

## City's \$17 Billion Water & Sewer Plan—Balancing Risks and Costs

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### SUMMARY

Last year, the city's Department of Environmental Protection released a more than \$17 billion, 10-year plan to repair and upgrade New York City's aging water and sewer system. In addition to the repair needs of the aging system, the city also must invest in improvements to meet numerous state and federal clean water mandates.

Under the plan, the city seeks to find a balance between regulatory and operating risks and the cost of making necessary repairs and improvements. The plan addresses the most pressing needs of the infrastructure that brings water into the city—ensuring that New Yorkers will continue to have running water—while seeking to renegotiate certain clean water mandates. The environmental department estimates that if the means of meeting these mandates cannot be changed, spending could rise to as much as \$24 billion.

Some key elements of the plan include:

- A \$5.6 billion investment in improving the city water supply and distribution system, including the start of construction of the Kensico-City Tunnel and completion of the first two stages of Water Tunnel #3.
- Spending more than \$6 billion on projects to protect the watershed from pollution, including \$2.5 billion to meet state and federal mandates.
- A \$3.6 billion investment in projects to maintain the quality of drinking water, including construction of the Croton Filtration Plant.

The cost of these projects ultimately will be borne by ratepayers. Financing the investment required to maintain the city's aging water and sewer infrastructure, to preserve drinking water quality, and to protect the surrounding waterways will continue to drive water and sewer rate increases.

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## INTRODUCTION

In October 2003, the Department of Environmental Protection (DEP) released its 10-year, \$17.4 billion capital plan. This plan was updated in April 2004 to reflect the most current funding commitments. The plan, which runs from 2004 through 2013, responds to two critical needs in the city's vast water and sewer system. First, much of the city's water system infrastructure dates back to the early 20<sup>th</sup> century and is in critical need of repair and maintenance. Second, DEP is subject to numerous federal and state clean water mandates that will require extensive investment in new infrastructure. DEP's capital strategy makes reconstruction of the existing water conveyance system its first priority.

The plan also embodies an approach to meeting clean water mandates that will require renegotiating existing federal and state mandates. If the department is not successful in its negotiations with the state Department of Environmental Conservation (DEC) and the federal Environmental Protection Agency (EPA), the total program cost will be greater than the current plan. In the broadest terms, at the planned funding level of \$17.4 billion, DEP will be able to meet the most pressing water supply infrastructure needs but could not meet all the existing state and federal clean water mandates. According to DEP, if the department is required to meet the existing state and federal mandates for nitrogen reduction and stopping the spill of untreated wastewater into the city's waterways during heavy rains (technically known as combined sewer overflow), a fully implemented capital program would require an investment of more than \$24 billion.

For purposes of this analysis, DEP's capital plan can be divided into five main areas:

- Water Supply and Distribution—including major tunnel work, water main replacements and extensions, and upstate dam maintenance;
- Water Quality Programs—including the Croton filtration project and other spending required to comply with the waiver granted to the city by the EPA, which exempts the city from construction of a water filtration plant in return for implementing a water quality protection program in the Catskill/Delaware watershed;
- Water Pollution Control—upgrades to wastewater treatment plants in the city, primarily to reduce nitrogen in local waters, and combined sewer overflow project funding;
- Sewers—maintenance and construction of sewers within the city; and,

- Equipment—general equipment needs departmentwide.

## WATER SUPPLY & DISTRIBUTION—FIXING AGING SYSTEMS

DEP is particularly concerned about the condition of the city's water supply and distribution system. Water supply refers to conveyance of city water from the network of upstate reservoirs; water distribution is the maintenance, extension and replacement of water mains within the city. Due to concern surrounding the condition of the two major aqueducts that deliver water from the reservoirs west of the Hudson River—including reports of major leaks in the upstate watershed—DEP has acknowledged that in order to ensure a reliable supply of clean water to the city in the future, a rehabilitated conveyance system is needed, and alternative storage capacity should be explored.

<b>DEP's Capital Strategy</b>	
<i>Total planned funding, 2004-2013, in millions</i>	
<b>Water Supply &amp; Distribution</b>	
Kensico-City Tunnel	\$ 1,715
Alternative Supply	1,133
City Tunnel #3	1,086
Main Replacements	529
Dam Safety Project	510
Main Extensions	576
Miscellaneous Programs	11
<b>Subtotal</b>	<b>\$ 5,560</b>
<b>Water Quality</b>	
Water Quality Preservation	1,947
Croton Filtration	1,549
Other System Improvements	86
<b>Subtotal</b>	<b>\$ 3,582</b>
<b>Water Pollution Control</b>	
Consent Decree Upgrading & Construction	2,499
Plant Component Stabilization	1,724
Plant Upgrading & Reconstruction	858
Water Quality Mandates	767
Sludge Disposal	181
<b>Subtotal</b>	<b>\$ 6,029</b>
<b>Sewers</b>	<b>\$ 1,434</b>
<b>Equipment</b>	<b>\$ 765</b>
<b>TOTAL</b>	<b>\$ 17,370</b>
SOURCES: IBO; Department of Environmental Protection.	

DEP projects spending \$5.6 billion—about one-third of the total—on water supply and distribution, including new tunnel construction and reconstruction of existing tunnels, dam maintenance, and alternatives to the city's aqueduct system.

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*The Kensico Tunnel.* One of the single largest elements of DEP’s capital strategy is the Kensico tunnel, which is expected to be completed in 2020 at a total estimated cost of \$2.5 billion—\$1.7 billion of which is included in this plan. The tunnel will run 16 miles from the Kensico Reservoir in Westchester County to the Van Cortlandt Park Valve Chamber in the Bronx.

According to DEP, the Kensico tunnel will offer redundancy to the Delaware Aqueduct, allowing for maintenance and repair work to be completed on the existing Delaware tunnel, while ensuring water supply to the city.

*City Water Tunnel #3.* City Water Tunnel #3 is the single largest capital construction project in New York City’s history. When completed (planned for 2020), it will span 60 miles and will provide redundancy to city tunnels #1 and #2, allowing for inspection and repair of these aging tunnels. Currently, DEP is not able to shut down either tunnel for needed inspection and repair because of the risk that it could not be re-opened—some of the huge valves are so old that engineers are concerned that they could not get them to open again, cutting off water supply for major areas of the city. A portion of tunnel #3 is already completed and has been in use since 1998. It begins at Hillview Reservoir in Yonkers and runs 13 miles, extending across Central Park to about Fifth Avenue and 78th Street and then stretches eastward under the East River and Roosevelt Island into Astoria, Queens.

Funding commitments for Stages 1 and 2 of the new water tunnel are included in the 10-year capital strategy for a total of just over \$1 billion. The remaining work on Stage 1 consists of facility improvements at the Hillview Reservoir. Stage 2 work will improve water conveyance to Manhattan, Brooklyn, Queens and Staten Island. DEP projects that the Brooklyn/Queens leg of Stage 2 will be completed in 2005; the entire Stage 2 section of Tunnel #3 is expected to be completed by 2012. Remaining stages of the tunnel will be funded and completed after 2013.

*Alternative Supply.* DEP projects spending a total of \$1.1 billion to study and construct a system of alternative water supply. The major project under consideration is the pumping of water into the Brooklyn/Queens Aquifer, storing between 300 million and 400 million gallons there until drought conditions require its use. A number of issues will require study and resolution before work will proceed, including how the water would be conveyed to the aquifers, land rights issues with Long Island property owners, and the permeability of the aquifer.

*Main Replacements and Extensions.* DEP must do ongoing work to replace failing water mains as well as to extend water mains into newly populated areas. Although DEP anticipates doing more extension work in the earlier years of the capital strategy, replacement funding is relatively level through the plan. Currently, DEP projects spending a total of \$1.1 billion on main replacements and extensions through 2013.

*Dam Safety Project.* At almost all of the city’s reservoirs, DEP uses dams to control water flow. One of the dams in the Croton watershed requires reconstruction at a projected cost of \$122.5 million. In addition, DEP has included funding for the construction of additional dams in the Catskill/Delaware watersheds at a cost of \$335 million. The remaining \$52 million is for smaller scale repairs and maintenance on several dams.

*Reduction of Spending at Hillview Reservoir.* The capital strategy eliminates funding for covering the Hillview reservoir, reducing costs by \$140 million. The “no cover” plan, however, depends on receiving a waiver from the current requirements to install or construct a cover under a state Department of Health administrative order, which has been in place since 1996 to address concerns over E.coli bacteria entering the water system. Pending completion of the waiver negotiations, the city has added roughly \$75 million in spending to DEP’s expense budget for security and safety projects at Hillview. This funding will be used for more aggressive water fowl control and increased security measures.

## **WATER QUALITY—TO FILTER OR NOT TO FILTER**

DEP plans to spend roughly \$3.6 billion on water quality projects in the 10-year plan. These include the construction of the Croton Filtration Plant and programs to protect water quality in the Catskill/Delaware watershed, including the development of an ultraviolet light treatment facility, under the filtration avoidance determination granted by the federal Environmental Protection Agency.

*Croton Filtration Project.* As the result of a federal court consent decree, DEP must construct a full-scale treatment facility to filter possible pathogens from the Croton system water, which supplies about 10 percent of the city’s water from reservoirs located east of the Hudson River. Because of controversy surrounding the location of the plant, DEP was required to complete studies of three potential sites: Van Cortlandt Park, a site in the Bronx located alongside the Harlem River, and a site in Mount Pleasant in Westchester County. DEP has included \$1.6 billion in the capital plan for

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construction of the filtration plant, which is based on estimates of the most expensive alternative, the Mount Pleasant site. DEP must have the Croton Filtration Plant operating by 2011, or face federal sanctions. DEP has begun some preliminary work at its preferred site in Van Cortlandt Park, but a final site decision must await state approval.

**Filtration Avoidance Program.** DEP's capital strategy provides another \$1.9 billion for water quality preservation projects, most of which are required under the terms of a Filtration Avoidance Determination (FAD) granted to the city for the Catskill/Delaware watersheds by the federal Environmental Protection Agency in 1998 and renewed in May 2002. The FAD exempts the city from filtering the Catskill/Delaware water supply in exchange for specified measures to protect the water quality in the watershed, including acquisition of environmentally sensitive property, the upgrading of non-city owned water pollution control facilities and the construction of an ultraviolet light water treatment facility (for additional details, see IBO's *The Impact of Catskill/Delaware Filtration on Residential Water and Sewer Rates in New York City*, November 2000, and *Status of Spending on Catskill/Delaware Watershed Protection*, March 2002).

Over 40 percent of the water quality preservation funding—\$588 million—is for the Catskill/Delaware ultraviolet light filtration facility. Construction of this facility was required by the 2002 extension of the FAD and must be completed by 2009. In addition to the ultraviolet facility, the 2002 FAD will require DEP to spend another \$255 million for expansion of existing programs and for new programs in the upstate watershed. New requirements include reducing turbidity levels in the Schoharie reservoir, prioritizing community stormwater needs, control of non-point source pollution (runoff from fields, roads, and other sources) and completion of a house-by-house survey of septic systems in the watershed communities.

The remaining water quality preservation dollars—roughly \$1.1 billion—will be spent on various projects in the upstate watershed. Funding for land acquisition in the watershed and the continuation of community programs, including the reduction of agricultural pollution, account for roughly \$139 million of the remaining preservation funds. Under the FAD the city was required to spend a total of \$250 million on land acquisition in the upstate watershed. To date, the city has acquired 53,000 acres of land with a value of roughly \$135 million. The next largest single component is \$101 million for the stabilization and repair of leaks in the Delaware Aqueduct. The remaining \$610 million consists of numerous small projects including continued upgrades to

upstate non-city owned wastewater treatment plants, bridge reconstruction, pump station construction, installation of a security system in the watershed, repair work at the Rondout-West Branch reservoir and dredging of the intake channel of the Shandaken.

Although the EPA renewed the city's FAD in the spring of 2002, filtration of the Catskill/Delaware system could be required at any time if water quality does not meet the required federal standards. Building a plant of the unprecedented size needed to filter the Catskill/Delaware system could potentially cost \$8 billion to \$10 billion.

### **WATER POLLUTION CONTROL—SEEKING A MORE COST-EFFECTIVE STRATEGY**

The capital strategy includes \$6.0 billion in water pollution control projects, including in-city water pollution control plants and the combined sewer overflow program. DEP is counting on renegotiating the current requirements for nitrogen reduction. In fact, the capital strategy anticipates a reduction in spending of \$208 million on combined sewer overflow projects and modifications of nitrogen reduction programs at the Ward's Island, Bowery Bay and Jamaica Bay water pollution control plants. Currently, DEP anticipates spending \$766.8 million on these programs. But there is unlikely to be a reduction in other federal and state mandates for the city's aging water pollution control plants.

**Nitrogen Control.** Nitrogen is a by-product of sewage, introduced into local waterways through discharges from sewage treatment plants. Bionutrient removal technologies remove nitrogen from the sewage before the effluent reaches the waterways. Nitrogen reduces levels of dissolved oxygen, which is required by almost all types of aquatic species. One of the leading indicators of water "health" is therefore the level of dissolved oxygen in the water. A decrease in the level of dissolved oxygen can lead to a condition known as hypoxia and cause the death of fish and plants in lakes, rivers, and streams. A decrease in dissolved oxygen is usually caused by the decay of organic matter by bacteria in a process known as eutrophication, which occurs when bacteria feast on algae that flourish when there are excessive nitrogen and phosphorus levels. This most commonly occurs in the summer months when warmer water temperatures exacerbate poor flushing and stagnant conditions leading to lower oxygen levels.

Under current federal and state regulations, DEP is required to reduce nitrogen discharge levels into bodies of water in the city, including Long Island Sound. DEP anticipates that the

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state DEC and the federal EPA will impose even more stringent nitrogen discharge levels as the result of an ongoing joint federal-state-local program to study and identify major environmental problems, and of a 2001 analysis of the Total Maximum Daily Load of dissolved oxygen in Long Island Sound. More stringent levels would require costly retrofits of the city's existing wastewater treatment plants.

DEP is proposing what it considers to be a more cost-effective program to deal with nitrogen discharge levels, which it believes will still reduce nitrogen discharge to acceptable levels. DEP's strategy concerning the nitrogen reduction programs is to renegotiate the state and federal mandates from construction-based indicators to performance-based indicators, with additional emphasis on new technologies and better management of resources as opposed to simply increasing the size of wastewater treatment plants and adding more chemicals to treat the effluent. An ongoing study by DEP's Nitrogen Technical Advisory Committee—a group of experts in the nitrogen field—has endorsed DEP's proposed revisions through a study funded in part by DEP. The city is currently negotiating its proposal with DEC and EPA.

DEP argues that failure to win approval of the proposed revisions to the current consent decree requirements would mean that the city would almost certainly have to adopt wholly new technologies in order to meet the stringent nitrogen reduction targets. In order to increase the size of the plants currently in operation, DEP would in most cases be forced to either build out over the water or to condemn surrounding land. These options would face significant hurdles in gaining approval from either the City Council or the state.

Regardless of the outcome of the negotiations, DEP must still move ahead with a bionutrient removal program. Included in the capital plan is \$89 million in funding for bionutrient removal facilities in the city. These facilities include froth control systems, upgrades to existing facilities to allow for additional bionutrient removal as required by state mandates, and funding for additional pilot studies.

*Combined Sewer Overflows.* Another challenge to nitrogen reduction are combined sewer overflows. The sewer system's water pollution control pump stations convey wastewater to the water pollution control plants for treatment. Because stormwater drains also feed into the same system, during periods of heavy rainfall a combination of stormwater and sewage frequently exceed plant capacities, bypassing treatment and releasing untreated wastewater into the city's waterways. DEP is projecting spending a total of \$766.8 million—

including \$641.3 million in city funds and \$125.5 million in non-city funds—on combined sewer overflow abatement programs and the study, design, and construction of facilities necessary to control the polluting effects of such releases. This program is part of the same consent decree requiring water pollution control plant upgrading.

*Water Pollution Control Plants.* There are three funding areas that relate to the city's water pollution control plants (WPCP): Consent Decree Upgrading and Construction, Plant Upgrading and Reconstruction, and Plant Component Stabilization. As part of the consent decree requirements, the department projects spending \$2.5 billion, including \$1.6 billion for the continued upgrading of the Newtown Creek WPCP, an additional \$460 million for the rehabilitation of the Hunts Point plant, and \$471 million for upgrades at the Wards Island plant.

The capital plan includes \$858 million for the reconstruction or replacement of individual components at in-city water pollution control facilities. Additional needs in this area are driven by mandated upgrades as well as the age of the city's wastewater facilities, which are in some cases already 50 years old.

Finally, the plan projects \$1.7 billion in spending through 2013 to temporarily increase the capacity or make much-needed repairs to in-city wastewater treatment facilities. These facilities require a systemwide reconstruction, but the temporary improvements and repairs will enable the city to continue to meet state permit regulations for up to 20 years.

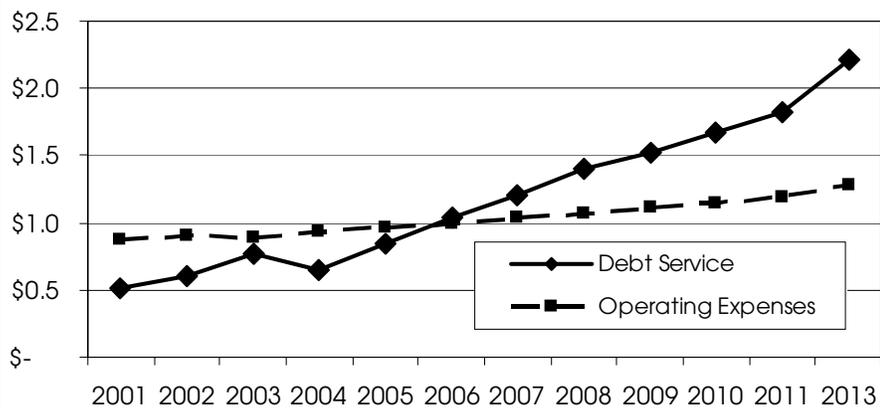
*Sludge Disposal.* DEP is constructing docking facilities and a new sludge transport vessel to remove the sludge—the solid material remaining after wastewater treatment—from the wastewater treatment plants and transport it to dewatering facilities, where excess moisture is removed and the material is prepared for either use as fertilizer or is disposed. The estimated cost of this project is \$180.6 million.

## **FUNDING THE PLAN—THE GROWING DEBT BURDEN**

The cost of the department's capital plan ultimately will be borne by ratepayers. Financing the investment required to maintain the city's aging water and sewer infrastructure, to preserve drinking water quality, and to protect the health of surrounding waterways, will continue to drive water and sewer rate increases. While the basic operating and maintenance costs of the system have grown and will continue to grow at a steady but fairly modest rate, the cost of servicing the system's

## Water and Sewer System Debt Service Will Grow Rapidly

Projected annual operating and maintenance spending and debt service, in billions



SOURCE: IBO.

growing debt will grow much faster, requiring greater rate increases than would the rise in operating costs alone.

Since the creation of the Municipal Water Finance Authority (MWFA) in 1985, 99 percent of DEP's capital improvement projects have been financed through the proceeds of bonds sold directly to the public, or privately placed with the state Environmental Facilities Corporation under its revolving loan fund program. DEP also receives federal and state capital grants for water quality capital projects, and funds some pay-as-you-go capital out of overall system revenues. These sources of funding, however, are minimal compared to water authority borrowing.

As of April 2004 the MWFA had \$12.5 billion in outstanding debt and projects issuing an average of \$1.9 billion annually from 2005 through 2008 in new debt in order to fund the 10-year capital strategy (based on projected capital commitments in the April 2004 Financial Plan). In addition, DEP projects receiving state and federal grants of roughly \$155 million in 2004 to offset the costs of some mandated construction work and \$25 million annually for 2005-2011 for water quality improvement projects.

IBO expects the growing volume of MWFA debt needed to finance the long-term capital program to drive up the cost of debt service substantially. DEP will spend \$694 million in 2004 on debt service. This amount will increase to \$1.2 billion in 2008 under the water authority's current projections. Water and wastewater system operation and maintenance expenses increased by roughly 3 percent per year from 2001 through 2004, and are projected to continue to grow at a similar rate through 2008. Debt service costs, however, will increase at an

average annual rate of 21 percent. The MWFA projects that by 2008, 56 percent of system revenue will be used to cover debt service; IBO forecasts that by 2013 debt service costs will consume fully 63 percent of system revenue. As a result of this steep rise in borrowing costs, system revenue will need to increase at an annual average rate of 10.1 percent for 2004 through 2008 and will likely continue to grow at close to that rate through the end of the 10-year plan period and beyond.

The New York City Water Board sets the rates paid by in-city and upstate system users, both commercial and residential. By law, the rates must be set at a high enough level that the revenue collected will cover 115 percent of the estimated principal and interest on MWFA first resolution bonds and 100 percent of projected second resolution (subordinate) principal and interest, MWFA expenses, the operation and maintenance expenses of the system and any other expenses not provided for through other means. Each year, the water board determines the rate increase necessary to meet these requirements.

Water and sewer rates will likely increase more slowly than overall system revenue. This is due to DEP's efforts to collect delinquent water bills—currently DEP collects roughly 85 percent of total annual charges.

The water board currently projects an increase of 5.5 percent for 2005, 6 percent in 2006 and 9.8 percent in 2007 and 2008, the rate necessary to meet projected debt service payments and operating and maintenance expenses. The water board in recent years has regularly over-estimated the size of the necessary rate increases, however, in part due to lower than expected interest rates and to higher than projected system revenue.

## CONCLUSION

DEP has presented a fully-articulated 10-year capital program through 2013—something of a novelty for the city in its capital planning process, in which most agencies do not include the full cost of projects beyond the current four-year Financial Plan. Moreover, the strategy clearly reflects DEP's decisions and priorities, and a strategy for meeting urgent system needs while holding down total cost.

The strategy acknowledges some risk. The department's proposed alternative to the current nitrogen reduction mandates could be rejected, requiring a much more costly investment in new nitrogen reduction technologies, and potentially resulting in substantial fines until the more costly infrastructure is put in place.

The city also remains at risk of being required to filter water from the Catskill/Delaware watersheds, which provide 90 percent of the city's water. If the water quality preservation programs required under the EPA's filtration avoidance determination fail to keep the water supply up to federal standards, the EPA could require the city to build a filtration plant that could ultimately cost as much as \$8 billion to \$10 billion.

The department has chosen to balance these risks against others—notably the risk of a major failure of the city's aging water delivery infrastructure. While the failure of either the nitrogen reduction or filtration avoidance strategies would result in enormous additional costs, the failure of the water delivery system would confront the city with potentially much more serious and immediate consequences, without the luxury of time in which to mitigate them.

#### **The Water & Sewer System, Legally Speaking**

Two separate corporations lease and finance the city's Water & Sewer System: the Municipal Water Finance Authority, and the New York City Water Board. The Department of Environmental Protection manages and operates the system. The authority issues bonds to finance the system's capital program. The water board, technically a separate entity, leases the operating system from the city, sets water and sewer rates, and collects system revenues. The water board reimburses DEP for costs of operating the system, and makes a lease payment to the city equal to the greater of (1) principal and interest payments on remaining City bonds issued for water and sewer purposes prior to the creation of the MWFA, or (2) 15 percent of principal and interest on authority-issued debt for the fiscal year.

Because the capital program is funded almost entirely through user payments, any increase in DEP's capital plan will necessarily increase what in-city and upstate consumers pay for their water. This could necessitate customer rate hikes on an order not seen since the system's inception. It is this balancing act between risks and costs that DEP seeks to address in its long-term capital strategy.

*Written by Merrill Pond*

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