Regional Truck Study

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1 EXECUTIVE SUMMARY

Objectives and Background of the Study

This study investigated a number of truck-related issues in Cambridge, Somerville, and portions of Boston, Arlington, Belmont, and Watertown, most notably through-truck traffic on local streets, nighttime truck traffic, the need for preferred truck routes, and problems associated with restricting hazardous cargoes from portions of the expressway system.

The enactment of City of Cambridge Zoning Ordinance 1224 in June 1999, which sought to ban all nighttime through trucks in Cambridge, prompted the creation of the Committee on Regional Truck Issues (the "Committee") representing municipal, state, and industry stakeholders. The Committee was specifically charged with developing a "regional approach to traffic, noise and safety issues associated with large truck traffic and trucks placarded for the transport of hazardous materials." A Technical Subcommittee was also formed to plan and guide the study and evaluate its results. The Technical Subcommittee was charged with relaying its recommendations to the Committee, which would submit final recommendations to whichever bodies have authority over a particular measure, and those bodies would consider the measures for approval and implementation.

The Central Transportation Planning Staff (CTPS), the technical staff of the Boston Metropolitan Planning Organization, conducted the study for the Committee. This report, prepared by CTPS, documents the technical materials and analyses provided to the Committee and presents the recommendations the Committee arrived at.

Process of the Study

Information on existing conditions regarding truck travel was collected to determine the existing truck network, truck volumes, and origin and destination patterns in and around the study area. This information was used in developing the travel model set used in the study. The study analyzed alternative truck routing strategies, systematically applying to them a set of performance

measures categorized as qualitative and quantitative. The qualitative measures related to institutional constraints, noise and safety consequences, physical roadway constraints, and intersections of concern. The quantitative measures examined changes in truck volumes and truck vehicle miles of travel and impacts on residential areas and air quality.

Twelve different alternative truck routing strategies were examined using the qualitative and quantitative measurements. After the results of this analysis were reviewed, six of these strategies were eliminated from further consideration. Each of these six strategies had an unfavorable impact, compared to the other six strategies, on one or more of the following: vehicle miles of travel, residential impact, nitrogen oxide emissions, and intersections of concern. The strategies that were eliminated at this point were:

General Truck Actions

- Change Prospect Street and Webster Avenue in Union Square in Somerville to two-way streets and remove the truck exclusion from Prospect Street during the day.
- Remove truck exclusions on all of Alewife Brook Parkway.
- Enforce the current truck exclusion on Brattle Street.
- Ban through truck traffic in Cambridge at night.

Hazardous Cargo Carrying (HC) Truck Actions

- Allow HC trucks into express highway tunnels.
- Restrict HC trucks from the Massachusetts Turnpike east of Route 128.

The six strategies that were retained for further consideration were:

- Open Memorial Drive to trucks from BU Bridge to Vassar Street.
- Open Memorial Drive to trucks from Western Avenue to Vassar Street.
- Exclude trucks on Cardinal Mederios Avenue.
- Open Alewife Brook Parkway from Massachusetts Avenue to Broadway.
- Exclude trucks on Kirkland Street for 24 hours instead of maintaining the existing nighttime exclusion.

- Remove exclusion on Blanchard Road and Brighton Street north of Concord Avenue, but impose exclusion on Blanchard Road south of Concord Avenue.

In addition to the review of alternative truck routing strategies, the study included the collecting of information from public officials, trucking representatives, law enforcement officials, and citizens to obtain their perspectives on trucking issues. The Technical Subcommittee hosted a number of meetings to gather this information. It met with officials from the Massachusetts Turnpike Authority, the Boston Fire Department, and the Federal Highway Administration to discuss the transport of hazardous materials through tunnels. Meetings were held with enforcement officials to discuss enforcement of truck regulations in the study area and with truck drivers from companies with delivery routes through the study area to get their perspective on the issues. In addition, four public meetings were held to solicit inputs from citizens in the study area. All of the information collected was examined to determine whether any existing policies or regulations should be modified.

Findings and Conclusions

The following is a summary of the study's findings and conclusions derived from examination of the policy and regulatory issues and from analysis of the existing conditions data.

General

- Through truck traffic in Cambridge represents approximately 37% of all truck traffic *entering* the city and 16% of all truck traffic *in* the City of Cambridge.
- Trucks are essential in providing goods and services to Cambridge and the region as a whole and the practical reality is that trucks will continue to travel on Cambridge roadways.
- On average, 75% of all trucks on roadways in Cambridge, not part of the truck route, are two-axle trucks.
- Truck access between the cities of Cambridge and Somerville is needed to ensure continued economic activity for the commercial and industrial areas in northeast Cambridge and southeast Somerville.

Truck Route Signs

- Truck route signs are nonexistent or not visible throughout the study area.
- Truck-related signs frequently disagree with the regulatory status of the roadway.
- Existing truck exclusion signs in the study area create confusion among truck drivers.

Infrastructure

- Specific bridges in the study area have deteriorated and are posted with weight restrictions or closed to truck traffic altogether.

Noise and Vibration

- The majority of specific complaints made by residents of the study area regarding noise and vibration from trucks occur at night during roadway construction projects or when roadway conditions are deteriorated.

Enforcement

- According to enforcement officers, violations on truck excluded roadways are not a significant problem throughout the study area.

Recommendations

This study's recommendations were developed in the following manner. CTPS prepared recommendations based on the findings and conclusions summarized above and submitted them to the Technical Subcommittee for its review (the CTPS recommendations are provided in Appendix B of this report). The Technical Subcommittee used those recommendations to formulate draft recommendations that were presented to the public for comment and to the Committee on Regional Truck Issues. Subsequently, the Committee voted on the final recommendations of the study. A summary of the final recommendations is given below, while a detailed description is provided in chapter 7.

Truck Routes

- All state-numbered routes and roadways designated as part of the National Highway System cannot exclude trucks.
- All state-numbered routes should have sufficient route guide signs.
- The following roads should be designated as truck routes, and should be clearly signed as such by the appropriate community:
    1. Eastern truck route comprised of First Street, Land Boulevard, and Binney Street in Cambridge
    2. JFK Street in Cambridge
    3. Broadway in Somerville
    4. Somerville Avenue in Somerville (when reconstruction is completed)
    5. Washington Street between Somerville City Line and McGrath Highway in Somerville
- The following roads should be designated as truck routes for connectivity purposes only, but not signed as a such:
    1. Gilmore Bridge in Cambridge
    2. Cambridge Street in Cambridge
    3. Arsenal Street in Watertown
    4. Western Avenue in Boston
    5. North Harvard Street in Boston
- Alewife Brook Parkway between Massachusetts Avenue in Cambridge and Broadway in Somerville should be open to two-axle trucks.
- The Massachusetts Turnpike Authority should install signs that encourage trucks to remain on the Turnpike into Boston and onto the north-south expressway system, except for hazardous cargo trucks, which must exit at the Brighton/Cambridge interchange.

Truck Exclusions

- Coordinated actions to improve access between the cities of Cambridge and Somerville in the Union Square area should be pursued.
- The City of Cambridge should request a 24-hour truck exclusion on Cardinal Medeiros Avenue, Warren Street, and Putnam Avenue.

Nighttime Exclusions

- MassHighway should consider permits for necessary truck exclusions between the hours of 11 P.M. to 6 A.M. in the six MOU communities, except on the designated nighttime truck routes or for trucks that have an origin or destination in that community, after consultation with trucking industry representatives.
- Based on the work done as part of this study, the Committee recommends that the ban on nighttime truck traffic as part of the Cambridge zoning ordinance be repealed and replaced by the recommendations in this report.

Hazardous Cargo Routing

- The Committee does not recommend pursuing opening of tunnels to hazardous cargo trucks on the expressway system in Boston at this time. However, they recommend the following:
    1. Determine how other states deal with hazardous cargoes in tunnels.
    2. Conduct a risk/hazard assessment to determine the feasibility of opening the Prudential Tunnel to gas and oil cargoes.
- The City of Cambridge should post additional signs on River Street, Western Avenue, and Pleasant Street between Massachusetts Avenue and Western Avenue to indicate that hazardous cargo trucks are allowed on these roadways 24 hours a day.

Infrastructure Needs

- Funding for adequate maintenance of pavement and bridges along preferred regional truck routes should be a priority in future Transportation Improvement Programs.
- Bridges with structural problems on routes with significant truck traffic should be identified and repaired as soon as possible although with lower priority than those on designated truck routes.

Noise

- The trucking industry has agreed to promote a voluntary limit on the use of jake brakes in densely populated urban areas, especially at night.

Enforcement

- Truck route and truck exclusion maps should be widely distributed to local and state police departments for distribution to truckers during routine stops and should be made available on the Internet.
- A program to educate truckers regarding excluded roadways throughout the study area should be developed.
- The six MOU communities should work together to encourage the Legislature to develop a program providing state grants to municipalities to supplement state and local truck law enforcement efforts.

Outreach to the Trucking Community

- Maps showing truck routes and restrictions should be produced and widely distributed to trucking organizations with operations in the state.
- Other ways to distribute truck information should be explored.

Ongoing Agency and Community Efforts

- An ongoing regional truck-related stakeholder group should continue to meet and monitor the implementation of this study's recommendations and respond to new issues.
- As part of a comprehensive freight plan, new ideas to limit the need for large trucks in residential areas should be investigated.

2 INTRODUCTION

2.1 BACKGROUND

2.1.1 Origins of This Study

In recent years, municipal officials in the metropolitan Boston area have become increasingly concerned about the growth of truck traffic on surface roadways. Since trucks are the primary method of urban goods movement, the increase in truck traffic is primarily the result of economic growth. An increase in general traffic and highway congestion has also resulted from this economic growth.

A major problem facing the truck operators in the Boston region is the lack of a coordinated truck route policy. Residential, commercial, and industrial development has affected street and expressway patterns in the Boston area over the past 350 years, resulting in a number of truck routes through heavily populated residential corridors. This causes a conflict between residents' desire for a quiet and safe street and truck operators' desire for a reasonably direct route between origin and destination.

These conflicting patterns of development, commerce, and transportation are most acutely evident in the city of Cambridge and portions of its neighboring municipalities. In response to concerns expressed by Cambridge residents about noise, vibration, air pollution, and safety hazards caused by large commercial trucks, the city manager convened a Truck Traffic Advisory Committee. The Truck Traffic Advisory Committee included both city officials and Cambridge residents not associated with city government, and began meeting in November 1995.

The following spring, the Metropolitan Area Planning Council (MAPC) organized some meetings that brought together representatives of local and state governments, as well as truck operators. From these meetings emerged a consensus that truck issues needed to be addressed on a regional basis. In December 1996, the Boston Metropolitan Planning Organization (MPO) approved a Central Transportation Planning Staff (CTPS) work program to "Define and Address Urban Truck Issues in the Boston MPO Region." This study will be referred to here as the "Boston MPO Region Truck Study," to

distinguish it from the present study (although the later has built upon the former, as will be explained).

2.1.2 Initial Study Efforts

As CTPS began its investigation, it learned that there was some concern that local truck exclusions, which are requested by individual municipalities and approved by the Massachusetts Highway Department (MassHighway), had evolved over the decades in a pattern that may have actually aggravated the negative impacts of truck traffic. For this reason it was decided that the first step would be to build a database of all the local truck exclusions, which would then be mapped using geographical information systems (GIS) techniques. This task was expanded to look more broadly at the regulatory status of the various components of the road network. This task was also expanded geographically to include the entire CTPS model region (164 cities and towns). This expansion was in support of a new truck traffic modeling capability then under development at CTPS.

The 1997 Massachusetts Transportation Bond Bill, Section 89, authorized and directed MassHighway to conduct a study of mitigation measures to reduce damage caused by excessive truck traffic on major thoroughfares in communities bordering on and directly impacted by the Central Artery/Ted Williams Tunnel Project. The study included Cambridge Street in Cambridge and Washington Street in Somerville. It was initially assumed that the work being undertaken by CTPS in the Boston MPO Region Truck Study, including sponsorship of a stakeholder working group, would be deemed to satisfy this statutory requirement.

Meanwhile, by January 1998, the Cambridge city manager's Truck Traffic Advisory Committee had come to a key juncture. While there was consensus in the committee about the goals of the study, it was unable to achieve consensus on how best to achieve them. It determined that two reports would be forwarded to the city manager. A report was prepared and approved by those committee members who were associated with the Cambridge city government, and this became known as "Report A." The other members, Cambridge residents not associated with the city government, approved a second report known as "Report B."

Cambridge City Manager's Truck Traffic Advisory Committee Report A

The recommendations from Report A included increasing police enforcement of truck restrictions, being aggressive in considering additional truck restrictions, increasing efforts to implement nighttime truck restrictions that target through

trucks on residential streets, considering a citywide nighttime restriction on through trucks and identifying the streets where daytime truck traffic is most onerous. In addition, the report recommended that Cambridge coordinate with adjacent communities, push to ensure a timely completion of the Boston MPO Region Truck Study underway at CTPS, and further evaluate and reduce potential safety impacts of the movement of hazardous cargoes through Cambridge.

Cambridge City Manager's Truck Traffic Advisory Committee Report B

Report B included most of the recommendations of Report A, but went beyond Report A in three key respects. First, it recommended that Cambridge adopt a zoning regulation to ban all trucks from Cambridge between 11:00 P.M. and 7:00 A.M. except those with a destination in Cambridge. Second, it suggested that the impacts of any daytime designated truck routes be thoroughly evaluated. Finally, it asked that the City of Boston's legal authority to force hazardous cargoes to exit the Massachusetts Turnpike at Allston and use River Street in Cambridge be challenged.

Reports A and B were submitted to the Cambridge City Council.

2.1.3 Completion of the Transportation Bond Bill Study

In the spring of 1998, the preliminary work for the Boston MPO region truck study had been completed. The network findings, rendered in GIS, were shared with various stakeholders in anticipation of the convening of the study's Working Group. The Working Group's first meeting was in August of that year.

At its first meeting, the Working Group identified a number of issues that have been investigated in the current phase of the present study. These include hazardous cargo restrictions, Metropolitan District Commission (MDC) policies, the problem of through trucks on local streets, and the need for preferred truck routes. The need to be able to model the flow of trucks independently of other traffic, and CTPS progress in this area, were also discussed.

Most Working Group participants assumed that a continuation of the Working Group process and the supporting CTPS analytical efforts would fully satisfy the requirements of the Bond Bill. It was pointed out, however, that the Bond Bill study was very specific, whereas, the Working Group was looking at a larger geographical area and at a number of truck impacts viewed as more pressing than those specified in the Bond Bill.

Because the study objectives of the Bond Bill were spelled out by statute, MassHighway argued that the issues in the Bond Bill needed to be fully addressed before work could proceed on other, perhaps more topical issues. The Working Group adjourned with the understanding that a study tailored to the specific requirements of the Bond Bill would be undertaken, after which the Working Group would resume its discussions of broader issues.

The Bond Bill Study Report, *Truck Traffic in East Cambridge and Somerville*

CTPS submitted this report to MassHighway in September 1999. Key findings included:

- Study area arterials bear a large amount of general traffic, including trucks.
- Despite the large number of trucks observed, they do not make up a large percentage of traffic, because of the extremely large numbers of cars, buses, and small commercial vehicles.
- Most trucks observed on the study area roadways were supporting local economic activity.
- The system of local truck exclusions has channeled truck traffic onto the few roadways, some residential, where trucks are still allowed.

Recommendations stated in the report were to change some of the existing truck exclusions, protect the usefulness of the National Highway System for trucks, and further study specific areas in Somerville and Cambridge. While the report was published solely in response to the 1997 Transportation Bond Bill, the fieldwork and analysis formed an important foundation upon which much of the present study efforts are based.

2.1.4 Enactment of the Cambridge Truck Curfew

In June 1999, the Cambridge City Council passed the nighttime ban on through truck traffic that had been recommended in Report B of the Cambridge City Manager's Truck Traffic Advisory Committee as Zoning Ordinance 1224. In March 1999, Somerville and Watertown, citing anticipated negative impacts on their cities, had expressed their opposition to this action in letters to the City of Cambridge. Watertown stated that all cities and towns must share the commerce and transportation burdens associated with the region and its economy. It also expressed the belief that the proposed amendment was subject to MassHighway approval. Somerville asserted that the amendment was inappropriate as a

zoning ordinance and would not address truck problems but merely shift them to other communities.

In July 1999, the City of Cambridge received a letter from the MassHighway chief counsel stating that the Cambridge ordinance was in violation of Massachusetts law. MassHighway requested that Cambridge submit the ordinance to MassHighway for review.

In September 1999, the Municipal Law Unit of the Massachusetts attorney general, in an attempt to avoid having communities engage in expensive and counterproductive litigation, stepped in and asked MAPC to convene a Committee on Regional Truck Issues (the "Committee"). The Committee members were to be the following parties with an interest in the Cambridge zoning ordinance.

Cities:	Boston Cambridge Somerville
Towns:	Arlington Belmont Watertown
State agencies:	Metropolitan District Commission Massachusetts Highway Department Massachusetts Turnpike Authority
Trade Associations:	American Trucking Association Massachusetts Motor Transportation Association Massachusetts Petroleum Council

The Committee convened and the parties prepared and agreed to a memorandum of understanding (MOU). In the MOU, the parties agreed that all legal actions with respect to Ordinance 1224 would be foregone for the duration of the MOU, and that Cambridge would suspend enforcement of Ordinance 1224 for the duration of the MOU. The MOU was to expire on February 16, 2001, but was extended to September 30, 2001 by mutual agreement of the Committee.

The MOU further stipulated that MassHighway must fund and ensure the completion of a study of regional truck issues that will "provide the Committee with information and recommendations for a workable, regional approach to traffic, noise and safety issues associated with large truck traffic and trucks placarded for the transport of hazardous materials traffic." The present study has been conducted in fulfillment of that stipulation. Each party to the MOU

agreed to submit the study recommendations upheld by the Committee to whichever bodies have authority over a particular measure, and that those bodies would then consider the measures for approval and implementation. A Technical Subcommittee was also formed to guide the study.

Table 2-1 summarizes the sequence of actions that led up to the decision to conduct this study.

TABLE 2-1

Chronology of Actions Leading To This Study

Date	Action
November 1995	Establishment of Cambridge city manager's Truck Traffic Advisory Committee
Spring 1996	Meeting organized by MAPC to address concerns about trucks in the region
January 1998	Report B from the resident representatives on the Cambridge Truck Traffic Advisory Committee, recommending a nighttime ban on through truck traffic in Cambridge
August 1998	Initial Working Group meeting for the Boston MPO regional truck study
June 1999	Enforcement of the Cambridge nighttime ban on through trucks
September 1999	The study *Truck Traffic in East Cambridge and Somerville* submitted by CTPS to MassHighway in response to the 1997 Transportation Bond Bill
December 1999	Memorandum of Understanding signed to initiate a new Regional Truck Study to address issues associated with the Cambridge nighttime ban on through truck traffic

2.1.5 Study Objectives and Tasks

The principal objectives of this study were to:

- Assemble the information required as a basis for formulating recommendations in support of the objectives of the MOU.
- Formulate such recommendations.

In other words, this study was to result in recommendations–supported by a body of information–designed to mitigate perceived negative impacts of truck traffic on residential areas of the study area while concurrently maintaining the ability of trucks to move goods and provide services.

The term "regional truck study" might imply to some that the study was conducted for the entire Boston metropolitan region. That is not true. The study area is defined as Cambridge, Somerville, and portions of the surrounding communities of Boston, Watertown, Arlington, and Belmont potentially affected by the proposed truck restrictions. The study area is shown in Figure 2-1. This is the area within which the bulk of truck-related issues known to the Technical Subcommittee have surfaced. It is worth noting, however, that the regional travel model that was used in this study covers all of eastern Massachusetts. Thus, interactions with a larger network of roadways and truck routes were considered even as the work focused in on the defined study area.

The study was originally composed of six tasks, each of which is briefly described below.[1]

TASK 1: CREATE AND REFINE ANALYTICAL TOOLS
This task included marshalling and refining CTPS's geographical information system (GIS) tools and travel modeling tools for use in this study. It also pertained to collecting and organizing truck count and other data items for use in the study.

TASK 2: DEVELOP A SET OF TRANSPORTATION AND ENVIRONMENTAL MEASUREMENTS
This task resulted in a set of measurements and other criteria by which the Technical Subcommittee and CTPS evaluated alternative policies and actions designed to meet the objectives of the MOU.

TASK 3: SPECIFY A SET OF POSSIBLE POLICIES OR ACTIONS
The Technical Subcommittee and CTPS agreed on a set of strategies to evaluate against the measurements and criteria established in the previous task.

TASK 4: EVALUATE POSSIBLE POLICIES OR ACTIONS
This task was at the heart of the study. It is here that the analysis of alternative strategies occurred. This task involved both quantitative and qualitative evaluations. In connection with the former, the CTPS regional travel model set

[1] For a fuller description, see "Work Program for: Regional Truck Study," memorandum to the Sub-Signatory Committee of the Boston Metropolitan Planning Organization from Luisa Paiewonsky, MPO Executive Secretary, February 17, 2000.

provided forecasts of the traffic and other consequences of alternative truck routings through the study area.

TASK 5: FORMULATE RECOMMENDATIONS
CTPS recommended to the Technical Subcommittee strategies evaluated in the previous task. Implementation issues and strategies were also addressed.

TASK 6: PREPARE DRAFT AND FINAL REPORTS
CTPS prepared a draft report for the Technical Subcommittee and then worked with that group to refine the draft into a final report.

In October 2000, the Technical Subcommittee decided that the study as described in the MOU needed to be expanded to include two new tasks:[2]

SUPPLEMENTAL TASK 1: EXPAND AND SHARE INFORMATION ON EXISTING CONDITIONS
CTPS collected and analyzed additional truck count data regarding volumes and size of trucks, and expanded its analysis of through truck traffic.

SUPPLEMENTAL TASK 2: RESEARCH REGULATORY AND ENFORCEMENT ISSUES
CTPS collected information on current enforcement practices, evaluated alternative truck restriction options, including innovative regulations in other communities, evaluated techniques to encourage desired truck movements, and investigated noise and vibration issues.

2.2 OVERVIEW OF THIS REPORT

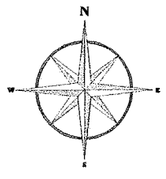
This report documents the research and technical analysis performed for the Regional Truck Study and presents the final recommendations of the Committee on Regional Truck Issues. A brief overview of the remaining chapters follows:

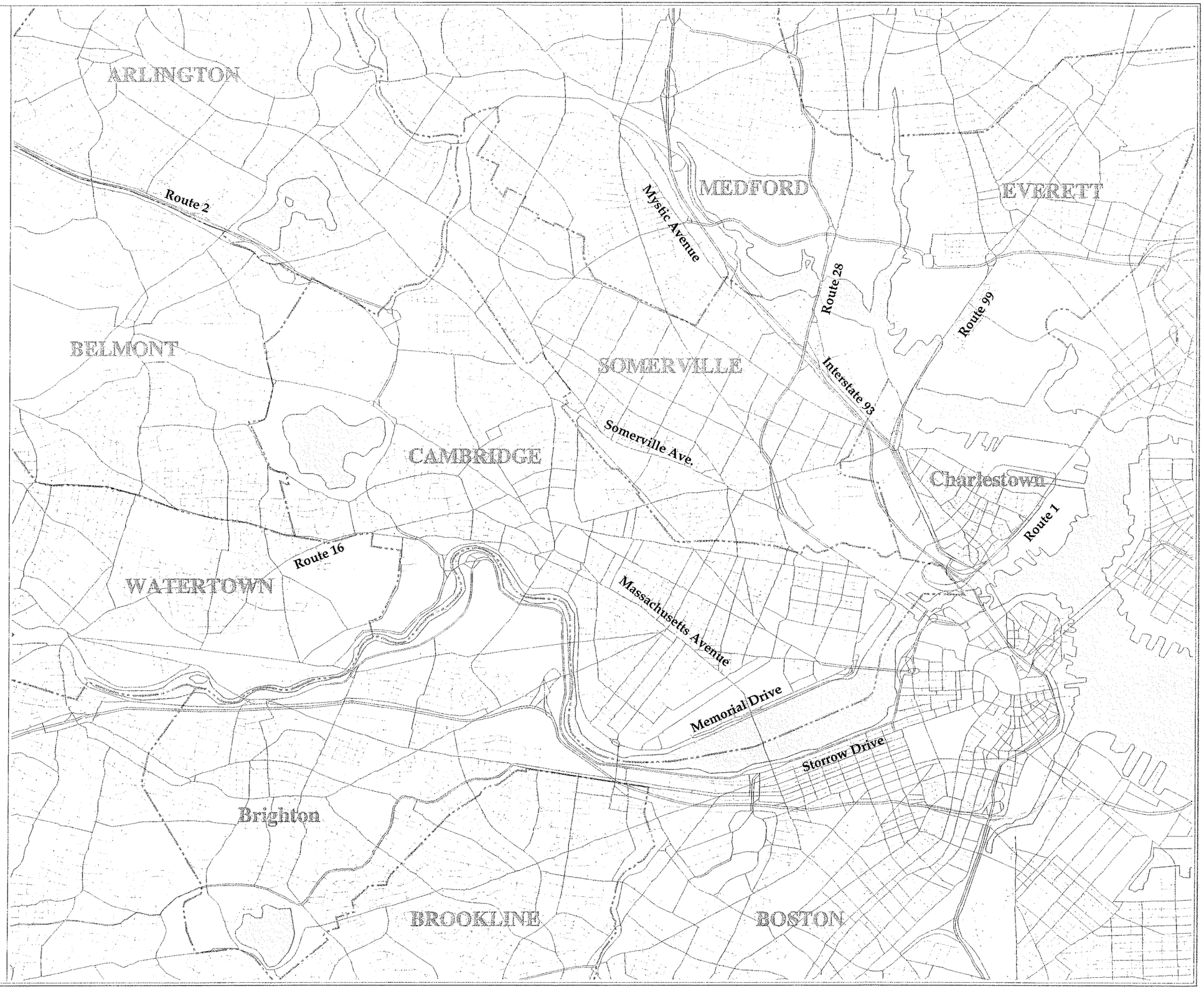
Chapter 3 describes the process and methods used in the study, including: the public process; how the existing conditions data was gathered, including traffic counts, hazardous cargo observations, and roadway constraints; and how the alternative policies and actions were evaluated using both qualitative and quantitative methods.

[2] For a fuller description of the supplemental workscope, see "Work Program for: Supplemental Regional Truck Study," memorandum to the Sub-Signatory Committee of the Boston Metropolitan Planning Organization from Luisa Paiewonsky, MPO Executive Secretary, October 25, 2000.

FIGURE 2 - 1

STUDY AREA





LEGEND

- Modeled roadways
- Roadways not in model
- Municipal boundaries

CTPS

Chapter 4 provides information on existing conditions in the study area. It describes the truck network, including the primary truck network, truck exclusions, and physical restrictions. In addition, the study area's truck trips are described in detail; the information presented includes truck volumes, major nodes of truck activity, and origin and destination patterns.

Chapter 5 provides information on truck issues presented during the study and describes the different perspectives of the parties involved. Information was obtained from public officials, citizens, trucking representatives, and local and state law enforcement officials.

Chapter 6 summarizes the major findings and conclusions stemming from the research and technical analyses performed in the study. Included are evaluations of the alternative truck routing strategies and qualitative evaluations that cover the results of research into regulatory and other policy matters. All of the input of the various parties involved throughout the study was taken into consideration in the development of these findings and conclusions.

Chapter 7 presents the final study objectives and recommendations of the Committee on Regional Truck Issues.

Appendix A consists of maps showing the changes in truck traffic that were forecast to result from each of the various alternative truck routing strategies.

Appendix B presents the recommendations of CTPS.

3 STUDY PROCESS AND METHODS

This chapter describes the process and methods used in this study. It includes descriptions of how the various analyses were performed, where information was obtained, and how alternative policies and actions were evaluated.

3.1 PUBLIC PROCESS

3.1.1 Technical Subcommittee

The MOU that mandated this study stipulated that a Technical Subcommittee, co-chaired and facilitated by MAPC and MassHighway, be formed to plan for, guide, and evaluate the results of the study. The Technical Subcommittee was charged with relaying its recommendations to the Committee on Regional Truck Issues, which would then consider them.

The Central Transportation Planning Staff (CTPS), which is the technical staff of the Boston Metropolitan Planning Organization, was asked to conduct the study under the supervision of the Technical Subcommittee generally and the two co-chairs specifically.

The Technical Subcommittee met at least monthly and as frequently as weekly during various stages of this study to discuss and resolve the issues that arose.

3.1.2 Public Meetings

Four meetings were held to solicit input from the public at various stages of the study. The first public meeting was held at Somerville City Hall on June 21, 2000. Information was presented on existing truck volumes and truck exclusions, and some known areas of concern were highlighted. The remainder of the meeting was devoted to receiving comments regarding trucking issues and concerns from citizens. Specific comments received during this meeting are presented in chapter 5. section 5.3 of this report.

The second public meeting was held on October 3, 2000 at Cambridge City Hall. At this meeting an overview was presented of the analysis of preliminary

regional truck routing strategies. Comments were then received from the citizens that focused on the strategies presented and on concerns about the impacts of larger trucks and through truck traffic in the communities.

The third public meeting was held on April 3, 2001, at the Cambridge Senior Center. Information presented at this meeting included additional research on existing conditions and current policies; the subjects included truck volume data, noise and vibration associated with trucks, enforcement issues, and through truck traffic. Progress in the analysis of truck mitigation strategies was described, including the narrowing down by the Technical Subcommittee of the strategies being considered. Citizens spoke of the need to address the issue of larger trucks and to provide a safe and quiet environment in the residential areas of Cambridge.

The fourth and final public meeting was held at the Somerville High School Auditorium on June 26, 2001. The Technical Subcommittee's draft recommendations were presented at this meeting. Comments from the public included input on implementation of the recommendations, hazardous cargo, and parkway and bicycle issues.

3.1.3 Other Meetings

The Technical Subcommittee hosted a meeting with each of the following:

- Enforcement officials, to discuss enforcement of truck travel regulations.
- Officials from the Massachusetts Turnpike Authority, the Boston Fire Department, and the Federal Highway Administration to discuss the transport of hazardous materials in tunnels.
- Truck drivers from companies with delivery routes in or passing through the study area, to discuss their concerns.

The issues are summarized in light of the various perspectives on them in chapter 5, Sections 5.1 and 5.2.

3.2 DATA COLLECTION

3.2.1 Traffic Counts

The following sources of truck traffic information were used:

- A 1998 MassHighway study of Washington Street in Somerville.
- The 1998 City of Cambridge cordon counts.
- Truck turning counts performed by CTPS in late 1998.
- Balanced truck volumes based on the above three sources, produced by CTPS in 1999.
- Additional City of Cambridge truck counts performed in 1998 and 1999.
- CTPS balanced 1999 expressway volumes and earlier CA/T classification counts.
- Truck turning and hazardous cargo counts performed by CTPS in 2000.
- Truck turning and classification counts performed by CTPS in 2000.
- City of Somerville truck counts performed in 2000.

This count information was used in the development of the base case conditions for the travel demand model used in this study. A discussion of the model will be presented in section 3.3.2.

Despite these extensive data collection efforts, the truck volumes generally are disconnected, and only indicate truck traffic between the major intersections adjacent to the point where the count took place. Beyond these adjacent intersections, the truck volumes are not reliably known, because a significant number of trucks observed at the count location may turn off the observed flow, and trucks from connecting streets may join the observed flow. The travel demand model was used in providing truck volumes between locations where specific counts were taken.

3.2.2 Hazardous Cargo Observations

Trucks carrying hazardous materials were counted as part of this study to determine the percentage they make up of total trucks in the region. Staff from CTPS performed these counts over the last year at various locations around the study area. In addition, the study made use of an origin-destination survey done

during the Central Artery project planning stage that included counts of trucks carrying hazardous materials.

3.2.3 Observations of Physical Roadway Constraints

Four types of restrictions based on the physical characteristics of the roadway (as opposed to local truck exclusions) can affect the ability of a truck to use the road network:

- Weight restrictions on bridge decks.
- Height restrictions for passing under bridges.
- Hazardous cargo prohibitions in extended underground roadways.
- Tight turning radii at intersections.

A number of restrictions of the first three types were identified in the study area. They are discussed in chapter 4, sections 4.1.6 and 4.1.7.

Roadway constraints of the fourth type are in large part due to the way street patterns developed within the region over the past 350 years. The narrow roadways and tight intersections are too numerous to inventory throughout the entire study area; however, these constraints were considered in the evaluation of alternative truck routing strategies.

3.2.4 Other Field Observations

To address concerns voiced about the amount of truck traffic on roadways that are signed as excluded to truck traffic, CTPS performed a classification count on Prospect Street in Cambridge that determined the types of trucks that use the street and if they are legally allowed to do so. A roadway that is excluded to truck traffic can legally be used by a truck that has a pickup or delivery along that corridor. Inspection of the count data indicated that the majority of the trucks using Prospect Street appeared to be engaged in some form of local commerce along the roadway.

3.3 EVALUATION OF ALTERNATIVE TRUCK ROUTING STRATEGIES

3.3.1 Specification, Description, and Use of Performance Measures

CTPS identified a set of qualitative and quantitative measurements that were systematically applied to alternative truck routing strategies that were examined in this study.[3] The values of the quantitative measures and the values used in some of the qualitative measures were derived from the regional travel model and geographic information system (GIS) tools that were developed for this study. The regional travel model will be described in the next section. The performance measures used in evaluating the strategies are listed and described below.

Qualitative Performance Measures

Institutional Constraints—The roadways in the study area are governed by federal, state, or local regulations, or by policies of independent authorities. In some instances, changing the use of a roadway can be achieved through a straightforward application of existing laws and regulations. Independent authorities also enjoy considerable latitude in regulating the use of their property assets. In many cases, however, changing the use of a roadway would require changing a law or regulation, or a standing policy of an agency or independent authority. For any strategy or action that would change the use of sections of roadway, relevant institutional constraints were identified.

Type and Proportion of Trucks Affected—Many of the negative impacts of trucks relate to the fact that these vehicles are larger than autos and vans, and consequently are powered by substantially more powerful and noisier engines. It must be recognized, though, that a proposed change in roadway use may not necessarily affect all of these trucks. For this reason it is important to identify at the outset whether a significant portion of trucks would *not* be affected by the change. For example, since government-owned trucks are exempt from some restrictions, the reduction of truck traffic from a prohibition on heavy commercial vehicles would only be partially successful on roadways used disproportionately by government owned trucks. Also, bridges that a fully loaded truck cannot use may be usable by smaller or partly empty trucks. Trucks have a right to use a street for access if they are based on it or serving customers on it, so this traffic would not be reduced by certain types of restrictions. Finally, some of the strategies looked at restricting hazardous cargo trucks only.

[3] It should not be inferred from the categorization of the performance measures as qualitative and quantitative that none of the measures in the former category made use of quantifiable information.

Obvious Noise and Safety Consequences—The more exposure someone has to truck traffic, the greater the perceived noise and safety hazard. This performance measure flagged obvious location-specific noise and safety consequences that may be associated with a particular truck mitigation strategy. These could be either intended or unintended consequences. An intended consequence might be that a proposed action reroutes truck traffic away from a school zone, thereby increasing perceived safety in that area. An unintended consequence might be that a proposed action reroutes trucks away from a dense residential neighborhood but through a hospital zone where increased truck-generated noise and vibrations could be perceived as a problem. Sensitive receptors, including schools, hospitals, and parks, were reviewed to determine if truck traffic would be rerouted past them under the various strategies.

Regulation Enforcement—Certain strategies may have implications for enforcement. Each alternative strategy was reviewed for any changes to current enforcement practices that would be required.

Physical Roadway Constraints—Strategies involving routing more or bigger trucks to particular roadways may prove unworkable due to constraints on the roadways receiving those trucks. These constraints have to do with turns, grades, effective roadway widths, and bridge restrictions. This performance measure flagged and rated the seriousness of any such constraint associated with a proposed strategy.

Accident Statistics—MassHighway compiles a list of the top 1000 accident locations in the commonwealth, ranked based upon the number and severity of accidents occurring over a three-year period. The study area locations identified in this list and the truck accidents that have occurred at these locations were compiled. These locations were reviewed to determine whether truck volumes would increase or decrease as a result of each of the strategies.

Truck Volumes at Intersections of Concern—Each of the communities in the study area was asked to compile a list of the intersections viewed as congested or problematic. These intersections were reviewed to determine whether truck volumes would increase or decrease as a result of each of the strategies.

Quantitative Performance Measures

In order to generate estimates of all the effects of a proposed network change, large and small, localized and diffuse, it is necessary to use a travel model. After the model assigns traffic flows to the numerous network links, it can generate a number of summary statistics. A key statistic that was used to measure and compare alternative truck routing strategies was the number of miles that trucks drive in each traffic analysis zone. Combining estimates of truck vehicle-miles traveled in each zone with a demographic database containing the population and population density of each zone, it was possible to form additional statistics useful in comparing the impacts of trucks under the different networks of the alternative strategies. The quantitative performance measures were as follows.

Traffic Volumes—For each alternative strategy, the travel model was used to forecast both total traffic volumes and truck volumes on every roadway section in the study area. Changes in total traffic volumes were used to gauge the possible changes in overall levels of congestion on roadways of interest. Changes in truck traffic volumes resulting from an alternative strategy were the most obvious performance measure of interest.

Truck Vehicle-Miles Traveled (VMT)—The total number of truck vehicle-miles traveled in the region was used to broadly represent the usefulness of the network to trucks. If a fixed set of truck flows requires additional truck vehicle-miles to complete, this suggests a disbenefit to truckers as a group. This measure was formed by summing the truck vehicle-miles estimated for each of the traffic analysis zones.

Air Quality—Truck and automobile VMT is roughly proportional to the regional air quality impact of traffic. In most cases, if the VMT increases, emissions from the vehicles will probably increase as well. Using the change in total truck and automobile VMT from existing conditions associated with each strategy, the change in emissions of volatile organic compounds (VOC) and nitrogen oxides (NOx) was calculated for each strategy.

Residential Impact—This was one of the most useful measures. It illustrates the power of combining the capabilities of the model with those of the GIS. The measure was formed by relating the truck vehicle-miles in each zone to the population and population density of the zone. The calculation, omitted here for simplicity, yields a value that represents the number of times per weekday that a truck passes within 100 yards of where someone lives. "Residential Impact" was measured throughout the region and the study area. Comparisons between the impact levels in the Base Case and in the alternative strategies were a key line of analysis. In some cases a strategy decreased "residential impact" while

increasing truck VMT because it routed truck traffic along more circuitous routes away from dense residential areas. However, other strategies reduced both truck VMT and "Residential Impact."

3.3.2 Travel Modeling

3.3.2.1 Description

The CTPS travel model set used in this study was developed using state-of-the-art procedures and a very large amount of observed transportation data. The model set encompasses 164 cities and towns in eastern Massachusetts; see Figure 3-1. This model set has been used extensively over the past several years for a wide variety of highway and transit projects.

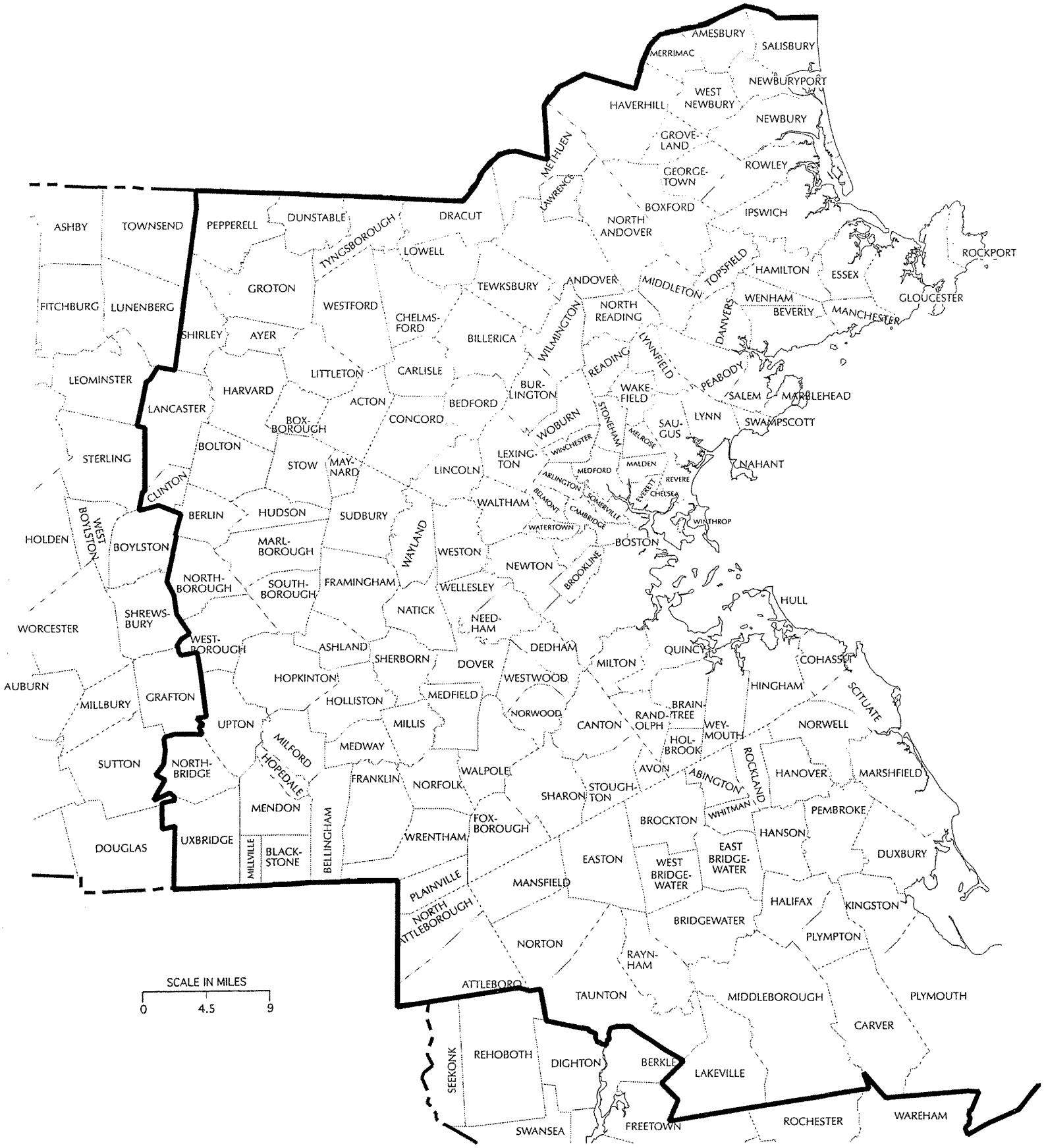
The primary inputs used in the model are the land use and demographic data such as population, employment by category, households and their socioeconomic characteristics, parking costs, vehicle operating costs, tolls and highway and transit levels of service. The model set simulates travel on the entire eastern Massachusetts transit and highway system. The model has two components. The first component deals with the estimation of passenger traffic and the second with truck traffic. Some examples of general actions that can be tested using the model include closing or opening a roadway section to trucks, adding new lanes on a roadway, implementing a new transit service, etc.

The component of the model that simulates the truck traffic is based on data obtained from two recent surveys: 1) the US DOT truck users survey conducted in 1993, and 2) a detailed phone interview survey conducted by CTPS in 1998 and 1999. The information obtained from these surveys was primarily used in determining where trucks begin their trips and how these trips are distributed throughout the study area. The truck trips modeled in this study include all trucks having three or more axles. Truck traffic occurring during different times of day such as AM, Midday, PM and Nighttime are modeled separately. Also included in the model are the truck prohibitions on certain roadways as they exist today.

Three classes of trucks are modeled in this study:

1. trucks that are subjected to prohibitions (most trucks fall in this category),
2. trucks that travel everywhere ignoring prohibitions (this is a small percent usually composed of garbage trucks, oil delivery trucks, etc), and
3. trucks that carry hazardous materials.

Figure 3-1 Modeled Area



Before applying the model to test any strategy, a process called calibration is performed. In this process, several parameters in the model are adjusted and refined until it simulates observed traffic with reasonable accuracy. Since most of the strategies tested in the Regional Truck Study are within the communities shown in Figure 2-1, more effort was put into calibrating the model to these communities than the whole region.

The observed truck volumes used in the calibration process came from several sources including the cities of Cambridge and Somerville, MassHighway, the Highway Performance Monitoring System (HPMS) data base, and recently performed field work by CTPS.

3.3.2.2 Specification and Evaluation of Alternative Strategies

CTPS in consultation with the Technical Subcommittee, formulated an initial set of alternative truck mitigation strategies to be reviewed and analyzed using the travel model. The strategies were developed based on review of existing conditions in the study area, recommendations from past reports and comments from local officials and citizens. In addition, after soliciting input from citizens at the public meetings, a number of strategies were added to the original list of those to be considered by the Technical Subcommittee. All of the strategies involved a modification to the existing truck network that currently exists. A list of the strategies that were modeled as part of this study are shown below:

General Truck Actions:

- Open Memorial Drive from BU Bridge to Vassar Street.
- Open Memorial Drive from Western Avenue to Vassar Street.
- Prospect Street and Webster Avenue in Union Square in Somerville changed to two-way streets with the truck exclusion removed from Prospect Street during the day.
- Close Cardinal Medeiros to trucks.
- Remove truck exclusions on Alewife Brook Parkway between Massachusetts Avenue and Broadway.
- Remove truck exclusions on all of Alewife Brook Parkway.
- Open Brighton Street (Belmont) and Blanchard Street (Cambridge) north of Concord Avenue.
- Enforce the current truck exclusion on Brattle Street

- Close Kirkland Street to trucks for 24-hours instead of the existing nighttime exclusion
- Nighttime ban on trucks through Cambridge.

Hazardous Cargo Carrying Truck Actions:

- Allow HC trucks into express highway tunnels.
- Restrict HC trucks from the Turnpike east of Route 128.

3.4 QUALITATIVE EVALUATIONS

In addition to evaluating each of the modeled strategies with the performance measures described above, CTPS researched alternative truck restriction options. CTPS conducted this search through a number of avenues. A notice was sent out through the Association of Metropolitan Planning Organization (AMPO) website requesting information from metropolitan planning organizations (MPO) with communities that have municipal laws regulating truck traffic at the local level including time of day deliveries and truck length restrictions. In addition, literature in the State Transportation Library was reviewed and a search of the internet was conducted seeking information on truck restrictions. The Massachusetts State Police Truck Enforcement Unit and the Massachusetts Motor Transportation Association were also contacted. The following is a summary of information gathered through this process.

- Town of Plaistow, New Hampshire

  The Town of Plaistow, NH passed a zoning ordinance that limits nighttime access to a local truck terminal located on the border of the town. The ordinance was passed to reduce dust, vibration and noise along the access road that passes through a residential area of the town. Truck access to the terminal as outlined in the ordinance is as follows:

  - 6:00 A.M. TO 9:00 P.M. - No restrictions
  - 9:00 P.M. TO 11:00 P.M. - Two trucks may arrive or depart
  - 11:00 P.M. TO 5:00 A.M. - No trucks may arrive or depart
  - 5:00 A.M. TO 6:00 A.M. - Three trucks may arrive or depart

- State of New Jersey

  The New Jersey Department of Transportation adopted an emergency rule (NJAC 16:32) in July of 1999 regarding large interstate truck restrictions. The law prohibits double-trailer truck combinations and 102-inch wide standard trucks from using state highways and county roads as through routes or short cuts between National Network highways when they are not originating their trip in New Jersey or do not have destinations within the state. This type of regulation could only be implemented within the study area of the Regional Truck Study if the Massachusetts state laws and regulations regulating commercial truck travel within the state were changed.

- Hillsborough County, Florida MPO Truck Route Study

  The Hillsborough County Board of Commissioners adopted, by ordinance, a Truck Route Plan for the county. The ordinance identifies specific roadways in the county where trucks with three or more axles and all non-passenger combination vehicles are restricted. It also identifies specific roadways that are designated truck routes without any restrictions. Trucks are allowed on restricted roadways only if making a pick-up or delivery or making a service call. It also states that a regulated truck must have a valid dispatch order or written proof if using a restricted roadway. The City of Tampa (located in Hillsborough County) has specified its own truck routes and trucks are allowed to "deviate only at the intersection nearest to its first destination point."

  The study talked about time of day delivery restrictions, however, a follow-up phone call indicated that there are currently no time of day restrictions in force. When asked about enforcement efforts related to this ordinance, the staff at the Hillsborough County MPO indicated that the majority of the enforcement efforts are on major roadways that are not designated truck routes. Enforcement officers respond to complaints as they are filed.

  The county form of government is stronger in the State of Florida than it is in Massachusetts. This type of ordinance was developed through the coordination of the cities and towns within Hillsborough County and is enforced at that level. This type of action in the Regional Truck Study area would require a change in Massachusetts state laws and regulations.

- New York City Congestion Pricing in Loading Zones

  New York City has been struggling with significant abuse of parking in loading zones. Because of lax police enforcement, loading zones in many locations were becoming long term parking spots for vehicles with commercial license plates. The result was that trucks wanting to make legitimate deliveries could not find open loading zones and would end up double parking. This decreased the capacity of the streets, resulting in increased congestion.

  The New York City Department of Transportation decided to charge trucks a parking fee on an experimental basis, for time at curbside loading zones during the busiest traffic hours of the day. The program went into effect on November 13, 2000. Commercial vehicles cannot park on streets within a certain area of the city unless they are parked in spaces controlled by Muni-Meters. A Muni-Meter resembles a small vending machine. The trucker can purchase a municard from the Department of Transportation and insert it into the munimeter. Quarters and dollar coins are also accepted. The trucker receives a machine-generated receipt for display on the dashboard, providing proof of payment. Rates are $1 for one hour, $3 for two hours, and $6 for three hours. Parking rates apply from 7 A.M. to 6 P.M. parking is free during other hours. This is to encourage vehicles to make deliveries at times when the traffic volumes are lower. The pilot program is expected to last for 18 months.

  Although this type of program was not a focus of the Regional Truck Study, this strategy could be effective in the more congested downtown areas of Boston to help improve traffic flow during peak periods.

- State of Georgia Regulations

  The State of Georgia currently has a regulation on delivery times for commercial trucks exceeding specific weights or dimensions traveling within the perimeter of Interstate 285. Interstate 285 is the circumferential interstate highway around the City of Atlanta. All commercial trucks over the limits shown below (generally trucks over 6 wheels) must use Interstate 285 unless they have a delivery or pick-up within the area:

  - Width - 8 feet 6 inches
  - Height - 13 feet 6 inches
  - Length - 100 feet
  - Gross Weight - 80,000 pounds

In addition, the regulation restricts deliveries by commercial trucks exceeding the limits stated above between the hours of 7:00 and 9:00 A.M. and 4:00 and 6:00 P.M. within the perimeter of Interstate 285. This regulation was enacted by the Georgia Department of Transportation.

This type of regulation could only be implemented within the study area of the Regional Truck Study if the Massachusetts state laws and regulations regulating commercial truck travel within the state were changed.

4 EXISTING CONDITIONS

4.1 TRUCK NETWORK

Since 1937, municipalities in Massachusetts have been allowed to exclude trucks from some roadways under certain circumstances. The status of these local truck exclusions was reviewed in 1998 by CTPS as part of the Boston MPO Region Truck Study, and the permitted exclusions were mapped in GIS. The exclusion permit database has been regularly updated since that time. There are several categories of roadways whose status with regard to trucks cannot be changes via the truck exclusion process. The system composed of these roadways is referred to in this study as the Primary Network.

Other types of truck regulations and restrictions that exist separately from the local truck exclusion process include:

- Hazardous material restrictions and alternate routes.
- Permits and routes for overweight vehicles.
- Tandem trailer routes and restrictions.
- Bridge and overpass restrictions.
- Curbside and on-street loading and unloading.
- Other contemplated municipal restrictions on local access.

This section discusses, first, the key statutes governing the local truck exclusion process and then the basis for and nature of the Primary Network. The specific local truck exclusions in the study area are then explained. The networks available to trucks in the daytime and in the nighttime (some exclusions apply only at night) are also discussed.

4.1.1 Key Statutes Affecting Local Truck Exclusions

Chapter 85 of the Massachusetts General Laws

The power of a municipality in Massachusetts to exclude trucks from a section of roadway is derived from Chapter 85 of the Massachusetts General Laws. While individual local exclusions may differ in scope, all exclusions in Massachusetts share certain characteristics:

- The excluded roadway must be owned by the municipality.
- A size of truck is specified, usually greater than 2.5 tons carrying capacity.
- The time period during which the exclusion is in force is specified.
- Only through traffic is excluded; local access is allowed.
- A MassHighway permit is required prior to posting any "No Trucks" signs or enforcing the exclusion.

Within these five characteristics lie the basic protections of access to the road network required for trucks to function effectively:

- There are many roads from which trucks cannot be excluded.
- Local access cannot be restricted.
- All local exclusions must be approved by MassHighway.

Chapter 85 incorporates by reference MassHighway's *Standard Municipal Traffic Code*. These regulations set out the conditions under which MassHighway is allowed to grant an exclusion permit. The municipality requesting a permit must provide a significant amount of analysis to support its application, and, most importantly, must convince MassHighway that *"a suitable alternate route is available."*

Federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)

Since 1994, access by trucks to key roadways in Massachusetts has been protected by provisions of the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The roads affected by ISTEA are owned variously by MassHighway, the Massachusetts Turnpike Authority, the Metropolitan District Commission (MDC), and several municipalities.

ISTEA required the fifty states, in cooperation with the Federal Highway Administration (FHWA), to define a "National Highway System" (NHS) embracing approximately 150,000 miles of the nation's roads. Not only would the NHS serve as the core network for commerce and national defense, but it would also define the scope of federal financial responsibility for the nation's roads.

Massachusetts was allocated a target mileage of 1,733 route miles for inclusion in the NHS. FHWA guidelines allowed for parkways that excluded trucks to be included in the NHS provided that a parallel roadway that allowed trucks was identified. Both roadways would be included in the NHS, but the parallel roadway for trucks would not count toward the target mileage and would lack a federal funding commitment.

During much of 1992 and 1993, the states and the FHWA worked together to define the NHS. In December 1993, the agreed-upon system was presented to Congress, which then officially created the NHS, by statute. Some municipally owned roadways had been specified as truck routes to bypass truck-excluded MDC parkways, and it was at this time that truck traffic on these roads gained federal protection.

4.1.2 The Primary Network

As Chapter 85 M.G.L., ISTEA, and other regulations make clear, there are certain sections of roadway from which trucks cannot be excluded. This should be kept in mind when possible modifications of existing local truck exclusions are analyzed. It should also be kept in mind that, in some cases, regulations could prevent an existing exclusion from being removed.

As has been mentioned, the system of roadways whose truck status cannot be changed by the local exclusion process has been named in this study the "Primary Network." As it consists of roadways from which trucks cannot be excluded, it is the backbone system for truck movements. Few if any portions of the Primary Network, however, are signed explicitly as "truck routes."

The Primary Network divides logically into four sets of roadway elements, based upon which regulatory principle is most relevant. These four elements are:

- The National Highway System (NHS), except for MDC parkways that exclude trucks.
- Other state owned roadways.

- Locally owned roadways that are numbered routes (state or U.S.).
- MDC roadways that allow general traffic.

Key examples and the regulatory basis for these Primary Network elements are discussed individually. The Primary Network is further described in section 4.1.4 and shown in Figure 4-1.

The National Highway System (NHS)

In ISTEA, Congress expressed its desire as to what kinds of roadways should be included in the NHS. Not surprisingly, it required that the Interstate system in its entirety be included. Beyond that, it wished to have an interconnected system of major roadways, and suggested that connections to intermodal facilities be included.

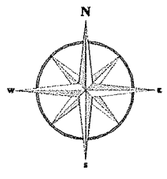
The Massachusetts NHS submission included, in addition to the Interstate system, all non-Interstate controlled access highways including U.S. 1 from the Tobin Bridge to Route 128, Route 2 from Cambridge to Concord, and Route 24 south from Randolph. Other major eastern Massachusetts highways incorporated into the NHS were U.S. 1 from I-95 in Dedham south and Route 9 from Boston west.

Many of the MDC roadways, both facilities that allow and facilities that exclude trucks, were included in the NHS. These roadways are key links in the NHS. Indeed, the NHS in the Boston area would barely qualify as a network without the MDC elements. Those MDC parkways that exclude trucks were supplemented with alternate truck routes, many of which are on city-owned arterials such as Massachusetts Avenue in Cambridge.

Finally, there are the intermodal connectors. These links are mostly surface streets, and they connect selected terminals to the rest of the NHS. Both passenger and freight terminals are connected to the NHS in this manner. Among the freight terminals with an NHS link are Conley Terminal in South Boston and Moran Terminal in Charlestown. Examples of passenger terminals include rapid transit stations at Ashmont, Wonderland, and Oak Grove and the commuter rail station at Lynn. The intermodal connector to the Mishawum commuter rail station in Woburn is noteworthy in that it also connects an expanding industrial area to the NHS.

FIGURE 4 - 1

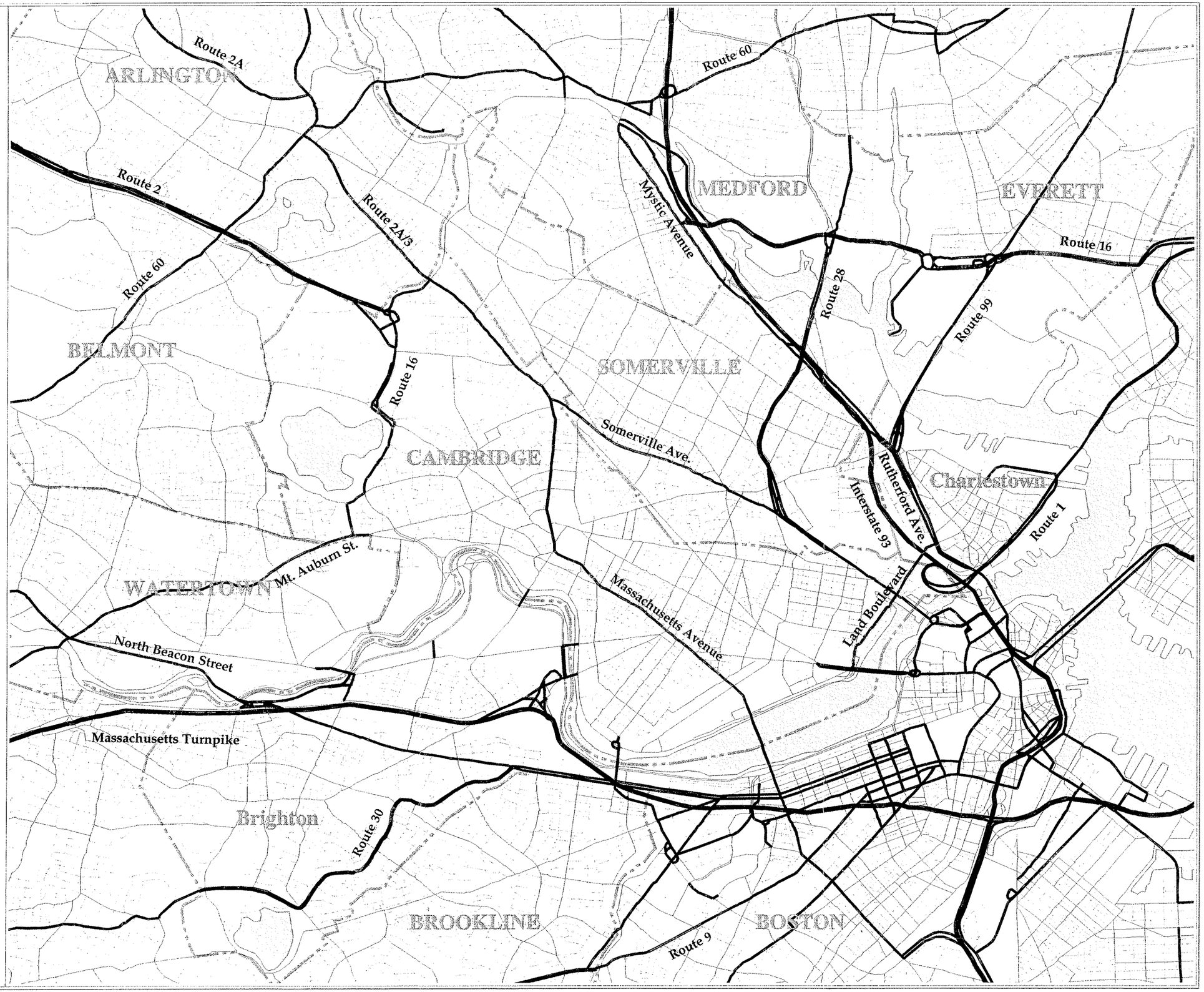
PRIMARY NETWORK



LEGEND

Primary Network

CTPS



Other State Owned Roadways

The state, through MassHighway, owns the controlled-access highway network except for the Turnpike system and the Metropolitan Highway System (i.e. the Central Artery), which is owned by the Massachusetts Turnpike Authority and the Tobin Bridge which is owned by the Massachusetts Port Authority. MassHighway also owns important segments of the surface road system. All of the controlled-access highways, and some of the surface roads owned by MassHighway are included in the NHS.

None of the MassHighway owned roadways, whether or not they are part of the NHS, may be granted a truck exclusion according to Chapter 85 M.G.L. Some of MassHighway's non-NHS roads are major suburban arterials, such as Route 38 in Woburn north of I-95. At the other extreme is A Street near Gillette in the South Boston Seaport area. This roadway gives every appearance of being a city street; however, the state filled the tidal flats for industrial use a century ago and still owns some of the streets in the area.

Locally Owned Numbered Routes

In 1995, the MassHighway Board of Commissioners amended the *Manual on Uniform Traffic Control Devices*, stating that numbered routes (state or U.S.) would no longer be eligible for new truck exclusion permits. This policy is only relevant for locally owned portions of numbered routes, since on the portions owned by MassHighway exclusions are forbidden by Chapter 85 M.G.L. directly.

The numbering of routes, *per se*, has no legal status. Numbers are placed solely for the convenience of drivers. A numbered route will typically alternate between state and local ownership over its course. For example, Route 38 in Woburn is owned by the state north of I-95, but is owned by the City of Woburn between I-95 and the Winchester city limits.

Some exclusions had been granted prior to the 1995 amendment, and those exclusions remain in effect. An example of such a grandfathered exclusion is Route 16 in Wellesley between Route 9 and the Newton city limits near I-95. This exclusion has been in effect since 1957.

MDC Roadways That Allow General Traffic

The individual segments of the road network owned by the MDC are designated either for "general traffic" (including trucks) or only for "pleasure vehicles." In the MDC system, the use of the term "parkway" does not necessarily mean

trucks are excluded. For example, Revere Beach Parkway allows general traffic, whereas various MDC roads not called parkways exclude trucks.

The authority to designate roadways as either "general" or "pleasure" lies with the MDC Commissioners. The Commissioners are constrained only by any legal covenants relating to the original transfer of the roadway to MDC ownership, and more recently by the inclusion of parts of the system in the NHS.

The MDC Commissioners have from time to time exercised their power to change the status of MDC roadways. Pleasure-only roads have been converted to general, and general roads have been changed to pleasure only. Chapter 85 M.G.L. does not grant MassHighway and the municipalities any powers with respect to MDC roadways.

4.1.3 Truck Exclusions

To assist in the understanding of local truck exclusions, CTPS prepared maps that show the lawful truck exclusions in the Boston metropolitan region. These maps were created using geographical information systems (GIS) software.

Correctly identifying the status of specific sections of roadway was a major undertaking. Administrative literature from MassHighway and the MDC was studied, the MassHighway exclusion permit database and Road Inventory file were scrutinized, key sections of roadway were visited, and draft maps were reviewed by State Police and others.

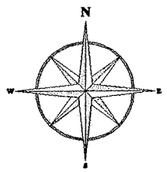
Local exclusions may vary by size of vehicle excluded or by hours in force. Almost all exclusions specify greater than 2.5 tons carrying capacity, though a few set the exclusion higher, such as greater than 5 tons. For the sake of graphical clarity, no attempt was made to distinguish in the maps between the less strict exclusions and the 2.5 ton exclusions.

Local exclusions in force for only part of a day presented an analytical challenge because such exclusions fundamentally change the topology of the network as they start or stop being in force. The vast majority of the exclusions are in force 24 hours a day. The remainder are in force only at night; the hours of these exclusions vary between permits. There are no exclusions in the study area that are in force only during the day.

Once again, some simplification was required to facilitate network analysis. To this end, CTPS defined two networks to display in working maps: the Daytime network (Figure 4-2) and the Nighttime network (Figure 4-3).

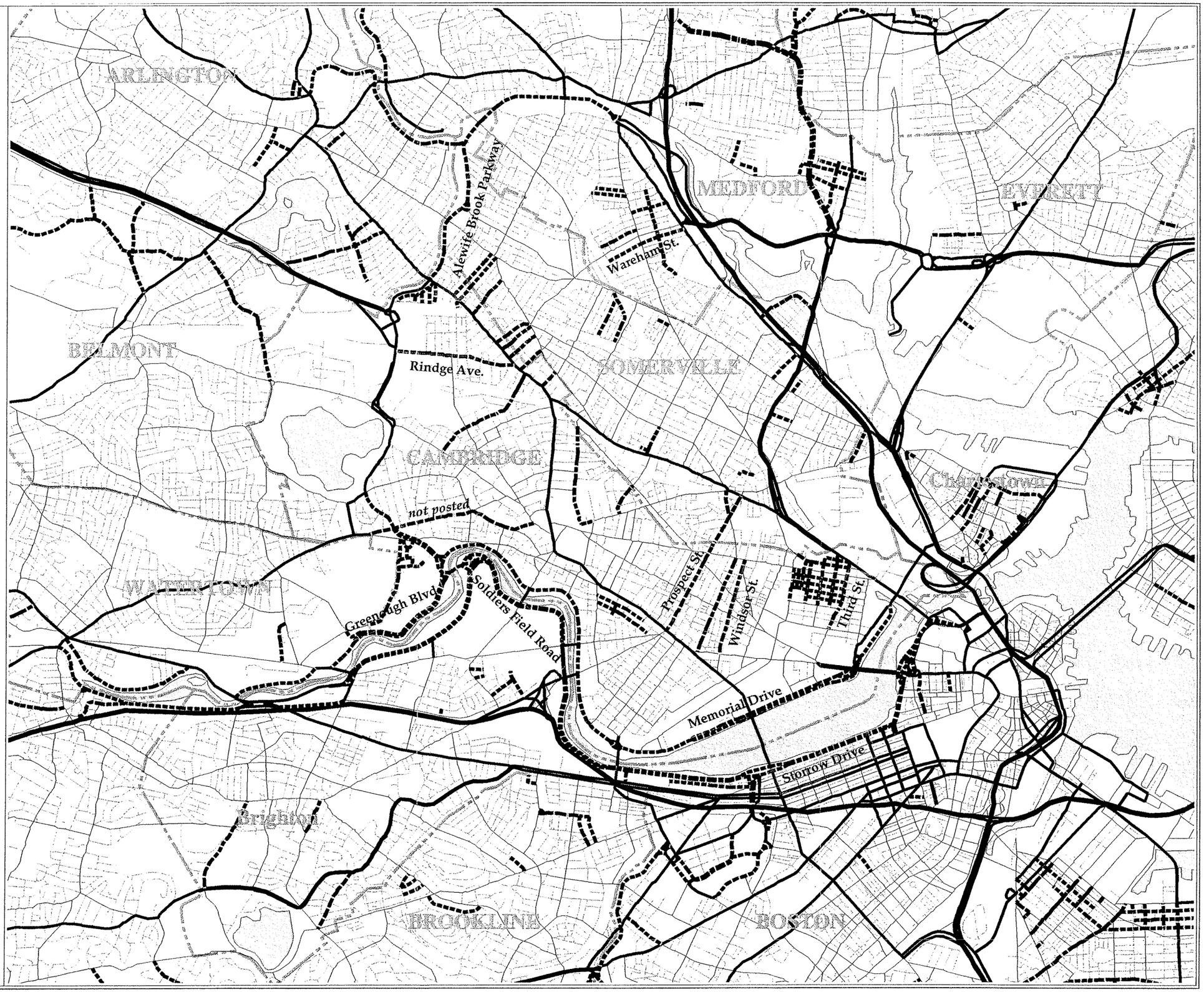
FIGURE 4 - 2

DAYTIME NETWORK



LEGEND

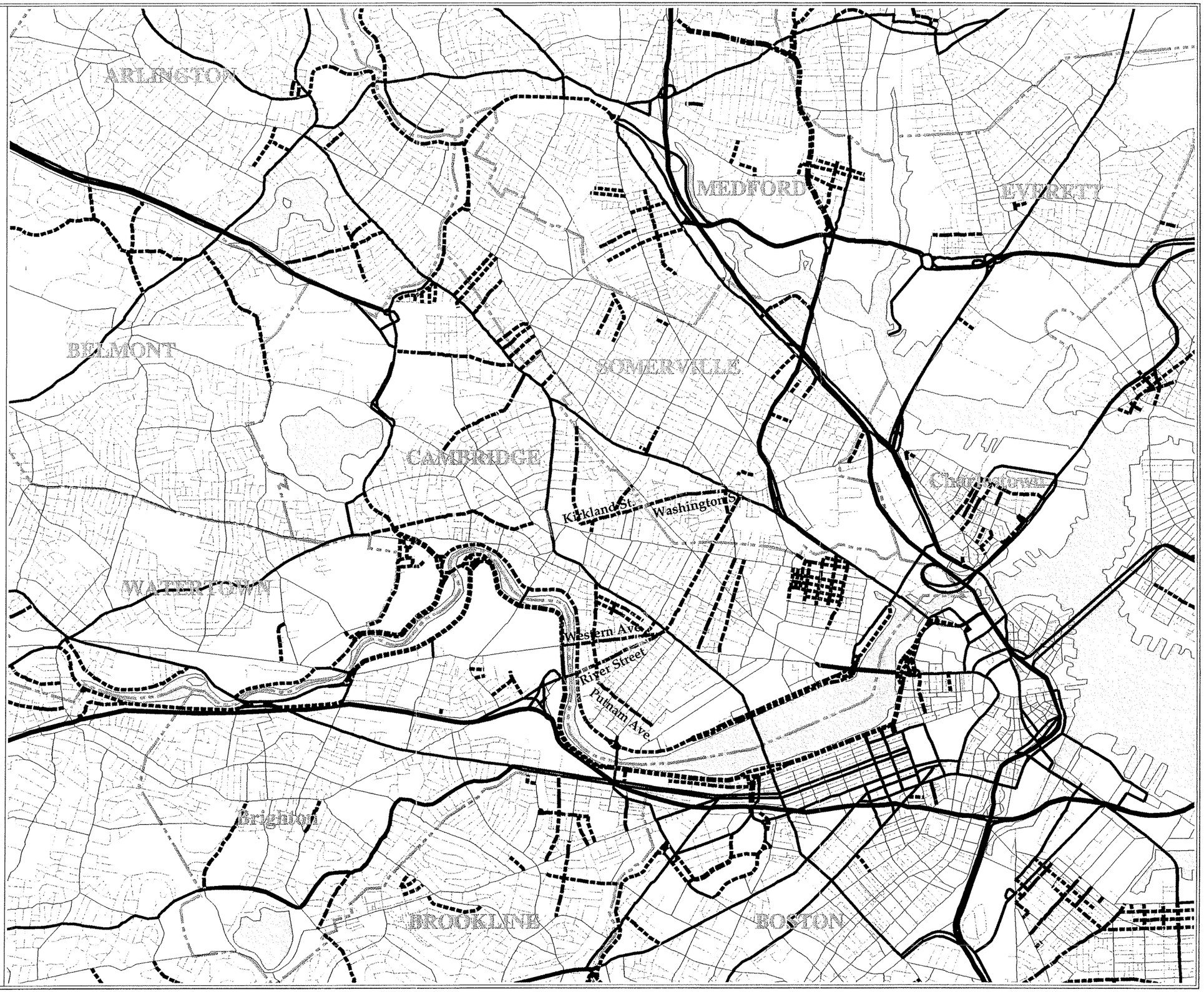
- Primary Network
- Truck exclusion in force 24 hours a day



CTPS

FIGURE 4 - 3

NIGHTTIME NETWORK



N

LEGEND

- Primary Network
- Truck exclusion in force at night

CTPS

4.1.4 Features of the Primary, Daytime and Nighttime Networks

The Primary Network consists of the regional express highways and a number of "surface" roadways. In the study area, the surface roadways of the Primary Network tend to be radial in nature. Notable examples are Rutherford Avenue in Charlestown, Route 99 in Everett, Mystic and Somerville Avenues in Somerville, Mount Auburn and North Beacon Streets in Watertown, and Massachusetts Avenue in Cambridge and Arlington.

Among the crosstown surface routes in the Primary Network is Route 16 west of Massachusetts Avenue. Also, trucks are allowed to use the Gilmore Bridge and Land Boulevard to move from Rutherford Avenue in Charlestown to O'Brien Highway and Binney Street in Cambridge. The most significant truck exclusions include important crosstown routes, notably Third and Prospect Streets in Cambridge.

At night, a number of additional exclusions come into effect. The exclusions on River Street, Western Avenue, and Putnam Avenue in Cambridge are in force from 7:00 P.M. to 7:00 A.M. Although trucks are excluded on River Street and Western Avenue at night, hazardous cargo trucks are permitted to use these roads during that time because of the restrictions to hazardous cargo in tunnels in Boston. The hazardous cargo restrictions will be discussed later in this chapter. In addition, between 11:00 P.M. and 7:00 A.M. trucks are excluded in Somerville on Washington Street between Union Square to the Cambridge city limits, and in Cambridge on Kirkland Street and one block of Quincy Street.

4.1.5 Truck Drivers' Preferred Truck Routes

The Technical Subcommittee met with truck drivers that use study area roadways for transport of their products. In that discussion, the truck drivers talked about the preferred routes that they currently use. The drivers use roadways through the study area because they are the most logical and direct route from the Chelsea and Everett area to Newton, Watertown and the Massachusetts Turnpike. While some truck drivers felt that Prospect Street was too narrow with many intersections, others felt that removing the exclusion on Prospect Street in Cambridge would give them an alternative to using Harvard Square. They like to stay out of Harvard Square as much as possible because there is a greater risk of accidents in that area due the a large pedestrian population.

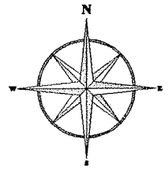
The drivers indicated that the truck routes through Cambridge and Somerville that are currently being used by truckers are as follows:

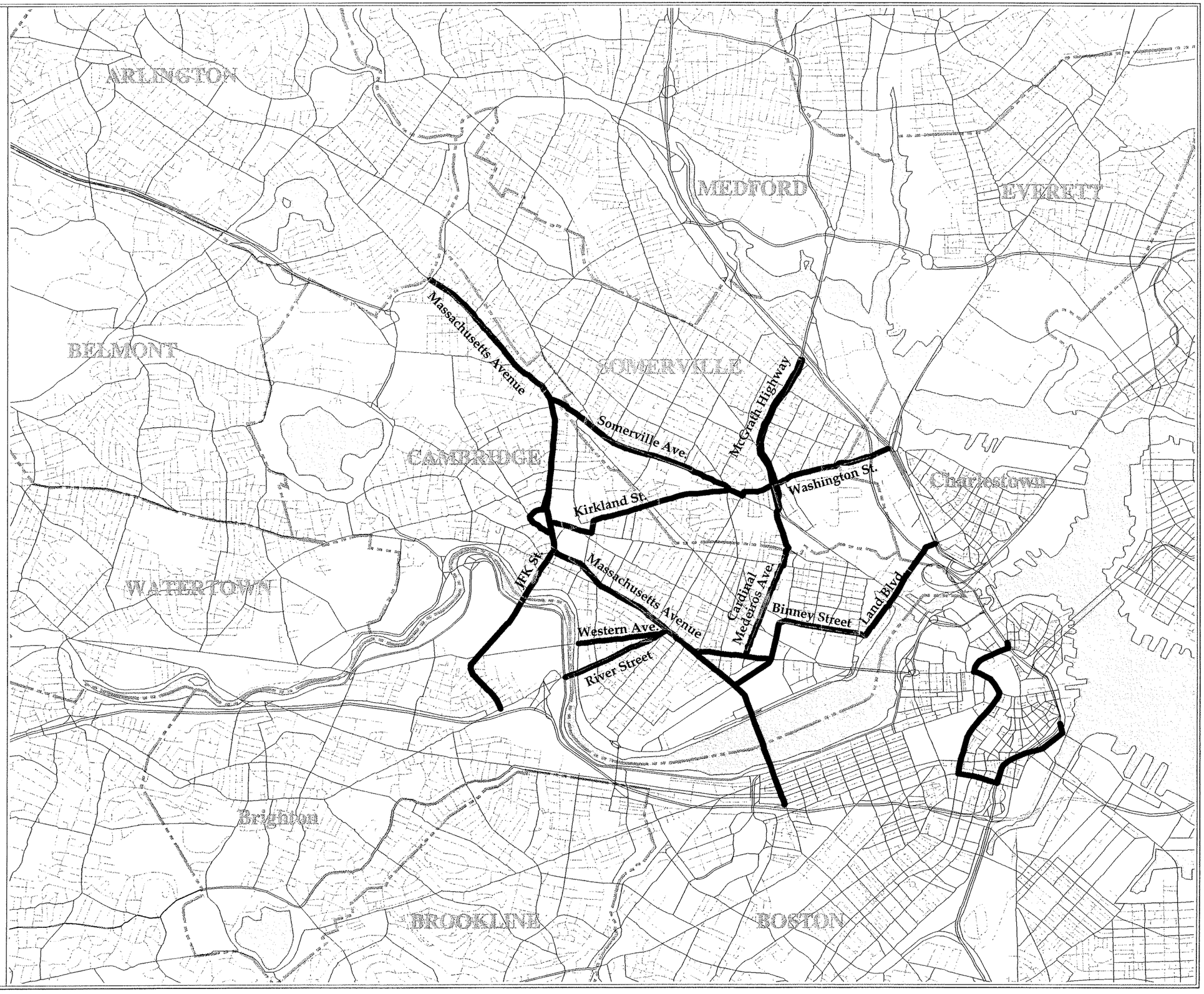
- Gilmore Bridge to Land Boulevard to Binney Street to Main Street to Massachusetts Avenue to Pleasant Street to Western Avenue and the reverse from River Street to Massachusetts Avenue to Main Street to Binney to Land Boulevard. This is the existing signed truck route through Cambridge.
- Truckers will also use Binney Street to Vassar Street to Massachusetts Avenue across the Harvard Bridge and onto the Massachusetts Turnpike at Newbury Street in Boston.
- During the peak travel periods there is congestion in the Gilmore Bridge area. Because of this congestion, truckers are using Main Street to Portland Street and Cardinal Medeiros to Warren to Medford Street and onto Route 28 rather than the truck route of Binney Street.
- Truckers traveling on Washington Street westbound in Somerville that are trying to access the Massachusetts Turnpike may be unfamiliar with the area. When they reach the intersection with Webster Avenue they find the truck exclusion sign. Instead of turning left, they continue along Washington Street. This turns into Kirkland Street which leads into Harvard Square. Truckers will then go around Harvard Square to JFK Street to North Harvard Street to Western Avenue to the Massachusetts Turnpike.
- Those truckers wanting to reach Route 2 and points to the northwest may choose a Somerville route. This route includes Washington Street to Union Square to Bow Street to Somerville Avenue to Massachusetts Avenue to Alewife Brook Parkway and out to Route 2.
- The hazardous cargo route through Boston for those trucks going south on Interstate 93 is Exit 24 (Haymarket Square), along the Surface Artery and back onto Interstate 93 at Exit 20. The Surface Artery is within the current construction area of the Central Artery so the route changes daily depending on construction. As of this writing, truckers are exiting at Haymarket, using New Chardon Street to Cambridge Street to Tremont to Kneeland and back onto Interstate 93. Hazardous cargo trucks traveling north on Interstate 93 must take exit 19 and travel along the Surface Artery and Atlantic Avenue and back on to Interstate 93.

A map showing these preferred routes by truckers today in shown in Figure 4-4. It should be noted that these routes are not necessarily the communities preferences for truck routes.

FIGURE 4 - 4

STUDY AREA ROADWAYS CURRENTLY USED BY TRUCKERS





LEGEND

Route used by truckers

CTPS

4.1.6 Physical Restrictions to Truck Travel

As described earlier, three types of roadway physical restrictions have been identified that can specifically affect the ability of trucks to use the road network. These include:

- Weight restriction on a bridge deck
- Height restriction for passing under a bridge
- Hazardous cargo prohibitions in extended underground roadways

A number of these restrictions have been identified in the study area and are shown in Figure 4-5.

The only height restrictions in the study area exist along Storrow and Memorial Drives. Figure 4-5 shows those restrictions that exist on Memorial Drive. The height restrictions on Storrow Drive are too numerous to show on this figure. Sixteen bridges and pedestrian overpasses exist on Storrow Drive between Leverett Circle and Soldiers Field Road. The bridge clearances range from 10 feet to 14 feet. Height restrictions on a bridge due to truss-style design are rare in Massachusetts, and none exist in the study area.

The weight-restricted bridges in Figure 4-5 are:

- Route 2 over Alewife Brook
- Walden Street over the Fitchburg commuter rail line in Cambridge
- Webster Avenue over the Fitchburg rail line in Somerville
- School Street over the Lowell rail line in Somerville
- Massachusetts Avenue over the Memorial Drive underpass
- Walnut Street over the Lowell Railroad Line in Somerville
- Charles River Bridge between O'Brien Highway in Cambridge and Cambridge Street in Boston

Bridges in the study area that have been closed to trucks due to structural deficiencies are:

- Lowell Street over the Lowell Railroad Line in Somerville
- Sycamore Street over the Lowell Railroad Line in Somerville

The ability of a truck to use a bridge depends upon the vehicle weight, the weight of the load, the distribution of the load, and the number of axles. In this report, weight restrictions have been defined as prohibiting use by any truck exceeding 2.5 tons over three axles. An important aspect of most bridge restrictions is that they will not prevent all truck traffic, only the trucks that exceed the limit. A truck may exceed the limit on one leg of its tour and be forced to use another route, but upon delivering a quantity of goods is able to use the same bridge later in the tour.

4.1.7 Hazardous Cargo Restrictions in Tunnels

A motor vehicle that transports a hazardous material, whether interstate or intrastate, must comply with Federal Hazardous Materials Regulations, Title 49 of the Code of Federal Regulations. The Federal regulations set minimum standards as they relate to hazardous materials. 49 CFR 397.9 states that "unless there is no practicable alternative, a motor vehicle which contains hazardous materials must be operated over routes which do not go through or near heavily populated areas, places where crowds are assembled, tunnels, narrow streets or alleys. Operating convenience is not a basis for determining whether it is practicable to operate a motor vehicle in accordance with this paragraph." 49 CFR 397.67 requires that motor carriers transporting hazardous materials shall not operate through tunnels. In addition, the federal regulations allow for states to further regulate hazardous materials.

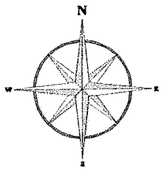
Currently, vehicles carrying any hazardous materials are banned from using the tunnels in the Boston area. These tunnels include:

- Central Artery under Dewey Square
- Turnpike Extension under Prudential/Copley
- Tobin Bridge approach under City Square in Charlestown (CANA tunnel)
- Sumner and Callahan Tunnels
- Ted Williams Tunnel

These tunnels are operated under the jurisdiction of the Massachusetts Turnpike Authority (MTA) as part of the Metropolitan Highway System. Regulations and policies of the MTA are that hazardous materials are prohibited in tunnels. Chapter 81A established the MTA and sets forth its authority to promulgate regulations. 730 CMR 7.10 (1) prohibits hazardous materials to be transported through tunnels.

FIGURE 4 - 5

PHYSICAL RESTRICTIONS



LEGEND

- Tunnel or approach prohibiting hazardous cargo
- ● Weight or height restriction
- HC Hazardous cargo

ARLINGTON
MEDFORD
EVERETT
BELMONT
SOMERVILLE
CAMBRIDGE
Charlestown
WATERTOWN
Brighton
BROOKLINE
BOSTON

Route 2 over Alewife Brook weight restriction (to be rebuilt)

Walden St. over the Fitchburg Line - weight restriction

Lowell, Walnut, School and Sycamore over Lowell Line - weight restriction

Webster Ave. over the Fitchburg Line - weight restriction

HC exit at Carter St. in Chelsea

Tobin Bridge approach under City Square

Charles River Bridge - weight restriction

Sumner and Callahan Tunnels

Pedestrian overpass height restriction

Mass. Ave. over Memorial Dr. underpass - weight and height restrictions

HC exit at High St.

HC exit at Allston

Central Artery under Dewey Sq.

Storrow Drive - various height restrictions

HC exit at Kneeland

Turnpike under Prudential

CTPS

4.2 TRUCK TRIPS

4.2.1 Trucks on Study Area Roadways

4.2.1.1 Truck Volumes

CTPS obtained and organized truck traffic volumes from the sources listed in Chapter 3.2. The truck volumes observed in the study area are shown graphically in Figure 4-6. In Figure 4-6, the roadways whose traffic is simulated in the model network are highlighted in black. Network roadways where a truck volume has been observed or calculated are shown, with the width of the band suggesting the volume of truck traffic on that roadway segment. The formula used is that every .01 inch of bandwidth represents 200 daily trucks.

Despite these extensive data collection efforts, the truck volumes generally are disconnected, and only indicate truck traffic between the major intersections adjacent to the point where the count took place. Beyond these adjacent intersections, the truck volumes are not reliably known because a significant number of trucks observed at the count location may be turning off the observed flow, or trucks from connecting streets may be joining the observed flow.

An exception to this fragmentary pattern is the area of Cambridge and Washington Streets in East Cambridge and Somerville. The flows in this area are shown as continuous bands. This is because as part of the CTPS study, *Truck Traffic in East Cambridge and Somerville,* an analytical process called "balancing" was undertaken. In balancing, observed volumes from the Cambridge cordon count and the CTPS turning movement counts were adjusted and reconciled in order to give a complete picture of truck traffic in this area.

Balancing volumes over a network any larger than the East Cambridge and Somerville study area is not really possible by manual methods. To connect the many isolated counts to give a complete traffic picture requires the use of a computer-based travel model. The process of calibrating the travel model, however, depends critically on these observed volumes, all of which have recently been incorporated into the calibration process.

Observations based upon current count base

Based on the current collection of truck counts, it is possible to make some useful observations. First of all, the largest truck volumes are found on the expressway system. The highest truck volume is 6850 daily trucks on the Southeast Expressway southbound prior to the Columbia Road exit. The highest volume that appears on Figure 4-6 is 6550 daily trucks northbound on the Central Artery

between the Sumner Tunnel on-ramp and the Causeway Street off-ramp. The Tobin Bridge carries over 5000 trucks daily despite the bottleneck of the temporary ramp connection to the Central Artery with only one lane in each direction.

Of the surface roadways analyzed thus far, Route 99 where it crosses the Mystic River has the greatest number of trucks. It is possible that other surface roadways in the region or in the study area may have higher truck volumes. Use of the travel model may suggest the existence of additional high truck locations, which could then be field checked.

West of Sullivan Square on Washington Street is a major truck flow in and out of Somerville. The strength of this flow diminishes towards the west as many trucks alter their routes to access local customers or other destinations. There is also a significant bottleneck at Union Square, where Somerville Avenue and Washington Street traffic intersects. At this location, all traffic must merge into a one block area along Somerville Avenue.

A major entrance to Cambridge from the west is River Street, across the Charles River from the Allston Turnpike entrance. While adjacent to the Turnpike exit ramps, this flow of trucks into Cambridge actually comes from three sources: the Turnpike, Cambridge Street in Allston, and from Western Avenue in Allston. Trucks from Western Avenue must proceed south on the Soldier's Field Road frontage road, and at Cambridge Street can turn left onto River Street, right onto Cambridge Street, or enter the Turnpike. Of the trucks entering Cambridge on River Street, 54% come from the Turnpike, and the remaining truck flows are split about evenly between Cambridge Street and Western Avenue.

All of the information presented above is based on observed truck volume counts. As presented in the travel model section, this observed count information was used to calibrate the travel model. Existing truck volumes as simulated by the travel model are provided in Figure 4-7.

Since these tunnels are within the limits of the City of Boston, the Boston Fire Department would be called upon to respond to any fires in the tunnel. The City of Boston has the authority to establish the Boston Fire Protection Code. The control of the transport of hazardous materials through tunnels was established under the *Regulations Controlling the Transportation of Hazardous Materials* by the Boston Fire Department effective in April of 1981 and later amended by a memorandum adopting additional sections of the Federal Motor Carrier Safety Regulations.

Approaching the tunnels listed above via a controlled-access highway, there are signs informing truck drivers of the last exit prior to the tunnel and stating that if they are transporting hazardous cargoes they must exit. CTPS counted trucks exiting at these mandatory HC exit ramps and observed whether the truck displayed a diamond-shaped HC placard. The most expansive definition of hazardous cargoes was used. For instance, compressed oxygen is considered a hazardous cargo and requires the display of a green placard. The CTPS HC counts, shown below in Table 4-1, included cargoes such as compressed oxygen, as well as, fuels and the like.

TABLE 4-1
Hazardous Cargo Truck Counts at Approaches to Boston Tunnels

Tunnel Approach	Mandatory Exit	Daily Trucks		Percent HC
		Non-HC	HC	
Turnpike eastbound	Allston toll plaza	513	27	5.0%
S.E. Expressway northbound	Kneeland Street	677	9	1.3%
Central Artery southbound	High Street	380	35	9.2%
Tobin Bridge inbound	Carter Street, Chelsea	775	67	8.6%

In addition, trucks carrying hazardous materials were counted in other locations as part of this study to determine the percentage of hazardous material trucks as compared to total trucks in the region. Staff from CTPS performed these counts over the last year at various locations around the study area. In addition, an origin-destination survey was done during the Central Artery planning stage that included counts of hazardous material carrying trucks (shown as C.A. in the

table). This information was also reviewed. Listed in Table 4-2 are the locations and count data where hazardous material trucks were observed.

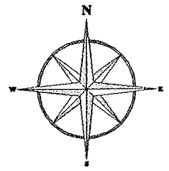
As shown in the table, the largest percentage of hazardous material trucks are travelling in the eastern fringe of the study area–East Boston, Chelsea and Everett. This is the location of the petroleum tank farms in the Boston area. A large number of gasoline tankers are leaving this area for distribution of their product throughout the Boston metropolitan area. Binney Street has a higher percentage of hazardous material trucks because this is part of the truck route through Cambridge that truckers use to access Watertown, Newton and points west on the Massachusetts Turnpike. Generally speaking, this information shows that the highest percentage of hazardous material trucks are either using the state roadway system or designated truck routes through the study area.

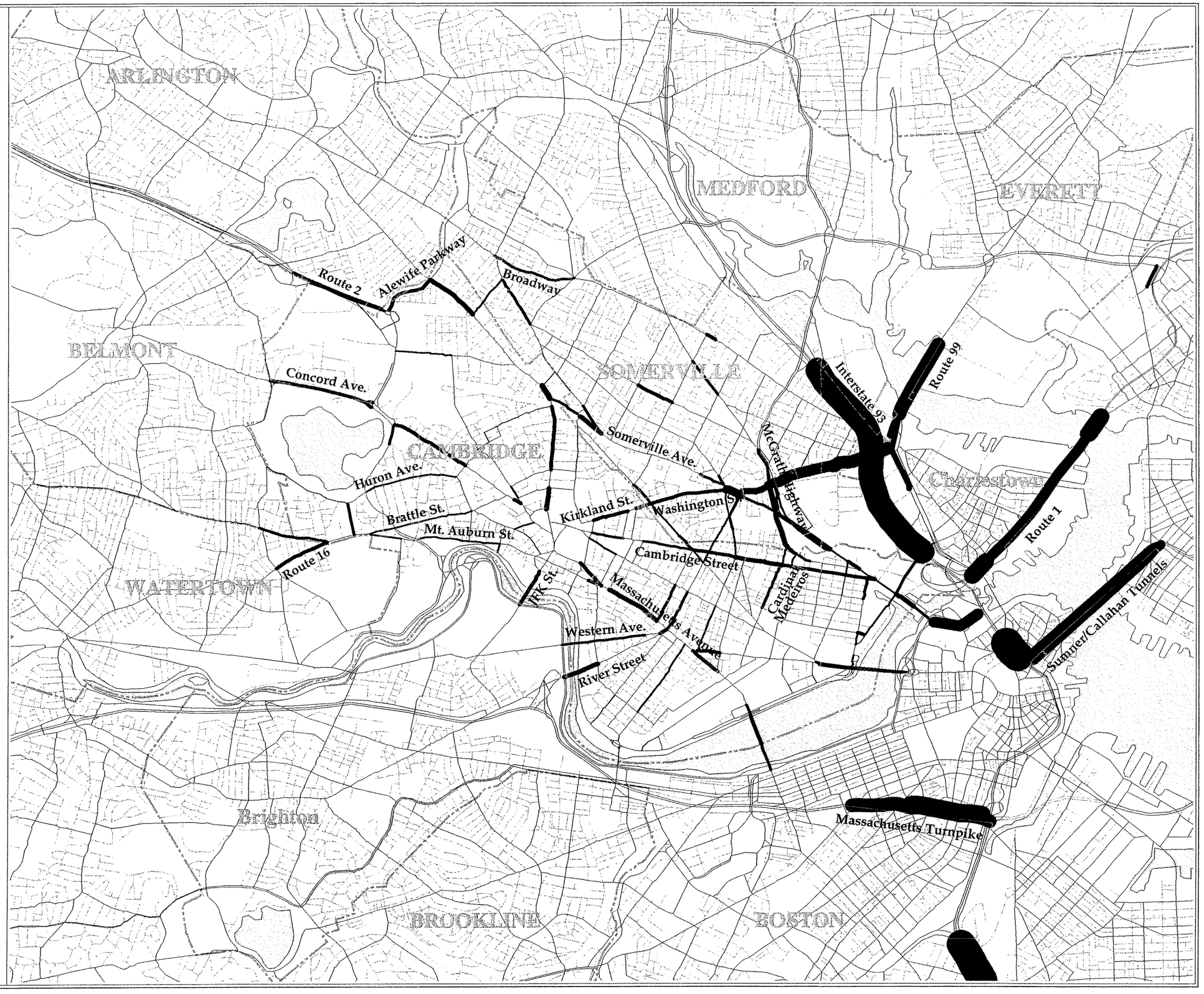
TABLE 4-2
Percentage of Hazardous Cargo Trucks to Total Truck Traffic In the Study Area

Location	Total Trucks	Hazardous Cargo Trucks	% Hazardous to Total
Route 16 exit from U.S. 1	418	56	13.4%
Route 99 SB @ Mystic River	2910	355	12.2%
Binney St west of First Street	1544	164	10.6%
Maffa Way entering Sullivan Square	2347	246	10.5%
I-93 in Somerville (C.A.)	3167	318	10.0%
High & Oliver Streets (Boston)	380	35	9.2%
Carter Street exit from U.S. 1 (Chelsea)	775	67	8.6%
McGrath Highway frontage roads	490	38	7.8%
Route 138 in Canton	993	62	6.2%
Southeast Expressway @ Southampton Street (C.A.)	5282	309	5.9%
McGrath Flyover	472	23	4.9%
River Street @ Soldiers Field	900	40	4.4%
B.U. Bridge	417	14	3.4%
Kneeland Street & Surface Artery	686	9	1.3%
EB Turnpike Exit in Newton Corner	469	11	2.3%

FIGURE 4 - 6

OBSERVED DAILY TRUCK VOLUMES





LEGEND

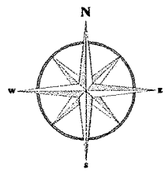
Observed Daily Truck Volumes
Sample Volumes

- 3000 - 3199 trucks per day
- 2000 - 2199 trucks per day
- 1000 - 1199 trucks per day
- 0 - 199 trucks per day
- Modeled roadway without data
- Roadway not in model

CTPS

FIGURE 4 - 7

BASE CASE TRUCK VOLUMES ON MODELED ROADWAYS (DAILY TRIPS)



LEGEND

Truck Volumes on Modeled Roadways

- 7800 - 8000 trucks
- 3800 - 4000 trucks
- 1800 - 2000 trucks
- 800 - 1000 trucks

Other Roadways

- Modeled roadway with negligible truck volume
- Roadway not in model

CTPS

4.2.1.2 Truck Traffic as a Percentage of Total Traffic

A combination of observed count data from Cambridge and Somerville and the transportation demand model data were used to determine locations where truck traffic exceeds 5% of the total traffic on the roadways. The 5% threshold is a trigger above which MassHighway will consider requests for truck bans on a street. As discussed in chapter 3, the observed count data was taken at spot locations throughout the study area and was used to calibrate the transportation demand model. Figure 4-8 provides the locations where modeled truck traffic exceeds 5% of total traffic.

4.2.1.3 Types of Trucks

The public has expressed that the negative impacts of trucks are not uniform, and that larger trucks are more onerous in a number of ways than smaller trucks. Larger trucks have more powerful, hence noisier engines. Tractor and semi-trailer combination rigs are long and appear threatening to motorists and pedestrians. Also, some trucks are designed specifically for heavy loads such as beverages, cement, or garbage. These trucks have a third or sometimes fourth axle, and when fully loaded to their lawful limit will cause a greater amount of pavement wear than typical loadings in the common two-axle, six wheel trucks. It should be noted, however, that the typical prohibition against trucks with a 2 1/2 ton carrying capacity will apply to virtually all two-axle, six wheel trucks configured for carrying cargo.

The data gathering and modeling processes in this study have emphasized the measurement of all trucks with six or more wheels, since contemplated changes in truck prohibitions will affect trucks of this size. However, some field data gathering by CTPS and others has obtained classification of truck volumes into various categories of interest. Figure 4-9 summarizes the findings of these truck classification counts, and divides truck traffic into two classes: 2-axle, 6-wheel trucks, and all trucks with any larger configuration. The percent of trucks which have one of the larger configurations is plotted in three ranges.

While the classification counts are performed at particular points, this graphic shows the size mix over the section of roadway for which that size mix would probably be stable, based upon the nature of the intersecting streets. One of the key findings of this analysis is that the larger truck configurations are usually a small portion of truck traffic, and only exceed 40% of trucks on the acknowledged truck corridors.

On the average, 75% of the trucks traveling on Cambridge roadways are 2-axle, 6-wheel trucks. This in not different from the national average. Although the larger trucks only make up about 25% of the total trucks in Cambridge, the perceived impact of larger trucks is greater than that of smaller trucks.

4.2.1.4 Truck Traffic by Time of Day

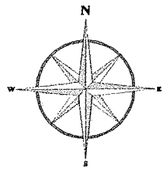
The observed count data from Cambridge was reviewed to determine the percentage of truck traffic by time of day. A total of 13,657 trucks at 39 locations were reviewed to determine the percentage of truck traffic for each hour over the 24-hour period. Nighttime truck traffic is of particular concern to the public because of noise and vibration issues. The figures in Table 4-3 indicate that approximately 10% of the truck traffic occurs between the hours of 11 P.M. and 7 A.M., with approximately 15% occurring between 7 P.M. and 7 A.M. The majority of the truck travel occurs between the hours of 7 A.M. and 4 P.M.

Members of the public have noted that large gasoline tanker trucks travel over Cambridge roadways during the nighttime hours. The petroleum industry has acknowledged this indicating that the business is 24 hour a day operation, 7 days a week. With the restrictions on hazardous materials in the tunnels in Boston, the truckers are using Cambridge roadways to reach their destinations.

Even though the percentage of trucks is low at night, it is these larger trucks that cause noise and vibration as they pass by residential areas. This issue has arisen often throughout the study process.

FIGURE 4 - 8

MODELED ROADWAYS
WITH OVER
5% TRUCK TRAFFIC



LEGEND

- Modeled roadway with over 5% truck traffic
- Other Roadways
- Modeled roadway with less than 5% truck traffic
- Roadway not in model

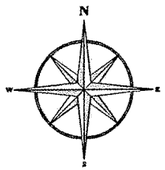
ARLINGTON
Route 60
Broadway
Route 2
MEDFORD
EVERETT
BELMONT
Concord Ave.
Highland Ave.
SOMERVILLE
Route 99
CAMBRIDGE
Washington St.
Rutherford Ave.
Charlestown
Route 16
WATERTOWN
Massachusetts Avenue
Cambridge Street
Binney Street
Western Ave.
Pearl St.
Main Street
Route 20
Brighton
Route 9
BROOKLINE
BOSTON

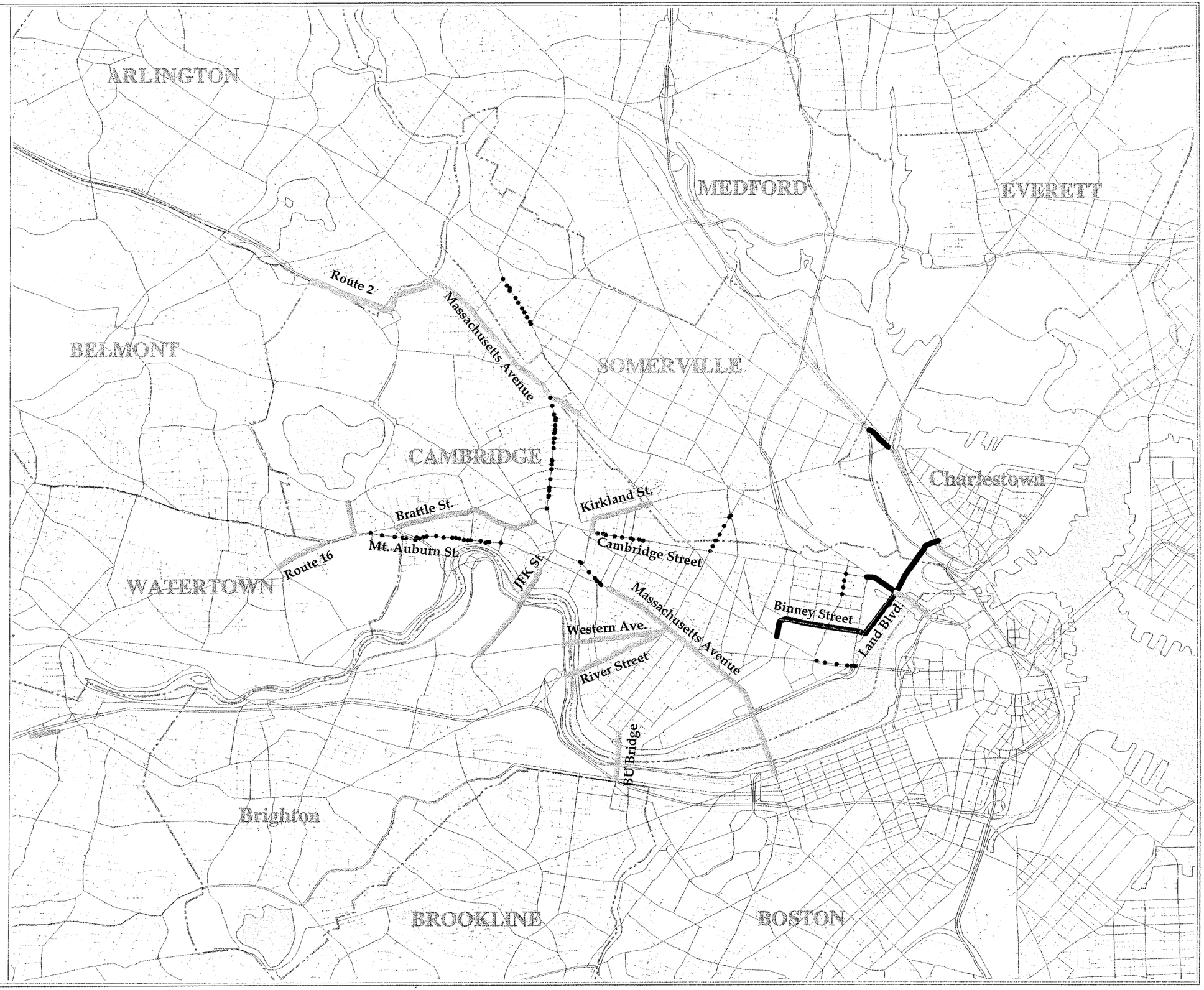
CTPS

FIGURE 4 - 9

TRUCKS WITH THREE OR MORE AXLES AS A PERCENT OF ALL TRUCK TRAFFIC

(From Mechanical and Visual Classification Counts)





LEGEND

Trucks with Three or More Axles as a Percent of all Truck Traffic

- Greater than 40%
- 20% to 40%
- Less than 20%

Other Roadways

- Modeled roadway without classification
- Roadway not in model

CTPS

TABLE 4-3
Truck Travel by Time of Day

Time Period	3+ axle Trucks	2 axle Trucks	Total Trucks	Hour Percent of Day	Avg. Hourly Percent During Period
6 - 7	234	381	615	4.5	
7 - 8	385	593	978	7.2	7.3
8 - 9	500	693	1,193	8.7	
9 - 10	386	817	1,203	8.8	
10 -11	371	821	1,192	8.7	
11 - noon	314	814	1,128	8.3	
noon - 1	352	712	1,064	7.8	7.8
1 - 2	330	690	1,020	7.5	
2 - 3	303	644	947	6.9	
3 - 4	327	597	924	6.8	
4 - 5	308	422	730	5.3	5.2
5 - 6	323	364	687	5.0	
6 - 7	235	283	518	3.8	
7 - 8	95	169	264	1.9	
8 - 9	64	136	200	1.5	1.3
9 - 10	50	89	139	1.0	
10 - 11	35	77	112	0.8	
11 - midnight	22	57	79	0.6	
midnight - 1	12	44	56	0.4	
1 - 2	33	31	64	0.5	
2 - 3	26	31	57	0.4	0.8
3 - 4	43	54	97	0.7	
4 - 5	50	85	135	1.0	
5 - 6	83	172	255	1.9	
24 Hours	4,881	8,776	13,657	100.0	

4.2.2 Origin/Destination Patterns

4.2.2.1 Subregion-to-Subregion Trip Patterns

In order to describe regional truck flows, the CTPS Model Region has been divided into five subregions, shown in Figure 4-10, for the purposes of this particular analysis. In the center of this figure is the area consisting of Boston and twelve nearby municipalities, including all municipalities adjacent to Cambridge and Somerville. (It should be noted that the study area shown in Figure 4-10 is larger than the study area established for the Regional Truck Study which only includes the Cities of Cambridge, Somerville, and Boston, and the Towns of Arlington, Belmont, and Watertown.) The remaining 151 municipalities have been grouped into four areas denoted as the North Suburb, West Suburb, Southwest suburb, and Southeast Suburbs subregions. These five subregions have been defined in relation to the highway network and are not intended to be of equal size. The suburban subregions also include trucks entering from outside the model region.

In the CTPS model development process, truck trip generation (where trucks begin trips) and trip distribution (where trucks go) are predicted for the entire model region. Truck trip generation and distribution are summarized at the top of Table 4-4 on the basis of the five subregions.

As can be seen in Table 4-4, the bulk of the truck trips take place entirely within a subregion. For instance, 107,385 truck trips begin in the study area shown on the map and then end in the study area. This is 77% of the truck trips beginning in the study area, as seen in the second matrix in Table 4-4. The truck trips that begin and end in the study area are about 20% of the 535,910 truck trips estimated to take place each day in the entire model region.

Of the truck trips which come from outside a subregion, most come from an adjacent subregion. For instance, of trucks going to the North Suburbs, only 1.0% are estimated to come from the Southwest Suburbs, and only 1.4% from the Southeast Suburbs, these being the two subregions not adjacent to the North Suburbs.

Figure 4-10

Five Subregions Defined for CTPS Model Region

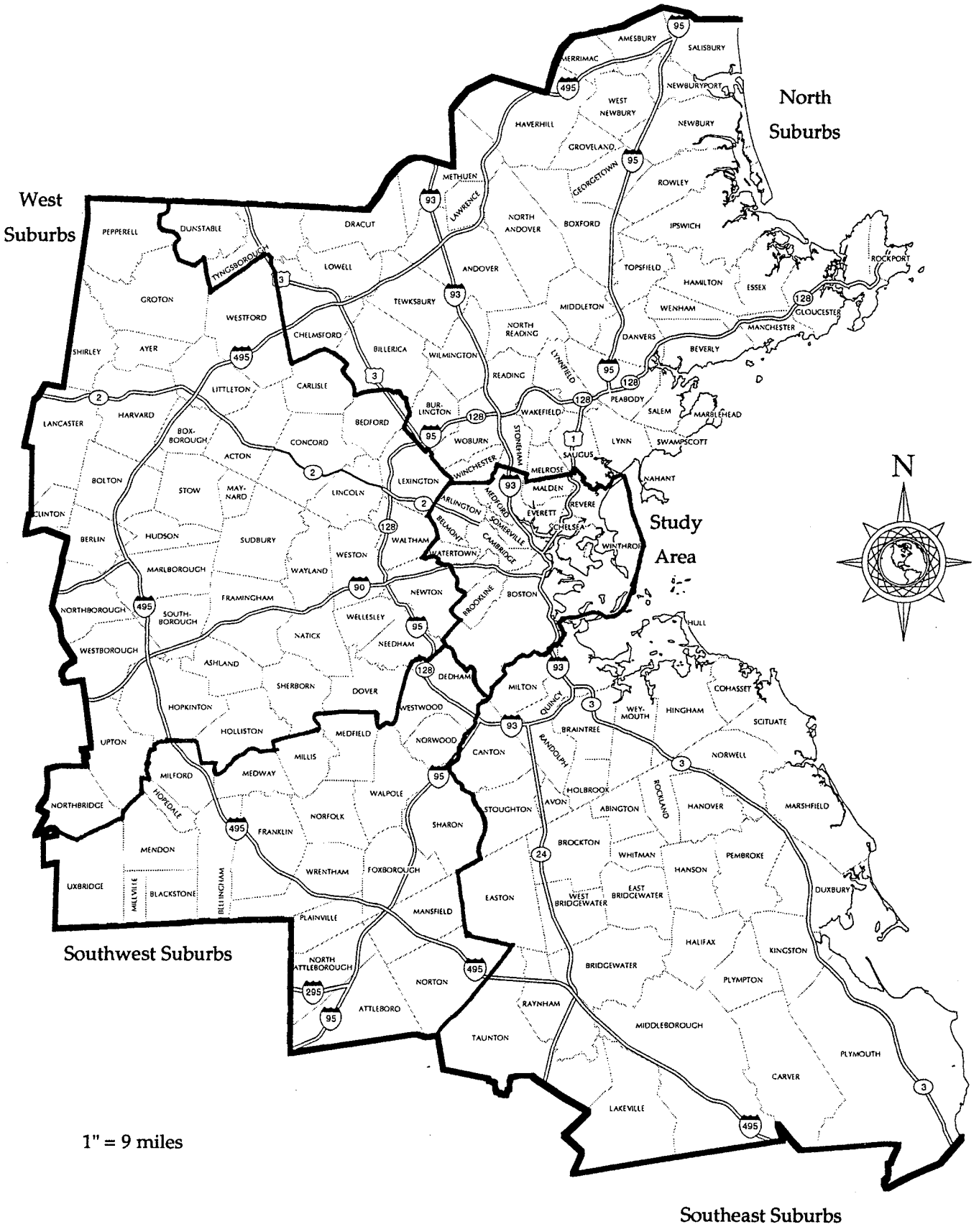


Table 4-4

Regional Daily Truck Trips Summarized by 5 Subregions

Truck Trips	Destination Subregion					
Origin Subregion	Study Area	North Suburbs	West Suburbs	Southwest Suburbs	Southeast Suburbs	To Whole Region
Study Area	107,385	11,719	10,409	3,324	7,367	140,204
North Suburbs	11,719	113,573	12,845	1,420	1,927	141,484
West Suburbs	10,409	12,845	73,313	6,505	1,829	104,901
Southwest Suburbs	3,324	1,420	6,505	37,560	9,566	58,375
Southeast Suburbs	7,367	1,927	1,829	9,566	70,257	90,946
From Whole Region	140,204	141,484	104,901	58,375	90,946	535,910

Distribution of Truck Origins	Destination Subregion				
Origin Subregion	Study Area	North Suburbs	West Suburbs	Southwest Suburbs	Southeast Suburbs
Study Area	76.6%	8.3%	9.9%	5.7%	8.1%
North Suburbs	8.4%	80.3%	12.2%	2.4%	2.1%
West Suburbs	7.4%	9.1%	69.9%	11.1%	2.0%
Southwest Suburbs	2.4%	1.0%	6.2%	64.3%	10.5%
Southeast Suburbs	5.3%	1.4%	1.7%	16.4%	77.3%
Region	100.0%	100.0%	100.0%	100.0%	100.0%

	Subregion					
	Study Area	North Suburbs	West Suburbs	Southwest Suburbs	Southeast Suburbs	Region
Truck VMT (000s)	702,947	1,531,392	1,609,517	825,052	1,163,696	5,832,604
Miles/trip	5.0	10.8	15.3	14.1	12.8	10.9
Population	1,111,398	1,139,390	686,870	377,254	807,163	4,122,075
Trips/resident	.13	.12	.15	.15	.11	.13
VMT/resident	632	1,344	2,343	2,187	1,442	1,415
Land area (sq. miles)	107	726	721	405	783	2,742
Population/sq. mile	10,428	1,569	952	931	1,031	1,503
Truck trips/sq. mile	1,315	195	145	144	116	195
Truck VMT/sq. mile	6,595,487	2,108,368	2,231,380	2,035,607	1,486,525	2,126,848

At the bottom of Table 4-4, the estimated truck trips in each subregion are related to a number of transportation and demographic measurements. The first row shows the total truck vehicle miles traveled (VMT) estimated by the model to take place in each subregion. Dividing the subregion VMT by the truck trips ending in the subregion gives an estimate of the average trip length. For the region as a whole this average trip length is 10.9 miles. Not surprisingly, the average trip length in the compact study area is only 5.0 miles.

The population of each subregion is then listed, and dividing the truck trips by the population yields the truck trips per person. Interestingly, the individual subregions do not vary much from the region average of 0.13 truck trips per resident. This suggests that a populace requires a certain number trucks for its provisioning and in support of its labor force. When the VMT is divided by the population, however, it is apparent that the compact study area can be provisioned by truck with much fewer truck miles than the more expansive suburban subregions.

The transportation efficiency of a dense urban core exacts a price, however. The population is compressed into a smaller area and must endure and contend with a higher density of urban traffic, including trucks. The land area of each subregion is shown, as well as population, truck trips, and truck VMT per square mile. In the study area, population and truck trips per square mile are both about seven times the regional average, suggesting the stable relation between truck trips and population. Truck VMT per square mile in the study area is only about three times the regional average, showing that in an urban environment businesses can serve their customers with shorter truck tours than in the suburbs.

4.2.2.2 Cambridge Through-Trips

Embedded within the thirteen study area municipalities is the City of Cambridge. The question that persistently arises in Cambridge is what fraction of the trucks observed on Cambridge roadways are merely passing through without conducting business at some Cambridge location. There are three analytical tools which help to understand how trucks using Cambridge roadways fit into regional truck travel patterns. First, the truck trip generation and distribution summarized for the five subregions in Table 4-4 can be further broken down to look at estimated truck trips to and from Cambridge alone. Second, a model-based procedure called a "select-link" analysis looks at all the modeled roadways entering Cambridge and sees where the model predicts the trucks crossing these model links are going. Third, the City of Cambridge

performed a physical cordon count in 1998 around the residential core of Cambridge. The cordon area is shown in Figure 4-11.

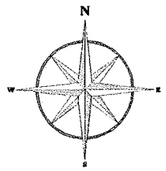
Our analysis suggests the following.

- Approximately 8,840 truck trips enter Cambridge each weekday.
- About 37% (3,300) of the 8,840 trips are through-trips.
- Of the through trips, 62% (2,060) both begin and end within the other twelve municipalities of the study area.
- The remaining 38% of the through-trips (1,230) have one end in a suburban subregion and the other end in one of the twelve other study area municipalities.
- The number of truck trips that both begin and end in a suburban subregion and go through Cambridge is negligible. As shown in Table 4-4, truck trips that completely cross the study area are a small portion of trips, and they generally use the expressway system.
- About 57% (1,885) of through-trips pass through the Cambridge cordon area shown in Figure 4-11.
- The remaining 43% (1,415) of trips passing through Cambridge do not cross the cordon, but instead pass through the "fringe" area shown in Figure 4-11. Note that the fringe area includes O'Brien Highway, Gilmore Bridge, the Charles River Dam, and parts of the Fresh Pond and Alewife Brook Parkways.
- The 3,300 through-trips represent only about 16% of all the truck trips that use Cambridge streets. The total number of trips using Cambridge streets includes about 6,080 trips beginning and ending within Cambridge, 5,530 trips starting in Cambridge and leaving, and another 5,530 trips starting outside Cambridge and entering.

In performing this analysis, wherever it was possible to make a comparison, the cordon data and the modeled truck activity agreed reasonably well. Also, the Traffic Enforcement Department of Cambridge has found that of the trucks it stops for routine inspections at key entry points to Cambridge, nearly 60% have business in Cambridge and 40% are passing through Cambridge without stopping. This generally agrees with our finding that 37% of trucks entering Cambridge at all locations are through-trips.

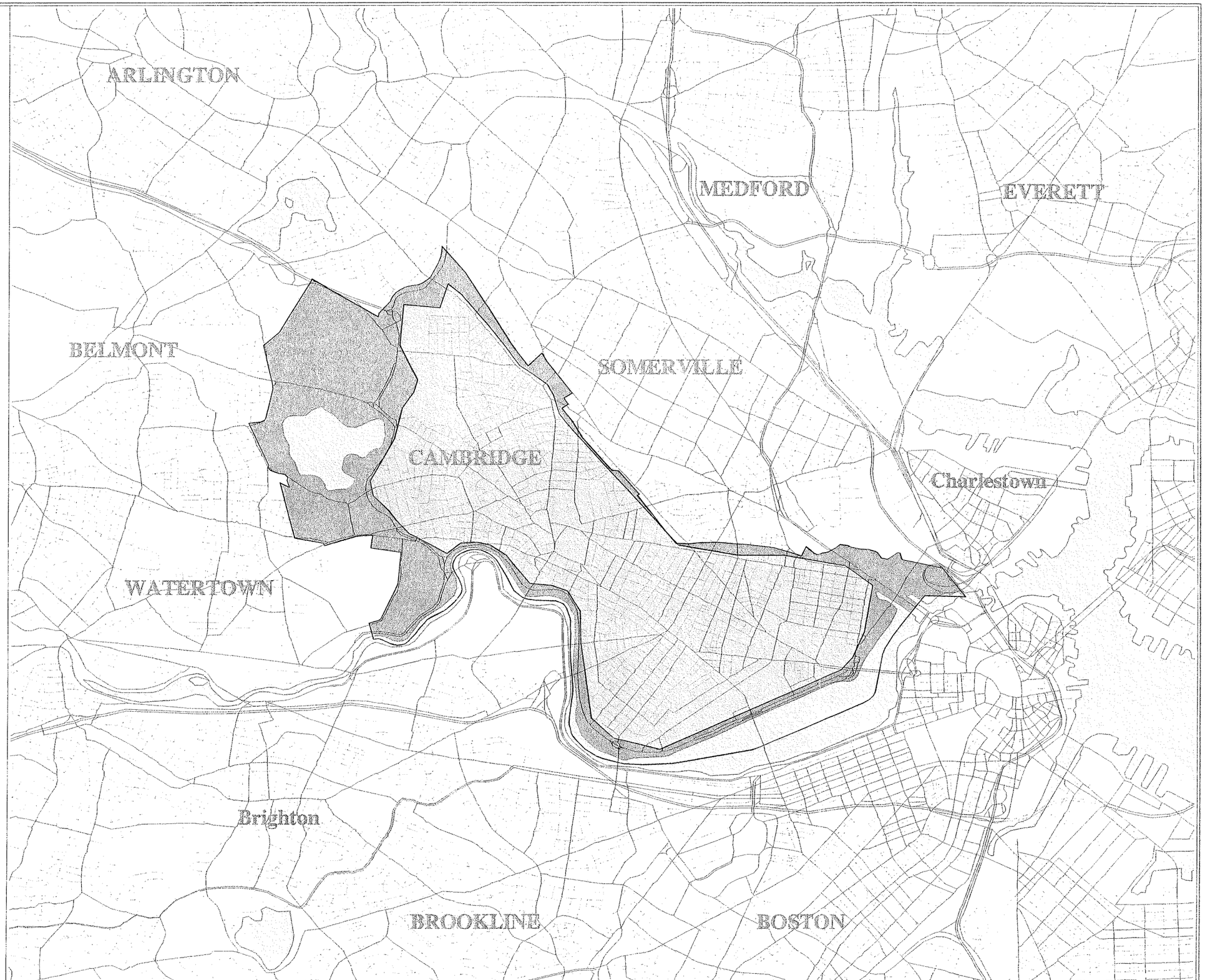
FIGURE 4 - 11

CITY OF CAMBRIDGE
CORDON AND
FRINGE AREAS



LEGEND

- Cordon Area
- Fringe Area
- Modeled roadway
- Roadway not in model



CTPS

The question often arises from the public as to why there are so many through-trips. The answer lies in the fact that Cambridge is a geographically small municipality embedded in a dense urban area. Trucks serving various points in this urban area will of necessity pass through individual municipalities without stopping. The expressway system can be used for many, but by no means all of the trips. Furthermore, virtually all trips must use the surface street system at the beginning and end of the trip and will only use the expressway in the middle section of a trip, and then only if practical.

4.2.2.3 Characteristic Areas Generating Large Numbers of Truck Trips

While truck traffic is spread broadly across the region, but is more concentrated in dense urban areas, it is still of interest to know if there are particular sites that generate a noticeably high number of truck trips. To answer this question it is useful to look at employment. Economic activity and its associated employment generally requires some service by trucks. The density of employment, as well as the nature of the employment will determine the propensity of an area to generate truck traffic.

Traditional "blue collar" employment, notably manufacturing, warehousing, and distribution, generate the greatest number of trucks per employee, by some estimates about one daily truck trip for every five workers. Retail employment generates a bit fewer trucks, about one truck for every eight workers. At the lowest average rate, there is a truck trip for about every 19 "white collar" workers.

Despite the fact that white-collar workers generate the fewest number of truck trips, there are a tremendous number of truck trips per square mile in the central business district because of the shear size of the labor force stacked in high-rise office buildings. Blue-collar industries tend to locate where land is less expensive and activity can be spread out over an industrial campus, often including a motor pool. Retail operations are found in both dense urban settings, as well as in familiar shopping center configurations.

Much blue-collar employment is located near railroad lines even though almost all rail traffic in metropolitan Boston is passenger. This is because available facilities and zoning regulations enable continued industrial use even after virtually all urban goods movement has converted over to truck. Even the highly successful rail piggyback operations require an over-the-road move to a ramp facility such as the one in Allston operated by CSX. Seaport areas also host blue-collar industries even as ocean going shipping has converted to containers, which also require an over-the-road move.

Interestingly, retailers have also found opportunities to build successful operations in transforming industrial areas. Twin Cities plaza on the Cambridge-Somerville line and the South Bay Center in Boston are examples of this industrial-to-retail change. Going from a declining industrial use to a vibrant retail use will usually increase truck traffic.

The fringe area shown in Figure 4-11 includes several industrial areas, most of which are evolving in some manner. Near Alewife, the fringe area north of the Fitchburg line is becoming mostly offices, while south of the Fitchburg line the old industries are still in operation. Near Webster Avenue on the Cambridge-Somerville boundary, the old Boston and Maine Boynton Yard has become a relatively modern complex of light industry, field service, distribution operations, and other mixed uses. In the Inner Belt in Somerville, new housing and a hotel coexist with a UPS distribution center as well as other industrial operations and high tech uses including telecom and office use. When the CA/T project is completed, the North Point, where Boston, Cambridge, and Somerville come together, will also surely be transformed in some manner.

It is the movement of trucks between this archipelago of industrial areas and the myriad of retail, office, medical, and other sites throughout the region that creates the observed truck traffic. The close proximity of these industrial and commercial sites in the study area creates the efficiencies associated with shorter trips lengths, but also results in a large number of truck trips taking place in areas with large numbers of residents.

5 TRUCK ISSUES

This chapter outlines all of the issues uncovered in this study and describes the different perspectives of those who have been involved.

5.1 PERSPECTIVES REPRESENTED

This subsection consists of brief statements that encapsulate the perspectives of the various parties involved in the study. Details of the issues will be provided in the subsection to follow.

5.1.1 Public Officials

5.1.1.1 Communities

As outlined earlier in this report, the City of Cambridge is concerned with the large numbers of trucks using their streets, particularly as through routes. One of their primary concerns is the problem of truck noise at night and very early in the morning. Other concerns include vibration, air pollution, and safety hazards caused by large commercial trucks, as well as, damage inflicted on roadway pavement and associated substructures. To address this issue, the City of Cambridge adopted Zoning Ordinance 1224 in June 1999.

With the enforcement of Cambridge Zoning Ordinance 1224, the communities surrounding Cambridge felt that the zoning ordinance was inappropriate and did not address the problem but merely shifted the truck traffic to other communities. The Town of Watertown specifically opposed the ordinance and felt that all cities and towns must share the commerce and transportation burdens associated with the region and its economy. The City of Somerville also opposed the ordinance citing that it did not address the problem but merely shifted it to other communities.

The City of Boston is conducting a citywide transportation planning process known as Access Boston 2000 - 2010, which is addressing truck-related issues brought to the table during the study.

All of the communities are working together as part of this study and are trying to find a regional solution to truck routing problems that will not place the burden on any one community.

5.1.1.2 State Agencies and Authorities

For several years, community officials, members of the trucking community and other citizens had made their concerns known publicly and MassHighway is aware of them. MassHighway is charged with the responsibilities of administering the requirements of ISTEA which require that the national highway system is maintained to serve as a core network for commerce. In addition, they maintain state owned roadways from which trucks cannot be prohibited. They have conducted studies at the request of communities to find solutions to truck related issues that have been brought forth by towns and communities in the Commonwealth. They are responsible for funding and ensuring the completion of this study.

The Metropolitan District Commission is charged with maintaining the system of parkways in the region. The MDC Commissioners have the authority to designate roadways in their jurisdiction as either general or pleasure roadways. Some roads under their jurisdiction allow trucks while others do not. As described earlier, the Commissioners are constrained only by any legal covenants relating to the original transfer of the road to MDC ownership. Two roadways in the study area, Memorial Drive and Alewife Brook Parkway north of Massachusetts Avenue are currently not open to trucks. The MDC feels that the roadway characteristics do not lend themselves to truck traffic, with narrow lane widths, tight turning radii and land uses along the roadways.

The Massachusetts Turnpike Authority operates the Turnpike that carries the largest volumes of trucks in the study area. However, the tunnels along the Turnpike in Boston have regulations and policies that prohibit the transport of hazardous materials through those tunnels. In addition, the Boston Fire Department adopted regulations that also prohibit the transport of hazardous materials through those tunnels due to safety concerns.

5.1.2 Citizens

Four public meetings were held to solicit input from the citizens of the communities included in the Regional Truck Study. A summary of the concerns and issues received at the meetings include:

- Too many trucks travel along roads where they should not be allowed.
- Large trucks are using local streets as cut through roadways.
- Health and safety issues related to truck traffic
- Noise and vibration related to truck traffic
- Traffic congestion related to truck traffic

These issues will be discussed in detail in Section 5.3.

5.1.3 Trucking Representatives

Members of the trucking community have raised issues related to fairness and the cost of doing business. Truck drivers want to use the most logical and direct route for the transport of their product. They are also concerned with infrastructure maintenance. Truck exclusions and hazardous cargo exclusions are also of concern because they may increase the length of a given truck trip, which could increase the cost to the trucker and ultimately could be passed on to the customer. This scenario might not be the case if the exclusion was not there. Truckers consider some exclusions to be reasonable, but may see others as burdensome.

5.1.4 Law Enforcement Officials

Enforcement for truck travel in the study area is performed by two agencies - the state police and the local police. Representatives of the Massachusetts State Police and the Cambridge, Somerville, and Belmont police departments were contacted during this study. The City of Cambridge has the most aggressive enforcement of trucks of all of the communities in the study area. They feel that the increased enforcement has helped by enforcing restrictions and by increasing safety through weight and equipment inspections in Cambridge. All of the law enforcement officials agreed that the majority of violations in the study area for weight and safety are by larger trucks, while the smaller trucks are being cited on restricted roads. In addition, most complaints regarding truck-related noise are mainly due to roadway conditions.

5.2 ISSUES SUMMARY

5.2.1 Overall Levels of Truck Trips and Need for Commerce

It is worth saying what is obvious to many people: our economy relies on trucks. Although goods are brought to and taken from the Boston area by rail, water, air and truck transportation, the nearly exclusive means by which goods and other materials are transported to and from households and businesses in the region is by truck. In addition, trucks are required to maintain infrastructure, pick up rubbish and perform numerous other service activities every day. Overall, trucks are needed to maintain a healthy economy.

Based on the current collection of truck counts and modeled truck information, the largest truck volumes are found on the expressway system - Interstate 93 and the Massachusetts Turnpike. Of the surface roadways in the study area, Route 99 in Everett, Route 1 in Boston and Route 28 in Medford carry the largest volume of trucks. Other roadways carrying large volumes of trucks include Washington Street with a major truck flow in and out of Somerville; the truck route through Cambridge which includes Binney Street, Main Street, and Massachusetts Avenue; Galen Street, Arsenal Street, and Route 20 which all intersect at Watertown Square in Watertown near the Massachusetts Turnpike Newton Corner Interchange; and Route 2 and Route 60 in Belmont, Arlington, and Medford. A map showing all the roadways in the study area with volumes over 600 trucks per day is shown in Figure 5-1.

5.2.2 Appropriate Routing of Trucks

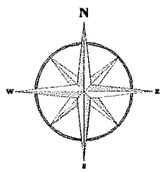
One of the chief concerns voiced by Cambridge public officials and other citizens is, simply put that too many trucks now travel along roads that they should not be allowed on. In particular, it is thought by many that there are too many large trucks and/or hazardous materials-carrying trucks traversing residential streets, posing safety, noise and other quality of life issues (all of which are addressed separately in subsequent sections). These trucks, it is said, ought to be diverted to arterial roadways or to the region's express highway system. There is a perception by many in Cambridge that these trucks are using their city as a cut-through to go between points west and south on the one hand and points north on the other.

It is thought by many citizens that much of the inappropriate truck traffic on residential and other sensitive streets results from restrictions imposed on roadways that trucks logically ought to use. MDC restrictions on Memorial Drive and elsewhere have been cited in this context, and there has been much

FIGURE 5 - 1

ROADWAYS WITH TRUCK VOLUMES OVER 600 TRUCKS PER DAY

(Observed Volumes with Input from Modeled Data)



LEGEND

- Modeled roadway with truck volume over 600 trucks per day
- Other Roadways
- Modeled roadway with negligible truck volume
- Roadway not in model

CTPS

ARLINGTON
BELMONT
CAMBRIDGE
WATERTOWN
Brighton
BROOKLINE
SOMERVILLE
MEDFORD
EVERETT
Charlestown
BOSTON
Route 2
Route 60
Route 60
Concord Ave.
Massachusetts Avenue
Broadway
Mystic Avenue
Interstate 93
Route 28
Route 16
Route 99
McGrath Highway
Somerville Ave.
Washington St.
Rutherford Ave.
Route 1
Kirkland St.
Cambridge St.
O'Brien Highway
Binney Street
Sumner/Callahan Tunnels
JFK St.
N. Harvard St.
Massachusetts Avenue
Main Street
River Street
Arsenal Street
Western Ave.
Massachusetts Turnpike
Route 20
Route 9

commentary about how the Boston Fire Marshall's restrictions on hazardous materials in the express highway's tunnels has diverted hazardous cargoes to surface streets in Cambridge and Somerville. Specifically, it is thought that hazardous cargo trucks exit the Massachusetts Turnpike at Newton Corner or Allston and traverse surface streets into and through Cambridge. Several people have testified that the tunnel restrictions and some of the MDC restrictions should be eliminated. In the case of the former, there seems to be a sentiment that the Interstate highway system is supposed to be carrying truck traffic, and that it is inappropriate for local officials to enact policies that divert that traffic to surface streets. Some are worried that when the Central Artery is complete, even more trucks, including hazardous materials-carrying trucks, will be diverted onto Cambridge surface streets.

In addition to concern over the number of trucks legally traversing residential roadways, there are concerns that existing truck exclusions are not being adequately enforced, and conversely, that designated truck routes are not being touted aggressively enough. This results, it is said, that many trucks are illegally using truck-excluded routes.

The Town of Belmont would also like to see a shift of truck traffic away from their town center on Pleasant Street (Route 60) if possible. They asked for analysis of the removal of the existing truck exclusion on Blanchard Street and Brighton Avenue to determine if this would help.

The Town of Watertown feels that trucks are exiting the Massachusetts Turnpike at Newton Corner to access Cambridge and Boston in order to avoid the tolls on the Turnpike. This increases the volumes of trucks entering Watertown Square.

5.2.3 Health and Safety

There has been a considerable expression of alarm over truck-related health and safety issues. Many people perceive that the sheer number of trucks on certain streets poses a safety hazard, particularly to children and other pedestrians. Moreover, large trucks and speeding trucks have been singled out as specifically contributing to unsafe conditions.

Hazardous cargo trucks are particularly worrisome to many people as they contemplate possible mishaps in their neighborhoods involving these trucks. As stated earlier, there is widespread belief that the numbers of these trucks on Cambridge streets, and to an extent on Somerville streets, is exacerbated by their being banned from the tunnels on the express highway system.

In addition to these concerns, there are those pertaining to air quality. Many people appear to believe that trucks contribute inordinately to air pollution on their streets. Fumes and particulates from diesel engine-powered trucks have been specifically cited as being problematic from both a health and aesthetic standpoint.

5.2.4 Noise and Vibration

Expressed concerns over truck-generated noise have been even more numerous than those related to health and safety. Although noise could rightly be categorized as a health issue to the extent that it contributes to sleep loss and hypertension, it is singled out here due to its prominence as an expressed subject of concern. Cambridge and Somerville residents alike appear to be greatly concerned about truck noise.

Some of these residents have said that poor pavement conditions exacerbate truck noise, presumably due to the extra rattling and banging that can occur as truck tires pass over potholes and other surface imperfections. Also of concern is the use of engine brakes or "jake brakes" by large trucks. These brakes, applied to help quickly slow down a truck, can be quite noisy.

Although truck noise during the day has been cited as problematic by those working at home and by others, noise occurring at night and in the very early morning is of particular concern. Some have spoken of being awakened at 4:00 or 5:00 A.M. by trucks rumbling past their homes. In consequence, there is considerable sentiment for nighttime truck exclusions.

While many people have complained specifically about the noise emanating from trucks, others have singled out the associated vibrations as the chief problem. For some, the vibrations are simply unpleasant and disruptive. Others are concerned over the impacts of vibrations on historic and other older structures.

5.2.5 Traffic Congestion

There appears to be a perception in many people's minds that trucks contribute disproportionally more to traffic congestion than do automobiles. In the case of large trucks, due to their size and performance characteristics, this is a fact. A large truck cannot accelerate as quickly as an automobile, particularly on a grade, and it may not traverse a roadway as fast as an automobile (although the more

common complaint is that trucks are going too fast, not too slow), and it may take more time to negotiate a turn than an automobile. All these factors contribute to a large truck taking up a given amount of roadway space for a longer time than an automobile; hence, trucks slow traffic.

In addition, some have expressed concern over the congestion impacts of trucks double parking on streets while loading or unloading. This could be occurring if automobiles are illegally parked in designated truck loading areas, and the trucker has no other choice than to double-park.

5.2.6 Infrastructure

Municipal officials and others have expressed unease over the perceived damage that trucks, particularly large and overweight ones, inflict on roadway pavement and associated substructures. It is a fact that a large truck does exert more stress on a road than does an automobile, so the more trucks in the traffic stream, all other things being equal, the more stress will be placed on the road.

Limitations in public infrastructure, such as roadway geometry, lead to damage of public and private property as a result of the roadways not being physically able to accommodate large trucks. This type of truck traffic often damages traffic control equipment, vehicles, sidewalks, and homes.

The City of Somerville is concerned that Somerville Avenue cannot sustain an increase in truck traffic due to roadway constraint problems, specifically an aging sewer system under the roadway. They would like to shift truck traffic from Somerville Avenue to Broadway whenever possible.

5.2.7 Enforcement

Current enforcement practices for truck travel in the study area are performed by two agencies - the state police and the local police. The state police are primarily responsible for enforcing the Massachusetts General Laws as they apply to truck travel.

The state police truck enforcement unit is responsible for enforcing truck restrictions and regulations. The officers in the unit are certified to perform truck inspections and issue citations to violators of the regulations for weights and measures and for moving violations such as speeding and failure to stop. Any state police officer can issue citations for moving violations on any roadway

throughout the Commonwealth, however, only the truck enforcement officers can perform truck inspections for weights and measures.

In the majority of communities throughout the Commonwealth, the local police are responsible for enforcing local truck restrictions and citing trucks for moving violations. The City of Cambridge on the other hand does have a five-man truck enforcement team that is certified to perform inspections for weights and measures. The City of Somerville, however, can only perform a full weights and measures truck inspection with the assistance of the city appointed personnel responsible for weights and measures. Enforcement officers findings include:

- The majority of violations for weight and safety are larger trucks, while the smaller trucks are being cited on restricted roads.
- Complaints regarding noise are mainly due to roadway conditions. Resurfacing of roadways in poor condition have reduced the number of complaints.
- Complaints are higher in areas where construction is occurring.
- If the police contact a trucking company with a complaint, most companies will do what is asked of them and correct the problem.
- In the majority of cases, once a trucker is made aware of a roadway restriction, they will not use the roadway again.
- Since the regulations for drivers with commercial licenses are strict, they follow the required regulations as to not put their license in jeopardy.
- Truck route signs should be improved.

5.2.8 Truck Company Business Considerations

Members of the trucking community have raised issues related to fairness and the cost of doing business. One such issue has to do with infrastructure maintenance. If trucks cannot use the quickest, legal route from one point to another, then their cost of doing business may increase unless the next quickest route is not materially longer than the quickest one. Sometimes, poor infrastructure is what prevents a truck from using the quickest legal route. A bridge that is functionally or structurally obsolete and is therefore unable to accommodate trucks over a certain size is the chief example of this problem. Another example is that of an old bridge, built to outdated design standards, that may not provide sufficient vertical clearance for today's trucks of over a certain height to pass under it. In both of these examples, the next quickest legal route for a truck may be significantly longer.

The other reason for truckers possibly having to divert to significantly slower routes is truck exclusion policies. Truck exclusions on surface roadways and hazardous materials exclusions in tunnels may cause a given truck trip to have to traverse a route that costs the trucker and therefore his customers more than would be the case in the absence of the exclusion. It seems that, while truckers consider some exclusions reasonable, they see certain others as insensible and burdensome.

5.3 SPECIFIC IDENTIFIED PROBLEM LOCATIONS

This section contains a comprehensive list of all locations that the Technical Subcommittee knows to be of concern to municipal officials, trucking officials and other citizens of Cambridge, Somerville and adjoining communities. In some cases, there is a perception that too many trucks traverse the road; neither the presumed cause of nor specific problems deemed to result from this truck traffic are explicitly articulated. In other locations, specific causes and/or impacts of truck traffic have been cited.

It is important to note that the following listing contains exact or paraphrased statements made by a variety of people, many of who spoke at the June 21, 2000 public meeting in Somerville.

Please refer to Figure 5-2 for a graphical depiction of the locations presented below.

Cambridge

- **Brattle Street:** Truck traffic here is thought by some to be exacerbated by trucks exiting the MassPike at Newton Corner and then entering Cambridge via this street. It is thought that removing trucks from Brattle Street will also benefit Kirkland Street and Union Square in Somerville. [Brattle Street has a legal truck exclusion, however, signs have never been posted and the truck exclusion has not been enforced.]
- **River/Western Streets:** There is a perception of high truck volumes in general and of a large increase in gasoline tanker trucks in recent years.
- **Cardinal Medeiros Avenue:** This road has dense housing and numerous children, making many nearby residents feel that it is an inappropriate street for trucks. Several issues, including those pertaining to noise, vibration, traffic congestion, excessive speed and air pollution, have been cited by several residents of the street. Also, it was noted that loading

docks at 600-700 Kendall Square that open on Cardinal Medeiros Avenue are frequented by trucks dropping off and picking up hazardous materials.

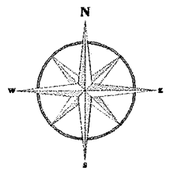
- **Binney and First Streets:** There is a perception that trucks avoid this signed truck route and instead improperly traverse other area through-streets. Area residents want this route to be enforced.
- **Kirkland Street:** There are too many trucks going too fast on this and Washington Street. Noise, magnified by poor pavement conditions, is a particular problem in the evening and at night.
- **Gore Street (and Medford Street in Somerville) and Warren Street**, on the Cambridge/Somerville line in East Cambridge are of particular concern to the city.
- **Cameron Avenue** on the Somerville line in North Cambridge is also of particular concern to the city.
- **Fulkerson Street:** There is a perception that truck volumes are inordinately high, in part, due to truckers not using Binney and First.
- **Memorial Drive:** The truck ban should be lifted on some sections of this MDC roadway, especially at night.
- **Prospect Street:** The truck exclusion on this street should be removed, at least during the day. It is appropriate for trucks to use this arterial route as it provides a direct connection to many destinations in the area. Removing the exclusion would remove truck traffic from other Cambridge streets.
- **Hazardous Cargo Trucks:** Gasoline tanker trucks are using Cambridge streets as a cut through during the nighttime hours. This concern is focused along the posted truck route of River/Western-Mass Ave-Main-Binney-Land and the partially-restricted route of JFK-Harvard Square-Kirkland.

Somerville

- **Summer and Bow Streets, Union Square:** Too many trucks use these streets. They speed, are noisy, generate too much air pollution, and their vibrations hurt historic buildings on Bow Street. The infrastructure of that street is insufficient for large trucks.
- **Webster Avenue:** Trucks are a problem in the evening and at night. Also, trucks go up onto and damage the sidewalk on Webster Avenue.

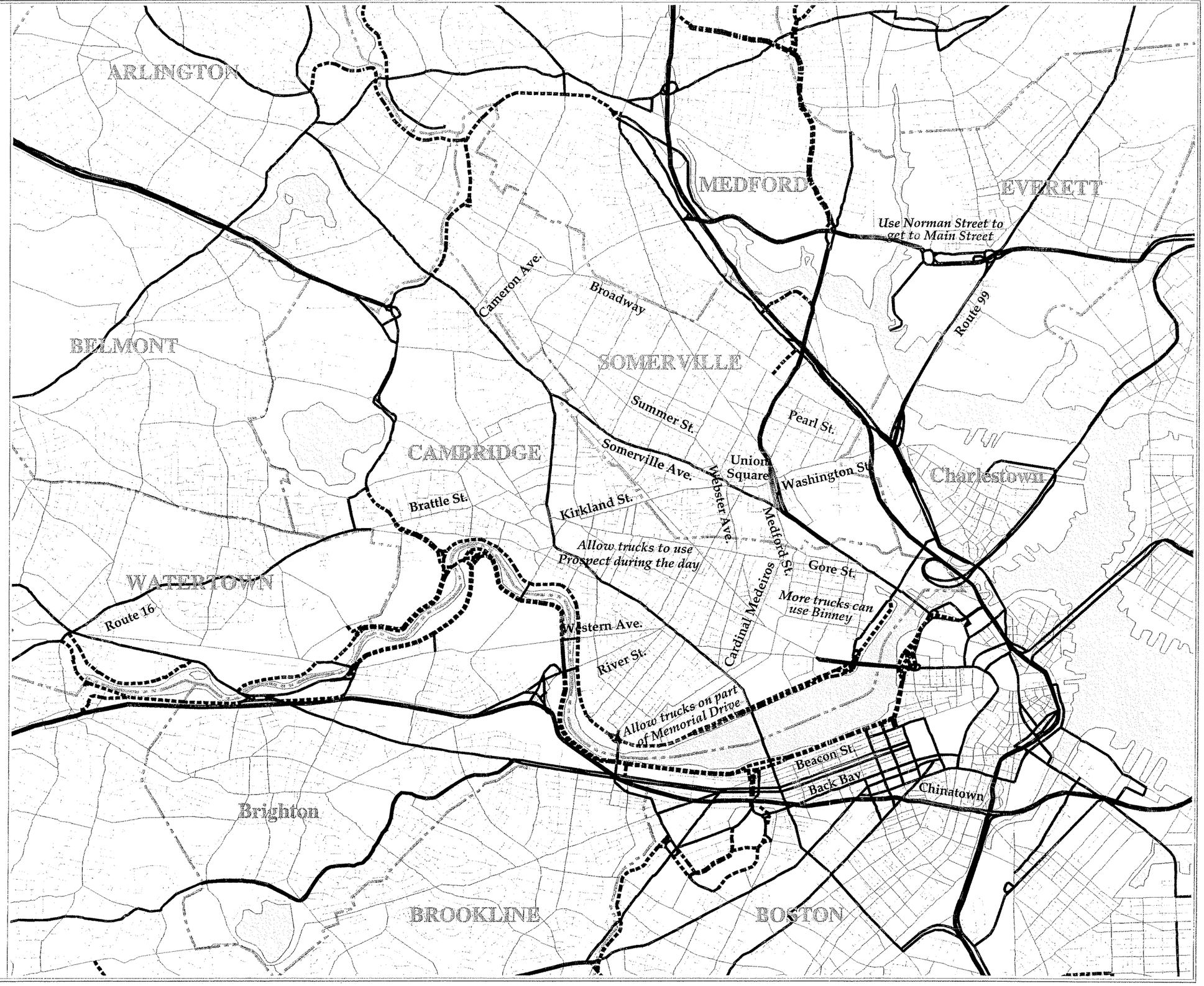
FIGURE 5 - 2

SPECIFIC PROBLEM LOCATIONS AS IDENTIFIED BY MUNICIPAL OFFICIALS, TRUCKING OFFICIALS, AND CITIZENS



LEGEND

- Primary Network
- MDC Parkway (trucks excluded)



CTPS

- **Union Square generally:** Large trucks are a problem due to narrow streets.
- **Washington Street:** Truck noise is a problem in the evening and at night.
- **Somerville Avenue:** Trucks are a problem in the evening and at night.
- **Broadway:** There is a perception that truck traffic is excessive.
- **Summer Street, west of Union Square:** This is a residential street that has excessive truck traffic. A truck restriction exists, but trucks use this as a route between Union and Davis squares.
- **Pearl Street:** Residents have observed that truck traffic has increased on this narrow residential street since the new ramp off of I-93 northbound to Sullivan Square opened, due to trucks cutting through to get to points west of the street.

Boston

- **Chinatown:** There should be strict enforcement of specific times for deliveries.
- **Back Bay:** The five-minute truck (and bus) idling law ought to be enforced, truck traffic should be better managed, and bans on trucks (and buses) in residential areas should be enforced. There has also been some concern expressed over flammable liquid-carrying trucks.
- **Beacon Street:** Truck traffic and truck noise should be reduced.

Watertown

- **Route 16:** It is felt that many trucks on this roadway, in order to avoid the Allston tolls, are exiting the MassPike at Newton Corner and using this roadway to access points in Cambridge, Boston or elsewhere. This concern is in tandem with that of Cambridge residents who suspect this cut-through behavior of accounting for much of the truck traffic on Brattle Street in that city. Route 16 leads directly into Brattle and Mount Auburn Streets.

Everett

- **Access to Everett from I-93:** Such access is made more difficult due to trucks being excluded from the MDC's Fellsway in Medford.
- **Route 99:** Hazardous material-carrying trucks use this route instead of Routes 1 and 16 to access points to the south of Route 16. Also, there are

too many construction trucks on this road. Trucks from Boston Sand and Gravel use the road to access sites on the North Shore, and trucks from the Saugus Tri-Mark plant use the road to access points to the south. A large percentage of the trucks on Route 99 are dump trucks.

- **Main Street to Waters Street cut-through:** A local official believes that trucks should use a new "preferred" route consisting of Santilli Circle (Norman Street) to Water Street. It is thought that getting permission from the MBTA to cross unused tracks slated for the Bike-to-the-Sea bike path may be an issue.

Medford

- **Route 60:** Despite being a numbered route, it is a narrow residential street with rotaries, churches and schools. Truck traffic is extremely heavy, especially in the morning. It's designation as a numbered route should be re-evaluated.

6 FINDINGS AND CONCLUSIONS

This chapter presents this study's findings and conclusions on which its recommendations (presented in chapter 7) are based. The first of this chapter's two sections describes the findings that were derived using the transportation model based information–those findings where specific alternatives were analyzed using the model. The second section describes findings as they relate to information gathered from various city and town officials, comments from public meetings, interviews with trucker drivers, and research on existing conditions throughout the study area.

6.1 EVALUATION OF ALTERNATIVE TRUCK ROUTING STRATEGIES

Chapter 3 outlined the performance measures that were used to evaluate the twelve alternative truck routing strategies identified by the Technical Subcommittee. This section provides the results of the evaluations. A matrix of the results was developed so that a comparison could be made by the Technical Subcommittee. The matrix is shown in Table 6-1; the following is a review of the measures included:

- Change in truck vehicle miles of travel (VMT) from existing conditions.
- Change in residential impact - Change in the number of times per weekday that a truck passes within 100 yards of where someone lives, as compared to existing conditions. Negative numbers indicate that fewer trucks are in a residential area; positive numbers indicate an increase.
- Changes in institutional requirements - Any required changes to regulations or need for approval by a governing agency.
- Bridge constraints - In reviewing the physical roadway constraints, the Technical Subcommittee found that the major constraint on implementation of these strategies was bridge constraints, more specifically, posted weight restrictions, height restrictions, and closed bridges. Although narrow roadways and tight turning radii at intersections are common in the study area (due to the development pattern of the area), there are no locations where these characteristics eliminated a strategy from consideration.

- Change in regional emissions of volatile organic compounds (VOC) and nitrogen oxides (NOx) from existing conditions.
- Potential impacts to sensitive receptors: hospitals, schools and parkland. A notation of negative indicates an unfavorable impact on the receptor because of increased truck traffic, while a positive notation indicates a favorable impact because of reduced truck traffic.
- Change in weekday truck traffic volumes from existing conditions on roadway segments: The change in truck volumes on roadways within the study area as estimated by the travel model. Maps showing the change for each strategy are provided in Appendix A.
- Change in weekday truck traffic volumes from existing conditions at intersections of concern: These intersections were identified by community officials and/or as intersections with high accident locations.

The evaluation results were reviewed by the Technical Subcommittee to determine which alternative strategies should be eliminated and which should be retained for further consideration. These two sets of strategies are discussed in the following two sections. As a group, those retained would have a more favorable impact on vehicle miles of travel, residential impact, nitrogen oxide emissions, and intersections of concern than those eliminated. In general as a group, those retained would have a less favorable impact on sensitive receptors and volatile organic compound emissions. It should be noted that although the retained strategies received further consideration, they did not necessarily become recommendations, due to the influence of other findings and subsequent considerations.

6.1.1 Alternative Strategies Eliminated After First Phase of Evaluation

The following alternatives were those that were initially eliminated during the study process:

Remove truck exclusions on all of Alewife Brook Parkway

With the desire of the City of Somerville to shift trucks from Somerville Avenue to Broadway as much as possible, the Technical Subcommittee wanted to keep one of the Alewife alternatives under consideration to allow for trucks to access Broadway. The results of the analysis on removing truck exclusions on all of Alewife Brook Parkway show that this alternative would have more of a negative impact on residential and recreational areas than removing truck exclusions on Alewife Brook Parkway from Massachusetts Avenue to Broadway.

Table 6-1
Performance of Alternative Truck Routing Strategies

Performance Measure	Strategies Not Eliminated by Technical Subcommittee in First Analysis Phase						Strategies Eliminated by the Technical Subcommittee in First Analysis Phase					
	Open Memorial Drive: BU Bridge to Vassar	Open Memorial Drive: Western to Vassar	Exclude Cardinal Medeiros	Open Alewife: Mass. Ave. to Broadway	Exclude Kirkland 24 Hours	Open Brighton & Blanchard North of Concord	Open All of Alewife Brook Parkway	Cambridge Nighttime Ban	Open Prospect Street During Daytime	Enforce Brattle Exclusion	Allow Hazardous Cargo (HC) Trucks in Tunnels	Ban HC Trucks on Turnpike East of Route 128
Truck Vehicle Miles of Travel (VMT) Change												
Freeways	-140	218	-409	599	240	-652	1,773	392	-179	229	4,647	-300
Arterials	-92	-208	495	-348	-202	1,061	-663	-5	-221	-133	-5,072	396
Local	-52	-29	229	-156	-142	-585	-607	55	41	91	-87	-43
Study Area Total	-284	-19	315	95	-104	-176	503	442	-359	187	-512	53
Residential Impact*												
Freeways	-349,000	320,000	71,000	-400,000	290,000	-575,000	707,000	834,000	-159,000	262,000	10,385,000	-538,000
Arterials	-314,000	-968,000	-565,000	587,000	75,000	1,051,000	969,000	-688,000	-988,000	-88,000	-9,188,000	282,000
Local	-126,000	-41,000	276,000	-362,000	-404,000	-713,000	-758,000	66,000	-26,000	136,000	-216,000	-108,000
Study Area Total	-789,000	-689,000	-218,000	-175,000	-39,000	-237,000	918,000	212,000	-1,173,000	310,000	981,000	-364,000
Institutional Requirements												
MDC vote	X	X		X			X					
Engineering analysis									X			
Municipal vote					X	X			X	X		
MassHighway approval			X		X	X		X	X			
Remove signs						X			X			
Post signs			X		X	X				X		
MassPike approval											X	X
Boston Fire Dept. approval											X	
Bridge Constraints												
Low overpass		X										
Posted weight restrictions									X			
Air Quality (change in regional kilograms per day)												
Volatile Organic Compounds (VOCs)	2	-6	17	-31	-14	-4	-13	4	-30	-9	-36	-23
Nitrogen Oxides (NOx)	-18	-7	2	-12	-7	-14	-9	5	-24	-6	-13	-9

The results for each alternative truck routing strategy show the change from existing conditions.

* "Residential Impact" is the number of times per day that a truck passes within 100 yards of a residence as compared to existing conditions. Negative numbers indicate that fewer trucks are in residential areas.

Table 6-1
Performance of Alternative Truck Routing Strategies

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Potential Impacts on Sensitive Receptors												
MDC Parkland	neg	neg		neg			neg					
Schools												
Arlington												
Arlington High				pos			pos					
Belmont												
Chenery						pos						
Wellington						neg						
Winn Brook				neg			neg					
Boston												
Boston High											neg	
Brighton High											pos	pos
Garfield											pos	pos
Josiah Quincy											neg	
Madison Park High											pos	
Cambridge												
Graham Parks		pos	pos		neg				neg		pos	pos
Harrington			pos	pos	neg		pos		pos			
King		neg			pos				pos			
Matignon High				neg			neg					
Morse		neg										
Rindge & Latin			neg		neg				pos	neg		
Everett												
Center							neg				pos	
Devens							neg				pos	
Medford												
Hillside				neg			neg					
Kennedy Lincoln				neg			neg					
Roberts Junior High				pos								

(neg) = unfavorable impact to receptor
(pos) = favorable impact to receptor

Table 6-1
Performance of Alternative Truck Routing Strategies

Performance Measure	Strategies Not Eliminated by Technical Subcommittee in First Analysis Phase						Strategies Eliminated by the Technical Subcommittee in First Analysis Phase					
	Open Memorial Drive: BU Bridge to Vassar	Open Memorial Drive: Western to Vassar	Exclude Cardinal Medeiros	Open Alewife: Mass. Ave. to Broadway	Exclude Kirkland 24 Hours	Open Brighton & Blanchard North of Concord	Open All of Alewife Brook Parkway	Cambridge Nighttime Ban	Open Prospect Street During Daytime	Enforce Brattle Exclusion	Allow Hazardous Cargo (HC) Trucks in Tunnels	Ban HC Trucks on Turnpike East of Route 128
Somerville												
Curtis/Tufts							pos					
Kennedy				pos			pos					
Lincoln Park Community			neg	pos	pos		pos		pos	pos		
Powder House				neg			neg					
St. Anthony's				pos	neg		pos		neg			
St. Joseph's			neg	pos	pos		pos		neg	pos		
Watertown												
Watertown High School						neg						
Hospitals												
Boston												
Brigham & Women's											pos	neg
Franciscan Children's											pos	pos
Cambridge												
Cambridge			neg		neg			pos	pos			
Mt. Auburn										neg		
Youville			neg		neg			pos	pos	pos		
Medford												
Lawrence Memorial							pos					

Negative = unfavorable impact to receptor
Positive = favorable impact to receptor

Change in Weekday Truck Traffic Volumes from Existing Conditions: On Roadway Segments												
Arlington												
Broadway (Pleasant St to Alewife)				-450			-520	120				
Massachusetts Avenue (River to Alewife)				-180			-360					
Pleasant Street (Arlington)				-400				120				
River Street				-140			-370					
Route 2 (Pleasant St to Alewife)				525		-180	675					
Route 2 (Pleasant St to Winter in Lexington)												

Table 6-1
Performance of Alternative Truck Routing Strategies

Performance Measure	Strategies Not Eliminated by Technical Subcommittee in First Analysis Phase						Strategies Eliminated by the Technical Subcommittee in First Analysis Phase					
	Open Memorial Drive: BU Bridge to Vassar	Open Memorial Drive: Western to Vassar	Exclude Cardinal Medeiros	Open Alewife: Mass. Ave. to Broadway	Exclude Kirkland 24 Hours	Open Brighton & Blanchard North of Concord	Open All of Alewife Brook Parkway	Cambridge Nighttime Ban	Open Prospect Street During Daytime	Enforce Brattle Exclusion	Allow Hazardous Cargo (HC) Trucks in Tunnels	Ban HC Trucks on Turnpike East of Route 128
Belmont												
Blanchard Street						-600						
Brighton Street						270						
Common Street						150						
Concord Avenue (Blanchard to Pleasant)						180						
Cross Street				50			60					
Grove Street						-275						
Pleasant Street							-520	120				
School Street						-200						
Boston												
BU Bridge	90	80										
Cambridge Street (Turnpike to Memorial)		50										
Interstate 93			-100					160			300	
Massachusetts Turnpike											400	-200
Meridian Street											-175	
Route 1											300	
Route 9 (South of Mass. Turnpike)												75
Rutherford Avenue			300					120				
Ted Williams Tunnel											200	
Western Avenue (N Harvard to Greenough Blvd)										40		
Western Avenue (Market to N Harvard)												50
Cambridge												
Aberdeen						230				50		
Alewife Brook Parkway (Route 2 to Concord St)				60		-180	100					
Alewife Brook Parkway (Route 2 to Mass Ave)							800					
Alewife Brook Parkway (Mass Ave to Broadway)				600			1200					
Binney Street			320		50				-60		-120	-50
Brattle Street					-60					-230		
Broadway (Inman to Columbia)			60									
Brookline Street	-50	-50										
Cambridge Street (JFK St to Kirkland)					-120							
Cambridge Street (Cardinal Medeiros to Ellery)					300							
Cambridge Street (Hampshire to Webster)			170									
Cambridge Street (Prospect to Card. Medeiros)									-200			
Cardinal Medeiros			-640						-150			
Concord Avenue (Alewife Br. Pkwy to Smith Pl.)						260						
Concord Avenue (Fresh Pond to Garden)						60						

Table 6-1
Performance of Alternative Truck Routing Strategies

Performance Measure	Strategies Not Eliminated by Technical Subcommittee in First Analysis Phase						Strategies Eliminated by the Technical Subcommittee in First Analysis Phase					
	Open Memorial Drive: BU Bridge to Vassar	Open Memorial Drive: Western to Vassar	Exclude Cardinal Medeiros	Open Alewife: Mass. Ave. to Broadway	Exclude Kirkland 24 Hours	Open Brighton & Blanchard North of Concord	Open All of Alewife Brook Parkway	Cambridge Nighttime Ban	Open Prospect Street During Daytime	Enforce Brattle Exclusion	Allow Hazardous Cargo (HC) Trucks in Tunnels	Ban HC Trucks on Turnpike East of Route 128
Cambridge (cont.)												
First Street			200									
Fresh Pond Parkway						300						
Hampshire St (Cardinal Medeiros to Cambridge)			75									
Huron (Aberdeen to Sherman)										60		
Inman Street			75									
JFK Street					-90					75		
Kirkland Street					-330					-40		
Lambert Street					140							
Land Boulevard and Gilmore Bridge			120		50							
Main Street (Mass Ave to Longfellow Bridge)											-200	-100
Main Street (east of Portland)			75									
Main Street (Mass Ave to Binney)	-65	-65			50							
Main Street (Mass Ave to Portland)			-110						-250			
Mass Ave north of Somerville Ave							-90					
Mass Ave (Prospect to Main)					50				-250			
Mass Ave (Putnam to Beacon, Boston)		-90									-200	-100
Mass Ave (Pearl to Charles River)	-40											
Mass Ave (Somerville Ave to Harvard Sq)					70							
Memorial Drive (BU Bridge to Vassar)	180											
Memorial Drive (Magazine to Vassar)		250										
Memorial Drive (River to Magazine)		400										
Mount Auburn										130		
O'Brien Highway (First to McGrath)			210									
O'Brien Highway (Somerville to Leverett)								-230				
Pearl Street	-50	-80										
Prospect Street									530			
Putnam Street (Brookline to River)		-70										
Putnam Street (Western to Mass Ave)		50										
River Street (Charles River to Mass Ave)									130		-80	-50
River Street (Memorial to Mass Ave)		-40										
Upland Road					50							
Vassar Street	100	100										
Warren Street			-400		140							
Western Avenue									40		-100	-50
Everett												
Beacham Street											-300	
Route 99											-350	

Table 6-1
Performance of Alternative Truck Routing Strategies

Performance Measure	Strategies Not Eliminated by Technical Subcommittee in First Analysis Phase						Strategies Eliminated by the Technical Subcommittee in First Analysis Phase					
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Medford												
River St				-140			-370					
Route 16											-200	
Route 60 (Harvard Ave to Mystic)				-140								
Somerville												
Alewife Brook Parkway (Broadway to Mystic)							600					
Beacon Street					50							
Broadway (Alewife to Warner)				500								
Broadway (east of Warner)				210								
Broadway							150	100				
McGrath Highway (I-93 to Medford St)			-90									
McGrath Highway (Medford to Washington)					220							
McGrath Highway (Washington St. to I-93)								110				
Medford Street			-175		250							
Mystic Avenue (McGrath to Rutherford)			100									
Powder House Boulevard							200					
Somerville Avenue							-100	-100				
Somerville Avenue (Mass Ave to Central)					80							
Somerville Avenue (Union Square to Beacon)									75			
Somerville Avenue @ Union Square									-60			
Warner Street to Harvard Street to Mystic Valley				165			100					
Washington Street (east of McGrath Highway)			-90		-90							
Washington Street (Kirkland to Union Square)					-460					-40		
Washington Street (Union Sq to McGrath Sq)					-290							
Washington Street (Union Sq to Sullivan Sq)								100	100			
Webster Street (Cambridge to Columbia)									-280			
Webster Street (Columbia to Prospect)									300			
Watertown												
Arlington Street						-225						
Common Street						130						
Mt Auburn Street (Rte 16): Arlington to Aberdeen						130						
Mt Auburn Street (Rte 16): Square to School						-150						

Table 6-1
Performance of Alternative Truck Routing Strategies

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Change in Weekday Truck Traffic Volumes from Existing Conditions: At Intersections of Concern												
Arlington												
Mass Ave @ Park												
Mass Ave @ Pleasant				-480			-625	140				
Belmont												
Leonard @ Concord												
Pleasant @ Trapelo												
School @ Belmont						-190						
Trapelo @ Common						110						
Trapelo @ Mill												
Boston												
Cambridge Street @ Soldiers Field		100							100		-90	-115
Charles Circle*											-120	
Comm Ave @ Brighton*											-200	
Comm Ave @ BU Bridge*	75	55									-240	
Kenmore Square*	-65	-60	-70								-190	
Leverett Circle							-65	-230	55			
Mass Ave @ Beacon*	-65	-95						-95			-90	
North Harvard @ Cambridge											125	
Rutherford @ Gilmore Bridge			290				-100		-75		-425	
Sullivan Square					-90			145	130			
Western @ Market						-50						
Western @ Soldiers Field											-90	
Cambridge												
Fresh Pond @ Concord						300						
Fresh Pond @ Huron						290				75		
Memorial @ BU Bridge	110	200										
Mass Ave @ Alewife				650				-160				
Mass Ave @ Garden					-50					-120		
Mass Ave @ Memorial	-60	-90						-115			-75	
Mass Ave @ Prospect		-120			60				345		-110	
Mass Ave @ Route 16							985					

* Community officials are also concerned about the potential for conflict between trucks and pedestrians at these intersections.

Table 6-1
Performance of Alternative Truck Routing Strategies

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Cambridge (cont.)												
Mass Ave @ Somerville				-165	110		-195	-130				
Prospect @ Broadway			65						595			
Prospect @ Hampshire			75						495			
River @ Memorial		90									-95	
Route 2 @ Route 16				630		-155	810	-140				
Western @ Memorial		290							80			
Everett												
Broadway @ Beacham											-550	
Everett @ Revere Beach Pkwy											-205	
Santilli Circle				50			65	50				
Second St @ Revere Beach Pkwy				60			90				-200	
Sweetser @ Revere Beach Pkwy				70			70				-250	
Vine @ Revere Beach Pkwy							70				-200	
Medford												
Main @ Harvard				160			80					
Mystic Valley @ Fellsway				80			80	70				
Mystic Valley @ Harvard				130			90					
Mystic Valley @ I-93				-95			90				-145	
Mystic Valley @ Locust				90			110					
Mystic Valley @ Main				-95			325					
Mystic Valley @ Winthrop							825					
Somerville												
Broadway @ Alewife						-100						
Davis Square*							-50					
Magoun Square*				180			100					
McGrath @ Broadway*			-110	125			75	170				
McGrath @ Somerville			-410	-65	210		-100	-185	-140			
McGrath @ Washington			-350	-55			-80	55	90			
Mystic @ McGrath	-50			100			70	175				
Pearl @ McGrath			-90					120	65			
Somerville @ Beacon*				-140	50		-170	-100				
Somerville @ Prospect*				-95	-340		-125	-75	360			
Somerville @ Webster*				-105	-400		-135		160			

* Community officials are also concerned about the potential for conflict between trucks and pedestrians at these intersections.

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Somerville (cont.)												
Teele Square*				490			50	70				
Washington @ Beacon				-55	-600		-70		-165			
Webster @ Prospect									840			
Watertown												
Arsenal @ Greenough						-50						
Watertown Square						-50					-60	

* Community officials are also concerned about the potential for conflict between trucks and pedestrians at these intersections.

Ban through truck traffic in all of Cambridge at night

If enforced, the Cambridge zoning ordinance excluding through truck traffic between 11:00 P.M. and 7:00 A.M. would increase truck traffic in the municipalities surrounding Cambridge. Model results indicate that while nighttime truck traffic would decrease throughout all of Cambridge, it would increase on streets in the surrounding communities including:

- Broadway, McGrath Highway, and Washington Street in Somerville
- Pleasant Street, River Street, and Broadway in Arlington
- Pleasant Street and School Street in Belmont
- Rutherford Avenue, Beacon Street, and Boylston Street in Boston
- Route 60 and Harvard Avenue in Medford
- Route 16 and Route 28 in Everett

Complaints of truck traffic volumes and noise by residents in Cambridge would be alleviated at the expense of residents in other communities living on the roadways listed above.

In addition, local businesses would be adversely affected by this zoning ordinance. Existing hourly count data shows that approximately 10% of the daily truck traffic occurs between the hours of 11 P.M. and 7 A.M., however, 4.5% of the total traffic occurs between 6 A.M. and 7 A.M. This ordinance may require businesses to change delivery schedules or use routes that take more time or add miles to their routes. This can cause delays in deliveries, increased costs associated with the transport of goods, and increased roadway congestion.

The initial implementation of the zoning ordinance was confusing and problematic to truckers due to lack of signage and notification. In order to effectively implement the zoning ordinance, signs would likely have to be posted at entry points into the City of Cambridge to alert truckers that it exists. The posting of any truck restriction sign requires approval by MassHighway under Chapter 85. The City of Cambridge must provide a significant amount of analysis to support an application for truck exclusion signs and must convince MassHighway that a suitable alternative route is available.

Remove the truck exclusion on Prospect Street in Cambridge and Somerville

Both the cities of Cambridge and Somerville and some of the truckers, felt removing the truck exclusion on Prospect Street could be problematic due to traffic operations issues along the roadway. The issues include current lane geometry, traffic signals along the roadway, existing peak hour congestion, high accident rates, and existing parking along the northern section of the roadway.

Enforce the current truck exclusion on Brattle Street

Analysis shows that closing Brattle Street to trucks could shift trucks to Mount Auburn Street and Huron Avenue. This action could have negative impact on residents in the study area with an increase of truck passings in residential areas and an increase of truck vehicle miles of travel.

Allow hazardous cargo trucks into express highway tunnels

Currently, vehicles carrying any hazardous materials are banned from using the tunnels on the Massachusetts Turnpike (under the Prudential Building), Central Artery (Dewey Square Tunnel), the Sumner/Callahan Tunnel, the Ted Williams Tunnel, and the Central Artery North Tunnel (CANA) on Route 1. These tunnels are operated under the jurisdiction of the Massachusetts Turnpike Authority (MTA) as part of the Metropolitan Highway System. Regulations and policies of the MTA are that hazardous materials are prohibited in tunnels under 730 CMR 7.10 (1).

Since these tunnels are within the city limits of Boston, the Boston Fire Department would be called upon to respond to any fires in the tunnels. The City of Boston has the authority to establish the Boston Fire Protection Code. In 1980, the Boston fire code was amended to exclude the transport of hazardous materials through tunnels.

There are many different types of hazardous materials and there are just as many ways to fight each type of fire. Currently, there are three types of systems in tunnels to help fight fires, but none are specifically designed for hazardous materials. The three systems include:

- Ventilation system for the dilution of noxious gases.
- Drainage system designed for spills - They are not, however, designed for an environmental threat or treatment of spills.

- Sprinkler systems – Many if these have been abandoned because not all fires can be extinguished with water.

Modern design of tunnels in the United States provides for a design fire of 20 megawatts, which is the equivalent of a passenger vehicle with approximately 20 gallons of gasoline. The Prudential Tunnel is currently not designed for a design fire. The Sumner/Callahan Tunnels are being rehabilitated and will have a ventilation system. The new Central Artery and the CANA tunnels have been designed for a design fire. Since none of these tunnels are specifically equipped with systems to handle hazardous cargo fires, the operating and public safety agencies are not willing to open these tunnels to hazardous materials.

Trucks carrying hazardous materials were counted as part of this study to determine the percentage of hazardous material trucks as compared to total trucks in the study area. Hazardous cargo trucks are a small percentage of total truck traffic in the study area, ranging from approximately 7% on typical roadways in the study area to approximately 9% on roadways with mandatory hazardous cargo exits. The largest percentage of hazardous material trucks is travelling in the eastern fringe of the study area – Medford, Chelsea and Everett. This is the location of the petroleum tank farms in the Boston area. A large number of gasoline tankers are leaving this area for distribution of their product throughout the Boston metropolitan area. Binney Street in Cambridge has a higher percentage of hazardous material trucks because this is part of the truck route through Cambridge that truckers use to access Watertown, Newton and points west on the Massachusetts Turnpike. Generally speaking, the highest percentage of hazardous material trucks is either using the state roadway system or designated truck routes through the study area.

River Street and Western Avenue are part of the truck route through Cambridge. Currently there is a nighttime exclusion on Pleasant Street, River Street and Western Avenue. However, hazardous cargo trucks are allowed to access these roads 24-hours a day because of the exclusions in the tunnels in Boston. The signs indicating the nighttime restrictions on these roadways, however, do not indicate this information. Therefore, truckers may not know that these roadways are open for their use.

Restrict hazardous cargo trucks from the Turnpike east of Route 128

Access by trucks to key roadways in Massachusetts is protected by provisions of the federal Intermodal Surface Transportation Act of 1991 (ISTEA). ISTEA required all fifty states to define a "National Highway System" (NHS).

Massachusetts allocated over 1,700 route miles for inclusion in the NHS. The Massachusetts Turnpike is part of that system. The Turnpike is meant to carry large volumes of traffic including trucks. It was built for long-haul and through traffic to keep these volumes of vehicles off of local roadways.

A model run was performed to see what routes hazardous cargo trucks might use if they were restricted from the Massachusetts Turnpike east of Route 128. Model results indicate that the hazardous cargo trucks would decrease on the Massachusetts Turnpike, however, these trucks would not continue on Route 128 to Interstate 93, but would instead use Routes 9, 20 and 2 to access points to the east through local communities. Hazardous cargo trucks would most likely still end up traveling through the study area. Federal approval would be required to implement this action.

Trucking companies were asked how this change would affect them. It was the consensus that using Route 128 as the alternative would add an additional 45 to 90 minutes to each trip with approximately $100 per trip added to the delivery cost.

6.1.2 Alternative Strategies Retained After First Phase of Evaluation

The Technical Subcommittee agreed that the following alternatives would not be rejected on the basis of the routing evaluation alone:

Open Memorial Drive from BU Bridge to Vassar Street
Open Memorial Drive from Western Avenue to Vassar Street

Both of these alternatives could divert truck traffic away from the Cambridgeport area of Cambridge, more specifically from Brookline and Pearl Streets. Both of the Memorial Drive alternatives have a positive residential impact, that is, less trucks passing by residences. However, if implemented it would require opening up a roadway that is part of the MDC parkway system. The MCD Parkway system has some different qualities than local roadways offering aesthetic and recreational opportunities in the area. The MDC is opposed to opening up any part of Memorial Drive to trucks.

Review of future roadway projects in Cambridge showed that the Cambridgeport Roadway Project could provide an alternative to opening Memorial Drive from the BU Bridge to Vassar Street to trucks. Analysis indicates that opening the Cambridgeport Roadway could have similar results as opening Memorial Drive from the BU Bridge to Vassar Street by

diverting a portion of trucks from of Brookline and Pearl Streets, both residential streets. Trucks currently crossing into Cambridge at the BU Bridge are using Brookline Street to access points in east Cambridge. The Cambridgeport Roadway Project will provide a new connection between Brookline Street and Waverly Street for vehicles traveling north and between Brookline Street and Sydney Street for vehicles traveling south. Sydney Street and Waverly/Albany Street could provide an alternate route diverting trucks from the residential area of Brookline Street.

Exclude trucks on Cardinal Mederios Avenue

The current truck exclusion on Prospect Street prohibits north-south truck travel through Cambridge and Somerville. Therefore, trucks are using Cardinal Medeiros Avenue and Warren Street to access Gore Street for destinations in south Somerville and destinations to the north and east or Lambert Street and Cardinal Medeiros Avenue to access destinations such as Boston and the Massachusetts Turnpike to the south and west. Currently there are approximately 600 trucks per day using Cardinal Medeiros Avenue. Residents along Cardinal Medeiros Avenue have complained to Cambridge officials about noise, vibration, congestion and excessive speed from trucks along this roadway. Noise and vibration are of a particular concern when residents are trying to sleep and relax during the night. Pursuing a 24-hour truck exclusion on Cardinal Medeiros Avenue would close another north-south route currently being used by truckers and increase the vehicle miles of truck travel. It does however, have a positive residential impact. The layout and width of this roadway can accommodate the truck traffic. A nighttime ban would allow trucks to use the roadway during the day and help to reduce the noise from trucks when residents are more likely to be home at night.

Warren Street and Lambert Street are one-way pairs connecting Cardinal Medeiros Avenue to Gore Street. These streets are very narrow and are not suitable for truck traffic.

Open Alewife Brook Parkway from Massachusetts Avenue to Broadway

Somerville Avenue currently carries approximately 600 trucks per day. The pavement depth on this roadway is about 7 inches as compared to a pavement depth of 12 inches on Broadway. In addition, the conditions of Somerville Avenue are deteriorating due to an aging sewer system under the roadway causing sinkholes. Because of the characteristics of these roadways, local officials would like to see a shift of trucks using Somerville streets from Somerville Avenue to Broadway.

Route 2 through Arlington and Belmont into Cambridge carries over 1000 trucks per day. Route 2 empties into Alewife Brook Parkway in Cambridge. Alewife Brook Parkway to the south of Route 2 is opened to trucks. Alewife Brook Parkway to the north of Route 2 is open to trucks but only up to Massachusetts Avenue. All trucks must exit Alewife Brook Parkway at Massachusetts Avenue where they travel south on Massachusetts Avenue through Cambridge or can turn off onto Somerville Avenue and travel east into Somerville. Specific truck classification counts indicate that approximately 75% of all trucks on Alewife Brook Parkway between Route 2 and Massachusetts Avenue are 2 axles trucks. The remaining 25% of trucks are 3+axle trucks.

Alewife Brook Parkway is a MDC owned parkway on which trucks are prohibited north of Massachusetts Avenue. The specific land use on Alewife Brook Parkway along the half mile stretch between Massachusetts Avenue and Broadway from south to north is a gas station, eight single/multi-family family homes, Matignon High School, two multi-family homes and three high rise apartments on the east side and Alewife Brook and a cemetery on the west side. The remainder of the parkway north of Broadway runs along Alewife Brook with open space and recreation facilities available to the public. The roadway is four lanes wide with ten foot lanes.

Analysis shows that opening up Alewife Brook Parkway from Massachusetts Avenue to Broadway could have a positive residential impact in the study area with less residential passings. It may also divert trucks from Somerville Avenue to Broadway in Somerville. This would have a positive impact to schools along Somerville Avenue, however, could negatively impact schools in north Somerville and Medford. In addition, this alternative would open up a roadway that is part of the MDC parkway system.

Exclude Trucks on Kirkland Street for 24 hours instead of maintaining the existing nighttime exclusion

Currently Kirkland Street has a nighttime truck exclusion - from 11 P.M. to 7 A.M. Kirkland Street in Cambridge turns into Washington Street in Somerville that then leads into Union Square. Washington Street from Kirkland Street to Union Square also has a nighttime truck exclusion. Union Square has a high volume of truck traffic and Somerville officials indicated that they would not impose 24 hour truck exclusion on Washington Street. The Technical Subcommittee did, however, consider the results of the analysis if Kirkland Street had a 24-hour truck exclusion. The analysis indicated that trucks may be diverted to Cambridge Street, Cardinal

Mederois Street and Binney Street in Cambridge. It would have less residential passings in the study area. It would, however, have an adverse effect on the hospitals on Cambridge Street.

Remove exclusion on Blanchard Road and Brighton Street north of Concord Avenue, but impose exclusion on Blanchard Road south of Concord Avenue

Belmont officials have been receiving complaints from their citizens that truck traffic through the town center on Pleasant Street has been increasing. Currently, there is a truck exclusion on Brighton Street in Belmont and Blanchard Road along the Belmont/Cambridge Line to Concord Avenue. Belmont officials requested an analysis to determine where truck traffic would be diverted if this exclusion was lifted. Both Belmont and Cambridge officials agreed that if this exclusion was lifted, an exclusion on Blanchard Road south of Concord Avenue may be warranted.

Model results indicate that trucks would most likely use Brighton Street and Blanchard Road to access the commercial area on Concord Avenue in Cambridge. The exclusion on Blanchard Road south of Concord Avenue would most likely divert trucks away from that section of Blanchard Road, as well as, Grove Street and School Street in Belmont which is a residential area. An increase in trucks would most likely occur on Common Street in Belmont and Fresh Pond Parkway and Concord Avenue in Cambridge.

Model results indicate that removing the truck exclusion on Brighton Street in Belmont and Blanchard Road along the Belmont/Cambridge Line to Concord Avenue and imposing a truck exclusion on Blanchard Road south of Concord Avenue may not shift trucks off of Pleasant Street, however, it could divert truck traffic away from the residential areas on Grove and School Streets and Blanchard Road south of Concord Avenue. Although there is not a major shift in trucks from Pleasant Street, the impact to these residential locations along Blanchard Road, Grove Street and School Street is positive.

If this action is to be pursued, the City of Cambridge and the Town of Belmont must work together to apply for a new truck exclusion on Blanchard Road south of Concord Avenue and to revoke the current exclusion on Brighton Street in Belmont and Blanchard Road along the Belmont/Cambridge Line to Concord Avenue.

6.2 EVALUATION OF POLICY AND REGULATORY ISSUES

In addition to looking at alternative routing-specific strategies, the Technical Subcommittee reviewed research into regulatory and policy issues gathered through the study process, as well as, the research of existing conditions in the study area. The findings are grouped into categories including general findings, signs, enforcement, noise and vibration, and infrastructure needs. The following are the findings as they relate to these topics.

General

The following are what the Technical Subcommittee feels are the most significant findings and conclusions based on information gathered from various city and town officials, comments from public meetings, interviews with truckers, and research of existing conditions throughout the study area.

Through truck traffic in Cambridge is approximately 37% of all truck traffic entering *the city and 16% of all truck traffic* in *the City of Cambridge.*

As described in Chapter 4.2.2, roughly 37% to 40% of the truck trips entering the City of Cambridge are through truck trips. With the locations of the petroleum tank farms in Chelsea and Everett, coupled with the restrictions of hazardous cargo in the tunnels on the Central Artery and the Massachusetts Turnpike, trucks accessing the petroleum farms contribute to through truck trips in the cities of Cambridge and Somerville. When considering all truck trips in the City of Cambridge (not just trucks entering Cambridge but also those truck trips that begin and end in Cambridge and never leave the city), about 16% of all truck trips are considered through trips. This information indicates that the majority of trucks using Cambridge streets have business within the city limits of Cambridge.

Trucks are essential in providing goods and services to Cambridge and the region as a whole and the practical reality is that trucks will continue to travel on Cambridge roadways.

As noted above, 37% to 40% of truck traffic in Cambridge is considered to be through traffic with no direct business in Cambridge. Conversely, model results indicate that 63% of all trucks (or approximately 5,550 trucks per day) using Cambridge roadways do have business in the city. Information from the Cambridge Police Truck Enforcement Unit routine truck inspections corroborates the model results.

Vehicle counts and classifications were performed on Prospect Street in Cambridge to sample the types of trucks that use excluded roadways. The results showed that trucks traveling on Prospect Street appeared to be engaged in some form of local urban commerce. This indicates that even with the truck exclusions throughout the city, trucks are still needed to serve the economy of Cambridge. In most cases, the transportation services that trucks provide cannot be provided by any other type of vehicle. One way to reduce the number of trucks in Cambridge would be to use larger trucks, however, larger trucks are perceived as more disruptive than smaller trucks.

The reality is that in order for Cambridge to maintain its economy, a large number of trucks will have to continue to use Cambridge roadways on a daily basis.

On average, 75% of all trucks on roadways in Cambridge, not part of the truck route, are two-axle trucks.

Existing truck classification counts performed in Cambridge indicate that larger trucks (3+axles) are a small portion of the total truck traffic within the city. The only area of Cambridge where 3+axle trucks exceed 40% of total truck traffic is in the eastern part of the city. The roadways where 3+axle trucks exceed 40% of the total are Binney Street, Land Boulevard, Gilmore Bridge, and O'Brien Highway (First Street to Land Boulevard)

The roadways where truck classifications were performed that have 3+axle trucks between 20 and 40% of total truck traffic are, Route 2, Alewife Brook Parkway (Route 2 to Massachusetts Avenue, Massachusetts Avenue (Alewife Brook Parkway to Somerville Avenue), Massachusetts Avenue (Ellery Street to Newbury Street), River Street, Western Avenue, Kirkland Street, JFK Street to North Harvard, Brattle Street, Aberdeen Street, and the BU Bridge.

As indicated above, the larger 3+axle trucks are concentrated in eastern Cambridge on roadways that are considered part of the truck route in Cambridge. The truck route consists of Land Boulevard or First Street, Binney Street, Main Street, Massachusetts Avenue, Pleasant Street, and Western Avenue/River Street. When reviewing the classification counts on roadways not considered part of the truck route, an average of 75% of all trucks are 2-axle trucks. As stated earlier, the majority of these trucks have business in Cambridge.

Even though the volume of 3+axle trucks is relatively small in the City of Cambridge, it is these larger trucks that are perceived as the most disruptive.

Public comments from the residents of Cambridge indicate that the larger 3+axle trucks are indeed the most disruptive, especially the gasoline and oil tank trucks. They indicated that this is a problem (creating noise and vibration) particularly during the nighttime hours. With the current restrictions of hazardous cargo trucks in the tunnels in Boston, gasoline and oil trucks leaving the petroleum tank farms in Chelsea and Everett are using Cambridge and Somerville roadways to access the Massachusetts Turnpike and areas to the west. The gasoline and oil industry is a seven day, 24-hour operation and a large number of deliveries are made during the nighttime hours due to traffic congestion during the day and individual business requests. In these cases, trucks may not be able to access and complete deliveries due to traffic congestion in the vicinity or at the point of delivery during the daytime hours.

Truck access between the cities of Cambridge and Somerville is needed to ensure continued economic activity for the commercial and industrial areas in northeast Cambridge and southeast Somerville.

Industrial and commercial properties in Northeast Cambridge (Webster Avenue, Cambridge Street, Gore Street area) and Southeast Somerville (Washington Street, O'Brien Highway, Medford Street area) require access to the local roadway network in the vicinity of their businesses. The current truck exclusion over the entire length of Prospect Street and Webster Avenue from Union Square to Prospect Street restricts north-south travel at all times in this area. In addition, the existing traffic flow patterns in Union Square contribute to congestion in that area. Prospect Street between Webster Avenue and Somerville Avenue is one-way in the northerly direction, prohibiting left turns from Somerville Avenue and through movement from Washington Street onto Prospect Street. Traffic wanting to access Prospect Street or points to the south must continue on Somerville Avenue and take a left onto Webster Avenue that is one-way in the southerly direction between Washington Street and Prospect.

Truck Route Signs

Truck route signs are non-existent or not visible throughout the study area.

The roadways in the study area that currently carry the highest volumes of trucks are:

Cambridge:

- Massachusetts Avenue
- JFK Street
- River/Western Streets
- Binney Street
- Land Boulevard
- Cardinal Mederios Avenue
- Cambridge Street
- Kirkland Street
- Main Street (Massachusetts Avenue to Binney and Broadway across the Longfellow Bridge)
- O'Brien Highway
- Vassar Street (Main Street to Binney Street)
- Broadway
- Alewife Brook Parkway (Concord Avenue to Massachusetts Avenue)
- Concord Avenue (Huron Avenue to Belmont Town Line)

Somerville

- Washington Street
- Somerville Avenue
- McGrath Highway
- Medford Street
- Broadway
- Mystic Avenue

Boston (not all roadways are included; the list includes a sampling of roadways with the highest volumes)

- Rutherford Avenue
- Huntington Avenue (Route 9)
- Commonwealth Avenue (Route 2)

- Massachusetts Avenue
- Cambridge Street

Arlington

- Route 2
- Pleasant Street (Route 60)
- Broadway
- Massachusetts Avenue
- River Street

Belmont

- Pleasant Street (Route 60)
- Blanchard Road
- Trapelo Road
- Lexington Street
- School Street

Watertown

- Galen Street
- Watertown Street (Route 16)
- Main Street (Route 20)
- North Beacon Street (Route 20)
- Arsenal Street
- Arlington Street
- Waverly Avenue

These roadways have not formally been signed as truck routes with the exception of Main Street and Binney Street in Cambridge and Mystic Avenue in Somerville. The existing signs on Main Street and Binney Street denote the truck route through Cambridge. The only posted truck route signs in Somerville are on Mystic Avenue. These signs were posted by MassHighway.

It is important to designate a route for those truckers not familiar with the area. The Cambridge and Somerville police indicated that many of the restricted truck route violations are due to truckers that are unfamiliar with the area. They end up on excluded roadways due to confusion from either lack of signs or because they encountered truck exclusion or nighttime restriction signs and were unsure of where to go.

Truck-related signs frequently disagree with the regulatory status of the roadway.

Three types of situations where truck-related signs disagree with the regulatory status of the roadway have been identified throughout the study area. They are the following:

- Truck exclusion signs have been posted without the municipality obtaining a Chapter 85 exclusion permit from MassHighway. The operation of trucks on a roadway not legally signed is the same as if the road was legally excluded to trucks. Truckers will not use these roadways because they do not want to be cited for moving violations in fear of jeopardizing their commercial licenses. In the majority of these cases, the driver does not know whether it is a legal or illegal exclusion.
- MassHighway has granted an exclusion permit, but the municipality has not posted signs. Problems can arise if the municipality posts or removes signs at their discretion. This can cause confusion among truck drivers in the area if conditions such as signage change over time.
- A roadway is a designated route for hazardous cargoes, but it is not indicated as such by any signs. Currently River Street, Western Avenue and Pleasant Street between Massachusetts Avenue and Western Avenue are signed as excluded roadways from 7 P.M. to 7 A.M. and all day Saturday and Sunday. These roads, however, are open at all times to hazardous cargo trucks, but the signs do no indicate this.

Existing truck exclusion signs in the study area create confusion among truck drivers.

Truckers use Cambridge and Somerville roadways because they are the most logical and direct routes from the surrounding communities to the north and east to access the surrounding communities to the south and west, as well as the Massachusetts Turnpike. In the past, Prospect Street was the most direct route used by these trucks before it was excluded to truck traffic. Truck drivers are now using routes including Washington and Kirkland Streets and Cardinal Medeiros Avenue to access these same areas.

Truck drivers transporting gasoline and oil (hazardous cargo) from the Chelsea, Everett and Medford area are using study area roadways. Many of these drivers are making deliveries for the first time or are one time only drivers making deliveries in the area. Because of this, many drivers are not accustomed to a regular route and will take the most direct route they find to be available. With the restriction of hazardous cargo in tunnels on the Central Artery and the Massachusetts Turnpike, trucks transporting gasoline and oil use Cambridge and Somerville roadways to access locations to the west. When they reach a roadway that has a truck exclusion sign they will try to find the next most direct route. This causes confusion, especially in the Union Square area of Somerville and northern Cambridge (24 hour exclusion on Prospect Street) and also on River, Western, and Pleasant Streets in Cambridge during the evening hours (7 P.M. to 7 A.M. exclusion on these roadways). As discussed earlier, a nighttime truck exclusion is imposed on River, Western, and Pleasant Streets, however, hazardous cargo trucks are not subject to this exclusion because of the restrictions in the tunnels in Boston. The roadways, however, are not signed to indicate that hazardous cargo trucks can use these streets at all times.

The drivers expressed that they want to stay out of Harvard Square in Cambridge as much as possible due to the high pedestrian volumes, but with the posted truck exclusion signs as they currently exist, the majority of the trucks end up in Harvard Square. These particular truck exclusion signs create more truck traffic on roadways in the Harvard Square area than would normally exist especially on Kirkland Street, Brattle Street, Mount Auburn Street and JFK Street.

Enforcement

According to enforcement officers, violations on truck excluded roadways are not a significant problem throughout the study area.

The majority of complaints in the study area regarding trucks have been in Cambridge. Interviews with enforcement officials in Cambridge, Somerville, and also the State Police were conducted to receive their input on this issue.

The Massachusetts State Police are primarily responsible for enforcing the Massachusetts General Laws as they apply to truck travel. The state police have a designated unit that is responsible for enforcing truck weight, length, height, and width restrictions that have been set in State legislation. The officers in the unit are certified to perform truck inspections and issue

citations to violators of the regulations for weights and measures and for moving violations such as speeding and failure to stop. Any state police officer can issue citations for moving violations on any roadway throughout the Commonwealth, however, only the truck enforcement officers can perform truck inspections for weights and measures. The state police are also responsible for enforcing truck traffic on the Metropolitan District Commission roadways.

The City of Cambridge Police Department is unique from the majority of communities in the Commonwealth in that they have their own truck enforcement team. The officers in this team have been federally certified and can stop trucks and perform any of the safety checks including weights and measurements. However, any Cambridge police officer can cite trucks for unlawfully using excluded roadways. The enforcement team has launched a rigorous effort to educate truck drivers regarding the restricted roadways in Cambridge. When a truck is stopped for any reason, the driver is given a map of the restricted roadways in the city. The majority of violations for weight and safety in Cambridge are issued to drivers of large trucks, while smaller trucks are generally being cited on restricted roadways.

The Cambridge enforcement team feels that their efforts to educate truckers has helped and feel that since the enforcement team has been in operation there has been a big change in the way deliveries are being made. They have found that there are not a high number of repeat offenders. Once a trucker is educated on the use of excluded roadways, they will generally not use that roadway again.

The City of Somerville does not have police officers that are federally certified for truck inspections. They can only perform a full truck inspection with the assistance of the city appointed personnel responsible for weights and measures. They have two officers responsible for truck enforcement during the day and three at night. They can cite drivers for moving violations and those on restricted roadways. There have not been a large number of complaints of trucks on restricted roadways in Somerville.

As noted above, Cambridge has an effective program for addressing enforcement of truck excluded roadways. No other communities or participants at public meetings have voiced concerns regarding trucks on excluded roadways. The majority of complaints in Cambridge have been related to high volumes of trucks or truck noise rather than trucks using excluded roadways.

Noise and Vibration

The majority of specific complaints made by residents of the study area regarding noise and vibration from trucks occur at night during roadway construction projects or when roadway conditions are deteriorated.

Truck noise is generated from several of its components - the exhaust system, engine, gears, fan and air intake. At higher speeds, tire and wind noise adds to the problem. The truck engine exhaust noise, especially during acceleration, tends to be more dominant for most operating conditions. Trucks are noisier than automobiles because of their size and power.

Parameters that contribute to traffic induced vibration are pavement surface roughness, vehicle weight, vehicle speed, and the vehicle suspension system. Pavement surface roughness, however, is considered the primary vibration source. New pavement will create less vibration when traffic travels over it. With continuous wear and tear of travel over the roadway and varying weather conditions, pavement conditions begin to deteriorate. Cracks in the pavement and potholes appear. When vehicles, especially trucks, hit these defects in the pavement, loud noise and vibrations can occur due to shifts in loads or from the truck's suspension system itself. Roadway conditions contribute to noise and vibration from truck traffic and, as noted by local enforcement agencies, the majority of the complaints are routinely logged when roadway construction projects are underway or when roadway conditions are deteriorated.

As outlined in the General Laws of Massachusetts - Chapter 90, the Commonwealth of Massachusetts collects user fees that relate to the use and operation of motor vehicles and trailers, such as vehicle registration and licensing fees. These fees are credited to the Highway Fund. The Highway Fund is used for maintaining, repairing, improving and constructing town and county ways and bridges and for other transportation enhancements outlined in the Federal Transportation Act. The Commonwealth distributes Chapter 90 funding to the individual cities and towns for the maintenance of their highways and bridges.

Another issue raised during the study regarding noise from trucks was the use of engine compression brakes, also known as jake brakes, by truckers. Based on the knowledge of how jake brakes work and discussions with city and state truck enforcement officers, banning these brakes is not a major issue in the study area. The use of these brakes is most common where there are steep grades and a trucker wishes to save wear and tear on the vehicle's normal brakes. Other common uses are approaches to toll plazas, rotaries, and situations where queuing occurs and trucks travelling at high speeds

need to rapidly slow down. With the exception of the major interstates and highways including the Massachusetts Turnpike, Interstate 93, and Route 1, most of the study area does not have steep grades, toll plazas, or trucks traveling at high speeds. Therefore, most truckers don't find it necessary to use their jake brakes.

Infrastructure

Specific bridges in the study area have deteriorated and are posted with weight restrictions or closed to truck traffic altogether.

The ability of a truck to use a bridge depends upon the vehicle weight, the weight of the load, the distribution of the load, and the number of axles. In this study, weight restrictions have been defined as prohibiting use by any truck exceeding 2.5 tons over three axles. An important aspect of most bridge restrictions is that they will not prevent all truck traffic, only the trucks that exceed the limit. A truck may exceed the limit on one leg of its tour and be forced to use another route, but upon delivering a quantity of goods is able to use the same bridge later in the tour. In addition to bridges with weight restrictions, some bridges have been closed to all traffic due to structural deficiencies. A list of the bridges that have weight restrictions or have been closed is listed below:

The weight-restricted bridges are:

- Route 2 over Alewife Brook
- Webster Avenue over the Fitchburg Rail Line in Somerville
- School Street over the Lowell Rail Line in Somerville
- Walnut Street over the Lowell Rail Line in Somerville
- Massachusetts Avenue over Memorial Drive
- O'Brien Highway at the Museum of Science

Bridges that have been closed are:

- Lowell Street over the Lowell Rail Line in Somerville
- Sycamore Street over the Lowell Rail Line in Somerville

7 RECOMMENDATIONS

Recommendations based on the findings and conclusions presented in chapter 6 were prepared by CTPS and submitted to the Technical Subcommittee for its review. The CTPS recommendations are provided in Appendix B. The Technical Subcommittee used those recommendations to formulate draft recommendations. The draft recommendations were presented to the Committee on Regional Truck Issues, and to the public at a public meeting on June 26, 2001, in Somerville. The Committee voted on the final recommendations on June 27, 2001. The Committee's final recommendations are presented below, along with its final study objectives.

The recommendations will be submitted to all bodies that have authority over any particular measure recommended. Those bodies should consider the measures for approval and implementation.

STUDY OBJECTIVES

1) Reduce the impacts of truck noise and vibrations on residents in the six MOU communities, especially at night, by reducing nighttime truck traffic in residential neighborhoods.

2) Ensure the continued delivery of goods and services by maintaining truck access to businesses and residences in those communities.

3) Ensure, where feasible, that truck traffic is directed towards those roadways with the least impact on residential areas and other sensitive receptors, and whose physical characteristics are best able to accommodate truck traffic.

4) To carry out these objectives, truck routes will be designated based on the following criteria:

    - Existing truck volumes.
    - Truck origins and destinations along the route.
    - Roadway geometrics and conditions.

- Current truck restrictions and National Highway System requirements.
- Continuous connections between communities.
- Impacts on residential areas and sensitive receptors.

RECOMMENDATIONS

Truck Routes

1) The following roads (shown in dark blue on Figures 7-1 and 7-2) should be designated as truck routes, and should be clearly signed as such by the appropriate community:

    a) Eastern truck route comprised of First Street, Land Boulevard, and Binney Street in Cambridge
    b) JFK Street in Cambridge
    c) Broadway in Somerville
    d) Somerville Avenue in Somerville (when the reconstruction project is completed)
    e) Washington Street between the Somerville city line and McGrath Highway in Somerville

    Truck route signs should be consistent with the Manual on Uniform Traffic Control Devices (MUTCD). MassHighway should work with communities that lack sufficient resources to provide truck route signs. Sign maintenance should be the responsibility of the community.

2) The following roads (shown in light blue in Figures 7-1 and 7-2) should be designated as truck routes for connectivity purposes only, but not signed as such:

    a) Gilmore Bridge in Cambridge
    b) Cambridge Street in Charlestown
    c) Arsenal Street in Watertown
    d) Western Avenue in Boston
    e) North Harvard Street in Boston

Figure 7-1
Committee on Regional Truck Issues - Proposed Daytime Truck Routing Network

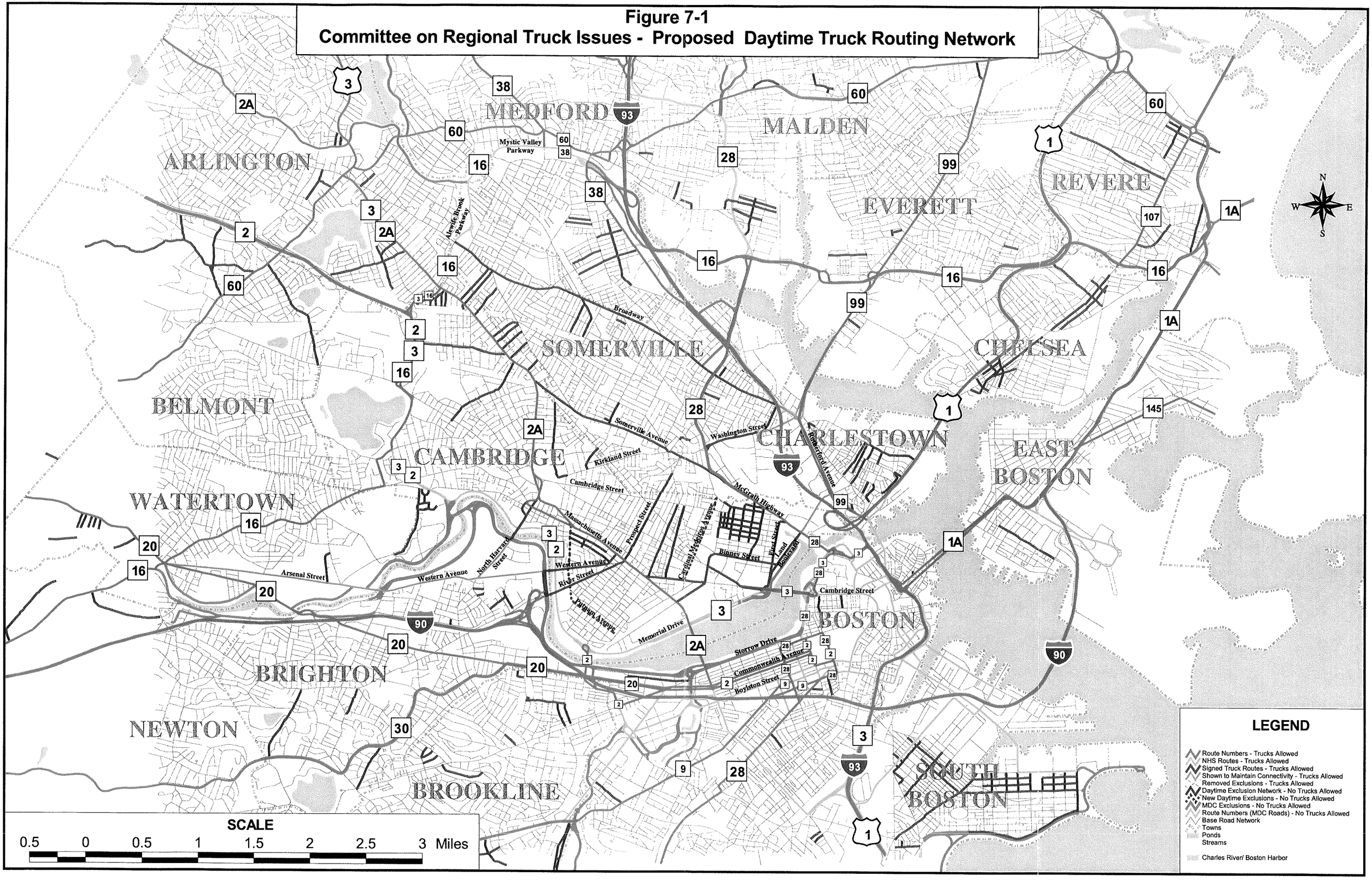
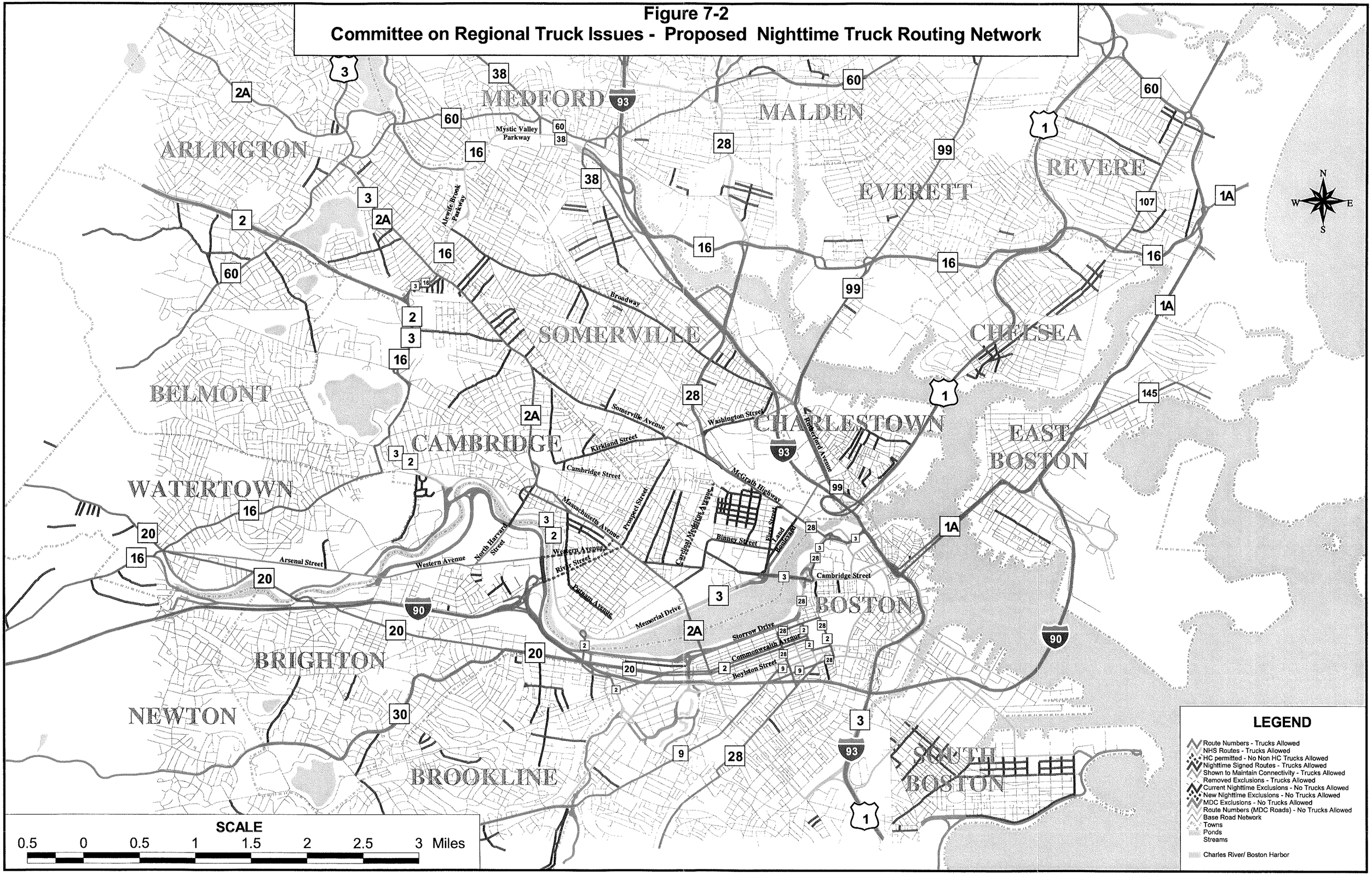


Figure 7-2
Committee on Regional Truck Issues - Proposed Nighttime Truck Routing Network



3) Alewife Brook Parkway between Massachusetts Avenue in Cambridge and Broadway in Somerville, a distance of approximately one-quarter mile (shown in light blue in Figures 7-1 and 7-2) should be open to two-axle trucks, in addition to automobile traffic. It should be noted that the Metropolitan District Commission does not concur with this recommendation.

4) All state-numbered routes in the study area where trucks are allowed and cannot be excluded (shown in dark green in Figures 7-1 and 7-2) should have sufficient route guide signs. MassHighway should inventory these routes and install additional signs as necessary; specific attention should be shown to ensuring sufficient route guide signs in the vicinity of Harvard Square in Cambridge to allow trucks to easily follow Route 2A in that area. Route guide signs inappropriately erected should be removed. In addition, Route 1 signs on Metropolitan District Commission roadways in the Fenway area of Boston should be removed to avoid confusion.

5) National Highway System roads where trucks are allowed and cannot be excluded are shown in light green on Figures 7-1 and 7-2.

6) The Massachusetts Turnpike Authority should install signs, consistent with MUTCD designs, that encourage trucks to remain on the Massachusetts Turnpike into Boston and the north-south expressway system, except for hazardous cargo (HC) trucks, which must exit at the Brighton/Cambridge interchange.

7) Communities should not change their intercommunity truck routes without consultation with adjacent communities and approval by MassHighway. Intercommunity routes are defined as those truck routes affecting more than one community.

Truck Exclusions

1) The following coordinated actions are recommended to improve access between the cities of Cambridge and Somerville to ensure continued economic activity for the industrial areas in southeast Somerville:

    a) Continue the truck exclusion on Prospect Street in Cambridge from Massachusetts Avenue to the Somerville City Line and on Prospect Street in Somerville from the Cambridge City Line to Webster Avenue.

b) Remove the truck exclusion on Prospect Street from Webster Avenue to Washington Street in Somerville to allow for truck access from Cambridge Street to Washington Street.

c) Remove the truck exclusion on Webster Avenue from Washington Street to Prospect Street to allow for truck access from Union Square in Somerville to Cambridge Street in Cambridge, when Webster Avenue is structurally capable.

d) Continue to allow trucks on Webster Avenue in Cambridge from Prospect Street to Cambridge Street.

e) After the project to reconstruct the Webster Avenue bridge has been completed, change Webster Avenue from Union Square to Prospect Street and Prospect Street from Washington Street to Webster Avenue from one-way to two-way streets to improve traffic flow in the Union Square area.

2) The City of Cambridge should request from MassHighway a 24-hour truck exclusion on Cardinal Medeiros Avenue, Warren Street, and Putnam Avenue. The planned relocation of the MBTA's Lechmere Station and associated intersection improvements should be designed to make First Street a more attractive north-south route for trucks.

3) The majority of the committee recommends that Alewife Brook Parkway should be opened to two-axle trucks from Massachusetts Avenue in Cambridge to Broadway in Somerville. Based on analysis results, this is expected to divert a large portion of trucks accessing Somerville from Somerville Avenue to Broadway. The MDC, which owns and operates Alewife Brook Parkway, does not concur with this recommendation. Also, the majority of the committee recommends that Broadway in Arlington from the Somerville City Line to Route 60 should be designated as part of the regional truck network. The Town of Arlington, through a unanimous vote of its Board of Selectmen on June 25, 2001, does not concur with this recommendation.

4) Roadways with truck exclusions should be well signed.

5) Every effort should be made to reduce the length of the approval process for truck restrictions currently in place with MassHighway. An expedited review should be established for functionally classified local roadways that is no longer than 30 days.

6) The communities in the study area should review locations of currently posted truck exclusions, and, for routes without official exclusions, and based on the information developed as part of this study, either remove those posted exclusion signs, or work with MassHighway to formally designate those roadways for truck exclusions. Where communities have been granted truck exclusions but do not wish to post exclusion signs, the community should inform MassHighway to revoke the truck exclusion permit.

Nighttime Restrictions

1) MassHighway should consider permits for necessary truck exclusions between the hours of 11 P.M. to 6 A.M. in the six MOU communities, except on the designated nighttime truck routes or for trucks that have an origin or destination in that community, after consultation with trucking industry representatives. Those routes are shown in Figures 7-1 and 7-2. A community's application for this nighttime restriction should list all streets where trucks are expected to be prohibited between 11 P.M. to 6 A.M. As part of the approval, each community must provide within its borders an appropriate, continuous, designated, alternate truck route open to trucks at all times.

2) Based on the work that has been done as part of the regional truck study, the Committee recommends that the ban on nighttime traffic enacted as part of the Cambridge zoning ordinance be repealed and replaced by the series of recommendations included in the Technical Subcommittee's recommendations.

Hazardous Cargo Routing

1) The Subcommittee does not recommend pursuing opening of tunnels to hazardous cargo trucks on the expressway system in Boston at this time. However, the Technical Subcommittee recommends that the following actions be taken:

    a) Determine how other states deal with hazardous cargoes in tunnels, and,

    b) Conduct a risk/hazard assessment, based on Boston Fire Department and Mass Turnpike requirements, to determine whether it is feasible to open the Prudential tunnel to gas and oil cargoes. This assessment should review previous risk assessments that have been conducted, including a discussion of the assumptions regarding type of vehicular

traffic that were made by the designers of the tunnels. It should also include a review of short-term and long-term impacts of previous tunnel fire/hazardous material incidents around the world. The review should consider the impact from a life safety, property protection, and economic/continuity of operations perspective. The City of Boston Fire Department should be invited to help in the development of the scope of work for the study and to participate in the study itself.

2) The City of Cambridge should post additional signs on River Street, Western Avenue, and Pleasant Street between Massachusetts Avenue and Western Avenue to indicate that hazardous cargo trucks are allowed on these roadways 24 hours a day. This, along with the recommendations of posted truck route signs, should provide clear information for truckers.

Infrastructure Needs

1) Funding for adequate maintenance of pavement and bridges along the preferred regional truck routes should be a priority in future Transportation Improvement Programs. Four bridges and one roadway along these routes are currently structurally deficient with posted weight restrictions:

   a) Route 2, Cambridge/Arlington
   b) Mass Ave over Memorial Drive, Cambridge
   c) Webster Avenue, Somerville
   d) O'Brien Highway at the Museum of Science
   e) Somerville Avenue, Somerville

2) Bridges with structural problems on routes with significant truck traffic should be identified and repaired as soon as possible although with lower priority than those on designated truck routes. The bridges currently identified in the study area include:

   a) Sycamore St, Somerville
   b) Lowell St, Somerville
   c) Walnut Street, Somerville
   d) School Street, Somerville
   e) Cross Street, Somerville

3) The Boston Metropolitan Planning Organization should seek to identify additional funding sources, beyond those currently existing, to make sure that sufficient funds are available for these infrastructure needs.

4) Advanced Traveler Information Systems (ATIS) and mapping projects that help identify truck routes and improve flow along them should also have priority funding.

Noise

1) The trucking industry has agreed to promote a voluntary limit on the unnecessary use of jake brakes in densely populated urban areas, especially at night. Although documented use of jake brakes has not been widespread, it is acknowledged by the trucking industry that even infrequent use of jake brakes (a mechanism on large trucks whereby engine compression is used to slow a vehicle in addition to the vehicle's normal braking system), especially during nighttime hours, can be disturbing to residents. The industry will alert its members to the need to limit use except at the discretion of the driver in preserving public safety, and will urge compliance among all its members and drivers. This request should also be made through all outreach efforts, including maps and Internet postings, to the trucking industry.

Enforcement

1) Truck route and exclusion maps should be provided to all local and state police departments for distribution to truckers during routine stops. This map should also be provided through the Internet.

2) State and local police departments should continue enforcement of truck exclusions throughout the study area.

3) A program to educate truckers regarding excluded roadways throughout the entire study area should be developed. Current education efforts employed by the Cambridge Police Department have been effective and can be used as the basis for this program.

4) The six MOU communities should work together to encourage the Legislature to develop a program providing state grants to municipalities to supplement state and local truck law enforcement efforts.

Outreach to the Trucking Community

1) An essential part of mediating truck impacts involves informing the truck drivers themselves. Maps showing truck routes and restriction information will be produced and should be directly distributed to all trucking organizations with operations in the State. Companies making truck deliveries on routes through the study area should provide drivers with these maps and should also indicate the most appropriate routes to use.

2) Other ways to distribute this information should be explored. (For example, a web site could also be developed with this information, and a phone hotline could be established for drivers to contact when confronted with a confusing regulatory situation on the road.) The education program can be facilitated through MassHighway.

Ongoing Agency and Community Efforts

1) This study effort has been greatly benefited by the coordination of a number of concerned public and private sector organizations. This coordination should be continued because trucking-related concerns will continue indefinitely. MAPC and MassHighway should organize an on-going regional truck-related stakeholder group that would meet at least quarterly to discuss and develop regional truck issues and possible solutions and to monitor the implementation of the recommendations of this study.

2) As part of the Boston MPO's development of a comprehensive plan for moving freight into and within the Boston region, new ideas to limit the need for large trucks in residential areas, such as "bulk distribution terminals," should be investigated.

APPENDIX A
MAPS SHOWING CHANGE IN TRUCK TRAFFIC ON TRAVEL MODEL ROADWAYS FOR ALTERNATIVE TRUCK ROUTING STRATEGIES

FIGURE A - 1

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

MEMORIAL DRIVE:
Remove Exclusions from
BU Bridge to Vassar

N

LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

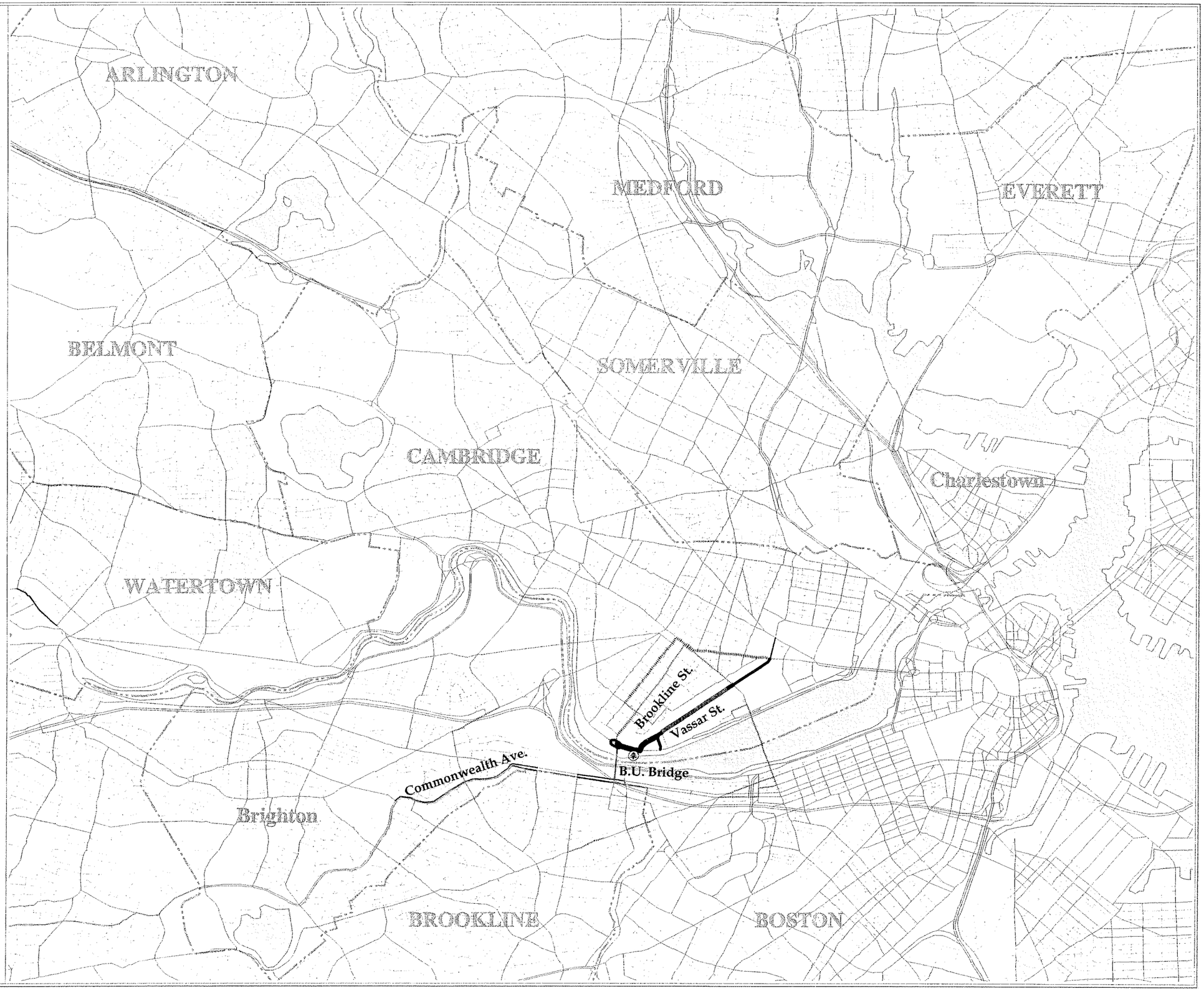


FIGURE A - 2

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

MEMORIAL DRIVE:
Remove Exclusions from Western to Vassar

N

LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

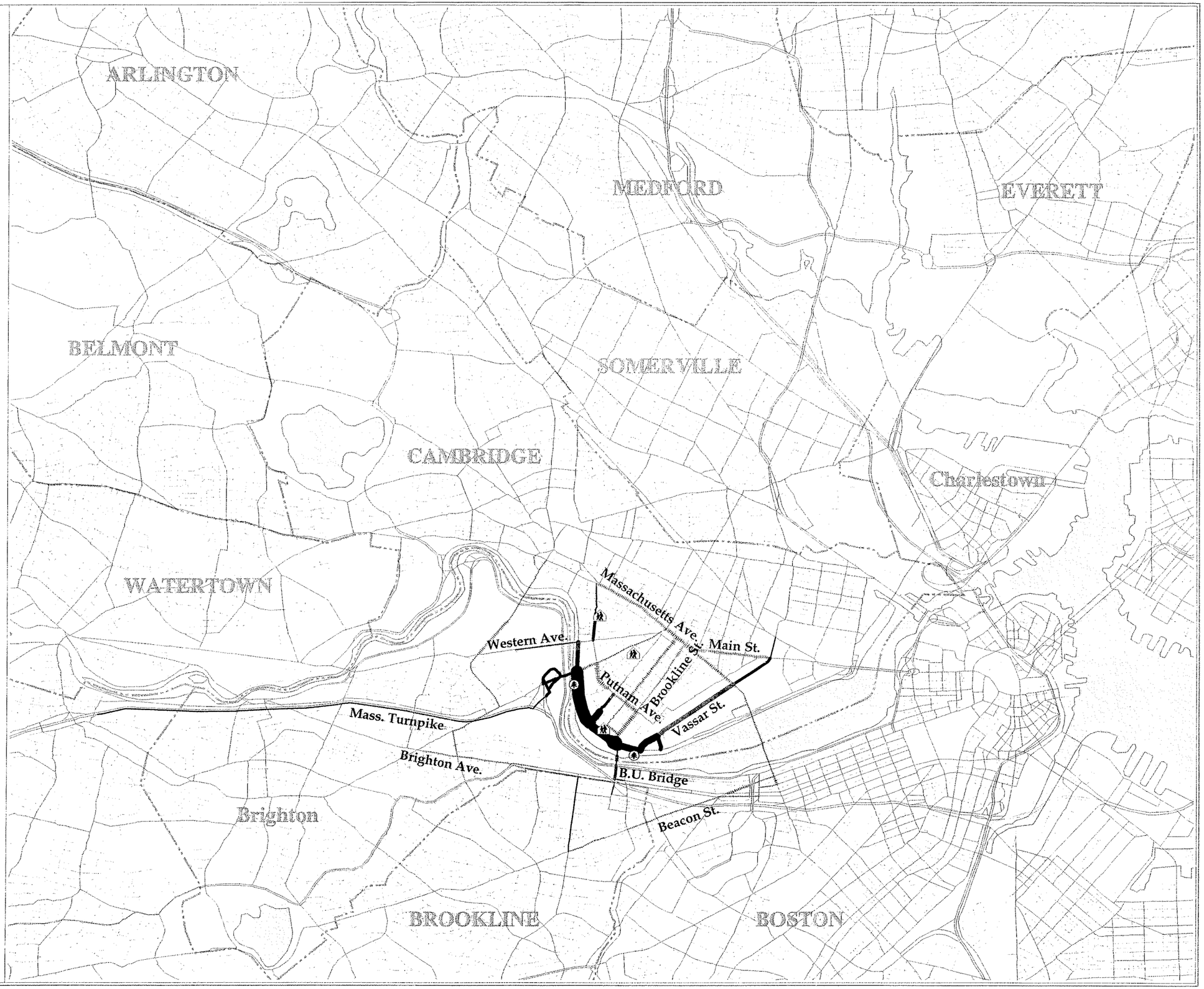
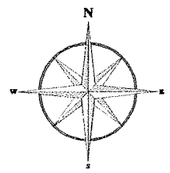


FIGURE A - 3

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

CARDINAL MEDEIROS AV: Impose Truck Exclusions



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

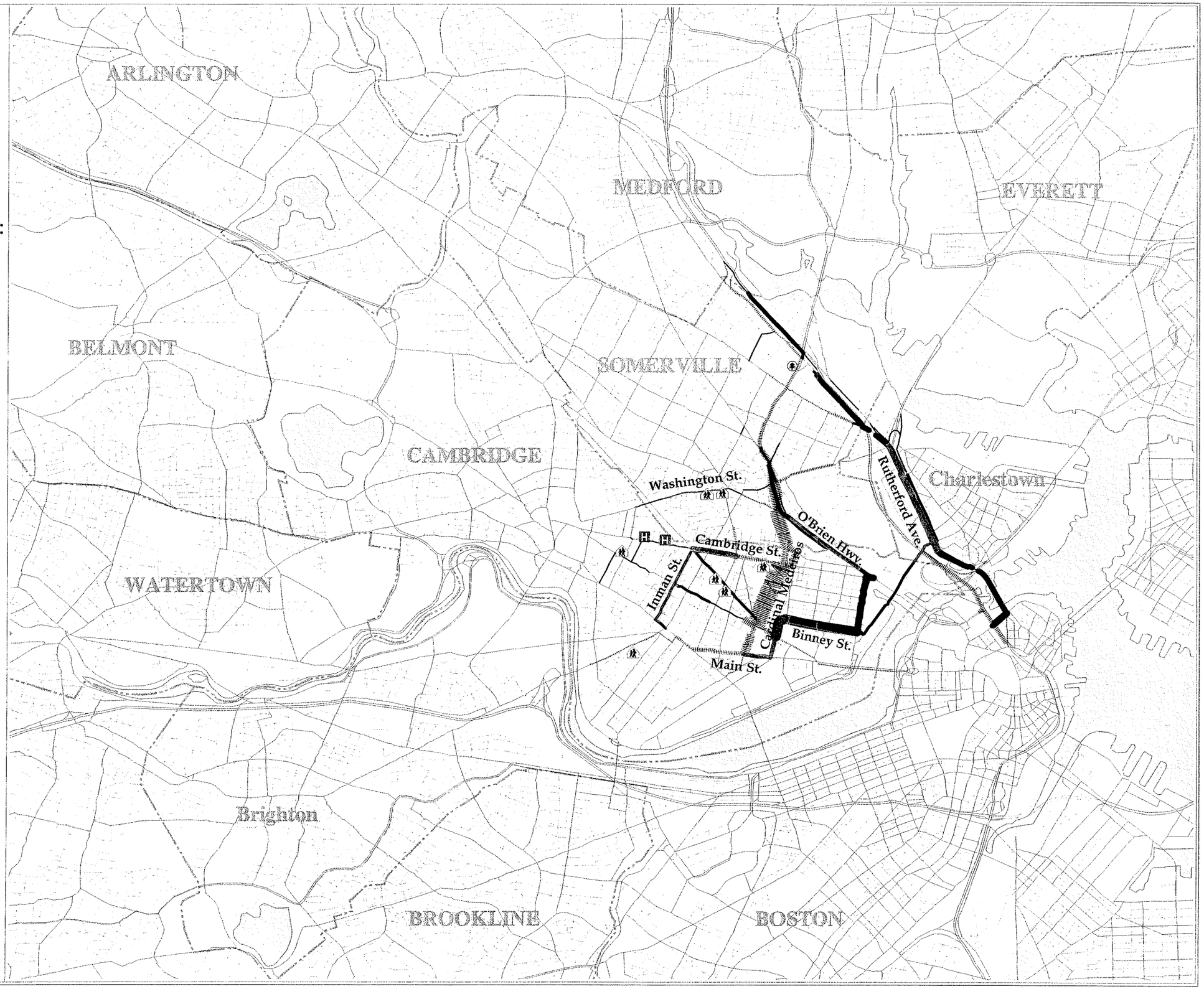
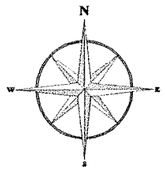


FIGURE A - 4

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

ALEWIFE BROOK PKWY: Remove Exclusions from Massachusetts Avenue to Broadway



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

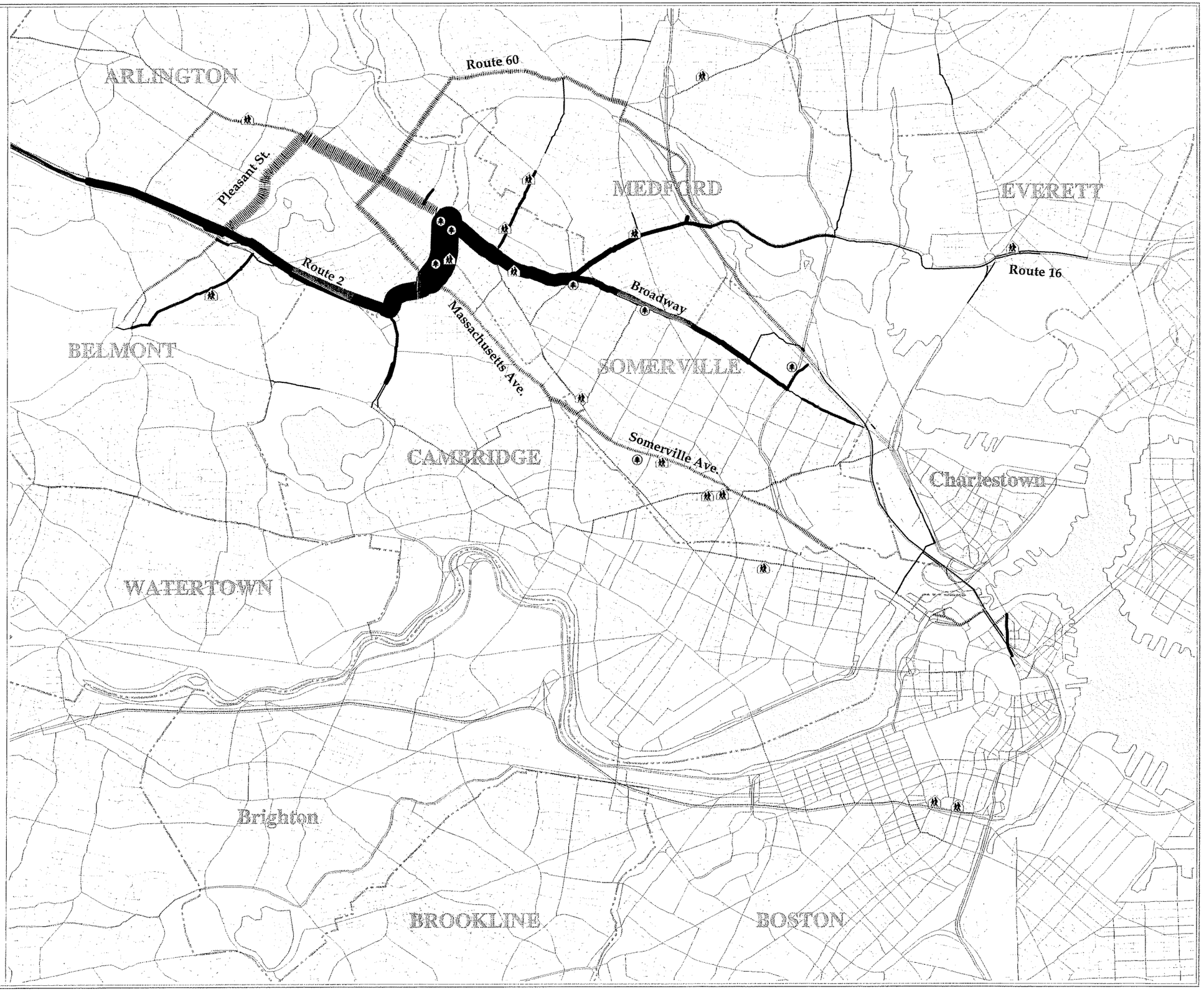
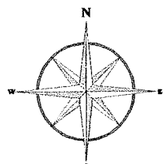


FIGURE A - 5

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

KIRKLAND STREET:
Impose 24-Hour Truck Exclusion



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

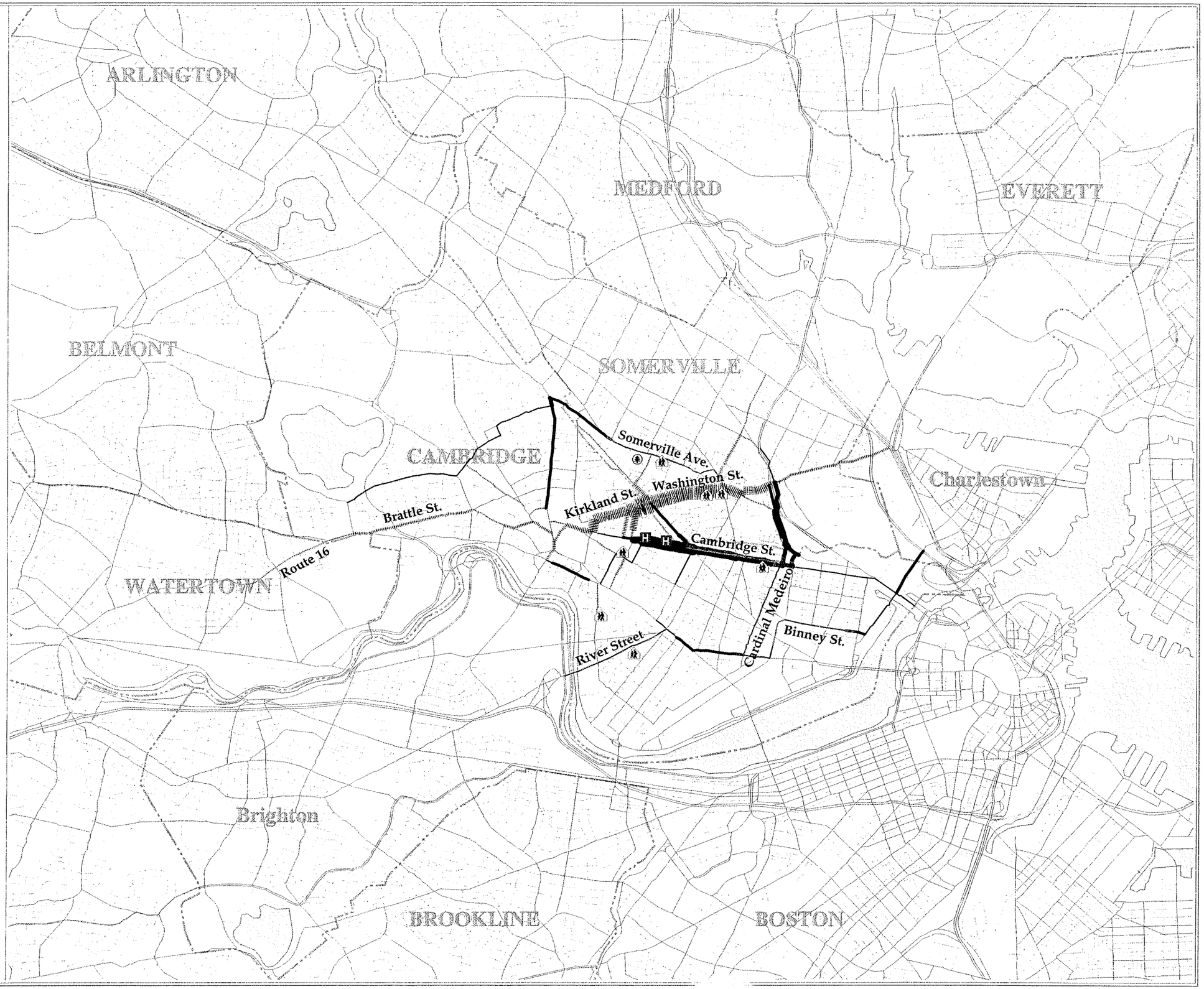


FIGURE A - 6

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

BLANCHARD AND BRIGHTON:
Remove Exclusions
on Brighton St.
and Blanchard Rd.
North of Concord Ave.
Impose Exclusions on
Blanchard Rd.
South of Concord Ave.

LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

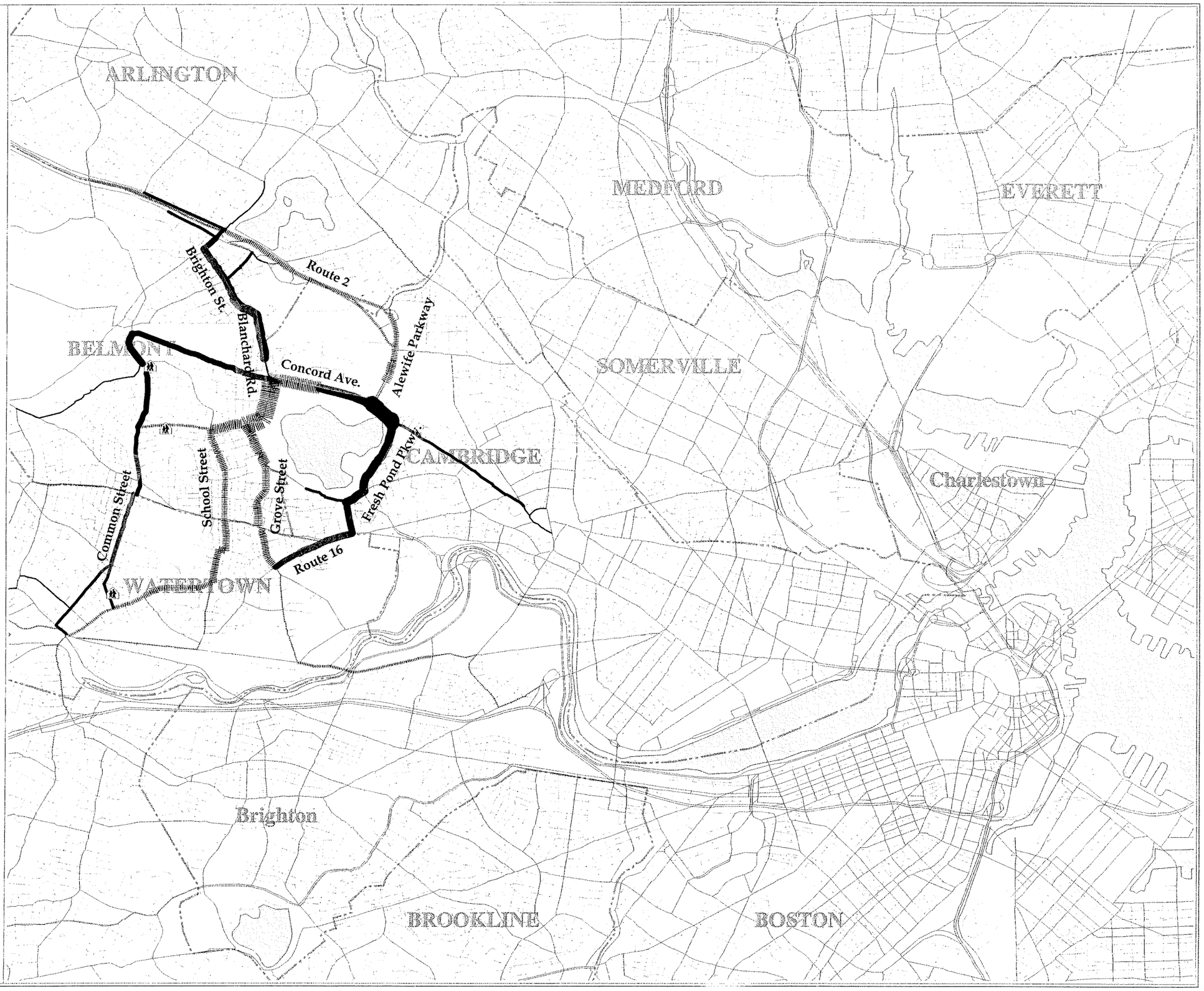
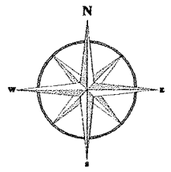


FIGURE A - 7

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

ALEWIFE BROOK PKWY:
Remove Exclusions



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

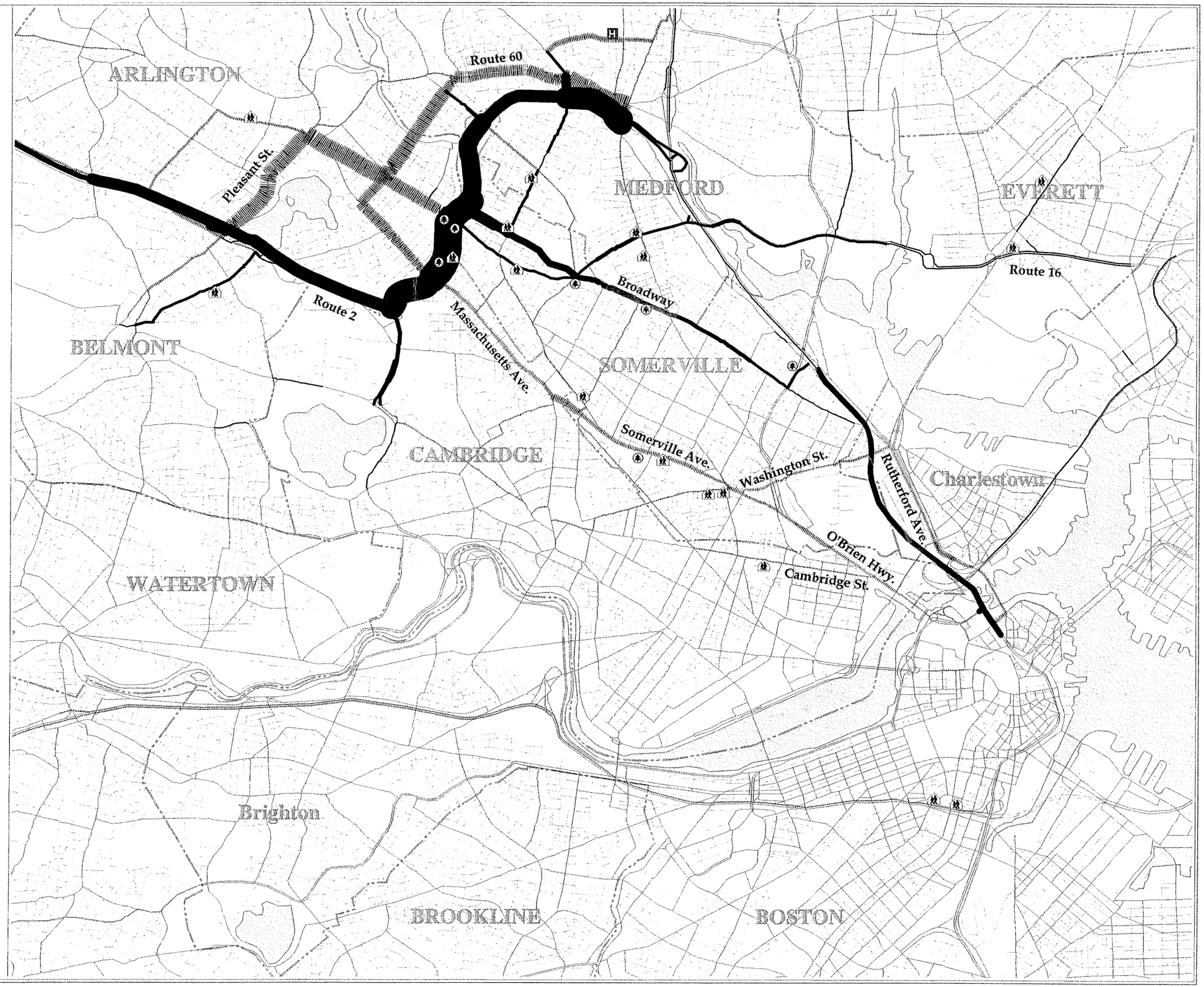
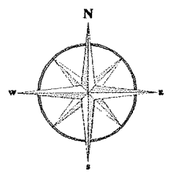


FIGURE A - 8

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

CAMBRIDGE NIGHTTIME TRUCK BAN



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

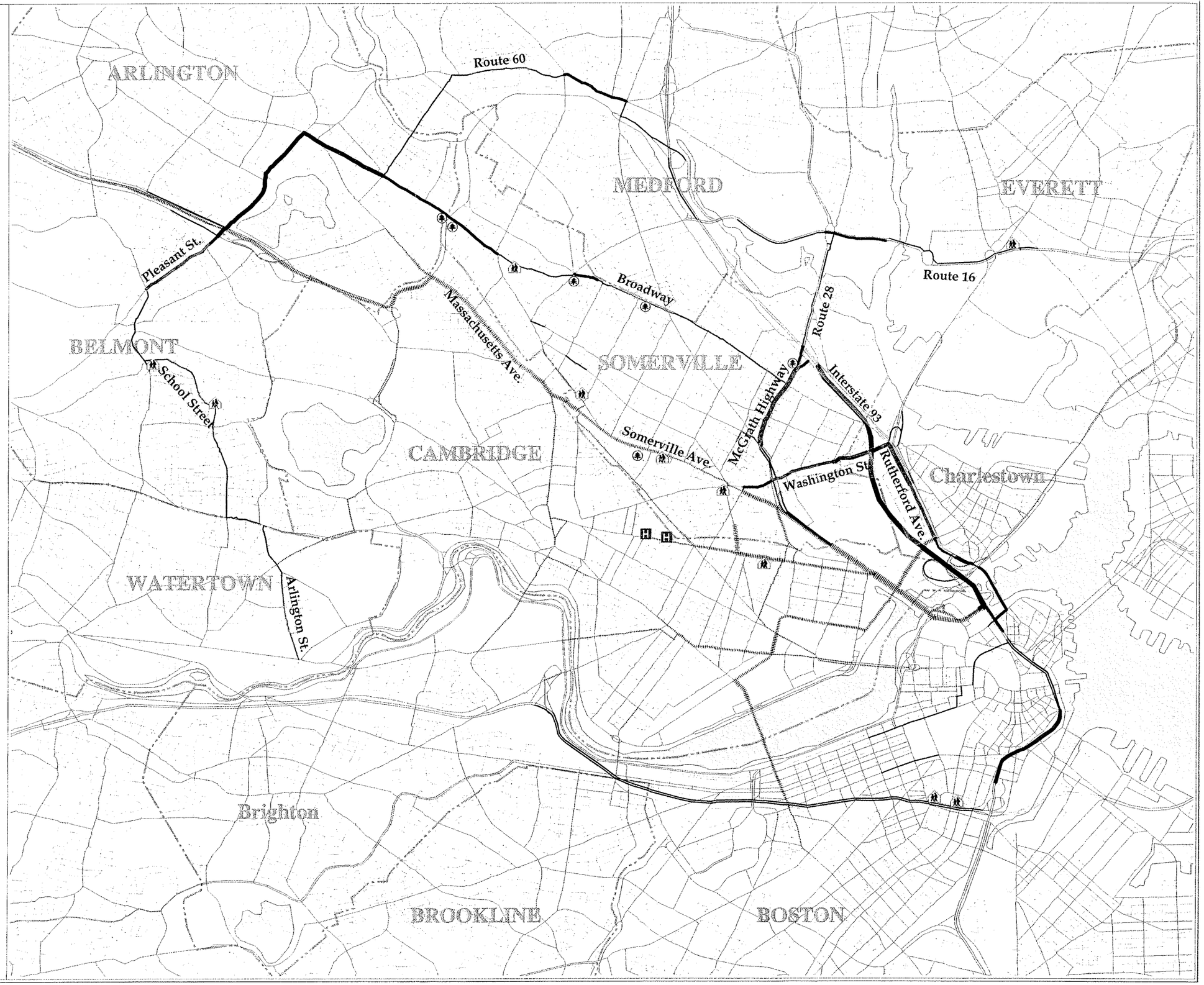


FIGURE A - 9

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

PROSPECT STREET:
Remove Exclusion from 6:00 AM to 6:00 PM with Two-Way Streets at Union Square

N

LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

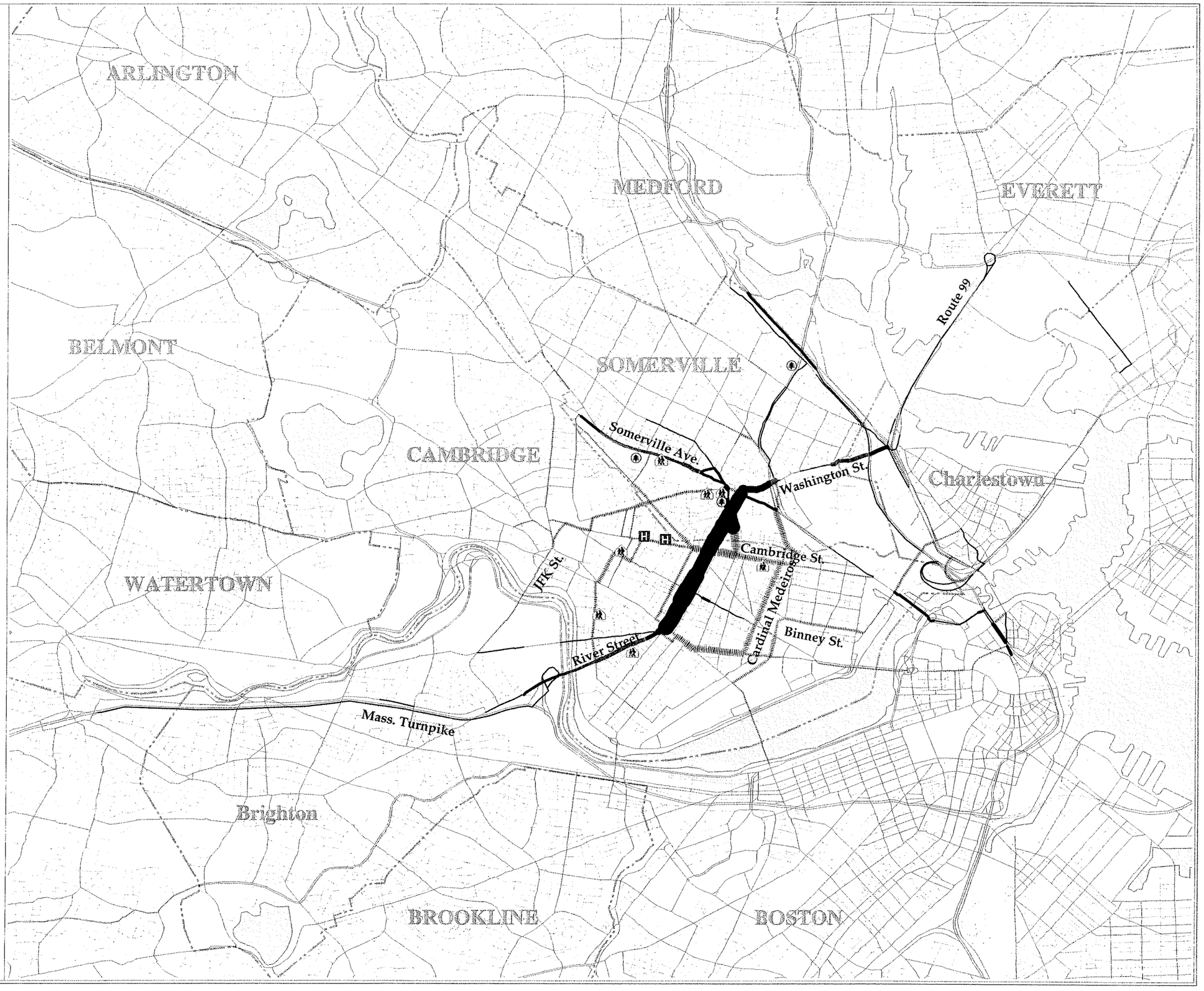
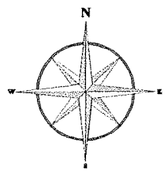


FIGURE A - 10

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

BRATTLE STREET:
Enforce Truck Exclusion



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

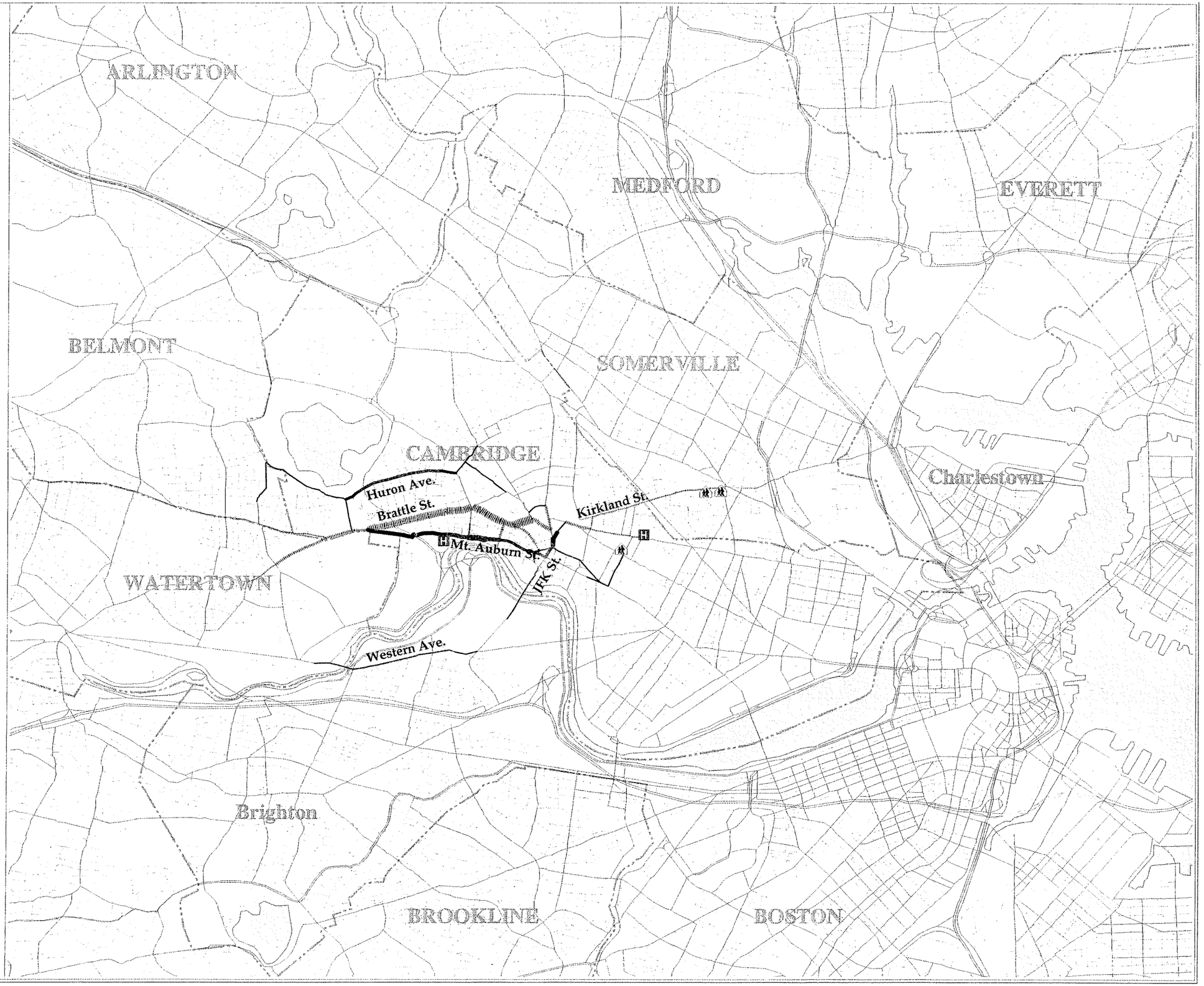
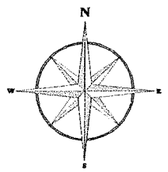


FIGURE A - 11

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

EXPRESSWAY TUNNELS: Allow Hazardous Cargo Trucks



LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

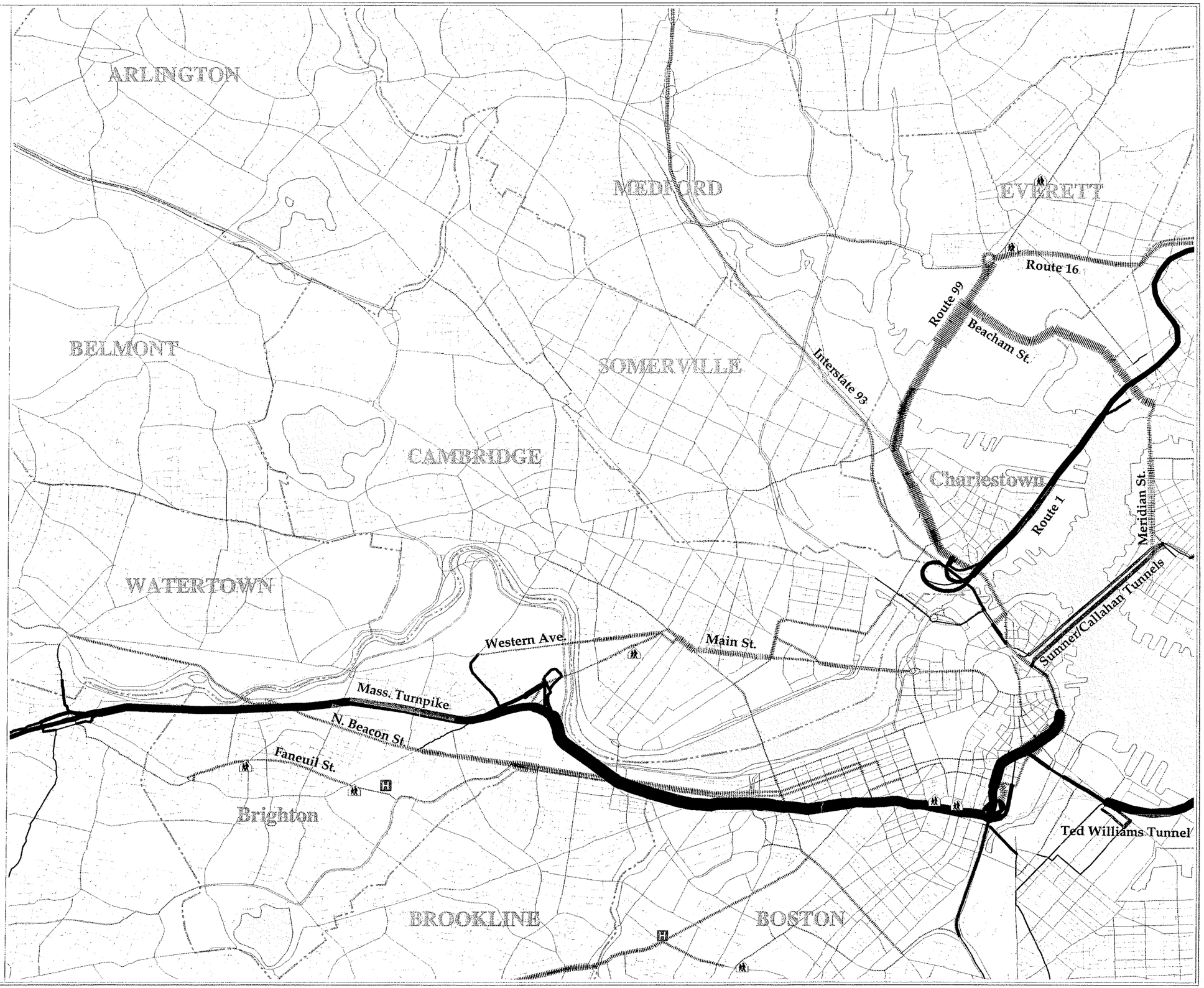


FIGURE A - 12

CHANGE IN TRUCK TRAFFIC ON ROADWAYS OF THE CTPS REGIONAL MODEL NETWORK (DAILY TRIPS)

MASS. TURNPIKE:
Ban Hazardous Cargo Trucks
East of Route 128

N

LEGEND

Increase in Truck Traffic

- 450 - 500 additional trucks
- 250 - 300 additional trucks
- 50 - 100 additional trucks

Decrease in Truck Traffic

- 450 - 500 fewer trucks
- 250 - 300 fewer trucks
- 50 - 100 fewer trucks

Other Roadways / Features

- Modeled roadway with negligible change
- Roadway not in model
- School within 300 feet of affected roadway
- Hospital within 300 feet of affected roadway
- Park within 300 feet of affected roadway

ARLINGTON
MEDFORD
EVERETT
BELMONT
SOMERVILLE
CAMBRIDGE
Charlestown
WATERTOWN
Route 16
Western Ave.
Mass. Turnpike
Faneuil St.
Brighton
Commonwealth Ave.
BROOKLINE
Route 9
BOSTON
Beacon St.

APPENDIX B
CTPS FINDINGS AND RECOMMENDATIONS SUBMITTED TO THE TECHNICAL SUBCOMMITTEE

The findings and recommendations in Appendix B were formulated by the Central Transportation Planning Staff based on the information collected and analyzed during this study. The findings and recommendations are organized in the same format as chapter 6 - those related to specific alternative truck strategies and those dealing with policy and regulatory issues. These findings and recommendations were presented to the Technical Subcommittee and the Committee on Regional Truck Issues who used them in formulating the final recommendations for the Regional Truck Study.

Alternative Truck Routing Findings and Recommendations

Finding: The Cambridge zoning ordinance excluding nighttime through truck traffic, as it currently exists on the books, will harm surrounding communities and local businesses if enforced.

If enforced, the Cambridge zoning ordinance excluding through truck traffic between 11 P.M. and 7 A.M. will increase truck traffic in the municipalities around Cambridge. Model results indicate that trucks will decrease throughout all of Cambridge. However, truck traffic will increase during the nighttime hours on streets in the surrounding communities. Complaints of truck traffic volumes and noise by residents in Cambridge will be alleviated at the expense of residents in other communities.

In addition, local businesses will be adversely affected by this zoning ordinance. Existing hourly count data shows that approximately 10% of the daily truck traffic occurs between the hours of 11 P.M. and 7 A.M., however, 4.5% of the total traffic occurs between 6 A.M. and 7 A.M. This ordinance may require businesses to change delivery schedules or use routes that take more time or add miles to their routes. This could cause delays in deliveries, increased costs associated with the transport of goods, and increased roadway congestion.

Recommendations:

- No truck exclusion permits should be granted by MassHighway to the City of Cambridge reflecting the existing zoning ordinance banning nighttime truck traffic.
- Enforcement of the existing zoning ordinance by the City of Cambridge should not be pursued.

Finding: High volumes of truck traffic on Somerville Avenue accelerate the deterioration of roadway conditions along that roadway.

Somerville Avenue currently carries approximately 600 trucks per day. The pavement depth on this roadway is about 7 inches as compared to a pavement depth of 12 inches on Broadway. In addition, the conditions of Somerville Avenue are deteriorating due to an aging sewer system under the roadway causing sinkholes. Alewife Brook Parkway is a MDC owned parkway that prohibits trucks north of Massachusetts Avenue. The roadway is four lanes wide with ten-foot lanes.

Recommendation:

- Open Alewife Brook Parkway from Massachusetts Avenue to Broadway to trucks under 3 axles. This will divert a large portion of trucks accessing Somerville from Somerville Avenue to Broadway without imposing on Alewife Brook Parkway's traffic and geometric limitations.

Finding: With exclusions on Prospect Street, Cardinal Mederios Avenue has become a north-south route for trucks between Somerville and Cambridge and surrounding areas.

The current truck exclusion on Prospect Street prohibits north-south truck travel through Cambridge and Somerville. Therefore, trucks are using Cardinal Medeiros Avenue and Warren Street to access Gore Street for destinations in south Somerville and destinations to the north and east, or Lambert Street and Cardinal Medeiros Avenue to access destinations such as Boston and the Massachusetts Turnpike to the south and west. Currently there are approximately 600 trucks per day using Cardinal Medeiros Avenue. Warren Street and Lambert Street are one-way pairs connecting Cardinal Medeiros Avenue to Gore Street. These streets are very narrow and are not suitable for truck traffic.

Recommendations:

- Impose a nighttime truck exclusion on Cardinal Medeiros Avenue from 7 P.M. to 7 A.M. Truckers from the north can use Cambridge Street to access the truck route of Binney Street, Main Street and Massachusetts Avenue during the nighttime hours. Truckers from the south can use the reverse route of Binney Street to First Street or Land Boulevard to Cambridge Street.
- Impose a nighttime truck ban on Warren Street and Lambert Street from 7 P.M. to 7 A.M. until roadway improvements are designed and completed in the MBTA's Lechmere Station area. The planned relocation of the MBTA's Lechmere Station and associated intersection improvements can be designed to make First Street a more attractive north-south route for trucks.

Finding: Access between the cities of Cambridge and Somerville is needed to ensure continued economic activity for the commercial and industrial areas in northeast Cambridge and southeast Somerville.

Industrial and commercial properties in northeast Cambridge (Webster Avenue, Cambridge Street, Gore Street area) and Southeast Somerville (Washington Street, O'Brien Highway, Medford Street area) require access to the local roadway network in the vicinity of their businesses. The current truck exclusion over the entire length of Prospect Street and Webster Avenue from Union Square to Prospect Street restricts north-south travel at all times in this area. In addition, the existing traffic flow patterns in Union Square contribute to congestion in that area. Prospect Street between Webster Avenue and Somerville Avenue is one-way in the northerly direction, prohibiting left turns from Somerville Avenue and through movement from Washington Street onto Prospect Street. Traffic wanting to access Prospect Street or points to the south must continue on Somerville Avenue and take a left onto Webster Avenue, which is one-way in the southerly direction between Washington Street and Prospect.

Recommendations:

- Continue the truck exclusion on Prospect Street in Cambridge from Massachusetts Avenue to the Somerville City Line and on Prospect Street in Somerville from the Cambridge City Line to Webster Avenue
- Remove the truck exclusion on Prospect Street from Webster Avenue to Washington Street in Somerville to allow for truck access from Washington Street to Cambridge Street.
- Remove truck exclusion on Webster Avenue from Washington Street to Prospect Street to allow for truck access from Union Square in Somerville to Cambridge Street in Cambridge.
- Continue to allow trucks on Webster Avenue in Cambridge from Prospect Street to Cambridge Street.

- Change Webster Avenue from Union Square to Prospect Street and Prospect Street from Washington Street to Webster Avenue from one-way to two-way streets to improve traffic flow in the Union Square area.

Finding: It appears that the future Cambridgeport Roadway Project, proposed for completion in 2002, could provide an alternative routing for some portion of trucks currently using Brookline Street.

Early in the study, a truck routing alternative to open Memorial Drive from the BU Bridge to Vassar Street was proposed to divert trucks from the residential area of Cambridgeport. Trucks currently crossing into Cambridge at the BU Bridge are using Brookline Street to access points in east Cambridge. The Cambridgeport Roadway Project will provide a new connection between Brookline Street and Waverly Street for vehicles traveling north and between Brookline Street and Sydney Street for vehicles traveling south. Sydney Street and Waverly Street could provide an alternate route diverting trucks from the residential area of Brookline Street.

Recommendations:

- There may be no need to pursue the opening of Memorial Drive between the BU Bridge to Vassar Street or Western Avenue to Vassar Street.
- Provide signs to direct truck traffic to Sidney and Waverly Streets

Finding: Belmont officials would like to divert truck traffic away from Pleasant Street, which runs through the center of town.

Belmont is receiving complaints that truck traffic through their town center on Pleasant Street has been increasing. Model results indicate that removing the exclusion on Brighton Street in Belmont and Blanchard Road along the Belmont/Cambridge Line to Concord Avenue will not shift trucks off of Pleasant Street. Trucks will use the opened roadway to access the commercial area on Concord Avenue in Cambridge. By imposing a truck exclusion on Blanchard Road south of Concord Avenue, truck traffic would be diverted away from the residential areas on Grove and School Streets and Blanchard Road south of Concord Avenue. Although there is not a major shift in trucks from Pleasant Street, the impact to these residential locations along Blanchard Road, Grove Street and School Street is positive.

Recommendation:

- Cambridge and Belmont officials should work together to implement a new truck exclusion on Blanchard Road south of Concord Avenue and to revoke the current exclusion on Brighton Street in Belmont and Blanchard Road along the Belmont/Cambridge Line to Concord Avenue if the results are considered favorable by the two communities.

Finding: Allowing hazardous cargo trucks in the tunnels in Boston is not viable.

Currently, vehicles carrying any hazardous materials are banned from using the tunnels on the Massachusetts Turnpike (under the Prudential Building), Central Artery (Dewey Square Tunnel), the Sumner/Callahan Tunnel, the Ted Williams Tunnel, and the Central Artery North Tunnel (CANA) on Route 1. These tunnels are operated under the jurisdiction of the Massachusetts Turnpike Authority (MTA) as part of the Metropolitan Highway System. Regulations and policies of the MTA under 730 CMR 7.10 (1) are that hazardous materials are prohibited in tunnels.

Since these tunnels are within the city limits of Boston, the Boston Fire Department would be called upon to respond to any fires in the tunnels. The City of Boston has the authority to establish the Boston Fire Protection Code. In 1980, the Boston fire code was amended to exclude the transport of hazardous materials through tunnels. None of these tunnels are specifically equipped with systems to handle hazardous cargo fires, therefore, the operating and public safety agencies are not willing to open these tunnels to hazardous materials.

Recommendations:

- Do not pursue opening of tunnels to hazardous cargo trucks on the expressway system in Boston at this time. However, a risk assessment study should be conducted, per the requirements of the Massachusetts Turnpike Authority and the Boston Fire Department, to determine whether the Prudential Tunnel could be opened to hazardous cargo trucks carrying gasoline and oil.
- Mitigation of truck traffic throughout the study area should be focused on non-hazardous cargo trucks since they make up the majority of trucks.
- Re-sign Pleasant Street (between Massachusetts Avenue and Western Avenue), River Street and Western Avenue to clarify that hazardous cargo trucks can use these roads 24-hours a day.

Finding: Restricting hazardous cargo truck traffic on the Massachusetts Turnpike east of Route 128 is not a viable option.

Access by trucks to key roadways in Massachusetts is protected by provisions of the federal Intermodal Surface Transportation Act of 1991 (ISTEA). ISTEA required all fifty states to define a "National Highway System" (NHS). The Massachusetts Turnpike is part of that system. The Turnpike is meant to carry large volumes of traffic including trucks. It was built for long-haul and through traffic to keep these volumes of vehicles off of local roadways.

A transportation demand model run was performed to see what routes hazardous cargo trucks might use if they were restricted from the Massachusetts Turnpike east of Route 128. Model results indicate that the hazardous cargo trucks would decrease on the Massachusetts Turnpike, however, these trucks would not continue on Route 128 to Interstate 93, but would instead use Routes 9, 20 and 2 to access points to the east through local communities. Hazardous cargo trucks would most likely still end up traveling through the study area. Federal approval would be required to implement this action.

Recommendation:

- Do not pursue restricting hazardous truck traffic on the Massachusetts Turnpike east of Route 128 because access by trucks on this roadway is protected by federal legislation and trucks would most likely continue to access the study area communities using other state numbered routes.

Policy and Regulatory Issues Findings and Recommendations

General

Finding: Through truck traffic in Cambridge is approximately 37% of all truck traffic entering *the city and 16% of all truck traffic* in *the City of Cambridge.*

Approximately 8,840 truck trips enter the City of Cambridge on a daily basis. Roughly 3,300 of the 8,840 trips are through trips (about 37% of truck trips *entering* Cambridge). Through trips are defined as trips that have neither an origin nor destination in Cambridge. Information collected by the Cambridge Police Truck Enforcement Unit during routine inspections of trucks shows that about 60% of all trucks stopped have business in Cambridge. Therefore, the remaining 40% are through trips. This corresponds to the CTPS finding that approximately 37% of trucks *entering* Cambridge are through trips.

In further reviewing the through truck trips *in* Cambridge, two-thirds or about 2,020 of these trips originate and terminate within the 13 cities and towns surrounding Cambridge. One-third of the through trips have one end in the suburbs and the other end in one of the 13 cities and towns. Suburb to suburb trips (those trips outside of the 13 cities and towns) are negligible.

When looking at *all truck trips* in the City of Cambridge (not just trucks entering Cambridge but also those truck trips that begin and end in Cambridge and never leave the city), about 16% of all truck trips are considered through trips. This information indicates that the majority of trucks using Cambridge streets have business within the city limits of Cambridge.

Recommendation:

- Ensure that all truck traffic, including through truck traffic, is directed to those roadways with the least impact on residential areas and whose physical characteristics (roadway width, pavement depth, etc.) are best able to accommodate truck traffic.

Finding: Trucks are essential in providing goods and services to Cambridge and the region as a whole and the practical reality is that trucks will continue to travel on Cambridge roadways.

Model results indicate that 63% of all trucks (or approximately 5,550 trucks per day) using Cambridge roadways do have business in the city. Information from the Cambridge Police Truck Enforcement Unit routine truck inspections corroborates the model results.

Vehicle counts and classifications were performed on Prospect Street in Cambridge to sample the types of trucks that use excluded roadways. The results showed that trucks traveling on Prospect Street appeared to be engaged in some form of local urban commerce. This indicates that even with the truck exclusions throughout the city, trucks are still needed to serve the economy of Cambridge. In most cases, the transportation services that trucks provide cannot be provided by any other type of vehicle. One way to reduce the number of trucks in Cambridge would be to use larger trucks, however, larger trucks are perceived as more disruptive than smaller trucks.

The reality is that in order for Cambridge to maintain its economy, a large number of trucks will have to continue to use Cambridge roadways on a daily basis.

Recommendation:

- Focus on actions and policies that mitigate the negative impacts of trucks.

Finding: On average, 75% of all trucks on roadways in Cambridge, not considered part of the truck route, are two-axle trucks.

Existing truck classification counts performed in Cambridge indicate that larger trucks (3+axles) are a small portion of the total truck traffic within the city. The only area of Cambridge where 3+axle trucks exceed 40% of total truck traffic is on roadways that are considered part of the truck route in Cambridge. The truck route consists of Land Boulevard or First Street, Binney Street, Main Street, Massachusetts Avenue, Pleasant Street (between Massachusetts Avenue and Western Avenue), and Western Avenue/River Street. When reviewing the classification counts on roadways not considered part of the truck route, an average of 75% of all trucks are 2-axle trucks. As stated earlier, the majority of these trucks have business in Cambridge.

Even though the volume of 3+axle trucks is relatively small in the City of Cambridge, it is these larger trucks that are perceived as the most disruptive. Public comments from the residents of Cambridge indicate that the larger 3+axle trucks are indeed the most disruptive, especially the gasoline and oil tank trucks. They indicated that this is a problem (creating noise and vibration) particularly during the nighttime hours. With the current restrictions of hazardous cargo trucks in the tunnels in Boston, gasoline and oil trucks leaving the petroleum tank farms in Chelsea and Everett are using Cambridge and Somerville roadways to access the Massachusetts Turnpike and areas to the west. The gasoline and oil industry is a seven day, 24-hour operation and a large number of deliveries are made during the nighttime hours due to traffic congestion during the day and individual business requests. In these cases, trucks may not be able to access and complete deliveries due to traffic congestion in the vicinity or at the point of delivery during the daytime hours.

Recommendation:

- Other recommendations provided in this document including signage, education, and roadway restrictions that pertain to all truck traffic will, by definition, help mitigate the impacts of the largest trucks. These recommendations focus on directing truck traffic to designated truck routes and away from residential areas.

Truck Route Signs

Finding: Truck route signs are non-existent or are not visible throughout the study area.

The roadways in the study area have not formally been signed as truck routes with the exception of Main Street and Binney Street in Cambridge and Mystic Avenue in Somerville. The existing signs on Main Street and Binney Street denote the truck route through Cambridge. The only truck route signs in Somerville are on Mystic Avenue and these were posted by MassHighway.

It is important to designate a route for those truckers not familiar with the area. The Cambridge and Somerville police indicated that many of the restricted truck route violations are due to truckers that are unfamiliar with the area. They end up on excluded roadways due to confusion from either lack of signs or because they encountered truck exclusion or nighttime restriction signs and were unsure of where to go.

Recommendations:

- Formally designate truck routes throughout the study area. Truck routes should include:

  Cambridge:

  1) River Street, Western Avenue, Pleasant Street (between Massachusetts Avenue and Western Avenue), Massachusetts Avenue, Main Street, Binney Street, Land Boulevard, and First Street.
  2) Massachusetts Avenue from Prospect Street across the Massachusetts Avenue Bridge to the Newbury Street ramps onto the Massachusetts Turnpike.

  Somerville:

  1) Mystic Avenue to Sullivan Square
  2) Broadway

- Post signs along designated truck routes in visible locations.

Finding: Truck-related signage frequently disagrees with the regulatory status of the roadway.

Three types of situations where truck-related signage disagree with the regulatory status of the roadway have been identified throughout the study area. They are the following:

1. Truck exclusion signs have been posted without the municipality obtaining a Chapter 85 exclusion permit from MassHighway. The operation of trucks on a roadway not legally signed is the same as if the road was legally excluded to trucks. Truckers will not use these roadways because they do not want to be cited for moving violations in fear of jeopardizing their commercial licenses. In the majority of these cases, the driver does not know whether it is a legal or illegal exclusion.
2. MassHighway has granted an exclusion permit, but the municipality has not posted signs. Problems can arise if the municipality posts or removes signs at their discretion. This can cause confusion among truck drivers in the area if conditions change over time.
3. A roadway is a designated route for hazardous cargoes, but it is not indicated as such by any signs. Currently River Street, Western Avenue and Pleasant Street are signed as excluded roadways from 7 P.M. to 7 A.M. and all day Saturday and Sunday. These roads, however, are open at all times to hazardous cargo trucks, but the signs do no indicate this.

Recommendations:

- Municipalities should remove illegal truck exclusion signs or, if desired, pursue approval from MassHighway for those roadways currently signed as truck exclusions but not permitted.
- Municipalities should review all excluded municipal roadways not currently signed and determine if the roadway should be excluded to trucks. The permit should be forfeited for those roadways where trucks are allowed. Signs should be posted for those roadways where trucks should be excluded.
- Post new signs on River Street, Western Avenue, and Pleasant Street (between Massachusetts Avenue to Western Avenue) to indicate that hazardous cargo trucks are allowed on these roadways 24 hours a day. This, along with the recommendations of posted truck route signs, should provide clear information for truckers.

Finding: Existing truck exclusion signs in the study area create confusion among truck drivers.

Truckers use Cambridge and Somerville roadways because they are the most logical and direct routes from the surrounding communities to the north and east to access the surrounding communities to the south and west, as well as the Massachusetts Turnpike. Truck drivers transporting gasoline and oil (hazardous cargo) from the Chelsea, Everett and Medford area are also using study area roadways. Many of these drivers are making deliveries for the first time or are

one time only drivers making deliveries in the area. Because of this, many drivers are not accustomed to a regular route and will take the most direct route they find to be available. With the restriction of hazardous cargo in tunnels on the Central Artery and the Massachusetts Turnpike, trucks transporting gasoline and oil use Cambridge and Somerville roadways to access locations to the west. When they reach a roadway that has a truck exclusion sign they will try to find the next most direct route. This causes confusion, especially in the Union Square area of Somerville and northern Cambridge (24 hour exclusion on Prospect Street) and also on River, Western, and Pleasant Streets in Cambridge during the evening hours (7 P.M. to 7 A.M. exclusion on these roadways). As discussed earlier, a nighttime truck exclusion is imposed on River, Western, and Pleasant Streets, however, hazardous cargo trucks are not subject to this exclusion because of the restrictions in the tunnels in Boston. The roadways, however, are not signed to indicate that hazardous cargo trucks can use these streets at all times.

The drivers expressed that they want to stay out of Harvard Square in Cambridge as much as possible due to the high pedestrian volumes, but with the posted truck exclusion signs as they currently exist, the majority of the trucks end up in Harvard Square. These particular truck exclusion signs may create more truck traffic on roadways in the Harvard Square area than would normally exist especially on Kirkland Street, Brattle Street, Mount Auburn Street and JFK Street.

Recommendations:

- A map of all truck excluded roadways and designated truck routes throughout the study area should be developed in hard copy format and also be made available on the Internet. This should be facilitated by MassHighway.
- Truck drivers using Cambridge and Somerville roadways for through trips should use roadways that are designated as truck routes.
- Companies making truck deliveries on routes through the study area should provide drivers with a map of all truck excluded roadways and designated truck routes, and indicate the most appropriate routes for the drivers to use at the onset of each delivery.

Enforcement

Finding: According to enforcement officials, violations on truck excluded roadways are not a significant problem throughout the study area.

The majority of complaints in the study area regarding trucks have been in Cambridge. Interviews with enforcement officials in Cambridge, Somerville, and also the State Police were conducted to receive their input on this issue.

The Cambridge enforcement team feels that their efforts to educate truckers has helped and feel that since the enforcement team has been in operation there has been a big change in the way deliveries are being made. They have found that there are not a high number of repeat offenders. Once a trucker is educated on the use of excluded roadways, they will generally not use that roadway again.

The City of Somerville Police Department cites drivers for moving violations and violations on restricted roadways. There have not been a large number of complaints of trucks on restricted roadways in Somerville.

Cambridge has an effective program for addressing enforcement of truck excluded roadways. No other communities or participants at public meetings have voiced concerns regarding trucks on excluded roadways. The majority of complaints in Cambridge have been related to high volumes of trucks or truck noise rather than trucks using excluded roadways.

Recommendations:

- Develop a program to educate truckers regarding excluded roadways and designated truck routes throughout the entire study area. Current education efforts regarding excluded roadways employed by the Cambridge Police Department have been effective and can be used as the basis for this program. The program can be expanded to educate truck drivers to use designated truck routes and divert them away from residential areas.
- Develop a map showing all truck exclusions and designated truck routes within the study area.
- Provide the truck exclusion and designated truck routes map to all police departments for distribution to truckers during routine stops, as well as, through the Internet.
- The education program can be facilitated through MassHighway.
- Continued enforcement of truck exclusions by local police departments throughout the study area.

Noise and Vibration

Finding: The majority of specific complaints made by residents in the study area regarding noise and vibration from trucks occur at night during roadway construction projects or when roadway conditions are deteriorated.

Truck noise is generated from several of its components – the exhaust system, engine, gears, fan and air intake. At higher speeds, tire and wind noise add to the problem. The truck engine exhaust noise, especially during acceleration,

tends to be more dominant for most operating conditions. Trucks are noisier than automobiles because of their size and power.

Pavement surface roughness is considered the primary vibration source. New pavement will create less vibration when traffic travels over it. With continuous wear and tear of travel over the roadway and varying weather conditions, pavement conditions begin to deteriorate. Cracks in the pavement and potholes appear. When vehicles, especially trucks, hit these defects in the pavement, loud noise and vibrations can occur due to shifts in loads or from the truck's suspension system itself. Roadway conditions contribute to noise and vibration from truck traffic and, as noted by local enforcement agencies, the majority of the complaints are routinely logged when roadway construction projects are underway or when roadway conditions are deteriorated.

Another issue raised during the study regarding noise from trucks was the use of engine compression brakes, also known as jake brakes, by truckers. Based on the knowledge of how jake brakes work and discussions with city and state truck enforcement officers, banning these brakes is not a major issue in the study area. The use of these brakes is most common where there are steep grades and a trucker wishes to save wear and tear on the vehicle's normal brakes. Other common uses are approaches to toll plazas, rotaries, and situations where queuing occurs and trucks travelling at high speeds need to rapidly slow down. Most locations in the study area do not have steep grades, toll plazas, or trucks traveling at high speeds, with the exception of the major interstates and highways including the Massachusetts Turnpike, Interstate 93, and Route 1. Therefore, most truckers don't find it necessary to use their jake brakes.

Recommendations:

- Truck impacts on local roadways should be factored into the decision-making process when municipalities are allocating their Chapter 90 funds for roadway maintenance.
- Regulations on restricting the use of jake brakes throughout the study area are not necessary.

Infrastructure

Finding: Specific bridges throughout the study area have deteriorated and are posted with weight restrictions or closed to truck traffic altogether.

The ability of a truck to use a bridge depends upon the vehicle weight, the weight of the load, the distribution of the load, and the number of axles. In this study, weight restrictions have been defined as prohibiting use by any truck

exceeding 2.5 tons over three axles. An important aspect of most bridge restrictions is that they will not prevent all truck traffic, only the trucks that exceed the limit. A truck may exceed the limit on one leg of its tour and be forced to use another route, but upon delivering a quantity of goods is able to use the same bridge later in the tour. In addition to bridges with weight restrictions, some bridges have been closed to all traffic due to structural deficiencies.

Recommendations:

- Chapter 90 Funding should be targeted to the bridges in the study area that have been closed or weight restricted to trucks.
- The Boston Metropolitan Planning Organization should give priority to funding the maintenance of roadways and bridges included as part of designated truck routes.