SECTION 1 EXISTING CONDITIONS

Zoning/Land Use

The core of Union Square is within the CBD zone (Central Business District), as also shown in Figure 1. Outlying areas within the study area primarily include residential zones such as RC (Residence C), RB (Residence B), and RA (Residence A). The central part of the Square contains business and retail zones, such as BA (Business A), as well as OS (Open Space) and IA (Industry A). High density residential development, such as multi-family housing increases the level of pedestrian and vehicle activity entering and exiting the Square.

Retail, offices, and services in Union Square have historically met the needs of the local residential community. Major destinations include the post office, public safety building, flower market, a range of ethnic and neighborhood-based restaurants, charter and elementary schools and banks. Union Square has an established reputation in the metropolitan Boston area for its diverse, affordable, and ethnically varied restaurants and markets. These activity nodes generate pedestrian traffic within the Square, an indicator of a thriving community.

The City's Zoning Ordinance is currently under review by The Office of Housing and Community Development. Several land use and zoning strategies to revitalize the Square, including maximizing the use of the CBD area by increasing building height, redefining Permitted Uses and managing signage are being reviewed. Infill development will increase the impact on traffic flow in the Square.

Business Survey

The viability of businesses is of primary concern to the City as well as those who live, work and shop in the Square.

In a Business Survey conducted by the Office of Housing and Community Development in December 2000, as part of the Union Square Revitalization Study initiative, businesses were asked a series of questions about the business climate in the Square. Although there is an even split between businesses who rent and businesses who own their business location, those who rent have been renting for over five years showing the stability of the location. The best day for business is Saturday and the worst day is Sunday. Monday and Friday are weekday peaks. According to the survey, businesses are busy all day between 9:00 AM and 6:00 PM.

Businesses stated they chose Union Square because of its proximity to customers. Reportedly, most customers are residents and workers from Cambridge and Somerville, with almost 30% of their customers being residents within walking distance of the Square and others from the Boston Region. Businesses indicate that 85% of their customers used the automobile to access their businesses. Business Survey Results indicate that the biggest concerns among Union Square business owners regarding the conditions within the Square are cleanliness, traffic flow, and customer and employee parking problems. The high number of automobiles used to access business increases the demand for improved parking and traffic flow.

Since the majority of businesses open at 9:00 AM, traffic in the early morning (between 6:00-9:00 AM) is primarily commuter traffic. However, during the afternoon commute (4-6:00 PM), businesses show a high level of activity with increased interaction between commuter traffic and business traffic (those accessing local retail and services) through the Square.

Regarding parking issues, survey responses indicate that there are too few parking spaces for businesses, too much traffic passing through the Square, and phases on traffic signals are too short. As indicated through a survey of Union Square businesses, the majority of businesses are not interested in the construction of a parking structure.

Transportation Circulation

Figure 2, Regional Transportation Network shows the study area in the context of the region, noting the primary cut-through routes between the major roadways. Three traffic signals control traffic flow through the Union Square area. Prospect Street, Webster Street and Somerville Avenue form a triangular road network that controls traffic into and out of Union Square. The Prospect Street at Webster Street intersection controls traffic entering from the south and Central Square in Cambridge. The Somerville Avenue / Prospect Street / Washington Street intersection controls traffic entering from the east (from the McGrath Highway and I-93) and north into Union Square. Somerville Avenue at Washington Street and Webster Street forms the main Union Square intersection. This intersection controls traffic to and from other squares in Somerville from the west, and residential areas to the north and east.

Turning movement count data has been collected from the City of Somerville Traffic & Parking Department for the three major intersections in Union Square. Additional count data was provided by the City for minor streets leading to Union Square. These volumes were used to analyze cut-through routes and recommend circulation changes in residential neighborhoods. Although, most of the streets fall below the 2000 vpd threshold, several streets in the Prospect Hill section adjacent to Union Square section of Greenville Street, Monroe Street and Prospect Hill Avenue exceed 2000 vpd and have been included in the City's Neighborhood Study for Prospect Hill.

In order to determine the extent of congestion and delay, capacity analysis has been conducted for existing conditions and will be assessed in the alternatives section.

Proposed Development Projects

Union Place

This proposed project incorporates a Planned Unit Development with parking garage component in the Webster Ave/ Boynton Yards area. The mixed use development will provide 52 residential units at 411-429 Norfolk Street in Phase I and 50 additional residential units, artist's workspaces, retail and office development and parking garage at 84 Webster Ave and 481 Columbia Street in Phase 2. Projected traffic impacts as a result of this development include an increase in delay at the Webster Ave/ Prospect Street traffic signal in the morning peak hour southbound direction. A review of the traffic impact study by the City indicates that minor modifications to traffic signals and an increase in the number of lanes approaching the intersection can improve the delay. The future traffic projections provided in our traffic forecasts for Union Square included normal background traffic as well as specific traffic increases due to this development.

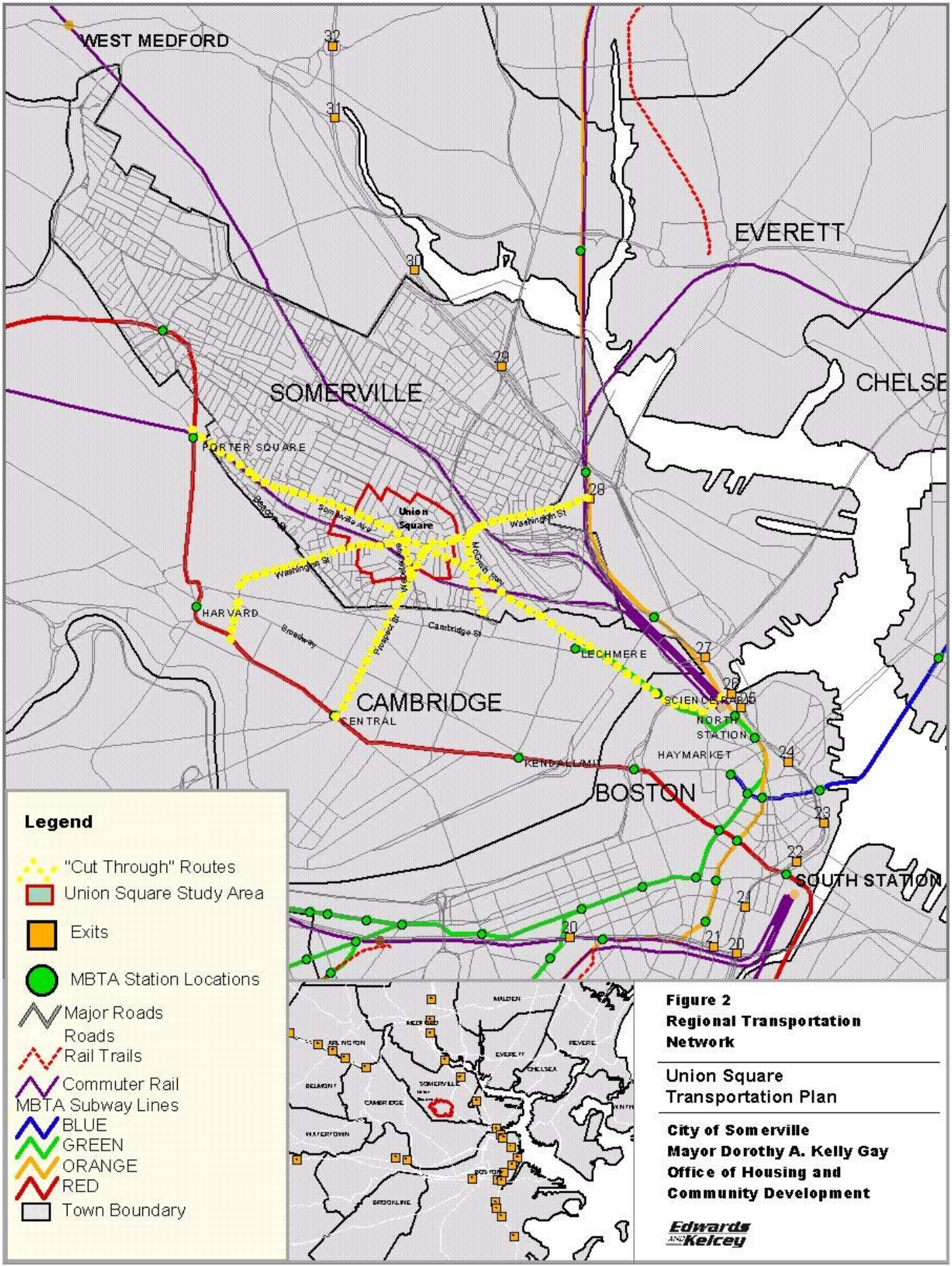


Figure 2
Regional Transportation Network

Union Square Transportation Plan

City of Somerville
Mayor Dorothy A. Kelly Gay
Office of Housing and Community Development

Edwards and Kelcey

Public Safety Facility

A Feasibility Study of the Public Safety Facility located at 220 Washington Street was completed in February 2002. The study provides detailed Facility Program for the Police and Fire Department at the Union Square location. It also considers aesthetics, access and site relocation issues. It should be noted that input provided by safety personnel in police and fire departments preferred a two-way boulevard scheme to facilitate access to/and from Union Square.

Linden Street

The Somerville Community Corporation has proposed an affordable senior and family housing development at 34 Linden Street. The City Traffic and Parking Department reviewed the plans and suggested a conditional approval based on recommended changes to the parking layout.

Regional Plans – The Urban Ring

Public transit, an integral component of the transportation network in the Square, will be impacted by the decisions made on a regional level by the Massachusetts Bay Transportation Authority. Union Square ridership demand and local vehicular congestion indicate that mass transit service on a dedicated right of way is warranted. Union Square transit service must be expanded beyond bus service to include Bus Rapid Transit (BRT) on a dedicated alignment (not within mixed traffic), Light Rapid Transit (LRT) connections to subway service, or extension of the Green Line from Lechmere Square to Union Square. The underutilized Fitchburg Commuter Rail right of way (ROW) provides a convenient, logical, and accessible transit corridor not only for commuter rail service, but for local transit service via BRT, LRT and potential Green Line subway service. Use of the ROW would remove many of the nearly 200 buses per weekday from Union Square, thereby reducing the congestion associated with buses stopping in traffic on or near the right curb and then crossing several lanes of traffic to turn left at the next intersection. Although BRT service has the potential to utilize both the rail ROW and the local street network, this bus line would adversely affect the flow of vehicular traffic by using signal preemption to speed bus traffic at the detriment of vehicular traffic.

Current ridership projections of 3,200 daily boardings (year 2025) for Union Square indicates a strong demand for an Urban Ring Station at this location. Additional economic development planned by the City of Somerville utilizing a “targeted growth” methodology of projecting transit demand instead of the “trends extended” methodology utilized would only increase ridership projections as the economic development initiatives are implemented by the City in Union Square.

Bus Rapid Transit (BRT) alone is probably not an adequate commitment to Union Square’s transportation problems. The high demand for transit and potential for increased density requires additional transit connections. BRT would require signal preemption in the Square and if in mixed traffic from Lechmere, would both be a victim of, and contribute to congestion on Somerville Avenue and McGrath Highway.

The Urban Ring, MBTA's circumferential transit improvement, intends to connect all commuter rail lines, subway lines and more than half of existing bus lines. The ring, a 14-mile corridor, would complete the hub-and-spoke system by providing connections to existing transit. The effort is expected to improve transit times and reduce transfers, reduce congestion and serve underserved areas by providing direct transit access. Environmental justice concepts are at the core of the Urban Ring project. Somerville and Brookline bear much of the impact of the regional transportation infrastructure created to bring suburban residents downtown and home again but do not benefit by increased transit access. Both Somerville and Brookline, in addition to Everett and Chelsea (two communities with minimal transit infrastructure) and Boston and Cambridge (two communities with both subways stops and commuter rail) could benefit from increased access with a properly implemented Urban Ring.

Phase 1

During Phase 1 of the Urban Ring project, cross-town service was implemented with stops in Union Square for CT2 with service to Sullivan Square and Ruggles via Kendall/MIT and the Longwood medical area. This service has been successful in providing access to destinations not located between Union Square and downtown Boston by providing an alternative to riding into and back out of downtown to reach these destinations. Additional cross-town service through Union Square is also proposed as part of the Urban Ring Phase 1: including the CT8 bus service from Sullivan Square to Longwood Medical Area via Union Square, University Park, Lower Cambridgeport and Boston University.

Phase 2

During Phase 2 of the Urban Ring project, BRT service is proposed to be initiated in Union Square. Original concepts had included a new station stop along the Fitchburg commuter rail line on Prospect Street. The BRT alignment would emerge from the railroad right of way (ROW) at a station stop on Prospect Street where it would join mixed traffic on Prospect Street through Union Square to Somerville Avenue. This alignment would require signal preemption in Union Square where BRT joins mixed traffic. Signal preemption would require longer signal phases which could increase overall vehicular congestion in the Square. This congestion could decrease potential BRT travel times in mixed traffic while adversely affecting traffic flow through the Square. The MBTA is considering a variation of Somerville Avenue Service in one or both directions. BRT in mixed traffic is not an adequate transit improvement to serve a urban commercial center the size of Union Square. In addition, Phase 2 would include a commuter rail station on the Fitchburg Line at Union Square.

By implementing BRT service through mixed traffic in Union Square, there may never be a firm commitment from the MBTA for a Green Line extension to Union Square, a necessary connection to provide service to residents and businesses, and to provide a catalyst for future economic development. If the MBTA commits to the capital expenditure of constructing a true "busway" along the Fitchburg ROW, it could later be converted to light rail. However, if the BRT utilizes existing roads, it would be very easy for the MBTA to discontinue service in the future if traffic congestion results in increased travel time for passengers if they have to service Union Square. This would leave Union Square with no benefit from the Urban Ring.

Phase 3

Phase 3 of the MBTA's Urban Ring project includes an extension of rail transit from the Assembly Square terminus of the Orange Line. Neither Alternative A (Green Line-compatible Light Rail Transit technology or Orange Line-compatible Heavy Rail Transit technology) nor Alternative B (Light Rail Transit) includes a station stop at Union Square.

MBTA Subway Service: Green Line Extension

A Green Line extension from Lechmere to Medford Hillside is required as mitigation from the CA/T project. It must be completed by the year 2011. The route between Lechmere and Medford Hillside, however, is not specified.

The Green Line extension should include a station in Union Square. Union Square typifies the characteristics beneficial for station locations, including mixed-use development, high residential density and proximity to other regional destinations. In addition, Union Square is undergoing significant revitalization through public improvements. The MBTA has agreed to include this project in its "universe of projects" in its five-year capital improvement program (PMT) although the language in the plan was not changed to specifically include a Union Square stop on the Green Line.

Summary of Union Square Conditions

The Transportation Plan concentrates on four transportation-related issues requiring immediate and long-term remedy:

- *Traffic Congestion*
- *Pedestrian/Bicycle Safety*
- *Public Transportation*
- *Parking*

Traffic Congestion / Safety

Study Area – The study area for this transportation plan includes the three signalized intersections of Somerville Avenue, Washington Street and Webster Street; Somerville Avenue, Washington Street and Prospect Street; and Webster Street and Prospect Street.

This study investigates the following two options on Webster Street and Prospect Street: maintaining the existing alignment with a change in traffic flow from one-way to two-way along Webster Street and Prospect Street; and reversing the one-way flow on Prospect and Webster Street.

In addition, the following options are investigated on Washington Street and Somerville Avenue in the Square: re-opening Washington Street through the existing business parking lot and using Washington Street and Somerville Avenue as a one-way pair between Webster Street and Prospect Street; and opening Washington Street as a two-way street while retaining Somerville Avenue as a two-way street.

The study examines existing (2000) traffic volumes and operating conditions. Traffic projections were made to a future design year (2010) and include the background traffic growth anticipated for the area, and the additional traffic due to proposed development projects.

Existing roadway and traffic conditions were determined for the project study area. The existing conditions analysis is based on field visits performed by Edwards and Kelcey and previous traffic studies performed for the area. Information was collected regarding roadway geometric conditions, traffic control, traffic volumes, and peak period traffic operations. The results of these investigations are described below.

Roadway Network – Union Square consists of three signalized intersections that control traffic flow in and out of the Square. Together these intersections form a triangular roadway network.

Washington Street provides access to Union Square from Charlestown, I-93 and McGrath Highway to the east and Cambridge from the west. Washington Street is generally a two-way, four-lane roadway between McGrath Highway and Somerville Avenue. To the west, Washington Street is generally a two-way, two-lane roadway.

Somerville Avenue provides access to McGrath Highway to the southeast and connects to Massachusetts Avenue via Porter Square to the northwest. Somerville Avenue is generally two-way with two travel lanes in each direction.

Webster Street provides access to Union Square from Cambridge to the south. Webster Street begins at Hampshire Street to the south and is generally a two-way, two-lane roadway. Webster Street becomes one-way southbound between Washington Street and Prospect Street.

Prospect Street provides access to Union Square from Cambridge and the Mass. Pike via River Street at Central Square to the southwest and is generally a two-way, two-lane roadway. Prospect Street becomes one-way northeast between Webster Street and Somerville Avenue.

Critical Intersections

Washington Street, Somerville Avenue and Webster Street

The intersection of Somerville Avenue, Washington Street and Webster Street is a 4-leg signalized intersection. This is the main intersection of Union Square. Although the direction of Somerville Avenue changes within the project area, for simplification of orientation, Somerville Avenue is considered an east-west artery (based on its overall direction within the city). Directions are therefore given as being east- or westbound. Washington Street eastbound is one lane and widens to two lanes at the intersection with a shared left and through lane and a shared through and right lane. Somerville Avenue westbound is two lanes and widens to three lanes at the intersection with a left-turn lane, a shared through/left-turn lane and a right-turn lane. The Somerville Avenue eastbound approach is two lanes and widens to three lanes with a left-turn lane, a shared left and through lane, and a shared through and right lane. Webster Street is one-way southbound with two travel lanes. The signal is a four-phase fully actuated traffic signal with an exclusive pedestrian phase.

Washington Street, Somerville Avenue and Prospect Street

The intersection of Somerville Avenue, Washington Street and Prospect Street is a 4-leg signalized intersection. The Somerville Avenue eastbound approach is two lanes with a left-turn lane and a through lane. Somerville Avenue westbound is two lanes with a through lane and a shared through and right lane. Washington Street southbound is two-lanes both of which are exclusive right-turn lanes. The Prospect Street northeast bound approach is one-way with two lanes and widens to three lanes with a left-turn lane, a shared left and through lane and a shared through and right lane. The signal is a four-phase fully actuated traffic signal with an exclusive pedestrian phase.

Webster Street and Prospect Street

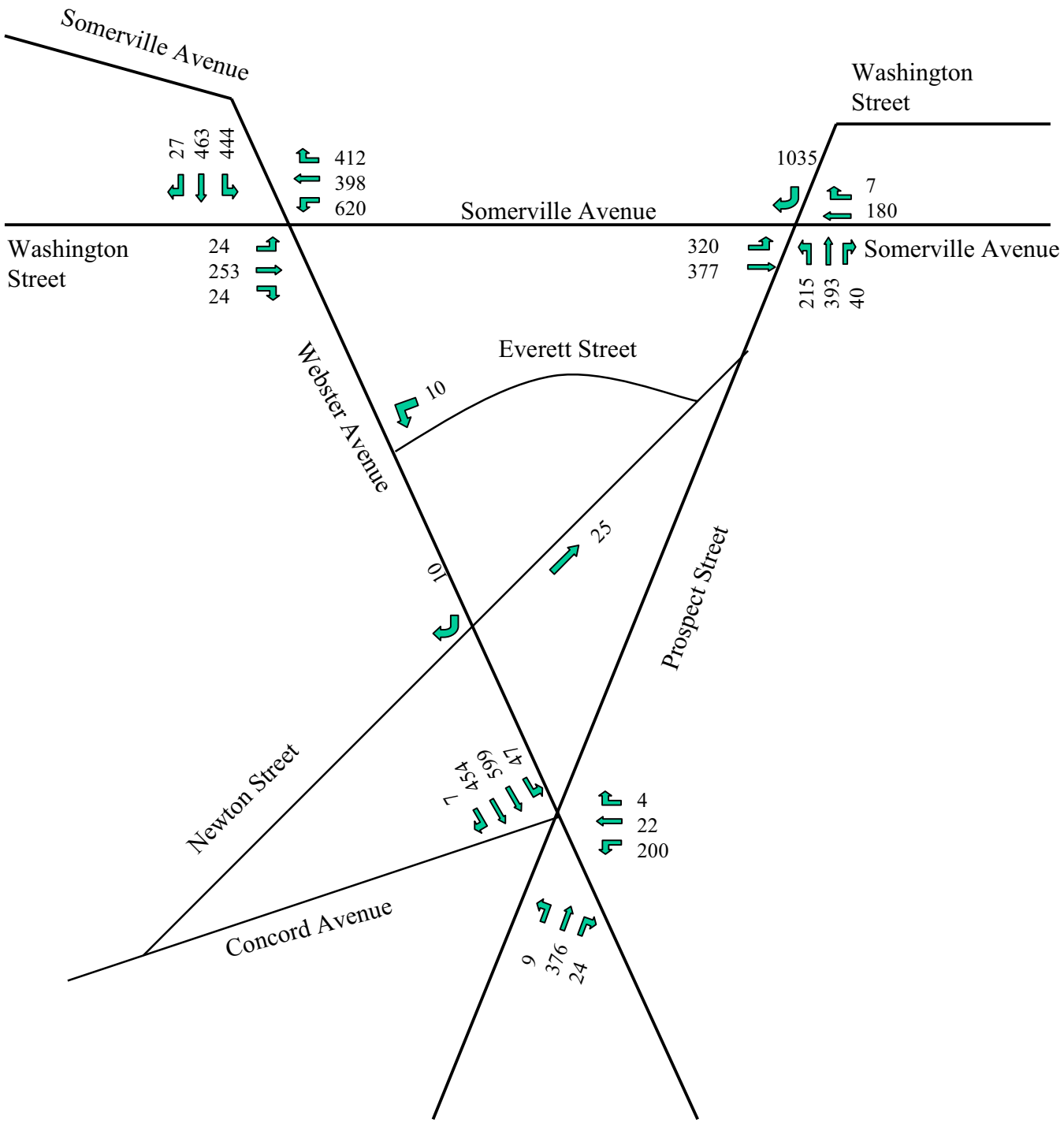
The intersection of Webster Street and Prospect Street is a 5-leg signalized intersection. The Webster Street northbound approach is one lane with a shared left, through and right lane. Webster Street southbound is one-way with two lanes and widens to three lanes at the intersection with a left-turn lane, a through lane and a right-turn lane. Prospect Street eastbound is one lane with a shared left through and right lane. Prospect Street is one-way northeast bound beyond the intersection. Concord Avenue makes up the 5th leg of this intersection and is one-way westbound heading away from the intersection with one lane. The signal is a three-phase fully actuated traffic signal with an exclusive pedestrian phase.

Existing Traffic Volumes -Year 2000 traffic volumes for the study area locations were obtained from the City of Somerville. These volumes were compared with the volumes shown in the Union Square Traffic Analysis prepared by Bruce Campbell and Associates dated May 1995 and the volumes provided by Vollmer Associates in a memorandum dated June 2, 1999 outlining the traffic operations during the reconstruction of the Webster Street Bridge over the Fitchburg Commuter Rail Line.

The 2000 volumes provided by the City of Somerville were consistent with the previous studies. These volumes were used as the 2000 baseline volumes. The peak hour turning movement volumes were balanced between the intersections within the roadway network.

The turning movement counts provide an indication of traffic patterns in the study area. The existing peak hour turning volumes are summarized in Figures 3 and 4. As shown, the heaviest movements of traffic occur westbound on Washington Street continuing on to Somerville Avenue westbound and southbound on Webster Street during the AM peak hour. Somerville Avenue eastbound between Webster Street and Prospect Street is also heavy. During the PM peak hour, the heaviest movements of traffic occur northeast bound on Prospect Street and both directions on Somerville Avenue between Webster Street and Prospect Street.

Traffic Operations – Existing peak hour traffic operations in the traffic study area were assessed from both a quantitative and qualitative perspective. The qualitative analysis is based on field observations made during peak traffic periods, while the quantitative analysis is based on calculated intersection operating levels of service as described in greater detail below.



NOT TO SCALE

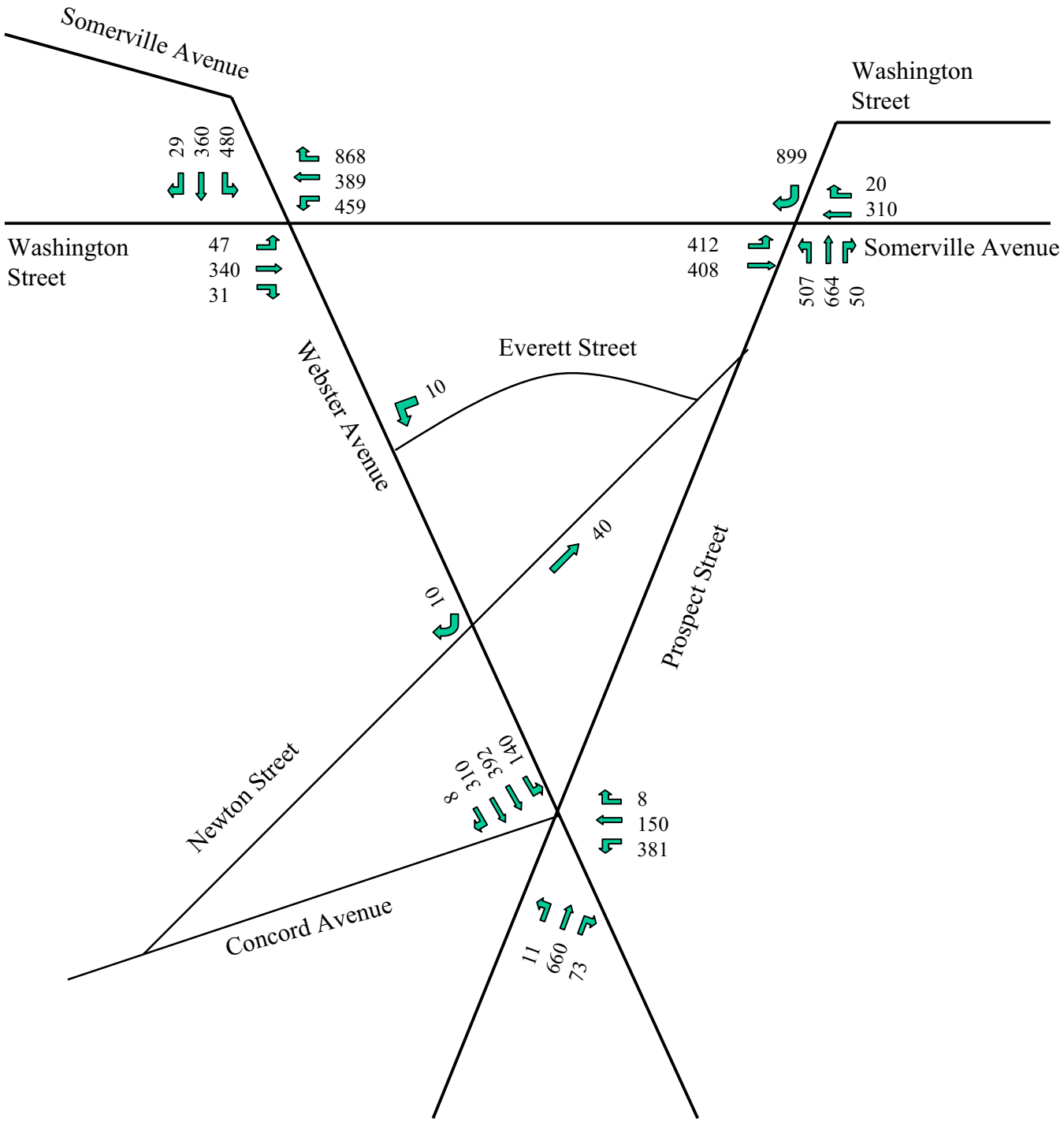
Legend

XXX - Year 2000 Existing AM Peak Hour Volume

Figure 3

2000 AM Peak Hour Volumes
City of Somerville, MA
Union Square Transportation Plan

Edwards AND Kelcey



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XXX - Year 2000 Existing PM Peak Hour Volume

Figure 4

2000 PM Peak Hour Volumes
City of Somerville, MA
Union Square Transportation Plan

Edwards AND Kelcey

Level of Service Criteria –Level of Service is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. It is an aggregate measure of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway facility capacity to travel demand. Operating levels of service are reported on a scale of A to F, with Level of Service A representing the best operating conditions and Level of Service F representing the worst operating conditions. Level of Service A represents free-flow conditions with little or no traffic delays, while Level of Service F represents a forced-flow condition with long delays and traffic demands exceeding roadway capacity.

Level of Service C is often cited as a design standard for rural roadways and Level of Service D is used for urban roadways. However, when trying to establish minimum "acceptable" level of service thresholds for existing roadways a number of factors must be considered. These would include existing operating levels of service at other similar and nearby facilities; the duration of the peak traffic periods; the feasibility and cost of providing traffic mitigation; and applicable state and local regulations.

Intersection Operating Conditions -Traffic operations were analyzed using SYNCHRO Version 5, a traffic analysis software program that determines existing peak hour operating levels of service at study area intersections. The results, based on the traffic volume and roadway conditions presented above, indicate that the intersection of Somerville Avenue, Washington Street and Webster Street presently operates at LOS E during the AM peak hour and LOS D in the PM peak hour as shown in Table 2. The Somerville Avenue, Washington Street and Prospect Street intersection presently operates at LOS C during the AM peak hour and LOS F in the PM peak hour. Webster Street and Prospect Street presently operates at LOS B during the AM peak hour and LOS D in the PM peak hour.

Table 2 - YEAR 2000 LEVEL-OF-SERVICE (LOS)

	AM Peak Hour		PM Peak Hour		Critical Queues[a]	
Location	LOS	Delay[b]	LOS	Delay[b]	AM Peak	PM Peak
Washington Street / Somerville Avenue / Webster Street	E	72.9	D	45.7	WBL 773 (c)	WBR 681 (c)
Washington Street / Prospect Street Somerville Avenue	C	21.0	F	83.7	NBL 330 (c)	NBL 740 (c)
Webster Street / Prospect Street	B	14.3	D	53.5	SBT 419 (c)	NBT 505 (c)

[a]Queue length in feet for the designated approach (westbound left turn-WBL, westbound right-WBR, southbound through-SBT, etc.)
[b]Seconds of delay
(c) Queue exceed capacity

Queue Analysis -The results of the existing conditions analysis indicate:

- Somerville Avenue westbound between Webster Street and Prospect Street has excessive queues during the AM and PM peak periods with queues exceeding the available storage. During the AM peak periods, this 773 foot queue for vehicles proceeding through the Square on Somerville Avenue and making a left on Webster Street extends through the Square, potentially blocking the Prospect Street intersection. During the PM peak period, traffic turning right onto Bow Street from Somerville Avenue westbound, also has the potential to extend back through the Square, blocking the Washington/Somerville /Prospect intersection at the east end of the Square.
- Somerville Avenue eastbound between Webster Street and Prospect Street has excessive queues during the AM and PM peak periods with queues exceeding the available storage. At the Washington Street/Prospect Street/Somerville Avenue intersection, during the AM peak period northeast bound traffic on Prospect Street making a left onto Somerville Avenue would encounter a 330-foot queue. During the PM peak period the queue for this left turn movement would extend 740 feet. Many of these vehicles then weave to the right lane to make the right turn on Bow Street, as described above.
- Southbound traffic on Webster Street to Prospect Street experiences an average 419-foot queue. During the PM peak, northeast bound traffic on Prospect Street has an average 505-foot queue at the Webster Street intersection. The queue for this intersection extends south of Columbia Street.

Origin and Destination Study -A study was performed to determine the existing traffic patterns through Union Square. Origins and destinations were analyzed to determine the travel routes most likely used by drivers traveling through Union Square. The turning movement counts in conjunction with the origin and destination study performed by Bruce Campbell and Associates were used for this task. The results indicate the following:

- There is a significant volume of traffic entering the Union Square area from Prospect Street and Webster Street (south of Union Square) traveling northeast towards Washington Street eastbound.
- The majority of the traffic entering from the west on Washington Street continues towards Washington Street to the east and Somerville Avenue to the southeast.
- Vehicles entering from the east on Washington Street splits almost equally between Washington Street to the west, Somerville Avenue to the northwest, and Webster Street and Prospect Street to the south. The vehicles from the east heading towards Prospect Street and Webster Street to the south create a heavy left turn volume on Somerville Avenue at Webster Street.
- Somerville Avenue traffic from the east is continuing towards Somerville Avenue and Washington Street to the west.
- The Somerville Avenue traffic from the west splits somewhat equally between Washington Street and Somerville Avenue to the east, and Webster Street and Prospect Street to the south.

The results of this study will be applied to the reassignment of traffic under each of the Alternatives studied under the future conditions. The percentage of traffic distributed through Union Square from the key roadways to the key destinations during each of the peak hours is shown in Tables 3 and 4.

Table 3 - UNION SQUARE TRIP DISTRIBUTION PERCENTAGES (AM Peak Hour)

	Destinations						
Origin Location	**Washington EB**	**Washington WB**	**Prospect WB**	**Webster SB**	**Somerville WB**	**Somerville EB**	**Totals**
Prospect EB	57%	15%	---	6%	16%	6%	100%
Webster NB	60%	16%	2%	---	17%	5%	100%
Washington EB	39%	---	3%	4%	8%	46%	100%
Washington WB	---	24%	23%	29%	24%	NA	100%
Somerville WB	4%	28%	17%	21%	30%	---	100%
Somerville EB	22%	3%	21%	28%	---	26%	100%

Table 4 - UNION SQUARE TRIP DISTRIBUTION PERCENTAGES (PM Peak Hour)

	Destinations						
Origin Location	**Washington EB**	**Washington WB**	**Prospect WB**	**Webster SB**	**Somerville WB**	**Somerville EB**	**Totals**
Prospect EB	49%	12%	---	10%	26%	3%	100%
Webster NB	53%	13%	2%	---	28%	4%	100%
Washington EB	41%	---	4%	3%	11%	41%	100%
Washington WB	---	17%	24%	20%	39%	NA	100%
Somerville WB	6%	23%	10%	9%	52%	---	100%
Somerville EB	28%	3%	22%	19%	---	28%	100%

Accident Analysis

Accident data for study area intersections were obtained from Massachusetts Highway Department (MHD) for the three most recent years – from January 1998 through December 2000. Two intersections are listed in the State's High Crash Locations Summary (Top 1000's List) and were also cited in Bruce Campbell's report utilizing data from MHD's 1990-1992 summaries. The two intersections are Somerville Avenue/Washington Street/Webster Street and Somerville Avenue/Prospect Street/Washington Street intersection. The following data is provided:

Intersection	(Rank)	Total Crashes	PDO	Injury	Fatalities
Somerville/Washington/Webster	(132)	98	58	40	0
Somerville/Prospect/Washington	(457)	52	30	22	0

Although no specific data is provided about pedestrians, the poor levels of service, and extreme congestion, coupled with a significant history of safety problems, leads to the conclusion that the environment for vehicles and pedestrians at these locations are long standing and in need of relief.

Pedestrian/Bicycle Safety

Pedestrian circulation around Union Square is via a series of connected sidewalks on Somerville Avenue, Washington Street, Prospect Street and Bow Street. The three key intersections: Somerville Avenue at Washington Street and Prospect Street, Somerville Avenue at Webster Street and Washington Street, and Prospect Street at Webster Street provide pedestrian buttons at the crosswalks to provide safe crossing of these busy streets. Crosswalks are provided throughout the Square at the key signalized intersections. Pedestrian countdown signals exist in the center of the Square.

Pedestrian Phasing Signals

Dedicated pedestrian phases are provided at the Somerville/ Prospect/ Washington and Washington/ Somerville/ Webster/ Bow signalized intersections. However, there are long delays. Crosswalks are striped but are not raised, textured, or otherwise delineated by solid paint. Signs are posted mid-block on the Somerville Avenue, near bus stops, encouraging pedestrians to cross at the crosswalks (at intersections).

The pedestrian signal at Bow Street and Somerville Avenue and Warren Avenue provides for pedestrian crossing directly after the main Somerville Avenue at Washington Street at Webster Street intersection. This pedestrian signal stops all right turning traffic out of Union Square when the pedestrian button is activated. This causes the right turning traffic to stop twice at certain times of the day entering the Square, once at the main pedestrian signal and a second time at Warren Ave.

Moderate pedestrian activity is located around the Union Square Plaza north of Somerville Avenue. The Plaza is a concrete covered surface with brick pavers that extends from Union Square to the parking lot to the east, adjacent to the Washington Street right-turn lane. The Plaza provides a safe haven for pedestrians to wait for the bus away from direct conflict from heavy traffic flow on Somerville Avenue. It also provides park benches and bicycle lock facilities for pedestrian traffic in Union Square.

The sidewalks and crosswalks in Union Square are in need of improvement to provide for safer pedestrian movement throughout the Square. The sidewalks are approximately ten feet wide in many locations through the Square, but the section south of Somerville Avenue, from Webster Street to Prospect Street is approximately 5 feet wide with obstructions narrowing the sidewalk width even more. Trees, hydrants, and parking meters reduce the sidewalks to less than five feet in several locations. The sidewalks are also in poor condition along this stretch from Webster Street to Prospect Street.

Bikeways - There are no designated bikeways in Union Square. An on-road bike lane is striped on Washington Street, east of the project area.

The Minuteman Bikeway extends from Arlington to Bedford on a 10.5-mile one-way route. This route, located west of the project area, is popular with local avid cyclists Although the trail was built through the Rails-to-Trails program as a commuter bikeway, it offers hiking, biking, blading and cross-country skiing for recreation as well. The wide-asphalt trail parallels much of Paul Revere's late-night ride. The 12-foot wide two-lane trail is barrier-free and is one of the most successful of the over 500 Rails-to-Trails projects. The eastern-most endpoint is located in Arlington just north of the Red Line at the Alewife Train Station in Cambridge. At Alewife, the Minuteman bikeway connects to the Linear Park path, which runs through North Cambridge to Davis Square in Somerville. The Somerville Community Path extends this trail eastward from Davis Square to Cedar Street.

In addition, the City's May 2001 Somerville Community Path Feasibility Study proposes an extension of the Somerville Bicycle Path. The recommended alternative is to provide a rail trail from the existing bikepath at Cedar Street in Somerville to the Lechmere area in Cambridge. The path would be located within a half mile north of the Square.

Public Transportation

The availability of convenient and attractive public transportation opportunities is of paramount importance to residents and businesses in and around Union Square. Public transportation is provided by the MBTA and by the City of Somerville Senior Shuttle. MBTA bus service provides connection to destinations within Somerville and adjacent communities as well as with the Red, Orange and Green Line MBTA subways. Bus locations are identified in Figures 5 and 6. As demonstrated at the first public workshop, Union Square residents consider many of the bus routes as connections to MBTA subway line, providing access to Boston.

Several public transportation modes serve the Square within a 1 to 1 ½ mile distance. Although there are bus and shuttle stops, no commuter rail or subway stops are located within walking distance of the Square.

MBTA Bus Routes (CT2, #85, #86, #87, #91). Although Route 85 only offers weekday service, daily service is offered on all other routes. All buses on Route 86 are equipped with wheelchair lifts. The most comprehensive service is offered on Route 87 with stops daily from 5:16 AM to 1:19 AM. A total of 376 buses on the five routes stop in the Square weekdays. During the AM peak from 6:00 to 9:00, a total of 85 buses stop at least once in the Square (44 inbound and 41 outbound); during the PM peak from 3:00 to 6:00, another 85 buses stop in the Square (41 inbound and 43 outbound). During the peak hours between 6:00 and 7:00 AM and between 6:00 and 6:00 PM, between 29 and 30 buses stop in the Square.

Location of bus stops and ridership counts are presented in Table 5. Total ridership within the project area is 2,131 passengers per day during the week, including 647 passengers boarding (ons) buses inbound, 540 passengers arriving (offs) inbound, 424 passenger boarding (ons) buses outbound, and 520 passengers arriving (offs) outbound. Within or adjacent to the Square, 549 passengers board the bus (ons) daily during the week and 474 arrive (offs). MBTA does not have ridership count information for CT2.

Table 5 - MBTA WEEKDAY RIDERSHIP, UNION SQUARE

Route	Stop No.	Location	Total Ons	Total Offs
Route 85		**Spring Hill-Kendall/MIT Station**		
Inbound	2574	Bow Street after turn	4	0
	2595	Somerville Ave @ Carlton St.	0	1
	2596	Somerville Ave @ Union Square	42	7
	2511	Webster Ave @ Washington St	9	2
	2512	Webster Ave @ Newton St	11	0
Outbound	2612	Somerville Ave @ Before Stone St	4	12
	26131	Bow Street @ Warren Ave	2	7
	2614	Bow Street @ Wesley Park	0	5
Route 86		**Sullivan Sq. Station-Reservoir (Clev. Circle) via Harvard**		
Inbound	2612	Somerville Ave @ Before Stone St	65	100
	2613	Washington St after Webster Ave.	180	64
Outbound	25713	Washington St @ Kingman Rd	17	99
	2597	Somerville Ave @ before Prospect St	115	54
Route 87		**Arlington Center or Clarendon Hill - Lechmere Station**		
Inbound	2595	Somerville Ave @ Carlton St	30	52
	2596	Somerville Ave @ Union Square	64	161
	2597	Somerville Ave @ before Prospect St	57	29
Outbound	2612	Somerville Ave @ before Stone St	72	62
	26131	Bow St @ Warren Ave	146	83
	2614	Bow St @ Wesley Park	4	6
	2574	Bow St @ #45	14	39
Route 91		**Sullivan Square Station - Central Square, Cambridge**		
Inbound	2612	Somerville Ave @ before Stone St	61	64
	2511	Webster Ave @ Washington St	104	31
	2512	Webster Ave @ Newton St	20	29
Outbound	2530	Newton @ Webster Ave	39	103
	2531	Prospect St. @ Somerville Ave	11	50
		Total Inbound	**647**	**540**
		Total Outbound	**424**	**520**
		TOTAL RIDERSHIP	**1071**	**1060**

Note: Ridership data is not available for CT2.
Source: MBTA Comprehensive Ridecheck Program, Charlestown Garage – Winter 1998

Senior Shuttle (Red and Blue Route). The routes link Union Square with Winter Hill, Davis Square and Porter Square and travel 4 trips per day. The Red Route covers Tuesdays and Thursdays and the Blue Route covers Wednesdays and Fridays.

Subway. The following subway stops serve Union Square within a 1 and 1½ miles radius. MBTA buses provide access to the following stations:

- The Green Line at Lechmere stop via Route 87.
- The Orange Line at Sullivan Station via Route 86, 91 and CT2.
- The Red Line at Harvard, Central or Porter Squares via Route 85, 86, 87, 91, and CT2.
- The Fitchburg Commuter Rail at Porter Square via Route 87.

Table 6 indicates the number of people waiting at bus stops. All bus stops in the Union Square area are shown with the number of waiting people at each time interval within the area. On May 31, 2001, 18 observations were conducted at Area 1 (every half-hour) and only 11 observations were conducted in Area 2 (every 50 minutes). In order to aid comparison of blocks from each of the areas, an average number of people waiting per observation was calculated. From this value, the busiest stops can be determined.

As indicated, one of the busiest bus stops observed is located west of the Square on Washington Street, near the Somerville Avenue intersection. Other busy stops were located in the Square between Stone Street and Prospect Street, on the north side of Somerville Avenue and between Prospect and Webster Street on the south side of Somerville Avenue. Another popular stop is located on Bow Street near Warren Avenue.

Parking

A review of the Union Square Traffic Analysis report conducted in May 1995 by Bruce Campbell and Associates supplemented by a recent parking survey conducted by Edwards and Kelcey assists in developing a framework for the existing parking condition in the Square.

May 1995 Union Square Traffic Analysis – According to the Union Square Traffic Analysis, parking surveys were conducted in the following areas:

1. Washington Street- east of Union Square
2. Union Square lot
3. Union Square roadways
4. Prospect Street lot
5. Bow Street
6. Somerville Ave- east of Union Square
7. Somerville Ave- west of Union Square

Of the total number of spaces (278), 199 of these were metered and 79 were unmetered. The report concluded that there was not an overall shortage of parking, however that there was a shortage on the main streets during midday. Bow Street was reported as 100% occupancy on an average Saturday from 10:00 AM to 3:00 PM. Midday peaks were found on Somerville Ave, Bow Street, Union Square roadways and Washington Street east of Union Square.

TABLE 6 - BUS STOPS AND NUMBER OF PEOPLE WAITING FOR BOTH CIRCUITS OF UNION SQUARE

	TIME OF DAY																			
Location of Bus Stop	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**1:00**	**1:30**	**2:00**	**2:30**	**3:00**	**3:30**	**4:00**	**4:30**	**TOTAL**	**AVG**
E01: Between Stone Ave. and Prospect St.	0	0	2	3	2	6	3	2	3	4	0	1	1	2	0	1	1	3	34	1.9
K01: Between Webster Ave. and Prospect St.	0	0	2	0	7	4	1	1	2	3	0	4	2	2	3	3	0	2	36	2.0
I02: Between Somerville Ave. and Webster Ave.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
J01: Just West of Newton Street	1	2	0	2	0	0	0	1	0	0	0	0	0	0	5	5	0	1	17	0.9
J01: Just East of Washington Street	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

	CIRCUIT NUMBER												
Location of Bus Stop	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**TOTAL**	**AVG**
A02: Washington near Somerville Ave.	5	7	1	4	2	0	5	2	2	0	8	36	3.3
A01: Somerville Ave. just before Washington	3	0	2	1	0	0	2	0	1	0	0	9	0.8
A03: Somerville Ave. just after Carlton St.	4	0	0	1	0	0	0	0	0	0	1	6	0.5
C01: Bow St. West of Summer Street	1	0	0	0	0	0	0	0	1	0	0	2	0.2
D01: Bow St. east of Summer Street	0	0	0	2	0	0	0	0	0	0	2	4	0.4
D01: Just east of Warren Avenue	0	0	1	2	0	0	3	2	4	2	4	18	1.6

May 2001 Parking Survey – Edwards and Kelcey conducted a parking study of Union Square in Somerville, MA. on Thursday, May 31, 2001, between 8:00 A.M. and 5:00 P.M. The parking areas, as shown in Figures 5 and 6, were observed at certain time intervals throughout the nine-hour period. The parking spaces shown in Figure 5 were observed every half an hour; and the parking spaces in Figure 6 were monitored every 50 minutes due to the number of spaces encompassed. Three off-street parking lots were also included in the study, labeled Lot F, Lot H, and Lot L, in Figure 5 and Figure 6. For analysis and comparison purposes, these three lots were analyzed separately from the on-street spaces and curbside parking.

Parking Regulations - As indicated in Figures 7 and 8 parking is regulated throughout Union Square. Metered parking (30-minute and two-hour), permit parking (both residential and business) and curbside (no limit) parking is indicated.

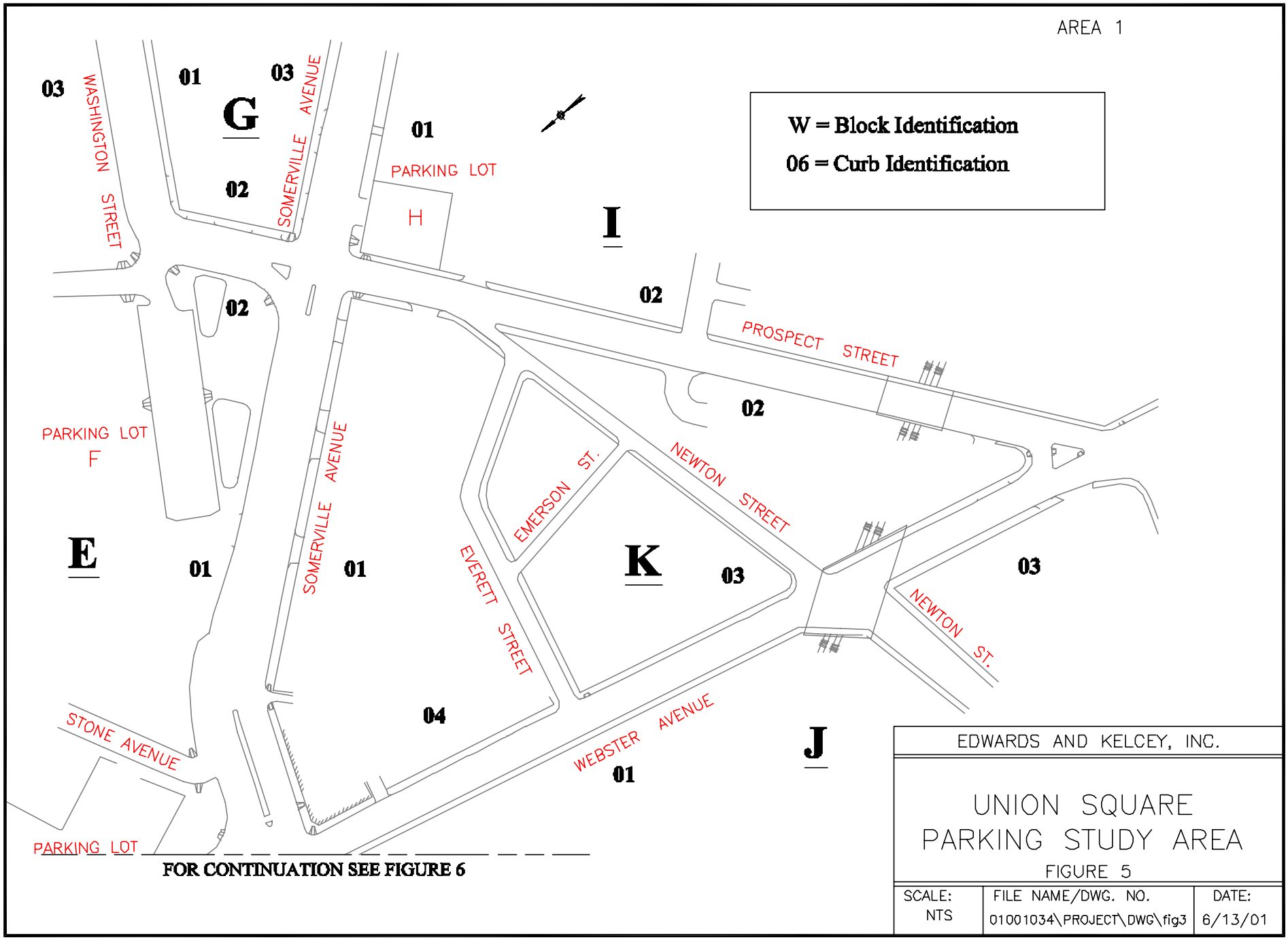
Parking Supply - The Union Square study area was divided into blocks with each block and parking lot having a specific identification letter and each curb face was assigned an identification number to help simplify data collection and analysis. This identification system (Block A1 through L) has been used in all of the summary tables and analyses.

Parking Usage - Parking usage studies provide information essential to evaluate the adequacy and regulation of parking supply. Several characteristics are observed from parking usage such as the number of vehicles parked, the time of day when parking demand peaks, the lengths of time vehicles remain parked in a particular area, and the actual adherence to parking regulations. This information can help determine the greatest need for parking in a particular area at a certain time of day, and it can show how better regulation could help free up more spaces. See Figures 7 and 8 for existing parking regulations and Tables 7, 8 and 9 for parking usage.

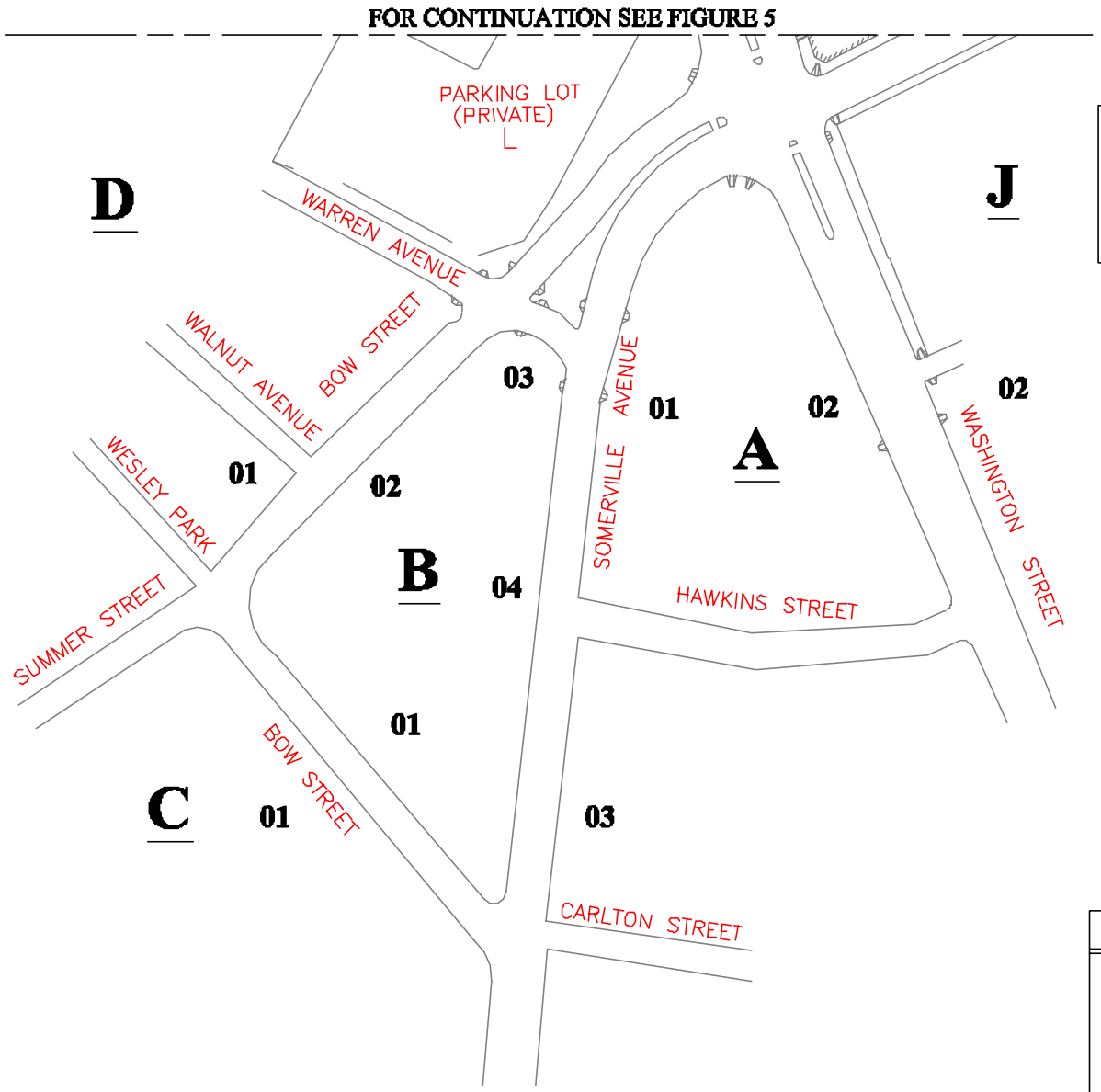
The measurement of parking space usage typically includes three items: occupancy, duration, and turnover.

- Occupancy = the percent of time that the parking space is occupied by a vehicle
- Duration = average length of time a vehicle occupies a space
- Turnover = the number of times a space is occupied by a different vehicle over a certain time period.

Shopping areas normally show low duration and high turnover since several vehicles occupy spaces for short periods of time. However, areas intended for employee parking exhibit opposite characteristics, that is, high duration and low turnover. This is due to a long length of time parking and a small change in the number of different vehicles occupying this area.


AREA 1
W = Block Identification
06 = Curb Identification
03
WASHINGTON STREET
01
03
G
SOMERVILLE AVENUE
02
01
PARKING LOT
H
I
02
PROSPECT STREET
02
02
PARKING LOT
F
SOMERVILLE AVENUE
EMERSON ST.
NEWTON STREET
E
01
01
EVERETT STREET
K
03
03
NEWTON ST.
04
STONE AVENUE
WEBSTER AVENUE
01
J
PARKING LOT
FOR CONTINUATION SEE FIGURE 6
EDWARDS AND KELCEY, INC.
UNION SQUARE
PARKING STUDY AREA
FIGURE 5
SCALE:
NTS
FILE NAME/DWG. NO.
01001034\PROJECT\DWG\fig3
DATE:
6/13/01

AREA 2



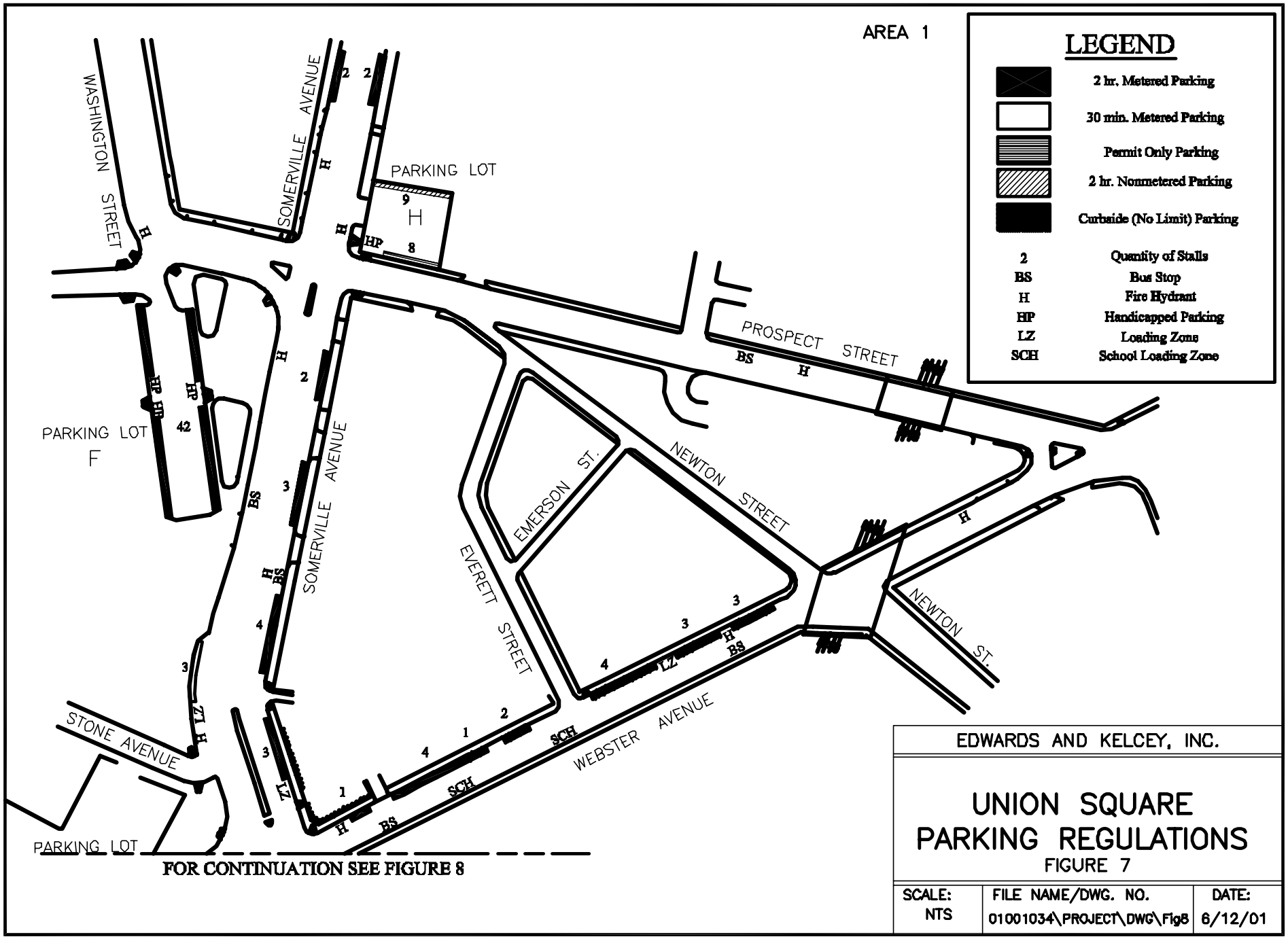
W = Block Identification

06 = Curb Identification

EDWARDS AND KELCEY, INC.

UNION SQUARE
PARKING STUDY AREA
FIGURE 6

SCALE:	FILE NAME/DWG. NO.	DATE:
NTS	01001034\PROJECT\DWG\fig4	6/13/01



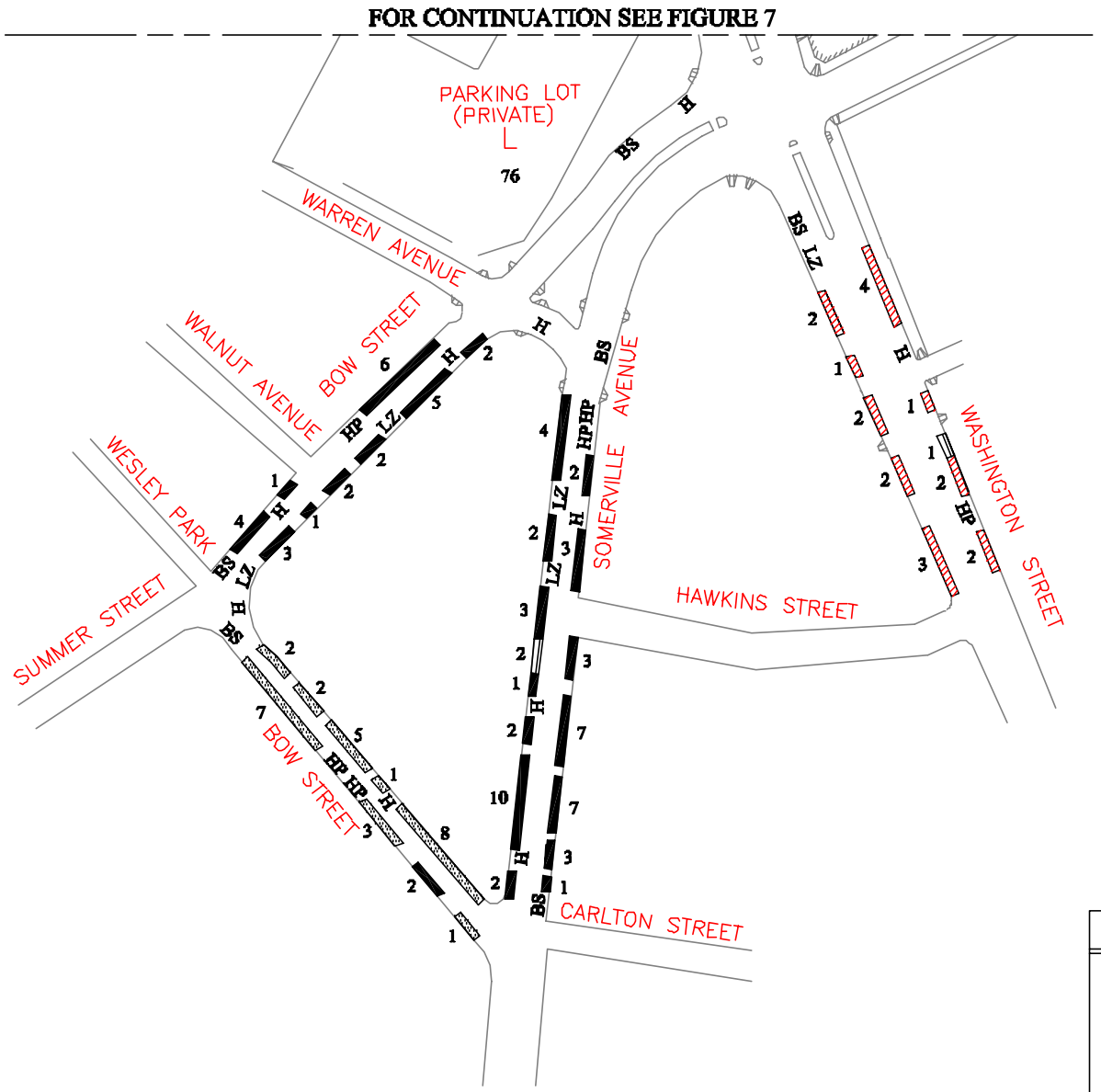
EDWARDS AND KELCEY, INC.

UNION SQUARE PARKING REGULATIONS

FIGURE 7

SCALE:	FILE NAME/DWG. NO.	DATE:
NTS	01001034\PROJECT\DWG\Fig8	6/12/01

AREA 2



LEGEND

	2 hr. Metered Parking
	30 min. Metered Parking
	Permit Only Parking
	2 hr. Nonmetered Parking
	Curbside (No Limit) Parking
2	Quantity of Stalls
BS	Bus Stop
H	Fire Hydrant
HP	Handicapped Parking
LZ	Loading Zone
SCH	School Loading Zone

EDWARDS AND KELCEY, INC.

UNION SQUARE PARKING REGULATIONS

FIGURE 8

SCALE:	FILE NAME/DWG. NO.	DATE:
NTS	01001034\PROJECT\DWG\FIG8	6/13/01

Table 7 - PARKING SPACES AVAILABLE, NUMBER OF VEHICLES PARKING, AND DAILY TURNOVER BY TYPE OF FACILITY AND BLOCK

		Spaces Available			Number Parked Vehicles				Daily Turnover		
					Curb Spaces		Lot Spaces				
Block	**Street**	**Curb**	**Lots**	**Total**	**Legal**	**Illegal**	**Lots**	**Total**	**Curb**	**Lots**	**Total**
A 01	Somerville Ave	7	0	7	21	5	0	26	3.0	0	3.0
A 02	Washington St	10	0	10	37	4	0	41	3.7	0	3.7
A 03	Somerville Ave	21	0	21	112	8	0	120	5.3	0	5.3
B 01	Bow St	18	0	18	36	2	0	38	2.0	0	2.0
B 02	Bow St	15	0	15	80	12	0	92	5.3	0	5.3
B 03	Connector	0	0	0	0	0	0	0	0	0	0
B 04	Somerville Ave	27	0	27	133	16	0	149	4.9	0	4.9
C 01	Bow St	15	0	15	34	2	0	36	2.3	0	2.3
D 01	Bow St	12	0	12	68	3	0	71	5.7	0	5.7
E 01	Somerville Ave	3	0	3	20	9	0	29	6.7	0	6.7
E 02	Prospect St	0	0	0	0	0	0	0	0	0	0
E 03	Washington St	0	0	0	0	5	0	5	0	0	0
F	Washington St	0	42	42	0	0	189	189	0	4.5	4.5
G 01	Washington St	0	0	0	0	5	0	5	0	0	0
G 02	Prospect St	0	0	0	0	0	0	0	0	0	0
G 03	Somerville Ave	2	0	2	5	2	0	7	2.5	0	2.5
H	Prospect St	0	18	18	0	0	22	22	0.0	1.2	1.2
I 01	Somerville Ave	2	0	2	1	0	0	1	0.5	0	0.5
I 02	Prospect St	0	0	0	0	1	0	1	0	0	0
J 01	Webster Ave	8	0	8	32	24	0	56	4.0	0	4.0
J 02	Webster Ave	11	0	11	9	1	0	10	0.8	0	0.8
J 03	Webster Ave	0	0	0	0	6	0	6	0	0	0
K 01	Somerville Ave	12	0	12	61	14	0	75	5.1	0	5.1
K 02	Prospect St	0	0	0	0	3	0	3	0	0	0
K 03	Webster Ave	10	0	10	24	11	0	35	2.4	0	2.4
K 04	Webster Ave	8	0	8	34	12	0	46	4.3	0	4.3
L	Bow St	0	77	77	0	0	241	241	0.0	3.1	3.1
Total		**181**	**137**	**318**	**707**	**145**	**452**	**1304**	**3.7**	**8.8**	**67.3**

Source: Parking Survey. May 31, 2001. Edwards and Kelcey.

Table 8 - PARKING USAGE CHARACTERISTICS BY NUMBER OF VEHICLES PARKED AND TIME USED BY TYPE OF FACILITY AND BLOCK

		Legal Curb Space			Illegal Curb Space			Total Curb Space			Lots			Total		
		Veh.	Veh.	Occupancy	Veh.	Veh.	Occupancy	Veh.	Veh.	Occupancy	Veh.	Veh.	Occupancy	Veh.	Veh.	Occupancy
Block	Street	Parked	Hours	(%)	Parked	Hours	(%)	Parked	Hours	(%)	Parked	Hours	(%)	Parked	Hours	(%)
A 01	Somerville Ave	21	36	57.14	5	4	2.78	26	40	19.32	0	0	0	26	40	19.32
A 02	Washington St	37	36	72.22	4	4	16.67	41	40	41.92	0	0	0	41	40	41.92
A 03	Somerville Ave	112	132	69.84	8	7	9.72	120	139	53.26	0	0	0	120	139	53.26
B 01	Bow St	36	147	90.74	2	2	2.78	38	149	63.68	0	0	0	38	149	63.68
B 02	Bow St	80	112	82.96	12	27	21.43	92	139	53.26	0	0	0	92	139	53.26
B 03	Connector	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B 04	Somerville Ave	133	195	80.25	16	27	25.00	149	222	63.25	0	0	0	149	222	63.25
C 01	Bow St	34	100	74.07	2	2	2.02	36	102	43.59	0	0	0	36	102	43.59
D 01	Bow St	68	84	77.78	3	3	1.28	71	87	25.44	0	0	0	71	87	25.44
E 01	Somerville Ave	20	15	55.56	9	5	2.78	29	20	9.66	0	0	0	29	20	9.66
E 02	Prospect St	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E 03	Washington St	0	0	0	5	3	4.17	5	3	4.17	0	0	0	5	3	4.17
F	Washington St	0	0	0	0	0	0	0	0	0	189	212	56.08	189	212	56.08
G 01	Washington St	0	0	0	5	5	7.94	5	5	7.94	0	0	0	5	5	7.94
G 02	Prospect St	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G 03	Somerville Ave	5	6	33.33	2	1	1.23	7	7	7.07	0	0	0	7	7	7.07
H	Prospect St	0	0	0	0	0	0	0	0	0	22	97	59.88	22	97	59.88
I 01	Somerville Ave	1	1	5.56	0	0	0	1	1	5.56	0	0	0	1	1	5.56
I 02	Prospect St	0	0	0	1	1	0.34	1	1	0.34	0	0	0	1	1	0.34
J 01	Webster Ave	32	15	20.83	24	13	9.03	56	28	12.96	0	0	0	56	28	12.96
J 02	Webster Ave	9	9	9.09	1	1	1.39	10	10	5.85	0	0	0	10	10	5.85
J 03	Webster Ave	0	0	0	6	3	3.03	6	3	3.03	0	0	0	6	3	3.03
K 01	Somerville Ave	61	60	55.56	14	22	20.37	75	82	37.96	0	0	0	75	82	37.96
K 02	Prospect St	0	0	0	3	5	1.92	3	5	1.92	0	0	0	3	5	1.92
K 03	Webster Ave	24	78	86.67	11	9	8.53	35	87	43.94	0	0	0	35	87	43.94
K 04	Webster Ave	34	43	59.72	12	13	18.06	46	56	38.89	0	0	0	46	56	38.89
L	Bow St	0	0	0	0	0	0	0	0	0	241	514	74.17	241	514	74.17

Table 9 – OTHER PARKING USAGE CHARACTERISTICS BY NUMBER OF VEHICLES PARKED AND TIME USED IN DIFFERENT FACILITIES

Block	Street	Total Observed Vehicles-Hours of Parking	Overtime Vehicle-Hours of Parking	Vehicle-Hours of Parking with No Illegal Parking	Space-Hours Capacity of Available Space	Space-Hours Capacity	
						Deficiency	Surplus
A 01	Somerville Ave	36	10	26	63	-----	37
A 02	Washington St	36	27	9	90	-----	81
A 03	Somerville Ave	132	7	125	189	-----	64
B 01	Bow St	147	0	147	162	-----	15
B 02	Bow St	112	18	94	135	-----	41
B 03	Connector	0	0	0	0	-----	0
B 04	Somerville Ave	195	25	170	243	-----	73
C 01	Bow St	100	8	92	135	-----	43
D 01	Bow St	84	8	76	108	-----	32
E 01	Somerville Ave	15	1	14	27	-----	13
E 02	Prospect St	0	0	0	0	-----	0
E 03	Washington St	0	0	0	0	-----	0
F	Washington St	0	0	0	0	-----	0
G 01	Washington St	0	0	0	0	-----	0
G 02	Prospect St	0	0	0	0	-----	0
G 03	Somerville Ave	6	0	6	18	-----	12
H	Prospect St	0	0	0	0	-----	0
I 01	Somerville Ave	1	0	1	18	-----	17
I 02	Prospect St	0	0	0	0	-----	0
J 01	Webster Ave	15	0	15	72	-----	57
J 02	Webster Ave	9	0	9	99	-----	90
J 03	Webster Ave	0	0	0	0	-----	0
K 01	Somerville Ave	60	2	58	108	-----	50
K 02	Prospect St	0	0	0	0	-----	0
K 03	Webster Ave	78	0	78	90	-----	12
K 04	Webster Ave	43	1	42	72	-----	30
L	Bow St	0	0	0	0	-----	0

Table 7 indicates the parking spaces available, number of parked vehicles and the daily turnover. The number of legal parking spaces was determined by visual inspection of the study area. Legal spaces include metered parking, regulated non-metered parking, unregulated curbside parking, handicapped parking, and all marked spaces included in parking lots (public lots were observed as well as the Citizen's Bank lot). Illegal parking includes double parking, parking in front of fire hydrants, bus stops, crosswalks, unauthorized parking in a loading zone, and parking in areas prohibited by parking regulation signs. Column three shows the number of legal parking spots available. The column labeled Number of Parked Vehicles indicates the number of vehicles parked in that area throughout the study period. This number is found by reviewing license plate observation notes and checking how many different vehicles parked in each spot. The illegal space column shows the number of vehicles parked illegally throughout the day. Turnover is calculated below.

$$\text{Turnover} = \frac{\text{Number of legally parked vehicles}}{\text{Number of legal parking spaces}}$$

The higher the turnover value, the greater the change in parking. In other words, the areas with the highest turnovers are going to be areas with the highest demand for short-term parking. Block E01, Somerville Avenue has the highest value, with a daily turnover equal to 6.7. Although this block only includes three legal spots, these are located right in the heart of the Square, so a high turnover value should be expected. There are several other blocks with very high turnover values also (three above 5.0). Of the three parking lots analyzed, Lot F on Washington Street is the busiest based on our findings with a turnover ratio of 4.5.

Occupancy percentages are calculated to determine the amount of available parking in use. Total number of vehicle hours was determined to calculate the occupancy percentage. This is where analysis differs a bit between the two circuits.

In Area 1, the time between observations was exactly half an hour. So each time a vehicle is logged into the field book, it is assumed to be in that area for 30 minutes. Therefore, to calculate the legal vehicle hours, the number of occupied legal spots in the field book must be multiplied by 30 minutes. The value must then be converted to vehicle hours.

In Area 2, the time between observations was approximately 50 minutes due to the extended length of the route and the greater number of spaces covered. In the calculation of legal vehicle hours, the number of occupied legal spots in the field book must be multiplied by 50 minutes rather than by 30. The value must again be converted to vehicle-hours.

The same process determines illegal vehicle hours and lot vehicle hours. The only difference is that the value of occupied legal spots changes to values of occupied illegal spots and occupied lot spaces, respectively. The following formulas show how all of the occupancy values are calculated:

$$\textit{Legal Occupancy} = \frac{\textit{Number of legal vehicle hours}}{\textit{Number of legal spots* Length of time (hrs) of study}}$$

$$\textit{Total Occupancy} = \frac{\textit{Number of vehicle hrs (legal + illegal + lot)}}{\textit{Number of spots (legal + illegal + lot) * Length of time (hrs) of study}}$$

$$\textit{Total Curb Occupancy} = \frac{\textit{Number of legal vehicle hrs + number of illegal vehicle hrs}}{\textit{Number of spots (legal + illegal) * Length of time (hrs) of study}}$$

In this study, the length of time is equal to 9 hours. As shown above, each occupancy formula requires a small revision to the formula above it. Most attention should be focused on the legal occupancy value when evaluating curb space, and on the lot occupancy percentage when evaluating parking lots. Illegal occupancy should also be considered but its importance is not primary. Typically a relatively high illegal occupancy value indicates that insufficient parking is available or spaces are inconvenient (therefore forcing people to park illegally). In our analysis, we found the areas where parking was prevalent during the entire day (highest legal occupancy rates) to be along Bow Street, specifically B01 and B02. Somerville Avenue also had a significant occupancy rate as well. The parking lot with the greatest occupancy was Lot L.

Table 8 shows the total observed vehicle-hours of parking and the overtime vehicle-hours of parking. This helps determine whether better regulation would be beneficial to Union Square's parking situation. It also displays the areas of the Square where overtime parking occurs most often, and, therefore, it helps give an idea of where to target regulation if the situation warrants it.

The overtime hours are calculated by adding the total time of vehicles parked longer than the parking regulations allow to the total time of vehicles parked at expired meters. The vehicle hours of parking with no illegal parking is equal to the overtime hours subtracted from the total observed vehicle-hours. This number can then be compared to the capacity hours of legal space.

$$\textit{Capacity = number of legal spaces * length of study (hrs)}$$

The comparison between capacity hours and hours without illegal parking will generally result in a surplus (the difference between the two). A deficiency will occur when a proposed plan or change eliminates some parking spaces. In a deficiency situation, the number of proposed spaces will not be enough to meet the current parking demand, so there will be a parking shortage. A deficiency can be improved by adding more spaces elsewhere or by revising parking regulations to increase vehicle turnover.

Parking Conclusions

During the course of the nine hour turnover study, 1,159 different cars where recorded in on-street spaces and three off-street lots. Seventeen percent of the cars (147) parked in illegal spaces such as bus stops, loading zones and near intersections. The 181 legal spaces where used by 707 cars, for an average turnover rate of 3.9 cars per parking stall.

Overall occupancy peaked at 199 cars, which is 63% of capacity. This occurred at 2:00pm but reflected a relatively stable condition throughout the day. As indicated in the previous tables, the turnover and parking activity differed by the location and time limit designation of the on-street parking spaces, but was generally reflective of the 2-hour time limits in metered spaces and twice that in the unmetered spaces with the exception of the Prospect Street lot in which cars parked by permit all-day. Of particular concern is the illegal parking in bus stops and loading zones in the Bow Street – Somerville Avenue triangle area. Cars parked for long periods of time in these locations and contributed to double parking by trucks.

The parking study was conducted for a single day's duration for the entire study area, but additional data collected for the Washington Street lot for three additional days and for later hours to confirm parking characteristics. While the data collected would indicate generally a surplus of parking exists in Union Square, a perceived lack of parking may occur at peak times because of the "convenience factor" which results in parking violations in heavily parked areas of the square.

Public Meeting Summary (April 25, 2001 at 7:00 – 9:00 PM)

Purpose

Approximately 35 area residents attended a public meeting in Union Square on April 25, 2001 at 7:00 PM. Meeting objectives included:

- Explain the project and receive public input.
- Increase public knowledge of project objectives and issues.
- Learn the public's existing perceptions about Union Square's transportation problems and potentials.

Participants were asked to complete a questionnaire, leave written comments and participate in a small group work session. The work session focused on four areas of study: traffic congestion, pedestrian access, public transit, parking. Five small groups worked on developing a list of priority problems in the Square and used large mapping to mark up their concerns. The maps were compiled into a composite map presented in the appendix.

The following text is a compilation of 28 survey responses, written comments and results of the small group exercises. Identification of existing problems and proposed solutions in this section are those of workshop participants and will be evaluated in later sections.

Common Themes

Although there were some disagreements about possible solutions to Union Square's transportation problems, participants expressed the following common concerns.

- Excessive traffic in the heart of Union Square caused by "pass-through" traffic
- Poor pedestrian network due to high traffic volumes
- Limited public transit routes and awkward location of bus stops
- Isolated parking problems such as double parking along Somerville Avenue and poor use of the Union Square Plaza parking lot

The regional transportation network emerged as the major cause of Union Square's traffic problems. Through traffic is increasing in Union Square due in part to those exiting from I-93 at McGrath Highway. As a result, businesses are suffering and the livability of the Square is diminishing. The majority of participants agreed that the reduction of traffic is key to creating a pedestrian-friendly, business center and viable neighborhood.

The following strengths were identified by some participants:

- Reactivating the Union Square Task Force could be a useful means of developing potential solutions
- Bump-out at Walnut Street works well
- The Square has the potential to be pedestrian friendly
- Bike route on Somerville Ave (east of Union Square)
- Attractiveness of neighborhoods and plaza (north of the Square)
- Pedestrian count-down signals are good

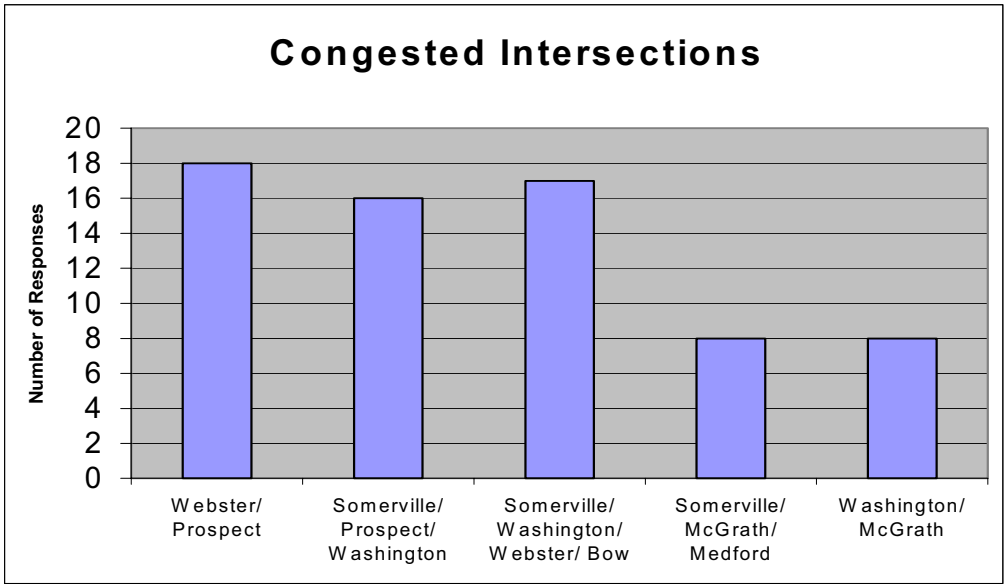
The following describes participants' comments regarding each component of the plan and broken down into identification of problems and recommendations. The following Composite Map illustrates in graphic format the common problems as identified by participants.

Traffic Congestion

Participant's Identification of Problems – Traffic congestion occurs at key problem intersections. According to responses in the questionnaire, although the majority of people identified the bolded intersections listed below as the most difficult to drive through, the following intersections are problematic.

- **Somerville/Washington/Bow/Webster**
- **Webster/Prospect**
- **Somerville/Prospect/Washington**
- Washington/Bonner/Washington Street parking lot
- Webster/Newton
- Warren/Bow
- McGrath/Medford/Somerville
- McGrath/Washington

SOMERVILLE
Composite Map
April 25, 2001
Public Meeting Results
Union Square
Transportation Plan
City of Somerville
Mayor Dorothy A. Kelly Gay
Office of Housing and
Community Development
Edwards AND Kelcey
Source: OHCD
200 0 200 400 Feet
Legend
Sinkhole
Traffic Signal
Traffic Congestion
Problem Intersections
Bus Circulation Problems
Crosswalk Needed
Bump
MBTA Bus Route CT2
MBTA Bus Route 91
MBTA Bus Route 87
MBTA Bus Route 85
MBTA Bus Route 86
Double Parking
Dangerous Corners
Loading Zone Problem
Excessive Road Width
Municipal Schools
Destinations
Railroad
Project Area
Parcel Boundaries
Webster Ave and Prospect Street =
Recommended Two-Way Traffic
SOMERVILLE AVE
SCHOOL ST
QUINCY ST
CHURCH ST
VINAL AVE
WALNUT ST
COLUMBUS AVE
MUNROE ST
BOSTON ST
DANE ST
Super-
market
BOW ST
WARREN AVE
STONE AVE
BONNER AVE
LAKE ST
LELAND ST
Union Square
Plaza
Post
Office
WASHINGTON ST
St.
Joseph's
Church
Parochial
School
Dunkin
Donuts
Public
Safety
Bldg.
Lincoln Park
Elementary School
CLARK ST
JOSEPH ST
WEBSTER AVE
MCGRATH HWY
MERRIAM ST
NEWTON ST
PROSPECT ST
RAILROAD
CONCORD AVE
COLUMBIA ST
TO
CAMBRIDGE



Several traffic-calming measures were addressed. The majority of participants felt that sidewalks should be widened. A median strip especially along Somerville Avenue could help slow down traffic, beautify the area, and create safer pedestrian access.

Traffic congestion and parking problems frequently occur at the location of the charter school on Webster Street.

Traffic travels too fast on Washington Street and too little time is provided in the pedestrian cycle to assure safety. It is difficult to access Washington Street from the parking lot by the SCAT building.

Participant's Recommendations

- Create diagonal parking on Somerville Avenue to decrease the drivable width of the road
- Construct a plantable median on Somerville Avenue to decrease the driveable width of the road
- Increase sidewalk widths on Somerville Avenue to decrease the driveable width of the road
- Add bike lanes to Somerville Avenue.
- Instead of paving traffic islands, plant them – better stormwater retention and better aesthetics.
- [Institute] an Adopt-A-Tree program for street trees.
- Install better street name signage.

Pedestrian/Bicycle Safety

Participant's Identification of Problems – Although not indicated on the map, pedestrian pathways are important connections throughout the entire Square. Better-marked crosswalks were a common response. Pedestrian crossings are a key concern. Several intersections were considered unsafe to cross. Residents find it dangerous to cross at certain intersections, especially from SCAT to the Dunkin Donuts.

Improved bike path connections especially to Central Square were emphasized. This would attract people from MIT and Boston University. When asked if bicycle routes were safe and accessible throughout the Square, all respondents stated NO.

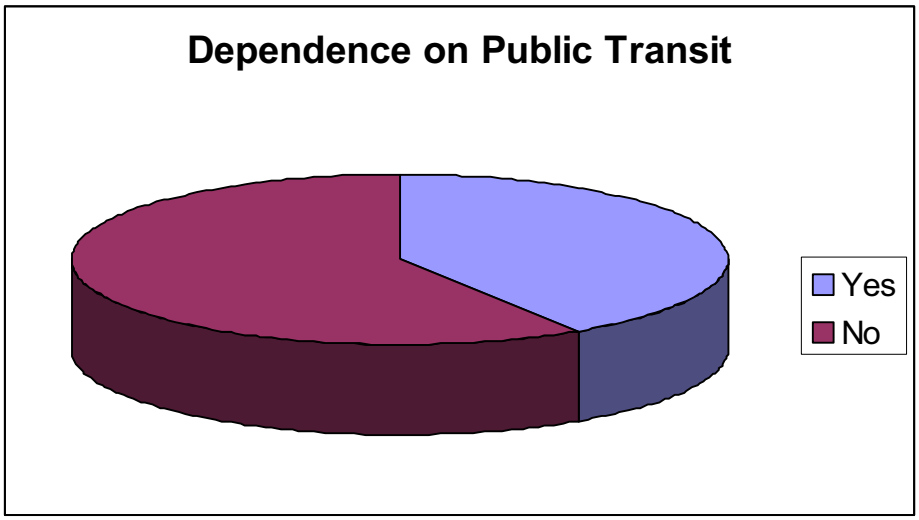
The majority of survey respondents stated they would walk between one and four minutes from their car to a Union Square destination.

Participant's Recommendations

- Reduce traffic volumes and congestion within the Square.
- Better marked crosswalks with orange, reflective cones in the crosswalk; construct crosswalks with different pavement type than street surface
- Widen sidewalks.
- Add pedestrian signals at additional locations within the Square.
- Add signage to increase awareness of bicyclists.

Public Transportation

Participant's Identification of Problems – The majority of respondents use the MBTA bus and subway. Although all subway lines are used, the Red Line appeared to be the most popular. A direct shuttle to the Red Line is desired. Diesel buses were considered unacceptable by some; electric or clean powered gas were identified as alternatives. MBTA bus stops are considered unattractive and uncomfortable. When asked what type of improvements should be made at bus locations, construction of bus shelters had the highest rating. Other important needs include sufficient sidewalk width, benches, ADA accessibility, signage and convenient location. The majority of respondents to the questionnaire stated they were not dependent on public transit (16), however approximately 11 respondents stated they were dependent.

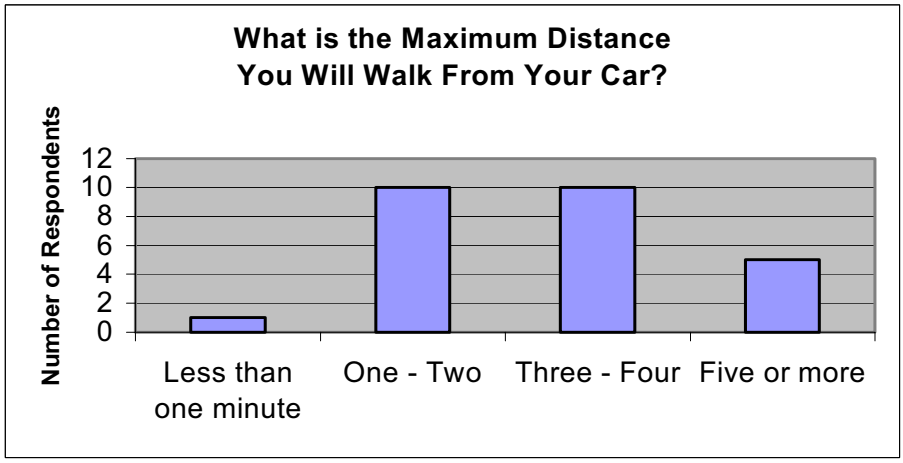


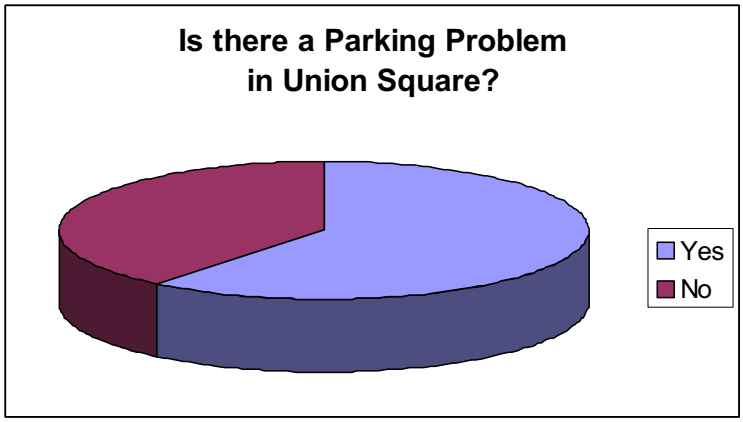
Participant's Recommendations

- Add a commuter rail stop in Union Square.
- Add a direct shuttle to the Red Line commuter rail stop.
- Implement clean buses.
- Improve MBTA bus stops.

Parking

Participant's Identification of Problems – There was a mix of feelings about parking. Some stated there is a parking shortage. Others felt that parking should be convenient and available for commercial uses to promote their viability. When asked how long it takes them to find a parking space, there was an even distribution between those who stated less than 3 minutes and those who stated 3 to 10 minutes. No respondents stated more than 10 minutes. Most respondents stated the maximum distance they would walk from their car to their destination is between one and four minutes.





Participant's Recommendations

Use the land behind the stores between Stone and Warren Ave as a parking area.

The following chart indicates public comments made by workshop participants as separated by project category. Comments were made by local residents based on their observations and do not necessarily reflect professional judgement or field research by the consultant.

Traffic Congestion	Parking	Pedestrian Access	Public Transportation
Traffic congests the center of the Square and affects pedestrians and buses – too much traffic	Double parking is a problem especially on Somerville Ave	Need to make more pedestrian friendly – need crosswalks	Public transportation needed – "T" and Rail will change the Square (like Davis Square)
Lack of signage to I-93 (coming from Mass. Avenue/Route 2)	Could install a parking structure at Warren and Stone	Lack of pedestrian safety	Bus shelters
Sight distance is bad at the various bridge crossings, especially Newton Street. Crossings add to traffic in the Square and are dangerous.	Some indicate there is a general lack of parking, others state parking is not unusually difficult	Benches needed	Buses back up on Bonner Avenue and therefore drivers avoid Columbus because it is too dangerous
Newton Street should only be available for local traffic during rush hour – fix the sinkhole.	Meters in the Washington Street parking lot should run later in the evening, to prevent overnight parking.	Eliminate barriers on Webster Street	Bus Routes CT2 is an addition to Square (publicize this new route)
There is traffic gridlock at the post office on Washington Street	Could use area behind the old police station as parking	Add curb cuts and widen sidewalks	Bus stops – Somerville

Traffic Congestion	**Parking**	**Pedestrian Access**	**Public Transportation**
Speeding occurs especially on streets with one-way traffic flow such as Bow, Webster and Somerville Avenue- not enough enforcement.	Enforcement of parking is needed	Remove trash	There are numerous buses on Prospect Street, but no bus stop. Buses travel at unregulated times, often with few travelers.
Lane changing on Bow Street	Parking needed on Lake Street	Prevent jaywalking	Lack of schedules
Prospect Street and Webster Street should be two-way streets	Provide more parking for businesses	Crosswalk at front of Public Safety Building needs repair	Buses do not pull over and use bumpouts
Traffic from I-93 should be diverted from the Square	Lack of postal worker parking	Lack of pedestrian access going south to Washington	Move bus stops out of middle of Square
The Vietnam Memorial obstructs the sight of drivers and should be removed.		Need bike lane striping on Somerville Avenue (especially for those wanting to access Inman Square)	The bus stop in front of the furniture store on Somerville Avenue is used as a loading zone
Need to identify alternate routes for truckers (ie. Broadway)- too big and too many. A regional truck study is on going.		Difficult for pedestrians to cross at Somerville, Washington, and Prospect	Buses should all pass through one centralized location with multiple stops
Reduce traffic in Union Square by way of Broadway		Crosswalks needed	
Intersection improvements are needed		Want brick, raised or textured crosswalks	
By-passes are a benefit because of the availability of alternate routes, however a challenge because of neighborhood cut-throughs		Pedestrian crosswalks are dangerous at Dunkin' Donuts, Bow St and Webster Ave (especially for kids)	
Traffic lights should be longer		Widen sidewalks/ curbs	
Need improved access to City Hall, Post Office, restaurants and public safety building		Need more median strips for pedestrian refuge (consider elderly)	

Traffic Congestion	**Parking**	**Pedestrian Access**	**Public Transportation**
Too much traffic on Bow Street and within the Square		Too much litter/not weeded (lack of care)	
Illegal running of red lights			
Two-way streets are needed			
Traffic light at Washington and Webster is too short.			
Other Comments			
Need a comprehensive plan for the Square to address not only traffic issues			
Were air quality studies ever done? (affects schools, etc.)			
Need mix of land uses including more retail, a bakery, ice cream shop, and hardware store			
Smart traveler technology is a good tool			
Need more input on how children and the elderly access their destinations			
Revitalization study goals and objectives should be posted on City Web Site			
Need better mapping			
Source: April 25, 2001 Public Meeting.			

SECTION 2 ISSUES AND OPPORTUNITIES

Introduction

Section 2 is a compilation of public input, City comments, business survey results, field research and observations. Identification of existing issues and possible opportunities are outlined and will be evaluated in the analysis and alternatives section of the report. While issues define what the problems are, opportunities identify the existing assets that could be better utilized.

Union Square is the City's oldest commercial center and serves as a regional crossroads for Somerville and other inner Boston communities. The Square's location at the intersection of several major arterials provides cross-town and regional highway system access which adds to congestion on local residential and commercial streets. Union Square's streets are gridlocked during morning and afternoon peak periods because all of the Square's major streets are at or over capacity. In addition, the Square is a hub for MBTA service, including the recently initiated CT2 buses. These factors provide opportunities for economic development but also place a significant burden on the local roadway infrastructure. Transit helps alleviate this congestion, enhances the regional transportation network, and improves the economic vitality of the area.

The livability of the Union Square neighborhood is critically important to any economic redevelopment. The convergence of the existing roadway network in the heart of Union Square forms a natural gathering place for people as they access their destinations. The road pattern creates a high activity node where retail businesses, offices, services and residences have developed, forming a typical downtown center with major destinations such as the post office, public safety building, ethnic restaurants, charter and elementary schools and banks. These activities generate pedestrian, automobile, public and commercial traffic within the Square. By utilizing the existing network and coordinating the interaction of public transit, pedestrian mobility, traffic and parking, travel patterns can be modified to meet the growing traffic demands in the Square.

Issues

Primary Issues

Key issues surrounding Union Square's transportation problems include the following.

1. **Traffic Congestion -**Excessive traffic within the limits of the Square
2. **Pedestrian/Bicycle Safety -**Incomplete pedestrian network due to inadequate pedestrian paths and crossings
3. **Public Transportation-**Limited public transit and awkward location of bus stops
4. **Parking -**Isolated parking problems

Traffic Congestion Issues - High traffic volumes entering in Union Square, as well as through traffic from regional origins congest the Square especially during weekday commute hours. The convergence of several roadways that connect to Cambridge and I-93 (forming the pathway to the region's metropolitan center) coupled by a high density residential and business district increases traffic congestion. The effect of this congestion compromises business activity, degrades air quality, and discourages pedestrian mobility.

Key traffic congestion issues include the following:

Intersection Congestion

- Long queue lengths at intersections block adjacent intersections, especially at the following key intersections in Union Square:
    - Somerville/ Washington/ Bow/ Webster
    - Webster/ Prospect
    - Somerville/ Prospect/ Washington
    - Webster/ Newton
    - Warren/ Bow
    - McGrath/ Medford/ Somerville
    - McGrath/ Washington
- Traffic signal phases are too short, especially at the Washington Street and Webster Street intersection
- Buses do not use curb locations for passenger pickup, thereby blocking a lane of traffic at bus stops
- Need to enforce traffic regulations relating to speeding, running traffic signals, and double parking

Through Traffic

- "Cut-through" traffic destined for locations other than Union Square adds unnecessary congestion; through truck traffic is excessive
- Poor I-93 signage on Massachusetts Ave and Alewife Brook Parkway reportedly results in "cut-through" traffic in Union Square
- Local by-passes around the Square adversely affect neighborhoods; e.g. Newton Street, Webster Street, Prospect Street, Greenville Street, Monroe Street, Prospect Hill Avenue and Warren Avenue are used as cut-through roadways

One-Way Streets

- Excessive speed during off-peak travel is a problem on one-way streets such as Bow Street, Webster Street, Somerville Avenue and Washington Street

Access To and From Local Destinations in the Square

- Traffic congestion and parking problems frequently occur at the Charter School on Webster Street during drop-off/pickup times
- Access to and from the parking lot on Washington Street in the Square is difficult; gridlock is common
- Access to the Post Office, local restaurants, the public safety building, and other destinations in the Square is difficult due to congestion at the access/egress (queue for the Washington Street /Somerville Avenue intersection blocks access to the Union Square plaza parking lot and to Bonner Street)
- Vehicular access to Stone Avenue from Washington Street is via the Citizen's Bank parking lot due to the one-way traffic pattern
- Traffic calming measures to discourage through traffic from residential neighborhoods are lacking in some areas and ineffectual in others