



**SPRINGFIELD WATER WORKS  
LITTLE RIVER SUPPLY  
STUDY FOR PROPOSED DEVELOPMENT**

SCALE: 1000 0 1000 2000 3000 4000 FEET

### COBBLE MOUNTAIN RESERVOIR

In 1924 the Board of Water Commissioners secured permission to construct additional structures in connection with the Little River water system, which would substantially double its capacity. The filtration plant has been doubled; a contract has been let for an additional main pipe between the clear water reservoir on Provin Mountain and Springfield, which will a little more than double the rate at which water can be delivered to the city; plans are under way for the enlargement of the clear water reservoir on Provin Mountain; and there remains one principal feature which now becomes the subject of the request for additional funds.

#### Possibilities for Reservoirs on Little River.

The present capacity for storage water is 2,500,000,000 gallons in the Borden Brook reservoir. No shortage has occurred which would demand all of this water in any dry season but the actual use of water is such that but a slight increase would make stored water necessary in a dry year. It is therefore proposed that preparation be made for the enlargement of this portion of the supply to the same extent as has been done in the case of the filters, pipe line, and clear water reservoir.

The Little River water shed lies at a high elevation, and the stream flows through rather steep gorges. There are possibilities for small reservoirs in North Blandford and at Blair Pond. There is a possibility for a large reservoir at Cobble Mountain. The smaller

reservoirs mentioned would be temporary in value and require construction of additional reservoirs within a very few years. The Cobble Mountain reservoir is ultimately a necessity whatever other storage is obtained for immediate uses. There are two possibilities for development at Cobble Mountain. It is possible to design a dam which later could be enlarged to ultimate needs; or, it is possible to build at this time a dam which will be needed with the continued growth of the city. The largest portion and greatest expense of any dam is in its foundation and lower section. Therefore any dam built to be raised later carries with it a very large part of the total expense in the first stage. It is also true that work is done more cheaply on large projects than is possible when smaller amounts are undertaken at different times. Added to this is the interruption to a supply in the enlargement of a structure actually in use.

When the investigation led to the conclusion that the amount, which it was advisable and even necessary to spend at the present time, would involve such large capital payments in interest and principal without providing for a long future, the study was made of the costs of the full development with the hope of adding sufficient revenue to carry a little more than the excess cost.

Capacity of the Little River Supply.

With the present storage, substantially 18 million gallons per day can be supplied with reasonable safety. The Cobble Mountain dam is so situated that any height of a dam is possible

and the calculation becomes that of determining the proper height to make available all of the water of the river. The height selected for the ultimate reservoir would produce over 50 million gallons of water per day, an amount well in excess of the immediate future requirements, but not beyond the amount which it would be advisable to produce if possible for a city of the type of Springfield. At least 30 million gallons per day, an increase of 12 million gallons per day over the present capacity, should be provided for now. Structures to produce this amount and still leave the site available for future extension are unnecessarily expensive and involve a large part of the full price due to the utilization of a site before the need for full development.

Realizing that provision must be made for the complete development, and that a considerable development must be made now, an attempt has been made to secure sufficient revenue to finance all of that portion of the complete development which is in excess of the immediate future requirements. The proposition which is now made does this and pays for a portion of the extension now required, thus making the net expenditures less than if the entire project should not be carried out. To this consideration must be added the fact that future expenditures for storage are entirely eliminated and the city will be in possession of a completely developed system, together with power appurtenances fully paid for which will produce in perpetuity revenue which will not otherwise be available.

Cobble Mountain Control Works Portion of dam, and tunnel now under construction,	\$458,000.	
Cobble Mountain dam Including all classes of construction, clearing reservoir site, construction of a spillway, with control gates on the present tunnel, and all other outlet works,	4,589,600.	
Land, Roads, Partially completed, to replace present roads and secure access to the dam site,	235,000.	
Power Works Including penstocks, power house, transformer station, transmission lines, etc - built at a cost guaranteed not to exceed	1,100,000.	
Provin Mountain Reservoir Additional clear water unit	325,000.	
54"-48" Transmission Main Additional Pipe Line from Provin Mountain to Main and Mill streets, Springfield,	1,075,000.	
Improvements and enlargement Connections from present outlet tunnel to West Parish Filters	<u>115,000.</u>	\$7,925,600

Estimate of Cost			\$7,925,600.00
Less Items now Paid			<u>173,600.00</u>
Amount of expenditure necessary for entire project			7,752,000.00
Bond Issue Authorized, 1924		\$4,000,000.00	
Bond Issue Authorized, 1918		<u>500,000.00</u>	
Total Authorization		4,500,000.00	
Bonds Issued to date	\$2,490,000.00	<u>2,490,000.00</u>	
Bonds authorized but not issued		2,010,000.00	
Amt. Bonds expended to date	<u>1,175,815.21</u>		
Balance bonds issued, unused	1,314,184.79	<u>1,314,184.79</u>	
Total Bond Issue, Issued and Unissued, Authorized and unexpended		3,324,184.79	<u>3,324,184.79</u>
Balance necessary to carry out project			\$4,437,815.21

Power Proposition

The Cobble Mountain reservoir, as proposed, will have a flow line with an elevation of 945 feet above sea level with the possibility of adding flash boards 7 feet high, making the extreme flow line at an elevation of 952 feet. The present Intake dam from which the water used by the City is taken, has an elevation of 500 feet. The difference represents the possibility for the use of the water for power. This head available for power is 452 feet before any friction losses, or differences in reservoir elevations, are considered. A summary of these conditions is as follows:

Elevation, Cobble Mt. Dam, top of flashboards	952 feet
Lowest Point to which water could be drawn for power	840 "
Elevation, Diversion reservoir, at Intake Dam	500 "
Average net head, about	420 "
Total annual production, kilowatt hours, about	22,000,000 KWH
Capacity of Cobble Mt. Reservoir at El. 952	22,287,000,000 gals
Amount held at Elevation 840	2,021,000,000 "
Storage available for power development	20,266,000,000 "
Capacity of generators,	30,000 KVA
Capacity of Power house at a minimum head of substantially 297 feet,	21,000 KVA

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Length of term of contract, 30 years

Payment per annum

When use of water by City for supply is 30,000,000 gals per day, or less, \$270,000

When use by City is from 30 to 35 mgd 250,000

All operating costs to be paid for by the Power Company

Cost of construction of electric plant to be borne by the Power Company and taken over by the City when the plant is in operation

Guaranteed by the Power Company to be not over 1,100,000

Corporation contracting with City for Purchase of Power Turners Falls Power & Electric Co.

Use of Water for Water Supply.

It is proposed to dedicate 30 million gallons per day to the use of the city, and storage requisite for this amount to be retained in the reservoir for such use regardless of the demands for power. When the actual use by the city reaches 30 million gallons per day, the amount reserved is to be 35 million gallons per day. This is accomplished by establishing monthly drawing levels beyond which the water is never to be drawn. A definite height is set which insures the amount of water needed to produce 30 million gallons from the first of each month to the end of the dry season. Stored water in excess of these requirements may be used for power at the most convenient time for the power company. The water actually drawn each day will be used for the generation of power, but no excess amounts will be drawn except for use in the manufacture of power by the power company. In addition to this the outlet to the power house is set at such an elevation that two thousand million gallons are reserved as an extreme emergency and assurance of city use beyond that calculated for any period. One billion gallons of the capacity of the Borden Brook reservoir is also exempted from use for power, so that the total storage allotted to the city is 3 billion gallons in excess of the calculated needs.

Suggestions for Financing.

The amount required beyond the present bond issue is \$4,500,000. There are outstanding two authorized issues of bonds unused. If bonds for this purpose were issued serially, as is at present required for bonds for usual city purposes, the interest and retirement in the first year would amount to 7.53% of the issue. This



is on the basis of 4% bonds running thirty years. If it were not for the attitude of the General Court on the use of Sinking Fund Bonds, the means of retirement afforded by them would be ideal. It does not seem probable that such an issue would be approved, and the suggestion is therefore made for a bond to be issued serially but with predetermined dates for retirement, and retirements arranged in such a manner that the principal and interest in each year will be substantially the same as in every other year.

With a fixed income of \$270,000 per year applied to the retirement of bonds, much more than the excess requirements due to the larger reservoir and power plant, could be paid; and if the same principal could be applied to all of the issues made for this combined project, a peak or unusually high payment in the earlier years could be avoided and the total amount paid off at a minimum expenditure from water income, after the use of all the revenue obtained from power.

Without any attempt to fix the final figures or percentages in this manner, a payment of 5.8% per year will retire 4% bonds and pay all of the interest in 30 years. Lower interest rates make the payments more favorable. On this means of financing, the \$270,000 reserved annually from the power sold, would retire at 4% a little more than \$4,500,000, in 30 years without the expenditure of any money from other sources; and would insure the payment of the construction now undertaken which is of longer life than now needed.

The various features of these recommendations have been studied over a long period by the Board of Water Commissioners who have had the advice of their Consulting Engineer, Mr. Allen Hazen of New York City. Estimates and plans have been reviewed by Mr. Charles T. Main and his associate Mr. William F. Uhl of Boston; and Mr. George A. Orrok, Consulting Electrical Engineer of the New York Edison Company.