6. Long-Term Watershed Protection Program

6.1 Introduction

With this submission, the City of New York requests that the United States Environmental Protection Agency approve the New York City Department of Environmental Protection's (DEP's) application for an extension of the Filtration Avoidance Determination for the City's Catskill and Delaware water supply systems.

New York City's Watershed Protection Program for the Catskill/Delaware Systems

In the early 1990s, DEP embarked on an aggressive program to protect and enhance the quality of New York City's drinking water. In 1989, the federal Surface Water Treatment Rule (SWTR) was promulgated requiring filtration of all surface water supplies. The SWTR provided for a waiver of the filtration requirement if the water supplier could meet certain objective and subjective criteria. The City was able to demonstrate that the Catskill/Delaware supply easily met the objective criteria, including (1) the source water met the turbidity and fecal coliform standards of the SWTR, (2) there were no source-related violations of the Coliform Rule and (3) there were no waterborne disease outbreaks in the City. The subjective criteria of the SWTR required the City to demonstrate through ownership or agreements with landowners that it could control human activities in the watershed which might have an adverse impact on the microbiological quality of the source water. Meeting this standard presented a challenge as, at that time, only 27% of the lands in the Catskill/Delaware watershed was in public ownership (New York State owned 20%, within the Catskill Preserve, and New York City 7%).

To demonstrate a basis for a filtration waiver, DEP advanced a program to assess and address water quality threats in the Catskill/Delaware system. This program has provided the basis for a series of waivers from the filtration requirements of the SWTR (January 1993; December 1993; January 1997; May 1997). As outlined in the SWTR, issues of concern fall into several categories: coliform bacteria, enteric viruses, *Giardia sp.*, *Cryptosporidium sp.*, turbidity, disinfection by-products, and watershed control. DEP has developed comprehensive programs to address each of these.

Assessing the Potential Threats to the Water Supply

Over the last decade, the City has made great progress in assessing the potential sources of water contamination and has designed and implemented programs to address these sources. As part of DEP's source water monitoring program, samples are collected and tests are conducted throughout the watershed – including sites at aqueducts, reservoirs, streams, and watershed wastewater treatment plants. Each year, DEP collects more than 35,000 samples from 300 sites and performs more than 300,000 laboratory analyses. Modifications of the source water monitoring program began in the early 1980s, based on the recognition that a comprehensive water quality monitoring program was integral to the City's efforts to protect its source water. The expanded

program, modeled after the studies performed at the Hubbard Brook Experimental Watershed, is based on the principle that water quality assessments of lakes and reservoirs are best approached from a watershed/regional perspective. DEP expanded its data collection to include more extensive reservoir surveys and flow-based tributary surveillance. The City's current monitoring program addresses four major needs: security, operations, regulatory compliance and specialized research. The monitoring program's fundamental goals are to help manage the system to provide the best possible water, to develop a database through which water quality trends can be identified, and to identify water quality conditions of concern to focus watershed management efforts. Findings of the source water monitoring program have served as the scientific basis for the City watershed protection program.

Designing a Comprehensive Watershed Protection Program

Based upon the information collected as part of its monitoring and research efforts, DEP designed a comprehensive watershed protection strategy which focused on implementing both protective (antidegradation) and remedial (specific actions taken to reduce pollution generation from identified sources) initiatives. DEP's assessment efforts pointed to several key potential sources of pollutants: waterfowl on the reservoirs; wastewater treatment plants discharging into watershed streams; failing septic systems; the approximately 350 farms located throughout the watershed; and stormwater runoff. DEP has crafted a protection strategy to target those primary pollution sources and a host of secondary ones. DEP has advanced many protective programs as well.

Implementing the Watershed Protection Program & Achievements to Date

In January 1997, the New York City Watershed Memorandum of Agreement (MOA) was signed, ushering in a new era of watershed protection and partnership with numerous watershed stakeholders. The MOA signatories include the City, the State, EPA, watershed counties, towns, and villages and certain environmental and public interest groups. This unique coalition has come together with the dual goals of protecting water quality for generations to come and protecting the economic interests of watershed communities. The MOA establishes the institutional framework and relationships needed to implement the range of protection programs identified as necessary by the City, the State and EPA.

DEP and its partners have concentrated on the implementation of several key watershed protection initiatives: the Watershed Agricultural Program; the acquisition of watershed lands; the enforcement of improved Watershed Regulations; and the initiation and expansion of environmental and economic partnership programs that target specific sources of pollution in the watershed. In addition, the City continued its enhanced watershed protection efforts in the Kensico reservoir basin and advanced the upgrades of City-owned and non-City owned watershed wastewater treatment plants. Key watershed protection program highlights are listed below:

- **Watershed Agricultural Program** – In the early 1990s, the City proposed extensive regulation of farms within the watershed. The farming community expressed concern that further regulation would drive farms out of business, leaving farmlands vacant and available for development. Recognizing the mutual benefits of a healthy, environmentally conscious farming community, the City teamed with upstate partners to develop the voluntary Watershed Agricultural Program. Working through the Watershed Agricultural Council, the City funds development of farm plans and implementation of structural and non-structural best management practices. To date, more than 90% of watershed farms have signed up to participate in the program. In addition, the City has augmented the program with the addition of a City/federal cost-sharing effort known as the Conservation Reserve Enhancement Program (CREP). CREP pays farmers to take sensitive riparian buffer lands, adjacent to waterbodies, out of active farm use and re-establish a vegetative buffer.
- **Land Acquisition** – The program is just shy of completing its fifth year and to date the City has solicited owners of more than 244,903 acres of Catskill and Delaware land in high priority purchase locations. To date, DEP has more than 33,700 acres either acquired or under purchase contract.
- **Watershed Regulations** – On May 1, 1997, enhanced Watershed Rules and Regulations became effective, replacing regulations that had been in place since 1953. Since the new regulations became effective, DEP staff has reviewed thousands of applications for projects that proposed one or more regulated activities, requiring numerous changes to proposed developments to better protect water quality.
- **Environmental and Economic Partnership Programs** – As of October 2001, New York City has made more than $272 million in payments to support a variety of partnership programs in accordance with the terms of the MOA. The City, in conjunction with its partners, has continued to implement programs that remediated more than 1,300 failing septic systems, upgraded 30 facilities that store winter road de-icing materials, and constructed stormwater BMPs in areas with previously uncontrolled stormwater runoff.
- **Wastewater Treatment Plant (WWTP) Upgrades** – There are 34 non-City-owned WWTPs in the Catskill/Delaware watershed, that account for 60% of the WWTP flow in the west of Hudson watershed. All WWTP owners in the Catskill/Delaware watershed have signed agreements to participate in the program and have obtained DEP approval of their proposed upgrade compliance schedules. Upgrade designs are proceeding quickly and construction has begun at the four largest WOH facilities. Approximately 83% of non-City-owned Catskill/Delaware WWTP flow will be upgraded by mid-2002. In addition, DEP has completed the upgrades of six City-owned wastewater treatment facilities that account for 40% of the WWTP flow in the west of Hudson watershed, at a cost of more than $240 million.
- **Protection of Kensico Reservoir** – The City has implemented a variety of programs to ensure protection of Kensico Reservoir. Construction of best management practices designed to reduce pollutants conveyed to the reservoir by stormwater run-off is nearly complete. The City completed preventative dredging of sediments from the areas in front of Delaware Aqueduct Shaft 18 and the Catskill Upper Effluent Chamber (CUEC). A turbidity curtain is maintained to protect the CUEC, waterfowl harassment continues to be exceptionally effective in maintaining low levels of fecal coliform bacteria, and the Kensico Environmental Enhance-

ment Program (KEEP) maintains an educational link with the community focused on pollution prevention. In addition, the City has teamed up with the Town of North Castle and a number of corporations in the Kensico basin to form the Kensico Watershed Improvement Committee (KWIC). Under KWIC, the corporate landowners in the basin will undertake a range of voluntary measures to protect water quality, including minimizing use of pesticides and road de-icing materials, controlling stormwater runoff, and managing grounds to discourage roosting by geese and other birds.

The Quality of Catskill/Delaware Water

Overall, the City's Catskill/Delaware system continues to demonstrate a very high level of water quality. Kensico Reservoir, the source water for the Catskill/Delaware system, consistently meets the turbidity and fecal coliform bacteria criteria required by the SWTR. Protozoan pathogens (*Cryptosporidium* and *Giardia*) are found only at the minimum levels typical of pristine undisturbed watersheds. All Catskill and Delaware reservoirs support cold water fisheries; this is a biological indication of their high quality.

Nonetheless, there remain some areas of concern that DEP continues to address. Due to the nature of the underlying geology, the Catskill system periodically experiences elevated levels of turbidity in streams and reservoirs. High turbidity levels are mostly associated with high flow events, which mobilize the streambeds and suspend the glacial clays that underlie the streambed armor. The Catskill system was designed with the local geology in mind, and provides for settling within Schoharie, Ashokan West Basin, Ashokan East Basin and the upper reaches of Kensico Reservoir. Under normal circumstances this extended detention time in the reservoirs is sufficient to allow turbidity to settle out, and the system easily meets turbidity standards at the Kensico effluents. From time to time, however, the City has had to use chemical treatment to control high turbidities. Additionally, Cannonsville Reservoir is notable for late summer blooms of blue-green algae due to elevated nutrient levels. These nutrients originate from agricultural land use and wastewater treatment plants. DEP has programs in place to address these potential pollutants and expects to see significant improvements as they are fully implemented.

DEP's Long Term Program

Volume One of this report provides a detailed account of the accomplishments of DEP's watershed protection program and a rigorous, science-based assessment of current water quality and the effectiveness of certain aspects of that program. Based on that assessment and the knowledge gained by the City in a decade of watershed protection, DEP has developed an enhanced, comprehensive long-term program that forms the basis for its application for a continued filtration waiver. That program is described in detail in the pages that follow. There are several aspects of that program which deserve special emphasis:

The proposed program represents the City's continued commitment to long-term watershed protection. The programs that DEP is proposing to advance represent core elements of the City's watershed protection effort. The City expects that, so long as the

Catskill/Delaware system remains unfiltered, these core programs will remain in place. Most of the milestones presented here for these core programs extend out for 5-7 years. The City intends to continue to review and refine these programs, with input from the primacy agency and other watershed stakeholders. It is possible that, based on those reviews, some programs will be modified or phased out if they are no longer needed. Nonetheless, the City regards the overall program it is proposing as representing a long-term commitment to watershed protection and water quality.

Support from and cooperation with the City's watershed partners is key to the successful implementation of the City's program. Perhaps the greatest achievement of the past decade of watershed protection has been the development of vital, locally-based organizations working with the City on the common goal of watershed protection. Initially, the City was reluctant to cede responsibility for program implementation to others. But the success of organizations like the Catskill Watershed Corporation, the Watershed Agricultural Council, the county Soil and Water Conservation Districts, and others at developing and overseeing programs has led the City to recognize that long-term watershed protection will be achieved through such partnerships. Continued cooperation with our implementation partners is an integral part of our long-term vision for protecting the water supply.

The program proposed here represents a significant enhancement to watershed protection. Through this proposal, DEP is committing significant new resources to the continuation and expansion of key programs. Among the key commitments are continued funding for septic rehabilitation and establishment of a new fund to support proper operation and maintenance of septic systems; additional funding to address communities 6 and 7 in the New Infrastructure Program (NIP); establishment of a new program through CWC to provide wastewater solutions for certain smaller, lower priority communities from the NIP; continued financial support for the CWC Stormwater Retrofit Program, and new funding for CWC and county staff throughout the watershed to identify and prioritize community stormwater needs; extension of the successful Watershed Agricultural Program and broadening its reach to smaller farms and farms in the Croton watershed; substantial new resources to expand the Stream Management Program to develop plans and construct demonstration projects throughout the watershed; a commitment to evaluate non-point sources of pollution in the east of Hudson Catskill/Delaware basins and develop and implement certain non-point source controls; and a schedule for design and construction of enhanced UV disinfection for the Catskill/Delaware supply to eliminate the threat of pathogens. Taken together, these and other enhanced programs comprise a comprehensive watershed protection effort that is second to none.

It is important to note that no protection program for the City's water supply, no matter how carefully crafted, can succeed without support and involvement of the City's partners and watershed stakeholders. These include EPA, the New York State Departments of Health and Environmental Conservation, CWC, WAC, the SWCDs, the watershed counties and towns, environmental groups and other interested parties. To ensure that interested parties have adequate information upon which to evaluate the overall program, and to provide input for improvements,

DEP is committed to a schedule of regular reporting on programs and water quality. Included is a new annual report, produced each July, which will summarize water quality, assess trends and provide analysis of water quality data and program implementation at a basin scale. In addition, the City will provide a periodic, comprehensive review of City data and programs that will provide the scientific basis for making program refinements over time. Section 6.11 outlines DEP's reporting commitments.

On the following pages are program-by-program write-ups that provide brief summaries and detailed milestone commitments for the next phase of the City's long-term program. DEP has divided the Five Year Plan into a number of major sections including SWTR Objective Compliance; Environmental Infrastructure; Protection and Remediation Programs; Watershed Monitoring and Modeling; Regulatory Programs; Filtration Planning and Enhanced Disinfection; In-City Programs; Administration; Education and Outreach; and Reporting. For several program areas – stream management, septic systems, wetlands, modeling and education and outreach – the City has prepared longer, more detailed program plans. Those plans are provided here as appendices. However, those plans contain important details and commitments by the City that are integral to the overall program. This document and its appendices should be read together for a better understanding of the full range of the City's long-term watershed protection plan.

6.2 SWTR Objective Compliance

Under the SWTR, in order to qualify for a waiver from the filtration requirement, a water supplier must meet certain objective water quality criteria. The SWTR requires compliance with certain source water criteria (coliforms and turbidity levels) and disinfection criteria (inactivation requirements, maintenance of chlorine residual, disinfection system redundancy and other requirements). In addition, a supplier must meet the Total Coliform Rule (TCR) and the Disinfectant and Disinfection By-products Rule (D/DBPR). As discussed in section 4.3 of this report, the City has consistently met all SWTR standards.

The City will continue to sample in accordance with applicable rules to demonstrate compliance with the objective criteria. The City will report sampling results monthly, with the exception of trihalomethane results, which are reported quarterly, and cross connection reports that are submitted semi-annually.

Distribution system chlorine residual monitoring results are reported monthly. DEP will continue to monitor chlorine residual results and will inform EPA if appropriate residual levels are not maintained throughout the system and what DEP is doing to remediate the situation.

FAD Milestone	*Due Date*
Continue to meet SWTR Objective Criteria – Provide monthly reports on raw water fecal coliform concentrations, raw water turbidity, raw water disinfection CT values, operational status of Kensico and Hillview disinfection facilities, entry point chlorine residuals, distribution system disinfection residuals and distribution system coliform monitoring	Monthly
Submit reports on trihalomethane monitoring results	Quarterly

6.3 Environmental Infrastructure

DEP will continue supporting core environmental infrastructure programs throughout the Catskill/Delaware watershed during the next five years.

As is detailed in Volume One, since the 1997 MOA/FAD, DEP worked closely with CWC and local communities at developing and implementing core environmental infrastructure programs in the WOH watershed, including septic systems, wastewater treatment plants and storm-water controls. These core environmental infrastructure areas together address some of the most significant anthropogenic sources of pollution in the watershed. Control of the pollution sources in these areas means creation and management of infrastructure systems. DEP's continuing support of these programs fosters tangible on- and in-the-ground results offering long-term pollution prevention.

6.3.1 Septic Programs

Due to the relatively low density of development in the West of Hudson watershed, septic systems are the primary means of sanitary treatment/disposal. There are approximately 22,000 residential septic systems throughout the watershed. Because many of these systems are older and were not designed and installed in accordance with current regulations, and/or are situated on small parcels with poor soils, they are prone to failure, posing a water quality threat.

Pollutant concentrations found in raw sewage are reduced as settling and biological activity occur in septic tanks and is further treated in the soil absorption system. Properly functioning septic systems reduce the following pollutants of concern: biological oxygen demand, phosphorus, nitrogen, suspended solids, fecal coliform, bacteria, *giardia lambia* and viruses.

As was detailed in Volume One, the 1997 MOA established the Septic Rehabilitation and Replacement Program. The objective of the Program was to facilitate identification and remediation of failed or likely to fail septic systems having a high potential to contaminate the City's drinking water supply. DEP committed $13.6 million in 1997 to the Septic Rehabilitation and Replacement Program. More than 1,300 septic systems have been replaced or repaired under the Program to date.

Much was learned by DEP and CWC through implementation of the Program between 1997 and 2001, as is detailed in Volume One. Beyond the 1,300 systems replaced or repaired under the Program, a significant unknown number of additional failing or likely to fail systems exist. In 2001, DEP prepared a document that details the City's strategy for addressing failing septics in the Catskill/Delaware watershed. That strategy is attached as Appendix G. In summary, in the next five years, DEP is committed to funding two major initiatives: a continuation of the basic Septic Rehabilitation and Replacement Program, with appropriate adjustments; and a new initiative to support proper septic maintenance throughout the watershed. Further, DEP will continue its ongoing efforts to complete design and construction of sewer extensions at five City-owned WWTPs to pick up certain priority areas with failing or likely to fail septics. In addition, DEP will implement certain programs to address septics in EOH Catskill/Delaware basins. Finally, DEP will also use its regulatory powers to oversee design and construction of new septics and remediation of failed septics that are not covered by these other septic programs.

Planned Activities/2002-2007 Milestones

For the term of the Five Year Plan, DEP is prepared to fund additional activity in the basic Septic Rehabilitation and Replacement Program. Generally, CWC and DEP will continue the approach of focusing on priority areas embodied in CWC's current (2A) program rules. Some minor program rule adjustments may be made to refine the prioritization methodology. The funding level will essentially allow CWC to advance the Program to address the historical maximum physical capacity for area system installers, approximately 300 systems per year. DEP will work with CWC to make adjustments in the program to ensure that a maximum number of systems get addressed.

Current funding in the Program contract continues through April 2002, and will be sufficient to keep the Program operational through summer 2002. DEP will work with CWC staff to execute a contract modification to its current Septic Rehabilitation and Reimbursement Program within six months of issuance of a 2002 FAD.

DEP is also committed to establishing with CWC a Septic Maintenance Program. Proper maintenance of septic systems extends the functioning life and effectiveness of septic systems. The single most important maintenance action that can be taken to facilitate proper functioning of septic systems is regular pumpouts of systems. DEP will work with CWC to develop a pumpout program with appropriate incentives. The Septic Maintenance Program will seek to include plans for addressing maintenance of: a) septics already remediated under CWC programs, b) new septics to be remediated by CWC going forward, and c) certain other septics not remediated under past programs and not needing remediation under future programs. DEP will also work with CWC to develop and disseminate appropriate maintenance education materials to foster proper maintenance and participation in the Program. DEP will work with CWC staff to prepare a contract and scope of services for a Septic Maintenance Program for execution by December 31, 2002.

East of Hudson, DEP will complete a house-to-house septic survey that is already underway in the Kensico basin (see section 6.4.8 for more details). In addition, DEP will initiate a house-to-house septic survey in the West Branch and Boyds Corner basins. Details on that effort can be found in the 2001 Septic Program Plan, which is Appendix G to this document.

As was detailed in Volume One and in Appendix G, one of the five communities (Town of Hunter/Tannersville WWTP) eligible to participate in the Sewer Extension Program has entered into a contract with DEP for design and construction of the proposed extensions. DEP had expected that the other four communities (Neversink, Roxbury, Shandaken and Middletown/Margaretville) would have signed by the writing of this report, but they have not. In early December 2001, DEP established an April 1, 2002 cutoff date by which time the four communities must enter into agreements with DEP in the Sewer Extension Program or forfeit their priority status. Due to the fact that a variety of contracting scenarios are contemplated (some communities will manage design and construction contracts, others will rely on DEP), a uniform set of design and construction milestones for the four outstanding communities is not practicable. When each community signs the contract, DEP will notify EPA of the milestones for that community. If communities drop out of the Sewer Extension Program, funds associated with proposed extensions will be available for reallocation to the next highest ranked unfunded extensions in the remaining communities on the priority list. Further, in the event that communities have not entered contracts with DEP in the Sewer Extension Program by June 30, 2002, properties in designated Sewer Extension areas in those communities will be eligible for participation under the Septic Remediation and Replacement Program, consistent with the program rules governing that program. Failing systems in such communities will also be subject to and fall under the City's enforcement of the Watershed Rules & Regulations.

Septic failures that are identified outside of the identified priority areas and that will not be addressed through the CWC program, the New Infrastructure Program, or the Sewer Extension Program will be subject to enforcement action by the City, or other measures as appropriate.

FAD Milestone	***Due Date***
Continue funding for CWC Septic Rehabilitation Program at a level to address approximately 300 septic systems per year	Ongoing through 2007
Execute contract changes with CWC for Septic Rehabilitation Program	6 months of issuance of new FAD
Develop WOH Septic Maintenance Program with CWC – execute contract with CWC	12/31/02
Continue implementation of Sewer Extension Program – notify EPA as each community executes a contract (or opts out) and provide implementation milestones	Ongoing

6.3.2 New Infrastructure Program

Most of the development in the West of Hudson watershed is at density levels that do not require the development of centralized wastewater management infrastructure or wastewater treatment plants. For this reason, most communities rely on septic systems. But for some communities with concentrated development, centralized wastewater treatment plants may be the right solution for sanitary treatment and disposal. The New Sewage Treatment Infrastructure Program focused on these communities.

Volume One of this document details the development of the 1997 MOA New Sewage Treatment Infrastructure Program. The objective of the Program was to facilitate the decommissioning of failing and likely to fail septic systems in identified older hamlets and villages by funding the development of new state-of-the-art WWTPs to be constructed in conformance with the Watershed Regulations or through the funding of septic maintenance districts to the extent allowed by DEP's funding commitment of $75 million. Through September 2001, five communities, Hunter, Fleischmanns, Windham, Andes and Roxbury, signed contract amendments to proceed with design and construction of wastewater treatment facilities. The Program also funded complete studies of proposed wastewater solutions for Phoenicia and Prattsville, communities listed 6 and 7. Finally, through the Program, preliminary studies of wastewater needs and potential remedies at each of the so-called "8-22 Communities" (communities prioritized 8-22 in the MOA) were completed. Remaining Program funds are not sufficient to design and construct projects at communities 6 & 7 (Phoenicia and Prattsville), nor to advance projects in any of communities 8-22 beyond the preliminary study phase.

Planned Activities/2002-2007 Milestones

Below is a schedule for completion of design and construction for New Infrastructure Communities 1-5. The 2001 Septic Program Plan describes the City's plan if one or more of these communities opt out of the Program after completion of the design phase.

Table 6.1. Schedule for completion of design and construction for New Infrastructure Communities 1-5.

Municipality	Design/Construction Amendment Execution Date	Design Complete	Construction Bids Complete	Functional Completion
Roxbury	3/28/2001	3/28/2002	9/30/2002	9/30/2004
Andes	3/28/2001	3/28/2002	9/30/2002	9/30/2004
Windham	5/31/2001	5/31/2002	11/30/2002	11/30/2004
Fleischmanns	8/14/2001	8/14/2002	2/14/2003	2/14/2005
Hunter	9/24/2001	9/24/2002	3/24/2003	3/24/2005

Phoenicia and Prattsville

In the next five years, DEP is committed to funding wastewater treatment plant projects in Phoenicia and Prattsville. DEP will work with the New York State Environmental Facilities Corporation (DEP's agent in the Program) staff and with representatives of Phoenicia (Town of Shandaken) and Prattsville to prepare contract amendments to Phoenicia's and Prattsville's existing contracts for execution within 4 months of execution of the 2002 FAD. Per timeframes established in the Program, Phoenicia and Prattsville would proceed under the following milestones:

Milestone	**Target Timeframe**
FAD Renewal	April 2002
Design/Construction Amendment Execution	August 2002
Design Complete	August 2003
Construction Bids Complete	February 2004
Functional Completion	February 2006

FAD Milestone	***Due Date***
Continue implementation of New Infrastructure Program for Communities 1-5 in accordance with schedule provided	Ongoing
Implement New Infrastructure Program for Communities 6&7 (Phoenicia and Prattsville) in accordance with the schedule provided	Ongoing

Note: The milestones relate to actions to be taken by the communities, rather than DEP.

6.3.3 Community Wastewater Management Program

In the Five Year Plan, DEP is committed to work with CWC to develop a Community Wastewater Management Program, whose intent will be to implement creative wastewater solutions, such as the development of septic maintenance districts and/or community or cluster septic systems, in priority communities among the original so-called 8-22 communities.

Potential solutions to two of those communities have already been identified. Septic systems serving properties in Haines Falls are to be decommissioned because sewers from the City's Tannersville WWTP will be extended to serve them (see section 2.5.4 on the Sewer Extension Program and Section 6.3.1 on Septic Programs for additional detail). Bovina Center has secured grants through CWC to create a septic maintenance district.

Thirteen communities therefore, as listed below, remain from the MOA's original list. As was noted in Volume One, EFC's "8-22" Study identified potential management technology solutions taking into account site-specific conditions at each of these communities. The study generally identified the likely need for a combination of cluster systems and individual septic system remediations. Both can be handled under a septic maintenance district.

Community Wastewater Management Program Potentially Eligible Communities

1. Bloomville, Kortright (Delaware)
2. Boiceville, Olive (Ulster)
3. Hamden, Hamden (Delaware)
4. Delancy, Hamden (Delaware)
5. Ashland, Ashland (Greene)
6. Trout Creek, Tompkins (Delaware)
7. Lexington, Lexington (Greene)
8. S. Kortright, Stamford (Delaware)
9. Shandaken, Shandaken (Ulster)
10. Conesville, Conesville (Schoharie)
11. Claryville, Denning/Neversink (Ulster/Sullivan)
12. Halcotsville, Middletown (Delaware)
13. New Kingston, Middletown (Delaware)

DEP will enter into a new contract with the Catskill Watershed Corporation to implement septic maintenance districts in a number of priority communities if they elect to participate in the program, generally prioritized in accordance with the above ranking.

A block grant funding model will be used in these communities. In addition to the cost associated with implementing a septic maintenance district, the block grant amount will also include a set amount for capitalization of ongoing operations and maintenance activities. Program details will be developed in conjunction with CWC. DEP anticipates that the block grant funding will enable the establishment of districts in five communities.

Planned Activities/2002-2007 Milestones

DEP proposes, subject to coordination with CWC, the following timeframes for implementing the Community Wastewater Management Program. DEP will enter into an agreement with the Catskill Watershed Corporation to administer and implement the Community Wastewater Management Program within 7 months of the execution of the 2002 Filtration Avoidance Determination. Within 3 months of entering into an agreement with DEP to administer the Program, CWC, in consultation with DEP, will adopt program rules. Within 3 months of the adoption of program rules, CWC will solicit identified communities of their interest in participating in the program. Based upon the responses, within 3 months CWC will authorize what DEP anticipates will be five projects, or as many as funding allows and will execute contracts with communities to commence the projects. Within three months, participating communities will hire consultants to study and design proposed solutions. A study and design period of 1 year will follow execution of project agreements. Following design and a 6-month bid solicitation period, will be a 2-year period to implement septic maintenance district or other appropriate remedies.

Milestone	Target Timeframe
FAD Renewal	April 2002
Execute Contract with CWC	November 2002
CWC to Adopt Program Rules	February 2003
CWC to Solicit Community Interest	May 2003
CWC Executes Implementation Contracts	August 2003
Community Hires Consultant	November 2003
Community Study/Design Complete	November 2004
Construction Complete	November 2006

Properties located in the above-listed communities, which are not funded for development of septic maintenance districts, and/or community or cluster septic systems will continue to be eligible for participation in the Septic Program consistent with CWC Septic Program rules. DEP will coordinate with CWC on properties in communities that participate in the Community Wastewater Management Program to optimize management of systems. If a community signs on to the Community Wastewater Management Program and then subsequently opts out, the Septic Program would be applied to qualifying properties consistent with CWC Septic Program rules. DEP will work with CWC to identify sources of secondary gap capital funding as part of its efforts under the Community Wastewater Management Program, to support potential grant shortfalls in Bovina (previously listed # 12 in the New Infrastructure Program's list of 8-22.)

FAD Milestone	*Due Date*
Implement Community Wastewater Management Program in accordance with the schedule provided	Ongoing

Note: Most of the milestones relate to actions to be undertaken by the communities rather than DEP.

6.3.4 WWTP Upgrade Program

Pursuant to the MOA, the City agreed to fund two programs aimed at upgrading wastewater treatment plants in the City's watershed.

The first program, known as the Regulatory Upgrade Program, is intended to fund the costs of designing, permitting, constructing and installing all Regulatory Upgrades required at non-City owned WWTPs in operation or permitted and under construction as of November 2, 1995, in both the East of Hudson and West of Hudson watersheds. In general, Regulatory Upgrades mean equipment and methods of operation that are required solely because of the WR&Rs, and not because of any provision of federal or State law, regulation or enforceable standard otherwise applicable to a WWTP and/or certain equipment and methods of operation which are enumerated in Paragraph 141(c) of the MOA. Pursuant to this Program, the City will also be

paying for the incremental annual costs of operating and maintaining such Regulatory Upgrades, subject to certain terms and conditions set out in an agreement with the WWTP governing operation and maintenance of Regulatory Upgrades.

Treatment technologies to be installed under the Regulatory Upgrade Program include, without limitation, the following items if required at a WWTP: phosphorus removal, sand filtration, back-up power, back-up disinfection, microfiltration (or DEP-approved equivalent), flow metering and alarm telemetering.

The second program, known as the SPDES Upgrade Program, is intended to assist existing WWTPs in the West of Hudson watershed by providing certain funds to rehabilitate, replace or upgrade equipment that is unreliable, failing or nearing the end of its useful and is necessary to the treatment process, where such measures are not required solely by the WR&Rs, and where such measures will allow the WWTPs to reliably meet the conditions of their respective State SPDES permits. A total of $4.6 million was allocated to fund SPDES Upgrades pursuant to this Program. These funds can only be used to pay for work commenced after November 2, 1995. A separate segment of the SPDES Upgrade Program dedicates an additional $400,000 towards new work to correct infiltration and inflow (I&I) problems at existing WWTPs in the West of Hudson watershed.

DEP, with the assistance of EFC, administers both the Regulatory Upgrade Program and the SPDES Upgrade Program. Together, these constitute the City's WWTP Upgrade Program in the watershed.

Planned Activities/2002-2007 Milestones

DEP will complete the Regulatory Upgrades per the following schedule.

Table 6.2. Schedule of Regulatory Upgrades.

WWTP	FLOW MGD	FAD MILESTONE				
		PUP Approval	FUP Approval	Construction Start Up	Functional Completion	DEP's Auth. Startup & Perform Testing***
Mountainside Dairy Farms*	0.0498	3rd Qt '01	3rd Qt '01	4th Qt '01	2nd Qt '02	
Hunter Highlands*	0.040	3rd Qt '01	3rd Qt '01	4th Qt '01	2nd Qt '02	
Village of Delhi (includes Ultra Dairy flow)*	0.715	3rd Qt '01	3rd Qt '01	3rd Qt '01	2nd Qt '02	

Table 6.2. Schedule of Regulatory Upgrades.

WWTP	FLOW MGD	FAD MILESTONE				
		PUP Approval	FUP Approval	Construction Start Up	Functional Completion	DEP's Auth. Startup & Perform Testing***
Village of Hobart*	0.1600	3rd Qt '01	3rd Qt '01	3rd Qt '01	2nd Qt '02	
Village of Stamford*	0.5000	3rd Qt '01	3rd Qt '01	3rd Qt '01	2nd Qt '02	
Village of Walton*	1.1700	2nd Qt '01	3rd Qt '01	3rd Qt '01	2nd Qt '02	
Allen Residential	0.020	4th Qt '01	4th Qt '01	4th Qt '01	2nd Qt '02	
Harriman Lodge	0.020	1st Qt'02	1st Qt'02	2nd Qt'02	3rd Qt'02	
Camp Nubar	0.0125	2nd Qt'02	2nd Qt '02	3rd Qt '02	4th Qt '02	
SEVA Institute (see Note 1)	0.0078	1st Qt'02	3rd Qt'02	3rd Qt' 02	4th Qt '02	
Latvian Church Camp	0.007	1st Qt '02	2nd Qt'02	3rd Qt'02	4th Qt '02	
Liftside	0.081	1st Qt '02	2nd Qt'02	2nd Qt'02	4th Qt '02	
Roxbury Run Village	0.035	4th Qt '01	1st Qt'02	2nd Qt'02	4th Qt '02	
Clear Pool Camp	0.020	1st Qt'02	2nd Qt'02	2nd Qt '02	1st Qt '03	
Mountainside Inn	0.0031	2nd Qt '02	3rd Qt '02	3rd Qt' 02	1st Qt '03	
Olive Woods (Rotron)	0.0128	1st Qt '02	2nd Qt '02	3rd Qt '02	1st Qt'03	
Golden Acres Farm	0.0092	2nd Qt '02	2nd Qt '02	3rd Qt' 02	2nd Qt '03	
Onteora Central Schools	0.027	1st Qt'02	2nd Qt'02	3rd Qt'02	2nd Qt '03	
Ron De Voo Restaurant	0.0010	2nd Qt '02	2nd Qt '02	3rd Qt '02	2nd Qt '03	
Whistle Tree	0.0125	2nd Qt '02	3rd Qt '02	4th Qt '02	2nd Qt '03	
Camp L'man Achai (a.k.a. Tai Chi Camp)	0.0075	3rd Qt '02	3rd Qt '02	4th Qt '02	3rd Qt '03	
Camp Timberlake	0.034	3rd Qt '02	3rd Qt '02	4th Qt '02	3rd Qt '03	
Delaware BOCES (see Note 2)	0.0025	2nd Qt '02	3rd Qt '02	3rd Qt '02	3rd Qt '03	
Elka Park	0.010	3rd Qt '02	4th Qt '02	2nd Qt '03	4th Qt '03	

Table 6.2. Schedule of Regulatory Upgrades.

WWTP	FLOW MGD	FAD MILESTONE				
		PUP Approval	FUP Approval	Construction Start Up	Functional Completion	DEP's Auth. Startup & Perform Testing***
Mountain View Est. 1	0.007	3rd Qt '02	4th Qt '02	2nd Qt '03	4th Qt '03	
Mountain View Est. 2	0.006	3rd Qt '02	4th Qt '02	2nd Qt '03	4th Qt '03	
Camp Loyaltown**	0.021	NA	NA	NA	NA	
Colonel's Chair Estates**	0.030	NA	NA	NA	NA	
Forester Motor Lodge**	0.0039	NA	NA	NA	NA	
Frog House**	0.0018	NA	NA	NA	NA	
Regis Hotel**	0.0096	NA	NA	NA	NA	
Snow Time, Inc.**	0.120	NA	NA	NA	NA	
The Thompson House**	0.0048	NA	NA	NA	NA	

Total Flow Catskill/Delaware system:	3.1618 mgd
Projected Upgrade Program Total Flow Functionally Complete by end of 2nd Qtr. 2002:	2.6348 mgd
Projected Upgrade Program % Flow Functionally Complete by end of 2nd Qtr. 2002:	83.3%

* WWTPs committed by DEP to be upgraded by 2nd Qtr. 2002 (as part of DEP's request for relief from certain FAD requirements relating to Catskill/Delaware filtration design).

** WWTPs to be tied into New Infrastructure Program (NIP) WWTPs.

*** DEP's authorization to begin startup and performance testing will be within 45 days of Functional Completion. It is possible that some for some seasonal facilities, construction may be completed during the off season; in those cases authorization to begin startup will be with 45 days of Functional Completion, or at the start of the next seasonal operations, whichever is later.

Note 1: Schedule assumes hold and haul. Completion date will be six months earlier if DEC approves design prior to approving full upgrade design. If a surface or sub-surface discharging WWTP is constructed PUP approval will be 2nd quarter 2002, FUP approval and construction start up will be 3rd quarter 2002, and functional completion will be 2nd quarter 2003.

Note 2: Schedule assumes construction of a sub-surface discharging WWTP. If a surface discharging WWTP is constructed PUP approval and FUP approval will be 2nd quarter 2002, construction start up will be 2nd quarter 2003, and functional completion will be 4th quarter 2003.

Owners of seven WWTPs have opted not to upgrade their facilities. Instead, they will decommission their plants and divert the wastewater flow to new WWTPs being constructed as part of the New Infrastructure Program (NIP). Under the NIP schedule, new WWTPs will be coming on line and ready to accept flow in late 2004 and early 2005. (see section 6.3.2 of this document for more information on the NIP). Tie-in of these seven facilities will be completed by the "Functional Completion" date listed under the NIP schedule in section 6.3.2.

DEP is committed to providing interim enhanced ultraviolet (UV) disinfection at six of the seven existing WWTPs that will be tied into New Infrastructure Program WWTPs. The seventh facility, Frog House, is a sub-surface discharging WWTP and not a candidate for enhanced disinfection. DEP will provide a copy of the study of the feasibility of implementing enhanced disinfection to EPA, DEC and DOH by December 31, 2001. A scope of work describing the enhanced disinfection has been developed and circulated to the engineering firms for the six WWTPs. UV disinfection will be implemented at those facilities on the following schedule:

FAD Milestone	***Due Date***
Initial Meeting With WWTP Owner	1st Quarter 2002
Amendment to EFC – Owner Agreement Signed	2nd Quarter 2002
Submission Of Design For Interim UV System	3rd Quarter 2002
Approval of Design for Interim UV System	4th Quarter 2002
Functional Completion	2nd Quarter 2003

This schedule applies to the following WWTPs: Snow-Time, Colonel Chair Estates, Camp Loyaltown, Regis Hotel, Thompson House, Forester Motor Lodge.

New WWTPs

DEP has identified 10 additional small, subsurface discharging wastewater treatment plants WOH that were not included in the initial round of the upgrade program. DEP will complete upgrades of those facilities in accordance with the attached schedule. Note that two of the facilities, Palace Hotel and Windham Mountain Village, may fall into the defined service areas of the New Infrastructure Program WWTPs. Those facilities will not be upgraded; instead their wastewater flow will be incorporated into the New Infrastructure Program WWTPs.

FAD Milestone	*Due Date*
Initial Meeting With WWTP Owner	1st Quarter 2002
EFC – Owner Agreement (Upgrade Contract) Signed	3rd Quarter 2002*
Approved Engineering Contract	2nd Quarter 2003
Approved Facility Plan (Proceeded by Approved Project Approach Letter)	4th Quarter 2003
Approval of PUP	2nd Quarter 2004
Completion and Approval of FUP	2nd Quarter 2004
Functional Completion**	1st Quarter 2005

* An additional six months may be required for some Owners to negotiate the agreement.

** DEP's authorization to begin startup and performance testing will be within 45 days of Functional Completion.

This schedule applies to the following WWTPs: Batavia Kill Recreational Area, Bread Alone, Cortina Valley Ski, KJ Western Playground, Latvian American Disabled Veterans, Palace Hotel, Sportsman's Diner, White Birches Campsite, Windham Mountain Village and Windham Ridge Club.

Note: Originally twelve facilities were identified as possible candidates for the WWTP Upgrade Program. However two of these, Antonia's Diamond Horseshoe Ranch and Four Seasons Restaurant, were found not to be WWTPs under the definition set out in the Watershed Rules and Regulations and therefore are not part of the Program. Additionally, two of the facilities listed above, Palace Hotel and Windham Mountain Village are currently candidates for connection to New Sewage Treatment Infrastructure Program WWTPs and may be removed from this list.

Reporting

At the end of each month, DEP will provide reports on WOH WWTP Upgrades. As part of the reports that fall on the quarterly cycle (January 31, April 30, July 31, October 31), DEP will provide discussion of any modification of the Upgrade schedules and detail corrective actions that are needed.

FAD Milestone	*Due Date*
Reports on WOH WWTP Upgrades, Installation of UV at six NIP Tie-in Facilities, and Upgrades of 10 subsurface discharging WOH WWTPs	Monthly

6.3.5 Stormwater Programs

Volume One of this report documents the development and implementation of the MOA's Stormwater Retrofit Program. The Program funds stormwater best management practices at existing sites throughout the watershed, thereby reducing the input of suspended solids, pathogens and excessive nutrients into reservoir systems.

Planned Activities/2002-2007 Milestones

DEP proposes in the Five Year Plan to refinance the Stormwater Retrofit Program sufficiently to sustain the historical project activity level in the Program. DEP proposes amending its current Stormwater Retrofit contract with CWC within 6 months of the issuance of the 2002 Filtration Avoidance Determination to provide additional funding.

In the Five Year Plan, DEP proposes to develop a new component of the Stormwater Retrofit Program to afford interested communities the opportunity for funding to perform community-wide stormwater infrastructure assessments and planning. While the Stormwater Retrofit Program as conceived in the MOA and CWC Program Rules has been effective over its term, DEP has increasingly recognized that the Program could be significantly strengthened if decisions about projects were informed by detailed and comprehensive information on existing community stormwater infrastructure. Moreover, such a program would benefit by active community involvement throughout the process of developing detailed community-specific infrastructure assessments. Such assessments and planning will yield specific proposed stormwater retrofit projects and management practices in the context of an overall plan which will improve the effectiveness and pool of Stormwater Retrofits projects for evaluation. This effort will be designed to not only yield better projects; it is intended to foster the type of community involvement, management and consciousness of stormwater issues needed to optimize project implementation.

In coordination with CWC, DEP will amend the Stormwater Retrofit Program contract with CWC within 6 months of the issuance of the 2002 Filtration Avoidance Determination. Within 3 months of entering into an agreement with DEP to administer the Program, CWC, in consultation with DEP, will adopt program rules. Following the adoption of program rules, CWC will solicit identified communities of their interest in participating in the program. Based upon the criteria developed in the Program rules, CWC and DEP will evaluate responses and CWC will authorize projects to commence.

The Future Stormwater Controls Program Paid for by the City for Single Family Houses, Small Businesses, and Low Income Housing (the City Program), administered by the City, provides for payment of design, implementation and maintenance costs required by the WR&Rs beyond the requirements of State and federal law. In particular, the City Program provides full funding for Individual Residential Stormwater Permits (IRSPs) for certain single family homes, and for Stormwater Pollution Prevention Plans (SPPPs) for publicly-subsidized low income housing, and 50% funding for SPPP for small businesses. The WOH Future Stormwater Controls Pro-

gram, administered by CWC, was funded in the MOA for $31.7 million to cover incremental costs for other eligible WOH projects or portions of projects not otherwise funded by the City Program.

Demand for these programs in the four years since the inception of the Watershed Regulations has been light. During this period only eight applications amounting to less than $350,000 have been determined to be eligible under the City Program, and only 16 applications amounting to less than $450,000 have been determined to be eligible under the CWC program. The number of projects eligible for these programs will decrease in the future as the federal Phase II Stormwater requirements become applicable. In CWC's program, per the MOA, the City will continue making monthly payments of $264,167 to CWC through 2007. (CWC has flexibility to transfer funds from the Program to certain other identified programs in the MOA and did transfer $3 million in 1998.)

Because these programs have successfully aided applicants in complying with the City's stormwater regulations, and because the programs are adequately funded into the future, no additional funding for, or modifications to, these programs is recommended.

East of Hudson, DEP expects to implement stormwater controls in certain areas following the completion of the Croton Strategy contract. In addition, the City will fund a program designed to target small, localized stormwater problems. Details on both these efforts can be found in section 6.4.7 of this report.

FAD Milestone	***Due Date***
Amend CWC Stormwater Retrofit Agreement to provide additional funding to Retrofit Program to continue Program at historical levels	Within 6 months of issuance of new FAD
Amend CWC Stormwater Retrofit Agreement to support community-wide stormwater infrastructure assessment and planning	Within 6 months of issuance of new FAD

6.4 Protection & Remediation Programs

6.4.1 Waterfowl Management Program

First implemented at Kensico Reservoir, the Waterfowl Management Program has been one of the most successful and cost-effective watershed protection programs developed by the City. It has led to dramatic decreases in levels of Fecal Coliform Bacteria in Kensico. More information on the success of this program can be found in section 3.3 of this report.

The Waterfowl Management Program includes three activities: 1) avian population monitoring; 2) avian deterrence activities; and 3) avian harassment.

DEP has determined from baseline bird population monitoring that the Waterfowl Management Program should be maintained at Kensico Reservoir and new programs should be implemented at West Branch, Rondout and Ashokan Reservoirs. Enhanced programs at these reservoirs are necessary due to documented seasonal congregations of birds and associated water quality threats.

Population monitoring at Kensico is conducted daily from August 1 through March 31 and weekly from April 1 through July 31. Avian deterrence includes routine monitoring and maintenance of shoreline fencing, intake netting and meadow management. Canada goose egg-depredation and nest destruction activities occur from March through June annually. Bird banding and collaring occurs in May and June for geese and gulls. A gull telemetry study is scheduled to begin in 2002. Kensico's bird management measures will be continued following the current methods.

The Waterfowl Management Program will be expanded to three additional potential source water reservoirs (West Branch, Rondout and Ashokan). West Branch and Ashokan bird populations are currently monitored weekly and Rondout is monitored biweekly. Population monitoring will be increased to daily surveys at West Branch and Rondout during part of the year and weekly for the rest, whereas bird counts at the Ashokan Reservoir will remain on a weekly basis. Avian deterrence at West Branch, Rondout and Ashokan, which includes Canada goose egg-depredation and nest destruction activities from March through June, will be continued annually. Bird banding and collaring will continue from May through June for geese and gulls. A gull telemetry study is proposed to begin in 2002.

DEP will implement a permanent bird harassment component to the program for both West Branch and Rondout beginning in the late summer and continuing up through reservoir ice cover. Bird harassment is not necessary after ice cover because populations of some birds (gulls, cormorants and geese) often disperse when the reservoirs freeze.

At the Ashokan Reservoir, bird populations often roost far enough away from the water intakes to obviate the need for a more routine harassment campaign. DEP will evaluate the following criteria and will implement the same harassment measures used at Kensico "as needed" at Ashokan. The term "as needed" refers to active bird harassment measures implemented based on the following criteria:

- Current bird populations, including roosting or staging locations relative to water intakes;
- Elevated fecal coliform bacteria levels at effluent structures and reservoir and stream sampling locations coincident with elevated bird populations;
- Recent weather events;
- Operational flow changes within the reservoir (i.e., elevations and flow patterns and

amounts); and
- Reservoir ice coverage and watershed snow cover.

The use of red-beam lasers is proposed for trial test in 2002 for bird control at all four reservoirs.

Note: DEP is currently evaluating the need to conduct environmental review under SEQRA of the proposed expansion of the Waterfowl Management Program. DEP does not anticipate that SEQRA review, if needed, will change schedule proposed herein.

Planned Activities/2002-2007 Milestones

Table 6.3. Waterfowl Management Program FAD Milestones 2002-2007

Reservoir	Avian Deterrence Methods Implemented Seasonal (annually)	Avian Harassment Methods Implemented Seasonal (annually)	Avian Population Monitoring Year-around (annually)
Kensico	Conducted by DEP Staff * Canada Goose Egg-depredation/Nest Destruction * Shoreline Fencing * Meadow Management * Bird Banding * Avian Collaring * Gull Telemetry (Proposed for 2002) * Alewife Monitoring * Intake Netting	Implemented under existing Contract (August - April) * Motorboats * Hovercraft * Airboats (Proposed for new contract 2002) * Pyrotechnics * Avian Distress Tapes * Propane Cannons * Lasers (Proposed for new contract 2002)	Conducted by DEP and Contractor Staff (Daily/Weekly) * All Waterbirds (Canada Geese, Gulls, Cormorants, Other Waterfowl) * Swallows

Table 6.3. Waterfowl Management Program FAD Milestones 2002-2007

Reservoir	Avian Deterrence Methods Implemented Seasonal (annually)	Avian Harassment Methods Implemented Seasonal (annually)	Avian Population Monitoring Year-around (annually)
West Branch	Conducted by DEP Staff * Canada Goose Egg-depredation/Nest Destruction * Bird Banding * Gull Telemetry (Proposed for 2002) * Alewife Monitoring	Proposed for new Contract (August - April) * Motorboats * Hovercraft * Airboats (Proposed for 2002) * Pyrotechnics * Avian Distress Tapes * Propane Cannons * Lasers (Proposed for 2002)	Conducted by DEP and Contractor Staff (Daily/Weekly) * All Waterbirds (Canada Geese, Gulls, Cormorants, Other Waterfowl) * Swallows
Rondout	Conducted by DEP Staff * Canada Goose Egg-depredation/Nest Destruction * Shoreline Fencing (Proposed for 2002) * Meadow Management (Proposed for 2002) * Bird Banding * Avian Collaring * Gull Telemetry (Proposed for 2002) * Alewife Monitoring	Proposed for new Contract (August - April) * Motorboats * Hovercraft * Airboats (Proposed for 2002) * Pyrotechnics * Avian Distress Tapes * Propane Cannons * Lasers (Proposed for 2002)	Conducted by DEP and Contractor Staff (Daily/Weekly) * All Waterbirds (Canada Geese, Gulls, Cormorants, Other Waterfowl) * Swallows
Ashokan	Conducted by DEP Staff * Canada Goose Egg-depredation/Nest Destruction * Bird Banding * Gull Telemetry (Proposed for 2002) * Alewife Monitoring	Proposed for new Contract (August - April) * Motorboats * Hovercraft * Airboats (Proposed for 2002) * Pyrotechnics * Avian Distress Tapes * Propane Cannons * Lasers (Proposed for 2002)	Conducted by DEP and Contractor Staff (Weekly) * All Waterbirds (Canada Geese, Gulls, Cormorants, Other Waterfowl) * Swallows

6.4.2 Land Acquisition

The Land Acquisition and Stewardship Program (LASP) seeks to prevent future degradation of water quality by acquiring sensitive lands and by managing uses on these lands. The MOA requires the City to contact landowners of 355,050 acres of eligible watershed land in the most sensitive areas over 10 years. Interested landowners are offered fair market value as determined by independent appraisers hired by the City; either fee or conservation easements may be acquired by the City. Landowner participation in the program is completely voluntary – the City will only acquire land under the Program from willing sellers. The City pays property taxes on all real property interests acquired; for conservation easements, taxes are assessed at a ratio equal to that of the value of the easement to the overall property value.

As of November 2001, LASP has successfully completed solicitation requirements for the first four years of the program (totaling 203,454 acres), in addition to completing about 95 percent of the year 5 requirement. In total, 270,244 acres have been solicited program-wide.

Planned Activities/2002-2007 Milestones

The MOA established a 10-year schedule, with milestones through 2007. DEP will continue to comply with the elements of that schedule as follows:

Watershed Land Acquisition Program FAD Solicitation Milestones

Due Date	*Acres to be Solicited*	*Notes*
1/21/03	48,531	20,081 acres in Priority Area (PA) 3; 28,450 acres in PA 4
1/21/05	47,800	14,558 acres in PA 3; 33,243 in PA 4
1/21/05	252,358	Complete solicitation of a total of 68,700 acres in Schoharie basin; 78,630 acres in Pepacton basin; 105,028 acres in Cannonsville basin
1/21/07	355,050	Complete solicitation of a minimum of 61,750 acres in PA 1; 42,300 acres in PA 2; 96,000 acres in PA 3; 155,000 in PA 4

The 1997 FAD condition 301y required that, if determined to be necessary by EPA/DOH and DEP, the City would ask DEC to renew the water supply permit to enable DEP to continue the land acquisition program for an additional 5 years. The DEC land acquisition permit for the

Program provides for automatic renewal for an additional five years at the option of the City. DEP will commit to confer with EPA and DOH by January 21, 2005, to discuss possible extension of the Program and if the City elects to extend the Program, it will submit the required notice to DEC by January 21, 2006.

DEP will continue quarterly reporting. The reports will include updates on number of acres solicited and acquired in each basin and priority area and provide updates on implementation of the outbasin prioritization strategy and resolicitation efforts. In addition, quarterly reports will include information on Kensico acquisition efforts, and the range of time from contract signing to closing.

FAD Milestone	***Due Date***
DEP will confer with EPA and DOH by January 21, 2005, to discuss possible extension of the Program.	1/21/05
If the City elects to extend the Program, it will submit the required notice to DEC by January 21, 2006	1/21/06
Provide Quarterly Reports on Land Acquisition and Stewardship Program. Include updates on outbasin prioritization strategy, Kensico acquisition efforts, and contract closing time.	Quarterly

6.4.3 Watershed Agricultural Program

The Watershed Agricultural Program is a comprehensive effort to develop and implement pollution prevention plans on 85% of the commercial farms in the City's Catskill and Delaware watersheds. The program is a voluntary partnership between the City and farmers in the watershed to manage nonpoint sources of agricultural pollution, with particular emphasis on waterborne pathogens, nutrients, and sediment. In addition, the program incorporates the economic and business concerns of each farm into the development of its Whole Farm Plan in order to fully integrate the principles and goals of pollution prevention into the farm operation.

The Watershed Agricultural Program strives to maintain and protect the existing high quality of the water supply system from agricultural nonpoint source pollution through the planning and implementation of Best Management Practices (BMPs) on farms. When possible, the Program uses traditional BMPs that are proven to protect and enhance source water quality, and, if necessary, to employ and evaluate innovative BMPs to increase the number of alternatives available to farmers to address "non-traditional" agricultural water pollution concerns, especially waterborne pathogens.

Fully funded by the City, the Program is administered by the not-for-profit Watershed Agricultural Council, whose board consists of farmers, agri-business representatives and the DEP Commissioner. Over time, the City and WAC have been able to leverage generous financial support from other sources to enhance the Program, particularly the US Department of Agriculture, EPA, and Army Corps of Engineers. Local, State, and federal agricultural assistance agencies provide planning, technical, educational, engineering, scientific and administrative support for the program under subcontractual agreements with the Council.

The objective of the program is to protect the sources of the New York City's water supply while keeping farms in operation. Agriculture should be continued and promoted as a preferred land use in the City's watersheds. The Watershed Agricultural Program is guided by the following principles:

- scientifically based risk assessment framework for pollution prevention;
- regulatory relief for affected industry that does not compromise environmental and public health goals;
- public-private partnership involving industry, government and academic stakeholders;
- urban-rural partnership.

Stakeholder Representation and Community Outreach

The farmer-led Watershed Agricultural Council, Inc. was established in 1993, to provide a forum for farm industry input and leadership in the Watershed Agricultural Program. The watershed's agricultural leadership has itself committed to a goal of 85% farm participation in this Program. The Watershed Agricultural Council consists of farmers and federal, New York City and State representatives, and has administrative and operational control of the Watershed Agricultural Program.

Multiple Barrier Approach

To achieve its objectives, the Watershed Agricultural Program takes a "multiple barrier" approach to best management practice planning and implementation on the farms. These on-farm barriers control or eliminate to the best extent possible the generation, transport and viability of agricultural pollutants before they enter the surface waters of the City's watershed system. Examples of the three "barriers" include:

- *First Barrier - Pollutant Source Controls*. These controls include herd health maintenance, sanitary improvements, calf housing improvements, separation of young and old stock to eliminate or minimize pathogen infection in livestock; soil sampling, grass/hay production to reduce need for excess fertilizer; Integrated Pest Management (IPM) to reduce amounts of pesticides used on farms; and conversion of fields from row crops to grass/hay and altering rotational patterns to reduce soil runoff.

- *Second Barrier - Landscape Controls.* These controls include barnyard improvements, manure storage, scheduled and directed spreading of manure, and composting to control application of animal waste to the landscape to reduce or eliminate the risk of pathogens, nutrients, sediments and pesticides from reaching surface waters.
- *Third Barrier - Stream Corridor Controls.* These controls include streambank stabilization, stream crossings, animal watering systems, and vegetated buffers to keep animals out of watercourses and slow down and reduce transport of pollutants into watercourses.

The multiple barrier approach has been accepted by EPA as the preferred means of achieving the rigorous Watershed Agricultural Program goals and milestones that were established as part of the Filtration Avoidance Determination for the City's water supply. This approach recognizes the inherent difficulties in quantifying long-term pollution prevention. It also acknowledges the fact that the most important changes that can take place on a farm to protect water quality are often hard-to-quantify behavioral and managerial changes.

Program Enhancements

While the Watershed Agricultural Program meets or exceeds the milestones established in EPA's Filtration Avoidance Determination, the City and WAC have also enhanced the Program beyond those milestones in many ways, among them:

- In August 1998, DEP and USDA entered into a Memorandum of Agreement to enhance the federal Conservation Reserve Program in the City's watershed in order to promote the voluntary establishment of riparian buffers on farms. To date, approximately 184 miles of stream buffers have been planned on farms.
- The Program is placing greater emphasis on developing and maintaining up-to-date Nutrient Management Plans on farms.
- A "Small Farms" Program has been established that directs assistance to farms that do not meet the Watershed Agricultural Program's gross farm income threshold for participation. Many of these small farms have significant water quality concerns.
- The Watershed Agricultural Program is now expanding to include farms in the Croton watershed.

Scientific research and support to the Program has matured into an intensive subbasin approach involving the leadership of the USDA Agricultural Research Service, USGS, Cornell University and DEP scientists.

Recognizing the value of the Watershed Agricultural Program, DEP and WAC signed a new contract in October 2001, which will support the Program through September 2003 and bring the City's total financial commitment to the Program to $53 million, since 1992.

Planned Activities/2002-2007 Milestones

DEP will continue to implement Whole Farm Plans in accordance with the following schedule:

Table 6.4. Watershed Agricultural Program WFP FAD Implementation Milestones

YEAR	WFP Implementation Agreements	Commenced Implementation	Farms Substantially Implemented[1]	Annual Follow Up
2002	297	250	143	105
2003		288	181	143
2004		All Participating Farms	219	181
2005			257	219
2006			All Participating Farms	257

[1] See new definition below

DEP and WAC have also developed a new definition of "Farms Substantially Implemented" in place of the "Farms Substantially Complete" milestone previously used. This definition is more useful and consistent with the concepts laid out in the document entitled, “Watershed Agricultural Program Prioritization” (see Appendix H). Above all, the new definition allows the Watershed Agricultural Program to meet its goals while implementing practices according to priority. Under the old definition, goals could be met without necessarily addressing highest priority pollution problems. Farms with seven of the nine highest priority pollutant categories addressed and the two remaining pollutant categories' BMPs scheduled for implementation within the next two years will be considered "fully implemented." The first nine pollutant categories address the highest priority pollutants (i.e., pathogens, nutrients and pesticides). Program rules require that whenever practical, BMP implementation should proceed in order of pollutant category priority. Lower priority pollutant categories – fuel storage (#10) and other materials (#11) – will be scheduled after the highest priority BMPs have been implemented, contingent upon need and availability of funding.

A “Small Farms” Program has been established that directs assistance to farms that have not met the Watershed Agricultural Program’s gross farm income threshold for participation. Many of these small farms have significant water quality concerns. DEP and WAC have developed a Small Farms Program Action Plan (see Appendix I) and commenced a pilot effort to develop Whole Farm Plans based on the New York State Agricultural Environmental Management (AEM) model. CREP will be a central element of the Small Farms Program. To date, 65 small farms have completed detailed assessments (Tier II Surveys), WAC has approved four

small Whole Farm Plans, and two farms have commenced implementation. The Small Farms Program expects to approve fifteen plans each year over the next two years. DEP will submit a Small Farms Program Plan in September 2002

The Watershed Agricultural Program is now expanding to include farms in the Croton watershed. A Croton Agricultural Program Plan (see Appendix J) has been developed, and WAC has begun the process of selecting farms for the program according to the priorities described in the Plan. It is anticipated that twelve farms will begin Whole Farm Planning this year. In addition, DEP and WAC have been monitoring the development of a statewide CREP agreement that would cover farmland in the Croton Watershed. Once the statewide agreement is in place, the Croton Agricultural Program will be well positioned to encourage landowners to enroll East of Hudson riparian lands in CREP.

The Watershed Agricultural Program shall annually establish goals for Nutrient Management Planning on participating farms and report quarterly on the progress toward meeting those goals. Annual Nutrient Management Planning goals shall set forth the percentage of qualifying farms that will have current Nutrient Management Plans adopted, revised and/or confirmed in the coming year. A current Nutrient Management Plan shall be updated triennially and include soils testing; manure testing; calibration of manure spreading equipment; and a manure and fertilizer spreading schedule.

FAD Milestone	***Due Date***
Develop and submit a WOH Small Farms Program Plan	9/30/02
Implement the Croton Agricultural Program in accordance with the Croton Agricultural Program Plan	Ongoing
Continue quarterly reports on program progress including report on Small Farms Program progress based on Small Farms Strategy and report on Croton Agricultural Program progress	Quarterly
Continue submitting annual Implementation Plan	Annually, by January 31
Submit annual Research Report	Annually, by October 31
Submit new 5-year Plan	10/31/03
Review Evaluation Criteria with Program Advisory Committee	12/31/05

Ensure that planning and implementation policies and documents are consistent with the program prioritization methodology	Ongoing
Consistent with the WAC contract, WAC will continue to recruit farms (with more than $10,000 gross farm income) to participate in the Watershed Agricultural Program for the design and implementation of Whole Farm Plans	Ongoing
The Watershed Agricultural Program will establish a definition of "Nutrient Management Plan" designed to meet the water quality goals of the New York City watershed and the practicalities of the Program	4/30/02
The Watershed Agricultural Program shall annually establish goals for Nutrient Management Planning on participating farms and report quarterly on the progress toward meeting those goals	Annually, by January 31

6.4.4 Watershed Forestry Program

The Watershed Forestry Program supports and maintains well-managed forests as a beneficial land cover for watershed protection. The Program is a voluntary partnership between the City and watershed forestry community, representatives of which helped develop the program based on the model of the Watershed Agricultural Program. The Forestry Program has been administered locally by the Watershed Agricultural Council (WAC) since September 1997. Specific projects and programs are implemented by WAC and its various partners, with the USDA Forest Service providing a major source of matching grants and project funding. The major elements of the Program are as follows:

Forest Management Planning - The Forestry Program provides funding to private landowners to develop 10-year forest management plans written by professional foresters trained and approved by WAC. All forestry plans are approved by DEC to ensure they meet specific watershed protection criteria. In 2001, WAC and DEP conducted a comprehensive review of all current management plans and worked with DEC to revise the forestry plan specifications to include an improved focus on water quality recommendations and riparian area delineation. All foresters previously approved to develop WAC forestry plans are now required to receive additional training regarding the revised specifications in order to retain their approval status and receive cost-sharing. A plan update program is underway to upgrade non-WAC forestry plans at least five years old to meet the newly revised watershed specifications. This expanded forest management planning program will encourage private stewardship and promote long-term forest management for watershed protection.

BMP Implementation - The Forestry Program offers cost-sharing, technical assistance and other incentives to watershed loggers for implementing forestry BMPs, with a particular focus on promoting the use of portable bridges and new erosion control technology. These initiatives were

developed based on the results of a logger compliance/BMP research study sponsored by WAC, and to assist landowners with implementing the water quality recommendations listed in their forestry plans. Another major focus is to assist loggers with the proper design and layout of timber harvest roads, which are the source of most forest-related sedimentation. To date, fourteen timber harvest road BMP projects have been completed and four projects are pending. Finally, a full-time WAC forester provides education, outreach and technical assistance to dozens of watershed loggers each year, including dissemination of forestry BMP fact sheets and the first-ever "New York State Forestry BMPs for Water Quality" field manual.

Logger Training - The Forestry Program offers cost-sharing to watershed loggers for voluntarily participating in the statewide Trained Logger Certification Program and other BMP workshops sponsored by WAC. WAC maintains a list of more than 130 "watershed approved" loggers representing 38 different companies and all the major individual timber harvesters working in the watershed. Most of the forestry BMP cost-sharing programs are only available to "watershed approved" loggers, which provides a further incentive for training and continuing education.

Research and Demonstration - The Forestry Program coordinates four model forest sites throughout the watershed that integrate research, demonstration, continuing education and public outreach. When fully completed, every model forest will include permanent forest inventory research plots, an educational kiosk with informational materials, and a properly installed demonstration road with interpretive signs highlighting various erosion control BMPs and assorted silvicultural treatments. In cooperation with the USGS and SUNY-ESF, water quality monitoring gauges are currently installed at three of the model forests to gather baseline data for studying the effects of different silvicultural treatments on stream flow and water quality. Since each watershed model forests will be managed over the long-term as a working landscape, they will provide a valuable living laboratory for both forestry and water quality research and demonstration.

Education and Outreach - The Forestry Program supports various educational programs and outreach activities targeted to forest landowners, water consumers, environmental groups and other audiences. Annual events include the Watershed Forestry Institute for Teachers, watershed forestry bus tour, educational workshops and site visits that promote forest stewardship to hundreds of watershed landowners, and participation in regional lumberjack festivals and county fairs. WAC and DEP also conduct or host dozens of presentations and professional speaking engagements throughout the year, including New York State Forestry Awareness Days and the Northeast Association of Watershed Forest Managers.

Planned Activities/2002-2007 Milestones

- Continue funding the development of forest management plans for landowners, including training and educational opportunities for professional foresters who write the plans.
- Continue sponsoring sediment control training and other BMP workshops for watershed log-

gers, including cost sharing to become fully certified under the state-wide Trained Logger Certification Program administered by New York Logger Training.

- Continue providing cost-sharing, technical assistance and other incentives to landowners, loggers and professional foresters for implementing specific forestry BMPs, including portable skidder bridges, new erosion control technology, and riparian forest buffers.
- Continue coordinating the ongoing research, demonstration, continuing education and outreach projects at the four Model Forests.
- Continue sponsoring and supporting forestry education projects and programs for watershed landowners, environmental groups, youth and other upstate/downstate audiences, including the publication of newsletters, brochures and progress reports.
- In the new WAC contract, DEP is funding four major forestry tasks: (1) Logger Training, (2) Research, Demonstration and Forestry Education, (3) Forest Management Planning, and (4) BMP Implementation. DEP will commit to a semi-annual reporting requirement for each of these tasks.

DEP will evaluate and report annually (beginning January 31, 2003) on the 5-year implementation status of forest management plans cost-shared by WAC. This annual report will document and assess the degree to which private landowner's follow the forestry and BMP recommendations listed in their 10-year management plans.

FAD Milestone	***Due Date***
Provide semi-annual reports on implementation of the Forestry Program	Semi-annual
Evaluate and report on 5-year implementation status of forest management plans cost-shared by WAC (beginning 1/31/03)	Annually, by January 31

6.4.5 Stream Management Program

Following the January 1996 flood event, which produced significant stream and infrastructure damage throughout the Catskills, the City recognized that a program to repair isolated streambanks would not effectively address the systemic causes of stream channel instability. With its watershed partners, the City developed a stream management strategy to be implemented by the Stream Management Program (SMP), with its overall mission to restore stream system stability by providing for the long term stewardship of Catskill streams and flood-plains.

To achieve its overall mission, the SMP has defined four principle Programmatic goals:

1) Creating an approach for stream management that is watershed scale, multi-objective, and community-based by promoting and applying the principles of fluvial geomorphology.

Through a comprehensive series of workshops and training programs for a wide variety of audiences, DEP has generated an awareness of a new strategy for addressing instability in the rivers and streams of the Catskills. This approach diagnoses persistent and chronic stream related problems by examining the underlying physical processes and targets treatments at the reach and watershed scale. This "geomorphic approach" recognizes that the physical structure of stream channels governs habitat quality, fisheries health, flood behavior, rates of erosion and ultimately water quality.

DEP has made significant gains in advancing this approach with federal, State and local government. Attesting to this accomplishment, ACOE and DEC have funded stream management planning efforts in five watersheds and six reach-scale geomorphic restoration projects. Four county Soil and Water Conservation Districts (SWCDs) have undertaken local leadership for these stream management planning efforts. Anglers have embraced the approach, partnered with the SWCDs, and contributed their funds to stream restoration efforts. DEP's leadership in advancing the geomorphic approach has brought DEC, USGS and DEP together to extend the development of regional hydraulic geometry relationships statewide.

DEP will continue to advance this approach by building upon the outreach skills and capacities of the SWCDs, extending practical solutions to private landowners and public groups, and advocating stream stewardship.

2) Preparing and implementing stream management plans in priority sub-basins which include the demonstration of stream stability restoration practices;

A stream management plan is a practical plan for the residents and managers of a stream prioritized by DEP for its instability, flood hazard, development potential and water quality concerns. Each stream management plan is developed by the county SWCD, with advice from a Project Advisory Committee, and input from the community residents. The plan's centerpiece is an assessment of the stream network stability and the identification of processes contributing to declining water quality, bank or bed erosion, habitat degradation, or the presence of flood hazards. Each plan includes funds for the construction of a demonstration restoration project.

In total, $14.73 million dollars has been committed to stream management planning and restoration by the City and its funding partners to date.

Over the next five years, stream management plans will be completed for basins accounting for 65% of the west of Hudson watershed; currently, plans are in place for basins covering 31% of the west of Hudson watershed. The number of problem reaches addressed by restoration projects will expand by a minimum of 10 projects.

3) Develop an informed constituency of regional stream managers and community participants.

The fact that 75% of watershed lands along river valleys in the Catskills is in private ownership means that the solution to river system instability lies in the adoption of stream stewardship practices by private landowners. Early on in the process, DEP recognized that the Soil and Water Conservation Districts are the traditional support for land owners with stream related problems. DEP invested $280,000 to bring more than 900 training opportunities through 18 workshops and short courses to the SWCDs and other regional stream managers. The SWCDs are now technically prepared to address the needs of land owners and their communities.

Going forward, DEP will work closely with the SWCDs to extend the understanding and application of the geomorphic approach to Project Advisory Committees and riparian landowners in priority sub-basins. Through the creation of a Technical Advisory Committee comprised of key regional agency representatives, DEP and the SWCDs will draw upon the knowledge of regional managers in development and implementation of the management plans. Finally, DEP will convene an Advisory Board which will assist in developing Program and project evaluation strategies, and will ensure that the restoration projects, assessment tools and design protocols are meeting the most advanced scientific and engineering standards.

4) Develop and distribute regional stream morphology databases to support stream management decisions, stream design specifications and Program evaluation.

Successfully implementing the geomorphic approach depends upon the availability of a stream geomorphology dataset that enables identification of the channel forming flow as a function of drainage area (regional curves), regional hydraulic geometry relationships of streams, and stable reference stream channel morphology. This information is being used by restoration engineers at the SWCDs, consultants, and local, county and state highway departments to complement traditional engineering designs to address sediment transport processes.

DEP has made substantial gains in compiling this dataset by completing provisional regional curves, initiating a reference reach database, and securing additional funding through the SDWA to allow expansion of this research effort to include an erosion and scour study, and a study to monitor the effectiveness of stream restoration projects.

In the next five years, DEP will fulfill these research and data collection goals, distribute this information effectively to those who will use it, and convene an Advisory Board to assist with Program and restoration project evaluation.

Planned Activities/2002-2007 Milestones

In July 2001, DEP drafted a comprehensive five-year plan for the Stream Management Program. That plan was revised somewhat and the final version is dated December 2001. The plan includes details on site selection, the planning process and specific programmatic commitments. While most of those commitments are summarized here, DEP will implement the full program described in the December 2001 plan, which is Appendix K to this document.

- DEP will prepare a bi-annual report on the Stream Management Program. This will provide a status report on each SMP plan and project, and report progress on the development of stream geomorphic databases and evaluation of restoration projects. In addition, the report will review the program progress in meeting overall program objectives.
- DEP will develop and implement an evaluation strategy and database to support restoration designs and overall program effectiveness, in accordance with the following schedule:

Table 6.5. Schedule for Developing the Stream Management Program Evaluation Strategy

Five Year Plan submitted with a draft Program Evaluation outline	December 2001
Advisory Board is Convened	March 2002
Advisory Board is Convened with Program Evaluation Strategy Focus	September 2002
Final Program Evaluation Strategy Outline	December 2002
Draft (First) Program Evaluation	December 2003
Final (First) Program Evaluation	April 2004
Draft (Second) Program Evaluation	December 2005
Final (Second) Program Evaluation	April 2006

- DEP will produce Stream Management Plans and Demonstration Restoration Projects in priority watersheds according to the following schedule:

Table 6.6. Schedule for Stream Management Plans and Demonstration Restoration Projects in priority watersheds.

Stream Management Plan • Restoration Project	Proposed Completion Date
Broadstreet Hollow • (Broadstreet Hollow Demo Project completed in 2000)	**12/2002** –
Chestnut Creek • Undetermined	**12/2003** 12/2003
Stony Clove Creek • Undetermined	**12/2003** 12/2003
Batavia Kill • Red Falls • Big Hollow • Red Falls Monitoring Report	**12/2001** 12/2004 12/2001 12/2007
West Branch Delaware • Hamden	**12/2004** 12/2002
West Kill • Undetermined	**12/2005** 12/2005
Esopus Creek • Woodland Valley	**12/2006** 12/2003
East Branch Delaware • Undetermined	**12/2007** 12/2007
Schoharie Creek - Including East Kill • Undetermined	**4/2007** 12/2006

- DEP will undertake an additional restoration project (beyond those listed above) in either the Schoharie or Ashokan Reservoir basins. That restoration project has yet to be identified.
- As part of the December 2001 plan, DEP prepared a second list that includes additional restoration projects that are partially or wholly out of DEP's control. The list will serve as a tracking sheet for stream restoration efforts other than, or in addition to, those that DEP is implementing in priority watersheds listed above, and will be updated periodically. Because DEP does not control these projects, however, they are included for information purposes and do not reflect DEP commitments.

FAD Milestone	***Due Date***
Implement Stream Management Program, including development of Stream Management Plans and construction of Restoration Projects, in accordance with the December 2001 SMP Program Plan	Ongoing

DEP will develop and implement an evaluation strategy and database to support restoration designs and overall program effectiveness, in accordance with the schedule provided	Ongoing
Provide semi-annual reports on Stream Management program	Semi-annual
Prepare a bi-annual report on the Stream Management Program. This will provide a status report on each SMP plan and project, and report progress on the development of stream geomorphic databases and evaluation of restoration projects. In addition, the report will review the program progress in meeting overall program objectives.	Every two years commencing 12/31/03

6.4.6 Wetlands Protection Program

While wetlands are an important part of the natural features of the New York City watershed, they are not a major part of the landscape. Wetlands occupy 3,872 acres, or 1 percent of the Catskill watershed and 8,287 acres, or 1 percent of the Delaware watershed. These wetlands are in part responsible for maintaining the high quality of surface waters in the water supply system. Wetlands moderate peak runoff and improve water quality through sedimentation, chemical transformations and biotic uptake. Wetlands also recharge groundwater and maintain baseflow in watershed streams. Recognizing these important water quality functions, DEP has long targeted protection of these resources through a variety of regulatory and non-regulatory means. DEP believes that strong enforcement of existing regulations and an emphasis on wetlands in the land acquisition and partnership programs, coupled with cutting-edge scientific research and community outreach, is the best way to afford protection to the watershed's valuable wetlands resources.

In 2001, DEP revised its Wetlands Protection Strategy, first prepared in December 1996. This revised strategy provides greater detail on the elements of DEP's wetlands protection program and can be found in Appendix L to this document.

Planned Activities/2002-2007 Milestones

Regulatory Programs

- DEP will continue to review all Pre-Construction Notifications (PCNs), and Individual Permit Applications, received from the Army Corps. When appropriate, DEP will request that the Corps require an Individual Permit application, rather than a PCN, for projects in the watershed that may have a significant adverse impact on water quality, or on the water quality function of a wetland. In addition, DEP has compiled an inventory of all municipalities that have adopted wetland regulations. DEP will assume an active role in the review of wetland permit applications pending before the Corps, DEC, and the watershed towns and villages that have adopted wetland regulations. DEP's 2001 wetland strategy included a discussion on regulatory coordination with the Corps, DEC and watershed towns.
- DEP will provide in-house training for its project review staff in the review of wetland permit

applications, relying upon the technical guidance manual developed by DEP for the review of federal, State and local wetlands.

- By December 31, 2001, DEP will complete a spatial database to track wetland permit applications, wetland acreage lost through development and other land use activities, and acreage of wetlands created through impact mitigation. DEP will continue to maintain its enhanced wetland database to track wetland losses and gains, and will use the data generated in the database to direct its Wetlands Protection Strategy. DEP's 2001 strategy included a list of the wetlands tracking database fields and a discussion of how information from the database will be used in other aspects of the wetlands protection program.
- DEP has received a commitment from the State to map wetlands that are adjacent to NYC reservoirs or controlled lakes as being of unusual local importance (ULI). DEP will work with the State to support the field work necessary for ULI designations.

Wetlands Science and Research

DEP will contract with the USFWS to expand the wetland functional analysis to the entire Cat/Del watershed. This work is scheduled to be completed in two years after contract registration.

DEP will continue its wetland inventory, mapping and wetland trend analysis efforts through intergovernmental agreements with the United States Fish and Wildlife Service (USFWS) to update the WOH National Wetlands Inventory (NWI) maps and to continue the analysis of EOH wetland trends. Both WOH and EOH projects will be based on new spring color infrared aerial photography. The new photography will be compared with earlier photography; updated GIS coverages will be produced through the photo interpretation and mapping of wetland losses, changes in wetland vegetative cover type, and recent pond construction. The current plan is to acquire the aerial photography in spring 2002, and the project schedule reflects this. The success of the overflight is weather-dependent, requiring snow- and cloud-free conditions during late winter-early spring. If either condition is not met, the aerial overflight will be rescheduled for spring 2003 and target dates will be adjusted accordingly.

The WOH wetland mapping update will revise the original NWI wetland maps, which were completed in 1995, and based on 1982-1987, 1:58,000 scale color infrared aerial photography.

DEP will continue the mapping of EOH wetland trends. The 1999 USFWS EOH wetland trends mapping project supported the analysis of EOH wetland trends by reservoir basin and town for a 26-year period (1968-1984, 1984-1994). The proposed work would extend the EOH trend analysis from 1994 to 2002.

Schedule for Wetland Mapping Update and Trend Analysis Projects

Project	Completion Date
Contract for aerial overflight (WOH NWI Update and EOH Trend Analysis)	May 2003
Acquire aerial photography	May 2002
Photo processing and indexing	May 2003
Contract for WOH NWI Update	April 2004
Produce draft maps	June 2003
DEP field checks	November 2003
Finalize maps and GIS coverages	February 2004
Final report	April 2004
Contract for EOH Wetland Trend Analysis	July 2004
Photo analysis and GIS mapping	May 2004
Final report	July 2004

Other

- DEP will continue its focus on acquisition of wetlands and wetland buffers to ensure their permanent protection.
- The Farm Program will continue to identify, map and strive to protect wetlands on participating farms. The Conservation Reserve Enhancement Program will continue to protect riparian areas that include wetlands.
- The use of DEP's *Water Quality Protection Guidelines for Forest Harvesting* will be followed for all silvicultural activities performed on City lands, lands participating in the WAC Forestry Program and lands with DEP conservation easements.
- Stream management plans are being developed throughout the Watershed and include wetland identification and strategies for protection.
- The City will continue to conduct outreach and education on the importance of wetlands and abilities to protect them.
- DEP will meet again with DEC and USFWS to explore implementation of the Partners for Wildlife Program in the NYC watershed. The Partners Program has developed a list of landowners in the watershed who have expressed interest in participating in the Program. DEP will work in concert with USFWS to conduct field assessments of sites on the list and will provide other technical support to USFWS in assessing potential sites for inclusion in the program.

FAD Milestone	*Due Date*
Continue implementation of Wetlands Protection Program in accordance with the December 2001 Wetlands Protection Strategy	Ongoing
Report on progress of implementation of Wetlands Protection Program	Annually, by March 31

6.4.7 Non-point Source Pollution Strategy for East of Hudson Catskill/Delaware Basins and Cross River and Croton Falls Basins

DEP has implemented a comprehensive watershed protection program in the Kensico basin. In the FAD Mid-course Review, EPA recommended that DEP pursue development of a NPS Strategy for the other Catskill/Delaware basins EOH (West Branch and Boyds Corner), as well as the Croton Falls and Cross River Reservoir basins. DEP will follow a two-pronged approach:

- Implementation of certain programs to target specific potential pollution sources in those reservoir basins. These programs include: Agricultural Program, Forestry Program, and septic and stormwater initiatives.
- Completion of a Croton Watershed Strategy contract that will include a watershed-wide assessment at a sub-basin scale of potential sources of pollutants. Results from the study will be used to prioritize allocation of DEP protection resources.

Additionally, Putnam and Westchester Counties are continuing the Croton Planning process and the results of their analyses are likely to impact nonpoint sources in the Croton system as well. These efforts are described in more detail below.

Planned Activities/2002-2007 Milestones

Farm Program - DEP and WAC have always treated Kensico and West Branch basins as part of the existing Catskill/Delaware program. At this time there are no farms in those basins that meet WAC criteria for inclusion in the Farm Program. The most recent Farm Program contract with the Watershed Agricultural Council (WAC) includes a Croton Farm Program (see section 6.4.3 for more details). The Croton Farm Program will give priority to the Croton Falls and Cross River basins, and is anticipated to be a cost-sharing program. Under the new contract, WAC will perform an inventory of agricultural operations in the Croton system, including small farms, and assess and prioritize those farms for development of Whole Farm Plans and implementation of BMPs. With the expansion of the farm program to small farms, small farms in the Kensico, West Branch and Boyds Corners watersheds, if any are found, will be included in the program.

In addition, DEP has pursued expansion of the CREP program to the Croton system. The State has developed and submitted to USDA a plan to expand CREP to certain priority areas throughout the State, including the Croton watershed. The State reports that they have had follow-up discussions with USDA, and that USDA approval of the plan is expected shortly. DEP has asked to be included in a "stakeholders" meeting with the State in the near future to discuss the logistics of implementing CREP in the Croton watershed, including the issue of cost-sharing. As proposed by the State, the Croton CREP program would include comparable incentives for farmer sign-up as the current Catskill/Delaware program.

Forestry Program - The new contract with WAC lists as deliverables the following goals, which apply to both EOH/WOH:

- Forest Management Planning: enroll at least 10,000 acres/year and sponsor at least 2 training workshops/year with the goal of maintaining at least 50 "watershed approved" foresters (who develop the plans for the landowners)
- Logger Training: sponsor at least 6 training workshops/year with the goal of training at least 200 "watershed approved" loggers by 2004.

Also, WAC has current USFS funds ($50,000) to spend specifically on EOH forest management planning and BMP implementation.

Septics - DEP will pursue implementation of a septic program in the West Branch and Boyds Corner basins similar to the house-to-house approach used in Kensico. DEP will seek support from the County and towns for this approach. The first step in developing the program will be an assessment of the universe of septics in the basin. Further details of this effort can be found in Appendix G. Note that this effort will be applied in the West Branch and Boyds Corner basins only; DEP will use information from the Croton Watershed Strategy (described below) to evaluate the need for and, if necessary, design a septic program for the Cross River and Croton Falls basins.

Stormwater - DEP will use a $410,000 WRDA grant to construct up to four stormwater BMPs in problem areas in the West Branch, Boyds Corners, Croton Falls or Cross River basins. In addition, DEP will use approximately $300,000 in SDWA funding to monitor performance of the BMPs. DEP intends to give priority to the West Branch, Boyds Corner, Croton Falls and Cross River basins. An implementation schedule for the SDWA monitoring program and WRDA BMP grant is provided in Attachment A.

DEP anticipates that additional stormwater related problem areas will be found through the Croton Strategy, Croton Planning, inspections by DEP staff and referrals from outside entities. DEP will prioritize and remediate sources of non-point pollution through the *Non-point Pollution Management Plan for East of Hudson Catskill/Delaware Watersheds* (see below).

In addition, DEP is committed to establishing a program to address small, localized areas of erosion, sedimentation or other stormwater-related problems in Cat/Del basins east of Hudson, including Cross River and Croton Falls. A program plan is provided in Attachment B.

Croton Watershed Strategy

Goals

The Croton Watershed Strategy is a two-year project (Dec 00 – Dec 02) to develop an integrated watershed management plan for the Croton system. This project will allow DEP to integrate the numerous programs at DEP, as well as more easily incorporate work by other stakeholders (e.g., Croton Planning results). The completed watershed strategy will allow DEP to optimize management efforts and focus resources on critical areas to achieve maximum water quality benefit. DEP has retained the services of Malcolm Pirnie, HydroQual and LimnoTech for this work.

The specific project goals are to:

- Assess existing and future watershed impacts on water quality;
- Evaluate watershed management alternatives;
- Develop an integrated watershed management strategy for the Croton system.

Data Collection

In addition to DEP's extensive GIS data, the consultants are gathering "readily available" data from federal, State, County and local sources, and transferring the data into a GIS format. Each data set is being assessed with regards to quality, resolution, development methodology and documentation. A "data gap" analysis will identify critical data that is either missing or of insufficient quality to support the intended analyses. The project will also incorporate the results from other DEP projects as they become available such as the Wetland Functional Assessment and the Process Studies project. This will allow DEP to target future data acquisition and development on the most essential needs.

Watershed Analysis

"Metrics"

The key water quality variables that will be analyzed are: phosphorus, pathogens (fecal coliforms, Cryptosporidium, Giardia), total suspended solids, total organic carbon, toxics (pesticides, other toxics).

Metrics will be developed to assess the sources of these key variables and the effects of local watershed conditions (i.e., slope, soils, land use, etc.). Potential loads will be developed where sufficient scientific information is available and a ranking system will be used for the other variables.

The subbasins will be characterized for each variable individually and as a whole for:

- Existing conditions – provide more detailed information on sources at a finer scale; provide guidance for remedial programs (e.g., TMDL implementation)
- Future conditions (full buildout) – comparison of existing and future impacts will provide guidance for regulatory and non-regulatory protection programs

Management Alternatives

A wide range of management alternatives will be considered including structural BMPs, nonstructural BMPs, voluntary programs and education/outreach. Management alternatives will be evaluated with regards to implementability, effectiveness and general costs.

GIS-based Management Tools

The watershed assessment and management options will be incorporated into GIS-based management tools. This will allow DEP to:

- update analyses as new data is obtained or site-specific scientific information is available;
- readily access and visualize the watershed characterizations and base data;
- conduct "what-if" scenarios for watershed management alternatives.

Peer Review

The methodology and interim work products will be reviewed by in-house experts (DEP, Malcolm Pirnie, HydroQual, and LimnoTech) not directly involved with the project, as well as an external peer review panel. This will provide greater scientific credibility to the analyses and management decisions.

Documents

Basin Reports

The watershed characterizations and general management recommendations will be compiled in a series of 12 basin reports. These reports will be written for general audiences with supporting scientific information in appendices or companion documents. The draft basin reports will be developed during the second year of the project and finalized in December 2002.

Integrated Watershed Strategy

The information from each basin will be evaluated with respect to the Croton system as a whole, taking into account locations of intakes and other water supply specific concerns. An integrated watershed strategy will be presented in a separate document at the end of the project (December 2002).

Implementation Plan

DEP will take the results of the Croton Watershed Strategy and develop an implementation plan for nonpoint source management in the Croton Watershed, focusing on the Catskill/Delaware basins located East-of-Hudson. A copy of a draft implementation plan is provided in Attachment C.

DEP expects to use results from the Strategy to focus in-house resources, particularly in the areas of project review, SEQRA review, and monitoring.

FAD Milestone	***Due Date***
Implement West Branch/Boyds Corners house-to-house septic survey in accordance with the December 2001 Septic Strategy	Ongoing
Implement WRDA/SDWA EOH stormwater projects in accordance with the schedule provided	Ongoing
Establish a program to address small, localized areas of stormwater-related problems in Catskill/Delaware basins EOH (including Cross River and Croton Falls) in accordance with the program plan provided	Ongoing
Complete Croton Watershed Strategy	December 2002
Use findings of Croton Watershed Strategy to develop Implementation Plan for nonpoint source management in Catskill/Delaware basins EOH (draft plan and milestones have been provided)	Ongoing

Attachment A

Water Resources Development Act Grant and Safe Drinking Water Act Grant

Stormwater Management/Created Wetlands

Project Schedule Summary

	TASK	SCHEDULE
1.	Complete Site Selection Process	Complete
2.	Develop Baseline Monitoring Plan	October 2001 – December 2001
3.	Design and Construct Baseline Monitoring Facilities and Implement Baseline Monitoring Plan. Develop Preliminary Designs for selected Stormwater BMPs. Conduct Pre Application Meetings with Federal, State, and Local Regulators	December 2001 – August 2002
4.	Secure Federal, State, and Municipal Regulatory Approvals. Develop Post Construction Monitoring Plan and Final Facility Designs, and Contract Specifications for Construction of the selected Stormwater BMPs	August 2002 – November 2002
5.	Issue Construction Plans and Specifications for Bids	November 2002
6.	Award Construction Contract/Begin Construction	June 2003
7.	Complete Construction	November 2003
8.	Conduct Post Construction Monitoring	December 2003 – August 2004
9.	Issue Final Project Report	October 2004

Notes: 1) The project schedule may be extended as a result of permitting and/or contractual delays.

2) The summary identifies major components of the stormwater project with anticipated start and completion dates. It is not meant to identify all of the steps necessary to complete the project.

Attachment B
DEP Stormwater Remediation Small Projects Program
for the East of Hudson Catskill/Delaware Basins
October 19, 2001

Program Purpose

The goal of the stormwater remediation small projects program is to identify and repair incidences of erosion and sedimentation in the Catskill/Delaware basins east of Hudson (including Cross River and Croton Falls) that may be impacting the quality of New York City's water supply. Projects included in this program will be relatively small and not candidates for repair under any other federal, State, City or municipal initiatives. Examples of sites that will be remediated under this program include eroding stormwater discharges at the outfalls from existing infrastructure; stream channel and bank erosion; and failing slopes adjacent to reservoirs, wetlands, and watercourses.

To execute this program, DEP will develop site selection criteria by April 2002. These criteria will be applied on an ongoing basis to select sites for remediation. In addition, DEP will secure funding for the design and implementation of remediation measures; prepare and administer design and construction contracts and requisition orders; secure regulatory approvals; design and oversee remediation plans; and conduct routine operation and maintenance inspections.

Site Selection

For nearly a year the City has been cataloging eroding sites in the watershed that are sources of turbidity. Based upon DEP's inventory, and referrals from other organizations, DEP will select up to ten sites annually for repair under this program.

Sites to be repaired will be selected on the basis of their proximity to watercourses, wetlands, and reservoirs; the severity of the erosion and the risk the erosion (or other stormwater related condition) poses to water quality; the costs for designing and implementing the remediation measure(s); and the absence of other programs for which the project would qualify.

Permitting

It may be necessary to secure federal, State, municipal and City regulatory approvals to implement the remediation plans. To expedite the permitting process, DEP will solicit the involvement of all regulatory bodies with jurisdiction during the site evaluation and preliminary design phase of each project. Incorporating the comments of regulatory agencies early in the site assessment and project design processes will accelerate the approval and implementation processes.

Project Designs

Designs for the repair projects may be funded in one of two ways. Depending on the scope and complexity of the repair, DEP will either utilize in-house engineers to prepare the design, or develop an extended duration contract under which DEP will engage an engineering contractor to prepare the designs on an as needed basis.

Inspection and Maintenance

Once the remediation projects have been completed, DEP will routinely inspect and maintain the remediated site.

Attachment C
Implementation Schedule
Non-point Source Pollution Strategy for the East of Hudson Catskill/Delaware Watersheds

August 2001 - December 2002

Evaluate Croton Strategy Draft Reports: In this task, DEP will evaluate the Draft Basin Reports to ensure that the contractor has included all of the information required by the strategy contract, and that the basin analysis methodology approved by DEP has been applied in a manner that will assist DEP in prioritizing the components of the Non-point Source Implementation Plan. This evaluation will focus on the Review and Evaluation of Potential Sources of Non-point Sources of Environmental Impairment, Enforcement Information, and Watershed Ecological Protection Areas sections of the Croton Watershed Strategy.

November 2001 - December 2002

Collect and Analyze Impervious Surface Data: Through numerous discussions with the contractor engaged to map impervious surfaces in the target basins, DEP has provided specifications for the work products. This task requires DEP to collect the impervious mapping data, and the draft results of a literature search and summary report prepared by the contractor. DEP will utilize this information to develop preliminary conclusions concerning the relationship between the percentage of an impervious surface in a sub basin and irreparable degradation of surface water in each basin.

January 2003- March 2003

Review Final Croton Strategy/Impervious Surfaces Reports: This task requires the contractors to provide DEP with the final versions of the Croton Strategy Report and the Impervious Surfaces Reports, incorporating DEP's comments submitted in response to the draft versions of the reports.

August 2002 - April 2003

Develop Conceptual Non-point Management Plan/Cost Estimate: Based upon the Basin Reports, and Watershed Strategy developed by the contractor, the impervious surfaces data and analysis, and other site specific information, DEP will develop a Conceptual Implementation Plan to control non-point pollution in the West Branch, Boyds Corner, Croton Falls, and Cross River reservoir basins. Developing the Conceptual Implementation Plan will be a critical task in the process. The conceptual plan will identify, and propose a strategy to abate, a wide range of non-point pollutant, and their sources. The plan will address non-point pollutant sources such as exfiltration from defective sewers, proposed land use and development site discharges from failing septic systems, improper use of turf and landscape chemicals, pollutant laden stormwater, and the generation, use, storage, and discharge of hazardous materials.

Preliminary cost estimates developed at this stage will be based upon the anticipated costs of identifying site-specific non-point pollution sources, and implementing structural and non-structural measures to abate those sources.

February 2003 - May 2003

Develop and Submit CP Requests/Issue initial SEQRA Determination: At this stage of the program, DEP will submit a request to the Office of Management and Budget for funds to implement the plan. The request will be based upon DEP's preliminary estimate of the cost to implement the regulatory and non-regulatory components of the plan. DEP will also begin the environmental analysis of the plan required by the State Environmental Quality Review Act (SEQRA) by issuing a declaration of lead agency. DEP may also issue a declaration of no significant impact, in which case, barring objections, the SEQRA process would be complete.

March 2003 - September 2003

Conduct Public Outreach/Secure Federal, State, and Local Permits/ Issue DEIS/ Secure Landowner agreements as necessary/prepare DEIS (if necessary)/secure private property owner agreements: Since the Croton Falls Report will be finalized first, DEP will initiate its outreach effort in that basin. The outreach will include briefings for municipal Supervisors, Town Attorneys, and Chairs of local regulatory agencies, and County representatives involved in developing the Croton Plan. The outreach program will consist of presentations that explain the purpose and benefits of the program, and possible impacts on federal, State, and municipal resources. This task will be initiated as soon as possible after the Conceptual Implementation Plan has been completed.

At this stage, DEP will also identify the range of regulatory approvals necessary to execute the conceptual plan, and conduct pre-application consultations with appropriate agencies. By this point in the implementation schedule, DEP will have also determined the SEQRA status of the plan, and issued a determination of impact. In the event DEP issues a positive declaration, DEP will begin preparing a Draft Environmental Impact Statement. DEP will also begin contacting any private property owners whose permission will be needed to implement any program component. In order to ensure compliance with the schedule, DEP will attempt to complete outreach and permitting tasks as early in the process as possible.

April 2003 - August 2003

Finalize Implementation Plan: In coordination with federal, State, County, and municipal agencies, DEP will finalize the Non-point Source Implementation Plan, and develop plans and specifications for elements of the plan for which a contractor will be engaged. At this stage DEP will conduct a public hearing on the DEIS, if one is prepared.

Issue FEIS Findings Statement, if necessary: This task will be required if it is necessary for DEP to prepare a Draft Environmental Impact Statement. If so, DEP will prepare the Final Environmental Impact Statement, and issue a SEQRA Findings Statement.

September 2003 - December 2007

Begin Implementation (Non Contractual Components): In this task DEP will initiate implementation of the plan components that will be accomplished by DEP professional staff rather than a contractor(s). Plan components, such as the review of development proposals in areas identified in the plan as being vulnerable to water quality impairments, will begin upon completion of the Final Implementation Plan.

July 2004 - December 2007

Engage Contractors(s) to commence work on components of the program to be contracted: At this stage contracts will be executed, and contractors engaged to perform design, construction, and other work not being performed by DEP, will begin. Examples of plan components that might be completed in this task include sewer system inspections, water quality modeling, and designing spill containment systems.

September 2004 - October 2004

Develop Program Monitoring, Maintenance, and Evaluation Criteria: This task will require DEP to develop criteria to evaluate the effectiveness of the Implementation Plan, gauge its success and the need for modification(s), and identify maintenance requirements for any structural elements of the plan.

September 2004 - December 2007

Implement Success Monitoring and Maintenance Programs: In this task DEP begins to assess the effectiveness of the program based upon a qualitative measure of nonpoint pollutants removed from the basin, or measurable improvements in water quality. This task includes qualitative and quantitative assessments.

September 2004 - December 2007

Evaluate Plan Success and Modify Program as a Necessary: Based upon the data gathering in the proceeding tasks, DEP will conduct routine evaluations of the effectiveness of each component of the plan. Base upon those evaluations, DEP will modify the plan in order to meet its goals. As part of this task, DEP will issue an Implementation Plan Assessment Report.

Notes:

1) Impervious surface data referred to in Tasks 2 and 3 include the results of a literature search and impervious surfaces mapping.

2) Engaging contractors(s) to commence work requires estimating and securing funds (included in Tasks 4 and 5), development of contract specifications (Task 7), awarding the contract(s), and registering them with the comptroller, and issuing a notice to commence work.

3) The program development and implementation schedule will be impacted by the actions necessary to satisfy the State Environmental Quality Review Act, (Tasks 5, 6 and 8) and the time required to secure Federal, State and Local regulatory approvals, and landowner license agreements.

6.4.8 Kensico Water Quality Control and Related Programs

The Kensico Reservoir serves as the final impoundment for more than a billion gallons of potable water that enters the reservoir from the Catskill and Delaware watersheds each day. From the Kensico, the high quality Catskill/Delaware water enters the City's distribution system by way of the reservoir's two effluent chambers. Maintaining high quality water in the Kensico is one of the highest priorities for the City.

New York City developed a multi-faceted program to protect and improve water quality in the Kensico Reservoir. Major elements of the program include aggressive stormwater and waterfowl management programs, installation and maintenance of a turbidity curtain, maintenance dredging, and design and installation of hazardous spill containment facilities. Programs included: 1) inspection of some 50,000 feet of sewer lines and the repair of thirty-nine defective segments; 2) video inspection of stormwater sewer systems in the Kensico watershed to identify and eliminate illicit sewer connections; 3) a house-to-house septic system survey to identify and remediate failing septic systems in the watershed; 4) evaluating the need to extend sewers in the watershed to eliminate the threat of pollution from failing septic systems on lots of one half acre or less; 5) monitoring activities at Westchester County Airport; 6) reviewing and issuing comments concerning NYSDOT's proposed Route 120/22 modifications; 7) reviewing and issuing comments during the SEQRA review of land use proposals, and 8) serving as technical advisors to the Kensico Watershed Improvement Committee's efforts to prevent pollution of the reservoir from turf and landscape management practices, stormwater runoff, the use of road and highway de-icing materials, the use and storage of hazardous materials, solid waste, and waterfowl. The programs have been successful in preventing Fecal Coliform Bacteria (FCB) and turbidity from entering the reservoir, and in eliminating sources of these constituents.

DEP has identified opportunities to enhance the Kensico plan and provide additional protection for the reservoir and its watershed. The enhanced Kensico Management Plan summarized below is a compilation of ongoing programs that DEP determined to be effective in preventing

FCB and turbidity from entering the reservoir, modified versions of existing programs, and new programs that DEP developed to eliminate sources of FCB, turbidity, and other contaminants, and otherwise prevent them from entering the reservoir.

Planned Activities/2002-2007 Milestones

DEP will continue certain existing programs including:

- DEP will complete installation/construction of BMPs 58, 59, 74 and 75 by December 2002. DEP will also continue implementation of the Monitoring Plan, and inspect and maintain facilities in accordance with the Operations and Maintenance Plan prepared by DEP. DEP will submit semi-annual monitoring, inspection and maintenance reports.
- DEP will replace the turbidity curtain at Malcolm Brook and implement the Interstate 684 spill containment plan by September 2002. Thereafter, DEP will inspect, maintain, repair and replace as necessary the spill containment facilities and the curtain. Beginning in December 2002, DEP will include monthly inspection and maintenance reports in the Kensico Watershed Management Report.
- DEP developed criteria to determine the need for sediment removal at Shaft 18, Catskill Upper Effluent Chamber and the mouths of Malcolm and Young Brooks in September 2001. Going forward, DEP will follow those criteria and dredge sediment as necessary and submit semi-annual status reports.
- In order to continue efforts to identify and remediate failing septic systems, DEP will complete the ongoing house-to-house septic system survey by September 2002, and initiate another house-to-house survey in 2006.
- DEP will complete video inspection of stormwater infrastructure in sewered areas of the Kensico basin by May 2002, and initiate action to ensure disconnection of any illicit sewer connections by September 2002.

In addition, DEP will implement certain new initiatives in Kensico as follows:

- DEP will participate in annual meetings of the Kensico Watershed Improvement Committee (KWIC) and pursue expansion of membership in KWIC by finalizing an inventory of appropriate facilities by April 2002, and meeting with municipal Supervisors by July 2002. DEP will provide program status reports in the Kensico Watershed Management Report.
- Attachment D is a schedule for implementation of an enhanced Kensico Spill Containment Plan that addresses potential spills from Nanny Hagen Road, and Routes 120 and 22. DEP will implement the enhanced plan in accordance with the schedule.
- DEP will complete basin-wide stormwater infrastructure mapping for use in stormwater management planning by September 2002, and submit a status report in December 2002. DEP will use the mapping to determine whether additional stormwater controls, or maintenance or repair actions, are necessary in the Kensico basin; the December 2002 report will include recommendations for further actions, if any, and a timetable for implementation. The City will also use the mapping to determine if diverting stormwater out of the Kensico basin is feasible and cost-effective. The December 2002 report will include a discussion of this analysis, rec-

ommendations for further action, if any, and a timetable.

- DEP will continue to work with Westchester County to complete a sewer system operations, inspection and maintenance protocol for County-owned sewers by January 2002. Beginning in July 2002, updates on program status will be included in the Kensico Watershed Management Report.
- DEP will develop an integrated semi-annual Kensico Watershed Management Report.

FAD Milestone	***Due Date***
Complete installation/construction of stormwater BMPs 58, 59, 74 and 75.	12/31/02
Replace Malcolm Brook turbidity curtain and implement I-684 spill containment plan.	9/30/02
Follow established criteria for evaluating need for sediment removal at Shaft 18, Catskill Upper Effluent Chamber, and Malcolm and Young Brooks. Remove sediments as necessary.	Ongoing
Complete Kensico house-to-house septic system survey.	9/30/02
Initiate additional Kensico house-to-house septic system survey.	12/31/06
Complete video inspection of stormwater infrastructure in sewered areas of Kensico basin.	5/31/02
Initiate action to ensure disconnection of any illicit sewer connections discovered by video inspection of stormwater infrastructure.	9/31/02
Continue participation in KWIC. Pursue expansion of KWIC by developing inventory of appropriate facilities in Kensico basin by April 30, 2002, and meeting with municipal supervisors by July 31, 2002.	7/31/02
Complete implementation of enhanced Kensico spill containment plan for Nanny Hagen Road and Route 120 and 22 in accordance with the schedule provided.	Ongoing
Complete mapping of stormwater infrastructure in Kensico basin by September 30, 2002. Submit report, including recommendations for further action and a timetable for such action, by 12/31/02.	12/31/02
Submit integrated semi-annual Kensico Watershed Management Report	Semi-annual

Attachment D
Enhanced Kensico Spill Containment Plan
Implementation Schedule

TASK		SCHEDULE
1.	Inventory watershed and select spill containment sites, facility types, and spill response routes;	**January 2002 - March 2002**
2.	Design containment facilities and prepare biddable construction drawings;	**March 2002 - June 2002**
3.	Prepare detailed construction specifications, and other contract components, and submit them to DEP's Agency Chief Contracting Officer and DEP/City Legal Departments for review;	**June 2002 - September 2002**
4.	Develop program cost estimates, prepare and submit Capital Purchase Request (CP) and CP registration. Secure project funding; Identify required federal, State, and municipal regulatory approvals. Conduct pre-application meetings with regulatory agencies, prepare and submit applications, and represent the project before regulatory agencies as required. Secure regulatory approvals**;**	**September 2002 - May 2003**
5.	Advertise request for bids, hold pre-bid conferences, open bids, and select contractor;	**June 2003 - August 2003**
6.	Award and Register Implementation Contract;	**September 2003 - March 2004**
7.	Begin and Complete Installation of Spill Containment Facilities and response routes;	**May 2004 - October 2004**
8.	Perform necessary maintenance and prepare annual project status reports.	**October 2004 - October 2007**

Notes:

1. The project schedule may be protracted as a result of permitting and/or contractual delays.
2. The schedule identifies the major components of the Spill Containment Implementation Plan with their anticipated start and completion dates. It does not specify all the steps necessary to develop and implement the enhanced plan.

6.4.9 Catskill Turbidity Control

Due to the nature of the underlying geology, the Catskill system is prone to elevated levels of turbidity in streams and reservoirs. High turbidity levels are mostly associated with high flow events, which mobilize the streambeds and suspend the glacial clays that underlie the streambed armor. The Catskill system was designed with the local geology in mind, and provides for settling within Schoharie, Ashokan West Basin, Ashokan East Basin and the upper reaches of Kensico Reservoir. Under normal circumstances this extended detention time in the reservoirs is sufficient to allow turbidity to settle out, and the system easily meets turbidity standards at the Kensico effluents. Periodically, however, the City has had to use chemical treatment (alum) to control high turbidities.

Planned Activities/2002-2007 Milestones

DEP has conducted an in-house analysis of the issue of turbidity in the Catskills, and will compile and finalize that information. In addition, DEP has engaged a contractor to conduct a preliminary assessment of the engineering feasibility of a range of structural steps that could be taken at Schoharie to reduce turbidity levels leaving the reservoir. A report is expected from the contractor shortly. The in-house analysis and the consultant assessment will be reviewed by DEP. DEP will prepare a scope of work for a more rigorous, comprehensive analysis of engineering and structural alternatives at the Schoharie Reservoir that may reduce turbidity levels leaving that reservoir and minimize the need to use alum at Kensico. The analysis will assess a range of options, including, at a minimum, construction of a multi-level intake, relocation of the intake, removal of the cofferdam in the reservoir, utilization of a turbidity curtain in the reservoir and reservoir dredging. The analysis will evaluate the cost effectiveness of the options studied and identify the expected benefit of each alternative, if any.

DEP will develop a scope of work for the study and issue a request for consultant proposals by May 30, 2002. Potential bidders will be given approximately two months to submit proposals, after which DEP will evaluate the proposals and select a consultant. A contract will be developed and the selected consultant will be given an order to commence work by July 31, 2003. DEP anticipates that completion of the study will require extensive modeling of Schoharie Reservoir. It is likely that data will need to be collected to support the modeling efforts and it will be necessary to obtain at least two, and possibly three full years of data collection (to allow for inter-annual variations in basin conditions). [This proposed study schedule may be shortened once a consultant is selected if it is determined that no significant additional data collection is necessary, or if necessary data can be collected in fewer than three full field seasons.] The consultant will be directed to prepare interim reports in November of 2004, 2005 and 2006. The consultant will issue a final report by January 31, 2007. After review of the final report, DEP will develop a plan and milestones for implementing any feasible, cost-effective measures identified by the study by July 31, 2008.

DEP will work with DEC in the development of the SDWA-funded model to support efforts to control turbidity and improve water quality in the Esopus and Schoharie basins. The project will also provide a technical foundation for TMDL decisions in these basins.

In the context of the current evaluation and revision of the release and diversion strategies for all of the West of Hudson reservoir basins, DEP will work with DEC to develop a release management strategy from Schoharie Creek to Esopus Creek (and Ashokan Reservoir) that will help to meet water quality and water quantity objectives. By January 31, 2002, DEP will provide a date by which such a release management strategy will be completed. If a regime cannot be completed by the identified date, DEP and DEC will provide a discussion as to what was and what was not agreed upon, with a detailed explanation of issues of disagreement.

DEP will identify sources of turbidity in the Schoharie basin and analyze their relative impacts on the Schoharie Reservoir and how they are currently being addressed through the City's watershed protection program. DEP, in consultation with DEC, will use this information to guide future efforts to control sources of turbidity in the Catskill system that are not currently being addressed through the watershed protection program.

DEP will expand the City's water quality telemetry system in order to provide for the transmission of real-time water quality data for the Schoharie reservoir and Shandaken Tunnel to facilitate better control of the Shandaken Tunnel operations.

FAD Milestone	***Due Date***
Complete study of engineering and structural alternatives at Schoharie Reservoir that may reduce turbidity levels leaving the Reservoir	1/31/07

6.5 Watershed Monitoring, Modeling and GIS

New York City believes that its watershed monitoring, modeling and science programs are second to none in the world. They form the basis for the City's ongoing assessment of watershed conditions, changes in water quality and ultimately any modifications to the strategies and management of the watershed protection program. DEP will continue to support and enhance these programs.

6.5.1 Watershed Monitoring Program

The magnitude, scope and objectives of DEP's watershed monitoring program for the MOA and FAD were described in detail in the report titled "Water Quality Surveillance Monitoring Program", November 1997. The program consists of, but is not limited to, the following core tasks/objectives:

Compliance Monitoring
- Ensure compliance with SDWA and CWA
- Support the FAD, MOA, and WR&Rs

Surveillance Monitoring
- Conduct surveillance monitoring to optimize water quality and quantity and support efficient operations
- Support evaluation of long-term water quality trends
- Provide early indicators of water quality problems for operational assessments
- Track water quality problems such as turbidity, algae and bacteria and guide operational changes
- Help identify potential sources of environmental impairment

Research Support
- Conduct monitoring to support targeted assessments of watershed processes affecting the sources, pathways, fate, transport and effects of key constituents (or indicators of environmental impairment) such as phosphorous, nitrogen, pathogens, macro-invertebrates (e.g. forest regeneration study, pesticide study).
- Support targeted assessments of the effectiveness of key watershed programs under the MOA such as BMPs.

Modeling Support
- Provide critical data to support the development, calibration and verification of DEP's integrated terrestrial and reservoir modeling program.
- Provide critical data to utilize models for predictive and management purposes

Each of the program elements can consist of both routine monitoring and targeted monitoring of varying frequency and duration to evaluate specific watershed questions or concerns. To date, DEP's watershed monitoring program has generated an extensive water quality database that has already been used to support DEP's watershed management program and to evaluate the effectiveness of some of the programs established under the FAD and MOA. However, these data have been obtained based on a set of goals and objectives established some years ago. In the interim, analytical methods have changed for certain key constituents such as the protozoan pathogens. DEP believes that it is now appropriate to reassess the objectives of the watershed monitoring program in order to ensure that the samples collected over the next several years are collected in a defensible, targeted and efficient manner. To that end, each of the major monitoring programs has been involved in reassessing the data collection efforts to meet more clearly defined data quality objectives. The objective-based monitoring program documents are expected to be completed by April 2002, and will set forth the scope of the watershed monitoring program for the next several years.

Planned Activities/2002-2007 Milestones

1. Assessing watershed monitoring program
2. Enhanced dissemination of data
3. Continuation of special studies
4. Use of data by others
5. Periodic reassessment of program effectiveness

1. Assessing and redesigning watershed monitoring program.

- DEP will conduct a rigorous analysis of its current monitoring program to determine the adequacy of the program to meet data quality objectives, detect trends (where practicable given environmental variability and the time needed to construct and implement the various MOA programs), and measure constituent variability within and across watershed programs, at varying scales. This review will enable DEP to assess the results of the last several years of sampling results, and to ensure that sampling locations, frequencies and analytes are appropriate to meet critical objectives such as trend detection, evaluation of watershed remedial programs, etc. To this end, DEP has initiated a review of each major field sampling program area. As part of this FAD objective, DEP will provide a review of, and redesign as necessary, each of the major program elements (Hydrology, Limnology, Modeling, and Pathogens) by April 30, 2002.
- DEP anticipates that the redesigned Pathogen Program will incorporate a series of special research studies with defined objectives and duration. EPA will be given an opportunity to review Quality Assurance Plans for these Pathogen Program research studies prior to their commencement. The redesigned pathogen program will also include a plan for long-term monitoring of wastewater treatment plants for *Giardia* cysts and *Cryptosporidium* oocysts. The research will also include collecting operational information for facilities that use microfiltration and facilities that use approved equivalent methods for protozoan pathogen reductions.

2. Enhanced dissemination of data. DEP will expand its data analysis, reporting and presentation efforts. To this end, DEP will provide the following:

- Annual Report of water quality indicators. The annual report will provide a status report of major watershed water quality indicators. The report will also meet the reporting requirements under the WR&Rs for phosphorus- and coliform-restricted basins. This report will be completed by July 31 of each year. An outline for this report is Attachment E.
- Annual report on research objectives. DEP will also provide an annual report indicating the status of various research programs addressing the sources, fate, and transport of key constituents. This report will also address research on watershed processes affecting water quality such as key modeling programs. This report will be completed by May 15 of each year.
- Watershed Protection Program Evaluation Report. DEP is committed to long-term filtration avoidance for the Catskill and Delaware systems. We believe that our overall watershed protection program, in conjunction with our continued compliance with the objective criteria of

the SWTR and meeting milestones toward development of a UV disinfection facility, will provide a basis for continued filtration avoidance. We also recognize the ongoing need for regular evaluation and appropriate revision and refinement of the program. Accordingly, DEP is committed to undertaking a comprehensive evaluation, comparable to this five-year evaluation and plan, so that the program can be evaluated on a five-year cycle. We expect that the precise duration of the FAD and timing of reports evaluating the program and proposing revisions will be agreed upon in early 2002. An outline for an MOA/FAD evaluation report will be developed once agreement has been reached by the involved parties.

- Periodic Monitoring Reports. DEP will continue to issue periodic monitoring reports and after action reports to address specific monitoring projects, chemical treatments, etc.
- Seminars. DEP will conduct periodic seminars to help disseminate data.

DEP will post the annual report of water quality indicators and the annual report on research objectives on the DEP web site.

3. **Continuation of special studies.** DEP is engaged in a number of special studies, with supplemental funding from SDWA and WRDA grants. DEP will continue to conduct special studies to meet targeted objectives as set forth in the objectives-based monitoring program documents. As opportunities arise, DEP will conduct additional studies to meet changing conditions in the watershed.

4. **Use of data collected by other agencies.** DEP already uses and evaluates data collected by other agencies such as the USGS, DEC, etc. DEP will continue to evaluate all research efforts conducted in the watershed by other agencies of government, academia or by the various stakeholders, to guide and assess its programs. In general, such data must meet industry standard practice to ensure that samples are collected and analyzed according to appropriate methods as specified in a detailed QA/QC plan that has been reviewed and approved by the funding agency (e.g., EPA, DEC, USGS). The QA/QC plan needs to meet the basic requirements for Quality Assurance as identified by EPA. Based on past experience, DEP reserves the right to conduct an independent assessment of the quality of any data (and any report based on data) submitted by others, before accepting the validity and usability of the data. If DEP has technical issues with the usability of outside data, it is DEP's practice to submit its concerns to the appropriate agency, in writing.

FAD Milestone	*Due Date*
Review, and redesign as necessary, major monitoring programs, including Hydrology, Limnology, Modeling and Pathogens.	4/30/02
Prepare and submit annual Water Quality Report.	Annually, by July 31
Prepare and submit annual report on research objectives.	Annually, by May 15

Attachment E

New York City Department of Environmental Protection
Water Quality Annual Report Outline

1. Water Supply – Storage
   This section will summarize the precipitation for the year, water supply status as per the DRBC plots showing relation to drought levels, and storage status of each reservoir for the year (min., max. and mean for monthly data compared to long-term means.) Data on water supply "storage" will be presented as total annual precipitation and total annual runoff for selected major reservoir basins, i.e., where gauges permit these estimates to be made. These will be shown as bar charts that indicate each annual value as part of the long-term record with a long-term mean reference line. An additional plot will be the depiction of total storage vs. time for the Delaware River Basin; this plot shows where storage is relative to "normal" and relative to the various stages of drought for the current water year. Total gallons per month supplied by each of the Croton, Catskill and Delaware Systems for the current water year will be included, rather than gallons from each reservoir, since the cascading nature of the system would make it more complex to interpret the meaning of the individual measurements.

2. Transport – Flow characteristics
   This section will list runoff coefficients for major drainage areas and water residence times of reservoirs; it will include description of notable storms and their impacts (such as effects on the watershed, or their role in creating water quality problems that require treatment.)

3. Water Quality Status and Trends
   This section will focus on turbidity, coliform, pathogen levels and coliform- and phosphorus-restriction status watershed-wide, and any other notable parameters. Parameters to be evaluated will include pathogens, turbidity, nitrogen, dissolved oxygen, phosphorus and fecal coliform. The current status will be compared to the long-term record and appropriate benchmarks or regulatory criteria. The report will include notes on how zero or below detection level values are treated. Stream data will be included in the analysis and particular emphasis will be put on those that are major inflow tributaries to the reservoirs where gauging stations exist.
   - 3.1 SDWA compliance: results of turbidity, coliform and pathogen monitoring for the year in relation to regulatory compliance criteria; a summary of the waterfowl management effectiveness will be included.
   - 3.2 CWA compliance:
     - TMDL status and phosphorus restricted-basin evaluation of all reservoirs
     - Coliform-restricted basin status of all reservoirs
   - 3.3 Trophic status of all reservoirs (chlorophyll, phosphorus, Secchi depth)
   - 3.4 Status of other selected parameters relative to long-term means or specific criteria.

4. Model Development and Applications
   This section will summarize specific examples of model development or applications that result in informed decision making for operational purposes or for watershed management.
   - 4.1 Operational decisions – model applications used to guide routing and intake changes
   - 4.2 Evaluation of Programs – model applications to evaluate the long-term effects of management scenarios and identification of remedial needs to maintain excellent water quality into the future.

5. Relationship of Watershed Management to Water Quality Improvements
   This section will tabulate the major accomplishments for the year of watershed programs devoted to the reduction of pollutant sources. It will summarize what has been done in each reservoir drainage basin and evaluate program status (%complete.) The primary programs to be included are the WWTP upgrades, Whole Farm Plan, stormwater control, septic remediation, and research on pathogen sources.* Programs will be related to water quality improvements wherever possible.

* DEP is planning to convene an Advisory Board to guide the development of Stream Management Program and Project evaluative criteria. The benefits or goals of the SMP include improved bank stability in localized areas, decreases in bed and bank scour rates allowing improved habitation by macrobenthic invertebrates, improved fish habitat under conditions of normal flow variations, and reduced flood hazard risk. When appropriate evaluative criteria have been developed with the assistance of the Advisory Board, the SMP will be added to the list of programs included in the annual water quality report.

6.5.2 Multi-tiered Water Quality Modeling Program

DEP has developed a predictive "Nutrient Management Eutrophication Modeling System" to support watershed management and reservoir operations to control eutrophication in Catskill/Delaware Reservoirs. The modeling system utilizes the terrestrial model GWLF, plus a one-dimensional hydrothermal and nutrient-phytoplankton reservoir model. DEP has completed an evaluation of point and non-point source management by MOA programs in Cannonsville and Pepacton watersheds, using the modeling system. Modeling results that show potential improvements from MOA programs are part of this report. Improvements in DEP's Nutrient Management Eutrophication Modeling System are planned, through additional data collection, model development and testing, and integration of the Kensico Reservoir model with the Catskill/Delaware models. Use of the modeling system to guide watershed management and reservoir operations will continue and expand, as model improvements and additional data are incorporated.

Calibrated/verified two-dimensional reservoir models have also been utilized to support management decisions for short-term operational strategies. These include: 1) 60-day travel time questions resulting from the dry period of summer 1999, 2) copper sulfate treatment questions for Cannonsville and Rondout Reservoirs, 3) the impact on water leaving Ashokan Reservoir from a

pathogen loading episode that occurred during a storm event on Ashokan Brook, and 4) the consequences of phosphorus loading to Cannonsville Reservoir following the 100-year storm in January 1996. Simulations of turbidity using real-time data for Kensico Reservoir models have also provided assistance to managers making operations and treatment decisions. These types of model applications in support of operations will continue as needed. In addition, efforts will continue to collect data on pathogen and other particle transport to support future modeling.

Future findings and management implications from use of the models will be reported and disseminated through internal reporting, bi-annual reports to EPA and other stakeholders, and a comprehensive MOA programs evaluation report that will be completed on a five-year cycle.

Appendix M discusses DEP's comprehensive Modeling Program.

Planned Activities/2002-2007 Milestones

1. Continue and expand data acquisition to support model development, testing, and applications

- By February 28, 2002, DEP will identify monitoring needs for future watershed and reservoir model testing. These needs will be incorporated into the coordinated water quality monitoring plans described in section 6.5.1.
- Maintain and improve modeling databases of meteorology, stream flows, reservoir operations, water quality monitoring, and spatial GIS data (ongoing)
- Continue cataloguing and improving quantification of land uses and watershed management practices in Catskill/Delaware Systems (ongoing)

2. Continue calibration and verification of Catskill/Delaware (Rondout, Neversink, Pepacton, Ashokan, Schoharie and West Branch watersheds and reservoirs) GWLF and reservoir eutrophication models using additional monitoring data

- Continued testing of GWLF models for Catskill/Delaware watersheds as data become available (ongoing). DEP will provide milestones for further calibration and verification of the GWLF models. (Milestones to be provided by April 2002)
- Continued testing of reservoir hydrothermal and water quality models as additional data become available (ongoing)

3. Enhance and refine terrestrial and reservoir eutrophication models and model linkages

- Develop more accurate phosphorus loading coefficients for agricultural land uses and management practices (ongoing)
- Incorporate model and data improvements into GWLF management models (ongoing)
- Incorporate a mechanistic submodel into the Cannonsville Reservoir eutrophication model to accommodate the effects of resuspension on water quality (June 2003)
- Incorporate a mechanistic submodel for THM precursors into the existing Cannonsville eutrophication framework (December 2002)
- Incorporate PAR modeling integration tools into DEP's Nutrient Management Eutrophica-

tion Modeling System. (Six months after receipt of software from PAR SDWA contract)
- Continue to develop and refine integration of one- and two-dimensional Catskill/Delaware reservoir models into a multiple reservoir modeling system. (December 31, 2002 (contingent upon PAR contract work))

4. Develop and implement a plan to establish compatibility between Kensico modeling and Catskill/Delaware models
- Integrate/link the Kensico Reservoir model into the existing Catskill/Delaware models (December 31, 2002 (contingent upon PAR contract work)
- Continue developing and testing of Kensico modeling tools (ongoing)

5. Continue ongoing modeling research for pathogens and other particles
- Continue efforts in developing necessary pathogen monitoring and kinetic information to support pathogen and particle modeling (ongoing)

6. Continue to apply/use models to guide watershed/reservoir management and operational support
- Use Nutrient Management Eutrophication Modeling System to evaluate watershed protection programs and provide guidance for long-term watershed and reservoir management.
- Continue use of models to guide reservoir operational decisions for problems/issues as needed.
- Results of modeling system applications to support management and operations will be reported on and distributed through internal reporting channels, semi-annual reports to EPA and other stakeholders, and the comprehensive program evaluation report.

7. Semi-annual progress reports to EPA on Multi-Tiered Modeling Program
- DEP will submit a progress report every 6 months, detailing progress on activities and milestones. This report will include results of model applications to guide management and operational decisions.

FAD Milestone	***Due Date***
Conduct monitoring needs assessment to support terrestrial and reservoir modeling.	2/28/02
Provide milestones for further calibration and verification of GWLF models.	4/30/02
Incorporate a mechanistic submodel into the Cannonsville Reservoir eutrophication model to accommodate the effects of resuspension on water quality.	6/30/03
Incorporate a mechanistic submodel for THM precursors into the existing Cannonsville eutrophication framework.	12/31/02

Incorporate PAR modeling integration tools into DEP's Nutrient Management Eutrophication Modeling System.	Six months after receipt of software from PAR SDWA contract
Continue to develop and refine integration of one- and two-dimensional Catskill/Delaware reservoir models into a multiple reservoir modeling system. (completion contingent upon PAR contract work)	12/31/02
Integrate/link the Kensico Reservoir model into the existing Catskill/ Delaware models (completion contingent upon PAR contract work)	12/31/02
Submit semi-annual progress reports on reservoir and terrestrial modeling	Semi-annual

6.5.3 GIS Program

DEP's upstate Geographic Information System (GIS) is designed for natural resource management applications of GIS and remote sensing, in particular, watershed management. The GIS program acquires, updates, or develops new GIS data, performs GIS analysis and research, and produces maps and statistical reports.

The GIS is used to manipulate spatial data and create databases in support of existing program objectives and future evaluation of watershed protection programs. The GIS is also used to support terrestrial and reservoir modeling of water quantity and quality in the watersheds. GIS staff generates an average of more than 500 maps per month from the large format plotters and supports requests for data, as needed. GIS staff also provides extensive training of staff, interns, and local government agents in the use of GPS for project specific data gathering efforts (e.g., Stewardship forest inventory, sewer extensions, baseline documentation of Conservation Easements, etc.). Remote sensing support is also provided, such as the analysis of imagery for land use mapping, forest inventory, wetland tracking and conservation easement monitoring.

Data is incorporated into the GIS Library to benefit the entire organization, such as raster layers required for drainage area delineation and flow analysis, those necessary to assess runoff and erosion potential, estimated population within drainage basins, political boundaries based on parcels, and enhanced land cover/land use. Examples of data acquired from other sources include Digital Ortho Quarter Quad (DOQQ) imagery for the entire watershed, LANDSAT satellite imagery, digital tax parcel data from all watershed counties, Delaware River Basin watershed layers, USFWS wetland coverages, and digital elevation models (DEMs).

The following are some examples of the capabilities of the GIS:

Watershed-wide:

- analysis of land use to map wetlands, urban, agricultural, and forested areas.

Reservoir / Terrestrial Modeling-specific:

- calculations of model input data for estimation of water, sediment, and nutrient loads to streams and reservoirs.
- development of model parameters from GIS layers, such as erosion indices, run-off curve numbers, and sediment delivery ratios, and translation of land-cover characteristics from GIS layers into model parameters.

Watershed Protection Program-specific:

- development of target areas for Land Acquisition with newly acquired parcel data.
- creation of database links between GIS tax parcel data for various towns and revised land use codes in order to re-classify the parcel data by land use, such as "vacant" and "low density residential." In the lower priority "out-basins" WOH, more refined GIS criteria are being applied for parcel acquisition based on importance to water quality.
- creation of a preliminary Forest Inventory and development of a stewardship database of NYC-owned lands utilizing remotely sensed data, tax parcel data, and other existing GIS data.
- use of high-resolution topographic data gathered from airborne LIDAR to accurately delineate reservoir boundaries to satisfy regulatory mapping requirements related to setbacks from reservoirs and their tributaries.

DEP has developed data sharing policies and manage data sharing issues with watershed communities and their designated consultants. DEP is working to create a data dissemination FTP site. In the interim, GIS staff write GIS data to CDs for data sharing, and DEP has published a GIS data dissemination CD for the most commonly requested GIS data layers.

Planned Activities/2002-2007 Milestones

Watershed Management Applications:

- continue supporting watershed management programs as described above.
- continue developing GIS/remote sensing data, including new high-resolution ortho-imagery, land use/land cover, impervious surfaces, LIDAR elevation models, parcel data refinement, build-out analysis, and development of historic data to allow evaluation of trends.
- update wetland maps and perform trend analysis to support wetland protection goals.
- through contracted support, use GIS and multiple remotely sensed data formats to further define flood plains within priority watersheds and classify streams throughout the watersheds.

Outreach:

- continue efforts to disseminate information to the public through DEP's website.

GIS Infrastructure:

- migrate all GIS Library data to a truly concurrently managed central GIS database. This new central database will take advantage of the latest ESRI GIS data structures and functionality, allowing linkages between the GIS and other non-GIS data, such as water quality data, land acquisition data, and protection/enforcement data.
- upgrade GIS Infrastructure with additional servers, software, and network bandwidth to support the extensive library of satellite imagery and aerial photography, including cataloging/ archiving of imagery, metadata, and links to the central GIS database.
- acquire additional expertise or contracted support in order to further develop customized GIS applications and user interfaces to support watershed management programs.

FAD Milestone	***Due Date***
Continue support and enhancement of watershed GIS. Provide semi-annual progress reports.	Semi-annual

6.6 Regulatory Programs

6.6.1 Watershed Rules and Regulations and Other Enforcement/Project Review

The Watershed Rules and Regulations (WR&Rs) give DEP regulatory authority over activities that, if improperly carried out, could threaten to add nutrients, pathogens, and other contaminants into the water supply. The WR&Rs are directed primarily toward controlling sewage collection and treatment, stormwater discharges and impervious surfaces, but also govern such activities as petroleum storage, winter highway sand and salt storage facilities, and solid waste management and disposal. In general, they require that persons proposing to engage in a regulated activity in the watershed meet stringent standards set out in the regulations and, in many cases, obtain prior DEP review and approval of the activity.

By expanding DEP's regulatory role in the watershed, the WR&Rs have also changed the manner in which local communities and developers address DEP's concerns. In particular, DEP is now consistently recognized as a regulatory authority and as an involved agency for purposes of environmental review under SEQRA, and DEP's attendance at Planning Board meetings has become generally accepted. To assist communities and developers in understanding what the WR&Rs require, DEP encourages pre-application conferences, has developed Applicant's Guides for each regulated activity, and has conducted workshops with Planning Board members.

DEP has also instituted an aggressive WWTP inspection program throughout the watershed and coordinates WWTP enforcement and technical support with DEC in quarterly WECC meetings. These efforts have combined to dramatically reduce WWTP violations. DEP has begun the establishment of a similar effort to address stormwater requirements and reduce turbidity violations.

Planned Activities/2002-2007 Milestones

1. DEP will amend WR&Rs Section 18-38(b)(2) to prohibit use of new galleys and seepage pits for treatment within the watershed. This decision is based upon the results of the Galley Study. DEP expects that the amended regulations could be effective as early as April 2002.
2. By June 2002, DEP will develop internal guidance for DEP project review staff about effective participation in the SEQRA process, focusing both on identifying projects where heightened involvement in SEQRA is appropriate and on addressing broad water-quality based planning concerns, as well as regulatory compliance, in the City's comments. Criteria that may trigger heightened DEP involvement may include project size, proximity to reservoirs, wetlands and streams, the amount of impervious surface in the sub-basin, TMDL and terminal reservoir status and amount of site disturbance.
3. DEP currently actively participates in the SEQRA review process for watershed projects. Where appropriate, DEP will continue to actively participate in the SEQRA review process for projects proposed in the watershed, to identify broader water quality concerns raised by such projects, to encourage consideration of alternatives and require mitigation of impacts. Although stormwater pollution prevention plans may not be required during the environmental review process, DEP will nonetheless encourage applicants to analyze measures for appropriately managing stormwater from and minimizing impervious surfaces on development sites during SEQRA.
4. DEP will continue to attend Planning Board meetings on a regular basis in addition to attending meetings in connection with projects of particular concern.
5. Milestones 2 – 4, above, will be aided and guided by DEP's mapping and comprehensive analysis of impervious surfaces, at the sub-basin scale, to be completed by December 2002, and DEP's Croton Strategy, to be completed by December 2002. DEP's mapping and analysis of impervious surfaces will be made available to counties, watershed towns, and to other interested parties upon request.
6. DEP will continue to monitor the effectiveness of structural BMPs to determine in-the-field removal efficiencies. By June 2004, DEP will review and make appropriate revisions to SPPP guidance to reflect BMP field monitoring data, refine BMP assumptions, create performance-based benchmarks, highlight the importance of non-structural BMPs and buffers, and promote innovative site design to meet SPPP requirements.
7. DEP will modify a handout, originally prepared to be distributed by DEC, for Planning Boards to issue to applicants as part of municipality application packages. This handout provides applicants with information regarding DEP's pre-application process, including contact names and a pre-application conference request form.
8. DEP will conduct additional workshops on the WR&Rs and DEP's role in SEQRA for design professionals, Planning Boards, Building Inspectors and other municipal staff. This training will begin in the spring 2002 and will be repeated every four years. Through these workshops, DEP will encourage local officials to participate in Stormwater Project Review Committees.

9. DEP will work with a watershed municipality to pursue a pilot protocol for overseeing and enforcing SPPPs during construction of projects approved by DEP. Based upon discussions with the municipality, DEP will attempt to develop an agreement that allows for early, coordinated project reviews, joint inspections and enforcement actions, where necessary. The pilot program will continue for two years, and be evaluated every six months. If the program is successful, DEP will approach other municipalities to pursue similar arrangements. Details of this effort can be found in Attachment F.

10. DEP has provided training for selected Police and Protection staff to identify and report violations of the Watershed Rules and Regulations and water quality violations. Refresher training will continue in the future on a yearly basis.

11. DEP will report on the progress implementing Milestones 2–10 in its FAD annual report. This report will also include an assessment of these efforts and suggested changes or enhancements.

12. DEP Engineering, Protection and Police have begun and will continue to hold routine meetings to coordinate DEP's stormwater enforcement efforts with DEC and the State Attorney General's office to ensure compliance with stormwater pollution prevention plans and other applicable regulations, and prompt detection and remediation of water quality violations. DEP and DEC will develop an addendum to their existing MOU by December 2002, which details coordination objectives, points of contact, roles and responsibilities, and information needs and flow. DEP will also provide an interim report on efforts to improve coordination, with examples, by December 2002.

13. DEP will continue to participate in WECC and the Technical Support Program, and to assist in the training of small facility operators

14. DEP will report on variance applications in the 501A FAD Deliverable.

15. DEP will report through its annual Watershed Water Quality report on its annual phosphorus-restricted and coliform-restricted analyses.

16. DEP, in consultation with DOH, will substantially implement the recommendations made in its Septic Siting Study through a guidance document or other effective mechanism. (see #19 below)

17. DEP will work with State DOT and counties to encourage efficient use of appropriate winter highway maintenance materials in the watershed. DEP will report on its efforts in the FAD Annual Report (901a).

18. DEP will develop a draft methodology for evaluating the Pilot Phosphorus Offset Program by July 31, 2002. The draft methodology will be shared with EPA, DOH and watershed stakeholders.

19. DEP has begun the process of revising all Applicants Guides under the WR&Rs, including guides for preparation of SPPPs, IRSPs and CPDPs. The SSTS guide revisions will reflect DEP's recommendations based on the Septic Siting Study. Pursuant to the requirements of the MOA, these revised guides will be submitted to the WPPC for review. DEP anticipates that the revised guides will be ready for distribution by summer 2002.

FAD Milestone	*Due Date*
Develop internal guidance for DEP staff on participation in SEQRA process.	6/30/02
Complete mapping and analysis of impervious surfaces in EOH Catskill/ Delaware basins (including Cross River and Croton Falls).	12/31/02
Review and make appropriate revisions to SPPP guidance based on DEP research on stormwater BMP performance.	6/30/04
Develop draft methodology for evaluating Pilot Phosphorus Offset Program.	7/31/02
Prepare and submit semi-annual reports on project review activities, including variance applications and DEP regulatory enforcement actions.	Semi-annual
DEP will work with DEC to develop an addendum to the existing MOU to improve coordinate of stormwater enforcement actions between the agencies. Provide interim report.	12/31/02

Attachment F
Stormwater Enforcement Coordination Pilot Program

DEP has proposed to a watershed municipality that it work with DEP to develop and implement a pilot program that would enhance DEP's existing stormwater enforcement protocols, and increase (through the application of SEQRA) DEP's goal to reduce the area of impervious surface in the design of proposed land use and development projects in the watershed. Discussions with the Town Supervisor and Town Attorney indicate their receptiveness to the pilot concept. Accordingly, DEP and the Town met to begin developing the pilot with the Town's supervisor, attorney, planner, engineer and code enforcement officer/building inspector. DEP expects to formalize an agreement with the Town by March 30, 2002, under which the Town and DEP would coordinate their enforcement actions, and by which DEP can reduce impacts on water quality by participating in SEQRA during its earliest stages to ensure properly sited, designed, and constructed impervious surfaces. This pilot program will continue for two years, and DEP will provide semi-annual reports. If the program is successful, DEP will approach other municipalities to pursue similar arrangements.

6.6.2 WWTP Inspection Program

To ensure that watershed WWTPs are operated and maintained in accordance with their State Pollutant Discharge Elimination System (SPDES) permits, DEP inspects all year-round operating wastewater facilities every quarter, and inspects in two out of four quarters for seasonal operating facilities, groundwater remediation sites, or industrial permits. In addition, DEP has expanded its sampling program to include regular monitoring of the effluent parameters of all treatment plants in the watershed. DEP uses the results of the sampling to assist plant operators or to initiate enforcement activities as necessary. Sections 2.6 and 3.1 of this report describe in detail the improved compliance DEP has achieved through this program and the attendant water quality improvements.

Following an inspection and review of DEP sampling results and the facility's self-monitoring data, DEP may require an independent evaluation of the facility. If a facility is not willing to address non-compliance, or if an adequate response is not given, the case will be referred to DEP's legal counsel and the New York City Law Department for follow-up enforcement action as appropriate.

DEP has taken enforcement actions against a number of wastewater treatment facilities in the watershed for specific violations of their SPDES permits. Wastewater plant owners are often required to enter into orders of consent by which they agree to remediate their facilities and return to compliance with the SPDES permits. Regular inspections by DEP personnel ensure that the repairs and/or corrections are being completed in accordance with the consent order.

Regular inspections also allow DEP to follow-up on instances of non-compliance, mistakes or problems with self-monitoring reporting or record keeping, or modifications or expansions to the facilities.

Planned Activities/2002-2007 Milestones

- DEP will continue to inspect watershed WWTPs on the same schedule (see attached).
- DEP will continue to monitor watershed WWTPs on the same schedule (see attached).
- DEP will continue to enforce compliance with SPDES limits at the watershed WWTPs.
- DEP will continue to interact with DEC through the WECC program and continue timely and appropriate enforcement coordination with DEC through the WECC process.

DEP will continue to assist watershed WWTP operators in the proper operation of their facilities. By June 30, 2002, DEP will prepare a document that summarizes the "lessons learned" from the operation of microfiltration units at City-owned WWTPs. This document will be circulated to the operators of non-City-owned WWTPs that will be installing microfiltration prior to start up of microfiltration units at those facilities.

FAD Milestone	*Due Date*
Continue to monitor and inspect watershed WWTPs in accordance with the schedule provided. Provide semi-annual summary reports.	Semi-annual
Prepare a document that summarizes the "lessons learned" from the operation of microfiltration units at City-owned WWTPs.	6/30/02

Table 6.7. West of Hudson wastewater treatment plants, Catskill and Delaware watersheds.

WWTP	Town	County	Reservoir	SPDES Flow Permitted (MGD)	Minimum No. Inspections/ Yr.
Allen Residential Center	Kortright	Delaware	Cannonsville	0.02	4
Chichester	Shandaken	Ulster	Ashokan	0.0099	4
Clearpool Camp	Kent	Putnam	West Branch	0.0020	4
Colonels Chair Estates	Hunter	Greene	Schoharie	0.03	4
Crystal Pond Townhouses	Windham	Greene	Schoharie	0.03	4
Dairyvest (Ultra Dairy/DMV)	Delhi	Delaware	Cannonsville	0.2	4
Delaware County BOCES	Masonville	Delaware	Cannonsville	0.0025	4
Delhi (V)	Delhi	Delaware	Cannonsville	0.515	4
Elka Park	Hunter	Greene	Schoharie	0.01	2
Forester Motor Lodge	Hunter	Greene	Schoharie	0.0039	4
Frog House Restaurant	Windham	Greene	Schoharie	0.001788	4
Golden Acres Farm	Gilboa	Schoharie	Schoharie	01- .0058, 02- .0011, 03- .0023	2
Grahamsville (V)	Neversink	Sullivan	Rondout	0.18	4
Grand Gorge (V)	Roxbury	Delaware	Schoharie	0.5	4
Harriman Lodge	Jewett	Greene	Schoharie	0.02	2
Hobart (V)	Stamford	Delaware	Cannonsville	0.16	4
Hunter Highlands	Hunter	Greene	Schoharie	0.08	4
Latvian Church Camp	Hunter	Greene	Schoharie	0.007	2
Liftside	Hunter	Greene	Schoharie	0.081	4
Loyaltown, Camp	Hunter	Greene	Schoharie	0.021	2
Margaretville (V)	Middletown	Delaware	Pepacton	0.4	4
Mountain View Estates, Inc.	Jewett	Greene	Schoharie	0.006	4
Mountain View Estates, HOA	Jewett	Greene	Schoharie	0.007	4
Mountainside Farms	Roxbury	Delaware	Pepacton	0.036	4
Mountainside Restaurant	Hurley	Ulster	Ashokan	0.003076	4
Nubar, Camp	Andes	Delaware	Pepacton	0.0125	2

Table 6.7. West of Hudson wastewater treatment plants, Catskill and Delaware watersheds.

WWTP	Town	County	Reservoir	SPDES Flow Permitted (MGD)	Minimum No. Inspections/ Yr.
Onteora High School	Olive	Ulster	Ashokan	0.027	4
Pine Hill (V)	Shandaken	Ulster	Ashokan	0.5	4
Regis Hotel	Middletown	Delaware	Pepacton	0.0096	2
Ron De Voo Restaurant	Gilboa	Schoharie	Schoharie	0.001	4
Roxbury Run Village	Roxbury	Delaware	Pepacton	0.035	4
SEVA Institute	Kortright	Delaware	Cannonsville	002 -.0066, 003 -.0012	4
Ski Windham (Snowtime)	Windham	Greene	Schoharie	0.12	4
Stamford (V)	Stamford	Delaware	Cannonsville	0.5	4
L'man A'chai, Camp	Andes	Delaware	Pepacton	0.0075	2
Tannersville (V)	Hunter	Greene	Schoharie	0.8	4
Thompson House	Windham	Greene	Schoharie	0.004775	2
Timberlake, Camp	Lexington	Greene	Ashokan	0.034	2
Walton (V)	Walton	Delaware	Cannonsville	1.17	4
Whistle Tree Development	Hunter	Greene	Schoharie	0.01245	4
Woodstock/Olive Woods	Olive	Ulster	Ashokan	0.01275	4

Notes:

1. SPDES permitted cooling water and floor drain discharges not included.
2. Subsurface dischargers consistently discharge to within 90% of their SPDES permitted flow.
3. Golden Acres and SEVA have multiple discharge outfalls as noted.
4. DEP labs sample Non-City owned WWTPs twice a month. City owned plants are sampled weekly.

6.7 Catskill/Delaware Filtration/UV Disinfection Facilities

Although water from the Catskill and Delaware supplies currently meets all water quality regulations, DEP, in accordance with the 1997 FAD, began to plan for the filtration of its Catskill and Delaware water supplies.

As part of the planning process established by the FAD, DEP prepared Preliminary Designs and a Preliminary Draft Environmental Impact Statement, and completed several other planning and engineering tasks, including: (1) studies of plant capacity, (2) an evaluation of alternative sites for construction of the plant, (3) pilot testing of alternative treatment processes, and (4) development of conceptual designs for the plant. The preliminary design proposed an 1,840 million-gallon-per-day (mgd) WTP that would filter and disinfect both the Catskill and Delaware water supplies and be constructed in central Westchester County, on an undeveloped site owned by the City. The approximately 150-acre project site, known as the Eastview property, is located in the Towns of Mount Pleasant and Greenburgh. The property was purchased by the City and

equipped with connections to the Catskill and Delaware Aqueducts in the early 1900s, in anticipation of the potential future need for a water filtration plant. It was also selected as the most suitable site for construction of the plant during DEP's recent evaluation of alternative sites. The proposed process train would include pre-ozonation, coagulation, flocculation, high-rate (direct) filtration, disinfection, post-treatment chemical addition, as well as residuals recovery and treatment facilities.

On November 29, 2001, EPA granted DEP relief from completing further deliverables for the filtration planning process, subject to certain conditions outlined below. In anticipation of the promulgation of enhancements to the federal Safe Drinking Water Act, DEP began to assess Ultraviolet Disinfection (UV) for the Catskill and Delaware water supplies. As a condition of relief, the City committed to a schedule for the feasibility study, design and construction of UV facilities. The decision to proceed with design and construction of UV facilities will be made by EPA, in consultation with DOH, based on the City's feasibility study report and other relevant data. Earlier this year, DEP and their consultants, the Joint Venture of Hazen and Sawyer/Camp Dresser & McKee, conducted a preliminary assessment of the engineering feasibility for UV disinfection of these supplies. Based on this work, DEP authorized the Joint Venture to proceed with bench-scale studies to assess the effectiveness of ultraviolet light in rendering *Cryptosporidium* cysts inactive. Samples of water from Kensico Reservoir have undergone inactivation studies and Disinfection By-Product assessments. This work has been conducted using low and medium pressure UV lamps.

Additional work is being conducted to further address the engineering feasibility of installing UV disinfection facilities at one of three City-owned sites (Kensico Reservoir, Eastview and Hillview Reservoir) and to refine economic and operational considerations. Efforts are also underway to identify manufacturers of equipment suitable for such an installation and to design a model suitable for demonstrating that the full-scale units are capable of transmitting adequate UV radiation to all points in the reaction chamber.

Planned Activities/2002-2007 Milestones

DEP will provide a UV Feasibility Report on or before December 31, 2001. Provided that UV disinfection remains a feasible and promising option for meeting the goals of the enhancements to the Safe Drinking Water Act and supporting filtration relief, DEP would advance the designs of UV facilities and complete a conceptual design report and associated drawings for UV disinfection by May 31, 2002.

If EPA and DOH agree by May 31, 2002 to advance UV disinfection for the Catskill and Delaware supplies, DEP will initiate final design work and construction activities with the intention of commencing operation of UV disinfection facilities by August 31, 2009. DEP will continue conducting monthly project progress meetings for the Catskill/Delaware water treatment projects.

Catskill/Delaware Water Treatment: UV Disinfection Program

FAD Milestone	*Due Date*
Complete Conceptual Designs of UV facility. (This design will provide the basis for design including site identification and spatial requirements.)	5/31/02
Commence Final Design	8/31/02 *
Prepare Draft Environmental Impact Statement	5/31/04**
Prepare Final Environmental Impact Statement	11/30/04**
Complete Final Design	5/31/05**
Commence UV Operation	8/31/09**

* *or within 3 months of EPA decision to proceed with UV, whichever is later*

** *due dates for subsequent deliverables will be adjusted accordingly*

In addition, DEP intends to produce updates in the preliminary design for a Catskill/Delaware filtration plant every two years so that the filtration planning designs completed in late 2001 do not become obsolete.

Catskill/Delaware Water Treatment: Filtration Planning Process 2002-2007

FAD Milestone	*Due Date*
Prepare Preliminary Design Update	9/30/03
Prepare Preliminary Design Update	9/30/05
Prepare Preliminary Design Update	9/30/07

The biennial preliminary design updates will include the following at a minimum:

Assess all design assumptions for adequacy:
- Consider impacts from new or changes to existing regulations on plant's design.
- Revisit log removal and bin determination assumptions.
- Assess adequacy of site layout.
- Impacts due to advances in technology.

Review design parameters, including:
- Average water demand, peaking factor
- Water quality parameters (Turbidity, TOC, Temperature, etc.), calculate new 10-year running averages.

Evaluate Unit Operations:
- Residuals Handling
- Chemical Feed Systems
- Ozone Feed Systems
- Filter overflow Rates
- Filter Backwash Rates

Reporting:
- Submit a Catskill/Delaware Filtration Facilities Design Update Report in accordance with the schedule above. The Update Report will discuss the analysis and redesign work performed. Changed pages to the Final Preliminary Design Report and Drawings shall be submitted as required.

6.8 In-City Programs

6.8.1 Waterborne Disease Risk Assessment Program

New York City's Waterborne Disease Risk Assessment Program (WDRAP) was established in 1993. The objectives of the program are: 1) to determine rates of giardiasis and cryptosporidiosis in New York City and to collect demographic and risk factor information on case patients; 2) to provide a system to track diarrheal illness to assure rapid detection and investigation of outbreaks; and 3) to assess the feasibility of conducting studies to learn more about the nature of gastrointestinal illness (e.g., cryptosporidiosis) in the population, including risk factors for infection. Two city agencies are involved in this effort, the Department of Environmental Protection (DEP) and the New York City Department of Health (NYCDOH).

Following is a summary of current program activities:

Active Disease Surveillance
- Call or visit, on a regular basis, all laboratories certified to test for *Giardia lambia* and *Cryptosporidium* on New York City residents to enhance the capture of lab diagnosed cases of giardiasis and cryptosporidiosis. Data collected is used to calculate rates of disease as well as determine the demographics of persons with *Cryptosporidium* and *Giardia* infections.
- Conduct telephone interviews of all cases of cryptosporidiosis to gather risk exposure information. Call health care providers to verify information as necessary. Also, calls are made to patients with giardiasis who are at high risk for transmitting infection to others (food handlers, healthcare workers and daycare attendees).

Diarrheal Disease Monitoring (Outbreak Detection Program)
- Monitor sales of anti-diarrheal medications (ADM).
- Monitor reports from clinical laboratories on the number of stool specimens submitted for bacterial and parasitic testing.
- Monitor reports of diarrheal disease in selected nursing homes.

Other Activities

- Conduct outreach to the medical community, and any other appropriate communities (i.e., HIV/AIDS population), to convey relevant public health and water supply information.

Reporting

- Prepare reports on program activities and findings (illness rates, demographics, risk factors). Current FAD reporting requirements are: quarterly reports, annual report, mid-year meeting

Planned Activities/2002-2007 Milestones

- Continue active disease surveillance for cryptosporidiosis and giardiasis – including laboratory visits/calls in order to assess case rates and demographic patterns. For cryptosporidiosis, case interviews will be continued to collect risk factor information.
- Continue outbreak detection programs to achieve more rapid detection and investigation of any community outbreaks of diarrheal illness. The City will continue efforts to add additional pharmacy chain(s) to the program. Specific activities will be reviewed on an ongoing basis to determine value toward achieving program goals.
- The City will conduct a review of significant epidemiological studies that have been performed or proposed to date, designed to investigate the relationship between water consumption and gastrointestinal illness. This review will present study findings and identify strengths and weaknesses of each study and study design. Utilizing the results of this review, a determination will be made of the feasibility of conducting a study in the City that will produce valid and meaningful information. The study design review and determination will be completed by May 31, 2002. If a study design is accepted, the City will provide a timeline for the implementation of such a study.
- Continue educational and outreach activities to the medical community, and any other appropriate communities (i.e., HIV/AIDS population), to convey relevant public health and water supply information. The City will pursue efforts to increase *cryptosporidium* testing, such as education of health care providers. The City will report on activities in semi-annual and annual reports.
- In order to report on program activities and findings (infection rates, demographics and risk factors), we will prepare two semi-annual reports and an annual report. The annual report will be due May 31st of each year.

FAD Milestone	*Due Date*
The City will undertake a review and determine the feasibility of conducting a epidemiological study to investigate the relationship between water consumption and gastrointestinal illness in NYC. Submit report.	5/31/02
Prepare and submit annual report.	Annually, by May 31
Prepare and submit semi-annual reports.	Semi-annual

6.8.2 Cross Connection Control

The Cross Connection Control Program has as its primary objective the avoidance of any potential for backflow from within premises to the public water supply system. To accomplish this objective, property owners are required to install backflow prevention containment devices in water service lines for premises that pose a potential hazard. After installation, backflow prevention containment devices are required to be tested by a certified tester at least once a year. Installation of containment devices, or a review leading to an exemption from installation of such a device, is initiated due to one of the following reasons:

- Complaints to DEP indicating that there may be a potential for a backflow to the public water supply system.
- Construction of new premises or renovation of existing premises which require installation of a tap or wet connection in a size two (2) inches or larger.
- Premises that appear to be at "high hazard" for contamination of the public water supply in the event of a backflow.

There are from 4 to 8 investigations annually regarding the need for a backflow prevention containment device as a result of complaints.

Construction of new premises and/or renovation of existing premises that involves installation of a two inch tap or a larger connection frequently involves a potentially hazardous occupancy. Such construction/renovation requires a mandatory cross connection control review. This review may result in installation of a containment device as part of the construction/renovation, or an exemption from installation of such a device. There are approximately 1,100 reviews annually regarding the need for a backflow prevention containment device as a result of permit applications for taps or wet connections in a size two inch or larger. There are an additional 100 reviews annually where permit applications for smaller taps reveal potentially hazardous occupancies.

A recent study by DEP indicates that approximately 105,000 premises may require installation of backflow prevention containment devices. Approximately 51,910 of these appear to be at "high hazard" for contamination in the event of a backflow. "High hazard" premises were identified by using Department of Finance Building Classification categories that are deemed potentially hazardous and include facilities such as factories, garages, hospitals, doctor's offices, funeral homes and laboratories. In the future, cross connection control enforcement will be directed at the 51,910 "high hazard" premises.

Before conducting inspections of the 51,910 "high hazard" premises, preliminary non-entry inspections will be performed in order to see if any of the 51,910 premises can be eliminated from the "high hazard" listing. Preliminary non-entry inspections completed thus far indicate that approximately 25% of these premises should not have been included in the "high hazard" category.

Enforcement Protocol

DEP's Cross Connection Control Task Force developed an enforcement protocol in 2000. In May 2001, the Task Force accepted DEP's proposal for a minor change in the enforcement protocol. The revised protocol is as follows:

1. Advance letter to the property owner requesting that access to the premises by a cross connection control inspector be permitted.
2. Inspection is performed.
3. If the premises needs a backflow preventer, a letter is sent to the property owner directing him/her to initiate the process for installation of a device within sixty (60) days.
4. If plans are not submitted and there is no response from the property owner within sixty (60) days, a Commissioner's Order is sent to the property owner directing him/her to install a device within sixty (60) days.
5. If plans are not submitted and there is no response from the property owner within the second sixty (60) day period, a letter is sent to the New York City Health Department advising that agency that DEP intends to issue a Notice of Violation due to the owner's non-compliance.
6. If there is no objection from the New York City Health Department within thirty (30) days, a Notice of Violation is issued.
7. At an Environmental Control Board hearing, an administrative law judge may impose a penalty of up to $1,000 for failure to comply.

Note that this enforcement protocol will be implemented first with funeral homes and hospitals.

Planned Activities/2002-2007 Milestones

- DEP will respond to Annual Complaints Indicating that Backflow Prevention Containment Devices are needed.
- DEP will continue to perform annual reviews regarding the need for backflow prevention containment devices in conjunction with tap and wet connection permit applications. This will capture most new buildings, major renovations and water service line upgrades.
- DEP will continue preliminary non-entry inspections of 51,910 "high hazard" premises.

These inspections began in November/December 2000.

- DEP will perform full cross connection control inspection where need is indicated by preliminary inspections.
- DEP will direct property owners to install cross connection control containment devices where need is indicated by full cross connection inspections.

Table 6.8. Cross Connection Control FAD Milestones 2002-2006

YEAR	Response To Complaints	Review of New Bldgs, Renovations and Water Service Line Upgrades	Preliminary "High Hazard" Inspections
2002	4 - 8	1200 *	2000 **
2003	4 - 8	1200 *	2000 **
2004	4 - 8	1200 *	2000 **
2005	4 - 8	1200 *	2000 **
2006	4 - 8	1200 *	2000 **

***** Cross connection control review in connection with new building construction, major renovations and water service line upgrades will be dependent upon applications for new taps and wet connections. The number of such reviews may be greater or lesser than anticipated.

****** These preliminary inspections will be followed by approximately 500 full cross connection inspections per year during the following year. These full inspections are expected to result in approximately 250 letters per year directing property owners to install containment devices.

6.9 Administration

Beginning in the early 1990s, to support its comprehensive watershed protection program, DEP hired literally hundreds of professionals in a variety of fields, including hydrology, limnology, engineering, wastewater treatment, project management and administration. The efforts of this dedicated staff have allowed the City to successfully implement the elements of the overall protection effort.

DEP is committed to maintaining the level of staffing, funding and expertise necessary to support all elements of the watershed protection program and to meet all associated milestones. This will be achieved through in-house staffing and use of contractors.

Planned Activities/2002-2007 Milestones

As part of this report, DEP has provided a detailed description of the various units within the agency that support watershed protection programs (see Appendix A)**.** The write-up describes how various units interact to accomplish program goals, as well as how DEP uses contractor support for certain efforts. In addition, DEP has provided a table showing current staffing levels.

The City has the staff, funds and expertise necessary to support all elements of the watershed protection program and to meet all associated milestones. On an annual basis, DEP will provide a table listing staffing levels for each of the divisions and sections involved in supporting the watershed protection program, and confirm that resource levels are adequate to support the watershed protection program.

6.10 Education & Outreach

Public education and outreach efforts have been a component of the City's watershed protection strategy since the expansion of the protection program in the early 1990s. DEP's activities are built on the principle that an informed base of watershed residents and water consumers facilitates development and implementation of protection strategies. An effective outreach program enhances consumer confidence in the safety and quality of the water supply, while teaching watershed residents and consumers alike the importance of watershed protection and conservation.

DEP's efforts have included, and will continue to include, both program-specific education efforts and broad-based outreach. In many cases, program-specific outreach efforts are conducted in coordination with DEP partner agencies and organizations – the Catskill Watershed Corporation, the Watershed Agricultural Council, KEEP and the watershed counties, to name a few. It is important to acknowledge the contributions of these locally-based groups in spreading the word about the links between land use activities and water quality.

During 2001, DEP drafted a document to summarize its water supply education and outreach efforts and strategy. That document is attached as Appendix N, and contains additional detail about the City's commitments for the coming five years.

Planned Activities/2002-2007 Milestones

DEP will work on its own and with its partner agencies and organizations to continue program-specific education efforts. At a minimum, education will continue to be a component of the Watershed Agricultural Program, the Forestry Program, the Stream Management Program, certain CWC-administered programs and the Kensico protection program. See Appendix N for specific educational initiatives planned for the coming years.

School-based Education Efforts have long been a component of DEP's outreach program. DEP will continue to conduct teacher training and workshops in the City; make class visits and presentations; work with schools on environmental curriculum development; sponsor an annual water conservation art and poetry contest; and offer internships and mentor programs to high school and college students.

DEP will continue to produce a wide range of publications to provide general and program-specific information. DEP will produce program brochures, the annual Consumer Confidence Report, special papers and scientific reports, and other publications. In addition, DEP will create and publish a semi-annual watershed newsletter to be sent to watershed residents, libraries, town halls, et al., and posted on DEP web site.

DEP's website (www.nyc.gov/dep) provides Internet users access to a wide range of information and data about the water supply system, water quality, watershed protection program content and status. The goal is to give users current system and program information while also presenting topics that DEP considers critical to understanding developing watershed issues. DEP is currently developing new areas on its website, which would allow the public to learn more about the activities and status of the variety of projects and programs under the City's watershed protection program. DEP will continue to update the web site with current information, including certain FAD reports.

In recent years, DEP has recognized the need for, and benefits of, providing outreach on various aspects of the New York City Watershed Rules and Regulations, and other regulations governing activities in the watershed. Accordingly, DEP has amended its training curriculum for municipal land use officials, town engineers, design professionals and potential applicants to focus on the benefits of addressing integrated stormwater management during the early stages of project planning, and to address community concerns about the stormwater provisions of the Watershed Regulations. While DEP has addressed these groups in the past, the amended workshop series, to be scheduled with the release of the revised Applicant's Guides in 2002, will include an examination of the stormwater provisions of the Watershed Regulations and the applicant's guides, and the more aggressive use of the State Environmental Quality Review Act as a stormwater management and environmental impact mitigation tool. Other regulatory outreach efforts are planned.

6.11 Reporting

Through the years, DEP has provided numerous comprehensive reports to EPA, DOH and interested parties on all aspects of its watershed protection efforts. These reports are designed to give regulatory oversight agencies and watershed stakeholders the information they need to judge the progress of the watershed protection program. At times, these reports have been too detailed or cumbersome, and important information may have been buried in the stacks of documents. In addition, the heavy reporting burden has diverted City resources from other important tasks.

For the next phase of the watershed protection effort, DEP is proposing a modified schedule of reports, which will provide vital and timely information to interested parties. Key highlights of this new reporting scheme include:

- Publication of an annual water quality report;

- New stand-alone reports on important programs including the Stream Management Program and the Forestry program;
- A new annual report on DEP scientific research programs; and
- A comprehensive assessment report.

EPA Region II will conduct annual on-site inspections until primacy for the Catskill/Delaware system is delegated to DOH, scheduled for May 15, 2007. EPA will provide DEP with a written report of its findings, including recommendations that must be implemented for continued SWTR compliance. DEP will provide EPA with a written response to the on-site inspection report within 60 days of the date of the report. The response will include a discussion of each of the SWTR-required recommendations made by EPA and, if appropriate, a schedule for implementing the recommendation.

A full list of proposed reports is found in Table 6.9.

Table 6.9. List of proposed reports.

Deliverable	*Frequency*	*Comments*
Objective Compliance Report	Monthly	
WWTP Upgrade Report	Monthly	
Land Acquisition Status Report	Quarterly	
WWTP Monitoring Report	Quarterly	
WWTP Inspection Report	Quarterly	
Project Review Report	Quarterly	
Enforcement Report	Quarterly	
Disease Surveillance Program Report	Quarterly	
Forestry Program Report	Semi-annually	
Cross Connection Report	Semi-annually	
UV Facility Status Report	Semi-annually	
GIS Status Report	Semi-annually	
Modeling Status Report	Semi-annually	
Farm Program Status Report	Semi-annually	
Pathogen Program Status Report	Semi-annually	

Table 6.9. List of proposed reports.

Deliverable	*Frequency*	*Comments*
Stream Management Program	Semi-annually	
Technical Support Plan (Circuit Rider) Report	Semi-annually	
Phosphorus Offset Program Report	Semi-annually	
Annual WAP Plan and Budget	Annual	January 31
Annual Forestry Report (beginning 1/31/03)	Annual	January 31
FAD Annual Report	Annual	March 31
Report on Research Objectives	Annual	May 15
Annual Report on Waterborne Disease Program	Annual	May 31
Annual Report of Water Quality Indicators	Annual	July 31
Report on Waterfowl Program	Annual	July 31
WAP Annual Research Report	Annual	October 31
Stream Management Program	Biennial	December 31
Annual On-site Inspection Response	Annual	within 60 days of EPA Inspection Report