HIGHWAY FINANCING BY MEANS OF REVENUE BONDS

AS APPLIED TO A PROPOSED TOLL HIGHWAY ACROSS MASSACHUSETTS

by

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Submitted in Partial Fulfillment of
The Requirements for the Degree
of Bachelor of Science
from the
Massachusetts Institute of Technology
1949

Department of Civil Engineering
May 20, 1949
Cambridge 39, Massachusetts
May 20, 1949

Professor Joseph S. Newell
Secretary of the Faculty
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Dear Sir:

In partial fulfillment of the requirements for the degree of Bachelor of Science in Civil Engineering, I herewith submit this thesis entitled **Highway Financing By Means of Revenue Bonds As Applied to a Proposed Toll Highway Across Massachusetts**.

Respectfully yours,

William G. Mitchell
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INTRODUCTION

In this thesis I shall endeavor to show how a superhighway may be created through the instrumentality of revenue financing and to cover the administrative and financial phases of the project rather than the design aspects. The engineering work which I have studied dealt with traffic surveys and basic cost estimates.

This type of financing is based solely on revenues from the project itself to pay off the outstanding bonds. I feel it is the ideal way to finance any highway or bridge which a state cannot afford to build from its own tax revenues.

The increased use of the automobile in the past decade has brought about an unforeseen condition of traffic congestion in this country. Furthermore, all indications are that a greater percent of the population will be operating cars and trucks in the future. In addition to this, the total population is on a decided trend upward. We are beginning to find ourselves with a tremendous automotive fleet without the roads to carry it.
Massachusetts has one of the highest population densities in the country, especially the eastern part of the state. The eastern sector also contains a great number of manufacturing facilities which create a vast amount of commercial traffic on the roads. The time has come in Massachusetts to build an adequate system of roads before the state is strangled in its own web of traffic congestion.

In the body of this paper I propose that a main arterial highway be built from the Connecticut border at Route 15 to the Metropolitan Boston area, terminating at Route 128. I have endeavored to show how this road, which I will call the Massachusetts Turnpike, could be built by means of revenue financing. I have carried the project from the early promotional work to the theoretical conclusion when the bonds have been completely paid off and the Turnpike has become the property and responsibility of the Commonwealth of Massachusetts.
NEED FOR THE ROAD

As of the past decade or so, there has been a great deal of through highway traffic between New York City and Boston. Passenger cars have excellent four-lane highways from New York along the West Side Highway to the Hutchinson River Parkway to the Merritt Parkway in Connecticut (which charges a total of twenty cents toll for its entire length of thirty-seven miles) to New Haven. From New Haven the Wilbur Cross Parkway takes the traffic all the way to the Massachusetts border where it comes to narrow two-lane highways, which are by no stretch of the imagination designed to accommodate the present day automobile and its ability to travel at reasonably high speeds. Even when the traffic comes to the Worcester Turnpike (U.S. Route 9), it has a congested road to contend with.

There is also a great deal of heavy trucking between New York and Boston. Every day and night great fleets of trucks carry tons of freight between these two metropolitan areas. Hours of precious time are taken up in battling congested roads by these truckers. Fuel and maintenance costs are also high, and as a result, the truckers are having an extremely difficult time keeping up with railroad competition. They would welcome a high-speed highway, such as the Massachusetts Turnpike, with open arms. One hundred and fifty miles of the state highway system are over thirty years old, while five hundred and eighty miles are between twenty and thirty years old; none of this
mileage is suited to meet the requirements of modern travel. The sight distances are too short, grades are too steep, curves are too sharp, pavements are worn out and broken. They lack the proper safety signals, such as traffic signals and lane separation lines on the pavement, which are so vital and necessary for safe driving. The economic losses due to extra time and accelerated depreciation of equipment, as well as the loss of human life, are tremendous on the highways.

There are also one thousand and forty-four miles of the state highway system which are between ten and twenty years of age. A substantial portion of these are in the wrong location, heading directly into and through practically all congested residential and commercial areas. These bottlenecks and traffic hazards are greatly responsible for the appalling death rate on these roads. (1)

Much of this entire mileage is obsolete and worn out; it should be rebuilt on new locations, by-passing congested areas, with proper approaches to the business districts. The cost of maintaining some of these worn-out highways is extremely high and in time uses up the very money needed to rebuild them.

In addition to the through traffic between New York and Boston, there is a great deal of automotive traffic between New York and New Hampshire headed in the general direction of the White Mountains, and also the Maine seacoast. This traffic will by-pass Boston by means of Route 128 to Route 1 and connect with the proposed New Hampshire Turnpike, which will feed into the White Mountain Highway and the Maine Turnpike going along the coast.

The roads through Massachusetts do not handle any of the heretofore mentioned traffic adequately. If Massachusetts is to take part in any further industrial expansion, it must have arterial connections which will handle the modern means of automotive power. Just as urban Boston needs a system of expressways to keep it abreast with the other expanding cities of the United States, so the rural part of the state needs a highway system adequate to handle the volume of traffic present today and expected in the future. Large and small industries alike will not locate where the avenues of transportation bog down under a normal amount of industrial traffic. Massachusetts must prepare itself for the future and build a road system of the future, the Massachusetts Turnpike!
PROMOTION

As the need for this Massachusetts Turnpike grows, more and more people of importance start thinking of ways to promote and eventually finance it. Big businessmen find their goods bogged down on crowded highways, while cities and towns find their main streets overflowing with through traffic to the point where the townspeople have an extremely difficult time doing their shopping. Newspapers all over the state start printing editorials about the over-burdened traffic facilities; chambers of commerce worry about getting traffic away from the shopping areas when they know the through route traffic will not buy produce there; business men talk to men of influence in the government as to possible solutions of the problem. Meetings are held throughout the state advocating many varied plans for alleviating traffic congestion in numerous parts of the Commonwealth.

Civic-minded groups such as the Rotary or the Lions Club might be instrumental in organizing one large meeting to which prominent men from all over the state would be invited. These people at the meeting would first of all decide among themselves where a superhighway is most urgently needed. I will assume that they are agreed on a general route similar to the one I have already proposed.
At this meeting there would be investment bankers telling those assembled of various financial schemes and types of bonds. I believe that for a project of this sort, the bankers would encourage a revenue bond issue. I might note here that bond men are often present at promotional meetings encouraging the leaders of the communities to go ahead with new construction work that must be financed by the sale of bonds which these bond men hope to underwrite. They do, however, perform a very valuable service to the local people by telling them of the most feasible and economical ways of financing certain projects. These investment bankers have had experience all over the country and can tell people what type of bonds will sell on the market.

If the civic-minded people at this promotional meeting are convinced of the worth of a revenue bond issue, further pressure will be brought to bear on the state legislature to appropriate funds for traffic work and to pass the necessary legislation to create the Massachusetts Turnpike Authority. This money, which the legislature would grant for preliminary studies would be returned to the state by the Authority if the Turnpike project were to go to completion.
PRELIMINARY WORK

After a great deal of the promotional work has been done and it is felt that a revenue bond issue would be the best way to finance the Turnpike, the state legislature would appropriate around three hundred thousand dollars to be spent on a preliminary engineering report and a traffic and revenue report for the proposed Turnpike. From these reports it can be seen more closely whether or not the entire Turnpike project is feasible. The engineering report would determine a rough cost estimate for the route generally agreed upon by the instigators of the project. From the engineering figures the over-all size of the bond issue can be determined. Then, with the traffic and revenue report, an approximate annual income can be estimated. With this information the banking men could figure out how much interest and principal could be retired each year and how many years it would take to retire the entire issue at certain basic interest rates. If the bankers feel that the bonds which fit this project would sell on the market, the Turnpike project will progress.

The state already has a mass of traffic information from which the engineers can pretty well determine how much traffic would go over the Turnpike at any particular location. Considering the route mentioned previously from Route 15 in Connecticut, going south of Worcester and connecting with Route 128 near Boston, I believe the total
mileage would be about fifty-one miles to be built by the Authority. I arrived at this location after studying the Traffic Flow Map put out by the Department of Public Works in 1941. This preliminary location work would be done by the State Highway Department after they had taken some "origin and destination" surveys to determine the quantities of through traffic at the various locations around the proposed route of the Turnpike.

Comparing this fifty-one mile Turnpike with the Maine Turnpike of forty-six miles, which required a twenty million dollar bond issue, and the one hundred mile Pennsylvania Turnpike Philadelphia Extension, which required an eighty-seven million dollar issue, some idea can be had as to the total bond issue necessary for the Massachusetts Turnpike. Of course, factors such as the topography, number of tunnels and bridges, number of overpasses and the effect of rising costs must be considered when comparing the three turnpikes. I think that the state engineers would consider a thirty million dollar bond issue sufficient to build the Massachusetts Turnpike. The topography is similar to the Maine Turnpike so grading costs would be little higher allowing room for rising costs. The Massachusetts Turnpike, however, would require a great many more overpasses per mile since it would be running through more populated areas where there are more main streets. These overpasses would add a considerable sum to the total construction costs as would a higher cost of right-of-way.
With the traffic counts the state has and the "origin and destination" surveys they would take, the State Highway Department could pretty well determine how many vehicle miles would be traveled over the road each year by the various types of automotive vehicles. Considering similar toll schedules as used by the Maine and Pennsylvania Turnpikes, they could figure a gross revenue figure and deduct from it estimated operating and maintenance expenses. They would find out that the net revenues would be about one and a half million dollars the first year. The feasibility of the entire project can be roughly determined from these figures. If the Department of Public Works sincerely felt that the Massachusetts Turnpike was feasible, they would recommend that the legislation be passed to create the Turnpike Authority.

The Department of Public Works would be reimbursed for the preliminary engineering work they had done from the proceeds of the bonds on the revenues of the Turnpike project as provided for in the bill which would grant the Department funds to carry out this preliminary work.
THE LEGISLATION

After a great deal of preliminary conferences and promotional work, an investment banker would request a municipal bond attorney to prepare a bill for the Massachusetts State Legislature. The bill would probably be sponsored by the recess committee on highways.

In general the bill would provide for the creation of the Turnpike Authority and define its powers and duties. It would also provide for financing the construction of the Turnpike by the issuance of turnpike revenue bonds of the Authority, payable solely from tolls and other miscellaneous revenues taken in on the Turnpike. The bill would also grant the Authority the power to collect tolls and other revenues to pay the cost of maintenance, repair and operation as well as to pay off the outstanding bonds and the interest thereon.

The first section of the bill would describe what the Turnpike will do to facilitate traffic movement and grant the Authority power to build it at such locations as shall be approved by the State Department of Public Works. This section also allows the Authority to issue turnpike revenue bonds, payable solely from revenues, to pay for the cost of the Turnpike.
The second section states that neither the faith and credit nor the taxing power of the Commonwealth is pledged to the payment of the principal or interest of the bonds. It would also say that the Authority itself is not liable to pay off the bonds or the interest thereon except from revenues.

Section number three duly creates the Massachusetts Turnpike Authority as a corporate body, a quasi-public instrumentality. The Authority will contain five members, including the State Commissioner of Public Works, who would be a member ex-officio, and four members appointed by the Governor. The bill would go on further to explain the length of the terms of the various members of the Authority and that three members would constitute a quorum. Before any bonds are issued each member of the Authority would have to take out a surety bond. This section would also fix the salary to be received by each member of the Authority. Though this provision varies widely among various authorities, I would say five thousand dollars a year per man would be a fair reimbursement. This is a just amount since the men the Governor would appoint would have other positions as well, or would be retired executives of some sort.
The next section would describe the powers and duties of the Authority. I will take these up in a separate chapter.

The fifth section would authorize the Authority to issue revenue bonds to pay for the cost of the Turnpike in part or in whole, explaining that these bonds would be payable solely from the revenues taken in on the Turnpike. This section would also fix a maximum interest rate, say five per centum, and set a maximum time in which the bonds must be paid off, say forty years. Furthermore, this section would grant the Authority power to sell the bonds at either public or private sale, a matter which I will discuss in a future chapter.

Section number six provides that a trust agreement shall be written between the Authority and a corporate trustee pledging or assigning the tolls and other revenues to be received. This trust agreement would also contain the proper provisions for protecting and enforcing the rights and remedies of the bondholders.

The next section will authorize the Authority to levy and collect tolls with the power to revise these tolls at their discretion. It also allows them to rent sections of the right-of-way to gas stations, restaurants, and the like. This section would further provide that the
as revenues they come in be set aside in a sinking fund with the trustee to pay:

(1) the interest as it falls due,

(2) the principal as it shall fall due, and

(3) the redemption price of the bonds called in.

The remaining sections would describe the trust funds and the bondholders' rights in respect to these funds. One important section would state that the Turnpike property is exempt from any state land taxes or assessments and that the revenues of the Turnpike are free from a state income tax. One extremely important item also provides that the income made by the bondholders on the interest from the bonds owned within the state is free from federal income taxes though it cannot be stated in the bill since the bill is for the state legislature. One more section would grant the Authority power to refund the bonds at their desire. By refunding, it is meant that the outstanding bonds are called in at a certain premium as provided for in the trust agreement and the refunding bonds issued at a lower interest rate.
WHY REVENUE BONDS

In this thesis I have proposed that the Turnpike be financed by the revenue method, whereby tolls are collected. Is this method fair? Or is there a better way in which the road could be built?

It is my sincere opinion, after studying all other possible means of financing the Turnpike, that the issuance of revenue bonds backed by tolls is the fairest and most efficient way to carry through the financing of the entire project.

"The user should pay in accordance with the benefits received" — this brief statement from a publication put out by the Associated Farmers of California, Inc., entitled "Modern Financing for Modern Highways" puts the entire picture in a 'nutshell'. The motorist who uses this super-highway saves gas, wear and tear on his car, and quantities of valuable time. Above all this, the user is traveling over a road designed for safety, a road which is designed to meet the standards of the modern automobile. This safety insurance alone is worth the moderate toll which usually amounts to about one cent a mile for passenger cars. For truckers, it has been proven from data collected from the Pennsylvania and Maine Turnpikes, that it is more economical to use the toll road than the existing free state highways. The savings in gas, oil, wear and tear on the trucks, drivers' wages, and lengths of delivery
time have more than paid for the toll which the truckers have to pay to use these modern arteries of safety and convenience.

With these facts in mind, I do not think it fair that the residents of Western Massachusetts, and other sections not surrounding the project should have to pay for a highway through increased taxes which will bring economical gains to motorists and truckers in Central and Eastern Massachusetts, as well as to through traffic from all over New England and New York. "The user should pay in accordance with the benefits received."

A survey made by the American Institute of Public Opinion over ten years ago, showed that sixty-six percent of motor vehicle operators would pay a fair toll for the use of "special high-speed roads". Now, with existing highways even more crowded than before, more people would use a toll superhighway. There is little danger that adequate tolls cannot be collected to pay off the bonds and the interest thereon. Revenues from the Pennsylvania Turnpike are far above preliminary estimates. I am firmly convinced that the American motorist will pay a moderate toll for the privilege of using a safe and high-speed highway.
The other methods considered to finance a Turnpike of this size were to have the Commonwealth issue gas tax debentures or general obligation bonds. Gas tax debentures are payable from revenues obtained from an increase in the gas tax. With a gas tax considerably higher already than most people like, it seems very unlikely that many residents of the Commonwealth would look upon this method of financial action with much favor. If this method were followed, motor fuel users from every nook and corner of the state would be paying for a road which benefited only a portion of the state.

The issuance of general obligation bonds would mean that the entire taxing power of the Commonwealth would be in back of the bonds. Even though the Turnpike would aid the state as a whole, I do not feel that money should be taken from the general tax fund to pay off the bonds and the interest thereon. This would mean that consumers, regardless of whether or not they owned a motor vehicle and use the state highways, would in part be paying for the Turnpike through various state taxes.

When a new toll road opens, complaints are often heard from trucking concerns to the effect that the tolls are too high. Yet there is not a toll superhighway in the country that trucks do not use regularly, because they have found
in the long run it is more economical to use the toll super-
highway rather than the free road in the overall operation 
of their trucking operations. There has never been one 
failure to pay off the bonds when they fall due and the 
interest thereon for any project financed by the revenue 
bond method.
POWERS AND THE DUTIES OF THE AUTHORITY

Once the legislation has passed both the House of Representatives and the Senate of the Commonwealth of Massachusetts, the Governor will appoint four residents of the state to the Authority. These four men, together with the State Commissioner of Public Works, a member ex-officio of the Authority, will then meet and elect a Chairman and a Vice-Chairman. They will also select a Secretary and a Treasurer, who need not necessarily be appointed members of the Authority.

The powers of the Authority as set forth by the legislation would be:

(1) to adopt a set of by-laws with which to regulate its affairs and conduct its business.

(2) to adopt an official seal.

(3) to maintain an office at such place within the Commonwealth as it may designate.

(4) to sue and be sued in its own name.

(5) to construct, maintain, repair and operate turnpike projects at such locations within the Commonwealth as would be approved by the State Department of Public Works.

(6) to issue turnpike revenue bonds of the Authority, payable solely from revenues, to pay for the cost of the Turnpike, either in part or in whole.

(7) to fix and revise from time to time the tolls over the Turnpike.

* No page 20. Mistype by author.
(8) to acquire, hold and dispose of real or personal property in exercising its powers and performing its duties as set forth in the legislation.

(9) to acquire by purchase or by the right of eminent domain if need be, such property necessary for the right-of-way of the Turnpike.

(10) to designate the locations of the points of ingress and egress from the Turnpike to insure the proper operation and maintenance of the project, and to prohibit entrance to the Turnpike from any point not so designated.

(11) to enter into all contracts and agreements necessary to the performance of its duties and to employ consulting engineers, attorneys, accountants, construction and financial experts, superintendents and any other employees deemed necessary, and to fix their compensation; provided, they be paid solely from the revenues of the Turnpike.

(12) to receive and accept grants from any federal agency to aid in the construction of the project, and to receive and accept aid or contributions from any source of either money, property, labor or other things of value, to be used only for the purposes for which such grants and contributions be made.
The Authority would have such incidental powers as the right to construct grade separations at intersections of the Turnpike with public highways and to change the line and grades of such highways so as to adjust them to fit the design of the grade separations. Any expense incurred in doing this type of work will be included as a part of the Turnpike cost. They will also have the right to change the location of a public highway provided the new road is of the same type and is left in as good condition as the old road. The Authority and its authorized agents and employees shall have the right to enter upon any lands, waters and premises in the Commonwealth for the purpose of making surveys, soundings, borings and any other examinations deemed necessary in the over-all construction of the Turnpike.

The powers of the Authority as I have just outlined cover in a general manner the duties of the Authority. Now that the Authority has been appointed by the Governor, they will at once employ a consulting engineer. The engineer and the Authority will then go over the preliminary engineering cost estimates and see that a conservative amount has been set for the entire bond issue. We will assume that the thirty million dollars is the amount
decided upon for the bond issue. The Authority will then negotiate with one of the bond men who did a great deal of the educational work and afforded preliminary financial advice as to the feasibility of floating a bond issue of this size.

This contract between the Authority and an investment banker provides that the banker will do the following:

1. Employ qualified bond attorney who will prepare all necessary legal papers including the Trust Indenture and all necessary procedures for the issuance of the bonds, and who will render an opinion as to the legality of the bonds.

2. Prepare the offering circular and prospectus and any other necessary literature.

3. Provide for the printing of the bonds and deliver them to the Trustee.

4. Supervise publicity before the sale of the bonds and, after the bonds are sold, publish periodic statements and facts concerning the operations of the Authority for the benefit of the bondholders.

5. Act as a financial adviser to the Authority and assist in coordinating all necessary procedures in the entire operation both before and after the issuance of the bonds.

6. Prepare an appropriate schedule of interest and bond maturity, redemption dates and prices, and other terms of the bonds.

The contract will further state that the banker agrees to purchase the entire issue of the turnpike bonds providing their legality has been approved of by the bond attorney. The price the banker will pay for the bonds
shall be determined on both traffic and consultant engineering reports and on the basis of the market for bonds of this general type at the time of the sale providing both parties agree to the price.

After this contract has been signed between the Authority and the banker, the Authority will wait until the bond attorney and the banker have carried through all the details of the financing and the bonds are on the market. Then the Authority will set up the machinery for procuring the right-of-way after the engineers have decided upon the best location.
THE CONSULTING ENGINEER

Simultaneously with signing a contract with an underwriter the Authority will hire a consulting engineer. Along with the consulting engineer the Authority would probably hire a firm of consulting traffic engineers. Past experience has shown that revenue bonds of this type cannot be sold unless a nationally known firm of traffic engineers submits a favorable report as to estimated traffic and revenues. The two firms of consultants will then go over state traffic reports and data compiled by the traffic engineers' firm and decide upon such things as the size and exact location of the road and the best places for the interchanges. I believe they would decide that a four lane divided highway would be sufficient to handle the traffic studied. If the traffic engineers' report showed that traffic would not be sufficient to provide ample revenues to pay off the bonds, the Authority would become inactive and sit back until such time as the Turnpike seemed feasible. However, as shown by the traffic tabulations in Exhibit Three of the Appendix, the revenues from the Massachusetts Turnpike would indeed be sufficient to meet the financial obligations.
The exact location of the Turnpike at its interchanges would be as I have shown it in Exhibit One. This location of the Turnpike and the interchanges would have to be approved by the Department of Public Works as provided for in the legislation creating the Authority. Of course, the exact location of the center line could only be determined with detailed topographic maps of the entire area and with reports showing the assessed valuation of all the land in the area considered for the Turnpike. However, my purpose is only to show the location of the Turnpike accurately enough so that the estimated traffic and revenues can be determined.

The breakdown of the various costs of the project are shown in the appendix. It is here in the engineering report that the final size of the bond issue is determined. The consulting engineer would also estimate the future operating and maintenance costs as I have done in Exhibit Four. With this information an amortization sheet can be worked out for retiring the bonds seen in Exhibit Five.

Preparing this report, which presents the various costs and revenues and an opinion as to the soundness of the venture, is part of the engineer's preliminary work. Other preliminary work includes topographical surveys, geological investigations and borings, and determination of the exact location of the center line.
Following the issuance of the bonds, the engineers would prepare contract plans and specifications, arrange for the advertising and receiving of bids (including such things as performance bonds, contract documents, qualifications of bidders and reviewing contractors' proposals) and any other engineering work necessary before the actual construction gets under way.

After the contracts had been awarded, the engineers would be responsible for seeing that the work of constructions and its cost were in accordance with the plans and specifications. They would also have to inspect and test all materials, inspect and approve the work as it progresses, approve all expenditures from the construction fund, and prepare a final report on the Turnpike after conducting a final inspection of the entire project.

This same firm of consulting engineers would probably be retained to take over the supervision of the maintenance and operation of the Turnpike, and make recommendations as to the revenue fund for operation and maintenance. They would also prepare an annual report which would present the figures for operation and maintenance for the past year and compare them with the estimated budget prepared in the original engineering report. This annual report would also describe in general the condition of the Turnpike.
TRAFFIC ENGINEERS

As mentioned in the previous chapter, the traffic engineer would be hired along with the consulting engineer. His duty would be to prepare a report showing how much traffic of each class would go over the Turnpike if the Turnpike were to follow the route proposed by the consulting engineers. This report would also contain proposed toll schedules for all types of vehicles; combining this data with the estimated volumes of traffic would show approximate revenue figures for the future.

The vital parts of a traffic and revenue report for the Massachusetts Turnpike are presented in the appendix.

The origin and destination surveys which the traffic engineer would make would aid the consultants a great deal in determining the best route for the Turnpike. From these surveys the engineers can determine what percentage of the traffic is through traffic and will be induced to use the Turnpike. As I have been unable to conduct actual origin and destination surveys myself, I have had to use some data which I do not feel is complete enough but which seems to be sufficient to satisfy my needs in this thesis.

Now that the traffic engineers have determined how much total traffic will flow over the Turnpike and have
projected these traffic estimates into the future, they will decide upon a toll schedule for the entire Turnpike project. These traffic estimates would not include the so-called "induced" traffic. This traffic is defined as "traffic in addition to that obtained by diversion from existing facilities; that is, traffic that would not move except for the provision of the projected facility". (1) This is sometimes called a "facility increase"; an example of this for the Massachusetts Turnpike would be travelers between New York City and Boston who previously used the train because of traffic congestion on the highways would again travel by car over the Massachusetts Turnpike since the Turnpike would eliminate most of the congestion between the two cities. This "induced" traffic would tend to make my estimated traffic volumes on the conservative side. Some traffic engineers feel that the "induced" traffic over super highways increases the volume by thirty (30%) per cent. The estimated revenues for the Turnpike could then be determined, not including the "induced" traffic, and we could see how much money will be available for amortizing the bonds. Of course, there are some basic assumptions that must be made in determining what the future revenues would be. I sum these up to be:

(1) Molander, Winston L., Bridge Revenue Bonds, p. 28
(1) That there will be no major depression in major business conditions which effect the traffic adversely.

(2) That there will be no major fuel rationing.

(3) That the general ratio of growth of vehicular traffic will continue in Massachusetts as in the past.

(4) That the routes paralleling the Turnpike will not be improved to the extent where they will afford all the advantages of a modern expressway.

(5) That there will be no difficulty in transferring the franchises held by trucking and bus companies from the routes they are now using to the Massachusetts Turnpike.

(6) And, that there will be no legislation passed adversely affecting the amount of truck travel through Massachusetts.

Even if some of these assumptions prove to be wrong, the estimated revenues more than provide enough coverage to pay off the bonds and the interest thereon.
THE UNDERWRITERS
(Investment Bankers)

With the contract signed duly authorizing the investment banker to underwrite the bonds at a private sale, the banker will proceed to prepare a prospectus once the engineer has determined the total cost of construction. This prospectus is a booklet which presents the bonds to the public. I believe a private sale of this type between the Authority and the banker will guarantee the most efficient sale of the bonds. In a private sale the banker and the Authority will negotiate a price to be paid for the bonds knowing what the banker will be able to sell them for on the open market. They both will know about what the banker's profit would and should be for the work he has done in preparing the prospectus and paying for legal counsel. Consideration must also be given to all the preliminary work and advice the banker would have performed prior to the creation of the Authority. If the bonds were up for public sale, the Authority would have had to hire financial counsel before the sale to determine what interest rate and type of bonds the market would take. Then in the public sale the highest bidders would probably pay the Authority just about the same price for the bonds as had been negotiated in the private sale and would not have a prospectus prepared.
I think the banker would advise the Authority to issue term bonds maturing the 1980. This is ample time to pay off all the bonds and interest thereon as shown by Exhibit Five in the appendix. Term bonds appear to be more favorable than serials in new construction work of this type since no set schedule has to be met for retiring the bonds. With serial bonds the first bonds have to be paid off three or four years after the bonds are issued. If anything happened to delay the construction schedule and the Turnpike was not open long enough to accumulate enough revenue to retire these bonds, the bonds would go into default and cause a great deal of trouble. Term bonds will legally fall due in thirty years, the Authority is required to keep tolls up where they will pay off the bonds as set forth in the official amortization sheet of the prospectus.

The prospectus would start off by stating the size of the entire issue, thirty million dollars and the interest of perhaps three and one-quarter per cent, which these term bonds will pay. It would then say that these bonds are offered to the public at one hundred and one per cent. The interest rate and offering price seem to be about what the market will take now in term bonds. I might add here
that when the banker agrees to purchase the bonds, he will have to form a syndicate to help him sell the bonds. There is not a bond house in the country that could possibly sell all the bonds for an issue of this magnitude. The banker might get as many as a hundred bond houses to take the bonds. If the original bond man were to pay the Authority $29,100,000 for the bonds, he would probably let the houses in his syndicate have them for $29,250,000, taking a moderate manager's fee. He would probably keep only a small per cent of the bonds to sell himself.

The remainder of the prospectus will go on to explain the functions of the Authority and the type bonds which they shall issue. It will also contain a general description of the proposed construction and advantages of the Turnpike. Following this would be a breakdown of the traffic and revenue reports and a basic amortization sheet as to how these revenues will retire the bonds. Then the prospectus will describe the application and disbursement of all moneys taken in on the Turnpike as recommended by the consulting engineer. The report will conclude in discussing remedies of the bondholders and what tax exemptions these securities have.

This prospectus is not a legally bound document like the trust indenture. It is merely a well-prepared bit of selling literature presenting the bonds to the investing public.
SALE OF THE BONDS

This thirty million dollar issue of term bonds would be sold mostly to institutions and to private investors in the high income brackets, since the income from the bonds is exempt from any existing federal income taxes. In effect, these bonds which pay an interest rate of three and one half per cent would yield a six and one half per cent return to the individual who loses half of his earnings in federal income taxes. The more a man earned, the better these bonds would be to him.

Banks would probably not be interested in these term bonds. They cannot afford to tie up their money for too long a period of time. They would buy short term serial bonds if issued.

Insurance companies would also be very interested in these comparatively high yield bonds. They are always looking out for a sound investment since they have such a magnitude of money to take care of. However, some of the insurance companies do not feel that the insurance statutes allow them to buy revenue bonds for new construction work. They would be more apt to buy these bonds on the open market after a few years' earnings had come in on the Turnpike.
No matter who the investor may be, he is not going to buy a bond which he thinks will not be paid off at maturity. That is why so much importance is placed upon the traffic and revenue report of a nationally known firm of traffic engineers. It is this report which the prospective bond buyer will read to see if adequate funds will be available in the future to retire the bonds. The traffic engineers' professional reputation is at stake every time he prepares a report of this kind. He necessarily has to tend to be conservative in his figures and be very truthful in stating whether or not the proposed project is feasible.
MUNICIPAL BOND ATTORNEY

The municipal bond attorney would be hired by the banking group for the purpose of preparing a trust indenture and passing an opinion as to the legality of the bonds. The bond attorney hired would most likely be the one who was requested to write the legislation which created the Authority.

In preparing the trust indenture, the bond attorney will have to satisfy the desires of the Authority as well as insure that the bonds are marketable and protect the interests of the bondholder. The Authority cannot be tied down too much; however, the indenture will provide that the tolls must be set high enough to cover the debt service. This would be done to prevent any political figure connected with the Authority from saying that "If elected, I will reduce the tolls on the Massachusetts Turnpike". The trust indenture also provides that all expenditures made by the Authority must be approved by the consulting engineer. This will protect the bondholder's interest.

The indenture also provides how the money is to be handled in various funds by the trustee as it is taken as tolls by the Authority. I will cover this in more detail in the next chapter.

I feel that the indenture should be left open-ended to the extent of providing for the Authority to issue more
bonds if the original issue did not provide sufficient funds for the complete construction of the Turnpike project. I believe that provision should be made for extending the Turnpike to the West after a few years time when the actual earnings from the original Turnpike can be compared with the estimated revenues. Additional legislation would be needed to build a western extension if the original bill only authorized the Authority to construct the road in such a location as I have described.

The next major section will provide for the redemption provisions of the bonds. Since they are to be term bonds, as decided in the previous chapter, they will be called in lot by the trustee when enough money accumulates in the sinking fund to retire a part of the issue. The particular bonds to be called in will be decided in a manner similar to a lottery. If a bond is to be called before maturity, it will be necessary to work out a scale of redemption premiums.

One important provision provided for in the trust indenture is that of refunding any outstanding bonds. If the Authority and the financial counsel ever feel that the market will take term revenue bonds at a lower interest rate, they are empowered to call in the outstanding bonds at the fixed premium conditions and issue new bonds. They
would only do this if the earnings of the Turnpike were very favorable and if revenue bonds were selling on the open market at generally lower interest rates.

The main points of interest contained in the opinion prepared by the bond attorney just prior to the issuance of the bonds is that the income from the bonds is exempt from all present federal income taxes, and that the bonds are valid special obligations of the Massachusetts Turnpike Authority.
THE TRUSTEE

The trustee would be named in the trust indenture and hired by the Authority. It would probably be a fairly large bank or trust company in Boston which would receive this job. The bank would receive an annual fee plus various commissions for receiving the revenues from the Turnpike and depositing them in various funds.

When the bankers would pay the Authority for the bonds, the money would be deposited with the trustee in a construction fund. This money would be used to pay the costs of construction, procurement of the right-of-way and any other such items necessary to the complete construction of the Turnpike as approved by the consulting engineer. This fund would also include the interest requirements during construction and for one year after completion.

All tolls and other revenues shall be deposited in a revenue fund daily if it is practical. All transfers from this to the other funds shall be made by the trustee under the conditions set forth in the indenture. All operating and maintenance expenses would be taken from this revenue fund if such expenses were approved by the consulting engineer.
There would also be a reserve maintenance fund which would receive annual payments from the revenue fund of not less than seventy thousand dollars. However, once this fund has reached three hundred and fifty thousand dollars, no further payments shall be received. This fund would be created to cover the possibility of any major repairs which could not be handled by the annual maintenance budget.

The balance of the revenue fund after setting aside enough money to take care of current operating and maintenance expenses would be deposited to an interest and sinking fund each month. The money in this fund would be pledged for the following: payment of interest upon the bonds, payment of the principal of the bonds at maturity, redemption of the bonds, and purchase and retirement of the bonds each maturity as provided for in the trust indenture.

Each month the accountant retained by the Authority would prepare a report to be filed with the trustee, consulting engineer and the original underwriters of the bonds containing the following: an income and expense account for the Turnpike, the number of each classification of vehicles using the Turnpike, the number of each classification of vehicles using the Turnpike, all deposits and withdrawals from each fund, any bonds issued, purchased or
redeemed, a balance sheet, and the amounts made from the sale of any of the Turnpike property.

Every six months there would be a formal audit of all the books relating to the Turnpike made by an independent firm of certified public accountants. These audits would be open to the inspection of any interested persons.

Once the bonds have been completely retired and all operating and maintenance bills paid up to date, any remaining funds in the hands of the trustee would be turned over to the state as of the day the tolls would be discontinued on the Turnpike. From this day on all operating and maintenance expenses would be paid for by the Commonwealth.
CONCLUSIONS

As I have already indicated in the body of this thesis, I definitely feel that a toll highway is quite feasible in the location I have indicated, if financed through the instrumentality of revenue finance. With the state building and improving indicated connecting routes, an extremely high percentage of any traffic taking trips over ten or twenty miles in length will travel over some part of the Turnpike.

This Massachusetts Turnpike would be a great step in the advancement of New England's highway network. However, if it were not for the great triumvirate of engineering, law, and finance, it could never be possible. Reliance is placed upon the traffic engineer for an accurate forecast of traffic and revenues, upon the consulting engineer for successful planning and supervision of the construction of the Turnpike, upon the bond attorney for legal security and upon the investment banker for proper financial advice and promoting the sale of bonds.

With millions of new trucks and cars foreseen in the future, many additional facilities such as superhighways will be imperative, and financing by means of revenue bonds offers a sound and equitable method of obtaining the required funds.
BIBLIOGRAPHY


Chamberlain, Wilson, "Thanks, I'll Pay My Own Way", Reader's Digest, April, 1938.

Chicago Park District, Traffic Engineering Section, Preliminary Study - Initial Stage - Adaptation of the Poll Principles to the Outer Drive, February, 1941.

Commonwealth of Massachusetts, "1941 Traffic Flow Map", Department of Public Works and Public Roads Administration.


APPENDIX
LOCATION OF THE TURNPIKE

The Turnpike would start with a toll house where U. S. Route 15 enters Massachusetts. It would then proceed towards Worcester with a toll interchange where it would cross U. S. Route 20. The next toll interchange would be located at the Turnpike's intersection with Route 12 south of Worcester. Proceeding to the Northwest from here, there would be an interchange where the project crosses Route 122 Southwest of Worcester. The next interchange would be placed at the intersection with Route 9. Heading East from here the Turnpike would terminate with a toll house at Route 128.

A great deal of the traffic which would use the road would be people coming up from New York and Connecticut traveling the entire length of the Turnpike to Boston. The interchange at Route 20 would enable the motorists coming in from the Springfield area and points West to take the road into Boston. The two interchanges just South of Worcester would handle a part of the large volume of traffic going between Worcester and Boston every day. The interchange at Route 9 would handle a great deal of the local traffic originating and terminating in the Framingham, Natick area as well as part of the large flow between Worcester and Boston.

I terminated the project at Route 128 since the state plans, and is, making this road into a first-class belt
parkway. As can be seen on the accompanying map, Route 128 would distribute incoming traffic very rapidly to any desired direction. Traffic wishing to go the New Hampshire and Maine will connect with Route 1 without the bother of any city driving. The same holds for those desirous of heading for the Lowell, Haverhill area by means of Route 28. I might mention here that the state also plans to improve Routes 1 and 28 into first-class arterials.

If the project I have described in this paper were to be built by means of revenue finance, the state would not have to spend any funds for this much-needed link and could so concentrate their spending on these other heretofore mentioned routes. This planned cooperation of spending available funds would speed the day when the Commonwealth's outdated road network would be replaced by a system of adequate highways.
EXHIBIT TWO

TOTAL BOND ISSUE
ESTIMATED TOTAL OF BOND ISSUE

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<th>Description</th>
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<td>Right-of-Way Costs</td>
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<td>Construction Costs (including all grade separations)</td>
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<td>Interchanges</td>
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<td>Contingencies - 10%</td>
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22,000,000

Engineering Costs (7%)  1,540,000

Miscellaneous Project Costs  360,000

Legal, Administrative and Overhead Costs  500,000

Purchase of Maintenance Equipment and Supplies  350,000

Financing Charges  1,000,000

Interest During Construction (3½%) from June 1, 1950 to June 1, 1952, inclusive. 1,250,000

Total Bond Issue  $30,000,000

Preliminary Costs

Preliminary costs include aerial and preliminary surveys; investigations and estimates of cost; traffic survey and report; preparation of the engineering report and other related costs which would be incurred before the sale of the bonds.

Right-of-Way Costs

The cost of the right-of-way has been estimated on what is considered a current fair market value of the properties considered. The amount set forth in this exhibit was determined
by comparing the costs incurred for purchase of right-of-way on the Pennsylvania and Maine Turnpikes. Also included in this item is the cost of acquisition which comprises such items as property surveys, appraisals, legal fees and other related expenses.

Construction Costs

The construction cost was estimated on a very general basis as it is not the purpose of this thesis to determine an exact cost of the project. The figure was arrived at after studying the actual construction costs of similar projects. This amount would provide for constructing two twenty-four foot "black-top" roadways separated by a twenty foot medial divider and flanked with shoulders ten feet in width between the edge of pavement and the gutters or embankment slopes.

An amount equal to 10% of the estimated construction costs has been added to provide for unforeseen contingencies that might arise during the period of construction.

Engineering Costs

The engineering costs include the preparation of construction plans, specifications, estimates and contract documents; geological investigations and borings; and final surveys. They also include analyzing bids and awarding contracts; general supervision and inspection of the work.
as it progresses; shop and mill inspection of materials; and general coordination of construction and material contracts.

Miscellaneous Project Costs

Miscellaneous project costs comprise the various items of expense incidental to supervision and inspection of construction contracts such as engineering equipment, field offices, automobiles and other supplies for the personnel engaged in the inspection phases of the project.

Legal, Administrative and Overhead Costs

This item includes the salaries and expenses of the Authority, general officers and clerical staff, legal advice and opinion on contractual matters and the sale of the revenue bonds, and other similar expenses incurred before the completion of the project.

Purchase of Maintenance Equipment and Supplies

This item of cost comprises the purchase of automotive equipment necessary for maintaining the project after its completion; the cost of uniforms and equipment for the toll officers and tellers; and the acquisition of other supplies required to commence operation of the Turnpike.
Financing Charges

This item is the expense incurred by the investment bankers in setting up the financing and selling the bonds. Their specific duties are better described in the chapter concerning the underwriters.
EXHIBIT THREE

TOLL RATES AND ESTIMATED ANNUAL REVENUES
TOLL RATES

All rates presented below are for the entire length of the project. Rates for shorter trips would be proportionately to the nearest nickel.

Motorcycles $ 0.25
Passenger Cars 0.50
Semitrailer Trucks 1.50
Heavy Trucks 1.00
Medium Trucks 0.75
Light Trucks 0.50
Buses - 13 passenger and over 1.50
Buses - up to and including 12 passengers 0.75

REVENUE TABULATIONS

All revenue tabulations have been made using an average toll rate of $0.015 per vehicle mile. This figure is in accordance with the ratio of passenger cars and trucks using the Maine and Pennsylvania Turnpikes.

I have chosen 1953 as the first full year of operation since the Turnpike would not be open for traffic until June 1, 1952 if construction were started June 1, 1950.

All traffic estimates have been made after considerable discussion with the Department of Public Works and other traffic experts. I also based my estimates on figures obtained from a traffic-flow map of the state.
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<tr>
<th>Route</th>
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<td>Conn. to Worcester</td>
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<td>Route 20 to Route 128</td>
<td>2,000,1(38.5)(.015) 365</td>
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**Total** $2,073,000

This revenue figure includes only the main through trips. There would be other incidental revenue from shorter trips such as those which would terminate at the interchange over Route 9.

1. Annual average 24 hours traffic of all motor vehicles.
2. Average distance from two interchanges south of Worcester to Route 128.

This gross revenue figure for 1953 has been projected into the future in the Amortization Sheet (Exhibit Five). I have based these revenue figures of the future on an expected forty to fifty per cent increase for 1970 over 1950. This seems to be the general opinion of the Massachusetts State Highway Department.
EXHIBIT FOUR

ESTIMATED ANNUAL OPERATION AND MAINTENANCE EXPENSES
## Expenses 1953

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<th>Description</th>
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<td><strong>Total Maintenance and Operating Expenses</strong></td>
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<td><strong>Total</strong></td>
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### General Administration

The cost of general administration includes the salaries and expenses of the Authority, general counsel, clerks and attendants; general office expenses such as light, heat, telephone, janitor service and publications; trust indenture expenses including fees for trustees; advertising and public relations; and other miscellaneous expenses.

### Roadway and Structures Maintenance

Included in this cost are the salaries and expenses of superintendents, division supervisors, attendants and watchmen; general office expenses at maintenance buildings; pavement maintenance including traffic lines, bituminous patching and resurfacing; maintenance of shoulders, medial strip, gutters, drains, curbs, drainage ditches, bridges, culverts, guard rail, right-of-way fence, directional signs, toll booths, collection...
equipment, buildings and surrounding grounds, and mobile
maintenance equipment; snow removal and cinderling of the
pavement; maintenance of access roads; and general cleanup
of the right-of-way.

Fare Collection

Fare collection costs include the salaries and expenses
of superintendents, tellers, drivers, and collectors; power
and lamp renewals for interchange lighting systems; purchase
and repair of uniforms for fare collection personnel; main-
tenance and repairs of toll collection equipment; and mis-
cellaneous supplies.

Police Patrol

This item provides for the salaries and subsistence of
sargeants, patrolmen and clerks; maintenance, operation of
patrol cars; and the general operation of the police barracks.

Storea and Inventory

Included in this cost are the salaries of the purchasing
agent, clerks and attendants.

Insurance Fund

Payments to this fund are determined by the annual
premium requirements of all types of insurance carried.
The insurance to be held would include multi-risk; use and
occupancy; fire; property damage - public liability; blanket
fidelity bond; fire, theft and collision; comprehensive
liability; workmen's compensation; and retirement fund.
Replacement Reserve

This reserve fund would provide funds for major repairs, replacement of equipment and other expenditures which would occur at infrequent intervals.
EXHIBIT FIVE

AMORTIZATION SHEET
AMORTIZATION SHEET

The Net Income column is obtained by subtracting the estimated annual Operating and Maintenance expenses, Insurance expenses, and Replacement Reserve expenses from the estimated Gross Revenues for a year.

The annual Interest Charges are subtracted from the Net Income to give the Balance in the Reserve Account. This Reserve Account must always be twice the succeeding year's interest expense before any bonds can be retired.

The Bonds Redeemed column merely shows the amount of bonds retired each year and the premium paid on these bonds.

The Balance in the Sinking Fund represents the money left over each year after a certain amount of bonds have been retired and the Reserve Account has been provided for.
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$30,000,000
MASSACHUSETTS TURNPIKE AUTHORITY
3 1/4% TURNPIKE REVENUE BONDS

DATED JUNE 1, 1950
DUE JUNE 1, 1980

June 1 — December 31: 16614000, 15697500, 30000000, 340600