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**HISTORY of EAST PARK RESERVOIR**  
**Philadelphia, PA**  
**1869-1889**

**By Jane Mork Gibson**  
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**May 2009**

The East Park Reservoir took almost twenty years to build. The need for a large storage reservoir in Philadelphia became apparent in 1869 after an unprecedented drought threatened complete stoppage of the water supply in Philadelphia. A reservoir of considerable size would also provide for sedimentation of raw water pumped from the river, one of the major theories about pollution control. Although construction was begun in 1871, the East Park Reservoir was not opened until October 8, 1889. The intervening years were filled with controversy to the extent that even after a considerable amount of money had been spent, the idea of abandoning the project was real. Based on the Annual Reports of the Philadelphia Water Department, the following drama unfolds.

In November of 1869 Chief Engineer Frederic Graff, Jr. reported on the situation and proposed construction of two new reservoirs within the Fairmount Park boundaries, one at Strawberry Mansion and one later termed the East Park Reservoir. It was estimated that the Strawberry Mansion Reservoir at an elevation above city datum of 150 feet could contain 89,120,000 gallons. The East Park Reservoir at an elevation of 130 feet above city datum could contain 635,704,200 gallons. Subsequently, because of lack of available space, the plan for the proposed Strawberry Mansion Reservoir was abandoned and it was never built, even though the elevation was higher and it could serve more of the city. The construction of the East Park Reservoir would enable a change to be made in the distribution of water as soon as the necessary mains could be laid, so that the Delaware, Spring Garden, Corinthian, Fairmount and East Park Reservoirs would have a supply of at least six to eight days, or more, for the several districts depending upon them.

On November 30, 1869, the date of Graff's report, a request was made to Councils for funds to construct the East Park Reservoir, but it was March 15, 1870 before one-third of the sum was granted, and even then some of the funds had to be used for other projects. There was delay in passage of the desired loan, then a veto by the Mayor over the appropriation bill, and an injunction placed upon the city treasurer and water department by the Supreme Court. Finally the loan became available November 6, 1871. Work began immediately November 9<sup>th</sup> on the construction of the large storage reservoir. This was the first of many delays in building the reservoir.

The location of the reservoir in the newly created Fairmount Park made it possible to plan on a large scale for the city's use of part of the former Parade Ground. The size of the reservoir was overwhelming, with the whole circuit of the embankment measuring nearly one and one-half miles. In 1871 a great deal of preparation work was done, removing unsuitable soil from the base of the embankments and moving it to a spoil bank for future use. According to Graff in a letter of October 24, 1889, "The preparation of the ground for the reception of the new embankment, and the construction of the puddle wall through the center of the same, occupied much time and labor, as it is a work upon which the future safety of the reservoir may mainly depend upon which the strictest care is required." It was decided to divide the reservoir into two unequal parts by an embankment, raised not quite to the normal height of water in the reservoir, so when the reservoir was entirely filled, the surface would appear to be a

single sheet spreading out for nearly one hundred acres. This division also provided for safety in case of accident and for use during temporary repairs.

Graff was removed from office in 1873 and there may have been a political reason for the abrupt cessation of work on the East Park Reservoir due to the power of the Republican Party. Graff was defeated by one vote which aroused considerable controversy in the press. The new Chief Engineer was William McFadden who served for many years. He continued to embrace the construction of a storage reservoir that could supply other reservoirs, but he considered it had been a mistake to build the East Park Reservoir because at 135 feet above city datum, it was only 15 feet above Spring Garden and Corinthian Avenue reservoirs, and other reservoirs were too high and could not be supplied by gravity from East Park.

Construction during 1873 included the division embankment that separated the two northern sections, the laying of 36-inch pipe, and the construction of the large gate chamber, at Thirty-third and Montgomery Avenue. Work was begun on the gate-house at Norris Street. The main outlet was determined to be at the junction of the three division embankments, arranged so that the water can be passed into either one or all the sections.

In the Annual Report for 1874, there is no mention of East Park or Storage Reservoir. The Annual Report in 1875 contains information on estimates of the earth work at the East Park Reservoir. The total estimate of excavation from the beginning was 1,133,000 cu. yds. Again there was no mention of East Park Reservoir in 1876, but the need for funds is stressed, with McFadden fearing the consequences of more delay. However, in 1877 McFadden reversed his opposition to completing East Park Reservoir and proposed completion, with raw water pumped from Spring Garden and Fairmount Reservoirs and then water "filtered by subsidence" conducted to other basins. No action was taken, and the Annual Reports continued to plead for money necessary to operate the water system.

A Report from a Board of Experts dated April 1883 considered the subject of the present and future water supply of the city. Along with other considerations, the report stated, "The city has already expended large sums at East Park, and storage for its levels of distribution of from fourteen to sixteen days supply can be had by completing it, at far less cost than in any other way." In 1884 William Ludlow was Chief Engineer and summarized the value of the East Park Reservoir, "The East Park Reservoir, when completed, at the elevation of 133 feet above City Datum, will contain seven hundred million gallons, for the supply of all the City below Spring Garden street, say seven hundred thousand people, who, with fifty gallons each per day, can draw from the Basin for twenty days. It has cost one and a quarter millions of dollars, and will require as much more to complete. The existing Basins of Fairmount, Spring Garden and Corinthian contain only about two days' supply."

Interest in the completion of the East Park Reservoir is shown in the Annual Report for 1885 where William Ludlow reviewed the situation. "The East Park Reservoir was designed as a Storage Basin for all that extensive area, say from Spring Garden street southward and from Broad and Ninth streets eastward, which its projected surface elevation of 133 feet would enable it to reach. Work on it has been suspended since 1875, and the expenditure of about \$1,250,000 has so far been rendered useless by the failure to complete the work. To put it in service will cost about \$1,250,000 more, and require two or three years time. When completed it will not only furnish an opportunity to get rid of a considerable proportion of the weightier sediment with which the Schuylkill water is frequently charged, but will be a valuable safeguard against failure of the pumps or bursting of mains."

Discussion about the East Park Reservoir continued in the 1886 Annual Report where Chief Engineer Ogden summarized the work: "This reservoir was begun in November 1871, and continued partly by day's work and partly by contract until July 1875, when the appropriation became exhausted. The banks were constructed to near the proposed height and the outlet chambers built." The basin was to

be in three unequal divisions with capacities as follows: Southern section 62,740,931 gallons; Eastern section 311,639,614 gallons; and Western section 326,939,009 gallons; making a total of 701,319,554 gallons. He advised that work should resume as soon as appropriations were made, "beginning with the smallest or southern division, where the least work remains to be done." Completion of East Park Reservoir and the Cambria Reservoir – proposed but never built - assured the city of from 15 to 20 days' storage.

In 1887 the construction of East Park Reservoir was once again taken up, and in 1889 it was completed. In 1887 the smaller basin (southern section) of East Park reservoir was built, with a capacity of 60,000,000 gallons. The labor force was varied: "The bank was finished by days' work, and the lining with concrete and brick laid in Portland cement was done under contract awarded after advertisement." The work was completed ahead of time and provided experience for the larger basins. In 1888 the northeast section of the reservoir was completed and the western section was completed in 1889. A detailed description of the work is included in the Annual Reports of 1887, 1888 and 1889. Cambria Reservoir considered too expensive and unnecessary in 1887.

In the Annual Report for 1888 a brief description gives details about the construction of the interior of the northeast basin: "The clay was put on bottom in three layers 6 inches deep; each layer was well puddled, then dressed, and rolled to proper grade. The total number of loads of clay brought from outside was 123,984, and 60,000 cubic yards of gravel were hauled out. The bottom and slopes were lined by contract; the slope begun May 1<sup>st</sup> were lined with straight, hard paving brick, laid on edge on cement mortar two inches thick; the bottom was begun June 5<sup>th</sup>, and lined with 4-1/2 inches of concrete, composed of one part of the best Portland cement to two of bar sand and four of stone, broken to pass through 1/12 inch ring, the cement and sand were thoroughly mixed first; afterwards the stone was well mixed with the mortar, and spread evenly on the bottom, well rammed and covered with 1/2 inch of mortar; on top of this a dryer was used, composed of equal parts of cement and dry sand, then floated and troweled to a smooth and dry surface; the top of embankment was graded four inches below the top edge of brick curbing, and an average of 16 feet wide for a vulcanite pavement, done by contract, from west division bank around southeast and north sides of reservoir to west division bank, also division embankment between north and southeast basins, a distance of 4, 764 feet; for this pavement 990 cubic yards of clean sharp gravel was excavated from bottom of basin, and distributed where required, all the above contracts were complete October 19<sup>th</sup>."

The Annual Report for 1889 recognizes the importance of this new reservoir: "The final completion of the East Park Reservoir marks an epoch in the history of the water supply of our city." By providing this large storage reservoir receiving water from pumping stations and connected to the city's distribution system, water could be directed where it was needed in most of the city. "Work on the third and last section of the reservoir was begun on February 27, under a contract covering the whole work of clay puddling and of brick and concrete lining for the slopes and the bottom. The work was completed and water let into the basin on October 8.... The completed reservoir has three sections of unequal dimensions, which can be used separately or as a whole. The pumping mains are so arranged that water can be pumped into any one of the sections, but it can be distributed from only two of them. The extent of the work is best appreciated from a personal inspection, but some idea can be formed of its magnitude by the statement that it will hold nearly 700,000,000 gallons of water, and that the distance around the inside slopes is 13,210 feet, very nearly two and one-half miles." After twenty years, much controversy and almost complete abandonment, "one of the largest reservoirs built with artificial banks from bottom to top was finally finished...."

One of the great advantages of the new East Park Reservoir in providing for storage of a large amount of water, not only in times of emergency but also in the normal need for water is given in the

Annual Report for 1890. In 1889 the wheels were stopped 4,533-1/2 hours at the Fairmount Pumping Station due to full basins at East Park, whereas in 1890, they were stopped only 893 hours.

On October 8, 1889 a formal ceremony for “Turning on the Water” was held at the reservoir, with many dignitaries attending. The Evening Star newspaper recorded the event on October 9: “ No chief marshal in a heated campaign has ever succeeded in getting such an influential array together on parade as the four hundred and odd who, at the command of General Wagner [Director of the Department of Public Works], first marched up the hill to the reservoir, and then marched down again, . . . Mayor Fidler and his guest, the Mayor of Manchester, England, descended the flight of wooden steps to the vulcanite bottom of the empty basin, and the great crowd of public men followed. Immediately behind the Mayor, and unknown to many of the younger men present, came Frederic Graeff, who was the water engineer of the city twenty years ago, and who designed the reservoir.”

A letter from Frederic Graff, Jr., in which he relates his role in the development of the East Park Reservoir beginning in 1867, is contained in the Annual Report for 1889. The letter is reproduced here:

Philadelphia October 24, 1889

To LOUIS WAGNER, ESQ.,  
Director of Public Works of the City of Philadelphia

DEAR SIR: -- I proposed and designed the East Park Reservoir immediately after the unprecedented drought in 1869, when the safety and comfort of the city was so seriously imperiled; the urgent necessity of providing means of avoiding so great a disaster as the city was then threatened with became painfully evident. At that time the combined contents of all the reservoirs then in use on the east side of the Schuylkill was only equal to about one and two-tenths days of the required supply; it will therefore be seen how imperative was the demand for additional storage.

I made the first special report to Councils on the subject of enlarging the capacity of the works, November 30, 1869, and finally the site of the reservoir was decided upon. The first map showing its form, size, and position was published in the annual report of the Water Department for 1871. The reasons for this selection were, that it was desirable that a reservoir should be constructed of the largest possible capacity – my desire being to get storage of 750,000,000 or more, which could, at the same time, be situated as near as possible to the existing pumping works, those at “Schuylkill Works” (now Spring Garden Works) being within two thousand five hundred feet could be made available, thereby avoiding the necessity and expense of erecting a new pumping station, which would necessarily have to have been situated higher up the river, at a point nearer to the pollutions at that time discharged at Manayunk. It was also desirable that the reservoir should be placed as convenient as possible to the points of its intended distribution.

It was evident that no reservoir of anything like the size which would fill the above requirements could be built outside the limits of the Park, without the vacation of very many streets running in both directions, which, of course, would have been very objectionable.

In addition to this, the ground in the Park was already the property of the city.

When careful calculations indicated inclusively that at least 88 per cent. of the whole population of the city, then estimated at 673,726 souls, could be adequately supplied from a reservoir so placed, and which could be large enough to contain a supply sufficient for from fourteen to twenty days of the maximum demand at that time, I had no hesitation in recommending the site for, and designing the reservoir where it now stands. Since that time the population has materially increased, and the demand for water has been greatly augmented by more extravagant use and waste of it. The height of the houses and stores is gradually getting greater, and therefore the relative capacity of the reservoir, and the demand

upon it, have materially changed in the past twenty years, yet I feel confident, that with a proper enlarged system of distributing mains, more than 75 per cent. of the present population can be properly supplied from the East Park Reservoir.

In this opinion it is a satisfaction to be confirmed by the reports of the Board of experts, who have, at different times, investigated the condition of the water supply of the city. The board of 1875 reported that 75 per cent. of the population could then be supplied from the reservoir, and that 70 per cent. could be properly supplied from a storage reservoir with a water-level of 120 feet, or thirteen feet lower than will be carried in the East Park Reservoir.

The area of high ground needing water which could not be supplied from Roxborough or Chestnut Hill Works was comparatively small, and it did not appear to be good economy to pump the total supply required for the entire city to so great a height, simply that a small area of high ground, then with a limited population, could get water, particularly when this has to be raised by expensive steam power. Therefore, as 88 per cent. of the population could be supplied by East Park Reservoir, it was considered best that the remaining 12 per cent. should be supplied from other sources.

A site could have been obtained (and surveys and estimates were made for it) in the Park at Strawberry Mansion, in which a water level of 148 feet could have been carried, but the area of the ground available would have only been sufficient for a capacity of 89,000,000 gallons, which I did not consider large enough for the purpose, and, therefore, with the reasons given above, accepted a somewhat lower level.

When I left the work February 28, 1873, the whole of the black top soil had been removed from the ground, puddle trench made to unite the new work with the ground, and the embankment raised to an average height of 7.37 feet all around, nearly one and a half miles. New Park roads were made at several places to take the place of those covered by the embankment. Most of the original black soil, which was from 15 to 20 inches deep, had to be hauled to spoil bank on Thirty-third street, half a mile or more away.

You will recognize the very great importance of having the foundation of the work (so to speak) done with the utmost care and attention, and its consequent increased cost, over the mere hauling, sprinkling and rolling of the earth put upon the embankment afterward.

The sum expended upon the work during my connection with it was \$249,252.13, which included the purchase of water-carts, rollers, tools of all kinds, granite and building stone for the gate houses, as well as other materials, most of which were made available later on.

Hoping that the above may supply the information asked for in your favor of October 11, 1889, I remain,

Very respectfully and truly yours,

FRED GRAFF

First report made by me to Councils on the subject, November 30, 1869.

Ordinance making appropriation, passed Councils, June 29, 1871.

Ordinance vetoed by Mayor Fox, August 22, 1871.

Passed by Councils over his veto, September 5, 1871.

Injunction granted by Judge Thompson to restrain me from going on with the work, September 18, 1871.

Injunction withdrawn and appropriations finally passed by Councils, October 26, 1871.

Bill finally signed by Mayor Fox, November 6, 1871.

Work commenced under my direction, November 9, 1871.

May 2009

JMG

# **EAST PARK RESERVOIR, Philadelphia, PA 1869-1889**

**Historical Information compiled by Jane Mork Gibson  
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May 2009**

**(For full bibliographical references, contact Adam Levine at the address listed on this Website)**

## **SUMMARY**

- East Park Reservoir proposed and designed by Frederic Graff following unprecedented drought in 1869.
- see copy of Oct. 24, 1889 Graff letter below.
- Construction started November 1871; completed 1889.
- Nov. 30, 1869 - Request made to Councils for funds to construct East Park Reservoir
- March 15, 1870 – One-third of sum granted.
- Delay in passage of desired loan, veto of Mayor over appropriation bill, injunction placed upon City Treasurer and Water Department by Supreme Court
- Appropriation passed October 26, 1871
- Loan available November 6, 1871
- Work begun on constructing large storage reservoir November 9, 1871.
- Construction continued in 1872 and 1873
- Circuit of the embankment measures nearly one and one half miles in extent.
- Altitude of “storage reservoir” 135 feet above city datum, only 15 feet above Spring Garden and Corinthian Avenue reservoirs.
- No work done 1874
- Work planned but suspended in 1875
- 1876-1883 no response to pleas for completion
- 1883 Cambria Reservoir proposed; higher than East Park at Cambria and 30<sup>th</sup> Street
- 1886 Propose completion of East Park and Cambria Reservoirs
- 1887 Plan for Cambria Reservoir abandoned due to excessive cost
- 1887 East Park smaller basin completed – 60,000,000 gallons added to storage capacity
- Water first pumped into section November 19, 1887.
- 1888 - Northeast division of reservoir completed - Capacity 306,869,805 gallons
- 1889 - Work on third division of reservoir completed.
- Official opening Oct. 8, 1889, see newspaper article below.
- Note from PWD Annual Report for 1890 re Fairmount, indicating value of new basin:
  - 1889 wheels stopped 4,533-1/2 hrs. due to old full basin [no storage space]
  - 1890 wheels stopped only 192 hrs. due to new full basin
  - This is owing to the connection with the East Park reservoir.
  - Wheels No. 1 and 3 (1851 turbine and new turbine 3) pump into Fairmount basin alone
  - All others into the East Park Reservoir, from which the water is drawn into the Corinthian avenue and Lehigh avenue basins

## **NOTES FROM PHILADELPHIA WATER DEPARTMENT ANNUAL REPORTS**

### **EAST PARK RESERVOIR**

Chief Engineer Frederic Graff, Jr.  
PWD Annual Report for 1871, pp. 5-6

As early as November 30, 1869, a report was made to councils by the chief engineer, detailing certain required renewals and additions to the work, and an appropriation asked for the purpose of effecting the objects named.

On the 15<sup>th</sup> of March, 1870, about one-third only of the sum asked was granted. As this was insufficient to accomplish all the improvements required, it was decided to divide the amount between several of the most urgent of the objects for which the loan was asked although it was evident that even these could only be partly done with the limited sum granted.

It was confidently hoped that the balance necessary to complete the works commenced and others proposed, would be promptly appropriated, but owing to the unavoidable delay in the passage of the required loan, the veto of the mayor of the city upon its appropriation bill, and the injunction placed upon the city treasurer and this department by the Supreme court, the loan was not, finally, put at our disposal until November 6, 1871, almost two years after the first application had been made.

Thus all the best part of two summer seasons, fit for out-door work, was entirely lost.

The work suspended was the completion of the Delaware reservoir, the commencement of the large storage reservoir on East Park, the ascending main from the Delaware engine-house to the reservoir, the finishing of the Belmont reservoir, and the rebuilding of the dam.

It has been considered necessary to advert to this matter in order that it may be seen that the unfortunate delay in commencing and finishing work of vital importance to the city, cannot be chargeable to any failure of duty on the part of the chief engineer of the department.

### **EAST PARK RESERVOIR**

Chief Engineer Frederic Graff, Jr.  
PWD Annual Report for 1872, pp. 16-17

The work of constructing the large storage reservoir in the East Park (after two years' delay in obtaining the necessary loan) was commenced November 9<sup>th</sup>, 1871, and carried forward energetically; during part of the season difficulty was experienced in getting a sufficient number of men. A very large amount of work has been done, much of it entirely of preparatory character, such as stripping of the black, vegetable and unsuitable soil from the base of the embankments, and its cartage to spoil bank for future use upon the outside slopes of the banks when finished. This soil was in places 15 or 18 inches deep and had to be hauled to very considerable distances.

The preparation of the ground for the reception of the new embankment, and the construction of the puddle wall through the centre of the same, occupied much time and labor, as it is a work upon which the future safety of the reservoir may mainly depend and upon which the strictest care is required. This work has been done for nearly the whole circuit of the embankment, nearly one and one-half miles in extent. The raising of the banks can go on rapidly and without interruption next year.

Considerable work was required in making new park roads over the heads of two valleys, at the points where the reservoir crossed the old roads.

For safety, in case of accident, and for the convenience of temporary repairs, the reservoir will be divided into two unequal parts by an embankment, which will be raised not quite to the normal height of the water in the reservoir; so that when the reservoir is entirely filled, this bank will not show – and the surface will present the appearance of a single sheet of nearly one hundred acres in area.

A map will be found in the front of this report showing the ground plan of the East Park and the space occupied in it by the reservoir, together with inlet and outlet gate and screen houses, the supply mains, and routes which may be followed by the future discharge mains; also a position for new pumping works at the Schuylkill Works, to be erected and used when the old works have been entirely filled with engines. This work has been put under the immediate charge of Assistant Engineer James M. Kreamer, who has obtained experience on similar work at the Belmont and Delaware Reservoirs under the present Chief Engineer. The general superintendent of the work Edward S. McGlue, who was employed in the same capacity at the Delaware Reservoir.

## EAST PARK RESERVOIR

Chief Engineer William McFadden

PWD Annual Report for 1873, pp. 12-14

### Storage Reservoir [East Park Reservoir]

The altitude of this reservoir is 135 feet above city datum, only 15 feet above the Spring Garden and Corinthian Avenue reservoirs. This is much to be regretted, for had a higher altitude been chosen, the high ground in the Fifteenth, Twentieth, Twenty-eighth, and Twenty-ninth Wards could have secured an adequate supply, and a sufficient pressure for any emergency, without depending upon Belmont or Roxborough. The storage reservoir can only be considered a part of the first system, embracing the Fairmount, Spring Garden, and Delaware Works, the reservoirs of which range in altitude from 94 to 120 feet.

This structure was in charge of James M. Kramer, the Assistant Engineer, from whose report I am enabled to give the following facts. The embankment at the northeast corner was raised to within 10 feet of the finished level. The banks were raised on the north side an average of 12 feet, on the west 9 feet, and the south 4-1/2 feet, and on the east side 4 feet.

During the coming year the small basin of the reservoir can be finished. The completion of the gate house will permit the whole embankment to be carried up at once, and will guard against unequal settling. A portion of the north and east bank has had the clay lining placed on, so that when the work is resumed, the whole can be carried up solid. Much labor was required in preparing the base of the embankment where intersected by old roads, park drives, hedges, etc.

The division embankment, separating the two northern sections was started in the fall, and much progress made. Three lines of 36-inch pipe, which are in place, pass through this bank, each line controlled by a valve. Three lines of 36-inch pipe will connect the small section with the two larger. The balance of the top soil, remaining over from last year, and a large amount of other material unfit for main embankment, have been removed to spoil banks.

The large gate chamber, at the junction of Thirty-third and Montgomery Avenue, is nearly completed. This structure contains about 5,000 perch of stone. Eight 36-inch pipe lead from the gate chamber, each controlled by a stop, and so arranged that water may be drawn through either one or all. Work has been commenced on the gate-house at Norris Street; all the excavation was finished during the

fall and most of the foundation laid. This structure, when finished, will have two 60 inch pipes, and will be used as an outlet chamber exclusively. It will be provided with gates for shutting off the water from the pipes in case of repairs.

The main outlet will be at the junction of the three division embankments, and so arranged that the water can be passed into either one or all the sections. The pumping main will be arranged to introduce the water either through the main gate chamber or the inlet chamber on the division embankments.

#### EAST PARK RESERVOIR

Chief Engineer William McFadden

PWD Annual Report for 1874

[No mention of East Park or Storage Reservoir.]

[Maps of other stations and reservoirs, but none of East Park.]

#### EAST PARK RESERVOIR

Chief Engineer, William H. McFadden

PWD Annual Report for 1875, pp. 58-61

In accordance with order of May 5<sup>th</sup>, 1875, I have used every effort to obtain the data by which to make correct estimates of the earth work at the East Park Reservoir.

In the report of the Chief Engineer, for 1872, I find the following:

[quotes "The work of constructing the large storage reservoir in the East Park ... where the reservoir crossed the old roads.]

There is also in the department a plat of the area occupied by the East Park Reservoir, showing the elevation of the ground at equal distances of 100 feet, made before the work of excavation and filling was commenced.

No bill of quantities, however, showing the amount of excavation required to finish the reservoir from the beginning; nor one showing the amount of work done at the time of the above report, can be found in the Department.

A plat and field notes, showing the condition of the work May 15<sup>th</sup>, 1874, was made at the time of the letting of the contract and notes have been taken showing the condition of the work October, 1875. By a comparison of these data, and bearing in mind the necessary contingencies incident to construction, we are enabled to determine the amount of excavation required to build the reservoir.

Those portions of the bottom of the basin originally below sub-grade, before being filled to that grade, should have been, and no doubt were, denuded of their soil and objectionable matter, so that in estimating the amount of material excavated in building the basin, we must take into consideration not only that, above the sub-grade of the basin, but also the vegetable soil removed and the material excavated for the puddle ditches; also, such sub-grade excavations as were considered expedient.

These items would give the amount of material moved once. Such a quantity as would be required from the soil piles, to place on the outer slope of the embankments, has of necessity, however, been moved twice.

Such of the material excavated found unfit for use in the embankments, was placed in spoil banks. An examination of the estimates will show how much material was *used* and how much *wasted*.

The exact amount of work done before the contract cannot be determined, inasmuch as we cannot ascertain the total amount of material handled twice. The estimate is made not crediting the city with any material so handled. The contractor hauled only into the embankments and spoil banks.

[Table of Estimate for the work follows. The following is excerpted from this table]

Total approx. estimate of excavation required from the beginning –

1,133,000 cu. yds.

Of which

438,600 cu. yds. done prior to the contract

487,000 cu. yds. done under the contract

207,133 cu. yds. to be done

#### EAST PARK RESERVOIR

William H. McFadden, Chief Engineer

PWD Annual Report for 1876, p. 18

[Warning about funding; citing need to complete East Park Reservoir]

The pressing wants of the Department are in brief, power (involving boilers, engines, and pumps), storage at the proper elevations and large distributing mains.

During the last seven years I have importunately urged the authorities to prove the means for these ends, without avail, and it seems to me the City is liable to suffer between the conflict of opinions.

In my judgment it will be much cheaper to prevent than to cure, and I would most urgently suggest that something be agreed upon and consummated before a calamity overtakes the City. To remove some popular errors, which have been extensively circulated, I would recall to mind the action of the experts who reported in 1875 extensions to the water works involving an expenditure of three millions of dollars, whereupon the Department in 1875 requested a loan of \$1,200,000 for the further extension of the water works, including the completion of the East Park Reservoir, which passed common council but failed to secure the sanction of the select branch. Then an appropriation of \$500,000 was sought which passed both chambers, but failed to receive the sanction of his Honor the Mayor, since which not one dollar of loan has been provided for the further extension of the works, and I do not think any one will disagree with me when I assert that it will be impossible to continue to extract nearly *four times* as much from the Department as is furnished for its maintenance.

In railroad experience the amount used in their maintenance is nearly 60 per cent of their gross receipts, while for several years there has been but a return for maintenance to the Department of only *thirty per cent* of its gross receipts. It therefore, must be evident that the course pursued is only an exhaustive one and likely to terminate disastrously to the City.

#### EAST PARK RESERVOIR

Chief Engineer William H. McFadden

PWD Annual Report for 1877, p. 14

[Discussion of rearrangement of distribution districts.]

The next step to be taken would be the subsidence of the water in the East Park Reservoir. My reasons for not urging the completion of the East Park Reservoir at this time, are the same as those presented to His Honor, the Mayor, some five years ago, a few weeks after my first election. They were urged upon many members of Councils, and led to my communication of June 24, 1873, asking for a Board of Experts, with a view to its abandonment, because it was too low in elevation to supply the rapidly growing necessities which have yearly increased and can be met in no cheaper way than recommended. When the necessities are provided it might be well to complete the East Park reservoir and

pump all the water from Fairmount and Spring Garden Works into it; then conduct the water filtered by subsidence to all the basins of the first system supplying as high an elevation as 60 feet above City datum.

**EAST PARK RESERVOIR**

Chief Engineer William H. McFadden  
PWD Annual Report for 1878  
No mention of East Park Reservoir

**EAST PARK RESERVOIR**

Chief Engineer William H. McFadden  
PWD Annual Report for 1879, p. 20  
[Discussing water supply]

To impound enough water in the East Park Reservoir to supply a deficiency of 10 million gallons per day for only 12 days, and at the same time keep up the head of water in the basins, an expenditure of \$500,000 will be necessary.

**EAST PARK RESERVOIR**

Chief Engineer William H. McFadden  
PWD Annual Report for 1880, p. 35

The Chairman of Finance Committee who is also a member of the Water Committee, made the following arraignment of the Department, when the annual appropriation for 1881 was presented, upon the recommendation of the Water Committee, to the Finance Committee for approval. . . .

“Mr. Chairman:

“Before discussing the different items of this bill I ask the indulgence of the committee for a few moments, that I may make a general statement as to the management of the water department for six years past, as compared with the year 1873, the first year in which the present Chief had charge of the works.

“I hope by so doing we will be better prepared to vote intelligently on each item as it comes before us.

“On examination you will find that the amount of water pumped has increased only 22 per cent., while the salary payroll has increased 51 per cent.”

This method of taking the average pumpage for the six years ... in comparison with the pumpage of 1873 is calculated to mislead.

[McFadden then lists various other comparisons, including the transfer to “salaried workers” of those previously paid by loans, etc.]

**EAST PARK RESERVOIR**

Chief Engineer William H. McFadden  
PWD Annual Report for 1881, p.3

In my judgment, one million dollars would not compensate the loss sustained by one days suspension of the City’s industries for want of an adequate water supply, not to speak of the inconveniences of a domestic and sanitary character, and its importance of safety in case of fire.

Is it not, therefore, better to prevent by the proper use of the means at *your* command than to cure at such a fearful sacrifice? Are not the people, who pay through this Department a surplus of one million dollars a year, entitled to an abundant supply of water and of an acceptable quality, which could be obtained by reservoir capacity for subsidence?

p. 7, Comparative statements

During the nine years, including 1873 and 1881, the receipts were \$12,018,533.68 and the expenditures \$7,400,157.70, an expenditure of less than 62 per cent. on the basis of the receipts. In other words, the 38 per cent. of surplus of receipts amounting to \$4,618,375.98 during the last nine years has been deposited with the City Treasurer and has been used by Councils for the maintenance of the other departments or to lessen the tax rate.

#### EAST PARK RESERVOIR

Chief Engineer William H. McFadden

PWD Annual Report for 1882

Table of Revenue and Expenditure since (1855) Consolidation Report: (foldout chart)

[repeats “one million dollars would not compensate...”]

p.10

Water for benefit of citizens.

[Theory was not to make the Water Works a source of profit, but to be self-sustaining, and the application of the surplus revenue to extensions, in order to secure and maintain an abundant supply of the best quality, and in quantity equal to the rapidly-growing demands of such a municipality?]

#### EAST PARK RESERVOIR

##### FINAL REPORT OF THE BOARD OF EXPERTS

Dated April 1883

From mayor to select and common councils

Transmitting final report of J. Vaughan Merrick, Frederick Graff, E. S. Chesbrough and William Ludlow, the Board of Experts appointed to consider the subject of the present and future water supply of the city. Samuel G. King, Mayor

p. 333

Reservoirs

In the foregoing schedule no provision is made for the reservoirs mentioned in the preliminary report. It was there stated, as to the completion of East Park, the acquisition of land for and the construction of Cambria, and the acquisition of land for and the extension of Mt. Airy that “all of them are needed now, and will ultimately form proper centers of distribution whatever may be the permanent source of supply for the city.”

This remark is based upon the fact that the vast extent of territory to be supplied with water in the city, and the diversified character and altitude of its surfaces, point out certain locations as peculiarly fitted for points of distribution independently of the source of supply. It is not probable that better points could be selected now if the whole subject were an open one. The city has already expended large sums at East Park, and storage for its levels of distribution of from fourteen to sixteen days supply can be had by

completing it, at far less cost than in any other way. The location at Cambria and Thirtieth streets is as yet unimproved, and unless speedily acquired may be reached by building enterprises which will render it more difficult and expensive to obtain at a future time. There seems to be no better site for a reservoir to command this district, which already contains two hundred and thirty thousand persons, is now without any subsiding reservoir, and is growing more rapidly than any other part of the city. Adjacent to Mt. Airy Reservoir unimproved land can be had of suitable character and elevation at less cost than in the future... Your Board would therefore again most urgently press upon your consideration the importance of immediately taking steps to acquire the needed land at the two points named, even if, as they are advised, no money is at the moment available for proceeding with the work of construction.

#### EAST PARK RESERVOIR

William Ludlow, Chief Engineer

PWD Annual Report for 1884, p. 26

The East Park Reservoir, when completed, at the elevation of 133 feet above City Datum, will contain seven hundred million gallons, for the supply of all the City below Spring Garden street, say seven hundred thousand people, who, with fifty gallons each per day, can draw from the Basin for twenty days. It has cost one and a quarter millions of dollars, and will require as much more to complete it. The existing Basins of Fairmount, Spring Garden and Corinthian contain only about two days' supply.

#### EAST PARK RESERVOIR

William Ludlow, Chief Engineer (General Superintendent John L. Ogden)

PWD Annual Report for 1885, p. 26

The East Park Reservoir was designed as a storage Basin for all that extensive area, say from Spring Garden street southward and from Broad and Ninth streets eastward, which its projected surface elevation of 133 feet would enable it to reach. Work on it has been suspended since 1875, and the expenditure of about \$1,250,000 has so far been rendered useless by the failure to complete the work. To put it in service will cost about \$1,250,000 more, and require two or three years time. When completed it will not only furnish an opportunity to get rid of a considerable proportion of the weightier sediment with which the Schuylkill water is frequently charged, but will be a valuable safeguard against failure of the pumps or bursting of mains.

#### EAST PARK RESERVOIR

John L. Ogden, Chief Engineer (was 1884 Assistant Engineer)

PWD Annual Report for 1886, p. 11

This reservoir was begun in November, 1871, and continued partly by day's work and partly by contract until July 1875, when the appropriation became exhausted. The banks were constructed to near the proposed height and the outlet chambers built.

When finished this basin will be in three unequal divisions. The following is a brief description:

Capacity southern section	62,740,931 gallons
Eastern section	311,639,614 gallons
Western section	326,939,009 gallons
	701,319,554 gallons

Around the base of the embankment the distance is one and one-half mile.

Work should be resumed and the sections prepared for use as fast as appropriations can be made, beginning with the smallest or southern division, where the least work remains to be done.

p.30

With the completion of the East Park and Cambria reservoirs, all that part of the city which can be supplied therefrom, including that now under direct pumpage, will have from 15 to 20 days' storage, and during a minimum flow, if necessary, the supply to city can be supplemented by drawing upon the storage. [note: Cambria reservoir was never built.]

## EAST PARK RESERVOIR

Louis Wagner, Director

1887 Report of Department of Public Works

p. 40 - The storage capacity [of entire system] is 263,000,000 gallons, an increase over the previous year of 60,000,000 gallons, by reason of the completion of the smaller basin of the East Park Reservoir.

Arrangements are being made to continue work upon this reservoir for the purpose of completing the next larger section, having a storage capacity of 310,000,000 gallons. When the remaining section, with a capacity of 320,000,000 gallons is complete, water sufficient in quantity, and of a superior quality, can be furnished for many years without any material increase either of pumping machinery or storage reservoirs.

The question of a new reservoir at Cambria and Thirtieth streets has had serious attention. When the land upon which this basin is to be built was purchased it was for the purpose of giving the higher districts in the northwestern part of the city a better supply of water than that furnished them by direct pumpage from the river. A more careful examination of the subject has convinced the Department that the great expense attached to the construction of this reservoir will not be justified by the resulting benefits.

By reason of the topography [p. 41] of the land, and the peculiarity of the street lines, this reservoir would cost more per 1,000,000 gallons than any one heretofore built, and when the advantages of pure water can be had at once and at a very much less cost than by the building of this basin, it is a matter of economy to abandon, for the present at least, any expenditures in that direction.

It is the immediate intention of the Department to lay two large mains, which will eventually be required to fill the East Park Reservoir when it is completed, and to connect them with one of the engines at the Spring Garden Pumping Station, then use one of the mains for the purpose of supply, and the other for the purpose of distribution to the residents in the northwestern part of the city, taking the water from the small section already completed. This section has a larger capacity than any one of the reservoirs now in use, and will hold water sufficient for supplying the district referred to, the water having first been permitted to remain in the basin four or five days for purposes of subsidence. If this plan prove feasible by actual trial, it will no doubt be enlarged upon when the other sections of this reservoir are completed, and instead of pumping into a basin at higher elevation and there permitting the water to subside, we will first permit the water to subside in the reservoirs already constructed, and pump it thence to the higher elevation required. This second pumpage will be but little, if any, greater in expense than a direct pumpage from the river into the contemplated reservoir at Cambria and Thirtieth streets.

The work on the section of the East Park Reservoir now finished was completed in a very satisfactory manner. The bank was finished by days' work, and the lining with concrete and brick laid in Portland cement was done under contract awarded after advertisement. The contractors finished their

work ahead of time and all was done within the original estimates. The basin had been gradually filling with water, and there is no leak perceptible anywhere.

With the experience gained in building this smaller section it is expected that the work on the larger, which will be commenced as soon as the weather permits, will be done equally well, with the same expedition and regard to economy as well as to good work.

#### EAST PARK RESERVOIR

John L. Ogden, Chief Engineer

PWD Annual Report for 1887, p. 54

One section of this reservoir has been completed. The bottom was brought to grade and the banks trimmed to the proper lines by men employed by this Bureau. The contract for the lining thereof was awarded to Mr. Lewis Grant, of Pottsville, for the sum or price of \$1.29 per square yard.

The bottom lining consists of a layer of concrete five inches in thickness, composed of four parts of broken stone, two parts of sharp sand, and one part of the best Portland cement. The concrete was joined together so as to form one continuous sheet over the entire bottom, and the upper surface was finished smooth with concrete, composed of one part cement and two parts sand.

The sides were lined with hard paving bricks set on edge and imbedded in two inches of concrete, composed of one part cement and two parts sand.

The contractor began work on August 3 and finished November 19, eleven days less than his contract stipulated.

The work was carefully inspected during its progress, the cement frequently tested, and in both quality and workmanship the lining is in all respects equal to the standard required by the specifications.

Water was first pumped into this section November 19. For fear of an accident the filling was discontinued until after the completion of the fence around the top.

The outlet chamber was thoroughly repaired, the gates and screws put in, coping set, and iron girders to support grating placed in position.

#### EAST PARK RESERVOIR

Chief Engineer John L. Ogden

PWD Annual Report for 1888, pp. 171-174

During the year the northeast division of the reservoir was completed. In February and March the Engineer corps made surveys of this section, estimated the amount of gravel to be removed, clay required, and square yards of concrete and brickwork to be laid.

(p.172)

Clay, to the right elevation had been placed on 1/5 of the bottom, also on the north, south and part of the east slopes, but slopes were badly washed, making a deposit at the foot, from there to five feet deep, and extending into bottom from 125 to 150 feet. On April 2 a gang of workmen were started. A drain pipe through Montgomery street stop-house was cleaned out. A growth of brush, sod, etc. was grubbed from slopes, preparatory to puddling them to their original pitch. The slopes were carried up in steps 18 inches wide, in layers of two to three inches deep, well rammed, and afterwards dressed to a smooth and true grade. To replace clay on south bank, a derrick and three platforms were erected; tracks laid at foot of slope: trucks with detached boxes were filled with clay, washed from slope, hoisted by derrick and dumped into carts which hauled to place required.

Four gangways, 300 feet long and 18 feet wide were erected. the first, near the middle of west embankment, the second on inside of basin, at northeast corner, the third and fourth opposite each other inside, and outside at middle of each embankment. Adjoining the latter gangways the contractor put up a stone-crusher. A three inch water pipe was laid along the greater portion of the western bank, and part of the southern connections were made with pipe on Thirty-third street, and laid through both stop-houses, another over embankment to foot of slope. Finally, a three-inch pipe was laid from south basin two-thirds of the way diagonally across bottom.

The east embankment, 300 feet each side of Norris street stop-house was built from natural surface to the proper height. Rubbish was removed from base of stop-house, and a puddle, four feet wide as thoroughly rammed up, the fill around stop-house being 32 feet, and the rest from 16 to 18 feet.

The west embankment was built up, from three to five feet, its entire length From an area of ground 250 feet long, 200 feet wide and 6 feet deep, the top soil was removed; 2-1/2 feet of clay was used on bottom, the remainder being gravel, was (p.173) hauled out. A runway of clay, containing 1600 cubic yards, and clay washed from slopes, was spread on bottom. A runway at east embankment, contained 5500 cubic yards and an average of 18 inches of gravel on bottom, that has not been puddled, was mostly used in building embankments, and filling up space on Thirty-third street, from which clay was taken for basin. The clay was put on bottom in three layers 6 inches deep; each layer was well puddled, then dressed, and rolled to proper grade. The total number of loads of clay brought from outside was 123,984, and 60,000 cubic yards of gravel were hauled out.

The bottom and slopes were lined by contract; the slope begun May 1<sup>st</sup> were lined with straight, hard paving brick, laid on edge on cement mortar two inches thick; the bottom was begun June 5<sup>th</sup>, and lined with 4-1/2 inches of concrete, composed of one part of the best Portland cement to two of bar sand and four of stone, broken to pass through 1-1/2 inch ring; the cement and sand were thoroughly mixed first; afterwards the stone was well mixed with the mortar, and spread evenly on the bottom, well rammed and covered with 1/2 inch of mortar; on top of this a dryer was used, composed of equal parts of cement and dry sand, then floated and troweled to a smooth and dry surface; the top of embankment was graded four inches below the top edge of brick curbing, and an average of 16 feet wide for a vulcanite pavement, done by contract, from west division bank around southeast and north sides of reservoir to west division bank, also division embankment between north and southeast basins, a distance of 4,764 feet; for this pavement 990 cubic yards of clean sharp gravel was excavated from bottom of basin, and distributed where required, all the above contracts were complete October 19<sup>th</sup>.

A brick curbing, 5,231 feet in length, was laid in cement mortar on top of slope; a fence of yellow pine was placed on top of embankment, on the east and north sides, and painted. On the west bank a temporary fence was put up, and three (174) man-holes to the stop chambers were built up, and iron covers placed on them; a portion of the brick facing was rebuilt, also stone grooves for screens were repaired on Norris street stop house; in both the Montgomery and Norris street stophouses the bottom of chambers were cleaned out and repaired with cement mortar; the walls were repointed, the wing walls were repaired, pointed, and covered with cast-iron plates; the buttresses covered with cement coping; the tops set with beams two feet apart, and brackets for gate hoists and grates were placed on them; six gates were set on Montgomery street and four on Norris street stop-house; rods were put in to operate them from the top; in Montgomery street stop-house screens were placed in front of inside gates; six stops were put in drainpipe; rods to work them from the top were attached to four of them; office and tool house were removed from the top of Montgomery street stophouse, and part of stone coping set on it.

Five brick piers supporting the pipes connecting the other basins and brick casing over drain pipe through north embankment were repaired, pipes cleaned out, and stops put in working condition; three gauges were made and placed in basins; to roadways of gravel, 100 feet long, 18 feet wide, were made on

outer slope at northeast corner; 800 feet of the outside slope of the east embankment was dressed down 1-1/2 to 1, covered six inches with top soil and seeded; a border 18 inches wide out of vulcanite pavement was sodded from west division bank around south and part of east embankment.

#### DIMENSIONS

Area of bottom	172,044 square yards
Area of slopes	29,710 square yards
Elevation of bottom	108,375 City Datum
Elevation of water line	133,4 City Datum
Elevation top of embankment	137,385 C. D.
Distance around top of slope	5,231 feet
Distance around foot of slope	4,975 feet
Capacity	306,869,805 gallons
Pavement laid	8,900 square yards

p.195

The construction of the East Park reservoir will enable a change to be made in the distribution of water as soon as the necessary mains can be laid, so that the Delaware, Spring Garden, Corinthian, Fairmount and East Park reservoirs till have at least from six to eight days, or more, supply for the several districts depending upon them. To do this the distribution should be arranged as follows: [lists reservoirs and distribution systems]

#### EAST PARK RESERVOIR

Chief Engineer John L. Ogden; Frank L. Hand, General Superintendent  
 PWD Annual Report for 1889, p.175

#### REPORT OF OPERATIONS DURING 1889 AT EAST PARK RESERVOIR.

The following is a report of operations at East Park reservoir for the past year.

During the year the third or western section of the reservoir was completed.

p. 176

In January and February the Engineer Corps made sections of the bottom and banks of this section, from which were calculated the finished grade of the bottom, the amount of gravel to be moved and thee quantity of clay required, as well as the approximate quantities of concrete and brick-work.

It was also deemed advisable to stake out before the contractors began operations the main grade lines in the bottom; all curves at both top and bottom of the banks, and many intermediate intersections of the bottom and foot of slope. One set of engineers was thus enabled without difficulty to keep ahead of the contractors.

The first load of clay for the lining was received on February 27, the contractors beginning to grade the bottom, and grub out trees and bushes about the same time.

During March the entire bottom was dressed to sub-grade; the stone-crusher erected and put in operation; and a single line of track laid from the Pennsylvania Railroad through the Park grounds to the center of the basin. To accommodate this tract the embankment at the south end was cut down 14 feet, the cut being 18 feet wide at the top and 10 feet at the bottom. From the inside face of this cut a heavy trestle was built 600 feet into the basin, the height at the cut end being 14 feet. At the south end a gangway was built into the basin, 300 feet long and 18 feet wide. From the outside berm of the north bank to the Parade grounds, a long gangway was built, having a truss-bridge across the Park drive. This gangway was 750

feet long, 18 feet wide, and was used almost exclusively for the transportation of clay from the Parade grounds to the basin. About 170,000 loads of clay were received at this point during the work.

A large cement shed was built in the center of the basin at the end of the railway track. Water was furnished the contractors from 2-inch and 3-inch pipes, laid entirely around the basin on the banks, connected with the mains in the Park, and from each of the pass pipes on the east side of the basin.

The inside slopes were dressed to a slope of one vertical to one and a half horizontal, and received a lining of 2 feet of good clay. At some places clay of the required thickness had been placed on the banks when the basins were originally constructed. On top of this clay lining a layer of two inches of cement mortar was spread, mixed in the proportion of one part cement to two of sand. Bricks on edge were bedded on this mortar, and the top edge finished with a border of bricks set on end, laid and pointed with mortar, consisting of one part cement to one of sand.

The bottom of the basin was graded to drain into the drainbox on the west side, and received a clay lining 18 inches thick. The clay was put on in three layers, each layer being rolled thoroughly with a steam roller weighing 18 tons.

On this clay a concrete lining 4-1/2 inches thick was placed, the concrete being composed of one part cement, two parts sand, and four parts 1-1/2 inch broken stone or slag. The concrete was mixed and used according to the method adopted in lining the other sections.

The contractors, Messrs. Filbert and Porter, laid the first brick on April 10, and the first concrete on April 12; the following shows the progress of the work during the season:

Month	Concrete laid Sq. yds.	Brickwork laid Sq. yds.
April.....	18,000	4,500
May.....	64,100	10,500
June.....	60,900	8,700
July.....	24,500	4,300
August.....	11,326	1,638
	178,826	29,628

The last concrete was laid August 21, and the last brick August 27. Water was let into the basin on October 8.

The top of the bank was graded to have a rise of 6 inches toward the outside berm, and covered with a pavement composed of 1-1/2 inches of asphalt laid over 4 inches of concrete of the same character as that used in the basin. During the season 12,597 square yards of this pavement were laid.

The four brick piers at the ends of the pass pipes were reconstructed, the man-holes over these pipes raised to grade and finished with iron covers.

The drain box on the west side of the basin was overhauled, and a new 12-inch stop placed at the end of the drain pipe.

A pine fence was placed on top of the embankment and painted.

The drive at the south end was widened and raised 4 feet at the upper end to conform to the finished grade of the banks.

The outside slope of the bank was dressed up at points requiring it, and trees and underbrush were cut out.

In October a 48-inch pumping main was laid on the south division bank to the intersection of the three division banks, and entered by a quarter-turn into the foundation of the new overflow basin constructed at this point. This overflow basin will be 45 feet in diameter, with an outlet 22 feet wide to each of the three basins. The foundation is of concrete over 12 inches of clay, and contains 216 cubic

yards of concrete. A pumping main 48 inches in diameter was let into the brick lining at the south end of the basin, and a sheet-iron apron placed under it to receive the discharge.

A brick apron was built upon the outlet from the overflow basin.

The following are the dimensions and elevations of the section completed:

Area of bottom.....	178,826 square yards.
Area of inside slopes.....	29,628 square yards
Area of water surface.....	199,976 square yards
Elevation of bottom.....	109.5 C.D.
Elevation of water line.....	133.4 C.D.
Elevation of top embankment.....	137.4 C.D.
Distance around top of inside slope.....	5,479 feet
Distance around foot of inside slope.....	5,218 feet
Capacity.....	304,736,360 gallons

No. 1 Section – The apron at the southwest corner was washed out, and a new one 18 feet wide build and sheathed with iron. At the overflow in center of division banks, an apron was built 20 feet wide, lined with bricks on edge and grouted.

No. 2 Section – This section was emptied to examine the condition of the bottom and slopes. Only slight repairs were required to the bottom. The slopes were repaired to some extent, made necessary by settling of the banks. The basin was cleaned of the mud remaining in it; an apron was built in the southwest corner of the overflow to conform to those in the other sections, and the stop-house and the screens cleaned.

The coping stones on the stop houses were completed; the brackets and columns for the gate hoists put up; an iron fence put on both the houses and all iron work painted; the entrance to them on the outside was pointed, cement floors laid, coping of cement made on the walls, iron gates fitted on the top of them. The asphalt pavement was repaired around Norris street stop-house and on division bank; the banks kept mowed and the grounds at foot of bank cleaned and graded.

## EAST PARK RESERVOIR

Louis Wagner, Director Department of Public Works

1889, Annual Report of Department of Public Works

Summary

[Explains delay and includes letter from Frederic Graff re reservoir]

p. 86

The final completion of the East Park Reservoir marks an epoch in the history of the water supply of our city. Work for the completion of the third and last section was begun on February 27, under a contract covering the whole work of clay puddling and of brick and concrete lining for the slopes and the bottom. The work was completed and water let into the basin on October 8.

178,826 square yards of concrete, and 29,628 square yards of brick work were laid, and it is estimated that 112,000 cubic yards of earth and clay were handled in the prosecution of the work.

The total cost of completing this basin was \$361,667.69.

The bottom of the basin is 109 feet above city datum; it is 28 feet deep and has a capacity of 304,736,360 gallons. The water surface, when full, is 199,976 square yards. The distance around the top of the inside slope is 5,479 feet

The completed reservoir has three sections of unequal dimensions, which can be used separately or as a whole. The pumping mains are so arranged that water can be pumped [p. 87] into any one of the sections, but it can be distributed from only two of them. The extent of the work is best appreciated from a personal inspection, but some idea can be formed of its magnitude by the statement that it will hold nearly 700,000,000 gallons of water, and that the distance around the inside slopes is 13,210 feet, very nearly two and one-half miles.

On October 8 an examination of the work was made by Councils and other city authorities, accompanied by many distinguished gentlemen, both from Philadelphia and from abroad, interested in structures of this character. All were pleased with what they saw, and with the advantages to accrue to the water supply of our city by the completion of this reservoir.

Thus, after more than twenty years from the inception of this work, after much adverse criticism of the plans, and more of the manner in which the work under them was prosecuted, and which brought about a total cessation of work for many years and almost its entire abandonment, one of the largest reservoirs built with artificial banks from bottom to top was finally finished, ready for use, in a little more than two years from the time when the work passed under the control of this Department.

Its importance in the water system of Philadelphia permits the publication, at this time and place, of a letter from Mr. Fred. Graff, the gentleman who, as the chief Engineer of our Water Department, planned, located and begun this important structure. The present results and the still greater advantages to be derived from it in the immediate future, justify this letter, and also the lengthy reports made of the progress of the work in this, and in the first and second annual reports.

pp. 88-91

[Letter from Frederic Graff, Jr.]

Philadelphia, October, 24, 1889

To LOUIS WAGNER, ESQ.,

Director of Public Works of the City of Philadelphia

DEAR SIR: -- I proposed and designed the East Park Reservoir immediately after the unprecedented drought in 1869, when the safety and comfort of the city was so seriously imperiled; the urgent necessity of providing means of avoiding so great a disaster as the city was then threatened with became painfully evident. At that time the combined contents of all the reservoirs then in use on the east side of the Schuylkill was only equal to about one and two-tenths days of the required supply; it will therefore be seen how imperative was the demand for additional storage.

I made the first special report to Councils on the subject of enlarging the capacity of the works, November 30, 1869, and finally the site of the reservoir was decided upon. The first map showing its form, size, and position was published in the annual report of the Water Department for 1871. The reasons for this selection were, that it was desirable that a reservoir should be constructed of the largest possible capacity – my desire being to get storage of 750,000,000 or more, which could, at the same time, be situated as near as possible to the existing pumping works, those at “Schuylkill Works” (now Spring Garden Works) being within two thousand five hundred feet could be made available, thereby avoiding the necessity and expense of erecting a new pumping station, which would necessarily have to have been situated higher up the river, at a point nearer to the pollutions at that time discharged at Manayunk. It was also desirable that the reservoir should be placed as convenient as possible to the points of its intended distribution.

It was evident that no reservoir of anything like the size which would fill the above requirements could be built outside the limits of the Park, without the vacation of very many streets running in both directions, which, of course, would have been very objectionable.

In addition to this, the ground in the Park was already the property of the city.

When careful calculations indicated conclusively that at least 88 per cent. of the whole population of the city, then estimated at 673,726 souls, could be adequately supplied from a reservoir so placed, and which could be large enough to contain a supply sufficient for from fourteen to twenty days of the maximum demand at that time, I had no hesitation in recommending the site for, and designing the reservoir where it now stands. Since that time the population has materially increased, and the demand for water has been greatly augmented by more extravagant use and waste of it. The height of the houses and stores is gradually getting greater, and therefore the relative capacity of the reservoir, and the demand upon it, have materially changed in the past twenty years, yet I feel confident, that with a proper enlarged system of distributing mains, more than 75 per cent. of the present population can be properly supplied from the East Park Reservoir.

In this opinion it is a satisfaction to be confirmed by the reports of the Board of experts, who have, at different times, investigated the condition of the water supply of the city. The board of 1875 reported that 75 per cent. of the population could then be supplied from the reservoir, and that 70 per cent. could be properly supplied from a storage reservoir with a water-level of 120 feet, or thirteen feet lower than will be carried in the East Park Reservoir.

The area of high ground needing water which could not be supplied from Roxborough or Chestnut Hill Works was comparatively small, and it did not appear to be good economy to pump the total supply required for the entire city to so great a height, simply that a small area of high ground, then with a limited population, could get water, particularly when this has to be raised by expensive steam power. Therefore, as 88 per cent. of the population could be supplied by East Park Reservoir, it was consider best that the remaining 12 per cent. should be supplied from other sources.

A site could have been obtained (and surveys and estimates were made for it) in the Park at Strawberry Mansion, in which a water level of 148 feet could have been carried, but the area of the ground available would have only been sufficient for a capacity of 89,000,000 gallons, which I did not consider large enough for the purpose, and, therefore, with the reasons given above, accepted a somewhat lower level.

When I left the work February 28, 1873, the whole of the black top soil had been removed from the ground, the puddle trench made to unite the new work with the ground, and the embankment raised to an average height of 7.37 feet all around, nearly one and a half miles. New Park roads were made at several places to take the place of those covered by the embankment. Most of the original black soil, which was from 15 to 20 inches deep, had to be hauled to spoil bank on Thirty-third street, half a mile or more away.

You will recognize the very great importance of having the foundation of the work (so to speak) done with the utmost care and attention, and its consequent increased cost, over the mere hauling, sprinkling and rolling of the earth put upon the embankment afterward.

The sum expended upon the work during my connection with it was \$249,252.13, which included the purchase of water-carts, rollers, tools of all kinds, granite and building stone for the gate houses, as well as other materials, most of which were made available later on.

Hoping that the above may supply the information asked for in your favor October 11, 1889, I remain,

Very respectfully and truly yours,  
FRED GRAFF

First report made by me to Councils on the subject, November 30, 1869.

Ordinance making appropriation, passed Councils, June 29, 1871.

Ordinance vetoed by Mayor Fox, August 22, 1871.

Passed by Councils over his veto, September 5, 1871.

Injunction granted by Judge Thompson to restrain me from going on with the work, September 18, 1871.

Injunction withdrawn and appropriations finally passed by Councils, October 26, 1871.

Bill finally signed by Mayor Fox, November 6, 1871.

Work commenced under my direction, November 9, 1871.

F. GRAFF

## **NEWSPAPER CLIPPINGS**

### **THE EVENING STAR**

October 8, 1889

*Editorial*

#### **TURNING ON THE WATER**

Ceremonies at the Reservoir this Afternoon

The last section of the East Park Reservoir being completed, the formal ceremony of turning on the water will take place at four o'clock this afternoon in the presence of a large number of invited guests, including members of Councils, heads of municipal departments and others in official stations, who have been invited by Director Wagner and Chief Ogden, of the Water Bureau, to be present. A special train, conveying the invited guests, will leave Broad Street Station for the reservoir at 3 o'clock.

After the work at the reservoir has been inspected and the flow of water begins the guests will, by invitation of Messrs. Filbert and Porter, the contractors, sit down to a dinner at the Reservoir Mansion, where a number of addresses will be made.

### **THE EVENING STAR**

October 9, 1889

*Editorial*

By the completion of the last and largest section of the East Park Reservoir, we shall now have what has been so long wanted, immense subsiding reservoirs, and although there may occur seasons when long continued rains will keep the water in such a rolled condition that a perfectly limpid article will be impossible, the chances are that such a contingency is not likely to happen once in a generation.

### **THE EVENING STAR**

October 9, 1889

#### **ON THE BIG BASIN'S BANK**

Politicians Gather and Watch the Water Flow

There was a procession yesterday afternoon – diagonally across a field of the East Park from the Pennsylvania Railroad to Engleside – remarkable for the number of politicians it contained, representatives of both parties.

No chief marshal in a heated campaign has ever succeeded in getting such an influential array together on parade as the four hundred and odd who, at the command of General Wagner, first marched up the hill to the reservoir, and then marched down again, to take the train for St. George's Hall, at Thirteenth and Arch Streets.

There were in the line candidates for Mayor, candidates for Congress, candidates for all the [Boro] offices and candidates for Councils from every ward. There were “sprigs” in politics, and others who have held quite a sway in their day, but are now booked among the back numbers.

Mayor Fidler and his guest, the Mayor of Manchester, England, descended the flight of wooden steps to the vulcanite bottom of the empty basin, and the great crowd of public men followed. Immediately behind the Mayor, and unknown to many of the younger men present, came Frederick Graeff [Graff], who was the water engineer of the city twenty years ago, and who designed the East Park Reservoir.

Just as he had begun the work he was defeated in the caucus of Republican members of Councils by a majority of one vote. It was in the Pilgrim days, and the defeat of Graeff raised a howl, but Dr. McFadden took his place, and there was such a scandal over the work of the reservoir within the two years following that the public demanded that it should be stopped.

[October a very political time in Philadelphia. The newspaper lists guests and delicate seating arrangements. Comment that “Mayor Fidler rarely comes to public gatherings,” but was evidently at this one. General Wagner’s speech was broken up to “a perfect Babel of discord.” He quieted the crowd, and someone commented, “Woe unto any of you fellows who interrupted the Director, if you hold positions in the Department of Public Works!” Guests listed include: City Treasurer John Bardsley; Judges Hanna, Williams, Ashman, Pennypacker; Mayor Candidate Edwin S. Stuart; Thomas Thompson; William M. Smith, President of Common Council; Henry Clay, Receiver of Taxes; Captain John Taylor. Colonel Fitzgerald was absent, although 5 cases of Montebello had been provided. Other guests included: Leader James McManes; City Chairman Rourke; Appraiser Leach; Col. William Mann; William Leeds; D.A. Graham; Peter Monroe. Colonel McClure’s Orchestra played. Note that when McManes came in, seating was rearranged to provide distance from an opponent.]

#### EAST PARK RESERVOIR

Chief Engineer John L. Ogden; Frank L. Hand, General Superintendent  
PWD Annual Report for 1890, p. 143

[Comment following Table of Water pumped at Fairmount]

A comparison of the [1890] table with a similar one of the previous year is interesting. During 1889 the wheels were stopped 4,533-1/2 hours on account of full basins. In 1890 they were shut down for the same reason only 192 hours. This is owing to the connection with the East Park Reservoir.

Wheels No. 1 and 3 pump into Fairmount basin alone; all of the others into the East Park Reservoir, from which the water is drawn into the Corinthian avenue and Lehigh avenue basins.

During 1889 the wheels were stopped 893 hours for high water, while in 1890 but 343-1/2 hours. On account of low water they were stopped 3,620 hours as against 166-1/2 hours in 1889. During 1890 the rain-fall and flow of the river was much less than during the previous year.

May, 2009  
JMG