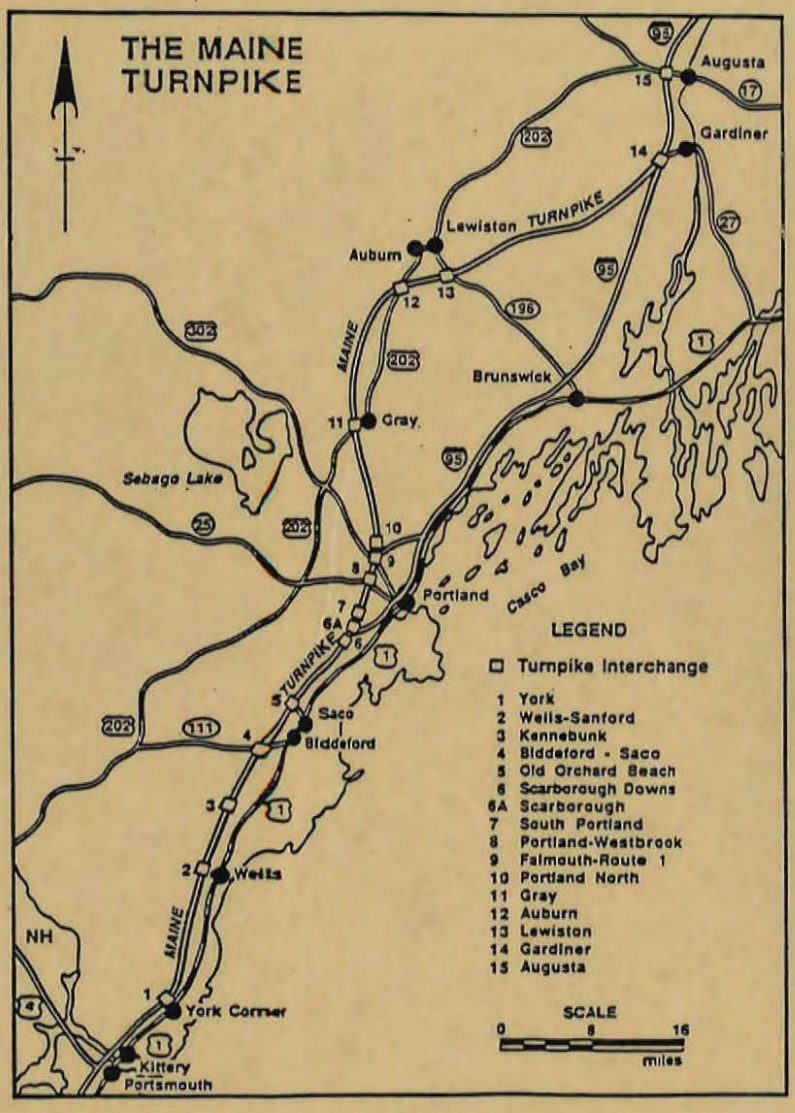
Widening the Maine Turnpike: the Case for a Management Alternative



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January 1988

WIDENING THE MAINE TURNPIKE:
THE CASE FOR A MANAGEMENT ALTERNATIVE

MAINEWATCH INSTITUTE

January, 1988

This report was funded by a grant from Maine Times to the Mainewatch Institute . The research was conducted for Mainewatch by The Irland Group of Augusta, Maine. Richard Barringer coordinated and edited the project, and Lloyd Irland was principal investigator. Greg Barringer and Karen Nielsen served as research assistants, and Frank O'Hara provided editorial suggestions. Graphics were prepared by Dick Kelley.

Founded in 1987, the Mainewatch Institute is an independent, nonprofit research and public education organization. Its purpose is to identify, monitor, and analyze longterm trends and issues that bear upon the environment and the economy of the Northeast, with Maine as its focus.

SUMMARY AND HIGHLIGHTS

1. This report reviews the justification for and alternatives to the Maine Turnpike Authority's $63 million proposal to add 2 lanes to the highway between York and South Portland. In brief, it finds that the proposal has not been justified with sound analysis and is inferior to the management alternative.

2. If this widening project proceeds, it will generate secondary and environmental impacts that have not even been initially inventoried, much less thoroughly analyzed. It will preclude the use of the funds to address other important statewide transportation needs such as economic development corridors into rural areas.

3. The problem to be solved by widening the Turnpike has not been clearly defined and measured. In addition, no case has been made that transportation benefits of the project would exceed its large direct and secondary costs.

4. Financing the widening by the Authority's proposed toll increases is clearly inequitable.

5. The issue of Turnpike congestion and its management cannot be considered apart from the increasing urban area congestion along the Turnpike Corridor.

6. The Authority has made no effort to now to examine alternatives to the widening. A strong case can be made for adopting a management approach rather than expanding Turnpike capacity. The various management practices needed have been tested in practice. A management solution would have many side benefits and would avoid the secondary impacts the widening will cause. Most importantly, the management approach is more in tune with Maine values of thrift and common sense than is a massive, costly, and unnecessary construction project.

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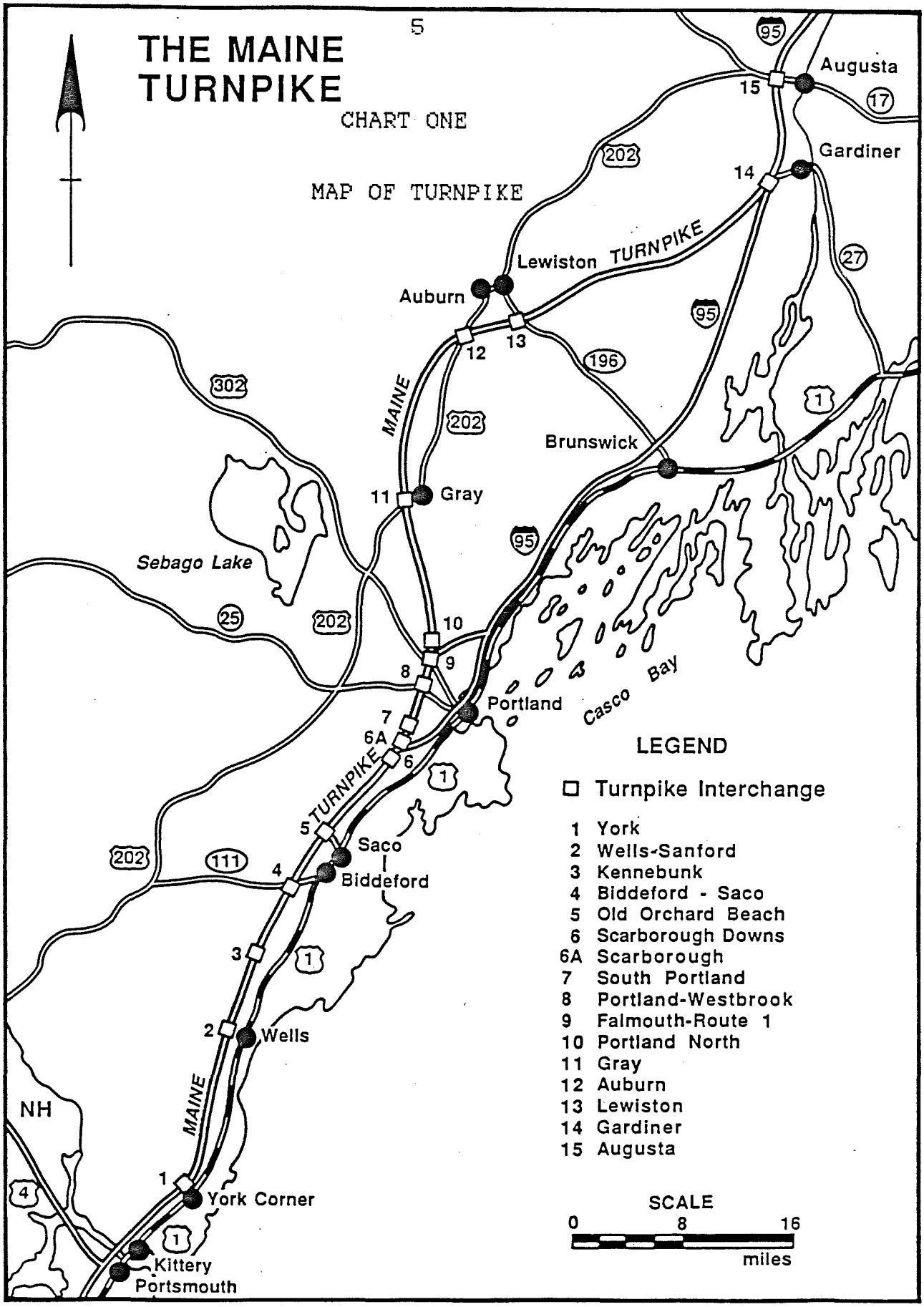
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INTRODUCTION

The construction of the Maine Turnpike in the late 1950's was a strategic public works investment by and for the people of the State. It has facilitated the strong development of tourism, light manufacturing, and residential development in southern and south central Maine. Maine's current economic strength would be unimaginable without such a highway artery connecting it to the rest of the Northeast and the nation. Because of its very success, the Turnpike now suffers from heavy congestion for a few hours on about 10 days each year.

In wide areas of our national life, we are now turning from past, capital intensive methods to new approaches to solving problems. In many areas, for example, federal agencies, cities, and states are turning from construction to management solutions when facility capacities are reached. This is happening for irrigation water, municipal water, electricity, and even sewage treatment plants.

When Maine's power system experiences high winter peak demands, for example, Central Maine Power does not immediately propose building a costly new power plant. Instead, it advertises on television to encourage consumers to reduce peak-hour electricity use. It also provides customer advice and long term incentives to help in energy

conservation. In other words, the utility resorts to load management techniques to deal with occasional peak loads.

When Maine's telephone system experiences high peak demand on major holidays or on weekdays, New England Telephone does not just build more lines. Instead, it offers discount prices to users who will make their long distance calls after 5 PM.

In both instances, the utilities are saving capital costs and maintaining service by managing the demand as well as the capacity. Of course, this was not always the case. Steadily rising capital and operating costs, and incentives provided by the Maine Public Utilities Commission, have pushed them into new approaches to load management in place of the past emphasis on expanding capacity alone.

Transportation planning in Maine is where the power and phone companies were 20 years ago: when there is a brief period of peak congestion, the obvious, thoughtless solution is simply to expand capacity; considerations of equity, benefit-cost issues, management alternatives, local traffic impacts, and environmental impacts are all "Someone Else's Department". This primitive approach to transportation planning has long been criticized by economists. Years ago, a prominent transportation economist wrote:

"...in no other major area are pricing practices so irrational, so out of date, and so conducive to waste as in urban transportation. Two aspects are particularly

deficient: the absence of adequate peak-off differentials and the gross underpricing of some modes relative to others." (Vickery, 1973a, p. 106; reprint of 1963 article)

The Turnpike widening proposal exhibits essentially no progress in the application of our improved knowledge of traffic engineering since Vickery wrote in 1963.

The purpose of this report is to argue for extreme caution in embracing the construction approach to solving the Maine Turnpike's congestion problems. We shall review the weak argument for widening the Maine Turnpike, and suggest alternatives for consideration. In fact, there has been no persuasive case offered as yet that the widening is needed; that its many different costs have been seriously, much less adequately considered; that it is worth bearing those costs; and that it will be fairly financed by and for Maine people.

On the contrary, we believe that a strong case can be made for aggressively pursuing all available alternatives to the widening, and deferring the construction project indefinitely. This approach will require the reorientation of conventional thinking in Maine traffic planning, and will demand certain sacrifices of people who insist on travelling during the well-known peak periods. It will require the exercise of public leadership that is now conspicuously absent on this issue, for major changes in public policy do not occur without leadership. And it will require

innovation, since there is little direct experience in the U.S. with traffic management in corridor settings like the Maine Turnpike.

Our thesis, then, is that it is time for those responsible for managing the Maine Turnpike to actually manage it , to begin paying attention to real costs and to larger planning issues, and to develop a positive program of traffic systems management that will minimize peak period congestion at minimal expense to Maine people.

The management approach would take its lead from the "excellence" literature on modern industrial management. This literature stresses the importance of understanding the market for a service, of devising solutions that economize on capital, and of properly defining problems. The excellence literature demonstrates how the mindless application of outdated thinking leads to business failure.

Before the new management approach may be implemented, however, some additional study is needed. To facilitate this work, we attach a draft "Request For Proposals" that reflects our view of the work that is now needed. (A Request for Proposals is a document used by an organization when it is seeking contractors to perform specifically described consulting work.) We recommend it to those responsible for managing the Turnpike, The Maine Turnpike Authority, and to the people of Maine.

THE PROPOSAL TO WIDEN THE TURNPIKE

This section summarizes the history of the Turnpike and briefly introduces the proposal as it was developed by the Turnpike Authority and its consultants (HNTB, 1986)

The Maine Turnpike was opened from Kittery to Portland in 1947 and completed to Augusta in 1955 (Chart 1). The project was part of a broad movement in the Northeast of financing major bridges and highways through toll-financed independent authorities. The Turnpike quickly proved itself an important element in Maine's economic infrastructure.

In 1982, the Legislature considered what to do after the payment of the last Turnpike bonds, and decided to continue the Turnpike as a toll highway managed by its independent Authority. It also provided that a fixed amount, $4.7 million per year, would be transferred from Turnpike revenues to the Maine Dapertment of Transportation to pay for maintenance on overpasses and adjacent highways affected by Turnpike traffic.

In recent years, extensive needs have become apparent for better local access to the Turnpike in the growth corridor south of Portland. At the same time, increasing peak-period congestion has shown a need to expand the York toll station, and led some to conclude that a full-length widening to six lanes to Portland would soon be necessary.

In 1986, the Turnpike Authority authorized a consultant's study of these needs, and developed a proposal for a $128 million expansion program including 9 new interchanges and a 30 mile widening (HNTB, 1986); the bond issue to finance all this would be paid off over 25 years by toll increases. The Authority brought its proposal to the Maine Legislature early in 1987 and, following minimal public debate, received authorization for the bond issue. There ensued a vigorous public debate with newspapers and outside critics raising questions about the proposal. Last-minute protests led the Authority to table its plans in August, and to undertake further study of the major issues. Study is now underway concerning the Lewiston leg of the Turnpike, and additional work is being done by two consultants, former Transportation Commissioners Roger Mallar and George Campbell, to refine the Authority's view of the issues and opportunities before them.

The Authority's widening proposal responds to three distinct kinds of needs: first, for reducing congestion during peak hours on peak weekends (by widening); second, to reduce congestion at the York toll station (through improvements to it); and third, to improve access to the Turnpike for motorists and commercial traffic along the Route 1 corridor (by adding interchanges). The interchange proposals have been developed cooperatively with the communities affected, and in most cases have already been

agreed upon as part of a longrange improvement program. We will not consider the interchanges and the York toll station further in this report.

The important and controversial question is the proposed widening, from mile 12 (where the Turnpike presently narrows to 2 from 3 lanes) to exit 7 in South Portland. Traffic divides at this point, heading east on I-95 through the City of Portland toward Freeport, or proceeding northward toward Lewiston and Augusta. So, peak period congestion north of Exit 7 is rare, occurring only during accidents or construction.

The cost of the total improvement program is about $128 million, of which some $63 million will be required for the widening; of the $63 million, about $17 million is to be used for major bridge alterations to carry the third lanes (HNTB, 1986, pp. 56, 60, 61, 80). The total cost of the widening is not made clear in the Authority's reports, but would consist of capital recovery, interest over the lifetime of the bonds, and increases in annual plowing and maintenance for the additional lanes. The information is not now publicly available to make a detailed analysis to clarify these costs.

The widening proposal comes at a time when the State Department of Transportation is considering how to finance several major bridge replacements; how to continue a strong highway maintenance program; and how to respond to regional

needs for improved highway corridors into the State's less prosperous regions (Table 1). The need for improved highway access to rural Maine has been repeatedly emphasized by University of Maine economist John Coupe (1985) who has demonstrated a relation between county income growth and location near major highways. In addition, the Governor's Economic Development Strategy Task Force has recently identified "economic development corridors" as a priority development issue for Maine (Mallar, 1987).

So, it is essential that the Turnpike widening be considered on its merits in comparison with the full range of the State's transportation needs (see, e.g., Veazie, 1987) . The fact that the Authority is an independent body does not diminish the need for a full and good-faith weighing of alternative applications of the funds made available to it by the public. If it proceeds, the widening project will be paid for mostly by Maine citizens and businesses through higher tolls--making those funds unavailable to meet alternative public needs.

TABLE ONE

STATE TRANSPORTATION NEEDS: SUMMARY OF COMPETING DEMANDS

1. REBUILD MAJOR BRIDGES, SUCH AS MILLION DOLLAR BRIDGE, OVER NEXT 10-15 YEARS
2. MAINTAIN QUALITY PAVEMENT CONDITION ON EXISTING HIGHWAYS AND BRIDGES
3. RESTORE SOUND CONDITIONS IN THE MANY SMALLER BRIDGES THAT ARE 50 YEARS OR OLDER
4. ECONOMIC DEVELOPMENT CORRIDORS INTO MAINE'S LESS DEVELOPED REGIONS
5. ONGOING REPAIR AND IMPROVEMENTS AT AIRPORTS, FERRY SERVICES, FISH AND CARGO PIERS.

Note: cost estimates are not offered here because of the high uncertainty as to cost and degree of priority that might be accorded to specific proposals following further study.

More significantly, however, to widen the major inbound traffic artery to the State will produce many additional secondary impacts which the Authority has not considered at all. It will generate additional traffic at both peak and off-peak periods. Increased traffic means higher air and noise pollution loads. This will be so even though faster driving speeds from congestion relief will reduce certain forms of air emissions at the peak periods.

The widening will produce additional traffic congestion on nearby roads (like Route 1) and within the City of Portland. It will likely produce additional land use pressures and increases in land prices along the Turnpike corridor and at destination points where traffic will be increased. Because of the potential importance of these secondary impacts, it is crucial that the need and justification for the project be clearly defined in light of the relevant alternatives.

If the widening were a federally funded project, it would require an Environmental Impact Statement; but it is not clear at present if there will be <u>any</u> review at all of the project by the Maine Department of Environmental Protection. Clearly, not enough work has been done to date by the Authority to allow the drafting of even a minimally acceptable environmental impact statement on one of the largest public works projects in the State's history.

THE CASE FOR WIDENING HAS NOT BEEN MADE: TESTS THE PROPOSAL SHOULD MEET

A thorough review of the analysis conducted so far by the Turnpike Authority on the widening proposal shows that no plausible case has been made for proceeding with it. The critical data to define and document the problem have not been presented. There has been no professional analysis showing that the proposal is worth its high costs. There has been no examination of the merits of the management alternative. Further, the various relevant secondary impacts of the proposal have received no consideration whatever.

To reach a prudent decision on whether to widen the Turnpike, the Authority, the Legislature, affected local governments, and Maine citizens would need to have convincing analyses of the following points:

-- clear evidence of need, that in fact the problem addressed is a real one;

-- clear evidence that construction is a better way to address the problem than implementing traffic management systems.

--clear demonstration that the project deserves high priority compared to alternative uses of the funds;

--clear evidence that the secondary impacts are acceptable and manageable;

--a clear consensus that the financing mechanism to be used is a fair one.

On the basis of the analysis now on the public record, the only conclusion that a reasonable person could reach is that the widening proposal fails each one of these tests. The following sections of this report address these questions in turn.

THE PROBLEM HAS NOT BEEN DEFINED

The Turnpike widening proposal was developed to deal with a congestion situation that is growing increasingly severe during peak hours on peak weekends. It is traditional for highway engineers to define congestion itself as a problem; yet congestion is a natural feature of transportation networks in our society. The real questions are: why, exactly, is the congestion a problem; what is it worth spending to alleviate it; and what are the best alternatieve ways to alleviate it? These questions have simply not yet been asked, much less addressed to now by the Turnpike Authority.

Congestion

The Authority's consultants have presented a report showing a variety of traffic data describing the Turnpike's current conditions and outlook. The report employs standard traffic analysis in terms of levels of service, which is a relationship between traffic volumes and highway capacity (see Chart 2).

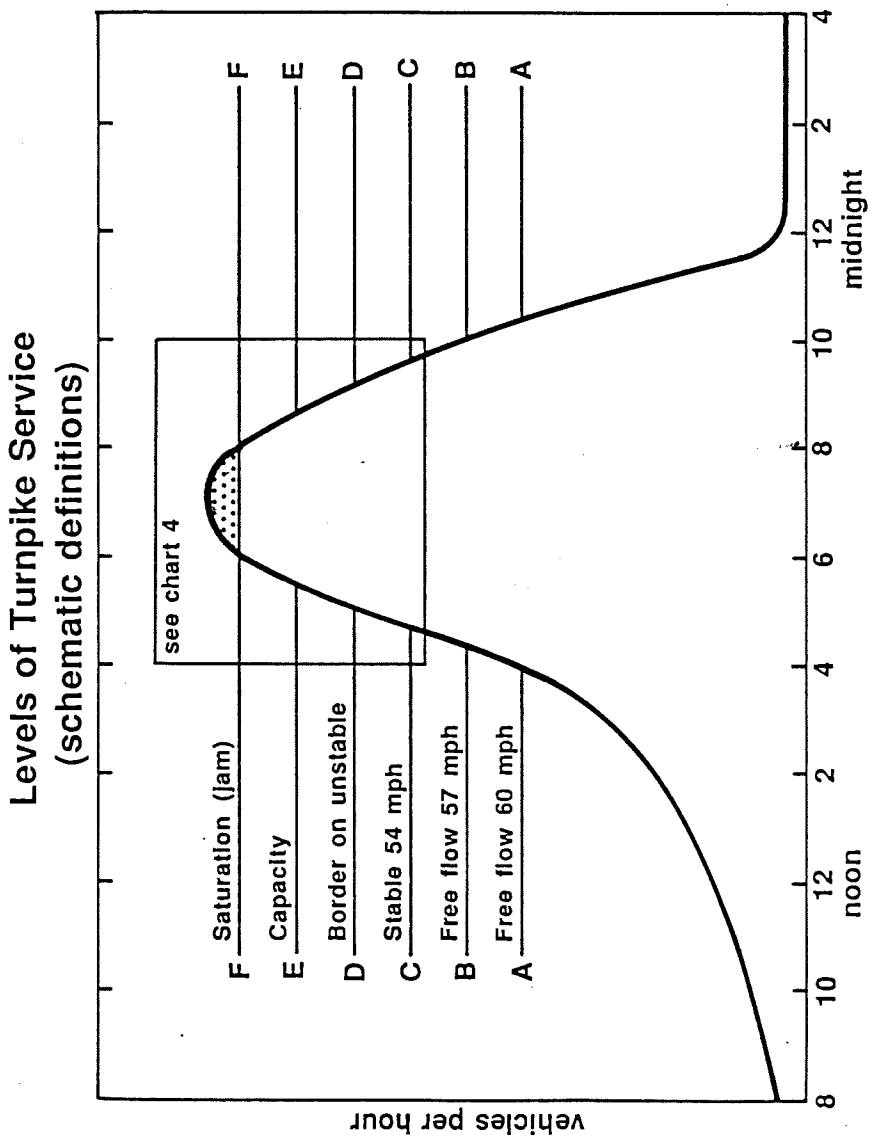
In Level of Service (LOS) "A", there is free flow of traffic, and even a one-lane accident does not affect speeds or motorist perceptions of safety and congestion. LOS "C" is a condition of free flow but somewhat reduced speed, and is generally viewed as a acceptable level of flow, fully

using the highway's capacity. In LOS "F", which is saturated or forced flow, vehicles move in long lines and experience periods of standing in stalled traffic.

The consultants' analysis shows that low levels of service are expected to prevail for increasing lengths of time in the York-Portland Corridor (see Chart 3); but the report does not reveal just how many hours per day and how many days per year those conditions will exist. The report does include considerable annual average daily traffic data, which is irrelevant to defining the problem of peak period congestion.

CHART 2: SCHEMATIC DEFINITION OF

"LEVEL OF SERVICE"



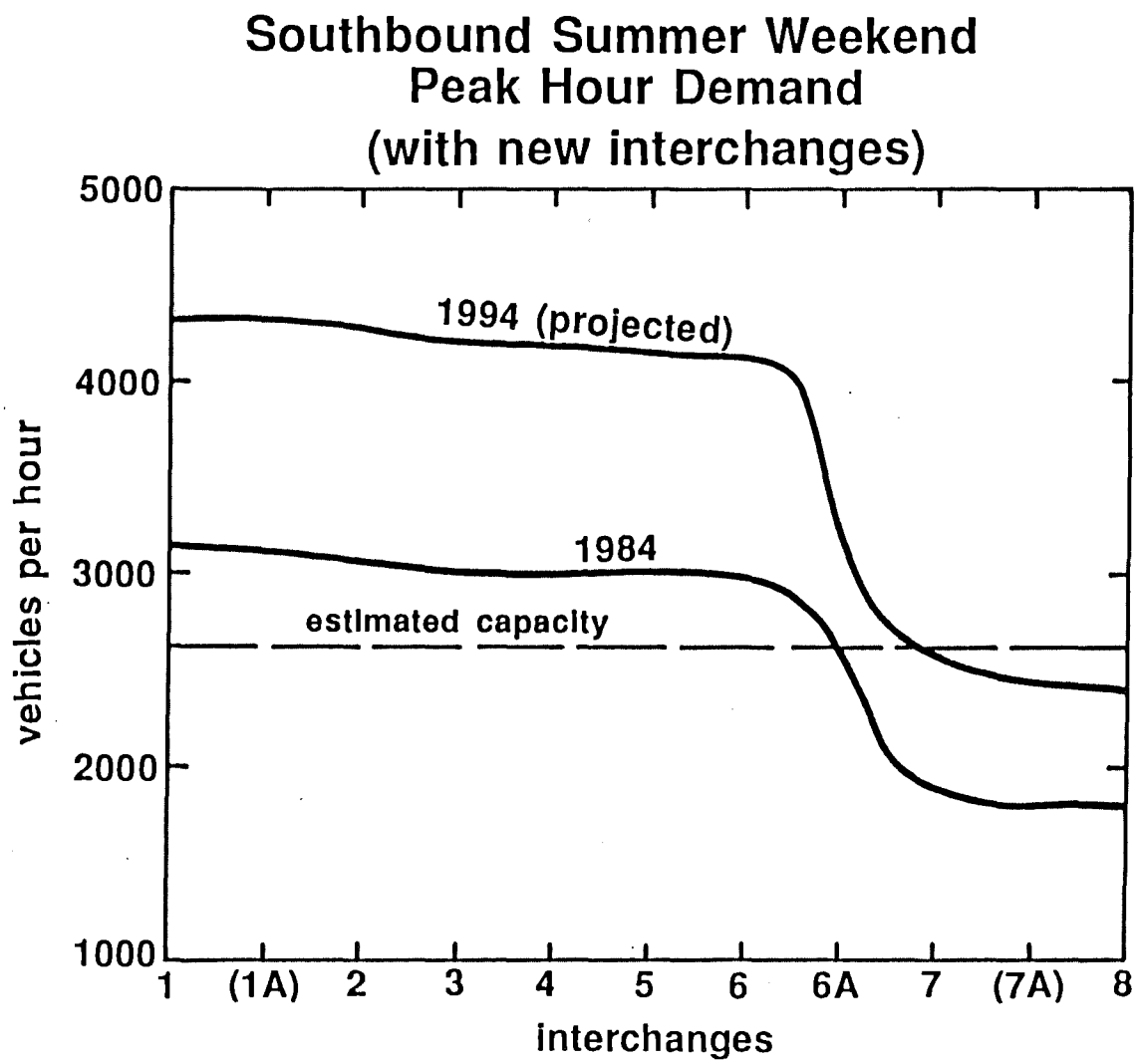


CHART 3: PROJECTED PEAK HOUR TRAFFIC

The Authority has released undocumented statements that Turnpike traffic currently exceeds 100,000 vehicles per day on 10 days a year, which may be expected to increase to 20 days in a decade's time. Such figures are likewise useless in understanding the exact character of the congestion problem.

The Authority maintains no data on hourly traffic conditions during peak periods. (The Maine DOT, on the other hand, maintains an extensive database of current traffic counts on nearby highways, including many locations on Route 1.) The Authority refuses to release its daily counts by toll stations, stating that the figures are "unaudited". For its recent study, the Authority's consultants did traffic counts for a small sample of summer weekends to characterize peak hour flow conditions and develop level of service estimates. There remains a real question as to the representativeness of this database; and, indeed, the consultants have recommended that a new origin and destination study be done (HNTB, 1986, p.5-6) . In the absence of information, one may also only speculate on whether the new 65 mph speed limit will have an effect on Turnpike congestion.

At this writing, our efforts to obtain this more detailed information from the Authority's consultants have been unsuccessful due to their professed lack of time to fill our information request.

The best we can say, therefore, is that there is no publicly available, professional description of the congestion conditions, their frequency and duration, on the Maine Turnpike. Further, the Authority makes no effort to monitor these conditions in any way that would be useful for effective traffic planning and management.

We can roughly characterize the congestion situation from general knowledge and experience, however. On peak late summer and winter holiday weekends, periods of extreme congestion occur. At times, these last several hours and involve hundreds of vehicles moving at Level of Service "F"--saturated flow. In these conditions, traffic movement is slow and any minor incident produces paralysis (Anon. 1981). These peak congestion periods now occur on at least 10 days per year and occasionally at other times during maintenance activities or as a result of accidents (Table 2).

On the Fridays of peak weekends, the congestion is extreme from Portland to Biddeford as a result of an overlap in the evening commuting peak with inbound vacationer traffic (Wilbur Smith & Assoc. 1981). This fact suggests one alternative for managing the congestion problem at least for those days: better urban commuter traffic management.

Extreme congestion conditions are currently highly localized. They occur at the York toll plaza; at the point where the pavement shrinks from 3 to 2 lanes northbound; and

wherever accidents or construction impede traffic. It is probably true, as the Authority's consultants predict, that the incidence of Turnpike congestion conditions will increase in the future, and that the widening program would substantially eliminate them. The question, which we discuss further below, is whether solving these problems on 10 days a year is a responsible use of funds and worth the secondary costs it will generate.

In summary, congestion is a predictable traffic condition. The periods and places of congestion on the Maine Turnpike are entirely predictable to regular Turnpike users, who are well aware of where and when they occur. Motorists expect them; in that sense, they voluntarily choose to endure the inconveniences they encounter. Presumably, they view the benefits from travel during congestion periods as worth the costs.

TABLE 2
EXAMPLE OF TURNPIKE CONGESTION:
PEAK HOUR TRAFFIC LEVELS, 1984.
I-95 NORTHBOUND AT KITTERY

Hr.	Day		Time	Vehicles per Hour	
			HIGH HOURS		
1.	Aug 18	Sat.	1200	4,111	(21.6)
10.	July 14	Sat.	1300	3,894	(20.5)
20.	June 30	Sat.	1200	3,658	(19.3)
30.	May 25	Fri.	1700	3,391	(17.9)
50.	Aug 24	Fri.	1700	3,189	(16.8)
			HIGH DAYS		
1.	Aug 31	Fri.		45,746	(241)
2.	Aug 4.	Sat.		39,900	(210)
3.	Aug 3.	Fri.		39,873	(210)
4.	Sep 1.	Sat.		39.729	(209)
5.	Jul 20	Fri.		39.213	(206)

Source: Maine Dept of Transportation.

1984 Average Annual Daily Traffic (AADT) was 18,995.

Notes: These are selected entries from an array of the top 50 hours and top ten days in 1984. There is little correspondence between high days and hours. Though Aug 31 was the year's top day, the highest hour on that day was only the 8th highest in the year.

Numbers in parentheses indicate the percentage that the entry is of the year's daily average. Thus, the August 18th noontime alltime high hour was 21.6% of the year's daily average. This indicates how the total daily traffic is concentrated into a few hours.

The 30th hour is often selected as a design criterion, implicitly recognizing the impossibility of eliminating all congestion. In 1984, the 30th hour was 3,391, or 82% of the peak hour. Considering two-lane capacity at 2600 vehicles/hr., the 30th hour volume was 30% above estimated capacity for free flow.

Why is Congestion a Problem?

What, then, is the problem with a few hours' congestion on 10 days per year? Nowhere in the Authority's analysis was any attention given to the question of just why congestion is a problem.

Common knowledge, however, suggests that the problem lies in several areas. First is in the value of lost time to motorists. Also, congestion can cause additional problems: higher accident rates, additional pollution from engines idling and running at inefficient speeds, hindrance of commercial traffic, and interference with tourism development by discouraging visitors.

First is the question of travel time. We have no data on how many motorists are affected by peak period delays and how many aggregate hours of time they lose to congestion. We have been advised by transportation economists, however, that it is extremely unlikely that the value of travel time lost in short periods on 10 days per year could ever amount to enough to pay the construction cost of widening the Turnpike. (We shall examine the question of user benefits in more detail below).

We have inquired of the Turnpike Authority and the State Police whether accident rates increase during congested periods, and found no evidence that Turnpike congestion creates unsafe conditions.

It is not likely that Turnpike congestion is a significant cost to commercial traffic for two reasons: first, the hours of congestion are entirely predictable and most commercial traffic can avoid them if need be; second, many larger trucks are radio-equipped and can readily gain information on traffic conditions.

It would be reasonable to expect that congestion and delay would be an irritant to visitors, and might injure the State's image as a tourist destination. We spoke with an official in the Maine Department of Economic and Community Development's tourism program. He reports that in all of the market research with which he was familiar, there is no mention of Turnpike congestion as a negative factor in visitor perceptions about Maine. Surprisingly, then, there is no evidence that Turnpike congestion is a negative image problem for Maine tourism.

The Turnpike's capacity could conceivably be a limit on the number of visitors to Maine, and hence constrain tourism industry growth and employment. This does not seem likely, however. On the peak periods of peak weekends, there exist other capacity constraints, on the New Hampshire Turnpike as well as beyond Portland on the Bath bridge on Route 1. Further, the capacity of the State's motels, parks, restaurants, beaches, and ski slopes is generally overcrowded at present. Those capacity limits are more

important to future tourism industry growth than the Turnpike's capacity.

The State's tourism promotion program has recognized these facts for years and focused its efforts primarily on attracting more visitors during the "shoulder" seasons, when Turnpike traffic is not congested.

Overall, then, it is not at all clear in what way a few peak periods per year of Turnpike congestion pose a problem for the State. Virtually all of those inconvenienced are aware of the congestion periods in advance, yet voluntarily choose to become ensnarled in them. The most significant cost of congestion, lost time of travellers, has never been measured.

Traffic Projections: Some Questions

The consultants' report on the Turnpike widening used standard methods to project future traffic volumes (see Anon. 1979; Memmott, 1983) . They analyzed economic growth and demographic trends and examined past traffic trends. In the case of the interchanges, a complex analysis was done to assess how traffic patterns would change when the new interchanges are added to the system.

We have not made our own traffic projections, but a number of questions do arise. While these are not critical in themselves to determining the need for a widening project, they are important. The questions are:

-- why do the consultants assume that traffic volume will be the same with and without the expansion? All traffic experts consulted agree that expanding capacity will increase traffic. Also, do the capacity of the New Hampshire Turnpike and the Kittery Bridge place any upper limit on traffic volumes reaching the Maine Turnpike?

-- is it realistic to extrapolate for 10-20 years into the future the experience of the last decade, which has seen our State move to an unprecedented, low unemployment rate and a historic land boom?

-- is the Maine tourism industry approaching saturation, based on congestion and on consumer attitudes and demographics?

-- can we really assume that traffic will be unaffected by the doubling of the tolls to finance the improvement package?

-- how will the peaks and their duration shift as total volume increases?

-- how will worsening commuting conditions in the Portland area affect this outlook?

In short, highly complex, interacting forces need to be examined critically in order to better understand the outlook for future traffic congestion on the Maine Turnpike, and the need for its expansion at this time.

COSTS AND BENEFITS HAVE NOT BEEN CONSIDERED

We have seen that there has been no attempt to define the exact nature and severity of the problem that the widening is supposed to solve. The problem has been defined as congestion--pure and simple. Even with that unacceptable definition of the problem, as we shall see, no effort has been made to examine alternative ways of solving it: there was only a proposal for a single, costly solution; and many of the costs, especially in terms of secondary impacts, have not been analyzed at all.

Benefits and Costs to Motorists

The limited information available to the public places us in a difficult position in attempting to analyze the costs and benefits of the widening. In the consultants' reports, there is no mention of the concept that a given amount of congestion reduction ought to have definable benefits. There is simply an assumption that high levels of service--virtually unimpeded flow--must prevail at essentially all times. When such assumptions are employed, of course, a logical balancing of benefits and costs is not needed.

So, the information needed to balance costs and benefits is simply not publicly available. Let us look briefly at one aspect of the matter: might the savings in

travel time due to eliminating peak period congestion justify the costs of the widening?

Our research uncovered no recent synthesis of the considerable literature on the valuation of motorist travel time. We have been advised, however, that the figures proposed in the 1977 AASHTO manual (1977), suitably updated, would be sufficient. In addition, the custom has arisen among transportation economists of valuing vacationer travel time at one half that of trip-to-work time.

The AASHTO manual cites two different estimates of the value of motorist time, one of $3.00/person hour, and another of $3.90 (pp. 14, p. 90). Using the higher figure and updating it for inflation from 1975 to 1987 yields a figure of about $8.00. The other method suggested in the AASHTO report was to use a fraction (52%) of hourly earnings to value travel time. Using that ratio for the Portland area's average hourly earnings of $9.00 yields a value of $4.68. These considerations yield the following high and low estimates of travel time values:

	High	Low
Vacation	$4.00	$2.35
Work	8.00	4.70

Due to the lack of data, we do not know how many traveller hours would be saved by eliminating congestion on the Turnpike. There is therefore no way to carry this

analysis to a conclusion that would help support a reasoned decision, taken together with all the other costs and benefits of the proposal. From Turnpike file data not accessible to us, however, we believe that a useful approximation could be reached.

The annualized costs of widening the Turnpike include capital recovery, interest, increased maintenance expenses, and the value of all negative secondary impacts of the project. These have not been properly analyzed; but interest on the construction cost alone would be on the order of $6 million annually. Incremental maintenance costs would probably be significant, though the HNTB report waves them aside as insignificant. The annual costs of the widening, then, are approximately equal to one third of the Authority's total annual revenues(which are some $25 million per year).

The question then, is, would the benefits in time saved to motorists enduring congestion for a few hours a day on ten days a year pay for at least $8 million in costs per year, not counting secondary impacts? Would the affected motorists themselves be willing to spend that sum to have the advantages of free traffic flow at all times? Transportation economists we consulted suggested it is most unlikely that this investment could possibly be justified on the basis of such limited actual benefits.

Of course there exist other benefits of the widening that could be valued in a similar spirit. Our point is, simply, that no such analysis was considered necessary at any point in the planning for this project.

Secondary Impacts

We have alluded above to the many potential secondary impacts of the widening proposal. There has been no comprehensive attempt to inventory the potential effects, much less assess their significance and costs to Maine people in practical terms. There are a number of categories of secondary costs. The Authority's consultants were not asked to study these questions; no one else appears ready to assume the responsibility to do so.

First is pollution. We have made inquiries with environmental officials on the air pollution impacts of additional traffic, but have been unable to develop useful information. The improvement in vehicle speed from reducing congestion does increase fuel efficiency and reduce pollution per vehicle; but the increased traffic in off-peak periods will undoubtedly increase air pollution. Since significant concentrations of population live downwind of the Turnpike, this question is of some public interest. We did not examine the question of noise pollution.

Other effects include induced congestion on nearby roads from the higher traffic volumes and diversion caused

by higher tolls. Effects on land use from accelerated development will be significant. Increased peak weekend congestion at beaches and parks is likely.

Even a cursory look at the proposed widening and its potential effects suggests that serious attention must be given to studying them before a decision is made.

THE PROPOSED MEANS OF FINANCING THE PROJECT IS INEQUITABLE

The widening proposal is part of a large program of improvements that will cost $128 million. A considerable part of this cost will be financed by a bond issue. The debt retirement and expanded maintenance costs will be funded by a doubling of Turnpike tolls, in two increments, over a period of time. This approach raises several difficult questions.

First, it will require motorists who drive primarily on the Turnpike north of Exit 7 to contribute heavily to the costs of the interchanges and additional lanes benefitting others. The additional tolls will amount to upwards of $200 per year per commuter, and more for families with more than one person in the workforce.

Second, it will require the regular commuter in the corridor south of Portland to pay for the costs of improvements needed only 10 days a year, primarily by visitors from out of state.
These commuters will be paying to solve a problem that they don't create, even though they travel regularly in the corridor.

Third, it will mean that those whose actions actually give rise to the congestion in the first place--the peak

weekend commuters--will not have to bear the cost of solving their problem; they will be able to shove much of that cost off onto others.

It has not been made clear why and by what standards these outcomes are fair in the ordinary sense of the term. In fact, their manifest unfairness is one of the major reasons that the Authority tabled the entire proposal for further study.

Below, we allude to the role of "congestion pricing" in a fair pricing policy. A proper system of congestion pricing places the costs of reducing congestion squarely on the people whose patterns of use make the improvements necessary. Under congestion pricing, people who don't drive during the predictable peak periods will not have to pay anything to solve the congestion problem. The people who do cause the problem will then face incentives to modify their behavior in ways that will be socially efficient and tend to reduce congestion to a lower level.

ALTERNATIVES HAVE NOT BEEN CONSIDERED:
THE MANAGEMENT ALTERNATIVE

In any proposal to spend a sum of money as large as this, and bringing with it such significant secondary impaacts, citizens have a right to expect a searching look at alternatives before the decision is made. As far as we can tell, no examination of alternatives has ever taken place. The Turnpike consultants' report waves aside the alternative of not widening, simply by noting that it does not solve the congestion problem (HNTB, pp. 45-47).

The most economical alternative is not to construct the additional lanes, and to deal with the congestion problem by applying traffic management. It is true that traffic management is sometimes unpopular with motorists, politically unappealing to administrators and elected officials, and difficult to implement. Yet our nation has endured the transition from construction to management solutions in many different fields; we believe the time has come for highways as well.

The case for the management alternative is supported by three facts:

-- first, that motorist behavior is voluntary, and responds to incentives and to information;

-- second, that significant congestion relief is often

made possible by modest traffic reductions or modest shaving of peaks; and

-- third, that complete elimination of all congestion is not necessary or financially feasible.

When these facts are admitted to our thinking about congestion, a new and more realistic portayal of management alternatives becomes possible.

We are not able to offer an extended analysis of the possibilities, much less a fully developed program. There is considerable experience with traffic systems management (TSM) in other parts of the country, however (See Meyer and Gomez-Ibanez, 1981; Cervero, 1986 Anon. 1986; Chatterjee and Hendrickson, 1985; Ju, Cook & Maze, 1987; Witheford. 1987). Most of this experience deals with highly congested urban areas and concerns mass transit alternatives. There is little useful analysis of TSM on long stretches of freeway where peak congestion is caused primarily by recreational travel (see Delaware DOT, 1987; Hughes, 1982; New York DOT, 1979, however).

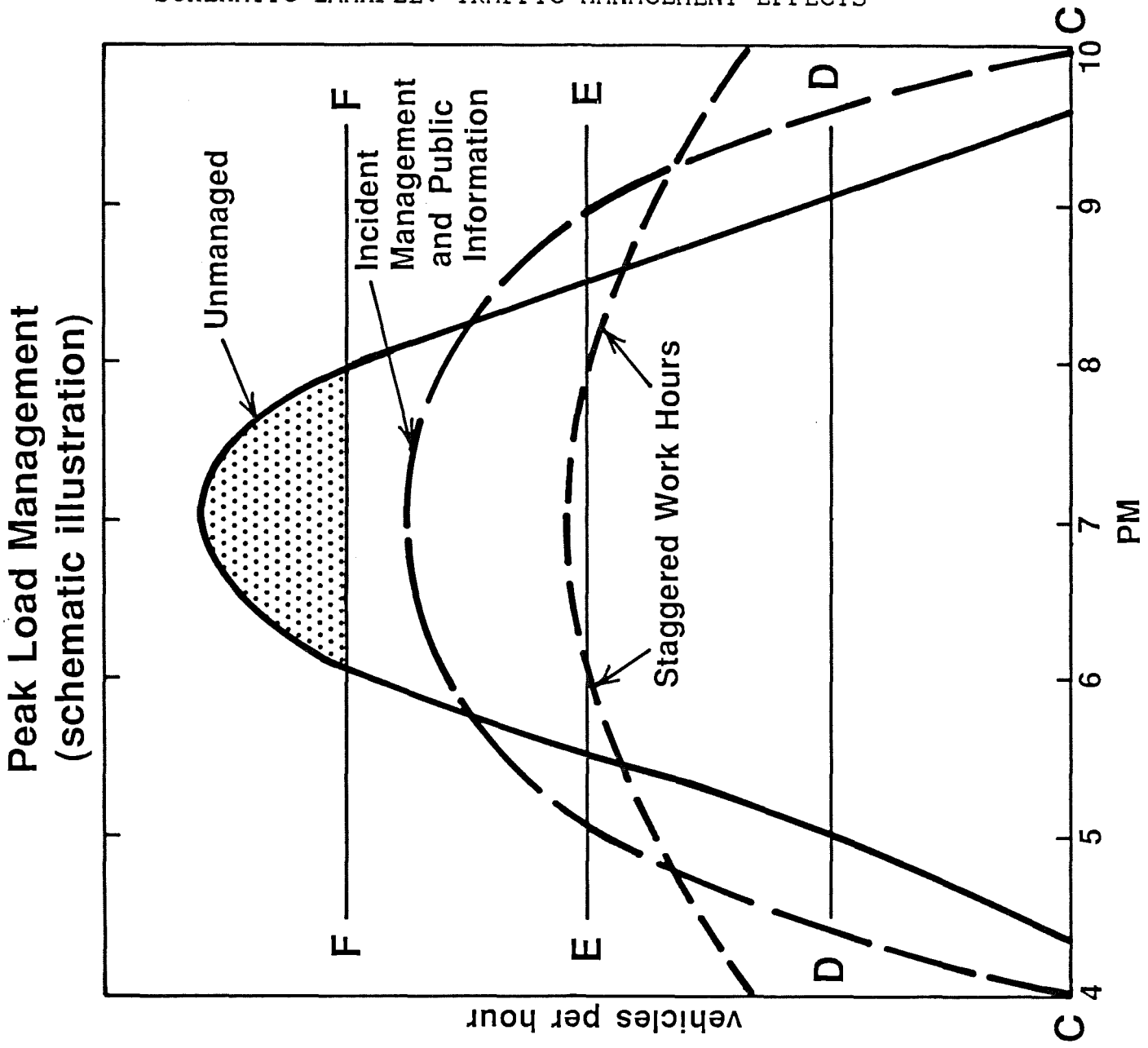
A review of the literature, interviews with experts, and our own thinking leads to quite a list of alternatives (Table 3; see also Ju, Cook & Maze, 1987). In actual application, action programs would consist of a mix of these measures and not just one at a time (Chart 4). This is because no one measure will in itself make enough of a difference to alter the situation significantly; but

TABLE 3.
TRAFFIC MANAGEMENT METHODS FOR A MANAGEMENT SOLUTION

Commuting Management	Ridesharing
	Staggered work hours
	High occupancy vehicle priorities
	Full-cost pricing of parking
	Mass transit
Diversion	Determine diversion potential of the new interchanges
	Study diversion potential of alternative routes
Congestion Pricing	Peak hour toll surcharges
	Toll reductions/waiver for nonpeak travel
	Noncash incentives for offpeak use
	Modify collection systems
Information Programs	1-800 information number
	Radio broadcasts
	Variable Message signing
Capacity conservation	Incident management
	Ramp metering

CHART 4.

SCHEMATIC EXAMPLE: TRAFFIC MANAGEMENT EFFECTS



taken together, with determined application, they could arguably relieve the situation indefinitely. Critics of the management alternative will insist on finding a single "silver bullet", as clear and easy as the construction solution. They will wave aside the management option just because no one single method provides a complete and final solution. It is not possible in this paper to anticipate and answer all objections that will be offered to each of these methods. Taken together, however, these management methods amount to a full-blown engineering discipline that has generally accepted principles and a wide body of applied experience (Anon. 1986; Reinke & Curry, 1983; Caravan for Commuters, 1987).

As Capelle (1984, Chatterjee & Hendrickson, p. 29) notes: "freeway management is no longer considered research. It has been clearly demonstrated that improved operations can be achieved through the application of better management techniques that can provide tangible benefits to freeway users. Another expert, in a recent review, argues: "the research projects and other experiences have plainly shown that active management of urban freeways pays off in currency that counts: accident reduction, time savings, energy conservation, and cleaner air." (Witheford, 1987, p. 515)

Commuting Management

It is important to recognize the close connection between Turnpike traffic conditions and urban commuting management problems in Portland, Saco-Biddeford, and the Wells-Kittery area. (Note in Table 3 above the appearance of commuting period peaks in the year's highest hours.) Rarely do government officials, traffic planners, and citizens turn their attention to commuting management until paralysis rules the roadways day after day. In some of the nation's fastest-growing and most congested cities, traffic paralysis has threatened business, commerce, and growth. In a few localities, experience has been developed with a range of methods for traffic reduction through commuter management. The recent Portland Area Comprehensive Transportation Study (PACTS) suggests that peak hour congestion is already serious in much of metropolitan Portland, and will only get worse under present conditions (Vanasse Hangen Brustlin, 1987). So, there is good reason apart from the Turnpike for Maine people to think seriously about commuting management.

Ridesharing has been fostered to a limited degree in Maine, more as an energy conservation than a traffic control measure. There is little experience with high occupancy vehicle priorities because of little need (Stokes, Christiansen, & Levine, 1984). With our scattered population, mass transit probably has little potential for reducing commuting loads; but with the emergence of suburban office parks as major employment centers, the potential

for commuting management increases. Probably the single procedure that could have the greatest impact at least cost would be the use of staggered work hours on those Fridays that normally experience Turnpike congestion--perhaps half a dozen days a year. Experts agree that the wide availability of free parking at retail stores and workplaces is a major cause of vehicle trips and, therefore, of congestion. They often urge the pricing of parking space as a carpooling incentive.

Diversion

Diversion options are limited in the Turnpike case because of the facts of geography, but the new interchanges will enrich the possibilities for devising workable adjacent routes that could draw off vehicles during peak periods. The potential for diverting modest volumes into southwestern Maine via the Spaulding Turnpike in New Hampshire might be considered. But in the consultants' report, diversion options received no consideration.

Congestion Pricing

In many areas of life, consumers accept the use of pricing mechanisms to provide incentives for conserving scarce peaking capacity of costly facilities. Thus, peak hour charges and off-peak rates are well established in telephone and electric rates and in seasonal lodging rates. The use of peak load pricing has been studied in commuter rail systems (Kessler and

Simonsen, 1983). Among transportation economists, peak load pricing is referred to as "congestion pricing."

There are many possible variants to a congestion pricing scheme, which would have to be applied creatively and with a learning period to assess their effectiveness (Vickery, 1973a, b.). Some of the possiblities include:

-- assess a peak hour toll surcharge.

-- provide lower or waived tolls for travel outside of peak hours on peak weekends.

-- noncash incentives for offpeak use (packets of discount coupons at restaurants and stores were used successfully in Maryland's Reach the Beach program (Buck, 1987)).

-- modify the collection system to reduce tollstation delays.

-- specify that commuter passes are invalid during peak hours of peak weekends

With an existing toll mechanism in place, the Turnpike is already set up to employ congestion pricing; but the use of congestion pricing is virtually nonexistent in the US highway and toll bridge experience. It is foreign to the thought processes of the engineers who design and administer these systems, and is apparently thought to be too politically sensitive to touch. Thus, in Maryland's Reach the Beach program, an intensive TSM effort to moderate congestion enroute to the beaches, use of toll incentives on the key toll bridge to the region--the most obvious solution-- was not attempted.

As a result of this bias against using existing toll facilities to help control congestion through pricing, there is essentially no US experience to draw on in assessing whether congestion pricing could work on the Maine Turnpike. This is no excuse for waving aside a potentially promising option. Congestion pricing could also contribute to a more equitable financing arrangement, as noted above.

Information Programs

There is good evidence that motorists respond to information and there is some experience in using a range of methods to provide that information (Ju, Cook, & Maze, 1987, pp.527-529). Toll-free telephone numbers, CB channels, public service announcements on TV and radio, and variable message signs have all been used. The Maine Turnpike is well positioned to make the most of information strategies, given the proximity of the road's principal urban traffic generators--Portland and Boston.

Capacity Conservation

In extremely congested situations, aggressive incident management pays high dividends. Roving towtrucks remove stalled vehicles from the pavement and restore traffic flow quickly. The most extreme form of capacity conservation is ramp metering, under which entering vehicles are simply denied access to the freeway by signal controls during periods of saturated flow on the freeway. While this is a low cost and arguably efficient method, it may be more extreme than needed in Maine, at least

initially. But methods like ramp metering become necessary when urban areas and freeway managers ignore the other management tools, allowing congestion to build up to intolerable levels.

So, Why Not Manage?

Practical experience elsewhere convinces us that a mix of management measures, pursued with skill, determination, and education over a period of a few years, could replace the "need" to widen the Maine Turnpike. It is time to rein in the urge to serve motorists' whims at any cost. Maine must apply its scarce transportation dollars where they will meet greatest needs.

An aggressive management strategy would bring many other social benefits and avoid the financial and environmental costs of the widening program. Adopting this approach would place Maine in a leadership position in an important area of transportation policy. It would be far more consistent with Maine values of thrift and common sense than would pouring cement for another pair of lanes. And it would not compromise the opportunity, should a real need arise in the future, to widen the Turnpike later.

WHAT SHOULD BE DONE? A POSITIVE ALTERNATIVE

As we have seen, the most fundamental questions dealing with the widening proposal, its costs, its likely effects, and its alternatives have not yet been asked by the Maine Turnpike Authority. If the Authority and Maine people are to have the information they need to fairly consider these questions, more work must be done. The Appendix to this document consists of a Request for Proposals (RFP) which is a workplan to gather this information and present it in ways that will further public understanding of the issue. We recommend it for the Authority's consideration. We expect that at least part of this work is ongoing now.

We believe that if the work outlined in the RFP is completed, a more efficient and specific mix of alternatives to the widening will emerge. We strongly suspect that the best proposal for dealing with Turnpike congestion will consist of the following simple mandate: adopt a wide-ranging program of management methods and improvements to diversion routes that will simply make the widening unnecessary. Use better traffic management practice, rather than capacity expansion, to solve a congestion situation that exists a few days per year!

We do not underestimate the practical and political difficulties of this course; but it is clear that the costs and difficulties of the construction option have been grossly

underestimated. In fact, the "problem" that the widening seeks to solve has nowhere been clearly stated; and nowhere have the benefits of the widening solution been properly compared with its many costs.

Adopting a management solution to the problem will not eliminate all congestion, but will reduce it considerably. A management solution will bring many additional benefits and help avoid the need for other costly roadway improvements. The first step will be to conduct fully, and in good faith, the research outlined in the attached Request For Proposals. The next step will be to begin a program of public education to forge a consensus that a management solution represents the wisest and fairest way to deal with this issue. Such an educational effort would be facilitated if backed by senior political leaders.

Pouring cement is the easy way out of this problem, but not the cheapest way. It is a "solution" in name only. It is consistent with the traditional American impatience to build now and ask questions later.

The management solution, on the other hand, is not a "do-nothing" solution; far from it. It is the <u>tough choice</u>, the one that involves a whole new way of thinking about transportation. Adopting the management approach will avoid the secondary costs of the widening solution, and will create other benefits, as well. Getting in the habit of managing scarcities, rather than mindlessly trying to relieve them through capital outlays, will pay Maine people dividends in other ways, as well.

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PERSONS INTERVIEWED

In the course of this project, we spoke with many people who helped us directly with information or with leads to others. We cannot list all of them here, but have attempted to note the ones who were most helpful and took the most time with us.

Antos, Curtis, TRB, NRC
Buck, Ed. Maryland DOT
Fuller, John Univ. of Iowa
Gomez-Ibanez, Jose. Harvard University
Meyer, John. Harvard University
Paul Minor. Maine DOT
Johnson, Michelle, Institute of Transportation Engineers
Kain, John. Harvard University
Regan, Ed. Wilbur Smith Associates
Rudinger, David New York DOT
Torbik, R. Federal Highway Adm.
Witheford, D. TRB, NRC

APPENDIX

REQUEST FOR PROPOSALS

BENEFITS AND COSTS OF WIDENING THE MAINE TURNPIKE FROM YORK TO SOUTH PORTLAND

The Maine Turnpike Authority seeks a qualified consultant or team of consultants to conduct a thorough analysis of a proposal to widen the Maine Turnpike between Mile 12 (York) to Mile 42 (So. Portland) from four lanes to six lanes. Interested consultants should file a detailed proposal and statement of qualifications with the MTA by April 1, 1988.

This Request for Proposals (RFP) consists of general background, an overview of the proposed study, general provisions concerning the study process, a detailed section describing study components, and adminstrative provisions.

This study is expected to be completed not later than June, 1989. Significant new primary data gathering will be required.

1. Background

Due to rapid development and economic growth in southern Maine, and to increasing tourism visitation, the Maine Turnpike has been experiencing congested conditions to an increasing extent in recent years. On about 20 days a year, especially on peak vacation weekends, extreme congestion is present during peak periods. As overall traffic increases, peak period congestion is expected to increase.

This situation on the Turnpike is occurring at a time when many difficult and costly choices are facing Maine as it modernizes its highway and bridge transportation system for the future. The Governor's Economic Development Strategy Task Force noted the importance of moving ahead on proposals for major regional development corridors. In addition, costly bridge and highway renovations are required in the next 15 years, which cannot be funded under the existing revenue structure. Thus, there is a need for a searching analysis of the place to be taken by Turnpike needs in the context of the State's overall transportation and regional development needs.

The proposed project to widen the Turnpike for the full 30 miles between York and South Portland (hereafter, "the project") has been estimated to cost roughly $70 million in 1985 dollars. An additional proposal provides for 9 new interchanges, which at certain times will draw traffic to the Turnpike from adjacent Route 1, thereby relieving congestion there. The interchanges are not the subject of this request for proposals except insofar as they may affect the widening project itself.

Significant congestion is experienced during Friday evening commuting periods on peak vacation weekends when commuting traffic overlaps with peak inbound vacation traffic. In

addition, increasing congestion in the Portland/Biddeford region suggests a need for consideration of traffic management to deal with peak period congestion apart from the Turnpike issue. This study will address the role to be played by managing metropolitan area traffic in helping to manage Turnpike traffic loads.

Full details on past trends, current conditions, and initial construction options for addressing this situation are given in the September 1986 report to the MTA by HNTB engineers, which prospective bidders are invited to review as they prepare proposals.

2. The Study: General Provisions

The MTA requires a full analysis of the costs, benefits, and likely indirect impacts of the widening project. The aspects of the project to be considered include, at a minimum, alternative toll and borrowing techniques for financing the improvement, congestion pricing and traffic systems management (TSM) techniques as full or partial substitutes for the widening project; air quality and other direct environmental effects; impacts on land use and indirectly stimulated development; definition of the specific social problems caused by existing and prospective congestion levels; economic benefits to Maine Turnpike users from widening; life cycle costs, including financing and maintenance of a range of project options; and a display of considerations for ranking the Turnpike improvement relative to other state highway and bridge needs. Impacts of various alternatives, including different toll options, on different groups of users and neighbors of the Turnpike will be studied.

In addition, the study requires a thorough display of considerations to be applied in ranking the relative priority of a Turnpike widening program as part of the full statewide agenda of highway and bridge needs, including proposed regional economic development corridor opportunities.

The study will include an extensive effort to identify local government and neighborhood views as to the impact of the widening project on local traffic conditions and other concerns.

The project is to be subdivided into such logical units as might be considered for separate construction in sequence as traffic conditions require; or which might give rise to distinctively different economic, social, or environmental issues; or which might pose distinctively different alternatives.

The consultant will identify any significant gaps in data that should be filled by special studies or regular monitoring before final conclusions can be drawn.

These requirements are described more fully below.

Consultant Qualifications

At a minimum, the consultants must present a team including experts in the following fields in order to be considered as presenting a qualifying bid:

traffic engineering, including TSM and simulation studies of complex traffic networks;

social, economic, and land use impacts of highway improvements, including motorist response to different route capacities and toll levels;

air pollution and other environmental impacts of highways;

financial and economic analysis of construction projects;

local transportation and land use planning.

Expert Advisory Task Force

The MTA will empanel an Expert Advisory Task Force of experts in various aspects of transportation, public works planning, and policy analysis to assist the consultant and the MTA in assuring that all relevant issues are identified, and that mutually understood choices are made as to the priority to be given to different issues in view of the time and budget limitations for this study.

The Task Force will review the consultant's detailed plan of work as well as drafts of report sections as completed, in addition to providing review and comment on the draft final report. The consultant will consider comments and suggestions of the Task Force in completing the final report.

Reports

The consultant will complete each component of the work and provide 20 copies of detailed project memoranda on each component. It will then complete a synthesis report summarizing findings, conclusions, limitations of the data and analysis, and a set of options for dealing with the problem as characterized by the consultant. The options will be fully described and characterized and compared according to relevant decision criteria such as LOS achieved, cost per benefitting motorist, and other factors.

3. Study Components

The study components are described in greater detail in this section. These components are expected to be completed with thorough use of available technical literature, up to date theories and field experience in each technical area, and giving due weight to the limitations of existing data and methods.

a. Update the MTA's 1981 survey of travel origins and destinations. During 1988 and 1989 , the consultant will conduct necessary studies to obtain a complete picture of the current travel patterns on the Maine Turnpike, placing special emphasis on the peak hour congestion periods.

b. Obtain hourly traffic counts to precisely characterize traffic conditions in the most congested periods of the year, paying particular attention to the holiday weekend travel, the composition of traffic at peak hours (state of origin, type of vehicle, passengers per vehicle, etc.), and the overlaps of vacation and tourist traffic

c. Review economic and traffic projections. Assess the degree to which existing projections are likely to be affected by increasing metropolitan area congestion, by limits on peak period capacity on the New Hampshire Turnpike, and by the alternative likely economic development scenarios for the South Portland-Kittery Corridor.

d. Analyze in depth existing and potential congestion points on the Maine Turnpike, and how different options would improve flow at those points.

e. Precisely characterize the problems for Maine citizens and the Maine economy resulting from the existing and projected congestion on the Maine Turnpike. This should include any impacts on the flow of tourists and tourism spending in Maine, the relation between accident rates and congestion, the impact of congestion on travel time and convenience for Maine residents, and any impacts on Maine commerce an industry. Existing tourism market research will be studied.

f. Develop estimates of the benefits to motorists from reducing congestion, using the most up to date methods of assessing benefits in travel time, and other methods as appropriate.

g. Fully review international experience in Traffic System Management (TSM) methods for peak-shaving on highways under similar conditions. This review should determine which if any of these techniques may hold promise for use on the Maine Turnpike. The study will consider separately the need to manage rising metropolitan area traffic loads and the management options for vacation travel, and how these issues interact.

For any of these methods which appear to have promise, the report should present recommendations as to steps that should be taken as alternatives to an early widening or in addition to a widening project. The review should give in depth consideration to, at a minimum, congestion pricing; provision of congestion information to motorists through radio, variable signs, and 1-800 phone numbers; flex-time programs; incentives for off-peak use and high occupancy vehicle (HOV) incentives; paratransit and parking management; and ramp metering. Interactions between Maine Turnpike traffic and nearby routes will be considered.

h. Analyze various toll structuring and collection options for financing the project. These might include peak load pricing, differential tolls for the project section compared to the northerly sections, different collection procedures, waiving tolls at certain times, etc. This analysis is to take advantage of the most up to date experience internationally, as well as the best academic analysis of equity in highway pricing.

i. Analyze the traffic effects of the proposed toll increase, including how the toll increase would affect use of the Maine Turnpike and Route 1 and other alternative routes especially during peak weekends and peak hours.

j. Fully analyze the effects of the widening proposal on air pollution, land use, and nearby economic development. This

component will also consider effects experienced on nearby routes and indirect effects on traffic and land development. Full study of existing and future air pollution impacts will be conducted, to include estimates of the effects of differences in speeds and traffic volumes, and projected increases in population exposed over time. Effects on land use and nearby economic development will consider the proposed interchanges as well as existing zoning, the status of growth management efforts in corridor communities, and other relevant factors.

k. Based on the above information, the consultant will formulate a set of project construction alternatives which will allow the comparison of options that vary along several dimensions. The options will include good faith consideration of a no-widening option. Others would include segmenting the additional lanes into logical units and indicating which should be constructed first, indicating which segments raise different promising alternatives in terms of TSM, and determining if a program of widening sequenced over a span of time might offer some advantages. Specifically, the consultant will present one option that would allow the widening program to be financed on a pay as you go basis without a major upfront bond issue.

Consultant will indicate a short list of promising options for supporting better metro area and Turnpike traffic management by constructing or improving additional highway links that would help meet peak period capacity needs.

l. The report will present a straigthforward method of determining the relative degree of priority that ought to be given, in a statewide context, to the Maine Turnpike widening compared to other major items on the state's highway and bridge agenda. The agenda will consider all major regional development corridor and bridge renoviation opportunities. Among the factors to be considered in ranking the opportunities would be the effects on regional development, importance to local businessess, the number of users affected, the cost of improvements per user, and the safety, bridge and pavement condition, or other aspects of the existing situation.

m. Indicate what additional specific field studies are desirable to develop a full understanding of the traffic, environmental, and land use impacts of the proposed widening and the most promising alternatives.

4. Administrative Provisions

(insert standard MTA contract requirements)