

The Commonwealth of Massachusetts

REPORT OF THE METROPOLITAN DISTRICT WATER SUPPLY COMMISSION UPON THE USE OF THE SOUTH SUDBURY AND COCHITUATE SOURCES OF WATER SUPPLY FOR THE METROPOLITAN DISTRICT, THE SANITARY REQUIREMENTS OF THE SUDBURY RIVER BELOW DAM NO. 1, THE REQUIREMENTS OF THE TOWN OF FRAMINGHAM FOR A WATER SUPPLY FROM THE DISTRICT SOURCES, AND THE MATTER OF SEWERAGE IN THE TOWN OF ASHLAND.

[Water Supply. Dec. 1, 1926.]

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION,
24 SCHOOL STREET, BOSTON, MASSACHUSETTS, December 1, 1926.

*To the Honorable Senate and House of Representatives of Massachusetts
in General Court assembled:*

On May 28, 1926, chapter 375 was approved by the Governor, creating this commission and providing in the second paragraph of section 3 as follows:

The commission shall also consider the recommendations of the metropolitan district commission relative to making available by filtration or chlorination, or both, the waters of the Sudbury and Cochituate watersheds as contained in house document number eleven hundred and ten of nineteen hundred and twenty-six; shall consider the effect on the present water supply of the metropolitan district of the addition thereto of water purified by filtration or other means and the effect of such water upon the present aqueducts, reservoirs and other facilities of the metropolitan water district; and shall report in

detail plans and specifications for such land takings and for the construction of such additional works in the town of Framingham, and of such covered reservoirs as it may recommend, and the estimated expense thereof. The commission shall also consider and report on the amount of water which should be required for reasons of health and sanitation to flow below dam number one on the Sudbury river notwithstanding any provision of chapter one hundred and seventy-seven of the acts of eighteen hundred and seventy-two, and on all matters set forth in house document number ten hundred and forty-eight of nineteen hundred and twenty-six and the petition accompanying the same, especially the present and future water supply needs and resources of the town of Framingham, and the terms and conditions upon which said town should be entitled to receive water from the water supply now owned by the metropolitan district. The commission shall also consider and report upon the effect of the diversion for water supply purposes of the waters of the South Sudbury river upon public health in the town of Ashland, and whether or not a system of sewage disposal should be provided in said town in the event of such diversion. The commission shall report to the general court its findings and recommendations relative to the questions outlined in this paragraph, together with draft of such legislation as may be necessary to effect its recommendations, by filing the same with the clerk of the house of representatives not later than December first of the current year, and it shall at the same time file a copy thereof with the budget commissioner.

The commission has considered the recommendation of the Metropolitan District Commission for making available by filtration or chlorination or both the waters of the Sudbury and Cochituate watersheds. For several years the consumption of water by the communities served by the metropolitan supply has exceeded the yield of the watersheds now available for use. The daily consumption now amounts to 134 million gallons as against a safe yield of 119 million gallons. The Wachusett Reservoir, the principal storage reservoir of the district, holds 65 billion gallons when filled. It has not been filled since the spring of 1924. Each year since 1924 the stored supply has been reduced. The excess of the present consumption over the safe yield amounts to about $5\frac{1}{2}$ billion gallons a year. At the present time the Wachusett Reservoir contains about one-half of its capacity of 65 billion gallons. Even if the next few years beginning with 1927 should prove to be of more than

average wetness, the Wachusett Reservoir would still be subject to further excessive drafts, which in the course of a few years, would not leave a sufficient quantity in storage to insure the present excellent quality of the supply. If a critically dry period such as began in 1910 should now be upon us, the stored supply of the reservoir would be exhausted before the end of 1929.

The Ware River supply from Coldbrook, which this commission is now engaged in diverting, we are advised, probably cannot be secured for use before the spring flows of 1931. The works required for the filtration of the South Sudbury supply as recommended by the Metropolitan District Commission in its report of 1926 could hardly be carried to completion sooner than one year earlier or only in time to filter the winter and spring flows of the season of 1929-1930.

The commission feels that it is not safe to wait for the completion of either of these projects before supplementing the present supply. The earliest possible use should be made of the Southern Sudbury supply. The headwaters of this drainage area are already controlled by the district at its three basins, Whitehall, Hopkinton, and Ashland reservoirs and are of sufficiently low color and satisfactory quality for use without treatment. Diversion works can be constructed which will take a supply directly from these reservoirs into the existing system. An estimated average of 15 million gallons daily can be made available in this way with the possibilities of a considerable additional amount in wet years or by pumping directly at certain times of the year from the mill pond at the Cordaville Woolen Company if an emergency requires. The cost of the diversion works necessary for this purpose is estimated at \$900,000.

An additional supply of 8 million gallons daily can be obtained from the Cochituate Reservoir through the existing works. Chlorination works should be provided before this supply is relied upon for regular use or for emergencies.

The quality of the water in the Wachusett supply may become unsatisfactory because of the reduced storage or any

further reduced storage. It would seem only prudent to provide for chlorination of this supply in case the quality of the water should become such as to require it. The cost of chlorination works is small and the works need be operated only when the quality of the water makes it advisable.

The commission therefore recommends that it be authorized to proceed at once with the construction of the works necessary to divert upper waters of the Southern Sudbury and that \$900,000 be made available for this purpose. The commission further recommends that the Metropolitan District Commission be authorized to install proper chlorination plants at its works at Chestnut Hill and at the Weston Terminal.

The commission has also considered, as directed, the amount of water which should be required for reasons of health and sanitation to flow below Dam No. 1 on the Sudbury River, the present and future water supply needs of the town of Framingham, and the terms and conditions upon which said town should be entitled to receive water from the water supply now owned by the Metropolitan District, and the effect of the diversion for water supply purposes of the waters of the South Sudbury River upon public health in the town of Ashland, and its necessity of a system of sewage disposal.

The construction of the diversion works recommended would require no additional land takings in the town of Framingham except for a short pipe line and only small takings for pipe lines, diversion trenches and a small pumping station in the towns of Hopkinton, Ashland and Southborough. Furthermore the drainage from 13 square miles of the Southern Sudbury area will not be diverted and from 15 square miles only at times, if at all, and the waters from these areas will continue to flow as at present in an amount more than sufficient for any minimum requirements in the river below Dam No. 1. The problems raised by the town of Framingham by reason of any additional land takings for the filtration of the entire supply are not affected and can well wait until the Metropolitan District Commission concludes that filtration of the entire Southern Sudbury

supply is required. Furthermore as the supply now proposed to be diverted lies above the town of Ashland, the question of a system of sewage disposal for that town is not affected.

The water requirements and other matters affecting the town of Framingham in its relation to the Metropolitan District are not affected by the recommendations herein made. This commission has been unable in the time available for this report to give these questions proper consideration, and therefore makes no recommendation.

The commission in making these recommendations has relied upon the investigations and report of its Chief Engineer and his conclusions have been approved by X. H. Goodnough, the engineer of the Department of Public Health and by J. Waldo Smith as consulting engineer.

The report and plan of the Chief Engineer, together with a suggested draft of the legislation necessary to carry out the recommendations, accompany this report.

Respectfully submitted,

DAVIS B. KENISTON,
CHARLES M. DAVENPORT,
JOSEPH H. SOLIDAY,

Metropolitan District Water Supply Commission.

REPORT OF THE CHIEF ENGINEER.

METROPOLITAN DISTRICT WATER SUPPLY COMMISSION,
24 SCHOOL STREET, BOSTON, November 26, 1926.

Metropolitan District Water Supply Commission, Boston, Massachusetts.

GENTLEMEN:— Herewith is submitted a report of the results of an investigation of the availability of the waters of the Sudbury and Cochituate watersheds to supplement the present Metropolitan District Supply, and other related matters upon which your commission is required, by chapter 375 of the Acts of 1926, to report to the General Court on or before December first of the current year.

Your Chief Engineer reported for duty on October 1, and the engineering organization is still in the formative stage. The time available for making these investigations has been very limited, but we have had the benefit of the co-operation of the Metropolitan District Commission and the Department of Public Health, and have had access to data available from previous studies. The conclusions already reached are believed to be sound, and the delay attendant upon any further investigation is, in view of existing emergency, not justified.

PRESENT STATE OF THE EMERGENCY.

The Wachusett Reservoir is the principal storage reservoir of the district. Its capacity is about 65 billion gallons. From the time of its first complete filling until 1924, it has practically filled each spring except 1911. It filled for the last time in the spring of 1924. In 1925, it failed to fill by the margin of about 11.5 billion gallons, and in 1926 by about 16 billion gallons. The outstanding reason for the existing emergency is the fact that the district sources are being called upon to furnish about 134 million gallons of water daily, whereas the dependable yield of the present sources of water supply of satisfactory quality does not average more than 119 million gallons daily during a series of exceptionally dry years such as occasionally occur and such as may already be at hand.

CONSUMPTION OF WATER IN METROPOLITAN DISTRICT.

Recent Fluctuations in Wachusett Reservoir, etc.

	1922.	1923.	1924.	1925.	1926.	§ [1927.
Average annual yield of Nashua River watershed in million gallons per square mile	1.321	1.207	1.035	0.854	0.873 ¹	-
Corresponding excess or shortage over 30-year average of 1.802 million gallons daily per square mile.	+0.239	+0.125	-0.047	-0.228	-0.209	-
Consumption of water from district sources within the district in million gallons daily.	119.3	125.2	124.1	128.3	129.8 ¹	-
Sold to Newton (million gallons daily)	-	0.2	0.3	0.5	0.9	-
Supplied outside the district from district sources except Southern Sudbury (million gallons daily).	1.4	1.7	2.2	4.7	3.0 ¹	-
Total consumption (million gallons daily)	120.7	127.1	126.6	133.5	133.7 ¹	-
Maximum amount in storage in billion gallons (capacity at spillway level equals 65 billion gallons).	Spillway overflowed Apr. 8, 1922	Spillway overflowed Apr. 9, 1923	Spillway overflowed Apr. 7, 1924	53.5 Apr. 27, 1925	50.0 May 24, 1926	-
Minimum quantity in storage in billion gallons	53.8 Feb. 19, 1922	53.7 Mar. 3, 1923	48.0 Nov. 23, 1923	42.1 Feb. 10, 1925	36.2 Nov. 13, 1925	31.1 ² on Nov. 18, 1926

¹ Estimated.² Lowest point up to date of report. May get lower before spring.

The table on page 7 shows the fluctuations of Wachusett Reservoir during the last five years. In the same table is shown, for comparison, the average annual yield of the Nashua River, tributary to the Wachusett Dam, and also the average annual consumption of water from the district sources now in use.

The seriousness of the emergency which will exist during the next few years will depend not only upon the demand for water but also, and to a much greater extent, upon the rainfall and the net yield available for water supply therefrom. The situation will be governed largely by conditions which cannot be predicted with reasonable accuracy. Certain assumptions, however, can be made based upon what has actually occurred in the past.

For example, if the next few years, beginning with 1927, should prove to be such critically dry years as actually occurred beginning in 1910, then a total consumption averaging 134 million gallons daily, which must certainly be anticipated, would result in a further draft upon Wachusett Reservoir, which would leave only about 21 billion gallons in storage in this basin at the end of 1927, and only about 5 billion gallons at the end of 1928, which would practically drain the reservoir dry before the end of 1929. Actually, of course, such an extremity might be mitigated by a forced curtailment of use and by the use of the Southern Sudbury, Cochituate and other sources.

On the other hand, if the next few years, beginning with 1927, should bring as abundant a rainfall and yield as actually occurred beginning in 1913, which was followed by a period of a little more than average wetness, then a total consumption averaging 134 million gallons daily would result in a draft upon Wachusett Reservoir, which, although not as serious as the draft assumed above, would still leave in the Wachusett Reservoir only about 25 billion gallons at the end of 1927, 20 billion gallons at the end of 1928, and 15 billion gallons at the end of 1929.

A rainfall somewhere between these two extremes may be expected during the next few years. Moreover, in making provision for the water needs of the district, it is necessary

to anticipate a critically dry period and to take adequate steps to meet it. The seriousness of the situation in which the district finds itself is further apparent in view of the fact that the district relies upon a considerable volume retained at all times in the Wachusett Reservoir to insure its purification by long-term storage. Such excessive drafts as may be unavoidable in the next few years may require treatment of the entire supply with chlorine.

In view of the conditions that should be anticipated, there is need of immediate action that will check the draft upon storage at the earliest possible date, and provide sufficient reserve storage at all times to insure a reasonably satisfactory quality of the supply.

WARE RIVER SUPPLY.

Work has already been started upon the preparation of contracts for the construction of a tunnel from the Wachusett Reservoir to the Ware River at Coldbrook, for the purpose of diverting the flood flows of the Ware River, in accordance with the provisions of chapter 375 of the Acts of 1926. This tunnel cannot be lined and put into commission, in completed form, in any case earlier than to receive the spring floods of 1931, and probably not earlier than to receive the spring floods of 1932. If the emergency demanded, and no unexpected obstacles are encountered, the tunnel could be holed through and used temporarily without lining so as to divert the spring floods of 1931 into Wachusett Reservoir.

SOUTHERN SUDBURY FILTRATION.

We have considered the plans developed by the Metropolitan District Commission to reclaim by filtration the Southern Sudbury sources of supply. These are now, and for some years past have been, allowed to flow to waste down the Sudbury River below Dam No. 1, although the district has a right to the entire flow at that point in excess of 1.5 million gallons daily. These plans, in accordance with the suggestions of the Metropolitan District Commission in

House Document 1110, of the year 1926, could be developed and, in the absence of unforeseen difficulties, the construction could be carried to completion so as to be ready to filter the winter and spring flows not earlier than the season of 1929-1930.

The total Southern Sudbury areas not now used are as follows (not including 17.58 square miles in the Cochituate watershed and not including Farm Pond in Framingham):

TRIBUTARY TO —	Watershed Area (Square Miles).
Ashland Reservoir	6.43
Whitehall Reservoir	4.35
Hopkinton Reservoir	5.86
Total Headwaters Reservoirs	16.64
Additional above Framingham Reservoir No. 2	28.50
Additional above Framingham Reservoir No. 1	1.84
Total above Dam No. 1 considered by the Metropolitan District Commission to be filtered.	46.98
Additional area above Dam No. 3, total yield of which is already used at present and which would necessarily be combined with the filtered supply.	5.40
Total above the filters	52.38

The total yield obtainable by filtration from the 46.98 square miles, allowing only the minimum legal requirement of 1.5 million gallons daily to flow down the Sudbury River below Dam No. 1, has been estimated by the Metropolitan District Commission to be 26 million gallons daily.

SELECTED AREAS IN THE SOUTHERN SUDBURY WATERSHED.

The area from which this proposed filtered supply would come contains, as shown in the above tabulation, 16.64 square miles tributary to three existing reservoirs of the district, a direct supply from which would have a sufficiently low color and satisfactory quality for mixing with the present supply. However, under present conditions, these reservoirs cannot be drawn upon except through the natural river channels into Reservoir No. 2, there to be mixed with the drainage from the intervening 28.50 square miles,

including Great Cedar Swamp, Westborough, and the main valley of the river through the villages of Southville, Cordaville and Ashland.

The lack of adequate storage capacity in or near Basin No. 2 to retain the spring flows from these Southern Sudbury areas would make it necessary to provide a large filtering capacity that would be used at the maximum rate in the spring during times of high flow, but only a small portion of which would be required during the remainder of the year at times of low flow. The plans developed by the Metropolitan District Commission contemplated an initial filtering capacity of about 60 million gallons daily in order to make available from these Southern Sudbury sources a yield of 26 million gallons daily.

However, it is possible to obtain a much higher yield per square mile from the areas tributary to the three existing reservoirs of the district at the headwaters of these Southern Sudbury areas. The storage in these reservoirs also improves the quality of their waters to such an extent that filtration is not required for the supply from these headwaters if means can be found for taking this water directly into the system. Our studies have led us to recommend that, in order to provide an early remedy in the present emergency, these headwaters reservoirs be piped directly into the existing system without delaying to construct filters for the entire area at the lower Framingham Basin No. 1.

The plan by which it is proposed to accomplish this result involves:

(1) Diverting into Hopkinton Reservoir the brook which flows out of the Whitehall Reservoir at a convenient point about one-half mile below Woodville by means of an open channel or pipe line extending across the divide between Whitehall and Hopkinton reservoirs.

(2) A pipe line about 19,000 feet long from Hopkinton Reservoir crossing the Sudbury River near Cordaville and extending northerly across the divide into the upper reaches of the Sudbury Reservoir. This pipe line would be capable during a portion of the time, except at times of high flow,

of delivering by gravity into the Sudbury Reservoir. In order to increase the rate of diversion at times of high flow, it is proposed to install at Cordaville, in an emergency pumping station two or more electrically-driven centrifugal pumps, any one of which may be used either as a booster in the line from Hopkinton Reservoir, or to pump directly out of the Sudbury River above the Cordaville Woolen Company's mill at such times as an emergency may demand the addition of this inferior supply. This direct pumping from the river would be resorted to only at times of high flow and then only in case the analysis of the water indicates that its quality would not deteriorate the supply.

(3) A pipe line from Ashland Reservoir through the village of Ashland and directly into the Sudbury Aqueduct.

These headwaters areas from which an emergency supply can be obtained with very little delay are as follows:

TRIBUTARY TO —	Watershed Area (Square Miles).
Whitehall Reservoir	4.35
Hopkinton Reservoir, including a small area below Whitehall Reservoir which would be diverted into Hopkinton Reservoir.	8.14
Total diverted by a pipe line from Hopkinton Reservoir into Sudbury Reservoir No. 3.	12.49
Ashland Reservoir to be diverted directly into Sudbury Aqueduct	6.43
Total	18.92

The safe yield available from these headwaters reservoirs during a critically dry period would be as much as 15 million gallons daily on account of the benefit of the existing storage. Actually greater quantities could be drawn from these areas in all except dry years, and the pipe lines are to be designed of sufficient capacity to take care of increased drafts and to take advantage of all such periods of high flows.

In addition to the 15 million gallons daily or more obtainable from these three reservoirs, there is the further emergency supply obtainable at all times from Lake Cochituate. The amount available from this source in an emergency depends on the extent to which the level of the

lake is lowered. It is not safe to count on drawing more than a few feet in depth or so as to give a continuous yield of more than 8 million gallons daily. Hence, the total available from these existing reservoirs of the district which are not now used is 15 million gallons daily from the Southern Sudbury, and 8 million gallons daily from Lake Cochituate, or 23 million gallons daily minimum safe yield throughout a critically dry period; and in addition to this, whatever excess flood flows might be available in the fortunate event of wet years, and whatever flood flows might, upon careful analysis, prove to be available by direct pumping from the Sudbury River above the Cordaville Woolen Company's mill.

CHLORINATION OF THE SUPPLY.

In spite of any steps that can be taken to meet the existing emergency, the amount of storage in the Wachusett Reservoir will probably remain for the next three or four years at a level so low as to make it questionable whether satisfactory purification can continue to be obtained without chlorination of the entire supply. Furthermore, it may be necessary to chlorinate the diversions herein proposed from these headwaters reservoirs in the Southern Sudbury area, and it will doubtless be necessary to chlorinate the water from Lake Cochituate.

Apparatus for chlorinating the entire supply as it leaves Chestnut Hill Reservoir and for chlorinating the waters of the Weston Aqueduct at or near its terminus should be installed at once for use if and when needed.

FILTRATION OF RESIDUE OF SOUTHERN SUDBURY.

This proposal for direct diversion from the existing Southern Sudbury reservoirs cuts down the area from which a further supply could be obtained by filtration to 28.06 square miles. The yield from this remaining area would be relatively small since no storage would be available except a negligible amount in the small Framingham Basins Nos. 1 and 2. It remains to be determined whether filtration should be applied to this remaining area.

If the direct diversions from the headwaters of the

Southern Sudbury be provided for promptly after the meeting of the Legislature in January, 1927, it should be possible to begin the use of these waters early next summer. Water from Lake Cochituate can be used as soon as chlorination can be provided, probably during the coming winter. An immediate increase in supply can therefore be provided for, and the question as to whether the water from the remaining less desirable area of the Southern Sudbury should be further reclaimed by filtration may well be postponed for later consideration if and as an emergency develops.

ADDITIONAL EMERGENCY SOURCES.

In case of extreme emergency, particularly if the coming spring brings a disappointingly low rainfall, certain areas in the headwaters of the Assabet or Ware rivers could, at moderate cost and with little delay, be temporarily diverted during the season of flood flows. This could be done under the Emergency Water Supply Act without requiring additional legislation at this time.

REQUIREMENTS BELOW DAM No. 1.

We have considered in the short time available various data as to the requirements of the municipalities and industries on the Sudbury River below Framingham Dam No. 1, and conclude that our proposal to divert water from only 18.92 out of the total 46.98 square miles of drainage area above Dam No. 1 will leave a stream flow below this dam that will be more than sufficient to take care of the sanitary conditions in the stream, and will on the average be several times the legal requirement of 1.5 million gallons daily. Our proposal means that there will flow down the river from Dam No. 1 the entire drainage from about 12.7 square miles between this dam and Cordaville, and also, except at times of high stream flow, when the quality of the water is sufficiently good or the emergency necessitates the pumping of a portion into the Sudbury Reservoir, the entire flow from about 15.36 square miles above Cordaville.

ASHLAND SEWERAGE.

Our proposal does not contemplate the use at present of the Sudbury area below the village of Ashland (as well as a considerable area above the village) pending a later decision as to the use of water from this area by filtration, hence the question of what to do with the sewerage of Ashland is not immediately pressing. If the town of Ashland wishes to construct a system of sewers, the effluent of which would enter Framingham Basin No. 2, and, if the commission later, with a treatment plant, should decide to filter the water from Framingham Basin No. 2, the sewerage effluent could be diverted by the district to a point outside the watershed.

FRAMINGHAM'S SUPPLY.

The questions which have been raised in regard to the price which Framingham pays the district for water are similar in many respects to those which have confronted, and which will continue to confront, the Metropolitan District Commission when additional cities and towns seek admittance to the district to share both the benefits and the cost of the extensive additions which are now about to be begun. The cost of admittance to the district has in the past been subject to considerable discussion, and will have to be studied with greater care than is possible in the time available before the date of filing this report. Under these circumstances, it would appear that Framingham's problem can well be considered with those of other interested communities and that the entire matter should be made the subject of a further investigation.

We have estimated that the sum of \$900,000 should be provided to take care of the construction cost of the diversions proposed herein, to purchase the necessary land, rights of way, water rights, etc., to pay all damages involved and to defray any other expenses that may be required.

Respectfully submitted,

FRANK E. WINSOR,
Chief Engineer.

PROPOSED LEGISLATION.

AN ACT MAKING ADDITIONAL PROVISION FOR THE WATER SUPPLY NEEDS OF THE METROPOLITAN WATER DISTRICT BY DIVERTING A SUPPLY FROM THE HEADWATERS OF THE SUDBURY RIVER.

Whereas, The deferred operation of this act would, in part, defeat its purpose, therefore it is hereby declared to be an emergency law necessary for the immediate preservation of the public convenience.

Be it enacted, etc., as follows:

SECTION 1. The metropolitan district water supply commission, established by chapter three hundred seventy-five, of the acts of nineteen hundred and twenty-six, on behalf of the commonwealth, shall forthwith, for the purpose of extending the present sources of water supply of satisfactory quality available for the needs of the metropolitan district, divert into Indian brook in the town of Hopkinton, the waters of the brook flowing from Whitehall reservoir of said district at a point not more than one mile downstream from the village of Woodville in the town of Hopkinton; and shall divert into the Sudbury reservoir or Sudbury aqueduct of said district, or both, the waters of Indian brook, at or immediately below the dam of Hopkinton reservoir of said district in the town of Ashland, and the waters of Cold Spring brook at or immediately below the dam of Ashland reservoir of said district in the town of Ashland; said commission may also divert into the Sudbury reservoir of said district the waters of the Sudbury river at a point in the village of Cordaville in the town of Southborough or Hopkinton above the dam of the Cordaville Woolen Company.

Said commission shall construct as a part of the metropolitan water system such works as it may deem necessary for such extensions and diversions, and all structures and appurtenances incidental or complementary thereto. Said works, when completed, and all other property incidental thereto, shall be turned over to the metropolitan district commission and shall thereafter be maintained and operated

as a part of the metropolitan water system, under chapter ninety-two of the General Laws, with all the powers and duties conferred by said chapter.

The waters of the Sudbury river above the dam of the Cordaville Woolen Company shall be diverted only at and during such times as shall be approved by the state department of public health. Nothing in this act shall alter the provisions of chapter one hundred seventy-seven of the acts of eighteen hundred and seventy-two.

SECTION 2. In constructing the works herein authorized, the metropolitan district water supply commission shall proceed with the organization and in the manner provided by said chapter three hundred seventy-five for extending the metropolitan water system, and as therein provided may adopt such emergency methods as in its opinion may be necessary or desirable to secure their completion as soon as the public necessity may require; and may insert in contracts the provision specified in section two of said chapter three hundred seventy-five.

SECTION 3. For any of the purposes of this act, or for the further protection of the purity of the waters to be diverted under this act, said commission, on behalf of the commonwealth, may, at any time and from time to time, take by eminent domain, or acquire by purchase or otherwise, such lands, waters, water rights, easements, and other property in the towns of Hopkinton, Ashland, Westborough, Southborough and Framingham, as it may deem necessary or desirable. Any taking under this act may be in fee or otherwise, perpetual in duration, or for a limited period of time, according as the commission shall determine and set forth in the order of taking.

All takings under this act and all proceedings in relation to or growing out of the same shall conform to the provisions of chapter seventy-nine of the General Laws, except in the following particulars:

(a) The commission need make no award of damages sustained by persons or corporations in their property by any such taking.

(b) The notice required by section eight of said chapter may be given at any time within one year after the recording of the order of taking as provided in section three of said chapter.

(c) Petitions for the assessment of damages under section fourteen of said chapter may be filed within two years after the recording of the order of taking provided for in said section three, but petitions for the assessment of damages for the taking of rights of diversion may be filed within two years after, and not before, the actual diversion. The last six lines of section sixteen of said chapter seventy-nine, beginning with the word "but" in line three, shall have no application to takings under this act.

(d) For all property taken under this act, except rights of diversion, the right to damages shall vest upon the recording of the taking in the registry of deeds. For taking of rights of diversion the right to damages shall vest upon and not before the actual diversion of water.

SECTION 4. Said commission shall also have the same powers relative to acquiring an emergency water supply as are conferred upon the metropolitan district commission by section forty of chapter forty of the General Laws, as amended by chapter three hundred and eighteen of the acts of the year nineteen hundred and twenty-six.

SECTION 5. In carrying out the powers and duties conferred upon it by this act, the commission may construct and maintain buildings, pumping stations, machinery, conduits, aqueducts, pipes and drains; may alter or change the grade or direction of any water course; may carry and conduct any aqueduct, conduit, pipe or drain under or over any water course, or any railroad, street or other way, in such a manner as not unnecessarily to obstruct or impede travel thereon; may dig up any such road, street or way, and lay, maintain and repair, aqueducts, conduits, pipes and other works beneath the surface thereof, conforming to any reasonable regulations made by the selectmen of towns wherein such works are performed, and restoring, so far as practicable, any such road, street, or way to as good order and condition as the same was in when digging commenced. The commission may enter upon and use the land of others; may take down dams to such an extent as it may deem necessary, and shall rebuild such dams whenever the necessity for keeping them down ceases; shall use such lands and do all work relating to such dams in a reasonable manner, with regard to the interests of the owners thereof, and, so far as practicable, shall heed all reasonable requests made by such owners;

and in general may do any other act or thing necessary or proper in carrying out the powers and duties conferred upon it by this act.

The commission may make such surveys, borings and do such other preliminary work on private lands as the commission may determine to be necessary or desirable, doing as little damage as possible and paying for the same.

SECTION 6. For the purpose of carrying out the provisions of this act and of installing such purification or treatment works in connection with the water supply of the district as may be required by or incidental to the diversions herein required or authorized, the commission may expend such amounts not exceeding in the aggregate nine hundred thousand dollars as may from time to time be approved by the governor and council. To meet such expenditures, the state treasurer shall, from time to time, on the request of the commission and subject to such approval, issue bonds of the commonwealth to an amount not exceeding the sum of nine hundred thousand dollars, which shall be an addition to the loan authorized by section eight of chapter three hundred seventy-five of the acts of nineteen hundred and twenty-six. Such bonds shall be issued as coupon or registered bonds, for such term of years as may be recommended by the governor, in accordance with section three of Article LXII of the amendments to the constitution, and shall bear interest at such rate as shall be fixed by the state treasurer, with the approval of the governor and council. The amounts necessary to meet interest and serial payment requirements on said bonds and the expenses of maintaining and operating the works to be constructed by the commission under this act, and such other expenses as may be authorized hereunder, shall be added to the annual assessments upon the cities and towns comprising the metropolitan water district and apportioned and collected as provided by section twenty-six of chapter ninety-two of the General Laws.

SECTION 7. The supreme judicial court or any justice thereof and the superior court or any justice thereof, during a sitting of the court or in vacation, on the petition of the commission or of any city, town, corporation or person interested, or of the attorney of any such petitioner, shall have jurisdiction in equity or otherwise to enforce the provisions of this act and of any rule, regulation or order made under

the authority of the same and to prevent any violation of said provisions, rules, regulations or orders: provided, however, that no suit in which the right of the commission to make any taking authorized by this act is questioned shall be brought except in the supreme judicial court for the county in which said taking has been made or is to be made, nor unless the said suit is brought within six months after the passage of this act.