APPENDIX A
PUBLIC PARTICIPATION

PUBLIC INVOLVEMENT PLAN

Executive Office of Transportation/
Office of Transportation Planning

I-495 Transportation Study

Public Involvement Plan

October 11, 2006

Public Involvement Goals

- To provide a structure and forums for interested and affected parties to provide input and comment on major issues, problems, and potential improvement strategies along the Interstate 495 Corridor.
- To educate agency representatives, legislators, stakeholders, and members of the public and media about issues, opportunities, goals, and alternatives affecting the Interstate 495 study area.
- To create general awareness of the study among highway or roadway users, the business community, residents, and municipal officials.
- To engage all key stakeholders in the study process and results and build agreement for implementation activities.

Principles

- Create an environment in which decisions are based on an objective, transparent, and inclusive planning process that actively seeks input from a variety of stakeholders.
- The Working Group, Study Advisory Group (SAG), and the public will inform the Executive Office of Transportation (EOT) decision-making process. EOT and the Office of Transportation Planning will make decisions about alternatives, recommendations, and projects and studies listed in the Corridor Improvement Plan.
- Ensure open, honest, and clear communications.
- Facilitate two-way education.

Study Participants

Working Group

- Executive Office of Transportation
- Northern Middlesex Council of Governments (NMCOG)
- Merrimack Valley Planning Commission (MVPC)
- Fay, Spofford & Thorndike (FST)

SAG

- Congressmen John Tierney and Marty Meehan
- State Representatives from the
  - First, Second, Third, Fifth, Fourteenth, Sixteenth, Seventeenth, and Eighteenth Essex districts; and
  - the Second, Third, Fifth, Fourteenth, Sixteenth, Seventeenth, Eighteenth, Nineteenth, and Twenty-second Middlesex districts.
- State Senators from the
  - First Essex District;
  - First Middlesex District;
  - Second Essex and Middlesex Districts; and
  - Third Middlesex District.
- Chambers of Commerce from
  - Salisbury;
  - Greater Lowell;
  - Newburyport;
  - Merrimack Valley; and
  - Greater Haverhill.

- Cities of
  - Haverhill;
  - Lawrence;
  - Lowell; and
  - Methuen.
- Towns of
  - Amesbury;
  - Andover;
  - Billerica;
  - Chelmsford;
  - Merrimac;
  - North Andover;
  - Salisbury;
  - Tewksbury; and
  - Westford.
- Agencies and Organizations:
  - Massachusetts Bay Transportation Authority;
  - Merrimack Valley Regional Transit Authority;
  - Lowell Regional Transit Authority;
  - Federal Highway Administration;
  - Merrimack Valley Transportation Management Association;
  - Merrimack Valley Economic Development Corporation; and
  - Alliance for Amesbury.

Decision-making Process

EOT will be responsible for making all final study decisions with assistance and input from the Working Group and the SAG. Below is a summary of the roles and responsibilities of each study participant.

EOT

- Review consultant's work
- Manage the project
- Propose recommendations and make final decisions

Working Group

- Provide input to the study process
- Review and revise technical work
- Provide input on recommendations

SAG

- Provide input to the study process
- Assist with alternatives development
- Provide input on the technical materials and alternatives

Consultant Team

- Perform technical work
- Prepare technical material and presentation for SAG meetings
- Prepare technical material and presentation for Public Informational Meetings

Public Information and Activities

All public involvement activities are derived from the basic need for open, two-way communication among EOT, the SAG, and the public.

Activities

- Stakeholder interviews will be conducted with planners, engineers, and other municipal officials and Regional Planning Agency (RPA) representatives.

- SAG meetings. These meetings will take place on a regular basis to ensure that stakeholders have sufficient opportunities to review data and assumptions as well as study results.

- RPA briefings. The project team will conduct periodic briefings with the RPAs to keep them informed of upcoming activities and overall study progress.

- Public Informational Meetings will be held at key study milestones. Meetings will be widely advertised through newspaper advertisements, media releases, and paper and electronic notices.

- Communication with SAG members in between meetings and particularly those who are unable to attend meetings regularly but wish to be kept up-to-date.

- Provide SAG members and others with information and materials to update their constituencies.

Public Information

- Media releases will be developed on topics such as introduction to the study, Web site roll-out, key facts from existing conditions analysis, alternatives; alternatives screening, recommendations, etc.

- Fact sheets. An interactive fact sheet will be developed for each of the 19 interchanges in the study area. Fact sheets will provide information about the interchange, local roadways, traffic volumes, alternatives evaluation, etc. Printed versions can be distributed as newspaper or newsletter insert via chambers of commerce, interest groups, and other groups. Electronic versions will be posted on the project Web site and can be disseminated via e-mail by SAG members who represent diverse constituencies. Other fact sheets about key topics, such as the connection between land use and development and transportation, may also be developed.

- Short articles on the status of the study will be developed for inclusion in existing newsletters produced by business associations, developers/property managers, and MassRIDES.
- Link the study Web site to SAG member Web sites such as municipalities, agencies and others as appropriate.

Schedule of Activities

Task	
○	Task 1. Study Area, Goals and Objectives, and Evaluation Criteria
○ □	Task 2. Existing Conditions and Issues Evaluation
○ □	Task 3. Alternatives Development
○	Task 4. Alternatives Analysis
○ DRAFT	Task 5. Recommendations
○ □ FINAL	Task 6. Corridor Improvement Plan and Final Report

○ SAG Meeting □ Public Meeting Report

Fall 2005

Activities at the start-up of the study will have two objectives:

- informing the public and interested and affected groups that the study has begun and
- getting input on issues to determine perceptions and assumptions.

All materials will be posted on the study Web site.

- Prepare short article for inclusion in SAG members' existing publications, the *Boston Globe* NorthWest Weekly section, and other local community papers announcing the start of the study and the Web site.

- Meet with the SAG.
- Conduct Stakeholder interviews with planners, engineers, and other municipal officials and RPA representatives.
- Launch interactive Web site, send announcement, and link to media and other appropriate Web sites.

Fall 2006

Activities in this period will focus on reporting on key findings from the Existing Conditions analysis. All materials will be posted on the study Web site.

- Meet with the SAG to review findings of Existing Conditions analysis and issues evaluation.
- Meet with the SAG in advance of the Public Informational Meetings to review and discuss meeting structure, agenda, publicity, and materials.
- Prepare media releases and meeting notices announcing the Public Informational Meetings. Provide SAG members with print and electronic versions of the meeting notice for dissemination to their constituents and posting in public places.
- Hold two Public Informational Meetings—one in each of the RPA districts—to present and review information about the study and the Existing Conditions findings.
- Provide mail-back comment forms at the Public Informational Meetings for asking for input on the study in general, public information and communications, and comments on the Existing Conditions analysis.
- Prepare summary of key input received at the meetings and post on the Web site.

Winter 2006

Activities in this period will center on working with the Working Group to develop, screen, and prioritize alternatives for transit, TDM, ITS, and Interstate 495 mainline and ramps. All materials will be posted on the study Web site.

- Meet with the SAG to review alternatives and get input.
- Prepare summary materials on the alternatives for SAG members to use at meetings with their constituents to assist with explaining the alternatives for feedback.
- Prepare media releases for local media describing the alternatives. Provide text and graphics or visualizations to SAG members and other interested groups for inclusion

on their Web sites. Highlight the study Web site as resource for more detailed information.

- Prepare media releases and meeting notices announcing Public Informational Meetings. Provide SAG members with print and electronic versions of the meeting notice for dissemination to their constituents and in public places. Provide media with text and graphics describing the alternatives.

- Hold a widely advertised Public Informational Meeting in each RPA area to review the alternatives.

- Provide mail-back comment forms at the Public Informational Meetings for asking for input on the study process and comments on the alternatives.

Winter 2006/2007

Activities in this period will involve further definition of the benefits and impacts of the alternatives. All materials will be posted on the study Web site.

- Meet with the SAG to discuss the results of the evaluation of safety benefits, mobility enhancements, environmental impacts, air quality and noise impacts, community impacts and benefits, and planning-level cost estimates of evaluated alternatives.

- Prepare summary materials on four alternatives including matrix of benefits and impacts of the alternatives for SAG members to use at meetings with their constituents.

- Prepare media releases and meeting notices describing the four alternatives for the local media and *NorthWest Weekly.* Provide SAG members with print and electronic versions of the meeting notice for dissemination to their constituents and in public places.

Spring 2007

Activities in this period will focus on reviewing the proposed recommended improvement packages. All materials will be posted on the study Web site.

- Meet with the SAG to review and discuss preliminary short- and long-range recommendations for highway and non-highway improvements.

- Draft list of projects to be included in the study Corridor Improvement Plan; post on the Web site and SAG members sites.

Summer 2007

The draft final report and recommendations will be prepared for review.

- Meet with the SAG to review the draft final report and Corridor Improvement Plan.
- Prepare media releases and meeting notices describing the recommendations and announcing the final Public Informational Meeting. Contact key reporters to inform them and encourage attendance. Provide SAG members with print and electronic versions of the meeting notice for dissemination to their constituents and in public places.
- Hold a widely advertised Public Informational Meeting to review the recommendations.
- Prepare media releases/fact sheets announcing recommendations.

Web Site – www.495studyinfo.com

The study Web site will provide public access to all documents, plans, meeting notices, and summaries, and provide a place for members of the public to comment on documents or the study in general. All comments and suggestions will be read, catalogued, and distributed to the EOT project manager and to the Fay, Spofford & Thorndike team project manager. All comments will be acknowledged and all questions responded to as quickly as possible.

Contact Information

EOT Project Manager:

Ethan Britland
Executive Office of Transportation
Office of Transportation Planning
10 Park Plaza
Boston, MA 02116
(617) 973-8236
(617) 973-8035
Ethan.Britland@eot.state.ma.us

SAG MEETING NOTES

I-495 CORRIDOR TRANSPORTATION STUDY

STUDY ADVISORY GROUP MEETING #1

Thursday, July 28, 2005 at 10:00 AM
Sanborn Hall, Quinn Public Safety Building
90 Hampshire Street
Methuen, MA

MEETING AGENDA

1. Introductions (Ethan Britland - Office of Transportation Planning)

2. Corridor Background and Study Purpose

   (Tony Komornick – Merrimack Valley Planning Commission)
   (Robert Flynn – Northern Middlesex Council of Governments)

3. Study Process (Ethan Britland - Office of Transportation Planning)

   a) Goals, Evaluation Criteria, Public Participation
   b) Problem Evaluation
   c) Alternatives Development
   d) Alternatives Analysis/Evaluation
   e) Recommendations

3. Study Overview (Ed Hollingshead - Fay, Spofford and Thorndike)
   (Anne McKinnon – Howard/Stein-Hudson)

4. Roles and Responsibilities (Handout)

5. Discussion of Study Area, Goals, Evaluation Criteria, and Public Participation (Ed Hollingshead - Fay, Spofford and Thorndike)

6. Next Steps (Ethan Britland - Office of Transportation Planning)

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF TRANSPORTATION

MITT ROMNEY
GOVERNOR

KERRY HEALEY
LIEUTENANT GOVERNOR

JOHN COGLIANO
SECRETARY

I-495 CORRIDOR TRANSPORTATION STUDY

STUDY ADVISORY GROUP MEETING

Tuesday, November 28, 2006

10:00 AM – 12:00 PM

Tewksbury Public Library
300 Chandler Street
Tewksbury, MA 01876

AGENDA

1. Welcome and Introductions

2. Review of Study Activities To-Date

3. Review of Task 2 To-Date: Existing Conditions Summary

4. Discussion of Future Conditions and Next Steps

5. Public Informational Meetings / Other Business

TEN PARK PLAZA, BOSTON, MA 02116-3969
TELEPHONE: (617) 973-7000 • TELEFAX: (617) 523-6454 • TDD: (617) 973-7306 • WWW.MASS.GOV/EOT

Directions
The Library is located on the corner of Main Street (Route 38) and Chandler Street.

I-495 North and South:
Take exit 38 off of I-495. This will bring you to Route 38. Take a left onto Route 38 (you will be driving south) and travel approximately 2.5 miles. After you pass through the center of Tewksbury, you will come to a set of lights with a Shell gas station on your left. Take a left onto Chandler Street. The library is located at 300 Chandler Street on your right hand side.

I-93 Traveling South:
Take exit 42 off of I-93. This is Dascomb Road. Dascomb Road turns into East Street almost immediately. Travel approximately 3 miles on East Street. You will see the Tewksbury Hospital campus (surrounded by a stone wall) on your left hand side. Look for a blinking light, this is Chandler Street. Take a left onto Chandler Street. The library is located at 300 Chandler Street on your left hand side.

I-93 Traveling North:
Take exit 42 off of I-93. This is Dascomb Road. Take a left onto Dascomb Road, which turns into East Street almost immediately. Travel approximately 3 miles on East Street. You will see the Tewksbury Hospital campus (surrounded by a stone wall) on your left hand side. Look for a blinking light, this is Chandler Street. Take a left onto Chandler Street. The library is located at 300 Chandler Street on your left hand side.

Executive Office of Transportation

I-495 Corridor Transportation Study
Study Advisory Group Meeting

Tuesday, November 28, 2006
Tewksbury Public Library, 10:00 a.m.

Meeting Summary

Attendees

Curt Bellavance, Director of Community Development, North Andover
Ethan Britland, Executive Office of Transportation, Office of Transportation Planning (EOT)
Lincoln Daley, North Andover
Ian Durrant, MassRIDES
Dorothy Fennell, Howard/Stein-Hudson Associates, Inc. (HSH)
Stan Franzein, The Junction TMO
Bob Halpin, Merrimack Valley Economic Development Corporation
Joanne Haracz, DMJM + Harris
Justin Howard, NMCOG
Anthony Komornick, Merrimack Valley Planning Commission
Andrea Leary, Merrimack Valley Transportation Management Association
Paul Materazzo, Town of Andover, Planning Division
Anne McKinnon, HSH
Paul Nelson, EOT
Joe Onorato, Massachusetts Highway Department (MHD)
Hardy Patel, MHD-Highway Design
Steve Sadwick, Town of Tewksbury
Beth Sousa, Representative Micelli
Beverly Woods, Northern Middlesex Council of Governments (NMCOG)

Purpose of meeting

To introduce the Study Advisory Group on the status of the I-495 Corridor Transportation Study and to provide an overview of existing conditions in the study area.

Summary

Welcome and introductions

Ethan Britland, project manager from the Executive Office of Transportation (EOT), welcomed the group to the second Study Advisory group (SAG) meeting and led introductions. He said that most materials and notices about the 495 study will be distributed by e-mail and through the project Web site, www.495study.com, but those requiring the information by mail should notify him (617-973-8236) or Paul Nelson at EOT (617-973-7479).

Ethan Britland reviewed the activities of the study team since the last SAG meeting in July 2005. The data collection efforts did not go well—hundreds of automatic traffic recorders on Interstate 495 ramps did not produce usable data, so the team shifted to manual turning movement counts to determine the number of vehicles exiting and entering at all of the interchanges along the 40-mile corridor. The issues with the data collection were the cause of the delay in overall study process.

Follow-up on requests from July 2005 SAG meeting.

- NHDOT representative was invited to participate in SAG.

- The MBTA has been requested to participate.
- The team is working to establish a strong Web site that will be a repository for all documents and information on the study.

Existing Conditions, Task 2

Ed Hollingshead from Fay, Spofford and Thorndike (FST), lead consultant for EOT, briefly reviewed the study process and participants. A Working Group consisting of EOT, representatives from the Northern Middlesex Council of Governments (NMCOG) and the Merrimack Valley Planning Commission (MVPC), and FST meet regularly to discuss and review the progress of the study. The SAG consists of 40 representatives including elected officials, city and town officials, business groups, MBTA, and others who meet to review key issues and recommendations and provide overall guidance. Ed Hollingshead described the study area: a 40-mile-long corridor that runs through13 cities and towns. He reviewed the goal of the study—to improve safety and mobility in the corridor—and said this and more would be included in Task 1.

Ed Hollingshead described Task 2, Existing Conditions, and reviewed the characteristics of the corridor. For analysis purposes, the corridor was divided into western and eastern sections. He described the four main types of interchanges found in the study area and identified the key advantages and disadvantages. The majority of the interchanges in the study area are partial coverleafs and partial cloverleaf variants.

Traffic volume: Traffic volumes are growing at a greater rate in the western section and the overall percentage of trucks is high—between 15% and 22%. The average daily traffic in the western section is about 120,000 vehicles per day (vpd) and about 108,000 vpd in the eastern section. The directional distribution of traffic in the western section is fairly uniform (volumes eastbound and westbound are similar). This changes somewhat approaching I-93. In the eastern section, the traffic flow is predominantly to and from I-93.

Level of service: Ed Hollingshead reviewed the concept of level of service (LOS). Level of service measures the amount of delay and is measured at signalized intersections, merge/diverge points, weaves, and on the mainline. The analysis shows that at the on and off ramps, only five locations are at LOS F (failing) on a scale of A to F in the morning peak hour. Nineteen ramps have acceptable LOS in the morning peak hour, defined as LOS E or better. In the evening peak hour, eight ramps operate at LOS F and 16 operate at LOS E or better. One of the primary causes of the problems at the ramps is operations at the I-495/I-93 interchange that causes traffic to back up onto Interstate 495. In addition, at other locations, factors independent of Interstate 495, such as intersecting street traffic, influence operations and level of service on Interstate 495. At merge/diverge points, six operated at LOS F in the morning and evening peak hours and 18 operated at acceptable LOS, E or better. He mentioned several possible ways to slow deterioration of LOS, including extending merges at Rte.133 and extending the short acceleration lane on Rte. 213 in Methuen. He summarized the Interstate 495 mainline is not over capacity in either section, and the western section is growing at a faster rate than the eastern section.

Crash History: The study team reviewed crash data between 2002 and 2005. The two highest crash locations are the I-495/I-93 interchange and at the Interstate 495/Rte.125 interchange, Beverly Woods, Northern Middlesex Council of Governments (NMCOG), asked about the methodology used in the analysis—were crashes on the mainline and at interchanges counted? Ed Hollingshead said any crash that could be identified as within the interchange study area was included. Beverly Woods suggested consulting with Bonnie Polin at MassHighway who is doing research on lane departure crashes.

Transit: Joanne Haracz from DMJM + Harris described the existing transit in the study area. The Merrimack Valley Regional Transit Authority and the Lowell Regional Transit Authority currently operate systems that feature downtown hubs with little circumferential transit. MBTA commuter rail is well used: 45% of all boardings on the Lowell line occur at Lowell and 52% of all boardings on the Haverhill line occur at Haverhill. Two Transportation Management Associations serve the region: The Junction TMO and Merrimack Valley TMA.

Land use: Joanne Haracz said study area land use is primarily residential and forest:
- 35.4% residential
- 35.5% forest
- 2.4% commercial (located primarily in cities and on state highways close to Interstate 495)

- 4.5% industrial

Buildout: Joanne Haracz said the buildout analysis prepared by the Commonwealth estimated that 34,000 additional housing units and 141 million s.f. of commercial and industrial property could potentially be developed at full buildout. Housing is expected to be developed primarily in Haverhill, Lowell, Westford, and Andover. Industrial/commercial is expected to be concentrated in Lowell, Billerica, Westford, Andover, and Haverhill. The potential implication of housing and commercial growth on traffic was demonstrated using trip rates from the Institute of Transportation Engineers and illustrated potential new trips for the top five growth communities ranging from 206,000 new vehicle trips from new residential development to almost 1 million new trips from commercial development at full buildout**.**

Ed Hollingshead said the study team is working with the Central Transportation Planning Staff (CTPS) to develop the estimates of future traffic, year 2025 LOS, problems and issues and will meet with the SAG in late winter to review the results. The team will develop alternatives that will eventually lead to concept-level solutions. The existing conditions analysis and alternatives will be presented at two public meetings—one in each of the regional planning commission areas—in early spring. The study is expected to be completed in fall 2007.

Questions and discussion

Andrea Leary, Merrimack Valley TMA, said the information was presented very clearly and it is easy to understand. She said she will be able to provide this information to her constituents. She said more park-and-ride lots are needed on Interstate 495 to help commutes along the corridor. MassCommute recently did a survey of its members and others to find out about issues about park-and-ride, the results of which she will share with the team.

Paul Materazzo, Andover Director of Planning, referenced Rte. 28 access issues and asked when it would be appropriate to talk about other issues affecting the corridor. Ethan Britland responded, when FST begins looking at alternatives would be the most appropriate time, but initiating discussion sooner rather than later is always best. Tony Komornick, Merrimack Valley Planning Commission, noted that traffic volumes presented in the beginning of the PowerPoint are not consistent with those presented later on. Ed Hollingshead said he would correct this. Hardy Patel, MassHighway, said the projections should be made to 2030, not 2025. Beverly Woods concurred. Hardy Patel asked if the team was aware of a location study for Rte 125/Interstate 495 prepared by MassHighway. Yes. He noted that the 10-foot shoulder on Interstate 495 are on the outside and the 4-foot shoulders are inside.

Beverly Woods asked that that the corrected PowerPoint be posted to the www.495study.com Web site.

Action Items

- Review and correct PowerPoint as needed; post to 495study.com Web site
- Add SAG members web links to 495study.com

STUDY ADVISORY GROUP MEETING

Thursday, February 7, 2008

11:00 AM – 12:30 PM

Merrimack Valley Planning Commission
160 Main Street
Haverhill, MA

AGENDA

1. Welcome and introductions
2. Study updates
3. Review of 2006 and No-Build (2030) Conditions
4. Review of Future (2030) Conditions with proposed improvements
5. Next Steps
6. Questions/discussion

Executive Office of Transportation and Public Works

I-495 Corridor Transportation Study
Study Advisory Group Meeting

Thursday, February 7, 2008
Merrimack Valley Planning Commission, 11:00 a.m.

Meeting Summary

Attendees

Curt Bellavance, Director of Community Development, North Andover
Ethan Britland, Executive Office of Transportation and Public Works, Office of Planning (EOTPW)
Kelley Conway, P.E., Billerica Engineering
Joe Costanzo, Merrimack Valley Regional Transit Authority
Lisa DeMeo, P.E., Lowell Engineer
Dennis DiZoglio, Merrimack Valley Planning Commission (MVPC)
Ed Hollingshead, Fay, Spofford & Thorndike
Justin Howard, Northern Middlesex Council of Governments (NMCOG)
Anthony Komornick, Merrimack Valley Planning Commission (MVPC)
Andrea Leary, Merrimack Valley Transportation Management Association
Paul Materazzo, Town of Andover, Planning Division
Anne McKinnon, Howard/Stein-Hudson Associates
Joe Onorato, Massachusetts Highway Department (MHD)
Hardy Patel, MHD-Highway Design
Steve Robertson, Billerica DPW
Steve Sadwick, Town of Tewksbury
Elliot Schmiedl, MassRIDES
Rep. David Torrisi, State Representative
David Walker, Rockingham Regional Planning Commission
Beverly Woods, Northern Middlesex Council of Governments (NMCOG)

Purpose of meeting

Update the Advisory Group on the status of the Interstate 495 Corridor Transportation Study and to review the 2006 conditions, 2030 projections, and improvement ideas for the Interstate 495 corridor.

Summary

Welcome and introductions

Ethan Britland, project manager from the Executive Office of Transportation and Public Works, welcomed the Study Advisory Group (SAG) and led introductions. He said the project has been delayed due primarily to delays with the modeling. The 2030 projections were prepared by the Central Transportation Planning Staff (CTPS), which provides technical and policy-analysis support to Boston Metropolitan Planning Organization (MPO), and its volume of other work was so great that it was a long time before it could start the work. The study is on schedule to finish at the end of June 2008.

495 Corridor Review

Ed Hollingshead from Fay, Spofford & Thorndike (FST), lead consultant for EOTPW, described the study area, a 40-mile-long corridor that runs through 13 cities and towns. He reviewed the goals of the study—to improve

safety and mobility in the corridor. For analysis purposes, the corridor was divided into western and eastern sections. Ed Hollingshead described the three analysis cases: 2006 existing conditions, 2030 projected without improvements, and 2030 projected with potential improvements. Improvement options will be roadway, transit/TDM, and land use modifications.

2006 peak-hour traffic volumes: Daily traffic volumes in the western segment are generally higher than in the eastern segment. Traffic volumes in the a.m. and p.m. peak hours are evenly balanced in the western segment but not in the eastern segment.

2006 level of service: Ed Hollingshead reviewed the concept of level of service (LOS). Level of service measures amount of delay and is measured at signalized intersections, merge/diverge points, weaves, and on the mainline. Thirty-one intersections were studied—10 are signalized and 21 are unsignalized. None of the signalized intersections in the a.m. peak operated at LOS F and only 4 were F in the p.m. peak. At unsignalized intersections, 6 operated at LOS F in the a.m. peak and 10 were F in the p.m. peak.

At intersections off Interstate 495 on/off ramps with Interstate 495 travel lanes (merge/diverge/weave operations), the analysis of 2006 conditions shows that there are only a small number of problems. Of a total of 53 diverge points, only 6 operate at LOS F in the peak hours. Of the 49 merge movements, none operates at F in peak hours. Of the 19 weave movement, 6 operate at LOS F in the peak hour.

Top crash locations: The three crash locations that have the highest number of crashes are the I-495/I-93 interchange (Exit 40), the I-495/Rte. 125 interchange (Exit 51), and the I-495/Rte. 3 interchange (Exit 35). The top two crash locations are both full cloverleaf interchanges which require merge and weave movements in a congested interchange.

Projected 2030 peak-hour traffic volumes: The CTPS regional traffic model was used to project the future volumes along Interstate 495 in the study area. Known projects that will generate additional traffic were also included. In general, in the western segment, volumes are projected to increase between 8% and 18% by 2030. In the eastern segment, volumes are projected to increase at a higher percentage due largely to the fact that the overall volumes in the eastern segment are lower to start with. The analysis shows that in 2030, if no improvements are made, operations at some of the unsignalized intersections will worsen to an undesirable level of service (E or F). Nine unsignalized intersections will operate at LOS E or F in 2030 compared to 5 in 2006. Two signalized intersections are projected to worsen in 2030. Merge/diverge/weave locations that will operate at undesirable LOS are expected to increase from 14 to 52 throughout the corridor, with most of the problems found in the western segment.

Potential improvements: Ed Hollingshead described the nature of potential improvements the study team is looking at for the Interstate 495 corridor. Near-term improvements are those that would be done in less than 2 years (examples include signal retiming and lane restriping); mid-term; 3–8 years (examples include installing traffic signals and lengthening acceleration/deceleration lanes; and long-term, more than 8 years (examples include widening the Interstate 495 mainline and adding a new interchange).

<u>Potential near-term improvements (less than 2 years)</u>

- Exit 38 NB retime signal
- Exit 39 SB retime signal
- Exit 46 NB retime signal

<u>Potential mid-term improvements (3–8 years)</u>

Western segment

- Exit 32 NB lengthen acceleration lane
- Exit 32 NB and SB lengthen deceleration lanes
- Exit 33 NB install new signal
- Exit 34 NB and SB install new signal

- Exit 34 NB and SB lengthen acceleration lanes
- Exit 34 NB and SB lengthen deceleration lanes
- Exit 35 SB lengthen acceleration lane
- Exit 37 NB and SB install new signal
- Exit 37 NB and SB lengthen deceleration lanes
- Exit 38 SB lengthen acceleration lane
- Exit 39 NB and SB lengthen acceleration lanes
- Exit 40 NB and SB lengthen acceleration lanes

Eastern segment

- Exit 41 NB and SB lengthen acceleration lane
- Exit 41 NB and SB lengthen deceleration lanes
- Exit 42 NB and SB lengthen acceleration lanes
- Exit 42 NB and SB lengthen deceleration lanes
- Exit 43 NB and SB install new signal
- Exit 43 NB lengthen deceleration lane
- Exit 44 SB install new signal
- Exit 46 NB lengthen deceleration lane
- Exit 47 NB lengthen acceleration lane
- Exit 47 NB lengthen deceleration lane
- Exit 48 NB lengthen acceleration lane
- Exit 49 NB install new signal
- Exit 49 SB lengthen acceleration lane
- Exit 50 NB lengthen acceleration lane
- Exit 50 SB install new signal
- Exit 51 NB and SB lengthen acceleration lane
- Exit 52 NB and SB lengthen acceleration lane
- Exit 53 NB and SB lengthen acceleration lane
- Exit 54 NB lengthen deceleration lane
- Exit 55 NB and SB lengthen acceleration lane

Ed described the analysis of the non-standard merge/diverge/weave locations. The findings show that 29 of 49 acceleration lanes are non-standard and 21 of 53 deceleration lanes are non-standard. Three acceleration lanes are too short by a relatively few feet and two non-standard acceleration lanes would require lengthening bridges to accommodate longer acceleration lanes—nothing is proposed for these. Similarly, there are five deceleration lanes that are short by only a little and two that would require lengthening bridges to accommodate longer deceleration lanes—nothing is proposed for these locations. Nonetheless, 23 of the non-standard acceleration lanes and 14 of the non-standard deceleration lanes are candidates for improvements in 3–8 years. Although improving the acceleration/deceleration lanes may not have a dramatic impact on level of service, the improvements will help safety and driver comfort.

<u>Potential long-term improvements (more than 8 years)</u>
Western segment: Approximately 15 miles of widening from Exit 32 to beyond Exit 40
Eastern segment: Approximately 7 miles of widening from Exit 43 to beyond Exit 49

A long-term project such as a proposed Add-a-Lane project is likely to require 5–8 years for environmental review and design plus 3–4 years for construction. Given that implementation is likely to take 8–12 years, for the widening to be in place by 2030 work must start by 2018. Consequently, first steps are to include the Add-a-Lane projects in the NMCOG and MVPC Long-Range Transportation Plans. Also, it will be important for NMCOG and MVPC to conduct on-going checks of traffic-volume growth on Interstate 495 to monitor traffic increases. If traffic is increasing at a much greater rate than expected, the RPAs will have a handle on it through on-going monitoring.

Finally, Ed reviewed outstanding issues. A proposal for a new interchange at Rte. 225 in Westford is being evaluated. CTPS is preparing estimates of new traffic at this proposed interchange, and the estimates will be incorporated into this study soon. The evaluation of transit-improvement benefits, including new park-and-ride lots and other transportation demand management solutions, will be finished and presented at the next Study Advisory Group meeting in late March.

Questions and discussion

Dennis DiZoglio, MVPC, asked for more information on the near- and mid-term improvement projects. Ed Hollingshead said the near-term projects included retiming signals and restriping lanes. Mid-term improvements could include projects that would be on the Transportation Improvement Program to get in line for federal funding, such as new signals or simple improvements to acceleration/deceleration lanes.

Andrea Leary, Merrimack Valley TMA, asked if the recommendations will include identifying locations for more park-and-ride lots in the corridor. She said that steps to promote long-term institutional change are needed as part of the planning study's recommendations. Ed Hollingshead said the Study Advisory Group meeting at the end of March will go into detail about the impact transit and TDM improvements could have on congestion and mobility as well as possible long-term recommendations for mobility enhancements.

Curt Bellavance, No. Andover Community Development, asked about the 2030 travel demand model. Does it reflect the projected traffic as worst case or average? Statistics from MassHighway in the past have shown increases in drivers and miles traveled. Ed Hollingshead said travel demand model incorporates these factors. A key question to understand is who is using Interstate 495—if most of the drivers are from outside the region going to destinations along Interstate 495, then attempting to control traffic growth via land use is hard. However, if local trips are growing, then influencing land use decisions could have an effect.

Beverly Woods, NMCOG, asked about the impact of trucks. Ed Hollingshead said that the study team, with the help of the NMCOG and MVPC, estimated the percentage of trucks on Interstate 495. Trucks were counted at four locations and were estimated to be up to 14% of the daily traffic on Interstate 495. This is a high percentage, but there are other locations in the state with similar truck volumes. The study team re-analyzed the merge/diverge/weave level of service incorporating the new truck volumes and the LOS was not changed. Nevertheless, driver comfort and convenience are affected by high numbers of trucks, and addressing the geometric constraints along the corridor may improve drivers' comfort around trucks. Beverly said many have a perception that accidents are often caused by trucks. Ed said the study team did not study the individual accident reports to determine how many involved trucks.

Ethan Britland clarified that the recommendations for the long-term Add-a-Lane projects are at this point based on this initial analysis of projected volumes in 2030. He acknowledged that the impacts of widening are significant in many ways and said the mid-term improvements would have an impact on operations and safety. Dennis DiZoglio asked what the impact on Interstate 495 would be if I-93 in Massachusetts is not widened. Ed Hollingshead said there would be fewer vehicles traveling from I-93 to Interstate 495 at the peak time, but drivers would still make the trips.

Rep. David Torrisi asked if cost estimates will be prepared. Ed Hollingshead said cost estimates will be presented as ranges based on this planning level of analysis. Joe Onorato, MassHighway, asked how the three top crash locations would be improved to address the safety issues. Ed Hollingshead said the Add-a-Lane projects would incorporate these three interchanges and would eliminate the cloverleafs, thereby improving the design of the interchange for safety and operational reasons. Andrea Leary asked how realistic land use controls would be when there is so much developable land. Ethan Britland said the Commonwealth does not control land use and zoning making it difficult for state agencies to influence local land use decisions. Andrea Leary said the non-highway and multimodal recommendations part of the study report can be instrumental in helping cities and towns promote and plan for alternatives to the automobile.

Tony Komornick, MVPC, asked if there are links on the Interstate 495 mainline with significant crash activity

that might indicate design problems. MassHighway was doing a study of lane departure crashes. Ed Hollingshead said the study team looked at an area in Westford for this purpose but could not identify design-related issues; it was inconclusive. Joe Onorato said Industrial Avenue in Lowell is often used as a short cut from Interstate 495 to Rte. 3 and should be noted. He suggested that the report describe fully the scope of the Add-a-Lane projects to ensure that people understand the bridges and interchanges would be part of the Add-a-Lane projects, too.

Beverly Woods asked that the PowerPoint slides be posted to the www.495studyinfo.com Web site.

Next Steps

- Continue the analysis and refine the proposed near term (1–2 years); mid term (3–8 years); and long term (8+ years) improvements (highway and non-highway)
- February and March: Meetings with RPC committees and other interested organizations
- Late-March: Study Advisory Group meeting; focus on non-highway improvements and actions
- April: Public meetings, one in the NMCOG region and one in the MVPC region, on the draft recommendations
- June: The final report, the Corridor Improvement Plan, will be prepared incorporating input from the outreach and public meetings. This document will be a road map for MassHighway and cities and towns to use to identify projects to advance.

The meeting adjourned at 12:16 p.m.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF TRANSPORTATION

EOT

I-495 CORRIDOR TRANSPORTATION STUDY

STUDY ADVISORY GROUP MEETING

Wednesday, April 23, 2008

1:00 PM – 3:00 PM

Tewksbury Public Library
300 Chandler Street
Tewksbury, MA

AGENDA

1. Welcome and Introductions
2. Non-Highway Improvements
3. Refined Highway Improvements
4. Discussion of Public Informational Meetings
5. Questions/Discussion

Tewksbury Public Library, 300 Chandler Street, Tewksbury
Phone: 978-640-4490

Directions
The Library is located on the corner of Main Street (Route 38) and Chandler Street. Following are directions from points North and South on I-495 and I-93.

495 North and South:
Take exit 38 off of I-495. This will bring you to Route 38. Take a left onto Route 38 (you will be driving south) and travel approximately 2.5 miles. After you pass through the center of Tewksbury, you will come to a set of lights with a Shell gas station on your left. Take a left onto Chandler Street. The library is located at 300 Chandler Street on your right hand side.

93 Traveling South:
Take exit 42 off of I-93. This is Dascomb Road. Dascomb Road turns into East Street almost immediately. Travel approximately 3 miles on East Street. You will see the Tewksbury Hospital campus (surrounded by a stone wall) on your left hand side. Look for a blinking light, this is Chandler Street. Take a left onto Chandler Street. The library is located at 300 Chandler Street on your left hand side.

93 Traveling North:

Take exit 42 off of I-93. This is Dascomb Road. Take a left onto Dascomb Road, which turns into East Street almost immediately. Travel approximately 3 miles on East Street. You will see the Tewksbury Hospital campus (surrounded by a stone wall) on your left hand side. Look for a blinking light, this is Chandler Street. Take a left onto Chandler Street. The library is located at 300 Chandler Street on your left hand side.

Executive Office of Transportation and Public Works

I-495 Corridor Transportation Study
Study Advisory Group Meeting

Wednesday, April 23, 2008
Tewksbury Public Library, 1:00 p.m.

Meeting Summary

Attendees

Rachael Bain, Executive Office of Transportation and Public Works, Office of Planning (EOTPW)
Ethan Britland, EOTPW
Lisa DeMeo, P.E., Lowell Engineer
Ed Hollingshead, Fay, Spofford & Thorndike
Jeffrey R, Gomes, City of Lowell
Joanne Haracz, DMJM Harris
Justin Howard, Northern Middlesex Council of Governments (NMCOG)
Anthony Komornick, Merrimack Valley Planning Commission (MVPC)
Andrea Leary, Merrimack Valley Transportation Management Association
John Livsey, Town of Westford
Paul Materazzo, Town of Andover, Planning Division
Anne McKinnon, Howard/Stein-Hudson Associates
Paul Nelson, EOTPW
Hardy Patel, MHD-Highway Design
Constance Raphael, MassHighway District 4
Steve Sadwick, Town of Tewksbury
Elliot Schmiedl, MassRIDES
Michelle Stein, Town of Tewksbury
Joanne Weinstock, EOTPW
Beverly Woods, Northern Middlesex Council of Governments (NMCOG)

Purpose of meeting

Update the Advisory Group on the status of the Interstate 495 Corridor Transportation Study, focusing on the non-highway options, refined highway improvements, evaluation of the proposed interchange at Route 225, and plans for public meetings in May.

Summary

Welcome and introductions

Ethan Britland, project manager from the Executive Office of Transportation and Public Works, welcomed the Study Advisory Group (SAG) and led introductions.

495 Corridor Review

Ed Hollingshead from Fay, Spofford & Thorndike (FST), lead consultant for EOTPW, said there are basically three types of improvement options for Interstate 495 in the study area: land use modifications, multi-modal options, and roadway-oriented improvements.

Land-use modifications:

A potential solution for preserving future Interstate 495 operations through land use changes involves studying how many trips start or end in the corridor and how many trips start and end in the corridor and use Interstate 495. In 2006, 58% of all a.m. three-hour peak-period trips stay in the corridor. Of the trips that start or end in the corridor, only 19% use Interstate 495 and only 14% of the trips that start and end in the corridor use Interstate 495. About 80% of the trips in the corridor communities do not use Interstate 495. Further, about 51% of all trips in the three-hour a.m. peak period are through trips not going to destinations in the study area. When considering how much impact land use changes could have on corridor congestion in 2030 given these facts—only about 1,450 additional trips by direction are projected for the entire corridor starting or ending in corridor communities—it appears to be small.

Multi-modal (non-highway) options:

Existing transit radiates from hubs in Lowell, Lawrence, Andover, North Billerica, and Haverhill. Transportation Management Associations (TMA) such as the Junction TMO and The Merrimack Valley TMA provide ridesharing and vanpool services that supplement MBTA and RTA transit services. Options for increasing transit, carpool, and vanpool patronage include adding new Park and Ride lots in the study area. Potential locations for further study include:

- Chelmsford at Route 3 and Route 27
- Tewksbury at Exit 39 and Rote 133
- Haverhill at Route 97 near Exit 50
- Haverhill at Route 110 near Exit 52

Roadway-oriented improvements:

Near-term improvements (less than 2 years): Signal retiming

- Exit 38 NB and Route 38 retime signal
- Exit 39 SB and Route 133 retime signal
- Exit 46 NB and Route 110 retime signal

Near-term estimated cost: $3,000 per location, Total Cost $9,000

Mid-term improvements (3–8 years): Intersection improvements

Western segment

- Exit 33 NB install new signal
- Exit 34 NB and SB install new signal
- Exit 37 NB and SB install new signal

Eastern segment

- Exit 43 NB and SB install new signal
- Exit 44 SB install new signal
- Exit 49 NB install new signal
- Exit 50 SB install new signal

At Exit 51 at Route 125 an opportunity exists for a capacity improvement that would take advantage of an underutilized travel lane, the two-way left turn lane on Route 125.. The roadway could be reconfigured to provide two 12-foot travel lanes and a 5-foot shoulder NB and one 12-foot lane and a 5-foot shoulder SB. This reconfiguration would improve level of service.

Mid-term improvements (3–8 years): Merge and Diverge improvements

Western segment

- Exit 32 NB lengthen acceleration lane
- Exit 32 NB and SB lengthen deceleration lanes
- Exit 34 NB and SB lengthen acceleration lanes

- Exit 34 NB and SB lengthen deceleration lanes
- Exit 35 SB lengthen acceleration lane
- Exit 37 NB and SB lengthen deceleration lanes
- Exit 38 SB lengthen acceleration lane
- Exit 39 NB and SB lengthen acceleration lanes
- Exit 40 NB and SB lengthen acceleration lanes

Eastern segment

- Exit 41 NB and SB lengthen acceleration lane
- Exit 41 NB and SB lengthen deceleration lanes
- Exit 42 NB and SB lengthen acceleration lanes
- Exit 42 NB and SB lengthen deceleration lanes
- Exit 43 NB lengthen deceleration lane
- Exit 46 NB lengthen deceleration lane
- Exit 47 NB lengthen acceleration lane
- Exit 47 NB lengthen deceleration lane
- Exit 48 NB lengthen acceleration lane
- Exit 49 SB lengthen acceleration lane
- Exit 50 NB lengthen acceleration lane
- Exit 51 NB and SB lengthen acceleration lane
- Exit 52 NB and SB lengthen acceleration lane
- Exit 53 NB SB lengthen acceleration lane
- Exit 54 NB lengthen deceleration lane
- Exit 55 NB and SB lengthen acceleration lane

Mid-term estimated costs:

Intersection improvements: Western segment—$1.15 million; Eastern segment—$1.5 million–$X.XX million. Total corridor: $2.65 million.
Acceleration and deceleration lane improvements: 24 merge/diverge locations, $51,000
Route 125 reconstruction: Approximately $500,000
Total: $3.2 million

Potential long-term improvements (more than 8 years)

Western segment: Approximately 15 miles of widening from Exit 32 to beyond Exit 40
Eastern segment: Approximately 7 miles of widening from Exit 43 to beyond Exit 49

Long-term estimated costs:

Widening in the median and replacing all interchanges along 15 miles of highway (excluding Route 3 and the Lowell Connector): Approximately $84 million

Timetable for the long-term improvements: Environmental analyses and design will take between 5 and 8 years and the construction will take about 3 or 4 years. To be in place by 2030, work must start by 2018.

Proposed Route 225 Interchange

A proposal for a new interchange at Route 225 in Westford was evaluated. Typically, interchanges are spaced about 1 mile apart, and the proposed interchange would be 1 mile from both Exit 31 and Exit 32. The Central Transportation Planning Staff projected the volumes that would use the new interchange and estimates of impacts of the new interchange on Exits 31 and 32. The new interchange would add about 850 vehicles to Route 225 SB at Route 110 and about 600 vehicles to Route 225 NB at Route 110 in the a.m. peak hour. One of the goals of building a new interchange was to relieve Exit 32, but the analysis shows that the new interchange would have more of an impact on Exit 31 (Route 119) in Littleton. Beverly Woods said the Route 225 intersection was originally supposed to be improved by a developer, and a proposed bypass road would have helped the situation.

Westford could consider the bypass road at some point again

Next Steps

Ed Hollingshead said the Corridor Improvement Plan will be finalized over the next month. The report will be sent to the SAG, Working Group, and available on the Web site. Two public meetings will be held, one in each Regional Planning Agency area:

Thursday, May 22, 2008, Lowell City Hall 6:30 – 8:30 p.m.
Tuesday, May 27, 2008, Northern Essex Community College 6:30 – 8:30 p.m.

The study will be completed by June 30, 2008.

Ethan Britland said communicating the key issues and recommendations to the public and getting input is key to advancing the improvements. He encouraged SAG members to help get the word out to people and businesses.

Questions and discussion

Joanne Weinstock, EOTPW, asked if there is a "margin of error" for the estimated 2030 volumes. Ethan said the Federal Highway Administration has standards that it uses, and the CTPS estimates are within the allowable range. Ed Hollingshead said the volumes are solid estimates based on a series of documented assumptions. These estimates should be strong if the assumptions hold.

Tony Komornick asked if the transit analysis included improved or additional service on commuter rail. Discussions about double-tracking the Haverhill line have been underway along with the possibility of extending commuter rail service to Plaistow, NH. Ed said these were not factored in, but typically, the impacts would be seen south of the station expansion or service upgrade. Tony requested that these commuter rail improvements be referenced in the final report

Stan Wood, MassHighway, questioned the cost estimates for the widening and the bridge reconstruction. These will be checked again. Steve Sadwick, Tewksbury, asked how the Route 495/93 interchange would be addressed. Ed said this location would receive additional study either under the future study to widen I-495 or as part of a future study to widen I-93. Constance Rafael, MassHighway District 4, suggested rephrasing the "future steps" for the long term projects to say that the RPAs and MassHighway will work to develop projects for their TIP. She asked what the cost estimate for the signals includes. Controller only. Beverly Woods requested that the cost estimates be presented as ranges. She said the costs for the signals seemed low.

Constance Rafael asked for details on which acceleration/deceleration lanes were included in the mid-term improvements. Some could possibly be included in resurfacing projects. Paul Nelson, EOT said all of the acceleration and deceleration lanes that are non-standard should be listed despite some being short by only a few feet.

The meeting adjourned at 2:20 p.m.

PUBLIC MEETING NOTES

Executive Office of Transportation and Public Works

I-495 Corridor Study Public Meeting

Meeting Notes

May 22, 2008
Lowell City Hall, Lowell, MA

Attendees: See attached attendance sheet.

Following an Open House that began at 6:00 where the public could review graphics and plans with project staff, the public meeting began at 6:30. The meeting began with a presentation focusing on the western part of the I-495 from the Westford Town Line to I-93 by Ethan Britland, EOTPW Project Manager; Ed Hollingshead, consultant Fay, Spofford & Thorndike (FST) Project Manager; and Joanne Haracz, DMJM + Harris Project Manager. The PowerPoint presentation from the meeting is available to the public on the project web site www.495studyinfo.com.

Questions from the Public

The following questions were raised by attendees and answered by the team.

Q: As gas prices go up, what is the impact on volumes? Has this been accounted for in the study?
A: This has not been accounted for in the study.

Q: Of interest to the public are alternative modes of transportation, such as public transit, park & rides, etc. Someone should develop a model of mode choice based on gas prices.
A: The model uses employment, population, land use, etc.

Q: Short-term issue – reactive to growth/development once fleet converts to alt. fuel, growth could continue.

I-495 Corridor Study
Public Meeting
Sign-In Sheet
Lowell City Hall, Lowell, MA, Thursday, May 22, 2008

Please Print Clearly

Name	Affiliation	Complete Mailing Address	Telephone/Email
*(12) MARK E. GOLDMAN	Concerned Citizen	58 Oakland St. Lowell, Ma. 01851	978-441-1374
Elliot Schmiedl	Massrides	10 Park Plaza Boston, MA 02116	617-892-6097
Lisa Redmond	Lowell Sun	491 Dutton St. Lowell	lredmond@lowellsun.com
DAVID GINNS	NMCOG	115 THORNDIKE ST. 01852	978/454-8021x13
BRUCE KELLER	TOWN OF AMESBURY	62 FRIEND ST, AMESBURY MA 01913	978 388-8110 x 313
Beverly Woods	NMCOG	115 Thorndike St, Lowell 01852	978-454-8021x20
LISA DeMEO	CITY	375 MERRIMACK ST.	978-970-3331
PROMISE OTALOLA	FHWA	55 BROADWAY CAMBRIDGE	617-494-2528
Jeffrey R. Gomes	City of Lowell	50 Arcand Drive Lowell MA 01854	978/970/7200

Executive Office of Transportation and Public Works

I-495 Corridor Study Public Meeting

Meeting Notes

May 27, 2008
Northern Essex Community College, Haverhill, MA

Attendees: See attached attendance sheet.

The meeting began with a presentation focusing on the western part of the I-495 from I-93 to I-95 in Salisbury by Ethan Britland, EOTPW Project Manager; Ed Hollingshead, consultant Fay, Spofford & Thorndike (FST) Project Manager; and Joanne Haracz, DMJM + Harris Project Manager. The PowerPoint presentation from the meeting is available to the public on the project web site www.495studyinfo.com.

Questions from the Public

The following questions were raised by attendees and answered by the team.

Q: A signal has recently been put in place at one of the proposed signal locations.
A: The team was unaware of the signal installation- they will look into it.

Q: Questions about Exit 51 Reconstruction, lane widening and lane utilization.
A: The history of the exit interchange was discussed by the Regional Planner (in attendance) and the project team addressed comments and stated southbound widening was not a solution because the traffic was only a problem in one peak direction.

Q: Is the middle lane reversible?
A: It was looked into by the project team, and not found to be a possible solution.

I-495 Corridor Study
Public Meeting
Sign-In Sheet
Northern Essex Community College, Haverhill, MA, Tuesday, May 27, 2008

Please Print Clearly

Name	Affiliation	Complete Mailing Address	Telephone/Email
BRUCE KELLER	TOWN OF AMESBURY	62 FRIEND ST, AMESBURY MA 01913	978 388-8110 x313 KELLERB@CI.AMESBURY.MA.US
TOM KOMORWICK	MVPC	160 Main Street, Haverhill MA	978-374-0519 AKomorwick@mvpc.org
Elliot Schmiedl	MassRides	10 Park Plaza, Boston, MA	617-892-6097 elliot.schmiedl@eot.state.ma.us
Kate Rozzi	Rep. David Torrisi	Rm 39, State House	978 943-6085 kate.rozzi@state.ma.us
Jenn + Robert Ciofolo	Resident	60 calumet Rd Methuen MA	978-689-4098 none
LISA/PETER DeMEO	CITY OF LOWELL & RESIDENTS HAVERHILL	57 NORTH AVE HAVERHILL, MA 01830-2635	978-374-9344 pjdwile@comcast.net

STUDY ADVISORY GROUP (SAG) MEMBERS

Study Advisory Group members (invited members)

First	Title	Town /Agency
Honorable Cory Atkins	State Representative	14th Middlesex District
Honorable Steven Baddour	State Senator	1st Essex District
Joseph Bevilacqua	President & CEO	Merrimack Valley Chamber of Commerce
Curt Bellavance	Director of Community Dev.	North Andover
Honorable Linda Campbell	State Representative	15th Essex District
Robert Carroll	Chair, Board of Selectmen	Salisbury
Kay Carson	Program Director	MassRIDES
Edward “Bud" Caulfield	Mayor	Lowell
Sally Cerasuolo-O'Rorke	President	Greater Haverhill Chamber of Commerce
Rosemary Connelly Smedile	Chair, Board of Selectmen	North Andover
Kelley Conway, P.E.	Town Engineer	Billerica
Joe Costanzo	Administrator	Merrimack Valley Reg’l Transit Authority
Honorable Michael Costello	State Representative	1st Essex District
Honorable Brian Dempsey	State Representative	3rd Essex District
Lisa DeMeo, P.E.	City Engineer	Lowell
Dennis DiZoglio	Executive Director	Merrimack Valley Planning Commission
Richard Doyle	Regional Administrator	Federal Transit Administration
Philip Eliopolous	Chair, Board of Selectmen	Chelmsford
Honorable Susan Fargo	State Senator	3rd Middlesex District
Honorable Barry Finegold	State Representative	17th Essex District
James Fiorentini	Mayor	Haverhill
Stan Franzeen	Director	Junction TMO
Stanley Gee	Division Administrator	Federal Highway Administration
Joseph Gill	Former Selectmen	Tewksbury
Honorable Thomas Golden, Jr.	State Representative	16th Middlesex District
Daniel Grabauskas	General Manager	MBTA
Honorable William Greene, Jr.	State Representative	22nd Middlesex District
Honorable Geoffrey Hall	State Representative	2nd Middlesex District
Robert Halpin	President	Merrimack Valley EDC
Geraldine Healy-Coffin	Former Selectmen	Westford
David Hildt	Mayor	Amesbury
Tony Komornick	Transp. Program Manager	Merrimack Valley Planning Commission
Honorable William Lantigua	State Representative	16th Essex District
Andrea Leary	Executive Director	Merrimack Valley TMA
Patricia Leavenworth	District 4 Highway Director	Massachusetts Highway Department
Honorable Barbara L'Italien	State Representative	18th Essex District
William Manzi	Mayor	Methuen
Paul Materazzo	Director of Planning	Andover
Honorable James Miceli	State Representative	19th Middlesex District
Maria Miles	President	Salisbury Chamber of Commerce
Honorable Kevin Murphy	State Representative	18th Middlesex District
Honorable David Nangle	State Representative	17th Middlesex District
Jeanne Osborn	President & CEO	Greater Lowell Chamber of Commerce
Ann Ormond	President	Greater Newburyport C of C and Industry
Joe Onorato	District 4	MassHighway
Honorable Steven Panagiotakos	State Senator	1st Middlesex District
Hardy Patel	MassHighway Design	MassHighway
Camille Pattison	Transportation Planner	Nashua Regional Planning Commission
Lowell Richards	Dir., Econ. Plng. & Dev.	Massachusetts Port Authority
Michael Rosa	Chair, Board of Selectmen	Billerica
Steve Sadwick	Community Development	Tewksbury
James Scanlan	Administrator	Lowell Regional Transit Authority
Honorable Harriett Stanley	State Representative	2nd Essex District
Michael Sullivan	Mayor	Lawrence
Ted Teichert	Board of Selectmen	Andover
Honorable John Tierney	U.S. Congress	6th District of Massachusetts
Honorable David Torrisi	State Representative	14th Essex District
Honorable Niki Tsongas	U.S. Congress	5th District of Massachusetts
Carol Traynor	Board of Selectmen	Merrimac

Honorable Susan Tucker	State Senator	2nd Essex and Middlesex Districts
David Walker	Transportation Planner	Rockingham Planning Commission
Dennis Welcome/Stefanie McCowan	Executive Director	Alliance for Amesbury
Beverly Woods	Executive Director	No. Middlesex Cncl. of Government

WEBSITE COMMENTS

Name:

Date: 8/8/2006 6:05:07 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Chelmsford to Andover.

3. **What is your experience on the 495 corridor?**

   Overall not too bad during the day although constantly congested but moving. Do see bottlenecks at the route 3 interchange and the 93 interchange.

4. **What are the most important issues this study should address in your opinion?**

   Lengthening of onramps for cars and especially large trucks to accelerate to highway speed before entering the main lanes. Adding a fourth lane would possibly offer a significant improvement to traffic flow, but off-ramps and on ramp design need a serious redesign as to minimally affect traffic already in main lanes.

Name: Siedzik, Michael

Date: 12/30/2006 10:04:22 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   No
   If I did live nearby, I would encourage the use of quiet pavement.

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Amesbury (live in NH) to Westford (work in Westford).

3. **What is your experience on the 495 corridor?**

   I find traffic moves well, except for a few bottleneck areas:

   1) AM commute, southbound, I-93 interchange. Traffic merging from I-93 south onto I-495 south can cause backups to the double decker bridge. The problem is compounded by the hill trucks must climb after merging. A short-term solution could be to pave a 4th lane to the right of the 3 existing lanes and force slow moving vehicles (or all vehicles from I-93 south) to use this lane. The overpass at the top of the hill will limit the length of this lane, but I think it would help. A long-term solution may be to split I-495 into local/express lanes at the I-93 interchange, as happens at the Rt3 interchange.

   2) Evening commute, northbound, Rt-3 interchange. Too many cars. May need to add a 4th lane from Rt3 all the way to I-93.

3) Evening commute, northbound, Exit 41-50. Again, too many cars. The congestion quickly clears up after exit 50. What might help between exits 48 and 50 is driver education. Use signs or a radio campaign to let people know that the left lane is for passing only. A lot of cars continue to cruise along in the left lane at 45mph after the congestion clears. These slow cars fall behind the car in front of them by 10 or 20 seconds, which greatly reduces overall highway capacity.

Also, I think the road surface is in excellent condition. Good job!

4. **What are the most important issues this study should address in your opinion?**

a. Lane expansion, where necessary.
b. Driver education (left lane is for passing only).
c. Driver information (electronic signs which warn of accidents and/or road conditions).
d. Encourage carpooling by adding a park-and-ride lot in Amesbury.
e. Public transportation. Have buses or vans, which travel from the park-and-ride lot to major technology parks along the I-495 corridor.

Name: Reitz, Paul

Date: 1/17/2007 12:02:34 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   No

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   I commute from Hopkinton to Chelmsford exit 33 or 35, depending on time of day, and reverse, about 36 miles.

3. **What is your experience on the 495 corridor?**

   I must arrive Hopkinton prior to 6 am to prevent a very stressful commute.

4. **What are the most important issues this study should address in your opinion?**

   There is usually very limited visibility due to roadspray when the roadway is wet EXCEPT for one stretch of this corridor, northbound, from about 3 miles south of the Chelmsford rest area to exit 33, where the paving seems to reduce road spray.

   The improvement in visibility is so obvious and so amazing that I must ask whether the feature is intentional. If it is a design feature, then kudos to the engineering team!! If not, please investigate whether the characteristic can be replicated elsewhere. That segment of the study corridor is much easier and safer to drive in dense traffic on rainy days than other sections.

Name:

Date: 1/17/2007 1:20:39 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Westford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Westford-Andover, and Andover to 95

3. **What is your experience on the 495 corridor?**

   495/3 interchange is a mess, as is the 495/93 interchange. The distance between on ramps and off ramps causes un safe conditions and "road rage" driving to enter/exit the highway. Drivers often skip the line and plow through traffic to get through faster.

4. **What are the most important issues this study should address in your opinion?**

   Exit structure and road conditions, Potholes don’t seem to get fixed for over a year.

Name: Hooper, Tyler

Date: 1/17/2007 5:37:41 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Amesbury, between exit 53 and 54

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

   I primarily use 95 South to Route 1. I would love to be able to get to 95 South from 495N. This would save considerable congestion along rt110 especially in the summer with the beach traffic.

3. **What is your experience on the 495 corridor?**

   I travel through the Merrimack Valley regularly between Methuen and Salisbury. The traffic through Lawrence, Methuen, and Haverhill can be very slow. It was a factor leading to my move from Haverhill to Amesbury.

4. **What are the most important issues this study should address in your opinion?**

   I would like you to consider making connections between 495N and 95S and from 95N to 495S. This would relieve significant congestion from the Route 110 area in Amesbury and Merrimack year round. Amesbury and Salisbury would greatly improve in the summer.

Name: Farrell, Bernard

Date: 1/17/2007 8:12:01 PM

Publication Consent: Yes

---

1. **Do you live in the study area?**
   If yes, please list which town.

   No

   I live in Littleton (just outside the area) and commute daily to Chelmsford.

   Can you provide an RSS feed for this site, so I can subscribe for updates to the site?

   If this is not possible, it would be nice to problem a mailing list so I could receive an update by e-mail when available.

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   From Littleton to Chelmsford. For about 4 years now.

3. **What is your experience on the 495 corridor?**

   Increasingly busy. Even in the slow lane, it's hard to maintain a 65 MPH speed limit, as the speeds on the highway seem to often exceed 75 MPH.

4. **What are the most important issues this study should address in your opinion?**

   Better on and off ramps, extra road width for busy portions.

Name:

Date: 1/18/2007 10:42:53 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Live in Methuen. A short term problem I see in the AM commute at the lights to enter 495 South at exit 46 are the traffic light and sign indicate only the left lane to enter 495 south. However the 2nd lane from the left is painted with an arrow to enter 495 south. The one lane can back up and require up to 3 signal changes to get on the highway during some rush hours. Therefore drivers use the 2nd lane from the left to cut cars off in the correct lane to get on. I have seen angry drivers and near accidents. This was a change from the original contraction several years ago when the lights were installed. I believe it would be better to allow 2 lanes of traffic to enter the highway. This may be safer if the on ramp was widened a bit to allow cars move room to merge to a single lane before entering the highway.

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes
   Commute to exit 28 in Boxborough weekdays.

3. **What is your experience on the 495 corridor?**

   95% of time commuting for the work hours of 7:30am to 4:00pm is great 65mph each way. I take off Fridays on 3 long summer holiday weekends as commuting home is at least doubled due to the expected holiday traffic heading north.
   This was not the case for several years when the bridges were rebuilt over Rt 3 the same time the double decker bridge in Lawrence had to be replaced.

4. **What are the most important issues this study should address in your opinion?**

   Short term I notice some steel bridge beams have been maintained but other look like they are corroding. Long term I would like this study to be able to keep a step ahead of maintenance increased future traffic flow and growth.

Name: Morgan, Kenneth

Date: 3/13/2008 1:35:59 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Westford.

   The large increase in traffic on I-495 has resulted in significantly higher noise levels experienced by abutters, particularly residences. I feel that consideration of noise barriers is essential to this study and would like to know whether noise barriers have been/will be included?

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What is your experience on the 495 corridor?**

   The large increase in traffic on I-495 has resulted in significantly higher noise levels experienced by abutters, particularly residences. I feel that consideration of noise barriers is essential to this study and would like to know whether noise barriers have been/will be included?

4. **What are the most important issues this study should address in your opinion?**

   The large increase in traffic on I-495 has resulted in significantly higher noise levels experienced by abutters, particularly residences. I feel that consideration of noise barriers is essential to this study and would like to know whether noise barriers have been/will be included?

Name: Morgan, Kennth

Date: 3/14/2008 9:48:34 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Westford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What are the most important issues this study should address in your opinion?**

   Noise barriers between Interchanges 31&32.

Name: Budrow, Jackie

Date: 5/10/2008 9:56:07 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Lowell between exits 37 & 38.
   Will the future construction to increase the amount of traffic on 495 are there any plans to install sound barriers along this section?
   My house backs up to 495 and the traffic noise has got to be so bad that I can't leave my windows open.

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

   I commute via the Lowell Commuter rail from North Billerica to Boston.

3. **What is your experience on the 495 corridor?**

   15 years ago when I first moved to this area the traffic was at its heaviest in the morning and even commutes. Now the traffic and traffic noise is virtually non-stop.

4. **What are the most important issues this study should address in your opinion?**

   Installation of sound barriers in areas that housing abuts 495.

Name: Impink, Paige

Date: 5/22/2008 12:14:29 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Tewksbury. The merge from Rt 3 N to 495 N is horrible. The way the lines are painted, it puts two lanes of traffic together, leaving the drivers to sort out which car will "win", which we know doesn't work. The line from the "already" northbound 495 stream, the line from the "going to the Lowell connector but decided not to" and the "coming from Rt 3 N" all collide. There needs to be more delineation for longer before cars sort out their lanes.

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No
   Just live in the area. Mom with kids.

3. **What is your experience on the 495 corridor?**

   It is a very fast road. The trucks are everywhere. There should be better signage for out of state drivers, of which there are tons on 495. Perhaps signs such as "slower vehicles keep right" would be useful. Also, a better heads up before exits would be good.

4. **What are the most important issues this study should address in your opinion?**

   The massive clog at Rt3 N/Rt 495N in the summer. Much could be mitigated by repainting the lines as referenced in my earlier comments.

Name: Doherty, Sandra

Date: 5/22/2008 1:04:41 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Billerica

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Billerica to Lowell

3. **What is your experience on the 495 corridor?**

   I go against the flow so it is not too bad and I also work 7:30 to 2:30

Name: Dean, Aemy

Date: 5/22/2008 3:12:14 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Tewksbury

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What is your experience on the 495 corridor?**

   I travel on 495 on almost a daily basis. I travel north to the Andovers as well as south to Chelmsford for classes, medical appointments, etc. As an urban planner, I see many aspects of the roadway that are unsafe. For instance, the interchange from 495 South to Rt. 3 South is extremely dangerous even during times of light traffic. Having three lanes of traffic merging and crossing lanes in such a short space is chaotic at best. Also, the merge from Rt. 3 North to 495 North is dangerous and poorly designed. Again, the merging of three lanes of traffic in such a short stretch of roadway is dangerous and nerve-racking for drivers. These designs may "work" in theory but that's when everyone obeys the rules of the road and properly yields the right-of-way, which is a rare occurrence indeed.

4. **What are the most important issues this study should address in your opinion?**

   Roadway design and traffic logistics especially during times of high traffic volume.

Name:

Date: 5/22/2008 4:30:08 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Tewksbury

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What are the most important issues this study should address in your opinion?**

   The merge northbound just after Rt. 3 is an issue. The highway contracts from five lanes to three, creating a traffic bottleneck due to mergers. It would be best to start a forth lane from there onto Salisbury, or at least to Exit 37. Also making Exit 40 a flyover would help with safety and flow.

Name:

Date: 5/22/2008 5:33:52 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Tewksbury

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Not for work, but use 495 quite often

3. **What is your experience on the 495 corridor?**

   Do not like the merge from Rt3 North to Rt495 North

Name: Ward, Max

Date: 5/22/2008 7:47:58 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Chelmsford to Marlboro

3. **What is your experience on the 495 corridor?**

   Increasing traffic over the last 15 years that I've been commuting.

4. **What are the most important issues this study should address in your opinion?**

   Eliminate the half-exit from 495 to North Rd in Chelmsford. The only purpose this exit appears to have is to allow NH commuters to bypass the rte 495-rte 3 interchange by cutting down North Rd (Rt 4), creating large volumes of traffic on North Rd. Personally, I have no problem getting off and on the rte 110 exit instead of exiting on rte 4.

Name: Impink, Paige

Date: 5/22/2008 9:37:08 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Tewksbury

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

   Just live in the area.

3. **What is your experience on the 495 corridor?**

   Very fast road. Definitely would never pull over if I had car trouble- too dangerous.

4. **What are the most important issues this study should address in your opinion?**

   The downramp at exit 37 Woburn Street on 495 N- it is much too short to make a safe stop, and the hill is too steep. Not enough run time to come to an easy yield, and many people blow through the yield

   Also, 495 S, same exit other side- hard to see oncoming cars to make the left, pavement is a mess, brush makes it hard to see, and when the trains let out from No. Billerica Station, there is no chance to take a left toward Billerica or Tewksbury

Name: Doherty, Brian

Date: 5/23/2008 12:36:50 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Chelmsford to Tewksbury

3. **What is your experience on the 495 corridor?**

   Problem area is in Chelmsford on the northbound side where Route 3 traffic comes on. There are 5 lanes that merge into three, and this seems to be an area that can be improved.

4. **What are the most important issues this study should address in your opinion?**

   For me, it is the on-ramp in Chelmsford on Route 4 to 495 South and the off-ramp on Route 4 from 495 North. It would seem worthwhile to figure how much traffic flow is using Route 4 as a cut through to, or from, Route 3.

Name: Freeman, Kenley

Date: 5/23/2008 7:19:09 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. Do you commute along the 495 corridor?
   If yes, from which town and to which town?

   Yes

   Chelmsford to Haverhill

3. **What is your experience on the 495 corridor?**

   Generally good as I am mostly against traffic. Biggest problem is at 495/93 intersect

4. **What are the most important issues this study should address in your opinion?**

   495/93 intersects. In rush hours traffic is stopped in travel lanes attempting to exit. This includes middle lanes. Dual exit lanes would be helpful.

   Also, Rt 4 Chelmsford exit traveling northbound on 495 is unnecessary, dangerous, and a general hemorrhoid to Chelmsford residents. It offers no benefit to residents but gives NH residents a convenient cut-through at high speeds on city streets.

Name:

Date: 5/23/2008 7:26:18 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Andover, exit 41

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What is your experience on the 495 corridor?**

   Noisy. In the past 4 years the noise level has gotten worse.

4. **What are the most important issues this study should address in your opinion?**

   Noise.

Name:

Date: 5/23/2008 8:41:45 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Andover

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Andover to Boston

3. **What is your experience on the 495 corridor?**

   It is very dangerous. Cars drive way too fast for the amount of congestion. Fatal accidents are common.

4. **What are the most important issues this study should address in your opinion?**

   Safety.

Name:

Date: 5/23/2008 9:48:40 AM

Publication Consent: No

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What are the most important issues this study should address in your opinion?**

   My issue is the ramp system from 495 South to 3 South. After you take the exit and cross under the Lowell Connector, there are two on-ramps in a row (one from Lowell Connector and one from 3 North) that each add a lane. So now you have about 700 feet to cross over two lanes of traffic to get onto 3 South, at the same time folks from 3 North are moving to the left to get onto 495 South.

Name: Gazda, Thomas

Date: 5/23/2008 11:21:18 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Live in Chelmsford.

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Frequently travel north to Lawrence, Methuen, Andover, N. Andover, Haverhill and beyond. Less frequently to the south to I-290 and glad to hear recently that efforts are progressing to redesign the I-495/I-290 interchange. I encourage that process!

3. **What is your experience on the 495 corridor?**

   Rush hour traffic is problematic due to poor design of entrance/exit ramps and their proximity to each other, particularly in the Lowell Connector area.

   Note: please feel free to contact me with regard to my comments and suggestions. I will be more than glad to discuss them and even join engineers at the sites to explain these further.

4. **What are the most important issues this study should address in your opinion?**

   Here are some suggestions:

   1. Lower speed limit from Exit 33 (Rt. 4) on I-495 North to Exit 36 (Woburn Street) and on I-495 South from Exit 36 (Woburn Street) to Exit 34 (Rt. 110).
   2. The Rt. 495 northbound for Rt. 3/Lowell Connector (Exit 35 A-B-C) feeder/collector road should be extended on the northern end (approaching the Carlisle St. underpass. Traffic exiting the feeder/collector road is currently in two lanes, which has free access to cut across lanes and enter the main 495 northbound flow. The alternative by extending the feeder/collector portion (with an extended separation barrier) would be to have those two lanes merge into one lane in the feeder/collector so that only one lane is merging from the feeder/collector into the three northbound travel lanes of 495 north. This merge should occur approximately Â½ mile further north near the Carlisle street, making for safer merges and improving mainstream 495 north traffic flow.
   3. The southbound feeder collector road on 495 southbound for Exit 35 A-B-C to the Lowell Connector and Rt. 3 should be extended (with extended barrier separation) to separate exit traffic from the main southbound 495 traffic and preventing exiting traffic from using a travel lane to queue for these exits.
   4. The exit from the southbound feeder/collector should be modified to force merging traffic into one lane before merging into the main southbound 495 traffic flow.
   5. Exit 33, Rt. 4 Chelmsford: Install traffic signals at end of ramp at Route 4 north/south. Redesign end of this ramp so that both left and right turns are controlled by the traffic light. (Eliminate free merge to Rt. 4 south to prevent running off the ramp direct into Rt. 4 south traffic. Widen ramp slightly to accommodate two stacking lanes, one for left and one for right turns.
   6. Redesign intersection of Rt. 495 North/South and Rt. 93 North/South with feeder/collector roads. (Similar to the setup at Rt. 495 North/South and Rt. 3 North/South.)

Name: belanger, Barbara

Date: 5/24/2008 9:11:19 AM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   Chelmsford and all along the Merrimack Valley

3. **What is your experience on the 495 corridor?**

   Very tight near Lowell connector, route 3
   also tight in Lawrence over bridges going north

4. **What are the most important issues this study should address in your opinion?**

   Safety. We need sound barriers at the end of Chamberlain Road in Chelmsford - noise pollution

Name:

Date: 5/24/2008 4:39:36 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Chelmsford

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   No

3. **What is your experience on the 495 corridor?**

   They should call it truck highway. It must be about 75% trucks. Give them their own high-speed lane and let them go, keep them off my bumper. They go 80 anyways, kinda scary having them right on your bumper.

4. **What are the most important issues this study should address in your opinion?**

   Have partial lanes - longer - for people coming onto 495, sometimes you're having to jump in the slow lane with heavy traffic or stop in the breakdown lane. Need more room to merge.

Name: Barnum, Roger

Date: 5/28/2008 2:01:09 PM

Publication Consent: Yes

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1. **Do you live in the study area?**
   If yes, please list which town.

   Yes

   Marlborough

2. **Do you commute along the 495 corridor?**
   If yes, from which town and to which town?

   Yes

   From Marlborough up to Tyngsboro

3. **What is your experience on the 495 corridor?**

   Very crowded around routes 290 and 3 at rush hours (particularly in summer). Pavement and center landscaping seems to be in poor shape at some locations (good to see current project around route 2 addressing). I was under the impression that Solomon Pond mall developer had to pay for added lanes at 290 interchange - why hasn't this been done?

4. **What are the most important issues this study should address in your opinion?**

   Traffic, location of interchanges, surrounding developments, timeline and milestones for getting particular projects done

APPENDIX B
EXISTING CONDITIONS

SEASONALITY OF TRAFFIC ON I-495

Memo

To: Ethan Britland, EOT&PW

From: Fay, Spofford & Thorndike

Date: 11/08/2007

Re: Seasonal Variations in Traffic on I-495

In their response to the weekday peak hour existing level of service conditions on the I-495 corridor, the regional planning agencies in the area expressed concern that seasonal peak traffic was not represented in the existing conditions. They were particularly interested in the potential differences in operations during the summer season's Thursday and Friday peak periods and weekend midday traffic. A similar concern was expressed regarding peak period traffic variations during the fall season.

To address these points, Fay, Spofford & Thorndike (FST) reviewed traffic count data provided by the Executive Office of Transportation and Public Works (EOT&PW), Merrimack Valley Regional Planning Commission (MVPC), and Northern Middlesex Council of Governments (NMCOG), at three locations on I-495 to identify the variability of traffic volumes at different times of the year. The involved locations are I-495 at: Route 133 in Tewksbury, the Salisbury/Amesbury town line, and at Route 4 in Chelmsford. Year 2001 – 2006 traffic count data for these locations was available for the winter (January), spring (April), summer (July – August), and fall (October – December).

Comparisons were made for three different times during the week. The first comparison of seasonal variations in traffic volumes was done for typical weekdays (Tuesday – Thursday), AM (7 – 9) and PM (4 – 6) peak periods. Next, a comparison of traffic volumes for the midday four-hour peak periods, 10 AM – 2 PM, on weekend days for different times of the year was calculated. Finally, a comparison of traffic volumes during AM and PM peak periods, 7 – 9 AM and 4 – 6 PM, on Thursdays and Fridays was analyzed.

Through these analyzes it was found that there is more traffic during certain times in the summer and on Thursday and Friday peak periods then there is during an average peak period, which is the standard practice to use in traffic analysis. Therefore, the level of service and summary of operations that have been presented for existing conditions and future conditions in the I-495 Corridor Study are for an "average" peak period and do not reflect the operations of facilities during higher use periods.

The three different time periods during the week that were analyzed for seasonal variations are discussed below.

Typical Weekday Peak Period Analysis

As presented on Table 1, during the typical weekday AM and PM peak periods, (Tuesdays, Wednesdays, and Thursdays from 7 – 9 AM and 4 – 6 PM) there is more traffic in the summer versus the fall in Amesbury for both peak periods. It was also found that there is 10 percent more traffic volume, or about 200 more vehicles, in the AM peak period and 15 percent more volume, or about 450 more vehicles, in the PM peak period in Amesbury in the summer versus the fall. Comparison data for other seasons was not available or inconclusive.

Table 1 - Summary of Seasonal Variation Analysis

Direction of Travel	Time Period	Season	Conclusion
I-495 at Salisbury Townline, Amesbury			
Both	Typical Weekday AM Peak Periods	Summer vs. Fall	10% (200) more vehicles in the summer.
Both	Typical Weekday PM Peak Periods	Summer vs. Fall	15% (450) more vehicles in the summer.
Both	Weekend Midday Peak Period	Summer vs. Spring & Fall	40% (1200) more vehicles in the summer.
Both	Thursday & Friday AM Peak Period	Summer vs. Spring & Fall	15% (540) more vehicles in the summer.
Both	Thursday & Friday PM Peak Period	Summer vs. Spring & Fall	18% (660) more vehicles in the summer.
I-495 at Route 133, Tewksbury			
Northbound	Typical Weekday AM Peak Periods	Summer vs. Spring	6% (400) more vehicles in summer.
Northbound	Typical Weekday AM Peak Periods	Summer vs. Fall	2% (300) more vehicles in the summer.
Northbound	Typical Weekday PM Peak Periods	Summer vs. Spring	Less than 1% more traffic in the summer.
Northbound	Typical Weekday PM Peak Periods	Summer vs. Fall	Less than 1% more traffic in the summer.
Northbound	Weekend Midday Peak Period	Summer vs. Spring & Fall	23% (1,000) more vehicles in the summer.
Northbound	Thurs. & Fri. AM & PM Peak Period	Summer vs. Spring & Fall	Approximately the same.
I-495 at Route 4, Chelmsford			
Northbound	Typical Weekday AM Peak Periods	Fall vs. Winter, Summer, & Spring	4% (270) or more vehicles in the Fall vs. any other season.
Northbound	Typical Weekday PM Peak Periods	Fall vs. Winter, Summer, & Spring	Between 2 – 14% (100 – 900) more vehicles in the Fall vs. any other season.
Northbound	Weekend Midday Peak Period	Summer vs. Fall, Winter, & Spring	20% (900) or more vehicles in the summer vs. any other season.
Northbound	Thurs. & Fri. AM & PM Peak Period	Summer vs. Winter, Spring, & Fall	Approximately the same.

There is 6 percent more traffic, about 400 more vehicles, in the summer as opposed to in the spring in Tewksbury and 2 percent more traffic, about 300 more vehicles, in the summer as opposed to in the fall during the AM peak period. For the PM peak periods there is a one percent change or less between the summer and spring and the summer and fall. Comparison data for the winter was not available.

The traffic volumes in Chelmsford reveal that the highest levels of weekday peak period traffic volumes occur in the fall as opposed to any other season. For the AM peak period there are at least 270 more vehicles, or 4 percent more traffic, in the fall as opposed to the winter, spring, or summer. In the PM peak period there is a range of 2 –14 percent more traffic, 100 – 900 more vehicles, in the fall as opposed to the winter, spring, or summer on I-495 in Chelmsford.

Thursday and Friday Only Peak Period Analysis

For AM and PM peak periods on Thursdays and Friday, it was found that there is more traffic in Amesbury during both peak periods in the summer as opposed to the spring or fall (Table 1). For the AM peak period there is at least 15 percent more volume, or 540 vehicles, in the summer on a Thursday or Friday as opposed to the spring or fall. In the PM peak period, there is at least 660 more vehicles or 18 percent more traffic in the summer. Analysis of the other two locations in Tewksbury and Chelmsford found that volumes during these periods were about the same for the spring, summer, fall, and winter with data unavailable for winter in Tewksbury.

Weekend Midday Peak Period Analysis

The comparison of weekend traffic, peak period from 10 AM – 2 PM on Saturdays and Sundays, found that there is always more traffic in the summer than any other time of year for all three locations. During a midday peak period on the weekend in Amesbury there is more than 40 percent more traffic, or over 1,200 vehicles, in the summer than in the spring or fall. Note, these 1,200 additional vehicles are spread out over the four-hour period and represent travel in both directions. Consequently, while undeniably higher, when this traffic volume increase is placed in context, is not as dramatic as the isolated volume increase could suggest. In Tewksbury there are more than 1,000 vehicles, or 23 percent more traffic, in the summer than in the spring or fall. Finally, in Chelmsford there is 20 percent or more traffic, or almost 900 vehicles, on I-495 on the weekend in the summer as opposed to the winter, spring, or fall. Please note that winter data was not available for the locations in Amesbury or Tewksbury

Link Level of Service

As part of the completed existing conditions analysis, Link Level of Service (LOS) was analyzed for a limited number of locations. Among these locations LOS was calculated between Exits 54 and 55 in Amesbury for the AM and PM peak period in the northbound and southbound direction of travel. Existing Link LOS on the northbound direction during the AM peak period is LOS A, while it is LOS B during the AM peak period on Fridays in July. The existing PM Link LOS is LOS B in the northbound direction and stays the same on Fridays in July. In the southbound direction, the existing AM Link LOS is LOS B and stays the same for Fridays in July. The PM Link LOS is LOS B in the southbound direction and stays the same in the PM peak on Fridays in July. Finally, Link LOS is LOS C in the northbound direction on the Saturday peak hour in July and LOS B for the southbound direction of travel (Table 1).

From the existing I-495 traffic count data it was found that traffic volumes increase by about 25 percent on a Friday in the summer during the AM and PM peak periods. Applying this 25 percent increase to Link LOS between Exits 36-37 (Chelmsford/Lowell) in the northbound direction and between Exits 34-35 (Chelmsford) in the southbound direction degrades the Link LOS from a LOS D (all locations, directions, and times) to a LOS F, except where it is a LOS E in the AM southbound direction between exits 34-35.

The link analysis shows degradation in LOS to failing (LOS F) or near failing (LOS E) conditions only on the roadway in Chelmsford and Lowell and not in Amesbury, where LOS stays the same or becomes slightly worse but is never worse than a LOS C.

Conclusions

In conclusion, it was found that there is more traffic volume in the summer than any other time of year on I-495 in Amesbury for typical weekday peak periods, Thursday and Friday peak periods, and during the midday peak period on Saturdays and Sundays. It was also found that there is more traffic in the summer during the weekend midday peak periods for all locations evaluated on I-495 versus any other time of year. It was found that Link LOS degrades on I-495 on Friday peak periods during the summer in Lowell and Chelmsford to a failing or near failing condition. LOS either stays the same or degrades in Amesbury but not below a LOS C.

Based on these seasonally influenced levels of I-495 mainline traffic volumes, the potential exists that some operations at the intersection of I-495 ramps with local street may have peak hour LOS in the summer that is lower than that experienced during the majority of the year.

Table 2 - Summary of Seasonal Variation Analysis

Direction of Travel	Time Period	Season	Conclusion
Between Exits 54 and 55, Amesbury			
Northbound	Link LOS AM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS A
Southbound	Link LOS AM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS B
Northbound	Link LOS PM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS B
Southbound	Link LOS PM Friday Peak Hour	Summer vs. Existing Conditions	LOS B vs. LOS B
Northbound	Link LOS Sat. Midday Peak Hour	July	LOS C
Southbound	Link LOS Sat. Midday Peak Hour	July	LOS B
Between Exits 36 – 37, Chelmsford/Lowell			
Southbound	(Projected) Link LOS AM Fri. Peak Hour	Summer vs. Existing Conditions	LOS E vs. LOS D
Southbound	(Projected) Link LOS PM Fri. Peak Hour	Summer vs. Existing Conditions	LOS F vs. LOS D
Between Exits 34 – 35, Chelmsford			
Northbound	(Projected) Link LOS AM Fri. Peak Hour	Summer vs. Existing Conditions	LOS F vs. LOS D
Northbound	(Projected) Link LOS PM Fri. Peak Hour	Summer vs. Existing Conditions	LOS F vs. LOS D

PERCENTAGES OF TRUCKS ON I-495

Truck Percentages

Counts of truck volumes on I-495 at several key locations along the study corridor were undertaken by regional planning agency staff members during 2007. These counts were directional (northbound and southbound) in nature and were taken during the AM and PM peak periods. The resulting volumes were then compared with total peak period traffic volumes at these same locations to determine the percentage of traffic during these peak periods that is comprised of trucks.

Four locations were selected at which to take the counts, which were taken by individuals stationed on overpasses looking down at the traffic below on I-495. Specifically, the count locations were at Hunt Road (Link 32-33) in Chelmsford, Trull Road (Link 38-39) in Tewksbury, Chandler Street (Link 40-41) in Andover, and Locust Street (over Link 52-53 in Merrimac.

The truck count data and the percentage that the counted trucks are of total traffic at the specific locations where the counts occurred are summarized immediately below.

Numbers and Percentages of Trucks in I-495 Study Area

	AM		PM	
	NB	**SB**	**NB**	**SB**
Hunt Road (Link 32-33)	10%	10%	6%	5%
Trull Road (Link 38-39)	9%	8%	5%	6%
Chandler Road (Link 40-41)	10%	6%	4%	6%
Locust Street (Link 52-53)	14%	8%	4%	8%
Average (West of I-93)	9.5%	9.0%	5.5%	5.5%
Average (East of I-93)	12.0%	7.0%	4.0%	7.0%

As can be seen from the above, the number of trucks counted during the AM peak hour, with one exception, always exceeded the number of trucks counted during the PM peak hour, in both directions at all four count locations. The one exception was at the Locust Street overpass in Merrimac in the southbound direction. The greatest number of trucks counted was at Hunt Road in Chelmsford on the far western end of the study area, where over 500 trucks in each direction were counted during the AM peak hour. The data above shows that, in general, the number of trucks counted decreased from west to east during in both directions during both the AM and PM peak hours.

Specifically regarding truck percentages, the percentage of trucks on the road was consistently greater during the AM peak hour than the PM peak hour. During the AM peak hour, truck percentages were greater in the northbound direction than in the

southbound direction. The opposite was generally found to be true during the PM peak hour. The highest percentage of trucks occurred during the AM peak hour in the northbound direction at Locust Street in Merrimac, where approximately 14 percent of all vehicles on I-495 headed in that direction were found to be trucks. It must be noted, however, that this percentage is somewhat deceiving as this same location was also that found to have the lowest actual truck count in the northbound direction in the AM peak hour. The high percentage results from the relatively low number of non-truck vehicles traveling on this section of roadway at that time.

The MassHighway website was consulted regarding truck percentages on similar-type highways elsewhere in the Commonwealth. While peak period data is presented, no distinction is made as to whether the peak period given in the data is AM or PM. Nevertheless, a few sample data points from locations throughout the state are presented in the Table below.

Peak Period Truck Percentages at Selected Locations on Major State Highways

	Year	Percent Trucks
I -91 Bernardston	2006	10%
Rte. 3 Billerica	2006	2%
I -95 Canton	2006	2%
Rte. 3 Chelmsford	2006	3%
I -195 Fall River	2005	3%
Rte. 2 Fitchburg	2006	7%
I-95 Peabody	2006	3%
I-93 Quincy	2006	3%
I-95 Salisbury	2006	4%
I-84 Sturbridge	2006	18%
I-93 Woburn	2003	2%

As can be seen from the above data, in general the peak period truck percentages at these locations are less than those recently observed on I-495 in the study area. The key exception to this statement is on I-84 in Sturbridge at the Connecticut state line where 18 percent of the peak period traffic in 2006 was found to be trucks. This particular location consistently produced truck percentages in the 15 to 20 percent range over a multi-year period covered by MassHighway's data collection efforts.

The section of I-495 comprising this study's area of interest plays an important role in providing a path for regional and interstate movement of goods. This role is reflected in the above average truck percentages found along this section of highway.

TABLES B-1 THROUGH B-8

Table B-1
2006 Manual Turning Movement Count Locations

Exit #	Locations	Municipality
31	Route 119 and Exit 31 NB ramps	Littleton
	Route 119 and King Street	Littleton
32	Boston Road at Exit 32 NB ramps	Westford
32	Boston Road at Exit 32 SB ramps	Westford
	Boston Road at Route 110	Westford
	Route 110 and Route 225	Westford
33	Route 4 and Exit 33 NB off-ramp	Chelmsford
33	Route 4 and Exit 33 SB on-ramp	Chelmsford
34	Route 110 and Exit 34 NB on-ramp	Chelmsford
34	Route 110 and Exit 34 NB off-ramp	Chelmsford
34	Route 110 and Exit 34 SB on-ramp	Chelmsford
34	Route 110 and Exit 34 SB off-ramp	Chelmsford
37	Christman Avenue and Exit 37 NB on-ramp	Lowell
37	Woburn Street, Christman Avenue, and Exit 37 NB off-ramp	Lowell
37	Woburn Street and Exit 37 SB ramps	Lowell
39	Route 133 and Exit 39 NB off-ramp	Tewksbury
39	Route 133 and Exit 39 NB on-ramp	Tewksbury
39	Route 133, International Place, and Exit 39 SB off-ramp	Tewksbury
39	Route 133, International Place, and Exit 39 SB on-ramp	Tewksbury
41	495 NB Off-Ramp to Route 28 (N. Main St.) SB @ Route 28 NB and SB to 495 NB	Andover
41	495 NB Off-Ramp @ Route 28 (Union St) NB	Andover
41	Route 28 (Union St) NB @ 495 SB On-Ramp	Andover
41	Route 28 (N. Main St.) SB @ 495 SB On-Ramp	Andover
41	495 SB Off-Ramp to Route 28 (N. Main St.) SB	Andover
42	495 NB Off-Ramp to Route 114 EB @ Route 114 EB and WB On-Ramp to 495 NB	Lawrence
42	495 NB Off-Ramp to Route 114 WB	Lawrence
42	495 SB Off-Ramp to Route 114 WB @ Route 114 EB and WB On-Ramp to 495 SB	Lawrence
42	495 SB Off-Ramp to Route 114 EB	Lawrence
43	Mass Ave and Exit 43 NB ramps	North Andover
43	Loring Street and Exit 43 SB ramps	North Andover
44	Sutton Street and Exit 44 NB ramps	North Andover
44	Merrimack Street and Exit 44 SB ramps	North Andover
46	Route 110 and Exit 46 NB on-ramp	Methuen
46	Route 110 and Exit 46 NB off-ramp	Methuen
48	Industrial Way EB to 495 SB On-Ramp	Haverhill
48	495 SB Off-Ramp @ Route 125 Connector/Industrial Way EB and WB	Haverhill
49	495 NB Off-Ramp to Route 113 EB and WB @ Route 113 EB and WB On-Ramp to 495 NB	Haverhill
49	495 SB Off-Ramp to Route 113 EB and WB	Haverhill
49	Route 113 EB and WB On-Ramp to 495 SB	Haverhill
50	495 NB Off-Ramp to Route 97 EB and WB	Haverhill
50	Route 97 EB and WB On-Ramp to 495 NB	Haverhill
50	495 SB Off-Ramp to Route 97 EB and WB	Haverhill
50	Route 97 EB and WB On-Ramp to 495 SB	Haverhill
51	495 NB Off-Ramp to Route 125 EB @ Route 125 WB On-Ramp to 495 N	Haverhill
51	Route 125 EB On-Ramp to 495 NB @ 495 NB Off-Ramp to Route 125 WB	Haverhill
51	Route 125 WB On-Ramp to 495 SB @ 495 SB Off-Ramp to Route 125 EB	Haverhill
51	495 SB Off-Ramp to Route 125 WB @ Route 125 EB On-Ramp to 495 SB	Haverhill

Table B-1
2006 Manual Turning Movement Count Locations (cont.)

Exit #	Locations	Municipality
52	495 NB Off-Ramp @ Route 110 EB and WB	Haverhill
52	Route 110 EB and WB @ 495 NB On-Ramp	Haverhill
52	495 SB Off-Ramp @ Route 110 EB and WB	Haverhill
52	Route 110 EB and WB @ 495 SB On-Ramp	Haverhill
53	495 SB Off-Ramp to Broad St EB and WB @ Broad St EB and WB On-Ramp to 495 SB	Merrimac
53	495 NB Off-Ramp to Broad St EB and WB @ Broad St EB and WB On-Ramp to 495 NB	Merrimac
54	495 NB Off-Ramp @ Route 150 NB and SB	Amesbury
54	Route 150 NB and SB @ 495 NB On-Ramp	Amesbury
54	495 SB Off-Ramp to Route 150 NB and SB @ Route 150 NB and SB On-Ramp to 495 SB	Amesbury
55	495 NB Off-Ramp to Route 110 EB	Amesbury
55	Route 110 WB On-Ramp to 495 SB	Amesbury

Table B-2
Existing 2006 AM and PM Peak Hour Levels of Service for Unsignalized Intersections
Western Segment

					AM			PM		
Exit[1]		**Approach**	**Dir.**[2]	**Mvmt.**[3]	**Delay (s)**[4]	**LOS**	**Queue (ft)**[5]	**Delay (s)**[4]	**LOS**	**Queue (ft)**[5]
33	**NB**	**Exit ramp**	**NB**	**L**	50	F	140	54	F	111
		Exit ramp	**NB**	**R**	24	C	109	14	B	51
33	**SB**	**Route 4**	**WB**	**L**	1	A	5	1	A	3
34	**NB**	**Exit ramp**	**NB**	**L**	20	C	40	88	F	28
		Exit ramp	**NB**	**R**	11	B	13	27	D	77
		Route 110	**WB**	**L**	2	A	2	4	A	14
34	**SB**	**Exit ramp**	**SB**	**L**	16	C	9	526	F	269
		Exit ramp	**SB**	**R**	11	B	23	27	C	129
		Route 110	**EB**	**L**	1	A	6	7	A	37
37	**NB**	**Exit ramp**	**NB**	**L/T**	68	F	111	234	F	242
		Exit ramp	**NB**	**R**	28	D	145	12	B	34
		Woburn St.	**EB**	**L**	15	C	34	18	C	31
		Christman Ave.	**SB**	**L**	2	A	7	3	A	10
37	**SB**	**Exit ramp**	**SB**	**L**	622	F	707	576	F	403
		Exit ramp	**SB**	**R**	10	B	17	12	B	26
		Woburn St.	**WB**	**L**	6	A	19	6	A	32

[1] Please see Figures 2-1 and 2-2.

[2] Approach direction.

[3] Turning movement.

[4] Average Delay in seconds per vehicle.

[5] Total length of queue in feet.

*Incalculable.

Table B-3
Existing 2006 AM and PM Peak Hour Levels of Service for Unsignalized Intersections
Eastern Segment

Exit[1]		Approach	Dir.[2]	Mvmt.[3]	AM Delay (s)[4]	AM LOS	AM Queue (ft)[5]	PM Delay (s)[4]	PM LOS	PM Queue (ft)[5]
41	**SB**	**Route 28**	**NB**	**R**	13	B	26	17	C	49
		Route 28	**NB**	**L**	17	C	37	43	E	114
43	**NB**	**Exit ramp**	**NB**	**L**	159	F	141	83	F	46
		Exit ramp	**NB**	**R**	22	C	118	17	C	71
		Mass. Ave.	**EB**	**L**	3	A	10	5	A	19
43	**SB**	**Exit ramp**	**SB**	**L/R**	*	F	*	732	F	867
		Loring St.	**WB**	**L**	7	A	38	7	A	28
44[6]	**SB**	**Exit ramp**	**SB**	**L**	29	D	143	50	E	212
		Exit ramp	**SB**	**R**	11	B	34	10	B	14
48	**SB**	**Industrial Way**	**EB**	**L**	10	B	2	9	A	1
		Exit ramp	**NB**	**L**	12	B	3	12	B	1
49	**NB**	**Exit ramp**	**NB**	**L**	25	D	19	43	E	71
		Exit ramp	**NB**	**R**	17	C	98	138	F	672
		Route 113	**EB**	**L**	10	B	7	11	B	14
49	**SB**	**Exit ramp**	**SB**	**L**	30	D	58	61	F	132
		Exit ramp	**SB**		13	B	12	14	B	14
		Route 113	**EB**	**L**	2	A	4	1	A	3
50[6]	**SB**	**Exit ramp**	**SB**	**L**	93	F	73	126	F	157
		Exit ramp	**SB**	**R**	15	B	37	24	C	120
		Route 97	**EB**	**L**	9	A	24	10	A	11
52	**NB**	**Exit ramp**	**NB**	**L**	23	C	48	39	E	106
		Exit ramp	**NB**	**R**	11	B	14	21	C	118
		Route 110	**WB**	**L**	1	A	3	1	A	2
52	**SB**	**Exit ramp**	**SB**	**L**	20	C	13	27	D	23
		Exit ramp	**SB**	**R**	13	B	33	13	B	36
		Route 110	**EB**	**L**	3	A	6	2	A	5
53	**NB**	**Exit ramp**	**NB**	**L**	9	A	11	11	B	26
		Exit ramp	**NB**	**R**	9	A	4	9	A	4
53	**SB**	**Exit ramp**	**SB**	**L/R**	10	B	8	12	B	27
		Broad St.	**WB**	**L**	2	A	2	1	A	2
54	**NB**	**Hunt Rd. S.**	**NB**	**L/R**	11	B	4	12	B	8
		Route 150	**WB**	**L**	1	A	0	0	A	0
54	**NB**	**Exit ramp**	**SB**	**L**	12	B	5	12	B	5
		Exit ramp	**SB**	**R**	10	A	19	10	B	31
		Route 150	**EB**	**L**	6	A	7	6	A	7
54	**SB**	**Exit ramp**	**SB**	**L**	15	C	8	15	C	6
		Exit ramp	**SB**	**R**	10	A	4	11	B	11
		Route 150	**WB**	**L**	2	A	3	1	A	3

[1] Please see Figures 2-1 and 2-2.
[2] Approach direction.
[3] Turning movement.
[4] Average Delay in seconds per vehicle. *Incalculable.
[5] Total length of queue in feet.
[6] Intersection was signalized after the data was collected for existing condition in 2006. It is analyzed as a signalized intersection in the future 2030 case.

Table B-4
Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations – Western Segment

Exit[1]		Approach	Dir.[2]	Mvmt.[3]	AM Delay (s)[4]	AM LOS	AM Queue (ft)[5]	PM Delay (s)[4]	PM LOS	PM Queue (ft)[5]
32	**NB**	**3Exit ramp**	**NB**	**L**	17	B	22	20	B	75
		Exit ramp	**NB**	**R**	24	C	134	18	B	2
		Exit ramp	**NB**	**ALL**	22	C		19	B	-
		Boston Rd.	**EB**	**L**	7	A		3	A	
		Boston Rd.	**EB**	**T**	7	A	290	3	A	59
		Boston Rd.	**EB**	**ALL**	7	A		3	A	-
		Boston Rd.	**WB**	**T**	4	A	41	6	A	158
		Boston Rd.	**WB**	**R**	4	A		6	A	
		Boston Rd.	**WB**	**ALL**	4	A		6	A	-
		INTERSECTION			**9**	**A**		**7**	**A**	-
32	**SB**	**Exit ramp**	**SB**	**L**	17	B	129	19	B	84
		Exit ramp	**SB**	**R**	13	B	16	18	B	45
		Exit ramp	**SB**	**ALL**	17	B		19	B	-
		Boston Rd.	**EB**	**T**	16	B	502[6]	5	A	105
		Boston Rd.	**WB**	**T**	6	A	63	6	A	225
		INTERSECTION			**15**	**B**		**10**	**A**	-
38	**NB**	**Exit ramp**	**SB**	**L**	26	C	109	65	E	220[6]
		Exit ramp	**SB**	**T**	28	C	72	47	D	104
		Exit ramp	**SB**	**R**	27	C	62	55	E	182
		Exit ramp	**SB**	**ALL**	27	C	-	59	E	-
		Route 38	**EB**	**L**	18	B	121[67]	52	D	316[6]
		Route 38	**EB**	**T**	7	A	91	21	C	261
		Route 38	**EB**	**R**	4		9[7]	18	B	50
		Route 38	**EB**	**ALL**	9	A	-	28	C	-
		Route 38	**WB**	**L**	48	D	65	53	D	127
		Route 38	**WB**	**T**	22	C	149	32	C	498[6]
		Route 38	**WB**	**R**	19	B	38	24	C	65
		Route 38	**WB**	**ALL**	24	C	-	33	C	-
		Home Depot driveway	**NB**	**L**	29	C	106[6]	65	E	222[6]
		Home Depot driveway	**NB**	**T**	30	C	44	45	D	78
		Home Depot driveway	**NB**	**R**	29	C	24	43	D	38
		Home Depot driveway	**NB**	**ALL**	29	C	-	54	D	-
		INTERSECTION			**24**	**C**	**-**	**40**	**D**	**-**

[1] Please see Figures 2-1 and 2-2.

[2] Approach direction.

[3] Turning movement.

[4] Average Delay in seconds per vehicle.

[5] Total length of queue in feet.

[6] 95th percentile volume exceeds capacity, queue may be longer.

[7] Volume for 95th percentile queue is metered by upstream signal.

Table B-4
Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations – Western Segment (continued)

Exit[1]		Approach	Dir.[2]	Mvmt.[3]	AM			PM		
					Delay (s)[4]	LOS	Queue (ft)[5]	Delay (s)[4]	LOS	Queue (ft)[5]
38	**SB**	**Exit ramp**	**SB**	**L**	29	C	130	29	C	165
		Exit ramp	**SB**	**L/R**	29	C	126	34	C	181
		Exit ramp	**SB**	**R**	25	C	55	28	C	149
		Exit ramp	**SB**	**ALL**	27	C	-	31	C	-
		Route 38	**EB**	**ALL**	20	C	248 [6]	36	D	364 [6]
		Route 38	**WB**	**L**	8	A	90 [6]	35	C	423 [6]
		Route 38	**WB**	**T**	3	A	56	7	A	183
		Route 38	**WB**	**ALL**	5	A	-	16	B	-
		INTERSECTION			**16**	**B**	**-**	**26**	**C**	**-**
39	**NB**	**Exit ramp**	**NB**	**L**	50	D	341	51	D	140
		Exit ramp	**NB**	**R**	47	D	331	48	D	75
		Exit ramp	**NB**	**ALL**	48	D	-	48	D	-
		Route 133	**EB**	**T/R**	4	A	117	1	A	71
		Route 133	**WB**	**L**	56	E	61	54	D	92
		Route 133	**WB**	**T**	10	B	419	4	A	278
		Route 133	**WB**	**ALL**	12	B	-	8	A	-
		INTERSECTION			**24**	**C**	**-**	**14**	**B**	**-**
39	**SB**	**Exit ramp**	**SB**	**L**	48	D	81	84	F	104 [6]
		Exit ramp	**SB**	**T**	79	E	293 [6]	47	D	70
		Exit ramp	**SB**	**R**	47	D	87	48	D	90
		Exit ramp	**SB**	**ALL**	59	E	-	51	D	-
		Route 133	**EB**	**L**	9	A	19	24	C	144 [6]
		Route 133	**EB**	**T/R**	16	B	415	13	B	331
		Route 133	**EB**	**ALL**	15	B	-	15	B	-
		Route 133	**WB**	**L**	20	C	332 [6]	5	A	8 [7]
		Route 133	**WB**	**T/R**	3	A	76	9	A	375
		Route 133	**WB**	**ALL**	10	B	-	9	A	-
		International Pl.	**NB**	**L**	46	D	10	46	D	15
		International Pl.	**NB**	**T**	47	D	61	236	F	449 [6]
		International Pl.	**NB**	**R**	46	D	41	47	D	54
		International Pl.	**NB**	**ALL**	47	D	-	140	F	-
		INTERSECTION			**25**	**C**	**-**	**48**	**D**	**-**

[1] Please see Figures 2-1 and 2-2.

[2] Approach direction.

[3] Turning movement.

[4] Average Delay in seconds per vehicle.

[5] Total length of queue in feet.

[6] 95th percentile volume exceeds capacity, queue may be longer.

[7] Volume for 95th percentile queue is metered by upstream signal.

Table B-5
Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations – Eastern Segment

Exit[1]		Approach	Dir.[2]	Mvmt.[3]	AM Delay (s)[4]	AM LOS	AM Queue (ft)[5]	PM Delay (s)[4]	PM LOS	PM Queue (ft)[5]
42	**NB**	**Exit ramp**	**SB**	**R**	1	A	0	1	A	0
		Route 114	**EB**	**L**	17	B	50	17	B	99
		Route 114	**EB**	**T**	0	A	0	0	A	0
		Route 114	**EB**	**ALL**	2	A	-	4	A	-
		Route 114	**WB**	**T**	5	A	99	7	A	157
		Route 114	**WB**	**R**	5	A	24	7	A	96
		Route 114	**WB**	**ALL**	5	A	-	7	A	-
		Exit ramp	**NB**	**R**	0	A	0	1	A	0
		INTERSECTION			**3**	**A**	**-**	**5**	**A**	**-**
42	**SB**	**Route 114**	**EB**	**T**	7	A	52	11	B	115
		Route 114	**WB**	**L**	22	C	191	32	C	393 [6]
		Route 114	**WB**	**T**	0	A	0	0	A	0
		Route 114	**WB**	**ALL**	10	B	-	18	B	-
		INTERSECTION			**7**	**A**	**-**	**13**	**B**	**-**
46	**NB**	**Route 110**	**EB**	**T/R**	25	C	100	25	C	240 [7]
		Route 110	**WB**	**L**	9	A	56	7	A	47
		Route 110	**WB**	**T**	0	A	0	0	A	0
		Route 110	**WB**	**ALL**	1	A	-	1	A	-
		INTERSECTION			**10**	**A**	**-**	**14**	**B**	**-**
46	**NB**	**Route 110**	**EB**	**T/R**	2	A	11	1	A	6
		Route 110	**WB**	**L**	22	C	34 [7]	20	C	70
		Route 110	**WB**	**T**	6	A	184	3	A	75
		Route 110	**WB**	**ALL**	29	C	-	5	A	-
		Calumet Rd.	**NB**	**L/R**	6	A	116	31	C	75
		INTERSECTION			**8**	**A**	**-**	**6**	**A**	**-**
46	**NB**	**Exit ramp**	**SB**	**L/T**	33	C	99	58	E	347 [6]
		Exit ramp	**SB**	**R**	0	A	0	0	A	0
		Exit ramp	**SB**	**ALL**	15	B	-	34	C	-
		Route 110	**EB**	**T/R**	0	A	0	4	A	44
		Route 110	**WB**	**L**	3	A	10	7	A	14
		Route 110	**WB**	**T**	4	A	137	7	A	67
		Route 110	**WB**	**ALL**	4	A	-	7	A	
		Gas station driveway	**NB**	**L/R**	30	C	53	22	C	42
		INTERSECTION			**6**	**A**	**-**	**17**	**B**	

[1] Please see Figures 2-1 and 2-2.
[2] Approach direction.
[3] Turning movement.
[4] Average Delay in seconds per vehicle.
[5] Total length of queue in feet.
[6] 95th percentile volume exceeds capacity, queue may be longer.
[7] Volume for 95th percentile queue is metered by upstream signal.

Table B-5
Existing 2006 AM and PM Peak Hour Levels of Service for Signalized Locations – Eastern Segment (continued)

Exit[1]		Approach	Dir.[2]	Mvmt.[3]	AM Delay (s)[4]	AM LOS	AM Queue (ft)[5]	PM Delay (s)[4]	PM LOS	PM Queue (ft)[5]
46	**SB**	**Exit ramp**	**SB**	**L**	29	C	69	24	C	87
		Exit ramp	**SB**	**T**	32	C	114	25	C	87
		Exit ramp	**SB**	**R**	7	A	31	7	A	26
		Exit ramp	**SB**	**ALL**	20	C	-	16	B	-
		Route 110	**EB**	**T/R**	20	C	176	23	C	147
		Route 110	**EB**	**R**	21	C	174	24	C	140
		Route 110	**EB**	**ALL**	20	C	-	23	C	
		Route 110	**WB**	**L**	23	C	124	19	B	53
		Route 110	**WB**	**L/T**	28	C	165	24	C	120
		Route 110	**WB**	**ALL**	26	C	-	23	C	-
		Merrimack St.	**NB**	**L**	29	C	39	29	C	98
		Merrimack St.	**NB**	**T/R**	32	C	94	42	D	156
		Merrimack St.	**NB**	**ALL**	32	C		42	D	
		INTERSECTION			**24**	**C**		**27**	**C**	
50	**NB**	**Monument St.**	**SB**	**L/T**	11	B	43	11	B	46
		Monument St.	**SB**	**R**	11	B	46	11	B	34
		Monument St.	**SB**	**ALL**	11	B	-	11	B	-
		Route 97	**EB**	**L**	4	A	15	7	A	32
		Route 97	**EB**	**T/R**	7	A	67	12	B	155
		Route 97	**EB**	**ALL**	7	A	-	11	B	-
		Route 97	**WB**	**L**	20	B	21	25	C	46
		Route 97	**WB**	**T/R**	8	A	77	12	B	143
		Route 97	**WB**	**ALL**	8	A	-	13	B	-
		Exit ramp	**NB**	**L**	11	B	46	15	B	189
		Exit ramp	**NB**	**L/T**	11	B	60	14	B	245
		Exit ramp	**NB**	**R**	10	B	29	11	B	41
		Exit ramp	**NB**	**ALL**	11	B	-	13	B	
		INTERSECTION			**9**	**A**	**-**	**13**	**B**	

[1] Please see Figures 2-1 and 2-2.

[2] Approach direction.

[3] Turning movement.

[4] Average Delay in seconds per vehicle.

[5] Total length of queue in feet.

[6] 95th percentile volume exceeds capacity, queue may be longer.

[7] Volume for 95th percentile queue is metered by upstream signal.

Table B-6
I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations – Western Segment

Interchange	AM		PM	
	Density (pc/mi/ln)[1]	LOS	Density (pc/mi/ln)[1]	LOS
Exit 32: I-495 at Boston Rd.				
I-495 NB off-ramp to Boston Rd.	20	B	18	B
I-495 NB on-ramp to Boston Rd.	30	D	28	C
I-495 SB off-ramp to Boston Rd.	30	D	29	D
I-495 SB on-ramp to Boston Rd.	30	C	26	C
Exit 33: I-495 at Route 4				
I-495 NB off-ramp to Route 4	25	C	23	C
I-495 SB on-ramp to Route 4	30	D	28	D
Exit 34: I-495 at Route 110				
I-495 NB off-ramp to Route 110	28	C	26	C
I-495 SB off-ramp to Route 110	46	F	49	F
I-495 SB on-ramp to Route 110	25	C	32	D
Exit 34-35: I-495 at Route 110-Route 3				
I-495 NB weave to Route 110-Route 3	42	E	46	F
Exit 35: I-495 at 495 NB C-D				
I-495 NB C-D off-ramp to Route 3 SB	16	B	18	B
I-495 NB C-D weave to Route 3	57	F	66	F
I-495 SB C-D off-ramp to Route 3 NB	10	A	10	A
I-495 SB C-D weave to Route 3	35	D	38	E
I-495 SB C-D on-ramp to Route 3 SB	12	B	14	B
I-495 SB on-ramp to 495 SB C-D	33	D	34	D
Exit 36: I-495 at Lowell Connector SB				
I-495 NB C-D on-ramp to Lowell Connector SB	14	B	13	B
I-495 NB C-D on-ramp to Lowell Connector NB	19	B	20	C
I-495 NB on-ramp to 495 NB C-D	7	A	5	A
I-495 SB off-ramp to 495 SB C-D	30	D	30	D
I-495 SB C-D off-ramp to Lowell Connector NB	18	B	17	B
Exit 37: I-495 at Woburn St.				
I-495 NB off-ramp to Woburn St.	47	F	45	F
I-495 NB on-ramp to Woburn St.	29	D	30	D
I-495 SB off-ramp to Woburn St.	26	C	25	C
I-495 SB on-ramp to Woburn St.	32	D	33	D

[1]Density is expressed as passenger car per mile per lane.

Table B-6
I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations – Western Segment (continued)

Interchange	AM		PM	
	Density (pc/mi/ln)[1]	LOS	Density (pc/mi/ln)[1]	LOS
Exit 38: I-495 at Route 38				
I-495 NB off-ramp to Route 38	30	D	30	D
I-495 NB on-ramp to Route 38	27	C	27	C
I-495 SB off-ramp to Route 38	24	C	24	C
I-495 SB on-ramp to Route 38	32	D	31	D
Exit 39: I-495 at Route 133				
I-495 NB off-ramp to Route 133	30	D	29	D
I-495 NB on-ramp to Route 133	24	C	28	D
I-495 SB off-ramp to Route 133	31	D	27	C
I-495 SB on-ramp to Route 133	28	D	29	D
Exit 40: I-495 at I-93 SB				
I-495 NB off-ramp to I-93 SB	28	C	30	D
I-495 NB weave to I-93	27	C	34	D
I-495 NB on-ramp to I-93 NB	22	C	30	D
I-495 SB off-ramp to I-93 NB	27	C	21	C
I-495 SB weave to I-93	46	F	37	E
I-495 SB on-ramp to I-93 SB	31	D	27	C

[1]Density is expressed as passenger car per mile per lane.

Table B-7
I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations – Eastern Segment

Interchange	AM		PM	
	Density (pc/mi/ln)[1]	LOS	Density (pc/mi/ln)[1]	LOS
Exit 41: I-495 at Route 28 SB				
I-495 NB off-ramp to Route 28 SB	22	C	27	C
I-495 NB off-ramp to Route 28 NB	17	B	25	C
I-495 SB off-ramp to Route 28	35	D	28	D
I-495 SB on-ramp to Route 28	26	C	21	C
Exit 41-42: I-495 at Route 28-Route 114				
I-495 NB weave to Route 28-Route 114	14	B	29	D
Exit 42: I-495 at Route 114 EB				
I-495 NB off-ramp to Route 114 WB	19	B	26	C
I-495 NB on-ramp to Route 114	18	B	30	D
I-495 SB off-ramp to Route 114 EB	26	C	15	B
I-495 SB on-ramp to Route 114	31	D	20	B
Exit 43-42: I-495 at Loring St.-Route 114 WB				
I-495 SB weave to Loring St.-Route 114 WB	29	D	15	B
Exit 43: I-495 at Mass. Ave.				
I-495 NB off-ramp to Mass. Ave.	21	C	49	F
I-495 NB C-D on-ramp to Mass. Ave.	3	A	9	A
I-495 SB C-D off-ramp to Loring St.	3	A	6	A
I-495 SB on-ramp to 495 SB C-D	24	C	15	B
Exit 44: I-495 at 495 NB C-D				
I-495 NB C-D off-ramp to 495 NB C-D	18	B	29	D
I-495 SB off-ramp to 495 SB C-D	32	D	21	C
Exit 44-45: I-495 at Sutton St.-Marston St.				
I-495 NB C-D weave to Sutton St.-Marston St.	10	A	35	D
I-495 SB C-D weave to Marston St.-Merrimack St.	21	B	18	B
Exit 45: I-495 at Marston St.				
I-495 NB C-D on-ramp to Marston St.	7	A	11	B
I-495 NB on-ramp to 495 NB C-D	17	B	31	D
I-495 SB off-ramp to Marston St.	36	E	21	C

[1]Density is expressed as passenger car per mile per lane.

Table B-7
I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations – Eastern Segment (continued)

Interchange	AM		PM	
	Density (pc/mi/ln)[1]	LOS	Density (pc/mi/ln)[1]	LOS
Exit 46: I-495 at Route 110				
I-495 NB weave to Route 110	18	B	41	F
I-495 SB off-ramp to Route 110	38	F	25	C
I-495 SB on-ramp to Route 110	31	D	19	B
Exit 47: I-495 at Route 213				
I-495 NB off-ramp to Route 213	20	B	31	D
I-495 NB on-ramp to Route 213	21	C	34	D
I-495 SB off-ramp to Route 213	30	D	22	C
I-495 SB on-ramp to Route 213	28	D	18	B
Exit 48: I-495 at Route 125 Connector SB				
I-495 NB off-ramp to Route 125 Connector SB	20	B	29	D
I-495 NB on-ramp to Route 125 Connector NB	17	B	34	D
I-495 SB weave to Route 125 Connector	43	F	27	C
Exit 49: I-495 at Route 113				
I-495 NB off-ramp to Route 113	21	C	34	D
I-495 NB off-ramp to 495 NB C-D	20	B	32	D
I-495 SB C-D off-ramp to Route 113	11	B	7	A
I-495 SB C-D on-ramp to Route 113	16	B	11	B
I-495 SB on-ramp to 495 SB C-D	31	D	19	B
Exit 49-50: I-495 at Route 113-Route 97				
I-495 NB C-D weave to Route 113-Route 97	8	A	25	C
Exit 50: I-495 at Route 97				
I-495 NB C-D on-ramp to Route 97				
I-495 NB on-ramp to 495 NB C-D	8	A	23	C
I-495 SB off-ramp to 495 SB C-D	26	C	19	B
I-495 SB C-D off-ramp to Route 97	17	A	8	B
I-495 SB C-D on-ramp to Route 97	10	A	6	A

[1]Density is expressed as passenger car per mile per lane.

Table B-7
I-495 AM and PM Level of Service for Merge/Diverge/Weave Locations – Eastern Segment (continued)

Interchange	AM		PM	
	Density (pc/mi/ln)[1]	LOS	Density (pc/mi/ln)[1]	LOS
Exit 51: I-495 at Route 125 SB				
I-495 NB off-ramp to Route 125 SB	13	B	23	C
I-495 NB on-ramp to Route 125 SB	13	B	23	C
I-495 NB off-ramp to Route 125 NB	13	B	22	B
I-495 NB on-ramp to Route 125 NB	12	B	16	B
I-495 SB off-ramp to 495 SB C-D	15	B	12	B
I-495 SB C-D off-ramp to Route 125 NB	5	A	7	A
I-495 SB C-D on-ramp to Route 125 NB	5	A	7	A
I-495 SB C-D weave to Route 125				
I-495 SB C-D off-ramp to Route 125 SB	19	B	7	A
I-495 SB C-D on-ramp to Route 125 SB	19	B	13	B
I-495 SB on-ramp to 495 SB C-D	28	D	18	B
Exit 52: I-495 at Route 110				
I-495 NB off-ramp to Route 110	14	B	19	B
I-495 NB on-ramp to Route 110	10	A	14	B
I-495 SB off-ramp to Route 110	14	B	12	B
I-495 SB on-ramp to Route 110	16	B	13	B
Exit 53: I-495 at Broad St.				
I-495 NB off-ramp to Broad St.	14	B	18	B
I-495 NB on-ramp to Broad St.	10	B	12	B
I-495 SB off-ramp to Broad St.	13	B	11	B
I-495 SB on-ramp to Broad St.	13	B	11	B
Exit 54: I-495 at Route 150				
I-495 NB off-ramp to Route 150	14	B	17	B
I-495 NB on-ramp to Route 150	11	B	13	B
I-495 SB off-ramp to Route 150	12	B	13	B
I-495 SB on-ramp to Route 150	12	B	11	B
Exit 55: I-495 at Route 110				
I-495 NB off-ramp to Route 110	14	B	17	B
I-495 NB on-ramp to Route 110	no data	-	12	B
I-495 SB off-ramp to Route 110	no data	-	7	A
I-495 SB on-ramp to Route 110	17	B	15	B

[1]Density is expressed as passenger car per mile per lane.

Table B-8

I-495 Corridor Study - Deficient Merge/Diverge Analysis Recommended for Improvement

Interchange Number	Interchange Type	City/Town	Ramp Designation	Ramp Design Speed	Connecting Roadway	Required Accel. Length	Actual Accel. Length	Distance to Lengthen	Weaving Distance	Required Decel. Length	Actual Decel. Length	Distance to Lengthen	Impact of Achieving Required Distances
32	Full Diamond	Westford	Ramp D NB On-ramp	45 mph	Boston Road	820 FT	750 FT	70 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
34	Half Cloverleaf	Chelmsford	Ramp A-I (SB Off-ramp)	30 mph	Chelmsford St (Route 110)	N/A	N/A	N/A	N/A	520 FT	300 FT	220 FT	Can lengthen with little to no impact
34	Half Cloverleaf	Chelmsford	Ramp A-3 (SB On-ramp)	45 mph	Chelmsford St (Route 110)	820 FT	500 FT	320 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
38	Half Diamond Half Cloverleaf	Tewksbury	SE On-ramp	30 mph	Main Street (Route 38)	1,350 FT	900 FT	450 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
39	Half Cloverleaf	Tewksbury	Ramp C NB On-ramp	25 mph	Andover St (Route 133)	1,420 FT	870 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
39	Half Cloverleaf	Tewksbury	Ramp B SB On-ramp	25 mph	Andover St (Route 133)	1,420 FT	690 FT	730 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
40B	Full Cloverleaf	Andover	Ramp E NB On-ramp	25 mph	Route 93 SB	1,420 FT	720 FT	700 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
40A	Full Cloverleaf	Andover	Ramp D SB On-ramp	25 mph	Route 93 SB	1,420 FT	1040 FT	380 FT	850 FT	N/A	N/A	N/A	Minimum weave length per TRC212 = 1,000 FT
41	Half Cloverleaf	Lawrence	Ramp F NB On-ramp	25 mph	South Union St (Route 28)	1,420 FT	580 FT	840 FT	N/A	N/A	N/A	N/A	Extend auxiliary lane to next exit ramp
41	Half Cloverleaf	Andover	Ramp C SB On-ramp	25 mph	North Main St (Route 28)	1,420 FT	1340 FT	80 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
42	Half Cloverleaf	Lawrence	Ramp D NB On-ramp	25 mph	I-495 NB	1,420 FT	880 FT	540 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
42	Half Cloverleaf	Lawrence	Ramp A SB On-ramp	25 mph	I-495 SB	1,420 FT	870 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
42	Half Cloverleaf	Lawrence	Ramp S SB On-ramp	25 mph	I-495 SB	1,420 FT	870 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
43	Full Diamond	North Andover	Ramp S NB Off-ramp	55 mph	Mass. Ave.	N/A	N/A	N/A	N/A	280 FT	220 FT	60 FT	Can lengthen with little to no impact
47	Trumpet	Methuen	NB Outer loop Off-ramp	50 mph	Route 213	N/A	N/A	N/A	N/A	340 FT	300 FT	40 FT	Can lengthen with little to no impact
47	Trumpet	Methuen	NB Inner loop On-ramp	25 mph	Route 213	1,420 FT	730 FT	690 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
48	Half Diamond	Haverhill	Ramp B NB On-ramp	40 mph	Route 125	1,000 FT	530 FT	470 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
49	Qtr Cloverleaf	Haverhill	Northwest Inner loop SB On-ramp	25 mph	River Street (Rte 110/113)	1,420 FT	700 FT	720 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
50	Half Cloverleaf	Haverhill	Southeast Inner loop NB On-ramp	25 mph	Broadway (Route 97)	1,420 FT	1,040 FT	380 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
51	Full Cloverleaf	Haverhill	Northeast Outer Conn. NB On-ramp	25 mph	Main St (Route 125)	1,420 FT	710 FT	710 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
51	Full Cloverleaf	Haverhill	Southwest Outer Conn. SB On-ramp	30 mph	Main St (Route 125)	1,350 FT	800 FT	550 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
52	Half Cloverleaf	Haverhill	Southeast Outer Conn. NB On-ramp	35 mph	Amesbury Rd (Route 110)	1,230 FT	1,070 FT	160 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
52	Half Cloverleaf	Haverhill	Northwest Outer Conn. SB On-ramp	35 mph	Amesbury Rd (Route 110)	1,230 FT	740 FT	490 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
53	Full Diamond	Merrimac	Ramp D SB On-ramp	25 mph	Broad St	1,420 FT	900 FT	520 FT	N/A	N/A	N/A	N/A	Can lengthen with little to no impact
54	Qtr Cloverleaf	Amesbury	Ramp B-3 NB Off-ramp	25 mph	Route 150 Ext.	N/A	N/A	N/A	N/A	550 FT	280 FT	250 FT	Can lengthen with little to no impact

FIGURES B-1 THROUGH B-82
SEE ATTACHED CD

MASSHIGHWAY TYPE II NOISE BARRIER PRIORITY LIST

Massachusetts Highway Department

Type II Priority List

Barrier Priority Number	City/Town	Location Roadway	Status
1	Milton/Quincy	I-93	Constructed
2	Milton	I-93	Constructed
3	Milton/Quincy	I-93	Constructed
4	Boston	I-93	Studied
5	Boston	I-93	Construction 2006 - 2007
6	Lynnfield	I-95	Construction 2006 - 2007
7	Woburn	I-93	Design to Begin Winter 2006 - 2007
8	Wellesley/Newton	I-95	Design to Begin Winter 2006 - 2007
9	Lynnfield	I-95	Construction 2006 - 2007
10	Wakefield	I-95	Constructed
11	Fall River	I-195	Design to Begin Winter 2006 - 2007
12	Wellesley/Newton	I-95	Design to Begin Winter 2006 - 2007
13	Medford	I-93	Design to Begin Winter 2006 - 2007
14	Stoneham	I-93	To Be Studied
15	Boston	I-93	To Be Studied
16	Lowell	I-495	To Be Studied
17	Boston	I-93	To Be Studied
18	Wakefield	I-95	To Be Studied
19	Lynnfield	I-95	To Be Studied
20	Boston	I-93	To Be Studied
21	Wakefield	I-95	To Be Studied
22	Boston	I-93	To Be Studied
23	Lynnfield	I-95	To Be Studied
24	Lynnfield	I-95	To Be Studied
25	Newton	I-95	To Be Studied
26	Woburn/Reading	I-93	To Be Studied
27	Wakefield	I-95	To Be Studied
28	Lynnfield/Wakefield	I-95	To Be Studied
29	Reading	I-95	To Be Studied

30	Chelmsford	I-495	To Be Studied
31	Wakefield	I-95	To Be Studied
32	Wakefield	I-95	To Be Studied
33	Lynnfield/Wakefield	I-95	To Be Studied
34	Chelmsford	I-495	To Be Studied
35	Medford	I-93	To Be Studied
36	Lowell	I-495	To Be Studied
37	Wilmington	I-93	To Be Studied
38	Wilmington	I-93	To Be Studied
39	Wilmington	I-93	To Be Studied
40	Chelmsford	I-495	To Be Studied
41	Reading/Wakefield	I-93	To Be Studied
42	Methuen	I-93	To Be Studied
43	Chelmsford/Westford	I-495	To Be Studied
44	Randolph/Quincy	I-93	To Be Studied
45	Chelmsford	I-495	To Be Studied
46	Chelmsford	I-495	To Be Studied
47	Methuen	I-93	To Be Studied
48	Chelmsford	I-495	To Be Studied
49	Wilmington	I-93	To Be Studied
50	Chelmsford	I-495	To Be Studied
51	Medford	I-93	To Be Studied
52	Medford	I-93	To Be Studied
53	Braintree	I-93	To Be Studied

APPENDIX C
2030 NO-BUILD LEVELS OF SERVICE

TABLES C-1 THROUGH C-3
2030 NO-BUILD LEVELS OF SERVICE

TABLE C-1- 2030 No-Build Unsignalized Intersections

Exit		Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
33	NB	Exit ramp	NB	L	490	F	686	81	F	146
33	NB	Exit ramp	NB	R	54	F	237	15	C	66
33	SB	Route 4	WB	L	2	A	7	2	A	4
34	NB	Exit ramp	NB	L	61	F	49	131	F	45
		Exit ramp	NB	R	14	B	36	32	D	93
		Route 110	WB	L	1	A	3	4	A	15
34	SB	Exit ramp	SB	L	37	E	56	670	F	290
		Exit ramp	SB	R	25	D	128	37	E	186
		Route 110	EB	L	1	A	4	8	A	40
37	NB	Exit ramp	NB	L/T	87	F	132	699	F	367
		Exit ramp	NB	R	50	E	269	13	B	39
		Woburn St.	EB	L	36	E	88	25	C	46
		Christman Ave.	SB	L	8	A	8	5	A	19
37	SB	Exit ramp	SB	L	743	F	792	*	F	*
		Exit ramp	SB	R	11	B	25	12	B	27
		Woburn St.	WB	L	6	A	20	8	A	54
41	SB	Route 28	NB	R	13	B	27	17	C	49
		Route 28	NB	L	19	C	50	43	E	114
43	NB	Exit ramp	NB	L	658	F	261	363	F	150
		Exit ramp	NB	R	32	D	171	22	C	127
		Mass. Ave.	EB	L	11	B	15	10	B	28
43	SB	Exit ramp	SB	L/R	*	F	*	*	F	*
		Loring St.	WB	L	15	B	46	11	B	19
48	SB	Industrial Way	EB	L	4	A	2	4	A	3
		Exit ramp	NB	L	14	B	17	13	B	3
49	NB	Exit ramp	NB	L	192	F	117	461	F	260
		Exit ramp	NB	R	21	C	127	466	F	1442
		Route 113	EB	L	12	B	2	12	B	26
49	SB	Exit ramp	SB	L	29	D	67	85	F	163
		Exit ramp	SB	R	11	B	9	13	B	19
		Route 113	EB	L	8	A	2	1	A	4

TABLE C-1- 2030 No-Build Unsignalized Intersections

Exit		Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
52	**NB**	**Exit ramp**	**NB**	**L**	147	F	292	39	E	106
		Exit ramp	**NB**	**R**	15	B	31	21	C	118
		Route 110	**WB**	**L**	2	A	4	1	A	2
52	**SB**	**Exit ramp**	**SB**	**L**	48	E	46	27	D	23
		Exit ramp	**SB**	**R**	14	B	36	13	B	36
		Route 110	**EB**	**L**	4	A	17	2	A	5
53	**NB**	**Exit ramp**	**NB**	**L**	10	B	17	12	B	32
		Exit ramp	**NB**	**R**	9	A	6	9	A	4
53	**SB**	**Exit ramp**	**SB**	**L/R**	12	B	19	15	B	60
		Broad St.	**WB**	**L**	2	A	3	1	A	2
54	**NB**	**Hunt Rd. S.**	**NB**	**L/R**	13	B	6	15	B	18
		Route 150	**WB**	**L**	0	A	1	0	A	0
54	**NB**	**Exit ramp**	**SB**	**L**	13	B	9	17	B	12
		Exit ramp	**SB**	**R**	10	B	25	12	B	43
		Route 150	**EB**	**L**	2	A	4	7	A	15
54	**SB**	**Exit ramp**	**SB**	**L**	23	C	25	22	C	16
		Exit ramp	**SB**	**R**	11	B	15	12	B	27
		Route 150	**WB**	**L**	2	A	4	2	A	5

*Incalculable.

TABLE C-2- 2030 No-Build Signalized Intersections

Exit		Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
32	**NB**	**Exit ramp**	**NB**	**L**	15	B	29	20	B	73
		Exit ramp	**NB**	**R**	92	F	#346	18	B	23
		Exit ramp	**NB**	**ALL**	79	E	-	19	B	-
		Boston Rd.	**EB**	**L**	24	C		6	A	100
		Boston Rd.	**EB**	**T**	24	C	m#357	6	A	100
		Boston Rd.	**EB**	**ALL**	24	C	-	6	A	-
		Boston Rd.	**WB**	**T**	6	A	61	8	A	276
		Boston Rd.	**WB**	**R**	6	A		8	A	276
		Boston Rd.	**WB**	**ALL**	6	A	-	8	A	-
		INTERSECTION			**31**	**C**	**-**	**9**	**A**	**-**
32	**SB**	**Exit ramp**	**SB**	**L**	17	B	132	18	B	82
		Exit ramp	**SB**	**R**	13	B	19	19	B	109
		Exit ramp	**SB**	**ALL**	16	B	-	19	B	-
		Boston Rd.	**EB**	**T**	7	A	116	6	A	172
		Boston Rd.	**WB**	**L/T**	64	E	#751	10	B	#468
		INTERSECTION			**38**	**D**	**-**	**12**	**B**	**-**
38	**NB**	**Exit ramp**	**SB**	**L**	29	C	#169	78	E	#253
		Exit ramp	**SB**	**T**	28	C	93	47	D	110
		Exit ramp	**SB**	**R**	26	C	63	56	E	193
		Exit ramp	**SB**	**ALL**	28	D	-	65	E	-
		Route 38	**EB**	**L**	21	C	m#118	53	D	#346
		Route 38	**EB**	**T**	9	A	104	22	C	256
		Route 38	**EB**	**R**	5	A	m9	19	B	50
		Route 38	**EB**	**ALL**	11	B	-	29	C	-
		Route 38	**WB**	**L**	40	D	#81	53	D	140
		Route 38	**WB**	**T**	23	C	176	39	D	#640
		Route 38	**WB**	**R**	19	B	43	25	C	97
		Route 38	**WB**	**ALL**	24	C	-	38	D	-
		Home Depot driveway	**NB**	**L**	32	C	#128	70	E	#252
		Home Depot driveway	**NB**	**T**	31	C	49	44	D	82
		Home Depot driveway	**NB**	**R**	29	C	26	42	D	38
		Home Depot driveway	**NB**	**ALL**	29	C	-	57	E	-
		INTERSECTION			**21**	**C**	**-**	**44**	**D**	**-**

TABLE C-2- 2030 No-Build Signalized Intersections

Exit		Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
38	**SB**	**Exit ramp**	**SB**	**L**	30	C	143	36	D	#196
		Exit ramp	**SB**	**L/R**	30	C	141	41	D	#236
		Exit ramp	**SB**	**R**	25	C	67	31	C	#172
		Exit ramp	**SB**	**ALL**	28	C	-	36	D	-
		Route 38	**EB**	**ALL**	21	C	#297	63	E	#428
		Route 38	**WB**	**L**	17	B	#253	35	C	#405
		Route 38	**WB**	**T**	3	A	58	6	A	154
		Route 38	**WB**	**ALL**	8	A	-	16	B	-
		INTERSECTION			**18**	**B**	**-**	**36**	**D**	**-**
39	**NB**	**Exit ramp**	**NB**	**L**	52	D	#469	51	D	148
		Exit ramp	**NB**	**R**	47	D	#440	47	D	75
		Exit ramp	**NB**	**ALL**	49	D	-	48	D	-
		Route 133	**EB**	**T/R**	5	A	125	5	A	m131
		Route 133	**WB**	**L**	55	D	71	55	D	97
		Route 133	**WB**	**T**	13	B	445	5	A	310
		Route 133	**WB**	**ALL**	15	B	-	8	A	-
		INTERSECTION			**26**	**C**	**-**	**15**	**B**	**-**
39	**SB**	**Exit ramp**	**SB**	**L**	49	D	89	133	F	#126
		Exit ramp	**SB**	**T**	122	F	#367	43	D	87
		Exit ramp	**SB**	**R**	48	D	108	43	D	85
		Exit ramp	**SB**	**ALL**	72	E	-	53	D	-
		Route 133	**EB**	**L**	8	A	21	29	C	#212
		Route 133	**EB**	**T/R**	17	B	480	8	A	266
		Route 133	**EB**	**ALL**	16	B	-	13	B	-
		Route 133	**WB**	**L**	26	C	#524	6	A	m19
		Route 133	**WB**	**T/R**	3	A	74	14	B	555
		Route 133	**WB**	**ALL**	13	B	-	13	B	-
		International Pl.	**NB**	**L**	48	D	28	42	D	38
		International Pl.	**NB**	**T**	47	D	75	117	F	#425
		International Pl.	**NB**	**R**	46	D	43	43	D	51
		International Pl.	**NB**	**ALL**	47	D	-	76	E	-
		INTERSECTION			**31**	**C**	**-**	**35**	**C**	**-**

TABLE C-2- 2030 No-Build Signalized Intersections

Exit		Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
42	**NB**	**Exit ramp**	**SB**	**R**	1	A	0	1	A	0
		Route 114	**EB**	**L**	17	B	57	22	C	129
		Route 114	**EB**	**T**	0	A	0	0	A	0
		Route 114	**EB**	**ALL**	2	A	-	5	A	-
		Route 114	**WB**	**T**	5	A	111	5	A	106
		Route 114	**WB**	**R**	5	A	30	10	A	231
		Route 114	**WB**	**ALL**	5	A	-	7	A	-
		Exit ramp	**NB**	**R**	0	A	0	1	A	0
		INTERSECTION			**3**	**A**	**-**	**5**	**A**	**-**
42	**SB**	**Route 114**	**EB**	**T**	7	A	82	13	B	135
		Route 114	**WB**	**L**	24	C	206	32	C	#396
		Route 114	**WB**	**T**	0	A	0	0	A	0
		Route 114	**WB**	**ALL**	11	B	-	18	B	-
		INTERSECTION			**8**	**A**	**-**	**13**	**B**	**-**
44*	**SB**	**Merrimack Street**	**EB**	**ALL**	8	A	51	8	A	87
		Merrimack Street	**WB**	**ALL**	8	A	47	7	A	32
		Exit Ramp	**SB**	**L**	7	A	153	8	A	148
		Exit Ramp	**SB**	**R**	4	A		5	A	17
		Exit Ramp	**SB**	**ALL**	6	A	-	8	A	-
		INTERSECTION			7	A	-	8	A	-
46	**NB**	**Route 110**	**EB**	**T/R**	25	C	108	25	C	m236
		Route 110	**WB**	**L**	10	A	65	7	A	33
		Route 110	**WB**	**T**	0	A	0	0	A	0
		Route 110	**WB**	**ALL**	1	A	-	1	A	-
		INTERSECTION			**10**	**B**	**-**	**14**	**B**	**-**
46	**NB**	**Route 110**	**EB**	**T/R**	2	A	12	1	A	4
		Route 110	**WB**	**L**	21	C	m33	17	B	m74
		Route 110	**WB**	**T**	8	A	270	7	A	159
		Route 110	**WB**	**ALL**	8	A	-	8	A	-
		Calumet Rd.	**NB**	**L/R**	29	C	129	31	C	81
		INTERSECTION			**9**	**A**	**-**	**7**	**A**	**-**

TABLE C-2- 2030 No-Build Signalized Intersections

Exit		Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
46	**NB**	**Exit ramp**	**SB**	**L/T**	34	C	117	264	F	#615
		Exit ramp	**SB**	**R**	0	A	0	0	A	0
		Exit ramp	**SB**	**ALL**	17	B	-	181	F	-
		Route 110	**EB**	**T/R**	1	A	55	17	B	217
		Route 110	**WB**	**L**	4	A	12	7	A	17
		Route 110	**WB**	**T**	6	A	188	8	A	81
		Route 110	**WB**	**ALL**	5	A	-	8	A	-
		Gas station dirveway	**NB**	**L/R**	29	C	15	32	C	#76
		INTERSECTION			**7**	**A**	**-**	**82**	**F**	**-**
46	**SB**	**Exit ramp**	**SB**	**L**	28	C	69	25	C	86
		Exit ramp	**SB**	**T**	32	C	126	25	C	99
		Exit ramp	**SB**	**R**	7	A	32	7	A	32
		Exit ramp	**SB**	**ALL**	20	C	-	17	B	-
		Route 110	**EB**	**T/R**	22	C	196	24	C	161
		Route 110	**EB**	**R**	23	C	195	25	C	158
		Route 110	**EB**	**ALL**	22	C	-	25	C	-
		Route 110	**WB**	**L**	27	C	158	15	B	42
		Route 110	**WB**	**L/T**	30	C	#203	21	C	94
		Route 110	**WB**	**ALL**	28	C	-	19	C	-
		Merrimack St.	**NB**	**L**	29	C	43	31	C	103
		Merrimack St.	**NB**	**T/R**	32	C	107	67	E	186
		Merrimack St.	**NB**	**ALL**	32	C	-	62	E	-
		INTERSECTION			**26**	**C**	**-**	**32**	**C**	**-**
50	**NB**	**Monument St.**	**SB**	**L/T**	13	B	90	13	B	79
		Monument St.	**SB**	**R**	16	B	156	13	B	42
		Monument St.	**SB**	**ALL**	15	B	-	13	B	-
		Route 97	**EB**	**L**	7	A	24	13	B	46
		Route 97	**EB**	**T/R**	11	B	128	19	B	252
		Route 97	**EB**	**ALL**	11	B	-	19	B	-
		Route 97	**WB**	**L**	23	C	80	43	D	#155
		Route 97	**WB**	**T/R**	10	B	104	16	B	172
		Route 97	**WB**	**ALL**	12	B	-	20	C	-
		Exit ramp	**NB**	**L**	13	B	73	17	B	246
		Exit ramp	**NB**	**L/T**	13	B	108	23	C	490
		Exit ramp	**NB**	**R**	12	B	34	13	B	77
		Exit ramp	**NB**	**ALL**	12	B	-	19	B	-
		INTERSECTION			**13**	**B**	**-**	**18**	**B**	**-**

TABLE C-2- 2030 No-Build Signalized Intersections

Exit	Approach	Dir.	Mvmt.	AM Delay (s)	AM LOS	AM Queue (ft)	PM Delay (s)	PM LOS	PM Queue (ft)
50* SB	**Exit ramp**	**SB**	**L**	41	D	112	36	D	213
	Exit ramp	**SB**	**R**	39	D	54	32	C	164
	Route 97	**EB**	**L**	52	D	146	128	F	180
	Route 97	**EB**	**T**	3	A	52	5	A	97
	Route 97	**WB**	**TR**	2	A	16	2	A	32
INTERSECTION				15	B	-	21	C	-

[#] 95th percentile volume exceeds capacity, queue may be longer.

[m]Volume for 95th percentile queue is metered by upstream signal.

*Intersection was signalized after the data was collected for 2006 existing conditions. It is analyzed in the future 2030 case as signalized.

Table C-3 2030 No-Build Ramp Operations LOS

Interchange	AM Density (pc/mi/ln)	AM LOS	PM Density (pc/mi/ln)	PM LOS
Exit 32: I-495 at Boston Rd.				
I-495 NB off-ramp to Boston Rd.	over cap	F	21	C
I-495 NB on-ramp to Boston Rd.	over cap	F	32	D
I-495 SB off-ramp to Boston Rd.	33	D	over cap	F
I-495 SB on-ramp to Boston Rd.	32	D	over cap	F
Exit 33: I-495 at Route 4				
I-495 NB off-ramp to Route 4	over cap	F	26	C
I-495 SB on-ramp to Route 4	33	D	over cap	F
Exit 34: I-495 at Route 110				
I-495 NB off-ramp to Route 110	33	D	29	D
I-495 SB off-ramp to Route 110	over cap	F	over cap	F
I-495 SB on-ramp to Route 110	30	D	over cap	F
Exit 34-35: I-495 at Route 110-Route 3				
I-495 NB weave to Route 110-Route 3	>43	F	>43	F
Exit 35: I-495 at 495 NB C-D				
I-495 NB C-D off-ramp to Route 3 SB	21	C	21	C
I-495 NB C-D weave to Route 3	>43	F	>43	F
I-495 SB C-D off-ramp to Route 3 NB	11	B	11	B
I-495 SB C-D weave to Route 3	>43	F	>43	F
I-495 SB C-D on-ramp to Route 3 SB	17	B	17	B
Exit 36: I-495 at Lowell Connector SB				
I-495 NB C-D on-ramp to Lowell Connector SB	16	B	14	B
I-495 NB C-D on-ramp to Lowell Connector NB	21	C	21	C
I-495 NB on-ramp to 495 NB C-D	over cap	F	over cap	F
I-495 SB off-ramp to 495 SB C-D	33	D	over cap	F
I-495 SB C-D off-ramp to Lowell Connector NB	20	C	18	B
Exit 37: I-495 at Woburn St.				
I-495 NB off-ramp to Woburn St.	over cap	F	over cap	F
I-495 NB on-ramp to Woburn St.	over cap	F	33	D
I-495 SB off-ramp to Woburn St.	28	D	29	D
I-495 SB on-ramp to Woburn St.	over cap	F	over cap	F
Exit 38: I-495 at Route 38				
I-495 NB off-ramp to Route 38	over cap	F	32	D
I-495 NB on-ramp to Route 38	30	D	29	D
I-495 SB off-ramp to Route 38	26	C	27	C
I-495 SB on-ramp to Route 38	35	E	36	E
Exit 39: I-495 at Route 133				
I-495 NB off-ramp to Route 133	34	D	31	D
I-495 NB on-ramp to Route 133	27	C	32	D
I-495 SB off-ramp to Route 133	35	D	30	D
I-495 SB on-ramp to Route 133	31	D	33	D
Exit 40: I-495 at I-93 SB				
I-495 NB off-ramp to I-93 SB	31	D	33	D
I-495 NB weave to I-93	30	D	39	E
I-495 NB on-ramp to I-93 NB	23	C	34	D
I-495 SB off-ramp to I-93 NB	32	D	24	C
I-495 SB weave to I-93	>43	F	>43	F
I-495 SB on-ramp to I-93 SB	over cap	F	over cap	F

Table C-3 2030 No-Build Ramp Operations LOS

Interchange	AM Density (pc/mi/ln)	AM LOS	PM Density (pc/mi/ln)	PM LOS
Exit 41: I-495 at Route 28 SB				
I-495 NB off-ramp to Route 28 SB	23	C	31	D
I-495 NB off-ramp to Route 28 NB	19	B	28	D
I-495 SB off-ramp to Route 28	over cap	F	29	D
I-495 SB on-ramp to Route 28	32	D	24	C
Exit 41-42: I-495 at Route 28-Route 114				
I-495 NB weave to Route 28-Route 114	18	B	34	D
Exit 42: I-495 at Route 114 EB				
I-495 NB off-ramp to Route 114 WB	19	B	30	D
I-495 NB on-ramp to Route 114	19	B	34	D
I-495 SB off-ramp to Route 114 EB	31	D	19	B
I-495 SB on-ramp to Route 114	over cap	F	22	C
Exit 43-42: I-495 at Loring St.-Route 114 WB				
I-495 SB weave to Loring St.-Route 114 WB	34	D	16	B
Exit 43: I-495 at Mass. Ave.				
I-495 NB off-ramp to Mass. Ave.	29	D	over cap	F
I-495 NB C-D on-ramp to Mass. Ave.	4	A	14	B
I-495 SB C-D off-ramp to Loring St.	8	A	7	A
I-495 SB on-ramp to 495 SB C-D	31	D	19	N
Exit 44: I-495 at 495 NB C-D				
I-495 NB C-D off-ramp to 495 NB C-D	19	B	33	D
I-495 SB off-ramp to 495 SB C-D	over cap	F	26	C
Exit 44-45: I-495 at Sutton St.-Marston St.				
I-495 NB C-D weave to Sutton St.-Marston St.	21	B	>43	F
I-495 SB C-D weave to Marston St.-Merrimack St.	27	C	23	B
Exit 45: I-495 at Marston St.				
I-495 NB C-D on-ramp to Marston St.	8	A	14	B
I-495 NB on-ramp to 495 NB C-D	20	B	over cap	F
I-495 SB off-ramp to Marston St.	over cap	F	25	C
Exit 46: I-495 at Route 110				
I-495 NB weave to Route 110	23	B	>43	F
I-495 SB off-ramp to Route 110	over cap	F	34	D
I-495 SB on-ramp to Route 110	over cap	F	23	C
Exit 47: I-495 at Route 213				
I-495 NB off-ramp to Route 213	23	C	36	E
I-495 NB on-ramp to Route 213	25	C	over cap	F
I-495 SB off-ramp to Route 213	over cap	F	26	C
I-495 SB on-ramp to Route 213	over cap	F	23	C
Exit 48: I-495 at Route 125 Connector SB				
I-495 NB off-ramp to Route 125 Connector SB	23	C	over cap	F
I-495 NB on-ramp to Route 125 Connector NB	20	B	over cap	F
I-495 SB weave to Route 125 Connector	>43	F	35	D
Exit 49: I-495 at Route 113				
I-495 NB off-ramp to Route 113	26	C	over cap	F
I-495 NB off-ramp to 495 NB C-D	23	C	37	E
I-495 SB C-D off-ramp to Route 113	16	B	9	A
I-495 SB C-D on-ramp to Route 113	22	C	15	B

Table C-3 2030 No-Build Ramp Operations LOS

Interchange	AM Density (pc/mi/ln)	AM LOS	PM Density (pc/mi/ln)	PM LOS
Exit 49-50: I-495 at Route 113-Route 97				
I-495 NB C-D weave to Route 113-Route 97	10	A	40	E
Exit 50: I-495 at Route 97				
I-495 NB C-D on-ramp to Route 97	9	A	11	B
I-495 NB on-ramp to 495 NB C-D	18	B	29	D
I-495 SB off-ramp to 495 SB C-D	over cap	F	25	C
I-495 SB C-D off-ramp to Route 97	9	A	11	B
I-495 SB C-D on-ramp to Route 97	14	B	9	A
Exit 51: I-495 at Route 125 SB				
I-495 NB off-ramp to Route 125 SB	17	B	29	D
I-495 NB weave to Route 125	18	B	27	C
I-495 NB on-ramp to Route 125 NB	15	B	20	B
I-495 SB off-ramp to 495 SB C-D	18	B	16	B
I-495 SB C-D off-ramp to Route 125 NB	6	A	8	A
I-495 SB C-D weave to Route 125	32	C	9	A
I-495 SB C-D on-ramp to Route 125 SB	24	C	13	B
I-495 SB on-ramp to 495 SB C-D	over cap	F	22	C
Exit 52: I-495 at Route 110				
I-495 NB off-ramp to Route 110	17	B	22	C
I-495 NB on-ramp to Route 110	14	B	16	B
I-495 SB off-ramp to Route 110	17	B	16	B
I-495 SB on-ramp to Route 110	19	B	17	B
Exit 53: I-495 at Broad St.				
I-495 NB off-ramp to Broad St.	18	B	21	C
I-495 NB on-ramp to Broad St.	14	B	15	B
I-495 SB off-ramp to Broad St.	16	B	16	B
I-495 SB on-ramp to Broad St.	16	B	15	B
Exit 54: I-495 at Route 150				
I-495 NB off-ramp to Route 150	18	B	20	B
I-495 NB on-ramp to Route 150	15	B	17	B
I-495 SB off-ramp to Route 150	17	B	20	C
I-495 SB on-ramp to Route 150	16	B	15	B
Exit 55: I-495 at Route 110				
I-495 NB off-ramp to Route 110	20	B	23	C
I-495 SB on-ramp to Route 110	23	C	24	C

APPENDIX D
2030 LEVELS OF SERVICE WITH IMPROVEMENTS

TABLES D-1 THROUGH D-6
2030 LEVELS OF SERVICE WITH IMPROVEMENTS

Table D-1 Near-Term Signalized Intersection Improvements

Exit	Approach	Dir.	Mvmt.	2006 AM No-Build			2006 AM Build			2006 PM No-Build			2006 PM Build		
				Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)
38 NB	**Route 38**	**EB**	**L**	18	B	m#121	17	B	m#129	52	D	#316	23	C	m135
	Route 38	**EB**	**T**	7	A	91	6	A	70	21	C	261	8	A	m93
	Route 38	**EB**	**R**	4	A	m9	4	A	m7	18	B	50	7	A	m10
	Route 38	**EB**	**ALL**	9	A	-	8	A	-	28	C	-	12	B	-
	Route 38	**WB**	**L**	48	D	65	40	D	60	53	D	127	38	D	94
	Route 38	**WB**	**T**	22	C	149	19	B	131	32	C	#498	33	C	#345
	Route 38	**WB**	**R**	19	B	38	16	B	34	24	C	65	20	B	45
	Route 38	**WB**	**ALL**	24	C	-	20	B	-	33	C	-	31	C	-
	Home Depot	**NB**	**L**	29	C	#106	61	E	#96	65	E	#222	45	D	#171
	Home Depot	**NB**	**T**	30	C	44	29	C	42	45	D	78	35	C	67
	Home Depot	**NB**	**R**	29	C	24	27	C	24	43	D	38	33	C	38
	Home Depot	**NB**	**ALL**	29	C	-	45	D	-	54	D	-	39	D	-
	Exit ramp	**SB**	**L**	26	C	109	32	C	#119	65	E	#220	30	C	130
	Exit ramp	**SB**	**T**	28	C	72	26	C	73	47	D	104	31	C	84
	Exit ramp	**SB**	**R**	27	C	62	25	C	65	55	E	182	32	C	#118
	Exit ramp	**SB**	**ALL**	27	C	-	28	C	-	59	E	-	31	C	-
	INTERSECTION			**20**	**C**	**-**	**20**	**C**	**-**	**40**	**D**	**-**	**27**	**C**	**-**
39 SB	**Route 133**	**EB**	**L**	9	A	19	14	B	28	24	C	#144	17	B	17
	Route 133	**EB**	**TR**	16	B	415	69	E	#279	13	B	331	6	A	156
	Route 133	**EB**	**ALL**	15	B	-	63	E	-	15	B	-	9	A	-
	Route 133	**WB**	**L**	20	C	#332	11	B	#140	5	A	m8	5	A	m4
	Route 133	**WB**	**TR**	3	A	76	12	B	#243	9	A	375	16	B	#451
	Route 133	**WB**	**ALL**	10	B	-	12	B	-	9	A	-	15	B	-
	International Place	**NB**	**L**	46	D	10	10	B	3	46	D	15	20	C	9
	International Place	**NB**	**T**	47	D	61	11	B	18	236	F	#449	53	D	#241
	International Place	**NB**	**R**	46	D	41	11	B	16	47	D	54	21	C	44
	International Place	**NB**	**ALL**	46	D	-	11	B	-	140	F	-	37	D	-
	Exit ramp	**SB**	**L**	48	D	81	11	B	24	84	F	#104	22	C	43
	Exit ramp	**SB**	**T**	79	E	#293	12	B	67	47	D	70	21	C	40
	Exit ramp	**SB**	**R**	47	D	87	11	B	35	48	D	90	21	C	62
	Exit ramp	**SB**	**ALL**	59	E	-	11	B	-	51	D	-	21	C	-
	INTERSECTION			**25**	**C**	**-**	**27**	**C**	**-**	**48**	**D**	**-**	**19**	**B**	**-**

[#] 95th percentile volume exceeds capacity, queue may be longer.

[m] Volume for 95th percentile queue is metered by upstream signal.

Table D-2 Mid-Term Unsignalized Intersection Improvements

Exit	Approach	Dir.	Mvmt.	2006 AM No-Build			2006 AM Build Signal			2006 PM No-Build			2006 PM Build Signal		
				Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)
33 NB	Exit ramp	EB	L	50	F	140	13	B	170	54	F	111	18	B	167
	Exit ramp	EB	R	24	C	109	12	B	104	14	B	51	13	B	33
	Route 4	NB	T	Not Reported	Not Reported	Not Reported	6	A	94	Not Reported	Not Reported	Not Reported	11	B	341
	Route 4	SB	T	Not Reported	Not Reported	Not Reported	10	B	255	Not Reported	Not Reported	Not Reported	6	A	143
34 NB	Exit ramp	WB	L	20	C	40	28	C	42	88	F	28	47	D	182
	Exit ramp	WB	R	11	B	13	24	C	38	27	D	77	42	D	69
	Route 110	SB	L	Not Applicable	Not Applicable	Not Applicable	13	B	56	Not Applicable	Not Applicable	Not Applicable	17	B	136
	Route 110	SB	T	2	A	2	4	A	246	4	A	14	2	A	159
	Route 110	NB	TR	Not Reported	Not Reported	Not Reported	12	B	375	Not Reported	Not Reported	Not Reported	12	B	620
34 SB	Exit ramp	EB	L	16	C	9	25	C	65	526	F	269	27	C	83
	Exit ramp	EB	R	11	B	23	0	A	0	27	C	129	0	A	0
	Route 110	NB	L	Not Applicable	Not Applicable	Not Applicable	6	A	11	7	A	37	10	B	155
	Route 110	NB	T	1	A	6	4	A	125	Not Reported	Not Reported	Not Reported	3	A	117
	Route 110	SB	T	Not Reported	Not Reported	Not Reported	14	B	251	Not Reported	Not Reported	Not Reported	20	C	377
37 NB	Exit ramp	EB	L/T	68	F	111	17	B	56	234	F	242	42	D	167
	Exit ramp	EB	R	28	D	145	22	C	129	12	B	34	32	C	53
	Woburn St.	NB	TR	Not Reported	Not Reported	Not Reported	5	A	101	Not Reported	Not Reported	Not Reported	23	C	574
	Woburn St.	SB	L	15	C	34	4	A	36	18	C	31	23	C	128
	Woburn St.	SB	T	Not Reported	Not Reported	Not Reported	5	A	164	Not Reported	Not Reported	Not Reported	8	A	121
	Christman Ave.	WB	LTR	2	A	7	16	B	30	3	A	10	31	C	50
37 SB	Exit ramp	WB	L	622	F	707	22	C	186	576	F	403	37	D	199
	Exit ramp	WB	R	10	B	17	15	B	37	12	B	26	32	C	61
	Woburn St.	NB	L	6	A	19	13	B	117	6	A	32	13	B	168
	Woburn St.	NB	T	Not Reported	Not Reported	Not Reported	4	A	31	Not Reported	Not Reported	Not Reported	3	A	68
	Woburn St.	SB	TR	Not Reported	Not Reported	Not Reported	8	A	153	Not Reported	Not Reported	Not Reported	13	B	260
43 NB	Exit ramp	NB	L	159	F	141	32	C	40	83	F	46	21	C	41
	Exit ramp	NB	R	22	C	118	31	C	1	17	C	71	22	C	53
	Mass. Ave.	EB	L	3	A	10	24	C	80	5	A	19	28	C	102
	Mass. Ave.	EB	T	Not Reported	Not Reported	Not Reported	1	A	62	Not Reported	Not Reported	Not Reported	2	A	42
	Loring St.	WB	TR	Not Reported	Not Reported	Not Reported	21	C	819	Not Reported	Not Reported	Not Reported	22	C	588

Table D-2 Mid-Term Unsignalized Intersection Improvements

Exit	Approach	Dir.	Mvmt.	2006 AM No-Build			2006 AM Build Signal			2006 PM No-Build			2006 PM Build Signal		
				Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)
43 SB	**Exit ramp**	**SB**	**L**	29	D	143	25	C	287	83	F	46	20	B	145
	Exit ramp	**SB**	**R**	11	B	34	16	B	39	17	C	71	15	B	34
	Loring St.	**WB**	**L**	Not Applicable	Not Applicable	Not Applicable	20	B	115	5	A	28	14	B	51
	Loring St.	**WB**	**T**	Not Reported	Not Reported	Not Reported	5	A	34	Not Reported	Not Reported	Not Reported	2	A	16
	Loring St.	**EB**	**TR**	Not Reported	Not Reported	Not Reported	36	D	244	Not Reported	Not Reported	Not Reported	25	C	282
44 SB	**Exit ramp**	**SB**	**L**	29	D	143	7	A	153	50	E	212	8	A	148
	Exit ramp	**SB**	**R**	11	B	34	4	A	23	10	B	14	5	A	17
	Merrimack St.	**EB**	**T**	Not Reported	Not Reported	Not Reported	8	A	51	Not Reported	Not Reported	Not Reported	8	A	87
	Merrimack St.	**WB**	**T**	Not Reported	Not Reported	Not Reported	8	A	47	Not Reported	Not Reported	Not Reported	7	A	32
55 NB	**Exit ramp**	**NB**	**R**	217	F	892	16	B	#313	138	F	653	19	B	257
	Route 150	**EB**	**T**	Not Reported	Not Reported	Not Reported	12	B	86	0	A	0	9	A	62
	Route 150	**WB**	**T**	Not Reported	Not Reported	Not Reported	15	B	161	0	A	0	14	B	206

Not Reported: Major movements through unsignalized intersections are not reported.

Not Applicable: Movement does not exist in No-Build case

Table D-3 Long-Term Unsignalized Intersection Improvements

Exit	Approach	Dir.	Mvmt.	2030 AM No-Build			2030 AM Build Signal			2030 PM No-Build			2030 PM Build Signal		
				Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)
49 NB	**Exit ramp**	**NB**	**L**	192	F	117	19	B	40	461	F	260	9	A	49
	Exit ramp	**NB**	**R**	21	C	127	20	C	54	466	F	1442	47	D	#491
	Route 113	**EB**	**L**	12	B	2	16	B	#106	Not Applicable	Not Applicable	Not Applicable	15	B	64
	Route 113	**EB**	**T**	Not Reported	Not Reported	Not Reported	4	A	105	Not reported	Not Reported	Not reported	17	B	269
	Route 113	**WB**	**T**	Not Reported	Not Reported	Not Reported	11	B	#522	Not reported	Not Reported	Not reported	28	C	#292
49 SB	**Exit ramp**	**SB**	**L**	29	D	67	11	B	83	85	F	163	8	A	51
	Exit ramp	**SB**	**R**	11	B	9	10	A	24	13	B	19	8	A	18
	Route 113	**EB**	**L**	8	A	2	9	A	22	Not Applicable	Not Applicable	Not Applicable	4	A	19
	Route 113	**EB**	**T**	Not Reported	Not Reported	Not Reported	10	A	74	Not reported	Not Reported	Not reported	7	A	158
	Route 113	**WB**	**T**	Not Reported	Not Reported	Not Reported	11	B	m69	Not reported	Not Reported	Not reported	5	A	112
	Route 113	**WB**	**R**	Not Reported	Not Reported	Not Reported	20	B	m39	Not reported	Not Reported	Not reported	4	A	29
52 NB	**Exit ramp**	**WB**	**L**	147	F	292	12	B	121	39	E	106	12	B	27
	Exit ramp	**WB**	**R**	15	B	31	10	B	32	21	C	118	11	B	199
	Route 110	**SB**	**L**	2	A	4	6	A	25	Not Applicable	Not Applicable	Not Applicable	10	A	114
	Route 110	**SB**	**T**	Not Reported	Not Reported	Not Reported	6	A	112	Not reported	Not Reported	Not reported	14	B	54
	Route 110	**NB**	**TR**	Not Reported	Not Reported	Not Reported	11	B	232	Not reported	Not Reported	Not reported	17	B	221

Not Reported: Major movements through unsignalized intersections are not reported.

Not Applicable: Movement does not exist in No-Build case

Table D-4 Long-Term Signalized Intersection Improvements

Exit	Approach	Dir.	Mvmt.	2030 AM No-Build			2030 AM Build			2030 PM No-Build			2030 PM Build		
				Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)	Delay (s)	LOS	Queue (ft)
32 NB	**Exit ramp**	**EB**	**L**	15	B	29	31	C	99	20	B	73	29	C	202
	Exit ramp	**EB**	**R**	92	F	#346	38	D	164	18	B	23	20	C	0
	Exit ramp	**EB**	**ALL**	79	E	-	37	D	-	19	B	-	25	C	-
	Boston Rd.	**SB**	**L**	24	C		6	A	70	6	A	100	16	B	22
	Boston Rd.	**SB**	**T**	24	C	m#357	13	B	644	6	A	100	4	A	80
	Boston Rd.	**SB**	**ALL**	24	C	-	12	B	-	6	A	-	6	A	-
	Boston Rd.	**NB**	**TR**	6	A	61	8	A	76	8	A	276	10	B	#516
	Boston Rd.	**NB**	**ALL**	6	A	-	7	A	-	8	A	-	10	B	-
INTERSECTION				**31**	**C**	**-**	**16**	**B**	**-**	**9**	**A**	**-**	**12**	**B**	**-**
32 SB	**Exit ramp**	**WB**	**L**	17	B	132	12	B	105	18	B	82	24	C	108
	Exit ramp	**WB**	**R**	13	B	19	9	A	16	19	B	109	24	C	119
	Exit ramp	**WB**	**ALL**	16	B	-	11	B	-	19	B	-	24	C	-
	Boston Rd.	**SB**	**T**	7	A	116	9	A	157	6	A	172	4	A	58
	Boston Rd.	**NB**	**T**	64	E	#751	4	A	48	10	B	#468	4	A	m121
INTERSECTION				**38**	**D**	**-**	9	A	-	**12**	**B**	**-**	**11**	**B**	**-**
38 NB	**Route 38**	**EB**	**L**	21	C	m#118	20	B	m107	53	D	#346	23	C	m#128
	Route 38	**EB**	**T**	9	A	104	8	A	m103	22	C	256	6	A	m73
	Route 38	**EB**	**R**	5	A	9	6	A	m11	19	B	50	7	A	m8
	Route 38	**EB**	**ALL**	11	B	-	11	B	-	29	C	-	10	B	-
	Route 38	**WB**	**L**	40	D	#81	40	D	#81	53	D	140	39	D	104
	Route 38	**WB**	**T**	23	C	176	23	C	181	39	D	#640	42	D	#392
	Route 38	**WB**	**R**	19	B	43	19	B	44	25	C	97	19	B	45
	Route 38	**WB**	**ALL**	24	C	-	24	C	-	38	D	-	38	D	-
	Home Depot	**NB**	**L**	32	C	#128	30	C	96	70	E	#252	46	D	#204
	Home Depot	**NB**	**T**	31	C	49	31	C	49	43	D	82	35	D	74
	Home Depot	**NB**	**R**	29	C	29	29	C	26	42	D	38	33	C	41
	Home Depot	**NB**	**ALL**	31	C	-	30	C	-	57	E	-	40	D	-
	Exit ramp	**SB**	**L**	29	C	#169	29	C	#169	78	E	#253	33	C	33
	Exit ramp	**SB**	**T**	28	C	93	29	C	99	47	D	110	33	C	94
	Exit ramp	**SB**	**R**	26	C	63	27	C	67	56	E	193	43	D	206
	Exit ramp	**SB**	**ALL**	28	C	8	29	C	-	65	E	-	37	D	-
INTERSECTION				**21**	**C**	**-**	**21**	**C**	**-**	**44**	**D**	**-**	**31**	**C**	**-**
46 NB	**Exit ramp**	**EB**	**LT**	34	C	117	28	C	88	264	F	#615	29	C	291
	Exit ramp	**EB**	**R**	0	A	0	0	A	0	0	A	0	0	A	0
	Exit ramp	**EB**	**All**	17	B	-	14	B	-	181	F	-	20	B	-
	Gas Station	**WB**	**All**	29	C	55	21	C	41	29	C	#76	10	A	22
	Route 110	**NB**	**All**	1	A	15	6	A	71	1	A	217	5	A	98
	Route 110	**SB**	**L**	4	A	12	3	A	11	4	A	17	16	B	34
	Route 110	**SB**	**T**	6	A	188	5	A	175	6	A	81	17	B	144
	Route 110	**SB**	**All**	5	A	-	5	A	-	5	A	-	17	B	-
INTERSECTION				7	A	-	7	A	-	7	A	-	14	B	-

[#] 95th percentile volume exceeds capacity, queue may be longer.

[m]Volume for 95th percentile queue is metered by upstream signal.

Table D-5 Long-Term Ramp Operation Improvements

Interchange	2030 AM No-Build Density (pc/mi/ln)	LOS	2030 AM Build Density (pc/mi/ln)	LOS	2030 PM No-Build Density (pc/mi/ln)	LOS	2030 PM Build Density (pc/mi/ln)	LOS
Exit 32: I-495 at Boston Rd.								
I-495 NB off-ramp to Boston Rd.	over cap	F	16	B	21	C	12	B
I-495 NB on-ramp to Boston Rd.	over cap	F	27	C	32	D	23	C
I-495 SB off-ramp to Boston Rd.	33	D	27	D	over cap	F	29	D
I-495 SB on-ramp to Boston Rd.	32	D	26	C	over cap	F	28	D
Exit 33: I-495 at Route 4								
I-495 NB off-ramp to Route 4	over cap	F	21	C	26	C	17	B
I-495 SB on-ramp to Route 4	33	D	25	C	over cap	F	27	C
Exit 34: I-495 at Route 110								
I-495 NB off-ramp to Route 110	33	D	25	C	29	D	21	C
I-495 SB off-ramp to Route 110	over cap	F	26	C	over cap	F	29	D
I-495 SB on-ramp to Route 110	30	D	24	C	over cap	F	28	C
Exit 34-35: I-495 at Route 110-Route 3								
I-495 NB weave to Route 110-Route 3	>43	F	>43	F	>43	F	No Change- Not widening	
Exit 35: I-495 at 495 NB C-D								
I-495 NB C-D off-ramp to Route 3 SB	21	C	No Change- Not widening		21	C	No Change- Not widening	
I-495 NB C-D weave to Route 3	>43	F	No Change- Not widening		>43	F	No Change- Not widening	
I-495 SB C-D off-ramp to Route 3 NB	11	B	No Change- Not widening		11	B	No Change- Not widening	
I-495 SB C-D weave to Route 3	>43	F	No Change- Not widening		>43	F	No Change- Not widening	
I-495 SB C-D on-ramp to Route 3 SB	17	B	No Change- Not widening		17	B	No Change- Not widening	
Exit 36: I-495 at Lowell Connector SB								
I-495 NB C-D on-ramp to Lowell Connector SB	16	B	No Change- Not widening		14	B	No Change- Not widening	
I-495 NB C-D on-ramp to Lowell Connector NB	21	C	No Change- Not widening		21	C	No Change- Not widening	
I-495 NB on-ramp to 495 NB C-D	over cap	F	No Change- Not widening		over cap	F	No Change- Not widening	
I-495 SB off-ramp to 495 SB C-D	33	D	No Change- Not widening		over cap	F	No Change- Not widening	
I-495 SB C-D off-ramp to Lowell Connector NB	20	C	No Change- Not widening		18	B	No Change- Not widening	
Exit 37: I-495 at Woburn St.								
I-495 NB off-ramp to Woburn St.	over cap	F	31	D	over cap	F	25	C
I-495 NB on-ramp to Woburn St.	over cap	F	27	C	33	D	24	C
I-495 SB off-ramp to Woburn St.	28	D	18	B	29	D	18	B
I-495 SB on-ramp to Woburn St.	over cap	F	25	C	over cap	F	26	C
Exit 38: I-495 at Route 38								
I-495 NB off-ramp to Route 38	over cap	F	28	D	32	D	26	C
I-495 NB on-ramp to Route 38	30	D	25	C	29	D	23	C
I-495 SB off-ramp to Route 38	26	C	17	B	27	C	17	B
I-495 SB on-ramp to Route 38	35	E	22	C	36	E	22	C

Table D-5 Long-Term Ramp Operation Improvements

Interchange	2030 AM No-Build Density (pc/mi/ln)	LOS	2030 AM Build Density (pc/mi/ln)	LOS	2030 PM No-Build Density (pc/mi/ln)	LOS	2030 PM Build Density (pc/mi/ln)	LOS
Exit 39: I-495 at Route 133								
I-495 NB off-ramp to Route 133	34	D	29	D	31	D	24	C
I-495 NB on-ramp to Route 133	27	C	21	C	32	D	24	C
I-495 SB off-ramp to Route 133	35	D	29	D	30	D		
I-495 SB on-ramp to Route 133	31	D	25	C	33	D	24	C
Exit 40: I-495 at I-93 SB								
I-495 NB off-ramp to I-93 SB	31	D	26	C	33	D	27	C
I-495 NB weave to I-93	30	D	30	D	39	E	39	E
I-495 NB on-ramp to I-93 NB	23	C	16	B	34	D	22	C
I-495 SB off-ramp to I-93 NB	32	D	24	D	24	C	17	B
I-495 SB weave to I-93	>43	F	>43	F	>43	F	>43	F
I-495 SB on-ramp to I-93 SB	over cap	F	26	C	over cap	F	22	C
Exit 41: I-495 at Route 28 SB								
I-495 NB off-ramp to Route 28 SB	23	C	16	B	31	D	23	C
I-495 NB off-ramp to Route 28 NB	19	B	12	B	28	D	21	C
I-495 SB off-ramp to Route 28	over cap	F	28	D	29	D	16	B
I-495 SB on-ramp to Route 28	32	D	23	C	24	C	17	B
Exit 41-42: I-495 at Route 28-Route 114								
I-495 NB weave to Route 28-Route 114	18	B	18	B	34	D	34	D
Exit 42: I-495 at Route 114 EB								
I-495 NB off-ramp to Route 114 WB	19	B	12	B	30	D	21	C
I-495 NB on-ramp to Route 114	19	B	15	B	34	D	24	C
I-495 SB off-ramp to Route 114 EB	31	D	25	C	19	B	12	B
I-495 SB on-ramp to Route 114	over cap	F	25	C	22	C	16	B
Exit 43-42: I-495 at Loring St.-Route 114 WB								
I-495 SB weave to Loring St.-Route 114 WB	34	D	34	D	16	B	16	B
Exit 43: I-495 at Mass. Ave.								
I-495 NB off-ramp to Mass. Ave.	29	D	No Change- Not widening		over cap	F	No Change- Not widening	
I-495 NB C-D on-ramp to Mass. Ave.	4	A	No Change- Not widening		14	B	No Change- Not widening	
I-495 SB C-D off-ramp to Loring St.	8	A	No Change- Not widening		7	A	No Change- Not widening	
I-495 SB on-ramp to 495 SB C-D	31	D	No Change- Not widening		19	B	No Change- Not widening	
Exit 44: I-495 at 495 NB C-D								
I-495 NB C-D off-ramp to 495 NB C-D	19	B	No Change- Not widening		33	D	No Change- Not widening	
I-495 SB off-ramp to 495 SB C-D	over cap	F	No Change- Not widening		26	C	No Change- Not widening	

Table D-5 Long-Term Ramp Operation Improvements

Interchange	2030 AM No-Build Density (pc/mi/ln)	LOS	2030 AM Build Density (pc/mi/ln)	LOS	2030 PM No-Build Density (pc/mi/ln)	LOS	2030 PM Build Density (pc/mi/ln)	LOS
Exit 44-45: I-495 at Sutton St.-Marston St.								
I-495 NB C-D weave to Sutton St.-Marston St.	21	B	No Change- Not widening		>43	F	No Change- Not widening	
I-495 SB C-D weave to Marston St.-Merrimack St.	27	C	No Change- Not widening		23	B	No Change- Not widening	
Exit 45: I-495 at Marston St.								
I-495 NB C-D on-ramp to Marston St.	8	A	No Change- Not widening		14	B	No Change- Not widening	
I-495 NB on-ramp to 495 NB C-D	20	B	No Change- Not widening		over cap	F	No Change- Not widening	
I-495 SB off-ramp to Marston St.	over cap	F	No Change- Not widening		25	C	No Change- Not widening	
Exit 46: I-495 at Route 110								
I-495 NB weave to Route 110	23	B	23	B	>43	F	>43	F
I-495 SB off-ramp to Route 110	over cap	F	24	C	34	D	15	B
I-495 SB on-ramp to Route 110	over cap	F	26	C	23	C	18	B
Exit 47: I-495 at Route 213								
I-495 NB off-ramp to Route 213	23	C	18	B	36	E	32	D
I-495 NB on-ramp to Route 213	25	C	18	B	over cap	F	24	C
I-495 SB off-ramp to Route 213	over cap	F	31	D	26	C	23	C
I-495 SB on-ramp to Route 213	over cap	F	30	D	23	C	18	B
Exit 48: I-495 at Route 125 Connector SB								
I-495 NB off-ramp to Route 125 Connector SB	23	C	18	B	over cap	F	27	C
I-495 NB on-ramp to Route 125 Connector NB	20	B	16	B	over cap	F	27	C
I-495 SB weave to Route 125 Connector	>43	F	>43	F	35	D	35	D
Exit 49: I-495 at Route 113								
I-495 NB off-ramp to Route 113	26	C	17	B	over cap	F	31	D
I-495 NB off-ramp to 495 NB C-D	23	C			37	E		
I-495 SB C-D off-ramp to Route 113	16	B	13	B	9	A	8	A
I-495 SB C-D on-ramp to Route 113	22	C	13	B	15	B	13	B
Exit 49-50: I-495 at Route 113-Route 97								
I-495 NB C-D weave to Route 113-Route 97	10	A	10	A	40	E	40	E
Exit 50: I-495 at Route 97								
I-495 NB C-D on-ramp to Route 97	9	A	No Change- Not widening		11	B	No Change- Not widening	
I-495 NB on-ramp to 495 NB C-D	18	B	No Change- Not widening		29	D	No Change- Not widening	
I-495 SB off-ramp to 495 SB C-D	over cap	F	No Change- Not widening		25	C	No Change- Not widening	
I-495 SB C-D off-ramp to Route 97	9	A	No Change- Not widening		11	B	No Change- Not widening	
I-495 SB C-D on-ramp to Route 97	14	B	No Change- Not widening		9	A	No Change- Not widening	

Table D-5 Long-Term Ramp Operation Improvements

Interchange	2030 AM No-Build Density (pc/mi/ln)	LOS	2030 AM Build Density (pc/mi/ln)	LOS	2030 PM No-Build Density (pc/mi/ln)	LOS	2030 PM Build Density (pc/mi/ln)	LOS
Exit 51: I-495 at Route 125 SB								
I-495 NB off-ramp to Route 125 SB	17	B	No Change- Not widening		29	D	No Change- Not widening	
I-495 NB weave to Route 125	18	B	No Change- Not widening		27	C	No Change- Not widening	
I-495 NB on-ramp to Route 125 NB	15	B	No Change- Not widening		20	B	No Change- Not widening	
I-495 SB off-ramp to 495 SB C-D	18	B	No Change- Not widening		16	B	No Change- Not widening	
I-495 SB C-D off-ramp to Route 125 NB	6	A	No Change- Not widening		8	A	No Change- Not widening	
I-495 SB C-D weave to Route 125	32	C	No Change- Not widening		9	A	No Change- Not widening	
I-495 SB C-D on-ramp to Route 125 SB	24	C	No Change- Not widening		13	B	No Change- Not widening	
I-495 SB on-ramp to 495 SB C-D	over cap	F	No Change- Not widening		22	C	No Change- Not widening	
Exit 52: I-495 at Route 110								
I-495 NB off-ramp to Route 110	17	B	No Change- Not widening		22	C	No Change- Not widening	
I-495 NB on-ramp to Route 110	14	B	No Change- Not widening		16	B	No Change- Not widening	
I-495 SB off-ramp to Route 110	17	B	No Change- Not widening		16	B	No Change- Not widening	
I-495 SB on-ramp to Route 110	19	B	No Change- Not widening		17	B	No Change- Not widening	
Exit 53: I-495 at Broad St.								
I-495 NB off-ramp to Broad St.	18	B	No Change- Not widening		21	C	No Change- Not widening	
I-495 NB on-ramp to Broad St.	14	B	No Change- Not widening		15	B	No Change- Not widening	
I-495 SB off-ramp to Broad St.	16	B	No Change- Not widening		16	B	No Change- Not widening	
I-495 SB on-ramp to Broad St.	16	B	No Change- Not widening		15	B	No Change- Not widening	
Exit 54: I-495 at Route 150								
I-495 NB off-ramp to Route 150	18	B	No Change- Not widening		20	B	No Change- Not widening	
I-495 NB on-ramp to Route 150	15	B	No Change- Not widening		17	B	No Change- Not widening	
I-495 SB off-ramp to Route 150	17	B	No Change- Not widening		20	C	No Change- Not widening	
I-495 SB on-ramp to Route 150	16	B	No Change- Not widening		15	B	No Change- Not widening	
Exit 55: I-495 at Route 110								
I-495 NB off-ramp to Route 110	20	B	No Change- Not widening		23	C	No Change- Not widening	
I-495 SB on-ramp to Route 110	23	C	No Change- Not widening		24	C	No Change- Not widening	

Table D-6 Long-Term Link Operation Improvements

				2030 AM No-Build			2030 AM Build			2030 PM No-Build			2030 PM Build		
Dir.	Link		Location	Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
NB	32	33	Westford-Chelmsford	6580	>45	F	6580	28	D	5650	34	D	5650	23	C
NB	33	34	Chelmsford	5920	39	E	5920	25	C	5180	30	D	5180	21	C
NB	34	35	Chelmsford	6460	>45	F	6460	28	D	5590	34	D	5590	27	D
NB	35	36	Lowell	4350	24	C	No Change- Not widening			3450	19	C	No Change- Not widening		
NB	36	37	Chelmsford-Lowell	6580	>45	F	6580	28	D	5690	35	D	5690	23	C
NB	37	38	Lowell-Tewksbury	6140	43	E	6140	26	C	5760	35	E	5760	23	C
NB	38	39	Tewksbury	5690	36	E	5690	24	C	5510	33	D	5510	22	C
NB	39	40	Tewksbury-Andover	4800	27	D	4800	20	C	5680	35	D	5680	23	C
NB	40	41	Andover	3670	20	C	3670	15	B	5530	33	D	5530	22	C
NB	41	42	Andover	3360	18	B	3360	14	B	5770	36	E	5770	25	C
NB	42	43	Methuen	3210	18	B	3210	13	B	6040	>45	F	6040	25	C
NB	43	44	N. Andover-Lawrence	2520	14	B	No Change- Not widening			4840	27	D	No Change- Not widening		
NB	44	45	Lawrence	2520	14	B	No Change- Not widening			4840	27	D	No Change- Not widening		
NB	45	46	Lawrence-Methuen	3380	19	C	3380	14	B	6600	>45	F	6600	28	D
NB	46	47	Methuen	3530	19	C	3530	15	B	6170	41	E	6170	25	C
NB	47	48	Methuen-Haverhill	3960	22	C	3960	17	B	6420	>45	F	6420	27	D
NB	48	49	Haverhill	3490	19	C	3490	15	B	6610	>45	F	6610	28	D
NB	49	50	Haverhill	3210	18	B	No Change- Not widening			6200	42	E	No Change- Not widening		
NB	50	51	Haverhill	3120	17	B	No Change- Not widening			5280	30	D	No Change- Not widening		
NB	51	52	Haverhill	2830	16	B	No Change- Not widening			3700	20	C	No Change- Not widening		
NB	52	53	Haverhill-Merrimac	2690	15	B	No Change- Not widening			3320	18	B	No Change- Not widening		
NB	53	54	Merrimac-Amesbury	2750	15	B	No Change- Not widening			3200	17	B	No Change- Not widening		
NB	54	55	Amesbury	2590	14	B	No Change- Not widening			2980	16	B	No Change- Not widening		
SB	55	54	Amesbury	2870	16	B	No Change- Not widening			2960	16	B	No Change- Not widening		
SB	54	53	Amesbury-Merrimac	3100	17	B	No Change- Not widening			2390	13	B	No Change- Not widening		
SB	53	52	Merrimac-Haverhill	3140	17	B	No Change- Not widening			2870	16	B	No Change- Not widening		
SB	52	51	Haverhill	3360	18	C	No Change- Not widening			2910	16	B	No Change- Not widening		
SB	51	50	Haverhill	5370	32	D	No Change- Not widening			3541	19	C	No Change- Not widening		
SB	50	49	Haverhill	6270	44	E	No Change- Not widening			3510	19	C	No Change- Not widening		
SB	49	48	Haverhill	6790	>45	F	6790	29	D	3910	21	C	3910	16	B
SB	48	47	Haverhill-Methuen	6470	>45	F	6470	27	D	4530	25	C	4530	18	C
SB	47	46	Methuen	6080	41	E	6080	25	C	3940	21	C	3940	16	B
SB	46	45	Methuen	6550	>45	F	6550	28	D	4020	22	C	4020	16	B
SB	45	44	Lawrence	5320	31	D	No Change- Not widening			2950	16	B	No Change- Not widening		
SB	44	43	Lawrence-N. Andover	5320	31	D	No Change- Not widening			2950	16	B	No Change- Not widening		
SB	43	42	Lawrence	6310	45	E	6310	26	D	3750	20	C	3750	15	B
SB	42	41	Lawrence-Andover	5930	38	E	5930	25	C	3630	20	C	3630	15	B
SB	41	40	Andover	5610	34	D	5610	23	C	3940	21	C	3940	16	B
SB	40	39	Andover-Tewksbury	5930	38	E	6060	25	C	5100	29	D	5100	21	C
SB	39	38	Tewksbury	5700	35	E	5700	23	C	5690	35	E	5690	23	C
SB	38	37	Tewksbury-Lowell	5910	39	E	5910	25	C	6180	42	E	6180	26	C
SB	37	36	Lowell	5860	37	E	5860	23	C	6580	>45	F	6580	28	D
SB	36	35	Lowell	3820	21	C	No Change- Not widening			3920	21	C	No Change- Not widening		
SB	35	34	Chelmsford	5590	35	D	5590	23	C	6570	>45	F	6570	28	D
SB	34	33	Chelmsford	5460	33	D	5460	22	C	6140	42	E	6140	26	C
SB	33	32	Westford	5950	39	E	5950	25	C	6540	>45	F	6540	28	D