

WATER LAND MANAGEMENT ADVISORY COMMITTEE BACKGROUND

The Commissioners for the Water Supply District of Acton reestablished the Water-Land Management Advisory Committee (WLMAC) to define the conditions, if any, under which the District should consider expanding its service area beyond its present boundaries. The members of the Committee were selected after applications were reviewed and interviews conducted. Two members were appointed by the Acton Water District; two members were appointed by the AWD Moderator and one member was appointed by the Acton Town Selectmen. Not long after the WLMAC began meeting, Arthur Gagné, one of the original members resigned and was replaced by Charles Olmstead. The Committee would like to acknowledge the early contributions made by Art.

Meetings of the WLMAC were open to the public (except for very rare executive sessions) and were held two times per month on average. The Committee consulted publications and information available to it through the Internet, and conducted interviews with various Acton officials as well as with people in the AWD and Littleton Electric Light and Water District and with others. In addition, the WLMAC spent many hours discussing and refining points of view during its numerous and open meetings.

In an effort to make the public aware of a few of the issues the WLMAC was researching and discussing, the Committee contacted the local periodicals and asked them to publish a series of articles that the WLMAC would write. A number of them did publish some or all of the articles. Finally, on December 7, 2005, the Committee conducted a “Public Discussion Meeting” at the new Acton Public Safety Facility to let the citizens of Acton know about the WLMAC, explain our thinking up to that point and to elicit opinions and ideas from those in attendance. Many of the ideas expressed have directly influenced the thinking and therefore the conclusions articulated in this document.

This report summarizes the findings and opinions of the committee which are based on a review of all pertinent literature, technical reports, discussions with experts in the field and opinions of interested citizens.

HISTORY OF WATER SUPPLY IN ACTON

The concept of a public water supply district for Acton had its beginnings in the nineteenth century. Records of the 1895 Acton Town Meeting indicate that a committee was formed to study potential sources for water supply. While the specific reason for studying this topic was not stated, it is apparent that the water supply from private wells had become inadequate for growing domestic and commercial use, particularly in South Acton and West Acton. The study committee included members with names that are still well-known in Acton: H.A. Littlefield, D. J. Wetherbee, William D. Tuttle, D. H. Hall and Francis Conant.

Frank L. Fuller of Boston was hired by the committee to serve as engineer for the study. One of his recommendations was to use Great Hill, with an altitude of 361 feet, as a

standpipe. His study also examined a variety of possible sources for public water supply. Initially, Fort Pond Brook appeared to offer adequate supply for the populated districts in town, but subsequent test wells yielded very little water. After testing a number of other sites, a productive well site was found on land owned by Isaac Reed, the site of the present-day Acton Water District headquarters. Of this site, the committee stated that “it is an ideal location... free from anything likely to contaminate the water. The quality of the water is excellent.” Furthermore “Although 10 acres are not needed for driving the wells, it would be better for the town to control it, and thereby keep building or other things away that might tend to pollute the water.” .

The committee’s final report to the Town Meeting of 1896 states that residents of the “villages” (West Acton and South Acton) would benefit from a public water supply and for that reason the Town should move forward with this project, since “anything that helps the villages must correspondingly help the town.” It is evident from the wording in the report that the committee had concerns about the politics surrounding their recommendations. In fact, the report had insufficient impact to convince Town Meeting to support the development of a public water supply, and the study’s recommendations were ignored in the following years. Residents of Acton Center and other more sparsely populated areas did not want the financial responsibility for a water district that would primarily serve the villages of West Acton and South Acton.

It was not until 1912 that a public water supply district was formed in Acton. The State Legislature established “The West and South Water Supply District of Acton” in response to requests from the residents of the two villages for a self-funding water district that was independent from the Town. The District obtained financing to build a system based on the study prepared for the town by Frank Fuller 16 years earlier. The District could not reach agreement with Isaac Reed on the value of the land for the well site. The final value of the land (\$800) was eventually determined through an eminent domain proceeding. Once begun, the system was built quickly. During this process, the residents of Acton Center changed their collective view and successfully petitioned the State to amend the District boundaries to include an additional strip connected to their neighborhood. Over the course of the next several decades, the District was enlarged several times until it eventually encompassed the entire Town of Acton. It was re-named “The Water Supply District of Acton” although it is most commonly referred to as the “Acton Water District.”

Following completion of the initial water supply system, the District operated for many years without much change other than slow expansion of its service area. George Clapp served as superintendent, hiring local workers for “ditch digging” and other work as required to construct and maintain the infrastructure. Each year the District met its financial obligations and steadily paid off its loans. During this period, District income was derived from property taxes, water rates and hydrant fees charged to the Town. For a number of years in the early 20th century, the same bookkeeper served both the Town of Acton and the Acton Water District. Unfortunately this situation led to shuffling of funds between the two municipalities. When this treasurer died while in office, the water district was forced to absorb a discrepancy of \$1,800. Much of this was recovered through insurance after several years of wrangling.

The District survived the economic Depression of 1930's, and during that time was able to fund replacement of original pumps while it continued to extend new service lines. Maintenance and growth of the system were halted by the advent of World War II. During the war, concern about the security of the well site led to employment of a night watchman.

Once the war was over, the District experienced a sharp rise in demand for water to serve many types of development. In the late 1940's there were several years of debate at District meetings because those households that had originally been part of the District did not want additional addresses connected to the system without those new addresses paying additional fees equal to the original assessment taxes, in addition to guaranteeing revenue to pay for the mains extensions. At the same time, industry was attracted to the town. In 1947, a company called Dewey and Almy established a chemical industry on land that appeared to offer abundant clean water for its use. The following excerpt from Harold Phelan's encyclopedic 1954 *History of Acton* is ironic in light of the fact that the Dewey and Almy property would be acquired by W. R. Grace in 1954 and become a Super Fund site less than 25 years later.

Within recent years Acton has felt the impact of an entirely new trend in the industrial world. Due in part to prohibitive taxes in the completely urban areas...but certainly in major measure because of Acton's superior supply of cool water, new plants have come to town. These are not the architectural horrors that congregated along the railway in previous eras, but are located in unsettled areas, in some cases in the forest far away from residences and even from the highway. They are neat compact, modernistic structures, run by electricity and having none of the offensive attributes of the smoke belchers of the past.

Early among these newcomers was the Dewey and Almy Chemical Company, which, seeking to expand its Cambridge plant and needing location remote from dwellings where the more hazardous of its projects could be carried on, found the abandoned two hundred and fifty acre tract of the former smokeless powder mills particularly attractive since it had a sandy gravel soil, abundant water supply and was on the main line of the Boston and Maine Railroad. Here in 1946 they started the manufacture of solvent solutions of rubbers and resins.

As a result of expansion after the war there are now twenty two buildings in which are produced sealing compounds, soldering fluxes, and machinery used in the canning industries; similar compounds for the steel drum and pail manufacturers' insoles, cements, adhesives, and synthetic and reconstructed leather for the shoe trade, bags, shipping cases, and adhesives for the paper container market; sealing compounds, soldering fluxes and storage battery appurtenances for the automotive industry; and various products that are utilized in the rubber, paint and plastic industries.¹

¹ Phelan, Harold R. (1954), *History of the Town of Acton*, Middlesex Printing, Inc., Cambridge, Massachusetts.

Throughout the 1950's the District continued to expand service in small increments to existing streets at the edges of the service area. In addition significant housing development started in earnest in the 1950s and the developers connected their new neighborhoods to the system.

Up to this time, the Acton Water District had provided reliable water service at a reasonable cost to rate payers throughout the town. The actions of the District appeared to be centered on minimizing water rates, which encouraged both residential and commercial development.

1960 through 1985—a time of complete transformation

Great change occurred in the Water District between 1960 to 1985. In 1960, the District operated in much the same manner as it had 45 years earlier, serving about 2000 homes and businesses with about 150 million gallons of water pumped. The annual District budget was a little under \$100,000. These numbers are about 10 times what they were in 1915, but the original system infrastructure was still the majority of the system. By 1986, the District served approximately 4,000 customers, pumped 650 million gallons and had an operating budget over \$1 million. Through the efforts of the District managers and commissioners during this time, the District transformed itself from what was essentially a village well to a modern, complex, municipal water system which acts after giving careful consideration to the relationships between itself, the local environment and the community of people it serves. Many of the changes in this period are worth noting.

District name and boundaries

In 1962, after receiving a petition from residents in unincorporated areas, and with clear understanding that many land owners in Acton would convert their land into subdivisions and create water demand away from the railroad station areas in West and South Acton, the Commissioners asked District voters to approve a petition to the state legislature to incorporate all of the land in the Town of Acton into the District. The enabling legislation also changed the name of the District to reflect its increased size. Subsequent to this expansion, and with awareness that long time Superintendent Ray Harris would retire at the end of 1965, the commissioners reviewed with Town selectmen, in 1964, the possibility of merging the District into the Acton Town government. This idea apparently was not well received as it is not mentioned at all in subsequent annual reports.

Boxborough working framework

Through the early 1960's the District held discussions with Boxborough officials and residents about parallel issues of water supplies and water service in Boxborough. Boxborough residents were aware that there was substantial water supply available along the Acton/Boxborough town line near the site of the Whitcomb well and very little water supply in the rest of Boxborough. The result of these discussions was State legislation which allows the District to provide water service to homes in Boxborough and to develop wells in Boxborough, provided that the water from these wells can be used only in Boxborough.

Supply and Demand

Until 1960, the District was operating principally from its original well. The commissioners had struggled through the 1950's with inadequate supply in the summer months and most years had to ban lawn watering. The District had set up a temporary well on leased land in the mid 1950's, but given the rapid development of new homes in Acton, it was evident that more supply was needed. The District tested almost every potential well site in Acton and found some worthwhile and others not viable. This effort started in the early 1960's with the rental of the Christofferson land on School Street. The District had the opportunity to purchase this land in 1964 after two years of renting, but decided to continue renting. At the same time the District rented land off of Willow Street at the Stow line. The well on this site produced water, but drained the water table below some household wells in Stow and so its use was discontinued. The struggle to find more water continued for the next 40 years in the same pattern, with some potential sites working out and others not. The District believed it had solved the problem in the early 1970's with the opening of the Assabet wells. After these wells were taken off line in 1978 due to ground water pollution, the effort resumed at a greater pace. Eventually water needs convinced the Town to close down its septage disposal ponds in the area now occupied by NARA Park. This closure allowed the District to investigate well sites in North Acton. The current collection of many wells represents the results of these 40 year's efforts to maximize the available well sites.

Storage

In 1962, at the urging of Superintendent Harris, and the town's fire underwriters, the District voted to buy two acres of land near the top of Flagg Hill at the Boxborough-Stow-Acton corner. The District appropriated \$200,000 to buy this land and build a 2 million gallon storage reservoir. The foresight required to acquire this land and build this structure cannot be overstated, as this land would otherwise have been developed and there is no other point in town at the same height. (The water system in Acton operates as an open head system with operating pressure and flow coming from the height of the storage reservoirs in town. Small diameter storage, such as the standpipe on Great Hill does not have adequate volume per foot of height to maintain pressure during periods of high demand, such as when there are two simultaneous fires in town.) Only the Flagg Hill reservoir, which can supply water at a volume of 80,000 gallons per foot of head, can keep the system operating in these conditions. Undoubtedly part of the credit for this action belongs to commissioners of that time who understood the development potential for the balance of the Flagg Hill land and the need to preserve this highest land in the area for water supply purposes. In the mid 1970's another group of foresighted commissioners bought land adjacent to Nagog pond and developed the large storage tank on this land. The final piece of the present reservoir system was put in place with the purchase of seven Acres of land off Main Street in North Acton in 1980 and the appropriation of \$1.7 million for the construction of a 3 million gallon supply reservoir in 1988 on this land. This tank was named for William Walsh, a District commissioner in the 1980's. This last tank is 110 feet below the open head level of the water system and requires use of a supplemental pump to be placed in use as a supply.

Distribution

Throughout this period the commissioners and superintendent extended and expanded the District's piping system using 8-, 10- and 12-inch mains. Much of the system prior to 1960 had operated with 4- or 6-inch mains and some portions with 2-inch mains. It appears that these were installed as the lowest cost alternatives available, but while they provided water for simple domestic use for scattered houses, they were completely inadequate for any potential fire fighting use. In an effort to increase water main life, reduce corrosion byproducts and reduce costs in the 1930's, the District used pipe manufactured from Transite®, a mineral fiber and Portland cement composite that often included asbestos at that time,

Through the 1960-80s the District worked to complete "loops" in the system and to insure that there would be adequate fire-fighting flow throughout the town. A loop is a water main which serves no direct customers but creates a connection between two water mains that would otherwise be dead-end water mains. Loops are important because they allow minimal interruption of service for maintenance or repair of water mains. In addition, loops reduce water taste concerns for those households that would otherwise be near the end of the mains. Many of the water main extensions that were built in the 1920's and 1930's were dead-ends and benefited from the effort to complete loops during this period. A bizarre, almost humorous series of meetings occurred in 1964 in which a 12-inch main was first approved at the regular annual meeting, then a few months later rescinded at a sparsely attended meeting where in a separate article a 10-inch main in the same street for \$7,000 less was also rejected. Finally, three weeks later at another sparsely attended special District meeting, the original article to fund the 12-inch main, was again approved.

This example highlights the almost continuous conflict reflected in old District annual reports which seems to have existed between the Commissioners' foresighted planning and some small, now unknown group that wished to spend as little as possible to keep the system running.

Demand Management

Faced with inadequate pumping and storage capacity in the late 1950's, the District banned lawn watering for many years. With the opening of the school street wells and the construction of the Flagg Hill reservoir, the District was able to allow lawn watering beginning in 1964. Unfortunately, nature intervened and there was a prolonged drought in 1964-1966. The commissioners asked residents to conserve water until rainfall increased. This theme of supply expansion followed by either interruption or a jump in demand repeated itself again when the Assabet wells were closed in 1979 and when the Clapp well was closed in the early 1980's and again one more time when an interconnection valve between Acton and Maynard was inadvertently left open in the late 1990's.

During this period (1960 to 1986) the District implemented a number of innovative demand management practices, including having developers pay for part of the new mains built under older Acton streets, adding connection charges based on pipe size and implementing odd/even outdoor water use controls.

Tragedies at Well Sites

As part of the effort to develop additional well sites, the District acquired a sizable property where the sand and gravel deposit created a mound on the land surface. This land had for many years been used as a sand and gravel supply and the District allowed continued operations as a condition of the land acquisition. This activity had the apparent multiple benefits of providing a large water supply site, providing additional revenue to fund the ongoing costs of upgrading the supply and storage systems and increasing the water infiltration/retention rate for the co-located wells. Unfortunately, the mining company, Acton Sand and Gravel did not maintain banks sloped at safe angles and tragedy struck. On October 11, 1973, 10-year old Michael Neecewicz died after being buried alive by a collapsing sand pile while playing on the sand. Six years later, on December 1 1979, 15-year old David Palazini died in a similar accident. Mining continued despite the uproar, until March, 1980, at which time District voters voted to end the mining lease over some objections by District commissioners. Neither the commissioners nor the District superintendent mentioned the deaths in their annual reports to residents. The District appointed a committee on mining operations, which concluded that gravel mining in the District's well field would not hurt water supplies or the natural gravel filtration and that such mining could be conducted safely if the slope angles were better managed. Finally, in 1981, District voters created a Committee, partially appointed by the town selectman, to guide the commissioners in future Land and Water use policy. Eventually, a complex by-law was created which effectively prevents sand and gravel mining without extensive planning and hearings.

Contamination and resolution

In December 1978, while drilling to find a new well site near the existing Assabet wells, workers noticed a "chemical" smell emitted by water drawn from the test wells. As a "precaution" the Assabet 1 and 2 wells were tested and found to have similar problems. These wells were shut down, thus decreasing the water supply available to the District by 40 percent. In the annual report the following March, the District Commissioners confidently told residents that there was no known health threat from the then unidentified chemicals. However, further investigation identified the W. R. Grace plant as the source of a number of potentially toxic industrial contaminants in the groundwater. This discovery resulted in the declaration of one of the United States Environmental Protection Agency's (EPA) earliest Super Fund sites in the Northeast. Since that time, the Town of Acton and the Acton Water District have worked with W. R. Grace through the EPA to remediate the polluted site. Pollution from the Grace site worked its way north, eventually reaching the Lawsbrook well site.

The W. R. Grace plant has not been the only source of pollution to the groundwater resource upon which the Acton Water District depends. As discussed more fully in the Water Quality section of this report, contaminants from both natural sources and other human activities have been detected from time to time in water pumped from many of the wells in the District. In each of the other cases, however, a means has been found to treat the water so that the well could be brought back into service in a reasonable amount of time. The W. R. Grace site is unique in the town, as no other source of industrial contaminants has caused the closing of productive wells for such a long period of time, nor

has any of them raised the level of concern over health effects of the contaminants to such a high degree.

The 1970's and 1980's were a time of increased public concern about environmental pollution in its many forms. Like many other states, Massachusetts developed new regulations for the protection of water resources. While the Super Fund site heightened the importance of controlling land use on the groundwater recharge areas supply wells, the closure of three major wells also increased concern regarding adequate water quantity for the District. The District has responded to concerns about water quality by purchasing land over its well recharge areas. Water quantity concerns have been addressed through public education on water conservation. Water quality is maintained today through a set of water treatment and modification systems located at each well site throughout the District. The Districts' innovative local strict water standards and testing ensure that Acton water is among the most heavily tested and regulated water supplies in the country.

Coordination with other water services and community departments

Through this period, the District worked to increase its coordination with the Town of Acton in project timing, infrastructure development and mutual support. Examples include the District's providing a site for communication equipment for the Police. The District also provided water connection for Acton Housing Authority housing without charging the Town. During this period the District first established mutual aid connections with neighboring town and provided water, through District meeting votes, to some Boxborough addresses. In 1990 the District voted to provide water to some Littleton addresses.

By-law and voting changes

During this period, the District added many rules and by-laws drafted to protect and conserve water. The District realized the District meetings would always be sparsely attended and switched to having the commissioners elected on the ballot during other elections instead of at the District annual meetings. The commissioners decided to bill for usage after the fact rather than before the billing period began. This had been a concern to some residents who complained that they were being billed for water that they could not use due to lawn watering restrictions.

1986 through the present

The 20 years from 1986 to today have seen the completion and improvement of many changes first implemented during the age of transformation. Carefully, the District has added specific water treatment processes to improve water quality and system performance. Steadily, the District has worked to improve its well system and increase the reliability of supply. In measured steps, the District has modernized its control, metering, pumping, and accounting systems to increase efficiency and performance. The District has innovated on land protection practices and rules for new development and existing well recharge areas. District conservation practices, along with a five-year wet period, have created the unusual condition of serving many more customers with noticeably reduced water use. Hard working dedicated commissioners and District employees have quietly continued to provide non-stop high quality water service to over 7,000 connected customers.

WATER QUANTITY

Currently, the Acton Water District (AWD) supplies water to 95% of the residences, businesses and municipal facilities in Acton, as well as to a small number of properties in adjoining towns. The Concord Water Department and private wells supply water to the remaining 5% of Acton's properties. This section will focus on the source and quantity of water currently used in Acton.

Aquifer

AWD relies on groundwater for its source of water, because treatment and protection of available surface water such as the Assabet River would be very expensive. The groundwater is pumped via 22 wells and well fields developed in a discontinuous, shallow sand and gravel aquifer. An aquifer is a permeable geologic formation that holds a supply of water underground. The aquifer beneath Acton was formed at the end of the last Ice Age, approximately 11,000 years ago. Water from melting glaciers eroded a river channel through the bedrock and older sediments. As the river changed course, sand and gravel deposits filled the ancient channel, creating an aquifer. Adjacent to the aquifer, the bedrock in Acton is covered with a variable thickness of a less permeable glacial deposit called till. Groundwater in the aquifer is recharged by 40 inches of annual rainfall percolating through the surface of Acton's landscape. The depth to the top surface of the groundwater, or water table, changes with the amount of rain and snow, rising during the wet months of late winter and early spring, and falling during the dry months of later summer.

Safe Yield

The geologic properties of the aquifer control the amount of water that can be withdrawn from each well, as well as the rate of withdrawal. As Acton's wells are pumped, groundwater moves through the sand and gravel aquifer toward each well. If a well is pumped too quickly, ground water cannot flow fast enough to supply water at a constant rate. Available water is further reduced when the water table is lowered during dry spells. These phenomena control the "safe yield", defined as the amount of water that a given well can produce on a continuous basis. Each of AWD's wells has a safe yield between 200 and 500 gallons per minute, which translates to 288,000 to 720,000 gallons per day. Good engineering practice, along with the fact that each group of wells is drawing from the same aquifer, prevent all wells from being pumped at the same time. While AWD could pump as much as 3.4 million gallons per day (mgd) under ideal conditions, it considers 2.6 mgd the maximum amount it can pump for an extended period of time.

DEP Limits

The Massachusetts Department of Environmental Protection (DEP) imposes on AWD a limit of 1.93 mgd for 2005, averaged over the year. This limit is based on past usage, and its intent is to protect surface water and wetlands from drying out due to over pumping. The current DEP permit runs through 2012 and allows for only minor increases to Acton's withdrawal limit.