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BALTIMORE
ITS HISTORY AND ITS PEOPLE

BY VARIOUS CONTRIBUTORS

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BALTIMORE WATER WORKS

ALFRED M. QUICK, former Engineer in Charge.

As far back as 1792, when Baltimore was a town, an act was passed at the November session of the Maryland legislature, supplementary to an act entitled an act to erect and establish a fire insurance company in Baltimore county, and for other purposes, the ninth section of which provided that the directors of the insurance company might cause a subscription to be opened, divided into shares, for the purposes of supplying the town with water, the subscribers to be a body corporate, with the name of the Baltimore Water Company, to have the right to agree with parties for the use of water to be supplied by the said company. The insurance company did not, however, avail itself of this provision, and the people continued to get their water from wells and springs. The town had become a city in 1797, but it was not until 1800, after public attention had been directed by a visitation of yellow fever to the necessity of good and pure water, that the Act of 1800, Chapter 77, was passed, enabling the mayor and city council to introduce water into the city.

In 1803, at the instance of Mayor Calhoun, the first mayor, an ordinance was passed creating a board of twelve commissioners with ample authority to introduce into the city a supply of pure and wholesome water. The plans and efforts of these commissioners, who expected to obtain a water supply from what was known as Carroll's run, were stopped by injunctions obtained by property holders through whose lands the pipes were intended to be laid, and the year 1803 passed without anything being done. In his next message to the city council the mayor plainly told the council that it was for the members of that body to decide whether it would be possible to adopt any measure that would relieve the situation. The council replied by authorizing the mayor to receive proposals at his office until June, 1804, for introducing "a copious and permanent supply of water into the city by an individual or company", and an advertisement was published to this effect. The citizens then took the matter in hand themselves, and a public meeting was called for April 21, 1804, "to devise some scheme to relieve the city from the unpleasant dilemma in which it was placed". The meeting was held, Gen. Samuel Smith was made chairman, and it was then determined that a joint stock company should be formed to supply the city with water. A committee consisting of Samuel Smith, William Cooke, Elias Ellicott, Robert Goodloe Harper, Thomas McElderry, Alexander McKim and John Eager Howard, was appointed to prepare articles of association, and report to an adjourned meeting on May 1, 1804, when commissioners were to be appointed to open books and receive subscriptions for stock of the company.

There seems to have been much difficulty in obtaining subscriptions to the stock, but it must be remembered that the Baltimore of a century ago was not a very large city, and it was only by the personal efforts of the commissioners that insurance companies and other public institutions were prevailed upon to come forward and subscribe for the amount required.

The board of directors was elected on May 24th, 1804, and Mr. Jonathan Ellicott was employed as surveyor and engineer. After much consideration and hesitation between the advocates of Gwynns' Falls and Jones' Falls as a source of supply, the latter was decided upon as affording the better advantages.

It now became necessary to secure a site for the erection of the works, and in 1806 a purchase was made of a lot now occupied by the office of the Northern Central railroad, on Calvert street. The works, which were erected under direction of Mr. John Davis, consisted of a wheel and pumps, which forced the water into a reservoir on the southwest corner of Cathedral and Franklin streets. The water was obtained through a common mill race from what was known as Keller's Dam, which supplied Salisbury Mill, the site of which was near the site of the old Belvedere bridge.

Judging from what has been disclosed by excavations made in the older streets in the city in recent years, all of the original water pipes and services laid by the water company were of wood. The main pipes were hemlock logs about eight feet long with bores of from one and one-half inches to four inches in diameter. One end of the log was tapered to a spigot, and in the other end a bell was hollowed out. The logs were joined by being driven tightly together, and then a wrought iron band about two inches wide was shrunk on tightly over the bell end. The main valves were of cast iron with tapered spigot ends, which were driven into the wooden mains, and the valves were opened by lifting the valve plug with a hook. The service pipes were made of cedar logs about six inches in diameter and about six feet long, with a bore of about one inch. These service logs were joined to the main by a large brass ferrule with tapered ends, one of which was driven into the main log and the other into the service log. These log mains and services have been dug up in nearly all of the old streets near the water front in the Fells Point section, east of Jones' Falls, and in the district west of Jones' Falls comprised within the limits of Old Baltimore Town as laid out in 1729.

The iron pipes first laid by the water company were imported from England, and were of the conical or tapering joint, for which the parallel joint has long since been substituted. In the fall of 1805 the company was in condition to ascertain if the city would require water and in what quantity, to be delivered for public use for extinguishing fires, so that pipes might be prepared and laid adequate to the demand, the company offering to furnish the necessary fire plugs at the rate of \$10 per annum for each. This proposition was accepted at a general meeting of the city council, but by a subsequent agreement the city undertook to construct the fire plugs at its own expense.

The company soon after this erected a new pumping station on the site afterward occupied by the pearl hominy mill, near the old Belvedere bridge, and built a reservoir on high ground at the northeast corner of what are now Chase and Charles streets, and, in addition, constructed the old Mount Royal Reservoir, which occupied a part of the site now covered by the union station of the Pennsylvania railroad on North Charles street, and was supplied with water by natural flow from the dam of the Lanvale Cotton Company.

On May 11, 1852, the city council authorized the appointment of water commissioners to inquire into and report upon the present mode of supplying the city with water, and its expense, as compared with that of other cities, the quantity and quality of such supply, and the propriety and practicability of obtaining it from some other source. The commissioners ap-

pointed were John W. Randolph, James Murray, Joshua Vansant, John King, J. J. Turner, and Ross Winans. The result of their deliberations and intelligent investigation of the whole subject was that the time had arrived when the supply of the city with water ought no longer be left in the hands of a private corporation, no matter how excellent its management, but should be in charge of and subject to the control of the city government. To this proposition no objection was made by the water company, which had again and again proposed to sell to the city and place the whole matter of the supply of water in the hands of the mayor and city council, where, in the opinion of the company, it properly belonged.

At the January (1853) session of the legislature authority was given to the mayor and city council to issue bonds to the amount of \$1,350,000 for the purchase of the water company's property, and subsequently an ordinance authorized the purchase from the Baltimore Water Company for that sum of certain of its corporate rights, privileges and franchises, and all of its property comprised within the terms of the proposal of sale dated December 1, 1852, made in the communication from the president of the company to Joshua Vansant, chairman of the board of water commissioners. This purchase was consummated and the city thus found itself in the place, to all intents and purposes, of the old Baltimore Water Company.

It was manifest to the city water commissioners who now had charge of this department that many improvements were necessary to increase the supply, either by a new system of works in connection with Jones' Falls, or by reinforcing it from other sources. The newspapers of that day will show the great difference of opinion prevailing in this connection. The Patapsco, Gwynns' Falls, the Gunpowder River and Jones' Falls all had their strong advocates. The contest finally narrowed to the Gunpowder River and Jones' Falls. Majority and minority reports were made, but the question was finally decided in favor of Jones' Falls.

In 1856, Thomas Swann being mayor, the mayor and city council by ordinance authorized the appointment of a water board, of which the mayor was *ex-officio* chairman. This board was required to mature and decide upon all plans with regard to the general policy of the department, the existing system, and the procurement of an increased water supply from Jones' Falls, the plans in this connection to be submitted to the city council.

This board considered several plans that had been suggested for a better supply of water from Jones' Falls, and decided to recommend to the city council the plan of Mr. James Slade, a well-known consulting engineer of that day, as being the best for the city to adopt. This plan was, in brief, to introduce a supply of water from Jones' Falls by natural flow at an elevation of 220 feet above mean tide, by erecting a dam at Relay House, on the Northern Central railway, running an aqueduct four miles long from there to a high service reservoir at Hampden, and from there to run a line of cast iron pipes to supply water direct to the city and also to supply a low service reservoir to be built at the then northern city limits, at North avenue and the falls. In July, 1857, the mayor and city council by ordinance authorized the water board to proceed with the construction of these works. Meanwhile the original loan of \$1,350,000 authorized in 1853 to purchase the works of the Baltimore Water Company, had been increased by authorization of the legislature of 1855 to \$2,000,000, so as to provide for new improvements in the old works, and, on recommendation of the Water Board, the legislature of 1856 authorized a further increase of the loan to \$3,000,000, so as to cover the cost of installing the new works. Contracts were let and construction was commenced on the dam, aqueduct,

and high service reservoir (Hampden reservoir) in 1858. In the following year the rest of the work was started and all of the system was completed in 1862. It comprised: the impounding reservoir Swann Lake, now called Lake Roland, having an elevation of 225 feet above mean tide and an available capacity of about 400,000,000 gallons; a brick conduit about five by six feet in dimensions and four miles long, extending from Lake Roland to Hampden reservoir; Hampden reservoir, having an elevation of 217 feet above mean tide, a depth of 20 feet, and a capacity of 50,000,000 gallons; two lines of 30-inch cast iron pipe running from Hampden reservoir to the city, and the low service reservoir, having an elevation of 150 feet above mean tide, a depth of 20 feet, and a capacity of 30,000,000 gallons. As the old Mt. Royal reservoir on North Charles street near the falls was abandoned when this new system was put in service, the name of Mt. Royal was transferred to this new low service reservoir. All this work was done under the supervision of Mr. Charles P. Manning, chief engineer, and its total cost was about \$1,313,000.

After the completion of this system it was found that the receiving reservoirs (Hampden and Mt. Royal) did not have enough capacity to supply the city during the longest periods when Jones' Falls remained muddy after a rain, and consequently it was decided to construct a new and much larger lake in which to store more of the clear water flow of the falls, at the same elevation as Hampden reservoir. For this purpose a site was selected at the southeast corner of Druid Hill Park, the necessary private land was bought and construction was commenced in 1864. This lake was first called Lake Chapman, but the name was afterward changed to Druid Lake. It has a depth of from 20 to 65 feet, a water surface area of about 53 acres, and an available capacity of about 429,000,000 gallons. It was completed and water first let into it in 1870. It was constructed under the supervision of Robert K. Martin, chief engineer, and cost \$1,234,179.

At the time of the completion of the system of supply from Lake Roland in 1862 the consumption of water in the city was probably about 7,000,000 or 8,000,000 gallons a day. The system was designed to give the city in the driest year a dependable supply of from 18,000,000 to 20,000,000 gallons a day, which, it was estimated at that time, would serve for about half a million people. At this time the city was growing so rapidly toward the high ground to the west and northwest that these works were hardly completed before it was found absolutely necessary to establish a higher service than that from Hampden reservoir and Druid Lake. A committee of the water board was appointed in 1870 to investigate the matter, and early in 1871 they sent the water and civil engineers of the department to several northern cities to get information. They recommended the establishing of a high service system, with a pumping station near Druid Lake, taking a supply from a new 30-inch main to be laid between Hampden reservoir and Druid Lake, and pumping to a small reservoir to be built on the high ground at the northwest corner of Druid Hill Park, at an elevation of about 350 feet above mean tide. The contract for the reservoir now called the Western High Service reservoir was let in 1871. It is 20 feet deep, and has a capacity of about 26,000,000 gallons. A contract for a 3,000,000-gallon pump to be installed in the pump house was awarded in 1872, and in 1873 a contract was awarded and work begun on the pump house. All of this system, including a 20-inch force main from the pump house to the reservoir and a 16-inch supply main from the reservoir to the city, was completed in 1874, and on June 10th of that year the first water from this service was supplied to the high ground in the

northwest section of the city. The entire cost of this high service system, including the 30-inch suction main from Hampden to Druid Lake, was about \$320,000, all of which was provided for from the surplus revenues of the department.

Notwithstanding the confident assertions and opinions of the advocates of the Jones' Falls supply that there would be no want of water at any time after its introduction, in the severe drouth of 1872 it became apparent that unless the Gunpowder was resorted to, Baltimore would encounter the risk of a water famine in every dry summer. So evidently had this been demonstrated that an ordinance was passed by the mayor and city council in 1872, Joshua Vansant being mayor, providing for the construction of a temporary supply, or, as it might be called, a reinforcement of the Jones' Falls supply. In 1874 a dam was constructed at Meredith's ford, on the Gunpowder, from which an engine and two pumps forced through a main over the dividing ridge between the Gunpowder and Jones' Falls into the channel of Roland run, a tributary to Jones' Falls above Lake Roland, 5,000,000 gallons each 24 hours. The cost of this temporary supply was \$603,091.11, which was considerably within the estimate of \$700,000 on which the work was undertaken.

The insufficiency of the Jones' Falls supply having thus been thoroughly demonstrated, the water board in 1872 (Joshua Vansant, mayor) authorized and directed Robert K. Martin, civil engineer, to make all the necessary surveys and prepare plans for the construction of proper works providing for the permanent introduction of the waters of the Gunpowder as an additional water supply for Baltimore. These plans and surveys having had the approval of Charles P. Manning, consulting engineer, and being thoroughly discussed and digested by the water board, at the instance of the board an ordinance was enacted February 12, 1874, authorizing the issue of city stock to the amount of \$4,000,000, to construct a proper system of works for obtaining a water supply from the Gunpowder river. The enabling act was passed by the legislature on April 1, 1874, and ratified when submitted to the people by a vote of 14,120 to 6,127.

After obtaining the proper authority, the water board provided in 1875 to condemn the right of way for the introduction of the supply by natural flow from the Gunpowder river, and in November, 1875, the contracts were made for the construction of the entire line. The water board then consisted of Ferdinand C. Latrobe, mayor and *ex-officio* president of the board; John R. Seemuller, secretary; John F. Hunter, George P. Thomas, Thomas Bond, George U. Porter, and Thomas W. Hall Jr.

The introduction of the Gunpowder supply involved the construction of the following works: An impounding reservoir on the river, Loch Raven, having a total capacity when built of about 510,000,000 gallons, a depth of from 4 to 20 feet, a width of about 100 to 800 feet, and a length of about four miles; a dam about 800 feet long and 30 feet high with a 300-foot spillway; a gate house at the dam from which the supply tunnel to the city starts; a supply tunnel 12 feet in diameter and seven miles long extending from Loch Raven to the city; a receiving reservoir, Lake Montebello, into which the supply tunnel discharges, having a capacity of about 500,000,000 gallons and a depth of about 33 feet; a conduit 12 feet in diameter and about a mile long, running from Lake Montebello to a gate house on the "Clifton" estate of Johns Hopkins, then owned by the trustees of Johns Hopkins University; and 40-inch cast iron supply mains running from that gate house to the then northern city limits at North avenue. This work was completed in 1881, and water from the Gunpowder river

was first sent through the Gunpowder tunnel direct to the city on September 28, 1881.

The amount of the appropriation for the introduction of the Gunpowder water supply was \$4,000,000. Out of this sum the work was built and paid for, and the land and water rights were also purchased or condemned and paid for. The sale of the bonds, with the premium, amounted to \$4,122,003.73. The total cost of land, water rights and entire work was \$4,091,375.60, leaving an unexpended balance of \$30,628.13.

The water board under whose administration the Gunpowder supply was completed, consisted of Ferdinand C. Latrobe, mayor and *ex-officio* president; George U. Porter, secretary; John F. Hunter, George P. Thomas, Thomas Bond, William A. Fisher and N. Rufus Gill. Mr. Robert K. Martin was chief engineer; Mr. Charles P. Manning, consulting engineer; William L. Kenly, principal assistant engineer.

The daily consumption of water in the city at that time was about 25,000,000 or 30,000,000 gallons, and the capacity of these works comprising the Gunpowder river supply and the estimated minimum flow of the Gunpowder river were both so much in excess of the daily water consumption mentioned that it was generally believed that the water works thus established would be sufficient to supply as large a population as Baltimore would ever have.

Before the completion of the Gunpowder river supply system it had become evident that it was desirable to have a larger storage capacity for clear water from this source than would be furnished by Lake Montebello alone, so as to prevent having to send muddy water to the city. It was determined that the extra storage capacity would be more of a protection to the city if provided in a separate lake. Consequently plans were made for another large storage lake called "Lake Clifton", to have a capacity of 265,000,000 gallons and to be built adjoining the gate house on the "Clifton" estate at the end of the supply conduit from Lake Montebello. The necessary land was purchased from the trustees of the Johns Hopkins University, who at that time owned the "Clifton" estate, and the construction was started in 1879. It was planned to pay for this lake out of an anticipated unexpended balance from the \$4,000,000 Gunpowder supply loan, and from the surplus of the department, which at that time aggregated over \$384,000. Before the lake was completed, however, these funds were exhausted, and the lake remained in an unfinished condition for about two years until additional funds could be secured. For this purpose, and for completing the installation of the additional large mains running into the city from Lake Clifton, the city obtained from the State legislature of 1882 the authorization of a loan of \$500,000. This was approved by the voters in the fall of 1882. A new contract for completing the lake was made and work was resumed in 1883. Before the lake was completed the \$500,000 loan was exhausted, and authorization was asked from the legislature of 1886 for a new loan of \$1,000,000 to complete the lake, to provide for a pumping station and reservoir for an eastern high service which the growth of the city to the north and northeast had by that time made necessary, and also to provide for some necessary distributing mains. This loan was made to bear interest at three per cent., and the city could not for that reason sell the bonds. Consequently an ordinance had to be passed increasing the rate of interest to four per cent., and the loan was again submitted to the voters and approved in 1887. In December, 1888, water was finally turned into Lake Clifton, and it was put in service.

In the same year about three and one-half acres of land were bought

on Gay street, adjoining the P. W. & B. railroad tracks, for the Eastern High Service pumping station and for shops and a storage yard; and also about 12 acres of land on Cold Spring Lane, west of York road, were bought from the A. S. Abell estate for an Eastern High Service reservoir, which was given the name of the Abell estate, "Guilford". The construction of Guilford reservoir was commenced in the summer of 1888, but the construction of the eastern pumping station was not begun until 1889. In that year also much of the large force main from the eastern pumping station to Guilford reservoir and to the Western High Service reservoir in Druid Hill Park was laid, and a contract was let for the first pump to be installed in that pumping station, a 5,000,000-gallon Worthington horizontal pump.

In 1891 all of the work on the Eastern High Service supply, including Guilford reservoir, the Eastern Pumping Station, and its pump and boilers, the force mains from the station to both Guilford and Western High Service reservoirs, and the suction main from Lake Clifton to the pumping station, was completed, and the service was started in operation in the fall of that year. Also in the same year the machine shop at the Eastern Station yard was completed and started in operation.

In 1888 the city had annexed a large territory adjacent to its northern and western boundaries, and in the early 90's the growth of the city toward the high ground in the northern and northwestern sections of this annexed district demonstrated the necessity of largely increasing the high service pumping capacity and of providing a higher service to supply sections of the city that were too high to be supplied by the High Service reservoir in Druid Hill Park. Also at that period the increase in consumption in the older sections of the city, where most of the distributing mains were small, had so reduced the pressure in the higher parts of each service area as to cause a great deal of inconvenience and complaint. As it was evident that the expense of the necessary improvements would be so great that they could not be provided for out of the department revenues and surplus, the water board recommended that provision be made for them in a loan for general improvements which it was contemplated to ask the State legislature of 1894 to authorize. Consequently, out of a loan of \$4,000,000 authorized by the legislature in that year, \$2,000,000 was for improvements in the water system. This loan was approved by the voters in 1894, and in 1896 the water board engaged Mr. Samuel M. Gray, the well-known consulting hydraulic engineer of Providence, R. I., to make an investigation and recommend how the \$2,000,000 should be spent. He recommended the installation of a 10,000,000-gallon pump in place of the old 5,000,000-gallon pump at the Eastern High Service Pumping Station, and the erection of a new pumping station with two 17,500,000-gallon pumps and a new 75,000,000-gallon reservoir to provide for the increasing high service consumption; the installation of an entirely new service, to be called the Upper Service, for the districts that were at too high an elevation to be supplied from the High Service, with new pumping stations taking suction from the High Service reservoirs, and pumping to standpipes; a revision of the service areas so as to throw the low pressure districts in any service area into the next higher service; and the laying of many additional large mains all over the older parts of the city. In the latter part of 1896 work on these improvements was started under the administration of Mayor Hooper and the water board, with Major William L. Kenly as water engineer.

Early in 1897 Major Kenly was made consulting engineer, and Mr. Nicholas S. Hill Jr. was appointed chief engineer to carry out the proposed

improvements. In that year a lot was bought at North avenue and Mc-Mechen street for the new pumping station; contracts were let for and work was commenced on the construction of that station; contracts were let for the two 17,500,000-gallon pumps, boilers and other mechanical equipment to be installed in that station, and for the new 10,000,000-gallon pump to be installed in the Eastern Pumping Station; a lot was bought at the highest point in the city at West Arlington for a standpipe; and contracts were let for and construction commenced on a steel standpipe and masonry tower to enclose the standpipe, the standpipe having a high water elevation of about 550 feet above mean tide and a capacity of about 340,000 gallons. Instead of building new pumping stations to pump from the High Service reservoirs to the Upper Service, it was decided to use the old High Service (Western) Pumping Station near Druid Lake in Druid Hill Park for that purpose, taking suction from Druid Lake. Consequently, in 1897 also, contracts were let for remodeling the pumps in that station so as to fit them for the Upper Service pumping. In the same year also about thirty miles of new large supply mains were laid all over the city, and the work of rearranging the service areas to eliminate low pressure was commenced.

In 1898 the West Arlington standpipe was completed, the force main from the Western Pumping Station to the standpipe and the distributing mains to West Arlington, Forest Park, and Walbrook were laid, and this section of the upper service, called the Western Upper Service, was put in operation. In the same year about eighteen or nineteen miles more of the additional large distribution mains were laid.

In 1899 Mount Royal Pumping Station was completed, and all of its mechanical equipment was installed and the connections made from it to the High and Middle Service distribution systems. Also the 48-inch suction main from Lake Clifton to this station was laid. In addition to this main about seven more miles of large distributing mains were laid, which practically completed the work of that nature recommended by Consulting Engineer Gray.

In 1900 the new city charter went into effect, putting the water board on the same footing as other city departments in matters of awarding contracts, obtaining of appropriations, disposition of surplus, etc., and making the water engineer the president of the water board. Mr. Alfred M. Quick, who was assistant water engineer under Mr. Hill, was appointed president of the water board and water engineer. The machinery at Mount Royal Pumping Station was tested and started in regular service early in the year. Great progress was made in this year on the rearrangement of the service areas recommended by Mr. Gray, and many areas of low pressure were thereby eliminated. This year was a very dry year, the flow of the Gunpowder River was lower than shown by any previous records, and the consumption of water in the city had so increased that for the first time since the Gunpowder supply was introduced, the stream flow of both sources of supply was for a short period only about equal to the consumption.

In 1902, on account of the filling up of Loch Raven with sediment and the slow progress made in restoring the Loch to its original capacity with the small dredging plant then owned by the city, it was decided that a new suction dredge should be secured large enough to clear the Loch of sediment in three or four years. Consequently a suction dredging plant was built at the Loch under contract, and started in operation early in that year, the cost of the plant, \$100,000, being met from the balance remaining unexpended from the \$2,000,000 loan obtained in 1894. Finding that this balance was not sufficient to meet the cost of constructing the New High

Service reservoir recommended by Consulting Engineer Gray in 1896, it was decided to ask for a new loan of \$1,000,000 for that purpose, and also to purchase the mains of the Baltimore County Water and Electric Company in the southwestern section of the city, so as to supply that section with city water, and also to extend the upper service to the high ground in the city, east of Jones' Falls, which could not be supplied from the high service. The authorization of this loan was secured from the State legislature of 1902, and it was approved by the voters in the fall of that year. In the same year the construction of a large fireproof storehouse at Gay street yard was commenced.

By 1903 practically all of the changes in the service areas recommended by Mr. Gray had been made. In that year, also, work on the Eastern Upper Service system was started, a lot on Roland avenue, just north of the northern city limits, being purchased for a standpipe, and the laying of the force main from the Western Pumping Station in Druid Hill Park to that lot being started. Also, preliminary negotiations were entered into for the acquisition of the Baltimore County Water and Electric Company's interests in the southwestern section of the city. In the same year a site for the New High Service reservoir was selected by a commission delegated for that purpose in the ordinance of estimates, but on account of the cost of the site and other objections the city council repealed the clause delegating the authority, and the site was not purchased.

In 1904 occurred the great fire which destroyed a large part of the commercial and business section of the city. Notwithstanding that many of the mains and large service pipes were broken during the fire, the water supply system was so handled that the pressure and volume of water was maintained and the maximum depletion of any of the reservoirs was not over two and one-half feet. The destruction of mains, fire hydrants and meters, and the cutting off of revenue from the Burned District caused a considerable financial loss to the water department. This was practically compensated for by a special appropriation of \$73,000 made to the department during the year by ordinance of the city council from the fund received from the sale of the city's interest in the Western Maryland railroad. During this year an ordinance was passed authorizing a board of three arbitrators to be appointed to determine the value of the Baltimore County Water and Electric Company's interests in the southwestern section of the city, which the water board desired to acquire, and Bernard Carter, Esq., John V. L. Findlay, Esq., and Judge Thomas J. Morris were selected as the arbitrators. In the same year contracts were let for the steel standpipe and masonry tower for the Eastern Upper Service system, and the work of construction was then commenced. The most important occurrence of this year affecting the water service was the decision of the General Improvement Conference, called together by Mayor McLane immediately after the great fire to consider public improvements, to include in their program a general improvement of the water supply system. The sub-committee on water of this conference asked the water board's views as to the most important developments essential for the improvement, protection and preservation of the water supply. The water board recommended as the most important improvements the acquisition of the watershed of the Gunpowder river and the building of a large storage lake on the river above Loch Raven. The Conference sub-committee on water adopted the suggestions of the water board, and recommended that \$25,000 be at once appropriated for surveys and investigations from the \$1,000,000 loan obtained in 1902, and that an enabling act be asked from the State

legislature of 1906 to cover the cost of acquiring such land in the watershed and building such storage lakes as would be found necessary. Subsequently the Conference itself decided to make this enabling act for a \$5,000,000 loan. In 1904 also the water board secured from the State legislature an act authorizing the city council to largely increase the board's powers in applying, adjusting, and abating water rates, compelling payment of plumbing bills, and preventing waste of water. An ordinance covering these matters was prepared by the water board and passed by the city council in July.

In the same year the water board selected a site for the proposed New High Service reservoir, and introduced into the city council an ordinance making appropriations to pay for that site and for starting construction of the reservoir there, but on account of there being at that time litigation in regard to the site previously selected by the Reservoir Commission the ordinance was not passed.

In 1905 the arbitrators appointed to consider the value of the Baltimore County Water and Electric Company's interests in the southwestern section of the city, after hearing expert testimony and legal argument, awarded the company \$230,618. On the first of November a first payment was made on this purchase of about \$196,000, the property was turned over to the city, and the city water service was turned into the mains there. In 1905, also, the Roland avenue standpipe and tower, having a high water elevation of 340 feet above mean tide and a capacity of about 213,000 gallons, was completed and put into service, supplying the Hampden section of the Eastern Upper Service. In the same year, also, comprehensive plans were made and work was commenced on a revision and enlargement of the distribution system in the Burned District. Two special appropriations were made by ordinance for this work, the first of \$60,000, and the second of \$40,000. In this year also the water board started preliminary surveys and investigations to determine the proposed improvements to be provided for from the \$5,000,000 loan to be submitted to the legislature of 1906. The tentative plans suggested by the water department as a result of these surveys and investigations proposed a 20,000,000-gallon impounding reservoir to be built on the Gunpowder river, a short distance above the present dam at Loch Raven, impounding water at a height that would supply the Middle Service district of the city by gravity, that the Jones' Falls supply be abandoned, and that a beginning be made on the purchase and reforestation of land in the Gunpowder river watershed.

In 1906 the reconstruction and enlargement of the distribution system in the Burned District was completed, costing about \$100,000. Also, final payment was made to the Baltimore County Water & Electric Company, and about \$20,000 was spent in laying new and larger mains in the southwestern section of the city formerly supplied by that company. A new 75 h. p. boiler was erected in the Western Pumping Station; the Roland standpipe lot was graded, and ornamental walls, walks, steps, pool, etc., were built there, and the old City Hall, used by the department as a store-room and headquarters for the construction division, was entirely remodeled at a cost of about \$15,000. In the same year, after ordinances had been introduced in the city council to purchase two different sites for a new High Service reservoir and one of them had been passed and vetoed by the mayor, the council finally appointed a commission to select a site, composed of the mayor, the presidents of both branches of the city council, the city register, and the president of the water board. After considering both sites and getting expert advice this commission recommended the

purchase of the site known as the "Williams" site, which had been originally recommended and consistently advocated by the water engineer. An ordinance authorizing the purchase of this site was introduced into the city council in the same year. Also, the \$5,000,000 loan for water supply improvements was submitted to the legislature, but, through the opposition of private corporation and county interests that would be affected by the proposed improvements, the enabling act failed to pass.

In 1907 the Reservoir Commission purchased the "Williams" site for the New High Service reservoir, at a cost of about \$57,000. At the same time the park board bought from private estates about as much more land adjoining the Williams site to the north and east, and, by agreement between the commission and the park board, Mr. Frederic Law Olmstead, the celebrated landscape architect of Boston, was engaged to suggest plans for location and shape of the reservoir and the parking of the adjoining park grounds. In the fall of 1907 the matter of the \$5,000,000 water loan enabling act was again taken up, and the mayor called a conference of the officials of the county and corporations affected by the proposed improvements, to adjust matters in dispute before introducing the bill into the legislature of 1908. These disputed points were adjusted by compromising with the county and by the water board agreeing to purchase all of the property of the private corporation at a fixed price.

This act was then passed by the legislature of 1908, and in the fall of that year the loan was approved by the voters. In November, 1908, by authority of an ordinance of the city council, the mayor appointed two consulting engineers, John R. Freeman, of Providence, and Frederic P. Stearns, of Boston, to investigate and report as to the best method of improving the water supply system under the \$5,000,000 loan. In 1908, also, contracts were let and work was commenced on the New High Service reservoir. It was completed in December, 1910, and put in service in January, 1911. It has a high water elevation of 350 feet above mean tide, a depth of 30 feet, and a capacity of about 200,000,000 gallons, and it cost about \$550,000.

In 1909 practically the whole year was spent on the investigation by the consulting engineers by Messrs. Hazen and Whipple, of New York, who were called into consultation as to sanitary, clarification and purification questions, and by the engineers of the water department acting under their direction. Early in 1910 the consulting engineers made their report endorsing the plans of the water engineer for a large impounding lake on the Gunpowder river just above Loch Raven impounding water at an elevation that would supply the Middle Service districts in the city by gravity, and for abandoning Jones Falls as a source of supply, and also recommending that clarification and purification works, consisting of coagulating and settling basins and a slow sand filter plant, be installed to treat all of the water delivered to the city. This report was adopted by the water board, and the water engineer was authorized to prepare plans at once for the impounding reservoir and filter plant in accordance with the consulting engineer's recommendations. When these improvements are completed Baltimore will have a water supply system unsurpassed by any other in this country.