

Water Supply: The History of Newark's Life Source

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July 2009

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**Institute for Public Administration
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Foreword

It is our pleasure to publish this history of water supply in Newark, Delaware. Access to water supplies was important to the city's forefathers. Newark was founded before the American Revolution as a crossroads village due to its fortuitous location at the head of navigation between the banks of the White Clay and Christina Creeks. The rolling Piedmont creeks in and around Newark provided accessible hydropower for dozens of mills and industries during the 18th and 19th centuries. As the city's thirsty population quadrupled during the second half of the 20th century, new wells were drilled in Coastal Plain aquifers, and the long search for a new reservoir was underway. With the completion of the Newark Reservoir in 2006, the first major reservoir built in Delaware since the Great Depression, Newark's is the only water system in the First State that has the flexibility to provide drinking water from groundwater and surface-water sources. At the Institute for Public Administration, we believe that water supply is truly Newark's economic life source. Enjoy!

Dr. Jerome Lewis, Director
Institute for Public Administration
College of Education & Public Policy
University of Delaware

Dedication

This book is dedicated to the elected and appointed officials and staff of the City of Newark, who have modernized its water system by planning for and overseeing the construction and operation of the Newark Reservoir, notably:

City Mayors

Ron Gardner
Hal Godwin
Vance Funk

City Managers

Carl Luft
Kyle Sonnenberg

Assistant City Manager

Carol Houck

City Water Directors

Joe Dombrowski
Roy Simonson

City Finance Directors

George Sarris
Dennis McFarland

City Planning Director

Roy Lopata

City Public Works Director

Rich Lapointe

City Parks & Recreation Director

Charles Emerson

City Council Members

David Athey
Jerry Clifton
John Farrell
Jerry Grant
Karl Kalbacher
Stu Markham
Frank Osborne
Paul Pomeroy
Chris Rewa
Ezra Temko
Doug Tuttle
Kevin Vonck

Table of Contents

Along the Fall Line 1

The Mill Era 1

The Underground Reservoir 4

Reservoir Quest 5

Wild and Scenic 7

A Regional Approach 9

The Churchmans Redemption 10

The Newark Reservoir 14

Epilogue 27

Appendix 1. Chronology of the City of Newark Water Supply System 31

Appendix 2. Site Plans for the Newark Reservoir 36

Bibliography 37

Water Supply: The History of Newark's Life Source

Like many cities along the Atlantic seaboard, Newark was founded at a fortuitous location along streams like the Christina River and White Clay Creek that would provide plentiful supplies for mill power and potable water. From the 17th century, when the Lenni Lenape lived in Opasiskunk along the White Clay Creek, to the operation of the Newark Reservoir in 2009, Newark's growth flowed from the water supplies of these creeks and the ancient aquifers that run under the city. Today, 250 years after King George II chartered trade in was what then a crossroads village, Newark is the only municipality in Delaware able to access drinking water both from underground and surface sources.

Along the Fall Line

The City of Newark strategically straddles the fall line, the zone of rapids and riffles along streams between the hilly, rocky Piedmont (literally "foot of the mountains") Plateau to the north and the flat, sandy Coastal Plain to the south. The fall line runs from New Jersey to the Carolinas (USGS, 2009); through Newark it runs roughly along the Amtrak railroad right of way and I-95. The metamorphic rocks of the Piedmont are about 540 to 250 million years old (DGS). Steeply sloped Piedmont streams such as the White Clay Creek and Upper Christina River were ideally suited to provide the potential energy to power several mills. The two-million-year-old ancient underground sea beneath the Coastal Plain provided plentiful water supplies for wells. The fall line was the upstream limit of navigation to the European sailors and settlers. This unique combination of Piedmont water for mills, the vast underground reservoir of water in the Coastal Plain, and the limit to navigation at the fall line provided a logical place for a new European settlement in America, which later became the City of Newark.

The indigenous peoples of Newark, the Lenni Lenape, settled near the White Clay Creek from the early Archaic period (8000 to 6000 B.C.) through the early 1700s. In 1683, Lenni Lenape Chief Kekelappen sold a tract of land known as Opasiskunk (Indian Town) to William Penn (DCNR, 2009). A 1699 survey map noted that Indian Town was located at the confluence of the east and west branches of the White Clay Creek, just four miles upstream from present day Newark (Fig. 1).

The Mill Era

In 1694 Scots-Irish and Welsh settlers founded the village that would later be named Newark between the banks of the White Clay Creek and Christina River. The two streams provided the necessary drinking water and hydropower for mills to sustain European settlement. These two tributaries enabled settlers to sail up from the Delaware River and then travel overland to points a few miles inland, including the Newark area. By 1758, when King George II awarded a charter for trading in this crossroads village, there were dozens of mills for grain, grist and paper along the two Piedmont streams.

In 1746 English miller William Cooch purchased land along the Christina River at the foot of Iron Hill and later established a mill (Cooch, 1940). Cooch's Mill diverted water from the Christina River in front of the Cooch House along present-day Old Baltimore Pike. After forcing the Continental Army to retreat at the Battle of Cooch's

Bridge on September 3, 1777, the British under Lord Cornwallis overtook the Cooch House. After the family had fled, Cornwallis and his officers bunked there and drank all the liquor that had been left. Both the house and the mill were then burned. In remembrance, Mr. Ned Cooch hung an historic painting over his fireplace that can still be seen at the Cooch House that depicts Cornwallis's surrender to George Washington at Yorktown at the end of the American Revolution.

On September 8, 1777, the British departed from the burned Cooch property by the "light of a remarkable borealis" and moved north through Newark (Cooch, 1936). That morning the British marched "north on Academy Street, east on Main Street and north on Chapel Street, into Mill Creek Hundred." As the British passed through Newark, mischievous soldiers started the machinery in Simonton's flour and grist mill situated along the south bank of the White Clay Creek. Simonton's Mill was just downstream from the present day Paper Mill Road bridge, site of the old National Vulcanized Fiber (NVF).

This site of Simonton's Mill along the White Clay Creek dates to 1702, when William Penn issued a land grant to John Guest to operate a grist mill (Bryant, 2008). In 1882 the Joseph Dean and Sons Woolen Mills were built, which were later replaced by the National Vulcanized Fiber plant, which operated until 1990. A disastrous fire destroyed the Dean Woolen Mills during 1886. The City lacked a water supply to fight fires, and this shortfall led Newark to establish a municipal water system in 1888. In 2003 the City of Newark completed a brownfield-redevelopment project at this site, which converted the former NVF plant from a superfund site to the present-day Mill at White Clay including new offices, condominiums, and Timothy's restaurant.

The only mill remaining in Newark is the brick, three-story-tall Dayett Mills, constructed in 1838 by William Cooch, Jr. along the Christina River, just downstream from present day Old Baltimore Pike (Pencader Area Heritage Association, 2009). The mill is powered by a 3/4-mile-long raceway with headworks at a dam along the Christina River, just downstream from I-95. The Cooch family sold the mill to John W. Dayett in 1884. The mill eventually passed from the Dayett family to Jonathan Irwin. William and Alberta Johnson and Charles Golt acquired the mill in 1948. The mill operated until the 1980s, when Raynor Johnson became the site manager. In 1996 the state of Delaware purchased Dayett Mills, and the 27-acre property is now part of the state park system.

In 1789 Thomas Meteer set up a mill along the White Clay Creek just upstream from Paper Mill Road. In 1848 brothers George and Solomon Curtis purchased the mill and named it Nonantum Mills, the Indian name of their hometown of Newton, Mass. (Cooper, 1991). In 1870 the brick factory and distinctive smoke stack were built. Just after World War II, the Curtis Mill made the paper for the various war-ending peace treaties signed in 1946. In 1997 the James River Company closed the plant, ending paper mill operations after 208 years. Water power for the plant was provided by a half-mile-long raceway with headworks at White Clay Creek Dam No. 5. The dam diverted water into the raceway, where it flowed into a sluice that provided water power for the paper mill. In 1990 the City of Newark acquired the Curtis Paper Mill and raceway to build the White Clay Creek water-treatment plant. During 2007, the Curtis Paper Mill was razed; all that remains is the brick smoke stack with "Curtis" spelled in white brick lettering.



Figure 1. Map of Newark and environs (source: Water Resources Agency, Institute for Public Administration, University of Delaware*, 2008)

*hereafter referred to as WRA

The Underground Reservoir

Between 1758 (when King George II awarded a charter for trading) and 1888, residents obtained drinking water from private wells, springs, and by hauling water from the creeks. In 1888 the City of Newark dug its first municipal well (City of Newark, 1991). The City expanded the water-supply system in 1903 with the drilling of a well at the east end of Main Street at the former location of the Newark Senior Center. The first ten-inch-diameter water main was laid under Main Street connecting the new well with the water tank on the hill along West Main Street across from the Newark Country Club. For 90 years this sole tank controlled water pressures through the City. As neighborhoods grew around the University of Delaware campus, the City constructed additional water mains under the street-grid network.

By the Great Depression, increasing population in downtown Newark and growth of the University increased the demand for water supply. In 1931 the City of Newark constructed the North Wellfield consisting of four wells at the end of Academy Street south of Park Place near the Pennsylvania Railroad. Well water was pumped into an underground tank, where it was treated with chlorine and fluoride. This water plant was one of the first in the United States to add fluoride to the water for dental health. During the 1990s, the City discovered that Well 8 at the end of Academy Street was contaminated with the organic chemical trichloroethylene (TCE) so the well was closed to public water supply use. Well 8 is shallow, only 55 feet deep, and today is still capable of pumping 140 gallons of water per minute to supplement non-potable irrigation by the University of Delaware.

The post-World War II building boom in Newark again increased the demand for public water supply as the city population grew from 5,000 in 1940 to 20,000 by 1970. During the 1950s, '60s, and '70s, neighborhoods such as Arbour Park, Devon,

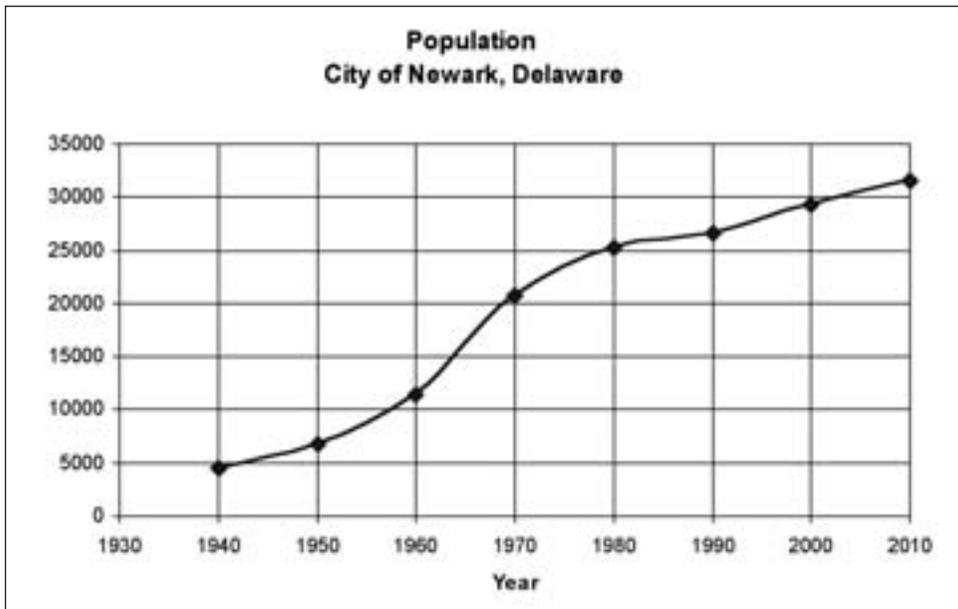


Figure 2. Population in the City of Newark, Delaware (source: Delaware Population Consortium, 2008)

Nottingham Green, and Fairfield sprung up, and Newark became more thirsty. Exploration by the Delaware Geological Survey (1954) found areas of high water yield called paleochannels (ancient underground sand rivers along the old White Clay Creek bed) in south Newark under the campus beneath the university farm and Delaware Stadium.

In 1956 the City drilled wells 11, 12, 13, and 14 in the South Wellfield in the Coastal Plain sediments along South Chapel Street just south of today's Route 4. In 1968 The City developed wells 15, 16, and 19 behind the Scottfield neighborhood near the intersection of South Chapel Street and I-95 and at the intersection of Route 72 and Reybold Road below Old Baltimore Pike. During 1971, the City drilled wells 23 and 25 in the Piedmont rocks near the Fairfield-Fairfield Crest Swim Club at the bottom of the hill from the corner of Country Club Drive and New London Road. During the same year, the City drilled well 19 to 188 feet deep just south of Glasgow High School near the corner of Old Cooch's Bridge Road and Route 896. In 1990, additional Piedmont rock wells 20 and 21 were dug along the banks of the White Clay Creek along Creek Road about a mile north of Cleveland Avenue. After six decades of groundwater supply development, the population of the City had grown from 5,000 in 1940 and is expected to hit 30,000 by 2010 (Fig. 2). Newark drinking-water wells now yield up to 3.5 million gallons per day of drinking water from the Piedmont and Coastal Plain aquifers.

Reservoir Quest

Between 1950 and 1960, Newark's population doubled to 12,000, and public and private interests made plans to supplement groundwater supplies with new water allocations from the White Clay Creek. After World War II, the Pennsylvania Railroad began buying land in the White Clay Creek valley for one of its holdings, the Delaware Water Company. At that time, many of the railroad company's trains were powered by steam locomotives; therefore, water was a critical need. In the 1950s the DuPont Company planned to expand the Newport and Edgemoor plants and drew up plans for a reservoir along White Clay Creek north of Newark to provide the water supply. In 1956 the DuPont Company purchased the Pennsylvania Railroad's land assets and began acquiring additional land in the White Clay Creek valley for the reservoir (WCWA, 2009).

The U.S. Army Corps of Engineers prepared a 1960 Delaware River Basin watershed plan of improvement that included schematics (Fig. 3) for a Newark Reservoir on White Clay Creek and a Christiana Reservoir on the Christina River (USACOE, 1960). In January 1960, the DuPont Company prepared a "Report of Water Resources Study of the White Clay Creek Basin," which recommended a dam on the White Clay Creek as a potential water supply source for New Castle County that would be "only second in yield to the Brandywine Creek." By 1963 a Wilmington Evening Journal editorial supported the cause for a new reservoir, stating, "The people and industry of the county cannot afford to let the [White Clay Creek] keep on flowing wastefully to the ocean."

On January 22, 1964, the Delaware General Assembly passed House Bill No. 444 as amended by House Amendment No. 1, which enabled "...the Levy Court of New Castle County to establish a water-supply and flood-control system in the White Clay Creek watershed...." Later that year on May 26, the New Castle County Levy Court authorized Whitman Requardt and Associates to prepare a feasibility report on the White Clay Creek reservoir.

From 1961 to 1966, streams such as the White Clay Creek suffered from a multi-



Figure 3. Schematic of proposed Newark Reservoir and Christiana Reservoir (source: U.S. Army Corps of Engineers, 1960)

year drought of record. Along the White Clay Creek near Newark, the lowest flow on record (previously dating to 1932) slowed to 4.7 cubic feet per second on September 11, 1966. The drought of 1966 fueled support for the reservoir from state, county, city, and industry officials. In 1965 a group of Newark citizens who opposed the reservoir formed the White Clay Watershed Association (WCWA). Active WCWA members and Newark residents included Dennis Neuzil from the Sierra Club, Don Sharpe from the United Auto Workers, and Dorothy Miller from the Newark Bird Club.

In March 1967, Whitman Requardt (1967) transmitted the White Clay Creek dam and reservoir feasibility report to the New Castle County Levy Court. The report recommended the construction of a 12.4-billion-gallon (71 million gallons per day or “mgd”) reservoir occupying 1,160 acres, half in Delaware and half in Pennsylvania. The proposed 100-foot-high, 1,000-foot-long earth dam would be erected just downstream from what is now Wedgewood Road, creating a four-mile-long pool (Fig. 4). The engineers estimated the cost of land acquisition and construction at \$12 million. By 1967 the DuPont Company had bought 87 percent of the land for the reservoir site. Whitman and Requardt estimated that if construction could begin in 1968, the reservoir could be filled by the summer of 1971.

During the turbulent 1960s and early 1970s, the White Clay Watershed Association stepped up opposition to the reservoir maintaining it would flood precious wetland, forest, and birding habitat and create mudflats up in Pennsylvania. A popular symbol of the activism was the “SAVE WHITE CLAY CREEK, DON’T DAM IT” bumper sticker that Dorothy Miller affixed on her car. In 1973 Dorothy and others, including University of Delaware civil engineering professor Dr. Robert Varrin, formed the Coalition for Natural Stream Valleys, which conducted surveys of the flora and fauna of the White Clay valley.

By the mid 1970s, as the years passed and memories of the historic drought of 1966 grew short, official support for the White Clay Creek dam began to dwindle in the face

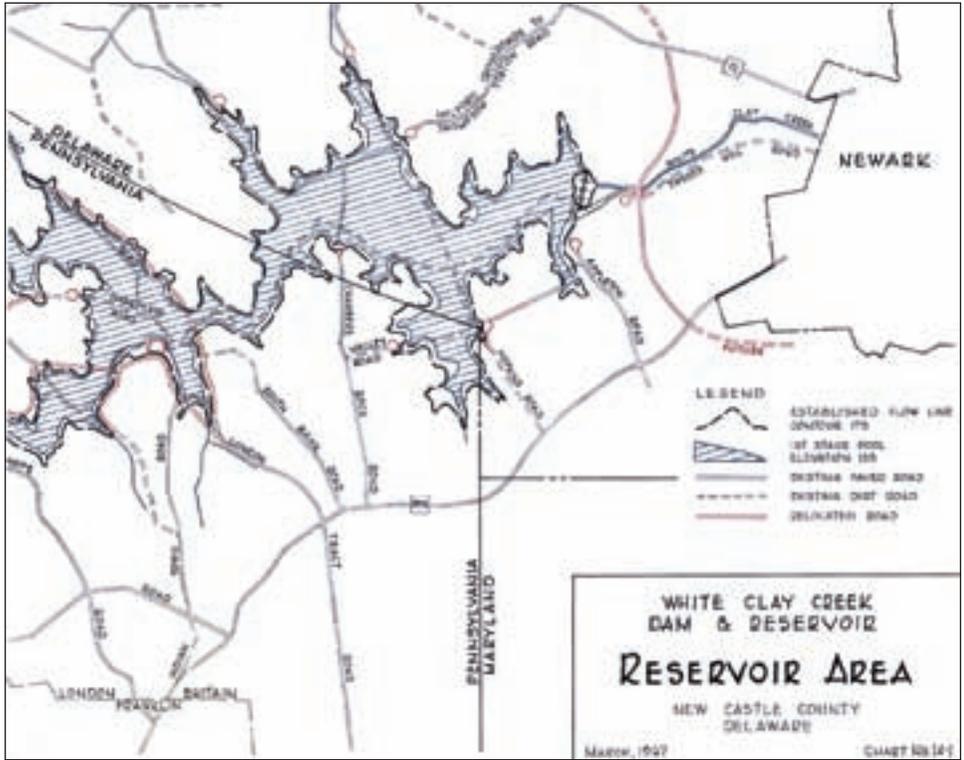


Figure 4. White Clay Creek main stream reservoir (source: Whitman, Requardt, 1967)

of mounting community opposition from the WCWA and the Coalition. In 1984, the DuPont Company realized that the main stem of the White Clay Creek reservoir had little public support. The company donated more than 1,000 acres of the reservoir land to the State of Delaware and Commonwealth of Pennsylvania park systems to establish the White Clay Creek Preserve. Ironically, the quest for the reservoir had resulted in the preservation of almost two square miles of permanent public open space in the White Clay Valley just outside Newark's backdoor.

Wild and Scenic

By the 1990s, public and legislative support grew for greater protection of the White Clay Creek valley. The National Park Service wrote, "On December 11, 1991, President Bush signed into law the White Clay Creek Study Act, responding to the concern of citizens of Pennsylvania and Delaware who lived within the White Clay Creek watershed and who wanted the creek, together with its tributaries and watershed, evaluated for possible inclusion in the National Wild and Scenic Rivers System." In January 1992, The National Park Service formed a White Clay Creek task force. In addition to representation by the City of Newark and WRA, subcommittee members included watershed residents and owners, private organizations, and representatives of local, county, state, and federal governments. In 1995, after the subcommittees had completed their studies, meetings, and reports, the study task force organized a management planning committee to develop this plan for the White Clay Creek watershed study area.

In 2000 legislation was introduced to Congress by then-U.S. Delaware Senators Joseph Biden and William Roth, Congressman Michael Castle, and Pennsylvania legislators to bring the White Clay Creek and its tributaries into the National Wild and Scenic Rivers system (Fig. 5). Public Law 106-357 designating the White Clay Creek as a National Wild and Scenic River was passed by both houses of Congress and signed into law by President Clinton on October 24, 2000 (WCCWS and NPS, 2001).

The White Clay Creek Wild and Scenic River designation is unique because it is Delaware's only Wild and Scenic River. The White Clay Creek became the first Wild and Scenic River in the nation to be designated as such on a watershed basis instead of a river-corridor basis. Federal Wild and Scenic River designation of the White Clay Creek protects the free flowing nature of the stream and effectively precludes a dam and reservoir from ever being constructed in the White Clay Creek valley.

A Regional Approach

By 1970 Newark's population had exceeded 20,000. Groundwater from the North and South Wellfields remained the city's sole water source. With the White Clay Creek main-stem reservoir proposal now only a memory, there still remained the need for additional water supply to sustain the growing population in the greater Newark area.

To resurrect regional water-supply planning, the City of Newark joined with the City of Wilmington and New Castle County to sign a 1974 interagency agreement to prepare a Water Quality Management Plan. By 1977 the three governments formed a policy board, which became the

Water Resources Agency for New Castle County (WRA) responsible for regional water supply planning and management (WRA, 1996). In 1990 the state of Delaware was added as the fourth voting member of the WRA policy board. In 1996 WRA board members included then-Governor Thomas Carper, New Castle County Executive Thomas Gordon, City of Newark Mayor Ronald Gardner, and City of Wilmington Mayor James Sills, Jr. (Fig. 6). In 1996 WRA staff responsible for regional water supply planning and management included Newark residents Bernard Dworsky, Gerald Kauffman, Vern

Policy Board



Figure 6. Policy Board of the Water Resources Agency for New Castle County, 1996 (source: WRA, 1996)

Svatos, and Martin Wollaston.

By 1990 Newark's population was 27,000, and the demand for water was increasing. On April 23, 1990, Mayor Ronald Gardner and Newark City Council appointed the Newark Water System Advisory Committee to address chronic water quality and quantity problems with the Newark water system, which included low water pressure as well as discoloration from high concentrations of iron and manganese. City staff directing the study included City Manager Carl Luft and Water Director Joseph Dombrowski. Water Resources Agency for New Castle County staff wrote the report for the City of Newark. In September 1991, the Water Advisory Committee completed the report (City of Newark, 1991) and forwarded the following recommendations to City Council: (1) investigate a new water-treatment plant at the Newark South Wellfield, (2) rehabilitate the aging water system, and (3) investigate additional regional water supplies including an "impoundment facility that would benefit Newark."

In 1990 the City began plans to access water from the White Clay Creek by purchasing the Curtis Paper Mill water-supply raceway and lagoons. In 1992 the City of Newark completed construction of a surface-water-treatment facility on the north side of town near Paper Mill Road. The treatment plant was designed to treat up to five million gallons per day withdrawn from White Clay Creek. The raw water from the creek enters a settling pond through the 3,500-foot raceway built years ago for the now defunct Curtis Paper Mill. Water is pumped from the pond into the Newark water-treatment plant, where it is then clarified, filtered, and disinfected with chlorine to meet Delaware drinking-water standards (WRA, 2002). With construction of the White Clay Creek surface-water-treatment plant, Newark became the only water supplier in Delaware to have conjunctive use from both wells (3.5 mgd) and streams (3.0 mgd).

A severe drought hit Newark in 1995 renewing the call for a new water-supply reservoir for the city and surrounding county. The City ordered mandatory water restrictions on August 28, 1995, due to declining White Clay Creek stream flows and the prospect of increased water demand from returning University of Delaware students. By September 8, 1995, the White Clay Creek at Newark slowed to its lowest flow since the drought of the 1966, and the City ceased withdrawals at the surface-water-treatment plant. The 12-month annual-precipitation deficit for October 2004 through September 2005 was ten inches, the third lowest total in 100 years. Eight inches of rain in October 1995 ended the dry period. But the drought resulted in the Churchmans Environmental Impact Statement (EIS) study, which began during the 1980s.

The Churchmans Redemption

In the early 1980s, the City of Newark joined in collaborative efforts to address regional water supply needs in New Castle County and north of the Chesapeake and Delaware Canal. These efforts, coordinated by a regional water-management program called the Water Resources Agency for New Castle County (WRA), involved developing an assessment of how much drinking-water supply was currently available, projecting how much water supply would be needed in future years, and evaluating the alternatives for increasing supply to meet those projected demands. These efforts, called WATER 2000, formed the basis for Newark's water-supply efforts for the next decade.

For years, Newark closed the gap between the town's water demands and developed supply by purchasing water from other suppliers. While this approach was acceptable, it still left Newark reliant upon other suppliers to meet the needs of its residents and

businesses. The city was particularly vulnerable to water shortages during drought conditions, when the other water suppliers typically curtailed supply for all customers, including the city. Newark grew weary of this reliance on other suppliers to meet its water needs and established the goal to become water-supply self-sufficient.

As a partner in the WATER 2000 planning work, Newark participated in WRA's efforts to identify the preferred regional water-supply solution for all of northern New Castle County. The work recommended that a new water-supply impoundment be built to store some of the stream flows that were very high during much of the year but almost always dramatically reduced during the summer and early fall. In 1987 WRA began the process of assembling the organizational structure and funding that would be required to conduct the EIS study necessary for a new reservoir. Two preferred sites for a new two-billion-gallon reservoir were identified by the WATER 2000 work, one at an area known as Churchmans Marsh along I-95 and a second a few miles north of Newark on a small tributary that drained to the White Clay Creek known as Thompson Station tributary (later named Lamborn Run).

Since the preferred reservoir at Churchmans Marsh would require dredging to construct, in 1988 WRA filed a Section 404 permit application with the U.S. Army Corps of Engineers. As expected, the Corps responded to the application by confirming that an EIS was necessary to advance this project. All work from this point forward was guided by Corps requirements.

From 1987 to 1990, the City of Newark collaborated with the state of Delaware, New Castle County, City of Wilmington, Artesian Water Company, and Wilmington Suburban (now United Water Delaware) as an EIS Project Management Committee in an effort to develop a work scope and hire a consultant for the EIS work. Additional funding was also identified at this time, as the organizational structure became more formalized. Finally, the firm Metcalf & Eddy was hired by the EIS Project Management Committee to work on the first phase of the EIS, which re-examined future water needs and supplies and alternatives to meet those needs. The Phase 1 work took the next several years to complete and involved the participation of hundreds of people representing technical agencies and public groups. After extensive discussions with federal agencies, state agencies, water suppliers, and many public groups, the future water-supply needs of 20 mgd was finally agreed upon in late 1993.

Throughout this time, Newark continued to work with these groups to advance the idea of developing a regional solution to meet future water needs. In 1994 the Corps of Engineers listed about 40 future water-supply projects that needed to be addressed at some level of detail. From 1993 to 1995, this listing of various impoundments, pipelines, and innovative projects (such as desalination) was steadily reduced, and work began to focus on the two sites originally recommended by the WATER 2000 work, a reservoir either at Churchmans Marsh or Thompson Station. The EIS work finally got the attention of everyone in 1995, when New Castle County again experienced drought conditions during the summer and early fall. The drought required mandatory water-use restrictions and focused everyone's efforts by reminding the public that New Castle County's water supply continued to be vulnerable to the weather.

During 1996, the project committee funded \$1.1 million in extensive field research at both potential reservoir sites. Inventories of plants, animals, and aquatic life were collected and analyzed, including investigations into potential protected species that could possibly live on these sites, such as bog turtles (Fig. 7 and Fig. 8). Detailed mapping of the contours and natural features of these sites was also developed, and numer-

ous water-quality samples were collected. Several Newark officials were optimistic that a regional water-supply solution was finally going to be developed.

Later in November 1996, the Project Management Committee voted to delete the Churchmans Reservoir alternative from consideration due to insurmountable environmental concerns, leaving the Thompson Station Reservoir in the White Clay Creek valley as the preferred alternative. As 1996 ended, Metcalf and Eddy was authorized to conduct habitat, cultural resources, and geologic studies at the Thompson Station



Fig. 7. Churchmans EIS committee tours the Thompson Station reservoir site north of Newark during the winter of 1997. City of Newark Water Director Joseph Dombrowski (far right) listens in. (source: M. W. Wollaston)



Fig. 8. Habitat evaluation of the Thompson Station Reservoir site north of Newark during the winter of 1997. Coalition for Natural Stream Valleys member Dorothy Miller (far right) monitors the work by Federal scientists and the project consultant. (source: M. W. Wollaston)

Reservoir site on some land owned by the state and some owned by Richard du Pont (Fig. 9). A draft EIS permit had been scheduled for release to the public in mid-1997.

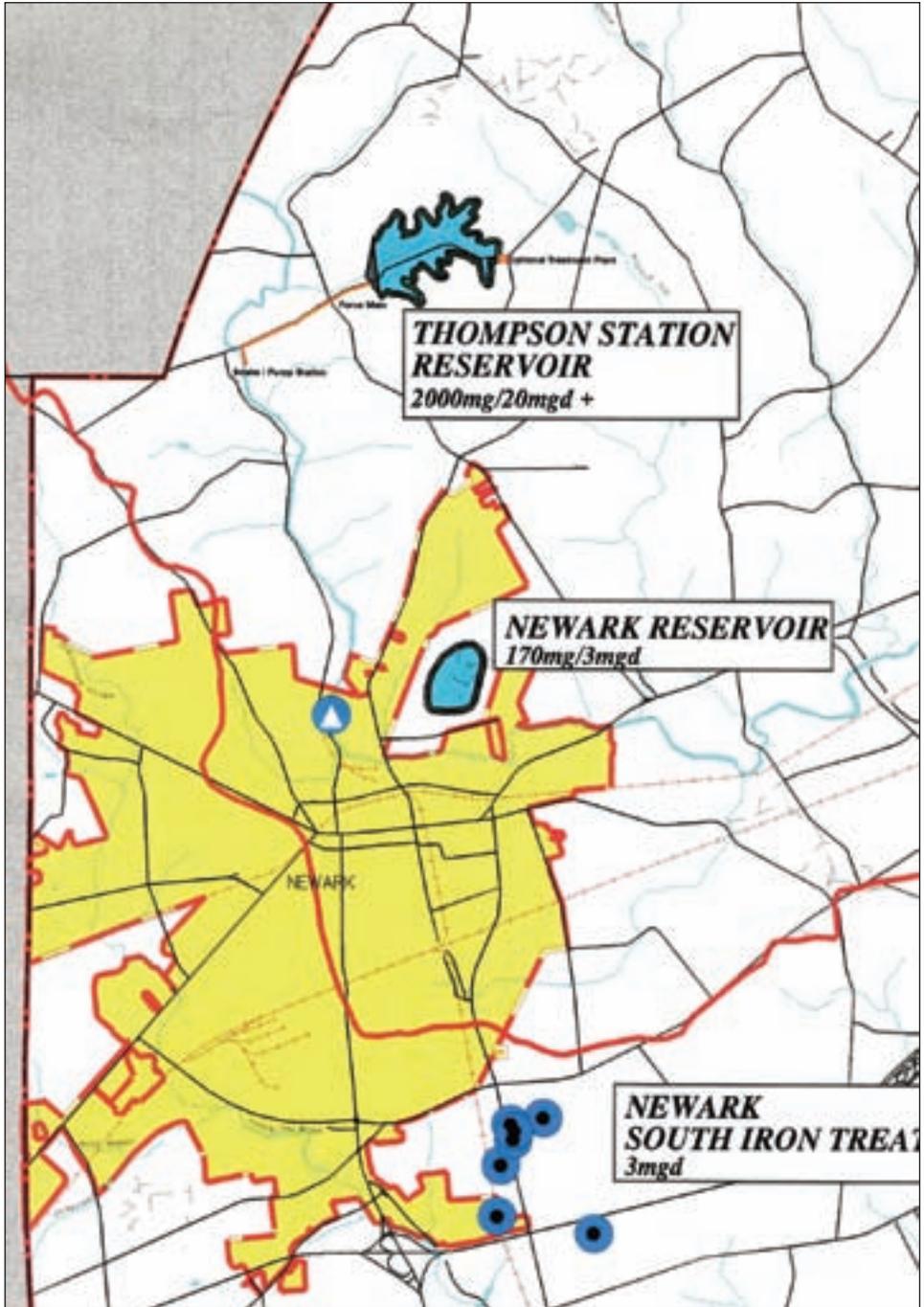


Figure 9. Map depicting the proposed Thompson Station Reservoir, Newark Reservoir, and Newark South Wellfield Iron Treatment Plant (source: WRA, 1999)

By the spring of 1997, optimism for a new water supply reservoir trickled away. In March 2007, at a public meeting convened by the U. S. Army Corps of Engineers at the University of Delaware, over 30 people spoke against the Thompson Station Reservoir with only one person in favor. A few weeks later, Project Management Committee members, New Castle County, and the Artesian Water Company voted to withhold further funding for this work in the face of rising public opposition. Additionally, Richard du Pont, the owner of most of the site for the Thompson Station Reservoir, suddenly withdrew his consent to do any additional geological drilling on his property.

The Committee decided that there should be an independent assessment of three key issues before any further work on the reservoir sites would resume. The Committee wanted a re-examination of future water needs, an assessment of the adequacy of a stream-flow pass-by standard (the amount of water that must be allowed to pass by the intake to maintain the aquatic environment), and a detailed study to determine the amount of additional groundwater available for water supply.

The year 1997 passed with the suspension of the Thompson Station EIS. Two years after the drought of 1995, the City of Newark was still without a reserve water-supply storage facility to supplement the flows at the new White Clay Creek water-treatment plant.

The Newark Reservoir

In 1998 the City of Newark decided to go it alone in the quest for additional water storage to insulate itself from drought. In June and July 1998, City Water Director Joseph Dombrowski delivered a presentation to Newark Council recommending the development of a Newark Water Supply Plan.

In February 1999, the Water Director, City Finance Director George Sarris, and Assistant City Manager Carol Houck briefed Mayor Hal Godwin and City Council about the completed Newark Water Supply Plan (Fig. 10 and 11). The plan recommended construction of (1) a new iron treatment plant at the Newark South Wellfield along South Chapel Street behind Scottfield and (2) a new reservoir at the Koelig Farm on Old Paper Mill Road within a half mile of the White Clay Creek water-treatment plant (City of Newark, 1999). The iron-treatment plant was estimated at a cost of \$2 million dollars to solve taste and odor and iron problems in the well water. The Koelig Farm reservoir site was selected because it was the largest parcel of open space near the treatment plant. The farm's corn and soybean acreage held minimal environmental constraints (such as forests, wetlands, and archeological resources) that would hold up U. S. Army Corps of Engineers permitting.

The City of Newark's proactive plans to build a new South Wellfield iron treatment plant and new reservoir were further validated by the onset of the drought of 1999, the second severe drought in northern Delaware in four years. The century-ending drought of 1999 caused stream flows along the White Clay Creek at Newark to decline to record low levels on 18 days during July and August (WRA, DGS, DNREC, 1999). The White Clay Creek stream flow dipped to 9.3 cfs on August 19, 1999, the third lowest since 1932. On August 5, 1999, Governor Thomas Carper declared a drought emergency with mandatory water restrictions in northern New Castle County. The drought ended with rains from Hurricane Dennis during the first week of September and a 500-year flood in the wake of Hurricane Floyd on September 15 and 16, 1999. The peak flow from Hurricane Floyd was 19,500 cfs, the greatest flood on the White Clay Creek since the USGS gage had been installed in 1932 (Table 1).

Flow (cfs)	Date	Storm
19,500	9/16/99	Hurricane Floyd
13,900	9/15/03	Tropical Storm Henri
11,600	7/5/89	Fourth of July Storm of '89
9,150	1/19/06	Snowmelt Storm of '06
9,080	6/22/72	Solstice Storm of '72

Table 1. Top five flood events along the White Clay Creek near Newark, 1932–2006.
(source: USGS)

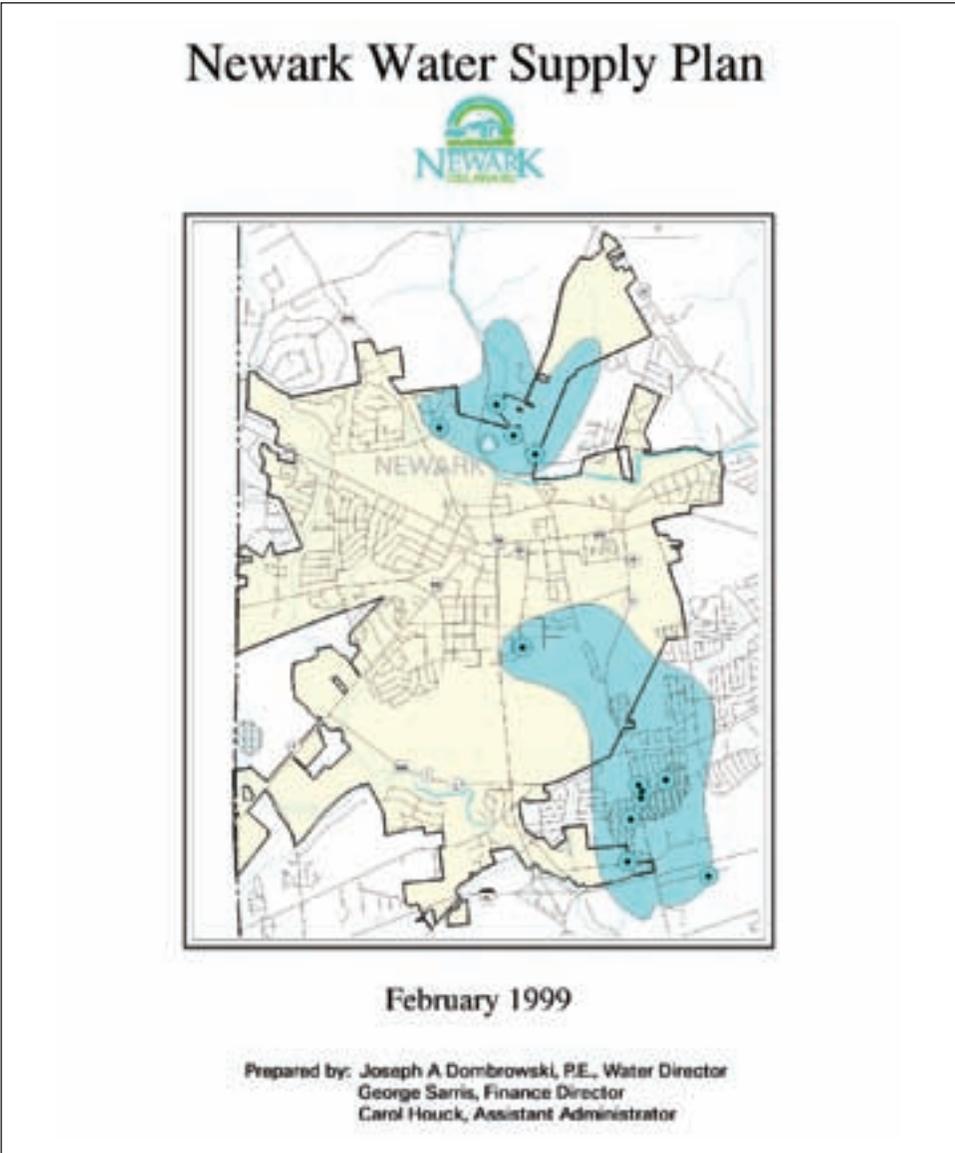


Figure 10. Newark Water Supply Plan, February 1999 (source: City of Newark, 1999)

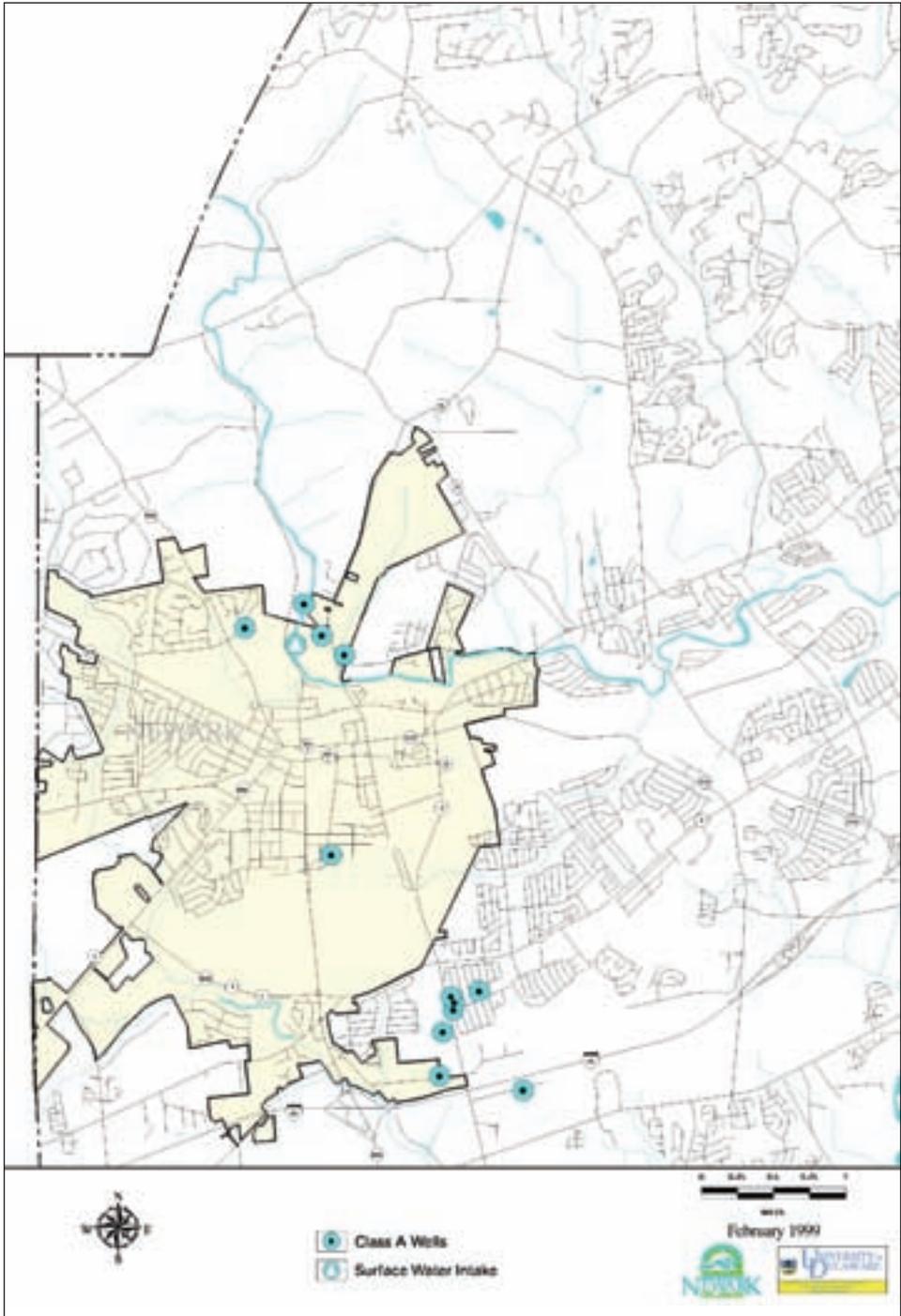


Figure 11. City of Newark Water Supply System, February 1999 (source: WRA, 1999)



Figure 12. Koelig Farm barn before construction of Newark Reservoir in April 2002. In the foreground is lifelong Newark resident Martin Wollaston of the Water Resources Agency. (source: G. J. Kauffman, 2002)

On August 26, 1999, then-Governor Carper issued Executive Order No. 65, which created a water-supply task force composed of state, regional, New Castle County agencies, and the five water purveyors in northern New Castle County, including the City of Newark. The mission as charged by the Governor was to evaluate the 1999 drought and recommend solutions to close a one-billion-gallon gap between water supply and demand. On December 2, 1999, the Water Supply Task Force delivered a report to the Governor recommending: (1) implementation of an “A” list of new water-supply alternatives including a Newark Reservoir and expansion of Hoopes Reservoir, (2) appointment of an interim water master to ensure the “A” list projects would be implemented by 2003, (3) and appointment of a Delaware Water Supply Coordinating Council to implement the water-supply options. By Executive Order No. 74 dated December 30, 1999, Governor Carper appointed the Water Resources Agency (which, by that time, had become part of the Institute for Public Administration at the University of Delaware) as the Temporary Water Coordinator or Water Master. The same order appointed the City of Newark as one of the Water Supply Coordinating Council members.

By May 31, 2000, the City of Newark continued with plans to construct an iron-treatment plant at the South Wellfield and build the 300-million-gallon Newark reservoir on the Koelig Farm. In July 2000, the General Assembly passed and then-Governor Carper signed House Bill No. 549, which appointed the Water Resources Agency as



Figure 13. City of Newark Water Director Joe Dombrowski standing in front of the Koelig Farm house before reservoir construction, April 2002 (source: M. W. Wollaston, 2002)



Figure 14. Artist rendering of Newark Reservoir drafted in 2002 (source: URS, 2002)



*You are cordially invited to attend
the groundbreaking ceremony
for the
City of Newark
Water Supply Reservoir
on Tuesday, May 14, 2002
at 11:00 a.m.
Koelig Farm Site
Old Papermill Road*

*Please R.S.V.P. by
Friday, May 10th
(302) 366-7055*

Light Refreshments

Figure 15. Invitation to Newark Reservoir groundbreaking ceremony, May 14, 2002 (source: City of Newark, 2002)

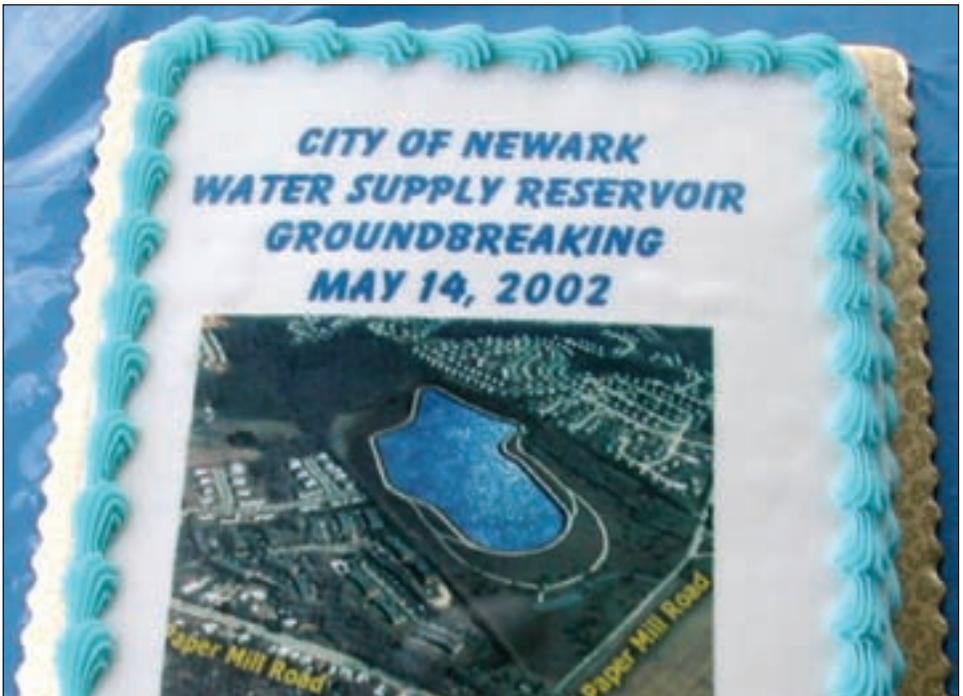


Figure 16. City of Newark Water Supply Reservoir Groundbreaking ceremony cake, May 14, 2002 (source: City of Newark, 2002)



Figure 17. Groundbreaking for the Newark Reservoir on May 14, 2002, included Mayor Hal Godwin (reading proclamation), Delaware Division of Water Resources Director Kevin Donnelly (to the Mayor's right), City Manager Carl Luft (with shovel), and City Water Director Joe Dombrowski (to Luft's left). The Koelig farmhouse is on top of the hill. (source: M. W. Wollaston, 2002)

Delaware's first Water Coordinator for a three-year period and appointed a Water Supply Coordinating Council (WSCC) until December 31, 2003. The City of Newark continued as a key WSCC member as the Newark Reservoir was the leading project on the "A" list of alternatives.

In February 1999, Newark City Council voted to approve City Water Director Joseph Dombrowski's recommendation to build a new reservoir at the 112-acre Koelig Farm property near Old Paper Mill Road (Fig. 12 and Fig. 13).

On August 23, 2000, the City reached a settlement with the Linden Hill Corporation to purchase the Koelig Farm property for the new reservoir. Earlier, New Castle County had approved this property for the site of a 215-home development, which, ironically, would have increased the City's water demand. In August 2000, Newark acquired 112 acres of land for the reservoir at the site of the former Koelig Farm for \$7.95 million with the assistance of \$3.4 million in funding from the Delaware General Assembly. On October 24, 2000, City Council awarded a \$729,000 contract to URS Engineers to prepare design plans and specifications for the reservoir construction. That same month, City Council awarded a second contract to Duffield Associates to design the reservoir pump station and pipeline. In September 2000, City Council awarded a contract to Whitman Requardt Associates to design an iron- and manganese-removal plant at the South Wellfield.

During 2001, Newark was on schedule with the permitting and design of the 300-million-gallon Newark Reservoir, which would become the first reservoir constructed in Delaware since Wilmington's Hoopes Reservoir was completed in 1932. On April 10, 2001, Newark residents went to the polls and voted by a 4-to-1 margin to support a referendum to increase water rates to pay for the new reservoir and iron-treatment plant. The voters approved an \$18.6 million bond issue to build the reservoir, pump station, and pipeline to fill the reservoir.

During 2002, the City of Newark began construction on the South Wellfield plant and the Newark Reservoir. On March 22, 2002, the City broke ground, and Hart Contractors Inc. commenced construction on the iron-treatment plant along South Chapel Street. On April 22, 2002, Newark City Council awarded a \$9.7 million construction contract to Donald Durkin, Inc., of Southampton, Pa., to build the 317 mg reservoir (Fig. 14). With projected expenditures of \$8 million for land and \$9.7 million for construction, the estimated cost of the Newark Reservoir was almost \$18 million. On May 14, 2002, Mayor Hal Godwin and dignitaries wielded shovels for the Newark Reservoir groundbreaking ceremony (Fig. 15, 16, 17). By the end of 2002, the contractor had completed almost 50 percent of the reservoir by installing the intake pipeline and excavating almost 1 million cubic yards of soil. At year's end, Hart Contractors continued construction on the South Wellfield iron-treatment plant with the project at 70 percent complete and installation of the aeration unit underway.

The 100-year drought of 2002 again reinforced the need for the Newark Reservoir construction, as it was the most severe drought in Newark since 1895, when precipitation records were first kept by the National Weather Bureau. The drought of 2002 was the third severe drought in seven years, coming on the heels of the droughts of 1995 and 1999. On March 5, 2002, then-Governor Ruth Ann Minner issued Executive Order No. 29, declaring a drought warning with voluntary water restrictions in northern New Castle County. On June 6, 2002, the City of Newark curtailed withdrawals at the White Clay Creek water-treatment plant as flows declined below the Delaware River Basin Commission's 14 mgd pass-by flow limit.

On August 2, 2002, then-Governor Minner declared a drought emergency in northern Delaware with mandatory restrictions in effect. In September 2002, the City of Newark ceased withdrawals at the surface-water plant as the creek was nearly dry at 5.4 cfs, the lowest flow since the drought of 1966 (Table 2). By October 4, 2002, the remnants of Tropical Storm Isidore helped replenish the water supplies in the White Clay Creek watershed. By October 11, coinciding with Tropical Depression Kyle that deposited 3.93 inches of rain on Newark, the Governor terminated the drought emergency ending the mandatory water restrictions in northern Delaware.

Flow (cfs)	Date	Drought
4.7	9/11/66	1966
5.4	8/17/02	2002
8.5	9/4/95	1995
9.3	8/19/99	1999
9.4	9/3/63	1963

Table 2. The five most severe droughts along the White Clay Creek near Newark, 1932-2006. (source: USGS)

The end of the drought of 2002 brought a renewed emphasis on completing the Newark Reservoir.

During 2003, the reservoir contractor completed 70 percent of the project with the renovation of the Curtis Paper Mill raceway, installation of the intake pipeline in place, and excavation of more than one million cubic yards of soil. During the summer of 2003, the contractor initiated placement of the soil for the liner. This work was not completed because of wet weather during the fall of 2003 and disagreements between the contractor and the city and the city's design engineer (URS) concerning the construction methods used to meet installation specifications. On November 21, 2003, the City completed construction of the iron-removal plant at the South Wellfield, which increased the well-water supply by one million gallons per day.

In January 2004, Newark City Council voted to terminate the reservoir contract with the contractor because there had been no movement on the installation of the liner since the fall and the city and contractor continued to disagree on the amount of payments for additional work requested by the contractor. By May 2004, work was suspended, as the City and the contractor battled in court over the reservoir's liner design (Fig. 18). No work was completed on the reservoir between January and October 2004, as the City made plans to hire a new contractor to resume the work (Fig. 19). City Council hired a new contractor, George and Lynch of New Castle, Del., in October 2004 at an estimated contract cost of \$6 million.



Figure 18. Newark Reservoir construction in May 2004 (source: City of Newark, 2004)

During 2005, work resumed with the new contractor George and Lynch. City crews performed clean-up and maintenance of the unfinished reservoir bowl during the winter of 2005. George and Lynch continued construction on the reservoir in March 2005.



Figure 19. Newark Reservoir under construction during summer of 2004 (source: City of Newark, 2004)



Figure 20. Newark Reservoir under construction in June 2005 (source: Eric Crossan, 2005)

During June 2005, the new contractor regraded the bottom and side slopes of the reservoir and installed the geomembrane and concrete liner (Fig. 20). In August 2005, subcontractor Hallaton, Inc., helped install the liner at the reservoir. George and Lynch completed construction, and the City began filling the reservoir in November 2005 at a rate of one foot per day, in accordance with the dam-safety instructions received from the design and construction engineer URS (Fig. 21).



Figure 21. Newark Reservoir filling with water in November 2005 (source: G. J. Kauffman, 2005)

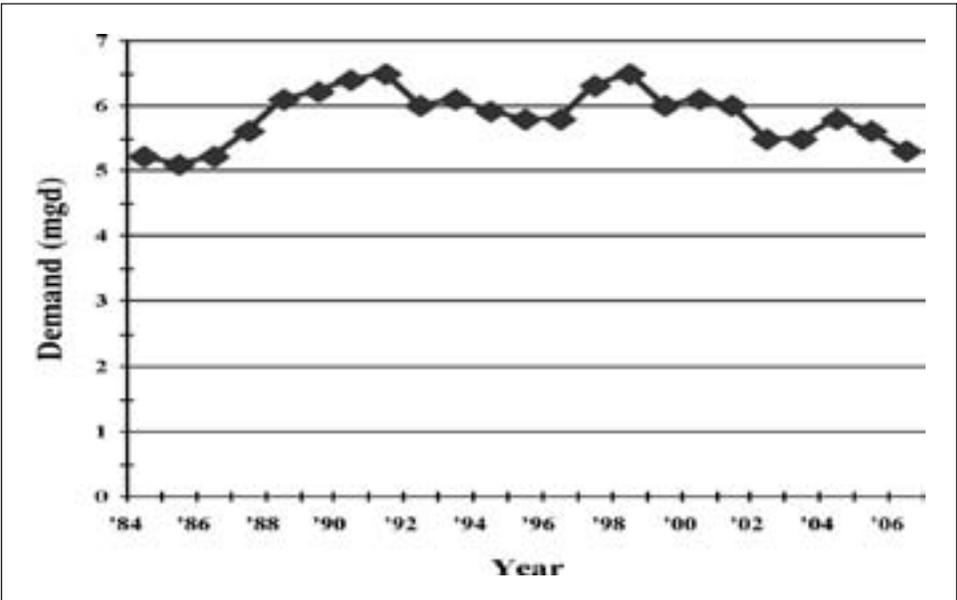


Figure 22. City of Newark peak water demand (source: WRA, 2008)

By January 20, 2006, the City had pumped water into the reservoir from the White Clay Creek pipeline to a depth of 42 with 14 feet of depth more to add. By February 2006, the reservoir was full, and the contractor completed finishing touches on the pedestrian path and turf stabilization. Newark peak water demand has fluctuated between 5 and 6.5 mgd (Figure 22).

With great fanfare, dignitaries from the City of Newark (including Mayor Vance Funk), Lt. Governor John Carney, Delaware's congressional delegation, and the Delaware Water Supply Coordinating Council celebrated at the ribbon-cutting ceremony to open the Newark Reservoir on May 24, 2006 (Fig. 23 and 24). The 317-million-gallon Newark Reservoir became the first major water supply reservoir constructed in Delaware since the Great Depression, when the City of Wilmington opened the Colonel E. M. Hoopes Memorial Reservoir on June 4, 1932. The Newark Reservoir may very well be the last reservoir constructed in the Delaware River Basin for quite some time.



Figure 23. Dedication of the newly opened Newark Reservoir on May 24, 2006, including (left to right) Assistant City Manager Carol Houck, Councilman Kevin Vonck, Councilman Jerry Grant, Councilman Karl Kalbacher, Former Mayor Ron Gardner, State Senator Joe Miro, Councilman David Athey (behind Miro), Mayor Vance Funk (back row, partially obscured), Councilman Frank Osborne, State Senator Liane Sorenson, Councilman Jerry Clifton, Lt. Gov. John Carney (third from the right), and City Manager Carl Luft (far right). (source: M. W. Wollaston, 2006)

The 30-acre Newark Reservoir holds 100 days of reserve water storage pumped via a half-mile pipeline from White Clay Creek and makes Newark 99.9 percent reliable and self-sufficient for all recorded droughts except for the tail end of the 1963 drought. The



Figure 24. Newark Reservoir looking northeast on May 24, 2006, the day of the dedication ceremony (source: M. W. Wollaston, 2006)

pumped storage facility cost \$20 million for the land and construction. The reservoir with surrounding 1.1-mile pedestrian/bike path has been a popular and healthy addition to the Newark park system. One of the City's residents was quoted as saying that walking by the azure blue water is like being near the beach.

In this day and age, construction of a drinking-water reservoir requires persistent political and economic commitment. Three Newark mayors-Mayors Gardner, Godwin, and Funk-worked long and hard to guide the reservoir from concept to creation. A committed City Council helped to design referenda wherein the residents approved water-rate and property-tax finances in two instances by at least a 3-to-1 margin. The staff in the City Manager's Office, Water Department, Public Works, Planning, and Parks & Recreation were all united in seeing the reservoir through to completion.

The completion of the Newark Reservoir is an historic and courageous achievement. On April 18, 2007, the President and Board of the Water Resources Association for the Delaware River Basin recognized the Newark Reservoir with the 2007 Government Award at the annual awards dinner at the Downtown Club in Philadelphia. With the Government Award, the City of Newark joins an august group of governments and individuals who have contributed to sound water management in the four-state Delaware River Basin. Congratulations to the City of Newark on accomplishing this noteworthy achievement, a watershed moment in water resources in the Delaware Basin.

In addition to the water supply use, the Newark Reservoir is a wonderful recreational opportunity for walkers, runners, and bicyclists. The reservoir is open during daylight hours. No swimming is allowed in the reservoir, and no feeding of geese and wildlife is permitted.

The Newark water system has grown from a single water main in 1903 to 100 miles

of mains in 2009, serving a population of 33,000 inside and outside of the city over a 25-square-mile area (Fig. 25 and 26). Figures 27 and 28 show the location of the Newark Reservoir before and after construction. Figures 29 and 30 (Appendix 2) depict the existing and proposed site plans for the Newark Reservoir.

Epilogue

In October 2006, the jury ruled against the City and awarded Durkin,, Inc., \$38.4 million in damages for breach of contract. Upon appeal by Newark in 2007, U.S. District Court Judge Gregory Sleet reduced the amount in damages to \$11.6 million. On April 9, 2008, on the City of Newark's further appeal, Sleet then reduced the breach-of-contract settlement amount to \$630,000, because the district court determined that originally the jury had calculated the amount of the settlement based on Pennsylvania, not Delaware, law.

The City paid the claim of \$630,000 to the contractor using funds from its insurance policy. The reduced-claim ruling validated the city's position that the Newark Reservoir could indeed be safely designed and constructed in accordance with the specifications.

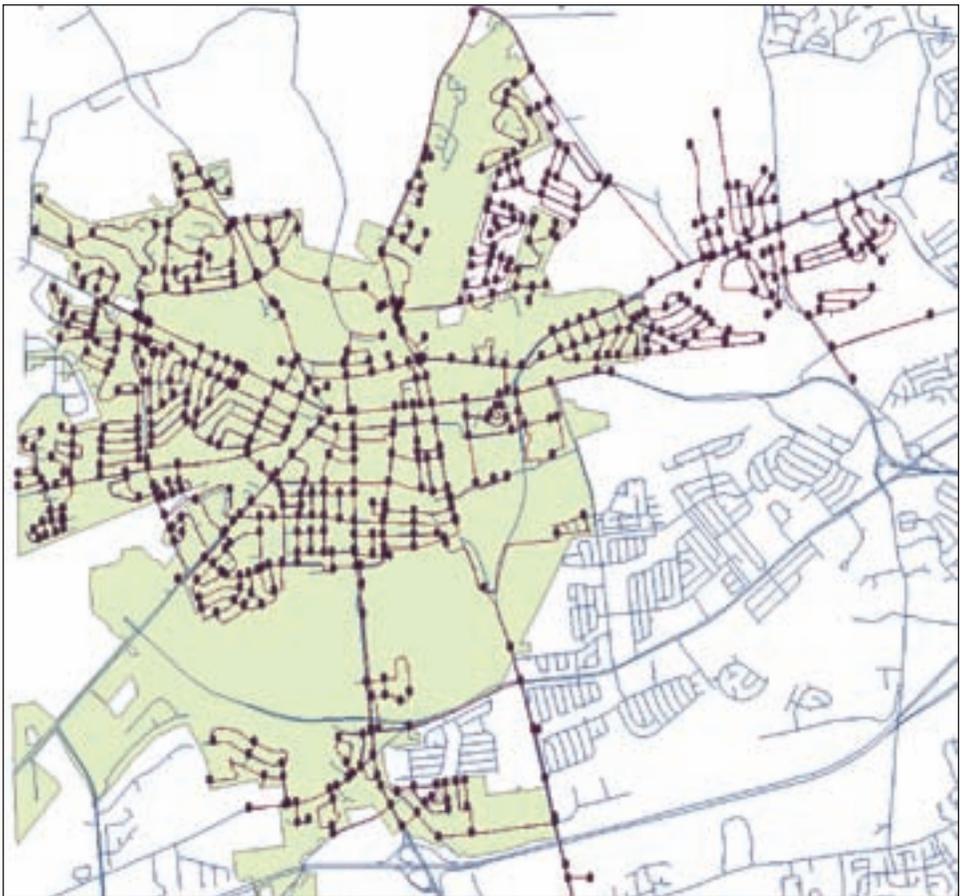


Figure 25. Map of Newark water supply system (source: WRA)

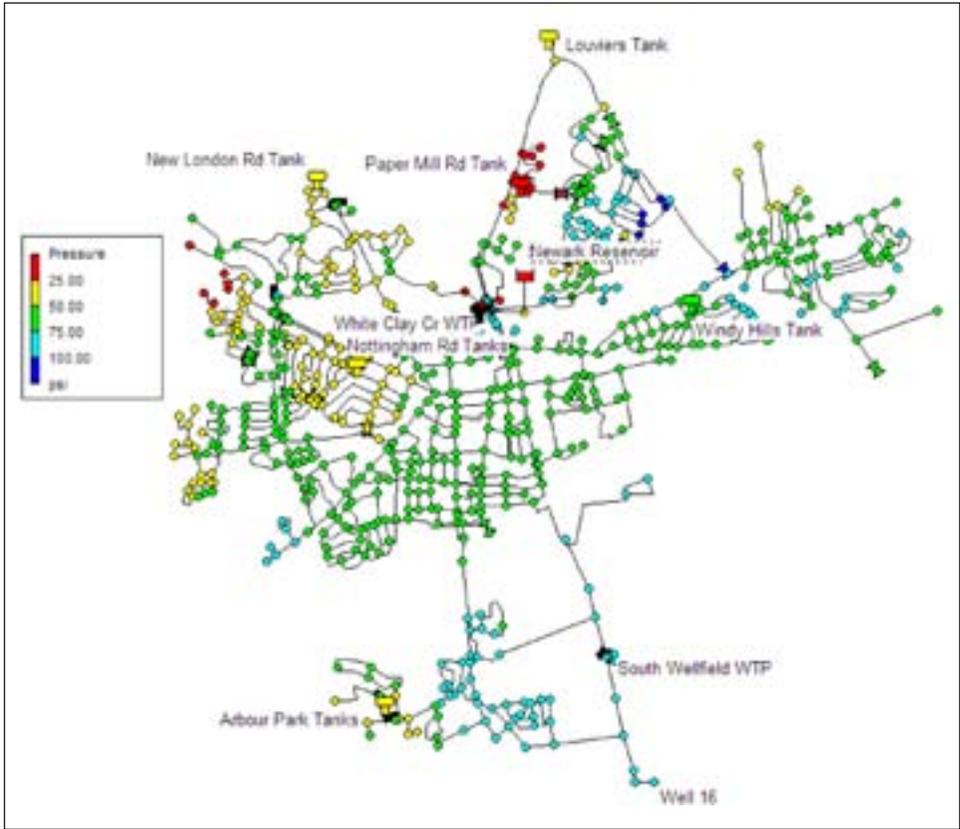


Figure 26. Schematic of Newark water supply system (source: WRA)



Figure 27. Koelig Farm east of the Newark water-treatment plant, aerial photograph 2002 (source: WRA)



Figure 28. Newark Reservoir, east of the Newark water-treatment plant, aerial photograph 2007 (source: WRA)

Appendix 1. Chronology of the City of Newark Water Supply System

- 250 million years ago Piedmont metamorphic rocks form along the White Clay Creek.
- 2 million years ago Coastal Plain sediments form over the ancient underground sea.
- 8000 B.C. Indigenous people, later known as the Lenni Lenape, settle by the White Clay Creek and use it as a drinking water source.
- 1683 Lenni Lenape Chief Kekelappen sells Opasiskunk (Indian Town) to William Penn near the White Clay Creek just four miles upstream from present day Newark.
- 1694 Scots-Irish and Welsh settlers founded the village that would become Newark between the banks of the White Clay Creek and Christina River.
- 1758 King George II awards a charter for trading in this crossroads village, where dozens of mills provided water power for grain, grist and paper.
- 1746 English miller William Cooch purchases land along the Christina River at the foot of Iron Hill and later establishes a mill.
- 1702 William Penn issues a land grant to John Guest to operate a grist mill along White Clay Creek just downstream from what is now Paper Mill Rd.
- Sept. 3, 1777 Cooch's Mill is burned by the British under Lord Cornwallis after Americans retreat at the Battle of Cooch's Bridge.
- Sept. 8, 1777 British march north through Newark, and mischievous soldiers start the machinery in Simonton's flour and grist mill situated along the south bank of White Clay Creek.
- 1789 Thomas Meteer sets up mill along White Clay Creek upstream from what is now Paper Mill Road. Now known as the Curtis Paper Mill.
- 1838 William Cooch, Jr., builds mill, later renamed Dayett Mill, along the Christina River just near present-day Old Baltimore Pike.
- 1848 Brothers George and Solomon Curtis purchased the Meteer mill and name it Nonantum Mills, the Indian name of the Curtis's hometown of Newton, Mass.
- 1888 City of Newark digs first municipal well.

- 1903 Newark forms first water system by drilling well at east end of Main Street and installs first ten-inch water main under Main Street.
- 1931 City constructs North Wellfield at south end of Academy Street near Pennsylvania Railroad.
- 1956 DuPont Company purchases Pennsylvania Railroad land assets and acquires land in the White Clay Creek valley for reservoir.
- 1956 South Wellfield Wells 11, 12, 13, and 14 developed in the coastal plain along South Chapel Street just south of present-day Route 4.
- 1960 U. S. Army Corps of Engineers and DuPont Company prepare separate reports recommending a dam and reservoir on White Clay Creek as a potential water supply source.
- Jan. 1964 The Delaware General Assembly passes House Bill No. 444 enabling "... the Levy Court of New Castle County to establish a water supply system in the White Clay Creek watershed...."
- May 1964 New Castle County Levy Court authorizes Whitman Requardt Inc. to prepare feasibility report on the White Clay Creek reservoir.
- 1965 Newark residents opposing the reservoir form the White Clay Watershed Association.
- Sept. 11, 1966 Along White Clay Creek near Newark, flow dipped to 4.7 cubic feet per second during 1966 drought, the lowest on record.
- Mar. 1967 Whitman Requardt transmits White Clay Creek reservoir report to New Castle County Levy Court, recommending 12.4-billion-gallon reservoir of 1,160 acres, half in Delaware, half in Pennsylvania.
- 1968 Wells 15, 16, and 19 developed behind Scottfield near intersection of South Chapel Street/I-95 and at Route 72/Reybold Road.
- 1971 Wells 23 and 25 drilled in the Piedmont rocks, near the Fairfield–Fairfield Crest Swim Club at the foot of Fremont Road.
- 1973 Newark residents form the Coalition for Natural Stream Valleys to conduct surveys of the flora and fauna of the White Clay Creek valley. Support for White Clay Creek reservoir dissipates.
- 1977 City of Newark joins with New Castle County and Wilmington to

- form policy board for regional water supply planning and management, which became the Water Resources Agency for New Castle County.
- 1984 DuPont Company realizes main-stem reservoir has little support and donates 1,000 acres of land to the Delaware/Pennsylvania park systems establishing the White Clay Creek Preserve.
- 1988 Water Resources Agency for New Castle County files a Section 404 permit application with the U.S. Army Corps of Engineers to construct a reservoir at either Churchmans Marsh or Thompson Station.
- 1990 Piedmont rock wells 20 and 21 are dug along the White Clay Creek along Creek Road about a mile north of Cleveland Avenue.
- Dec. 11, 1991 President George H.W. Bush signs law, the White Clay Creek Study Act, to evaluate for inclusion in National Wild and Scenic Rivers System.
- Sept. 1991 Newark Water Advisory Committee recommends to City Council: (1) Investigate a new water-treatment plant at the Newark South Wellfield, (2) rehabilitate the aging water system, and (3) investigate additional regional water supplies including an "impoundment facility that would benefit Newark."
- 1992 Newark completes new three-million-gallons-per-day surface-water-treatment plant along White Clay Creek on the north side of town near Paper Mill Road.
- 1995 On September 8 during drought of 1995, White Clay Creek at Newark dips to lowest flow since the drought of 1966, and City ceases withdrawals at the new surface-water-treatment plant.
- Nov. 1996 EIS Project Management committee votes to delete Churchmans Reservoir due to environmental concerns, leaving Thompson Station in the White Clay Creek valley as preferred reservoir site.
- Apr. 1997 EIS Project Committee suspends further studies on Thompson Station Reservoir, as New Castle County and Artesian Water Company withhold further funding, bowing to public opposition.
- 1998 Newark decides to go it alone in quest for new reservoir to insulate itself from drought. In June and July 1998, City Water Director briefs Newark Council about new Newark Water Supply Plan.

- Feb. 1999 City Council briefed about Newark Water Supply Plan recommending (1) a new iron-treatment plant at the Newark South Wellfield along South Chapel Street and (2) a new reservoir at the site of the Koelig Farm on Old Paper Mill Road.
- Aug. 1999 Century-ending drought of 1999 causes White Clay Creek stream flow to decline to 9.3 cfs on August 19, 1999, the third lowest flow rate since 1932.
- Dec. 1999 By Executive Order No. 74, Governor Carper appoints the Water Resources Agency at the University of Delaware's Institute for Public Administration as Temporary Water Coordinator or Water Master. The same order appoints the City of Newark as a Water Supply Coordinating Council member.
- Aug. 2000 Newark acquires 112 acres of land for the reservoir at the Koelig Farm site for \$7.95 million, with the assistance of \$3.4 million in funding from the Delaware General Assembly.
- Sept. 2000 City Council award contract to Whitman Requardt Associates to design iron- and manganese-removal plant at the South Wellfield.
- Oct. 2000 City Council awards \$729,000 contract to engineering firm URS to prepare design plans/specifications for the reservoir construction.
- Oct. 24, 2000 President Clinton signs Public Law 106-357 designating the White Clay Creek as a National Wild and Scenic River, which preserves free-flowing status of creek, effectively precluding construction of a reservoir in the valley.
- Apr 10, 2001 Newark residents went to polls and voted by a 4-to-1 margin to support referendum to increase water rates to pay for the new reservoir and iron-treatment plant.
- Mar 22, 2002 City broke ground, and Hart Contractors Inc. began construction on the iron-treatment plant along South Chapel Street.
- April 22, 2002 Newark City Council awards a \$9.7 M construction contract to Donald Durkin, Inc., to build a 317-million-gallon reservoir on the Koelig Farm site.
- May 14, 2002 Dignitaries wield shovels at the Newark Reservoir groundbreaking ceremony.
- 2002 On August 2, then-Governor Minner declares drought emergency in northern Delaware with mandatory restrictions in effect. In

- September, Newark ceases withdrawals at the surface-water plant as the White Clay Creek had become nearly dry at a flow rate of 5.4 cfs.
- Nov 21, 2003 City completes construction of iron-removal plant at the South Wellfield, increasing well water supply by one million gallons per day.
- January 2004 City Council votes to terminate reservoir contract with contractor because there had been no movement on the installation of liner since the fall. The city and contractor continue to disagree on the amount of payment for added work requested by contractor. Reservoir construction is 70 percent complete.
- May 2004 Work was suspended, as the City and the contractor battled in court over the reservoir's liner design.
- Oct. 2004 City Council hires new contractor, George & Lynch of New Castle, Del., at an estimated contract cost of \$6 million to complete the Newark Reservoir.
- Mar. 2005 George & Lynch resumes construction on the reservoir.
- June 2005 New contractor regrades the bottom and sides slopes of the reservoir and installs the geomembrane and concrete liner.
- Nov. 2005 George and Lynch completes construction, and the City begins filling the reservoir at a rate of one foot per day.
- Jan. 20, 2006 City continues pumping water into the reservoir from the White Clay Creek pipeline with the reservoir now at 42 feet deep, with 14 feet of depth more to add.
- Feb. 2006 The reservoir is full, and the contractor completes finishing touches on the pedestrian path and turf stabilization.
- May 24, 2006 City officials open the reservoir with a ribbon-cutting celebration attended by many state, community, and city representatives.
- Apr. 18, 2007 Water Resources Association for the Delaware River Basin recognizes the City of Newark Reservoir with the 2007 Government Award at an annual awards dinner in Philadelphia.
- Apr. 9, 2008 Using Delaware law, U.S. District Court Judge Gregory Sleet reduced the amount of the city's payment in the breach-of-contract ruling for Newark Reservoir contractor Durkin,, Inc., from \$11.6 million to \$630,000.

Appendix 2. Site Plans for the Newark Reservoir



Figure 29. Newark Reservoir - Pre-Construction Site Plan (source: URS, 2001)



Figure 30. Newark Reservoir - Proposed Site Plan (source: URS, 2001)

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