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Water Conservation and Long-Term Water Supply Planning in The Hudson Valley: A Rockland County Case Study

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IT SEEMS PARADOXICAL: THOUGH THE HUDSON VALLEY HAS AN ABUNDANCE OF WATER, ROCKLAND COUNTY FACES A WATER SHORTAGE. THIS CIRCUMSTANCE IS THE RESULT OF LAND USE DECISIONS TAKEN OVER MANY DECADES TO ACCOMMODATE MASSIVE GROWTH PRESSURES.

Responding to the shortage now in Rockland requires managing the complex interaction of four factors, two universally present in New York, two less common but very important in Rockland.

Home Rule: In New York State, land use decision making and water policy planning are highly decentralized, local government prerogatives;

Framgmented state regulation: The New York State Department of Environmental Conservation (DEC) is charged by law with protecting the supply and quality of the state’s water resources. The New York State Department of Health works directly and with county health departments to assure the safety of water provided by community water systems.

No access to a key regional resource: When the New York city water system was built in the early 20th century, state law

provided access to its water as a matter of right to residents of four counties through which it passed: Westchester, Putnam, Ulster and Orange. Unlike these other Mid-Hudson counties, Rockland does not have a legal right to use water from the New York City system.

A Private Supplier: Rockland County relies upon United Water New York (UWNY), a private company, to supply the vast majority of its water. This in turn has one simplifying and one complicating consequence:

- On the up side, it provides a rare opportunity for a county-wide approach, home rule notwithstanding.
- On the down side, it makes settling upon and implementing an integrated policy approach harder at both the state and local levels. At the local level, water sale and delivery is disconnected from

the authority to regulate its use. At the state level, because private water companies are utilities regulated by the Public Service Commission, an additional actor is brought powerfully into the picture.

Starting in 1980, regularly recurring drought conditions in Rockland resulted in the implementation of a series of demand reduction measures. Nonetheless, in 2006, the County hydrologist found that UWNYS peak water supply capacity had not been adequate since at least 1990, and that “[a] similar, but less immediate problem exists on an average supply and demand basis.” The Public Service Commission (PSC) required UWNYS to develop a new source of supply in that year. In the following year the company sparked considerable controversy by proposing a desalination plan for water drawn from the Hudson River as the best plan to meet the county’s long term water needs. Most localities in the county objected, and after review of its Draft Environmental Impact Statement (DEIS) the DEC required the company to prepare a revision, giving greater consideration to demand mitigation and reduction strategies, among other changes. The resultant revised DEIS was accepted by the DEC in January 2012 and released for public comment.

Six years into the process, the manner in which Rockland County’s future water needs will be met is still not settled. Some area activists and elected leaders persist in questioning the need for the proposed

desalination plant. A number continue to argue, too, that a part of the county’s future water needs might be better met through increased conservation. Many wonder about a state and local governance system that is unable in controversial areas of policy to reach decisions key to the county’s future in a timely manner. This discussion brief reviews this important ongoing debate about determining water policy for Rockland County, with an eye to what it tells us not only about the substantive policy choices but also about how we make them.

The Policy Context

Water shortages, like other shortages, are about too much demand, or too little supply, or both. Solutions must either increase supply or decrease demand or do some of each.

Increasing supply involves finding a usable, reliable source of water in sufficient quantity, tapping it, making sure its quality is assured and protected, and getting it to where it is needed. Not inexpensive, and not easy.

Reducing demand requires either identifying technologies that provide efficiencies in the use of water and giving people incentives to use these – e.g. installing different plumbing fixtures, or inducing simple but elusive changes in human behavior – e.g., watering lawns no more than needed. The idea is to get the same or more results with less water. This can, in some cases, be cheaper than producing more supply. One challenge, however, is that it typically requires action by a substantial number of users to make a difference.

Then there are the externalities. Often these are longer term. They involve answers to questions like: What is the effect of the solution or combination of solutions you choose outside of the supply/demand equation? How will it or they affect the culture, environment, and economy?

Embedded here are the questions of our time horizon and achieving long-term effects.

- Whether we build more capacity or invest in reducing demand, what level of residential and economic development do we want to invest in or prepare for?
- If we incorporate demand management into our plans, how can we be confident of the level of demand management we can achieve?

The choice of a strategy or combination of strategies gets even more complicated when there are different actors with different powers and different incentives situated to affect supply and demand. On the demand side in Rockland County, as elsewhere, county government is responsible for overall planning and has the power—through regulations and prohibitions – to impact consumption. The county’s five towns and nineteen villages have control over land use, a key element in driving the demand for water. The county, towns and villages must act, however, under the eye – and sometimes at the direction—of two state agencies: the Department of Health (DOH), responsible for the safety of water for human consumption, and the

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Department of Environmental Conservation (DEC), charged with assuring the long term viability of the region’s water ecology, including preserving the recreational uses of water bodies and maintaining adequate stream flows, a concern that arose in Rockland County as recently as 2005 (Heisig, 2010).

On the supply side in most places in the Hudson Valley the provision of water is a governmental function. This results in decentralized delivery. Not so in Rockland County where there is a private company, UWNY, that supplies most of the water. As an investor-owned public utility, UWNY is regulated not by the county government but by a third state agency, the Public Service Commission (PSC).

Private water suppliers have a long tradition in Rockland County. The Spring Valley Water Company (SVWC) was established in 1893, acquired by Hackensack Water Company in 1900, and changed its name to UWNY in 1995. Today UWNY serves 90% of the county population directly and 3% indirectly, with the remaining 7% relying on small water suppliers or 6000–8000 private wells serving individual homes. Rockland County is near unique in the Hudson Valley in dependence upon a

single water supplier, a seeming advantage in developing a truly workable “regional” plan.

United Water’s supply comes primarily from groundwater: 32% from 40+ bedrock wells in the central and eastern part of the county and 31% from the Ramapo Valley Well Field comprised of 10 shallow wells in the unconfined sand and gravel aquifers of the Ramapo and Mahwah River valleys. The remaining 37% comes from Lake DeForest, a reservoir on the Hackensack River completed in 1964.

There are many other factors that affect the water supply issue in Rockland County. County elected officials, mindful of public opinion, want to keep water supplies flowing and prices down. Professionals in state and county government – planners, environmental scientists, health department administrators – have informed ideas about what constitutes best practices. United Water is in business to make money. In the regulated utility context a water supplier can increase profits by increasing investment, but, typically, investing in demand management has not counted as part of the “investment” on which regulated utility profits are based (Cortright, 2012). In choosing how to proceed, the company must satisfy state regulators. This

paper explores how this array of interests may be aligned in the public interest.

Regional Planning, Home Rule and Water Policy

In southern New York State much of the overall planning and management activity for potable water supply is focused on meeting New York City’s needs. In addition to the city itself, New York City’s system supplies water to most of Westchester and smaller parts of Putnam, Orange and Ulster counties. Rockland County is an outlier among counties in the Mid-Hudson region of the state in that it does not have the legal right to utilize the city’s water system. (This is also true of Dutchess County.) Thus, though Rockland County has been profoundly affected by the same growth patterns driving development in other parts of the region, the county is largely on its own for water supply planning.

One key question in integrated water supply planning is the appropriate role for efficiency and conservation measures. In the northeastern US we have relatively abundant rainfall. Most communities near the Hudson River have actual or potential access to the river as a very large water source, and several use it already (Cuppert and Urban-Mead, 2010). At the same time, producing,

treating and distributing water all use energy and entail other economic costs and environmental impacts. The significant economic implications are not always fully understood. On the one hand, they include opportunity costs if adequate water for economic development is not available. On the other hand, they may result in unnecessary capital and operating costs for new water supply infrastructure if plans don't factor in reasonable water efficiency measures.

Rockland County represents an unusual Hudson Valley case, one in which demand is projected to exceed water supply in the next few years and the priority is therefore high for weighing the costs and feasibility of measurably increasing water conservation against the costs of a concomitant increase in supply. United Water frequently makes the point that its revenues have been decoupled from consumers' water usage by the Public Service Commission, to eliminate any disincentive for the company to promote water conservation. Removing disincentives, however, is not the same as providing incentives, and, as noted above, conservation investments don't generate profit like supply investments do.

In most other communities in the region water provision is a public function, and supply usually exceeds projected demand. Efficient use of water is one of many potential local government improvement opportunities, but it is one that may actually cost the supplying govern-

Primary State Agencies Involved in Water Policy and Regulation

NY State Department of Health (DOH)

The NY State DOH regulates public and private water supplying entities to ensure that there is an adequate quantity of water available for residential, commercial and firefighting uses, and that potable water quality meets standards intended to protect human health. Many counties in the state have a Department of Health that implements many aspects of the state's regulations locally (for the others, the state DOH administers the regulations directly). County health departments are authorized to enact certain regulations for relevant activities that are more stringent, i.e. more protective of public health, than the state's underlying regulations, but not to adopt regulations that are less stringent. The recent Executive Order describing the Rockland County DOH functions regarding the management of water resources provides a more detailed overview.

NY State Department of Environmental Conservation (DEC)

The NYS DEC is responsible for developing and administering regulations to protect and manage water resources in the ambient environment, including parameters that are directly related to human health. Its role includes oversight of the quantity of water in streams and other water bodies – e.g., to ensure that adequate stream flow is maintained to protect fisheries and other wildlife and ecological resources. It also includes oversight of water quality: DEC is responsible for the regulations governing all permitted discharges of municipal and industrial wastewater to surface water bodies, and for discharges to groundwater of 1,000 gallons/day or more. The agency's water quality regulations also cover stormwater runoff and nonpoint source pollution. The DEC administers water supply permits which regulate withdrawal of water from the environment for potable water supplies and other uses. A state law adopted in 2011 expanded the range of uses for which a permit is needed, but withdrawals for potable water supply systems were already required to obtain this permit (individual household wells are not subject to this requirement).

Public Service Commission (PSC) and Department of Public Service

The Public Service Commission is an appointed board responsible for regulating rates and certain other aspects of service provided by private water companies in New York. The Department of Public Service serves as the staff to the PSC and acts at its direction. The PSC is responsible for ensuring that private water companies provide an adequate quantity of water at a fair cost to meet the needs of consumers while allowing water companies an adequate rate of return on investments.

NY State Comptroller

The NY State Office of the State Comptroller (OSC) is responsible for oversight of many aspects of state and local government budgets and financial affairs, including the finances of municipal water systems in villages and cities. OSC also has a more limited role in regulating the creation and expansion of water districts and in assuring that their revenues cover the costs they incur. The Comptroller's office is not involved in this particular case because it does not oversee finances or rates of private water companies – this is the PSC's role.



ment revenue. Water supply is financed through fees: less water supplied means less revenue. Public suppliers, not regulated by the PSC, thus may have little incentive to promote water conservation unless it is accompanied by an increase in water rates. If a manager must maintain a system's overall revenues notwithstanding efficiency measures, and he or she increases rates, the bills of most consumers who conserve likely won't go down. In these communities, when efficiency is sought, priority is almost always given to finding and fixing leaks in the distribution

system, generally the lowest hanging fruit that calls the least upon consumers to change their behavior.

In general and in the abstract, few would question the value of ongoing attention to efficient use of water as a prudent practice. But even where there is general agreement among all the stakeholders, there are many questions on specifics. What are appropriate, reachable goals for conservation? How far and fast should infrastructure upgrades (e.g., installing more efficient fixtures) be pushed? How much stress

should be placed upon education to change behavior among water consumers? Decisions about these questions are decentralized. They are largely up to individual water suppliers and local elected leaders and their appointees.

In areas of the country where water is in short supply, California and Arizona for example, conservation and efficient water use have long been integrated into planning. California Senate Bill #7, enacted in November 2009, requires all water suppliers to increase water use efficiency with specific goals and deadlines. Arizona's Groundwater Management Act requires large providers to choose one of four conservation programs offered.

Cary, North Carolina is an East Coast example. Cary is similar to Rockland County in its precipitation and its development patterns. When Cary decided to establish its own water supply and stop relying on neighbors in 1996, the process it undertook provided a textbook example of the incorporation of water conservation into water supply planning (Platt, et al, 2001).

Closer to home, New York City has been doing long-term water supply planning since the nineteenth century. As recently as the 1960's New York City's mayor was proclaiming that not metering water use was a sign of the city's greatness, but by the 1990's the city implemented an ambitious water conservation program. For three decades now NYC has been lowering its consumption

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on both an absolute and a per capita basis. The NYC Department of Environmental Protection (DEP) reports annually on its progress in developing and implementing programs to increase the efficiency of water use and on next steps in developing new water conservation programs (NYSDEC Water Conservation Report, 2011). In contrast to Rockland County, however, both Cary and New York City are supplied by public municipal water utilities, not private providers.

Water policy decisions in New York are further complicated by the fact that ours is a home rule state. Local, not regional, land use decisions drive planning for water and wastewater infrastructure. With decentralized decision-making the norm, and water a secondary consideration in planning, Rockland County's experience may be a harbinger of a future time in which land use and development trends bump up against the sustainable capacity of local watersheds.

Development, Precipitation and Drought History

The opening of the Tappan Zee Bridge across the Hudson River on December 15, 1955 triggered the modern development of Rockland County. Rockland is the third most densely settled and the smallest county

in land area in New York State outside of New York City. When the 20th century began, 38,298 people lived within its 174 square miles; in 2010, at 311,687, the population was about nine times this size (US Census, 2010). Average rainfall is about 48 inches per year.

Drought has actually been a recurring phenomenon in the Hudson Valley and Rockland County for centuries. A look at tree-ring data from the Hudson River Valley allows measurement back to 1550; there is evidence of serious droughts in 1570, 1630, 1700 and 1820 (Cook, et al, 1996). However, drought was not a pressing policy issue until population began to grow rapidly during the second half of the 20th century (Lyon, et al, 2005). It makes no difference which of three definitions of "drought" is used; the story is the same. The longest, most severe drought of the 20th century occurred in the 60s. There was a recurrence of drought in the mid-eighties and mid-nineties, and then again early in the 21st century. Less severe droughts occur more frequently. The drought conditions experienced in 2005 occurred once every 2.2 years on average since 1900, but only every 3.3 years since 1970, which was a wetter period (Lyon, 2010).

Private Water Supply Companies in the Hudson Valley

Though roughly 15% of the people in the US obtain their water from a private water company, in New York State that proportion drops to 5%. In the Mid-Hudson region counties of Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester, however, it rises to 17%. This is primarily because United Water New York supplies water directly to 90% of the people in Rockland County. An additional 109,000 people in Hudson Valley counties are estimated to be served by roughly 115 small water companies (PSC, 2010).

Most people in the US and in NYS who obtain water from private companies are served by large companies. However, most of the private water companies in the US and NY are small. Company size impacts the most important issues faced by water companies and their customers. Small water companies often find the cost of complying with water quality regulations nearly prohibitive.

Earlier Conservation Efforts

Serious water conservation efforts in Rockland County date back to the drought of 1980. Even though the 1980 drought did not measure as extreme or severe, the county's population

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Drought Definitions

Palmer Drought Severity Index

The most commonly used drought definition in the US is the Palmer Drought Severity Index (PDSI). The PDSI, developed in 1965, takes into account the available water content of the soil as well as precipitation and temperature. Human impacts are not considered. It provides standardized measurements of moisture conditions to permit meaningful comparisons between different locations and time periods. The eleven PDSI drought categories range from extreme drought, through near normal, to extreme wet conditions. Zero values (and those between -1.0 and +1.0) on this scale represent “average” conditions for combined precipitation and temperature data. Values greater than +1.0 indicate wetter than average conditions; values less than -1.0 indicate drought conditions. The Hudson Valley has experienced severe or extreme drought in 15 periods since 1895, or about one every 7.5 years, lasting in total 70 months, for an average of about 5 months per drought occurrence.



Rockland County Department of Health Drought Definitions

The Rockland County Department of Health has defined multiple criteria for declaring Drought Watches and Drought Emergencies. In the first criterion a series of precipitation thresholds are defined, based on departures from a 20-year average of precipitation. A second criterion is the total capacity of water available for augmentation of base flow in the Ramapo River, relevant because over 30% of the Rockland County water supply comes from alluvial well fields. A third criterion is the level of water in the Lake DeForest reservoir. These definitions are the basis for the county Health Department’s triggers for the imposition of mandatory water use restrictions during droughts.

There are five levels of these restrictions, beginning with limitations on lawn and garden watering, the prohibition of use of non-recycled water for ornamental purposes and serving drinking water in restaurants unless requested. Level 3 restrictions, the most severe imposed in the generally wet period since the drought emergency framework was adopted in 1981, include prohibition of lawn watering and all paved surface washing and limitations on water use by golf courses, nurseries and athletic fields. Commercial and industrial water users are required to submit water conservation plans to reduce consumption by 10% - 30% as varying levels of drought are declared by the County.

Population, Drought and Water Supply

“Drought” refers to a deficiency in water availability in an area. Whether or not drought is a problem depends on the relationship between demand and the drought-diminished supply. Demand itself reflects the population of water users and the average daily use, which varies by type of user and most often by season as well. Rockland County is an example of an area that has had droughts for centuries without significant problems, until population and the subsequent rise in demand reached a level that stressed existing supplies. While demand management can be an effective tool in the water supply provider’s tool chest, growing population counters the effect of lowered per capita demand on the sufficiency of water supply.

Table I: 20th Century droughts in the Hudson Valley based on meteorological records

Periods of two or more months of severe or extreme drought since 1895

Start to End: Month/Year	Duration in Months	Lowest PDSI	Lowest Month
11/1908-1/1909	3	-3.50	12/1908
11/1909-12/1909	2	-3.61	12/1909
10/1910-1/1911	4	-3.20	10/1910
4/1911-7/1911	4	-4.02	5/1911
12/1930-1/1931	2	-3.15	12/1930
10/1941-2/1942	5	-3.76	11/1941
4/1942-5/1942	2	-3.12	4/1942
10/1949-12/1949	3	-3.97	12/1949
8/1957-11/1957	4	-3.54	11/1957
10/1983-12/1983	3	-3.74	10/1963
5/1964-9/1966	29	-6.66	11/1964
1/1967-2/1967	2	-3.13	1/1967
4/1985-5/1985	2	-3.38	4/1985
8/1995-9/1995	2	-3.14	9/1995
12/2001-2/2002	3	-3.60	2/2002
TOTAL	70		

Source: Northeast Regional Climate Center (Cornell)

level of consumption to the next, providing consumers a financial incentive to use less water. Non-residential rates have a pricing structure that first increases and then decreases, and therefore doesn't provide that incentive for the very largest users (Walton, 2010).

In November 1980, the Commissioner of the NYS DEC, Robert F. Flacke, took two actions specific to Rockland County. He appointed an Emergency Drought Coordinator to oversee the operation of the Spring Valley Water Company and initiated a study of Rockland County's water supply (NYSDEC, 1982). The DEC released an interim report quickly, in January of 1981, proposing immediate actions to address the drought. These included the development of guidelines for the operations of Lake DeForest and recommendations for the Rockland County Department of Health (DOH) to prepare changes to the sanitary code allowing for mandatory drought restrictions during DOH-declared droughts.

Before the final DEC report was released Rockland County had already amended the sanitary code as recommended, enabling mandatory water use restrictions during declared droughts. In its final June 1982 report, DEC asserted that more effective use of existing facilities and the institution of water conservation measures should be given priority before new water supply sources and facilities were considered. The report noted that actions taken during the 1980-81 period –

growth made the impact more significant.

Multiple conservation steps were taken. On January 1, 1980, the NY State water-saving plumbing fixtures law took effect, requiring sinks and faucets, showerheads, urinals and toilets to meet certain water-saving requirements. One study estimated that this law reduced water use in Rockland County by 5.5% in 1985, 6.3% in 1990 and 10.3% in 2000 (NYS DEC Division of Water, 1982). Also in 1980, a summer-winter water rate

structure for the county was established at the initiative of the PSC. Initially summer rates were set at three times winter rates. The overwhelming negative public response led to the reduction of the summer rate differential to 1.5 times winter rates in 1981, where it remains today (UWNY, 2000).

Residential and non-residential water rates are set at different levels and have a different structure. Residential rates have an "increasing block structure"; prices increase as usage goes up from one broad

In 1984 New York created a Water Resources Planning Council charged with developing and supervising a Water Resources Management Strategy for the State, and more targeted strategies for sub-state regions.

public education, conservation initiatives, and rate changes – resulted in the reduction of average daily water demands by about 15%. At the same time, maximum daily demands were reduced by as much as 25%. The DEC report emphasized demand reduction as the preferred option to meet peak water requirements. It also explored other options such as expansion of existing facilities, interconnections with nearby water systems, and the development of new surface water supplies.

NY State Water Conservation Programs

In the years immediately following the DEC’s 1982 report on Rockland’s water supply, New York State began developing a broader water strategy that included elements presaged by the conservation activity advocated by the state in Rockland County.

In 1984 New York created a Water Resources Planning Council charged with developing and supervising a Water Resources Manage-

ment Strategy for the State, and more targeted strategies for sub-state regions. One of these is the Delaware/Lower Hudson Region, which includes New York City, Rockland County and seven other counties.

The statewide water supply strategy adopted by the Water Resources Planning Council in 1988 included a recommendation calling for the development of “Water rates that reflect the true cost of water” (NYS DEC, 1989a, p. SR-5). It calls on four state agencies -- the DEC, DOH, PSC, and the Comptroller -- to undertake four tasks to develop revised rate and pricing structures. The regional strategy identifies water conservation as “the front line for planning for the present and future needs of the region” (NYS DEC, 1989b p. 3-9).

The NYS DEC Water Conservation Manual for Development of a Water Conservation Plan (1989, reprinted in 1998) provides guidance to water suppliers to help them comply with the state requirement for conservation plans as part of any permit application for water provision. It’s noteworthy that the manual directly addresses the challenge involved in implementing conservation in areas served by private utilities that lack enforcement authority. It indicates that such water suppliers, “(should) ne-

Table II: Residential rates per ccf (per 100 cubic feet) in Rockland County rise as usage increases; non-residential rates don’t for the biggest users.

RESIDENTIAL RATES	WINTER RATES	SUMMER RATES
<i>1st 900 cubic feet per quarter per ccf (per 100 cubic feet)</i>	\$3.346	\$5.033
<i>For all over 900 cubic feet per quarter per ccf (per 100 cubic feet)</i>	\$3.997	\$5.975
NON-RESIDENTIAL RATES	WINTER RATES	SUMMER RATES
<i>1st 900 cubic feet per quarter per ccf (per 100 cubic feet)</i>	\$2.97	\$4.183
<i>For the next 269,100 cubic feet per quarter per ccf (per 100 cubic feet)</i>	\$3.40	\$5.087
<i>For all over 270,000 cubic feet per quarter per ccf (per 100 cubic feet)</i>	\$2.372	\$3.545

Source: United Water New York 2012

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gotiate enforcement measures with local governments” (NYS DEC, 1989, p. 42). There is no evidence that this has occurred in Rockland County.

Though the Water Resource Management Strategy is the state's official policy framework for water resources management in this region, it has been largely forgotten. The required bi-annual review and update process for regional strategies was never implemented after the original policies were adopted.

A state law encouraging water reuse, adopted in 2005, makes “water conservation and reuse... priorities as we move into the future” (NYS Law, 2005, 4471B). A water reuse study called for in this law was completed and released by NYS DEC in November 2010. Two years earlier, in 2008, Commissioner Gran- nis of NYS DEC launched a sustainability initiative that included water conservation as one focal point. Illustrative of the inter-agency complexity of New York State government activities concerning water policy, this ongoing sustain- ability collaboration/initiative includes not only the DOH but also the NYS Environmental Facilities Corporation and the NYS Energy Research and Development Authority. Also in accord with this effort, the

NYS Environmental Facilities Corporation (a public ben- efit corporation established as the pass-through agency for federal funding for the State Revolving Loan Fund for water and wastewater infrastructure) has relatively recently produced a series of fact sheets aimed at specific commercial sectors encourag- ing water conservation. This agency's funding guidelines and decisions are increasingly incorporating sustainability concerns, including water and energy conservation.

Currently, following the DEC's conservation policy, when water suppliers receive a new or significantly revised water supply permit from the agency, they are generally required to implement certain conservation measures in their water systems, including met- ers on all sources and users, and leak-detection programs. More ambitious measures, such as education or incentives to reduce demand, or retrofit programs for toilets and other fixtures, have generally not been required by the DEC.

1990s: Response to Drought

In 1991, in response to the NYS PSC, Rockland's water supply company (then still the SVWC) commissioned a study to determine whether conservation could postpone



Roaring Brook (dry stream bed). Photo credit: Steve Chillrud, 2012. During dry periods in our region, the primary source of stream flow in many streams is groundwater that reaches surface streams after it flows laterally through the subsoil, known as base flow. Smaller streams can dry up earlier in the summer when the water table is lowered, and the USGS study of Rockland County's water resources found this happening in some locations due to pumping from United Water's wells. This photo shows Roaring Brook, a tributary of Sparkill Creek that drains into the Hudson in, during a dry spell in early July 2012.

the proposed Ambrey Pond water supply project and to explore what role conservation could play in long-term water supply planning (Gradilone III, 1996). Phase 1 of the study was planned for 1991-1995 with Phase 2 scheduled for 1996-2001.

Meanwhile, in 1993 a conser- vation program was imple-

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mented. Carefully designed, based on a survey done to understand then-current practices, attitudes and preferences, it included customer education and the distribution of low-flow devices to residences (close to 25,000 customers in the first 9 months). The PSC approved the conservation program as proposed by UWNY and further recommended accelerating the implementation of the water conserving retrofit device distribution component (Gradilone III, 1994). Since that time the company has regularly disseminated consumer conservation information using direct mail ads, radio and cable TV and public events and presentations (UWNY, 2008). An outdoor water conservation program was also initiated in 1993. Its central element, started the next year, is an evapotranspiration (ET) program that lets customers know each day whether lawn watering is required and, if so, how much. This effort too was thoughtfully planned. It started with a lawn watering practices survey to understand people's watering practices and the reasoning behind them. ET numbers were then provided to address the most common practices: weekend watering and watering every four days. Analyses and surveys were conducted following the first year of the program's implementation to determine its impact (Gradilone III, 1996).

The company also addressed its own practices. It installed water-conserving fixtures and established xeriscape gardens (with plants selected to require minimal irrigation) at its own facilities. It also studied internal company operations to identify opportunities to save water. As a result of the implementation of these demand reduction strategies, by 2000 unaccounted-for water in Rockland County decreased from 20% to 12-14% (UWNY, 2000).

In sum, the efforts to increase conservation in the county worked in the 1980s and 1990s, in some ways providing a model for the rest of the state.

The 2000 Master Plan and After

In 2000, the company (now UWNY) produced a Master Plan that included lower consumption projections, based upon the successful conservation activities of the 80s and 90s and lowered projections of countywide population growth. They concluded that "smaller scale water supply projects are anticipated to be needed to meet currently projected water needs." They said further, "UWNY intends to continue promoting conservation as one of its cornerstones to control water consumption." Finally, they observed "decreases in per capita consumption are evident

for all drought declaration years" (Ibid, p. 1-4).

However, drought declarations in 1999 and in 2002 reinvigorated concerns about the adequacy of long-term water supply. With reliance upon groundwater for two-thirds of the county's water, a key fear was that withdrawals were an unsustainably high percentage of total recharge. To address this question, in 2005, the Rockland County Legislature, together with NYS and UWNY, commissioned a US Geological Survey (USGS) study of the county's water resources. Interestingly, nearly simultaneously, the Rockland County Legislature defeated a proposal to reduce outdoor water use in non-emergency situations by requiring rain sensors to control automated irrigation systems. There was no drought warning that year.

Also in 2005, two researchers from the Lamont-Doherty Earth Observatory of Columbia University published a paper evaluating the recent history of recurring drought in Rockland County and concluded that the droughts of 1995, 1999 and 2002 were well within the normal range of past climate variability. They found further that the stress on the water supply could in fact be attributed largely to the growth of demand from residential

The 2007 Plan made virtually no provision for the further reduction of demand for water due to conservation efforts.

development outpacing the growth of water supply (Lyon, et al, 2005). Additionally, they noted as significant key elements of the problematic organizational environment that: a private company supplied the water; the county and the state oversaw and regulated the water supply; and smaller local governments controlled land use and development.

2006 Rate Case: 2007 Long-Term Project Plan for Desalination

In 2006, the Rockland County hydrologist, on the staff of the county's Department of Health, testified before the Public Service Commission that UWNY had an insufficient supply of water to meet a peak demand and deal with future problems arising from average demand (UWNY Rate Case No. 06-W-0131, 2010). In December of 2006 UWNY agreed, pursuant to a Public Service Commission order, to increase Rockland County water supply both in the near-term and the medium term (2015 and beyond).

In January 2007, UWNY submitted a plan for a Long-Term Water Supply project to provide the basis for agreement on how to meet water supply requirements and allowable water rates with the county and the PSC. In this plan, a desalination project at Haverstraw on the Hudson River was

selected as preferable for the provision of additional supply. This replaced the long-considered Ambrey Pond project, a new dam and reservoir in Stony Point for which the Spring Valley Water Company originally filed an application in 1979 and obtained approval, but which was never implemented. The desalination plant was estimated to be easier to construct and expand, more capable of tolerating drought and less expensive over the initial 20-year construction and operating horizon despite much higher annual operating costs.

The 2007 Plan made virtually no provision for the further reduction for demand for water due to conservation efforts. The possibility to eliminate reduced rates in the highest usage block for non-residential customers was explicitly considered during the immediately preceding 2006 rate case, but rejected as "in the best interest of the overall economic health of the County" (UWNY, 2007). The company's September 2008 preliminary Draft Environmental Impact Statement (DEIS) for the proposed desalination project envisioned little additional prospect for conservation gains. It said: "Many water conservation measures – such as changes to the local plumbing code to require low-flow fixtures – have already been implemented." Further, it pos-

ited, "Additional conservation programs will reduce demand, to the extent that they can be implemented," but no effort to identify concrete possible programs or measurements of their potential were identified (UWNY, 2008, p. 18).

Local Response to Desalination Plan

Most members of the Rockland Water Coalition, formed by civic and environmental groups in response to the desalination plant proposal, pressed for increased conservation. A number of the municipalities in Rockland County called for more consideration of conservation before rate increases and/or the desalination project were implemented. Several communities cited the existing 15% water loss rate, an increase from the earlier achieved level, as requiring priority attention. The Town of Ramapo asked the PSC to require United Water to do more analysis of green infrastructure, to "reuse stormwater," to replace infrastructure to reduce leaks, and to provide "incentives for water conservation" (Town of Ramapo, 2008). Orangetown called for the use of water bills as an educational tool to encourage conservation by providing comparisons between individual and average customer usage rates. Noting that the American Water Works Association regarded 30-50% reductions in use



Protestors outside public hearing on proposed desalination plant, Haverstraw Town Hall, March 6, 2012. Photo credit: Anne Phyllis Pinzow, printed with permission from Our Town Newspaper.

through conservation as possible, the town observed further “The potential for conservation measures to reduce water usage and to reduce the need for any new water supply is obvious” (Town of Orangetown, 2010). Clarkstown sought a neutral third party assessment of the underlying assumptions of the EIS, argued for the potential of further conservation measures and undertook to consider a local law to this end (Town of Clarkstown, 2010).

In contrast, and not surprisingly, the Town of Haverstraw, which would receive more local property tax revenues from the proposed desalination plant, expressed support for the project.

A watershed perspective offers one potentially positive aspect of desalination not considered at the local level. Desalination produces a tradeoff from upland freshwater to estuary water, thus reducing stress on upland water resources includ-

ing freshwater streams and rivers. In theory then, freshwater upland sources could benefit from the construction of a desalination plant in Rockland.

NYS DEC’s official scoping document (June 2009) requested additional analysis beyond what was contained in the preliminary DEIS in several areas, encompassing “All existing UWN Y water conservation and leakage management programs, including quantification of possible water savings achievable by 2015” (NYSDEC, 2009). The state agency raised questions about why the PSC, in its rate case, “did not allow consideration of water conservation and efficiency as crediting toward the requirement for increased water volume,” and directed the company to examine best practices elsewhere and, “describe potential measures for enhanced water conservation and implementation of green infrastructure in the UWN Y service area as an alterna-

tive to the Proposed Action.” UWN Y’s revised DEIS, submitted at the end of 2010, was rejected by DEC as not fully responsive to its directives (NYSDEC, 2010).

Finally, in January 2012 the revised Haverstraw desalination project DEIS was accepted by the DEC and released to the public for comment. In this document UWN Y notes the historical and ongoing conservation activities in Rockland County. The company estimates the impact of further replacement of inefficient fixtures with efficient ones over time, based on existing plumbing codes and fixture efficiency standards, is likely to produce a .5%/year reduction in consumption. With projected new development including automatic irrigation systems and multiple shower-heads per shower, they estimate the net reduction in consumption to be .1%/year or .7mgd by 2035. By inference they are assuming no additional impact of the conservation programs they continue to invest in – education and outreach, discounted water-efficient fixtures and the ET program.

Water Conservation in Rockland County in 2011-2012

The 2006 and 2010 decisions by the PSC in response to the company’s requests for rate increases required an annual Water Conservation Outreach and Education Plan from UWN Y. UWN Y’s August 2010 plan included four conservation efforts, accounting for 27% of the proposed \$542,000 to be spent for this purpose (UWN Y, 2100b). There were two school

The Rockland Water Coalition pushed to have the water policy itself included in the comprehensive plan along with specific conservation goals, but the legislature did not agree.

based programs, an effort to further inform customers on incentives in the rate structure to conserve water and work “to encourage customers to conserve water and to be educated on the importance of water conservation.” This latter initiative encompassed promotion of the ET program, promotion of xeriscape gardening, promotion of the conservation website, promotion of low-flow devices, distribution of the annual conservation guide, promotion of water-efficient irrigation devices, promotion of the WaterSense program,

expansion of a consumer water usage survey and partnerships with local landscapers and nurseries. Clearly, though UWNY continues to invest in promoting water conservation, quantitative goals have not been set.

In all the company’s long-term water supply plan communications it makes two major points: Rockland County has done better than most places on conservation, and the company cannot compel compliance by citizens with conservation measures.

On the first point, UWNY is correct. Rockland County residents do use water relatively efficiently. From 2000 to 2009 average single-family residential usage was 68.0 gpcd, average indoor single-family residential usage was 62.2 gpcd and average outdoor single-family residential usage was 11.5gpcd (Lamont-Doherty, 2011). Rockland’s average residential indoor use (62.2 gpcd) is more efficient than the average user in the US (69 gpcd). However, other water use benchmarks also illustrate that there is apparent room for achieving further residential water use efficiency. The issue is whether the county can realistically implement measures that can achieve greater residential water use efficiency (Table III).

UWNY is also right on the second point: it has no authority to demand conservation. Rockland County and its five towns and nineteen incorporated villages, not UWNY, have the authority to pass legislation requiring conservation in non-drought times. The PSC, UWNY, and other parties to a rate case might agree to rate structure modifications and/or rebate or giveaway programs to provide incentives to conservation. But the involvement of so many local governments and other agencies at the county and state levels does

Table III: Benchmarks indicate Rockland County can further reduce its indoor single-family residential water use efficiency (gallons / person / day benchmarks)

Pre-1994 inefficient <i>(David Broustis, Seattle)</i>	70+
1997 intensive research on 12 communities <i>(Aquacraft)</i> , accepted as a good proxy for a national average	69
2000-2009 average single-family residential use in Rockland County (Braman, 2011)	62.2
2008 estimates water use for standard new construction (EPA)	50
1997 conserving home (AWWA)	45
2008 WaterSense conserving home	40
2008 super efficient home <i>(David Broustis, Seattle)</i>	25

Integrated water resource planning and management is essential to the region's and New York State's future economically, socially, and environmentally.

present major challenges for systematically implementing water efficiency programs that UWNYS might reasonably be asked to rely upon over the long term as a component of a water supply plan.

On March 1, 2011, the county adopted a new Comprehensive Plan that recommended further development of a Comprehensive County Water Policy and “the promotion of water conservation” (p. 20). The Rockland Water Coalition pushed to have the water policy itself included in the comprehensive plan along with specific conservation goals, but the legislature did not agree. Rockland County Hydrologist Dan Miller noted, “additional consideration of more extreme water conservation measures... would need to include thorough unbiased assessment of the local applicability, feasibility and enforceability of specific conservation measures... including cost-benefit and time-to-implement analyses” (Miller, 2011).

In March 2012, the Rockland County Executive issued an Executive Order setting forth the functions of the Rockland County Department of Health regarding management of water resources. Four categories of functions are described: regulatory enforcement, technical assistance, scientific investigation, and public

education. Within the scientific investigation discussion, the Executive Order notes “Evaluation of potential conservation measures is also included in our ongoing efforts to maintain an adequate water supply. If determined to be locally implementable, and cost-effective, water conservation measures may be considered by state and local elected officials to reduce the need for future expansion of water supply infrastructure.”

How Can Rockland County Move Forward?

As Rockland County Hydrologist Dan Miller noted, a full analysis of the potential future contribution of water conservation, along with costs and time-to-implement, is needed as the basis for any rational investment in future demand reduction programs. In the absence of a clear PSC or NYSDEC requirement linked to rate setting or environmental regulation, UWNYS has demonstrated its disinclination to take such actions. Therefore, the responsibility falls to the Rockland County government. In January of 2012 the Sustainable Development Workshop at Columbia University, working pro bono, helped the county government move forward by launching a “first cut” four month project that began to analyze the costs and benefits of a range of conservation activities.

The water conservation measures that have been implemented in Rockland County over the past 30+ years have generally been responses to state initiatives: regulatory requirements upon United Water to act, or recommendations to the county, for example encouraging the adoption of drought-triggered conservation requirements as part of the Sanitary Code. Yet this case makes apparent the lack of coordination between the key state agencies: PSC, DEC, and DOH. And there are others involved as well. Consideration of infrastructure needs and options for potable water supply integrated with wastewater and stormwater requirements is just beginning. Energy use and supply considerations are also related; their coordination with water-related infrastructure plans is also just starting to happen. Better integration between these separate sectors (and others including solid waste management and recycling) may reduce costs and environmental impacts and facilitate the identification of opportunities for renewable energy production (Fidelis, 2011).

Outside of Rockland, most Hudson Valley counties – with the New York City system their ace in the hole – have fewer incentives to think broadly about water policy. Perhaps they should. Integrated

Green Infrastructure and Wastewater Reuse: Viable Alternatives for Augmenting Supply in Rockland County?

The debate about how to address Rockland County's water needs has generated discussion about green infrastructure and wastewater reuse alternatives among some engaged citizens and elected leaders. These alternatives have broad implications for the Hudson Valley region and fall into two categories: 1) stormwater management practices, including some known as green infrastructure, to augment groundwater recharge and thereby increase available yield from existing or new wells; and 2) reuse of wastewater effluent from existing treatment plants, after additional treatment steps, to augment potable water availability or for irrigation or other non-potable uses.

Green infrastructure includes a range of practices that are designed to allow runoff to infiltrate into the ground or to allow reuse for non-potable uses (in vegetated practices, a significant portion of the water evaporates through evapotranspiration from the leaves of plants and trees during the growing season). These practices include rain gardens, pervious pavement, green roofs, trees, rainwater harvesting for irrigation, and other variations. They hold more water on the land, reduce surface runoff, protect water quality and encourage groundwater recharge. This is now the preferred approach for managing stormwater runoff in NY State's stormwater policies and regulations, which are primarily aimed at protecting water quality. These practices can also reduce flood risks in smaller storms, a potential benefit which has gained more attention in Rockland County and elsewhere after the historic floods of 2011 in our region.

Wastewater reuse as an alternative or supplement to desalination was considered in United Water's initial planning in 2008 but rejected because of its cost and "the anticipated adverse public response to an alternative involving the use of wastewater for drinking water." The subsequent DEC Scoping Document in mid-2009 called for expanded discussion of reuse. DEC also required UWNY to "evaluate the alternative of installing an additional gray water piping network for collecting, treating and delivering captured runoff for irrigation or other non-potable uses..." and "...the combination of gray water and rain water for irrigation or other non-potable uses, including aquifer recharge." Some opponents of desalination in Rockland County have expressed support for considering wastewater and greywater reuse, in part because it was mentioned as an option worth further study in the USGS study of Rockland's water resources. In 2010, the DEC released a study, "Potential Reuses of Greywater and Reclaimed Wastewater in New York State," but it's not known whether a detailed policy or specific regulations will be proposed by the state, and this study is apparently not referenced in the DEIS (NYS DEC, 2010).

In the DEIS, UWNY evaluates some reuse and green infrastructure options, but they're organized and described in ways that make it challenging to summarize and compare them. In one section, the DEIS discusses "wastewater and stormwater reuse" together and distinguishes between direct reuse and indirect reuse: the former is reusing water for non-potable purposes including irrigation, while the latter is reusing water for recharging aquifers to increase the volume of water available for potable uses. The DEIS also addresses "wastewater reuse" in a separate chapter; here it focuses specifically on the potential for building new wastewater treatment facilities to provide higher levels of treatment for wastewater effluent discharged from existing treatment plants. The effluent would then be used to augment the capacity of Lake DeForest or the flow to New Jersey's reservoirs on the Hackensack River.

While the term "green infrastructure" is often understood to include a strong focus on infiltration of runoff to soil to recharge groundwater, UWNY's discussion combines enhanced water conservation and green infrastructure into a single section and focuses largely on water conservation. It seems to leave out the broader groundwater recharge potential for smaller, site-by-site stormwater management facilities. The DEIS states; "Implementation of a stormwater reuse system involves the collection, treatment, storage, and distribution of runoff." The DEIS briefly addresses onsite harvesting and reuse of rainwater (e.g. with rain barrels or cisterns) for irrigation or other on-site purposes. It also describes injection wells to directly pump water into aquifers and larger infiltration areas to which runoff could be conveyed through pipes.

UWNY's analysis concludes that green infrastructure, reuse and enhanced water conservation can augment the available supply incrementally, but that these approaches are not capable of meeting the PSC order's requirement for 7.5 MGD of additional safe yield capacity, or that they may be "cost-prohibitive." It notes that many of these options would mainly provide additional capacity during wetter periods and not at the very times when more capacity is most needed.

Wastewater reuse to directly augment the Lake DeForest supply is described in the DEIS as "the most feasible alternative for using treated wastewater as reclaimed water..." and it is therefore analyzed in the greatest detail. UWNY states that this alternative, unlike the others, could in fact meet the 7.5 MGD safe yield target. It concludes, however, that it would have greater capital costs than the proposed desalination plant: \$302.6 to \$325.9 million vs. \$139.2 to \$189.3 million. This option would also have higher operating costs.

Overall, however, the DEIS's presentation and cost analysis of all the alternatives lacks transparency and documentation of assumptions, so it is not possible to make fully informed judgments about UWNY's conclusions with the available information.

water resource planning and management is essential to the region's and New York State's future economically, socially and environmentally. Moreover, at both the state and local levels, achieving a more integrated approach is in accord with a major Cuomo administration goal for New York government – restructuring for greater efficiency and effectiveness. The Rockland case provides the outline of an agenda for such integration.

In the current tight fiscal climate, and given overall trends in the US, there is likely to be increasing attention given to the potential for private ownership or at least private management of more water supplies. In Rockland County, private ownership offers the advantage of the potential for systematic action by a single actor to serve regional needs. But the inability of a private actor to compel public behavior to conserve water, the powerful commitment in New York to home rule in land use decision making, and the highly diffuse and decentralized nature of local governmental authority all make it very difficult to develop systematic, comprehensive approaches to regional water policy. In addition, profit-making private companies, responsible to stock holders, are likely to be less considerate of citizen priorities in policy choices. Just as this case demonstrates the need for an integrated state approach, it shows the importance of finding means to induce collective local action to assure the well being of local communities and ecosystems.

Sources:

For a complete list of sources for this paper please reference the electronic version on the State University of New York at New Paltz CRREO website: www.newpaltz.edu/crreo

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