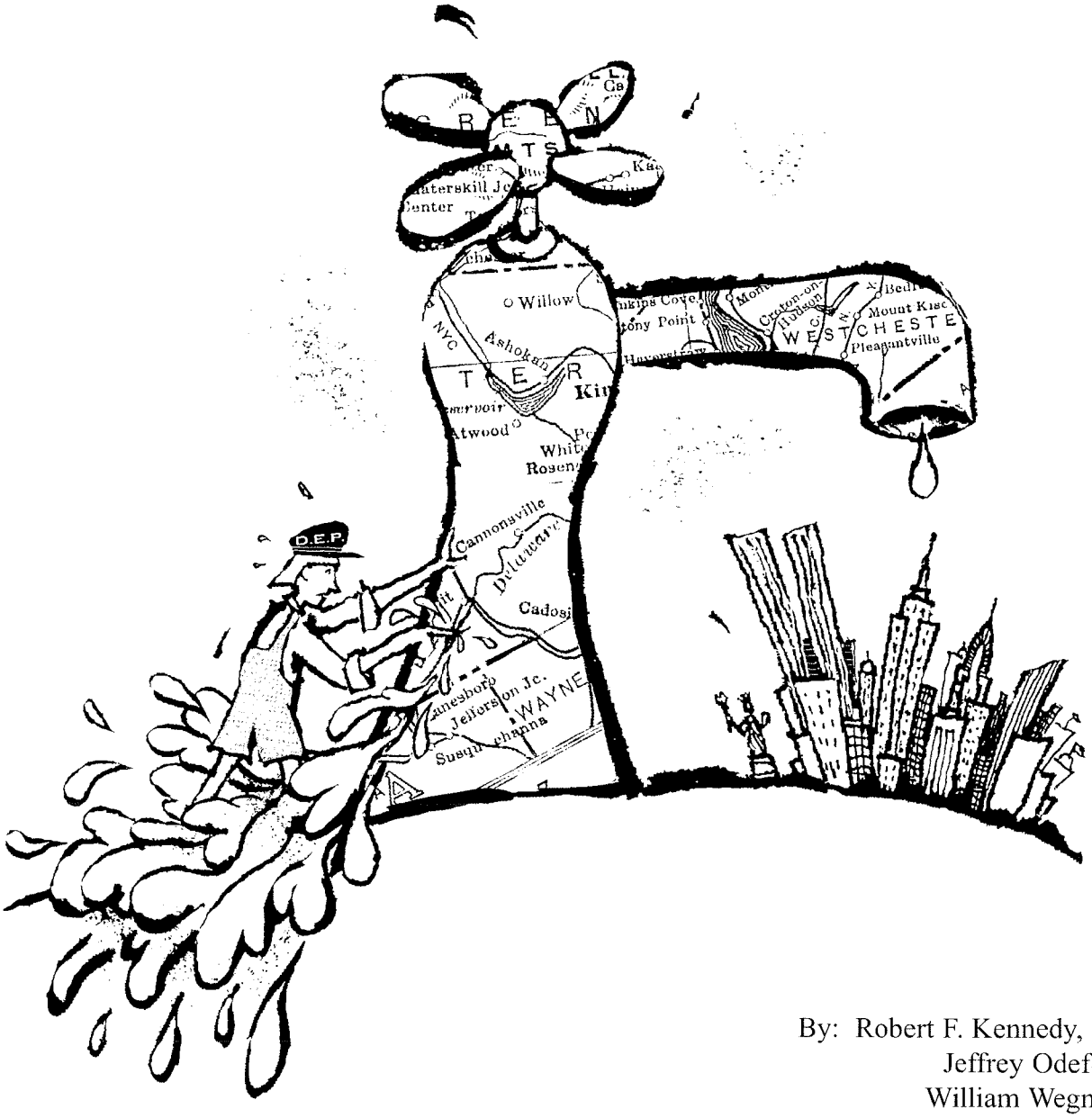
FINGER IN THE DIKE, HEAD IN THE SAND:

DEP's Crumbling Water Supply Infrastructure



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Open Space Institute
Riverkeeper
Trust for Public Land

Portions of this report were provided to DEP officials. DEP declined to provide specific details refuting certain aspects of this report. However, several conversations with DEP employees suggest the veracity of allegations contained herein.

FINGER IN THE DIKE, HEAD IN THE SAND:
DEP's Crumbling Water Supply Infrastructure

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FINGER IN THE DIKE, HEAD IN THE SAND: DEP'S CRUMBLING WATER SUPPLY INFRASTRUCTURE

Introduction

This is the third of five reports analyzing the New York City Department of Environmental Protection's (DEP's) performance in safeguarding the City's drinking water supply and implementing the terms of the 1997 Watershed Memorandum of Agreement.[1] This report examines DEP's aging infrastructure, including the potentially devastating consequences of leaking aqueducts, contaminated gatehouses, and other water quality and quantity concerns.

Executive Summary

Over nine million New Yorkers living in New York City, Westchester, Putnam, Orange, and Ulster Counties enjoy clean, unfiltered drinking water from the Croton, Catskill, and Delaware watersheds.[2] The 6,000-mile network of pipes, shafts, and subterranean aqueducts carries an average 1.4 billion gallons of pristine water each day from 19 upstate reservoirs. The City water delivery system is a remarkable engineering achievement and the single largest man-made financial asset in New York State. But the City's reservoir infrastructure is in a state of disrepair that threatens its capacity to protect the City's water supply.

Four decades ago, the City of New York was known as the Mecca of basic civil engineering and water delivery, and the City water supply was regarded among American civilization's proudest engineering accomplishments. The brilliant engineers of DEP's halcyon days have departed and the City is left with an ossified, worm-eaten engineering staff, which presides over the gradual deterioration of the system. Their greatest energies seem to be devoted to protecting perks and positions, pursuing whistleblowers, and keeping the public in the dark about important issues affecting community health and safety. Instead of taking the necessary steps to restore DEP's prestige and safeguard the City water supply, DEP leadership in the agency's LeFrak City headquarters in Queens and the upstate supervising engineers, who know the condition of the system, seem to be counting their days to retirement, hoping they make it before the dike bursts.

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[1]This report is part of a series of Clean Drinking Water Coalition reports authored by Riverkeeper. The first report, released in February of 1999 and entitled "Cops in Cuffs," outlined the City's failure to adequately staff and support the Bureau of Water Suply Police, DEP's enforcement and security arm. The second report, released in November of 1999 and entitled "Watershed for Sale," examined DEP's Bureau of Water Supply, Quality and Protection's Engineering Section, the branch of DEP charged with, among other things, reviewing new development proposals to ensure their consistency with water quality and regulatory controls.

[2]The City's water comes from three component systems of 19 reservoirs and 3 controlled lakes in Westchester, Putnam, Ulster, Greene, Schoharie, Delaware and Sullivan Counties in upstate New York. Under normal conditions, the Delaware System supplies 50% - 80% of the total water used, the Catskill System supplies 20% - 40% of the total water used, and the Croton System supplies the remaining 10%.

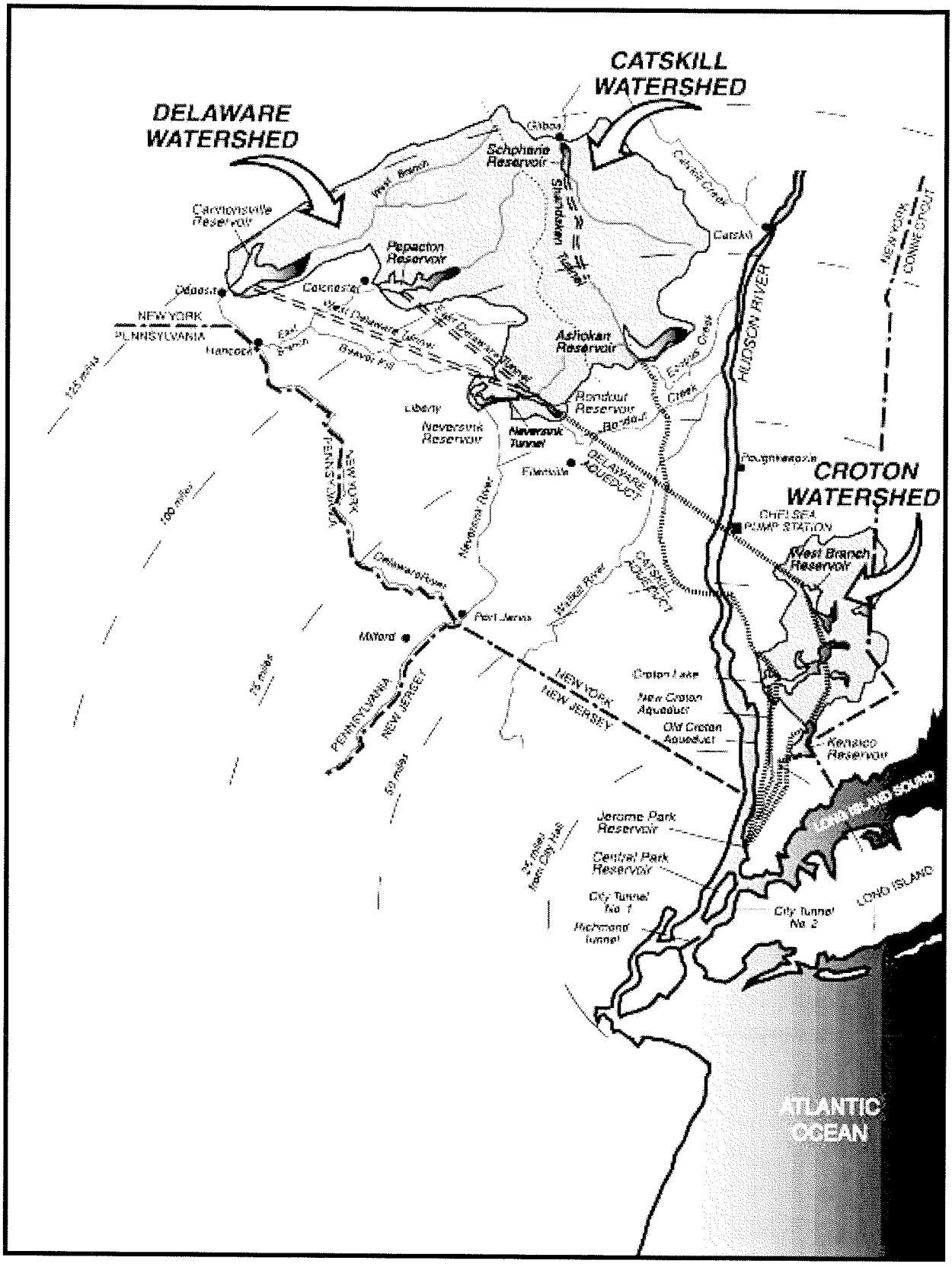
Westchester County's Kensico Reservoir - the terminal reservior for 90% of New York City's drinking water supply. Photo by William Wegner.

This report is in four sections, each covering a critical subject area affecting the performance and security of the City's water supply. Each section describes a looming crisis with the potential to interrupt the flow of high quality drinking water to City consumers and thereby jeopardize public health and safety.

Part I of this report deals with DEP's chronic failure to ensure adequate maintenance of the water supply infrastructure; some DEP facilities are literally crumbling into ruin. Part II describes a serious leak in the Delaware Aqueduct, New York City's newest and most important water supply tunnel. Part III examines how poor maintenance and outdated, malfunctioning equipment have caused numerous toxic spills at key water supply facilities. In some cases, mercury, PCBs, lead, and other chemicals have entered the drinking water supply. Part IV of the report describes another growing threat to our water quality; increasing levels of suspended solids (turbidity) in our drinking water pose a real public health threat.

This report documents serious flaws in DEP's management of the water supply infrastructure and offers concrete and workable recommendations for reform. In general, DEP needs to provide meaningful support to its field personnel, to fully fund maintenance and repair programs, to begin immediate repairs to the Delaware Aqueduct, and to ensure that toxic materials can never again threaten the City's drinking water supply.

WATERSHED MAP



Part I

Antique and Dilapidated Infrastructure Undermines DEP's Water Supply Capability

The City's water supply infrastructure is in critical condition. Dilapidated shaft houses, crumbling aqueducts, and antique machinery all contribute to the City's eroding ability to deliver reliable quantities of safe drinking water. Contamination of water supply facilities by toxic materials threatens the health of not only DEP employees, but of nine million water consumers. This deplorable state is the result of both institutional neglect and political shortsightedness. As a result of these maladies, infrastructure maintenance has suffered decades of fiscal starvation.

A. New York City's Reservoir Infrastructure

The City's water supply comes from three upstate reservoir systems through a complex system of aqueducts, reservoirs, and pipes that deliver water from as far away as 125 miles. The Delaware system, constructed between 1937 and 1945 and the farthest system from the City, is comprised of four reservoirs – the Cannonsville, Pepacton, Neversink, and Rondout.[3] Water is drawn through the East Delaware Tunnel, West Delaware Tunnel, and Neversink Tunnel to the Rondout Reservoir, from which the water is sent through the 84-mile-long Delaware Aqueduct.[4] The Delaware Aqueduct was built from 31 vertical shafts and is three distinct pressure tunnels on an approximate two percent grade.[5] The Delaware system supplies between 50% and 80% of the City's daily water demand and services several upstate communities.[6]

The Catskill watershed system drains 571 square miles of land surface and contains two drinking water reservoirs. The Ashokan Reservoir in Ulster County covers 12.8 square miles and has a capacity of 123 billion gallons.[7] The Schoharie Reservoir covers 1.8 square miles overlapping Schoharie, Delaware and Greene Counties, and has a capacity of 17.6 billion gallons.[8] The Schoharie Reservoir is connected to the Ashokan Reservoir by the Shandaken Tunnel, which travels 18 miles underground and joins with the Esopus Creek near the Village of Shandaken.[9] The joined waters then flow to the Ashokan Reservoir, which covers parts of the Towns of Olive, Hurley and Marbletown. The Catskill Aqueduct connects the Ashokan Reservoir to the Kensico Reservoir in Westchester County, passing through Ulster, Orange and Putnam Counties and traveling 1,114 feet beneath the Hudson River at Cornwall in Orange County. From the Kensico Reservoir, the aqueduct continues to the Hillview Reservoir in Yonkers. Total length of the aqueduct is 92 miles. It consists of 55 miles of cut-and-cover tunnel, 14 miles of grade tunnel, 17 miles of pressure tunnel, and 6 miles of steel siphons.[10]

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[3] More information on the Delaware system can be found at Part II, *infra*.

[4] The Rondout-West Branch Tunnel "runs from a mile below the Rondout Reservoir near the hamlet of Lackawack to the West Branch Reservoir in the Croton Watershed. It tunnels southeast across the Hudson River Valley though the towns of Wawarsing, Rochester, Gardiner, Plattekill and Marlboro in Ulster County; the Town of Newburgh in Orange County; the Towns of Wappinger, Fishkill and East Fishkill in Dutchess County, and the Towns of Kent, Putnam Valley and Carmel in Putnam County." *See* DIANE GALUSHA, LIQUID ASSETS: A HISTORY OF NEW YORK CITY'S WATER SYSTEM 179-80 (1999) [hereinafter LIQUID ASSETS]. The West Branch-Kensico Tunnel is "[a] 23-mile section connecting the West Branch Reservoir in Putnam and the Kensico Reservoir in Westchester...this portion of the aqueduct runs through the Town of Carmel, and the Westchester County Towns of Somers, North Salem, Lewisboro, Bedford and North Castle. A 2.4-mile by-pass tunnel was constructed beneath the West Branch Reservoir, and a 2.3-mile by-pass tunnel, 650 feet below sea level, was dug beneath the Kensico to allow Delaware water to be joined with, or skirt, Croton and Catskill waters, respectively." *Id.* at 180. The Kensico-Hillview Tunnel "carries water 13 miles from Kensico to the start of the city's delivery system at the outlet of Hillview Reservoir, where City Tunnel #2 commences. This section of the aqueduct traverses the Town of Mount Pleasant and Greenburgh, and the City of Yonkers." *Id.*

[5] *See id.* at 170.

[6] According to a 1997 DEP schematic, the Delaware Aqueduct supplies water to the following upstate communities: Marlborough, Town of Newburgh, Greenburgh, Blythedale Children's Hospital, Westchester Joint Water Works #1, Westchester County Water District #1. A 48" pipeline from the Kensico also supplies: North Castle, White Plains, Scarsdale (Eastchester), Mt. Vernon, and Yonkers. *See* NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, NEW YORK CITY WATER SUPPLY: UPSTATE CONSUMERS (1997) [hereinafter DEP UPSTATE CONSUMERS].

[7] *See* LIQUID ASSETS, *supra* note 4, at 268.

[8] *See id.* at 270.

[9] *See id.* at 273.

[10] *See id.* at 272.

In addition to supplying New York City with drinking water, the Catskill Aqueduct serves many upstate communities.[11]

The Croton watershed system draws from 3 branches of the Croton River and its principal tributaries, the Titicus, Cross, Kisco and Muscoot Rivers, in a 375-square-mile watershed that provides approximately 10 percent of New York City's drinking water supply (250 million gallons per day (MGD)).[12] Croton watershed reservoirs include the New Croton Reservoir (the terminus for all Croton System reservoirs and lakes), Boyd's Corners Reservoir, West Branch Reservoir, Middle Branch Reservoir, East Branch Reservoir, Bog Brook Reservoir (connected to the East Branch Reservoir by a 1,778-foot tunnel), Amawalk Reservoir, Titicus Reservoir, Muscoot Reservoir, Cross River Reservoir, Croton Falls Main Reservoir, and Croton Falls Diverting Reservoir (connected to the main reservoir by a 3,500-foot paved channel).[13] Three controlled lakes in the Town of Carmel, Putnam County, include Lake Gleneida, Lake Gilead and Kirk Lake. The New Croton Aqueduct connects the terminal New Croton Reservoir in Westchester County to the Jerome Park Reservoir in the Bronx and the 135th Street Gatehouse in Manhattan. It passes 300 feet beneath the high water mark of the Harlem River.[14] As with the Delaware and Catskill Aqueducts, the Croton also supplies drinking water to upstate communities.[15]

In some cases, this extraordinary infrastructure is literally crumbling. Recently, DEP's former Deputy Commissioner William Stasiuk acknowledged the agency's failure to maintain its crucial water supply facilities. "At the time of the financial crisis back in the early '70s, since that time, the City has not invested a nickel in the water infrastructure upstate... there really has been gross neglect of the infrastructure."[16] The admission is astonishing for its candor since Stasiuk himself was one of the top officials charged with overseeing the water supply infrastructure and budgeting infrastructure repair and maintenance during much of the period, first as a New York State Department of Health (DOH) official and later as DEP's Deputy Commissioner. As alarming as it is, Stasiuk's estimate may be conservative. Another former DEP employee goes even further stating, "[t]here has been no attention to infrastructure maintenance since the turn of the [20th] century. It is literally an embarrassment to the City."

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[11] According to a 1997 DEP schematic, the Catskill Aqueduct supplies water to the following upstate communities: New Paltz, Walkill Correctional Facility, Stewart Airport, St. Joseph's, City of Newburgh, Cornwall-on-Hudson, New Windsor, Cold Spring, Graymore, Putnam Valley, Continental Village, Peekskill, Cortlandt, Montrose Water District (Montrose, Verplanck, Buchanan), Yorktown, Orchard Hill, New Castle (Millwood), New Castle, Pleasantville, Cottage School, Thornwood, Cedar Knoll School, Valhalla, Hawthorne, Westchester County Water District #3, North Tarrytown, Tarrytown, Greenburgh (Knollwood), Elmsford, Greenburgh (Hartsdale), United Waterworks New Rochelle (Bronxville, Pelham, North Pelham, Tuckahoe, Dobbs Ferry, Ardsley, Hastings, New Rochelle, and Eastchester), Yonkers, and Mt. Vernon. *See* DEP UPSTATE CONSUMERS, *supra* note 6.

[12] *See* LIQUID ASSETS, *supra* note 4, at 266.

[13] *See id.*

[14] *See id.* at 272.

[15] According to a 1997 DEP schematic, the New Croton Aqueduct supplies water to the following upstate communities: New Castle, Ossining, Briarcliff Manor, North Tarrytown, Tarrytown, Irvington, and United Waterworks New Rochelle. The Croton lakes and reservoirs also supply water to Carmel, Putnam Hospital, Brewster Heights WD, Westchester County Water District #2 (Amawalk Heights, Somers, Cortlandt, and Yorktown), Walter Franks, Kantonah, Hunterbrook Cove, Ossining, and Croton-on-Hudson *See* DEP UPSTATE CONSUMERS, *supra* note 6.

[16] Deputy Commissioner Dr. William Stasiuk, New York City Department of Environmental Protection, Address to the City Club of New York (May 31, 2000).

Many of the water system's tunnels, mains, and control facilities are over 100 years old. Because of their age and design, they pose serious maintenance issues. In several cases, crucial elements of the supply infrastructure are so old that DEP engineers avoid using them altogether. For instance, the control valves in Water Supply Tunnels #1 and #2 are over 100 years old and are effectively inaccessible.[17] DEP engineers will not use them out of fear that the valves might break and cannot be repaired. The loss of these valves due to DEP mismanagement cripples DEP's ability to manipulate water flows to City neighborhoods and provides one justification for the approximately $6 billion construction of Tunnel #3.

Other problematic facilities include the Croton Falls Dam, where the intake tower has cracked and settled, preventing DEP engineers from inserting the wooden planks that act as gates. Without these planks, flow from the reservoir cannot be stopped. Aging and vulnerable valves at the base of the dam could, if not repaired, lead to an uncontrollable release of water and potentially result in the dam's failure.[18]

Greater concerns surround the condition of the Catskill Aqueduct. Simple structures, such as fences and gates controlling access to the aqueduct, are not maintained. As a result, cars, trucks, and ATVs frequently travel on top of this cut-and-cover tunnel, eroding the soil cover and weakening the aqueduct's structure.[19] Similar problems with aging equipment prevent DEP from making the best use of stored water supplies. Crumbling and decaying facilities, such as the Hudson River Drainage Chamber and the Foundry Brook Siphon, can no longer provide safe storage capacity for this critical source of drinking water.[20] The structural security of the Catskill Aqueduct is critically important since the City may soon have to shut down the Delaware or Croton aqueducts for repair.

Former DEP Police Director, Michael Collins, characterized the condition of the water supply infrastructure as a grave risk to the safety of New York City residents. According to Collins,

> We could very well spend in excess of a billion dollars on the [Filtration] Avoidance and Watershed agreements to ensure water quality and face the reality that our failure to address the security and viability of the storage and delivery infrastructure has left us with a system that could potentially fail to deliver the water we are attempting to protect.[21]

Collins was demoted and reassigned after his infrastructure report was leaked to the press.

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[17] *See* LIQUID ASSETS, *supra* note 4, at 245.
[18] *See* MICHAEL COLLINS, NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, VULNERABILITY RISK ASSESSMENT OF THE UPSTATE NEW YORK CITY WATER SUPPLY SYSTEM 30 (1997) [hereinafter VULNERABILITY REPORT].
[19] *See id.* at 67.
[20] *See id.* at 74.
[21] *Id.* at 122.

Another indication of the increasingly decrepit condition of the infrastructure is the Ashokan headworks. Originally, this facility was designed to allow DEP engineers to draw water from different levels of the Ashokan Reservoir in order to send the best water to the City. The gates that control this flow were constructed of wood when the dam was built in 1913; these antique gates are still in place, although they cannot be made to operate properly. In the past year, when water quality levels from the Ashokan dropped precipitously, DEP engineers were forced to manipulate the Ashokan gates, a procedure they had ignored for decades. Unsure of the correct procedure, DEP eventually pressed a crane into service to lift the heavy gates. This crucial facility is in dire need of upgrades to ensure its regular and trouble-free operation.

The Bureau of Water Supply constructed the Catskill Aqueduct headworks in 1915. These structures have not been rehabilitated since they were built. The aqueduct is also deteriorating rapidly. In many sections of the Catskill aqueduct, such as the Foundry Brook siphon, the base of the aqueduct is visibly collapsing. Concrete has eroded, metal reinforcement is exposed and corroding and internal pipes are visible through gaping holes in the aqueduct wall. According to one DEP employee, "a leak in the Catskill aqueduct is causing an estimated loss of up to 5% of Catskill water daily."[22] After an anonymous caller reported a leak in the Catskill Aqueduct near the Garrison golf course, Riverkeeper investigators discovered a small brook running parallel to the aqueduct. The brook's source appeared to be the aqueduct, and water could be seen gurgling out from the cut-and-cover tunnel. It was also evident that maintenance personnel had been cutting trees to prevent their root systems from puncturing the aqueduct. Nevertheless, a continuous stream of water still pours out from the aqueduct. Many miles of the Catskill Aqueduct are in a similar dilapidated state and have suffered from no efforts at repair.

Astonishingly, the Catskill Aqueduct does not have forms that might be used to fabricate aqueduct sections quickly for repair or replacement. DEP bigwigs have for years neglected this basic maintenance precaution, despite the pleas of mid-level staffers that forms be created immediately.

B. DEP's Engineering and Operations Staff: A Depleted Resource

The institutional neglect of the water supply infrastructure can be attributed chiefly to poor management and a declining sense of mission within DEP. During the past decades, top-down mismanagement has turned a once proud agency into a collection of warring fiefdoms controlled by the district engineers who leverage their positions mainly for political and personal privilege. Furthermore, decisionmaking within the agency has become increasingly secretive, and competent, conscientious workers are routinely sidelined in favor of loyal favorites without regard to their abilities. The arrival of William Stasiuk from the DOH in March 1996 had little beneficial effect on the institutional culture he was brought in to reform.

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[22] Confidential conversation with DEP employee.

Instead, Stasiuk retained the worst environmental performers within the agency and promoted inappropriate and inexperienced employees, based upon loyalty, to positions of great authority over infrastructure and operations. In 1996, Stasiuk elevated Thom Hook, one of DEP's most notorious environmental offenders, to head the Division of Operations and Engineering Unit. Hook is woefully under-qualified for this position, having no formal education or experience with the operation of sewage treatment plants or the upstate water supply. Hook, in turn, named Ed Polese as the Chief of Engineering Operations, a position that entails responsibility for all engineering both East- and West-Of-Hudson, and Lynn Sadosky as Deputy Chief of Engineering for East-of-Hudson. Less qualified or committed individuals could hardly be found within the agency. These appointments and the job performance of these individuals are discussed in detail in Riverkeeper's 1997 publication, *Culture of Mismanagement*.[23]

Ostensibly, Stasiuk (before his retirement), Hook and Polese would oversee the district engineers, who are responsible for the daily operation of the water supply infrastructure. In reality, the holders of these powerful positions have no real masters; they run their districts with little, if any, effective oversight.

1. The District Engineers

The three district engineers, one for each main component of the water supply system – East-of-Hudson (Croton), Catskill and Delaware – have presided, in some cases listlessly, over a dramatically deteriorated infrastructure. As operators of the City's sewer facilities and water delivery plants, the district engineers are among the worst and most persistent environmental violators in the watershed and are historically hostile to environmental oversight and regulation. Tight-lipped secrecy characterizes their management styles. They often conceal problems associated with sloppy engineering or failing infrastructure.

Despite their managerial deficiencies, at least two of the three district engineers are highly competent at their central job – water delivery. On many occasions, the district engineers have performed heroically to keep the water supply system functioning and to obtain sufficient resources from their pernicious agency to maintain their physical plants. Their knowledge of the system and their ability to manipulate water quality make them extraordinarily powerful. Several DEP commissioners have found it impossible to fire the district engineers, even after acts of deliberate indifference or incompetence. For example, according to DEP sources, on at least two occasions, Delaware District Engineer Kevin Cloonan has been demoted or threatened with termination and then reinstated because there was no one who could run the system.

Of DEP's three district engineers, Carl Picha, until recently the East-of-Hudson District Engineer, had been described consistently as the best and most competent, at least when it came to running the water system infrastructure. "He's great on the nuts and bolts of the aqueduct system." Picha's admirers describe him as mercurial but extremely knowledgeable.

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[23] *See* Robert F. Kennedy, Jr., *Culture of Mismanagement*, 15 PACE ENTL. L. REV. 233 (Winter 1997).

"He's like the nutty professor," says one former DEP employee, "he knows the system better than anybody. He could run and repair the system all by himself." In January 2001, Picha was reportedly forced to resign, allegedly due to the EPA and FBI investigation into mercury mishandling.[24]

There is concern that Picha was made a scapegoat and forced out to make room for Tim Lawler, a favorite of former Deputy Commissioner Bill Stasiuk. In 1999, Stasiuk brought in his friend Tim Lawler and promoted him to the number two position under Carl Picha. Prior to Lawler's arrival, Picha's heir apparent was Frank Barquette. But Barquette's years of experience as successor to Picha were trumped by Lawler's close relationship to Stasiuk. Many of the engineers who work with Lawler resent his promotion. They claim that he has very little knowledge of the mechanical engineering functions of the system. One DEP employee claims, "his [Lawler's] ability in that area is almost high school level."

Picha's resignation created a leadership crisis in the East-of-Hudson District Engineer's office. With Barquette sidelined, and Lawler seemingly unfit for the job, the agency appointed Thom Hook to at least temporarily take over the District Engineer position. Hook's appointment does little to inspire confidence. His management and environmental record raises grave concerns that little will be done to address development and pollution issues in the critical East-of-Hudson watershed or to reform DEP management of facilities in this area.

Lawler's ascendancy to the District Engineer's position may have been frustrated by misgivings about his leadership. According to former DEP employee Ed Redmond, on Friday, January 8, 1999, Lawler ordered a draw down of the West Branch Reservoir. District Engineer Carl Picha had been out sick most of the month and Lawler had taken over Picha's duties, sending out a memo that he was the engineer in charge. However, Lawler neglected to order his crew to raise the lower elevation valve that feeds the West Branch of the Croton River below the West Branch Reservoir. On Monday afternoon, plant personnel discovered that the lake level had dropped below the high elevation valve. The spillway was "bone dry" and there was no water left in the West Branch River. DEP was notified by United States Geological Survey – the agency that maintains flow measurement devices in the West Branch. Lawler and his crew concealed the incident by claiming that debris lodged in the valve and caused the interruption in flow. According to witnesses, the valve did have some small amount of debris, but nothing abnormal and certainly nothing that would impair the flow of water. Trash racks on the upstream side prevent larger debris from clogging the valves. The disturbing fact about the incident is not the engineering error, which can be attributed to inexperience, but the cover-up which is already so much a part of DEP's corrupt institutional culture.

Tim Lawler is son of John Lawler, reportedly a friend and golf partner of Dr. Stasiuk. But John Lawler has an unsavory reputation among environmental groups in the Hudson Valley and has been known to pervert science on behalf of his industry and developer clients. Lawler, Matusky & Skelley (LMS) frequently contracts with DEP and DOH on private and public projects overseen by these agencies. LMS won the Kensico Waterfowl Management contract for controlling bird populations on the reservoir in 1997 after Stasiuk arrived.

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[24] For a more detailed discussion of DEP's mercury mishandling, *see infra* Part III.

LMS' contract to remove geese and gulls from the Kensico Reservoir is worth $1.6 million over two years. City inspectors had been successfully conducting goose removal at the Kensico for a fraction of the cost and were livid when the program was taken from them. Judging by its track record, LMS is likely to bid on the filtration contract or on various related subcontracts should filtration be ordered.

Delaware District Engineer Kevin Cloonan is said to be competent and knowledgeable. He is also described as territorial. Cloonan and his fellow Catskill engineers govern their upstate districts as feudal fiefdoms. According to one DEP employee, "[t]hey are lords of the land up there." Cloonan operates by his own rules and sometimes this means violating the environmental laws that apply to everyone else. In 1989, Riverkeeper sued the City for illegally dumping a flocculent, aluminum sulfate (alum), and a disinfectant, chlorine, into the West Branch Reservoir without a federal Clean Water Act permit in order to treat inferior quality water drawn from the Hudson River.[25]

In another incident reported by DEP sources, on Saturday, November 28, 1997, DEP Police Officer Joe Kennedy smelled an overwhelming oil stench at the Grand Gorge sewer plant from the road outside the plant. When the security guard let him in, he found a pool of oil flowing through the snow of the facility compound. The guard told Kennedy he had reported the spill to his supervisor (Cloonan) and showed Kennedy the log where he had recorded his report two days earlier. DEP failed to report the spill within two hours of discovery, as required by law. DEC issued a summons to DEP for violating state regulations that prohibit the discharge of petroleum products into waters of the state or onto lands from which it might flow into said waters, and require that spills be reported within two hours.[26] This summons resulted in a January 23, 1998, order on consent whereby DEP was fined $500.

Even more serious doubts have been raised about Cloonan's replacements in the Delaware District. A lack of attention to grooming skilled replacements has already resulted in a serious accident. In the winter of 1995, Cloonan's staff was recharging the Neversink tunnel between the Neversink and the Rondout. Without Cloonan's supervision, the workers neglected to open the downstream valve to bleed air from the aqueduct – a fundamental precaution that a well-trained team would have taken. The error caused a wall of water to rush down the aqueduct south from the Neversink like a speeding freight train. Its power compressed the trapped air within the tunnel, forcing the water to recoil back with such strength that a column of water exploded the Neversink headworks facility, blowing through the floorboards and sending steel grates skyward to punch an eight-foot-wide hole in the concrete slab roof. At least two DEP engineers dove from the windows to save their lives. "It looked like a Scud missile hit the building," said one witness to the aftermath. The "water hammer" that exploded the Neversink gatehouse was a predictable outcome of a fundamental error that a skilled engineer would not commit.

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[25] *See* Hudson River Fishermen's Ass'n v. City of New York, 751 F. Supp. 1088, 1095 (S.D.N.Y. 1990).
[26] *See* N.Y. COMP. CODES R. & REGS. tit. 6, section 613.8.

According to several DEP employees, Catskills District Engineer Joe Boek is simply a problem. They claim that Joe Boek has no operational experience and no treatment credentials. Critics describe Boek as "the most dangerous person in the whole system." Former Commissioner Al Appleton considered firing him. Appleton has said that he believes Boek tried to kill the Watershed Agreement by releasing turbid water from the Ashokan into the Kensico in November 1993. During that incident, Boek allegedly left the wrong gate open at the Ashokan reservoir, draining the turbid West Basin of the Ashokan, instead of the settled East Basin, into the Kensico Reservoir. To deal with the cloud of turbidity that hit the Kensico, the City had to dump tons of alum directly into the Kensico Reservoir in violation of the 1990 Federal Court Order forbidding the City to dump treatment chemicals into its reservoirs without a federal Clean Water Act discharge permit.[27]

Under the care of the district engineers, the state of the water supply infrastructure is truly frightening. Basic capital maintenance, a fundamental responsibility of the district engineers, has been largely ignored. DEP insiders suspect that the engineers, who have good reason to know the condition of the system, are counting their days to retirement, hoping they make it before the dike bursts.[28] In fairness to district engineers, Thom Hook, who has been in charge of that unit as Deputy Director of the Division of Operations and Engineering, or as Acting Director for over four years, also bears responsibility. Hook has continued the tradition of skimping support for maintenance and repair. Hook's feud over this issue with Delaware District Engineer Kevin Cloonan has aggravated the infrastructure crises. Cloonan routinely requests funding for infrastructure repairs and maintenance, but without Hook's support, his requests are denied. Picha's advocacy for greater resources over infrastructure maintenance has also been ignored and Picha himself was pushed aside by Hook and Stasiuk. Their bullying has seriously damaged Systems Operations.

2. *Systems Operations Staff*

In addition to his role as East-of-Hudson District Engineer, Carl Picha until recently ran Systems Operations. This division within DEP is responsible for the "hardware" aspects of water supply. Systems Operations controls the flow of water from the reservoirs and through the aqueducts. Systems Operations also is responsible for the addition of chlorine and fluoride to the drinking water supply. They respond to calculations provided by DEP Laboratories based upon daily chemical measurements in the reservoirs. System Operations chooses the best batches of water to deliver to City consumers. For example, when algal levels are high on the surface of a reservoir, Systems Operations may opt to draw water from that reservoir's lower depths. During times of high turbidity, Systems Operations is responsible for adding alum to the water in order to bring turbidity levels down to meet the requirements of the Safe Drinking Water Act.[29]

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[27] The City claimed to have obtained a so-called "Emergency SPDES permit" from State Officials. No such permit exists under Federal law. *See* 33 U.S.C. sections 1342(a) *et seq. See also* Hudson River Fishermen's Ass'n v. City of New York, 751 F. Supp. 1088 (S.D.N.Y. 1990).

[28] Cloonan and Boek are of retirement age. As noted, Picha has resigned.

[29] *See* discussion of turbidity at Part IV. *infra.*

Almost everyone agrees that this group works miracles when the water quality breaks down in the Ashokan Reservoir.[30] This happens when the sediment-choked Esopus Creek is running high and fast or when one of the upstate engineers mistakenly sends sediment-laden water south in the aqueduct. Observers credit this unit with saving the system from a filtration order on more than one occasion by manipulating the gatehouse valves and using the best water from the Croton System to dilute the sometimes turbid brew from the Catskills to safe levels.[31] According to many witnesses, Picha and his lieutenant Mark Donecker "have bailed [DEP] out a bunch of times."

A high-level DEP official from another unit told Riverkeeper about Hook's impact on System's Operations. Hook has totally demoralized this group. He took away their agency cars and began scrutinizing their overtime and cutting staff levels. According to this DEP official, "these guys are not being paid to be on-call, but you could call them at two or three in the morning and BOOM, they are down there wrestling with the gates, saving the City. Those guys were a bunch of heroes, but now there is a severe morale issue that is a problem."

According to one maintenance engineer, the "maintenance unit is doing 40% of what they are supposed to be doing because they are understaffed. The [East-of-Hudson] maintenance unit is 50% staffed because [DEP Deputy Director] Thom Hook does not like stationary engineers." DEP also skimps on its budget for spare parts. During the March 1998 turbidity incident described infra Part IV, operations staff were doubly worried because they knew there were no spare parts to replace or repair the Croton gates or the ancient hardware that was falling off in every direction as the emergency team manipulated the giant gates. The same shortages prevail in the Delaware and Catskill systems. Recently, DEP had to replace a valve in the Neversink chamber, but the companies that manufactured the original mechanisms are long gone. It took DEP one year to fabricate and install a new valve.

One of the most skilled members of the water delivery team is Joe Hadden. Hadden, the Hillview Reservoir Supervisor, skillfully blends Croton and Catskill water and is likely the only DEP employee with sufficient knowledge to do so. Like other DEP engineering divisions, there are no competent replacements. According to one DEP employee, "if he [Joe Hadden] had a heart attack today, no one would know how to run the system down there."

The crumbling condition of the infrastructure is a disaster waiting to happen. When coupled with the operations expertise lost as the current generation of engineers retires, DEP faces a future of uncertainty. If New York City is to continue to enjoy a ready supply of safe drinking water, City officials must take immediate steps to reverse decades of neglect.

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[30] The principal tributary of the Ashokan Reservior is Esopus Creek, a world-class trout fishery. The ten-mile-long Shandaken Tunnel delivers water from the Schoharie Reservoir into the Esopus roughly 10 miles upstream from the Ashokan. Soils in the Schoharie Basin are characterized by red clays, which, upon disturbance or during severe rain or snowstorms, choke the reservoir and feeder streams with colloidal sediments. These clays are then discharged into Esopus Creek and make their way to the Ashokan. In order to control the sedimentation problem, the Ashokan is divided into two sub-basins. The City uses the West Basin to settle out the sedimentation, a fact that is plainly visible to the naked eye - the shores of the reservoir are stained red with Schoharie Basin clays. The City must carefully draw water from the East Basin of the Ashokan, sending relatively sediment-free water down to the Kensico Reservoir in Westchester County, the final holding basin prior to disinfection and distribution.

[31] Under the Surface Water Treatment Rule, the City would be forced to filter its water if turbidity levels in its source waters exceeded 5 nephelometric turbidity units (NTU) on more than two occasions in any 12-month period or on more than five occasions over five years. *See* 40 C.F.R. section 141.7. Turbidity is a concern to federal regulators because, besides giving water an unpalatable cloudy appearance, it conceals potentially dangerous pathogens, such as *Cryptosporidium or Giardia*, from detection.

Recommendation #1: DEP Should Repair Catskill Aqueduct Leaks Near the Garrison Golf Course and in Other Locations.

As noted above, DEP employees claim that the Catskill leaks are costing this system 5% of its daily flow. One important leak appears to be located near the Garrison golf course. DEP should immediately repair any and all leaks in the Catskill Aqueduct, particularly in light of the possibility of a Delaware Aqueduct catastrophe.

Recommendation #2: DEP Should Remove Toxics From the Croton Aqueduct.

Toxic contamination has forced DEP to all but shut down the Croton Aqueduct. This critical link in the water supply infrastructure must be returned to full operational capacity, especially if DEP contemplates shutting down the Delaware Aqueduct to repair its leaks. DEP must locate and completely remediate the source of perchloroethylene (perc) contamination that currently limits water flow through the tunnel. In addition, the Department must locate reported methyl tert-butyl ether (MTBE) sources and devise a cleanup plan. Past contamination events, such as the unremediated 1997 heating oil leak from the Ardsley Public Library, continue to threaten water transported through the Croton. Because the aqueduct's ancient mortar construction is crumbling and its walls are now largely pervious, its waters are vulnerable to penetration by toxic chemicals from accidental spills or contaminated groundwater infiltration. DEP must therefore develop a plan for keeping toxic chemicals at a safe distance from the aqueduct and for tracking plumes of toxic groundwater.

Recommendation #3: The City Should Create Forms For the Catskill Aqueduct.

As the second largest of the City's aqueducts, the Catskill will be the primary water lifeline during any repairs of the Delaware Aqueduct. However, the very nature of its construction is its greatest weakness. While the Delaware Aqueduct is a pressurized deep rock tunnel, the Catskill is a cut-and-cover aqueduct. For 55 miles, water is conveyed through a structure that is essentially a trench with un-reinforced concrete liner and cover. The concrete liner, topped by only three feet of earth, is vulnerable to damage from vehicle traffic, accidents, and even weather-induced erosion.

In the event of a leak or collapse in one of the cut-and-cover sections of the tunnel, DEP has no way to effect prompt repairs. The forms used to construct the horseshoe-shaped tunnel have long since been destroyed. DEP needs to maintain a supply of forms that can be used to quickly fabricate replacement sections for emergency repairs.

Recommendation #4: DEP Should Renovate the Catskill Aqueduct Headworks and Assure An Adequate Inventory of Spare Parts.

The dire condition of these structures has caused crisis after crisis in recent years as the City's efforts to avoid a filtration order have caused City engineers to frequently and often violently manipulate its gates and valves, putting new pressures on its aging infrastructure.

Recommendation #5: The City Should Insure an Orderly Transition in the District Engineer Offices by Recruiting and Training High Quality Replacement Engineers.

Carl Picha has already resigned, and Kevin Cloonan and Joe Boek are approaching retirement. According to current and former DEP employees, there are no manuals showing the operation of the system, and the new recruits slated to replace the current crop of district engineers do not seem up to snuff. There has been very little grooming of successors.

Recommendation #6: DEP Should Contract With Expert Engineering Consultants to Create a Manual on How to Operate and Repair the City Water System.

DEP has made no provision for educating new engineers about how the extraordinarily complex water system works. Rather, the engineers rely on a highly secretive oral tradition within an old boys network to pass vital information to the next generation. According to a current DEP employee, "[i]f you toe the line and give them what they want and tell them what they want to hear, you'll be part of the network." This system will not preserve the knowledge necessary to run the water supply reliably.

Recommendation #7: DEP Should Repair the Submerged Section of the Old Croton Aqueduct.

A submerged section of the Old Croton Aqueduct may threaten the operation of the New Croton System. Portions of the 160 year-old Old Croton system were covered by water when the New Croton Dam was constructed in the early 1900s. One section that carries water from Gatehouse #1 at New Croton Dam to the New Croton Gatehouse is now underwater and subject to stress and loadings for which it was not designed. As a result, this section is decaying and in danger of collapse.[32] This collapse would limit DEP's ability to bring in the highest quality water from the Croton. Instead, the agency would be forced to send more turbid water through the system.

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[32] *See* VULNERABILITY REPORT, *supra* note 18, at 1.

Recommendation #8: DEP Should Repair Debilitated Shafts and Gatehouses.

In the early to mid-1990s, DEP personnel began noticing that the roof was rotting at Shaft 9 on the New Croton Aqueduct in Tarrytown. The amount of chlorine that has to be added at the Croton Lake Gatehouse because of poor water quality produces excessive chlorine vapors that are corrosive. These heavy chlorine vapors were rotting the copper roof of the shaft. According to DEP sources, there is an exhaust fan in Shaft 9 to draw the fumes out, but it was not in operation. After one former employee notified DEP officials about the roof, it was torn down. Astonishingly, DEP did not replace the roof until some time in 2000. For several years, instead of replacing it, DEP relied on plastic sheeting spread on the floor to keep falling leaves, branches, and other debris from entering the drinking water.[33] The floor of Shaft 9 is grated and visitors could view Croton water running below the grates. Again, DEP's misfeasance regarding basic infrastructure needs created a situation that left the Croton system astonishingly vulnerable.

Recommendation #9: DEP Should Provide Safe and Potable Drinking Water For Its Employees and Visitors.

Emblematic of DEP's growing level of engineering incompetence are the drinking water fountains at the Croton Lake Gatehouse. The fountains were designed to provide potable water from Croton Lake. The chlorine feed system was so poorly engineered that chlorine residuals cannot be maintained across the building. The water supply also does not meet potable standards for a variety of other reasons, including coliform and turbidity levels. The Croton lab has no source of safe potable water for drinking, washing, coffee, safety showers, or eye wash in violation of OSHA and state DOH regulations. Furthermore, the water that is accessible to employees and the public is not labeled as non-potable. Ironically, DEP now must purchase bottled water for its upstate staff.

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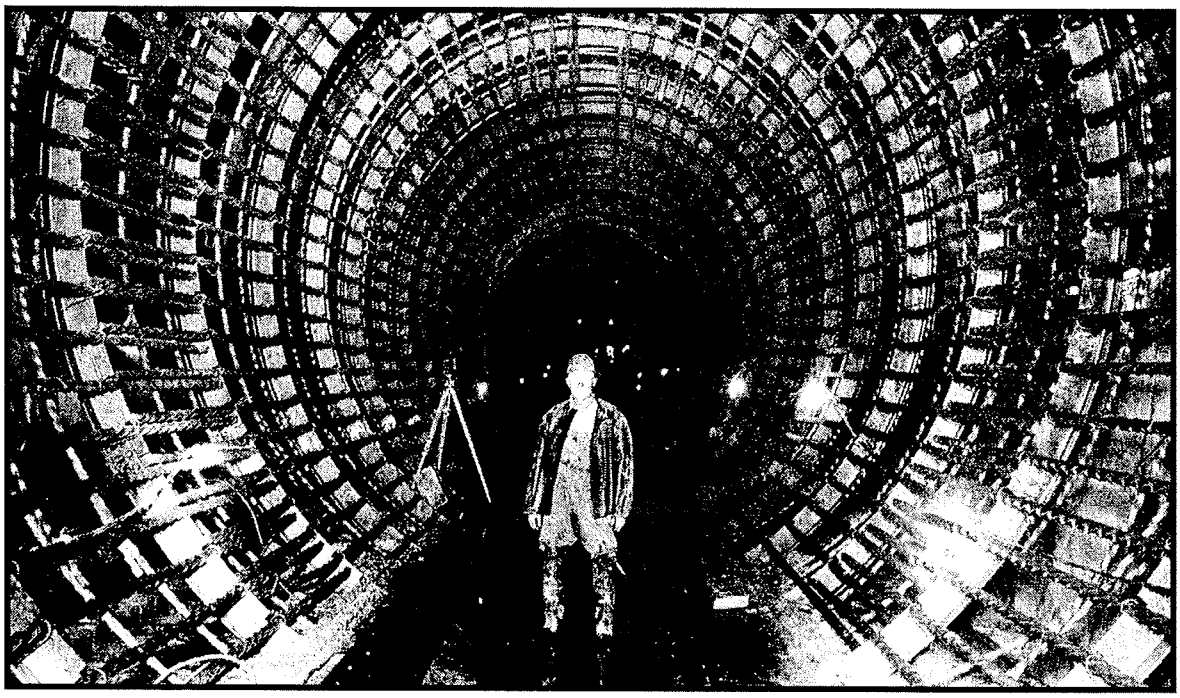
[33] *See id.* at 20, 23.

Part II

Leaks in the Delaware Aqueduct Threaten This Critical Source of Water

Rain and snow falling on the mountain farms and forests of Delaware County drain into the Cannonsville, Pepacton, Neversink, and Rondout reservoirs and flow to New York City through the Delaware Aqueduct – the longest continuous tunnel in the world. The Delaware Aqueduct, constructed between 1937 and 1945, is actually three distinct pressure tunnels driven through bedrock at depths ranging from 300 to 1,550 feet below the surface. Water runs by gravity on an approximate two percent grade carrying the purest Catskill mountain water as far as 125 miles to New York City consumers without the aid of pumps. The aqueduct is 13.5 to 19.5 feet in diameter and travels 83.8 miles, connecting the Rondout Reservoir in Ulster County to the Hillview Reservoir in Yonkers.[34] The tunnel crosses the Hudson River 600 feet beneath the river's surface at Roseton, in the Town of Newburgh, Orange County, and carries the great bulk of the City's drinking water supply to downstate consumers. The Delaware Aqueduct supplies nearly 80% of the water for drinking, fire fighting, and sanitary purposes to over nine million people. Of the 1.4 billion gallons per day (BGD) consumed throughout the City's water system, the Delaware Aqueduct can provide more than 900 million gallons.



Delaware Aqueduct under construction. Photo from DEP archives.

[34] *See* LIQUID ASSETS, *supra* note 4, at 179. "Built from 31 vertical shafts, except for a half-mile stretch of inclined tunnel between the Rondout effluent chamber and Shaft 1, where the grade is about 10 percent." *Id.*

The aqueduct's deteriorating condition threatens this critical flow of water. At several points between the Rondout Reservoir and the West Branch Reservoir, the Delaware Aqueduct is leaking. The leaks are growing and may threaten the aqueduct with significant water loss or a catastrophic collapse. DEP has been aware of these leaks for more than 10 years, yet has squandered this time and failed to apply the enormous ingenuity necessary to address the crisis. Two principal leaks occur as the tunnel runs for 44 miles from the Rondout Effluent Chamber to the West Branch Reservoir Influent Chamber: the first is at Wawarsing where the aqueduct passes beneath Rondout Creek; the second is near the Central Hudson Gas and Electric (CHG&E) power plant at Roseton. According to initial DEP reports obtained by Riverkeeper under the New York State Freedom of Information Law (FOIL),[35] DEP's engineering consultants concluded that "the data collected over more than four years of testing leads to the conclusive fact that there are substantial leaks in the tunnel."[36]

DEP personnel discovered the Roseton leak in 1990 when flow from the Rondout Effluent Chamber (the facility at Rondout Dam where water enters the aqueduct) appeared to be substantially greater than the flows at the opposite end of the aqueduct, where it empties into the West Branch Reservoir. Concurrently, a steady flow of water appeared on the hillside above the Roseton power plant. Tests confirmed that this water was from the Delaware Aqueduct.[37] Subsequently, DEP launched a series of tests to determine the extent and approximate location of the leaks. Dye tests conducted between October 1996 and December 1998 showed that the leak rate oscillated between 33 and 37 million gallons per day (MGD)[38] – more water than is used daily by the entire city of Rochester! According to confidential conversations with inside sources, some DEP engineers believe the leak rate is far greater than suggested by these tests – up to 100 million gallons per day! The results of more recent tests have confirmed that the problem is growing.

Engineers believe that holes or cracks on top of the high-pressure aqueduct are forcing the water upward with such power that it has created the equivalent of a 36-square-foot channel up through over 650 feet of limestone. A large portion of the flow has broken the surface, filling a pond and creating a wetland in the town of Newburgh.[39] Almost directly across the street from the entrance to its Roseton power plant, CHG&E has installed a pipe into the hillside and erected permanent housing to protect what locals considered an "artesian well"[40] that broke surface above the Roseton power plant. Engineering tests reveal that the supposed spring water is from the Delaware Aqueduct leak more than 600 feet below surface.[41]

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[35] N.Y. PUB. OFF. LAW section 87.
[36] NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, THE DELAWARE TUNNEL LEAKAGE INVESTIGATIONS, REPORT #3 at 9, 10 (5/18/99) [hereinafter DEP REPORT #3].
[37] *See id.*
[38] *See id.* at Table 3.
[39] *See id.* at 10 & Attachment I p.3.
[40] Groundwater that is under pressure.
[41] *See* NEW YORK CITY DEPARMENT OF ENVIRONMENTAL PROTECTION, THE DELAWARE TUNNEL LEAKAGE INVESTIGATIONS, REPORT #1 at 7 (1/20/00) [hereinafter DEP REPORT #1].

Locals are regularly drawn to the pure waters of this "artesian well", which is actually New York City drinking water leaking from the Delaware Aqueduct 600 feet below! Photo by Marc A. Yaggi.

While the size of the subsurface channel is "alarming" in the words of a consulting engineer retained by DEP to review leak data, surface flow measurements at Warwarsing and Roseton do not account for all of the water missing from the aqueduct.[42] According to this expert, a more worrisome scenario is the prospect that the rest of the leak is in the portion of the tunnel that passes through fractured rock underneath the Hudson River.[43] A leak there would be frighteningly close to the interface between the subsurface limestone and the Hudson River; only 350 feet of rock separate the tunnel from the bottom of the riverbed.[44] Because the tunnel leaks with sufficient force to push water through over 650 feet of rock, its effect on shallower rock is likely to be more dramatic.

According to DEP engineers, the worst-case scenario, a catastrophic aqueduct collapse, is a real possibility. The great danger is the leak's potential to dissolve the limestone geology surrounding the tunnel and cause a structural failure. A sinkhole could form around the leaks, either surfacing on the shores of the Hudson near the Roseton power plant, or under the Hudson itself. In either case, the result would be disastrous, as an aqueduct collapse would cut New York City off from the bulk (up to 80%) of its water supply.

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[42] DEP contracted with Mr. Victor Feigelman, a retired DEP engineer, to review the findings contained in Delaware Tunnel Leaking Investigations, Report #3, dated May 18, 1999. *See* DEP REPORT #3, *supra* note 36, at Attachment A. Mr. Feigelman calculated that the leak has channeled the equivalent of 36 square foot tunnels up through the bedrock, based on leakage quantity and velocity data contained in this report. Mr. Feigelman notes that there is a considerable chance of a significant leak from the tunnel as it passes beneath the Hudson River and recommends that a remotely operated submersible be developed "promptly" to accurately detect the location of the leaks. *See id.*

[43] *See id.*

[44] *See id.*

DEP engineers also worry that, even if acute structural failure does not occur in the near future, the erosion of the tunnel lining and subsurface geology may already be so severe that the opportunity to fix the leak has passed. They fret that this section of the aqueduct may now be held together only by the internal pressure of the water. If this is true, any attempt to drain the aqueduct for repairs would cause the tunnel to collapse. The urgency of this crisis is evident even in the stilted engineering vernacular of an internal DEP memorandum. "If there is a local failure of the lining due to tensile overstress, then the dangers of unwatering against residual external hydrostatic pressure are quite real."[45] Plainly put, the pressure exerted by the loose rock on the outside of the tunnel may be greater than the dewatered tunnel can withstand. DEP's highest-level engineers view the threat of the aqueduct's massive collapse seriously. According to a current DEP employee, "they are afraid it will collapse! ... [Delaware District Engineer Kevin] Cloonan, [Croton District Engineer Carl] Picha, and [Catskill District Engineer Joe] Boek don't want to give the order [to dewater the tunnel] because it probably would be the last order they ever gave."[46]

A consultant retained by DEP to review the department's investigations has pointed out that the pressure in the water tunnel as it passes beneath the river may be sufficient to cause over-stressing of the concrete liner.[47] This overstressed condition raises fears not only of a tunnel collapse, but of the possibility that the rock strata surrounding the tunnel are so weakened that a failure of the concrete liner may lead to an underground blowout. Such a blowout would send a high-pressure jet of aqueduct water up through the bed of the Hudson River, and lead to the failure of the aqueduct.

Six hundred feet above the fractured aqueduct, New York City drinking water fills this sinkhole in the forest floor near Roseton.
Photo by William Wegner.

45 *See id.*
46 Between the time that our story on the aqueduct broke in November 2000 and the time of this report's publication, Carl Picha resigned allegedly as a result of the FBI investigation discussed in Part III., *infra*.
47 *See* DEP REPORT #3, *supra* note 36, at Attachment I p.3.

A. DEP Has Concealed the Crisis From the Public

Although DEP engineering staff have known about the leak for over a decade, the agency has taken none of the dramatic steps necessary to address the potential catastrophe. "No one will shut down the aqueduct and risk their reputation and career. [DEP's district engineers and higher-ups] are all just hoping to make it to retirement," says one high level DEP official. Another official interviewed in 1999 agreed. He predicted that "[Catskill District Engineer] Joseph Boek, [Delaware District Engineer] Kevin Cloonan and [Former Deputy Commissioner Dr. William] Stasiuk intend to be long gone before the dam bursts." Stasiuk retired in June of 2000.

Prior to October 2000, DEP never voluntarily discussed the leaks. DEP dragged its feet for 15 months before responding to Riverkeeper's FOIL request for documents relevant to the leak. Riverkeeper finally obtained the documents, but only after threatening a lawsuit. Coincidental to releasing information on the leak to Riverkeeper pursuant to its FOIL request,[48] DEP issued a press release indicating that the agency was "dealing with those leaks" – its first public acknowledgement of the leak.[49] In the only forum in which DEP officials discussed the leak before Riverkeeper broke the story, agency officials minimized its significance. During a wrongful termination lawsuit brought by former DEP Police Director Michael Collins (who claims to have been fired because he voiced concerns about the vulnerability of the water system, including the Delaware Aqueduct leaks), Commissioner Joel Miele testified that the leak was approximately 20 MGD, depending on pressure in the tunnel.[50] In fact, tests conducted earlier the same year had confirmed the higher estimate of 34 MGD.[51] Even after being forced to acknowledge the leak's existence, DEP has consistently minimized its significance. Typical of DEP's unwillingness to face the gravity of the potential crisis is Commissioner Miele's blithe response to questions about the threat during the Collins' trial. "We were aware of the leak. The leak is of such a consequence that it doesn't threaten the integrity of the water supply system...."[52]

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[48] The FOIL response included several engineering reports acknowledging the leak and identifying locations at which New York City drinking water was found above ground in Newburgh - 600 feet above the aqueduct.

[49] NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, NEW YORK CITY TO REPAIR VALVE AT SHAFT 6 IN CHELSEA (Oct. 2, 2000). The DEP press release seemed to be issued in a way, and at a time, calculated to minimize press attention, while providing political cover.

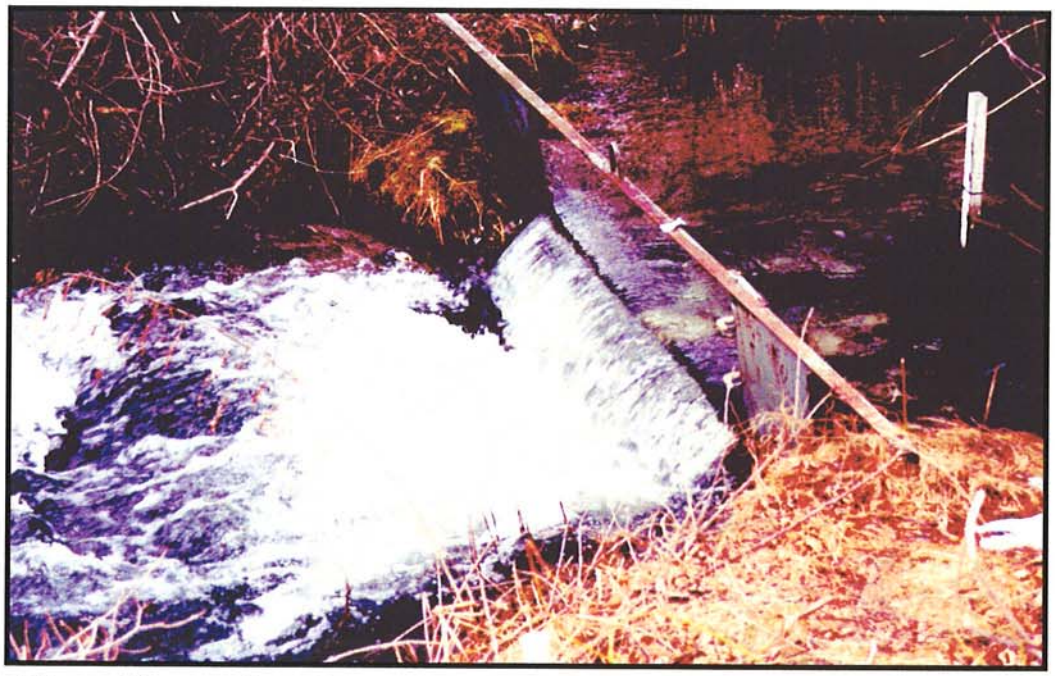
[50] *See* Testimony of Joel Miele, Michael Collins v. William Stasiuk & Joel Miele, 98 Civ. 7806 (S.D.N.Y. July 21, 2000), at 165-66.

[51] *See* MALCOLM PIRNIE, INDEPENDENT ANALSIS OF NYC DEP LEAKAGE QUANTIFICATION MEASUREMENTS at Exec. Summ. para. 1 (May 2000) [hereinafter MALCOM PIRNIE REPORT]. *See also* DEP REPORT #1, *supra* note 41.

[52] Testimony of Joel Miele, Michael Collins v. William Stasiuk & Joel Miele, 98 Civ. 7806 (S.D.N.Y. July 21, 2000) at 139.

B. The Leak in the Aqueduct is Growing With Each Passing Year

In their most recent internal reports, DEP engineers investigating the leak conclude that it is getting worse over time. In 1995 tests, DEP engineers measured the leak at 15 MGD.[53] Over the next five years, continued test results revealed an increase in the measured leak. By January 2000, DEP engineering consultants at Malcolm Pirnie agreed that the leak had grown to 34 MGD.[54]



DEP uses this measuring weir to monitor the millions of gallons of leaking Delaware Aqueduct water that rise daily to the surface in Newburgh. Photo by William Wegner.

[53] *See* NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTRECITON, THE DELAWARE AQUEDUCT LEAKAGE INVESTIGATIONS REPORT 3 (11/15/95) [hereinafter DEP 1995 LEAK REPORT].
[54] *See* MALCOLM PIRNIE REPORT, *supra* note 51, at Exec. Summ. para. 2.

C. DEP's Procedures Are Aggravating the Leak

Prior to 1966, DEP rarely operated the aqueduct at full capacity and flows rarely exceeded 800 MGD.[55] Since then, flows through the tunnel have steadily increased, with maximum flows reaching 960 MGD by the 1990s (total water demand by New York City is approximately 1.3 billion gallons per day).[56] On September 13, 1999, as DEP prepared to conduct another in a series of dye tests relating to the leaks, flow through the tunnel was 930 MGD.[57] It is quite clear that DEP is forcing through the Delaware Aqueduct flows that exceed its safe operating capacity, and that the increased pressure from these high maximum flows is likely to accelerate the size of the leaks.[58] DEP has ignored the recommendation of its own engineers to limit flow through the aqueduct to a safer level of 770 MGD.[59]

D. The City's Inaction Has Squandered Repair Opportunities For Over a Decade

Instead of responding decisively and aggressively, DEP's leadership has squandered nearly a decade, ordering up an anemic series of tests and studies, many of which have been botched and the rest of which constitute an indefensibly minimalist response to the crisis. After the initial discovery of the problem in 1991, DEP did not begin investigating it until 1993.[60] The agency then commissioned dye and other tests aimed at determining the magnitude and location of the leaks. These tests have been repeated over and over because of poor planning, irrelevant data production, flawed testing methodology, and deteriorating water supply infrastructure.[61] As of October 2000, over ten years after discovering the problem, DEP had not even completed bore tests of the geology surrounding the broken tunnel. It did not expect to do so before April of 2001.[62] A possible follow-up series of tests in 2002 will delay the release of any findings until June 2002.[63] The agency's molasses-like research and inept testing strategy seems calculated to delay the discovery of bad news until Mayor Giuliani's term has expired. While DEP has adopted more reliable testing methodologies over the past three years, the agency has failed to implement meaningful contingency plans or repair timetables to address the crisis.

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[55] *See id* at Exec. Summ. para. 4.

[56] *See id.* "Thus, in general, the 1990's have seen typical maximum flow values higher than those in the previous 30 years, punctuated by two steady climbs to all-time highs in 1990 and again in 1995." *Id.*

[57] *See* DEP REPORT #1, *supra* note 41, at 6.

[58] At a December 8, 2000 hearing before the New York City Council Environment Committee, Commissioner Miele stated that the Delaware Aqueduct has a safe capacity of 890 MGD. DEP records show that flow through the Aqueduct frequently exceeds this level. *See e.g.*, NEW YORK CITY DEPARTMENT OF ENRIRONMENTAL PROTECTION, ROUNDOUT EFFLUENT CHAMBER DIVERSION RECORDS 1985 - 1998, APPENDIX A, INDIVIDUAL VENTURI RECORDS at 13, 36, 37, 38.

[59] *See* Memo from Mohamad Hamade, DEP, to Kenneth E. Moriarty, DEP (June 1, 1999) (on file with authors). At the 770 MGD rate, DEP engineers believe that the leak will decline by approximately 50%. *See id.* Malcolm Pirnie also posits the connection between increased leakage rates and the increase in maximum flow forced through the tunnel by DEP. *See* MALCOM PIRNIE REPORT, *supra* note 51, at Exec. Summ. para. 5.

[60] *See* DEP 1995 LEAK REPORT, *supra* note 53, at 3.

[61] DEP was forced to conduct a third series of extensive dye tests in 1999 after realizing that the first two series, dating from 1995 and 1997, had produced inaccurate and irrelevant data. *See e.g.*, DEP REPORT #3, *supra* note 36, at 13. Malcolm Pirnie, in reviewing the DEP's test procedures, has noted that problems with Venturi meters and other equipment at REC and Shaft 6 likely have contributed to inaccuracies in DEP's dye tests. *See* MALCOLM PIRNIE REPORT, supra note 51, at Exec. Summ. paras. 8 & 9.

[62] *See* Memo from Geoff Ryan, DEP (Oct. 31, 2000) (on file with authors) [hereinafter Geoff Ryan Memo].

[63] *See id.*

DEP tests reveal that leaking aqueduct water fills this cemetery pond in Newburgh. Photo by Marc A. Yaggi.

For the past year, as reports of the Delaware Aqueduct leak began to surface, DEP has trumpeted its plans to use a submersible remotely operated vehicle (ROV) to examine the condition of the aqueduct's interior. DEP has repeatedly pointed to the submarine construction project as an achievement to counter criticism that the agency has been sitting on its hands for 10 years, as the leak worsened. However, statements made by agency officials regarding the submersible have proven to be misstatements. From Commissioner Miele on down, DEP has repeatedly misled the public about the existence of the submersible or a contract to construct one.

Commissioner Miele and other DEP officials repeatedly claimed that DEP had a contract for this ROV, nearly a decade after the need for such an examination became apparent.[64] "The plan," according to DEP Commissioner Joel Miele's sworn testimony, is to use

> an untethered subaqueous vehicle that has to be built specifically for the tunnel, because there is no other way to get at it. We got a contract to build that, and we have a contract basically to enter this vehicle into the tunnel and to have the vehicle go down to the area where the leak appears to be, so we can determine the extent of it. Once we get the information from direct on-site viewing of what problems there are with the tunnel, then our engineering firm is supposed to put together a solution for that so that it can be sealed.[65]

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[64] In his testimony at the Michael Collins trial, Commissioner Miele rejected the suggestion that need for the ROV was apparent as early as 1996, despite the fact that DEP had investigated the leak for five years by that date. *See* Testimony of Joel Miele, Michael Collins v. William Stasiuk & Joel Miele, 98 Civ. 7806 (S.D.N.Y. July 21, 2000) at 140.

[65] *See id.*

Later in this same testimony, Commissioner Miele testified, under oath, that DEP had signed a contract with Woods Hole Oceanographic Institute to construct a submarine to investigate the leak.[66]

Commissioner Miele subsequently repeated this statement in an October 2, 2000 DEP press release that coincided with DEP's release of documents relevant to the leak in response to Riverkeeper's FOIL request.[67] The commissioner clearly affirmed that a submersible "is now being built for DEP by Woods Hole Oceanographic Institute."[68] The Commissioner and his staff further repeated their representations in interviews with New York Newsday and the New York Post.[69] In each instance, the commissioner and his representatives claimed that the department had awarded a contract to Woods Hole, and that the submersible was already under construction.

All of these statements were, in fact, false. As of the date that each was made, no contract existed for construction of the submarine, and at the time of this writing, nearly seven months after Commissioner Miele's first deceptive claim, no submarine was under construction for DEP. A November 17, 2000, telephone call to the Director of Media Relations for Woods Hole revealed that the Institute had responded two years ago to a Request for Proposals issued by DEP for the construction of a submarine. However, Woods Hole had no further communication from DEP regarding the proposed submersible until December 2000 following a deluge of news reports questioning the commissioner's earlier statements.[70]

In October 2000, after Riverkeeper publicly exposed the issue, DEP scurried to make basic contingency plans that should have been made a decade ago. Geoff Ryan, DEP spokesperson, claimed that a contractor finally was retained to prepare specifications for materials, equipment, and repair contracts "as contingency in case of tunnel failure."[71]

The lack of contingency planning is DEP's most irresponsible omission. According to DEP engineers contacted by Riverkeeper, the agency is operating on the optimistic estimate that repairing the leaks will take eight months, if all goes well. Recently, however, DEP Chief of Staff Charles Sturcken told New Yorkers that the repair "may take a couple of years."[72] If repairs to the aqueduct are not possible, then the only feasible way to solve the problem is by building a bypass aqueduct around the leaking section. This was the recommendation made by former DEP Commissioner Marilyn Gelber in 1995, just before her dismissal by Mayor Giuliani. DEP has never acted on that recommendation. DEP's construction of City Tunnel #3, now delayed decades beyond its projected completion date, testifies to the expense and complexity of large, subsurface aqueduct construction. In more than five years as Commissioner, Joel Miele has not made provisions for emergency construction of a Delaware bypass, nor has DEP even estimated the time this construction would require.

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[66] *See id.* at 139-140.
[67] NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, NEW YORK CITY TO REPAIR VALVE AT SHAFT 6 IN CHELSEA (Oct. 2, 2000).
[68] *Id.*
[69] *See* Robert Polner, *Running on Empty?*, N.Y. NEWSDAY, Nov. 4, 2000, at A3. *See also* David Seifman, *Water Torture: City to Fix Multibillion-gallon Leak*, N.Y. POST, Nov. 4, 2000, at 9. A senior DEP engineer also claimed that Woods Hole would be building the submersible. See Testimony of Joseph C. Rutkowski, DEP Chief of Water System Planning, Michael Collins v. William Stasiuk & Joel Miele, 98 Civ. 7806 (S.D.N.Y. July 21, 2000) at 753.
[70] On February 27, 2001, a DEP official informed Riverkeeper that the agency would respond to our FOIL request for the contract "as soon as the contract is registered." Two months after Commissioner Miele assured the New York City Council that DEP had a contract for submersible, work had yet to begin.
[71] Geoff Ryan Memo, *supra* note 62.
[72] Polner, *supra* note 69, at A3.

The City has, for example, no contingency plans for water replacement if the repair work requires shutting down the Delaware Aqueduct.[73] Even under the City's best-case scenario, the eight-month repair timeline is still well beyond the existing six-month, or less, capacity of the rest of the water supply. Under a worst-case scenario, with low reservoirs and high turbidity conditions, the City's water reserve may dwindle to as little as 80 days. The City would run out of water at least five months before repairs could be completed. Should the Delaware Aqueduct actually fail, the City will be stranding for years the nation's financial center and nearly 10 million people who depend on the system.

During a December 8, 2000, New York City Council hearing, Commissioner Miele claimed that a collapse of the Delaware Aqueduct would not deprive the City of water because the City could supply one billion gallons per day for an indefinite period.[74] Miele was mistaken. Should the Delaware Aqueduct be forced to shut down, the City would be left with only the Catskill and Croton systems to provide drinking water. These two systems would not be able to supplement the supply adequately, and the City, after draining the West Branch Reservoir, could run out of water in less than 80 days. As one current DEP employee claimed, "after 60 to 80 days, I wouldn't want to be in their [DEP's] shoes."

Commissioner Miele based his overly optimistic estimate on misleading and irrelevant numbers, such as reservoir capacities and aqueduct flow rates.[75] A realistic accounting of the City's alternative drinking water sources paints a far less optimistic picture. The theoretical combined capacity of the Croton and Catskill systems contributes only 50 percent of the City's water; even when operated at maximum capacity, that figure would not rise appreciably. At current rates of water use, the full capacity of both systems would be exhausted in approximately 80 days. However, the real capacity of the system has been reduced through poor operations and maintenance practices.[76]

E. Alternative Emergency Sources Available to the City in the Event of a Delaware Aqueduct Collapse Will Not Keep the City From Running Out of Water

New York City draws almost all of its drinking water from the three northern reservoir systems: the Delaware, Catskill, and Croton. A Delaware Aqueduct collapse would decommission the four reservoirs that comprise the Delaware system. At this point, the City would be limited to the supply available in the Croton and Catskill systems. According to DEP, as of November 1, 2000, the reservoirs in these two watersheds had a combined capacity of 192 billion gallons. At current usage rates of 1.3 BGD, the Croton and Catskill reservoirs have enough water to supply the City's water consumers for 147 days, but only if every last drop of water could be drained from behind the dams.

[73] The absence of an emergency response plan was confirmed in numerous conversations with present and former DEP staff. Riverkeeper FOIL requests to DEP have also failed to uncover such a plan.

[74] *See* Hearing before City Council of New York, Committee on Environmental Protection, Dec. 8, 2000, transcript at 17.

[75] Commissioner Miele has also adopted the deceptive strategy of minimizing the crisis by understating the role of the Delaware Aqueduct. During testimony before the City Council Committee on Environmental Protection, he testified that "under normal conditions, the Delaware system provides 650 MGD", thereby underestimating the critical importance of the Delaware Aqueduct. In fact, DEP's own documents show that the Aqueduct routinely delivers over 700 MGD, with peak flows of up to 949 MGD - up to 80% of the water suplied to City consumers. *See* NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, ROUNDOUT EFFLUENT CHAMBER DIVERSION RRECORDS 1985 - 1998, APPENDIX A INDIVIDUAL VENTURI RECORDS.

[76] The City might buy some time by activating the Chelsea plant and sending 300 MGD of dirty and dangerous Hudson River water to New York City residents to drink. City engineers have ignored a 1990 court order that effectively required the City to construct a filter plant to prepare for just such an emergency. *See* Hudson River Fishermen's Ass'n. v. New York City, 751 F. Supp. 1088 (S.D.N.Y. 1990). Zebra mussels and poor water quality rule out the Hudson as a contingency water source.

However, it is impossible to draw down a reservoir completely in order to turn its entire contents into usable drinking water. A reservoir's volume is usually described in terms of its "safe yield."[77] As the City has shown in the past, safe yield figures are certain to over-exaggerate the amount of water actually available "because the capacity of a reservoir cannot be drawn down to zero and there is no assurance that the reservoirs would be full of water at the beginning of the period, as is assumed."[78] A reservoir's inability to be drawn down to zero stems from both the inherent design of water impoundment structures and from the fact that water quality declines as a reservoir's level drops. Much of the water behind the Catskill dams is undrinkable because of high levels of turbidity (cloudiness caused by suspended sediment) during spring and summer months.[79] Should the City need to rely on the full amount of water stored in the Catskill and Croton reservoirs, it would not be able to guarantee that this water would meet federal drinking water quality requirements. Over-reliance on the Catskill's turbid waters, particularly in the spring, may trigger a filtration order by EPA in the midst of water shortage emergency.[80]

In any event, these reservoir capacity numbers do not tell the real story. With the collapse of the Delaware Aqueduct, the water supply reaching New York City will be limited by the flow capacities of the Catskill and Croton Aqueducts. The duration of the City's water supply is determined not by how full the reservoirs are, but by how effectively the infrastructure can deliver it. Because the City's water supply system is gravity fed, meaning that it does not use pumps to move water from the reservoirs to the City, the flow of water through the aqueducts is entirely dependent upon the force of hydraulic pressure. When reservoirs are drained, their "hydraulic head" diminishes. As the hydraulic head diminishes, so does a reservoir's ability to force water through an aqueduct. In other words, DEP cannot force the full capacity of the Catskill reservoirs through the outlet into the Catskill aqueduct. Likewise, as the Croton Reservoir level drops, DEP's ability to push water through the Croton Aqueduct also drops.

DEP's reservoirs work reasonably well when they have high water levels; their ability to deliver water declines dramatically as their levels drop. So precipitous is this decline that the Kensico Reservoir, for example, will lose its ability to fill the aqueducts leading to the City when its level drops by as little as 23 feet. While DEP regularly quotes the reserve capacity of the Kensico as 30 days and 30 billion gallons, the useable capacity of the reservoir is only 12 billion gallons, which will last between 10 and 18 days.[81]

Similar conditions govern the flow from the reservoirs in the Catskill system. Therefore, DEP's claim that it has stored enough water to last for 147 days is misleading. Only about half of the water sitting behind the dams is actually accessible. The City will run out of water in approximately 80 days, and much earlier than that, the City will be sending highly degraded water to consumers.

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[77] Safe yield is the annual amount of water that can be taken from a source of supply over a period of years without depleting that source beyond its ability to be replenished naturally in "wet years."

[78] Hudson River Fishermen's Ass'n. v. New York City, 751 F. Supp. 1088, 1092 (S.D.N.Y. 1990).

[79] *See infra* Part IV. for a discussion on Catskill turbidity issues.

[80] In December 2000, the City was getting hits of more than 18 NTU in the Ashokan Reservior. These high turbidity levels caused turbidity levels in the Kensico Reservoir to reach approximately 3.2 NTU. Turbidity levels of 5 NTU in two consecutive months would trigger an automatic filtration order. *See* 40 C.F.R. section 141.7.

[81] This estimate is buttressed by a 1998 internal DEP email claiming that the Kensico supply is limited to 18 days.

Furthermore, the New Croton Aqueduct, which brings Croton system water into the City's distribution network, cannot be operated safely until DEP isolates and cleans up a pool of perc and possible MTBE that have contaminated that aqueduct. Perc is a colorless, non-flammable liquid largely used in the dry-cleaning industry that harms human health and the environment in varying degrees depending upon, among other things, the length and frequency of exposure. MTBE is one of a group of chemicals commonly known as "oxygenates" because they raise the oxygen content of gasoline. Introduced in 1979 as an octane enhancer to replace lead, it has been used at much higher concentrations since 1992. MTBE is a volatile, flammable and colorless liquid that at room temperature dissolves easily in water and even low levels can render water undrinkable. EPA banned MTBE, as a gasoline additive, in 2000.

Finally, DEP's optimistic calculations assume that the Catskill and Croton Reservoirs will be at full capacity on the day that the Delaware Aqueduct fails. There is, of course, no guarantee that the reservoirs would be at such high levels if the aqueduct should collapse. Normal storage for November, for example, is cited by DEP as being closer to 69%.[82] During the drought of 1985, reservoir levels dropped to as little as 53%.[83] By then, the City had declared a Stage III Drought Emergency, instituted severe water use restrictions, and begun to use the Chelsea Pump Station to pump 100 MGD of polluted Hudson River water into the system in an effort to provide sufficient drinking water.

1. *The Crisis is Compounded Because the Hudson River is No Longer Available as a Supplemental Supply During Emergency Water Shortages.*

Throughout the 1980s and 1990s, the City consistently maintained that the Hudson River was its only viable emergency source of water in the event of shortages. According to a 1986 Draft Environmental Impact Statement for re-opening the Chelsea Pump Station (to allow DEP to pump Hudson River water into drinking water system), DEP asserted that the City had no other emergency water supply sources; "[t]he Hudson River pumping station at Chelsea represents the only currently available, fully operational emergency source of water supply for the City of New York. Other alternatives have been investigated; however, none are currently available...."[84] This assurance was repeated in 1990 by Joe Conway, DEP Chief of the Bureau of Water Supply.[85]

The City can no longer rely on this short-term alternative. First, since 1990, zebra mussels have invaded the river and the City cannot risk introducing them to the water supply. Second, a court order obtained by Riverkeeper in a suit against the City in 1990 prevents DEP from restarting the Chelsea pumps until the agency obtains a Clean Water Act state pollutant discharge elimination system permit.[86] The City has not applied for a Clean Water Act permit and is unlikely to qualify for one.

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[82] *See* <http://www.ci.nyc.ny.us/html/dep/html/maplevels2.html> (last visited Nov. 11, 2000). At the 69% level, the Croton and Catskill systems, including Kensico Reservoir, would have a nominal capacity of 185 billion gallons. At current usage rates, this amounts to a 3 and half-month supply of water.

[83] *See* MALCOLM PIRNIE, DROUGHT OPERATION OF THE HUDSON RIVER PUMPING PLANT LOCATED AT CHELSEA, DUTCHESS COUNTY, NEW YORK, DRAFT ENVIRONMENTAL IMPACT STATEMENT, November 1986 [hereinafter Chelsea DEIS], Affidavit of Commissioner Harvey Schultz at 5.

[84] *See* CHELSEA DEIS, *supra* note 83, at 2-21.

[85] *See* Hudson River Fishermen's Ass'n v. City of New York, 751 F. Supp. 1088, 1095 (S.D.N.Y. 1990).

[86] *See id.* at 1101, 1103.

Third, without dilution with Delaware Aqueduct water, Hudson River water is not suitable for human consumption. According to DOH, the Hudson River water is suitable for emergency use only "with proper chlorination and treatment with alum[87] **and dilution with not less than four parts of additional water from the Delaware system.**"[88] This dilution is required under the state water supply permit (Water Supply Application No. 4974), which allowed the pump station to operate briefly in the drought emergencies of the 1960s and 1980s.[89] Since the Delaware Aqueduct will not be able to deliver Delaware system water, it would be impossible to dilute Hudson River water to safe drinking levels.

2. *Emergency Water Conservation Measures Will Not Result in Significant Savings*

Water conservation measures will not save the City. During the 1980-81 and 1985 droughts, the City implemented dramatic conservation measures and was able to reduce demand by approximately 200 MGD.[90] Two things work against repetition of such success. First, many of the measures instituted 15 years ago are still in place – such as water meters and reduced flow toilets and showerheads. They continue to save water today, and therefore will not be able to produce additional savings in the event of a future shortage.[91] For instance, some of the 250 MGD decline in water consumption between 1991 and 1998 can be attributed to the installation of water meters and 1.34 million low flow toilets.[92] DEP cannot reap any further benefit from such measures. Second, the population served by the NYC drinking water system has increased by over one million consumers since 1985: from eight million to nine million.[93] The City's previous conservation efforts largely resulted from reducing individual water consumption from 195 gallons per day to 169 gallons per day.[94] Because there are now more people, even if DEP were to limit daily use to 169 gallons, the City would not see the conservation benefits realized previously.

The 200 MGD saved in the 1980s represented 13% of the pre-drought flow. If DEP can convince us all to save 13% of the water we use today, these savings would bring daily water use down to 1.18 BGD. However, as discussed below, even these measures would not relieve the water shortage. Under various scenarios described below, DEP would have a daily supply deficit between 435 and 942 million gallons.

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[87] Alum is a chemical added to act as a coagulant to remove suspended solids from water.
[88] Chelsea DEIS, *supra* note 83, Affidavit of Commissioner Harvey Schultz, 8. (emphasis added)
[89] *See id.* at 2-16.
[90] *See id.* at 2-28. "During this drought (of 1980-81), the City was compelled to impose severe water use restrictions as part of the requirements to reduce water consumption from 1,554 mgd in 1980 to 1,347 mgd in 1981, a 13.3% reduction." *Id.*
[91] The City's aggressive metering campaign, instituted in 1986, added water meters to approximately 800,000 accounts. Currently, only 30,000 accounts remain to be metered. The City cannot expect to gain significant savings from these few remaining accounts. *See* Hearing before City Council of New York, Committee on Environmental Protection, Jan. 22, 2001, transcript at 3, 69.
[92] *See* NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, NEW YORK CITY WATER SUPPLY STILL BELOW NORMAL: WATER CONSERVATION CONTINUES TO BE ENCOURAGED, Dec. 14, 1998, available at <http://www.ci.nyc.ny.us/html/dep/html/press/drbc2pr.html> (last visited Mar. 22, 2001).
[93] *See* Chelsea DEIS, *supra* note 83, at 2-18. "The City's water supply system currently provides water for approximately 6.57 out of 7.09 million people in New York City. Approximately 525,000 persons in southern Queens are served by the Jamaica Water Supply Compnay. In addition, the City's system provides water for about 750,000 transients and 650,000 people in Westchester, Putnam, Orange, and Ulster Counties." *Id.* the City purchased the Jamaica Water Supply company in 1996. For current customer population estimate of "nearly 9 million" *see* <http://www.ci.nyc.ny.us/html/dep/html/celebrate.html> (last visited Nov. 28, 2000).
[94] *See* Hearing before City Council of New York, Committee on Environmental Protection, Jan. 22, 2001, transcript at 82.

3. *Pumping Increases in the Catskill and Croton Reservoirs, and the Queens Groundwater System Will Not Provide Adequate Supplementary Water Supply*

Even if the Catskill Aqueduct can deliver its advertised maximum of 500 MGD and the Croton can deliver a further 275 MGD (for a total of 775 MGD from upstate reservoirs),[95] the City will still be at least 435 MGD short of its current daily usage. There are no realistic alternatives to make up the missing water required to meet the City's needs and lost when the Delaware Aqueduct is off-line.

Commissioner Miele claims that DEP could get flow through the Croton up to 275 MGD in 48 hours. DEP engineers have strong doubts about this claim because of the deteriorating condition of the Croton Aqueduct. Today, the aqueduct is largely closed down while DEP tries to locate and repair several sources of contamination, including unidentified sources of perc that are leaking into the aqueduct somewhere in the Bronx or Harlem. These contamination problems limit DEP's ability to use the Croton Aqueduct; currently, only 40 MGD can be sent through this tunnel. As of now, there is no estimate as to when it will be safe to bring the Croton fully back on line.

Other factors conspire to limit the relief available through the Croton Aqueduct. First, even the agency's rosiest documents repeatedly put the maximum flow through the Croton Aqueduct at 240 MGD – 35 MGD short of Miele's estimate. Second, because the aqueduct is already providing water to the City at a rate of 40 MGD, Commissioner Miele's promise does not add 275 MGD in additional flow to the City. Theoretically, the City can add only 235 MGD, still far less than is required to make up for the shortfall when the Delaware Aqueduct goes down.[96] DEP engineers believe that the crumbling, weakened condition of the Croton Aqueduct makes it impossible to force additional capacity through this structure.

Commissioner Miele also has claimed in City Council testimony and elsewhere the DEP can get more water from wells in Jamaica, Queens.[97] This small system currently provides about 30 MGD to 525,000 residents of that area. Although it is theoretically possible to increase the production of these wells, that small increase is unlikely to add meaningfully to the City's emergency supply. On an ordinary day, 30% of the water supplied to the residents of this area must come from the City's upstate reservoirs.[98] The wells do not produce enough water to meet local demand, let alone supply water for the rest of the City. Indeed, the City system is the only alternative source of water for these communities, and DEP has not confirmed that it will be able to meet their needs in an emergency.[99] It is also likely that infrastructure problems would prevent any meaningful contribution of Queens water to the City. Already, water main connections between the City and Jamaica systems are too small to maintain sufficient pressure in the Jamaica area.[100] The lack of existing infrastructure and permits, as well as pollution problems with the aquifer, will prevent any increase in water supply from the Queens wells, at least in the near term. Thus, the Queens wells are an improbable source of extra water for the City.

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[95] Both of these contingencies are virtually impossible as described above.

[96] Generally, DEP maintains that the Croton system supplies approximately 10% of the City's drinking water needs, or approximately 140 MGD. If the Croton were flowing at this normal operating rate, the extra capacity available when the Delaware Aqueduct fails is only 120 MGD.

[97] *See* Hearing of the New York City Council, Committee on Environmental Protection, Dec. 8, 2000, Transcript at 57-58, 76-80. *See also*, NEW YORK CITY DEPARMENT OF ENVIRONMENTAL PROTECTION, AVAILABLE WATER RESOURCES IN THE EVENT OF A DELAWARE AQUEDUCT SHUTDOWN (internal memo) (on file with authors).

[98] EPA REGION 2, BROOKLYN-QUEENS AQUIFER SYSTEM, SOLE SOURCE AQUIFER SUPPORT DOCUMENT at 5, available on-line at <http://www.epa.gov/region02/water/aquifer/brooklyn/brooklyn.htm>(last visited Nov. 13, 2000) [hereinafter SOLE SOURCE AQUIFER].

[99] *See id.*

[100] *See id.*

The language of DEP's Drought Management Plan asserts that in a time of water shortage, DEP would attempt to "maximize the normal output of the wells in Queens County...and close selected interconnections to the surface water supply."[101] As a water crisis deepens, DEP would "close additional connections to the surface water supply." [102] This procedure suggests, Commissioner Miele's claim notwithstanding, that DEP has neither the intention nor the ability to transfer Queens well water to the rest of the City's distribution system. Its response in times of crisis is to cut Queens residents off from the reservoirs and supply them solely with well water. Raising production levels from the Queens wells should therefore free up significant quantities of extra water to the City system. However, the benefit to the rest of the City is limited to the amount of water that DEP no longer has to send to Queens to supplement the water supplied by the wells. Because DEP typically supplies 30% of Queens residents' needs with reservoir water, and the wells typically produce around 30 MGD, increasing well production will only free up 13 to 15 MGD for distribution to residents of the other four boroughs.

DEP also has named the Brooklyn-Queens Aquifer as an additional source of emergency drinking water.[103] It is somewhat alarming that DEP would even suggest this, let alone give it serious consideration. This underground reservoir is essentially the same body of water that supplies the Jamaica-Queens wells.[104] According to EPA, the Brooklyn-Queens Aquifer System "is highly vulnerable to contamination."[105] Already, the groundwater in this system suffers from dangerous levels of nitrates from pollution by fertilizers, landfills, and septic and sewer leaks.[106] When excessive groundwater is pumped out of the aquifer, saltwater from the Atlantic intrudes to the underground reservoir, making the water too salty to drink. An inter-agency study of the aquifer determined that pumping 100 MGD would render the aquifer unusable in 10 months.[107] Despite its low quality, wells in Queens provide the primary source of drinking water for over half a million people. The greatest threat to this source of drinking water is nothing other than precisely what DEP proposes to do: increase the Queens wells' pumping rates.

Commissioner Miele's claim that DEP can obtain 20 MGD from wells in Jamaica that are owned by Nassau County also is misleading. These wells draw water from the same aquifer as the City's wells and increased draws would amplify the pollution and saltwater intrusion. Furthermore, it is highly unlikely that Nassau County would respond positively to the City's request. DEP has not made any showing that a) Nassau County would be willing to supply a significant portion of its groundwater supply to the City, b) that Nassau County has the extra capacity to deliver this water, c) that the City's water mains are even connected to Nassau County's, and d) that the infrastructure in place is sufficient to convey Nassau County water to New York City in any realistic fashion. Until such questions are answered, it is far safer to omit Nassau's wells from any catalog of additional sources of water for thirsty New Yorkers.

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[101] NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, DROUGHT MANAGEMENT PLAN & RULES 6 (12/29/98).
[102] *Id.*
[103] *See* Geoff Ryan Memo, *supra* note 62. Even if all the measures suggested by Mr. Ryan were viable, he admits that plans for their implementation will not be complete until July 2003. *See id.*
[104] *See* SOLE SOURCE AQUIFER, *supra* note 98.
[105] *See id.* at III.
[106] *See id.* at II(D). "In addition to lowering ground water levels, urbanization and development of the ground water system in Kings and Queens Counties have caused serious deterioration of groundwater quality. The most striking example was that of salt water from surrounding tidewater in response to excessive drawdown. Other sources of contamination, some of which were present from the early stages of development, include road salts, leaking sewers, and toxic spills at land surface." *Id.*
[107] *See* Southeast New York Intergovernmental Water Supply Advisory Committee, Committee Reports, <http://www.senyiwsac.org/committe.htm> (last visited Nov. 13, 2000).

4. *Other Minor Sources*

a. The Croton Falls Pump Station

An additional, small possible source of water could be obtained by pumping water from one of the Croton system reservoirs, Croton Falls, directly into the Delaware Aqueduct at a point east of the Hudson River. While this reportedly would add 60 MGD to the daily supply available to the City, the Croton Falls Pumping Station is scheduled to be taken off-line in conjunction with dam reconstruction work and will be altogether out of service for several years beginning in 2002.[108] In any event, use of the Croton Falls Pump Station is no panacea in that the pumps actually waste more water than can be delivered. Because of the configuration of the pumps, nearly 180 million gallons must be spilled from Croton Falls Reservoir in order to send 60 million gallons through the pumps. This spilled water flows into Croton Reservoir, and almost certainly would wind up going over the spillway and into the Hudson River. Thus, the City would be using 240 MGD to send 60 MGD to consumers, quickly drawing down the Croton Falls, Middle Branch, East Branch, Diverting and Bog Brook Reservoirs. Such pumping would reduce the overall reserve capacity of the reservoirs; any water pumped to the Delaware Aqueduct from Croton Falls will not be available for later delivery through the Croton Aqueduct. While daily supply might be temporarily increased, the number of days that supply will last would be significantly shortened.

b. Commissioner Miele's Claim That the City Can Get an Emergency Water Supply From New Jersey is Absurd

At the December 8, 2000 City Council Hearing, Commissioner Miele claimed that in the event of an aqueduct collapse, New York City could obtain water from New Jersey.[109] When questioned by Council members, Miele said that a pipe already exists across the George Washington Bridge. The only known pipe extending across the Hudson to New Jersey was intended for the City to send water to New Jersey during a Delaware River basin drought threat in the 1950s. The pipe is not designed to bring water to New York from New Jersey. Moreover, it is hard to imagine any such pipe would be sufficient in size to replace the nineteen-foot diameter Delaware Aqueduct. DEP has not presented any hard information to the public about this imaginative water source. Where, for example, would this water come from?

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[108] *See* NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, DROUGHT MANAGEMENT PLAN AND RULES Table 1, fn. 10. Another pumping station with similar capability and capacity, the Cross River station, is also off-line and will be until 2003. *See id.*

[109] *See* Hearing before City Council of New York, Committee on Environmental Protection, Dec. 8, 2000, transcript at 58.

F. Running the Numbers: Catastrophic Water Shortages Face the City

DEP's own best-case scenario numbers still spell disaster for downstate New Yorkers. Commissioner Miele's prediction that DEP "will cope" assumes the following estimates, which we have shown above to be wildly optimistic: the Catskill Aqueduct will be able to provide 500 MGD, the Croton Aqueduct can safely deliver 275 MGD, and the Queens/Jamaica Wells somehow can contribute an additional 60 MGD.[110] The Croton Falls pumps will supply another 60 MGD. DEP will somehow be able to obtain an additional 20 MGD from wells in Jamaica that are owned by Nassau County. Under these lofty, improbable conditions, the total available supply would be 915 MGD. This best-case scenario still leaves the City with a shortage of 435 MGD in the winter when water use is lower. Water conservation measures would have some impact on this deficit, but even if it were possible to repeat the 13% reduction realized as a result of the drought measures of the 1980s, there would be a savings of only 175 MGD. According to its own figures, DEP would be at least 260 MGD short even in the wet, winter months. Under the best conditions, the City will run dry in six months. The deficit would be far higher and judgment day will come much sooner in summer months, when reservoir levels drop and water demand climbs as high as 1.7 BGD.[111]

The water shortage is far greater under a more conservative scenario, one that tempers DEP's wild claims with a dose of reality. Structural limitations make it likely that the Catskill Aqueduct can safely deliver a maximum of only 500 MGD. Similar structural issues limit the Croton Aqueduct to a maximum flow of 225 MGD,[112] while the Queens/Jamaica wells possibly may be upgraded to contribute 60 MGD. No water is available from the Nassau County-owned wells, due to infrastructure limitations and political obstacles. The Croton Falls Pumping Station, unused for years, remains off-line due to operating inefficiencies. The total supply under these circumstances would be 785 MGD, or 565 MGD short of water users' wintertime needs. The shortage would grow to as much as 785 MGD during thirsty summer months. While conservation measures will likely lower demand, even under this conservative estimate, DEP can supply only approximately two-thirds of the water currently required.

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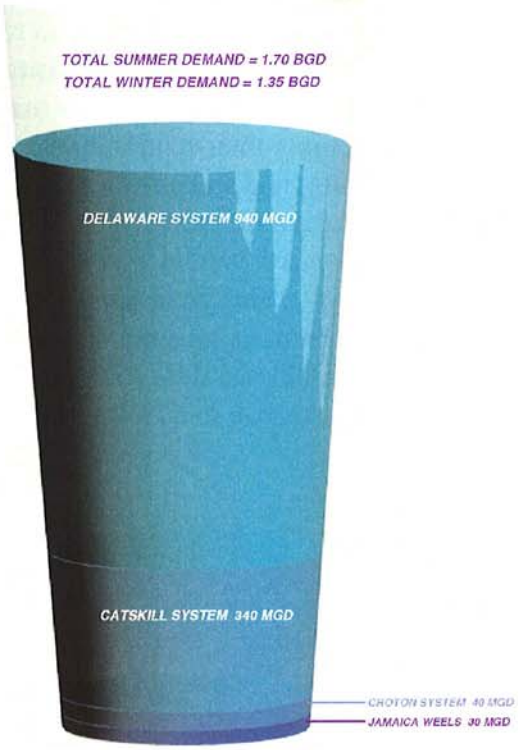
[110] *See* NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, AVAILABLE WATER RESOURCES IN THE EVENT OF A DELAWARE AQUEDUCT SHUTDOWN (internal memo) (on file with authors). In this memo, DEP asserts that "the Catskill System can provide 500 MGD; the Croton 275."

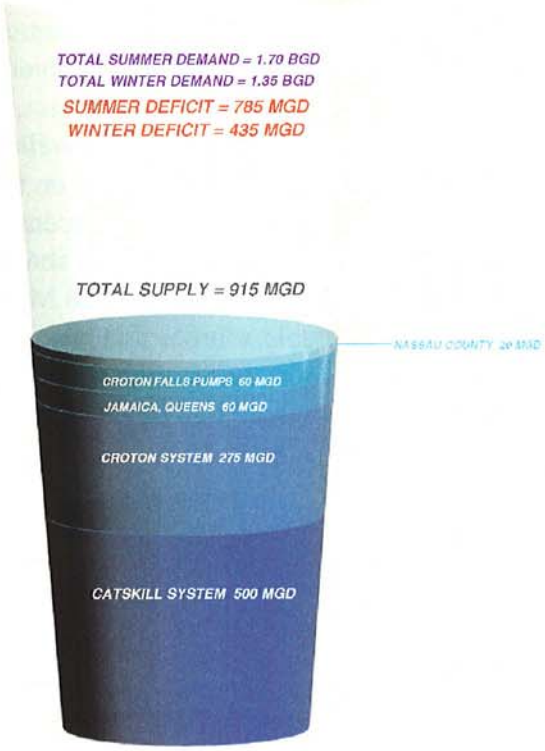
[111] *See* Chelsea DEIS, *supra* note 83, at 2-24. Two important considerations limit DEP's ability to provide this much water, however. First, the water in the Catskill System is notoriously turbid, full of tiny sediment particles. DEP cannot provide raw Catskill water to consumers without violating Federal Safe Drinking Water quality regulations. This overly turbid water also presents a number of health concerns. Pollutants (nutrients, metals, and pathogens, such as bacteria, *Giardia*, and *Cryptosporidium*) may be absorbed to suspended sediment particles, masking a fraction of the total pollutant load from detection. In addition, sediment interferes with the chlorination process. *See* NATIONAL RESEARCH COUNCIL, WATERSHED MANAGEMENT FOR A POTABLE WATER SUPPLY: ASSESSING NEW YORK CITY'S APPROACH 126 (1999). Second, with the Catskill Aqueduct flow at 500 MGD, the available water in the Catskill system, using November 27, 2000 figures, will run out in six months. DEP's web-site shows that the two Catskill Reservoirs, Schoharie and Ashokan, were at 24% and 87% capacity, respectively, on November 27, 2000. *See* <http://www.ci.nyc.ny.us/html/dep/html/maplevels2.html> (last visited November 30, 2000.)

[112] It should be noted that DEP regularly claims that the Croton supplies 10 percent of the City's water needs, or roughly 140 MGD by current standards. Many engineers claim that this reflects the maximum possible tunnel flow.

A Delaware failure today, or in the near future, would create the most likely and most devastating worst-case scenario. Under these easily envisioned circumstances, the Croton Aqueduct remains in its current contaminated state, but the need for water forces DEP to reactivate the tunnel to supply 225 MGD, even though doing so exposes city residents and visitors to toxic pollutants. The Catskill Aqueduct, the City's remaining lifeline, is operated at its maximum safe level, or 500 MGD. The wells in Queens can do little more than supply the 33 MGD to the residents who already depend on them for 70% of their water, and so contribute nothing to the rest of the thirsty City. This scenario is probably the most accurate prediction of the conditions that would confront the City should it be cut off from Delaware System water. The total available water supply would be 758 MGD: about half of what City water users would require. DEP has no available sources that can provide the missing 592 million gallons we would need every day. During summer, with water demand approaching 1.7 BGD, the deficit facing City water consumers would rise to almost 942 MGD. The City could run dry in as little as 80 days!

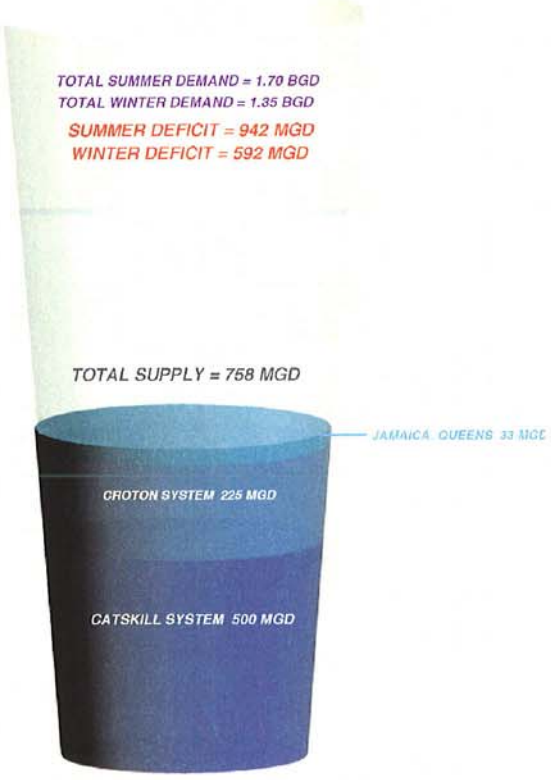


CURRENT WATER SUPPLY



D.E.P.'S SCENARIO

With the Delaware Aqueduct out of commission, the City will run out of water in 80 days - no air conditioning, no drinking water, no fire protection!



MOST REALISTIC SCENARIO

G. Impacts From the Loss of the Delaware Aqueduct Will Be Felt Upstate

Also routinely overlooked in DEP's assessments are the water supply impacts on upstate communities from the closure of the Delaware Aqueduct. Many towns and villages in Westchester, Putnam, Orange, and Ulster Counties rely on the New York City Drinking Water System for their drinking water. The City of Newburgh, for instance, obtains most of its drinking water from the Delaware Aqueduct. Without this source, Newburgh and the other communities will have to scramble to institute alternative water supplies.

A severe impact on Catskill communities may not arise from too little water, but from too much of it. With the Delaware Aqueduct out of service, the 900 MGD or so that normally flow through the tunnel will have to go elsewhere. For some time, this water can be collected behind the four reservoirs of the Delaware system. However, their ability to retain water that is normally siphoned off will depend on the length of time repairs to the Aqueduct require and the amount of water already in the reservoirs. The reservoirs will not be able to hold the additional 900 MGD indefinitely and DEP will be forced to increase flows over the spillways and back into the Neversink River and East and West Branches of the Delaware River. These rivers were originally dammed to create the reservoirs and still carry unstored flow into the main stem of the Delaware River.

DEP is currently required to release up to 800 MGD through these rivers, per a Supreme Court decree that divides rights to the Delaware River between New York, Pennsylvania, and New Jersey. The flow of the Delaware River will be significantly increased if DEP is forced to divert an additional 900 MGD over the spillways of the Neversink, Pepacton, Cannonsville, and Rondout Reservoirs. Suddenly engorged with twice their normal flow, the rivers will flood low-lying property, erode banks and riverbeds, and threaten the stability of roadways and bridges. The impacts of this much water on down-river communities can only be estimated, based on historical records of similar size floods. Downstream communities that rely on these rivers for drinking water will be forced to deal with increasingly turbid and contaminated water. The legal implications of such releases on the City's obligations under the Delaware River Basin Compact must also be considered.

With the Delaware Aqueduct out of commission, the City will run out of water in 80 days – no air conditioning, no drinking water, no fire protection.

H. Recommendations: Repairing the Aqueduct and Preventing a Crisis

Recommendation #10: DEP Should End 10 Years of Delay and Inaction and Immediately Pursue Concrete Remedies to This Potential Crisis.

The agency should take the following steps and any others required to bring urgent attention to this overdue repair.

Recommendation #11: DEP Should Accelerate the Schedule For Test Borings and Geologic Investigations Near the Roseton Leak Site, Including Tests to Determine the Structural Stability of the Tunnel Reaches Adjacent to and Under the Hudson River.

Incredibly, ten years after discovering the leaks, DEP has yet to conduct a thorough geologic investigation of the leak sites. Given the likelihood that subterranean limestone may have been eroding through contact with the leak waters, and the possibly adverse impacts this process has on the structural integrity of the aqueduct, these tests must be conducted at the earliest opportunity. Geologic bore tests are the primary means for discovering the ramifications of dewatering the aqueduct and for charting the scope of repairs that will be required.

Recommendation #12: DEP Should Accelerate the Deployment of the Woods Hole Constructed Submersible and Take Other Steps to Precisely Determine the Leak Locations.

Commissioner Miele has contracted studies so that no results will be available until the Giuliani Administration has left office. These studies should be accelerated using the City's emergency contracting procedures. This crisis should be recognized as an emergency and assigned the priority that its great risks merit.

Recommendation #13: DEP Must Begin an Adequate Planning Effort in Advance of Final Test Results.

Initial planning steps should evaluate possible repair technologies, their costs, and impacts upon water supply while repairs are underway. Any advance contracting and purchasing requirements should be identified and steps should be taken toward advance procurement of supplies and machinery.

Recommendation #14: DEP Must Immediately Begin to Plan Alternative Sources of Water For Use While the Delaware Aqueduct is Out of Service.

Despite the Department's public assertions, it is clear that there simply is no way, with current infrastructure, to meet the daily water needs of more than nine million people. DEP needs to identify possible water conservation measures, including rationing plans, as well as infrastructure improvements that can increase water supply. Planning today for the eventual loss of the Delaware Aqueduct will prevent difficult water shortages during repair work that could last years.

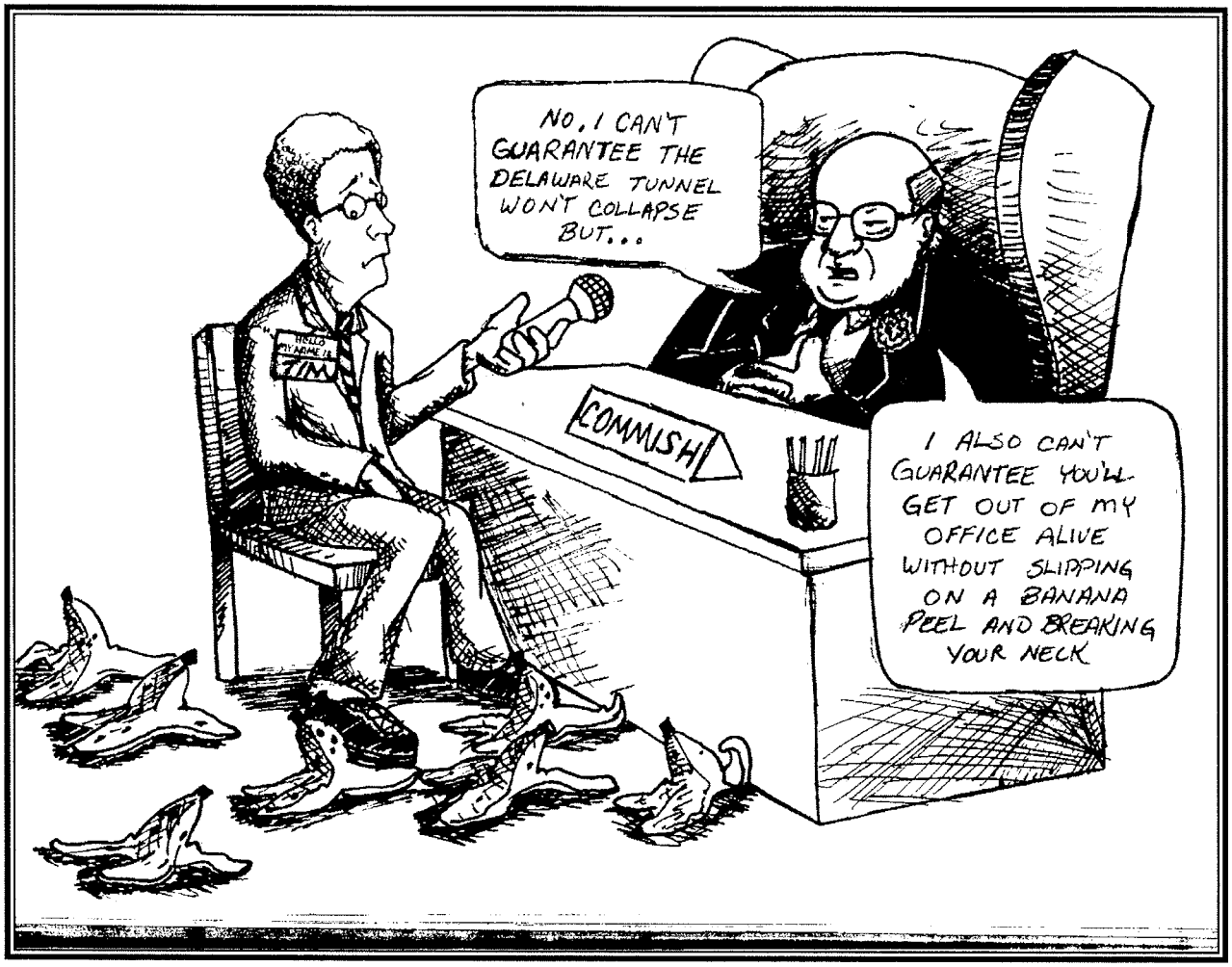
Recommendation #15: As Part of Its Efforts to Secure Alternative Sources of Water Delivery, DEP Must Begin Planning a Third Hudson River Tunnel.

This tunnel must have the capacity to carry water from both the Delaware and Catskill Aqueducts in order to ensure a constant supply should either of these two lifelines suffer damage west of the Hudson.

Recommendation #16: DEP Must Immediately Begin Repairs and Upgrades to the Catskill and Croton Aqueducts to Ensure That They Will Be Able to Safely Meet the City's Water Delivery Needs While the Delaware Aqueduct Is Out of Service.

Recommendation #17: DEP Should Stop Concealing Critical Information From Elected Officials and the Public.

As a government agency, DEP and its officers have an obligation to be honest, forthright, and cooperative with the community it is charged to serve and protect. It is simply unacceptable that DEP spent ten years covering up a problem as significant as a dangerous leak in the City's primary water supply aqueduct.

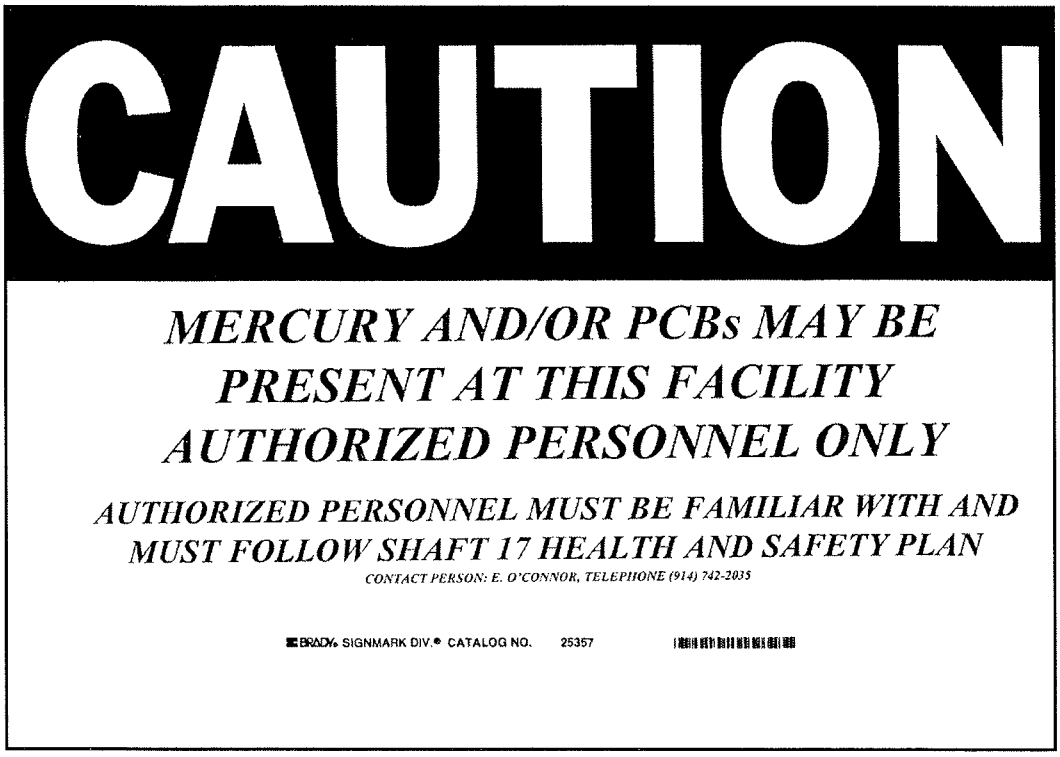


NBC News Channel 4 interview with DEP Commissioner Joel Miele (November 2000)

Part III

DEP Has Allowed Toxic Chemicals To Contaminate Its Facilities And Threaten The Water Supply

DEP's lack of attention to infrastructure issues is exemplified by the agency's routine mishandling of toxic substances at its shafts and gatehouses. These irresponsible and often illegal practices put both water consumers and DEP employees at risk. Riverkeeper's three-year investigation has disclosed that DEP routinely mishandles deadly toxics in its watershed, causing problems that have been aggravated by a pattern of secrecy and cover-ups. DEP has been aware of the contamination and its potential impacts on human health and worker safety since at least 1985.[113]



[113] *See* Memo from Eugene S. Egan, Director of Labor Relations/Safety officer, DEP, to Adam Postiglione, President, Local 1322 (Dec. 24, 1985).

A. Sluice Gate Operators Throughout the System Are Contaminated

Many New York City water consumers might be surprised to hear that the City's Department of Environmental Protection is a major polluter of its own reservoirs with contaminants that include deadly chemicals. Although DEP is supposed to be the front line environmental regulator in the almost 2,000-square-mile watershed, it is primarily an environmental facility operator and undoubtedly the biggest polluter in its own watershed. New York City owns and operates five large sewer plants that discharge into reservoir tributaries. These plants have a long and dismal history of environmental violations. Further, DEP operates and approves hundreds of construction projects in the watershed each year, many of which have disastrous impacts on water quality. But few people know that the City also handles large amounts of dangerous toxic chemicals that pose a serious pollution risk to the water supply and the surrounding environment.

The gatehouses and shafts that deliver water to the City resemble large industrial facilities. On the east side of the Hudson River, the flow of water through the Delaware Aqueduct is controlled by sluice gates which are raised and lowered by devices known as sluice gate operators. The sluice gate operators are connected to the sluice gates by long shafts that pass through vertical concrete chambers, known as gate wells. The sluice gate operators sit directly above the gate wells. The sluice gates are raised up in the gate wells when open and lowered to the base of the gate wells when closed. These sluice gate operators have been contaminated for decades. [114]

The most contaminated sluice gate operators are located in four buildings known as Shafts 9, 10, 17 and 18. Shaft 9 is on the West Branch Reservoir (inflow) in the town of Carmel, NY; Shaft 10 is on the West Branch Reservoir (outflow) in the town of Carmel, NY; Shaft 17 is on the Kensico Reservoir (inflow) in the town of North Castle, NY; and Shaft 18 is on the Kensico Reservoir (outflow) in the town of Mt. Pleasant, NY. Within these four Shafts, water from the Delaware Aqueduct and/or the reservoirs separates into several channels, each of which directs water through the base of a sluice gate well. The flow of water in any given channel may be regulated by opening or closing the sluice gate.

The sluice gate operators in the four shafts were installed in the 1940s. Originally, each of the sluice gate operators contained lubricating oil and relied on mercury seals to prevent the oil from leaking. Mercury is a naturally occurring heavy metal that exists in the environment in three forms: elemental mercury, organic mercury, and inorganic mercury compounds.[115] Organic mercury, especially methylmercury, and inorganic mercury compounds are neurotoxins, and present serious threats to human health, even at low doses.[116] Methylmercury can accumulate in the tissues of people, fish, and other animals, leading to increased health risks through cumulative exposure. Humans can be harmed through inhalation of mercury vapor, direct contact with bare skin, or through ingestion.

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[114] In November 1998, there were 45 sluice gate operators in Shafts 9, 10, 17, and 18, distributed as follows: Shaft 9 - 6 sluice gate operators; Shaft 10 - 7 sluice gate operators; Shaft 17 - 8 gluice gate operators; and Shaft 18 - 2 sluice gate operators. Shafts 10 and 18 are regularly staffed by DEP employees. No DEP employees are based at Shafts 9 or 17, but DEP employees are periodically present at Shafts 9 and 17 for inspections.

[115] *See* ENVIRONMENTAL LAW & POLICY CENTER, BRIEFING PAPER ON MERCURY, April 1997, available at <http://www.elpc.org/energy/MercuryBriefing1.html> (last visited March 7, 2001).

[116] *See id.*

As little as a teaspoon of mercury will contaminate a 1750-acre reservoir to the point that the fish in that reservoir are unsafe to eat.[117] Humans exposed to mercury, or who eat contaminated fish, can suffer chronic mercury poisoning, which causes a wide variety of debilitating conditions that are often misdiagnosed because the symptoms mimic recognized diseases. Mercury has been identified as the responsible agent producing symptoms of at least 45 illnesses, including fibromyalgia, chronic fatigue, anorexia, depression and Alzheimer's.[118] Besides mimicking various illnesses, chronic exposure to mercury damages kidney, liver, and the central nervous system.[119] Each sluice gate operator contained many pounds of this toxic material.

In addition, oil in the sluice gate operators almost certainly contained PCBs. PCBs are a suspected carcinogen and endocrine disruptor that, like mercury, bioaccumulate in fish and humans. Modest prenatal exposure to PCBs affects brain development in children, causing learning deficits and lowered IQs. [120] More concentrated exposure causes debilitating stomach pain, disfiguring skin eruptions, as well as a range of physical, behavioral, and cognitive disorders.[121] PCBs are known to cause kidney, liver and lung damage as well as cardiac arrhythmia. Overexposure causes vomiting, jaundice and skin disorders.[122] Because the sluice gate operators sit directly above the wells through which water flows, it is possible that mercury or PCB oil that leaks from inside a sluice gate operator may enter the City's drinking water supply.

The sluice gate operators are also contaminated with lead in excess of the 5.0 milligrams per liter (mg/l) regulatory limit for hazardous wastes.[123] These excessive amounts of lead have been found in the interior of sluice gate operators, within the torque tube tub of a Shaft 18 sluice gate operator, on base assemblies inside most of the sluice gate operators at Shafts 10 and 18, and in other sites. Within the human body, lead damages the nervous system, circulatory system, reproductive system, kidneys, and gastro-intestinal tract. In adults, lead poisoning can cause various symptoms including fatigue, stomach disorders, memory loss, headaches, insomnia, hypertension, anemia, impotence, dizziness, and weakness in the extremities. Lead exposure in children is far more serious. Because the brain has not yet completely developed in children, lead poisoning can cause learning disabilities, attention deficit disorders, lowered IQ, and antisocial behavior. Elevated levels of lead over a sustained period can damage the central nervous system of children and adversely impact their development.[124]

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[117] Joseph Roloff, *Mercurial Risks From Acid's Reign*, 130 SCIENCE NEWS 152-166 (1991).
[118] ANDREW HALL CUTLER, AMALGAM ILLNESS DIAGNOSIS AND TREATMENT (2000).
[119] Material Safety Data Shet (MSDS) for Mercury.
[120] *See* Joseph L. Jacobson & Sandra W. Jacobson, *Intellectual Impairment in Children Exposed to Polychlorinated Biphenyls in Utero*, 335 NEW ENDLAND JOURNAL OF MEDICINE (September 12, 1996).
[121] *See* MSDS for PCBs.
[122] *See id.*
[123] Lead is a hazardous waste under the Resource Conservation and Recovery Act and its implementing regulations if it meets the toxicity characteristic of 5.0 mg/l under the Toxicity Characteristic Leaching Procedure. *See* 40 C.F.R. section 261.24. At lower concentrations, lead that is discarded, spiled, leaked, or otherwise disposed is solid waste within the meaning of the Act. *See* 42 U.S.C. section 6903(27).
[124] *See* K.N.Dietrich et al., *Lead Exposure and the Cognitive Development of Urban Preschool Children: The Cincinnati Lead Study Cohort at Age 4 Years*, 13 NEUROTOXICOLOGY & TERATOLOGY 203-11(1991).

B. Actuators and Manometers Leak Mercury and PCBs

The sluice gate operators are not the only pieces of equipment that pose a high risk of contamination to the drinking water system. Actuators, located in the sub-floor chambers at Shaft 10, control the outflow of water from Shaft 10 into the Delaware Aqueduct through increment or rectangular gate valves. There are currently 12 actuators at Shaft 10. These actuators also contain mercury and may have contained PCB oil. The sub-floor chambers of Shaft 10 also house gauges called manometers, which are used to measure the volume of water flowing through Shaft 10. These manometers, also found in numerous other source facilities in the City's water supply system, contain significant quantities of mercury. In several locations, leaking or broken manometers have been identified as the sources of mercury contamination.

C. Numerous Mercury Spills Endanger Employee Health and Water Quality

In 1985, DEP identified and tested 40 shaft sites for the presence of mercury vapor. DEP found mercury spills and/or high vapor levels in 36 of those sites. The DEP study concluded, "the shafts registered very high levels of mercury vapor and are poorly ventilated."[125] DEP also tested 20 pumping station facilities for mercury vapor. Nineteen of those sites had mercury spills and/or high readings.[126] In addition, DEP tested 22 East-of-Hudson locations for mercury vapor. Eleven of those sites had mercury spills and/or high readings.[127]

According to current and former DEP employees, the agency failed to provide timely warning to the public or to DEP employees about dangerous mercury levels, in some cases waiting 14 years. Even though the agency had identified over 65 facilities contaminated with mercury, DEP field personnel were forced to work in conditions that directly threatened their health, without the information they needed to protect themselves. This same cavalier attitude governed DEP's response to the health threat to water consumers caused by mercury spills. DEP neither adequately cleaned up these spills nor inform the public about the dangers. Not infrequently, spilled mercury remained where it fell for months or even years.

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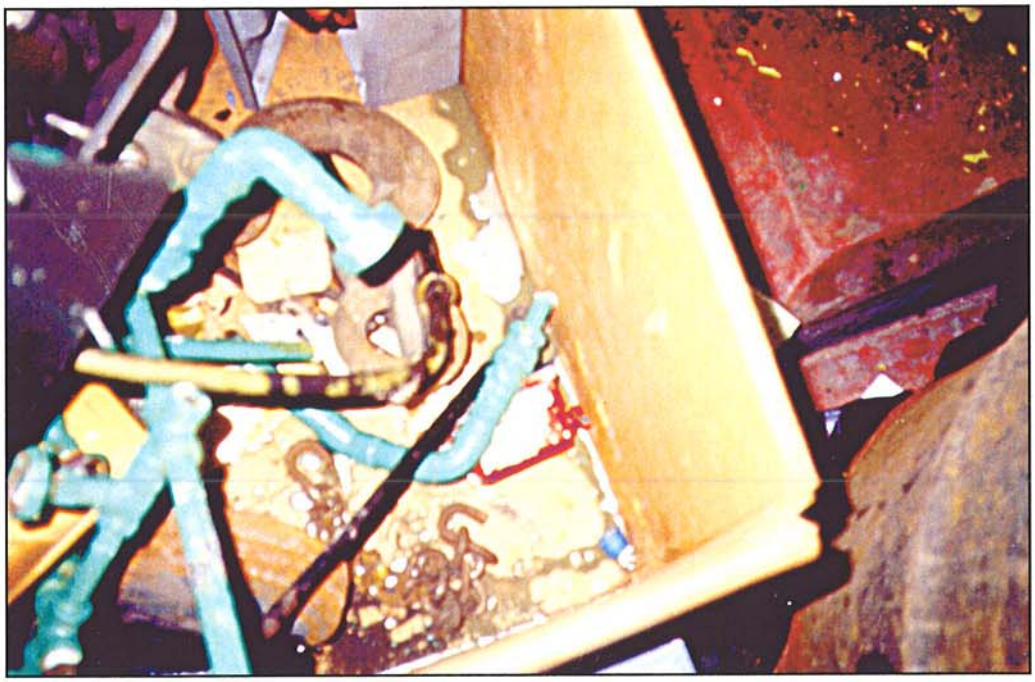
[125] *See* Memo from Eugene S. Egan, Director of Labor Relations/Safety Officer, DEP to Adam Postiglione, President, Local 1322 (December 24, 1985).
[126] *See id.*
[127] *See id.*

In an unidentified DEP facility, a barrel of hazardous waste sits next to a cardboard box of discarded materials and freestanding mercury (see photo below). Photo by unidentified source.



Freestanding pools of mercury in a cardboard box pose a threat to DEP employees and the water supply. Photo by unidentified source.

Stationary engineers in Shaft 10 began noticing mercury spills as early as 1987. According to Ed Redmond, a former DEP stationary engineer, "there were pools of it in the basement of the shaft, down where the manometers blew out." At times when the sump pumps were not working, the shaft would fill with water and DEP personnel would pump the water – mixed with the mercury and PCBs – out of the shaft. Originally, the employees thought they were pumping it into the reservoir, where they reasoned it would be diluted to safe levels in the eight billion gallon holding capacity of the West Branch Reservoir. (These DEP employees were clearly not toxicologists!) Later, after reviewing schematics, they realized the "water was being pumped into the downtake of the Delaware Aqueduct," from where it would be sent directly into distribution.[128]

In March 1998, Riverkeeper learned that a large amount of mercury had spilled from a broken manometer at Shaft 10 of the Delaware system.[129] The manometers, used to measure and control water flow throughout the water supply network, are aging relics, loaded with up to 60 pounds of mercury and subject to chronic failure. A single manometer contains enough mercury to contaminate the City's entire reservoir system. DEP's manometers are prone to bursting. When they break, they often spill their entire contents. As a result, DEP has a tremendous problem controlling mercury spills throughout the distribution network.

DEP engineers discovered the broken manometer in Shaft 10 as early as February 16, 1995, when a DEP safety inspector performed a check of the site.[130] The inspector discovered a broken sight glass on the meter but claimed to have found less than the one pound regulatory reporting threshold of mercury and, therefore, did not report the spill to DEC. Over three years later, on March 11, 1998, having secured a Hypervac used to clean up a separate mercury spill at Shaft 18, the DEP's Hazardous Material Response team revisited the Shaft 10 site to follow up on the spill. They discovered over six pounds of free mercury on the floor of the shaft, and belatedly reported the spill to DEC and commenced a hasty cleanup effort. When asked by DEC personnel to explain why the initial cleanup was incomplete and the original estimated amount of mercury was so far below the six pounds recovered, DEP engineer Thom Hook lamely responded that the "area below the manometer is dark and it is difficult to see."[131]

Delaware District Engineer Kevin Cloonan and other engineers also failed to make timely reports to the DEC regarding a mercury spill. According to DEP sources, when news of the spills was reported in the New York Post, Cloonan was temporarily demoted.[132]

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[128] Based on a confidential conversation.
[129] *See* Anonymous memorandum, New York City Department of Environmental Protection, Division of Environmental Remediation, Summary of Reported Spills - NYC Watershed (May 1998) (on file with authors).
[130] *See* Letter from Thom Hook, DEP, to Cesare J. Manfredi, DEC (March 20, 1998) (on file with authors). DEP sources state that the engineers likely discovered the broken manometer well before 1995.
[131] *See id.*
[132] Jackie Rothenberg, *FBI Seizes City Files In Probe of Toxic Spill*, N.Y. POST, June 16, 1999, at 28.

Around 1996, former DEP Stationary Engineer Ed Redmond reported another mercury spill at the Croton Falls Pump Station. Due to an absence of heat in the building, a meter froze, blowing out approximately 50 to 60 pounds of mercury. DEP officials illegally failed to report the spill. According to Redmond, the spill was neglected for at least two and half to three years. During that time, water repeatedly entered the station, splashing the mercury and spreading it all over the station. At one point, DEP employees fashioned a dam out of rags to keep the mercury from spilling into an adjacent stream.

These examples of mercury mishandling are only the tip of the iceberg for DEP. A 1998 memo reveals seven mercury spills reported March of that year alone.[133] In addition, an even more widespread problem is revealed in a draft Mercury Inventory that DEC ordered DEP to prepare following the spills in early 1998. The three-page chart lists the locations at which mercury is in use, or has been used in the past at DEP facilities. Most importantly, the chart includes a column captioned "visible spill?" For the East-of-Hudson District, an astonishing 46 locations indicate that some form of "visible spill" had taken place.[134]

D. Pollutant Spills Create Workplace Risks for DEP Employees

In 1999, Delaware District Engineer Kevin Cloonan sent a memo to DEP's Delaware District employees urging them to get tested for mercury contamination in their blood. According to DEP sources, DEP's Deputy Commissioner Dr. William Stasiuk reprimanded Cloonan for sending the memo – fearing the memo would cause panic among workers or be released to the public. However, almost a year later, public attention to the mercury spills brought by Riverkeeper forced Stasiuk to send out his own memo. An April 19, 2000 memo from Stasiuk to Bureau of Water Supply Staff notified staff that the bureau was offering biological screening for mercury, lead, and PCBs to employees whose duties require them to enter shaft facilities for any reason.[135] Stasiuk's memo states that "[p]ast medical screening of DEP employees has indicated that working in the shafts does not present a health hazard to personnel."[136] Stasiuk's statement was false. Earlier DEP memos relating to these tests, however, reveal the truth.

[133] At least seven spills occurred or were discovered in March of 1998 alone:

Date	Amount	Location	Explanation
3/6/98	Approx. 1 ounce	Rondout Reservoir	Manometer Failure
3/11/98*	1 pound or more	Delaware Aqueduct Shaft 10 (Carmel)	None
3/11/98	Approx. 1 pound	Delaware Aqueduct Shaft 10 (Carmel)	None
3/12/98	Few Drops	West Delaware Intake Chamber (Tompkins)	Leaking Manometers
3/13/98	Few Drops	East Delaware Release Chamber (Colchester)	Leaking Manometers
3/12/98	Few Drops	Neversink Intake Chamber	Mercury used in Electrical Switches for Relays
3/13/98	Few Drops	East Delaware Tunnel	None
3/13/98	Few Drops	Rondout Fluid Chamber	Outlet (at Rondout Res.) None

See Anonymous memorandum, NYC DEP, Division of Environmental Remediation, Summary of Reported Spills - NYC Watershed (May 1998) (on file with authors). *Another DEP memo estimates this spill at more than six pounds.

[134] *See* East of Hudson District Mercury Inventory (as of March 18, 1998), attached to memo from Thomas J. Hook, P.E., Deputy Director, Division of Operations and Engineering, DEP, to Cesare J. Manfredi, P.E., Division of Environmental Quality, DEC (May 7, 1998) (on file with authors). The Inventory reports visible spills (explained as visible residual mercury in tub area) at Shafts 9, 10, 17, and 18. The spills were inventoried as follows: 6 spills at Shaft 9; 7 spills at Shaft 10; 8 spills at Shaft 17; and 25 spills at Shaft 18.

[135] The medical screening included urine sampling for the presence of elemental mercury, and blood sampling for PCBs and lead.

[136] *See* Memorandum from William Stasiuk, Deputy Commissioner, Bureau of Water Supply, DEP, to Bureau Staff (Apr. 19, 2000) (memo attached *infra*).

A December 24, 1985 memo from Eugene S. Egan, DEP Director of Labor Relations/Safety Officer, to Adam Postiglione, President, Local 1322, states that the Department of Health completed urine tests on 34 employees from the shafts. "The results of urine mercury tests on the 34 shaft maintenance personnel indicated that 12 (35%) had urine mercury levels greater than 20 micrograms per liter (μ/l)."[137] Four employees' mercury levels were reported at 21-40 μ/l, seven were reported at 41-60 μ/l, and one was reported at 101-120 μ/l.[138] Less than 20 μ/l is normal; 21-99 qualifies as increased absorption; 100-199 qualifies as a warning; 200+ is hazardous.[139] As for symptoms, 13 (38%) of the employees reported at least one of the three classic symptoms of mercury poisoning: shaking hands, bleeding gums, and mood changes.[140] "The lowest exposure index associated with an increased urine mercury level was 11. Twenty-one of the 22 employees for whom work history was available had a mercury exposure index above this value."[141]

The agency's neglectful attitude toward its own employees extends beyond potential mercury exposure. The same shafts with elevated mercury levels are prime suspects for PCB contamination. However, DEP has failed to warn its workers or disclose the threat this contamination poses to drinking water consumers. While no employees were found to have elevated levels of PCBs in tests recently conducted by DEP, one DEP source claims that the agency cleverly selected low-risk employees to screen for PCB levels. "The people they were testing weren't the ones with the greatest level of exposure. They weren't testing the employees who spend the most time in the shafts." Equally appalling is the fact that DEP employees who work in the shafts claim that they were never told to wear protective gear until after the FBI initiated an investigation of DEP's contamination problems.

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[137] New York City Deparment Of Health, Epidemiology Unit, Summary Of Urine Mercury Testing Program, Department Of Environmental Protection, Water Shaft Maintenance Personnel, November 1985, And Recommendations For Further Medical Evaluations 3 (1985).
[138] *See id.* at 6.
[139] *See id.*
[140] *See id.* at 3. Employees also reported headaches, fatigue, difficulty sleeping, nervousness/anxiety, and depression.
[141] *See id.*

The City of New York

Department of Environmental Protection

71 Smith Avenue
Kingston, New York
12401

Joel A. Miele Sr., P.E.
Commissioner

Bureau of Water Supply

William N. Stasiuk, P.E., Ph.D.
Deputy Commissioner

Tel (914) 340-7500
Fax (914) 340-7504

MEMORANDUM

To: Bureau Staff

From: William Stasiuk

Date: April 19, 2000

Re: Medical Screening

The Bureau of Water Supply is providing biological screening for mercury, lead and PCBs to employees whose duties require them to enter shaft facilities for any reason. Past medical screening of DEP employees has indicated that working in the shafts does not present a health hazard to personnel. To reassure employees, we have agreed with the union that DEP provide medical screening for any employee requesting it.

Medical screening will include urine sampling for the presence of elemental mercury, and blood sampling for polychlorinated Biphenyls (PCBs) and Lead. Medical testing is being provided by Mount Sinai-Irving J. Selikoff Center for Occupational & Environmental Medicine at Phelps Memorial Hospital Center in North Tarrytown. If you are interested in medical screening, contact Christina Hug at (914) 742-2005 to be scheduled.

The best evidence indicates that the threats caused by these contaminants to worker health and safety were serious. In March 1998, DEP contracted with the environmental consulting firm Roy F. Weston, Inc. (Weston) to perform a preliminary assessment of the contamination of Shaft 9 in Carmel, NY.[142] This assessment measured mercury contamination within the six sluice gate operators through samples of air, debris, concrete, and from work surfaces within the shaft chamber.[143] Of these four test parameters, Weston found that three presented some threat to worker safety.

Ten air samples taken within the sluice gate operators exceeded the Occupational Safety and Health Administration (OSHA) limit for mercury exposure. Mercury vapors within the operators posed an inhalation hazard to DEP staff working in these areas.[144] Weston notes that the "elemental form of mercury found at Shaft 9 volatilizes easily, and is particularly harmful in its vapor state. Thus mercury vapor presents a considerable inhalation hazard."[145]

Weston employees found much more serious contamination of work surfaces within the shaft. Spilled mercury and mercury residue was widespread throughout the shaft; "[m]ercury was found to be present on all surfaces sampled with the exception of the wipe collected on the entrance door interior handle."[146] The highest levels were detected "on and directly adjacent to the sluicegate operators" with a peak measurement of 15,509.12 µg/ft2 at Operator IV.[147] Further mercury contamination, including visible drops of collected mercury, was detected in dust, dirt, and general debris that had collected on the floor of the shaft. The Weston investigation confirmed the presence of mercury on surfaces throughout the shaft, in the air, in debris, and on the sluice gate operators.[148]

The conclusion of the Weston report recommended that DEP develop a health and safety plan for Shaft 9 that would "clearly identify the hazards entering and/or working in the Shaft 9 building...Minimum personal protective equipment should include nitrile gloves and disposable latex booties for all persons entering the Shaft..."[149] Weston also concluded that the shaft facilities posed threats of PCB and lead contamination, and recommended that DEP investigate the potential hazard posed by these toxins. These recommendations seem to have fallen on deaf ears at DEP. Conversations with Shaft 9 workers reveal that they were not provided warnings about the adverse effects of mercury exposure or of the presence of mercury in their work environment until mid-2000, some two years after the Weston report. DEP workers were not ordered to wear protective clothing, or even provided with gloves or booties, until June 2000.

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[142] *See* ROY F. WESTON, INC., DRAFT REPORT OF BASELINE CONDITIONS AT NEW YORK CITY BUREAU OR WATER SUPPLY SHAFT 9, DIXON ROAD, CARMEL, NY, May 1, 1998.
[143] *See id.*
[144] *See id.* at v.
[145] *Id.* at 2
[146] *Id.* at 21.
[147] ROY F. WESTON, INC., DRAFT REPORT OF BASELINE CONDITIONS AT NEW YORK CITY BUREAU OF WATER SUPPLY SHAFT 9, DIXON ROAD, CARMEL, NY, MAY 1, 1998.
[148] *See id.* at 31.
[149] *Id.*

E. EPA Has Launched an Investigation of DEP's Record of Spills

In autumn of 1998, Riverkeeper requested that EPA and FBI investigate incidents related to the mishandling of toxics, including mercury, at the gatehouses by DEP employees and a cover-up by DEP officials of an oil spill in the Croton Aqueduct. In December 1998, EPA initiated an investigation, including on-site inspections of Shafts 9, 10, 17, and 18. On December 10, 1998, EPA and FBI personnel inspected Shaft 18. Thereafter, on June 30, July 1, July 8, and July 9, 1999, all four shafts were inspected by EPA personnel and/or their consultants, who collected samples on each of those four days.

During the summer of 1999, federal agents raided DEP offices and facilities, seizing DEP records and computer files and sealing file cabinets in search of evidence that DEP engineers and officials had covered up mercury and PCB spills at various buildings in the watershed.[150] Federal agents searched Joel Miele's office and other DEP offices in Valhalla, Katonah, and Ashokan.[151] In addition, federal agents began interviewing DEP employees who were thought to have had first-hand knowledge about DEP mishandling of toxic substances. Soon after the investigation commenced, DEP officials sent a memorandum to all involved DEP employees instructing them that they had no obligation to speak to the federal agents investigating environmental crimes.[152] Sources within DEP claimed that the memo implicitly discouraged employee cooperation with the federal agents.[153]

The FBI and EPA investigation of DEP continues. On February 8, 2000, EPA personnel inspected the South Increment Chamber and Rectangular Chamber, portions of the sub-floor area at Shaft 10. In July 1999, EPA's National Enforcement Investigation Center (NEIC) – the expert technical support center for EPA enforcement and compliance assurance programs – inspected Shafts 9, 10, 17, and 18. Since the summer of 1999, a grand jury has been convened to consider possible criminal indictments against various DEP officials. In the wake of this investigation and grand jury testimony, several high-level DEP officials have been asked to resign. Among these was East-of-Hudson District Engineer Carl Picha, who resigned from the department in January 2001. According to several sources, during the summer of 1999, Picha was caught by the FBI sneaking out of DEP's Katonah office at night to dump files and reports into a dumpster. Some of these reports allegedly concerned DEP's mishandling of mercury and other hazardous discharges in the watershed.[154]

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[150] *See* Andrew C. Revkin, *F.B.I. Seizes City Records on Reservoirs: Inquiry Is Over Handling of Hazardous Materials*, N.Y. TIMES, June 16, 1999, at B1.

[151] *See id.* In one of his characteristic misstatements, Commissioner Miele later denied that his agency was under federal investigation. During a civil suit brought by a DEP Police Officer who alleged that he had been disciplined for trying to enforce the Watershed Regulations, Miele testified under oath:

> Q: Presently are you or anyone on your administrative staff in the upstate or downstate Bureau of Water Supply being investigated by the FBI?
> A: By the FBI? Not that I'm aware of.

Deposition of Joel Miele, Commissioner, New York City Department of Environmental Protection (Gatto v. Giuliani, Apr. 5, 2000).

[152] *See* Memorandum from Robin Levine, NYC DEP to Distribution (June 26, 2000) (memo attached *infra*).

[153] Based on anonymous conversations.

[154] Based on several communications with current and former DEP personnel.

THE CITY OF NEW YORK DEPARTMENT OF ENVIRONMENTAL PROTECTION
JOEL A. MIELE SR., P.E., Commissioner

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General Counsel

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MEMORANDUM

To: Distribution

From: Robin Levine

Date: June 26, 2000

The federal government is investigating certain issues relating to the water supply. Representatives of the federal government may seek to speak with New York City Department of Environmental Protection employees, either at home or at work, in connection with the investigation. If you are contacted, you should be aware that:

- You may speak with the investigator but have no obligation to do so. The decision whether to speak to the investigator is entirely yours. If you do speak, you must provide truthful information.

- You have the right to consult with an attorney before agreeing to speak with a representative of the federal government and to have an attorney present during the interview. If you want an attorney to be present, you should tell the investigator and ask him to postpone the interview.

  If you wish to have an attorney present during your interview, please contact Robin Levine. She can be reached by calling either (718) 595-6555 or (917) 513-6817, or by paging her at 800-800-7759 PIN # 917-032-8196. The Department has made arrangements for counsel to represent employees in connection with their duties, if they so choose, at no expense to the employee.

59-17 Junction Boulevard, 19th Floor, Corona, New York 11368-5107

1. EPA Finds Mercury Spills in Gatehouses

Monitoring of the reservoirs and aqueducts generally shows that the City's drinking water has been, and continues to be, safe and that the water has met, and continues to meet, state and federal drinking water requirements for PCBs, mercury, and lead. Even so, during the above inspections, EPA and/or NEIC found mercury in concentrations exceeding the regulatory limit of 0.2 mg/l in the interior of sluice gate operators outside the mercury seal in most of the sluice gate operators sampled at Shafts 10, 17 and 18.[155] Mercury was found at Shaft 18 in the gate wells below sluice gate operators, in six gate wells sampled, and lead was found in one of the six gate wells sampled. Additional mercury spills were found at Shaft 18 on the floor below the hatch base assembly of at least one sluice gate operator. At Shaft 10, spilled mercury was discovered in the interior of some of the actuators, outside their original containment area, and beaded in small amounts on the floor and on pipes of the sub-floor area.[156]

The results of a DEP inspection conducted on July 22, 1999 revealed mercury and lead exceeding the regulatory limits in sludge, located in the interior bases of the three sluice gate operators sampled at Shaft 18. A subsequent City inspection of Shafts 9 and 17, in February 2000, found mercury exceeding the regulatory limit beaded in small amounts on the floor outside sluice gate operator 4 in Shaft 9 and throughout the floor of the sluice gate operator room in Shaft 17.[157] According to the consent decree, the City has cleaned up the mercury found during these inspections.

2. Mercury in Our Drinking Water and Reservoirs

The big question facing City and State officials is whether DEP's mercury spills are contaminating drinking water and endangering public health. Since DEP does not routinely or frequently test for mercury in the City's distribution system, we have no way of knowing how much of the spilled mercury has made its into City drinking water. However, a test performed on drinking water at the Hillview Reservoir in March of 1995 suggested a disturbing conclusion. The Hillview Reservoir in Yonkers is part of the City's distribution system. Any mercury in the Hillview could easily be drunk by City consumers within a few hours. When mercury was discovered in the Hillview, DEP officials quickly moved to conceal the discovery. They got help from a friendly state official. DEP's former Deputy Commissioner Dr. William Stasiuk, who was then the Director of Environmental Health at New York State Department of Health, rubber-stamped a report that erroneously attributed the mercury levels to a sampling error caused by contaminated bottles. However, similar mercury hits in Yonkers, which uses a different lab, show the poisonous metal was actually in the drinking water supply, not in the lab bottles.[158]

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[155] *See* 40 C.F.R. section 261.24 for regulatory limit. For details of EPA/NEIC investigation, *see* In re City of New York, RCRA-02-2000-7303 (2000).
[156] *See* In re City of New York, RCRA-02-2000-7303, at 5 (2000).
[157] *See id.* at 4.
[158] *See* sources on file with author.

ATTENTION ALL PERSONNEL 1/22/99

Some low levels of Mercury and PCBs have been detected on the floors in this (Shaft #18) facility. Until a complete risk assessment is done, boots and gloves are to be worn. Anyone doing maintenance in this facility will wear tyvek coveralls along with the boots and gloves.All Gloves will be worn when coming into contact with any non office surfaces. Boots will be worn at all times. Everyone entering this facility will wear boots and gloves or they will not be allowed to enter this facility. NYC/DEP Health & Safety have been notified along with District Council 37.

Thank you
Joseph Licari
Supervisor Systems Operation

[Memo warning DEP personnel of mercury hazard at Shaft 18.]

DEC tests in April 1997 revealed high levels of mercury in several fish species collected in the Neversink Reservoir in Sullivan County. In June 1998, DEC issued a Health Advisory urging fishermen to avoid eating fish caught from the Neversink. Ironically, this isolated reservoir has long been touted as the source of the City's finest water. DEP blames atmospheric mercury for these levels. While airborne mercury may indeed be the culprit, DEP's history of reckless mercury handling cannot be ruled out as an additional source of the Neversink's mercury problem. More recently, health advisories have been issued regarding fish consumption in the City's Rondout, Cannonsville, Pepacton, and Ashokan Reservoirs.[159]

3. PCBs Also Contaminate DEP Facilities

In addition to mercury contamination, EPA and/or NEIC found PCBs in the interior of most of the sluice gate operators sampled at Shaft 18 and one sluice gate operator sampled at Shaft 10. PCBs were also found at Shaft 18 on the outside wall of one sluice gate operator, on the floor below the hatch base assembly of a second sluice gate operator, and below some sluice gate operators, in the gate wells.[160]

Shafts 9, 10, 17, and 18 are part of the Delaware Watershed system and are subject to a June 12, 2000 consent decree with EPA requiring the City, at the cost of $100 million, to replace the equipment in the shafts and remove the contaminants.[161] In the consent decree, EPA found that the disposal and handling of solid and hazardous waste at these shafts may present an imminent and substantial endangerment to human health or the environment.[162] As a result of the consent decree, the City was ordered to thoroughly investigate and clean up all contamination at Shafts 9, 10, 17 and 18.

4. DEP's Keystone Cleanup

In November 1998, Roy F. Weston, Inc. began removing sluice gate operators at Shaft 18 pursuant to a contract with the City, known as DEL-57. Under DEL-57, Weston's scope of work includes decontamination of mercury, PCBs and lead at Shaft 18.[163]

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[159] *See* NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, FISHING REGULATIONS GUIDE 2000-2002.
[160] *See* In re City of New York, RCRA-02-2000-7303, at 4-5 (2000).
[161] *See id.* at 5-10.
[162] *See id.* at 5.
[163] *See id.* at 3-4. Under DEL-57 and its amendments, Weston is to remove the sluice gate operators from Shaft 18; dismantle, decontaminate and dispose of the sluice gate operators; remove and decontaminate and/or dispose of the base support structures under each sluice gate operator; and remove manometers and other mercury containing devices. Weston also is expected to prepare a health risk assessment for Shaft 18 and if necessary, may remediate Shaft 18 and the gate well walls beneath the sluice gate operators. Pursuant to a second contract, DEL-25, the City will replace the sluice gate operators and gates in Shaft 18. The City also has initiated procurement for DEL-157, a contract to remove manometers and other mercury containing devices located in facilities in the upstate portion of the City's water supply system, excluding Shaft 18. As of the date of the consent decree, Weston has removed, dismantled and decontaminated 15 of the 24 Operators from Shaft 18. *See id.*

Aside from the Weston contract at Shaft 18, DEP has been slow to respond to the terms of the consent decree. The City's cleanup of Shaft 18 has been plagued by problems associated with poor leadership and DEP's chronic lack of information about its own infrastructure. On or about November 15, 2000, DEP and its contractor had filled holding tanks with the hazardous substances, but the designated waste hauler would not take the waste due to its high lead levels.[164] Then, either DEP employees or the contractor's employees used a garden hose to dilute the contaminants. Later, someone disconnected the hose, left it in the holding tank, and exited the facility. Shortly thereafter, the garden hose siphoned the waste into the Delaware meter pit, filling it to the point where an alarm sounded. Fortunately, DEP personnel reacted in time to draw most of the waste back into the holding tanks.

One week later, however, DEP was not as fortunate.[165] On the morning of November 21, workers from DEP's Bureau of Environmental Engineering began discharging 20,000 gallons of contaminated wastewater from a holding tank at Shaft 18 into a manhole that engineers believed led to the Town of Mount Pleasant sanitary sewer system, and from there to the Yonkers wastewater treatment plant. Five hours later, after 16,000 gallons of wastewater containing hazardous levels of mercury, lead, zinc, and hydrocarbons had been discharged, a Bureau of Water Supply worker noticed that the pump room floor drain at Shaft 18 was overflowing and that the basement was flooded with 6 to 12 inches of water.

After the contractor shut down the discharge from the holding tank, workers discovered that the aforementioned manhole was not the sanitary sewer line manhole as believed but in fact the access to an abandoned coal bin, which drained into the Shaft 18 basement. The wastewater in the basement drained into an interior sump pit, which then drained into the Shaft 18 main floor drain and further into an unnamed tributary of the Bronx River. By 8:00 P.M., the contract resident engineer had managed to divert 3,000 gallons of wastewater into the Mount Pleasant sanitary sewer; the remaining 13,000 gallons was spilled into the Bronx River.

On the following day, workers washed down the basement floor and any previously submerged equipment with Simple Green, an environmentally benign degreaser incapable of dissolving heavy metals, and then pumped the wash water into the Town of Mount Pleasant sanitary sewer system. The Westchester County Department of Labs and Research reported that the contaminated spill contained 0.0198 mg/l mercury; 0.247 mg/l lead; 0.154 mg/l zinc; and lesser amounts of Arochlor (PCBs), O-xylene, and P&M xylene. The amount of mercury discharged alone is sufficient to render fish in the upper Bronx River unsafe for human consumption.[166] In response to concerns of DEC and DOH, DEP belatedly developed a protocol for the discharging of wastewater and any other contaminants from the Shaft 18 facility, as well as "sensitivity and awareness training" to address the presence of mercury, lead and PCBs at the Shaft 18 facility.

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[164] This incident is based on phone conversations with anonymous sources.
[165] The following three paragraphs are based on information found in DEP's Final Incident Report outlining the November 21, 2000 spill incident.
[166] *See* Joseph Roloff, *Mercurial Risks From Acid's Reign*, 130 SCIENCE NEWS 152-166 (1991).

One of the most significant water quality problems facing DEP is turbidity. Turbidity is particulate matter suspended in water. This condition occurs when rainwater erodes unstable soils carrying minute particles of sand, soil, and other minerals into waterways. Turbidity may also be caused by algae blooms associated with nutrient loading. Extreme turbidity leads to murky or muddy water, but levels of turbidity that violate the Safe Drinking Water Act may not be detectable with the naked eye. Even low levels of turbidity can threaten human health. Turbidity is a concern to federal regulators because it causes an unpalatable cloudy appearance and conceals dangerous pathogens, such as *Cryptosporidium* or *Giardia,* from detection and disinfection. Moreover, when turbidity levels rise, fecal coliform levels tend to increase as well. An extensive study of municipal tap water links small increases in cloudiness to gastrointestinal infections that cause nausea, vomiting, and diarrhea in children and to other ailments that doctors once attributed to food poisoning.[171]

For this reason, EPA's May 1997 Filtration Avoidance Determination requires that City water not exceed turbidity concentrations of 5 nephelometric turbidity units (NTU), a measure of the cloudiness of water.[172] Under the Surface Water Treatment Rule, the City would be forced to filter its water if turbidity levels in its source waters exceeded 5 NTU on more than two occasions in any 12-month period or on more than five occasions over five years.[173] At this level, pathogens can hide in turbidity, protected from chlorination by the suspended particles.

The primary turbidity threat to the City's drinking water comes from the reservoirs of the Catskill System, particularly the Ashokan Reservoir. The principal tributary of the Ashokan Reservoir is the Esopus Creek, a world-class trout fishery. The 10-mile long Shandaken Tunnel delivers water from the Schoharie Reservoir into the Esopus roughly 10 miles upstream from the Ashokan. Soils in the Schoharie Basin are characterized by red clays, which, upon disturbance or during severe rain or snowstorms, choke the reservoir and feeder streams with colloidal sediments that settle in the Schoharie Reservoir. The Shandaken Tunnel intake sucks themuck from the Schoharie's bottom and discharges the clay sediment into Esopus Creek, which carries it downstream into the Ashokan.

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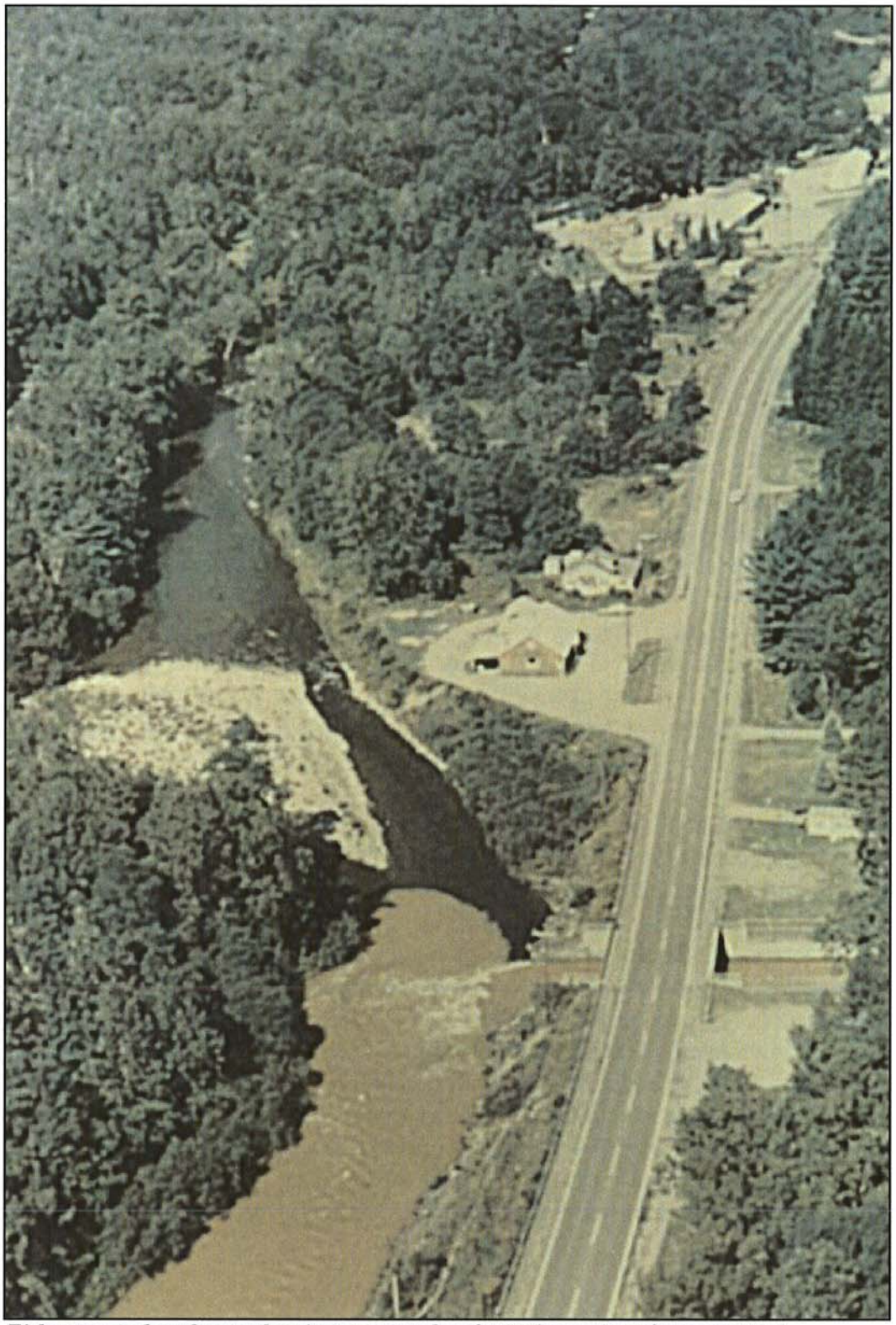
[171] *See* Denise Grady, *Turbid Tap Water May be Source of Unexplained Intestinal Ailments,* N.Y. TIMES, Nov. 4, 1997. Emblematic of the level of incompetence are the drinking water fountains at the Croton Lake Gatehouse. The fountains were designed to provide potable water from Croton Lake. The chlorine feed system was so poorly engineered that chlorine residuals cannot be maintained across the building. The Croton lab has no source of safe potable water for drinking, washing, or coffee in violation of OSHA and state DOH regulations. Ironically, DEP now must purchase bottled water for its upstate staff.

[172] *See* 40 C.F.R. section 141.7.

[173] *See id.*



Fishermen and outdoor enthrusiasts commonly refer to the portion of Esopus Creek downstream from the Shandaken Tunnel as "Yoohoo Creek" - in reference to its high turbidity levels. Photo by Tony Bonavist.

In order to control the sedimentation problem, the Ashokan is divided into two sub-basins. The City uses the West Basin to settle out the sediment. As a result, the West Basin of the Ashokan is opaque red and its shores are stained ochre with Schoharie clays. The City must carefully draw water from the East Basin of the Ashokan, sending less turbid water down to the Kensico reservoir in Westchester, the final holding basin prior to disinfection and distribution.

During a particularly dangerous "accident" at the Ashokan reservoir in 1993, DEP engineers opened the wrong gate, sending waters from the turbid west basin of the Ashokan into the Kensico Reservoir. To deal with the cloud of turbidity that hit the Kensico, the City had to dump tons of alum directly into the Kensico Reservoir in violation of the 1990 Federal Court Order forbidding the City to dump treatment chemicals into its reservoirs without a State Pollutant Discharge Elimination System (SPDES) permit. The City claimed at the time to have obtained a so-called "Emergency SPDES permit" from State Officials. No such permit exists under Federal law.[174]

Even during proper operation, waters from the Ashokan pose a tremendous threat to drinking water quality. As recently as January 2001, confidential sources informed Riverkeeper that they recorded turbidity levels in water coming from the Schoharie Reservoir as high as 55 NTU in early January and that turbidity even approached 100 NTU on several occasions. High turbidity levels make it most of the way to New York City. On or about December 17, 2000, DEP came perilously close to the 5 NTU limit when muddy waters from the Catskills made its way to the Kensico after a heavy rain event. Turbidity levels in the Kensico rose to 3.2 NTU. Many predicted that DEP would face similar episodes this spring when rain events were compounded by snowmelt.

Internal communication glitches and conflicts among different DEP departments have led to even more disastrous turbidity events. On March 9, 1998, Thom Hook and Tim Lawler ordered System Operations to close certain reservoir gates in order to set the Catskill Aqueduct to bypass the Kensico Reservoir and send water directly to the Hillview Reservoir. Ignoring advice from Systems Operation staff that such an operation requires six to eight hours to allow turbidity to settle, Hook ordered the gates closed. Turbidity levels in waters entering the Kensico immediately spiked to an astounding 64 NTU. Exceeding the 5 NTU limit did not cause the City to violate its federal filtration avoidance order because alert Systems Operations staff defied their superiors and aborted the mission before the EPA time limits were surpassed. Nevertheless, DEP labs estimated that 24 million gallons of water entering the City system had turbidity values between 20 and 64 NTU.[175] According to one DEP employee, "even though we didn't exceed the EPA tic mark, that incident jeopardized City water consumers. [The new engineers] don't know how to run the system."

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[174] *See* 33 U.S.C. section 1342(a) *et seq.*
[175] *See* Memo from Mark Donecker, System Operations, DEP to Tim Lawler, P.E., DEP (March 10, 1998).

DEP has failed to take adequate steps to control the turbidity threat, especially in the Schoharie and Ashokan Basins. The 1997 Watershed Memorandum of Agreement and Filtration Avoidance Determination called on DEP to complete stream stabilization and restoration projects in these areas.[176] Recent progress reports reveal these efforts to be either behind schedule or plagued by typical DEP bureaucratic delays. A typical example is the important project to reduce erosion-related impacts on water quality in the Prattsville Flood Plain. This critical project has been in the planning and approval stages since 1997. Construction will not begin until 2002 at the earliest.[177]

Conclusion

Under the Catskill/Delaware Filtration Avoidance Determination granted to the City by EPA, DEP is committed to ensuring a supply of drinking water that both meets safety criteria and supplies the needs of water customers. This Determination, or FAD, expires in 2002; the City must either obtain a successor FAD or begin the hugely expensive process of filtering these primary water supplies. The deteriorating condition of the water delivery infrastructure, including the Delaware Aqueduct leaks as well as the maintenance issues facing an antiquated system, threatens the City's ability to qualify for a new FAD. DEP leadership must begin to address these issues, before it is too late, in order to preserve New York City's ability to provide high quality, unfiltered drinking water.

[176] *See* New York City Watershed Memorandum of Agreement para. 127.
[177] *See* New York City Department of Environmental Protection, Quarterly Report on the Status of Implementing Projects Designed to Reduce Nonpoint Source Pollution, Oct. 1, 2000 - Dec. 31, 2000, at 37.