Comprehensive Tolling Plan
for
Additional Interstate and Controlled Access State Highways
in the Commonwealth of Massachusetts

Report to the Legislature
December, 2013

massDOT
Massachusetts Department of Transportation

Comprehensive Tolling Plan for Additional Interstate and Limited Access State Highways in the Commonwealth of Massachusetts

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Background

The Way Forward: A 21st Century Transportation Plan from January, 2013 identified capital program needs totaling billions of dollars for major transportation projects in the Commonwealth. Some major projects can be financed with existing plans and budgets, but many others cannot.

Chapter 46 of the Acts of 2013 (the "2013 Transportation Finance Legislation," or "TFL") includes provisions that require the Massachusetts Department of Transportation (MassDOT) to (i) develop a comprehensive tolling plan for additional Interstate and limited access state highways within the Commonwealth on or before July 1, 2018, and (ii) study and report on the feasibility of establishing additional Interstate tolls along the borders of the Commonwealth. Section 67 of the TFL specifically requires MassDOT to consider a variety of equity and policy issues, including consistency with the current highway program and "necessary waivers or approvals from the Federal Highway Administration to toll additional Interstate highways." This Comprehensive Tolling Plan (the Plan) was developed by MassDOT in response to Sections 67 and 74.

Policy Goals

Transportation revenues available to the Commonwealth today are primarily from the state motor fuels tax, the state sales tax, and Registry of Motor Vehicle fees. The fuels tax and sales tax are increasingly unreliable sources of revenue, unable to keep pace with the true funding needs of the transportation system, and regressive in their collection. Because gas taxes are a fixed value rather than a percentage of the overall sale, the Commonwealth receives no additional financial benefit when the price of gas increases. Additionally, after decades of significant increases in fuel consumption, the past decade has seen fuel consumption in the Commonwealth stagnate, largely because of increased fuel efficiency. While this has environmental benefits, it points to the decreasing value of the gas tax as a long-term means of funding the Massachusetts transportation system.

Tolling additional Interstate and limited (i.e. controlled) access state highways supports the policy goals set forth in The Way Forward Plan by providing an efficient and equitable source of transportation revenue enhancement, which can also be used as an effective tool for congestion management by setting toll rates lower for off-peak travel times.

Approach

MassDOT is taking decisive steps toward implementing a 21st century tolling system to better serve the traveling public. Work is underway to implement statewide All-Electronic Tolling (AET) to replace the existing toll plazas on the Massachusetts Turnpike, Tobin Bridge, and Harbor Tunnels with overhead gantries (sign structures with E-ZPass equipment and cameras) to be installed along the highways, allowing all traffic to travel at normal highway speed through the tolling areas without stopping or slowing. Cash will be eliminated from the system entirely, as all transactions will be conducted using either the current E-ZPass system or through video tolling (in which invoices are sent to customers whose license plates are recorded by the AET camera system). This concept will lessen congestion,

improve air quality, and reduce operating costs. Except for the Sumner/Callahan Tunnels, no existing toll plaza sites will be reused for the AET system.

Paying tolls with E-ZPass will be the same on the new AET system as on today's system – tolls will be paid electronically via a toll account. Drivers without E-ZPass will also be detected at the AET gantries where their vehicle license plates will be read at highway speed, and the owner will be invoiced for the toll via a new service called "PAY BY PLATE MA." These drivers will see their tolls accumulated on invoices, which are mailed to vehicle owners for payment. Concurrent with implementation of AET on the Massachusetts Turnpike and Harbor Tunnels, these customers may pay a higher toll rate to cover the additional costs of license plate image processing and billing. PAY BY PLATE MA customers will be encouraged and have the option to convert to E-ZPass at any time, to access the lowest available toll rate.

The following policy goals and assumptions were considered in development of the Plan:

- Establish a reliable source of transportation revenues using a tolling system that is both efficient and equitable;
- No toll plazas. The new toll systems would be All-Electronic Tolling (AET), with all tolls collected at highway speeds, available to all drivers, giving best rates to E-ZPass customers;
- New tolled routes and services would augment, not replace, the new MassDOT AET system under development today and scheduled to begin operations with the Tobin Bridge demonstration project in 2014;
- New tolled routes would keep new infrastructure requirements to a minimum by using mainline gantries for any given toll route;
- New tolled routes would allow local untolled movements between some interchanges in close proximity to each other;
- New tolled routes would have gantries (overhead structures which support E-ZPass readers and other technology) located to minimize diversion, so as to not impact adjacent routes and municipalities;
- The new toll network should improve system equity by assessing the most tolls to those who receive the most benefit from using the Commonwealth's network of Interstate and other controlled access highways;
- The new toll system should provide opportunities for MassDOT to use pricing as a traffic congestion management tool; and
- The new toll system should provide opportunities for drivers to find the least-expensive means and times to use the tolled Interstate and controlled access highways.

Reciprocity agreements and similar mechanisms of regional cooperation with other states are important today and become essential with an expanded AET system. In 2011 Massachusetts, Maine and New Hampshire established a pilot memorandum of agreement (MOA) for enforcement of tolls between the three states. This reciprocity agreement supports collection of out-of-state toll violations, including payment of tolls, penalties, and associated administrative fees.

Even greater coordination could be afforded with the formalization of a multi-state toll compact which would involve state DOTs partnering in the development of common road user rules and regulations related to tolls. Consistency and transparency will become increasingly important for drivers as toll operations are expanded. It is easier for drivers to comply with rules when those rules are consistent throughout a region. Also, if a driver makes the effort to open a toll account in one state, that account's

structures should ideally be valid across all compact states.

Key Findings

The accounting and invoicing of toll transactions on any new toll facilities will be provided by the new E-ZPass Massachusetts (E-ZPass MA) Customer Service Center (CSC), under design today. The E-ZPass MA CSC is being designed to take advantage of new technology and systems to fully support tolling based on license plate images. The new E-ZPass MA CSC is also being designed with the potential to support additional tolling of other routes in the Commonwealth.

For purposes of this Plan, it is assumed that some of the tolling operations costs would be allocated to each route being tolled: these include license-plate image processing and invoicing costs, credit card fees for all transactions, and maintenance and operation of the system. Other CSC operations costs will increase with additional routes, but such growth will be marginal, based on the number of additional E-ZPass accounts that are managed. In summary, as the Massachusetts toll system grows operations costs as a percentage of toll revenue decreases.

Significant further easing of Federal restrictions on tolling the Interstate Highway System and other Federal-aid facilities must occur in order to implement the Plan described in this report. The Federal Section 129 Tolling Program allows the reconstruction or replacement of a toll-free bridge or tunnel, or of a toll-free Federal-aid highway that is not an Interstate highway, and converting such facility to a tolled facility. The Federal law allows all lanes of an existing toll-free non-Interstate highway to be converted into a toll facility as part of a reconstruction project on that facility. The eligible activities include “major improvements to pavements or interchanges,” and the reconstruction of interchanges. An entire non-Interstate highway can be eligible for tolling even if only a segment is being reconstructed. The Federal guidance on this topic states clearly that the tolling eligibility under Federal law is not limited “only to those highway segments that are physically reconstructed.”

Section 1216(b) of TEA-21 established the Interstate System Reconstruction and Rehabilitation Pilot Program (ISRRPP) administered by the Federal Highway Administration (FHWA), allowing up to three existing Interstate facilities nationally (highway, bridge, or tunnel) to be tolled to fund needed reconstruction or rehabilitation. This program remains unchanged by MAP-21. There is no special funding authorized for this program. By law, Interstate maintenance funds may not be used on a facility for which tolls are being collected under this program. According to the FHWA website, ”all three of the slots authorized for this program are conditionally reserved as of September, 2013.”

In the event MassDOT sought to utilize this Federal authority, its Enabling Act would need to be amended to provide MassDOT with the broad authority to levy tolls on existing non-Interstate Federal-aid highways in accordance with Federal law eligibility requirements. Such an amendment to the Enabling Act might include a definition of such a facility, referencing the defined term in the Enabling Act’s grant of tolling authority at Section 3(18) and Section 13. Recent Massachusetts public-private partnership legislation may technically allow separate private entities, outside of MassDOT, to establish toll operations on concession facilities, but this has no bearing on the Federal provisions and limitations vis-à-vis tolling in MAP-21.

The question of border tolls presents both policy and legal issues. Federal law does not specifically

restrict border tolls or treat them differently than any other toll facility. Adding tolls to existing Federal-aid highways at the borders (both those on the Interstate system and those that are not) falls within the purview of Section 129 and would need to meet the various eligibility categories stated therein. The current Enabling Act would need to be amended to authorize MassDOT to establish border tolls.

Observations

The analysis was based on a high level review of nearly 500 miles of Interstate highways and over 200 miles of other controlled access highways in the Commonwealth. For purposes of the analysis, an automobile E-ZPass toll rate of 5¢ per mile was used in most locations (I-93 through Boston was priced at a rate to be consistent with other tolls entering into Boston, which was higher). Order of magnitude potential net revenues and toll-related roadway costs over a ten-year timeframe were developed, and were used to estimate a return on investment (ROI). The results are presented in descending order of ROI in Table ES-1.

Table ES-1 - Summary of In-State Tolling Study Routes and Results

Route	Location	NPV Rev ($m)	NPV Costs ($m)	ROI
I 93	Entire route	$2,032	$284	6.2
I 291	Entire route	$137	$21	5.6
US 3	All controlled access portion	$288	$49	4.9
US 6	by Sagamore Br	$162	$28	4.8
I 391	Entire route	$75	$14	4.4
I 290	Entire route	$233	$43	4.4
I 95	Entire route	$1,376	$258	4.3
I 495	Entire route	$1,391	$274	4.1
I 295	Entire route	$67	$14	3.9
I 84	Entire route	$89	$18	3.8
SR 25/28	by Bourne Br	$93	$20	3.7
SR 24	All controlled access portion	$434	$98	3.4
I 91	Entire route	$352	$81	3.3
SR 128	All controlled access portion	$140	$34	3.1
SR 3	All controlled access portion	$379	$93	3.1
I 195	Entire route	$306	$82	2.7
SR 146	All controlled access portion	$94	$25	2.7
I 395	Entire route	$85	$23	2.7
I 190	Entire route	$112	$33	2.4
SR 140	All controlled access portion	$109	$32	2.4
SR 2	All controlled access portion	$356	$111	2.2

Note – Revenues and costs shown are conceptual order of magnitude, which are not based on traffic and revenue (T&R) or design studies.

For example, tolling I-93 with the scenario and pricing assumptions described in this report could lead to a return on the investment of over 6 to 1. Tolling the controlled access portions of State Rte 2, in

contrast, would yield only about a 2 to 1 return on investment with the assumptions and calculations used in this analysis.

Clearly the three greatest revenue generators are I-93, I-95 and I-495. This potential revenue stream would support a substantial level of maintenance and operational improvements on the systems to be tolled and, with enabling legislation, facilitate aggregation of capital for major investments. Tolling the Cape Cod Canal crossings, i.e. the US 6 Sagamore Bridge approach and the SR 25/28 Bourne Bridge approach, would necessitate tolling both to avoid the traffic diversion impacts that would occur if one of them were to remain untolled.

In a similar manner, potential revenues and costs associated with border tolling were also estimated on the basis of a $1 car E-ZPass toll. The results are summarized in Table ES-2 below.

Table ES-2 – Summary of Border Tolling Study Locations and Results

Route	Location	NPV Rev ($m)	NPV Costs ($m)	ROI
I 95	Rhode Island Border Toll	$210	$47	3.4
I 95	New Hampshire Border Toll	$190	$46	3.2
I 93	New Hampshire Border Toll	$229	$59	2.9
US 3	New Hampshire Border Toll	$175	$45	2.9
I 295	Rhode Island Border Toll	$104	$28	2.7
I 91	Connecticut State Border Toll	$154	$41	2.7
I 195	Rhode Island Border Toll	$167	$45	2.7
I 84	Connecticut State Border Toll	$146	$41	2.5
SR 24	Rhode Island Border Toll	$76	$23	2.3
SR 146	Rhode Island Border Toll	$58	$19	2.1
I 91	Vermont State Border Toll	$42	$14	2.0
I 395	Connecticut Border Toll	$58	$20	1.9

Note – Revenues and costs shown are conceptual order of magnitude, which are not based on traffic and revenue (T&R) or design studies.

Diversion is estimated to be greater with border tolling than with tolling overall roadway sections because the border toll rates were assumed to be higher. Drivers would be more likely to be tempted to drive around a single point toll with a higher toll than a series of toll points with lower tolls.

Construction costs for border tolling are lower than for statewide tolling, because of a smaller number of toll points. However, annual operating costs are estimated to be much greater for border tolling because it is assumed that a high percentage of the vehicles would be registered out-of-state, which in turn would increase the cost for Pay by Plate processing and image review, in comparison with in-state trips predominantly by in-state vehicles. The high percentage of out-of-state vehicles at border tolls would also increase the “leakage” of revenue from the system when Pay by Plate invoices were not paid.

Major steps in the implementation of expanded statewide tolling are outlined below:

Step 1 – State Legislative Action: Changes in state law are needed to achieve the goals of this Plan, and to define the scope and limits of an expanded toll program. It would be anticipated that some requisite preliminary planning and engineering development, as well as legal and financial advisory services, would also be needed to support this effort. It is recommended that the legislature:

- Review existing enabling legislation to allow for expanded statewide tolling; and
- Provide greater flexibility in the use of toll revenues to fund transportation infrastructure not directly appurtenant to the facility being tolled.

Step 2 – Federal Approvals: The Massachusetts congressional delegation should be encouraged to support legislation at the Federal level that provides increased flexibility within Federal tolling programs administered by the Federal Highway Administration (FHWA), in part to allow for tolls collected on one facility to help fund improvements on other interstates and state highway facilities. Meanwhile, the state should apply for available slots under the FHWA toll pilot programs, such as the Interstate System Reconstruction and Rehabilitation Pilot Program (ISRRPP), and the Value Pricing Pilot (VPP) program.

Step 3 – Develop a Capital Plan: Preliminary designs, approximate locations of toll points, and environmental review and clearance need to be identified. The financing plan and preliminary work to support procurements would be completed. This would include definition of the contract methodologies and requirements, particularly if P3 financing support were intended. Also, it is anticipated that the actual procurement document preparation would begin.

Step 4 - Procure AET system design and delivery services: This step culminates with the actual design and construction of the toll systems on the routes to be tolled. This step assumes that the Massachusetts Turnpike and harbor crossing tolls will have already been converted to AET, and the new E-ZPass MA CSC will be operational and available for the expanded tolling system to utilize.

The above listed steps would allow roughly two to three years for design and deployment of the AET systems and preparation for expanded toll operations on existing facilities. This Plan did not review potential tolling of entirely new facilities. The implementation of this expanded tolling system by the legislated target date will be highly challenging, even with the favorable assumptions regarding Federal tolling policy. Those challenges include the extensive public review process associated with the project, including meeting applicable environmental and Title VI requirements.

1 PURPOSE AND NEED

1.1 Massachusetts Legislative Requirements

Chapter 46 of the Acts of 2013 (the "2013 Transportation Finance Legislation," or "TFL") includes provisions that require the Massachusetts Department of Transportation (MassDOT) to (i) develop a comprehensive tolling plan for additional Interstate and limited access state highways within the Commonwealth on or before July 1, 2018, and (ii) study and report on the feasibility of establishing additional Interstate tolls along the borders of the Commonwealth. Section 67 of the TFL specifically requires MassDOT to consider a variety of equity and policy issues, including consistency with the current highway program and "necessary waivers or approvals from the Federal Highway Administration to toll additional Interstate highways." The specific requirements of Sections 67 and 74 are provided below.

> *SECTION 67 Notwithstanding any general or special law to the contrary, on or before December 31, 2013, the Massachusetts Department of Transportation shall develop a comprehensive tolling plan for additional Interstate and limited access state highways within the commonwealth on or before July 1, 2018, which shall consider equity issues, revenue benchmarks established by state law, policy objectives, diversion issues, cost and consistency with the current highway program and necessary waivers or approvals from the Federal Highway Administration to toll additional Interstate highways and which also shall examine a regional value pricing program, road pricing program and other available tolling options.*
>
> *SECTION 74 Notwithstanding any general or special law to the contrary, the Massachusetts Department of Transportation shall study and report on the feasibility of establishing additional Interstate tolls along the borders of the commonwealth. The report shall examine the several options available to the commonwealth to pursue border tolls, including, but not limited to, seeking a Federal waiver, reaching Interstate or regional agreements and the commonwealth's ability to establish border tolls in the event of proposed changes to Federal law on Interstate highway tolling. The department shall file its report along with any legislative recommendations with the house and senate committees on ways and means and the joint committee on transportation on or before December 31, 2013.*

This Comprehensive Tolling Plan (the Plan) was developed by MassDOT in response to Sections 67 and 74.

1.2 Funding Goals

1.2.1 Legislative Base Requirements

Under the TFL, MassDOT is tasked with meeting revenue benchmarks to achieve specified percentages of its operating budget, ranging from 47% in 2014 to 51% in 2018, when the Comprehensive Tolling Plan would take effect. In practice, these benchmarks should be largely met with other existing sources of revenue.

If additional routes were to be tolled, there would be additional operation costs incurred by

MassDOT. These costs would include additional account management costs and costs of maintaining the new toll systems. Additional toll operations costs would be supported by additional gross toll revenues, before net revenues were passed on for other uses.

1.2.2 Capital Needs

The Way Forward: A 21st Century Transportation Plan from January, 2013 identified capital program needs totaling billions of dollars for major transportation projects throughout the Commonwealth. The projects would address safety and mobility concerns in corridors of the Commonwealth facing significant traffic congestion and deteriorated transportation infrastructure. Some of the major projects identified in that plan can be financed with existing plans and budgets, but many others cannot. The plan identified potential reforms, such as conversion to all-electronic tolling on the Mass Pike and other currently tolled assets, which MassDOT is now advancing. It also acknowledged the need for additional revenue to meet capital needs. The potential sources of new revenue identified in the plan included new tolling mechanisms.

1.3 MassDOT Policy Goals

The following were considered as guiding policy goals and assumptions in development of a plan to meet TFL reporting requirements:

1.3.1 Guiding Policies

MassDOT's mission is to deliver excellent customer service to the people who travel in the Commonwealth and to provide our nation's safest and most reliable transportation system in a way that strengthens our economy and quality of life. Two recent policies that guide MassDOT toward achieving its mission are GreenDOT and the Healthy Transportation Policy Directive.

GreenDOT

GreenDOT was developed in response to several existing state laws, Executive Orders, and MassDOT policies, including the 2009 Transportation Reform Law that created MassDOT and the Healthy Transportation Compact. It establishes that MassDOT shall be an innovator in promoting sustainability throughout the transportation sector, and sets three primary objectives:

- Reduce greenhouse gas (GHG) emissions
- Promote healthy transportation options of walking, bicycling, and public transit
- Support smart growth development

Healthy Transportation

MassDOT's Healthy Transportation Policy Directive requires all state transportation projects to increase bicycling, transit and walking options to promote multimodal access. The Directive builds on the goals established in the GreenDOT Implementation Plan and MassDOT's mode shift goal. The mode shift goal announced by MassDOT in October 2012

calls for tripling person-miles travelled in Massachusetts by bicycling, transit and walking by 2030. Together, these initiatives seek to improve service to MassDOT customers while improving the health of our public and natural environment.

Congestion Management

Metropolitan areas with populations over 200,000 are required by the Federal government to have an ongoing Congestion Management Process (CMP). The CMP is especially significant for the future of transportation within regions of the state that do not meet national ambient air quality standards, such as the Boston region. The variable pricing capability of all-electronic tolling (AET) is a potentially effective tool for reducing traffic congestion. Variable pricing provides an incentive for vehicle trips to be made outside the peak period when toll rates are lower, and will shift some trips to alternative modes, such as bicycle, transit, and walking in support of GreenDOT and the Healthy Transportation Policy Directive.

1.3.2 Transportation Finance Policy Goals

MassDOT has a large number of major capital projects to be funded, some of which are in the Capital Plan, and others which are needed but not programmed. A reliable dedicated funding source would enable planning and construction to be programmed most efficiently over a period of years, based on anticipated revenue streams.

Tolls must be as fair and equitable as possible, while taking into consideration the potential impacts on access and mobility of the driving public, goods movement, and the economy. Current legislation at the state and Federal level generally requires any tolls collected to be dedicated to improvement of the assets being tolled. Changes to the existing toll enabling legislation are needed to provide added flexibility on where tolls can be implemented and how toll revenues can be used. MassDOT would then be able to use existing revenue sources such as gas taxes, undiluted by Interstate highway needs, to focus on other highway and multimodal maintenance, construction and safety needs.

Timely regular maintenance is the most cost-effective way to maintain transportation assets in a state of good repair through their design life and beyond. Yet, most of the Commonwealth's highways have already aged beyond what is considered typical design lives of up to 50 years. A steady source of dedicated funding for highway and structure maintenance would greatly improve MassDOT's ability to keep facilities in the state of good repair that the driving public expects.

1.3.3 Toll System Design and Implementation Goals and Requirements

Consistent with MassDOT's policy goals as summarized above, the design and implementation of new tolling mechanisms in Massachusetts would need to meet the following requirements:

- No toll plazas would be built. The new toll systems would be All-Electronic Tolling (AET), with all tolls collected at highway speeds, available to all drivers, with the best

rates available to E-ZPass customers;
- New tolled routes and services would augment, not replace, the new MassDOT AET system under development today and scheduled to begin operations with the Tobin Bridge demonstration project in 2014;
- New tolled routes would keep new infrastructure requirements to a minimum by using mainline highway toll points, rather than highway ramps;
- New tolled routes would allow local untolled movements between some interchanges in close proximity to each other;
- New tolled routes would have gantries located to minimize diversion around toll points, so as to not impact adjacent routes and municipalities;
- The new toll network should improve system equity by assessing tolls on a more geographically balanced group of major Interstate and controlled access roadways in the Commonwealth; and
- The new toll system would provide opportunities for MassDOT to use pricing as a traffic demand management tool for drivers to find the least-expensive means and times to use the tolled Interstate and controlled access highway network.

1.4 Federal Tolling Policy

The conversion of previously un-tolled Interstate and other controlled access highways into toll facilities has been prohibited by Federal legislation and policy, with a few very specifically designed exceptions. This section reviews the current Federal legislation and policy and those exceptions that allow tolling today. This overall Plan provides a view of what additional waivers would be required to support a comprehensive tolling plan. Significant further easing of Federal restrictions on tolling the Interstate Highway System and other Federal-aid facilities must occur in order to implement the Plan described in this report.

1.4.1 Historical Perspective

The Interstate Highway System was developed and built as primarily a non-toll system, funded and supported by Federal and state gas tax dollars. Toll roads that were in place or proposed in the early years of the Interstate program were included as parts of the Interstate Highway System, with the restriction that no Federal-aid be used for their improvement.[1] The Massachusetts Turnpike was included in the Interstate Highway System on this basis. Except for I-90 in the Williams Tunnel as part of the Central Artery Project, all other Interstate highways in the Commonwealth were built under the Federal act as non-toll facilities.

Presently, many states including the Commonwealth need greatly increased levels of reliable transportation funding to support long-range capital planning needs, beyond that which can be provided by Federal-aid programs. To meet these needs, the current Federal-aid highway authorization has begun to allow some limited additional opportunities in

[1] See Section 113(a) of the Federal-aid Highway Act of 1956, authorizing the Bureau of Public Roads (the predecessor to FHWA) to incorporate existing or planned toll roads into the Interstate System in order to ensure connectivity without additional expense. There are approximately 2,900 miles of toll roads currently included as part of the 46,700 mile Interstate System.

tolling.

1.4.2 Current Federal Approach to Tolling Policy

The current Federal highway legislation in force is "Moving Ahead for Progress in the 21st Century Act" ("MAP-21") signed in July 2012. MAP-21 funds transportation programs through FY 2014. MAP-21 began what many believe will be a continued move away from the historic reluctance to encourage or participate in tolling Interstate highways. Increasing national interest in facilitating the use of toll roads is, in part, a response to a policy and political shift away from the gas tax as the primary method of generating transportation revenues. Particularly as vehicles become more fuel efficient and as hybrid/electric options continue to grow, there is a need to look more to user fees to augment or replace a declining gas tax.

Section 129 - Federal Toll Program

The Section 129 Tolling Program has been a mainstay of Federal tolling law. It generally provides the terms and conditions that govern tolling Federal-aid highways. MAP-21 made significant changes to Section 129, allowing states to impose new tolls on Federal-aid highways in certain circumstances and allowing Federal participation on the same basis in the same manner as construction of a toll-free Interstate. The specific circumstances that are eligible under the current law are:

1. Initial construction of a toll highway, bridge or tunnel[2].
2. Initial construction of a lane on an existing Federal-aid highway (both Interstate and non-Interstate) to increase capacity *provided that* such new lanes do not reduce the existing number of non-toll lanes[3].
3. Reconstruction or replacement of a toll-free bridge or tunnel, or of a toll-free Federal-aid highway that is *not* an Interstate highway, and converting such facility to a tolled facility[4]. Tolling on such a reconstructed toll-free Federal-aid highway is not limited to only that portion of the highway that has undergone reconstruction. See Guidance referenced in note 4, below.
4. Reconstruction, restoration or rehabilitation of an Interstate Highway *provided that* any new toll lane does not reduce the existing number of non-toll lanes[5].
5. Reconstruction, resurfacing, restoration, rehabilitation, or replacement of a toll highway, bridge, or tunnel or approach to the highway, bridge, or tunnel[6].
6. Conversion of a high occupancy vehicle lane on a highway, bridge, or tunnel to a toll facility[7].
7. Preliminary studies to determine the feasibility of a toll facility for which Federal participation is authorized.[8]

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[2] 23 U.S.C. 129(a) (1) (A)
[3] 23 U.S.C. 129(a) (1) (B) and (C)
[4] 23 U.S.C. 129(a) (1) (E) and (F). Reconstruction in this context means major improvements to pavements or interchanges. See Guidance provided by Federal Office on Innovative Program Delivery at: http://www.fhwa.dot.gov/ipd/revenue/road_pricing/tolling_pricing/section_129_faqs.htm
[5] 23 U.S.C. 129(a) (1) (G)
[6] 23 U.S.C. 129(a) (1) (D)
[7] 23 U.S.C. 129(a) (1) (H)

Toll Agreements & Use of Toll Revenues

MAP-21 repealed the provisions of Section 129 (a) (3) requiring that states execute a Toll Facility Agreement with FHWA prior to imposing tolls on a Federal-aid highway. [9] However, states must still abide by the restrictions imposed on the use of toll revenues. These restrictions do not apply to the setting of toll rates, which remains the decision of the state agency responsible for setting tolling policy. Toll revenues can be used only for—

> ''(i) debt service with respect to the projects on or for which the tolls are authorized, including funding of reasonable reserves and debt service on refinancing;
>
> ''(ii) a reasonable return on investment of any private person financing the project, as determined by the State or Interstate compact of States concerned;
>
> ''(iii) any costs necessary for the improvement and proper operation and maintenance of the toll facility, including reconstruction, resurfacing, restoration, and rehabilitation;

A new audit system has been put into place to ensure compliance with these restrictions.

Toll Revenue Flexibility

If a state certifies that the tolled facility is being adequately maintained, then toll revenues generated from such facility may be used in part to fund transit projects eligible for Federal funding support under Title 23 (*e.g.* capital costs of transit projects). See generally Guidance at: http://www.fhwa.dot.gov/ipd/revenue/road_pricing/tolling_pricing/section_129_faqs.htm

This provision may enable Massachusetts to employ user fees strategically to encourage modal shift and modal equity. MassDOT enabling legislation, however, does not allow this flexibility in the use of user fees across modes.

HOV and HOT Lanes

MAP-21 enables states to toll High Occupancy Vehicle (HOV) lanes on Interstates. Under Section 129 (a) (4), states may convert HOV lanes to toll lanes if they follow these rules:[10]

1. Submit written assurance that an impacted MPO has been consulted (in those circumstances where the HOV lane affects a metropolitan area).
2. Develop and manage an automatic toll collection system.
3. Establish policies and procedures to manage demand for the toll lane by varying the toll amount that is charged.

A State agency that allows tolled non-HOV vehicles to use an HOV lane on an Interstate

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[8] 23 U.S.C. 129(a) (1) (I)
[9] Section 129 tolling agreements in place prior to October 1, 2012 continue in force and effect.
[10] Fitch rating service has recently opined on the emerging challenges arising from financing HOV conversions. http://www.tollroadsnews.com/node/6813?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+tollroadsnews%2Fallnotifications+%28TOLLROADSnews+-+All+Notifications%29

must annually certify that operational performance monitoring programs and enforcement programs are in place to ensure that the performance of the HOV lane is not degraded.[11] If degradation is determined, States must take specific corrective actions, such as limiting or discontinuing the use of HOT facilities or increasing the toll paid by non-exempt vehicles for access to HOV lanes.

Massachusetts has limited opportunities to take advantage of this flexibility, primarily at one location on the I-93 southbound HOV lane, approaching Boston. A brief review conducted by MassDOT early in 2013 indicated that HOT conversion of the I-93 HOV lane would not provide adequate benefits in terms of congestion relief and net revenues to warrant further action.

Interstate System Reconstruction and Rehabilitation Pilot Program

Section 1216(b) of TEA-21 established the Interstate System Reconstruction and Rehabilitation Pilot Program (ISRRPP) administered by the Federal Highway Administration (FHWA), allowing up to three existing Interstate facilities (highway, bridge, or tunnel) to be tolled to fund needed reconstruction or rehabilitation. This program remains unchanged by MAP-21. There is no special funding authorized for this program. By law, Interstate maintenance funds may not be used on a facility for which tolls are being collected under this program.

According to the FHWA website, "all three of the slots authorized for this program are conditionally reserved as of September, 2013." Massachusetts has not applied for this pilot program, but it is recommended that the conditional status of the three available slots be monitored and that the state be prepared to apply in the event that one of the slots becomes available or if the program is expanded to provide additional slots.

Toll Credit Program

Under this program, states may use a toll credit as the state match for Federal funding for a transportation project. The amount of credit earned is based on revenues generated by the toll authority (*i.e.,* toll receipts, concession sales, right-of-way leases or interest), including borrowed funds (*i.e.,* bonds or loans) supported by this revenue stream, that are used by the toll authority to build, improve or maintain highways, bridges or tunnels that serve Interstate commerce. To be able to earn a toll credit, a State must satisfy a Maintenance of Effort (MOE) determination based on an assessment of a State's non-Federal transportation capital expenditures over a three-year period and a formula deigned to ensure a specific level of effort.[12]

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[11] Facility degradation is defined in Section 166(d) (2) as one that does not meet minimum average operating speed of 45 MPH for 90 percent of the time over a 180-day monitoring period during morning and evening weekday peak hours (or both), in the case of a HOV facility with a speed limit of 50 MPH or greater, or not more than 10 MPH below the speed limit in the case of a facility with a speed limit of less than 50 MPH.

[12] "If, for any 1 of the preceding 3 fiscal years, the non-Federal transportation capital expenditures of the State were at a level that was greater than 130 percent of the average level of such expenditures for the other 2 of the preceding 3 fiscal years, the agreement shall ensure that the State will maintain its non-Federal transportation

1.4.3 Summary

In conclusion, due to the limiting provisions of MAP-21's Section 129, tolling the Interstates in Massachusetts is not feasible at this time. This applies to toll concepts for the routes through Massachusetts as well to the imposition of border tolls.

As the Central Artery Tunnel complex is beginning to age and as it will become expensive to maintain properly, MassDOT is not currently permitted to add tolls to fund system maintenance and rehabilitation needs. This places the preservation of this significant Federal-aid investment at risk. Changes in Federal law would be required to enable tolling of the existing Interstate system without the burden of adding new projects that are not possible or needed. Expanded flexibility is needed to use tolls proceeds for Federal-aid purposes.

The opportunities to use provisions of Section 129 to toll the non-Interstate Federal-aid highways are only slightly greater, in that reconstruction of a toll-free Federal-aid highway and conversion of that reconstructed highway to tolls would also be allowed. In practical terms, this is of no additional assistance to MassDOT.

1.5 State Laws and Tolling

Current state law limits MassDOT's authority to impose tolls to the Turnpike and the Metropolitan Highway System. M.G.L. ch.6C, §§3(18) and 13. (Chapter 6C is referred to herein as the "Enabling Act"). While the Enabling Act contains broad language empowering MassDOT to undertake a variety of activities and enter in contracts with others, it would be prudent to provide specific legislative authorization in connection with the tolling of additional facilities, including the placement of border tolls.

1.5.1 Tolling Currently Non-Toll Federal-Aid Highways (non-Interstate)

The Federal Section 129 Tolling Program allows the reconstruction or replacement of a toll-free bridge or tunnel, or of a toll-free Federal-aid highway that is not an Interstate highway, and converting such facility to a tolled facility.[13] The Federal law allows all lanes of an existing toll-free non-Interstate highway to be converted into a toll facility as part of a reconstruction project on that facility. The eligible activities include "major improvements to pavements or interchanges," and the reconstruction of interchanges. An entire non-Interstate highway can be eligible for tolling even if only a segment is being reconstructed. The Federal guidance on this topic states clearly that the tolling eligibility under Federal law is not limited "only to those highway segments that are physically reconstructed."[14]

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capital expenditures in the fiscal year of the credit at or above the average level of such expenditures for the other 2 fiscal years."

[13] This federal eligibility program is not available for Interstate highways. Such conversions are governed by the Interstate System Reconstruction and Rehabilitation Pilot Program.

[14] See Guidance provided by Federal Office on Innovative Program Delivery at: http://www.fhwa.dot.gov/ipd/revenue/road_pricing/tolling_pricing/section_129_faqs.htm. "The limits of tolling on an existing toll free highway that is converted into a toll facility in conjunction with a reconstruction project

In the event MassDOT sought to utilize this Federal authority, its Enabling Act would need to be amended to provide MassDOT with the broad authority to levy tolls on existing non-Interstate Federal-aid highways in accordance with Federal law eligibility requirements. Such an amendment to the Enabling Act might include a definition of such a facility, referencing the defined term in the Enabling Act's grant of tolling authority at Sections 3(18) and 13.

1.5.2 Border Tolls

The question of border tolls presents both policy and legal issues. Federal law does not restrict border tolls or treat them differently than any other toll facility. Adding tolls to existing Federal-aid highways at the borders (both those on the Interstate system and those that are not) falls within the purview of Section 129 and would need to meet the various eligibility categories stated therein.

The imposition of border tolls in Massachusetts would only make sense on the Federal Interstate highways connecting the Commonwealth to neighboring states, as ratified by the legislative language of Section 74. Without a change in Federal law, however, Section 129 permits tolling Interstates only where additional capacity is provided and limits the imposition of tolls solely to that additional capacity. The practical implication of these provisions is that border tolls are not feasible unless Federal law is changed. MassDOT supports changing that law to allow additional tolling of Interstates and would also support additional flexibility on the use of such tolls.

1.5.3 DBOM/DBFOM/P3 Tolling

In order to actually deliver new tolling projects which might be permitted, alternate delivery methods, which include private financing to some measure, might be needed in order to complete tolling projects in a timely manner, for example to deploy a broad toll system in the timeframe indicated in the TFL.

"DBOM" means "design-build-operate-maintain" contracting, in which a single contracting entity designs and builds the system, and also operates and maintains it. "DBFOM" adds project financing to the contractor's responsibilities, in whole or in part. These types of arrangements are generally categorized as public-private-partnerships, or "P3s."

M.G.L. ch.6C §§ 63 and 64 contemplates the possibility that a private sector entity could make a solicited or unsolicited proposal to MassDOT for the design, reconstruction, replacement or improvement of a highway facility.[15] The law further contemplates that a public-private agreement arising from such solicitations would include the levying and

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may be based on the consideration of the extent to which the reconstructed segments benefit users of other non-reconstructed segments of the facility . . . and whether the toll limits have logical termini from the perspective of the users of the toll facility."

[15] M.G.L. ch.6C §64 (c) (1) contemplates public-private agreements for a broad range of activities, specifically the "planning, acquisition, engineering, financing, development, design, construction, reconstruction, replacement, improvement, maintenance, management, repair, leasing or operation of a transportation facility."

collection of a user fee for that highway facility.[16] A special public-private partnership infrastructure oversight commission (the "P3 Commission") has been established to review and approve all DBFOM and DBOM proposals. M.G.L. ch.6C §73.

1.6 Study Approach

This Plan responds to the requirements of the Transportation Finance Legislation with conceptual plans and recommendations, including discussion of the rationale, design, impacts and potential for implementation, given the state's financial and policy goals and Federal Highway constraints.

Chapter 2 summarizes recent analyses, the current Massachusetts Turnpike AET program, and other source material used to guide development of this analysis.

Chapter 3 describes the toll concept, in terms of what All-Electronic Tolling (AET) would look like out on the roadways, the new E-ZPass MA Customer Service Center, methods of payment, toll rate structures and plans/discounts, and regional agreements which would greatly aid Interstate violation enforcement and border tolling.

Chapter 4 reviews the total range of potential routes and locations to be tolled in Massachusetts, screens them for feasibility and provides traffic data and descriptive information for the routes and locations under consideration. These include the pre-feasibility analysis of the range of potential revenues given the traffic and toll concepts described above.

Chapter 5 provides the same information for border tolling.

Chapter 6 evaluates the traffic, toll concepts, revenues and costs, and the overall program on a route by route basis, and a possible implementation timeline for major tolling projects in the Plan.

Chapter 7 specifically responds to Sections 67 and 74 of the TFL with a summary of recommendations for consideration.

[16] The Enabling Act contemplates a public-private agreement that addresses "whether user fees will be collected on the transportation facility and the basis by which such user fees shall be determined and modified." Id. at §64 (c) (5).

2 RECENT STUDIES AND TOLL DEVELOPMENTS

2.1 MassDOT AET Studies (2012)

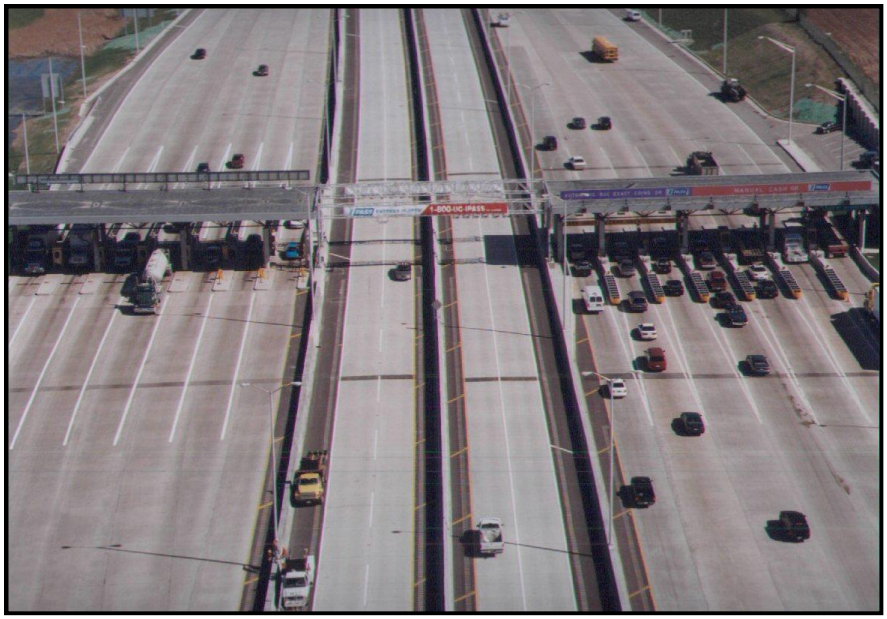
In 2012, MassDOT conducted a study of alternate strategies to improve toll operations for the sake of safety and efficiency of highway operations. The studies began with evaluation of improvement alternatives on the 124-mile Western Turnpike (Interstate Highway I-90) between the New York State line and Exits 14/15/55 in Weston. After that a similar review was done of the Metropolitan Highway System (MHS), which includes the urbanized part of I-90 as well as the Sumner/Callahan Tunnels, the Williams Tunnel, and the Tobin Bridge. These studies are briefly summarized below.

2.1.1 Statewide Tolling Strategy - Western Turnpike

This study considered the potential benefits and costs of replacing the current interchange-based toll system with a new system of mainline-based toll points relying to varying degrees on non-stop electronic toll collection. The alternatives which included cash-handling toll plazas were referred to as "Open Road Tolling" (ORT) alternatives. Other alternatives which did not include any cash toll plazas were called "All Electronic Tolling" (AET) alternatives.

An example of an ORT toll plaza is the Hampton Plaza on I-95 in New Hampshire. ORT plazas include highway lanes in the center and cash toll plaza lanes on each side in each direction. Drivers with E-ZPass use the highway lanes in the center. The overhead technology reads their E-ZPass transponder, and then adds a toll to their E-ZPass account. Drivers without E-ZPass essentially have to exit the expressway, stop at a plaza, pay cash, and then return to the expressway. If a driver without an E-ZPass uses an ORT lane, the driver is a violator.

Figure 2-1 - ORT Plaza Configuration (plaza on the Illinois Tollway in 2001)



Examples of AET tolling can be seen in Maryland on a new highway recently built called the Inter County Connector (Maryland Route 200) and on a new highway recently built in North Carolina called the Triangle Expressway (NC Route 540). Toll points on these routes have overhead structures called "gantries" which support E-ZPass readers and other technology. As with the ORT plazas, E-ZPass drivers don't have to slow down as the overhead technology reads their E-ZPass transponder and adds a toll to their E-ZPass account. Drivers without E-ZPass on AET facilities still can't pay with cash at the toll point. Instead, these drivers' license plate pictures are captured, and then an invoice is sent to the owner of record. If the invoice is not eventually paid, the vehicle owner becomes a violator.

Figure 2-2 – AET Toll Point and Gantry (courtesy North Carolina Turnpike)

The studies developed "build" alternatives with either ORT or AET plazas/toll points on the Mass Pike mainline, to facilitate elimination of the entry and exit plazas at existing Western Turnpike interchanges, resulting in a reduction of interchange-based congestion.

The various "build" and "no-build" alternatives were compared to each other. The study found that either ORT or AET would be a clear improvement compared to the no-build alternative. All the build alternatives were less expensive to operate than the current ticket system, would eliminate the need to maintain/repair old facilities nearing the end of their useful life, and would provide additional traffic operational benefits (such as improved safety by eliminating speed variations, simplifying weaving, and providing flexibility for interchange reconfiguration). Also, the ORT or AET build alternatives were able to grow with traffic or technology demands.

ORT works well, but with important caveats and issues. Under the ORT options (including four or five plazas), delays, fuel consumption and CO_2 emissions associated with cash transactions would still occur at the cash plazas adjacent to the electronic tolling gantries. In addition, ORT would cost more up-front to build, would be more vulnerable to diversion and toll equity issues, and ultimately would be eliminated as the projected obsolescence of cash toll plazas occurs during the next decade.

AET was the recommended alternative because it would provide the lowest up-front capital

cost, the highest traffic and environmental benefits, the least disruption and shortest schedule for implementation, the best long-term net present value, the ability to apply rate adjustments based on time of day or congestion, and be simpler for drivers to navigate.

The study concluded that based on reasonable performance numbers being achieved today, and what could conservatively be expected in 2017, there was no reason to delay the removal and replacement of the existing ticket system in favor of a new AET system.

2.1.2 Statewide Tolling Strategy – Boston Extension and Harbor Crossings

This study investigated the feasibility of converting the urbanized portion of the Massachusetts toll network, the Metropolitan Highway System (MHS), to All Electronic Toll (AET) operations. The study area included the "Boston Extension," which is the portion of the Massachusetts Turnpike (I-90) from Weston (the I-95/Route 128 interchange) to downtown Boston and I-93. The study also considered one-way and two-way tolling options for the Harbor Crossings, including the Williams Tunnel, the Sumner and Callahan Tunnels, and the Tobin Bridge.

Potential toll locations for the MHS were limited to the mainline, away from the existing interchanges. This has the advantage of avoiding physical constraints at existing toll locations, such as substandard horizontal and vertical curves and stopping distances. Other advantages include the ability to establish a more equitable tolling structure proportional to the distances travelled, the ability to establish variable pricing based on peak hours or measured congestion, and a smaller number of total toll locations.

A range of AET alternatives were considered, and the alternative with three toll points between Weston and Boston on I-90 provided the best balance between economy of implementation, operations, and revenue.

Likewise, it appeared that simultaneous conversion of the harbor crossings to AET would yield similar benefits such as improved safety and vehicle throughput, lower accident rate/higher safety performance, elimination of toll transaction delay and associated fuel consumption and vehicle emissions, elimination of light and noise pollution to the surrounding community, and low operational impact from adverse weather.

In addition, the study considered converting the current one-way tolling scheme to two-way tolling with the conversion to AET, and ultimately recommended two-way AET tolling at the three harbor crossings, to support greater user equity, and potential for implementing various travel demand management strategies.

Based on available data, it is likely that some motorists currently use the Alford Street Bridge inbound to avoid the Tobin Bridge (inbound only) toll. With Tobin Bridge tolls in both directions, it is reasonable to expect that the Tobin and the Alford Street Bridges would each achieve a better balance in their respective inbound and outbound traffic volumes.

2.2 MassDOT AET Program Development

Following completion of the MassDOT AET studies described above and in coordination with related initiatives, MassDOT is moving forward with development of an AET implementation program for I-90 and the Harbor Crossings for reasons further described below.

The Current Plan Moving Forward

MassDOT is currently advancing the implementation of a new statewide AET system for currently tolled facilities that is consistent with the statewide tolling strategy study recommendations. A series of gantries (sign structures with E-ZPass equipment and cameras) will be placed periodically along the Turnpike mainline, replacing existing toll plazas. Except for the Williams and Sumner/Callahan Tunnels, no existing toll plaza sites will be reused.

Figure 2-3 illustrates the planned MassDOT Turnpike AET system, with existing interchanges and toll plazas on the left, and the new AET system on the right.

Figure 2-4 illustrates the AET system locations for Boston area tolls as being designed today.

Figure 2-3 - AET System - Western Turnpike and Boston Extension

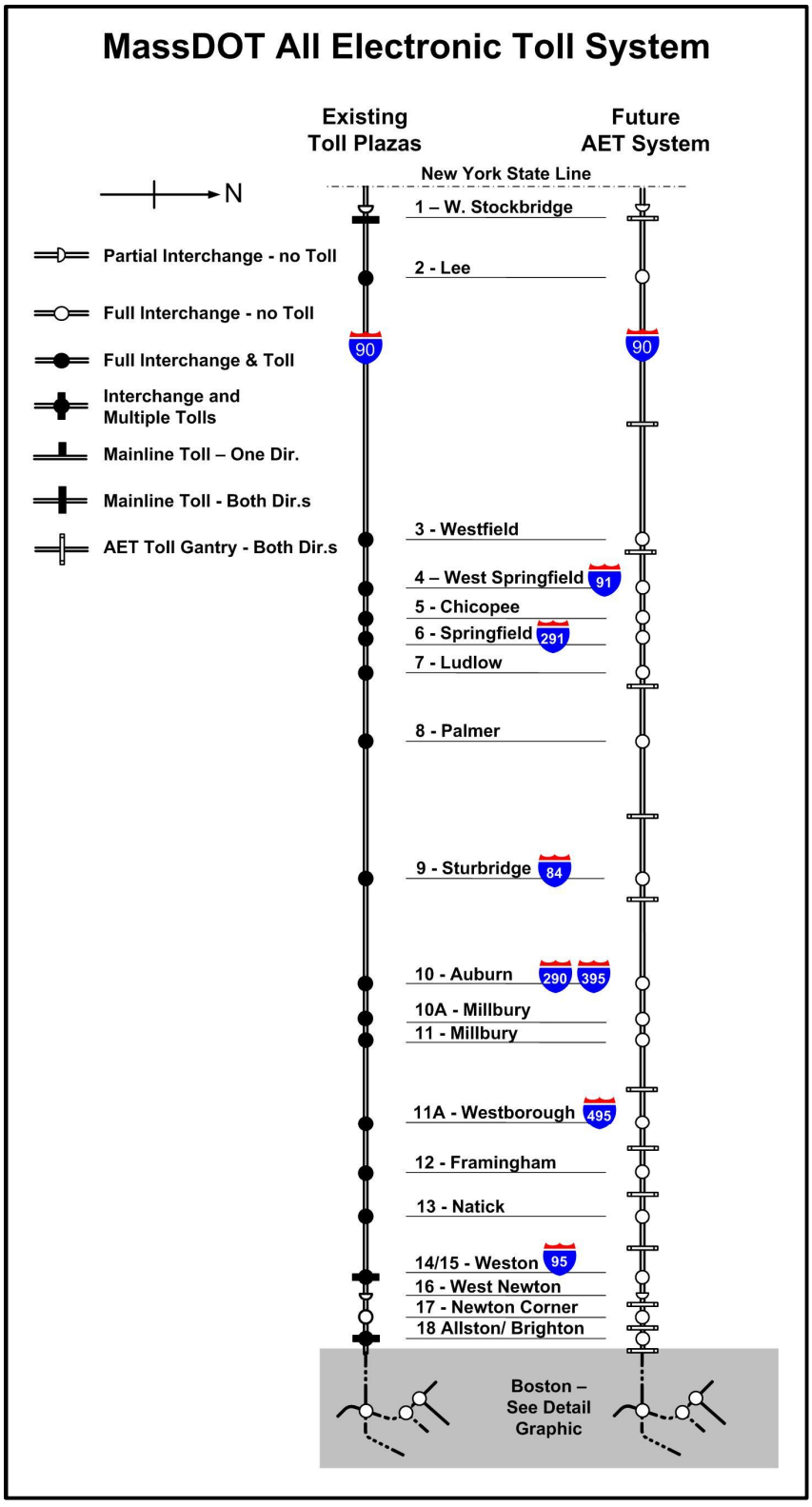
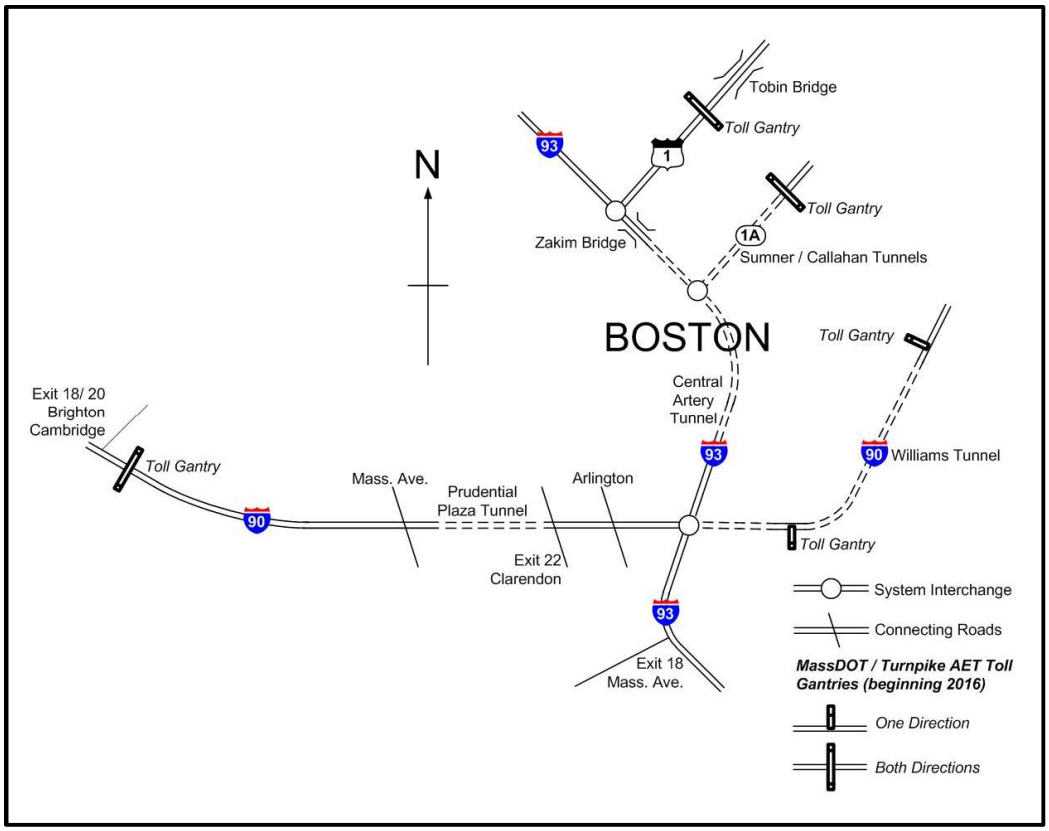


Figure 2-4 - AET System - Boston Urban Area



For E-ZPass customers, the toll concept remains unchanged, in that drivers' pre-paid toll accounts will be used to pay tolls. E-ZPass transponders will no longer be detected at toll plazas, but rather at gantries as was depicted in Figure 2-2. Tolls will be calculated for each trip, and the trip toll added to the E-ZPass account. For E-ZPass customers, the most significant difference will be in the lack of cash toll plazas as they exist today.

Drivers without E-ZPass will encounter greater changes. They will no longer have cash lanes in which to stop and pay a toll. Rather, their license plates will be read and the vehicle owner will receive a toll invoice under a program called "PAY BY PLATE MA." The tolls will be compiled in trips and calculated the same as those for E-ZPass customers, but the rates in the future will be higher than those for E-ZPass customers to cover the additional costs of license plate image processing and billing, which are not needed to process E-ZPass tolls.

PAY BY PLATE MA customers will be encouraged to convert to E-ZPass at any time, to access the lowest available toll rate. Drivers will save the most money by paying tolls with an E-ZPass account in good standing. MassDOT is considering new methods of payment to improve the accessibility of E-ZPass accounts for those who do not have access to credit or debit accounts. Expanded payment methods might include acceptance of account payments in cash at E-ZPass service centers or through various retailers located closer to population centers, for example.

Toll rates will be based on payment type (E-ZPass or PAY-BY-PLATE MA) and vehicle class. If invoices are ignored they will become toll violations collected through established

enforcement methods, including expanded reciprocity agreements with other states.

Impacts on Tolls

For each section of the system, MassDOT intends to maintain E-ZPass tolls at the same overall rates as they are now. Trip tolls will be calculated based on where vehicles with E-ZPass or license plate images were detected. Some specific points or exceptions include:

- In the future PAY BY PLATE MA toll rates will be set higher than E-ZPass toll rates, to cover the additional processing costs for license plate images and invoicing;
- Recently-restored tolls for passenger cars between Exits 1 and 4 will be retained;
- Vehicles will not be tolled between Exits 4 and 7;
- Vehicles will not be tolled between Exits 10 and 11;
- Between Exit 14/15 and I-93 in Boston, the overall E-ZPass toll rate will remain about the same. However, E-ZPass/PAY BY PLATE MA tolls will be collected at three points on the mainline of the Turnpike, rather than two mainline and three ramp locations. Some local trips will be more expensive in the future, and others will be less expensive;
- Between Exits 16 and 17, tolls will be restored for all vehicles;
- At the Williams and Sumner/Callahan Tunnels and the Tobin Bridge, tolls will be collected in both directions, not just in one direction. E-ZPass toll rates will be half of today's rates: thus there will be no toll rate change for a round trip for E-ZPass customers.

Implementation

MassDOT is currently preparing three contracts for the AET conversion project:

1. The AET system contract, which will build the gantries and the computer system to control them;
2. A new E-ZPass MA Customer Service Center ("CSC"); and
3. A project to partially or completely remove abandoned toll plazas.

In addition to these three system-wide projects, there will be some other separate MassDOT-led projects to make major improvements to specific interchange locations. Removal of the legacy toll plazas enables these interchanges to be reconfigured in the most effective and efficient manner to improve capacity and reduce environmental impacts.

During 2013, MassDOT has been developing the new AET toll point for the Tobin Bridge to use as a demonstration project. In 2014, MassDOT will open the Tobin AET toll point, while the new system statewide will be developed, installed and tested by mid-2016. The cash toll plazas will be closed, and demolition activities will commence, on the day the statewide AET system becomes operational.

By the end of 2016, the Commonwealth will have one of the most modern AET toll systems in North America, and will have already made much of the investment in new capacity, systems and business rules to support expanded tolling of the other Interstate and limited access highways in Massachusetts.

3 TOLL OPERATIONS CONCEPT

3.1 Introduction

This toll plan includes not only the design of where toll points could be located, but also reviews the operations-related components of the comprehensive tolling plan, which also must be addressed in the conversion of a free controlled access highway to an All-Electronic Toll (AET) highway. Toll points are locations along the mainline of a controlled access highway where AET gantries would be located to collect the tolls at highway speed.

3.2 Roadside AET Systems

The gantries detect vehicles and build individual records based on the location, whether or not there was an E-ZPass in the vehicle, the size of the vehicle (in the case of commercial vehicles), and, in some urban areas, possibly the time of day. The toll point infrastructure sends this data to a central system that will combine all the data into a "trip" transaction. This transaction data is transmitted to the E-ZPass customer service center for processing (see below).

For the purposes of this analysis, it is assumed there would be one central system per major toll route or project, but this issue would be developed further during the design process. For example, if the ultimate tolling plan ended up including one or two long Interstate routes and one or two short segments of other routes, these might be delivered by one contract, with one overall control system.

3.3 E-ZPass MA Customer Service Center

The E-ZPass customer would see a toll transaction on their statements for the trip on each route, with the trip location and toll charged to their E-ZPass account. Customers receiving PAY BY PLATE MA invoices in the mail would see the same trip, but at a higher toll rate along with other toll trips during the same billing period, and instructions on how to open an E-ZPass account and save money.

The accounting and invoicing of toll transactions on any new toll facilities will be provided by the new E-ZPass MA Customer Service Center (CSC), under design today. The new CSC will replace the legacy toll customer service center, which has been in operation since "Fast Lane" was implemented. The E-ZPass MA CSC is being designed not only to take advantage of new technology and systems, which were in need of upgrade, but also to fully support tolling based on license plate images as economically as possible. In addition, the new E-ZPass MA CSC is already being designed with the potential to support additional tolling of other routes in the Commonwealth.

For purposes of this Plan, it is assumed that some of the tolling operations costs would be allocated to each route being tolled: these include license-plate image processing and invoicing costs, credit card fees for all transactions, and maintenance and operation of the

system. Other CSC operations costs will increase with additional routes, but it will be less than a linear growth, based on the number of additional E-ZPass accounts that are managed. In summary, as the Massachusetts toll system grows, operations costs as a percentage of toll revenue decrease.

3.4 E-ZPass, License Plate Image Based Tolling, and Other

E-ZPass This Plan is built on the premise that most drivers will use E-ZPass to pay their tolls. E-ZPass is the most efficient and least expensive means of collecting tolls, and E-ZPass is virtually ubiquitous on toll facilities in the eastern United States. There are over 24 million active E-ZPass transponders in circulation today.

Pay by Plate Tolls Since there will be no toll plazas, there must also be an accommodation for customers without a pre-arranged toll account. The MassDOT program to provide this video-based service is called PAY BY PLATE MA, with the procedures under development now with the MassDOT Tobin Bridge AET Demonstration Project. Essentially, under this program, any driver can use any route, bridge or tunnel with tolls at any time. If an E-ZPass account or other toll account can be detected by transponder or by the captured image of the license plate, the toll is posted to that account. If no toll account can be found, the owner of record of the vehicle – in Massachusetts or beyond – is mailed a toll invoice.

Non-E-ZPass Electronic Tolls The current Federal Highway Authorization bill, MAP-21, requires national interoperability by 2016. "Interoperability" means the ability of drivers with other, non-E-ZPass electronic toll accounts, such as those from Florida or Texas, to use their accounts on E-ZPass roads as well. The new MassDOT CSC will be able to process these non-E-ZPass transactions, in a similar manner to E-ZPass transactions from other states outside of Massachusetts.

3.5 Toll Rates, Plans, Discounts

3.5.1 Toll Rates

This Plan assumes that toll rate policies on newly tolled facilities would be set to be consistent with those of the statewide AET system, which MassDOT is currently advancing towards implementation in all locations. Those rate policies are as follows:

E-ZPass The base toll rates will be E-ZPass rates. Variable toll rates and other discounts will be available through the E-ZPass toll account program. As the program advances, MassDOT will look for ways to further improve access to the E-ZPass account program for lower-income and "unbankable" customers without credit cards to include additional venues for payment and cash-based accounts, such that all drivers will be able to pay the lowest available toll rates. E-ZPass in Massachusetts currently offers Special Programs, which provide discounts based on specific eligibility requirements, such as place of residence and for carpooling.

PAY BY PLATE MA Tolls Toll collection by license plate image capture is a more complex process with greater operating and processing costs and a greater probability of non-

payment. So, Pay by Plate pricing should encourage drivers to use E-ZPass, and cover most if not all of the additional operating costs. There are two AET facilities currently operating in the E-ZPass service area: the Maryland Inter County Connector (the "ICC," marked as MD route 200), and the North Carolina Triangle Expressway, marked as Route 540. Both of these facilities charge a 50% surcharge for their video ("Pay by Plate") customers to address these issues. The same 50% surcharge level is recommended for the Massachusetts Comprehensive Tolling Plan.

Non-E-ZPass Electronic Tolls Non-E-ZPass accounts used for payment can still be processed at a generally low cost and will be treated in the same tier as E-ZPass toll payers. There is a caveat, however, in that if the Massachusetts E-ZPass system has to pay a transaction fee or surcharge to process these non-E-ZPass transactions, that fee or surcharge would be passed on to the driver in the toll. It is expected these will typically be minor surcharges.

3.5.2 Vehicle Classes

Vehicles are classified by size: the larger the vehicle, the higher the toll rate. On existing toll roads like the Massachusetts Turnpike, "size" is approximated by counting vehicle axles. On new AET facilities, sometimes size is measured by length and height of the vehicle. Either approach could be used in future AET tolling.

In practice, the two major categories of vehicles are 1) small vehicles - passenger cars and light trucks, and 2) large vehicles - truck with trailer combinations with one or more trailers – the "18-wheelers." Truck toll rates are typically three to four times the passenger car rate, and on the Mass Pike are roughly 3.5 times.

For purposes of the study, truck toll rates at 3 times the car rate were used for estimating revenue.

3.6 Pricing as a Strategy for Congestion Relief

If tolling were added to I-93 to the north and south of Boston, it would effectively complete a controlled access highway cordon around the city, as the other major routes (I-90 and the Harbor Crossings) are already tolled into downtown Boston. Conceivably, a toll point would be added on Storrow Drive if a cordon-pricing structure were to be developed.

With a cordon tolling plan, it would be possible for MassDOT to introduce a pricing regimen of normal, discount and peak pricing. Higher tolls could be charged during peak commute hours, and lower rates would be available during off-peak hours. Thus, discounted tolls would be provided for those who must enter the city, but can schedule their travel around lower toll rates.

For example, under current plans, E-ZPass tolls for drivers entering Boston from Cambridge or points west on I-90 are $1 or more. E-ZPass rates crossing into Boston via the Sumner or Williams tunnels will be $1.50 after the conversion to two-way tolls. To complete this cordon, tolls on I-93 into the Central Artery project could be set at a similar level.

Then, during morning or afternoon rush periods, at pre-determined times, rates could be raised higher to increase the attractiveness of alternate modes of travel, or alternate travel schedules. In a similar manner, during slow or overnight periods, rates on all the facilities could be lowered as an added incentive for drivers to choose to driver earlier or later than during the peak congestion period. This type of system can be referred to as "time-of-day pricing," because it is based on specific schedules which are widely publicized. In order to be most effective, the time-of-day pricing schedule must be widely known and understood so that drivers will use it in their daily travel planning

Time of day pricing would entice more use of the system in off-peak hours, and also hopefully encourage some drivers with city destinations to travel by transit. The result would be congestion relief during peak commute hours. Additional environmental benefits would include improved air quality due to decreased motor vehicle emissions and greenhouse gasses.

Any changes to the pricing structure in terms of scheduling and toll rate decreases or increases would all have to be carefully studied and evaluated with substantial public input.

3.7 Regional Agreements for Violation Enforcement and Border Tolling

In August 2011, Massachusetts, Maine and New Hampshire entered into a pilot memorandum of agreement (MOA) for enforcement of tolls between the three states. This reciprocity agreement supports enforcement of collections of out-of-state toll violations, including payment of tolls, penalties, and associated administrative fees.

This test program and similar efforts elsewhere are helping to coordinate regulations, rules, technology, contracts and services, while providing examples and "lessons learned" for future advances in strategic regional toll operations.

Even greater coordination could be afforded with the formalization of a multi-state toll compact which would involve state DOTs partnering in the development of common road user rules and regulations related to tolls. Consistency and transparency will become increasingly important for drivers as toll operations are expanded. It is easier for drivers to comply with rules when those rules are consistent throughout a region. Also, if a driver makes the effort to open a toll account in one state, that account's structures should ideally be valid across all compact states.

An Interstate toll compact could address simplification and synchronization of toll rules and regulations, provide mechanisms to improve the accuracy and efficiency of back office toll operations and enforcement, and potentially provide a model and structure for Interstate cost sharing and revenue sharing that could be acceptable to all parties. Perhaps even more importantly, a compact could become a vehicle for multistate advocacy to the Federal government to reconsider the rigidity of current national tolling policies.

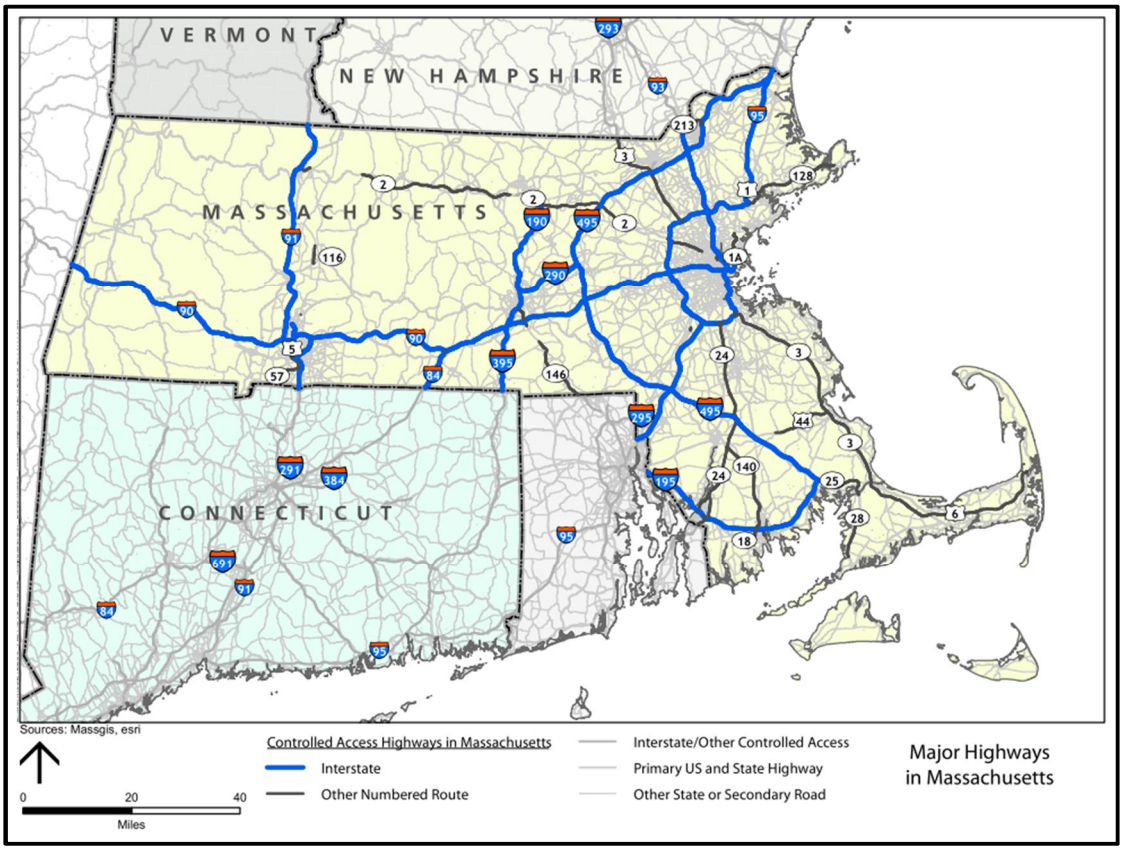
4 In-State Tolling

4.1 Introduction

This section reviews the potential locations for toll points on currently un-tolled facilities in the Commonwealth on a route-by-route basis. All the major numbered routes in Massachusetts are tabulated, and routes retained for consideration in tolling are identified.

This Chapter describes potential in-state toll routes. Basic traffic information and the physical characteristics of each route are tabulated and explored in further detail. Some facilities, such as I-93 and Route 3, are considered in sections.

Figure 4-1 – Major Highways in Massachusetts



4.1.1 Route Screening

Only controlled access highways were considered, including all Interstate highways and non-Interstates over 10 miles in length, plus the Cape Cod Canal crossings. Table 4-1 lists routes with controlled access sections; those in bold were carried further for analysis.

Table 4-1 - Routes Considered for Toll Analysis

Route	Controlled Access	VMT	Length (mi.)	Included in Analysis?
I 84	Yes	470,882	8.7	Yes
I 91	Yes	2,377,875	55.0	Yes
I 93	Yes	1,831,744	46.0	Yes
I 95	Yes	3,568,254	89.9	Yes
I 190	Yes	792,332	19.4	Yes
I 195	Yes	2,354,057	41.0	Yes
I 290	Yes	1,780,474	20.2	Yes
I 291	Yes	408,380	5.4	Yes
I 295	Yes	168,658	4.5	Yes
I 391	Yes	185,956	4.6	Yes
I 395	Yes	567,883	12.0	Yes
I 495	Yes	10,832,175	122.9	Yes
US 1	Portion(s)	2,865,973	9.4	No - See Note 3
US 3	Portion(s)	1,947,186	21.7	Yes - Controlled Access Portion
US 5	Portion(s)	111,858	3.4	No - Short Segment
US 6	Portion(s)	1,377,057	36.9	Yes - by Sagamore Bridge
US 20	Portion(s)	39,429	0.5	No - Short Segment
US 44	Portion(s)	227,477	11.9	No - low VMT
US 202	Portion(s)	179,693	8.1	No - low VMT
SR 1A	Portion(s)	13,728	0.9	No - Short Segment
SR 2	Portion(s)	1,077,995	66.5	Yes - Controlled Access Portion
SR 3	Portion(s)	2,903,347	42.4	Yes - Controlled Access Portion
SR 3A	Portion(s)	13,833	0.2	No - Short Segment
SR 18	Portion(s)	66,526	1.7	No - Short Segment
SR 24	Yes	3,044,523	39.2	Yes
SR 25	Yes	400,047	10.3	Yes - by Bourne Bridge
SR 28	Portion(s)	143,735	9.2	Yes - by Bourne Bridge
SR 38	Portion(s)	1,805	0.1	No - Short Segment
SR 57	Portion(s)	133,324	5.1	No - Short Segment
SR 79	Portion(s)	71,194	4.4	No - Short Segment
SR 83	Portion(s)	7,571	0.3	No - Short Segment
SR 116	Portion(s)	29,661	2.7	No - Short Segment
SR 128	Portion(s)	991,353	18.2	Yes
SR 138	Portion(s)	4,683	0.5	No - Short Segment
SR 140	Portion(s)	737,318	19.1	Yes
SR 146	Portion(s)	559,979	17.2	Yes
SR 213	Yes	186,923	3.7	No - Short Segment

Source: MassDOT Road Inventory, 2012

Legend:

Route System: "I" = Interstate, "US"=US Highway Route, "SR"=State Route

Notes:

Note 1: "Controlled Access" column identifies if part or all of tabulated route has controlled access. Only controlled access routes are considered for statewide tolling.

Note 2: "VMT" = Vehicle Miles Travelled.

Note 3: The controlled-access portion of US 1 feeds into the Tobin Bridge which is tolled already.

The term "controlled access highways" as used within this Plan means the same as the term "limited access state highways" as used in Section 67 of the 2013 Transportation Finance Legislation, and also includes controlled access US highways within Massachusetts not currently within the Federal Interstate highway system.

Table 4-2 - Massachusetts Routes Studied for Potential Tolling

Route	Controlled Access Section	Section Length	Number of Interchanges	Weighted Average ADT
I 84	CT / Holland to Sturbridge	8.7	4	54,074
I 91	Longmeadow to Bernardston	55.0	28	43,267
I 93	Woburn to Methuen / NH	16.3	11	131,569
I 93	Boston to Woburn	12.4	12	162,859
I 93	Quincy to Boston	10.5	18	188,165
I 93	Canton to Quincy/ Braintree	6.8	7	174,591
I 95	Peabody to Salisbury	26.0	16	76,487
I 95	Canton to Peabody	37.6	35	165,152
I 95	RI / Attleboro to Canton	26.3	9	95,354
I 190	Worcester to Leominster	19.4	8	40,871
I 195	Seekonk to Wareham	41.0	23	57,394
I 290	Auburn to Marlborough	20.2	21	88,315
I 291	Sprinfield to Chicopee	5.4	8	75,552
I 295	North Attleborough to Attleborough	4.5	2	37,348
I 391	Chicopee to Holyoke	4.6	6	40,177
I 395	Webster to Auburn	12.0	6	47,445
I 495	Wareham to Salisbury	122.9	57	88,157
US 3	Burlington to New Hampshire	21.7	14	89,787
US 6	Bourne to Orleans	36.9	23	37,358
US 44	Plymouth to Middleborough	11.9	6	19,132
SR 2	Greenfield to Acton	60.8	41	28,717
SR 2	Waltham to Cambridge	5.7	9	71,669
SR 3	Sagamore Beach to Braintree	42.4	19	68,400
SR 24	Fall River to Randolph	39.2	21	77,733
SR 25	Wareham to Bourne	10.3	3	38,828
SR 28	Bourne to Falmouth	8.3	8	28,828
SR 128	Gloucester to Peabody	18.2	17	54,351
SR 140	New Bedford to Taunton	19.1	12	38,543
SR 146	Milville to Worcester	17.2	12	32,536

Source: MassDOT Road Inventory, 2012

Legend

Route System: "I"=Interstate, "US"=US Highway, "SR"=State Route

4.1.3 Locating Toll Points

With AET there are no toll plazas, but rather toll points as depicted in Figure 2-2. Toll Points are service locations on the road with an overhead toll gantry. A gantry looks more or less like the support structure for overhead highway signs.

The toll gantry supports the actual toll equipment such as E-ZPass transponder readers, license plate cameras, and sensors to measure vehicle size for toll rate setting purposes. Toll points include all the computers and technology to support the gear on the toll gantry, and typically include a small service shelter and maintenance pullover area.

Toll points don't require a lot of space and generally can be located within existing highway rights-of-way. There is little if any right-of-way to purchase and almost any straight mainline highway location can be suitable for locating a toll point.

By highway construction standards toll points are not expensive to construct. Bid prices for these very specialized systems can vary, but for planning purposes a total cost per location (in both directions) of about $4.5 to $5.5 million was assumed, which has a substantial allowance for contingencies and inflation. Price will increase with the number of lanes and unique or complex site requirements.

Toll points would be located on the highway mainlines in between interchanges. In cases where interchanges are more than five to seven miles apart, it is simple to build a "closed" (that is, no free movement) toll system by installing a toll point between each interchange.

A reason to keeping toll points fairly close to one another would be to keep effective toll rates charged at each location low. The study generally used a car E-ZPass rate of 5¢/mile. At five to seven miles, this equates to tolls at each point of 25¢ to 35¢ - not a significant amount, and a sum that would probably drive relatively small percentages of drivers to avoid by exiting the controlled access highway and driving on local roads. The greater the distance between toll points, the higher the toll, and thus the greater the attractiveness of bypass routes around the toll points. The greater the activity of bypassing ("diversion") around toll points, the greater the impact to local communities along the bypass routes, and the less revenue collected at the toll point.

If interchanges are too closely spaced, however, the economics of construction and operations indicate that some minimum spacing between toll points should be sought. Once the space between toll points decreases below five to seven miles, the costs of construction and operations (particularly with processing and managing license plate images and invoicing) increase rapidly. For the analysis, this five- to seven-mile minimum spacing of toll points was generally used.

Where controlled access highway segments are only one or two miles long between interchanges, some of these segments would remain toll-free for local movements. The toll points would be located to minimize diversion into local communities and in sections where there are minimally attractive detour routes.

For each route, the length of the route and the number of full interchanges is tabulated. Subsequently, an estimated number of toll points are provided from which potential revenues, and costs are derived.

Also, for each section that has the potential for border tolling, the Plan identifies the issues and potential for traffic diversions that may result from the introduction of a border toll point.

4.2 Rates and Assumptions Used for Analysis

For this study, an average E-ZPass rate of 5¢ per mile for passenger cars and light trucks was used, with three times that rate for commercial vehicles. This compares favorably with other tolled Interstate and controlled access highways in the E-ZPass service area.

Table 4-3- Regional Comparable Interstate Toll Rates

State	Route	Facility	Length (mi.)	E-ZPass[1] Car Toll	¢/mi.	Cash Car Toll	¢/mi.	Pay by Plate Car Toll	¢/mi.
ME	I 95	Maine Turnpike	113.0	$6.45	5.7¢	$7.00	6.2¢	-	-
NH	I 95	NH Turnpike (Blue Star)	16.0	$1.40	8.8¢	$2.00	12.5¢	-	-
NH	SR 16	NH Turnpike (Spaulding)	33.2	$1.06	3.2¢	$1.50	4.5¢	-	-
NH	I 93 / US 3	NH Turnpike (Everett)	39.5	$1.40	3.5¢	$2.00	5.1¢	-	-
MA	I 90	Western Turnpike	120.4	$4.70	3.9¢	$4.70	3.9¢	-	-
MA	I 90	Boston Extension	11.3	$2.00	17.7¢	$2.50	22.1¢	-	-
NY	I 95	NE Thruway (1-way)	15.0	$1.66	11.1¢	$1.75	11.7¢	-	-
NJ	I 95	NJ Turnpike - Off Peak	111.0	$10.40	9.4¢	$13.85	12.5¢	-	-
DE	I 95	Del Turnpike	11.2	$4.00	35.7¢	$4.00	35.7¢	-	-
MD	I 95	JFK Highway (1-way)	50.0	$7.20	14.4¢	$8.00	16.0¢	$12.00	24.0¢
MD	SR 200	AET - ICC - Overnight	18.8	$1.60	8.5¢	-	-	$2.60	13.8¢
MD	SR 200	AET - ICC - Off Peak	18.8	$3.20	17.0¢	-	-	$4.80	25.5¢
MD	SR 200	AET - ICC - Peak	18.8	$4.00	21.3¢	-	-	$6.00	31.9¢
NC	SR 540	AET - Triangle Exp	18.6	$2.91	15.6¢	-	-	$4.46	24.0¢
MA	I 90	Williams Tunnel (1-way)	-	$3.00	-	$3.50	-	-	-
RI	SR 138	Pell Bridge	-	$4.00	-	$4.00	-	$10.00	-
NY	I 95	Geo Wash Br (1-way) Peak	-	$10.25	-	$13.00	-	-	-
NY	I 95	Geo Wash Br (1-way) Off Pk	-	$8.25	-	$13.00	-	-	-
DE	I 95	Del Mem Br (1-way)	-	$4.00	-	$4.00	-	-	-
MD	I 95	Ft. McHenry Tunnel	-	$3.60	-	$4.00	-	$6.00	-

Note [1] - Rates shown do not include local resident discounts, but do include state E-ZPass discounts.

The exception to this average rate was on the four potential toll points on the central section of I-93 - two south of the Central Artery Tunnel, and two on the northern segment between the Zakim Bridge and the I-95 interchange. A toll rate of $0.75 for cars and $2.25 for heavy trucks was used for the analysis at these locations. These would add up to $1.50

for cars entering or leaving Boston, a similar rate to that charged for the Harbor Crossings and slightly below that to use the Massachusetts Turnpike.

Just for these four toll points, a test of the impact of peak period pricing was also calculated, assuming a 50% discount used by 10% of the drivers on evening or overnight hours generally, and peak period pricing of a 50% increase paid by 40% of the drivers during the peak hours of the day.

A $0.75 toll for E-ZPass cars was also used at the toll points near the Cape Cod Crossings. Routes which were relatively short would have just one toll zone, for which a $0.50 toll for E-ZPass cars was used.

This study also included a 50% surcharge for PAY BY PLATE MA customers, and would not allow a discount rate to be applied to PAY BY PLATE customers.

To estimate the revenue of a border-tolling only regimen, a car toll rate of $1 was used, with trucks at $3. It was assumed that the border tolling would be two-way at each location.

Diversions were calculated on a scale similar to that described in a Reason Foundation study[17], except diversions were capped at 30% of traffic, and then factors were added to consider how attractive or unattractive the potential detour route was.

It was generally assumed that 70 to 75% of cars would be paying with E-ZPass, and 80% to 85% of trucks would be using E-ZPass by 2018.

For drivers without E-ZPass who would be receiving toll invoices based on license plate images, they would all owe the toll and be treated as violators if the toll was not paid, but for the purposes of estimating revenue, it was assumed that less than 100% of all invoices would be paid in a timely manner. It could be reasonably expected this would increase – along with E-ZPass participation – over time as drivers learned how to save money and avoid penalties.

[17] Interstate 2.0: Modernizing the Interstate Highway System via Toll Finance by Robert W. Poole, Jr., Reason Foundation.

4.3 Results by Route Section

Based on the assumptions described above, Table 4-4 below lists potential gross tolling revenues by route and roadway section.

Table 4-4 - Listing of Potential Gross Revenues by Route and Section

Route	Toll Point Locations	E-ZPass Car Toll	Annual Rev ($m)
I 84	One Toll Point by CT Border	$0.50	$11
I 91	Toll Points on I-91	$0.05 /mi	$42
I 93	Toll Points between I-95 and NH	$0.05 /mi	$39
I 93	Toll Point in area of Exits 35 or 36	$0.75	$47
I 93	Toll Point north of Exit 26	$0.75	$38
I 93	Toll Point by Exit 18	$0.75	$41
I 93	Toll Point in area of Exit 11	$0.75	$42
I 93	Toll Point between I-95 and Rt 3	$0.50	$34
I 93	**Total**	**> $0.05 /mi**	**$241**
I 95	Toll Points north of Rt 128	$0.05 /mi	$29
I 95	Toll Points around Boston	$0.05 /mi	$91
I 95	Toll Points south of I-93	$0.05 /mi	$43
I 95	**Total**	**$0.05 /mi**	**$163**
I 190	Toll Points on I-190	$0.05 /mi	$13
I 195	Toll Points on I-195	$0.05 /mi	$36
I 290	Toll Points on I-290	$0.05 /mi	$28
I 291	Toll Point on I-291	$0.50	$16
I 295	Toll Point on I-295	$0.50	$8
I 391	Toll Point on I-391	$0.50	$9
I 395	Toll Points on I-395	$0.05 /mi	$10
I 495	Toll Points on I-495	$0.05 /mi	$165
All Interstate Routes			**$742**
US 3	Toll Points on US 3	$0.05 /mi	$34
US 6	Toll Point near Sagamore Bridge	$0.75	$19
SR 2	Toll Points on SR 2	$0.05 /mi	$35
SR 2	Toll Points on SR 2 (inside I-95)	$0.05 /mi	$7
SR 3	Toll Points on SR 3	$0.05 /mi	$45
SR 24	Toll Points on SR 24	$0.05 /mi	$51
SR 25/28	Toll Point near Bourne Bridge	$0.75	$11
SR 128	Toll Points on SR 128	$0.05 /mi	$17
SR 140	Toll Points on SR 140	$0.05 /mi	$13
SR 146	Toll Points on SR 146	$0.05 /mi	$11
All Other Study Expressways			**$243**
TOTAL ALL STUDY ROUTES			**$985**

The impact of time of day pricing was also estimated by removing half of the toll revenue and substituting the potential toll revenue collected during discount rate hours (lower) and peak rates (higher), and it appeared there would be a potential addition of about $26 million per year in revenue.

Much further detailed analysis into proper time of day pricing rates, driver sensitivity to those rates, and a determination of the policy goals of pricing – whether to maximize revenue or maximize throughput – would be required in much greater detail before final design and rate choices were made.

Nonetheless, it is believed the numbers here provide a good representation of the potential to generate revenue to maintain and improve these assets.

4.4 In-State Toll Routes

This section describes the physical and operational characteristics of potential tolling roadway segments. Included are route lengths, annual daily traffic volumes, daily vehicle miles traveled, the percentage of trucks, and the number of interchanges along each roadway segment.

4.4.1 Interstate Highway 84

This nine-mile segment of I-84 is essentially a feeder route to the Massachusetts Turnpike. Basic study route data is listed below.

Table 4-5 - Interstate 84 Tolling Data

Length (mi)	8.7
Overall Annual Average Daily Traffic	54,074
Daily Vehicle Miles Travelled (million)	0.5
Approximate Truck% Used in Study	25%
Number of Interchanges	4
Estimated Number of Toll Zones	1

The existing toll plaza entering into the Turnpike is at the northern end of the study segment. A toll point located near the old plaza or on the northern section might induce some traffic to drive around the toll point.

4.4.2 Interstate Highway 91

This 55-mile portion of I-91 runs in a north/south direction through the Connecticut River Valley between Enfield, CT and Gilford, VT. I-91 Interchange 14 provides access to the Massachusetts Turnpike and US Route 5 in West Springfield. Basic study route data is listed below.

Table 4-6 - Interstate 91 Tolling Data

Length (mi)	55.0
Overall Annual Average Daily Traffic	43,267
Daily Vehicle Miles Travelled (million)	2.4
Approximate Truck% Used in Study	13%
Number of Interchanges	28
Estimated Number of Toll Zones	8

4.4.3 Interstate Highway 93

Interstate Highway 93 is the major north-south route through central Boston, through the Central Artery Tunnel, extending from a southern terminus with I-95 through Boston north, back across I-95 and then continuing up to New Hampshire. The route is considered in several sections, each of which have separate characteristics and would be treated distinctly for toll concept development purposes.

Interstate Highway 93 - from I-95 in Canton to Route 3 in Quincy

This very-high-traffic seven-mile portion of roadway forms the southern portion of the circumferential route surrounding the Boston metropolitan area, from I-95 to the junction with Route 3. Basic study route data is listed below.

Table 4-7 - Interstate 93 from I-95 in Canton to Route 3 in Quincy

Length (mi)	6.8
Overall Annual Average Daily Traffic	174,591
Daily Vehicle Miles Travelled (million)	1.2
Approximate Truck% Used in Study	4%
Number of Interchanges	7
Estimated Number of Toll Zones	1

Interstate Highway 93 - Through Boston (Route 3 Quincy to I-95 Woburn)

This 24-mile section of roadway runs north/south through the heart of Boston and is the primary route of the Central Artery Tunnel, connecting Route 3 in Quincy to I-95 in Reading. In Boston, I-93 connects with many major routes including the Massachusetts Turnpike, US 1 and other major routes. Basic study route data is listed below.

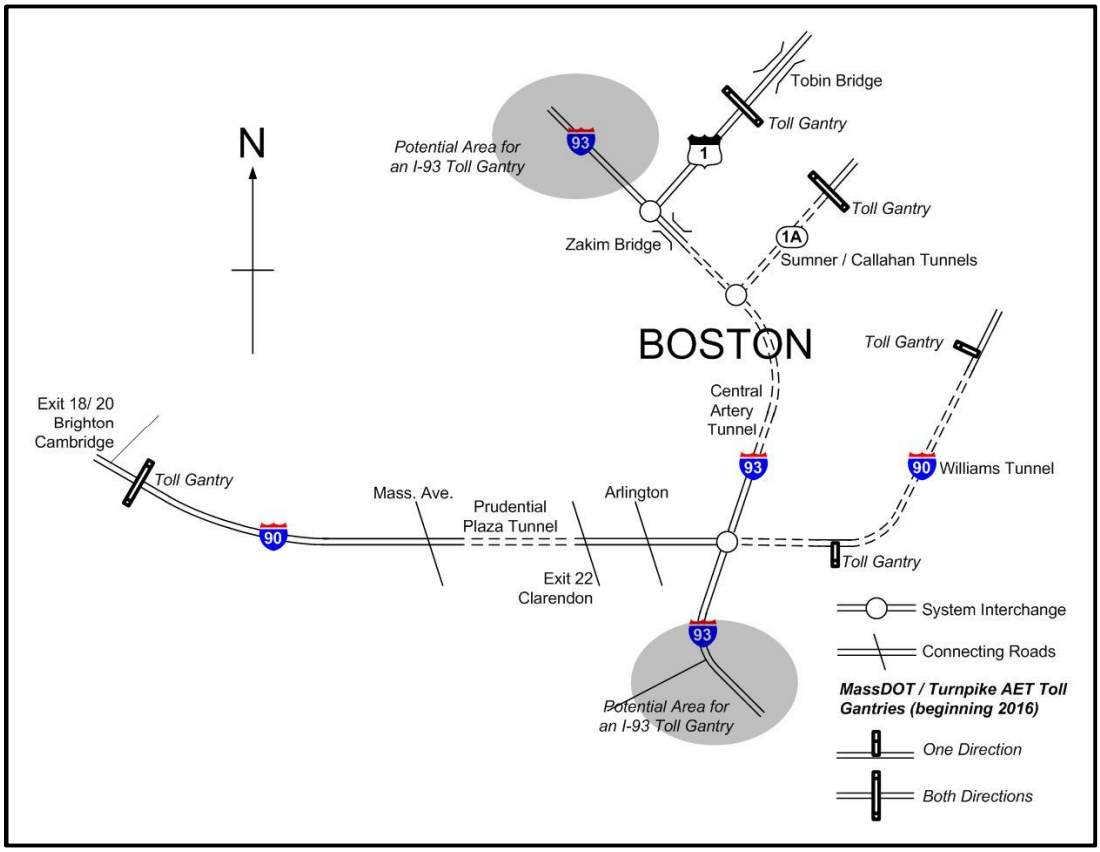
Table 4-8 - Interstate 93 Through Boston (Route 3 Quincy to I-95 Woburn) Tolling Data

Length (mi)	24.1
Overall Annual Average Daily Traffic	175,512
Daily Vehicle Miles Travelled (million)	2.0
Approximate Truck% Used in Study	4%
Number of Interchanges	30
Estimated Number of Toll Zones	4

This section could be considered for variable pricing to manage traffic because of the very high traffic volumes, in and out of the center business district.

Toll points would be located outside of the central business district (electronic tolling in tunnels is technically challenging). Tolling points located just north and south of Boston also effectively would complete a tolling "cordon" around Boston, as the other major controlled access highways in and out of the Boston central business district are all currently tolled. The tolled highways include the Massachusetts Turnpike from the west, the Williams and Sumner/Callahan Tunnels from the east and the Tobin Bridge from the northeast. Adding tolls to I-93 would improve equity, in that all drivers coming into Boston on a controlled access highway would pay for that service. This could function somewhat like a cordon and allow for variable pricing in the future.

Figure 4-2 – I-93 Central Boston Tolling Area



In addition to the highways depicted in Figure 4-2, there is one short roadway segment, Storrow Drive, along the south bank of the Charles River. Storrow Drive offers a toll-free bypass around the Mass Pike between Cambridge and Boston, and already operates at its capacity today.

Interstate Highway 93 - From I-95 Woburn to New Hampshire

This 16-mile section of road is one of three major connections between Greater Boston and points north. It runs between I-95 by Woburn north to the New Hampshire border. I-93 also connects with I-495 in Andover. Basic study route data is listed below.

Table 4-9 - Interstate 93 from I-95 in Reading to Methuen/New Hampshire Tolling Data

Length (mi)	16.3
Overall Annual Average Daily Traffic	131,569
Daily Vehicle Miles Travelled (million)	2.1
Approximate Truck% Used in Study	15%
Number of Interchanges	11
Estimated Number of Toll Zones	3

4.4.4 Interstate Highway 95

Interstate 95 is the major eastern United States north-south coastal route. In Massachusetts it comes up from Providence, RI to the interchange with I-93 and with SR 128 forms the inner beltway around Boston. North of the city, SR 128 splits off, and I-95 continues up to the New Hampshire Border. I-95 is considered in three segments.

Interstate Highway 95 – From I-93 in Canton to Rhode Island

This 26-mile route runs northeast from Providence, RI to Canton where it intersects with I-93. This portion of I-95 connects with US 1 twice (in Sharon and in Attleboro), and intersects with I-495 in Mansfield. Basic study route data is listed below.

Table 4-10 - Interstate 95 from RI to I-93 in Canton Tolling Data

Length (mi)	26.3
Overall Annual Average Daily Traffic	95,354
Daily Vehicle Miles Travelled (million)	2.5
Approximate Truck% Used in Study	16%
Number of Interchanges	9
Estimated Number of Toll Zones	4

Interstate Highway 95 – From I-93 in Canton to Route 128 in Peabody

This 38-mile portion of roadway forms most of the inner circumferential route around Greater Boston. This route intersects with most of the radial routes to/from Boston, including US 1 in Dedham, I-90 in Weston, Route 2 in Lexington, US 3 in Burlington, I-93 in Reading, and Route 128 in Peabody. Basic study route data is listed below.

Table 4-11 - Interstate 95 from I-93 in Canton to Route 128 in Peabody Tolling Data

Length (mi)	37.6
Overall Annual Average Daily Traffic	165,152
Daily Vehicle Miles Travelled (million)	6.2
Approximate Truck% Used in Study	7%
Number of Interchanges	35
Estimated Number of Toll Zones	7

Interstate Highway 95 – From Route 128 in Peabody to New Hampshire

This 26-mile section of roadway runs in a north/south orientation between Route 128 in Peabody and the New Hampshire border. This portion of I-95 connects with US 1 in Danvers and I-495 in Salisbury, Massachusetts. Basic study route data is listed below.

Table 4-12 - Interstate 95 from Route 128 in Peabody to New Hampshire Tolling Data

Length (mi)	26.3
Overall Annual Average Daily Traffic	95,354
Daily Vehicle Miles Travelled (million)	2.5
Approximate Truck% Used in Study	16%
Number of Interchanges	9
Estimated Number of Toll Zones	4

4.4.5 Interstate Highway 190

Interstate 190 is approximately 19 miles and extends north from Worcester towards Leominster and Route 2. Basic study route data is listed below.

Table 4-13 - Interstate 190 Tolling Data

Length (mi)	19.4
Overall Annual Average Daily Traffic	40,871
Daily Vehicle Miles Travelled (million)	0.8
Approximate Truck% Used in Study	10%
Number of Interchanges	9
Estimated Number of Toll Zones	4

4.4.6 Interstate Highway 195

This 41-mile roadway connects East Providence, Rhode Island with Wareham, Massachusetts. I-195 connects with State Routes 79 and 24 in Fall River, Route 140 in New Bedford, and I-495 in Wareham. Basic study route data is listed below.

Table 4-14 - Interstate 195 Tolling Data

Length (mi)	41.0
Overall Annual Average Daily Traffic	57,394
Daily Vehicle Miles Travelled (million)	2.4
Approximate Truck% Used in Study	10%
Number of Interchanges	23
Estimated Number of Toll Zones	7

4.4.7 Interstate Highway 290

This 20-mile route runs in a northeasterly direction from I-90 in Auburn to I-495 in Marlborough. I-290 connects with State Routes 146 and 9, as well as I-190 in Worcester. Basic study route data is listed below.

Table 4-15 - Interstate 290 Tolling Data

Length (mi)	20.2
Overall Annual Average Daily Traffic	88,315
Daily Vehicle Miles Travelled (million)	1.8
Approximate Truck% Used in Study	10%
Number of Interchanges	21
Estimated Number of Toll Zones	3

4.4.8 Interstate Highway 291

Interstate 291 runs in a northeast/southwest direction and connects the Massachusetts Turnpike (I-90) with I-91 in Springfield. Basic study route data is listed below.

Table 4-16 - Interstate 291 Tolling Data

Length (mi)	5.4
Overall Annual Average Daily Traffic	75,552
Daily Vehicle Miles Travelled (million)	0.4
Approximate Truck% Used in Study	10%
Number of Interchanges	8
Estimated Number of Toll Zones	1

4.4.9 Interstate Highway 295

This 4.5-mile section of roadway runs between North Attleboro (Rhode Island border) and I-95 in Attleboro. This section of I-295 runs in an east/west direction and provides a connection with US 1 in North Attleboro. Basic study route data is listed below.

Table 4-17 - Interstate 295 Tolling Data

Length (mi)	4.5
Overall Annual Average Daily Traffic	37,348
Daily Vehicle Miles Travelled (million)	0.2
Approximate Truck% Used in Study	5%
Number of Interchanges	2
Estimated Number of Toll Zones	1

4.4.10 Interstate Highway 391

Interstate 391 provides a short 4.6-mile connector through Springfield on the east side of the Connecticut River north to a river crossing and Holyoke. Basic study route data is listed below.

Table 4-18 - Interstate 391 Tolling Data

Length (mi)	4.6
Overall Annual Average Daily Traffic	40,177
Daily Vehicle Miles Travelled (million)	0.2
Approximate Truck% Used in Study	18%
Number of Interchanges	6
Estimated Number of Toll Zones	1

4.4.11 Interstate Highway 395

This 12-mile roadway runs in a north/south direction between I-90 in Auburn and the Connecticut border. Basic study route data is listed below.

Table 4-19 - Interstate 395 Tolling Data

Length (mi)	12.0
Overall Annual Average Daily Traffic	47,445
Daily Vehicle Miles Travelled (million)	0.6
Approximate Truck% Used in Study	14%
Number of Interchanges	6
Estimated Number of Toll Zones	2

4.4.12 Interstate Highway 495

This 123-mile highway forms the outer beltway around Metropolitan Boston, and is the longest route in this study. It connects I-95 in Salisbury north of Boston to I-195 and Route 25 in Wareham south of Boston. I-495 intersects with most of the radial routes to and from Boston, including I-93 in Andover, US 3 in Chelmsford, I-290 in Marlborough, I-90 in Hopkinton, I-95 in Foxborough/Mansfield, and Route 24 in Bridgewater/Raynham. Basic study route data is listed below.

Table 4-20 - Interstate 495 Tolling Data

Length (mi)	122.9
Overall Annual Average Daily Traffic	88,157
Daily Vehicle Miles Travelled (million)	10.8
Approximate Truck% Used in Study	9%
Number of Interchanges	57
Estimated Number of Toll Zones	20

4.4.13 State Route 3 from Sagamore Bridge to I-95 in Quincy/Braintree

This 42-mile portion of Route 3 runs in a northwesterly direction between the Sagamore Bridge in Bourne and I-93 in Braintree. This represents one of the major routes between Boston and Cape Cod. Route 3 connects with US 44 in Plymouth. Basic study route data is listed below.

Table 4-21 –State Route 3 from Sagamore Bridge to I-95 in Quincy/Braintree Tolling Data

Length (mi)	42.4
Overall Annual Average Daily Traffic	68,400
Daily Vehicle Miles Travelled (million)	2.9
Approximate Truck% Used in Study	5%
Number of Interchanges	19
Estimated Number of Toll Zones	7

4.4.14 US Route 3 from I-95 in Burlington to New Hampshire

This 22-mile portion of US 3 runs in a northwesterly direction between I-95 in Burlington to Tyngsborough and the New Hampshire border. US 3 is one of the major north/south routes to and from the Greater Boston area. It intersects I-495 in Chelmsford. Basic study route data is listed below.

Table 4-22 – US Route 3 from Burlington to New Hampshire Tolling Data

Length (mi)	21.7
Overall Annual Average Daily Traffic	89,787
Daily Vehicle Miles Travelled (million)	1.9
Approximate Truck% Used in Study	12%
Number of Interchanges	14
Estimated Number of Toll Zones	3

4.4.15 State Route 24

This 39-mile roadway runs in a north/south direction connecting I-93 in Randolph to Fall River and the Rhode Island border. Route 24 provides connections with I-495 in Bridgewater/Raynham, US 44 in Raynham, Route 140 in Taunton, and Route 79, US 6, and I-195 in Fall River. Basic study route data is listed below.

Table 4-23 – State Route 24 Tolling Data

Length (mi)	39.2
Overall Annual Average Daily Traffic	77,733
Daily Vehicle Miles Travelled (million)	3.0
Approximate Truck% Used in Study	10%
Number of Interchanges	21
Estimated Number of Toll Zones	7

4.4.16 State Route 146

This 17-mile roadway runs in a southeasterly direction between I-290 in Worcester and Millville on the Rhode Island border. This road represents a direct connection between Worcester and Providence. It provides a connection to I-90 in Millbury. Basic study route data is listed below.

Table 4-24 – State Route 146 Tolling Data

Length (mi)	17.2
Overall Annual Average Daily Traffic	32,536
Daily Vehicle Miles Travelled (million)	0.6
Approximate Truck% Used in Study	19%
Number of Interchanges	12
Estimated Number of Toll Zones	3

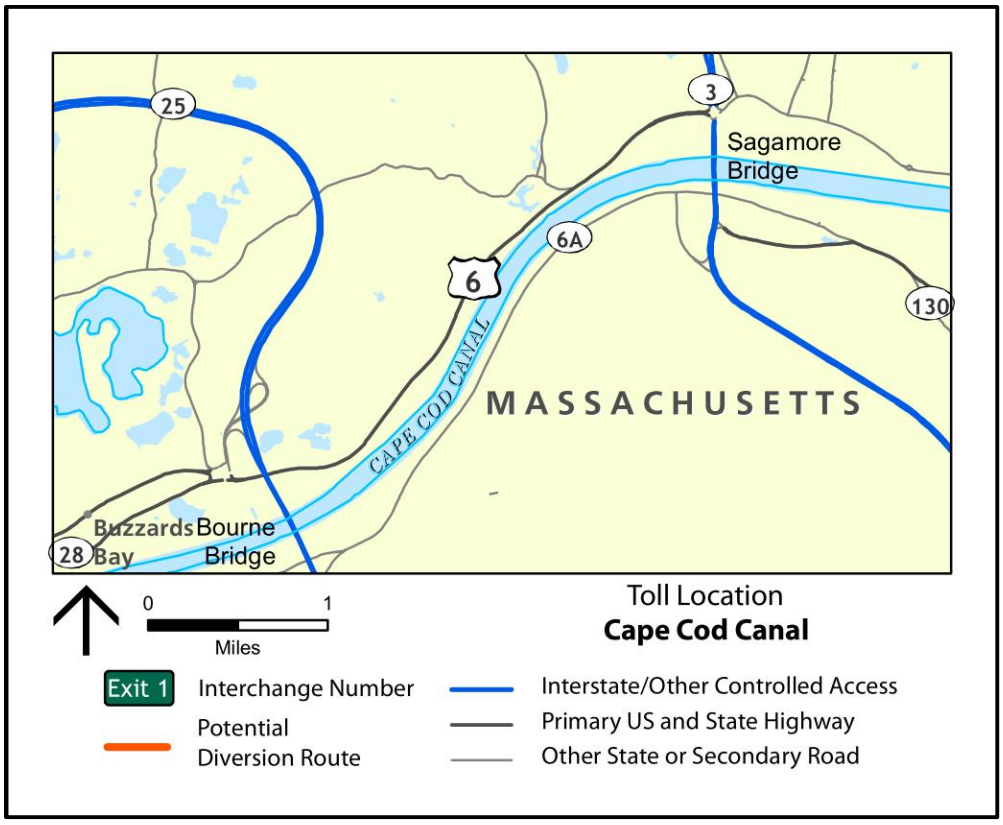
4.4.17 Cape Cod Canal Bridges

Route 28 in Bourne crosses the westerly portion of the Cape Cod Canal via the Bourne Bridge. Route 6 in Bourne crosses the easterly portion of the Cape Cod Canal via the Sagamore Bridge. These two bridges represent the only automobile connections to Cape Cod. Basic study route data is listed below.

Table 4-25 – Cape Cod Canal Bridges Tolling Data

US 6 / SR 3 - BOURNE BRIDGE	
Overall Annual Average Daily Traffic	45,053
Peak Season Daily Traffic	60,000
Daily Vehicle Miles Travelled	49,558
Approximate Truck% Used in Study	4%
Number of Interchanges	1
Estimated Number of Toll Zones	1
SR 25 / SR 28 - SAGAMORE BRIDGE	
Overall Annual Average Daily Traffic	66,464
Peak Season Daily Traffic	75,000
Daily Vehicle Miles Travelled	50,709
Approximate Truck% Used in Study	9%
Number of Interchanges	2
Estimated Number of Toll Zones	1

Figure 4-3 – Cape Cod Canal Crossing Bridges



Diversion Potential: *No automobile diversion routes are available for the bridge crossings. The only other way to cross the Cape Cod Canal is by train via the CapeFlyer seasonal passenger rail.*

4.5 Capital and Operating Costs

This section summarizes both capital costs and operational costs associated with the potential tolling options under consideration. Table 4-26 provides summary capital costs.

Table 4-26 - Estimate of AET Capital Costs

Route	Toll Point Locations	Segment Length	Capital Costs ($m)
I 84	One Toll Point by CT Border	8.1 mi	$6
I 91	Toll Points on I-91	54.8 mi	$26
I 93	Toll Points between I-95 and NH	15.1 mi	$13
I 93	Toll Point in area of Exits 35 or 36	6.7 mi	$6
I 93	Toll Point north of Exit 26	6.7 mi	$6
I 93	Toll Point by Exit 18	5.4 mi	$6
I 93	Toll Point in area of Exit 11	5.4 mi	$6
I 93	Toll Point between I-95 and Rt 3	6.8 mi	$4
I 93	Total	30.9 mi	$41
I 95	Toll Points north of Rt 128	26.0 mi	$22
I 95	Toll Points around Boston	37.6 mi	$39
I 95	Toll Points south of I-93	26.3 mi	$18
I 95	Total	89.9 mi	$79
I 190	Toll Points on I-190	19.4 mi	$13
I 195	Toll Points on I-195	41.0 mi	$31
I 290	Toll Points on I-290	20.2 mi	$13
I 291	Toll Point on I-291	5.4 mi	$4
I 295	Toll Point on I-295	4.5 mi	$4
I 391	Toll Point on I-391	4.6 mi	$4
I 395	Toll Points on I-395	12.0 mi	$9
I 495	Toll Points on I-495	121.8 mi	$88
All Interstate Routes		412.6 mi	$318
US 3	Toll Points on US 3	20.5 mi	$13
US 6	Toll Point near Sagamore Bridge	40.8 mi	$6
SR 2	Toll Points on SR 2	60.8 mi	$44
SR 2	Toll Points on SR 2 (inside I-95)	5.7 mi	$4
SR 3	Toll Points on SR 3	42.5 mi	$31
SR 24	Toll Points on SR 24	40.7 mi	$31
SR 25/28	Toll Point near Bourne Bridge	9.4 mi	$6
SR 128	Toll Points on SR 128	18.2 mi	$13
SR 140	Toll Points on SR 140	19.1 mi	$13
SR 146	Toll Points on SR 146	17.2 mi	$10
All Other Study Expressways		275.1 mi	$171
	TOTAL ALL STUDY ROUTES	687.6 mi	$489

Operating costs were considered to include the costs of maintaining the actual lane equipment and system costs directly related to toll activity on each section of highway, (image processing, invoice mailing, credit card fees, etc.), and the increased cost of E-ZPass account operations in the MA CSC. For purposes of this study, the cost of Turnpike AET customer service operations is assumed to double, to approximate the additional costs

incurred from additional E-ZPass account management. Table 4-27 provides summary operations costs.

Table 4-27 - Estimated AET Tolls Operations Costs

Route	Toll Point Locations	Ops Costs ($m)
I 84	One Toll Point by CT Border	$2 /yr
I 91	Toll Points on I-91	$6 /yr
I 93	Toll Points between I-95 and	$5 /yr
I 93	Toll Point in area of Exits 35 c	$5 /yr
I 93	Toll Point north of Exit 26	$4 /yr
I 93	Toll Point by Exit 18	$5 /yr
I 93	Toll Point in area of Exit 11	$5 /yr
I 93	Toll Point between I-95 and F	$4 /yr
I 93	Total	$28 /yr
I 95	Toll Points north of Rt 128	$4 /yr
I 95	Toll Points around Boston	$11 /yr
I 95	Toll Points south of I-93	$5 /yr
I 95	Total	$20 /yr
I 190	Toll Points on I-190	$2 /yr
I 195	Toll Points on I-195	$6 /yr
I 290	Toll Points on I-290	$4 /yr
I 291	Toll Point on I-291	$2 /yr
I 295	Toll Point on I-295	$1 /yr
I 391	Toll Point on I-391	$1 /yr
I 395	Toll Points on I-395	$2 /yr
I 495	Toll Points on I-495	$21 /yr
All Interstate Routes		$95 /yr
US 3	Toll Points on US 3	$4 /yr
US 6	Toll Point near Sagamore Bric	$4 /yr
SR 2	Toll Points on SR 2	$6 /yr
SR 2	Toll Points on SR 2 (inside I-9	$1 /yr
SR 3	Toll Points on SR 3	$7 /yr
SR 24	Toll Points on SR 24	$8 /yr
SR 25/28	Toll Point near Bourne Bridge	$2 /yr
SR 128	Toll Points on SR 128	$2 /yr
SR 140	Toll Points on SR 140	$2 /yr
SR 146	Toll Points on SR 146	$2 /yr
All Other Study Expressways		$38 /yr
	TOTAL ALL STUDY ROUTES	$133 /yr
Additional E-ZPass Management Costs		$18 /yr
	Total Operations Costs	$151 /yr

4.6 Summary

Without consideration of whether it would be permissible by Federal legislation and regulation to toll the Massachusetts controlled access highway network, it appears that from a system design perspective that statewide tolling would be feasible.

With reasonably close toll point spacing, it is possible to assess toll rates low enough that diversion, that is, drivers taking alternate routes to avoid individual toll zones, should be kept to low amounts, and to spread tolls reasonably equitably across geographic regions.

If Massachusetts were to pursue reconstruction of specific segments of the non-Interstate portions of this controlled access highway system, which would then meet Section 129 requirements to allow tolling, an AET solution for those individual sections should be possible in most locations.

5 Border Tolling

5.1 Border Tolling Pricing

Table 5-1 provides revenue estimates for a $1 border toll at selected location. There was a somewhat increased diversion from the system tolls because of the higher toll rates at these spot locations.

Table 5-1 - Listing of Potential Gross Revenues from Border Tolling

Number	Toll Point Locations	E-ZPass Car Toll	Annual Rev ($m)
I 84	CT Border	$1.00	$17
I 91	CT Border	$1.00	$18
I 91	VT Border	$1.00	$5
I 93	NH Border	$1.00	$27
I 95	RI Border	$1.00	$25
I 95	NH Border	$1.00	$22
I 195	RI Border	$1.00	$20
I 295	RI Border	$1.00	$12
I 395	CT Border	$1.00	$7
US 3	NH Border	$1.00	$21
SR 24	RI Border	$1.00	$9
SR 146	RI Border	$1.00	$7
		TOTAL	$190

5.2 Border Tolls

This section describes the physical and operational characteristics of potential tolling roadway segments at border locations. Included are the length of the border toll segment, the average daily traffic at the border, and the relative attractiveness of and potential local impacts associated with the most likely diversion route.

The assessment of the “attractiveness of a diversion route to a driver” is based on a comparison of a driver’s travel time on tolled routes to travel time along diversion routes. Diversion routes resulting in travel time increases of greater than ten minutes are considered to have a “low” diversion potential. Increases between 5 and 10 minutes are rated as “medium” diversion potential, and travel time increases of five minutes or less are considered to have a “high” diversion potential. This section lists only the fastest, and therefore the most likely, diversion route around each toll point. For some routes, multiple diversions are possible.

5.2.1 Interstate Highway 84 - Connecticut

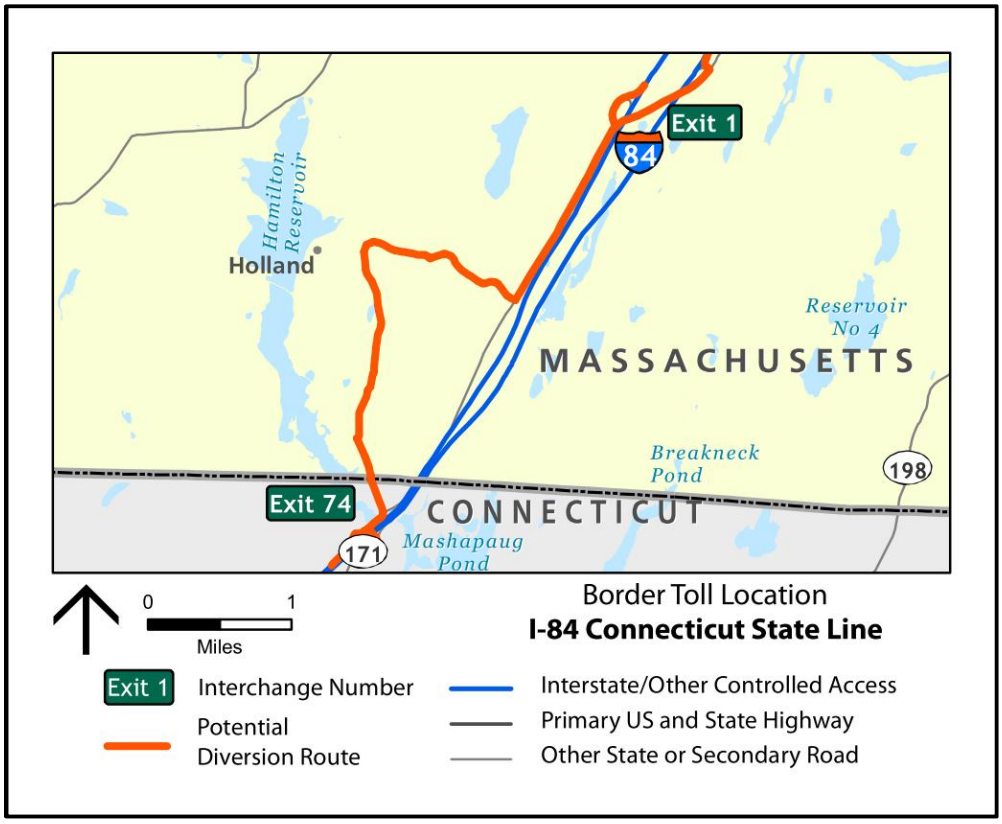
This segment of I-84 is essentially a feeder route to the Massachusetts Turnpike. Border tolling information is provided below.

Table 5-2 - Interstate 84 Connecticut Border Tolling Data

Length of Border Toll Segment (mi)	8.7
AADT in Border Toll Segment	54,074
Attractiveness of Diversion Route to Driver	Medium
Traffic Impact of Diversion on Local Communities	Low
	Undeveloped areas, low-density residential, rural/narrow 1 lane each direction with low speed limit (25 mph) and no sidewalks.

The border segment of I-84 between the northernmost interchange in Connecticut and the first interchange in Massachusetts is only a few miles, but there is no practical diversion route around this area.

Figure 5-1 - I-84 Connecticut Border Tolling Area



Diversion Potential: *The best potential diversion route leads from I-84 Exit 1 in Stur-bridge to Rt. 15, to unnumbered routes ultimately leading to I-84 Exit 74 in Union, CT.*

The diversion route shown above results in an additional nine minutes travel time along a narrow (one lane each direction), rural roadway with a 25 mph speed limit. This is a long bypass route with a medium potential for diversion.

5.2.2 Interstate Highway 91

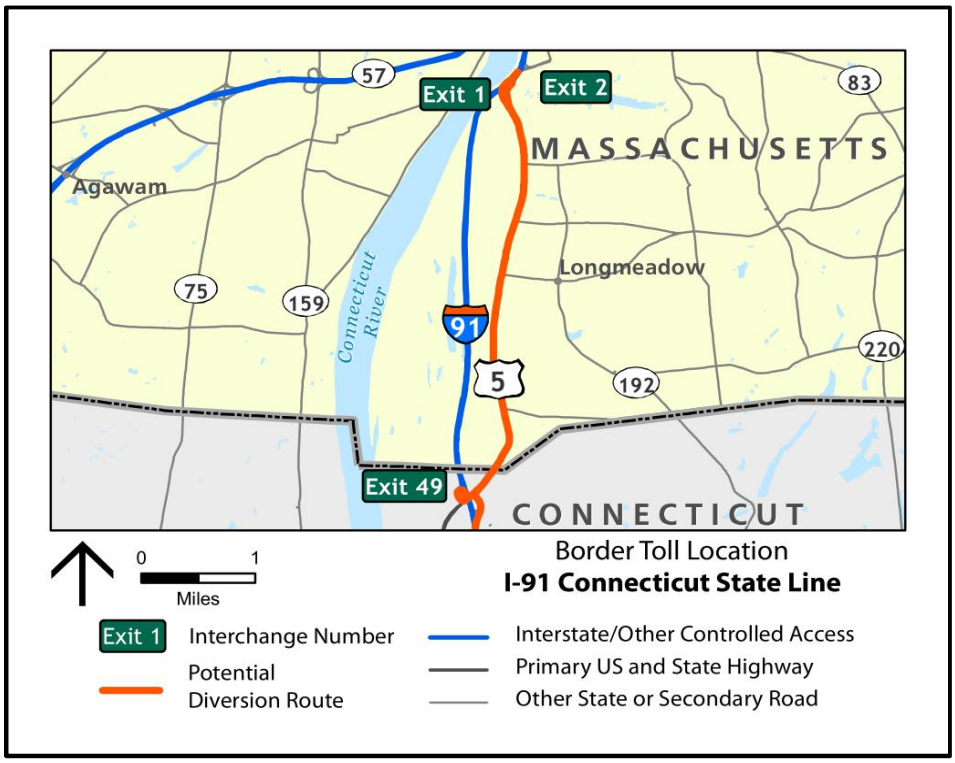
Interstate 91 runs in a north/south direction through the Connecticut River Valley, connecting to Gilford, Vermont in the north and to Enfield, Connecticut in the south. Border tolling information is provided below.

Table 5-3 - Interstate 91 Border Tolling Data

BORDER TOLL ZONE – CONNECTICUT	
Length of Border Toll Segment (mi)	3.8
AADT in Border Toll Segment	74,529
Attractiveness of Diversion Route to Driver	High
Traffic Impact of Diversion on Local Communities	High
	Single lane each direction through residential areas, with ball field, churches, elementary school, Bay Path College. Multiple lanes through commercial area.
BORDER TOLL ZONE – VERMONT	
Length of Border Toll Segment (mi)	4.5
AADT in Border Toll Segment	16,057
Attractiveness of Diversion Route to Driver	Medium
Traffic Impact of Diversion on Local Communities	Low
	Churches, commercial areas, library, fire station, farms, low-density residential areas, cemetery, undeveloped areas, camp ground. US 5 is 2-lane rural highway, 40-50 mph with no sidewalks.

I-91 Border Tolling - Connecticut

Figure 5-2 - I-91 Connecticut Border Tolling Area

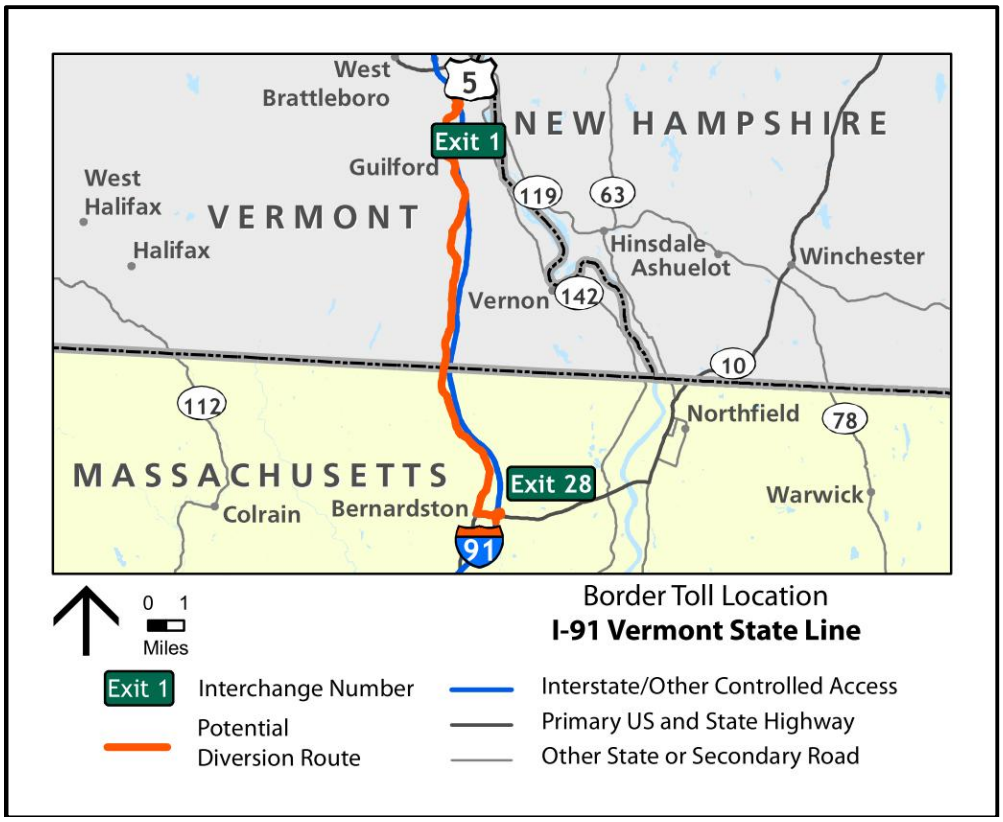


Diversion Potential: *I-91 Exit 1 in Springfield, MA to US 5. Continue on US 5 in CT to I-91 Exit 49 in Enfield, CT.*

This is a direct diversion route that only adds 3 minutes of travel time. This route has a high potential for diversion traffic along roadways with sensitive land uses, including a ball field and an elementary school.

I-91 Border Tolling - Vermont

Figure 5-3 - I-91 Vermont Border Tolling Area



Diversion Potential: *I-91 Exit 28 in Bernardston, MA to Rt. 10 to US 5. Continue on US 5 in Vermont to I-91 Exit 1 in Brattleboro, VT.*

US 5 is parallel to I-91 but an overall longer route with slightly lower speed limits (40-50 mph). The rural 2-lane diversion roadway passes by a variety of land uses and adds approximately nine minutes to overall travel time. The potential for diversion is anticipated to be medium.

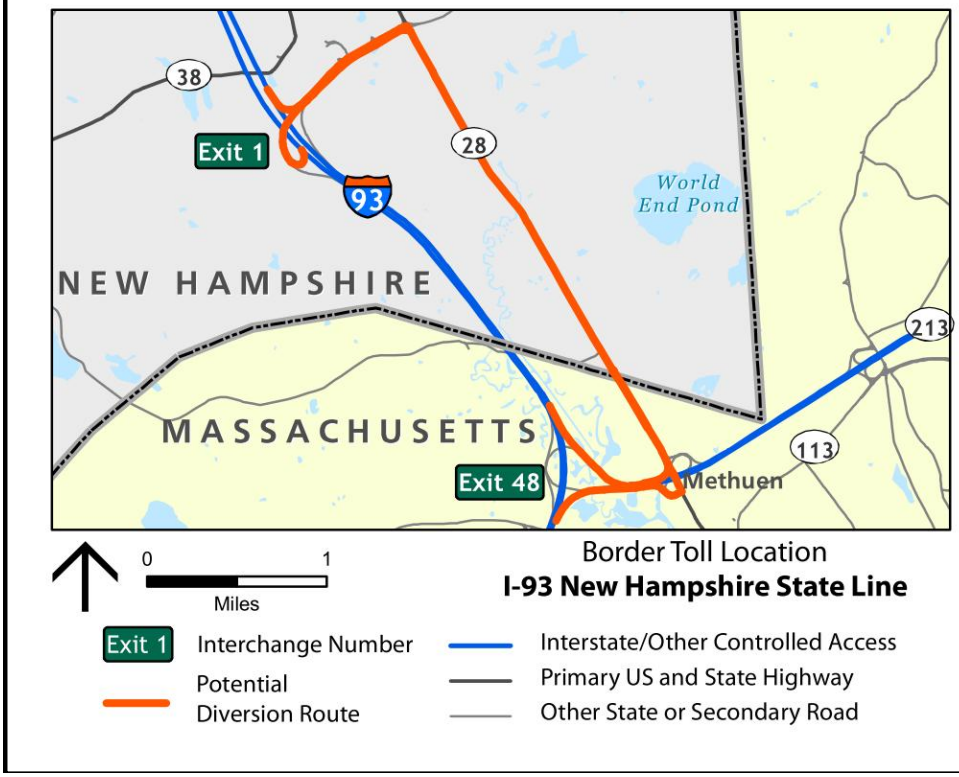
5.2.3 Interstate Highway 93 – New Hampshire

This section of I-93 is one of three major connections between Greater Boston and points north. It runs between I-95 in Reading north to the New Hampshire border. Border tolling information is provided below.

Table 5-4 - Interstate 93 New Hampshire Border Tolling Data

Length of Border Toll Segment (mi)	0.8
AADT in Border Toll Segment	103,131
Attractiveness of Diversion Route to Driver	Medium
Traffic Impact of Diversion on Local Communities	Medium
	Bird sanctuary, commercial shopping areas/malls, offices, retail, restaurants, residential areas. Rte 28 is busy commercial road with 2 lanes each direction (portions median-divided) and 30 mph speed limit.

Figure 5-4 - I-93 New Hampshire Border Tolling Area



Diversion Potential: *I-93 Exit 48 in Methuen, MA to Rt. 213, to Rt. 28. Continue on Rt. 28 in NH, to Rt. 38, to I-93 Exit 1 in Salem, NH.*

The route described above is direct and short, but slow speeds (30 mph speed limit) result in an additional ten minutes of travel time and a medium diversion potential. A majority of this diversion route is located in New Hampshire. Land uses impacted include primarily commercial, with some residential and office uses. A bird sanctuary is also located along this route adjacent to Route 213 in Massachusetts.

5.2.4 Interstate Highway 95

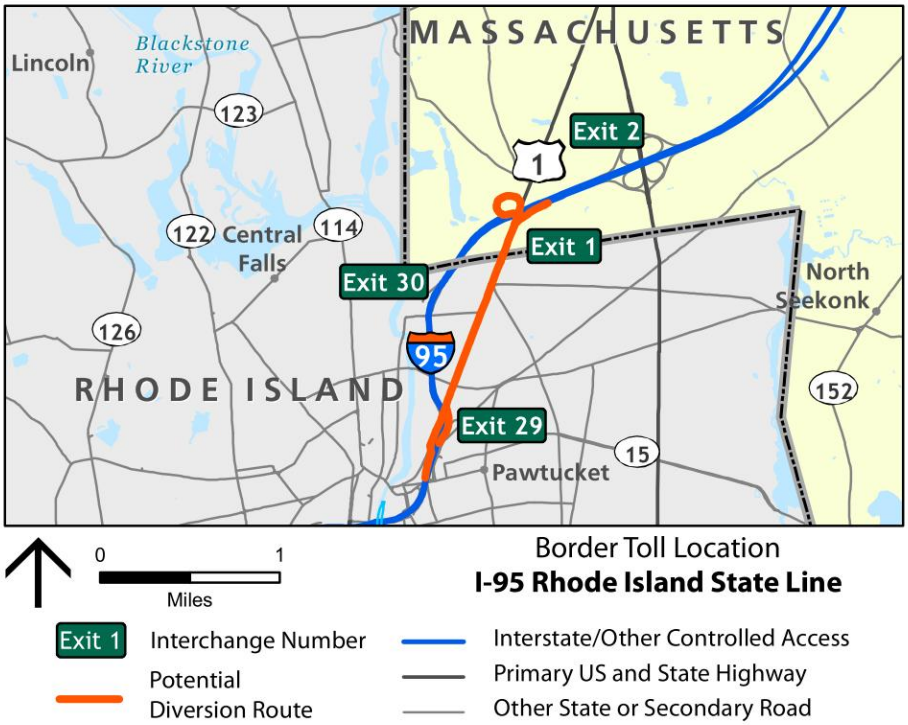
I-95 Border Tolling - Rhode Island

This portion of I-95 runs in a southwesterly direction between I-95 (which surrounds Metropolitan Boston) and Providence, Rhode Island. Border tolling information is provided below.

Table 5-5 - Interstate 95 Rhode Island Border Tolling Data

Length of Border Toll Segment (mi)	0.5
AADT in Border Toll Segment	89,054
Attractiveness of Diversion Route to Driver	High
Traffic Impact of Diversion on Local Communities	High
	Commercial area, playground, church, elementary school, residential. US 1 is 1-2 lanes each direction with 20-35 mph speed limits. Trucks currently restricted from this route.

Figure 5-5 - I-95 Rhode Island Border Tolling Area



Diversion Potential: *I-95 Exit 1 in Attleboro, MA to US 1. Continue on US 1 in RI, to I-95 Exit 29 in Pawtucket, RI.*

The route described above is direct and short with a high diversion potential. This route only adds three minutes to overall travel time, but the local community would be negatively impacted as the route passes by a playground and an elementary school (both in Pawtucket, Rhode Island). A bus route runs along US 1 in Rhode Island.

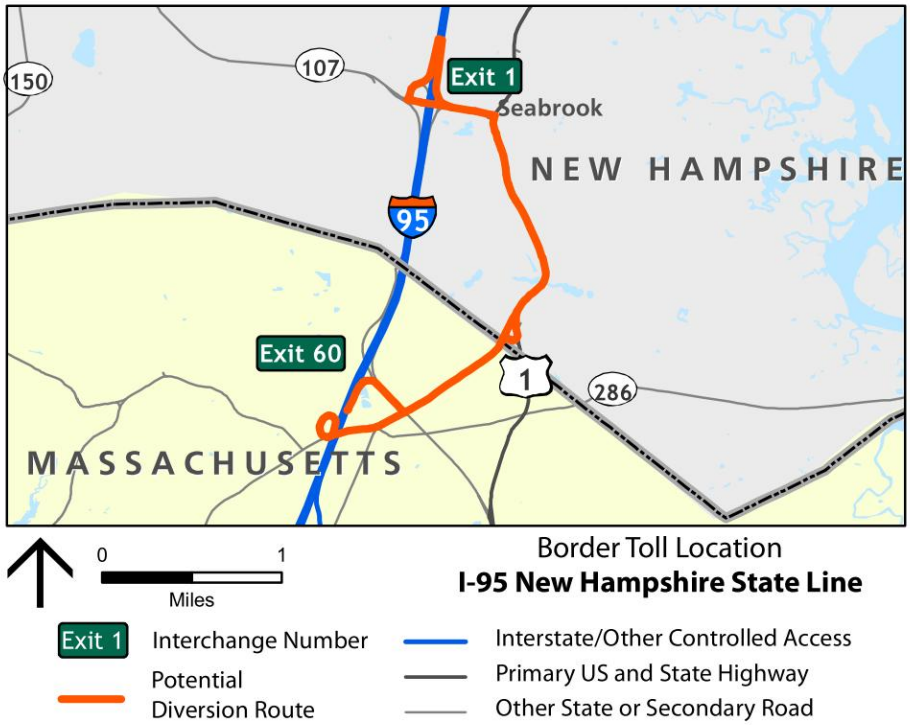
I-95 Border Tolling - New Hampshire

This northerly section of I-95 runs in a north/south orientation between Route 128 in Peabody and the New Hampshire border. Border tolling information is provided below.

Table 5-6 - Interstate 95 New Hampshire Border Tolling Data

Length of Border Toll Segment (mi)	0.5
AADT in Border Toll Segment	90,627
Attractiveness of Diversion Route to Driver	Medium
Traffic Impact of Diversion on Local Communities	Low
	Camp ground, retail, residential, churches, motel. US 1 is 1-2 lanes in each direction with a center turning lane, speed limit is 35 mph.

Figure 5-6 - I-95 New Hampshire Border Tolling Area



Diversion Potential: *I-95 Exit 60 in Salisbury, MA to Toll Road, to Main Street, to US 1 in NH, to Rt. 107, to I-95 Exit 1 in Salem, NH.*

The diversion route described above passes by churches, retail and residential uses. The speed limit along US 1 in this vicinity is 35 mph, and the diversion adds approximately seven minutes to the overall travel time. This route has a medium diversion potential.

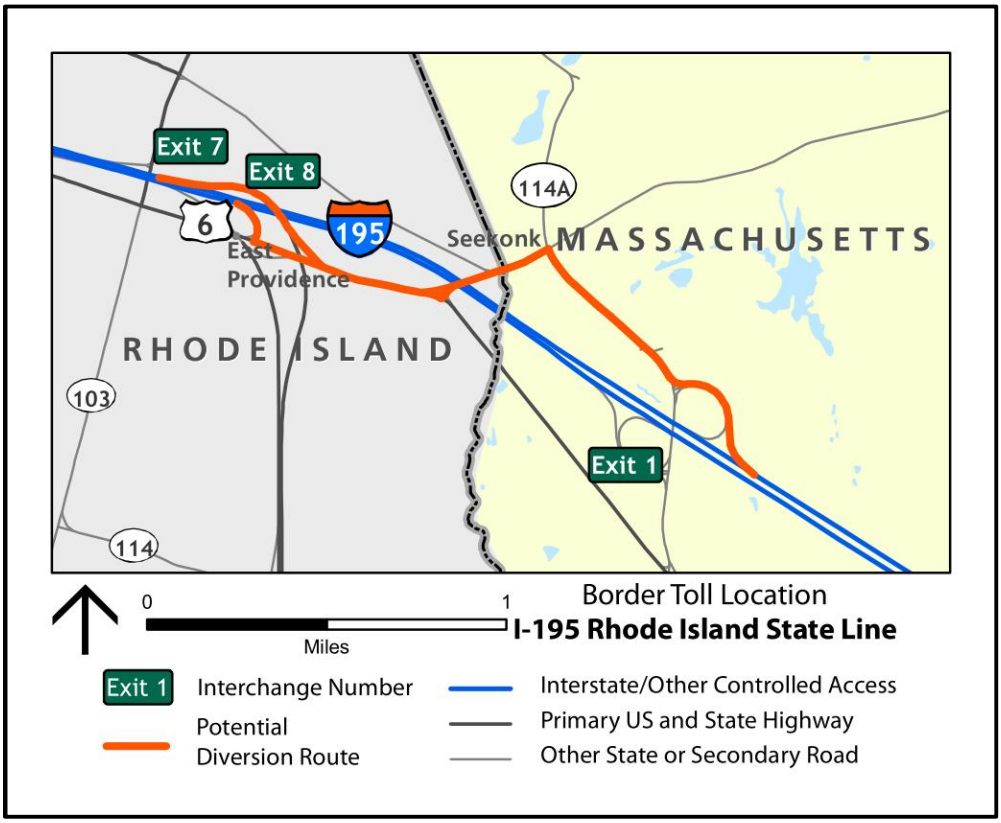
5.2.5 Interstate Highway 195 – Rhode Island

This roadway connects East Providence, Rhode Island with Wareham, Massachusetts. Border tolling information is provided below.

Table 5-7 - Interstate 195 Rhode Island Border Tolling Data

Length of Border Toll Segment (mi)	0.6
AADT in Border Toll Segment	77,163
Attractiveness of Diversion Route to Driver	High
Traffic Impact of Diversion on Local Communities	Low
	Hotels, restaurants, retail, commercial shopping areas, office. Rte 114A is 1 lane in each direction with wide shoulders and portions with sidewalks, and currently left-turn restriction at County Road. Rte 114 is 2 lanes each direction with sidewalks and 40 mph speed limit.

Figure 5-7 - I-195 Rhode Island Border Tolling Area



Diversion Potential: *I-195 Exit 1 in Seekonk, MA to Rt. 114A, to County Street/Warren Avenue, to US 6. Continue on US 6 in RI to Rt. 114 to I-195 Exit 8 in E. Providence, RI.*

The diversion route above is relatively short and runs primarily through retail areas. It adds only three minutes to total travel time, and is considered to have a high diversion potential.

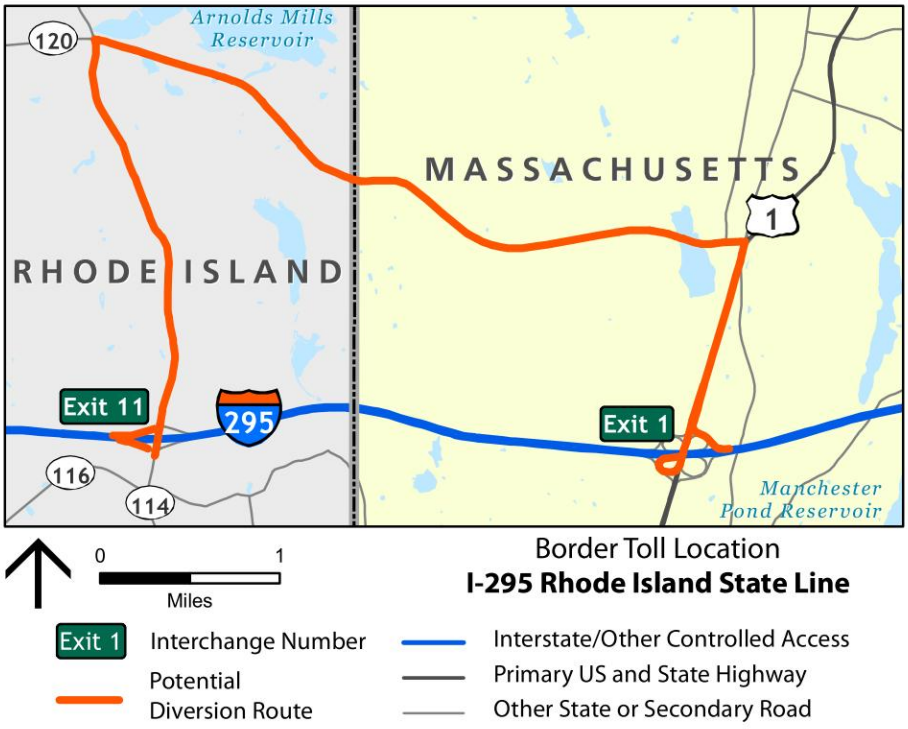
5.2.6 Interstate Highway 295 – Rhode Island

This roadway runs in an east/west direction between North Attleboro (Rhode Island border) and I-95 in Attleboro. Border tolling information is provided below.

Table 5-8 - Interstate 295 Rhode Island Border Tolling Data

Length of Border Toll Segment (mi)	1.9
AADT in Border Toll Segment	49,916
Attractiveness of Diversion Route to Driver	Medium
Traffic Impact of Diversion on Local Communities	High
	Commercial, restaurants, park, reservoir, residential, Historic District. Rte 120 is 1 lane each direction with wide shoulders, 40 mph speed limit, and sidewalks along RI portion of roadway.

Figure 5-8 - I-295 Rhode Island Border Tolling Area



Diversion Potential: *I-295 Exit 1 in North Attleboro, MA to US 1, to Rt. 120. Continue on Rt. 120 in RI to Rt. 114, to I-295 Exit 11 in Cumberland, RI.*

The fastest diversion route for I-295 into Rhode Island described above adds a total of ten minutes to overall travel time. This route passes a variety of land uses, including both commercial and residential areas, and a historic district. Because the route is somewhat long and out of the way, a medium level of diversion is expected.

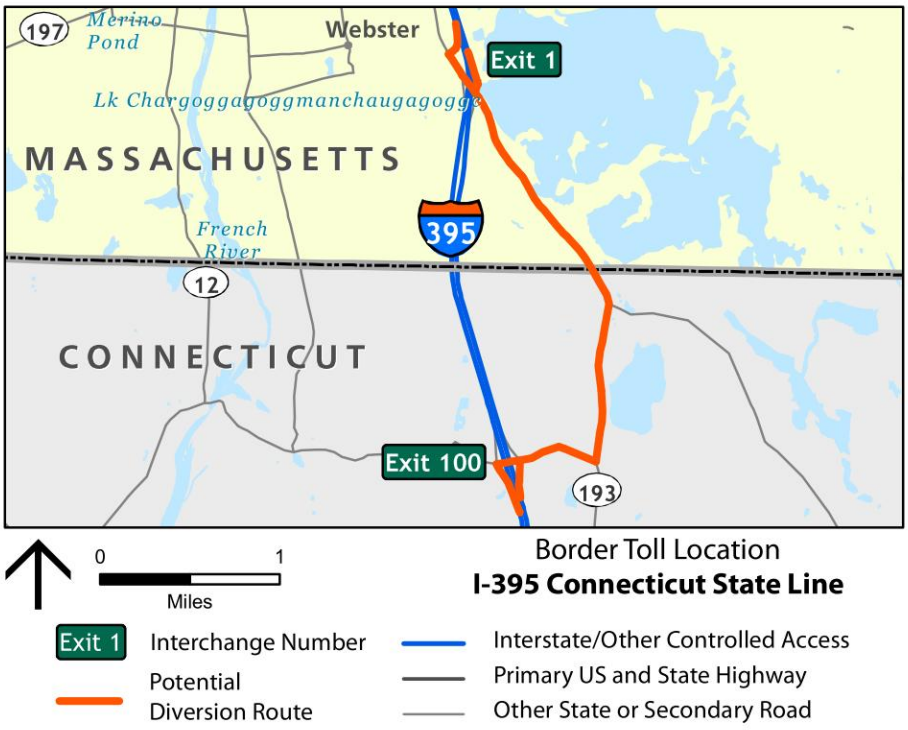
5.2.7 Interstate Highway 395 – Connecticut

This roadway runs in a north/south direction between I-90 in Auburn and the Connecticut border. Border tolling information is provided below.

Table 5-9 - Interstate 395 Connecticut Border Tolling Data

Length of Border Toll Segment (mi)	1.9
AADT in Border Toll Segment	27,613
Attractiveness of Diversion Route to Driver	Medium
Traffic Impact of Diversion on Local Communities	High
	Commercial, restaurants, park, reservoir, residential, Historic District. Rte 120 is 1 lane each direction with wide shoulders, 40 mph speed limit, and sidewalks along RI portion of roadway.

Figure 5-9 - I-395 Connecticut Border Tolling Area



Diversion Potential: *I-395 Exit 1 in Webster, MA to Rt. 193. Continue on Rt. 193 in CT to Wilsonville Road, to I-395 Exit 100 in Thompson, CT.*

The potential diversion route described above is long and adds approximately six minutes to the overall travel time. The route uses a narrow roadway with one lane in each direction, and passes through residential, commercial, and undeveloped areas. This route is considered to have a medium diversion potential.

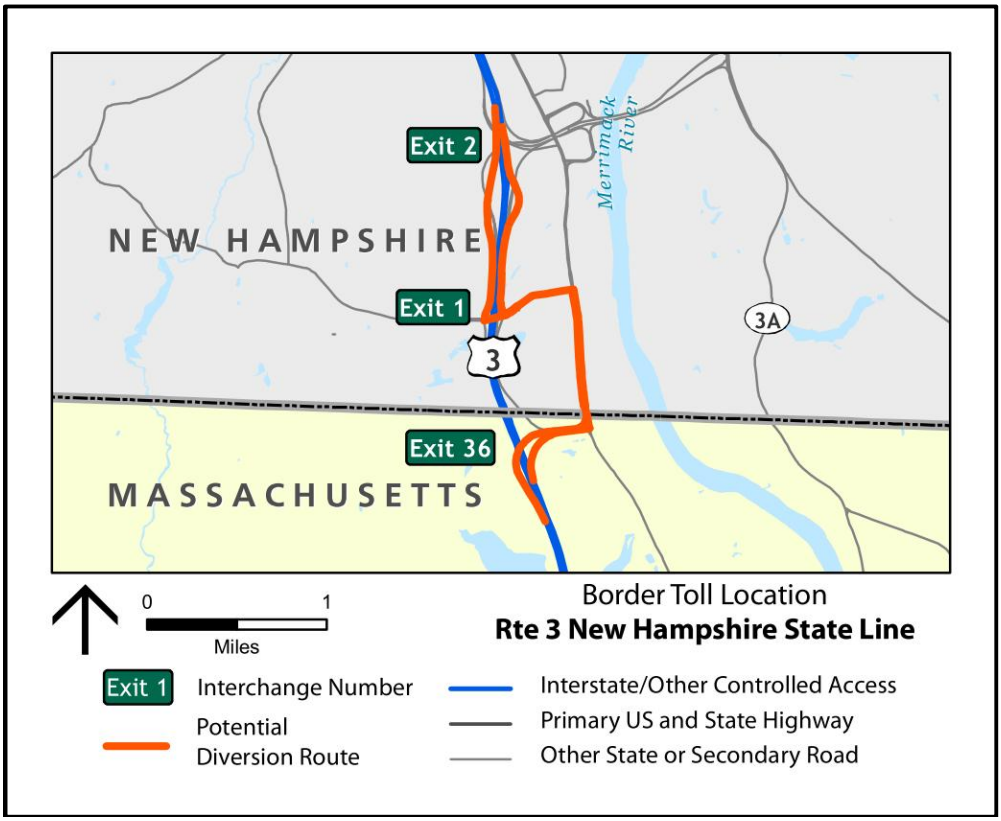
5.2.8 US Route 3 – New Hampshire

This portion of US 3 runs in a northwesterly direction between I-95 in Burlington to Tyngsborough and the New Hampshire border. US 3 is one of the major north/south routes to and from the Greater Boston area. Border tolling information is provided below.

Table 5-10 – US Route 3 New Hampshire Border Tolling Data

Length of Border Toll Segment (mi)	0.4
AADT in Border Toll Segment	73,100
Attractiveness of Diversion Route to Driver	High
Traffic Impact of Diversion on Local Communities	Medium
	Congested area with Commercial shopping areas/mall, office. Daniel Webster Hwy has 3 lanes each direction with center median and designated left-turn lanes at major intersections.

Figure 5-10 - US Route 3 New Hampshire Border Tolling Area



Diversion Potential: *US 3 Exit 36 in Tyngsborough, MA to Middlesex Road, to Daniel Webster Highway in NH, to US 3 Exit 1 in Nashua, NH. Note that other similar diversion routes are available using adjacent Exits depending on the placement of the toll.*

The potential diversion route(s) described above are very short and direct. The routes run through a very busy commercial area. The northbound route using US 3 Exit 36 (MA), Middlesex Road/Daniel Webster Highway, and Exit 1 (NH) only adds three minutes to overall travel time. This route has a high traffic diversion potential.

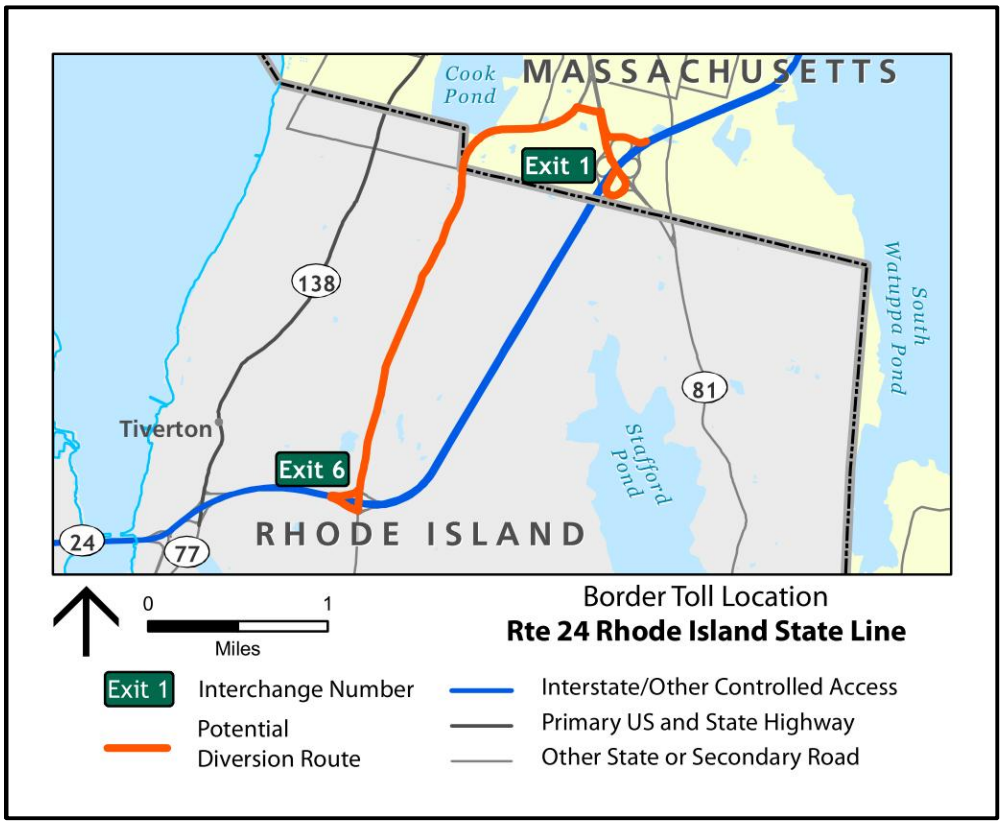
5.2.9 State Route 24 – Rhode Island

This roadway runs in a north/south direction connecting I-93 in Randolph to Fall River and the Rhode Island border. Border tolling information is provided below.

Table 5-11 – State Route 24 Rhode Island Border Tolling Data

Length of Border Toll Segment (mi)	0.2
AADT in Border Toll Segment	36,000
Attractiveness of Diversion Route to Driver	High
Traffic Impact of Diversion on Local Communities	High
	Cemetery, commercial shopping areas, rural roadway with undeveloped space, residential uses, school, pond. Marino Bishop Blvd/Fish Road is narrow, 1 lane each direction with minimal shoulder, speed limits 25-35 mph, and no sidewalks.

Figure 5-11 - State Route 24 Rhode Island Border Tolling Area



Diversion Potential: *Route 24 Exit 1 in Fall River, MA to Rt. 81/William S Canning Boulevard, to Amity Street/Newton Street, to Mariano Bishop Boulevard. Continue on Fish Road in RI to Route 24 interchange in Tiverton, RI.*

The diversion route described above adds approximately five minutes of travel time. Along this route, Marino Bishop Boulevard and Fish Road are narrow 2-lane roadways passing through low density development areas. Speed limits along these roadways vary between 25 and 35 mph. The route passes along the back side of Henry Lord Middle School.

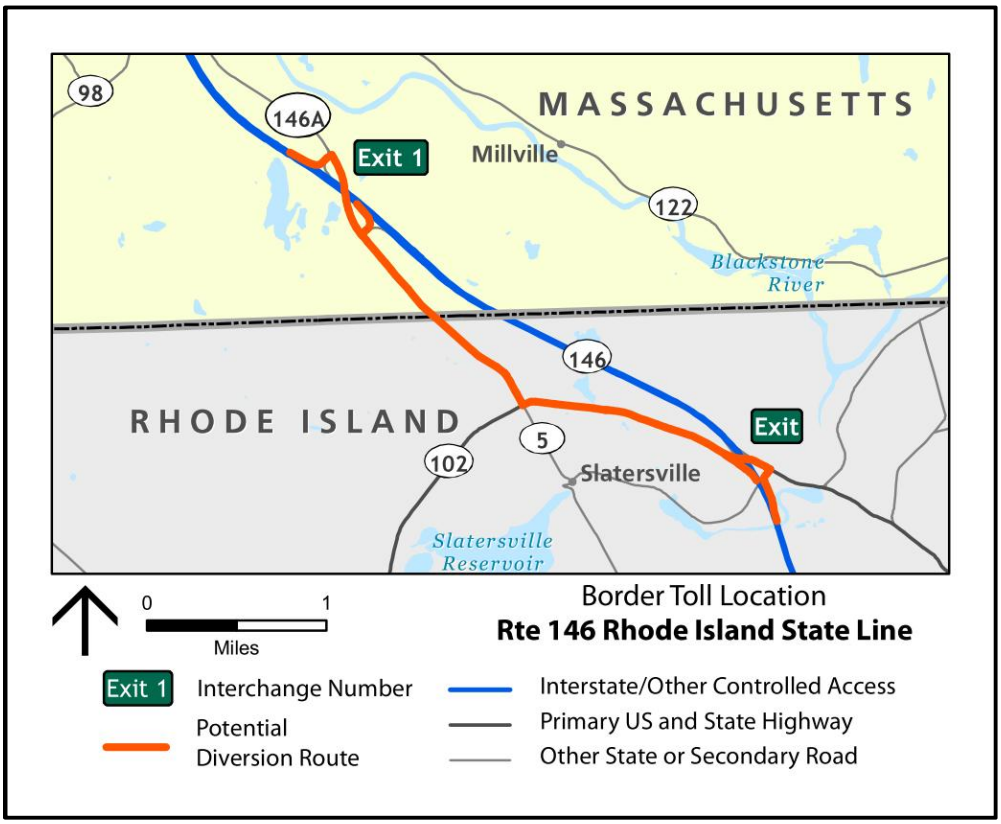
5.2.10 State Route 146 - Rhode Island

This roadway runs in a southeasterly direction between I-290 in Worcester and Millville on the Rhode Island border. This road represents a direct connection between Worcester and Providence. Border tolling information is provided below.

Table 5-12 – State Route 146 Rhode Island Border Tolling Data

Length of Border Toll Segment (mi)	1.1
AADT in Border Toll Segment	26,999
Attractiveness of Diversion Route to Driver	High
Traffic Impact of Diversion on Local Communities	High
	Retail, office, undeveloped parcels, residential, school. Rte 146A is one lane in each direction with 20-45 mph speed limits and sidewalks only south of Florence St.

Figure 5-12 - State Route 146 Rhode Island Border Tolling Area



Diversion Potential: *Route 146 Exit 1 in Uxbridge to Rt. 146A (Quaker Highway/North Main Street/Victory Highway). Continue on Rt. 146A in RI to Rt. 146/146A Interchange in North Smithfield, RI.*

Portions of the diversion route along Route 146A provide long stretches of straight roadway with limited driveways. Speed limits along Route 146A range from 20 to 45 mph. This route represents an additional five minutes of travel time, resulting in a high diversion potential. The diverted traffic would impact Halliwell Memorial School, which is located along this route.

5.3 Capital and Operating Costs

This section summarizes both capital costs and operational costs associated with the potential tolling options under consideration. Table 5-13 provides summary capital costs.

Table 5-13 - Estimated Capital Costs - Border Tolling

Number	Toll Point Locations	Capital Costs ($m)
I 84	CT Border	$6
I 91	CT Border	$3
I 91	VT Border	$3
I 93	NH Border	$4
I 95	RI Border	$6
I 95	NH Border	$6
I 195	RI Border	$4
I 295	RI Border	$4
I 395	CT Border	$4
US 3	NH Border	$4
SR 24	RI Border	$3
SR 146	RI Border	$3
	TOTAL	$50

Table 5-14 - Estimated Operating Costs - Border Tolling

Number	Toll Point Location	Ops Costs ($m)
I 84	CT Border	$4 /yr
I 91	CT Border	$4 /yr
I 91	VT Border	$1 /yr
I 93	NH Border	$6 /yr
I 95	RI Border	$5 /yr
I 95	NH Border	$5 /yr
I 195	RI Border	$5 /yr
I 295	RI Border	$3 /yr
I 395	CT Border	$2 /yr
US 3	NH Border	$5 /yr
SR 24	RI Border	$2 /yr
SR 146	RI Border	$2 /yr
	TOTAL	$44 /yr

5.4 Border Tolling Summary

Border tolling generates lower net revenues compared to in-state tolling due to fewer toll points and lower total volume of traffic. Accounting for those differences, border tolling is also constrained by the following issues:

- Diversion is estimated to be greater with border tolling – the driver "gains" from diversion would be larger and there would only be one toll point per route to avoid;
- Construction costs appear attractive, but operating costs are estimated to be much greater. Each border toll would be treated as a separate trip for billing purposes and would include a high percentage of out-of-state drivers. It is assumed that operating costs for Pay by Plate processing and image review would be much greater than with trips within the Commonwealth by primarily in-state drivers.

6 EVALUATION

The evaluation of tolling options is based on consideration of environmental, geographic, and geometric factors, diversion issues and local community impacts, equity issues, capital and operation costs, revenue potential, consistency with the current highway program, ability to meet policy objectives, consistency with the Federal tolling policy, and state laws and interoperability considerations. Revenues and costs shown are conceptual order of magnitude, which are not based on traffic and revenue (T&R) or design studies.

6.1 Results by Route Section

6.1.1 Interstates

The universe of Interstate highways considered for potential tolling within Massachusetts is shown in Table 6-1 with the potential annual revenue and costs for each route and potential toll point location.

Table 6-1 – Interstates

Route	Toll Point Locations	E-ZPass Car Toll	Annual Rev ($m)	Capital Costs ($m)	Ops Costs ($m)
I 84	One Toll Point by CT Border	$0.50	$11	$6	$2 /yr
I 91	Toll Points on I-91	$0.05 /mi	$42	$26	$6 /yr
I 93	Toll Points between I-95 and NH	$0.05 /mi	$39	$13	$5 /yr
I 93	Toll Point in area of Exits 35 or 36	$0.75	$47	$6	$5 /yr
I 93	Toll Point north of Exit 26	$0.75	$38	$6	$4 /yr
I 93	Toll Point by Exit 18	$0.75	$41	$6	$5 /yr
I 93	Toll Point in area of Exit 11	$0.75	$42	$6	$5 /yr
I 93	Toll Point between I-95 and Rt 3	$0.50	$34	$4	$4 /yr
I 93	**Total**	**> $0.05 /mi**	**$241**	**$41**	**$28** /yr
I 95	Toll Points north of Rt 128	$0.05 /mi	$29	$22	$4 /yr
I 95	Toll Points around Boston	$0.05 /mi	$91	$39	$11 /yr
I 95	Toll Points south of I-93	$0.05 /mi	$43	$18	$5 /yr
I 95	**Total**	**$0.05 /mi**	**$163**	**$79**	**$20** /yr
I 190	Toll Points on I-190	$0.05 /mi	$13	$13	$2 /yr
I 195	Toll Points on I-195	$0.05 /mi	$36	$31	$6 /yr
I 290	Toll Points on I-290	$0.05 /mi	$28	$13	$4 /yr
I 291	Toll Point on I-291	$0.50	$16	$4	$2 /yr
I 295	Toll Point on I-295	$0.50	$8	$4	$1 /yr
I 391	Toll Point on I-391	$0.50	$9	$4	$1 /yr
I 395	Toll Points on I-395	$0.05 /mi	$10	$9	$2 /yr
I 495	Toll Points on I-495	$0.05 /mi	$165	$88	$21 /yr
All Interstate Routes			**$742**	**$318**	**$95 /yr**

All Interstate routes without a toll currently in place were evaluated. Based on the analysis

the routes with favorable toll performance characteristics are detailed below.

Interstate-84

I-84 was assumed to have one toll point near the Connecticut border. This location would be advantageous due to the fact it could function as a border toll and as a route toll. Since I-84 is only approximately 8 miles long a single toll location is feasible.

Interstate-93

I-93 was broken into four zones: South, Boston South, Boston North, and North. Due to the variation in traffic inside I-95 the "Boston" area was analyzed separately. The South section was assumed to have 1 toll point in between I-95 and Route 3. Boston South and Boston North each were analyzed with two toll points totaling four toll points on I-93 inside I-95. The North was assumed to have 3 toll points from I-95 up to the New Hampshire border.

Table 6-2 – I-93

Route	Toll Point Locations	Segment Length	Segment Toll Points	Annual Rev ($m)	Capital Costs ($m)	Ops Costs ($m)
I 93	Toll Points between I-95 and NH	15.1 mi	3	$39	$13	$5 /yr
I 93	Toll Point in area of Exits 35 or 36	6.7 mi	1	$47	$6	$5 /yr
I 93	Toll Point north of Exit 26	6.7 mi	1	$38	$6	$4 /yr
I 93	Toll Point by Exit 18	5.4 mi	1	$41	$6	$5 /yr
I 93	Toll Point in area of Exit 11	5.4 mi	1	$42	$6	$5 /yr
I 93	Toll Point between I-95 and Rt 3	6.8 mi	1	$34	$4	$4 /yr
I 93	Total	30.9 mi	8	$241	$41	$28 /yr

Interstate-95

I-95 was broken into three zones: South, Boston, and North. Due to the variation in traffic inside I-95 the "Boston" area was analyzed separately. The South section was assumed to have four toll points. Boston was analyzed with seven toll points around the Boston area. The North section was assumed to have four toll points.

Table 6-3 – I-95

Route	Toll Point Locations	Segment Length	Segment Toll Points	Annual Rev ($m)	Capital Costs ($m)	Ops Costs ($m)
I 95	Toll Points north of Rt 128	26.0 mi	4	$29	$22	$4 /yr
I 95	Toll Points around Boston	37.6 mi	7	$91	$39	$11 /yr
I 95	Toll Points south of I-93	26.3 mi	4	$43	$18	$5 /yr
I 95	Total	89.9 mi	15	$163	$79	$20 /yr

Interstate-495

I-495 was assumed to have twenty toll points across it 122 miles.

Table 6-4 – I-495

Route	Toll Point Locations	Segment Length	Segment Toll Points	Annual Rev ($m)	Capital Costs ($m)	Ops Costs ($m)
I 495	Toll Points on I-495	121.8 mi	20	$165	$88	$21 /yr

U.S. and State Routes

State and U.S. routes with controlled access were evaluated for tolling. Some were not carried forward for analysis due to factors such as: short lengths, low ADTs, or infeasibility. Based on the analysis the routes and locations with favorable toll performance characteristics are detailed below.

Table 6-5 – State and US Routes

Route	Toll Point Locations	E-ZPass Car Toll	Annual Rev ($m)	Capital Costs ($m)	Ops Costs ($m)
US 3	Toll Points on US 3	$0.05 /mi	$34	$13	$4 /yr
US 6	Toll Point near Sagamore Bridge	$0.75	$19	$6	$4 /yr
SR 2	Toll Points on SR 2	$0.05 /mi	$35	$44	$6 /yr
SR 2	Toll Points on SR 2 (inside I-95)	$0.05 /mi	$7	$4	$1 /yr
SR 3	Toll Points on SR 3	$0.05 /mi	$45	$31	$7 /yr
SR 24	Toll Points on SR 24	$0.05 /mi	$51	$31	$8 /yr
SR 25/28	Toll Point near Bourne Bridge	$0.75	$11	$6	$2 /yr
SR 128	Toll Points on SR 128	$0.05 /mi	$17	$13	$2 /yr
SR 140	Toll Points on SR 140	$0.05 /mi	$13	$13	$2 /yr
SR 146	Toll Points on SR 146	$0.05 /mi	$11	$10	$2 /yr
All Other Study Expressways			**$243**	**$171**	**$38 /yr**

The controlled access portion of US Rte 3 functions very much as a part of the Interstate highway network, and feeds into a portion of the New Hampshire turnpike system.

The controlled access portion of US Rte 6 generally runs from the Cape Cod Canal through the cape. It was not evaluated as a toll route except for the section at the canal crossing area – the Sagamore Bridge.

The full length of SR 24 is controlled access within Massachusetts. SR 24 links Fall River with the Boston Metropolitan area. The roadway starts at the Rhode Island border as a continuation of Rhode Island Route 24 and ends at a junction with Interstate 93.

The controlled-access portion of SR 25 functions as an extension of I-495 around Wareham

to the Cape Cod Canal. It joins SR 28 at the canal crossing and was considered as one for the sake of this analysis – the Bourne Bridge.

The other state routes listed could be included in the toll network to the extent they are limited access and connect with the Interstates and other major routes. In general, their ratio of potential revenue in relationship to capital and operating costs is not as great as that of the other routes considered. Tolling could still be a reasonable option for these locations if specific major capital reconstruction or expansion projects were needed for those specific routes.

6.2 Border Tolling – Revenues, Costs, Diversion and Local Community Impacts

Border tolling was analyzed to determine the feasibility of tolling vehicles entering and exiting Massachusetts. Interstates and limited access freeways in Table 7-6 were analyzed as part of this study.

Table 6-6 – Border Tolls

Number	Toll Point Locations	E-ZPass Car Toll	Annual Rev ($m)	Capital Costs ($m)	Ops Costs ($m)
I 84	CT Border	$1.00	$17	$6	$4 /yr
I 91	CT Border	$1.00	$18	$3	$4 /yr
I 91	VT Border	$1.00	$5	$3	$1 /yr
I 93	NH Border	$1.00	$27	$4	$6 /yr
I 95	RI Border	$1.00	$25	$6	$5 /yr
I 95	NH Border	$1.00	$22	$6	$5 /yr
I 195	RI Border	$1.00	$20	$4	$5 /yr
I 295	RI Border	$1.00	$12	$4	$3 /yr
I 395	CT Border	$1.00	$7	$4	$2 /yr
US 3	NH Border	$1.00	$21	$4	$5 /yr
SR 24	RI Border	$1.00	$9	$3	$2 /yr
SR 146	RI Border	$1.00	$7	$3	$2 /yr
	TOTAL		$190	$50	$44 /yr

When a toll is placed in a single location with opportunities for diversion some drivers will be likely to take alternate routes in order to avoid paying a toll. The Table below lists the potential for diversion on the Interstates studied. This is based on the proximity of alternate routes and travel time. A Low Diversion Potential would mean that an alternate route is long and time consuming or not available. A High Diversion Potential would mean that an alternate route is short and would take minimal time. If border tolls were to be implemented as part of a region or state wide tolling strategy and not as "point" tolls the potential for diversion would likely change.

Table 6-7 – Diversion Potential for Potential Border Tolling Locations

Route	State Border	Potential Diversion Route(s)	Diversion Potential
I 84	Connecticut	Exit 1 in Sturbridge, MA, to Rt. 15, Mashapaug Road, to Rt. 198 in MA & CT, to Rt. 171 & Rt. 190, to Exit 73 in Union, CT.	Low
I 91	Connecticut	Exit 2 in Springfield, MA, to US 5 in MA & CT, to Exit 49 in Enfield, CT.	High
I 91	Connecticut	Exit 2 in Springfield, MA, to US 5, to Rt. 192 in MA & CT, to Rt. 220, to Exit 48 in Enfield, CT.	Low
I 91	Connecticut	Exit 7 in Springfield, MA, to Rt. 147, to Rt. 159 in MA & CT, to Rt. 190, to Exit 47 in Enfield, CT.	Low
I 91	Vermont	Exit 28 in Bernardston, MA, to Rt. 10, to US 5 in MA & VT, to Exit 1 in Brattleboro, VT.	Medium
I 91	Vermont	Exit 28 in Bernardston, MA, to Rt. 10, to Rt. 142 in MA & VT, to Rt. 9, to Exit 2 in Brattleboro, VT.	Low
I 93	New Hampshire	Exit 48 in Methuen, MA, to Rt. 213, to Rt. 28 in MA & NH, to Kelly Road, to Rt. 38, to Exit 1 in Salem, NH.	High
I 95	New Hampshire	Exit 60 in Salisbury, MA, to Toll Road, to Main Street, to US 1 in NH, to Rt. 107, to Exit 1 in Salem, NH.	High
I 95	Rhode Island	Exit 1 in Attleborough, MA ,to US 1 in MA & RI, to Exit 29 in Pawtucket, RI.	High
I 195	Rhode Island	Exit 1 in Seekonk, MA, to Rt. 114A, to US 6 in MA & RI, to Rt. 114, to Exit 8 in E. Providence, RI.	High
I 195	Rhode Island	Exit 1 in Seekonk, MA, to Rt. 114A, to US 44 in MA & RI, to Exit 4 in E. Providence, RI.	Low
I 295	Rhode Island	Exit 1 in North Attleborough, MA, to US 1, to Rt. 20 in MA & RI, to Rt. 114, to Exit 11 in Cumberland, RI.	Medium
I 295	Rhode Island	Exit 1 in North Attleborough, MA, to US 1, to Rt. 23 in MA & RI, to Rt. 114, to Exit 11 in Cumberland, RI.	Low
I 395	Connecticut	Exit 1 in Webster, MA, to Rt. 193 in MA & CT, to Wilsonville Road, to Exit 100 in Thompson, CT.	High
I 395	Connecticut	Exit 2 in Webster, MA, to Rt. 12 in MA & CT, to Wilsonville Road, to Exit 100 in Thompson, CT.	Low
US 3	New Hampshire	Exit 36 in Tyngsborough, MA, to Middlesex Road in MA & NH, to Exit 1 or 2 in Nashua, NH.	High
SR 24	Rhode Island	Exit 1 in Fall River, MA, to Rt. 81, to Mariano Bishop Boulevard, to Fish Road in RI, to Rt. 24 interchange in Tiverton, RI.	Medium
SR 24	Rhode Island	Exit 1 in Fall River, MA, to Rt. 81 in MA & RI, to Eagleville Road, to Fish Road, to Rt. 24 Fish Road Interchange in Tiverton, RI.	Medium
SR 146	Rhode Island	Exit 1 in Uxbridge, MA, to Rt. 146A in MA & RI, to Rt. 146/146A interchange in North Smithfield, RI.	High

6.3 Attainment of Policy Objectives

The evaluation considered broad policy objectives such as GreenDOT and the Healthy Transportation Initiative and more specific ones pertaining to the magnitude of net revenue, reduction in vehicle miles travelled (VMT), and the ability to reduce traffic congestion through value pricing. The analysis provides information on the options of tolling Interstate highways, controlled access routes, and major highway border crossings. These options can be combined in numerous ways in order to determine the best funding sources for the Commonwealth. Because MassDOT is already a mature E-ZPass operator with a new E-ZPass MA CSC being designed, almost any combination of additional routes to be tolled would be feasible to implement from the perspectives of technology and operating costs. The information provided above can be used to begin the discussions on how best to proceed.

6.4 Consistency with Current Highway Program

FHWA has a few tolling programs in place. Mainstream Tolling Programs include the Section 129 General Tolling Program and the Section 166 HOV/HOT Program. The Section 129 General Tolling Program allows tolling on new highways and new lanes added to existing highways, and on the reconstruction or replacement of bridges, tunnels and existing toll facilities. The Section 166 HOV/HOT Program allows toll-paying vehicles not meeting the minimum occupancy standards to use high occupancy vehicle (HOV) lanes.

6.5 Tolling Options: Regional Value Pricing, Road Pricing

Time of day pricing could be considered as an option to take advantage or heavy congestion in the Boston area during peak times. Time of day pricing can be a set toll rate based on the hours of operation or a variable toll rate based on congestion. Many locations are considering or have implemented time of day pricing as a means to mitigate congestion. New routes considered for Time of Day pricing could include:

- Interstate Highway 93 – Through Boston (Rte 3 Quincy to I-95 Reading)
- Interstate Highway 95 – From I-93 in Canton to Rte 128 in Peabody

In addition, it would be possible to consider including the existing toll facilities in the Boston area for variable pricing both for peak period management as well as discounts for light travel periods, with the caveats noted earlier that existing bonded debt requirements on the Metropolitan Highway System would have to continue to be met.

6.6 Equity Issues and Compliance with the Title VI Nondiscrimination Program

Equity concerns with regard to income are often raised when discussions of tolling begin. Equity issues can be based on geographic regions, social equity, and toll point placement. Congestion pricing can also raise equity concerns. Tolling also relies on electronic technology that may limit low income users that do not have credit cards or bank accounts, and cannot

afford large deposits on a toll account, though it may be possible to mitigate this potential impact through providing access to cash-based kiosks for purchasing and loading value on E-ZPass transponders. Other states, such as Florida, provide such cash-based kiosks for their customers. It is also significant to note that public opinion from at 2008 survey on using taxes versus tolling for transportation infrastructure found that support for tolls was higher among low-income individuals than among high-income individuals.[18]

Another equity concern associated with tolling is the potential hardship placed on individuals working in areas where public transit may not be available. Even if public transit routes do exists, often fewer options are available during off-peak hours.

Equity issues that are specific to tolling in Massachusetts include the following:

- Geographic Regions: While all drivers in the Commonwealth pay gas taxes and Registry fees, which support the operation and maintenance of highways statewide, the central and western portions of the state are also supporting Interstate 90 through their payment of tolls on the Massachusetts Turnpike. Similarly, Massachusetts Turnpike users east of Route 128 currently subsidize other users of the Metropolitan Highway System (including routes such as I-93, Route 128 and Route 3). By comparison, drivers in the remainder of the state use the other Interstate and controlled access state highways without paying any tolls. By tolling these other major routes in addition to Interstate 90, another source of transportation revenue would be established, which is directly tied to the use of such facilities.
- Benefit to Users: The users of I-93 have benefitted significantly from the Central Artery Project and related facilities. Now, in addition to continued payment for this project for the next 26 years, increasing levels of maintenance and repair for this complex transportation network will be needed. Tolling I-93 within the limits of the Metropolitan Highway System (MHS) would be analogous to the existing tolling of I-90 within the limits of the MHS.
- Environmental Justice: The daily costs of driving could increase for some lower-income populations whose daily trip from home to places of employment, education, and health care may necessitate driving on roadways that would be tolled.
- Toll Placement: Toll locations would be chosen that avoid disproportionate, high, and adverse effects on minority or low-income populations. Conceptually, the Plan proposes a network of toll points every five to seven miles apart, with toll rates generally at about $0.05/mile for cars paying with E-ZPass. In dense urban areas and local communities, some untolled movements would be permitted between close interchanges. Since a relatively large number of toll points will be implemented, most users of the controlled access highway system will pay something to use it.

[18] http://ops.fhwa.dot.gov/publications/fhwahop08040/cp_prim5_03.htm

MassDOT has developed a Title VI/Nondiscrimination Program to address equity issues. This program ensures full compliance with Title VI of the Civil Rights Act of 1964, as amended (Title VI) and related nondiscrimination statutes, Executive Orders, and regulations as detailed in *FHWA Assurances for Title VI and Other Nondiscrimination Statutes and Regulations* in all MassDOT programs and activities. MassDOT incorporates the principles of environmental justice (EJ) into its programs, policies, and activities to ensure that there are no disproportionate adverse impacts related to the transportation system on any group of persons, particularly low-income and minority persons. Additionally, the principles on limited English proficiency (LEP) are incorporated to ensure that meaningful access is provided to persons who have limited proficiency in the English language.[19]

MassDOT's "Title VI Planning Subprogram" guides the integration of Title VI considerations into the work done by MassDOT's Office of Transportation Planning (OTP). Title VI goals addressed in the Planning Subprogram include ensuring that all transportation projects "include provisions to actively engage minorities and gather their responses, as well as mitigate against potential discrimination based on race, color, national origin, English proficiency, income, religious creed, ancestry, disability, age, gender, sexual orientation, military service, or gender identity or expression."[20] As this effort moves forward into more detailed analysis, equity concerns related to toll placement and congestion pricing will be addressed according to the principals and methodologies presented in MassDOT's Title VI Planning Subprogram.

6.7 Implementation Timelines

In order to meet the timeline described in Section 67 of the 2013 Transportation Finance Legislation several major steps must be undertaken. The current efforts to replace the Turnpike toll system with a modern, large-scale all-electronic-tolling system provide MassDOT the business infrastructure to support an expanded system. New contracting options such as design-build project delivery (as is being done today at MassDOT) also greatly improve the ability to deliver these systems faster than would be possible using conventional project delivery methods.

Launch of the new E-ZPass MA Customer Service Center (CSC) by 2016 is vitally important to support expanded statewide tolling. Once the new CSC is operational, implementation of additional Comprehensive Tolling Plan projects can properly focus on the roadside infrastructure and equipment on the routes and/or locations to be tolled.

Other program development considerations add to schedule concerns:

- Changes in state law are needed to achieve the goals of this Plan, and to define the scope and limits of an expanded toll program. It would be anticipated that some

[19] Massachusetts Department of Transportation, "Title VI Nondiscrimination Program," September 2011, updated as of December 28, 2012.
[20] Massachusetts Department of Transportation Office of Transportation Planning, "2013 Office of Transportation Planning (OTP) Title VI Planning Subprogram," Draft, 9/26/13.

requisite preliminary planning and engineering development, as well as legal and financial advisory services, would also be needed to support this effort.

- Permission, waivers or changes in MAP-21 Section 129 would be required to enable most of the toll proposals considered here, because it is not feasible to construct projects with new toll lanes next to the existing lanes. This would be an extended process if even possible,
- The public engagement process to determine an acceptable and fair program for tolling the controlled access highway system would have to be comprehensive and thorough, which requires time.

6.7.1 Program Timing in Conjunction with Improvements

Because of the scale of work required to implement tolling statewide, a phased sequence to introduce tolling on selected high volume roadways may be the preferred approach.[21]

Tolling on specific routes could be introduced in conjunction with the initiation or completion of other improvements on such routes. For example, in the State of Washington tolling was launched on Route 520 to support funding and development of the replacement floating bridge.

Toll system contracts, like the current Mass Pike AET System procurement, would have extended system operations and maintenance provisions which do not align well with major civil infrastructure projects. It is recommended that future Interstate AET projects would be substantially dedicated to providing, maintaining and operating the new toll points and toll systems. Generally, while it could be advantageous under certain conditions to include the toll system as part of a major asset improvement program, it would be preferable to procure the toll system separately from the highway/bridge improvements.

6.7.2 Program Development

For a target introduction of tolling on any new highway or bridge facilities of the Commonwealth not previously tolled, lead time would be required to ensure that physical and logistical requirements could be met. These would include investigations into options for data and power utilities in various locations, potential environmental impacts, and some locations in which it would be challenging to install and maintain sophisticated electronic toll equipment such as along certain segments of I-93 immediately north and south of downtown Boston.

An extended time period for public education and engagement to understand how the program would impact motorists, to demonstrate how the monies would be used, and explain to the motoring public how to minimize their toll payments, would be planned during the first year of the process and conducted during planning phases of the project.

Major steps in the implementation of expanded statewide tolling are outlined below:

[21] MassDOT has taken such a phased approach in its implementation of a Real Time Traffic Management (RTTM) System.

Step 1 – State Legislative Action: Changes in state law are needed to achieve the goals of this Plan, and to define the scope and limits of an expanded toll program. It would be anticipated that some requisite preliminary planning and engineering development, as well as legal and financial advisory services, would also be needed to support this effort. It is recommended that the legislature:

Review existing enabling legislation to allow for expanded statewide tolling; and

Provide greater flexibility in the use of toll revenues to fund transportation infrastructure not directly appurtenant to the facility being tolled.

Step 2 – Federal Approvals: The Massachusetts congressional delegation should be encouraged to support legislation at the Federal level that provides increased flexibility within Federal tolling programs administered by the Federal Highway Administration (FHWA). Meanwhile, the state should apply for available slots under the FHWA toll pilot programs, such as the Interstate System Reconstruction and Rehabilitation Pilot Program (ISRRPP), and the Value Pricing Pilot (VPP) program.

Step 3 – Develop a Capital Plan: Preliminary designs, approximate locations of toll points, and environmental review and clearance need to be identified. The financing plan and preliminary work to support procurements would be completed. This would include definition of the contract methodologies and requirements, particularly if P3 financing support were intended. Also, it is anticipated that the actual procurement document preparation would begin.

Step 4 - Procure AET system design and delivery services: This step culminates with the actual design and construction of the toll systems on the routes to be tolled. This step assumes that the Massachusetts Turnpike and harbor crossing tolls will have already been converted to AET, and the new E-ZPass MA CSC will be operational and available for the expanded tolling system to utilize.

The above listed steps would allow roughly two to three years for design and deployment of the AET systems and preparation for expanded toll operations on existing facilities. This Plan did not review potential tolling of entirely new facilities. The implementation of this expanded tolling system by the legislated target date will be highly challenging, even with the favorable assumptions regarding Federal tolling policy. Those challenges include the extensive public review process associated with the project, including meeting applicable environmental and Title VI requirements.

7 OBSERVATIONS

7.1 Section 67 – Comprehensive Tolling Plan

7.1.1 Additional Interstate/Limited Access Routes on or before July 1, 2018

Routes

The analysis was based on a high level review of nearly 500 miles of Interstate highways and over 200 miles of other controlled access highways in the Commonwealth. For purposes of the analysis, an automobile E-ZPass toll rate of 5¢ per mile was used in most locations (I-93 through Boston was priced at a rate to be consistent with other tolls entering into Boston, which was higher). Order of magnitude potential net revenues and toll-related roadway costs over a ten-year timeframe were developed, and were used to estimate a return on investment (ROI). The results are presented in descending order of ROI in Table 7-1.

Table 7-1 - Summary of In-State Tolling Study Routes and Results

Route	Location	NPV Rev ($m)	NPV Costs ($m)	ROI
I 93	Entire route	$2,032	$284	6.2
I 291	Entire route	$137	$21	5.6
US 3	All controlled access portion	$288	$49	4.9
US 6	by Sagamore Br	$162	$28	4.8
I 391	Entire route	$75	$14	4.4
I 290	Entire route	$233	$43	4.4
I 95	Entire route	$1,376	$258	4.3
I 495	Entire route	$1,391	$274	4.1
I 295	Entire route	$67	$14	3.9
I 84	Entire route	$89	$18	3.8
SR 25/28	by Bourne Br	$93	$20	3.7
SR 24	All controlled access portion	$434	$98	3.4
I 91	Entire route	$352	$81	3.3
SR 128	All controlled access portion	$140	$34	3.1
SR 3	All controlled access portion	$379	$93	3.1
I 195	Entire route	$306	$82	2.7
SR 146	All controlled access portion	$94	$25	2.7
I 395	Entire route	$85	$23	2.7
I 190	Entire route	$112	$33	2.4
SR 140	All controlled access portion	$109	$32	2.4
SR 2	All controlled access portion	$356	$111	2.2

Note – Revenues and costs shown are conceptual order of magnitude, which are not based on traffic and revenue (T&R) or design studies.

For example, tolling I-93 with the scenario and pricing assumptions described in this report could lead to a return on the investment of over 6 to 1. Tolling the controlled access portions of State Rte 2, in contrast, would yield only about a 2 to 1 return on investment with the assumptions and calculations used in this analysis. Tolling the Cape Cod Canal crossings, i.e. the US 6 Sagamore Bridge approach and the SR 25/28 Bourne Bridge approach, would necessitate tolling both to avoid the traffic diversion impacts that would occur if one of them were to remain untolled.

Clearly the three greatest revenue generators are I-93, I-95 and I-495. This potential revenue stream would support a substantial level of maintenance and operational improvements on the systems to be tolled and, with enabling legislation, facilitate aggregation of capital for major investments.

7.1.2 Considerations

Equity Issues

An equity ("benefits and burdens") analysis for this Comprehensive Tolling Plan should be completed in compliance with the policies in MassDOT's "Title VI Nondiscrimination Program"[22] and the methodologies described in the "2013 Office of Transportation Planning Title VI Planning Subprogram."[23] MassDOT is currently developing a benefits and burdens analysis protocol to evaluate all planning studies and capital projects with respect to Title VI goals, and identify any possible disparities in project distribution and possible barriers to participation in the transportation project development process.

The first step for evaluating this project's benefits and burdens to Title VI areas is to look at the geographical distribution and compare the number of proposed tolls in Title VI areas versus non-Title VI areas. MassDOT has completed an initial web-based mapping application of minority, low-income, and Limited English Proficiency (LEP) populations across the Commonwealth, and has worked with MPOs to identify stakeholders in each community. The Title VI maps are available to determine the impacts of toll placement, and review of these maps will be the first step in the analysis of Comprehensive Tolling Plan benefits and burdens. MassDOT will also look at dollars spent in each Title VI area to make sure that money is being spent equitably. Evidence of disparities will prompt a finer grain analysis.

If analysis identifies any existing transportation effects on minority or low-income populations which are disproportionate, high, and adverse, then the location, severity, and impacted population will be identified and quantified, and potential mitigation and benefits will be determined.

MassDOT is committed to transportation equity/environmental justice and continues to

[22] Massachusetts Department of Transportation, "Title VI Nondiscrimination Program," September 2011, updated as of December 28, 2012.
[23] Massachusetts Department of Transportation Office of Transportation Planning, "2013 Office of Transportation Planning (OTP) Title VI Planning Subprogram," Draft, 9/26/13.

seek equitable distribution of benefits and burdens in the transportation system through ongoing compliance with its own policies and consideration of Title VI and environmental justice factors through its evaluations and input from the public.

Revenue Benchmarks

Establishment of specific benchmarks will depend on the shape of the final toll authorization, as well as the proposed capital improvements to be financed and/or otherwise supported by this tolls program.

For example, a revenue stream of about $1 million per mile in net revenue annually would provide an excellent baseline for basic maintenance and repair of pavement and safety devices throughout the year, as well as provide funding support for necessary major projects. This revenue stream would also allow a higher percentage of motor vehicle tax revenues to be set aside for the non-tolled routes.

Policy Objectives

A steady dedicated revenue stream would enable the Commonwealth to make strategic choices with the best return on investment for the travelling public, particularly where those best choices require capital for investment which is simply not possible today.

Regarding policy goals, the existence of a steady revenue stream enables long-range planning and commitments to be made without the uncertainty of Congressional action or other externalities. Toll revenue in a steady stream enables much faster project delivery, independent of Federal budgetary approvals.

Diversion Issues

It is critically important to minimize diversion impacts of drivers avoiding toll points or avoiding tolled routes completely, which could adversely impact revenue and burden local roadways and municipalities with cut-through traffic. The Interstates were built with many more interchanges than is normally seen on traditional toll highways (an average of one every 1.6 miles on the Interstate system in Massachusetts), and so it is necessary to allow some free movements between closely-spaced interchanges, which reduces operating costs of closely spaced toll points and eliminates the financial incentive for drivers to divert around the closely spaced toll points using local streets.

In addition to developing the system with relatively closely-spaced toll points with low rates, it would be generally possible to locate toll points away from where bypass routes are the most convenient, and rather in controlled access highway segments where there is no easy diversion route. By tolling the comprehensive network in one region of the state, if not throughout the state, there would be no major route choices available allowing drivers to avoid tolls unless they were willing to spend more money and time in much longer routes and fuel consumption than would be practical.

Nonetheless, some minimum level of diversion around local toll points and some major diversion around toll routes will occur.

Costs

Because the Commonwealth is currently developing a new AET system for the Massachusetts Turnpike, and a new E-ZPass MA CSC with the capacity to grow in terms of revenue as well as all electronic tolling options, it would be possible to enjoy significant economies of scale:

- Many costs of the new system will be based partially on the number of toll accounts, and Massachusetts already has a mature toll account program in place. Customers currently with an E-ZPass to use the Mass Pike or the Tunnels would not need to get another transponder in order to drive a newly tolled route such as I-93 or US Rte 3.
- The fixed costs of new system development and administration will apply equally to an operation collecting $350 million annually or $1.3 billion annually. Some costs do increase with activity and/or revenue, but the large, one-time, systems operations costs can be leveraged over an increased level of activity. For the sake of reviewing this program, it was assumed that the CSC costs would roughly double, even though the level of revenue collected would jump almost four times.

MassDOT is gaining current experience on the conversion of the Mass Pike to AET operations, which would be highly valuable in the next rollout of toll projects in the field.

AET is almost universally chosen for new projects precisely because of the much more favorable implementation costs. The program estimate for this high-level study developed a full cost of under $1 million per mile of highway. Similar to the CSC mentioned above, there are certainly economies of scale; a project for just one or two toll points would have much greater unit costs than a large system project.

Consistency with the Current Highway Program

Certain tolling and pricing strategies may be eligible for implementation under the Mainstream Tolling Programs or one of FHWA's Pilot Programs. FHWA prefers that the Mainstream Programs be used, thereby limiting request for participation in the Pilot Programs to situations that could not otherwise be accommodated.

Necessary Waivers or Approvals by FHWA

Section 129 of the MAP-21 legislation would generally have to be waived to support this comprehensive tolling plan because the plan currently includes tolling existing Interstate highway capacity – not just new capacity. One exception that would be possible: if the I-93 viaduct just north of Boston and US Rte 1 were to be removed and replaced, it appears that project would be allowed to be tolled to support funding for it. Independent of discussion of the merits of such a project, FHWA has allowed a project on I-95 in New Jersey/Pennsylvania (the Scudder Falls Bridge) to be tolled in order to finance its replacement.

Regional Value Pricing, Road Pricing and other Tolling Options

The focus of advanced tolling options was on the potential to institute time of day tolling on I-93 for the peak periods of travel in and out of Boston. It was estimated that there could be an additional $26 million of annual revenue available if 40% of the drivers of the most urbanized section of I-93 paid a 50% surcharge for that period of time. If allowed by Federal and state legislation and/or waivers, this additional funding could be targeted toward transit improvements along the I-93 corridor.

Value pricing and variable toll rates, could certainly be extended beyond this small area on I-93 potentially to other locations such as the harbor crossings and the Boston Extension of the MassPike. However, other costs and challenges do arise with an expanded value-pricing zone. Many more customers and many more locations would have to be provided with variable signing to clearly identify toll rates – this does not apply just to the tolled highways themselves but also to the connecting routes before a driver makes a decision to enter the tolled road. It appears the complexity of this feature would increase exponentially, while the benefit of variable-pricing tolling would be diluted over the wider area.

Also, in the single tight urban section of I-93, the practical diversion routes for regular drivers to use appear very limited. As the variable pricing zone expands, concentration of traffic lessens and the opportunities to divert around toll points increases.

Conditions do change over time, however, and the new AET systems that would be provided would include the ability to support variable toll rate structures at any time that would be desired.

7.2 Section 74 – Feasibility of Additional Interstate Border Tolls

Potential revenues and costs associated with border tolling were estimated on the basis of a $1 car E-ZPass toll using a methodology similar to that used for the longer in-state segments. The results are summarized in Table 7-2.

7.2.1 FHWA Waivers, Agreements and Potential Changes

The same FHWA waivers would be necessary for the border tolling regimen, with the additional challenge that tolls collected at the border would clearly not be intended to be used exclusively at the border location.

7.2.2 Interstate or Regional Agreements

With border tolling, there would always be another state involved with which to coordinate agreements, toll rates, and especially fines and enforcement mechanisms. If the border state wanted to share in the revenues this would either push rates higher than those used in the study or would further dilute the net revenue.

7.2.3 Ability to Establish Border Tolls with Potential Changes in Interstate Tolling

Table 7-2 – Summary of Border Tolling Study Locations and Results

Route	Location	NPV Rev ($m)	NPV Costs ($m)	ROI
I 95	Rhode Island Border Toll	$210	$47	3.4
I 95	New Hampshire Border Toll	$190	$46	3.2
I 93	New Hampshire Border Toll	$229	$59	2.9
US 3	New Hampshire Border Toll	$175	$45	2.9
I 295	Rhode Island Border Toll	$104	$28	2.7
I 91	Connecticut State Border Toll	$154	$41	2.7
I 195	Rhode Island Border Toll	$167	$45	2.7
I 84	Connecticut State Border Toll	$146	$41	2.5
SR 24	Rhode Island Border Toll	$76	$23	2.3
SR 146	Rhode Island Border Toll	$58	$19	2.1
I 91	Vermont State Border Toll	$42	$14	2.0
I 395	Connecticut Border Toll	$58	$20	1.9

Note – Revenues and costs shown are conceptual order of magnitude, which are not based on traffic and revenue (T&R) or design studies.

Comparison of study results when considering tolling the whole system at roughly 5¢/mile as opposed to just tolling the twelve border locations at $1 for E-ZPass cars is important:

- Diversion is estimated to be quite a bit greater – the gains from diversion would be larger and there would only be one toll point per route to avoid;
- While construction costs for border tolls are significantly less, annual operating costs and revenues are estimated to be much greater. Each toll is a separate trip by a relatively infrequent driver; it is assumed that operating costs for Pay by Plate processing and image review would be much greater than with trips within the Commonwealth by regular drivers.

7.3 Legislative Actions to Support Comprehensive Tolling

Legislative action is needed to support implementation of expanded statewide tolling. At the state level it is recommended that the Massachusetts Legislature:

- Review existing enabling legislation to allow for expanded statewide tolling; and
- Provide greater flexibility in the use of toll revenues to fund transportation infrastructure not directly appurtenant to the facility being tolled.

Current state law limits MassDOT's authority to impose tolls to the turnpike and the metropolitan highway system. M.G.L. ch.6C, §§3(18) and 13. (Chapter 6C is referred to herein as the "Enabling Act"). While the Enabling Act contains broad language empowering MassDOT to undertake a variety of activities and enter in contracts with others, MassDOT will need to seek further legislative authorization in connection with the tolling of existing

and new facilities, including the placement of border tolls. Such a revision to the Enabling Act would also include provisions regarding the use of toll revenues (e.g. the potential to use excess revenues for other transportation projects or purposes)

In order to toll currently Non-Toll Federal-Aid Highways (non-Interstate), the Enabling Act would need to be amended to provide MassDOT with the broad authority to levy tolls on existing non-Interstate Federal-aid highways in accordance with Federal law eligibility requirements. Such an amendment to the Enabling Act might include a definition of such a facility, referencing the defined term in the Enabling Act's grant of tolling authority at Section 3(18) and Section 13. The relevant Federal law (the Section 129 Tolling Program) allows the reconstruction or replacement of a toll-free bridge or tunnel, or of a toll-free Federal-aid highway that is *not* an Interstate highway, and converting such facility to a tolled facility.[24] The Federal law allows all lanes of an existing toll-free *non*-Interstate highway to be converted into a toll facility as part of a reconstruction project on that facility. The eligible activities include "major improvements to pavements or interchanges," and the reconstruction of interchanges. An entire non-Interstate highway can be eligible for tolling even if only a segment is being reconstructed. The Federal guidance on this topic states clearly that the tolling eligibility under Federal law is not limited "only to those highway segments that are physically reconstructed."[25]

[24] This federal eligibility program is not available for interstate highways. Such conversions are governed by the Interstate System Reconstruction and Rehabilitation Pilot Program.

[25] See Guidance provided by Federal Office on Innovative Program Delivery at: http://www.fhwa.dot.gov/ipd/revenue/road_pricing/tolling_pricing/section_129_faqs.htm. "The limits of tolling on an existing toll free highway that is converted into a toll facility in conjunction with a reconstruction project may be based on the consideration of the extent to which the reconstructed segments benefit users of other non-reconstructed segments of the facility . . . and whether the toll limits have logical termini from the perspective of the users of the toll facility."