u>

EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources *and the point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA's guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.*

NYCDEP maintains a comprehensive monitoring program. The basic monitoring program is described in the individual TMDL reservoir reports (NYCDEP, 1999). Surveys are conducted on a monthly basis for all reservoirs during the growing season and semi-monthly for the terminal reservoirs (Rondout, Ashokan, Kensico, West Branch and New Croton) as well as the West-of-Hudson reservoirs. At each station, water samples are withdrawn from multiple depths. In addition to the routine monitoring program, NYCDEP also conducts additional intensive sampling to support the development of multi-tier water quality models.

VI. Implementation Plan

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

The NYSDEC has provided an implementation plan identifying mechanisms for reducing phosphorus loads from point and nonpoint sources. The implementation plan is not a required element for TMDLs, but it is included in the following sections to inform readers.

Point Sources

As described under the WLA section, all point source discharges, in both the Catskill-Delaware and Croton systems, will be required to meet effluent limits established under the NYC Watershed Rules and Regulations. Under these regulations (Section 18-36), all wastewater treatment plants in the watershed must provide phosphorus removal using the best treatment technology to meet the revised phosphorus limits by May 2002. The Cannonsville Reservoir, the only water quality-limited reservoir in the Catskill-Delaware system, is expected to comply with the TMDL once all the wastewater treatment plants discharging to the reservoir are upgraded.

Nonpoint Sources

NYSDEC has developed a Statewide Nonpoint Source Management Program (March 2000) and a Coastal Nonpoint Source Management Program that provide for the control of nonpoint sources statewide.

The Watershed Memorandum of Agreement (MOA) provides specific programs that will improve water quality in the Catskill-Delaware system. Examples of these initiatives include: sewer extensions, septic system rehabilitation and replacements, storm water retrofits, stream corridor protection, future storm water controls, alternate septic systems design, forestry management, etc.

Most (eight out of nine) reservoirs that are water quality-limited and require TMDL-driven reductions are in the Croton system. Several of the water quality-limited reservoirs in the Croton system have significant phosphorus loadings from urban land use areas. NYSDEC will utilize the Phase II Storm Water Regulations to designate portions of the Croton system as "urbanized areas" under the Rule (represents approximately 20% of the land area). This designation triggers the implementation of a storm water management program in the designated urbanized area, including the implementation of BMPs for controlling storm water runoff. NYC has provided funding to Putman and Westchester Counties ($1 M each) for watershed planning to identify pollution sources and recommend measures to improve Croton water quality. Under the East-of-Hudson Water Quality Investment Program, New York City has provided $68 million to Westchester and Putnam Counties in support programs which may include design, construction and installation of projects such as rehabilitation or replacement of subsurface sewage treatment systems, community septic systems and related infrastructure, storm water best management practices, and stream bank stabilization. NYCDEP is also developing a Croton Watershed Strategy to address non-point source pollution.

In addition to the above programs, under the MOA and FAD, within six months of EPA's approval of the Phase II TMDLs, NYSDEC (with input from NYCDEP) will submit a report that identifies appropriate potential management practices for controlling nonpoint source pollution in the watershed. Six months later, NYSDEC (with input from NYCDEP) will submit a second report which will identify potential nonpoint source management practices it will implement and recommend potential nonpoint source management practices to be implemented by other parties.

Through a separate letter to NYSDEC, EPA has made specific recommendations regarding the reports and programs, mentioned above, that are currently being developed by a number of watershed stakeholders.

Six of the water quality-limited basins in the Croton system receive significant loads from upstream waterbodies. NYSDEC has identified reductions in non-point sources of phosphorus in upstream basins as possible management options to achieve necessary load reductions in downstream water quality-limited basins.

EPA anticipates that the TMDL process will continue beyond the Phase II TMDLs. The MOA states that "after Phase II NYSDEC and NYCDEP will continue to monitor and regularly assess phosphorus load allocations for each reservoir basin. As additional data become available, where appropriate and on a reasonable schedule, NYSDEC, NYCDEP and USEPA, together, will refine modeling efforts, adjust loading estimates and where necessary revise wasteload and load allocations."

Under, the FAD, NYCDEP is currently committed to completing reservoir and terrestrial models in the west-of-Hudson reservoirs. In support of similar modeling capabilities in the east-of-Hudson reservoirs, EPA and NYSDEC will continue to provide funding to NYCDEP, as available, through the Safe Drinking Water Act grant for enhanced monitoring. Under this grant, NYCDEP has funded hydrothermal model development for the East-of-Hudson reservoirs and eutrophication model development for the Cross River reservoir. In addition, NYCDEP will evaluate available terrestrial models for application to the Croton system. NYCDEP will be compiling, evaluating and computerizing critical daily hydrologic data to develop water budgets for the Croton reservoirs. These data provide the basis for TMDL modeling.

EPA encourages NYSDEC and NYCDEP to work cooperatively to continue to develop multi-tier water quality models for all NYC reservoirs. These models could be used for reevaluating Phase II TMDLs and, where necessary, developing Phase III TMDLs.

VII. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in Section VI, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

As described in the previous section, NYSDEC has provided an implementation plan to assure that the required load reductions will be met. The implementation plan relies on a variety of programs to address point and nonpoint sources. Under the NYC Rules and Regulations, all point sources will be required to upgrade their level of treatment for phosphorus by 2002. Under the MOA and FAD, NYSDEC must submit two reports to EPA which will provide the basis for identifying and implementing the necessary nonpoint source reductions need to achieve the load allocations. NYCDEP and watershed counties are also developing programs that will identify non-point sources of pollution and will propose measures to address them. NYCDEP will continue to monitor the reservoirs to assess changes in water quality and develop multi-tier water quality models. These data will also support reevaluation of Phase II TMDLs and where necessary, revise load allocations.

Therefore, based upon the implementation plan described in Section VI, the reasonable assurance requirement has been met.

VIII. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State must therefore provide for public participation consistent with its own public participation requirements. In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State's public participation process, including a summary of significant comments and the State's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA shall publish a notice seeking public comment. 40 C.F.R. § 130.7(d)(2).

Inadequate public participation is not a basis for disapproving a TMDL; however, where EPA determines that a State has not provided adequate public participation, EPA may defer its approval action until adequate public participation has occurred, either by the State or by EPA.

The availability of the proposed Phase II TMDLs was noticed in the State Environmental Notice Bulletin dated November 17, 1999. Four public meetings were held on December 9, 1999 in Stamford, NY, December 16, 1999 and February 4, 2000 in White Plains, NY and on December 13, 1999 in New York City. The comment period was then extended to February 18, 2000. The State's submittal notes that comments were accepted through April 2000. NYSDEC prepared a response to comment document, "Response to Public Comments on NYSDEC"s Phase II Phosphorus TMDL Proposed for New York City's Water Supply Watershed (July 2000).

The State provided adequate public participation and responded to all comments.

IX. Submittal Letter

A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under CWA Section 303(d) for EPA review and approval. This clearly establishes the State's intent to submit, and EPA's duty to review, the TMDL under the statute.

NYSDEC provided a submittal letter, dated June 29, 2000, indicating that the Phase II TMDLs for all 19 NYC drinking water reservoirs were being submitted to EPA for review under CWA Section 303(d).

References

1. Methodology for Calculating Phase I Total Maximum Daily Load (TMDLs) of Phosphorus for New York City Drinking Water Reservoirs, June 1996, Division of Drinking Water Quality Control, NYCDEP.

2. Methodology for Calculating Phase II Total Maximum Daily Load (TMDLs) of Phosphorus for New York City Drinking Water Reservoirs, March 1999, Division of Drinking Water Quality Control, NYCDEP

3. Development of a Water Quality Guidance Value for Phase II Total Maximum Daily Loads (TMDLs) in the New York City Reservoirs (including cover letter, NYCDEP, March 1999).

4. Proposed Phase II Phosphorus TMDL Calculations for Amawalk Reservoir and similar reports for Bog Brook, Boyd's Corner, Cross River, Croton Falls, Diverting, East Branch, Middle Branch, Muscoot, New Croton, Titicus, West Branch, Cannonsville, Ashokan, Schoharie, Neversink, Pepacton, Roundout, and Kensico Reservoirs, March 1999, DDWQC, NYCDEP,

5. Notice of Availability of the New York City watershed Phase II Total Maximum Daily Loads/Waste Load Allocations/Load Allocations (TMDL/WLA/LA) for Phosphorus in the Croton and Catskill-Delaware Systems, State Environmental Notice Bulletin, November 17, 1999, NYSDEC.

6. NYSDEC TMDL Submittal for Phase II Phosphorus TMDLs, *Phase II Phosphorus Total Maximum Daily Loads for Reservoirs in the New York City Water Supply Watershed (Delaware, Schoharie, Sullivan, Ulster, Putnam and Westchester Counties)*, dated June 2000, received by EPA on June 29, 2000, including public comment response document.

7. New York City Watershed Memorandum of Agreement, January 21, 1997.

8. New York City Watershed Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water supply and its Sources. Approved by NYCDEP January 17, 1997 and approved by NYSDOH January 21, 1997.

9. New York City Filtration Avoidance Determination, May 5, 1997.

10. Lake and Reservoir Restoration Guidance Manual, Second Edition, EPA-440/4-90-006

12. Technical Guidance Manual for Performing Waste Load Allocations, Book IV Lakes and Impoundments, Chapter 2 Eutrophication, EPA-440/4-84-019.

13. Guidance for Water Quality-based Decisions: The TMDL Process, EPA 440/4-91-001

14. Cannonsville Modeling, Filtration Avoidance Deliverable 303(c), December 1996, prepared by Upstate Freshwater Institute (Effler, Doerr, and Gelda) for NYCDEP.

15. Application of the Generalized Watershed Loading Function (GLWF) Model to the Cannonsville Watershed, Filtration Avoidance Deliverable 303(c), December 16, 1996, DDWQC, Watershed Modeling Section, NYCDEP.

16. EPA approval letter and support document for Phase I TMDLs, April 2, 1997 and June 26, 2000.

17. EPA's administrative record for Phase I TMDLs.

18. New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs) - Memorandum from Robert Perciasepe, EPA Assistant Administrator for Water (Aug. 8, 1997).

19. Phosphorus Availability and P-Cycling in Cannonsville Reservoir, Lake and Reservoir Management, North American Lake Management Society, Volume 14, No.2-3,1998.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
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NEW YORK, NY 10007-1866

OCT 1 5 2000

Mr. John P. Cahill
Commissioner
New York State Department
of Environmental Conservation
50 Wolf Road
Albany, New York 12233-3500

Dear Mr. Cahill:

Today EPA approved NYSDEC's submittal of Phase II Total Maximum Daily Loads (TMDLs) for phosphorus for the 19 reservoirs serving the New York City water supply. Reducing the nutrient load from point and non-point sources of pollution is an integral part of our efforts to protect the drinking water supply for nine million New Yorkers. For that reason, the New York City Watershed Memorandum of Agreement (MOA) and EPA's Filtration Avoidance Determination (FAD) for the Catskill/Delaware system, developed pursuant to the Safe Drinking Water Act, include commitments for the development of TMDLs and nutrient reduction strategies.

As we discussed last fall, and as detailed in the MOA and the FAD, NYSDEC will work with the New York City Department of Environmental Protection (NYCDEP) to develop two reports which will outline the strategy for achieving the load allocation of the TMDLs within the watershed. The first report, to be submitted six months after EPA approval of Phase II TMDLs, will identify "potential non-point source management practices based on the types of land use in the relevant basin and any other basin-specific conditions." Six months after completion of this report, NYSDEC will submit a second report identifying non-point source management practices it will implement and recommending management practices to be implemented by other agencies. We note also the ongoing development of the following programs: Westchester and Putnam Counties are each producing a "Comprehensive Croton System Water Quality Protection Plan" (Croton Plan), Delaware County is producing a "Comprehensive Strategy" and NYCDEP is producing a "Croton Watershed Strategy." An important element of each is to identify specific existing water quality problem areas and specific sources of pollution, and to propose measures to address them. EPA recommends that NYSDEC and EPA work with the City and other watershed stakeholders to ensure that, through these combined efforts, necessary load reductions are made to achieve water quality standards.

The development and subsequent implementation of a comprehensive, non-point source reduction program, which will be carried out by a number of stakeholders, are crucial elements of a multi-barrier approach to protecting the New York City water supply. Therefore, it is important that the program for achieving load reductions be as specific as possible so watershed stakeholders will understand the impacts of the TMDL program and be in a better position to participate in its implementation. To that end, and to ensure the timely achievement of water quality standards, EPA recommends that NYSDEC and EPA work together with NYCDEP and the watershed counties, such that the reports and programs currently being developed contain the following components:

- for each upstream waterbody, quantification of additional load reductions (including reductions from point sources, non-point sources and a margin of safety) above those required to meet the TMDL for that waterbody, that will result in achieving standards in downstream reservoirs (see Attachment A);
- identification of management practices specific to the land use areas within each basin that may be implemented to meet the more stringent of either the TMDL for that waterbody or the reduced load necessary to achieve downstream standards;
- a list of municipalities, and other storm sewer systems, by basin, that should be designated under the Phase II Stormwater Rule;
- for each reservoir, management practices that will be implemented to achieve standards in that waterbody and achieve standards in downstream reservoirs;
- a description of the implementation mechanism;
- the time frame for implementing the actions;
- funding sources for implementation; and
- a plan for evaluating/monitoring the effectiveness of the management practices.

Each step in the development and implementation of this strategy, from the first NYSDEC report to the locally-directed plans, should provide greater and greater detail. The success of this program will require the concerted effort of all watershed parties. We look forward to working with NYSDEC to initiate meetings with watershed stakeholders within the next three months to clarify responsibilities and timeframes for ensuring that the above components are developed.

I appreciate the efforts you and your staff have made in developing Phase II TMDLs for the New York City watershed. I look forward to working with you as the TMDL program moves forward, and as we continue our efforts to protect this vital resource.

Sincerely,

Jeanne M. Fox
Regional Administrator

Enclosure

cc: R. Tramontano, NYSDOH
J. Miele, NYCDEP
W. Harding, WPPC

Attachment A

Six of the water quality-limited basins in the Croton system receive significant loads from upstream waterbodies. In addition to in-basin nonpoint source reductions, NYSDEC has identified reductions in nonpoint sources of phosphorus in upstream basins as possible management options to achieve necessary load reductions in water quality-limited basins. In upstream water quality-limited basins, additional reductions beyond those needed to achieve their TMDLs may be needed to meet the necessary load reductions in downstream basins. Upstream basins that meet water quality standards may also require nonpoint source reductions for downstream reservoirs to achieve TMDLs.

Water Quality-Limited Reservoir	**Required NPS Reduction (kg/yr)**	**Upstream Basins Potentially Requiring Additional Reductions to Meet Downstream TMDL**
New Croton	1356	Muscoot
Muscoot	2058	Cross River•
		Amawalk
		Titicus
		Croton Falls
Croton Falls	885	Middle Branch
		Diverting
		West Branch•
Middle Branch	204	Lake Carmel
Diverting	983	Bog Brook•
		East Branch
East Branch	993	Putnam Lake•
		Peach Lake

• Not currently water-quality limited.