2 EXISTING CONDITIONS

2.1 Land Use

Salem is a community with a rich historical legacy. It was one of the earliest landing sites of the English colonists, the first major port in the colonies, the driving force of the East Indian trade, and a thriving hub of American commerce. Today, the city is the educational, medical, legal, cultural, and financial center of the North Shore area. It serves as the home of Salem State College, the North Shore Medical Center, the Essex County District, Superior, and Probate Courts, the Registry of Deeds, the Peabody Essex Museum, and many banks and other financial institutions. These establishments, except Salem State College and the North Shore Medical Center, are located in the downtown.

In addition, many tourist attractions and historical sites are located in or near the downtown. These include the National Park Visitor Center, the Salem Common, the Salem Maritime Historical Site and the ship Friendship, the Witch Trial Memorial, the Witch Museum, the Witch Dungeon Museum, the Witch House, and many other museums and historical sites. Figure 2-1 shows the locations of major business destinations and tourist attractions in downtown Salem and vicinity.

The primary type of land use in downtown Salem is commercial. Retail shops and restaurants are located throughout the area, with high concentrations on Washington Street, on Essex Street, in the Riley Plaza area, and in the Pickering Wharf waterfront area. Law, financial, and other offices are mainly located on Federal Street, Essex Street, Norman Street, and Washington Street. Another major land use is residential, and the main type is multiple-unit housing. In recent years, the number of condominiums has been increasing in the downtown area.

Downtown Salem also serves as a transportation center for the region. The Salem commuter rail station is a major stop on the Newburyport/Rockport Line. State Routes 1A, 114, and 107 all go through downtown Salem and connect to many North Shore communities. There are about 2,500 public parking spaces owned and operated by the City in the downtown area. The majority of these spaces (about 2,000) are located in the Museum Mall Garage, the Harbor Garage, the Church Street lot, the Riley Plaza lot, and other parking lots. The rest of them (about 500) are on-street parking located on various downtown streets. The City also designates nearly 20 bus parking spaces at various locations near major tourist attractions (see Figure 2-1).

2.2 Public Transportation

The major public transit services in the study area are the Newburyport/Rockport commuter rail line and a number of bus routes owned and operated by the Massachusetts Bay Transportation Authority (MBTA). Figure 2-2 shows the locations and alignments of these services.

The commuter rail line, connecting several North Shore communities to downtown Boston, carries about 18,000 person trips on an average weekday. In Salem, the line runs along the south side of the North River, stops at the station just north of Bridge Street, goes under Washington Street, comes up to the surface after it passes Riley Plaza, and continues southward in parallel with Canal Street. The station in Salem serves about 4,000 person trips on an average weekday. During the morning peak period of commuter rail boarding here, which is 5:30 to 8:30, about 1,400 passengers take the inbound trains at the station.[1] The station is located in a triangular site defined by the tracks, the North River, and Bridge Street. In addition to the station platform, the site contains a 344-space parking lot owned by the MBTA and a 123-space parking lot owned by the City. The MBTA is proposing to build a new 1,000-space parking garage at the site for both commuter rail riders and employees of the state courts.[2]

The MBTA bus routes provide services to/from nearby communities, Haymarket, and other locations in downtown Boston. Route 451 runs from Salem Depot (the commuter rail station), via Downtown Beverly, to North Beverly. Route 465 runs from Salem Depot to Liberty Tree Mall in Danvers via Peabody. Route 468 runs from Salem Depot to Danvers Square via Peabody. Route 456 runs from Salem Depot to Central Square in Lynn. Routes 450, 455, and 459 run from Salem Depot to downtown Boston via various locales in Lynn, Revere, and East Boston. In general, these buses travel on urban streets in densely settled areas. The MBTA 2003 ridecheck data indicate that these buses were not overcrowded but that most of them did not adhere to schedule.[3]

2.3 Roadway Conditions

Downtown Salem has a dense roadway network that serves regional and local traffic. Three major regional highways, Routes 1A, 114, and 107, carry more than 50,000 vehicular trips through the downtown area on an average weekday. Most motorists from the coastal communities in the region use these state highways to access I-95 and Route 1, as there is no direct connection. The downtown sections of these highways are all administered by the City. Major local arterials and collectors, including Canal Street, Derby Street, Essex Street, and Margin Street, connect the downtown to other areas of Salem. Due to congestion on the regional highways, through-town traffic also uses these local roadways during peak periods.

2.3.1 Arterial Travel Speeds

As part of Route 1A, 114, or 107, major arterials in downtown Salem, such as Washington Street, Bridge Street, North Street, Summer Street, Lafayette Street, Derby Street, and Hawthorne Boulevard, are congested during peak periods. The location and severity of congestion on these streets can be depicted by the average travel speeds on different roadway

[1] *Commuter Rail Train Audits*, Massachusetts Bay Commuter Railroad Company, November 2004.

[2] *MBTA Salem Commuter Rail Station and Parking Improvements – 15% Concept Design Report*, TAMS Architecture, August 2004.

[3] *MBTA Bus Data Collection Program – Selected Routes from Spring 2003 and Fall 2003*, Central Transportation Planning Staff.

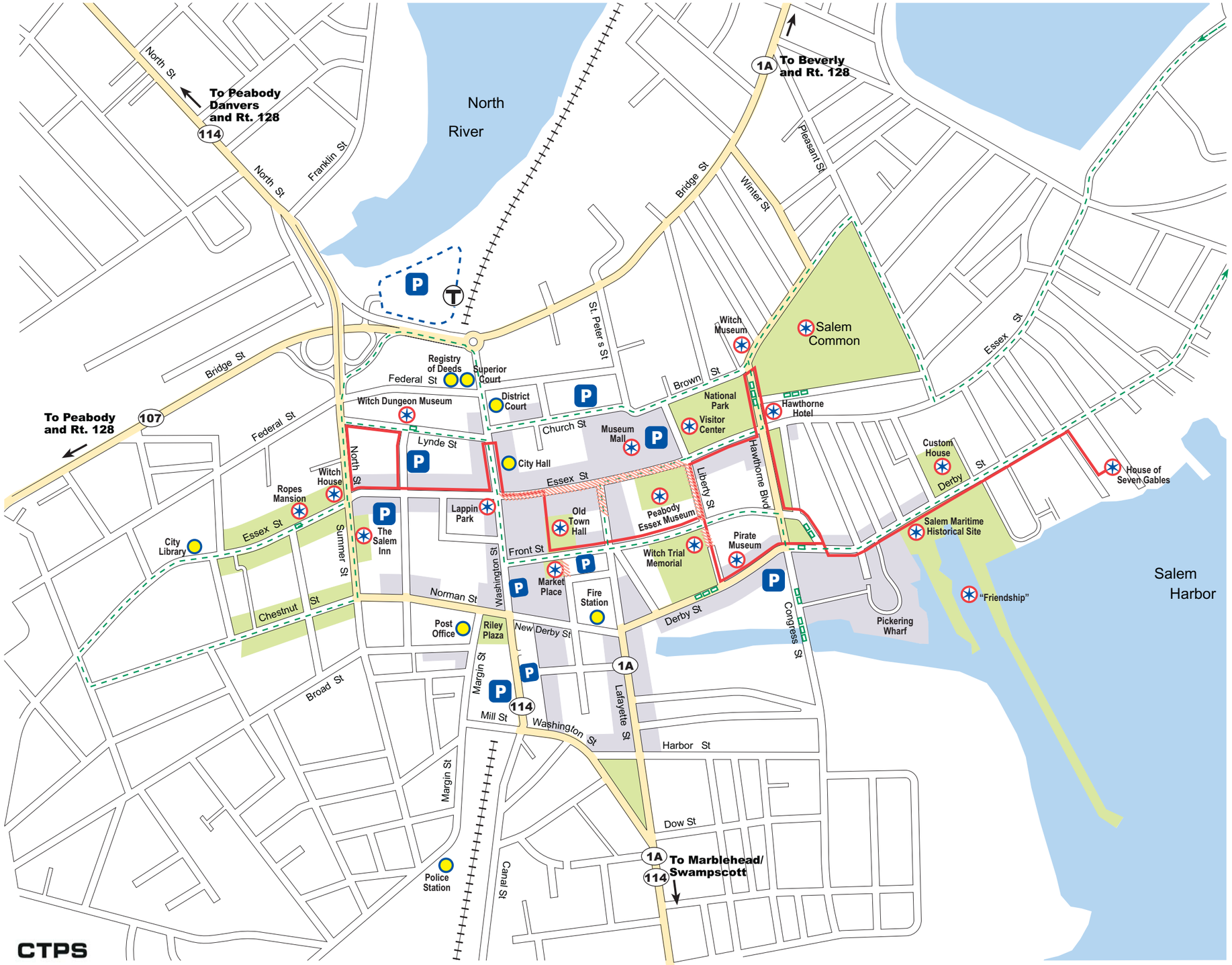
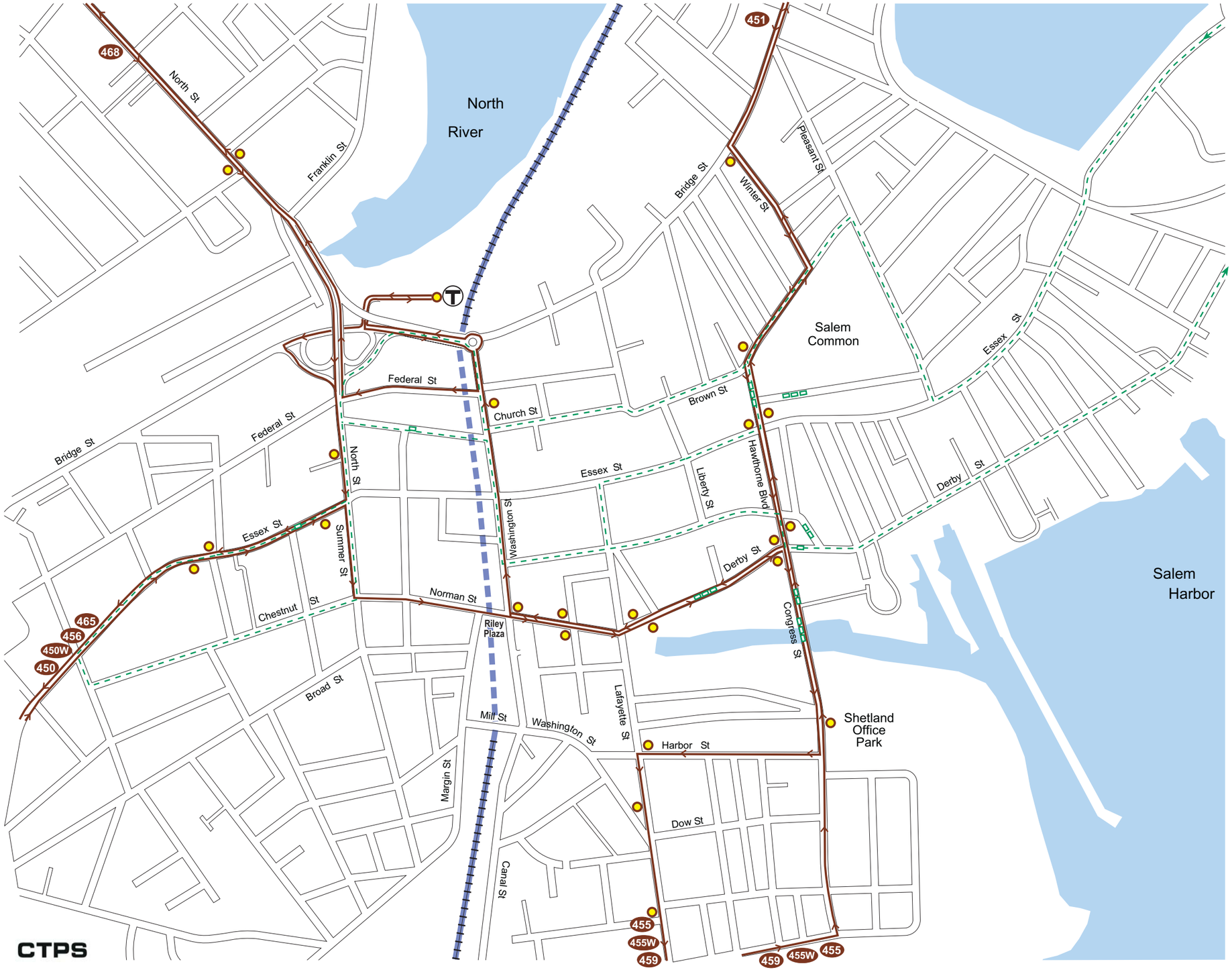


Figure 2-1
Business Destinations, Tourist Attractions, and Other Land Uses

Legend

- Tourist attraction
- Major public building
- Pedestrian mall
- Heritage Trail (walking path)
- Trolley route
- Open space/historical site
- State route
- Major shopping/retail area
- Commuter rail station
- Public parking
- Tourist bus parking

Downtown Salem Transportation Improvement Study



Legend

- MBTA bus route
- 451 Bus route number
- MBTA bus stop
- MBTA commuter rail
- Trolley route
- Tourist bus parking

Figure 2-2
Public Transportation

Downtown Salem Transportation Improvement Study

segments. CTPS performed travel time runs on Routes 1A, 107, and 114 in the region in 2001 and 2002 as part of the Congestion Management System process. Travel time data were collected using a probe vehicle that traveled with the flow of traffic. The "average speed" technique[4] was used, in which the average travel speed of a roadway segment is derived from travel time that includes the time the probe vehicle stops at an intersection and any other traffic interruptions.

Figure 2-3 shows the average travel speeds on these arterials in the morning peak period, 6:30 to 9:00. As shown, the speeds on most sections are in the range of 25 miles per hour (mph) or less. The travel speeds on Route 114 are generally lower than those on Routes 1A and 107. The lowest speed on Route 114 is on the section of Washington Street between Norman Street and Lafayette Street. This section is in the vicinity of Riley Plaza, where several roadways join together, and contains two signalized intersections (Washington Street at Norman Street and Washington Street at Canal Street). The section of Route 114 between Federal Street and Norman Street also has low average speeds: 15 mph or less. The roadway in this section is narrow, and there is a signalized intersection at Essex Street.

Figure 2-4 shows the average travel speeds in the evening peak period, 3:30 to 6:30. It displays an overall travel speed distribution pattern similar to that in the morning, with even lower travel speeds on some roadway sections. The most notable is Route 1A between Washington Street and Winter Street, especially on Hawthorne Boulevard northbound, where the average travel speed is estimated at 10 mph or lower. This section includes two signalized intersections (Lafayette Street at Derby Street and Hawthorne Boulevard at Essex Street) and a four-way-stop-controlled intersection (Derby Street at Hawthorne Boulevard).

2.3.2 Peak Hour Traffic Volumes

Traffic volumes are essential data for analyzing traffic conditions. For this study, CTPS collected AM and PM peak period turning movement counts at major downtown intersections in December 2003 and May 2004. From recent transportation studies related to the area, CTPS obtained 24-hour traffic counts on major roadways and turning movements at some other downtown intersections. These data were compiled and balanced with seasonal adjustments to produce traffic flow maps that illustrate peak hour traffic conditions in the study area. Figures 2-5 and 2-6 show the AM (7:30 to 8:30) and PM (4:30 to 5:30) peak hour balanced traffic volumes, respectively. As shown, North Street, Bridge Street, Washington Street, Summer Street, Norman Street, and Derby Street all carry high traffic volumes during the peak hours.

2.3.3 Intersection Traffic Operations

Intersection traffic operations are evaluated in terms of level of service (LOS). The criteria defining the six levels of service are based on six ranges of intersection delay, which is estimated from intersection geometry, operational parameters, and approaching traffic volumes. Table 2-1 shows the LOS criteria for unsignalized and signalized intersections from the Highway Capacity Manual (HCM 2000).[5] LOS A represents the most favorable condition,

[4] *Transportation and Traffic Engineering Handbook*, Second Edition, Institute of Transportation Engineers.
[5] *Highway Capacity Manual 2000*, Transportation Research Board, National Research Council, Washington D.C.

Table 2-1 Level-of-Service Criteria (HCM 2000)

LOS	Unsignalized Intersections	Signalized Intersections
	Control Delay per Vehicle (seconds)	Control Delay per Vehicle (seconds)
A	≤ 10	≤ 10
B	>10 and ≤ 15	>10 and ≤ 20
C	>15 and ≤ 25	>20 and ≤ 35
D	>25 and ≤ 35	>35 and ≤ 55
E	>35 and ≤ 50	>55 and ≤ 80
F	> 50	> 80

with minimal traffic delay. LOS F represents the worst condition, with significant traffic delay. LOS D is generally considered acceptable in an urban environment.

Using the balanced peak hour traffic volumes and intersection geometry data collected from field reconnaissance, CTPS analyzed the existing traffic operations of major downtown intersections. The analysis was performed through the application of Synchro/SimTraffic,[6] a traffic analysis and simulation software package that contains methodologies based on HCM 2000.

Figures 2-7 and 2-8 present, respectively, the AM and PM peak hour levels of service of major intersections in the downtown area under the existing conditions. Detailed capacity analysis results for each of the intersections are presented in Appendix B. In general, traffic operations are somewhat worse in the evening than in the morning, due to higher traffic volumes.

At the unsignalized intersections, most of the minor street approaches (usually under stop control) were evaluated at LOS F with significant delays. At the four-way-stop-controlled intersection of Derby Street at Hawthorne Boulevard, most approaches were evaluated at LOS F with extensive delays. The intersection of Bridge Street at Washington Street currently operates like a combination of traffic rotary and unsignalized intersection with a pedestrian-actuated signal to stop traffic on all approaches for pedestrian crossings (to/from the commuter rail station). Due to its unusual operation, it was analyzed as a three-way-yield unsignalized intersection; the pedestrian interruptions were not considered, and therefore the actual conditions may be worse than the analyzed results for the northbound and the westbound left-turn movements.

At the signalized intersections, the overall intersection delays are not extensive and were evaluated at LOS C or D. At some intersections, even though the overall intersection delay was modest, delays of some individual approaches (such as the northbound and westbound approaches at the intersection of Washington Street at Canal Street) are extensive and were evaluated as LOS E or F.

[6] *Synchro/SimTraffic Version 6*, Trafficware Corporation, 2003.

Figure 2-3
AM Peak Period
Arterial Travel Speeds

Legend: Average Speed

- 1 –10 mph
- 11 –15 mph
- 16 –20 mph
- 21 –25 mph
- 26 –30 mph
- 30+ mph

Downtown Salem Transportation Improvement Study

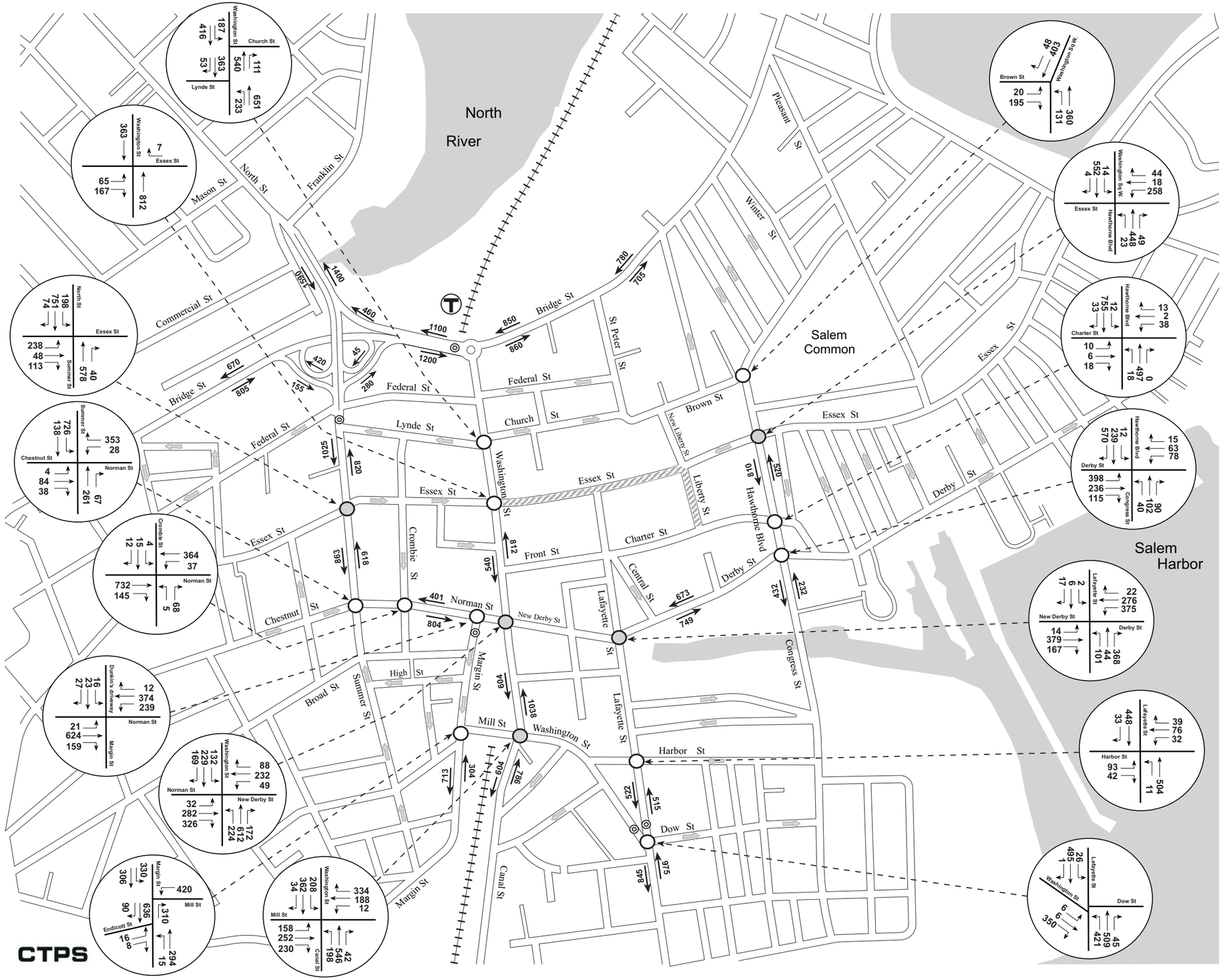
Figure 2-4
PM Peak Period
Arterial Travel Speeds

Legend: Average Speed

- 1 –10 mph
- 11 –15 mph
- 16 –20 mph
- 21 –25 mph
- 26 –30 mph
- 30+ mph

Downtown Salem Transportation Improvement Study

Figure 2-5
Base Year (2004)
AM Peak Hour
Balanced Traffic Volumes

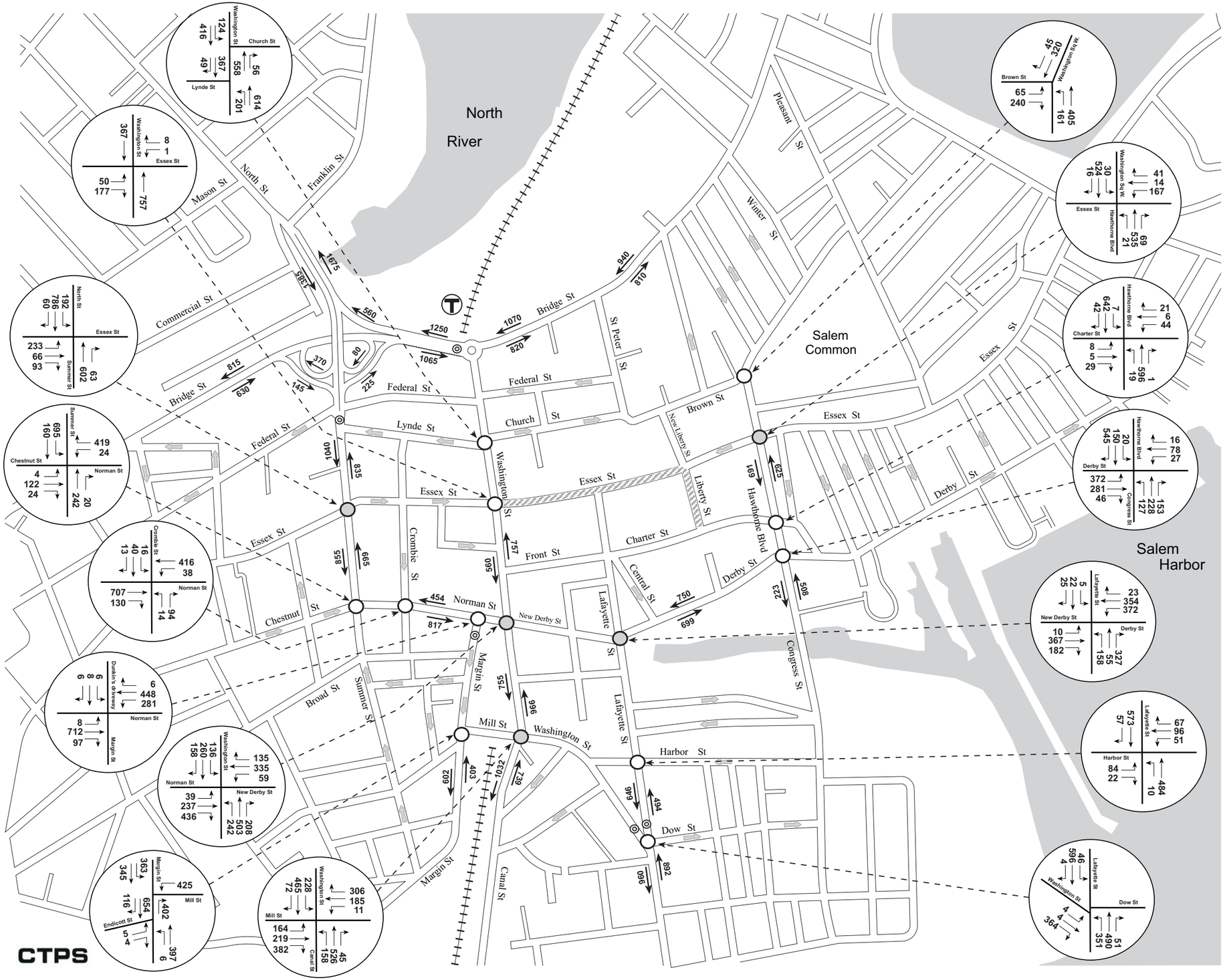


Legend

- Signalized Intersection
- Unsignalized Intersection
- Traffic Signal for Pedestrian Crossing
- One-way Street
- Pedestrians Only
- 88 / 224 / 49 — Turning-Movement Counts
- 673 — Directional Traffic Count

Downtown Salem Transportation Improvement Study

Figure 2-6
Base Year (2004)
PM Peak Hour
Balanced Traffic Volumes



Legend

- Signalized Intersection
- Unsignalized Intersection
- Traffic Signal for Pedestrian Crossing
- One-way Street
- Pedestrians Only
- 88 / 224 / 49 — Turning-Movement Counts
- 673 — Directional Traffic Count

Downtown Salem Transportation Improvement Study

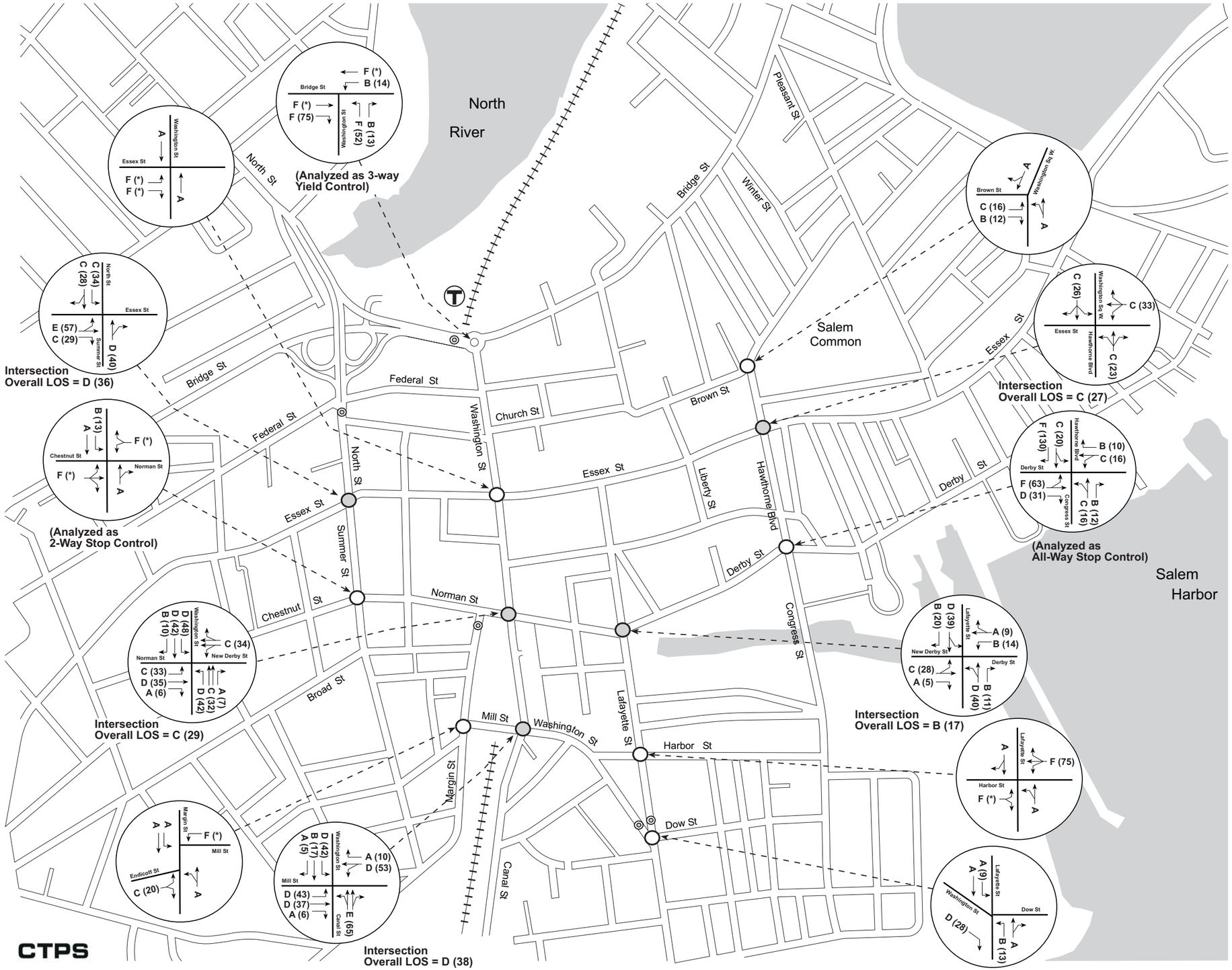


Figure 2-7
Base Year (2004)
AM Peak Hour
Intersection Capacity Analysis

Legend

- Signalized Intersection
- Unsignalized Intersection
- Traffic Signal for Pedestrian Crossing
- B (12) / E (63) Level of Service (Delay per Veh.)
- F (*) Delay per Vehicle > 120 Sec.

Downtown Salem Transportation Improvement Study

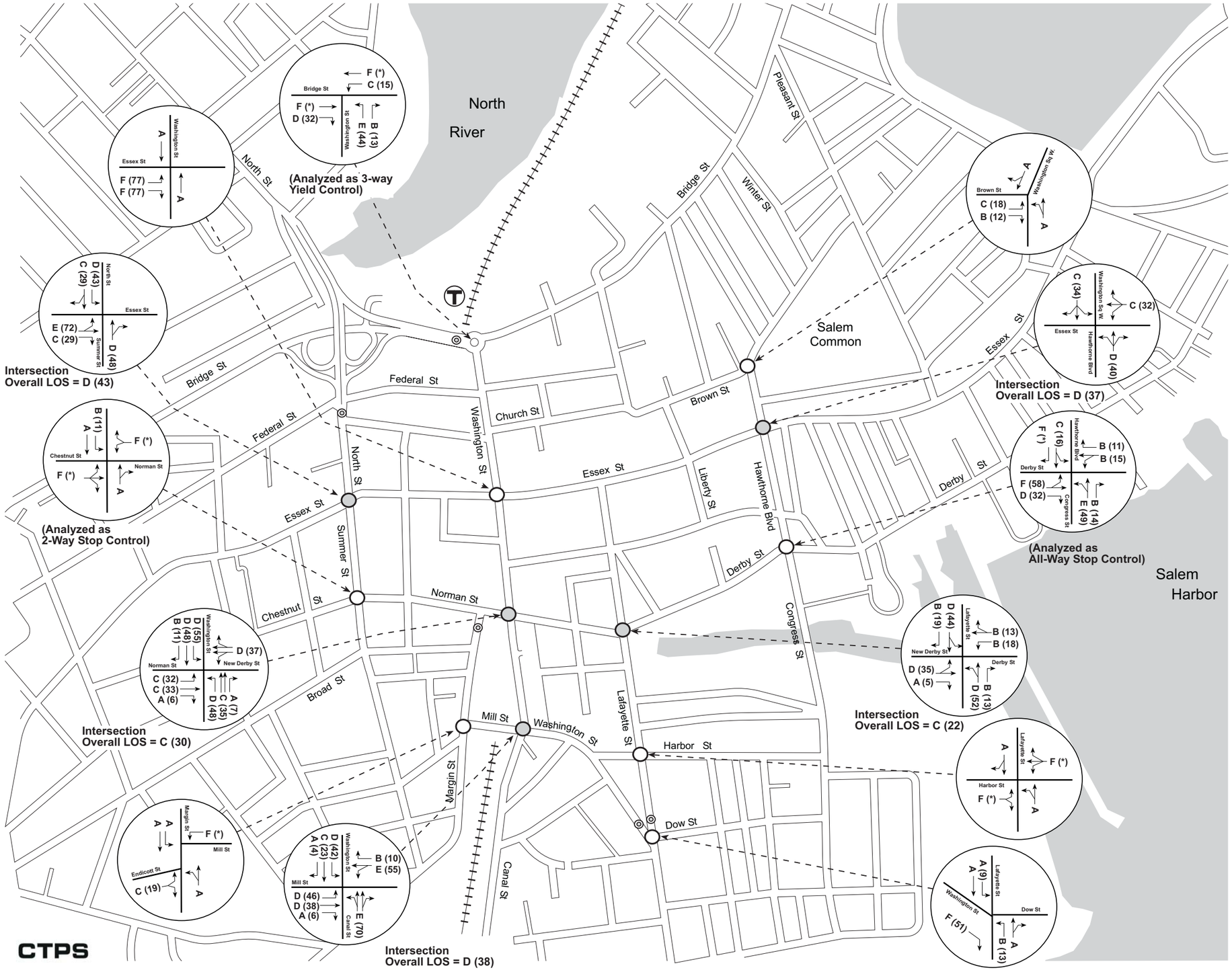


Figure 2-8
Base Year (2004)
PM Peak Hour
Intersection Capacity Analysis

Legend

- Signalized Intersection
- Unsignalized Intersection
- Traffic Signal for Pedestrian Crossing
- B (12) / E (63) Level of Service (Delay per Vehicle)
- F (*) Delay per Vehicle > 120 Sec.

Downtown Salem Transportation Improvement Study

It should be noted that intersection LOS analysis is a macro-level analysis that does not completely reflect the effect of closely spaced intersections under heavy traffic conditions. In addition to examining the study area intersections through that analysis, CTPS constructed a downtown network that includes major intersections and performed traffic simulations to examine intersection operations under the existing and future traffic conditions. Analyses of major congested locations are further discussed in Chapters 3 and 4.

2.3.4 Intersection Crash Statistics

CTPS compiled crash statistics for the downtown intersections from the Massachusetts Registry of Motor Vehicles (RMV) database. The statistics cover the five-year period of 1997 to 2001. Table 2-2 summarizes the RMV data by total number of crashes, average number of crashes per year, weighted total score, number of crashes involving pedestrians or bicycles, and average crash rate. The intersections were ranked according to total number of crashes weighted by the severity of each crash. The intersection of Washington Street at Canal Street is the worst, with over 30 crashes per year on average. The data also indicate that a few intersections had a relatively high number of crashes involving pedestrians or bicycles. These intersections are Washington Street at Canal Street, Lafayette Street at Harbor Street, Lafayette Street at Washington Street, and Washington Street at New Derby Street.

2.4 Pedestrian Environment

As downtown Salem is an area with many business destinations, tourist attractions, and resident activities, pedestrian movements are heavy there. Many streets in the downtown area are equipped with sidewalks on both sides of the street. And most of downtown has appealingly human-scale streets, as they were laid out before automobiles were widely used.

Pedestrian movements are especially heavy on Washington Street between Bridge Street and Norman Street and on Essex Street between Washington Street and Hawthorne Boulevard. The Washington Street section is the location of many pedestrian destinations, such as the courts, the city hall, banks, shops, and restaurants, and provides access to the commuter rail station and major public parking areas. Essex Street has the Peabody Essex Museum, the Museum Mall, and many retail shops. The section of Essex Street between Washington Street and Liberty Street is designated as an auto-free pedestrian mall. Other areas with substantial pedestrian movements include the Riley Plaza area, the harbor area, and the Salem Common and Hawthorne Hotel area (see Figure 2-1).

Meanwhile, traffic on many roadways in these pedestrian-active areas is heavy during daytime and early nighttime hours. In the study area, the signalized intersections are all equipped with push buttons to activate exclusive signal phases with audible sounds for pedestrian crossings. Pedestrians have more difficulty in crossing at some unsignalized intersections in the area, especially the intersections of Derby Street at Congress Street/Hawthorne Boulevard and Lafayette Street at Harbor Street. Pedestrian crossing is also difficult at the intersection of Bridge Street at North Street, which has a highway-interchange-type configuration with ramps. The interchange is a major pedestrian access point to the commuter rail station.

Table 2-2 Intersection Crash Statistics Summary (1997 to 2001)

Rank[1]	Major Street Name	Minor Street Name	Total Number of Crashes	Average Number of Crashes Per Year	Weighted Total Score[2]	Crashes Involving Pedestrians or Bicycles	Average Crash Rate[3]	Intersection Traffic Control
1	Washington St.	Canal St.	154	31	334	5	2.83	Traffic Signal
2*	Bridge St.	North St.	130	26	319	3	NA	Highway Interchange
3	Lafayette St.	Harbor St.	81	16	269	6	2.68	2-way Stop
4	Lafayette St.	Washington St.	112	22	260	5	2.84	2-way Stop
5	Washington St.	New Derby St.	99	20	203	6	1.79	Traffic Signal
6	Bridge St.	Washington St.	89	18	169	4	1.64	Rotary
7	Washington St.	Essex St.	73	15	149	3	2.64	2-way Stop
8	Derby St.	Congress St.	57	11	145	3	1.38	3-way Stop
9	North St.	Essex St.	69	14	137	2	1.62	Traffic Signal
10	Bridge St.	Saint Peter St.	49	10	121	1	1.21	2-way Stop
11	Lafayette St.	Derby St.	62	12	118	4	1.60	Traffic Signal
12	Summer St.	Norman St.	43	9	99	2	1.24	1-way Stop
13	Lafayette St.	Ward St.	36	7	72	1	1.35	2-way Stop
14	Essex St.	Hawthorne Blvd.	27	5	59	2	0.94	Traffic Signal
15	Norman St.	Crombie St.	26	5	46	3	0.87	2-way Stop

Note: 1. Rank is based on weighted total score.

2. Weighted Total Score = 1 * (Crashes with Only Property Damage) + 5 * (Crashes with Personal Injury) + 10 * (Crashes with Fatality)

3. Average Crash Rate (also known as Intersection "Million Entering Vehicles (MEV)" method)

= (Average Number of Crashes per Year * 1,000,000) / (Average Daily Entering Traffic Volume * 365 days)

MassHighway 2003 Statewide Average Crash Rates: 0.87 for signalized intersections, and 0.66 for unsignalized intersections

* One fatality occurred at this location during the five-year period.

Source: Massachusetts Registry of Motor Vehicles Database.

In general, downtown Salem has many favorable elements to support a pedestrian-friendly environment, such as busy commercial, tourist, and resident activities, human-scale streets, attractive streetscapes, and dense sidewalk distribution. One focus of this study is on increasing the safety of the pedestrian crossing environment while keeping traffic moving at the same time.

2.5 Transportation Issues and Concerns

This section summarizes the transportation issues and concerns that were raised and discussed by members of the study advisory committee and meeting participants in the first study meeting. They are roughly organized into the following categories: (1) roadways, (2) pedestrian and bicycle, (3) transit, (4) parking, and (5) other issues.

Roadway Issues and Concerns

- Major roadways in the downtown area endure heavy traffic during peak periods. Traffic is especially congested in the vicinity of Riley Plaza. Due to dense development in the area, pedestrian movements are extensive. The committee members concurred that Riley Plaza is a major problem and that the traffic circulation in the area should be reexamined. Improvements should be made to smooth traffic circulation, reduce traffic blockages, and maintain pedestrian safety.

- In addition to the Riley Plaza area, several other intersections are usually congested during peak periods. These intersections include:
  - Essex Street at North/Summer Street
  - Derby Street at Congress Street/Hawthorne Boulevard
  - Lafayette Street at Washington Street
  - Lafayette Street at Harbor Street
  - Lafayette Street at Derby Street

- The weekday trip purposes to downtown Salem include shopping, school (Phoenix School, day care centers, YMCA), tourism, and business (courts, Registry of Deeds, and others). According to the Salem police department's observations, in addition to the AM and PM peak periods, traffic surges between 2:15 PM and 3:30 PM, when schools (including Salem State College) release students. Traffic is congested during this time period, especially in the area around Riley Plaza. The situation may be due to heavy student crossings that stop traffic on Washington Street, Canal Street, and Margin Street. Traffic congestion on Fridays happens earlier than on other weekdays. On Fridays, traffic may start to build up as early as around 11:30 AM and continue until as late as 6:00 PM. However, the peak is not as obvious as on other weekdays.

- To avoid congestion on major roadways, motorists take different paths to go through the downtown area. Local streets in the area, such as Lynde Street, Church Street, St. Peter Street, Brown Street, and Essex Street between North Street and Washington Street, are frequently used by cut-through traffic.

- The impacts of the 100% designed Bridge Street bypass road on the downtown area should be examined in the future-year traffic simulation model.

- Truck traffic is not allowed on Essex Street between Highland Avenue and Summer Street. From time to time, trucks still speed down the street, especially in late-night and early-morning hours. Sometimes heavy trucks cannot complete turns within the intersection of Essex Street at Summer Street on the first try and must maneuver extensively.

- Left turns from Essex Street to Washington Street were reinstated a couple of years ago. New crash data (2001–2004) should be examined to see if crashes increased as a result of this change.

Pedestrian and Bicycle Issues and Concerns

- Both traffic and pedestrian movements are heavy on Washington Street between Riley Plaza and Bridge Street. The section contains seven pedestrian crosswalks, and traffic frequently must stop for pedestrians. Some committee members expressed concern that the number of crosswalks may be excessive and cause major traffic delays. They suggested that the crosswalk locations, the spacing of these crosswalks, and the interaction between traffic movement and pedestrian crossings be examined.

- Pedestrian access to and from the commuter rail station is inadequate, especially for people coming from the north and the west to the station. They usually cross the railroad tracks and the highway ramps to get to the station. On the south side, at the intersection of Bridge Street at Washington Street, the crosswalk on Bridge Street to the station carries heavy pedestrian volumes during peak periods. Currently, pedestrians using the push buttons frequently stop the already congested traffic on Bridge Street. Also, it is observed that some people cross the street without waiting for the pedestrian signal. One committee member suggested that an option for pedestrian crossings at this location is to provide an under-street pedestrian walkway to the station by utilizing the space already created by the existing commuter rail tunnel. The committee rejected the idea due to safety and cost considerations.

- The traffic signal at the intersection of Essex Street and North/Summer Street should allow pedestrians to go first. Pedestrians frequently do not wait for their turn to cross. During peak hours, these crossings add to traffic delay at the intersection.

- There is a heavy pedestrian movement from the parking garage to the courts, but the direction is not clearly signed. A trailblazer could be set up in front of the garage entrance or the visitor center. Furthermore, a comprehensive and consistent way-finding system could be considered for the downtown, with trailblazers at essential locations. The trailblazers have to be well designed and compatible with the architectural style and streetscapes of downtown Salem. They should be subordinate to the overall streetscape and be placed only at necessary locations.

- The core downtown corridors, namely, Washington Street between Bridge Street and New Derby Street, and Essex Street between Liberty Street and Summer Street, should be made as pedestrian friendly as possible. Bicycle-parking facilities can be placed at the periphery of the core area.

Transit Issues and Concerns

- The MBTA plans to convert the existing commuter rail parking lot into a garage. The design should consider environmental and aesthetic impacts and pedestrian and bicycle access.

- Some MBTA buses travel on Essex Street at high speeds when traffic is light. Because the area is a residential neighborhood with many historical houses, it is a safety and quality-of-life concern for the community.

- A committee member suggested that a minibus system should be considered for the downtown vicinity. The system could serve both residents and tourists with stops at major tourist attractions, neighborhood centers, parking facilities, and the commuter rail station.

Parking Issues and Concerns

- Parking is crucial to traffic management in downtown areas. Parking should be linked to traffic circulation. Usually people do not like to walk more than two blocks from their parking location. Convenient parking is the most significant consideration in a shopper's decision to visit downtown.

- According to committee members' observations and analyses, parking supply does not meet parking demand in the downtown area. People prefer surface parking. The strategy is to save on-street spaces for shoppers and business visitors (short-term parking—up to two hours) and to get tourists and employees into garages (long-term parking—over 2 hours). An integrated parking management program would discourage meter feeding and encourage long-term parking at off-street facilities.

- Yearlong tourist-bus parking spots could be considered for regular meter parking during low-tourism seasons. Additionally, these spaces could be used for resident parking after normal business hours (say, 8:00 AM to 6:00 PM). Another alternative would be to move the bus parking outside the downtown area through the use of communications technology (cell phone) so that bus spaces could be freed up for additional parking. This could be done with financial incentives; currently, long-term bus parking at designated locations is free.

- Illegal parking in the functional area of roadway intersections blocks traffic paths and causes intersection congestion. Strict enforcement of the prohibition of such parking should be considered.

- Improved signage directing motorists to both short-term (on-street) and long-term (off-street) parking can reduce the traffic congestion that results from searching for parking.

Other Issues and Concerns

- Signs to major downtown destinations (courthouse, museum, parking, etc.) are not clear. Tourists and business visitors need better direction.

- It is a concern that school crossing guards may stop traffic too frequently, causing traffic congestion. The police department actually has advised crossing guards to take signal operation and traffic flow into consideration. They will communicate with the crossing guards again.

- School buses always unload YMCA-bound students on Essex Street during the afternoon peak period, causing traffic congestion. They should unload students in the YMCA parking lot.