NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

ESTUARY WATERSHED STUDY

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Estuary Watershed Study

Final Report

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1 INTRODUCTION

1.1 Context of Study Assessment

This assessment was undertaken to deal with two basic issues and their interactions. First, after a long period where annual increases in water and sewer rates have been modest and basically equivalent to the annual increases in cost of living, the forward projections for water and sewer rates have become far larger, presenting the New York City Department of Environmental Protection (DEP) with a series of growing questions about Departmental priorities and the costs of maintaining compliance with Federal and State Clean Water mandates as interpreted and promulgated by the United States Environmental Protection Administration (EPA) and the New York State Department of Environmental Conservation (DEC).[1] Second, at a time when the capital program of the Department is facing these financial pressures, critical environmental needs in the estuary are not being addressed and need significant new funding to do so. This imbalance raises serious questions about the sustainability of the City's investment programs in water resources or, to be more precise, about the Federal and State legal mandates that set the framework for the environmental investments the City must make and how they are interpreted and pursued.

A fair amount of the information presented in this study will be familiar to many DEP readers. However, if the recommendation of this study assessment--that DEP take the lead in pursuing the issue of whether, as seems likely, the technical and regulatory requirements of the Clean Water Act have reached a point of diminishing returns and are now in some sense obstacles to the achievement of its program goals, so that DEP should develop a program, in collaboration with the more flexible, goal oriented elements of the environmental community and other official government stakeholders that would provide more environmental improvement in the estuary at significantly lower cost—is to be pursued, there will need to be a clear program narrative about that conclusion and the basis for it. The presentation of such a program narrative is therefore inherent in all parts of this presentation.

Finally, a brief note about the current strategic environment for new environmental initiatives should be made. When this study was begun, DEP was facing a concern that its decade-long attention to issues of sewage treatment and watershed protection would now have to give way to an expanded concern on guaranteeing the reliability of the City's water supply, a problem highlighted by the two new realities, one

[1] These questions are not limited to DEP's own mission, but concern larger City priorities as well. The Bloomberg Administration has made addressing the City's affordable housing needs a major priority and has earned considerable praise for both its goals and the success of its early measures in doing so. A major problem in affordable housing is the limited ability of tenants to pay market rents. Water and sewer rate increases that are consistently above the growth in the cost of living and in the growth rate of tenant income put growing pressures on rental levels and therefore the affordability of low and middle income housing, either limiting its appeal or driving up the need for public subsidy.

being 9/11 and the other the emerging understanding of the Delaware Aqueduct leak. Insuring that the benefit of Clean Water expenditures was maximized and low productivity expenditures identified and reduced was seen as critical to ensuring that the Department would have adequate resources to address the new problems of guaranteeing the City's water supply without imposing overly burdensome increases in water and sewer rates.[2] Those concerns remain, though the Department has now developed a much more concrete program for dealing with those supply concerns.

What is new is that in the last year, New York City's government has moved rapidly forward in the pursuit of sustainability and wishes to establish for New York an identity of leadership in addressing sustainability concerns. This not only gives an important new aspect to this analysis, whose conclusions embody a cutting edge approach to sustainability, but the upsurge in recognition of the urgency of sustainability on all scales, from local to global, means that the present time has become much more welcoming for the innovative initiatives this analysis will suggest.

1.2 The Return of High Annual Water and Sewer Water Rate Increases

The 1975 New York City fiscal crisis reduced the City's capital investment in water and sewer infrastructure to miniscule proportions. Spurred by this experience and further driven by the desire to diversify funding sources for capital investment in infrastructure, in 1984 New York City created the current structure of water and sewer management and financing institutions: DEP, the New York City Water Board, and the New York City Municipal Water Finance Authority. This flexible, well-designed institutional structure solved the problem of financing water and sewer infrastructure and further served the City well in successfully diversifying its sources of capital finance.

However, in its first decade, the success of the program led the City to indulge in an excess of capital spending whose impact on the water rates provoked a major political outcry from ratepayers that came to threaten the continuation of the Water Board system. The period between the years 1984 and 1991 saw eight unbroken years of steady, annual double digit water and sewer rate increases, culminating in the massive increases of 1990 and 1991 to pay for the crash program to end the ocean dumping of sludge.[3] The response to such increases, particularly after the 1989 recession, was a steadily growing crescendo of outcries, ranging from proposals to place the Water Board under the New

[2] Personal Communication, Christopher O. Ward, DEP Commissioner 2002 - 2004

[3] The phrase "crash program" requires some explanation. During the 1980s, as the political outcry for the City to end the ocean dumping of sludge steadily mounted, the City pursued an unimaginative policy of denying the environmental concerns and refusing to engage with the issue or its environmental critics seriously. Congressional outrage over this apparent City political game of chicken led Congress in 1989 to pass (practically unanimously with even NYC delegation members voting for it) draconian legislation that gave the City only two and a half years to end ocean dumping of sludge, a deadline that forced the City to make far greater expenditures than it would have had to if it had met its critics halfway and negotiated a more reasonable deadline with some mitigating environmental benefit programs as the tradeoff.

York State Public Service Commission, to demands that the City Council be given the power to approve the Water Board's annual water and sewer rate decisions. Had any such measure been enacted, it would have crippled the Department's capital program and severely hampered it in the management of the Department.[4]

Fortunately, between 1991 and 1993, DEP succeeded in defusing this crisis, largely by ending the ongoing water and sewer rate escalation. To do so was not easy. In response to the pressure for rate relief, the Budget Bureau's first strategy was to try to find places to reduce DEP staffing. Unfortunately, this strategy, a time tested and tried one in times of fiscal stringency and one that has the political benefit of appearing as a public proof of fiscal austerity and concern, was applied without considering the unique fiscal circumstances of DEP.

Thanks to the Water Board structure, unlike any other City agency, DEP has a self-contained revenue and expenditure system. Within that system, what determines the water rates are not just operating expenses but debt service.[5] By the early 1990s, debt service had risen to a point where it was DEP's single greatest expenditure, encompassing 45% of the water and sewer rate revenues. Moreover, with respect to operating expenses, non-personnel costs were nearly double those of personnel. This meant that personnel costs encompassed only 20% of the DEP budget, so that personnel service expenditures would have to be cut by 5% to reduce the water and sewer rates by 1%, making staff cutting a futile exercise in terms of controlling water and sewer rate increases, even before considering the many areas where staff increases would have a positive fiscal benefit for DEP.[6]

Instead DEP adopted a twofold strategy of controlling future water and sewer rate increases through reducing capital expenditures by innovative programs of watershed protection, water conservation and natural infrastructure, and enhancing revenue flows and lowering construction costs through strategic additions of staff. Refinancing existing debt obligations also made an important contribution to bringing the water and sewer rates under control.

The results of these measures was an improvement in DEP's fiscal situation to the point where there were no increases in the water and sewer rates in 1993 and 1994, and modest rate increases for nearly a decade thereafter.

But recently, rate pressures have increased. The increase in water and sewer rates was 6.5% in Fiscal Year 2005. It dropped back to 3% in Fiscal 2006 due to improved cash flow collections, but leaped to 9.5% in Fiscal 2007. Projections for annual increases

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[4] To be sure, there were many obstacles such as bond covenants and the need for state legislation that would have stood in the way of such proposals. But it would have been a mistake to rely upon them for, even if they had blocked a direct change in the Water Board system, the political pressure that was building would have sought some outlet and jerry-rigged some political solution that might have been even worse.

[5] Unlike the revenue bonds which the Water Board system created to support the DEP capital program, most city agencies have their capital programs supported by full faith and credit municipal bonds issued by the City and paid for the City directly, so they are not responsible for paying the debt service on them.

[6] See The Department of Environmental Protection Strategic Business Plan, 1993

in the next four years are 9%, (FY2008), 9% (FY 2009), 9% (FY 2010) and 8% (FY 2011). [7]

Should these projections hold, in the five years between 2005 and 2010, the City's water and sewer rates will increase by over 50%. Traditionally, actual increases do not match projected increases, so the actual increase will probably be somewhat reduced. Nevertheless, when a significant cost center increases steadily over time at a rate that is markedly above the growth of the cost of living, it has important and unsettling implications, for it means that some other cost center must be reduced to pay for it or income must also be increased faster than the normal growth in income to meet that need. Thus, in terms of the economics of the buildings that pay the water and sewer rates, either they must reduce some area of expenditure, or they must increase their rent income faster than otherwise.[8]

1.3 What Will Be the Reaction of Ratepayers to the Return of Well-Above Annual Rate Increases?

How soon, if at all, such new fiscal demands take to provoke a political reaction similar that seen between 1989 and 1992 depends on many things, but two of them are probably the most critical. The first is the general economic condition of the City in particular and of the housing industry in general. These are realities that DEP can do little about, but it is not hard to predict from historical experience their overall pattern. As long as the overall Metropolitan economy remains solid, as long as housing values continue to increase and housing industry cash flows remain high, building owner reactions are likely to remain muted and the tendency will be to ride it out, as least for some years, with no more than some grumbling and carping. But if the housing industry hits a significant economic downtown, then concern with major increases in a measurable cost center is likely to escalate in a hurry. Objections to the double digit water rate increases of the eighties greatly escalated after the stock market crash of 1987 and the resulting recession sent into reverse the real estate boom of the eighties. Should the current pause in the real estate boom of the last decade become a downturn, it could well combine with a new period of oversized water and sewer rate increases to replicate the political dynamic of the late 1980s and early 1990s (1987 – 1992) when the water and sewer rates, and their management and oversight, were major political issues.

On the other hand, one factor that was present in 1987 – 1992 is missing now. In 1988, the City began its transition to billing residential buildings for actual metered usage of water. In the first years of that program, the fear and uncertainty about what cost changes that transition would bring combined with escalating rates to paint a particularly

[7] New York City Water Board Rate Setting Documents, 2006

[8] This choice applies equally to rental buildings and to residences that are personally owned. However, the latter have fewer options to reduce other real estate related expenditures, so that water and sewer rate increases of this size generally require cutting into other areas of family expenditure. Family owners also have less independent income options with which to buffer cost increases.

bleak and frightening pictures for building owners[9] and heightened their opposition to what they saw as a revenue raising machine out of control. DEP's success since then in successfully transitioning to metered billing and establishing that well-managed water use can be a cost saving strategy is now a significant factor working to reduce fear of water and sewer rate growth. At the very least, it will buy DEP time, if it is willing to take advantage of it, to plan, and to involve the public, in developing a water and sewer rate control strategy.

Unlike the general economic health of the economy and the real estate industry, the second main factor in determining public response to escalating water and sewer rate expenditures is one DEP is very much in control of, or at least is perceived to be in control of. That factor is what DEP is spending its water and sewer revenues on and what return the public perceives it is getting for the increasing amounts it is paying in water and sewer rates. If the public understands both the necessity for and the benefit of these expenditures then, whatever the grumbles, they will be much more accepting of growing rates than if all they perceive is growing water and sewer rates without any visible or concomitant benefit.

Here, DEP is in a much weaker position than it was during the last period of major rate growth. As noted above, DEP rate revenue is spent on three things: personnel costs, other than personnel service, and debt service. Debt service now consumes 49% of water and sewer rate revenue[10] and is the most important component in the DEP budget. This makes control of debt service the key to control of the DEP budget.

Despite DEP's prior experience, this is not often well understood, even today. Traditional budget control practices by municipal budget bureaus and traditional responses in the civic community to budget pressures tend to focus on cutting operating expenses, especially personnel costs. But to reemphasize the discussion above, for the matter is of absolute critical importance, because so much of what DEP pays is spent on debt service, cutting operating costs is generally a very counterproductive strategy to use on DEP. Infrastructure agencies, with their enormous maintenance and operational burdens are generally understaffed to begin with, and non-personnel costs in an agency like DEP have very little slack in them. But to reduce the currently projected water and sewer rate growth to a cost of living level by cutting operating costs alone would require an across the board reduction in those costs of between 10 and 15%, which would have disastrous impacts on the Department's operations and New York City's quality of life. Moreover, such cuts cannot be repeated and would soon be offset by growing debt service.

Only by reducing debt service payments can DEP hope to gain ongoing control of the growth rate of water and sewer tariffs. But debt service, as all who work with public finance know, is the hardest budget component to control Once the bonds are issued to raise funds for capital expenditures, the borrower, in this case DEP, is committed to pay

[9] In retrospect, DEP could not have picked a more difficult time to begin the transition to metered billing but hindsight is always 20-20.
[10] Personal Communication, DEP Commissioner Christopher Ward

debt service on it for several decades.[11] To be sure, in the past, the City has often succeeded in lowering debt service costs by refinancing high interest debt for lower interest debt. The City has aggressively pursued refinancing strategies for many years and has greatly benefited from doing so, particularly during the recent period of historically low interest rates, 2001 to 2004. However, with the interest rate increases of the last two years, and with forecasts for future interest rates remaining more or less at their current plateau at best, and slowly but steadily increasing at worst, the opportunities that still exist in the short and middle term future for lowering pressure on water and sewer rates by refinancing DEP's bonded debt are extremely limited at best.[12] That means that if DEP wants to control the growth of debt service in the years immediately ahead, it will have to control the size of the DEP capital program, as DEP's own budget documents and public statements have emphasized.[13]

The size of the DEP capital program is driven by two major expenditure needs. The first is the size of the investments to maintain and upgrading the basic infrastructure systems for delivering water and sewer services in a timely manner. The second is the expenditures needed to insure and improve the overall environmental quality of the City's water resources and to meet Federal and state water quality mandates. Both sets of expenditures are targeted for significant increase in the decade ahead. According to DEP, much of its basic infrastructure will require major additional investment to maintain its performance levels and to carry out necessary technological upgrades. Meanwhile, to insure City compliance with various environmental mandates and the deadlines for meeting them, DEP projects major increases in expenditures in the years immediately ahead.[14]

Some of these new programs requiring major expenditure increases will be on the water supply side of DEP. These will include the costs of addressing the leak in the Delaware Aqueduct, the costs of the Croton system filtration plant and the construction of

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[11] The amount of debt service per unit of debt varies, depending on a number of factors. Assuming a thirty year debt term, the most critical factors in determining debt service are the interest rate and the credit rating of the borrower. In general, on an annual basis a qualified municipal borrower will pay $1 in interest for every $15 dollars borrowed + or minus 2. Thus, when considering just the annual expenditure, borrowing to pay for capital investment appears cheap. But the same amount must be paid year after year and each new borrowing adds to it.

[12]The advantages of refinancing debt are not without their cost. Most notably, continuous refinancing means debt is never retired, just rolled over, meaning bonded debt always grows without any offsets. But New York City has always regarded the cash flow benefits as justifying acceptance of an ever growing debt overhang, and the continued improvement in the classification of Water Authority Bonds by municipal bond rating agencies would seem to vindicate the City's position.

It is worth noting that the financial implications for the City of growing debt service are not limited to DEP. Mayor Bloomberg has said on several occasions that debt service (along with employee benefit and Medicaid costs) will be the future driver of budget pressures on the City.

[13] See NYC Executive Budgets, 2006 and 2007, and various offering statements, New York Water Finance Authority.

[14] The issue of meeting deadlines is a key component in determining the pace of capital investment and the size of the capital budget. How urgent is the need, what are the alternatives if some expenditures are made more slowly, and how to prioritize between equally pressing claims on the DEP capital budget is a key one in rate management. It will be discussed in more detail with respect to specific expenditures below.

the new UV drinking water treatment plant. But the bulk of them will be on the sewage treatment side of DEP's operations, upgrading current sewage treatment plants and initiating and expanding new clean water programs.

1.4 Why, the Public Will Wonder, Must the City Spend so Much More When Its Clean Water Programs Have Been so Successful

Unfortunately, there is a significant likelihood that the public is not going to see these programs as worth the growing costs in water and sewer rates that they are being asked to pay. In fact, if the current level of water and sewer rate increases persist over time and eventually sparks public debate and controversy, it is hard to see how DEP is going to explain what the public will be getting for all this additional money it has to pay for water and sewer service.

The reason for anticipating this problem is a simple one. For over a decade now, the City, DEP, its state and Federal regulators, and the City's environmental and planning community have all told the public the same thing about DEP's overall water quality investments. Despite criticism of the pace in one or two program elements, most often CSOs, none dispute that the overall Clean Water effort has been a great success and that the New York Harbor Estuary is now the cleanest it has been in over 100 years. Moreover, it is further acknowledge that this success has made the estuary an attractive urban asset, which has played an indispensable role in spurring the redevelopment for residential and mixed-use purposes of the City's decaying industrial waterfronts. Improved water quality has powered a major return to the waterfront, made the waterfront a center node of civic planning and urban revitalization, and helped bring levels of new construction of housing to their highest point in forty years.

That is not all cleaning up the estuary is given credit for. It has also been credited with spurring a new interest in public access to the waterfront, prompting creation or upgrading of a number of new waterfront parks and esplanades, and generating a major upsurge in recreational fishing.[15]

These facts are, of course, true and are part of the reason the Clean Water Act is regarded as one of the few uncontested public policy triumphs of the last thirty years. But it is also true that it is an iron law of economics that all investments reach a point of diminishing returns. It seems indisputable that, with respect to DEP's Clean Water program, that point has been reached and passed. That there are environmental improvements that can be made in the estuary is not in dispute. But with the waters of the estuary at a level of environmental health with regards to bacteria, dissolved oxygen and general cleanliness that has not been seen since the Age of Sail, what is the public

[15] Unfortunately, long term contamination of harbor estuary sediments still makes it a public health hazard to eat too many of the fish or shellfish harvested in the estuary, a fact that the fishing public often does not recognize when it views and then seeks to enjoy the harbor estuary's new water quality.

buying with another decade of multi-billion dollar pattern of environmental expenditures that can begin to compare with what has already been achieved?

If growing rates spur a renewal of public concern and debate that will be a hard question to answer. One argument that might be made is that these expenditures are necessary to maintain the gains that have already been achieved. Infrastructure agencies are notorious for an unwillingness to face up to the need for ongoing investment in maintenance, and for sacrificing maintenance needs for short term budget concerns and public rate relief. In that context, DEP's willingness to face up to its maintenance obligations should rightfully be regarded as an example of infrastructure leadership, one to be encouraged. Yet given the level of both infrastructure and environmental performance DEP has achieved in the management of its sewage infrastructure, if and when rate increase pressure begins to bite, the public is likely to ask when is enough enough? Why can't DEP manage its maintenance needs with a lower rate of revenue increase?

Or, an equally pregnant question, if these maintenance needs are so pressing and important, how should expenditures for new programs be balanced against them?

Thus, maintaining the gains of the last three decades is unlikely to be a very successful defense of rapidly climbing water and sewer rates. For most of the public, infrastructure maintenance is a rather abstract function that they assume is ongoing and only become aware very late in the day as infrastructure systems begin to approach breakdown. The civic community's collective memory is still vaguely aware of the disasters that struck the MTA in the late 1970s or the East River Bridges in the late 1980s from deferred maintenance and capital replacement. But both of these near collapses were after decades of gross under-investment in systems whose performance was visibly decaying. DEP is nowhere near that state of infrastructure disinvestments or deteriorating performance. Instead, its systems have been responsible for, and are recognized as being responsible for, an enormous public policy and environmental success, the recovery of the New York harbor estuary. If it comes to a point where the public begins to push back against water and sewer rate increases, the public will find it easy to accept the argument that there needs to be a more balance between the needs for system maintenance and water and sewer rate increase controls.

A second argument that DEP has often resorted to when faced with the issue of justifying rapid increases in water and sewer rates is that they have been forced to make the expenditures to meet environmental mandates, so that they should not be blamed for these increases because basically they had to do it whether they wanted to do so or not. In one sense, this argument is accurate. All Clean Water planning now starts with the requirements of the Clean Water Act and related Federal and State legislative enactments. Moreover, these requirements are not limited to the establishment of new programs or just to addressing new problems. As administered through state permit discharge permit processes (in New York, the SPDES permit system), they often include requirements with respect to ongoing maintenance and operations standards for sewage treatment plants and clean water facilities. This provides a potential regulatory hammer to enforce

maintenance standards that does not exist with respect to other infrastructure systems, with the partial exception of bridge maintenance.

But despite the indisputable role environmental mandates play in shaping the capital programs of water resource infrastructure agencies, the problem with making an argument that blames environmental mandates for escalating water and sewer rates is twofold. First, it is not an argument that leads to anywhere positive in terms of what the Department has to do or in reducing the Department's capital costs. It is basically an argument to shift blame and, occasionally, one that can buy some implementation time when the argument is pressed aggressively enough and can be linked to a lack of sensitivity about local conditions and tradeoffs. But though it can buy some short term rate relief, it does not ease the long term burden on the ratepayer and, in fact, can often increase it.[16] It only attempts to get them to shift their wrath away from the Department over to the regulator, something history shows rarely works, for the simple reason that it is DEP and the Water Board, not EPA or New York State DEC that is sending out the bills and collecting the money.

Second, not all environmental mandates are of equal weight. Many of them are sensible. Many have sensible goals but have reached a point of diminishing returns with respect to their means. Some are goal oriented, some are planning oriented; some are highly technical and rigid, some offer a surprising amount of flexibility, only to be administered rigidly by regulators. Some of them would not survive any kind of critical cost benefit scrutiny and some, while important, have clearly less of a priority than others. But a generalized attack on environmental mandates not only loses any opportunity to exploit these differences through a nuanced strategic approach but, by suggesting environmental mandates as a class are at fault, it immediately makes those who make that argument, in this case DEP, look antagonistic to environmental improvement and tends to rally the Clean Water constituency and the Federal and state regulators behind environmental mandates and to solidify support for them on the grounds that if concessions are made are on any one mandate then all environmental mandates may be at stake.

Thus a blanket attempt to blame environmental mandates for growing water and sewer rates, while often satisfying from an internal agency point of view (in part because it plays to underlying resentments, some valid, some not, about external roles in agency agenda setting and management), is not likely to be very persuasive, while the negative attitude it implies towards environmental improvement often does nothing more than make those who attack environmental mandates look anti-environmental, when what they are really trying to do is to look pro-common sense. Thus, by making an attempt to blame environmental mandates for escalating water and sewer rates, all one tends to do is to solidify and energize their supporters

Thus, if accelerating water and sewer rate increases combine with changing economic conditions, particularly for affordable housing, to begin to trigger a public

[16] Delayed projects are generally more expensive projects. Moreover, the cost of obtaining delay is often fines, penalties, or expenditures on short term environmental improvements.

backlash against excessive rate increases, DEP will not have a large menu of arguments to justify the financial burden its capital program is placing on the New York City public and its building owners. So far, there are few if any signs such a backlash has begun. The Spring 2006 Water Board Hearings saw almost no public comment on the size of the 2006-2007 rate increase.[17] One Congressman did report a number of constituent inquiries and complaints, and had staff make some initial background inquiries.[18] But he apparently has made no follow-up.

But if one year of elevated rate increases coming off a prior year of small increases and at the end of a real estate boom has produced very little response, that is not likely to be the case if there is a second, third, or forth major increase in a row, especially if it occurs at a time of softness in the real estate market. As noted above, steady cost increases that significantly exceed either the rate of increase of the cost of living (CPI); or the rate of growth of personal income of the payers force unwelcome and often difficult rearrangements in personal patterns of spending. If the surplus income is lacking to accommodate those changes, then resistance to them will develop quickly. When that happens, as the City saw fifteen years ago, the result can be a ratepayer outcry that can threaten DEP's capital program by politicizing its budget and the administration of water and sewer rates by the Water Board.

So what is the answer to this problem? On the surface the choices for DEP are to carry out such a program and risk financial and political upheaval or to defer such expenditures, risking regulatory and environmental upheaval. But there is a third way, and understanding it starts with the other issue that prompted this study: why, when DEP is spending so much on Clean Water, are there a number of critical environmental needs that remain badly underfunded? And what is the connection between the two?

[17] Personal Communications, Jim Tripp, Environmental Defense, and Eugenia Flatow, Coalition for the Bight

[18] Personal Inquiry from Washington D.C. staff, Office of Congressman Anthony Weiner, Summer 2006

2 POSSIBLE PIECES TO A BEYOND-MANDATED INTEGRATED WATERSHED AGENDA FOR THE NEW YORK NEW JERSEY HARBOR ESTUARY

2.1 Wetlands Preservation

Consider the status of New York harbor estuary habitat. While the water column in the New York Harbor Estuary has been restored to levels of purity not seen in 150 years, the core habitat of Harbor Estuary, any estuary, its tidal wetlands, continue to slowly but inexorably shrink. And where such habitat is not shrinking it is being isolated and fragmented, for while tidal wetlands enjoy some regulatory protection, the uplands adjacent to tidal wetlands enjoy virtually none at all.

Today over 80% of the original wetland habitat of the harbor estuary has been destroyed.[19] Yet protective efforts for the estuary's wetland habitats have proceeded fitfully at best. The progress of the 1980s and 1990s, which saw the creation of the Buffer the Bay and the Harbor Herons urban nature systems and the preservation of many individual wetland sites, has ground to a halt. In New Jersey, the successful preservation of the Hackensack Meadowlands and the transformation of the New Jersey Meadowlands Commission into an agency whose primary mission has become environmental stewardship has been the signal accomplishment of the last five years and has preserved what, after Jamaica Bay, is the estuary's most important wetland ecosystem. But it has also been largely a solitary one.

Elsewhere in the estuary, acquisition of critical ecological sites has dwindled to a virtual standstill and many critical and irreplaceable sites have been destroyed in the land boom of the last five years, particularly on the Arthur Kill shore of Staten Island. There are over 162 sites on the recommended for public acquisition and protection list of the Habitat Working Group (HWG) of the Harbor Estuary Program (HEP),[20] a number that is essentially unchanged from five years ago. Outside of the Hackensack Meadowlands, public acquisition of critical wetland sites and their adjacent uplands has become a rare occurrence. Thus, despite regulation and a supposed commitment to no net loss of wetlands at both the Federal and State level, the habitat base of the estuary continues to shrink and, equally pernicious in its long term implications, continues to be fragmented and constrained by failures of the regulatory structure to protect all of the components of estuary habitat, not just tidal wetlands.

Part of the problem with habitat acquisition and protection has been a lack of resources. Though so many factors go into valuation (and real estate negotiation) that it has been impossible to create a precise cost estimate, there can be no doubt that the purchase of the well over 100 pieces of vacant land along the estuary shoreline that the

[19] See Report to the United States Army Corps of Engineers on Needs and Opportunities for Restoration of the New York Harbor Estuary Ecosystem, May 2003, Habitat Working Group, Harbor Estuary Program

[20] See, www.harborestuary.org for the current listing of the estuary sites the Habitat Working Group has recommended for public acquisition and restoration, in New York City and elsewhere in the estuary.

Habitat Working Group of the HEP program has recommended for public acquisition and preservation would involve expenditures in the range of several hundred million dollars.[21] Yet in stark contrast to the many hundreds of millions routinely spent every year in the estuary on wastewater treatment and Clean Water initiatives, almost no money is routinely made available for public land acquisition, even when it is for resources as irreplaceable and as fundamental to the estuary's functioning as its remaining wetlands and adjacent uplands.

And even when some funding has been available, it has been difficult to spend it effectively. In 2001, the Port Authority of New York made $60 million dollars available for purchase of habitat in the harbor estuary, with the understanding that that $30 million dollars would be spent in each state, New York and New Jersey. The purpose was to make an initial investment in preserving wetland habitat to offset the impacts of Port Authority's port expansion programs and to establish a collaborative partnership between Port Authority's economic development and environmental stewardship obligations. Moreover, the $60 million was envisioned as an initial and program building investment, not as a one time payment.[22] Yet years later, despite the long list of sites identified for public acquisition by the HWG, and conscientious and aggressive efforts by Port Authority and other agency environmental and land acquisition staff, much of that money remains unspent and prospects for closing it out anytime soon are not considered promising.[23] In fact, without the transfer of $10 million to the New Jersey Meadowlands Commission for use in its successful land acquisition efforts (a notable contrast to experience in the rest of the estuary), the record would be even more disappointing.

Why, when the need is so pressing, have even the patently inadequate resources committed to land acquisition failed to be completely spent? There are two reasons for this. First, the state resources agencies involved in working with Port Authority on these programs have insisted that purchase negotiations be conducted solely on a willing seller, willing buyer basis, and that the regulatory authority and influence of the agencies will not be used in any way to affect the economic expectations of private landowners.[24] Thus, though the Port Authority and its agents have been unwilling to offer purchase prices above those that assume that the regulated status of the land will govern its use, private landowners have proceeded on the basis that their land has full market value and

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[21] It has not been uncommon on Staten Island to have owners ask for prices of several hundred thousand dollars per acre, personal communication, Rose Harvey, Senior Vice President, Trust for Public Land

[22] See Press Release, Office of New York State Governor George A. Pataki, September 7, 2001.

[23] Personal Communication, Christopher Zeppie, Director of Environment Programs, Port Authority of New York and New Jersey

[24] There is a general consensus among both public and private experts in land acquisition for environmental purposes that mere mention of the "C" word, condemnation, is counterproductive and creates a political backlash. This reflects extensive experience in rural and suburbanizing areas where there are lots of suitable parcels for acquisition and where most funding comes from voter passed bond acts or other local revenue raising measures such as surcharges on sales or property taxes, and where opponents of such additional revenue raising measures have tried to overcome the popularity of open space preservation by trying to stir up fears that passing such a measure will mean everyone's property will be vulnerable to condemnation by runaway environmentalists and bureaucrats. However, in urban areas where environmental parcels are limited, unique, and tend to have strong public support for their acquisition, it leaves the fate of needed environmental investment to its ability to outbid a speculative real estate market.

set purchase prices accordingly, meaning that their real expectation is that they will be able to overcome regulatory barriers to its full development (through practices like wetland mitigation or aggressive lobbying for a permit). Moreover, the land price spiral of the last five years has created speculative expectations that have changed much faster than government agencies have been able to respond to them in their bidding processes, particularly given the fact that, with their limited resources and many competing demands, such agencies have been understandably reluctant to get involved in bidding wars over private parcels.

Second, the agencies involved have simply lacked the staff and other resources to simultaneously and aggressively pursue multiple land resource opportunities. Care and feeding of landowners when one is dependent on their voluntary sale is a complex and often time-consuming discipline that public agencies are generally not staffed to carry out. Managing such care and feeding is one of the main reasons governments often attempt to use land trusts as an intermediary. Unfortunately, with respect to the estuary, though efforts with varying levels of commitment have been made to involve local land trusts, the difficulty of resolving all the financial issues such relationships involve in the complex environment of New York City has meant that whatever land trust involvement has taken place has resulted in only marginal improvements to the progress of acquiring critical harbor estuary habitat.[25]

In contrast, consider the recent success of the New Jersey Meadowlands Commission (NJMC) in acquiring Meadowlands habitat. Through its handling of development issues such as the Empire State Tract controversy and the Xanadu development proposals, the NJMC has established a reputation as bringing to development permitting decisions clear guidelines for environmental stewardship and a predictable willingness to enforce them in a consistent fashion. The Commission's Annual Report states that:

> The Commission's polices and regulations emphasize smart growth principles, minimal fill of wetlands, and the concept of sustainability. Sustainability requires the economy, society and the environment to function harmoniously to shape the quality of life now and in the future. (emphasis supplied)[26]

Thus owners of environmentally significant and regulated land in the Hackensack Meadowlands have come to understand that the environmental regulation their lands lie under actually does set the development expectations for their land. With no realistic hope of speculative profit, and with the Commission willing to deal fair and efficiently with them in terms of land purchase, the Commission has been able to steadily acquire environmentally significant parcels and ensure that the Meadowlands will remain a functioning ecosystem and a critical source of habitat for the larger Harbor estuary. And it should be mentioned, through its various funding mechanisms, the Meadowlands Commission has the resources to maintain a steady pace of land acquisition.

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[25] Personal communication, Rose Harvey, Vice President, Northeast Region, Trust for Public Land
[26] See Annual Report of the New Jersey Wetlands Commission, 2004 - 2005

The NJMC experience stands in strong contrast to the land acquisition experience in the rest of the estuary and highlights two things. First, resources do matter. Second, what also matters is a clear commitment to habitat protection, a functioning land use plan for doing so, and a sense of institutional mission about carrying out these tasks.

2.2 Environmental Restoration

If the lack of complete protection for what remains of the estuary's natural habitat is one contrast to the success of the estuary's sewage treatment programs, a second is in the failure to deal with the need to enhance and protect that habitat through a meaningful program of environmental restoration. In 2000, the United State Army Corps of Engineers released a reconnaissance study calling for a comprehensive program of environmental restoration program in the harbor estuary.[27] The result was inclusion of language in the 2001 Water Resource Development Act (WRDA) directing the Army Corps to create a comprehensive estuary restoration plan. Port Authority, as another step in the pursuit of a port development estuary environment collaboration that led it at the same time to commit the $60 million to land acquisition described above, agreed to be the local partner and put forward the 50% matching funds for what was expected to be a five year $20 million dollar planning effort.

This report was followed in 2003 by the HEP program's Habitat Working Group's Report on Needs and Opportunities for a Comprehensive Restoration of the New York Harbor Estuary. As laid out in that report, the list of environmental problems in the estuary was such that only a systematic program of environmental restoration could deal with them. These problems included degraded wetlands, reestablishment of wetland adjacent areas and upland habitats, contaminated bottom sediments, invasive species, protection of rare and locally unique plant communities, restoration of wildlife habitat, addressing habitat fragmentation, protection of endangered species, restoration of stream corridors and harbor tributaries, restoration of soft shoreline edges and, perhaps most critically, stabilizing and restoring the wetlands of Jamaica Bay. In addition to describing them, the Needs and Opportunities Report documented the enormous ecological benefits that would flow from such a program and provided a comprehensive blueprint for such planning, urging in particular that restoration activities be organized on the basis of regional ecosystems, instead of current site specific efforts. To address all of these programs, it envisioned an investment in environmental restoration of several hundreds of millions of dollars.

Yet with the exception of some efforts in Jamaica Bay that the wetland erosion crisis in the Bay has sparked and the landfill restorations that DEP has undertaken on the shorelines of Pelham Bay, Jamaica Bay and Staten Island, environmental restoration in the estuary remains lamentably underfunded and limited in scope. Due to cutbacks in Federal funding, the Army Corps of Engineers remains years away from completing a

[27] See United States Army Corps of Engineers, Comprehensive Restoration of the Estuary Planning Reconnaissance, 2000

comprehensive plan for estuary restoration. Outside of Jamaica Bay, the amount of money being spent on restoration efforts is limited to a few millions scrambled up here and there, largely from the Army Corps CAP program.

Finally, one aspect of the estuary restoration needs particular highlighting: the problem of marine environments. The issues with respect to the restoration of the Estuary's terrestrial habitat, its wetlands, shorelines, adjacent uplands and tributary stream corridors are well known. While agreement on their specific implications is far from universal, it is possible to envision their resolution and how a planning and redevelopment process might be structured to do so, and what it would take to properly fund it.

But the level of understanding of the restoration of marine habitats are far different. Though issues of toxic contamination are relatively well understood, and certain types of fishery data have been collected and used for issues like the timing of dredging activity and managing the harvest of selected fisheries, in general what a restoration program for benthic organisms, marine vegetation and critical fish habitat would look like is far less developed than restoration planning and understanding is for terrestrial habitat. The information on a whole series of issues, starting with what would be the historic baseline ecosystem and benthic typography, and ending with how to balance deeply embedded desires to maximize production of certain fish with an overall ecosystem approach to marine organizations is still largely in development. And the political debate over its implications has barely begun. Indeed, it is interesting to contemplate the extent of uncertainty and lack of public understanding about the ecological (as opposed to hydrological and bio-chemical) functioning of a resource the public has invested billions in to clean-up and protect and over which fishery interests have fought and continue to fight brutal if highly specific battles about its management.

2.3 Soft Shorelines

Two other problems present a particular contrast to the Clean Water success in the estuary. One is a particular subset of the restoration problem, the issue of softening shorelines in an estuary that is by and large bulkheaded. This issue is both ecological and a major concern in planning for waterfront revitalization. Most of the estuary's current bulkhead and pier facilities are aging and decaying, a process being accelerated by the success of the City's Clean Water program that, ironically, has also made the harbor safe again for wood boring worms. Who will pay for the restoration of this unsung but critical waterfront infrastructure and to what standard will they be restored is a critical infrastructure question. And along with that question is what to what extent the rebuilding processes could or should look for opportunities to recreate soft shoreline with all of its environmental benefits? A particularly complex element of that question that has plagued a number of waterfront redevelopment permitting decisions is what happens when a previously bulkheaded shoreline has begun to breakdown and, through the natural processes of decay, is recreating soft shoreline that is beginning to have positive ecological functions such as providing new fish habitat. Should the owners be allowed to

repair that bulkhead and restore it to its original and previously accepted state? Or should the permitting decision be based on the bulkhead's current state, raising state issues of tidal wetland permits and no net loss, and Federal issues of 404(c) dredge and fill policy and even Magnuson-Stevens fisheries management questions.[28]

2.4 Sediment Contamination

The other issue is sediment contamination. Harbor sediments, though they have grown steadily cleaner, still show serious impacts from of decades of discharge of industrial waste, as well as the flows from upstream sources of many other contaminants, including PCBs that have worked their way down the Hudson. Moreover, there remain a number of sediment hotspots, such as the dioxin site on the Passaic River that continue to leach sediments into the estuary water column.

Sediment management is the marine equivalent of terrestrial brownfields. But unfortunately, unlike brownfields, where environmental policies have become steadily more refined and sophisticated, marine sediments problems have remained stubbornly unresponsive. There are two reasons for this that are important for planning future environmental strategy. First, brownfield contaminants stay in one place. They leach downward and will ultimately reach groundwater, in which case they present a far more difficult problem,[29] but at least they begin by being spatially contained.

By contrast, marine sediments are always moving and, being always moving, carry with them and disperse any contaminants they have across the harbor. Moreover, the dynamics of that movement means that is far more difficult to cap and contain those sediments that it is with a site on land whose soil may be contaminated, but which is not going anyplace.

This also means that the amount of contaminated sediment that has to be treated to effect a cleanup of a contaminated site is generally far larger than a similar soil removal on a land site. Moreover, soil on land is dry, while marine sediments are waterlogged, creating not just volume but weight and dewatering problems when it comes to soil movement and transfer.

Finally, all these problems combine in the fact that the more marine sediment is disturbed, the more it is likely to move, thus releasing their contaminants into the water column in the short term and spreading them wider in the long term as they settle out. That means that in ship channels and other confined areas where there must be dredging, such as DEP undertook with the Gowanus, the issue of fish windows, that is identifying when the work can be done to avoid damaging impacts on migratory fish stocks or annual breeding activity, becomes a critical concern.

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[28] Personal Communication, Leonard Houston, United States Army Corps of Engineers

[29] Consider, i.e., the issues revolving around the remediation of Lake Mobil along Newtown Creek.

Moreover, marine contaminants, because they become spread geographically much more widely, have many more implications for marine food chains than brownfield sites have for land based wildlife. Despite the steady decreases in toxic waste loading contamination, many fish stocks removed from the harbor are either unsafe to eat or must be consumed in only limited amounts. Some have concluded that, because of PCBs, some critical fish stocks many never be safe for human consumption.

These characteristics have made the cost of remediating contaminated sediments enormous, in comparison to the costs of remediating on-land brownfields. Since criticism of the progress of on-land brownfield remediation programs for lacking sufficient funding is common, it is not surprising that resource constrained state environmental agencies and EPA have approached contaminated marine sediments with the greatest caution.

The result has been a de facto policy in the estuary, and in the larger country for that matter, of dilution being the solution to pollution. What has made this policy work, or at least work to the extent of showing major reductions in the amount of toxic pollution in the estuary water column, are two things. One has been the steady decline of manufacturing activity in the New York Metropolitan region, thereby reducing the amounts of toxic industrial pollutants being disposed of in the New York City watershed. And second have been the requirements of the Clean Water Act, which have set strict limits on the amount of toxic metal discharges from sewage effluent.

Most of the praise for the Clean Water Act's success focuses on its role in forcing (and in the 1970s funding) the systematic upgrading of the levels of sewage treatment in the United States. But significant praise is also due to the role of the act in setting discharge standards for toxic metals and other industrial pollutants such as solvents. Since these are not materials that are easily treatable or capturable during the sewage treatment process (though are drawn off into sewage sludge or biosolids), prevention is a far superior strategy. DEP's programs to reduce industrial discharge have been one of the Department's key Clean Water successes and have played a major role in reducing toxic parameters in the estuary water column and sediments.

But progress is slowing. The toxic load in harbor sediments continues to redistribute itself, releasing an ongoing stream of toxic pollution into the harbor estuary. And much of the toxic loading into the estuary now comes from non-point source pollution. Thus toxic pollution, particularly toxic sediments remain a critical and unresolved concern with regards to the overall ecosystem health of the estuary.

Four problems then, habitat protection, habitat restoration, soft shorelines, and contaminated sediments stand out as unaddressed and unresolved in the clean-up and restoration of the harbor estuary, raising significant questions, in light of Clean Water progress, as to whether it is time to reconsider investment priorities. Then there are two other problems that advocates regard as under-addressed, but may in fact raise issues from a different perspective, that is from the perspective of priority.

The first is nitrogen and nutrients, and the second is CSOs and stormwater.

2.5 Nitrogen and Nutrients

The recent agreement between DEP and NYSDEC over the schedule for upgrading the City's nitrogen treatment capacity and lowering its discharges solidified the final triumph of the City's quest for common sense management of the nitrogen issue. This project helped forward the agreement in a modest way by assisting in the brokering of an understanding between DEP and Long Island Sound's principal environmental advocates, most notably David Miller of National Audubon and John Atkins then of Save the Sound, and then, along with Jim Tripp of ED, working to build support for the City's approach in the environmental community, most importantly to overcome DEC anxieties about agreeing to such a flexible approach.[30] The financial and technological obligations of the agreement have been described by the City as acceptable.[31]

As will be discussed below, this experience suggests that a technologically and programmatically innovative, more priority based and flexible approach to Clean Water issues can gain general support from the environmental community for more flexible and realistic ways to meet regulatory needs.[32] The key is to demonstrate to key environmental stakeholders that it does a better job of meeting their environmental concerns, as DEP did with its Long Island Sound nitrogen approach.

Thus, the main place where nitrogen discharges currently remain an issue in the estuary for New York City is Jamaica Bay. Over a decade of study has established that traditional treatment upgrade approaches to nitrogen management are not likely to succeed in meeting Clean Water Act nitrogen standards. In the private sector, such a conclusion would suggest that spending money on a program that will not work is a bad idea and that a different approach should be taken.

2.6 CSOs and Stormwater

The other Clean Water issue where DEP is more or less constantly being pressed to do more is in Combined Sewer Overflows (CSOs) and stormwater control. Here, reviewing a little history is important.

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[30] Personnel Communications, Christopher Ward, DEP Commissioner 2002 – 2004, David Miller, New York State Executive Director, National Audubon Society, John Atkins, then Save the Sound, now Director, Regional Plan Association Connecticut Program

[31] Personnel Communication, Christopher Ward, DEP Commissioner

[32] DEC's anxiety, and one of the constant obstacles to overcoming what could be called Clean Water Act regulatory absolutism, seems to come from an institutional fear that, whatever the merits and realism of the proposal (and with respect to Long Island Sound, DEP had developed a technologically astute, managerially sophisticated approach to the problem of developing and implementing new nitrogen control technologies), anything that saves New York City money or agrees with something controversial that New York City proposes will subject DEC to the criticism that DEC politically sacrificed the environment to New York City's political clout.

CSOs are a common problem in older cities in the Northeast and Midwest and, for that matter, worldwide. Though over-zealous advocates sometimes regard this problem as a deliberate flaw in urban design, or as a cynical plot to save public money at the cost of the environment, in fact the practice of using the same sewer system for sewage and stormwater made perfect sense at the time these systems were built. At the time most cities built their sewer systems (late 19th, early 20th century), the purpose of sewer systems was not to collect sewage for treatment. It was to remove it from any possibility of contaminating local water supplies and to get it out of town so it would stop blighting and poisoning the urban environment. Consequently, sewage management consisted in sending sewage to the nearest body of flowing water, which is where stormwater wanted to go too, so it was logical to send them together.

When American began to build sewage treatment plants in earnest, they had to deal with the classic infrastructure planning problem: do you design for base capacity or peak flow? Catching peak storm flow in New York City would have required plants enormously bigger and therefore more expensive, thereby significantly delaying the overall sewage treatment program. So the decision was made to size the plants in ways that would set capacity at some hopefully optimized point that maximized treatment and minimized per unit cost by capturing some, but not all, of stormwater runoff.

However, as new sewage treatment capacity was added and began to make its effects felt in the Estuary, it gradually became clear to environmental regulators and estuary stakeholders that CSO, particularly in confined bodies of water, were going to be a problem that had to be addressed separately.[33] Moreover, by the early eighties, it had been realized that CSO runoffs were one of the main factors impairing beach use in the summer months. Thus cities like New York were required to develop separate CSO management plans.

The original strategy for CSOs in New York, as in many other areas, was based on building enormous containment tanks in critical areas of CSO outfall. These would fill during storm events and then be pumped by to sewage treatment plants when the storm events had abated. These programs were enormously expensive and produced major resistance from virtually all affected municipalities. Utilities fought to reduce them, stretch them out over time, develop alternatives to them. Enormous emphasis was put on building separate stormwater sewers in newly developing areas and on providing them in existing urbanized areas whenever possible and cost effective (which was not often). Starting in the mid-1980s, DEP and DEC have been in almost continuous negotiation over the CSO program, and it has been revised so many times they are almost too numerous to mention.

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[33] The point about confined bodies of water is an important one. The programs for CSO control in the 1980s included extensive facilities to control CSO runoff into the Hudson River. But the improvement in the Hudson due to North River and other new sewage treatments plants essentially restored the River's own treatment capabilities to where it could absorb the CSO runoffs that were directed into it without any additional CSO treatment. By contrast, in confined bodies of water, like Flushing Bay and Jamaica Bay that lack the river current of the Hudson and where tidal flushing is limited, even reduced CSO discharges can accumulated pollutants.

But in the early 1990s, the DEP came up with a different strategy. It began to explore in-line storage of CSOs. Instead of relying on containment tanks, the City would build as few as possible (currently only two major projects have been undertaken, Flushing Bay and Paerdegat Basin), and would try and use the sewer system itself as its major storage facility. Throughout the 1990s, using computerized SKADA management systems, the City became steadily more skilled and steadily more successful at doing so.

What made this program especially successful is that, at the same time, the City created far more storage capacity in its sewers, through the success of its water conservation program. Starting in 1990, the City created and carried out a comprehensive water conservation program that, by the end of the decade, permanently reduced City water consumption by roughly 20%, or between 250 million and 300 million gallons per day (mgd). Less water coming in means less water that has to go out via the sewage treatment system, freeing up an equivalent volume of sewer capacity for in-line storage.

As a result, the City has increased its volume of stormwater capture from 18% in the early 1990s to expected 72% once the Paerdegat Basin containment tank is fully operational.[34] And still further increases are expected. In the words of former DEP Commissioner Chris Ward, CSOs are no longer an estuary problem. They are a local problem.[35]

Local problems of course can often create extremely strong local responses. Nevertheless, CSOs are clearly another DEP success story. How much more investment should they receive, particularly to the extent it is money being spent on implementing programs that are addressing highly localized conditions, is now a fair question for the rate paying public.

The one complication is that environmental advocates nationally have, for several years, been mounting a strong campaign for water quality standards and policies that assume all beaches are open all the time. This campaign has already produced a significant strengthening of environmental regulations addressing water quality conditions off beaches by switching the regulatory benchmark for water conditions from *fecal coliform* levels (FC) to the level of *enterococcus*, a common human intestinal bacteria considered to be a more accurate measure of human health risk. In doing so, they have pushed beach regulation, and by implication, CSO standards back towards a rigid mandate approach, one that has the potential to significantly affect DEP priorities in years ahead, whatever DEP's own agenda may be.

[34] 2003 New York Harbor Water Quality Report, p.24
[35] Personal Communications, DEP Commissioner Chris Ward

2.7 Plant Maintenance and Upgrade

Finally, there is the question of the plant maintenance and upgrade side of the equation. A major portion of DEP's capital budget for the future is in investment in plant upgrades. In one sense, this is highly commendable. But, in another sense, it may be highly unrealistic. According to EPA, water utilities nationally should spend over $400 billion in upgrading their sewage infrastructure over the next decade. This figure has literally left the country's municipal sewage treatment programs agog for it dwarfs any current level of expenditures and is widely considered unaffordable. There has been a national upsurge of interest in what are called "non-structural" alternatives to meeting capital needs,[36] and even EPA seems to have put forth the figure more to provoke a debate on future funding for water and sewer infrastructure than as a statement of what EPA expects to seek and enforce with respect to maintenance investment in current water utility infrastructure.

In a 1998 report, a special panel on Federal Facilities Management convened by the Board on Infrastructure on the Constructed Environment of the National Research Council of the National Academy of Sciences concluded that existing maintenance standards for Federal facilities were formalistic and very imperfectly rooted in experience-based business strategy. They called for a switch to using to mission critical and performance based criteria to set maintenance priorities and guide maintenance investment. Above all they disparaged the kinds of maintenance standard setting based on uniform norms and rules that failed to take into account site specific conditions. They urged the empowerment of local maintenance staffs and agency maintenance managers as a key building block towards creating new and more cost effective facility maintenance programs. And one of their key conclusions was that chronological and temporal norms for maintenance were often suspect (though not chronological and temporal norms for reviewing and assessing maintenance needs).[37]

All of which suggests that there may be several points where the requirements for maintenance investment DEP has been asked to address may be subject to reconsideration, particularly from a mission oriented perspective of what will this maintenance investment contribute to the meeting of Clean Water goals in the estuary. In the past, DEP has distinguished itself by generally being at least one step ahead of other City agencies in defending the unromantic area of maintenance investments. Now it should consider similar leadership in review and potentially rethinking how to plan and carry them out in a more cost effective manner.

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[36] See, i.e. Agenda and Proceedings of Water Environment Federation, Annual Meeting 2005, Washington D.C., various panels and presentations on these topics, including Appleton, Non-Structural Alternatives to Capital Needs, paper delivered to the Panel, Maintaining Affordability of Future Capital Programs, Myron Olstein, Panel Coordinator.

[37] See, Stewardship of Federal Facilities: A Proactive Strategy for Managing the Nation's Public Assets, National Research Council, National Academy Press, Washington D.C., 1998

3 ASSEMBLING AN EFFECTIVE BEYOND-MANDATED INTEGRATED WATERSHED AGENDA FOR THE NEW YORK NEW JERSEY HARBOR ESTUARY

Thus, from an environmental perspective, the problem with DEP's current Clean Water program is twofold. First, it is currently structured to spend money on a series of investments that may not contribute equivalent gains to the estuary environment, even while some of the most significant environmental needs of the estuary are starved for funds that can be deployed in a problem solving manner. If, as DEP argues, its mounting capital expenditure burden is the result of unyielding environmental mandates, than that strongly suggests that such mandates have reached a point of diminishing returns. However, to merely attack such mandates as no longer cost effective will not succeed, for they will be defended by stakeholders who long ago were persuaded to view such arguments as a cynical attempt by DEP and New York City to avoid its environmental responsibilities. But, where the City has proposed replacing unproductive expenditures by more productive investments in the environment, from its watershed program to its recent Long Island success, it has generally prevailed.

The problem that will need to be overcome is that, in the past, the innovative programs the City has successfully offered have involved a strategic switch within one sector of environmental concern. The watershed program was a switch from filtration to watershed protection; water conservation from building a Hudson River waterworks to conservation technology and rate making; CSOs from building giant containment tanks to in-line storage. None of these and similar accomplishments involved taking money from one sector of the environment, i.e. CSOs, and moving it to another sector, i.e. habitat restoration. Refinement of sector strategies to maximize their cost effectiveness remains the clear first step in responding to out of date mandates. *But this time moving resources between sectors may need to be a key part of developing a program that gets the maximum environmental return for the dollars the City spends. If eno*ugh environmental gain is shown, momentum will behind innovative new policies and a reinterpretation of environmental mandates.

3.1 Prospects for Assembling Such an Agenda

What are the prospects for doing so? On the one hand, the many environmental and stakeholder interests who have specialized in this or that aspect of the Clean Water Act would appear to be a formidable obstacle. The diversity of the environmental movement, which is one of its main sources of grassroots strength and energy, has this major weakness: it is very hard for the environmental movement to look at issues from an overview perspective, or for organizations that are competing for public attention and for scarce foundation and membership funds to yield priority to others. This aspect of the environmental movement is so ingrained that an extensive internal culture has grown up for dealing with it in which the setting of overall environmental agendas is basically an

additive process, within which differing environmental organizations also tacitly agree not to compete with each other.[38]

On the other hand, a decade of ferment and discussion about alternatives to rigid, mandate based approaches is not yielding important fruit while the growing public enthusiasm for sustainability provides a context for asking such questions and pursuing such alternatives that has never been more favorable for innovation and for replacing individual categorical mandates with new and more integrated Clean Water strategies.

There is an even bigger opportunity here. Ultimately, the question that needs to be asked and that sustainability allows to be asked is whether or not there are environmental policies that are not sustainable. Doing so is badly needed, and not only in the Clean Water area, for environmental policies are as vulnerable as any others to group thinking, vested interests, unthinking zealotry and obsolescence. From DEP's particular perspective, raising the question in a context of sustainability offers the opportunity to focus the inquiry not on saving money by environmental cutbacks, but on saving money that can be invested in more fruitful environmental policies (while leaving some left over for the ratepayer) through innovative environmental thinking, thereby avoiding the common response to DEP proposals for reconsidering environmental mandates: that DEP proposals are merely a covert way of saving money through environmental retreat at the cost of the public interest.[39]

There are promising signs that in the more general environmental debate, this approach is already bearing fruit, and beginning to prompt a realization that new approaches to the Clean Water Act and other environmental mandates are needed. Many environmental groups are now anxious to separate themselves from being identified with a "top down" rigid, regulatory approach. And they are also anxious to demonstrate that environmentalism in general and their organization in particular do not have just a one issue focus indifferent to other concerns, but that they recognize the importance of dealing with broader social concerns, most importantly poverty. [40]

Given, therefore, the many merits in the case for reconsidering the current Clean Water mandates that are once again driving DEP's capital budget upward at a rate significantly faster than the cost of living, the there is a reasonable likelihood that the City could prevail in a debate to reconsider them. The critical requirements in such a

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[38] This does not mean that groups do not often quarrel, often vehemently over tactics, starting with the classic environmental dispute over being pragmatic versus idealistic. And it also means that, on any issue where collaboration is recognized as desirable, the environmental movement must often go through an extensive and intensive series of efforts that require a high level of administrative effort and can also seriously burden the movement's relatively slender administrative resources.

[39] As witnessed by the wave of criticism that has greeted a long line of environmental innovations, from pollution tradition for sulfur dioxide emissions under the Clean Air Act, to the development of more flexible standards for brownfield cleanups. Even the City's watershed program encountered considerable skepticism from environmental groups when it was originally proposed.

[40] See, for example, Environmental Defense (ED, www.ed.org, formerly Environmental Defense Fund, EDF, which was formed to, and for several decades specialized in, litigating for environmental causes, but which now emphasizes its commitment to innovative, market based environmental strategies.

platform will be threefold: first, the program must produce more environmental benefit than existing Clean Water investments; second, the program must have superior benefits for other important social areas. In DEP's instance, that is most likely to involve aiding the cause of affordable housing, an issue with water and sewer rates increases that has been recognized since the early nineties, and which once again has a particular resonance due to the upsurge in interest in the state of affordable housing due to both the current real estate boom and the widely publicized and admired commitment of the Bloomberg Administration to addressing affordable housing issues.

Finally, DEP must put the issue into an environmentally friendly framework, a framework of sustainability, holistic strategy and problem solving flexibility, rather than limiting itself to negative arguments that proposed mandates are too expensive, too unrealistic, or just some outsider's fault.

DEP possesses one of the most flexible and innovative financing structures of any infrastructure utility in the United States. It has a guaranteed flow of funds from user charges, and the oversight of the Water Board is free of the politicalization that drives most public utility commissions to bend over backwards to avoid rate increases, therefore leaving most utilities in a perpetual position of ongoing maintenance and long term capital investment catch-up. But maintaining the benefits of such a privileged position depends on an unspoken bargain with the City's ratepayers: that DEP will keep water and sewer rate increases within reasonable bounds. The rate history of the last several years signaling a changed rate environment, the large rate increases projected for the future, present a growing risk that DEP will begin to be perceived as violating that understanding and of the political backlash that could trigger. Whatever the merits of DEP's position with respect to externally imposed mandates, whatever DEP's frustration with the lack of sensitivity of its regulators to the rate pressures they are generating, DEP's best course, and the course most consistent with the broader interests of the City, will be not to play defense but to respond with a better mousetrap, one that beats the mandate makers at their own game. In this case, that better idea will be an integrated and prioritized Clean Water program for the estuary, a watershed program so to speak, one that responds to real environmental needs, not just to environmental mandates that, in accordance with the laws of diminishing returns, are becoming increasingly divorced from them.

3.2 Factors That Create a Context for DEP to Explore Designing and Pursuing Such an Agenda

3.2.1 Favorable and Supportive Trends – the New Fashions for Trading, Innovation and Flexibility, Market Driven Innovations, Goal Driven Policy, Watershed Approaches and Sustainability

It is a truism that the heart of the 1972 Clean Water Act was uniform, technology based mandates, enforced by a system of state administered discharge permits. There is also general agreement that the successes of the Clean Water Act were largely due to this

system, which has enforced a consistent technology standard and which, from the regulator's perspective, is relatively easy to administer. But it has also been clear that such a system would have two great weaknesses: a lack of sensitivity to the cost effectiveness of any one investment and a similar insensitivity to the affordability of the technology it was mandating.

In the first decade of the Clean Water Act, when the need for upgraded sewage treatment technology was manifest, when they were more plants to upgrade than could be handled and when the Federal government was absorbing the great bulk of the cost of doing so, these were unimportant concerns.

But in the 1980s, as the Federal government withdrew Clean Water funding support, and as the state of the country's sewage treatment infrastructure steadily improved, these questions began to assume more importance. By the end of the 1980s, the cost pressures of the technology based requirements of the Clean Water Act, were spurring widespread comment and debate, and unfunded mandates had become a political rallying cry for many, as they try to respond to ratepayer protests about ever escalating water and sewer rates.

DEP has often been found in that camp and "the mandates made me do it" has, as discussed above, been an argument used by DEP mantra for a generation. It has not been an overwhelmingly successful one. Persistently echoed, it has helped DEP renegotiate the pace of a number of programs, most notably CSOs, and bought time for DEP to come up with more innovative and less costly solutions for CSOs (such as in-line storage) and for nitrogen reductions in Long Island Sound. But it has not been able to alter the fundamental dynamic of Clean Water enforcement in the estuary or with regards to DEC attempts to hold NYC to their full execution.

This pattern of mixed success suggests what, should be the essential point for any attempt to restructure its water quality programs to be more cost effective. DEP has gotten public support and regulatory acquiescence whenever it has made its first focus getting more environmental improvement for less cost, including secondary benefits such as helping affordable housing, that a traditional water quality approach would provide. It has been far less successful when it has tried to argue that could spend less money and not lose ground environmentally.

DEP therefore wants to adopt a goal and a public program of seeking to be free of the shackles of aging mandates so that the City can pursue more environmental improvement faster, and can free up the resources to make investments, in new underfunded priority areas of the environment. This does not mean that DEP should uniformly condemn mandates, only those where it has a clearly preferable alternative. Nor doe sit mean that DEP should not emphasize the cost saving element of its proposals. Rather it should stress the more for less opportunities of its proposals, for both the ratepayer and the environment.

The time has never been more propitious for DEP to offer alternatives to mandate driven policy. Though the governmental outcry over unfunded mandates has largely petered out,[41] in large part because of the live and let live approach to environmental enforcement that has characterized EPA policy nationally in the last decade. Instead, EPA has chosen to meet the objections to overly rigid environmental mandates through exploring ways to meet the mandates more cheaply.

The first of these ways is trading. In order to pass acid rain legislation in the early nineties, Congress established a system of emissions trading. Under this system, utilities whose emission levels were significantly below the regulatory standard received emission credits could sell the credits to polluters as an alternative to those polluters installing air pollution equipment. The idea behind this trading was that those who could reduce emissions cheaply would do so and then sell the credits at a profit to utilities that would have to pay much more to install pollution equipment. The operative conclusion was that this trading would enable the same net reduction in emissions to be obtained more cheaply than if every plant had to meet the same technology standards.

As is widely known, this legislation was a significant success[42] whose approach has now spread to a large number of environmental areas. For example, trading carbon emissions was the way the 1998 Kyoto agreement on greenhouse gas emissions chose to solve the problems of greenhouse gas emissions from developing countries. The developing world successfully resisted the imposition of emission caps, claiming they were an unfair burden on their limited economic resources. Instead, developed countries can purchase emission credits by paying for pollution controls on greenhouse gas sources in the developing world.

These systems are generally referred to as cap and trade. They operate by setting an emissions cap, allocating it among significant emission sources and then allowing them to trade among themselves to minimize the cost of meeting the stated environmental goal. From a water quality strategy point of view they do three things:

- They legitimize a goal oriented approach to environmental problem solving and, by implication, suggest that technology based environmental standards have become obsolete;
- They legitimize broad based, regional approaches to a problem, shifting focuses from individual polluters and, again by implication, shift regulatory focus from formalistic permit enforcement to institutional innovation and design; and,
- They legitimize affordability and the tradeoffs that come with it as a legitimate concern of environmental policy.

[41] The main issue on which this remains an active political issue is the persistent objections of states to the lack of funding for the Federal mandates under the Bush Administration "No Child Left Behind" education legislation.

[42] See, for example, among numerous favorable assessments, Environmental Defense "From Obstacle to Opportunity: How Acid Rain Emissions Trading is Delivering Cleaner Air," 2000, New York City

Of these three implications, the third is perhaps the most important. Traditionally, environmental regulators and environmental advocates have treated environmental mandates as absolutes, and have resisted tradeoffs between environmental progress and affordability. In fairness, they have been good reasons for doing so. Environmental regulation exists because the costs of environmental pollution are hard to quantify, meaning that any tradeoff between the hard costs of environmental protection and the soft costs of environment damage, is an extremely difficult one to carry out in a consistent manner. Moreover, a fair assessment of affordability deals with both the relative wealth of the polluter and the relative efficiency of its capital investments and management strategy. Should a grossly inefficient or poorly managed polluter be allowed to claim environmental clean-up is too expensive when such an argument is really an attempt to avoid the management (and often the political) effort needed to run an efficient organization and carry out its programs in a cost effective manner.[43]

Nevertheless, this absolutist approach to environmental mandates and environmental regulation has two critical flaws. First, affordability is always an issue in real life. In fact, it is a major irony that environmentalists, one of whose major social and historic tasks is getting economic society to face up to the resource limitations of the planet should, in their approach to environmental cleanup, take an approach that essentially ignores the issue of resource limitations. Second, one of the iron laws of economics is the law of diminishing returns, a reality that an absolutist approach to environmental mandates and environmental regulation simply does not accommodate.

Thus, despite the problems that exist with trading schemes,[44] over the last fifteen years interest in environmental trading schemes has flourished. Water Quality Trading has been high on the list of those who have wanted to introduce market based, cost reducing trading schemes into water resource management. EPA issued its first official policy document, a draft framework to encourage development of water quality trading schemes in 1996.[45] In 2001, Chesapeake Bay published its nutrient trading guidelines[46] and, one year later, the State of Michigan followed with the first full fledged state program.[47] Finally, in 2003, EPA established an overall policy statement on the requirements for establishing credible watershed-based trading programs, identifying and discussing various aspects of water quality trading, including a number of restrictions.

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[43] In different form, this issue is one of the fundamental problems that state utilities regulators must deal with when asked to approve a rate hike to utility customers. Is the rate hike justified or are the utility customers being asked to bear the costs of management's inefficiency?

[44] For an excellent discussion of these issues as well as the social implications of environmental trading schemes across the board see, Landell-Mills, Natasha and Ina T. Porras, Silver Bullet or Fools' Gold: A Global Review of Markets for Forest Environmental Services and Their impacts on the Poor, International Institute for Environmental Development, London, 2002

[45] See Policy Statement for Effluent Trading in Watersheds, Memorandum for Stakeholders, Robert Perciasepe, Assistant Administrator, United States Environmental Protection Agency, Washington, D.C. January 25, 1996,

[46] Chesapeake Bay Program Nutrient Trading Fundamental Principles and Guidelines, the Chesapeake Bay Program, United States Environmental Protection Agency, Annapolis, Maryland, 2001.

[47] See Part 30, Water Quality Trading, Regulations of the Michigan Department of Environmental Quality, Surface Water Quality Division 2002.

Two points about those regulations should be noted. First, policies are not prescriptive. As long as Clean Water Act requirement are met, they can, and are encouraged to be, flexible and based on local needs. Second, a principle validating criteria for the trading scheme to be acceptable is that it produces clear environmental benefits.[48]

Since 2003, numerous trading schemes have sprung up.[49] Their widespread exploration, even given their many limitations, are strong testimony to the felt need for regional approaches that lower the cost while improving the environmental results of current water quality programs. To the extent they have limitations, or have not proceeded as rapidly as hoped, that is a manifestation of bureaucratic limitations and the attempt to keep them as close as possible to the longstanding models of water quality regulation. It does not imply either that the goal of such schemes is wrong or that these limits should not be transcended if the benefits would justify doing so. In short, it is clear that the rise of trading had spurred an ongoing reevaluation of the limits of the current administrative structures for water quality programs. As trading schemes reach the logical limitations of their current structures, it can be confidently predicted that pressure will mount to take them beyond these points and to encourage more experiment in their management, design and objectives.

Strengthening this conclusion as to how the interest in and development of environmental trading schemes in creating an environment in which environmental strategy is moving away from the traditional environmental approach, is the more general consensus is now manifest that environmental policy needs to encourage new and innovative approaches to addressing environmental problems. The decisive moment when this consensus broke surface was the decision of EPA, on September 6, 2000, to transform what had been the EPA Office of Policy into the Office of Policy, Economics and Innovation. As stated on the home page of its website, "(For EPA) innovation is the key to environmental progress."[50]

Within that office EPA has also created a National Center for Environmental Innovation, whose mandate is to promote innovation at the level of transforming environmental regulation, public private partnerships, development of market tools for environmental protection and to promote research on actual progress towards environmental goals.[51] Moreover, the site links demonstrate a similar endorsement of the consensus on environmental innovation from groups as diverse as the Aspen Institute and Resources for the Future to the Business Roundtable and the Reason Foundation, even if they may disagree on the details for practical or ideological reasons.

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[48] See, "Watershed Based NPDES Permitting Policy Statement," Memorandum to Water Division Directors, Regions I – X, United States Environmental Protection Agency (USEPA), Washington D C, USEPA. Office of Wetlands, Oceans and Watersheds, Fact Sheet, Water Quality Trading Policy, Washington, DC. 2003; USEPA, Office of Water, Can Water Quality Trading Advance Your Watershed's Goals, Washington DC, 2004; see more generally www.epa.gov/owow/watershed and www.epa.gov/npdes.

[49] See, for example, Breetz et al., Water Quality Trading and Offset Initiatives in the United States: A Comprehensive Survey, Dartmouth College, New Hampshire, 2004

[50] See www.epa.gov/opei.

[51] See www.epa.gov/policy.

The summary given on the national center site speaks for itself and could serve as the introduction for any DEP mandate-alternative initiative or any DEP sustainability program. It states:

> The U.S. Environmental Protection Agency created a National Center for Environmental Innovation to bring creativity to bear on solving pressing environmental problems. *Our long-term goals are to foster a performance-oriented regulatory system, promote environmental stewardship behavior, and create a culture of creative problem solving. (emphasis supplied)*

Moreover, it also states an EPA commitment to partner in the exploration of innovation. "We look forward to continuing our partnership with you (in that effort), and in continually improving our methods for sharing our collective experience along the way."[52]

None of which is meant to suggest the EPA will not, in considering proposals for innovation, be considered that they are genuine or remain, as far as possible, compatible with the existing regulatory system. But, it does mean that even sweeping proposals, if they are demonstrably superior in environmental result to a strict mandate-driven approach, will have both legitimacy and a range of potential allies across a broad horizon of political interest and beyond the narrow confines of traditional water quality stakeholders, allies that can play an important role in persuading EPA to expand its interest in innovation to addressing the challenges that not only the City but many others face, in better balancing its environmental ambitions and the limitations on the financial demands that can be placed on ratepayers.

Market Tools and Goal Driven Policy need little additional discussion. The interest in market tools springs from several sources: a growing awareness of the limits of regulation in that regulation is often necessary but seldom sufficient, a desire to put a positive incentive versus a negative compulsory face on environmental policy, a desire to break out of traditional environmental versus economy debates and arrive at a new synthesis, one of the driving forces behind the emergence of sustainability,[53] and a shift in the general political climate against governmental regulation and favoring market measures as more efficient.

As for goal driven policy, it is the fundamental concept behind which all strategy, whatever the enterprise, economic, governmental and military, is classically organized. In that sense, the technology driven mandates of environmental protection are an exception to how societal problem solving is normally organized. The explanation and justification is that when America's fundamental air and water pollutions statutes were passed, in the early 1970s, the problems were demonstrably so great, and the needs for basic control infrastructure so pressing, and the kinds of fine tuning effort that goal based

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[52] See www.epa.gov/innovation/portfolio.index.

[53] See, for example, www.rpa.org, Proceedings of the Conference, Transitioning the Region towards Sustainability, keynote address, the Honorable Michael Bloomberg, Mayor of New York City

assessment facilitates so far away from being a concern, that Federal legislators and regulators concluded that it would be both faster and more efficient to mandate a uniform technological standard.

However, thirty years later, those deficiencies in basic infrastructure have long since been remedied in the New York region, while the complexity and sophistication of environmental understanding have correspondingly grown. Thus, clinging to a mandate based approach is less and less realistic, and less and less productive. Given both the inherently limited nature of resources available for environmental investment, and the far different stages of environmental progress that different components of the estuary ecosystem manifest, the continued emphasis on goal driven policy by both EPA and private stakeholders of all political persuasion is one that is especially applicable to the New York harbor estuary. DEP long ago embraced such a policy in many of its programs, has the engineering and planning talent to make it work across the board, and has a historic weariness of having its agenda set by outside mandates with only limited opportunities to deploy its own problem solving creativity.[54] Now the circumstances see ever more opportune for doing so.

The final element in this survey of the policy and political environment for current environmental policymaking only reinforces that conclusion. That element is the emphasis on watershed planning and watershed approaches as the new building block of forward thinking water quality management.

The concepts of watersheds and watershed planning have been operative and well understood since the foundations of modern hydrology in the first decade of the 20th century, but until 1990, their chief practical application was in basin management, in the development of two kinds of programs: for the creation of dams and reservoirs to collect water for human use and agricultural irrigation, and the design of flood control works. Watershed planning, as it is now understood, as the organization, planning and management of water quality programs around preventive measures that use the watershed as the logical hydrological, land use and administrative unit, were rare and unimportant until the 1990s.[55] Then the success of DEP's watershed protection program gave a huge impetus to watershed planning for water quality purposes.

As this wave of interest grew, two things became apparent. First, as discussed above, the watershed was a logical unit within which to bound water quality trading schemes. Second, the logic of watershed management suggested that, ideally, there should be unified permit issuing for all the sources within the watershed. As noted

[54] Personal Communications, Christopher Ward and Francis X. McArdle, DEP Commissioners

[55] This disdain for the water quality benefits of watershed protection reflected two biases in the water quality elite: first the pre-occupation with the goal of building up the country's Clean Water infrastructure, highly expensive capital facilities focused on pollution cleanup, and two a belief that watershed protection, with its emphases on prevention and environmental restoration could not be made to work, because both concepts were intertwined with effective land use management and EPA had no confidence in its institutional ability (or anyone else's for that matter) to be able to deal with land use issues in the face of the political power of the American real estate community.

earlier, in 2003 EPA adopted the watershed as the logical unit for organizing trading schemes.

EPA has since gone on to move beyond watershed trading to pursue the idea of watershed permits. The first permit issued, for Portland, Oregon, suggests the potential for this approach.

First, it rolled permits for four sewage treatment works and one stormwater discharge permit for urban runoff into one permit with the goal of bringing the entire urban watershed (the Tualatin River, which flows through Portland's west suburbs into the Willamette River, an area that is the center of Metropolitan Portland's high tech industry) into compliance. It allows both point source trading and non-point source contribution based on market incentives. And the permit includes provisions for the utility, despite the fact that it is not the cause of such problems, to improve conditions in the river to help migrating salmon, endangered in the area because of high water temperatures. Though the plant could do so by refrigeratoring its discharges, which form a high percentage of summer flow on the River, but that would be prohibitively expensive. Instead, the plant will pay farmers to take streamside land out of production and plant trees along the canopy, and to irrigate with warm effluent, leaving cold upstream water for discharge into the stream.

Organizing water quality programs by watershed obviously raises some major administrative issues that categorical and technology-based programs, with their discharger by discharger focus, do not face. Three are of particular note. Most watersheds have more than one political jurisdiction operating water quality facilities and overseeing industrial facilities and other private sector dischargers. How would a watershed permit deal with the independent standard setting authority each body has? Second, how should watershed strategies deal with highly location-specific conditions, such as high levels of pollution in an enclosed body of water that most of the facilities in the watershed are making no contribution to that pollution problem? And third, should a watershed wide permit require, as a precondition, a watershed wide management strategy?

This latter question is more than academic. Fundamental to current watershed thinking is the belief that one of the main purposes of a watershed program should be to create a common watershed action strategy. But what will be the incentive for participants to undertake the effort to complete a common watershed program if there is no guarantee it will be implemented or if it leaves the base regulatory program unaltered.

These problems explain why so many watershed planning efforts have yielded so little fruit. If examined closely, almost all watershed programs in the United States have been developed as add-ons, as one more layer in an already complex matrix of water quality programs. Thus many watershed programs have disappointed in practice for what is the benefit to participants if going through all the work of developing a watershed program if they still have to meet all the traditional requirements as well.

By contrast, consider the approach of the centerpiece of the New York City Catskill watershed whole farming program. One of the fundamental elements of the program when it was established in 1991 was that participants in the program who implemented the agreed upon whole farm plan for their farm in good faith were exempt from all other City regulatory requirements, except a willful polluter safeguard. Thus, using an innovative, voluntary approach simplified the whole process of environmental compliance, as opposed to current watershed planning, giving an incentive for participants to accept the extra effort and risks of innovation.

In summary, all of these trends and the experience with them reinforce the conclusion that the city has much to gain from systematically exploring and putting forth an alternative to its current mandate driven capital budget strategy and that, if such a program is based on a strategy of saving money by a focus on environmental priorities that yields more overall water quality and environmental improvement, then it can obtain the support of the environmental and civic communities and, with their support and with careful placement in the context of these innovative tools, can obtain regulatory approval and blessing.

Two other points lend support to this conclusion. The City has the right horror story to illustrate the need, and the right successes to show it can responsibly undertake such a task and lead in the development of a priority based, integrated watershed approach to water quality and environmental improvement in the estuary.

3.2.2 The Right Horror Story – The $2.5 billion Investment in Upgrading Newtown Creek

When setting out to change public policy, two things are extremely helpful. The first is the right horror story, one that indicates the intrinsic weakness of the status quo when taken to its illogical extreme. Fortunately for the cause of addressing the problem of water quality mandates, if unfortunately for DEP's debt base and its lost opportunities, this story is the City's experience in upgrading the Newtown Creek sewage treatment plan to secondary treatment.

By the early 1990s, the City of New York had almost completed its mandate to provide secondary treatment for all of its sewage discharges. Thirteen of its 14 sewage treatment plants, all but Newtown Creek, were providing full secondary treatment. The results were a dramatic improvement in water quality, so dramatic that plans for controlling of CSO discharges into open waters such as the Hudson River were quietly shelved, for the water quality of those waters had improved to a level where they could absorb and quickly neutralize CSO discharges. From that base, significant additional improvements were obtained from two non-construction initiatives in the 1990s. First, ending the water and sewer rate crisis of the early nineties led to an improvement in staffing levels at sewage treatment plants, enabling Deputy Commissioner for Clean Water Ed Wagner to optimize maintenance and operations practices, producing further

noticeable water quality improvements. Meanwhile, the switch to in-line storage as the strategy for CSO control led to a major increase in the capture level of stormwater and a major reduction in CSO discharges into the harbor.

However, despite all these improvements, the City remained under obligation in the Clean Water Act to upgrade Newtown Creek to secondary treatment. At first glance, particularly from an EPA/DEC regulator perspective, this seemed to be a valid concern. Newtown Creek was the City's largest sewage treatment plant, with a 310 million gallon a day rated capacity (310 mgd), or over 17% of the City's total treatment capacity. But from the City's perspective, this overlooked four key facts. First, Newtown Creek was the last plant built pre-Clean Water Act and, unlike all the other plants,[56] which were designed to provide primary treatment, or 35% removal, Newtown Creek was built with step aeration, which achieved operational removal levels of sixty percent removal in the summer and 55% in the winter. This meant that the gains from upgrading Newtown to full secondary treatment, 85% removal, were going to be far less than those obtained by the earlier plant upgrades which went from 35 to 85 percent.

Second, Newtown Creek discharged its effluent into an enclosed body of water, which was arguably already the worst water body in the City from industrial discharges and contaminated sediment, so that the local environmental gain would be meaningful but not transformative. Even more tellingly, in terms of harbor wide water standards, the upgrade would make a measurable but at best very minor improvement, due to the much smaller size of the additional removal, the vigorous tidal action in the East River where it entered the harbor estuary and, most importantly, the already high level of improvement in the harbor estuary which had given the estuary far more buffering power.[57]

Third, to obtain that minor improvement, it soon became clear that to do so would have a multi-billion dollar price tag. There was the size of the plant to consider, the extremely difficult construction site, and most of all the difficulty of doing a complete rebuilding of the plant while continuing to operate it.[58] Fourth and finally, unlike previous secondary treatment upgrades, which had been largely paid for by Federal Clean Water Act dollars, with the phasing out of Clean Water construction grants in eighties, this was a cost DEP would have to pay itself.

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[56] Of the City's 14 sewage treatment plants, 12 were originally built prior to the Clean Water Act and then upgraded to secondary treatment with Clean Water funds. North River and Red Hook were completely new plants, completed in 1986 and 1987 respectively, though not fully operational at the secondary level until 1991.

[57] At most and at the most favorable sites the maximum DO improvement expected was .3mg/l. Averaged over the harbor, it was expected to be even less. These improvement levels were significantly below those obtained by the City's optimized maintenance and operations program, at the cost of a few million dollars for additional personnel. Personal Communication, early 1990s, Edward Wagner, DEP Deputy Commissioner, Clean Water. See also, Jamaica Bay Watershed Plan, DEP Clean Water Bureau, 1993

[58] For many years, DEP had carried a Newtown Creek upgrade in its 10 year capital plan at a cost of around $900 million, basically a back of the envelope estimate. When in late 1992, early 1993 the first rigorous costing of a Newtown Creek upgrade came done, the estimated cost was found to be close to $3 billion.

Spurred by this discovery, DEP aggressively attempted to find a less costly strategy for dealing with Newtown Creek. Though well aware that the expenditure could not begin to be justified by the small amount of environmental improvement, in the early and mid-nineties, in the throes of its watershed negotiation to avoid filtration, DEP was hesitant to mount an even more direct challenge to another environmental verity, in this case secondary treatment. The initial strategy therefore was to see how far technological innovation could reduce the cost, and having shown that cost was still off the charts to attack the implications of the mandate directly. However, as the nineties progressed, DEP put all of its eggs into the cost saving technology basket and, despite an occasional grumble, no systemic or direct public challenge to the mandate was ever organized.

DEP's effort to find a better way to meet the Newtown Creek mandate was strikingly successful and a testimony to the Department's tradition of engineering innovation. It ultimately got a DEC who was not unaware of the cost dynamic of Newtown Creek to agree to a treatment train that minimized the initial primary treatment component of secondary treatment, for an estimated cost savings of $1 billion.[59] The result was a final plant cost estimate of $1.4 billion and in the late 1990s the decision was made to proceed on that basis.[60]

Of course, even $1.4 billion was an absurdly high amount of pay for such a minimal water quality result. But, as often and predictably happens when rebuilding a piece of infrastructure while encumbered with the necessity to continue to operate it at the same time, particularly when the facility is on the kind of coffin corner of a site that the Newtown Creek Plant occupies, construction costs escalate. By now the estimated cost of the project is $2.5 billion. To put that number in perspective, $2.5 billion represents close to two years of the total DEP capital budget, two years worth of new water mains, sewer repairs, and existing facility upgrades. Its annual debt service is over $150 million dollars a year, an amount that would fund roughly 1,000 new employees for DEP.

But it is environmentally, where the City missed its greatest opportunity. One could buy a comprehensive restoration of the harbor's estuarine habitat for $1.5 billion, or purchase and restore every tidal wetland and wetland site in the City, carry out a major program of softening shorelines, or repaired decayed waterfront infrastructure, or clean up a least a dozen of the worst sites leaching sediment contaminating toxics into the harbor's water column. And there would still be money left over for significant ratepayer relief.

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[59] Personal Communication, Albert Lopez, DEP Deputy Commissioner Clean Water

[60] It is very unclear as to why the Giuliani Administration, which took an obvious and often productive delight in aggressively challenging accepted bureaucratic orthodoxy when it concluded that it was outdated or unrealistic nonsense, chose not to challenge the secondary treatment mandate with respect to Newtown Creek and the enormous cost it was imposing on the City. It may have thought that the cost reduction to $1.4 billion was the best that it could do in any event, or it may have lacked confidence in the Administration's ability to create a compelling, environment-friendly alternative program and mobilize the environmental and civic communities behind it. Whatever the reason, and the preceding are certainly not the only possible explanations, if ever Mayor Giuliani's vaunted pugnacity on behalf of the City was missed, Newtown Creek is probably the instance.

Ironically, by accepting the logic of the Newtown Creek mandate, as DEC and EPA interpreted it, the worst may be yet to come. What happens if DEP's modified treatment train process doesn't work to the regulators' satisfaction? primary stage doesn't perform to their expectations, there is every reason to believe that DEC and EPA would feel compelled to reopen the Newtown Creek proceedings and demand further investment in the plant, even to the point of ultimately requiring traditional primary treatment to be added to Newtown Creek, thereby imposing at least another billion in costs for an already classically cost ineffective investment.

Even the potential threat of just spending those extra billion dollars would justify a major effort by the Department to take advantage of the emerging ideas discussed above and create a post-mandate more cost effective integrated watershed program for the harbor estuary. But as this paper has, and will further point out below, there are many more compelling reasons than that for doing so. But, there can be little doubt that the insistence of Clean Water regulators that the City had to upgrade Newtown Creek to full secondary treatment, whatever the site specific circumstances, demonstrates the illogic of sticking to the rigid interpretation and administration of a mandate based policy developed under massively different conditions 35 years ago, while the failure of the Department to mount a more effective defense against such applications and the financial consequences for the Department and the ratepayer, point to the need for the Department to integrate into its great engineering tradition, a more holistic and sustainable approach to the laws and regulations that structure its missions.

3.2.3 The Resolution of the Long Island Sound Issue – A Starting Point for the Future

The recent debate over modifying the Long Island Sound consent order highlights some of the key ways in which the current structure of the Clean Water Act and its administration is, in an increasing number of cases, becoming an obstacle to cost effective, sustainable environmental investment. But, more importantly, it also shows how the City can effectively overcome such obstacles with innovative counter-proposals backed by the support of the environmental and civic community.

The issue of nitrogen reduction from the effluent of the six City sewage treatment plants on the East River has been ongoing since the late 1980s. Through the decade of the 1990s, a series of plans, modified plans, and consent orders culminated in the City signing a consent order as to how it would meet the 58.5% reduction from 1994 levels of nitrogen discharges. In typical mandate fashion, the program imposed a construction schedule for specific technological improvements, whose cost in present dollars was an estimated $1.3 billion.

In 2002, then DEP Commissioner Christopher Ward, faced with new priorities in terms of investment in the City's basic supply network, a concern spurred by the confirmation of the leak in the Delaware Aqueduct, he found that DEP had long been exploring more innovative ways to reduce nitrogen nutrient discharges sewage effluent. On the basis of this work, by the end of 2002, the Department had concluded that it could meet the discharge goals for far less than the estimated $1.3 billion, but that the proposed changes in the removal technology that was embedded in the consent order could not have their effectiveness confirmed or be installed under the schedule in the consent order. Given that the delays were small and likely to be insignificant in terms of long term water quality concerns, DEP decided to seek a modification of the consent order to give them the flexibility they needed to explore and exploit its innovative planning.

The main obstacle to this proposal was the resistance of DEC, who did not want to reopen a consent order that had been difficult to achieve and which feared that the DEP proposal was an attempt to undermine its integrity and enable DEP to avoid the financial obligations the consent order imposed. Meanwhile Long Island Sound environmental interests had, during the last part of the nineties, a confrontational relationship with the City that had convinced them that the City had no strategy for dealing with nitrogen concerns beyond stalling, and they viewed Ward's proposal as more of the same.

Wisely, Ward recognized the need to educate and gain the support of New York City's civic and environmental communities and to have their help in outreach to out of City political and environmental interests. He began with a presentation to the New York City Council, in March 0f 2003, in the context of which he was quoted as saying that, "We just think there's a way to do it potentially smarter and better, and we hope the other participants in the sound would adopt that strategy."[61] Ward's gave DEP the high ground, emphasizing the desire to do it better by doing it cheaper. He also undercut attempts to treat the prior consent order as written in stone by ensuring that the media were aware of the genuine scientific debate about the best way to pursue nitrogen reduction. As Hans Dam, an Associate Professor of Marine Sciences at the University of Connecticut, a particularly felicitous choice of source stated, "Nitrogen reduction is not based on very sound science…The question is, how do we balance the expenditures on nitrogen reductions with what we want to get out of it, and the answer is that we're really on shaky ground when it comes to that."[62]

Ward then briefed the New York City environmental community and won the understanding and support of key organizations, such aas NRDC, ED, RPA, Coalition for the Bight, for his desired cThen, with the help of RPA, he reached out to the leader of suburban Long Island Sound interests, David Miller, New York State President of National Audubon. A private meeting at RPA between Ward, Al Lopez and Miller and an RPA convener helped clear the air and open lines of communications. When Miller inquired if a new consent order could incorporate some short term environmental benefit measures, based on the resulting cost savings, Ward quickly and clearly agreed, further bolstering the credibility of the DEP approach as an environmentally friendly one.

[61] See, "Cheaper Means Sought to Clean L.I. Sound," Kirk Johnson, the New York Times, March 5, 2003
[62] Ibid

From then on, it was largely a question of wearing DEC down, a process that took over a year. Clearly uncomfortable with this DEP's flexible approach and its potential implications for the future, DEC interposed numerous procedural concerns and information requests, but did little to challenge, except by implication, DEP's proposals, all to the rising impatience of environmental stakeholders who were anxious to secure the benefits of DEP's initiative. Ultimately, after seemingly endless delays, DEC, without stakeholder support and without a shred of credible objection to lodge to the proposal, and in the face of a consistently patient and non-confrontational approach by DEP agreed in main to DEP's proposals.

This notable success offers a credible template for the future, and created considerable goodwill for DEP among environmental stakeholders.

Unfortunately, neither the environmental stakeholders who supported DEP, or DEC, took the opportunity to reevaluate the overall program and consider if the overall Long Island strategy made sense, or if the weaknesses DEP had identified were symptoms of a larger failure of policymaking. It is clear that, from the very beginning, the Long Island Sound program has taken a narrow and traditional water quality perspective that has led its regulators to concentrate on what they are most familiar with regulating, discharges from urban sewage treatment plants. The larger question this raises is whether such a policy is unfairly penalizing the urban areas that border Long Island Sound, given that the urban areas on Long Island Sound, particularly New York City, have long had relatively stable or even declining nitrogen discharges. Meanwhile, the program continues to evade direct engagement, except at the conceptual level, with the real sources of pollution growth in the Long Island Sound Basin, non-point source runoff.

As the paper, *Water and Smart Growth: The Impacts of Sprawl on Aquatic Ecosystems* observes, the largest source of pollution growth is polluted runoff. The largest source of polluted runoff is chemically-assisted agriculture, and the second largest and fastest growing source of polluted runoff is suburban sprawl, an endemic problem on Long Island and the Connecticut areas adjacent to Long Island Sound.[63]

While the success of the modified Long Island Sound is a welcome example of potential regulatory flexibility, it should be noted what it isn't. It still leaves the main burden of environmental investment on urban areas, where nutrient pollution is essentially stable, and minimizes the investment required by areas where pollution is growing, exactly the reverse of sound public policy. Perhaps the most compelling and perverse example of this is the Connecticut's nitrogen credit trading scheme, which specifically excludes non-point sources from its trading framework. The Connecticut scheme has many notable features such as the Nitrogen Credit Advisory Board and the Equivalent Nitrogen Credit Scheme, which are being aggressively viewed by other

[63] See, Water and Smart Growth: The Impacts of Sprawl on Aquatic Ecosystems, Translation Paper Number Fourteen, Funders Network for Smart Growth and Livable Communities, 2004, Coral Gables, Florida

jurisdictions as models. But in its limitation to point v. point source trading, justified variously on the grounds of overly vague regulatory requirements for non-point sources, difficulty of measuring such sources, and the multitude of non-point sources versus the limited number of point sources, these schemes provide no incentives to limit point source pollution or to address the key water quality problem of offsetting growth, except by ratcheting down point source requirements even tighter. Thus, though the logic of trading would seem to dictate a concentrated focus on point v. non-point source trading because the relatively smaller abatement costs for non-point source trading would maximize tradings economic benefits, in Connecticut and largely elsewhere as well, environmental regulators have generally chosen to take the path of least resistance.[64]

It should also be noted that focusing water quality investment on sprawl generated pollution would have multiple benefits, not only on other environmental parameters such as protecting natural habitat and open space, lowering traffic congestion and reducing infrastructure costs, improving local waterways, and preserving local agriculture, while enhancing local real estate values. A water quality strategy focused only on building clean up facilities and meeting categorical requirements has only one class of benefits, the short term indirect economic multiplier effect on the local economy. Pollution prevention strategies are not only cheaper; they often offer multiple, ongoing benefits that go beyond the environment. The Staten Island Bluebelt, New York City's pioneering program of natural infrastructure, not only provided stormwater management for far less than the cost of constructing stormwater drainage systems, but it also preserved natural habit and open space for local communities, and enhanced local real estate values. To the extent that sustainability is becoming a steadily more important concern in setting environmental policy, these factors should weigh heavily in New York City's favor as it begins to develop water quality strategies whose higher benefit lower cost approach also brings with it these kinds of secondary benefits.

Finally, the regional planning and environmental justice implications of these policies should be at least noted. By focusing on urban point sources of nutrient discharge and placing on them the primary cost burden of nutrient control to the neglect non-point sources created by suburban development sources, current policy asks urban areas with their poor and minority populations to subsidize much richer suburban communities in their growth.[65]

Thus, despite its success, the current Long Island Sound agreement is only an initial starting point in terms of a more goal-oriented, more cost effective Clean Water policy.

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[64] Personal Communications, Mark Kieser, Chair, Environmental Trading Network, and Senior Scientist and Principal, Kieser and Associates, Kalamazoo, Michigan, specializing in design of water quality trading schemes.

[65] An brilliant analysis of this topic and how pro-developing-suburb state policies, many unrecognized, often force urban areas to finance the growth of those who are undermining their urban vitality is the book "Metropolitics," by Myron Orfield, a must read for any serious urban policy manager.

All in all Long Island Sound represents an important example of water quality leadership by DEP, one that built on the Department's strengths of engineering innovation and quality, and one that showed that the Department can not only carry the torch of environmental innovation successfully, but can obtain the support of critical environmental stakeholders in doing so. But, as this discussion suggests, the Department should not be constrained by the somewhat narrow boundaries in which its Long Island Sound program was debated. Taking a broader look at both environmental priorities and environmental benefits offers DEP the opportunity to develop even more innovative strategies with even more environmental cost savings and benefits, and to obtain a broader band of public support as well, as proposed innovations expose the weakness of current mandate based water quality policies.

3.2.4 Summary of Context for Designing and Pursuing Such an Agenda

To sum up, there are numerous initiatives underway in both the public and private sectors of the water quality universe designed to make pursuit of water quality and realizing the objectives of the Clean Water Act, a more cost effective and more outcome oriented progress. These initiatives have been driven by the realization that the rational for the original technology driven, categorical standards approach the Clean Water Act took, the need to build a lot of infrastructure in a hurry, has now been rendered increasingly obsolete by its own success. What is now need, in the most simplistic terms is an increasingly qualitative policy that is site specific and is targeted at the unmet priorities in each area.

Unfortunately, as seen above, much of the potential of these benefits of more market driven and goal oriented policies has yet to be because of the limits set on them by water quality regulators. In specific, these regulators have tried to carry out such policies with the existing regulatory framework, making it difficult if not impossible to trade resources across point-non point source lines, between categorical standards and other values such as natural infrastructure and habitat preservation and by ignoring, as the Clean Water Act does, the issue of affordability.[66] But, it is worth noting, there is nothing intrinsic in any of these concerns that suggests that it would not be appropriate to propose a program of environmental investment where it could be shown that going across such program lines would produce far more environmental improvement at a far smaller cost.

As history has shown, the great weakness of the Clean Water Act is that it sets out a serious of comprehensive water quality goals, but it is not administered in such a

[66] The absence of a systematic treatment of affordability in the Clean Water Act, an issue that was not seriously considered because the first decade of Clean Water investments was largely paid for by Federal dollars, and because the issue of funding ongoing maintenance was largely ignored, means that the issue is dealt with informally, and inconsistently, in the local political arena, as for example in the 1996 New York State Environmental Quality Bond Act, which steered nearly all of its water quality support funds outside of New York City.

comprehensive fashion, nor are its concerns reconciled at either the statutory level, the regulatory level, or the administrative level, either in terms of its own requirements or in terms of related ones set out elsewhere. To take water quality planning for the New York New Jersey Harbor Estuary to this next level, is both the challenge and the opportunity that DEP has in its effort to balance the needs of the estuary environment and its environmental infrastructure with the financial needs of the water and sewer ratepayers and the City's economy.

3.3 Integrative Thinking for a Watershed Agenda

Assembling the pieces of a watershed agenda in such a way that resources can be targeted efficiently with the support of stakeholders, including the general public, will be a challenge. The next section lays out five potential starting points. Before these recommendations are given, a series of figures illustrate a conceptual approach to considering the overlap and trade-offs in an integrative approach. Figure 1 presents a series of desired outcomes, primarily in the form of problems to be reduced or eliminated. May of these were discussed in Section 2 above. They are grouped in terms of the area of primary impact: human, economic, or "critters," meaning non-human flora and fauna.

Figure 2 then presents a group of potential action areas that may address some of these issues. Figure 3 is a template: the potential action areas are given as the bottom of the figure, with desired outcomes at the top. Figure 4 shows the connections between one of these potential action areas, wetlands, and the desired outcomes. In this case, fourteen of the twenty desired outcomes are addressed by taking action in the area of wetlands, and only one is impacted negatively, commercial development, shown by the red arrow.

Figure 5 then takes the action area and replaces it with a specific action, in this case, buying a restoring all wetlands recommended by the Habitat Working Group (HWG) of the Harbor Estuary Program (HEP). By focusing on a specific action, both the costs and anticipated benefits can now be quantified.

This template could be used for internal use, particularly in integrative cost-benefit analysis (see Section 4.4 below), and also for communication with stakeholder groups to emphasize how the set of actions that constitute the integrated watershed agenda do address all of their concerns. Note that connections are numbered to reference explanations.

FIGURE 1: Areas of desired outcomes of Watershed Agenda

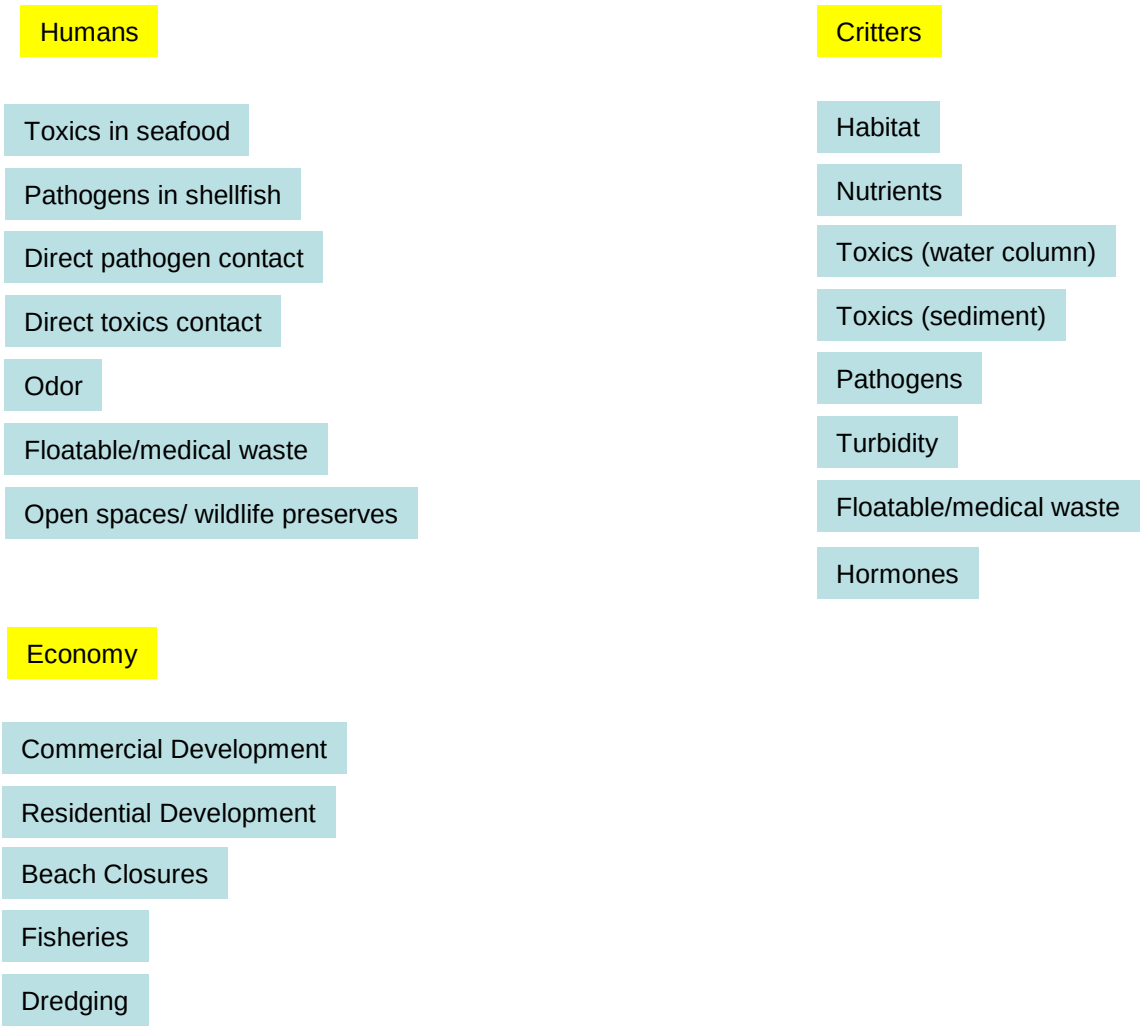


FIGURE 2: Potential Action Areas of Watershed Agenda

FIGURE 3: Template of Action Areas and Outcomes

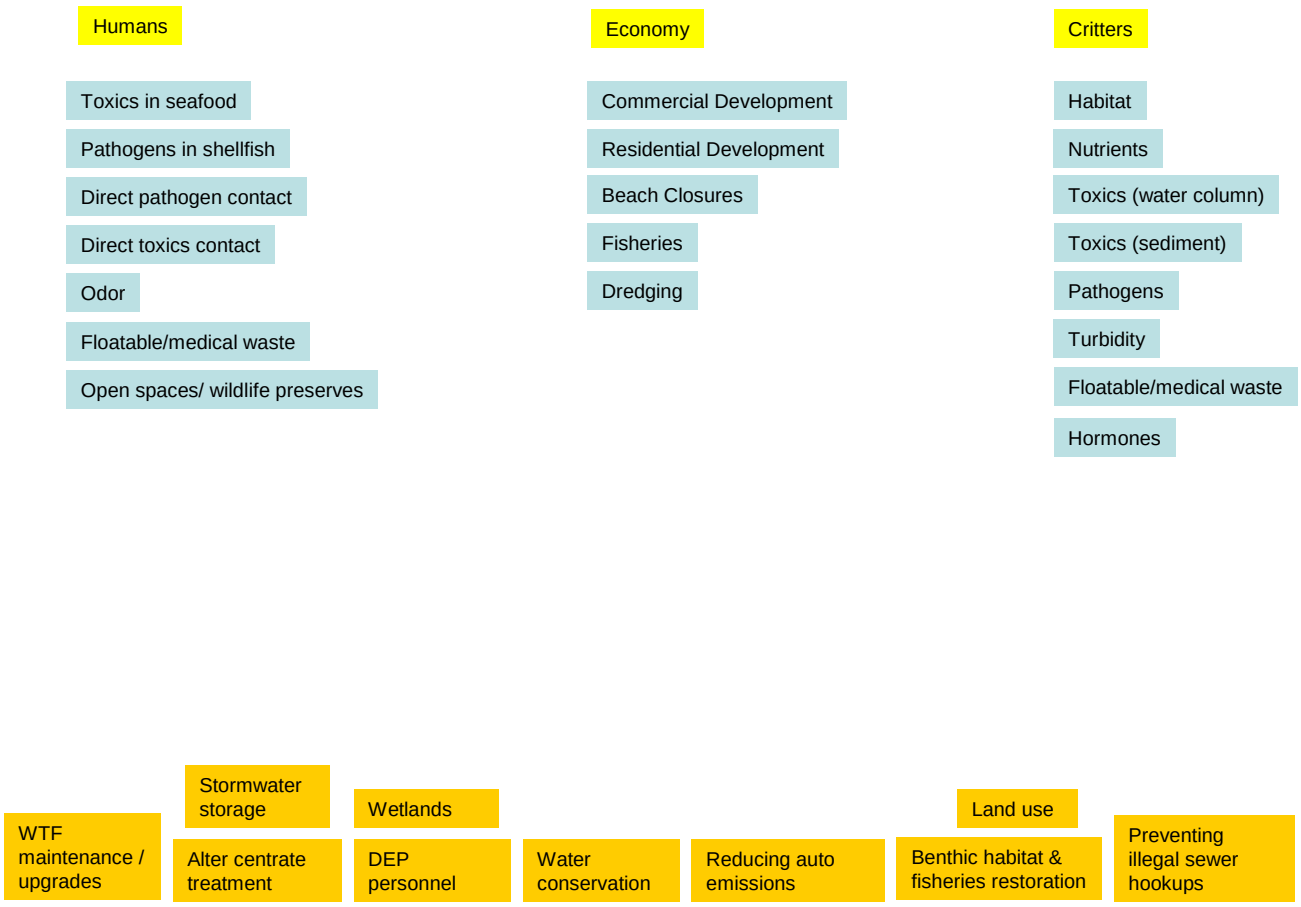


FIGURE 4: Connections between Actions in the Area of Wetlands and Potential Outcomes

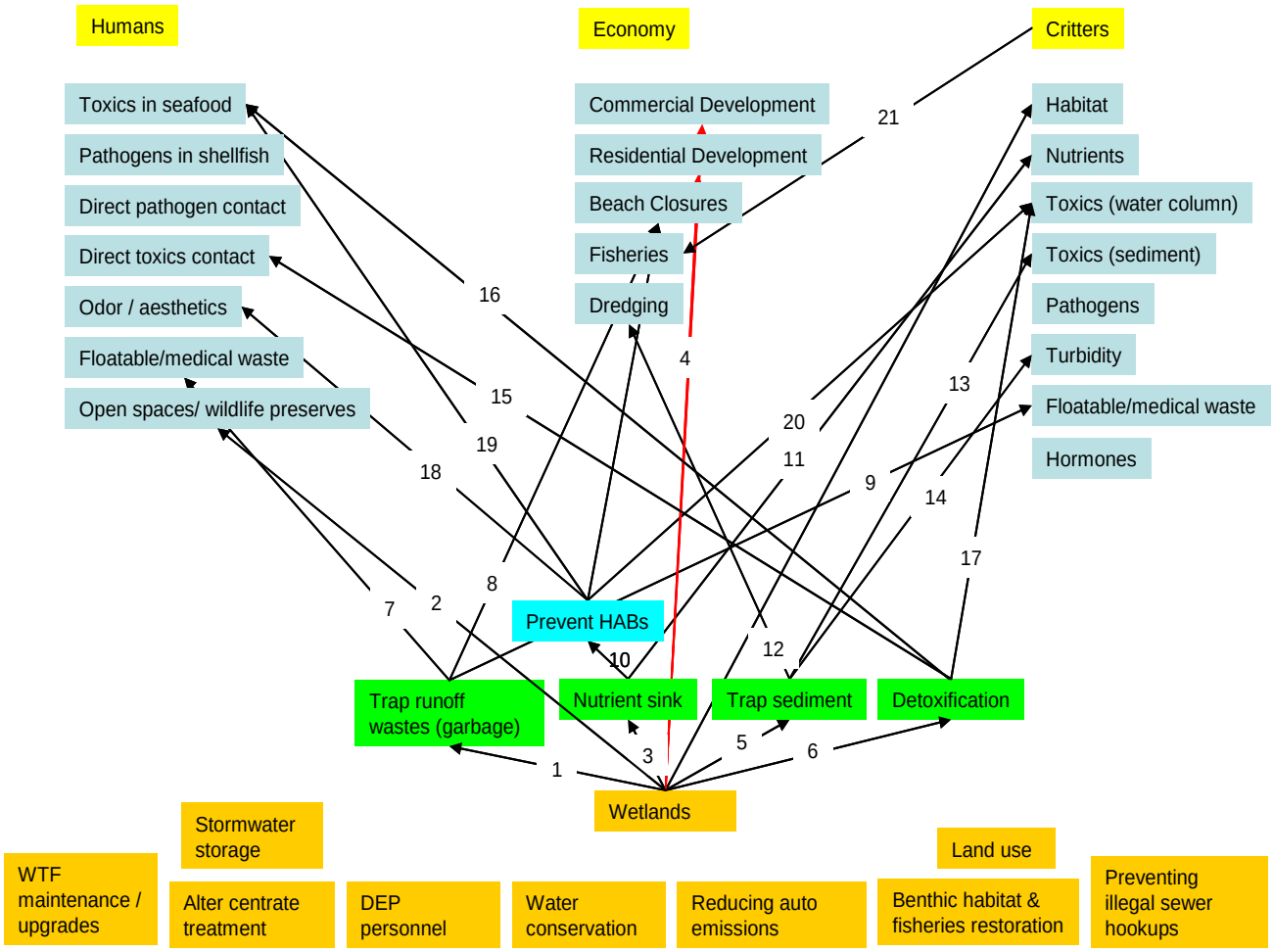
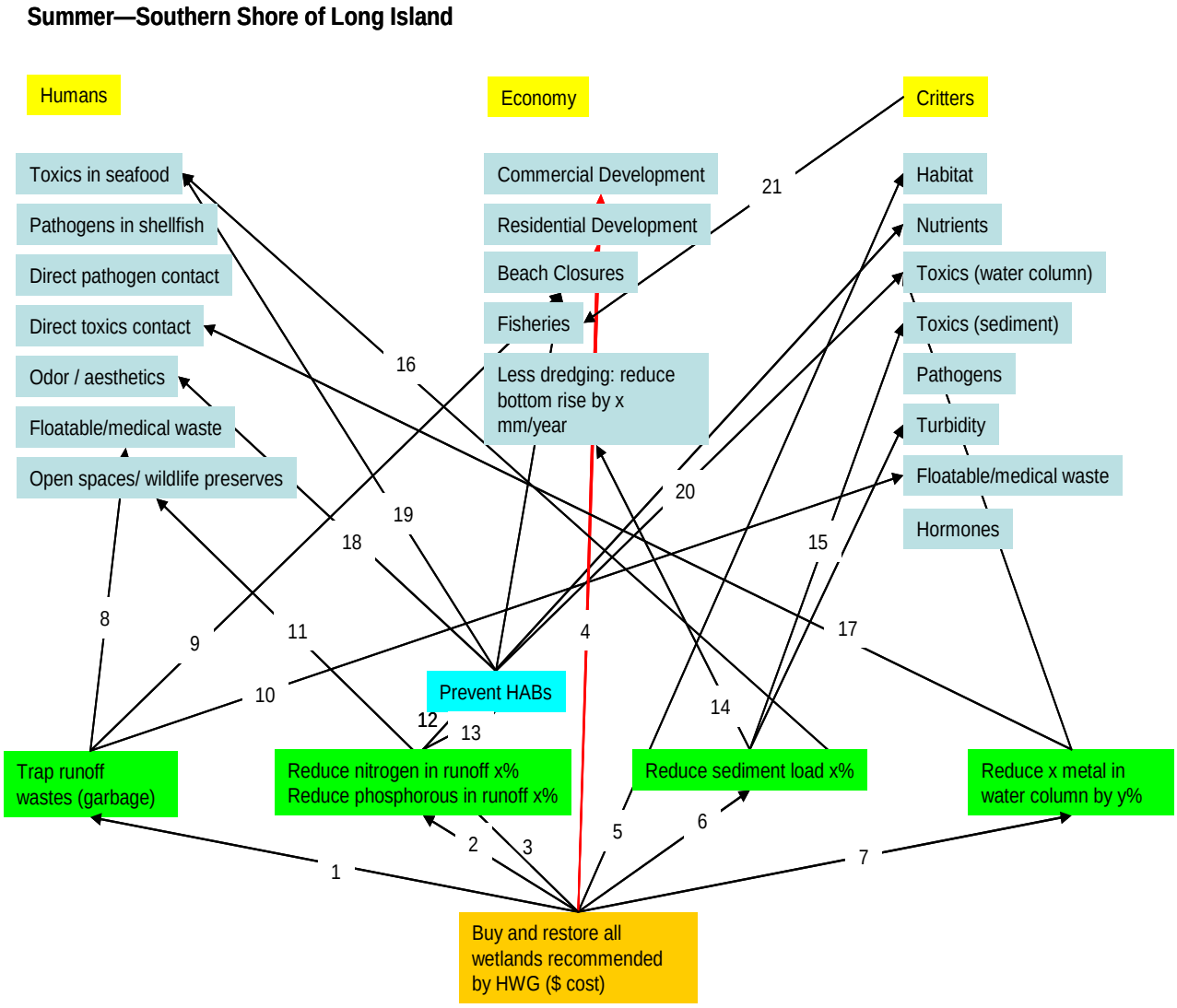


FIGURE 5: Connections between a Specific Action in the Area of Wetlands and Potential Outcomes



4 RECOMMENDED STEPS TO ASSEMBLE AN EFFECTIVE BEYOND-MANDATED INTEGRATED WATERSHED AGENDA FOR THE NEW YORK NEW JERSEY HARBOR ESTUARY

As part of this study, a host of possible courses of action were researched. The following five were chosen as holding the most potential benefits for the investment. They are presented in the form of a proposal: while we had a particular team of consultants and academic partners in mind when compiling the recommendations, "the contractor" could refer to any appropriate group.

4.1 Facilitate DEP development of comprehensive watershed management plan for 100% restoration of Jamaica Bay

Jamaica Bay is one of three major habitat complexes remaining in the New York-New Jersey Harbor Estuary and one of New York City's most significant ecological resources. The Bay is an internationally significant bird migrating resource, a foundation of the estuary's fisheries, a major clean water resource, one of the region's most beloved open spaces, and an extraordinary resource for sustainability. With 2.5 million residents living within 15 minutes of Jamaica Bay, it is nothing less than an urban Chesapeake. Despite the successful land preservation initiatives of Buffer the Bay, NYC Parks and others during the past two decades, unabated erosion has caused Jamaica Bay to lose an average of one acre of wetland every week.

Extensive planning has revealed that a traditional clean water agenda cannot achieve clean water goals and ecosystem-based restoration. A new strategy is needed, and DEP has begun work in this direction. The Contractor will support DEP's ongoing engineering and public outreach efforts.

In particular, the Contractor will work in close consultation with DEP staff and relevant stakeholders to develop a first draft comprehensive watershed management plan for Jamaica Bay (the "Draft Plan"). The Draft Plan will assess and, where relevant, incorporate innovative, site-specific sewage treatment, deep disposal and ecosystem-based measures aimed at full restoration of the Bay's ecological balance. To the extent possible, the experiences and lessons learned by other jurisdictions will be reviewed and reflected in the Draft Plan. A central goal of the Draft Plan will be the achievement of full watershed restoration and 100 % compliance with clean water objectives.

To ensure harmonization with DEP's broader agenda for Jamaica Bay, maximization of DEP's clean water knowledge base, and the rapid finalization and implementation of the Plan, the Contractor will work in close communication with relevant DEP staff from commencement of the project. In order to harness the best available knowledge, build an institutional framework for DEP's initiatives and enable the expression of a range of viewpoints, the Contractor will develop the Draft Plan in consultation with relevant federal, regional, state, municipal and community stakeholders. Among other things, the

Contractor will organize one or more informal, charette-style working sessions with a select group of key Jamaica Bay constituencies.

4.2 Determine the potential for non-structural solutions to CSOs tributary by tributary, develop a menu of potential abatement measures, and apply the appropriate combination to the region of top priority.

Cities across the country continue to struggle with the consequences of their combined sewer systems. New York's large commitment of city resources have shown limited impact on water quality at a time when the city has already achieved clean water standards in much of the estuary. CSOs no longer threaten the health of the estuary as a whole. They are, instead, a local problem causing odor pollution, beach closures, short-term hypoxia and other degradation of water quality. Therefore, a carefully targeted system of comprehensive non-structural solutions is the appropriate strategy to eliminate their effects. Determining the precise measures specifically for the problem tributaries is especially pressing now to avoid unnecessary investments as the EPA strengthens required CSO program commitments.

To determine the appropriate abatement strategies, the Contractor will, first:

- Identify relevant impact categories (e.g. odor pollution, ecosystem degradation, etc.) Much of that work has already been done as part of the present study, and is included as Appendix A.
- Quantify those impacts which are quantifiable and identify other impacts which are not (e.g. quantify the extent of odor pollution, beach closures, and water quality degradation tributary by tributary while simultaneously debriefing the city on its assessment of the potential to reduce CSOs.)
- Identify non-structural alternatives for addressing CSO impacts.
- Quantify, where possible, or at least specify the links between use of the nonstructural alternatives and the amelioration of negative impacts of CSOs, and other positive impacts directly attributable to these alternatives.

The Contractor will then prepare a study of the opportunities for CSO reduction via water conservation and infiltration areas as well as the dilution of CSO impact via bluebelts, again tributary by tributary. The report will include additional improvements due to these measures, such as public access to landscaped infiltration areas and habitat creation in bluebelt regions.

Once the needs and opportunities of each tributary have been established, the Contractor will create a hierarchy based on a cost/benefit analysis of these data. Quantified impacts of CSOs will be monetized (a rough measure of 'costs') as will quantified improvements or ameliorations of those impacts due to nonstructural; measure (a rough measure of

'benefits'). An action plan with projected outcomes will be developed for the tributary identified as the top priority. The action plan will also include community outreach strategies to better the plan, facilitate smooth implementation, and showcase the project. The final deliverable from this task will be a cost/benefit assessment of potential federal plans to tighten CSO regulations to ensure that any future CSO investments will address specific needs with maximum results. This report will include examples of successful site-specific variances obtained nationwide.

4.3 Assess the costs of achieving the Targets and Goals of the New York-New Jersey Harbor Estuary Program (HEP) and of alternatives to the Targets and Goals

In furtherance of the HEP's 1996 Final Comprehensive Conservation and Management Program, the HEP published the "Targets and Goals of the New York-New Jersey Harbor Estuary Program" ("Targets and Goals") in November 2003. The document sets forth a series of goals, including:

- ensuring that all of the Harbor waters meet the Clean Water Act's fishable/swimmable goals for pathogens, toxics, nutrients, oxygen levels and debris;
- preserving, managing and enhancing the Estuary's habitat, ecological function and biodiversity;
- ensuring that all Harbor residents have public waterfront access within 30 minutes of their homes without harming important habitat areas;
- reducing point and non-point sources and sediment hot spots entering the Harbor, so that toxics in newly deposited sediments do not inhibit healthy ecosystems and can be dredged and re-used;
- the quantity of sediments entering the Harbor system will support the Estuary's ecological health without excessively impairing navigational activities;
- navigation-related projects in the Harbor will be designed and implemented in an environmentally beneficial manner; and
- everyone living or working in the Estuary watershed will act as a steward for the ecosytem.

These goals are elaborated by a series of 22 more specific targets. No cost estimates are included in the document.

Using the Targets and Goals as a starting point and working in consultation with the Management Committee of the HEP and other relevant stakeholders, the Contractor will perform an ecological cost analysis of each of the Targets and Goals. In addition to assessing the costs of attaining the key Targets and Goals, the ecological cost analysis will relate the Targets and Goals to the broader goal of restoring ecological functioning. Following a comprehensive review of relevant harbor estuary data, the Contractor will work with DEP staff to structure model exercises and examine the implications for trade-offs between the Targets and Goals and other investment opportunities, if any, that may

lead to the restoration of ecological function. . The Contractor will also price the HEP agenda from a categorical perspective, review lessons learned from other NEP programs, and identify alternative least-cost approaches to achieving clean water objectives.

4.4 Use Cost-Benefit Framework to Compare Approaches to Harbor-Estuary Management

DEP has been very successful at employing non-structural alternatives to avoid large construction projects. Examples include BMPs in agricultural and other areas as an alternative to new drinking water treatment facilities and in-line storage and infiltration areas as alternatives to large storage facilities for CSO abatement. In cases where non-structural alternatives provide the same outcome as a new facility for less money, the choice is clear. However, different management approaches often produce different outcomes that contribute to the ultimate goal of maximizing ecosystem health while maintaining necessary standards for human health. For example, investing in wetland acquisition and restoration may not provide the same levels of DO during wet weather events, but the habitat may prove more essential to ecosystem functioning than these short periods of depressed DO. The focus of this task is to weigh the various benefits and the associated costs of a menu of management strategies using a two-phase approach.

First, the contractor will build on DEP's cost-benefit work on the current Newtown Creek upgrades as a case study of investing in a large construction project to address Clean Water Act standards. Along the methodological lines described in Task 2, this project will be placed into a framework of specified impacts, positive and negative, attributable to specific public policies employed in the Newtown Creek upgrade. These impacts will then be quantified and monetized and sorted into relevant cost and benefit categories. The contractor will add to the analysis additional upgrades that may be considered based on the performance of the operating plant.

In the second phase of this task, the contractor will set up a framework for a cost-benefit analysis of a number of approaches to harbor-estuary management, such as different options for nitrogen removal, BMPs in green spaces, additional water conservation incentives, and pinpointing the capacities of WPCPs. Whereas the first part of this task focused on strategies already carried out, this part of the task will extend the benefit-cost framework to proposed strategies. The purpose of this piece of work is two-fold: (1) to identify needed areas of research to provide sufficient information to complete such an analysis, and (2) to provide useful guidelines to aid DEP in decision-making. To maximize the utility of the results, the precise nature of the analysis and deliverables will be determined in partnership with DEP as the project progresses, depending on available information. For example, we may choose to limit the region of interest to a subsection of the Harbor-estuary.

4.5 Developing a framework for expanding public awareness of DEP's clean water and watershed management initiatives

For decades, DEP has pioneered clean water and comprehensive watershed management approaches, giving life and meaning to the goals of the Clean Water Act and consistently pointing clean water policymakers in ground-breaking directions. DEP's work has earned the respect of environmental officials and policy insiders in the environmental community. Public perception of DEP's first-in-class approaches, however, has lagged.

To better ground DEP's work in municipal policy, increase public awareness and expand the constituency for DEP's watershed management work, the Contractor will perform a number of interrelated activities in close cooperation with relevant DEP staff:

- Review DEP's urban watershed management work and develop an overarching "urban watershed management framework" document. The framework document will set forth DEP's clean water strategies, elaborating on the application and benefits of such key principles as innovation; adaptability; site specificity; full-problem, goal-oriented solutions; affordability and the integration of community impacts into sustainable solutions. The framework document will use a case study method to demonstrate how these methods have yielded important win-win outcomes in, e.g., the Long Island Sound, Jamaica Bay, CSO policy, Staten Island and the HEP.
- Identify and draft parallel public-oriented public information materials that would communicate tailored messages to key DEP constituencies inside and outside the City.
- Design clean water communications campaign for targeted constituencies, e.g., federal and state decision-makers and key municipal and local stakeholders in such areas as Jamaica Bay and the HEP.
- Schedule and begin implementation of a series of 6-8 stakeholder consultations that will maximize public engagement in DEP's clean water programs.

APPENDIX A: CSO Environmental Impact and Abatement Measures, Tributary by Tributary

East River

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
East River	Alley Creek	Yes	Storage Tanks	Yes	1	1	N/A	N/A	N/A	Dissolved oxygen levels are not in compliance with standards. Coliform levels are in compliance with standards (East River CSO Facility Plan, 1996). Dissolved oxygen levels are periodically below standards, primarily following rain events. Settleable solids and floatables are discharged by CSO.	CSOs, stormwater and other runoff
	Hutchinson River	Yes	Storage Tanks	Yes	7	0	N/A	N/A	N/A	Dissolved oxygen levels are not in compliance with standards. Coliform levels are in compliance with standards (East River CSO Facility Plan, 1996). Dissolved oxygen levels are in persistant hypoxic and periodic anoxic conditions in the upper reaches. Water quality generally improves towards Pelham Bay. Settleable solids and floatables are discharged by CSOs.	CSOs, storm water and other runoff
	Little Neck Bay	No	N/A	Yes	1	1	N/A	2	1988	N/A	Treatment plant bypass
							N/A	132	1993	High bacteria densities	N/A
							N/A	23	1998	N/A	N/A
							N/A	7	1999	N/A	Treatment plant bypass
							N/A	7	2001	High levels of total coliform bacteria	N/A
							N/A	0	2002	N/A	N/A

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
	Flushing Bay	Yes	Storage Tanks	Yes	13	0	N/A	N/A	N/A	Dissolved oxygen and coliform levels are in non-compliance throughout the bay and in the creek (Flushing Bay Water Quality Facility Plan, 1989). Dissolved oxygen and coliform conditions are significantly below standards in the creek with general improvements towards and within the bay. Settleable solids are discharged by CSOs. Floatables discharges are currently contained by booms and nets at several CSOs.	CSOs, storm water and other runoff
	Bronx River	Yes	Storage Tanks	Yes	5	1	N/A	N/A	N/A	Dissolved oxygen and total coliform bacteria levels are in non- compliance with standards (East River CSO Facility Plan, 1996). Settleable solids and floatables are discharged by CSOs to the lower, saline reaches. A majority of the floatables are contained by a boom.	CSO, storm water and other runoff, upstream water quality, East River
	Westchester Creek	Yes	Storage Tanks	Yes	5	0	N/A	N/A	N/A	Dissolved oxygen levels are in non-compliance (East River CSO Facility Plan, 1996).	CSOs, storm water and other runoff
	Bowery Bay WPCP	No	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
	Red Hook WPCP	No	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
	Wards Island WPCP	No	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
	Tallman Island WPCP	No	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
	Hunts Point WPCP	Yes	Storage Tanks	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
	Newtown Creek-Creek-WPCP	Yes	Storage Tanks	Yes	16	1	N/A	N/A	N/A	Dissolved Oxygen and Total Coliforms are in Non-Compliance (Inner-Harbor CSO Facility Plan, 1993). Water Quality Decreases with distance from East River. Anoxic dissolved conditions prevail at upper reaches. Settleable solids are discharged by CSO's; floatables are also discharged but are substantially contained at several locations by booms.	CSO, Stormwater and Other Runoff,Commercial and Industrial Discharges

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
East River	Alley Creek	Catch Basin Hooding Program;CSO Facility Plan– construct additional storm sewers– redirect storm water to wetlands treatment– construct additional conduit for in-line CSO storage (3 MG) and pumpback for treatment	None	$19,059K	$19,059K	Improved dissolved oxygen to compliance with standards. Substantial reduction of floatables and settleable solids discharges.	Final design including CPM analysis. Construction of CSO retention facility will start in 2006
	Hutchinson River	Catch Basin Hooding Program;CSO Facility Plan- construct storage conduit to provide in-line storage (7MG) with pumpback for treatment-construct additional CSO outfall to reduce pollutant loads Closure and remediation of Pelham Bay Landfill	None	2004 Proposed plan: $21,000K	Future phases: $61,000K	Dissolved oxygen conditions will improve but standards will not be met - periodic hypoxic conditions will occur. Substantial reduction of settleable solids and floatables discharges.	Phase 1 will start constructing CSO retention tank in 2011. Future phases will start construction in 2016
	Little Neck Bay	N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
		N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
	Flushing Bay	Catch Basin Hooding Program (WQIP) Interim Floatables Containment Program CSO Facility Plan - construct tank and in-line storage (43 MG) CSO Facility Plan - construction of 3 vortex concentrator devices is complete and being evaluated	None	$23,139K	$123,139K	Improved dissolved oxygen and coliform levels but will remain in non-compliance with standards. Substantial reduction of settleable solids and floatables discharges.	Under Construction
	Bronx River	Catch Basin Hooding Program; Interim Floatables Containment Program; CSO Facility Plan - construct storage conduit to relocate one CSO outfall and provide in-line storage (4 MG) with pumpback for treatment.	NYCDPR - acquisition of new open space areas and restoration of existing areas USACE - proposed restoration sites to restore ecological health and wildlife habitat - proposed Regional Flood Control and Ecosystem Restoration Study	$24081K	$24081K	No change in Class B waters. In Class I water dissolved oxygen and coliform levels will improve but standards will not be met. Substantial reduction of floatables discharges. NYCDPR - acquisition of new open space areas and restoration of existing areas USACE - proposed restoration sites to restore ecological health and wildlife habitat - proposed Regional Flood Control and Ecosystem Restoration Study	CSO tank is under Construction. The other programs are being applied
	Westchester Creek	Catch Basin Hooding Program;CSO Facility Plan- construction of CSO storage tank (12 MG)Interim Floatables Containment Program	None	2004 Proposed plan: $27,000K	Future phases: $133,000K	Dissolved oxygen levels will improve but standards will not be met. Substantial reduction of settleable solids floatable discharges.	Phase 1: Final design of Influent sewers. Actual construction will start in 2011. Future phases will start in 2017
	Bowery Bay WPCP	Nitrogen Removal	None			N/A	N/A
	Red Hook WPCP		None			N/A	N/A
	Wards Island WPCP	Nitrogen Removal	None			N/A	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
	Tallman Island WPCP	Nitrogen Removal	None	2004 Proposed Plan: $55,000K for interceptor improvements		N/A	N/A
	Hunts Point WPCP	Nitrogen Removal	None	$24,081K	$24,081K	N/A	N/A
	Newtown Creek-Creek-WPCP	Catch Basin Hooding Program;Interim Floatables ContainmentCSO Facility Plan-automate and improve regulators-construct throttling facilities to induce in-line interceptor storage (18 MG)-install inflatable dam to induce in-line storage (2 MG)- construct CSO Storage tank (3.5 MG). Upgrades to WPCP.	None	$10,000K	$27,000K	Dissolved oxygen and coliform conditions will improve but the creek will not comply with standards. Substantial reduction of floatables and settleable solids discharges.	Upgrades to existing WPCP is under construction. Other programs are up and running. CSO facility has not been constructed.

Hudson River and New York Bay

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
Hudson River	North River WPCP	N/A	N/A	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A
	Itself	No	N/A	No	~100	1 in New York City; 5 in New Jersey	N/A	N/A	N/A	Dissolved oxygen levels are in non-compliance. Total coliform levels are in compliance in I and SB waters. Fecal coliform in compliance in I waters; in non-compliance in SB waters (Inner Harbor CSO Facility plan, 1993). Settleable solids and floatables are discharged by CSO's.	CSOs, stormwater and other runoff, WPCP's,
Upper New York Bay	Kill Van Kull	No	N/A	No	23	1	N/A	N/A	N/A	Dissolved oxygen levels are not in compliance with standards (Outer Harbor CSO Facility Plan, 1993). Settleable solids and floatables are discharged by CSO's	CSO, stormwater and other runoff, WPCP,Commercial and industrial discharges, impacts of boundary water quality
	Owls Head WPCP	No	N/A	No	0	1	N/A	N/A	N/A	N/A	N/A
	Port Richmond WPCP	No	N/A	N/A	0	1	N/A	N/A	N/A	N/A	N/A
	Gowanus Canal	No	N/A	Yes	12	0	N/A	N/A	N/A	Dissolved oxygen levels are in non-compliance with standards (Inner Harbor CSO Facility Plan 1991.) However, when the DEP Flushing Tunnel is operating, dissolved oxygen is improved to general compliance throughout the canal with minor periods of non-compliance in lower reaches towards Gowanus Bay. There are no coliform standards for SD Waters . Settleable solids are dischaged by CSOs. Floatables are also dischared by CSOs but are substantially contained by a boom.	CSO, stormwater and other runoff

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
	Itself	No	N/A	N/A	~45	3	N/A	N/A	N/A	Coliform and dissolved oxygen levels are in compliance with standards (Inner Harbor CSO Facility Plan, 1993).	CSO, stormwater and other runoff, WPCP's, commercial and industrial discharges
Lower New York Bay	South Beach	No	N/A	Yes	N/A	N/A	N/A	?	1988	N/A	Medical Debris, Treatment plant bypass
		No	N/A	Yes	N/A	N/A	N/A	101	1989	N/A	Floatables
	Manhattan Beach	No	N/A	Yes	N/A	N/A	N/A	?	1988	N/A	Medical Debris
	Brighton Beach	No	N/A	Yes	N/A	N/A	N/A	?	1988	N/A	Medical Debris
	Midland Beach	No	N/A	Yes	N/A	N/A	N/A	?	1988	N/A	Medical Debris, Treatment plant bypass
							N/A	101	1989	N/A	Floatables
		No	N/A	Yes	N/A	N/A	N/A	6	1995	High bacteria densities	Surface runoff
	Great Kills Park (Beach)	No	N/A	Yes	N/A	N/A	N/A	29	1988	High bacteria densities	Medical Debris, Treatment plant bypass
		No	N/A	Yes	N/A	N/A	N/A	12	1998	Elevated bacteria levels	
		No	N/A	Yes	N/A	N/A	N/A	10	1999	Elevated bacteria levels	
	Kiddie Beach	No	N/A	Yes	N/A	N/A	N/A	11	1996	Elevated bacteria levels	Rainfall related
		No	N/A	Yes	N/A	N/A	N/A	3	1997	Elevated bacteria levels	Rainfall related
	Oakwood Beach WPCP	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	Coney Island Beach	No	N/A	Yes	N/A	N/A	N/A	?	1988	N/A	Medical Debris

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
	Coney Island Creek	No	N/A	Yes	1	0	N/A	N/A	N/A	Coliform and dissolved oxygen levels are in non-compliance with standards throughout the creek (Coney Island Creek CSO Facility Plan, 1994). Dissolved oxygen levels are persistently below standards in upper reaches with general improvements towards Gravesend Bay. Settleable solids are discharged by CSO. Floatables are discharged by CSO but are presently contained by a boom.	CSO, stormwater and other runoff
	Itself	No	N/A	N/A	2	1	N/A	N/A	N/A	Dissolved oxygen levels are not in compliance with standards. Coliform levels are in compliance with standards (Outer Harbor CSO Facility Plan, 1993). Settleable solids and floatables are discharged by CSOs	CSO, stormwater and other runoff, WPCPs, Impact of Jamaica Bay, Raritan Bay, Coney Island Creek, and Upper Bay water quality

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
Hudson River	North River WPCP	N/A	N/A			N/A	N/A
	Itself	Catch Basin Hooding Program;CSO Facility Plan- Automation of large regulators- Installation and conversion of regulators to induce in-line storage (1.5 MG)	NY/NJ Harbor Estuary Priogram- investigating potential habitat restoration sites.			Disolved oxygen levels will remain in minor non-compliance. All coliform levels will be in compliance with standards. Reduction of settleable solids and floatables discharges.	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
Upper New York Bay	Kill Van Kull	Catch Basin Hooding Program	None			Reduction of Floatables Discharges	N/A
	Owls Head WPCP	N/A	N/A			N/A	N/A
	Port Richmond WPCP	N/A	N/A			N/A	N/A
	Gowanus Canal	Catch Basin Hooding Program;Interim Floatables Containment ProgramCSO Facility Plan:- reactivation of Flushing Tunnel (180-300, averaging 200 MGD)- ongoing planning	None	2004 Proposed Plan: $51,000K		General compliance with dissolved oxygen standards when the flushing tunnel is operating. Floatable discharges are substantially contained.	N/A
	Itself	Catch Basin Hooding Program;Interim Floatables Containment Program;CSO Facility Plan- maximize use of inline storage. NYSDEC - Habitat identification	NYSDEC - Habitat identification			Reduction of floatables discharges.	N/A
Lower New York Bay	South Beach	N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
	Manhattan Beach	N/A	N/A			N/A	N/A
	Brighton Beach	N/A	N/A			N/A	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
	Midland Beach	N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
	Great Kills Park (Beach)	N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
	Kiddie Beach	N/A	N/A			N/A	N/A
		N/A	N/A			N/A	N/A
	Oakwood Beach WPCP	N/A	N/A			N/A	N/A
	Coney Island Beach	N/A	N/A			N/A	N/A
	Coney Island Creek	Catch Basin Hooding Program;Interim Floatables C ontainmentCSO Facility Plan- Identification and elimination of dry weather overflows- Upgrade Avenue V Pumping Station to reduce CSO discharges- Additional planning work to asses water quality- Dredge upper reaches	NYCDPR Plan for Brooklyn Waterfront- habitat restoration adjacent to Dreier-Offerman ParkNY/NJ harbor Estuary Program- salt marsh restoration at Dreier-Offerman Park to improve habitat diversity	0	0	Improved dissolved oxygen and coliform levels but will remain in non-compliance with standards. Substantial reduction of floatables discharges.	Final design including CPM analysis. Construction of CSO retention facility will start in 2007
	Itself	Catch Basin Hooding Program.	NY/NJ Harbor Estuary Program– salt marsh rehabilitation of Dreier-Offerman Park to improve habitat diversity.	0	0	Dissolved oxygen levels will remain in non-compliance with standards. Reduction of floatables discharges.	N/A

Harlem River, Raritan Bay, and Jamaica Bay

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
Harlem River	Itself	No	N/A	Yes	~100	0	N/A	N/A	N/A	Dissolved oxygen and coliform levels are in non-compliance with standards. (East River CSO Facility Plan, 1996). Settleable solids and floatables are discharged by CSO's	CSOs; stormwater and other runoff; impacts of boundary water quality
Raritan Bay	Arthur Kill	No	N/A	Yes	6	3	N/A	N/A	N/A	Dissolved oxygen levels are in non-compliance with standards (Outer Harbor CSO Facility Plan, 1993). There are no coliform standards for Class SD waters.	CSOs, storm water and other runoff, WPCPs, commercial and industrial discharges, landfill leachate, impacts of boundary water quality
	Fresh water input from the Raritan River	No	N/A	N/A	6	1?	N/A	N/A	N/A	Dissolved oxygen levels are not in compliance with standards. Coliform levels are in compliance with standards (Outer Harbor CSO Facility Plan, 1993).	Stormwater and other runoff, impacts of Arthur Kill and Raritan River water quality
Jamaica Bay	Paerdegat Basin	Yes	Storage Tanks	Yes	3	0	N/A	N/A	N/A	Coliform and dissolved oxygen levels are in non-compliance with standards (Paerdegat Basin CSO Facility Plan, 1991). Dissolved Oxygen levels are at persistent anoxic conditions at the head end. Settleable solids are discharged by CSO; floatables are also discharged but are presently contained by booms. Water quality conditions generally improve in downstream reaches towards Jamaica Bay. The mouth of the basin exhibits episodic conditions of non-compliance.	CSO, stormwater and other runoff, impact of Jamaica Bay water quality.

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
	Fresh Creek	Yes	Storage Tanks	Yes	1	0	N/A	N/A	N/A	Coliform and dissolved oxygen levels are not in compliance with standards (Jamaica Bay CSO Facility Plan, 1993). Dissolved oxygen levels are periodically below standards with hypoxic episodes in upper reaches but with general improvements towards Jamaica Bay. Settleable solids are discharged by CSO; floatables are also discharged but are presently contained by a net.	CSO, stormwater and other runoff; impact of Jamaica Bay water quality
	Spring Creek	No	N/A	Yes	1	0	N/A	N/A	N/A	Coliform and Dissolved oxygen levels are in non-compliance with standards (Jamaica Bay CSO Facility Plan, 1993). Periodic non-compliance with dissolved oxygen standards occur in the immediate vicinity of the Spring Creek AWPCP	CSO, stormwater and other runoff, impacts of Jamaica Bay water quality
	Hendrix Creek	No	N/A	Yes	1	1	N/A	N/A	N/A	Coliform and dissolved oxygen levels are in non-compliance with standards (Jamaica Bay CSO Facility Plan, 1993). Dissolved oxygen levels are in periodic hypoxic conditions in the upper reach. Dissolved oxygen significantly improves in the lower reach near Jamaica Bay. Settleable solids are discharged by CSO; floatables are also discharged but are presently contained by a boom.	CSO, stormwater and other runoff, WPCP, landfill leachate, impacts of Jamaica Bay water quality
	Shellbank Basin	No	N/A	Yes	N/A	N/A	N/A	N/A	N/A	Dissolved oxygen levels are in non-compliance with standards. Coliform levels are in compliance with standards (Jamaica Bay CSO Facility Plan, 1993). Basin morphology at head end and poor flushing contributes to stratification and hypoxic dissolved oxygen conditions. Water quality conditions improve in lower reaches towards	CSO, stormwater and other runoff,impact of Jamaica Bay water quality

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
										Jamaica Bay.	
	Bergen Basin	No	N/A	Yes	1	1	N/A	N/A	N/A	Coliform and dissolved oxygen levels are in non-compliance with standards throughout the basin (Jamaica Tributaries CSO Facility Plan, 1998). Dissolved oxygen levels are at persistent hypoxic conditions in upper reaches. The mouth of the basin exhibits episodic conditions of non-compliance. Settleable solids are discharged by CSO. Floatables are discharged by CSO but are presently contained by a boom.	CSOs, storm water and other runoff, compromised storm sewers with sanitary flows, WPCP
	Mill & East Mill Basin	No	N/A	Yes	N/A	N/A	N/A	N/A	N/A	Coliform and Dissolved oxygen levels are in non-compliance with standards in Mill Basin(Jamaica Bay CSO Facility Plan, 1993). Although no CSOs discharge to the basins, periodic episodes of dissolved oxygen non-compliance occur	Stormwater and other runoff
	Sheepshead Bay	No	N/A	Yes	0	0	N/A	N/A	N/A	Recent Harbor Survey data collected by the New York City Dept. of Environmental Protection near the mouth of Sheepshead Bay indicate compliance with Class I dissolved oxygen, total coliform, and fecal coliform standards.	Stormwater and other runoffSuspected chemical leaks and spills, Boat pollution,Impacts of Jamaica Bay water quality

Waterbody Region	Tributary	1992 Consent Order	Project Description	Historical Wetland	Total # CSOs outfalls	WPCPs Outfalls	Currently overflow frequency	Environmental Impact			
								Beach closures (duration days)	Year of beach closure	Existing Water Quality	Causes of pollution
	Thurston Basin	No	N/A	Yes	1	0	N/A	N/A	N/A	Total coliform and dissolved oxygen levels are not in compliance with standards Fecal coliform levels are in compliance with standards (Jamaica Tributaries CSO Facility Plan, 1998). Dissolved oxygen levels are periodically below standards occuring mostly towards head end. Settleable solids are discharged by CSO; floatables are also discharged but are presently contained by a boom.	CSO, stormwater and other runoff, compromised storm sewers with sanitary flows
	Jamaica WPCP	No	N/A	N/A	0	1	N/A	N/A	N/A	N/A	N/A
	Coney Island WPCP	No	N/A	N/A	0	1	N/A	N/A	N/A	N/A	N/A
	Rockaway WPCP	No	N/A	N/A	0	1	N/A	N/A	N/A	N/A	N/A
	26th WARD WPCP	No	N/A	N/A	0	1	N/A	N/A	N/A	N/A	N/A
		No	N/A	N/A	0	1	N/A	N/A	N/A	N/A	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
Harlem River	Itself	Catch Basin Hooding Program NY/NJ Harbor Estuary Program– salt marsh and riparian habitat restoration	None	0	0	Implementation of the Inner Harbor and East River Facility Plans will improve disolved oxygen and coliform levels, but the river will remain in non-compliance with standards. Reduction of floatables discharges.	N/A
Raritan Bay	Arthur Kill	Catch Basin Hooding Program	NY/NJ Estuary Harbor Program - restoration sites have been identified- CSO facility planning has determined that general water quality in the waterbody is primarily influenced by boundary conditions- improvements in water quality is dependent on general New York Harbor water quality improvements			Minor improvements in dissolved oxygen levels but will remain in non-compliance with standards. Reduction of floatables discharges.	N/A
	Fresh water input from the Raritan River	Catch Basin Hooding Program;South Richmond Drainage Plan- improve sanitary and storm drainage services to Richmond Creek drainage are	NY/NJ Harbor Estuary Program- land acquisition of the Paw-Paw hybrid oak forest areas in Tottenville for non-point source protection and soil erosion reduction.- establishment of an anadromous fish ladder passage on Lemon Creek to increase species diversity and habitat			Reduction of floatables discharges.	N/A
Jamaica Bay	Paerdegat Basin	Catch Basin Hooding Program; Interim Floatables Containment Program; CSO Facility Plan: Construct tank and inline-storage, Dredging, Remediate adjacent open space conditions.	USACE - proposed tidal marsh creation to improve fish and wildlife diversity.	$154,280K	$154,280K	Coliform levels will improve from persistent non-compliance to compliance. Dissolved oxygen levels will improve from persistent anoxic conditions to intermittent summer non-compliance, mostly at head end. Floatables discharges will be virtualy eliminated. Sediment mound and odors will be eliminated.	Final design including CPM analysis. Construction of CSO retention facility will start in 2005

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
	Fresh Creek	Catch Basin Hooding Program;Interim Floatables Containment Program;CSO Facility Plan- construct storage conduit to release CSO discharge to Hendrix Creek and provide storage (27 MG) with pumpout for alternative treatment- ongoing planning	USACE- proposed restablishment of submerged aquatic vegetation to improve aquatic habitat and restoration of monotypic stands of mugwort to uplands to increase diversity of plant species and improve habitat for woodland birds			Improved dissolved oxygen and coliform levels to compliance with standards. Virtual elimination of floatables and settleable solids discharges.	
	Spring Creek	Catch Basin Hooding Program;Spring Creek AWPCP upgrade- process involvement- sewer cleaning to maximize storage	USACE- restoration of low marsh habitat and creation of an upland grassland and woodland habitat to increase fish and wildlife habitat- establish a warm season grassland and creation of an oak-dominated woodland community to improve terrestrial wildlife habitat and increase habitat diversity			Improved coliform and dissolved oxygen levels but water quality standards will not be met. Virtual elimination of floatables discharges.	Under Construction
	Hendrix Creek	Catch Basin Hooding Program;Interim Floatables Containment Program;CSO Facility Plan- offline storage (27 MG)- redirect CSO to Fresh Creek conduit for storage (27 MG) with pumpout for alternative treatment- CSO discharge will continue at downstream location but with significant reduction of pollutant loads- ongoing planning	USACE- creation of tidal marshes to improve diversity of fish and habitat- remediation of Pennsylvania and Fountain Avenue Landfills to minimize storm water infiltration and leachate to surrounding waters	2004 Proposed Plan: $2,000K for dredging		Dissolved oxygen levels will improve but the creek will experience periods of non-compliance. Coliform levels will comply with standardsVirtual elimination of floatables and settleable solids discharges.	N/A
	Shellbank Basin	Catch Basin Hooding Program;CSO Facility Plan- elimination of CSO-alternative technology pilot testing- ongoing planning	NY/NJ Harbor Estuary Program-salt marsh restoration to improve habitat diversity	2004 Proposed Plan: $1,000K for destratificati on		Dissolved oxygen conditions will improve but standards will not be met throughout the basin. Reduction of floatables discharges.	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
	Bergen Basin	Catch Basin Hooding Program (WQIP) Interim Floatables Containment Program Jamaica WPCP Improvements - increase wet weather capacity from 200 to 250Ê MGD CSO Facility Plan - eliminate sanitary-compromised storm sewers - ongoing CSO abatement pilot testing	USACE - proposed shoreline and upland restoration, tidal marsh creation to improve terrestrial, fish and wildlife habitat.			Improved dissolved oxygen and coliform levels but will remain in non-compliance with standards. Substantial reduction of floatables discharges.	N/A
	Mill & East Mill Basin	Catch Basin Hooding Program	USACE- buffer restoration for protection of Four Sparrow Marsh.			Coliform and dissolved oxygen conditions will remain in non-compliance with standards. Reduction of floatables discharges.	N/A
	Sheepshead Bay	Catch Basin Hooding Program	None			Reduction in floatable discharges	N/A
	Thurston Basin	Catch Basin Hooding Program;Interim Floatables Containment ProgramCSO Facility Plan- eliminate sanitary-compromised storm sewers- ongoing CSO abatement pilot testing and planning	None			Improved dissolved oxygen and coliform levels but will remain in non-compliance with standards. Substantial reduction of floatables discharges.	N/A
	Jamaica WPCP	N/A	N/A	$8,400K	$28,400K	N/A	N/A
	Coney Island WPCP	N/A	N/A			N/A	N/A

Waterbody Region	Tributary	Abatement Measures					
		DEP Water Quality Improvement Projects (WQIP)	Other WQIP initiatives	2004-2008	2004-2013	Predicted Impact	Status
	Rockaway WPCP	N/A	N/A			N/A	N/A
	26th WARD WPCP	Combined Sewer Overflow 26th Ward	None	$4,000K	$4,000K	Improve Jamaica Bay's eutrophication problem	Final design including CPM analysis will start on January 2007
		26th Ward WPCP Wet Weather Expansion: Sewer Cleaning, dredging of Hendrix Creek and 5MG Storage Tank	None	2004 Proposed plan: $282,000K + $4,000K + $2,000K + $285,000K			Final designs won't be ready until 2006. Nothing will start before then. Construction will start in 2008.

NOTES:	
	Department of Environmental Protection DEP: Approved 2004 January Commitment Plan (Big Document page 5)
	NYCDEP's CSO Program Document: Technical and Regulatory Review
	1992 Consent Order applied to CSOs abatement projects: construction of CSO storage tanks at some specific locations throughtout the City