Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan Dover, New Hampshire

Submitted to:
City of Dover

February 14, 2005

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Steven Stancel, Director
Dover Planning Department
City Hall
288 Central Avenue
Dover, NH 03820

Re: Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan Dover, New Hampshire

Dear Director Stancel:

Rizzo Associates, Inc. is pleased to submit this Final Report on the Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan for your use. The report includes the existing conditions analysis, alternatives evaluation, and the study findings and recommendations. It is a comprehensive review of all of our data collection, our analysis, and our collaboration with City of Dover staff, the Transportation Advisory Commission, and representatives of Dover's residential and business communities.

Thank you for the opportunity to work with you on this important planning study, and for your department's hard work and assistance.

Very truly yours,

Edward T. Gardiner, P.E.
Branch Manager

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Executive Summary

Dover, New Hampshire has a successful downtown with a vibrant mix of uses. Downtown Dover has a concentration of small-scale retail and restaurant businesses. The downtown also has a significant residential population and several large employment centers, including two converted mill buildings and a concentration of government buildings around City Hall and the Dover District Court. Dover's residents and employees support the downtown businesses, which in turn make downtown Dover an attractive place to live and work. The mix of uses, along with the density and compact scale of the district, helps to make downtown Dover active and successful.

Study Purpose and Goals

The City of Dover and its Transportation Advisory Commission have undertaken the Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan in order to identify key issues and opportunities in the downtown, and to articulate Dover's transportation vision for the future of its downtown. The study has three principal goals:

- Ensure the safe and efficient function of all transportation modes in the downtown study area.
- Improve Dover's economic viability and development.
- Enhance the quality of life for Dover's residents, workers, and visitors.

In order to achieve these goals, the study will describe conditions and issues in a variety of dimensions, including different modes of transportation; evaluate potential improvement alternatives for motor vehicle traffic, parking, public transportation, pedestrians, and bicycles; assess future development scenarios and their transportation impacts; and make recommendations for future transportation improvements.

Existing Issues and Future Challenges

The transportation system is an important element of downtown Dover and its character. The following is a brief summary of the principal characteristics of Dover's transportation system, and the major issues that the Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan addresses. The downtown study area is shown in Figure 1.

Regional Transportation System. The Spaulding Turnpike is a major four-lane highway that runs through Dover to the southwest of downtown, providing access to Interstate 95 to the south. Four interchanges on the Spaulding Turnpike provide access to and from Dover: one near Weeks Crossing and the shopping centers north of downtown, two near downtown (at Route 9 and at Route 108), and one to the south at Dover Point Road (this last exit is immediately south of a toll plaza, and results in cut-through traffic in downtown Dover). Downtown Dover has direct connections via several state routes: NH 108, NH 9, and NH 4. Dover also has rail service through the center of downtown on the Boston & Maine line.

Downtown Roadway Network and Motor Vehicle Traffic. Downtown Dover is accessible to motor vehicle traffic via a number of major roadways that form a radial roadway network. At the center of this radial network is Dover's downtown one-way loop, formed by Central Avenue (Routes 108 / 9), Washington Street (Routes 108 / 9 / 4), and Main Street (Route 108 / 9). Because so many major roadways converge on downtown Dover, traffic volumes through the downtown are high, and there is

significant congestion at several locations. The following are some of the major motor vehicle traffic issues.

- Dover's roadway network concentrates traffic in the downtown center. Historically, this led to Dover's initiation of the one-way loop, which has advantages (more efficient traffic operations) and disadvantages (high traffic speeds, circuitous access, less pass-by traffic in the commercial core).

- There are traffic issues at each intersection in the downtown loop:

  - Lower Square (Central Avenue / Washington Street). Congestion is especially bad at Lower Square, where most of downtown Dover's major traffic routes converge.

  - Upper Square. Upper Square has a series of closely-spaced intersections with confusing traffic movements and wide areas of pavement.

  - Washington Street / Main Street. This location is the "back end" of the downtown loop. There are high traffic volumes turning left from Washington Street to Main Street, with no significant conflicts and high traffic speeds.

- The Chestnut Street – Walnut Street – Locust Street corridor provides a bypass around the Central Avenue corridor and the downtown one-way loop; traffic on this corridor has been growing much more quickly than in the downtown as a whole. There is congestion at the northern end of the corridor, where Chestnut Street intersects with Central Avenue and Sixth Street. The intersections of Washington Street / Chestnut Street / Walnut Street and Washington Street / Locust Street are also critical locations along the corridor.

- There is significant truck traffic through downtown Dover, due to the presence of industrial businesses in the Dover area, as well as the loading and service needs of the downtown business district. This is largely due to trucks making connections between the Spaulding Turnpike and Somersworth or the Berwicks in Maine. In addition, the location of the Dover Toll Plaza encourages traffic to cut through downtown, especially if they are bound for northern Dover (e.g. Weeks Crossing).

Parking. Downtown Dover has a significant supply of parking. This includes a total of 832 on-street parking spaces (both two-hour limit spaces and spaces with no time limit) and 3,153 off-street spaces. The off-street parking is provided exclusively in surface parking lots; there are no parking decks or garages in Dover. The off-street parking has a variety of ownership and management arrangements, including municipally-owned permit parking, municipally-owned metered parking, and privately-owned parking lots for downtown employees, retail business customers, and residents. Parking surveys were conducted to assess the degree of parking utilization and availability of excess parking. These surveys were conducted during the mid-morning and mid-afternoon on weekdays in September 2003 and June 2004. The following are some of the key findings from the parking surveys:

- Overall parking utilization in downtown Dover was generally in the range of 50 – 60% for both on-street spaces and off-street spaces.

- Parking utilization was somewhat higher for the on-street spaces with no time restriction than for the on-street spaces with two-hour parking limits.

- Off-street parking is available throughout the day; however, most of the available parking is in private lots or in city-owned lots for permit holders. Off-street public metered parking is highly-utilized.

- Many drivers were observed periodically moving their automobiles between on-street parking spaces to adhere to the two-hour parking limit. It is most likely that these are employees of downtown employers and downtown retail businesses, who are taking up on-street parking that would best be reserved for short-term retail customers.

Public Transportation. Downtown Dover has a range of public transit services, including Cooperative Alliance for Seacoast Transportation (COAST) local and regional bus service, Wildcat Transit service (provided through the University of New Hampshire), Amtrak Downeaster rail service, inter-city bus service on C&J Trailways, Hampton Shuttle service to Manchester Airport and Logan Airport, and downtown shuttle service on the Cocheco Falls Mill employee shuttle. These transit services have been aided by the construction of the Dover Transportation Center at the site of the downtown rail depot; this creates a recognizable transit hub for downtown Dover, although it is slightly removed from the center of downtown. However, transit service to downtown Dover is still fairly infrequent, and tends to be used principally by transit-dependent populations, such as the elderly, students, and lower-income riders. Dover is currently pursuing a supplemental downtown transit service using federal Congestion Mitigation and Air Quality (CMAQ) funding.

Pedestrian. Pedestrian access in downtown Dover is generally good, and pedestrian volumes are high, especially in the downtown center along the main Central Avenue commercial corridor. Because Dover is a historic city with a compact downtown and storefront retail, travel distances and street design are both suited to pedestrian travel. However, there are challenges for pedestrian access throughout downtown: these include wide streets and intersections, high-speed traffic (especially at Washington Street / Main Street), and confusing traffic movements (especially at Lower Square and Upper Square).

Bicycle. Dover's compact development patterns also make bicycle travel practical for Dover. A significant number of bicyclists were counted traveling through downtown Dover via Henry Law Avenue and Chestnut Street. The downtown one-way loop, however, is an obstacle for bicyclists due to the high traffic volumes and speeds. The city is pursuing the development of a bicycle rail-trail on the abandoned Newington Branch rail line immediately west of downtown, connecting the Dover Transportation Center to Bellamy Park in the south.

Development. Dover's future land development is also an integral element of planning Dover's transportation system. Dover has a successful downtown, with very retail vacancy rate. However, the Cocheco Falls Mill is approximately 50% vacant, with the potential for adding significant office utilization to downtown Dover, along with the accompanying traffic and parking demand. In addition, Dover has a promising opportunity to expand its downtown across the Cochecho River by developing the city-owned Riverfront parcel, located at the end of River Street, across the Cochecho River from the eastern end of Washington Street. The city has obtained state approval and preliminary funding to restore the Washington Street vehicular bridge, connecting downtown Dover to the Riverfront parcel. However, providing a convenient and practical vehicular connection to a significant development on the Riverfront parcel will require two-way circulation on Washington Street, and changes to the downtown one-way circulation pattern.

Alternatives Analysis

The Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan has evaluated a series of improvement alternatives for each element of the transportation system. These alternatives are designed to address Dover's existing transportation issues, and its future transportation needs.

Motor Vehicle Traffic. A series of improvement alternatives were reviewed to improve motor vehicle traffic access, operations, and safety. The analysis for each of these alternatives involved proposing conceptual designs that addressed existing issues and future needs; designing new roadway layouts; evaluating traffic flow diversions and traffic operations impacts; identifying impacts to on-street parking supply; and assessing advantages and disadvantages of each alternative.

Downtown Central Loop. The downtown central loop, formed by Central Avenue, Washington Street and Main Street, is critical to overall downtown traffic circulation and access to and from the Riverfront parcel. It also has a number of existing transportation issues. A wide array of potential improvement alternatives were evaluated, including schemes that implement two-way circulation in the downtown loop, two-way circulation on some segments of the loop, reversed one-way circulation on some segments, one-way pairing using Chestnut Street as a parallel corridor, and combinations of these elements.

Chestnut Street – Walnut Street – Locust Street Corridor. This corridor is an important bypass around the Central Avenue corridor and the downtown loop. It also has the potential for future growth and economic development. The alternatives analysis for this corridor addressed congestion and queuing at the Chestnut Street northbound approach to Central Avenue, and circulation improvements where the corridor intersects Washington Street (at the intersections of Washington Street / Chestnut Street / Walnut Street and Washington Street / Locust Street).

Other Locations. The alternatives analysis reviewed potential geometric and traffic control improvements at Broadway / St. John Street and Central Avenue / Silver Street.

Truck Traffic

In 1996, Dover and its residents and businesses worked with the Strafford Regional Planning Commission (SRPC) and NHDOT to develop a comprehensive policy on truck routes and truck prohibitions in Dover. There are limitations to making further changes to truck routes and truck prohibitions. This is particularly true in downtown Dover, due to the fact that the principal truck routes are state numbered routes. Truck prohibitions on state numbered routes require NHDOT approval, and are difficult to obtain. Truck routes on other roadways in downtown Dover are not high, and may be related to local truck deliveries.

However, there are ways to better manage truck access through downtown Dover. Trucks could be better directed to appropriate regional highways, such as the Spaulding Turnpike, by using improved signage and outreach to industrial businesses. In addition, bottlenecks and missing links in the truck route system could be addressed, such as the weight-limited bridge over the railroad tracks on Oak Street, which could serve as a bypass of downtown Dover.

Parking

Parking supply and utilization are major issues for downtown Dover. A detailed review of parking supply and utilization indicates that the existing parking supply is adequate for downtown Dover's current needs. In the near term, Dover should concentrate on improved parking supply management. Such measures may include review of public parking regulations, increased enforcement, shared-parking arrangements to take advantage of excess capacity, and oversubscription of permit parking lots.

However, future parking demand associated with full occupancy of the Cocheco Falls Mill and with the Riverfront development will likely require an increase in parking supply. There are no large, unused parcels in the downtown area that could be used for surface parking; in addition, converting scarce

downtown land into surface parking does not represent good long term urban planning. Therefore, it is likely that structured parking will be required to satisfy future demand in downtown Dover. There are many potential locations for parking garages and/or parking decks, such as the Orchard Street municipal parking lot, the Cocheco Falls Mill heating plant, the Bank of New Hampshire parking lot, the Dover Public Library parking lot, and the Riverfront parcel.

Public Transportation

Dover has local, regional, and inter-city public transportation connections. These services include local and regional service from the Cooperative Alliance for Seacoast Transportation (COAST) and the University of New Hampshire's Wildcat Transit; inter-city bus service from C&J Trailways and Hampton Shuttle (with service to Logan Airport and Manchester Airport); and rail service on Amtrak's Downeaster. Dover's regional and inter-city transit connections provide reasonable connections and frequency. However, the local public transportation connections are fairly infrequent, operating on approximately one hour headways during weekdays.

Dover is currently planning a supplemental public transit service using a Congestion Mitigation and Air Quality (CMAQ) grant. The Transit Resource Center is working with the City of Dover and COAST to plan and implement this supplemental service. Potential types of supplemental transit service include fixed-route systems (where passengers are picked up and dropped off at dedicated stops), demand-response systems (where passengers are picked up and dropped off at requested locations), and hybrid systems that combine characteristics of both approaches.

Pedestrian

Downtown Dover has a vibrant street life with significant pedestrian volumes. The study area's pedestrian crossings and key pedestrian desire lines were reviewed, including pedestrian connections to and from parking lots.

The key characteristics of the study area's pedestrian crossings were established. These characteristics included whether or not the crossing is signal-protected or unsignalized, whether it crosses a stop-controlled intersection approach or the major traffic flow, and the volume of traffic in conflict with the crosswalk.

Recommendations

The study recommendations build upon the study's goals and objectives, the existing conditions analysis, and the evaluation of alternatives. The study recommendations are intended address downtown Dover's existing transportation needs and issues; plan for future transportation access and demand; and work together as a cohesive whole. These recommendations represent the combination of options that best satisfies the downtown plan's goals and objectives.

The recommendations address traffic, parking, public transportation, pedestrian, and bicycle improvements for downtown Dover and the Riverfront Development. These recommendations also respond to issues and comments raised by the Transportation Advisory Commission (TAC), City of Dover staff, the Riverfront Committee, and the general public through the public meeting process and the extensive downtown survey process.

The recommended improvements are divided up into three categories based on priority and phasing:

- Immediate Recommendations (6 months – 1 year)
- Short-Term Recommendations (1– 5 years)
- Long-Term Recommendations (5 – 10 years)

Immediate Recommendations

A few transportation improvements are recommended for immediate implementation, i.e. within 6 months to one year. These are improvements that address pressing congestion and safety problems, and that can be implemented fairly quickly and cheaply. These recommendations are summarized in Table 1.

Table 1 Immediate Recommendations – Capital Improvements

Location	Improvement	Benefit	Timing	Cost
Motor Vehicle				
1. Lower Square	NB Approach: Change LT lane to shared LT - RT	Congestion relief	2005	$600
2. Chestnut St / Washington St	SB Approach: Widen to 3 lanes: LT - TH - RT WB Approach: Eliminate parking space in RT lane	Congestion relief, safety Congestion relief, safety	2005	$8,000
3. Locust St / Washington St	Pavement striping to define lanes, intersection	Congestion relief, safety	2005	$1,000
Pedestrian				
4. Chestnut St at Orchard St	Pedestrian refuge island at mid-block crossing	Safety, pedestrian access	2005	$17,000
Total				**$27,000**

Capital Improvements

Motor Vehicle Traffic

- **Lower Square.** Northbound left turns account for a low volume of traffic (less than 10% of volume), but this movement must be retained in order to accommodate bus access. Therefore, the existing left turn lane is converted to a shared left turn – right turn lane. Most of the time, the northbound approach can be used as a dual right turn lane to satisfy the major traffic movement around the one-way loop.

- **Chestnut Street / Washington Street.** Widening the southbound approach to three lanes (left turn / through / right turn) reduces congestion, increases Chestnut Street capacity, and addresses the safety issue of through-movements using the right turn lane to "sneak by" the queue. Eliminating the parking space on the north side of Washington Street between the hardware store driveway and Chestnut Street improves traffic flow, especially for westbound right turns, and reduces congestion.

- **Locust Street / Washington Street.** Re-striping Washington Street at this intersection provides three narrow travel lanes on Washington Street, including two eastbound lanes. This provides more

queuing capacity for the eastbound Lower Square approach. The re-striping also defines the lanes more clearly and discourages the Lower Square eastbound queue from blocking Locust Street traffic.

Pedestrian

- **Chestnut Street Pedestrian Crossing at Orchard Street.** Creating a pedestrian refuge at this location enhances the safety and visibility of this crossing and provides better pedestrian access by enabling pedestrians to cross the street in two stages.

Policy Recommendations

Motor Vehicle Traffic

- **Dover Tolls.** The State of New Hampshire plans to implement the EZ Pass electronic toll payment system in March 2005. At the same time, it will reduce the toll discount that is currently available to drivers who purchase toll tokens from 50% to 40% for EZ Pass users and 20% for token users. This could have a significant impact on traffic that uses Dover Point Road and downtown Dover to avoid the Dover Toll Plaza. The State of New Hampshire should promote the use of the EZ Pass system, offer incentives for its use, and delay the reduction of the toll discount for a period after the electronic toll system has been in place, in order to reduce the impact of the transition. The City Council should pass a resolution requesting that the State of New Hampshire delay reducing the token discount for six months after the implementation of the EZ Pass system, and send the resolution to the Governor and Executive Council.

Truck Traffic

- **Improved Signage.** Improved signage to direct trucks to use appropriate regional roadways. Signs should be posted at all the Dover exits on the Spaulding Turnpike exits. These signs should indicate that trucks coming from the south should use Exit 9 for access to Miracle Mile / Weeks Crossing businesses and for access to Route 9 and Berwick, Maine.

- **Oak Street Bridge Improvements.** The City of Dover should advocate with NHDOT for the reconstruction of the Oak Street Bridge over the Guilford Railroad tracks. This would remove the weight limit and allow trucks to bypass downtown when traveling between Weeks Crossing in northern Dover and Maine via Route 4.

Short-Term Recommendations

The following are improvements that are recommended for implementation in the short term, between about one year and five years. These recommendations are generally changes that address existing congestion, safety, and access issues. For the most part, they can be implemented independently of one another, and can therefore be phased as funding and capacity for the projects becomes available.

Table 2 summarizes the proposed capital improvements. Figure 2 shows the immediate and short-term capital improvement recommendations.

In addition to the improvements in Table 2, there are also proposals for changes to parking administration and management, and a discussion of Dover's potential supplemental public transit service.

Table 2 Short-Term Recommendations – Capital Improvements

Location	Improvement	Benefit	Timing	Cost
Motor Vehicle				
1. Lower Square	SB Approach: 3 lanes: LT - TH - TR	Congestion relief	2006	$52,000
	2 SB receiving lanes, rebuild SW corner of intersection	Congestion relief	2006	
Upper Square				
5. Main St / Chapel St	Reverse Chapel St (WB), consolidate central plaza	Pedestrian access, simplify circulation	2007	$128,000
6. Central Ave / 3rd St / Broadway	Signalize 3rd St approach	Simplify circulation	2007	$22,000
7. Washington St at Cochecho River	Build Washington Street Bridge	Economic development: access to Riverfront	2007	$1,500,000
8. Chestnut St / 2nd St	Install pedestrian refuge island and stamped asphalt	Pedestrian access, parking lot access	2008	$16,000
9. Chestnut St / 1st St	Move crosswalk, modify pavement markings	Pedestrian access	2008	$2,800
10. Chestnut St / Central Ave	Install traffic signal	Relieve Chestnut St NB congestion	2008	$274,000
11. Broadway / St. John St	Rebuild intersection	Simplify circulation, create plaza	2009	$127,000
12. Portland Ave / Chapel St	Rebuild intersection	Simplify circulation, improve sight distance	2009	$62,000
Parking				
13. Main Street	Additional parallel parking on west side of street	Increased on street parking supply	2006	$1,700
Pedestrian				
14. Portland Ave	Sidewalk construction from parking lot to Main St	Pedestrian access, parking utilization	2005	$60,000
15. Crosswalk Location Unsignalized, major traffic flow	Upgrade to stamped asphalt, improved signs	Safety, pedestrian access		
Central Ave at Hanson St			2005	$4,300
Central Ave at Williams St			2005	$3,200
Central Ave at St. Thomas St			2005	$3,600
Washington St at Locust St			2005	$4,300
Washington St at Main St			2005	$3,200
Main St at Portland Ave			2005	$2,500
Portland Ave at Main St			2005	$1,800
Young St at Main St			2005	$3,200
Main St at School St			2005	$2,900
Central Ave at 5th St			2005	$4,000
Chestnut St at 3rd St			2005	$3,600
3rd St at Chestnut St			2005	$2,900
Washington St at Fayette & Atkinson St			2005	$3,200
Washington St at Belknap St			2005	$3,200
Locust St at Hale St			2005	$5,000
Henry Law Ave at Central Towers			2005	$2,900
Total				**$2,299,000**

Capital Improvements

Motor Vehicle

- **Lower Square.** Minor geometric and signal changes provide two southbound through lanes.
- **Upper Square.** Reversing Chapel Street circulation provides better access for Portland Avenue traffic into downtown Dover and to Chestnut Street via Second Street.
- **Washington Street at the Cochecho River.** Construction of the Washington Street Bridge provides access to the Riverfront parcel.
- **Chestnut Street / Second Street.** Providing a new crosswalk, with stamped asphalt and a pedestrian refuge on the northern side of the intersection makes this a more attractive and comfortable pedestrian crossing, and provides pedestrian access between the downtown center and the Dover Transportation Center / Cocheco Falls Mill parking lot.
- **Chestnut Street / Central Avenue.** Installing a traffic signal at this location reduces the congestion and queuing on northbound Chestnut Street, which enhances Chestnut Street's ability to provide an alternate north – south route through downtown.
- **Broadway / St. John Street.** Consolidating this intersection simplifies circulation, reduces driver and pedestrian confusion, and creates the potential for useful plaza space.
- **Portland Avenue / Chapel Street.** Consolidating this intersection simplifies circulation and provides better sight distance for Chapel Street right turns.

Parking

- **Main Street.** Adding parallel parking on the west side of Main Street increases the supply of public parking. This parking is located immediately adjacent to the Cocheco Falls Mill, and could be regulated as short-term (two-hour) shopper / visitor parking.

Pedestrian

- **Pedestrian Connections to Parking.** Improving pedestrian connections to under-used parking lots would increase the effective parking supply.
    - **Portland Avenue Sidewalk.** Building a new sidewalk along Portland Avenue would enable Cocheco Falls Mill employees to use the city-owned parking lot on Portland Avenue near Cochecho Street.
    - **Chestnut Street / Second Street.** The proposed pedestrian refuge island at this location would provide an opportunity for pedestrians to cross the northbound or southbound side of the street and wait for an opportunity to cross the other side.
- **Enhanced Crosswalks.** The crosswalks with the highest priority for enhanced visibility are those that cross major traffic flows and are unsignalized. It is recommended that these crosswalks be enhanced with stamped asphalt, highly visible warning signs, and enhanced street lighting where necessary.

Policy Recommendations

Parking

Parking Management and Utilization

- **Orchard Street Parking Lot.** Convert all public parking spaces in the Orchard Street parking lot to metered parking spaces that can also be used by permit holders. If this change is successful, and if demand warrants, this policy could also be implemented in the First Street parking lot.

- **Revise Dover Code to Discourage Shuffling.** Limit parking in two-hour spaces to a total of four hours, two hours in any given block, throughout the downtown area. Undertake an educational campaign through the mill employers, the Greater Dover Chamber of Commerce, and Dover Main Streets to emphasize the importance of preserving two-hour parking for short-term visitors.

- **Remote Parking.** Work with Cocheco Falls Mill employers to identify potential remote parking opportunities, such as the Dover Arena or Miracle Mile. Incorporate the potential for shuttle service to this remote parking location in the planning for the downtown transit shuttle.

- **Leasing of Daytime Parking.** Work with the Cocheco Falls Mill and the owner of the Goodwill / NH State Liquor Store shopping center to explore daytime leasing arrangements for excess parking capacity in the shopping center parking lot.

- **Improved Parking Signs.** Parking in downtown Dover would be made more convenient and attractive with improved parking signs. Highly visible parking guide signs should be installed to direct visitors to available parking. On-street parking regulation signs should be replaced with signs that provide clear and comprehensive information.

Parking Administration

- Divide the parking management and traffic management functions, with a full-time director for each function.

- Retain parking management, administration, and enforcement as an integrated unit; the parking management unit should either remain centralized within the Dover Police Department (DPD) or be moved in its entirety to a new department.

- Ensure that the parking director has adequate time and experience to pursue financing, construction, and management of structured parking.

- Develop a "parking and traffic working group," which should include the parking director, traffic director, and representatives from relevant city departments: Planning and Economic Development; Facilities, Grounds, and Cemetery; and Public Works.

Public Transportation

- Transit Resource Center (TRC), in cooperation with COAST and the City of Dover, is developing a proposal for supplemental transit service for Dover. This service, known as the "Check-Point" service, is a hybrid fixed-route / demand responsive serve. The Check-Point service offers potential advantages for supplementing COAST's effective inter-city service, and could improve Dover's intra-

city transit access. The Check-Point service should be designed to ensure that it provides good circulation within downtown Dover, park-and-ride connections between downtown and under-utilized remote parking lots, and that it can be supported in the long-term without using any Dover property taxes.

Long-Term Recommendations

The long-term transportation recommendations are expected to be implemented in approximately six to ten years. However, the need for the long-term recommendations currently exists, especially the circulation changes to the downtown loop. Therefore, these changes could be implemented sooner if the design and funding can be prepared.

The long-term recommendations include the following transportation improvements:

- Significant circulation changes the downtown loop, and associated roadway and traffic signal improvements.

- Parking structures that will significantly increase the downtown parking supply.

Table 3 summarizes the proposed long-term improvements. These include the capital improvements that are recommended for implementation by the City of Dover. Figure 3 shows the long-term recommendations.

Table 3 Long-Term Recommendations – Capital Improvements

Location	Improvement	Benefit	Timing	Cost
Riverfront Parcel	Construction of Riverfront Development	Economic development, downtown vitality	2010 - 2015	
Motor Vehicle				
Changes to Downtown Loop			2011-2012	
1. Central Avenue	Two-way circulation with parallel parking	NB and SB access along commercial core		$111,000
2. Washington Street	Two-way circulation with parallel parking	Riverfront access, potential for retail		$77,000
3. Main Street	One-way southbound circulation with angle parking	Reduced traffic, increased parking supply		$60,000
4. Lower Square	Four-way signalized intersection	Congestion relief, shorter pedestrian crossings		$229,000
5. Upper Square	Central Ave through-connection, Main St T-intersection	Simplified circulation, plaza created		$221,000
6. Washington Street / Main Street	Signalized intersection	Improved Riverfront, pedestrian access		$274,000
7. Main Street / Portland Avenue	Through-connection: Main St (south) to Portland Ave	Satisfied major traffic flow, reduces congestion – Main St stop-controlled		$52,000
Downtown Loop Subtotal				**$1,024,000**
Parking				
8. Orchard Street Parking Lot	New parking deck	Parking for downtown businesses	2010	$2,000,000
9. Washington Street / Water Street	New parking garage	Parking for mill employees, Riverfront	2012	$7,000,000
Total				**$10,024,000**

Motor Vehicle Traffic

The alternatives evaluation in Section 3 indicates that Alternative 3, Two-Way Loop B for the downtown has the best combination of traffic operations, downtown access, pedestrian access, and safety improvements. As a result, the long-term recommendations for the downtown loop are based on Alternative 3. However, the long-term recommendation does include two changes to Alternative 3 that respond to concerns that have been raised.

- Northbound left turn lane at Lower Square to provide access for buses
- Angle parking on Central Avenue

The following are the major changes proposed for the downtown loop.

Roadway Circulation

- **Central Avenue.** Two-way circulation on Central Avenue.
- **Washington Street.** Washington Street becomes two-way.
- **Main Street.**
    - Main Street – Portland Avenue. There is a major traffic flow between Lower Square and Portland Avenue. Making a through-connection from Portland Avenue to the southern segment of Main Street satisfies this heavy traffic demand.
    - Main Street North of Portland Avenue. Two-way circulation on Central Avenue and on the Main Street – Portland Avenue connection satisfies the two principal traffic flows through the downtown loop.
- **Chapel Street.** It is recommended that Chapel Street become two-way.

Intersection Improvements

- **Lower Square.** Lower Square is redesigned as a four-way signalized intersection. Henry Law Avenue becomes one-way southbound.
- **Upper Square.** Upper Square is consolidated from three intersections to two signalized intersections at Central Avenue / Broadway / Third Street and at Central Avenue / Second Street.
- **Washington Street / Main Street.** This intersection is signalized in order to provide access to and from the Riverfront parcel, and in order to improve pedestrian access.
- **Main Street / Portland Avenue.** Portland Avenue – Main Street (to the south) becomes the major through-connection. Main Street to the north becomes the stop-controlled minor street.

Parking

On-Street Parking

Maximize the supply of on-street parking, while accommodating the new traffic circulation patterns.

- **Central Avenue.** Central Avenue is downtown Dover's principal street, and the main commercial corridor. Central Avenue merchants are concerned about the loss of convenient curbside parking that would result if the Central Avenue angle parking were converted to parallel parking. Parallel parking on both sides would provide superior traffic operations, but angle parking can be retained on the west side in order to preserve the on-street parking supply.

- **Washington Street.** Two-way circulation on Washington Street will slow traffic and enable the implementation of parallel parking on the south side of Washington Street, adjacent to Henry Law Park.

- **Main Street.** Traffic on Main Street will be significantly reduced, and will enable the implementation of angle parking on the west side of Main Street between Portland Avenue and Upper Square.

- **Henry Law Avenue.** Henry Law Avenue will be changed from two-way to one-way southbound in the block between Lower Square and Williams Street. This would allow the implementation of angle parking on one side of the street, which would increase the parking supply by approximately 10-12 spaces.

Off-Street Parking

Build new parking structures to increase the downtown parking supply without increasing the valuable downtown space dedicated to parking. The following parking structures are recommended:

- **Orchard Street Parking Deck.** A one-level parking deck is recommended for the eastern section of the Orchard Street parking lot. This parking deck can increase the parking supply for short-term visitors (such as downtown shoppers), employees, and residents (overnight parking).

- **Parking Garage on Washington Street at Water Street or Main Street.** A four level parking garage is recommended for Washington Street east of Main Street to provide additional parking supply for the Cocheco Falls Mill, the One Washington Center Mill, and the Riverfront Development. This garage could be located either on the site of the existing Water Street parking lot, or on the site of the strip mall on Main Street.

Riverfront Development

The long-term recommendations will be implemented in the context of the Riverfront development, which will also entail additional transportation improvements. Because the Cochecho Waterfront Development Advisory Committee is reviewing the plan for the Riverfront development, it is not possible to make highly specific recommendations. However, the following are general transportation recommendations that will improve access, safety, and traffic operations for the Riverfront development.

- Washington Street Bridge. Construction of the Washington Street Bridge (included as a short-term recommendation).

- Roadway Connection from Washington Street Bridge to Maglaras Park ("Washington Street Extension").

- Retention of the Pedestrian Bridge.

- Water Street Extension.

- River Street Circulation. The River Street approach to Washington Street Extension should be stop-controlled, and Washington Street Extension traffic should have the right of way. In addition, there are vertical sight distance limitations at the River Street southbound approach to Henry Law Avenue. In order to address the sight distance issue, River Street could be converted to one-way northbound.

- Niles Street Extension to the Top of the Bluff.

1.0 Introduction

The City of Dover has retained Rizzo Associates, Inc. to execute the Downtown/Riverfront Redevelopment Traffic Circulation and Parking Plan. This study is designed to provide the City of Dover with a comprehensive, creative and feasible blueprint of transportation improvements that can address Dover's existing issues and future needs.

Dover's downtown has achieved great success. Dover has a beautiful, historic downtown centered on the Cochecho River. Technology companies and other major employers have moved into large mill buildings on the river, preserving these structures and helping to create a lively street environment. As the Strafford County seat, Dover has a core of public employees who contribute the downtown's vibrancy and the success of its storefront retail. Downtown Dover and the immediately adjacent neighborhoods are also home to a significant residential population who live within walking distance of the downtown center. Figure 1-1 shows the Dover downtown study area.

Dover is poised to build upon its downtown successes. At the eastern edge of downtown, across the Cochecho River, lies the Riverfront development parcel. This parcel is located within about a quarter mile of Lower Square in the center of downtown. The Riverfront parcel has the potential to support significant new mixed-use development, and extend the downtown to currently under-utilized land.

In spite of these successes and opportunities, and in some cases because of them, Dover still faces challenges. Dover's concentration of downtown employment, downtown residents, and lively downtown retail district have created great demand for parking. Large surface parking lots ring the downtown, and significant portions of the downtown streets are dedicated to on-street parking, including a significant amount of angle parking. The center of downtown has a one-way loop, which process traffic efficiently but can pose challenges for vehicular and pedestrian access.

1.1 Study Goals and Objectives

The Downtown/Riverfront Redevelopment Traffic Circulation and Parking Plan will serve as Dover's transportation vision for the future of its downtown. The study will describe downtown Dover's existing transportation system, identify some of the critical transportation problems and opportunities in the downtown, evaluate alternatives that address these issues, and recommend a program of transportation improvements that can help to realize Dover's transportation vision.

The study has the following goals:

- Ensure the safe and efficient function of all transportation modes in the downtown study area.
- Improve Dover's economic viability and development.
- Enhance the quality of life for Dover's residents, workers, and visitors.

In order to achieve these goals, the study will evaluate conditions and issues in a variety of dimensions, including different modes of transportation, and in the relationship between the transportation system and Dover's land use and future development. The following are the objectives and products that the study will pursue, for each of these elements of the plan.

Motor Vehicle Traffic

Objectives

- Reduce traffic congestion in downtown Dover.
- Address key traffic bottlenecks.
- Improve traffic circulation and access.
- Improve traffic safety.

Products

- An evaluation of existing traffic patterns, traffic operations, and traffic problems.
- A plan for roadway design and downtown traffic circulation improvements that address the major traffic issues.

Truck Traffic

Objectives

- Minimize truck impacts on downtown Dover.
- Remove unnecessary or inappropriate truck trips from downtown.

Products

- Catalog of the major truck origins and destinations, desire lines, and routes through downtown Dover.
- Recommendations for changes to truck routes and/or truck guide signs that can reduce the impact of heavy vehicles on the quality of life in Dover.

Parking

Objectives

- Identify existing parking problems, and address future parking needs for all users: downtown residents, employees, business customers, and business owners / employees.
- Provide parking in appropriate locations, for appropriate users.
- Protect short-term parking for appropriate users (e.g. shoppers at storefront retail businesses).

Products

- An evaluation of existing on-street and off-street parking supply and demand in the downtown study area.
- Recommendations for changes to parking regulations (e.g. time limits and user type), parking administration, and parking supply (e.g. on-street parking, parking lots, parking decks, and/or garages).

Public Transportation

Objectives

- Serve major transit destinations.
- Improve service for transit-dependent populations.

- Use public transit service to address traffic and parking issues.

Products

- A catalog of public transportation services in downtown Dover, including connections and service characteristics.
- A plan for feasible public transportation system improvements, including supplementary services (e.g. the proposed downtown shuttle service).

Pedestrian Access

Objectives

- Provide safe and convenient pedestrian access throughout downtown Dover.
- Ensure that any proposed roadway or intersection design changes integrate pedestrian improvements: narrow crossings, visible crosswalks, and appropriate signal design.

Products

- Identification of critical pedestrian destinations, pedestrian crossing locations, and pedestrian volumes.
- Pedestrian improvement proposals, including improvements integrated into roadway redesign plans and opportunities for access improvements.

Bicycle Facilities

Objectives

- Improve bicycle accommodation and access through downtown Dover.

Products

- A catalog of existing and planned bicycle facilities in and around downtown Dover, both on-street bicycle lanes / routes and off-street bicycle paths.
- Integrate measures for improving bicycle access into proposals for roadway and intersection design.

Land Use and Development

Objectives

- Facilitate new downtown development and an expansion of Dover's downtown, especially on the Riverfront development parcel.
- Satisfy transportation needs (traffic, parking, public transportation, pedestrian, and bicycle) of new development.

Products

- Description of downtown land use and development patterns.
- Proposal for a development scenario encompassing the Riverfront parcel and any infill development in the existing downtown.
- A plan for transportation improvements in all modes that accommodates the transportation requirements of new development, and that provides optimal access for the new development, especially for the Riverfront parcel.

1.2 Study Scope

The Dover Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan will include the following principal components:

Existing Conditions. The downtown study is based on a thorough cataloging and evaluation of the existing transportation system and the state of downtown development. This evaluation includes physical features, land use (including existing development and parcels available for future development), population, employment, and transportation facilities and demand in all the principal modes of travel in Dover, which include motor vehicle, pedestrian, bicycle, and public transit. The existing conditions analysis also identifies the critical issues in each mode of transportation.

Alternatives Analysis. The alternatives analysis builds upon the findings of the existing conditions analysis. Based on the major issues identified through the existing conditions review, the study proposes a range of creative but feasible improvement alternatives in all transportation modes. These alternatives are then analyzed relative to a set of evaluation criteria, help to assess the advantages and disadvantages of the alternatives. The alternatives analysis summarizes the results of the technical analysis, and describes the advantages and disadvantages of the various alternatives, but does not identify the preferred alternatives or the final recommendations (which are described in the next section).

Recommendations. The study includes a comprehensive set of recommendations for downtown Dover. These recommendations include short-term improvements that can improve transportation conditions without major costs or impacts, as well as long-term improvements that can help to achieve Dover's long-term transportation vision for the downtown. The recommendations encompass capital improvements (accompanied by order-of-magnitude cost estimates), as well as policy and administration recommendations. The recommendations section includes all of the study recommendations, and is designed to be useful stand-alone reference for pursuing the study findings.

2.0 Existing Conditions

Downtown Dover is a dense, mixed-use urban district with a multi-modal transportation system. The automobile is the principal mode of travel to, from, and through the downtown study area, and Dover's major downtown streets carry heavy traffic volumes, including significant truck traffic.

Downtown Dover is also served by a variety of public transit services, including Cooperative Alliance for Seacoast Transportation (COAST) and Wildcat Transit local / regional buses, intercity buses, and intercity rail service. The downtown has a robust network of sidewalks, as well as off-street pedestrian and bicycle paths running through the riverfront parks.

2.1 Study Area

Regional Transportation System

Dover is located in the Seacoast region, in southeastern New Hampshire. Dover's downtown transportation system is influenced by Dover's regional transportation system, the geographic connections that this system offers, and the connections between the regional system and the downtown transportation system. The following is a description of the regional transportation system in and around Dover, as shown in Figure 2-1.

Spaulding Turnpike. The Spaulding Turnpike is a four-lane, divided limited access highway. The Spaulding Turnpike provides connections from Interstate 95 and Portsmouth to the southeast, runs through Dover (to the southwest of downtown), and provides connections to Rochester and the Lakes region in the north. Dover is served by four exits on the Spaulding Turnpike: Exit 6 (Dover Point Road), Exit 7 (Central Avenue / Route 108), Exit 8 (Silver Street / Route 9), and Exit 9 (Indian Brook Road, with access to Weeks Crossing and the Miracle Mile shopping district). The Spaulding Turnpike is a toll road with two barrier toll plazas: the Dover Toll, immediately north of Exit 6, and the Rochester Toll, between Exit 9 and Exit 11 in Rochester.

Dover Point Road. Dover Point Road connects downtown to Dover Point, a peninsula formed where the Cochecho River and Salmon Falls River join to form the Piscatacqua River. Dover Point Road also provides connections between downtown Dover and Exit 6 on the Spaulding Turnpike. The Exit 6 ramps are located immediately east of a barrier toll on the Spaulding Turnpike, so that drivers bound to and from downtown Dover have an incentive to avoid the toll by using Dover Point Road instead of the Spaulding Turnpike.

Central Avenue (Route 108). Central Avenue is the principal roadway into and through downtown Dover. To the south of downtown Dover, Central Avenue provides connections to the Spaulding Turnpike at Exit 7 and to Durham. To the north of downtown, Central Avenue becomes the "Miracle Mile," with large shopping centers near Exit 9 on the Spaulding Turnpike. To the north of the Miracle Mile, Route 108 provides access to Rochester, where it becomes South Main Street.

Route 9 (Silver Street / Central Avenue / High Street). Route 9 provides connections through downtown Dover between the southwest and the northeast. To the southwest, Route 9 (Littleworth Road) connects from Barrington to Dover. North of Route 155 (Knox Marsh Road), Route 9 becomes Silver Street, which provides access from Spaulding Turnpike Exit 8 to downtown Dover. Silver Street terminates at Central Avenue, at which point Route 9 joins Route 108 through downtown Dover. North

of downtown Dover, Route 9 (High Street) diverges from Central Avenue at Weeks Crossing and connects to Berwick, Maine.

Portland Avenue (Route 4). Portland Avenue is a two-way roadway that provides access between downtown Dover and South Berwick, Maine. Because there are only a few connections between New Hampshire and Maine in the Dover area, traffic between the two states is concentrated on these routes. As a result, Portland Avenue carries fairly heavy traffic volumes.

Study Area Roadway System

The study area encompasses Dover's downtown, extending roughly from Silver Street in the south to Sixth Street in the north, and from Belknap Street in the west to the Riverfront Redevelopment parcel in the east. The study area, and the key intersections in the study area, are shown in Figure 2-2.

The downtown Dover study area transportation system is characterized by the following key features:

- **Radial Roadway System.** The study area is characterized by a radial roadway system leading into downtown. The key radial roads are Central Avenue, Silver Street, Washington Street, Sixth Street, Broadway, and Portland Avenue.

- **Downtown One-Way Loop.** The major radial roads lead to the triangular one-way loop at the center of downtown. The one-way loop is made up of Central Avenue, Washington Street, and Main Street, and it enables high volumes of traffic to pass through the downtown street system by reducing traffic conflicts.

- **Parallel North-South Corridors.** Downtown Dover's street system has a principally north-south orientation, with Central Avenue as the main corridor through downtown. The Chestnut Street – Locust Street corridor runs parallel to Central Avenue, and provides similar connections. A review of traffic data and input from study stakeholders suggests that many drivers use the Chestnut Street – Locust Street corridor as an alternate route, especially for through-traffic. Portland Avenue (Route 4) also provides north-south access from downtown Dover to and from Maine.

- **Cochecho River.** The Cochecho River runs through the center of downtown, and is lined by waterfront park spaces, the largest of which is Henry Law Park. The Cochecho River also facilitated the construction of Dover's two large remaining mill buildings, the Cocheco Falls Mill Works and One Washington Center, which are downtown landmarks and important elements of Dover's successful downtown economy. The downtown roadway system crosses the Cochecho River several times, with bridges on Chestnut Street, Central Avenue, and Washington Street. The Cochecho River also separates the downtown Dover roadway system from the Riverfront parcel.

The study area includes the following principal roadways and intersections:

Principal Roadways

Downtown One-Way Loop. At the heart of downtown Dover's roadway system is the one-way loop. The loop is triangular with counter-clockwise traffic flow, and it is formed by Central Avenue, Washington Street, and Main Street. These three legs of the one-way loop each have two travel lanes, and some on-street parking.

Central Avenue (Route 108). To the north and south of the downtown one-way loop, Central Avenue / Route 108 is principally two-way, with one wide lane in each direction and a shoulder / parking lane on

each side of the street. In downtown Dover, between Chestnut Street and Upper Square, Central Avenue has a very wide cross-section, with two-way circulation, two lanes in each direction and a parking lane on each side. In the downtown loop, Central Avenue is one-way southbound, with two lanes and parking lanes on each side, including angle parking on the west side of the street.

Washington Street. Washington Street provides connections to and from the west of downtown. West of Lower Square, Washington Street is two-way, with one lane in each direction and on-street parking. Washington Street intersects Central Avenue at Lower Square, and to the east of Lower Square Washington Street becomes one-way eastbound toward Main Street. To the east of Main Street, Washington Street is two-way, but it ends at the Cochecho River and it only provides access to One Washington Center and parking lots. As a result, this section of Washington Street has low traffic volumes.

Main Street. Main Street is the third segment of the downtown one-way loop. Main Street runs only from Washington Street at its southern end to Chapel Street at its northern end, and does not provide connections beyond the one-way loop.

Portland Avenue (Route 4). Portland Avenue provides connections between downtown Dover and South Berwick, Maine. Portland Avenue connects to the downtown loop at Main Street, about 250 feet north of Washington Street. Portland Avenue is two-way, with one lane in each direction and on-street parking near Main Street.

Silver Street (Route 9). Silver Street provides access from Durham and the Spaulding Turnpike to downtown Dover at Central Avenue. In the downtown study area, Silver Street is two-way, with one lane in each direction and no on-street parking.

Chestnut Street. Chestnut Street is a two-way street that parallel to Central Avenue, about 400 feet to the west. Chestnut Street is used as an alternate route for Central Avenue, which carries heavier traffic volumes and is more congested than Chestnut Street. Chestnut Street runs from Central Avenue in the north to Washington Street, where it aligns with Walnut Street.

Locust Street. Locust Street is a north-south street that continues the Chestnut Street – Walnut Street corridor. Locust Street runs essentially parallel to Central Avenue, from Central Avenue at Spaulding Turnpike Exit 7 to Washington Street. Locust Street is two-way from Central Avenue to the end of Walnut Street; between Walnut Street and Washington Street, Locust Street is one-way northbound.

Chapel Street. Chapel Street provides connections between Portland Avenue and Upper Square. West of St. John Street, Chapel Street is one-way eastbound, and provides access from Upper Square to Portland Avenue. Traffic bound from Portland Avenue to Upper Square must take Chapel Street to St. John Street to Broadway to Central Avenue.

Sixth Street. Sixth Street is a two-way street that terminates at Central Avenue and provides connections to the northwest, including residential neighborhoods, businesses near Indian Brook Drive and Spaulding Turnpike Exit 9, and Rochester. Sixth Street is principally a two-lane roadway, and has some on-street parking at its eastern end, in the project study area.

Broadway. Broadway is a two-lane, two-way street that terminates at Central Avenue near Third Street. Broadway has a mix of residential, retail and industrial uses. It has a height-limited underpass beneath the railroad line approximately 800 feet from Central Avenue, and provides connections to Somersworth and Berwick, Maine to the north of downtown Dover.

Major Intersections

1. Central Avenue / Chestnut Street. This is a T-intersection, with a somewhat skewed alignment. Chestnut Street terminates at the stop-controlled approach to Central Avenue, which is the major street. The Chestnut Street northbound and southbound lanes are separated by a traffic island. The stop-controlled northbound Chestnut Street approach is a single wide lane, with adequate width to allow two vehicles to queue side-by-side at the stop line. There are two wide painted crosswalks: one crossing Chestnut Street at Central Avenue, and one crossing Central Avenue slightly north of Chestnut Street.

2. Chestnut Street / Sixth Street. The Chestnut Street/Sixth Street intersection is a four-way unsignalized intersection with all-way stop control. All four legs of the intersection consist of two wide lanes, one in each direction. There are three crosswalks at the intersection, across the northern and southern sides of Chestnut Street and across the western side of Sixth Street. Lincoln Street is a local street that terminates at Chestnut Street about 50 feet south of Sixth Street.

3. Central Avenue / Sixth Street / Preble Street. This is an unsignalized intersection. Central Avenue is the major street, and Sixth Street and Preble Street are stop-controlled minor streets. Central Avenue has high traffic volumes, Sixth Street has moderate traffic volumes, and Preble Street is a local street with low traffic volumes. The Sixth Street approach to Central Avenue is at a skewed angle, and most of the Sixth Street eastbound traffic turns right onto Central Avenue southbound. There is a single crosswalk across the Sixth Street approach.

4. Central Avenue / Fifth Street. This is a T-intersection, with Fifth Street terminating at a stop-controlled approach to Central Avenue. Fifth Street is a local street with low traffic volumes. There are two crosswalks at this intersection, on the western crossing of Fifth Street and on the northern crossing of Central Avenue.

5. Central Avenue / Fourth Street / Pierce Street. This is a complex location. Central Avenue is the major street, and Fourth Street and Pierce Street are stop-controlled minor streets. Pierce Street and Fourth Street are offset from each other by about 50 feet, with Fourth Street to the south. Pierce Street is two-way, while Fourth Street is one-way eastbound (toward Central Avenue). Located immediately north of Fourth Street is a Dunkin Donuts, which generates moderate entering and exiting traffic, especially during the morning peak period. Railroad tracks cross Central Avenue at-grade immediately south of Fourth Street. There are two painted crosswalks, across the Fourth Street and Pierce Street approaches.

6. Broadway / Pierce Street. The Broadway / Pierce Street intersection is an unsignalized T-intersection with a skewed approach angle. Broadway is the major street, with two lanes, one in each direction. The Pierce Street approach contains one general purpose lane, although it has no pavement markings. Pierce Street ends at Broadway, where it is under yield control. There is a painted crosswalk across Pierce Street.

7. Broadway / St. John Street / Winter Street. This unsignalized intersection is basically a T-intersection with excessive pavement and a closely-spaced additional leg. Broadway is the major street, St. John Street is the stop-controlled minor street, and Winter Street is a narrow local street with one-way circulation away from St. John Street. Broadway curves to the northeast near its intersection with St. John Street, but a redundant leg of Broadway continues straight, creating an intersection with a small central island, three conflict points, and excessive paved area.

8. Chapel Street / St. John Street / Mechanic Street. This is an unsignalized intersection. Chapel Street is the major street, and St. John Street and Mechanic Street are stop-controlled minor streets. The St. John Street and Mechanic Street are offset by approximately 50 feet. To the west of St. John Street, Chapel Street is one-way eastbound, and provides connections from Central Avenue to Portland Avenue. To the east of St. John Street, Chapel Street is two-way, and all westbound traffic must turn right onto St. John Street. Mechanic Street is one-way northbound, toward Chapel Street. A painted crosswalks is provided across St. John Street.

9. Central Avenue / Broadway. This signalized intersection is the northern corner of the downtown one-way loop, where Central Avenue changes from two-way circulation to one-way circulation. To the north of this intersection, Central Avenue is two-way; to the south, Central Avenue is one-way southbound, and Central Avenue is one-way northbound. The traffic signal controls the Central Avenue southbound approach, the Central Avenue northbound approach, and the Broadway westbound approach. There are signal-protected crosswalks at all three of these approaches.

10. Central Avenue / Third Street. This unsignalized intersection is located immediately adjacent to the signalized Central Avenue / Broadway intersection. Central Avenue, which has split and is one-way southbound in this location, is the major street, and Third Street, which is two-way with one lane in each direction, is stop-controlled at Central Avenue. Third Street traffic must turn right onto Central Avenue southbound, although it can make a U-turn onto Main Street northbound (to Central Avenue northbound) at the nearby Central Avenue / Main Street / Chapel Street intersection. There are painted crosswalks across the Third Street leg and across Central Avenue southbound to a center traffic island.

11. Upper Square: Central Avenue / Main Street / Chapel Street. This signalized intersection controls Main Street northbound, and Central Avenue southbound. At this location, Chapel Street is one-way eastbound, away from the intersection. Main Street is one-way northbound and is the eastern leg of the downtown one-way loop. At Upper Square, Main Street widens to a four lane approach, with one left turn lane (with connections to Central Avenue southbound and Second Street westbound), two through lanes, and one right turn lane to Chapel Street. Central Avenue southbound splits as it approaches this intersection: two lanes continue southbound to form another leg of the one-way loop, one lane provides access to Chapel Street westbound, and one lane provides access to a U-turn to Main Street northbound. The Central Avenue southbound to Chapel Street eastbound movement is controlled by the signal, while the U-turn is unsignalized.

12. Upper Square: Central Avenue / Second Street. This component of Upper Square functions like an unsignalized intersection. In this location, Central Avenue is a one-way southbound, two-lane roadway, and functions as the major street. The Second Street westbound approach consists of a two-lane stop-controlled approach, with one left turn lane to Central Avenue southbound (around the downtown one-way loop) and one through-lane to Second Street westbound. Second Street is one-way westbound.

13. Central Avenue / First Street. At this location, Central Avenue is one-way southbound, with two lanes and parking on both sides. First Street is one-way westbound, away from Central Avenue. As a result, there are no vehicular conflicts at this intersection. There are two painted crosswalks at the intersection: one crossing Central Avenue to the south of First Street, and one crossing First Street.

14. Central Avenue / Orchard Street. This is an unsignalized T-intersection. Central Avenue is a one-way roadway at Orchard Street, and consists of two southbound lanes. Orchard Street is two-way, with a stop-controlled eastbound approach. The eastbound Orchard Street approach enables only right turns onto Central Avenue southbound. Orchard Street provides access to and from the Orchard Street

municipal parking lot, between Central Avenue and Chestnut Street. A crosswalk extends across Central Avenue north of Orchard Street, and another crosswalk crosses Orchard Street.

15. Lower Square: Central Avenue / Washington Street / Henry Law Avenue. Lower Square is located at the heart of downtown Dover. It is a critical intersection for vehicular circulation, for traffic operations, and for the look and feel of downtown. Lower Square is a large, open signalized intersection. Most of the traffic traversing downtown Dover passes through this intersection, resulting in significant congestion. Lower Square is at the southwestern corner of the downtown one-way loop: to the south of Lower Square, Central Avenue is two-way, and to the north it is one-way southbound toward Lower Square. To the west of Lower Square, Washington Street is two-way, while to the east it is one-way eastbound away from Lower Square. Henry Law Avenue, a two-way street with lower traffic volumes than Central Avenue and Washington Street, also intersects at Lower Square; however, the Henry Law Avenue northbound approach to Lower Square is stop-controlled, and is not controlled by the Lower Square traffic signal. Lower Square has crosswalks across all intersection approaches, but many of these crossings are very wide, especially the Washington Street crossing east of Lower Square.

16. Washington Street / Main Street. This unsignalized intersection is located at the southeastern corner of the downtown one-way loop. Virtually all of the traffic through this intersection makes the free left turn from Washington Street to Main Street, around the one-way loop. Washington Street no longer provides a vehicular crossing of the Cochecho River, so Washington Street has very low traffic volumes (for access to parking). There is a painted crosswalk across Washington Street to the west of Main Street, but the crossing is wide and vehicular speeds at this intersection are high.

17. Main Street / Portland Avenue. Portland Avenue (Route 4) provides connections to and from Maine. Portland Avenue intersects the downtown one-way loop at Main Street at a T-intersection. Main Street is one-way northbound, and has two lanes. Portland Avenue has two-way circulation with one lane in each direction. The Portland Avenue southwestbound approach to Main Street is stop-controlled with a single approach lane, and all Portland Avenue traffic must turn right onto Main Street northbound. Young Street is a minor street with very low volumes; it intersects Main Street at the Portland Street intersection. Young Street does not have a significant impact on traffic operations, but can create conflicts with Main Street and Portland Avenue traffic.

18. Portland Avenue / Cochecho Street. The Portland Avenue / Cochecho Street intersection is an unsignalized T-intersection. Portland Avenue is the major street, with one lane in each direction. Cochecho Street is one-way northeastbound away from Portland Avenue. Cochecho Street has only one travel lane.

19. Portland Avenue / Chapel Street. The Portland Avenue/Chapel Street intersection is an unsignalized intersection with three conflict points. Portland Avenue is the major street, with one lane in each direction. Chapel Street approaches Portland Avenue from the west. The Chapel Street is two-way, with one lane in each direction. Chapel Street intersects Portland Avenue at a skew angle, with one stop-controlled approach lane. There is also a two-lane connection between Portland Avenue and Chapel Street about 50 feet west of the main intersection, creating a landscaped island and two additional conflict points. This connection is designed to make Chapel Street right turns and Portland Street left turns easier. However, these turns have fairly low volumes.

20. Chestnut Street / Fourth Street. The Chestnut Street/Fourth Street intersection is a four-legged, unsignalized intersection. The Chestnut Street northbound approach consists of two lanes, an exclusive left turn lane and a shared through/right lane. The Chestnut Street southbound approach consists of one general purpose lane. To the west of Chestnut Street, Fourth Street is two-way, with

one lane in each direction. The Fourth Street eastbound approach also consists of one general purpose lane and is under stop control. To the east of Chestnut Street, Fourth Street is one-way eastbound toward Central Avenue.

21. Chestnut Street / Third Street. The Chestnut Street/Third Street intersection is a four-legged, unsignalized intersection. The Third Street eastbound and westbound approaches are stop-controlled, while the Chestnut Street northbound and southbound approaches are uncontrolled. Traffic operations at this intersection are complicated by the at-grade, active railroad tracks that cross this intersection diagonally. The northbound approach consists of two lanes, a through-right lane and a left turn lane. The southbound approach has a single general purpose lane, and southbound left turns are prohibited in order to prevent cars from stopping on the railroad tracks. The eastbound Third Street approach has a single lane for right turns and left turns; through movements are not permitted. The westbound Third Street approach has a single lane that is split by a large traffic island as it approaches Chestnut Street; the left split is for left turns only, while the right split is for right turns only. The westbound approach is designed to allow cars to stop without blocking the railroad tracks. There are crosswalks at the western crossing of Third Street and the northern crossing of Chestnut Street.

22. Chestnut Street / Second Street / Dover Transportation Center Entrance. This is a four-legged, unsignalized intersection, with stop control on the Second Street westbound approach and on the eastbound transportation center driveway. The Chestnut Street northbound approach consists of two lanes, an exclusive left lane and an exclusive through lane. The southbound approach includes one exclusive through lane and a shared through-right lane. Second Street is one-way westbound, with a stop-controlled two-lane approach: an exclusive left turn lane and an exclusive right turn lane. The eastbound approach from the transportation center is under stop control; there are no pavement markings on this approach, but it is used as a two lane approach, with an exclusive left turn lane and an exclusive right turn lane.

23. Chestnut Street / First Street / Shopping Center Driveway. This is a signalized intersection with offset eastbound and westbound approaches. The Chestnut Street northbound approach and southbound approach each includes two lanes, a shared through-left lane and a shared through-right lane. The First Street westbound approach consists of an exclusive left and an exclusive right turn lane. First Street is one-way westbound except for the western end at Chestnut Street, which has a short eastbound segment that provides access to the First Street parking lot. The eastbound shopping center driveway approach has no pavement markings, but is used as an exclusive left and an exclusive right turn lane. Crosswalks extend across First Street and across the northern portion of Chestnut Street.

24. Chestnut Street / Orchard Street. This is a T-type unsignalized intersection; Chestnut Street is the north-south major street, and Orchard Street, which provides access to the Orchard Street municipal parking lot, is under stop-control. The Chestnut Street northbound approach consists of two lanes, an exclusive through lane and a shared through-right lane. The southbound approach consists of shared through-left lane and an exclusive through lane. The Orchard Street westbound approach has a single approach lane. A crosswalk crosses Chestnut Street north of Orchard Street.

25. Washington Street / Chestnut Street. This is a four-way signalized intersection. The eastbound Washington Street approach consists of two lanes, an exclusive left turn lane and a shared through-right turn lane. The westbound Washington Street approach has two lanes, a through-left lane and an exclusive right-turn lane. The southbound Chestnut Street approach also has a through-left lane and an exclusive right-turn lane. The northbound Chestnut Street approach has a single through-right lane; northbound left turns are prohibited. The southern Chestnut Street leg of the intersection has severe width constraints; it has one narrow lane in each direction, and fairly narrow sidewalks and adjacent buildings on each side. There are crosswalks at all legs of the intersection.

26. Washington Street / Locust Street. This is an unsignalized T-type intersection. Washington Street is the east-west major street, and the northbound Locust Street is under stop-control. This final block of Locust Street north of Chestnut Street is one-way northbound. The northbound Locust Street approach has two lanes, an exclusive left turn lane and an exclusive right turn lane. Crosswalks extend across the northbound and westbound approaches.

27. Washington Street / Atkinson Street / Fayette Street. This location consists of a pair of offset unsignalized T-type intersections. The stop-controlled Atkinson Street intersects Washington Street from the south. About 100 feet to the west of Atkinson Street, Fayette Street (which is one-way northbound) intersects Washington Street from the north. All approaches consist of a one general purpose lane. Crosswalks extend across the Fayette Street approach, as well as across Washington from the western corner of Fayette Street to the eastern corner of Atkinson Street. Atkinson Street and Fayette Street both have fairly low traffic volumes.

28. Washington Street / Green Street. This is an unsignalized T-type intersection. The Green Street approach is one-way southbound, toward Washington Street. The Green Street approach has a single general purpose lane and is under stop control. In the vicinity of Green Street, Washington Street consists of one lane in each direction. A crosswalk extends across Green Street.

29. Washington Street / Belknap Street. This is an unsignalized T-type intersection. All approaches consist of one general purpose lane. The northbound Belknap Street approach is stop-controlled.

30. Central Avenue / George Street / Church Street / Hanson Street / Court Street. This is a series of closely-spaced unsignalized intersections.

    - George Street is a minor, low-traffic street that climbs a steep grade from Henry Law Avenue. George Street intersects a stub-end of Central Avenue at an uncontrolled 90-degree turn. This stub-end of Central Avenue then intersects with the Central Avenue mainline at an acute angle in a widened section of Central Avenue. As a result, this approach functions more as a merge than as a stop-controlled approach.

    - Hanson Street intersects Central Avenue from the east to form a T-intersection. Hanson Street has a two-lane stop-controlled approach, with an exclusive left-turn lane and an exclusive right-turn lane.

    - Church Street intersects Central Avenue from the west to form a T-intersection. Church Street has a single-lane stop-controlled approach.

    - Court Street intersects Central Avenue from the southeast to form a T-intersection. Court Street has a two-lane stop-controlled approach, with an exclusive left-turn lane and an exclusive right-turn lane.

    Central Avenue in the vicinity of the intersections maintains three lanes, with one center lane for both left and right turns. Crosswalks extend across Hanson Street and Court Street.

31. Central Avenue / Silver Street. This is a signalized T-type intersection. The eastbound Silver Street approach consists of two lanes, an exclusive left turn lane and an exclusive right turn lane. The southbound Central Avenue approach to the intersection also has two lanes, a through-lane and an exclusive right turn lane. The northbound Central Avenue approach to the intersection has two lanes, an exclusive left turn lane and a shared through-right lane. The northbound left turn is a relatively low-volume movement, so an exclusive phase is not necessary; the exclusive left turn movement

provides adequate storage. The southbound approach has a lead phase in order to provide gaps in traffic for the unsignalized approaches at Court Street, Hanson Street, Church Street, and George Street. The gas station driveway on the eastern side of the intersection is signalized, but volumes are very low relative to the other approaches. Crosswalks extend across all approaches.

32. Locust Street / Silver Street. This is a four-way signalized intersection. The eastbound and westbound Silver Street approaches each consists of one general purpose lane. The northbound and southbound Locust Street approaches also contain one general purpose lane. Right-of-way constraints prevent widening any of the intersection approaches without impacts to private property. Crosswalks extend across all legs of the intersection.

33. Silver Street / Atkinson Street. This is an unsignalized T-intersection. The southbound Atkinson Street approach is stop-controlled, with a single general purpose lane.

34. Silver Street / Belknap Street. This is a four-way unsignalized intersection. Silver Street is the east-west major street, with one lane in each direction. Belknap Street has stop-controlled northbound and southbound approaches, with one general-purpose lane on each approach.

35. Henry Law Avenue / George Street. This is an unsignalized T-type intersection. Henry Law Avenue, the east-west major street, has a single lane in each direction and on-street parking is permitted on both sides of the street. George Street intersects Henry Law Avenue from the south. George Street is split by a traffic island with a flag pole and a monument. There are wide paved areas on both sides of the traffic island, with no pavement markings. The George Street northbound approach operates as a stop-controlled intersection, although it is unsigned. George Street traffic volumes are low.

36. Henry Law Avenue / River Street. This is an unsignalized T-type intersection. Henry Law Avenue, the east-west major street, has a single lane in each direction and on-street parking is permitted on both sides of the street. River Street is two-way, and has a single southbound approach lane that is under stop control. The River Street southbound approach has poor sight distance due to a hill immediately east of River Street.

37. Henry Law Avenue / Hanson Street. The Henry Law Avenue/Hanson Street intersection is an unsignalized T-type intersection. Henry Law Avenue, the east-west major street, has a single lane in each direction and on-street parking is permitted on both sides of the street. Hanson Street is two-way, and has a single northbound approach lane that is under stop control.

2.2 Motor Vehicle Traffic

Downtown Dover has high traffic volumes on its major streets. The Spaulding Turnpike provides a highway bypass around downtown Dover for much of the regional through-traffic traveling between Portsmouth / I-95 and the Lakes Region.

The major roadways that pass through downtown Dover also provide important connections. These connections include trips to and from downtown Dover's concentration of employment, commercial land uses, residences, and government agencies. However, based on traffic counts, origin – destination surveys, and a review of land uses in the downtown study area, approximately half of downtown Dover's traffic is through-traffic.

The following is a discussion of downtown Dover's principal motor vehicle characteristics, including traffic volumes, traffic accidents, and traffic operations. This data collection includes traffic volume

counts, both automatic traffic recorder (ATR) counts and turning movement counts (TMCs). Site visits provided information on roadway design and layout, traffic controls, and observed traffic flow and operations. Previously collected transportation data was reviewed and incorporated as appropriate.

The base year for the "existing condition" traffic volumes is 2004. This year was chosen because it is the year in which the plan will be complete. It is also the base year selected by the consultant for the *Central Avenue Traffic Signal Coordination Study*, which was completed in May 2003.

2.2.1 Daily Traffic Volumes

The New Hampshire Department of Transportation (NHDOT) collects and catalogs extensive traffic volume data. This traffic volume data includes ATR counts from locations throughout the state. ATR counts provide the number of vehicles that pass a point over the course of an extended period of time.

The NHDOT count stations include many locations in and near the downtown Dover study area. Some locations have permanent count stations, where traffic counting equipment is permanently installed, and traffic volumes are counted at all times. In the Dover area, NHDOT permanent count stations are located on Dover Point Road and at several locations on the Spaulding Turnpike. Other NHDOT daily traffic counts include many more locations in and around the study area that were counted periodically, typically for a period of several days to several weeks, every two or three years.

This NHDOT data was reviewed, and average daily traffic (ADT) volumes were catalogued for many locations in and around the downtown Dover study area. The NHDOT ADT data covers the years 1993 to 2002. In order to provide a consistent basis for traffic volume comparison, the ADT volumes were extrapolated to the Existing Condition base year of 2004 using a linear "best fit" projection.

The ADT volumes show the major traffic routes and the principal traffic distribution patterns in and around the downtown Dover study area, as shown in Figure 2-3.

The average annual traffic volume growth was calculated for each count location, from the earliest count through 2004. An overall average annual traffic growth rate was then calculated for the downtown study area, using a weighted average of the traffic volume and the annual growth rate at each count location on a surface street. A separate weighted average growth rate was calculated for the Spaulding Turnpike near the study area.

The resulting weighted average traffic growth rates were 1.0% for the surface streets, and 7.0% for the Spaulding Turnpike. The 1.0% annual growth rate calculated for surface streets is equal to the 1.0% annual growth rate that was used in the *Central Avenue Traffic Signal Coordination Evaluation* study. Therefore, the NHDOT traffic data for the Dover area supports the assumption of a 1.0% background traffic growth rate for the downtown study area.

At some locations, the average annual traffic growth was very low, or even negative (i.e. ADT volumes decreased over time). At other locations, there was only a single ATR count on which to base the 2004 traffic volume projection. In cases with only one count, or with a calculated annual growth rate below 1.0%, it was assumed that traffic grew at an annual rate of 1.0% between the previous count and 2004. This ensures that the ADT volumes assumed for the Existing Condition in the study area are sufficiently conservative.

The 2004 base year ADT volumes and the calculated annual average traffic volume growth are summarized below in Table 2-1. The locations that have no average annual growth rate are those that

have only one traffic volume count since 1993. The full tabulation of NHDOT traffic volumes is included in Appendix A.

Table 2-1 Average Daily Traffic Volumes

Count Location	NHDOT Count Station	Calculated Average Annual Growth	2004 Projected Volume
Downtown Dover – Surface Streets			
Arch Street south of West Concord Street	125093		6,123
Atlantic Avenue at Main State Line	125107	1.9%	5,753
Broadway north of Ham Street	125046	2.8%	9,575
Broadway north of St. John Street	125042	0.8%	7,134
Central Avenue south of Varney Street	125106	1.6%	26,645
Central Avenue north of Glenwood Avenue	125109		23,376
Central Avenue south of Glenwood Avenue	125037	-0.1%	23,621
Central Avenue south of Lowell Avenue	125108		17,447
Central Avenue south of Oak Street	125105		20,320
Central Avenue north of Ham Street	125045	-5.3%	17,034
Central Avenue north of Chestnut Street	125051	-0.3%	20,961
Central Avenue at B&M RR Crossing	125043		18,665
Central Avenue at Cochecho River Bridge	125066	-0.3%	14,903
Central Avenue at City Hall	125052	0.1%	24,122
Central Avenue north of Summer Street	125050	-0.4%	18,543
Central Avenue south of Birchwood Place	125115	1.6%	14,723
Chestnut Street NB south of First Street	125121	5.7%	8,190
Chestnut Street SB south of First Street	125120	5.4%	10,496
Cochecho Street west of Rogers Street	125061		930
Court Street west of Back Road	125060		2,422
Dover Point Road north of Hilton Road	125079	0.3%	12,349
Dover Point Road south of Elliott Park Road	125001	0.6%	15,322
Fourth Street at Cochecho River Bridge	125065	1.4%	2,805
Fourth Street west of Chestnut Street	125034	2.6%	2,690
Ham Street east of Central Avenue	125022	-2.7%	1,478
Henry Law Avenue East of Niles Street	125059	3.4%	1,878
Henry Law Avenue east of Hanson Street	125049		4,268
Locust Street north of Kirkland Street	125092		8,523
Locust Street south of Silver Street	125032	4.8%	10,251
Main Street south of School Street	125101	0.7%	17,128
Oak Street east of Central Avenue	125078	1.8%	10,260
Pierce Street east of Central Avenue	125044		3,294
Portland Avenue east of Essex Street	125047	-0.1%	12,492
Portland Street south of Cochecho Street	125011	1.9%	10,737
River Road north of Henry Law Avenue	125048		858
Silver Street west of Atkinson Street	125053	4.3%	11,456
Silver Street west of Towle Avenue	125114	2.4%	19,136
Sixth Street east of Whittier Street	125064	2.8%	5,247
Sixth Street over Spaulding Turnpike	125095	-4.3%	4,326
Sixth Street west of Chestnut Street	125084	-0.4%	7,646
Sixth Street west of Glenwood Avenue	125069	-0.4%	6,538
Sixth Street west of Indian Brook Road	125026	2.8%	8,788
Somersworth Road east of Spaulding Turnpike	125039	1.7%	26,437
Washington Street at B&M RR Crossing	125068	4.6%	6,932
Washington Street at Cochecho River Bridge	125067	0.5%	19,418
Washington Street west of Atkinson Street	125036		10,657
Spaulding Turnpike – Dover Exits			
Spaulding Turnpike NB between Exit 7 & 8	125031	7.2%	23,492
Spaulding Turnpike SB between Exit 7 & 8	125030	10.9%	24,982
Spaulding Turnpike NB south of Tolend Road	125072	4.4%	23,870
Spaulding Turnpike SB south of Tolend Road	125071	5.1%	23,917

The following are a few key findings from the ADT volumes in and around the downtown study area.

- Traffic has been increasing much more quickly on the Spaulding Turnpike than on surface streets in Dover (7.0% versus 1.0%). This is likely indicative of rapidly increasing population and development in the Seacoast region, as well as capacity constraints on major roadways in Dover.

- The highest traffic volumes on Central Avenue are at City Hall. This segment of Central Avenue (between Silver Street and Lower Square) has the greatest overlap of significant traffic connections: this section provides connections to and from Route 108 (Central Avenue) and Route 9 (Silver Street) to the south, and Route 108 (Central Avenue), Route 9 (High Street) and Route 4 (Portland Avenue) to the north.

- Traffic volumes on Central Avenue have remained fairly constant or declined slightly between 1993 and 2002. This is likely due to congestion and capacity constraints on Central Avenue, especially at Lower Square.

- Traffic volumes on Chestnut Street are lower than those on Central Avenue, but have been increasing dramatically (in the range of 5 – 6% per year). This is likely due to traffic seeking an alternative route to Central Avenue, which is congested and requires traffic to traverse the one-way loop and pass through congested Lower Square and Upper Square.

- The assumption that traffic is seeking an alternative to congestion on Central Avenue is supported by high traffic increases on Locust Street, which is the southern segment of the Chestnut Street corridor. Where historic counts are available, traffic on Locust Street increased by 4.8% per year.

- Saturday and Sunday ADT data were also reviewed for the NH DOT count stations in and around Dover. Saturday and Sunday ADT volumes were consistently lower than weekday ADT volumes. Saturday ADT volumes were generally 10-20% lower than weekday ADT volumes, and Sunday ADT volumes were generally 20-50% lower than weekday ADT volumes. This indicates that weekdays are the critical design day in the Dover downtown study area.

2.2.2 Peak Hour Traffic Volumes

Daily ATR traffic volumes show general traffic patterns, and relative traffic volumes on various roadways. The other critical measure of traffic volumes is TMCs during peak traffic periods. TMCs capture the volumes of all specific traffic movements at a given intersection, i.e. northbound left turn, eastbound through-movement, etc. The data were obtained in 15-minute increments and summarized to provide "peak hour" traffic conditions for each of the time periods surveyed. The peak hour of traffic represents the highest total volume entering each intersection on all approaches during four consecutive 15-minute periods. These peak hour turning movements enable the evaluation of each intersection's operational characteristics using traffic capacity analysis software.

TMCs were conducted in March and September, 2003. The March traffic counts were conducted for the *Central Avenue Traffic Signal Coordination Evaluation*, and they include most of the intersections along Central Avenue between Stark Avenue in the south and Weeks Crossing (High Street) in the north. Since these counts are quite recent, they are still valid, and have been used for the downtown study as well.

The September counts were performed specifically for the downtown study, and they captured intersections that were not included in the Central Avenue study. TMC data sheets are included in Appendix B.

The TMCs conducted in March 2003 for the Central Avenue study included weekday AM peak period counts (7:00 – 9:00 AM) and weekday PM peak period counts (3:00 – 7:00 PM) at all study area intersections. Downtown Dover also experiences a noticeable midday peak on weekdays, so midday TMCs were conducted from 11:00 AM to 1:00 PM at a few intersections in the central downtown one-way loop.

A review of the March 2003 TMC volumes shows that at all of the study area intersections, the PM peak hour has the highest traffic volumes. As a result, the PM peak hour represents the critical "design" hour. The September 2003 counts were conducted for the weekday AM peak period (7:00 – 9:00 AM) and the weekday PM peak period (4:00 – 6:00 PM), and the downtown study traffic analysis focuses on these two peak hours. The traffic volume data for all periods are included in Appendix B.

The TMC volumes were reviewed, and the AM and PM peak hours identified at each intersection. The AM peak hour was 7:15 – 8:15 AM or 7:30 – 8:30 AM at most intersections, although it was 7:45 – 8:45 AM or 8:00 – 9:00 AM at a few intersections. The PM peak hour was 4:30 – 5:30 PM at most locations, although several intersections had other PM peak hour periods.

Although traffic volumes were at their highest levels at different times for different study area intersections, the highest hourly volume for each individual intersection has been used to analyze the traffic operations for the downtown study area. Using traffic volumes from different time periods can result in traffic volumes that do not "balance," or match, between adjacent intersections. However, it is preferable to use the highest volumes at each individual intersection for two reasons: first, it provides the most conservative, "worst-case" traffic operations analysis; second, traffic volumes between intersections in the downtown Dover study area are likely to be out of balance due to trip origins and destinations (e.g. parking lots, parking spaces, garages) between intersections.

The hourly traffic volumes were also adjusted to reflect seasonal variations in traffic demand. In order to identify seasonal variations for peak hours, NHDOT permanent traffic recorder data was reviewed. The NHDOT permanent traffic recorder on Dover Point Road (south of Elliot Park Road) is closest to the downtown Dover study area. Therefore, data from this recorder was used to establish the seasonal adjustment factors.

The Central Avenue study obtained the NHDOT 2001 data for the Dover Point Road count station, and adjusted the traffic volumes based on the March 2001 factors. After the Central Avenue study was completed, 2002 data for Dover Point Road count station became available. The seasonal adjustment factors for these two years are shown in Table 2-2. Note that the adjustment factors are the number that traffic volumes should be multiplied by in order to adjust them to the annual average – a seasonal adjustment factor greater than 1 means that traffic volumes from that month are low, and must be increased.

Table 2-2 Seasonal Adjustment Factors

	2001		2002	
Peak Hour	**March**	**September**	**March**	**September**
AM	0.99	0.92	0.88	1.08
Midday	1.17	0.99	1.09	1.12
PM	1.09	0.95	0.97	1.08
Saturday	1.05	1.00	0.94	1.03

Based on the 2001 seasonal adjustment factors, the Central Avenue study decreased the AM peak hour counts by 1% (x 0.99), and increased the PM peak hour counts by 9% (x 1.09). The 2002 seasonal adjustment factors would entail decreasing the March 2003 counts by 12% (AM peak hour) and 3% (PM peak hour). Even though the 2002 seasonal adjustment factors are more up-to-date, the 2001 seasonal adjustment factors are more conservative for the March 2003 traffic counts, so these have been retained for the downtown Dover study. The 2002 seasonal adjustment factors for the September 2003 counts are both more up-to-date and more conservative than the 2001 seasonal adjustment factors, so the September 2003 AM and PM peak hour counts were increased by a factor of 1.08.

These resulting existing condition peak hour traffic volumes at intersections in the downtown Dover study area are shown in Figures 2-4 (AM Peak Hour) and 2-5 (PM Peak Hour).

2.2.3 Traffic Operations

Existing traffic volumes and roadway configurations were used to evaluate the current traffic operations at the study area intersections during the weekday morning and evening commuter peak periods. Traffic operations and levels of congestion at the study area intersections have been analyzed and described based on the criteria established in the reference that establishes traffic engineering industry standards, the *Highway Capacity Manual (HCM), 2000 Edition*, published by the Transportation Research Board. The criteria and approach for evaluating traffic operations are described below.

Level of Service Criteria

The quality of traffic operations at a given location is generally described in terms of level of service. Level of service (LOS) is a term used to describe the quality of the traffic flow on a roadway facility at a particular point in time. LOS is an aggregate indicator of travel delay, travel speed, congestion, driver discomfort, convenience, and safety based on a comparison of roadway system capacity to roadway system travel demand. Operating levels of service are reported on a scale of A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. LOS A represents free-flow or uncongested conditions with little or no delay to motorists, while LOS F represents a forced-flow condition with long delays and traffic demands exceeding roadway capacity.

Roadway operating levels of service are calculated following procedures defined in the *2000 Highway Capacity Manual (HCM)*. For signalized and unsignalized intersections, the operating level of service is based on travel delays. Delays can be measured in the field, but they are typically calculated by a computer analysis program that applies the criteria established in the *2000 Highway Capacity Manual (HCM)*.

For the Dover downtown study, the Synchro computer program was used. This program applied the HCM criteria to determine the delay and LOS at the study area intersections as a function of traffic volume; peaking characteristic of traffic flow; percentage of heavy vehicles in the traffic stream; type of traffic control; number of travel lanes and lane use; intersection approach grades; pedestrian activity; and signal timing, phasing, and progression where applicable. The threshold values for determining LOS as a function of vehicle delay, per the *2000 Highway Capacity Manual*, are summarized in Table 2-3.

Table 2-3 Intersection Level of Service Criteria

Level of Service	Average Delay per Vehicle (Seconds)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10.0
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0
F	>80.0	>50.0

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report 209, Third Edition, National Research Council, Washington, DC, 2000.

While levels of service for both signalized and unsignalized intersections are based on vehicular delay, there are major differences in the interpretation of the results for the two different intersection types. At signalized intersections, all vehicles that are under signal control must wait for the green phase for that traffic movement. "Green time" and delay are distributed among the various intersection movements. As a result, the calculated average delay per vehicle for signalized intersections applies to all vehicles entering the intersection and under control of the traffic signal.

For unsignalized intersections, the traffic movements on the "major" street (i.e. the movements that are not stop-controlled) have the right of way, and are not delayed by side street traffic. Vehicles turning left from the major street must yield to opposing traffic, so these vehicles are subject to some delay, although it is generally much lower than delay for vehicles on the minor street approach. In contrast, the traffic movements from the "minor" street (i.e. those that are subject to stop-control) must yield to major street traffic and opposing minor street traffic.

For unsignalized intersections, it is not unusual for stop-controlled minor street vehicles, especially those turning left, to experience significant delays as they wait for a gap in the major street traffic. Stop-controlled approaches to major arterials with high traffic volumes, such as Central Avenue or Chestnut Street, may have LOS F even with relatively low traffic volumes. It is important to remember that these high delays apply only to the stop-controlled minor street volumes. Therefore, an unsignalized intersection with LOS F may in fact have a very low aggregate delay.

The HCM analysis procedures may also overstate the delay experienced at unsignalized minor approaches, due to the fact that the analysis is based on driver acceptance of relatively long gaps in the major street traffic before a side street vehicle will make the turn. In actual operation, particularly in urbanized areas such as Dover, motorists often make their turns with much shorter gaps, resulting in shorter delays and better levels of service than provided by the procedures described in the HCM and used in this study. In addition, traffic signals at adjacent intersections can help to create gaps between "platoons" of opposing major street traffic.

The traffic operations analysis for the 2004 "existing" condition assumes that the signal timing and coordination improvements from the 2003 *Central Avenue Traffic Signal Coordination Evaluation* are in place. Although these improvements were not in place in March and September, 2003, when the traffic counts for the downtown study were conducted, the improvements are being implemented in spring and summer 2004, as the downtown study is being executed. Therefore, it is appropriate that the study's 2004 existing condition analysis reflect the conditions that will be in place at the study's conclusion. As a result

of this assumption, the existing condition analysis may indicate LOS and traffic operations that are somewhat better than actual current conditions, especially at such critical locations as Lower Square.

The LOS at each study area intersection are shown in Figures 2-6 (AM peak hour) and 2-7 (PM peak hour). At unsignalized intersections, LOS for each stop-controlled approach is also shown. The detailed traffic operations characteristics for each study area intersection in the existing condition (including LOS, average delay, and volume-to-capacity ratio) are included in Appendix C. The detailed Synchro traffic capacity analysis reports are included in Appendix D.

2.2.4 Origin and Destination Study

A traffic origin and destination study was executed to provide a more detailed understanding of traffic patterns into and through downtown Dover. An origin and destination study provides information on the exit point of every vehicle that enters the study area. Taken aggregately, the origin and destination study data shows the distribution of traffic from each entry point to the various exit points, and indicates traffic circulation patterns in the study area.

This study entailed recording the license plate numbers of vehicles entering and exiting the downtown Dover study area during the evening peak period (4:00 to 6:00 PM) on September 18, 2003. The origin – destination survey recorded partial license plate numbers of all vehicles entering and exiting the downtown study area on the following major routes:

- Central Avenue (north of Chestnut Street)
- Sixth Street (west of Chestnut Street)
- Washington Street (west of Belknap Street)
- Silver Street (west of Belknap Street)
- Locust Street (south of Silver Street)
- Central Avenue (south of Silver Street)
- Cochecho Street (east of Oak Street)
- Portland Avenue (north of Atlantic Avenue)
- Broadway (north of New York Street)

Because downtown Dover has high traffic volumes and many major access roads (due largely to its radial street network), the origin – destination survey included a very large vehicle population. The survey recorded a total of approximately 15,000 vehicles entering and exiting downtown Dover in the two-hour PM peak period. The origin – destination survey data is summarized in Appendix E.

The partial license plate records were tabulated and matched in order to identify each vehicle's entry and exit points. Due to the large number of vehicles in the survey, there were some redundancies in the origin – destination matching: some entering vehicles had partial license plate records that matched more than one entering vehicle, and vice-versa. As a result, there were more matches than vehicles.

The origin – destination data was adjusted so that the total matches correspond to the actual traffic volumes that were counted at each entry and exit point for downtown Dover. This produced an origin – destination matrix for downtown Dover that is consistent with the traffic counts and the observed circulation in downtown Dover. In order to determine the traffic that is traveling to or from a destination in the downtown Dover study area (as opposed to through-traffic), the origin – destination data is

supplemented by trip generation analysis based on the development and land uses in the study area. This analysis is discussed in Section 2.8.

The resulting origin – destination matrix is shown in Table 2-4.

Table 2-4 Origin – Destination Matrix

	Destination	Upper Central Avenue NB	Sixth Street WB	Washington Street WB	Silver Street WB	Locust Street SB	Lower Central Avenue SB	Henry Law Avenue SB	Cochecho Road EB	Portland Avenue NB	Broadway NB	Total
Origin	Total											
Upper Central Ave SB	992	5%	4%	17%	15%	15%	31%	6%	0%	8%	7%	1,074
Sixth St EB	392	5%	5%	22%	20%	18%	20%	4%	0%	6%	4%	410
Washington St EB	477	21%	13%	5%	2%	14%	7%	6%	4%	26%	8%	503
Silver St EB	691	24%	12%	1%	5%	11%	8%	3%	3%	24%	11%	702
Locust St NB	427	21%	29%	10%	17%	5%	0%	2%	1%	16%	6%	457
Lower Central Ave NB	858	22%	7%	8%	5%	4%	5%	5%	5%	30%	15%	921
Henry Law Ave NB	168	19%	7%	10%	5%	5%	4%	5%	5%	26%	12%	168
Portland Ave SB	574	17%	6%	12%	15%	5%	26%	5%	2%	5%	11%	588
Broadway SB	378	16%	6%	8%	14%	6%	30%	6%	0%	7%	5%	376
Total	**4,957**	**802**	**470**	**513**	**532**	**478**	**783**	**235**	**112**	**823**	**450**	**5,199**

Dover Traffic Patterns

While there are significant origins and destinations in downtown Dover, most of the traffic in the study area is through-traffic. As described above, Dover has a radial street pattern centered on the downtown one-way loop. The orientation of the major traffic flows through downtown is principally north – south. The following are the most critical traffic flows through downtown Dover:

- Central Avenue (Route 108). Central Avenue is the main roadway through downtown Dover, and carries the heaviest traffic volumes. The Central Avenue through-traffic traverses the downtown one-way loop, with southbound traffic remaining on Central Avenue and northbound traffic traveling via Central Avenue, Washington Street, and Main Street to continue northbound on Central Avenue.

- Silver Street (Route 9) and Washington Street to / from Portland Avenue (Route 4). Silver Street, Washington Street, and Portland Avenue have high traffic volumes, and the origin – destination survey indicates that there are heavy traffic flows between Silver Street / Washington Street to the southwest and Portland Avenue to the northeast. This traffic flow overlaps with the Central Avenue traffic flow as they pass through the downtown one-way loop, resulting in very high traffic volumes and congestion in the downtown one-way loop.

- Chestnut Street – Walnut Street – Locust Street. This corridor runs parallel to the Central Avenue corridor, and serves as a bypass for drivers seeking to avoid congestion on the Central Avenue corridor. This corridor avoids the downtown one-way loop, with its congestion and high traffic volumes. However, the Chestnut – Walnut – Locust corridor has significant capacity constraints of its own at Silver Street, Washington Street, Sixth Street, and Central Avenue.

2.2.5 Traffic Safety Analysis

Accident data was provided by the City of Dover Police Department (DPD) for intersections within the study area during the years 2001 and 2002. The accident data was reviewed and summarized in order to identify problem locations in the study area. Accident rates for study area intersections were calculated and are summarized in Table 2-5. All accident data are included in Appendix F.

Table 2-5 Traffic Crash Records

	Year	Type				Severity					
Intersection	2000-2001	Angle	Rear-End	Head-On	Other	Property Damage Only	Injury	Fatality	Other	**Average Annual Crashes**	**Crash Rate (MEV)**
Central Avenue / Chestnut Street	**11**	6	2	0	3	8	2	0	1	5.5	0.81
Chestnut Street / 6th Street	**13**	12	1	0	0	10	3	0	0	6.5	1.17
Central Avenue / 6th Street / Preble St	**10**	1	5	0	4	7	3	0	0	5	0.86
Central Avenue / 5th Street	**10**	4	3	0	3	7	3	0	0	5	0.81
Central Avenue / 4th Street / Pierce St	**25**	16	3	0	6	20	5	0	0	12.5	1.97
Broadway / Pierce Street	**5**	3	2	0	0	5	0	0	0	2.5	0.71
Broadway / St. John Street	**5**	1	2	0	2	4	1	0	0	2.5	0.66
Chapel Street / St. John Street	**5**	3	1	0	1	5	0	0	0	2.5	0.99
Central Avenue / 3rd Street / Broadway	**24**	5	13	0	6	21	2	0	1	12	1.55
Central Avenue / Main St / Chapel St	**10**	1	5	0	4	8	2	0	0	5	0.77
Central Avenue / 2nd Street	**26**	9	7	0	10	25	1	0	0	13	2.37
Central Avenue / 1st Street	**13**	2	9	0	2	11	2	0	0	6.5	1.32
Central Avenue / Orchard Street	**11**	3	7	0	1	10	1	0	0	5.5	1.08
Central Ave/Washington St/Henry Law	**21**	5	8	1	7	17	3	0	1	10.5	0.86
Main Street / Washington Street	**12**	1	4	2	5	11	1	0	0	6	0.82
Main Street / Portland Avenue	**14**	1	5	0	8	13	1	0	0	7	0.78
Portland Avenue / Cochecho Street	**10**	4	1	0	5	9	1	0	0	5	1.17
Portland Avenue / Chapel Street	**2**	1	1	0	0	1	1	0	0	1	0.19
Chestnut Street / 4th Street	**15**	13	0	0	2	9	6	0	0	7.5	1.37
Chestnut Street / 3rd Street	**7**	2	3	0	2	6	1	0	0	3.5	0.56
Chestnut Street / 2nd Street	**7**	6	1	0	0	6	1	0	0	3.5	0.54
Chestnut Street / 1st Street	**10**	3	4	0	3	10	0	0	0	5	0.67
Chestnut Street / Orchard Street	**3**	0	0	0	3	3	0	0	0	1.5	0.21
Washington Street / Chestnut Street	**12**	3	5	0	4	10	2	0	0	6	0.73
Washington Street / Locust Street	**3**	1	1	0	1	3	0	0	0	1.5	0.40
Washington St / Fayette St / Atkinson	**3**	2	1	0	0	3	0	0	0	1.5	0.27
Washington St / Green St / Belknap St	**7**	3	3	0	1	7	0	0	0	3.5	0.71
Central Ave / Church / Hanson / Court	**11**	8	3	0	0	11	0	0	0	5.5	0.67
Central Avenue / Silver Street	**3**	0	2	0	1	3	0	0	0	1.5	0.19
Locust Street / Silver Street	**19**	7	9	3	0	15	4	0	0	9.5	1.45
Silver Street / Atkinson Street	**5**	3	0	0	2	4	1	0	0	2.5	0.62
Silver Street / Belknap Street	**6**	4	1	0	1	5	1	0	0	3	0.64
Henry Law Ave / River St / George St	**4**	0	2	0	2	3	1	0	0	2	1.34
Henry Law Avenue / Hanson Street	**0**	0	0	0	0	0	0	0	0	0	0.00
Total	**342**	**133**	**114**	**6**	**89**	**290**	**49**	**0**	**3**	**171**	**0.86**

There are four intersections in the study area that had an average of more than ten accidents per year: Central Avenue / Fourth Street / Pierce Street, Central Avenue / Third Street / Broadway (Northern Section of Upper Square), Central Avenue / Second Street (Southern Section of Upper Square), and Central Avenue / Washington Street / Henry Law Avenue (Lower Square). These intersections are all along the Central Avenue corridor. Three of these four intersections are located within the boundaries of the one-way segment of Central Avenue.

The problems at the Central Avenue / Fourth Street / Pierce Street intersection could be due to the skewed nature of the intersection. The 50-foot offset between Fourth Street and Pierce Street could be the cause of some of the accidents at this intersection.

At the Central Avenue / Third Street / Broadway intersection, the lack of the signal control on the Third Street approach may cause some confusion. The high number of accidents could also be caused by those turning right from Third Street to get into the left hand lane to make the U-turn onto Central Avenue northbound.

At the Central Avenue / Second Street intersection, the problems could be caused by people accepting smaller gaps to get onto Central Avenue southbound. Since traffic is very congested on this stretch of Central Avenue, it can often be difficult to get out into traffic from Main Street. Instead of waiting for an acceptable gap to open up, people become frustrated and accept smaller gaps in traffic.

At Lower Square, the high number of accidents could be caused by the lack of signalization on certain approaches to the intersection and conflicts with pedestrians. The conflict between the pedestrians and the unsignalized approaches to this intersection are potentially dangerous, as those vehicles waiting to turn off of Henry Law Avenue onto Washington Street may be so focused on getting onto Washington Street that they may not be looking out for pedestrians in the crosswalk. Also, given the high traffic volumes that come through this intersection every day, it can be assumed that it would be more likely to experience more accidents than other intersections within the downtown study area.

2.3 Truck Traffic

As described above, the downtown Dover study area is at the center of a radial network of major roadways, including state numbered routes 108, 9 and 4. These roadways provide the principal connections among Dover, neighboring towns (including towns in Maine), and the Spaulding Turnpike. These roadways also have high traffic volumes and significant truck volumes. The percentages of trucks at study area intersections during peak periods are shown in Table 2-5.

Table 2-6 Truck Percentages at Study Area Intersections

Intersection	AM Peak Hour	PM Peak Hour
Central Avenue / Chestnut Street	3.2%	1.3%
Chestnut Street / Sixth Street	1.6%	0.5%
Central Avenue / Preble Street / Sixth Street	4.3%	2.7%
Central Street / Fifth Street	3.7%	1.0%
Central Avenue / Fourth Street / Pierce Street	4.2%	0.2%
Broadway / Pierce Street	3.7%	1.3%
Broadway / St. John / Winter Street	1.8%	0.8%
Chapel Street / St. John / Mechanic Street	4.4%	1.4%
Central Avenue / Third Street / Broadway / Main Street	3.7%	2.5%
Upper Square / Chapel Street / Main Street	4.1%	0.2%
Central Avenue / Second Street / Chapel Street	3.6%	2.2%
Central Avenue / Washington Street / Henry Law Avenue	2.7%	3.8%
Washington Street / Main Street	2.6%	3.8%
Portland Avenue / Main Street / Young Street	3.0%	3.8%
Portland Avenue / Cochecho Street	4.2%	2.5%
Portland Avenue / Chapel Street	4.2%	3.1%
Chestnut Street / Fourth Street	1.7%	0.6%
Chestnut Street / Third Street	2.0%	0.8%
Chestnut Street / Second Street / RR Parking Lot	3.9%	1.6%
Chestnut Street / First Street / Plaza Driveway	3.4%	1.2%
Chestnut Street / Orchard Street	2.6%	1.1%
Washington Street / Chestnut and Walnut Street	2.7%	2.3%
Washington Street / Locust Street	4.3%	3.4%
Fayette Street / Atkinson Street / Washington Street	2.0%	0.9%
Green Street / Belknap Street / Washington Street	2.5%	1.0%
Central Avenue / Church Street / Court Street / Hanson Street	5.0%	2.3%
Central Avenue / Silver Street	1.5%	0.9%
Locust Street / Silver Street	4.9%	2.6%
Atkinson Street / Silver Street	6.0%	3.7%
Belknap Street / Silver Street	6.2%	3.3%
River Street / George Street / Henry Law Avenue	2.1%	1.5%
Hanson Street / Henry Law Avenue	2.2%	1.3%

Table 2-6 shows that truck percentages are higher during the AM peak period than during the PM peak period. This is largely due to the fact that overall traffic volumes are lower during the AM peak hour, and commercial traffic makes up a higher proportion of traffic in the morning. Figures 2-9 and 2-10 show the volumes of truck traffic in the downtown study area during the AM and PM peak hours, respectively.

Figures 2-9 and 2-10 demonstrate the following truck traffic trends and circulation patterns.

- The heaviest truck volumes are on the state numbered routes: Central Avenue (Route 108), Silver Street (Route 9), and Portland Avenue (Route 4). The truck volumes suggest significant truck flows between the south and west (perhaps the Spaulding Turnpike interchanges) and the north and east (Maine destinations).

- These routes overlap in downtown Dover, especially in the one-way loop, resulting in high truck volumes.

- Truck volumes are significantly lower on the Chestnut Street – Locust Street corridor than on the Central Avenue corridor. This may be due to physical constraints on Walnut Street.

- The AM and PM peak periods truck volumes show distinct directional differences. In the AM peak hour, southbound truck traffic flows (toward the Spaulding Turnpike) are heavier, while in the PM peak hour, northbound truck traffic flows (toward Maine points) are heavier.

Specific land uses that contribute to truck traffic are shown in Figure 2-9. These land uses include:

- Waste Management on Rochester Neck Road. Waste Management trucks have access to and from the Spaulding Turnpike via Sixth Street and Indian Brook Road. However, Waste Management trucks traveling to and from Maine via Route 4 are likely to travel via Central Avenue or Sixth Street and through the downtown loop.

- Enterprise Park on Venture Drive off Sixth Street. Trucks to and from the Enterprise Park industrial area use Sixth Street, although many use Indian Brook Road to make connections to the Spaulding Turnpike.

- Industrial Parks on Route 9 (Littleworth Road). Trucks traveling between the Route 9 industrial parks and Maine travel through downtown Dover.

- Industrial Businesses in Maine. There are a number of industrial businesses in Berwick, North Berwick, and South Berwick. These businesses generate truck trips through downtown Dover, crossing into Maine via Route 9, Route 4, or Gulf Road. A major generator of high impact truck traffic is the automobile wrecking business in North Berwick, Maine. Trucks with junked cars pass through the downtown loop to Route 4 and or Route 9 traveling to and from North Berwick.

- Miracle Mile. North of the downtown Dover study area, Central Avenue becomes the "Miracle Mile" retail corridor. Major truck generators in this section of Central Avenue include the Wentworth-Douglass Hospital, Hannaford Brothers Supermarket, Shaw's Supermarket, and several smaller retail and entertainment establishments.

These truck origins and destinations are shown in Figure 2-11.

Truck access on Dover's major roadways is necessary to enable commercial vehicles to serve Dover, as well as to make reasonable connections through Dover. However, heavy truck traffic can also have negative impacts on land uses that are incompatible with this traffic.

The City of Dover and its residents have recognized and responded to the impacts created by the significant volumes of heavy vehicles in the downtown study area. Dover's City Council has instituted several truck prohibitions through Dover Code 166-53. Schedule F (included in Appendix G). These truck prohibitions are designed primarily to prevent trucks from using minor residential streets for short-cuts between truck routes.

In the downtown Dover study area, these prohibitions comprise segments of Atkinson Street, Belknap Street, Fourth Street, George Street, and Green Street. Other truck prohibited routes near the downtown study area include segments of Cushing Street, Lexington Street, Arch Street, Washington Street, Spring

Street, and Summer Street. These truck prohibitions apply only to through-traffic; trucks are still permitted to make local deliveries on these streets.

The state numbered routes and the streets on which trucks are prohibited are shown in Figure 2-12.

Table 2-7 Truck Prohibitions in or Near the Downtown Study Area

Street	From	To
Arch Street	Silver Street	Washington Street
Atkinson Street	Silver Street	Washington Street
Belknap Street	Silver Street	Washington Street
Columbus Avenue	NH Route 9 (Littleworth Road)	Tolend Road
Cushing Street	Silver Street	Washington Street
Lexington Street	Silver Street	Washington Street
Fourth Street	Washington Street	Grove Street
George Street	Henry Law Avenue	Angle Street
Green Street	Washington Street	Chestnut Street
Spring Street	Locust Street	Central Avenue
Summer Street	Locust Street	Central Avenue
Trakey Street	Locust Street	Central Avenue
Washington Street	Arch Street	Tolend Road
Watson Road (tractor trailers prohibited)	County Farm Road	Tolend Road
Whittier Street (tractor trailers prohibited)	Sixth Street	Tolend Road

2.4 Parking

Downtown Dover has a large supply of parking, both on-street and off-street. Dover also has significant parking demands. Key parking users include:

- Downtown residents
- Employees
    - Private sector: mills, retail establishments
    - Public sector: City of Dover, Strafford County
- Shoppers, tourists, and other visitors

It is important to maintain an appropriate parking supply for these constituencies. Achieving this requires striking a balance between land use and parking, a balance that can be challenging in a dense urban district like downtown Dover. The study area has a concentration of residential, employment, and retail land uses that create a vibrant downtown at the same time that they generate significant parking demand.

The parking supply and demand in the downtown Dover study area was inventoried on Wednesday September 17, 2003. The number of on-street and off-street parking spaces were counted, and the type of usage or regulation was identified for each space. The number of occupied parking spaces was also counted, during the morning (between 9 AM and 11 AM) and during the afternoon (between 2 PM and 4 PM). The parking utilization was then tabulated for each parking lot and each block of on-street parking.

On-street parking and off-street municipal parking is monitored and regulated by the Dover Police Department. These functions include enforcing on-street parking regulations, issuing parking permits for City-owned municipal parking lots, and monitoring and enforcing parking in the municipal lots.

Parking Supply and Demand

Parking supply and demand is a localized phenomenon. Drivers wish to park as close as possible to their destinations, so the specific location of parking supply and demand is important. In assessing the parking supply and demand, the downtown study area was divided into a total of nine different zones.

These zones are shown in Figures 2-13 and 2-14, and they include:

- Zone 1 at the center of the downtown study area includes the downtown one-way loop and the Cocheco Falls Mill
- Zone 2 includes many of the public and government buildings located southwest of the center, as well as many businesses and residences
- Zone 3 has businesses, senior housing, and several surface parking lots, including the municipal Orchard Street lot
- Zone 4 has businesses, residences, and many parking lots, including the First Street municipal lot, the Cocheco Falls Mill parking lot (adjacent to the Dover Transportation Center), and the large surface parking lot at the Goodwill / New Hampshire State Liquor Store plaza
- Zone 5 is located at the northern end of the study area, and includes businesses, a few residences, and the Third Street municipal parking lot
- Zone 6 includes a mix of residences and businesses
- Zone 7 includes businesses, residences, and several large parking lots, including the School Street municipal lot and the Portland Avenue municipal lot
- Zone 8 has mostly employee parking for the One Washington Center mill, as well as some municipal permit parking spaces, employee parking for the Foster's Daily Democrat, and parking for the Butterfield Gymnasium
- Zone 9 comprises the Riverfront parcel, which is owned by the City of Dover, and currently leased by the One Washington Center mill for employee parking

On-Street Parking

Supply. On-street parking is available throughout the downtown study area. A total of 832 on-street parking spaces were counted in the study area. This parking includes the following two principal types:

- Two-hour parking. The majority of parking in the downtown study area (a total of 61%) is regulated with a two-hour limit. The two-hour parking includes parallel parking, as well as some angle parking on Central Avenue and First Street. On-street parking spaces are intended for use by short-term visitors to downtown, including shoppers and diners. The curbside location is intended to maximize the visibility and convenience for these users.

- Unrestricted parking. There is also some on-street parking in the study area that does not have a time limit. These parking spaces are mostly located away from the center of downtown, where there are fewer storefront businesses, and demand for short-term parking is less.

Parking Utilization. Weekday on-street parking supply and demand was surveyed on September 11, 2003 during the typical weekday peak demand periods: during the morning from 9:00 to 11:00 AM and during the afternoon from 2:00 to 4:00 PM. The utilization of on-street parking is summarized in Table 2-8.

Table 2-8 On-Street Parking Supply and Demand

	Two-Hour Parking			Unrestricted			Total		
	Supply	Utilization		Supply	Utilization		Supply	Utilization	
		AM	PM		AM	PM		AM	PM
Zone 1	95	53%	58%	12	83%	75%	107	56%	60%
Zone 2	94	49%	53%	113	83%	67%	207	68%	61%
Zone 3	19	58%	11%	8	100%	88%	27	70%	33%
Zone 4	174	48%	35%	0	0%	0%	174	48%	35%
Zone 5	48	25%	27%	27	41%	30%	75	31%	28%
Zone 6	27	33%	67%	40	33%	48%	67	33%	55%
Zone 7	36	44%	31%	52	29%	8%	88	35%	17%
Zone 8	15	47%	47%	72	71%	51%	87	67%	51%
Zone 9	0	0%	0%	0	0%	0%	0	0%	0%
Total	508	46%	43%	324	62%	49%	832	53%	45%

The distribution of on-street parking and its utilization are shown in Figure 2-13.

The morning and afternoon parking utilization survey for the entire study area was supplemented with a parking turnover survey for the downtown center. The parking turnover study was conducted on Thursday, June 24, 2004, and it encompassed the on-street parking nearest to Dover's main commercial corridor (i.e. the downtown one-way loop and the adjacent blocks). The parking turnover study identified not only parking supply and demand during the morning and afternoon parking demand peaks, but also the parking turnover: how frequently parked cars departed, and were replaced with new vehicles, as well as an aggregate parking turnover rate, i.e. the average number of cars per parking space observed during the survey period (9 AM to 3 PM). This information is shown below in Table 2-10 for each block face in the downtown center.

Table 2-9 Parking Turnover Summary

Block Face	Total Spaces	Utilization				New Cars				Parking Turnover (cars per space)
		9 AM	10 AM	2 PM	3 PM	9 AM	10 AM	2 PM	3 PM	
Central Avenue-West (Washington St to 1st St)	41	59%	59%	76%	66%	59%	41%	66%	46%	2.12
Central Avenue-East (Washington St to 1st St)	11	64%	82%	73%	91%	64%	36%	45%	36%	1.82
Central Avenue-West (1st St to 2nd St)	15	80%	67%	87%	87%	80%	47%	80%	40%	2.47
Central Avenue-East (1st St to 2nd St)	8	100%	88%	50%	100%	100%	75%	50%	63%	2.88
Central Avenue-West (2nd St to 3rd St)	14	100%	79%	79%	100%	100%	57%	79%	57%	2.93
Central Avenue-East (Chapel St to Broadway)	15	47%	47%	93%	67%	47%	20%	87%	40%	1.93
Central Avenue Total	**104**	**70%**	**66%**	**78%**	**79%**	**70%**	**43%**	**69%**	**46%**	**2.28**
Washington Street-North (Central Ave to Cochecho R.)	19	74%	26%	58%	74%	74%	21%	58%	37%	1.89
Washington Street-South (Main St to Cochecho R.)	7	14%	14%	71%	71%	14%	0%	71%	43%	1.29
Washington Street Total	**26**	**58%**	**23%**	**62%**	**73%**	**58%**	**15%**	**62%**	**39%**	**1.73**
Main Street-West (School St to Washington St)	17	24%	6%	29%	18%	24%	0%	29%	12%	0.65
Downtown Loop Total	**147**	**62%**	**51%**	**70%**	**71%**	**62%**	**33%**	**63%**	**41%**	**1.99**
Central Avenue-West (Washington to Hale)	13	62%	69%	69%	38%	62%	38%	69%	23%	1.92
Central Avenue-East (Washington to Williams)	9	78%	33%	44%	44%	78%	0%	33%	11%	1.22
St. Thomas Street-North (Locust to Central Ave)	6	67%	83%	33%	67%	67%	33%	33%	50%	1.83
St. Thomas Street-South (Locust to Central Ave)	6	33%	33%	33%	33%	33%	17%	33%	17%	1.00
Locust Street-East (St. Thomas to Washington St)	8	75%	63%	50%	50%	75%	50%	50%	25%	2.00
Locust Street-West (St. Thomas to Washington)	7	29%	86%	29%	57%	29%	86%	29%	14%	1.58
Washington Street-North (Chestnut to Central Ave)	4	75%	75%	50%	75%	75%	75%	50%	75%	2.75
Washington Street-South (Chestnut to Central Ave)	7	100%	71%	29%	14%	100%	57%	29%	0%	1.86
First Street-South (Chestnut St to Central Ave)	47	30%	60%	55%	38%	30%	34%	21%	9%	0.94
Second Street-North (Chestnut St to Central Ave)	24	46%	25%	38%	50%	46%	13%	33%	29%	1.21
Second Street-South (Chestnut St to Central Ave)	30	50%	53%	47%	40%	50%	20%	17%	7%	0.94
Chapel Street-South (Main St to St. John St)	4	100%	75%	25%	25%	100%	0%	25%	25%	1.50
School Street-North (Main St to Mechanic St)	16	25%	19%	44%	38%	25%	6%	38%	13%	0.82
School Street-South (Main St to Mechanic St)	3	100%	67%	67%	67%	100%	0%	33%	33%	1.66
Downtown Total	**331**	**55%**	**52%**	**57%**	**55%**	**55%**	**30%**	**45%**	**28%**	**1.58**

This parking survey encompassed a total of 331 on-street parking spaces, located in the downtown one-way loop (the triangle defined by Central Avenue, Washington Street, and Main Street) or within about one block of the one-way loop. Because this includes the central retail corridor of the downtown on Central Avenue, the vast majority of this on-street parking has a two-hour time limit in order to encourage parking turnover and provide convenient parking spaces for short-term retail customers.

As Table 2-10 shows , parking spaces within the downtown one-way loop accounted for approximately half of the total parking spaces surveyed. The parking utilization levels and the parking turnover were higher in the downtown one-way loop than on adjacent blocks, although there was significant variation both within the one-way loop and outside the loop. Within the downtown one-way loop, parking utilization and turnover were highest on Central Avenue between Upper Square and Lower Square, in the main commercial corridor, while parking occupancy and turnover were lower on Main Street than the overall downtown average. Outside the downtown loop, the highest parking occupancy and parking turnover were observed on Washington Street, Central Avenue, and Locust Street, which are close to the main commercial corridor and located on routes into downtown Dover.

The Dover Police Department (DPD) regularly patrols the parking in this area, so there are very few cars that stay in one space for longer than two hours. There were 11 (3.3%) cars that stayed in one space all day long (from 9:00-3:00) and 12 (3.6%) additional cars that stayed in the same general area all day. Of the 11 cars that stayed in the same space all day long, six were parked on First Street and had city-issued

permits. There were also a total of 16 (4.8%) additional vehicles that were parked in the same general area for more than two hours. As a result, First Street had fairly low parking turnover of 0.92 cars per parking space during the survey period.

Nevertheless, not all of the parking turnover reflects short-term parking. Much of it reflects vehicles that are moved from one on-street parking space to another every two hours to avoid being ticketed, a process known as "shuffling." During the parking utilization survey and the parking turnover survey, many incidents of shuffling were observed. The people shuffling their cars between parking spaces appeared to be downtown employees (at the mills or retail stores) and/or business owners who park on-street all day and avoid purchasing a parking permit from the City. There are many parking spaces available during the day, which makes it relatively easy for people to move their vehicles every two hours.

Although DPD actively patrols the area and enforces parking regulations, it is relatively easy to avoid getting ticketed by moving a vehicle to a new parking space every few hours. According to Dover City Code Chapter 166.57. Schedule J: Limited Time Parking, it is illegal to exceed the parking time limit for a given segment of each street. Therefore, by the letter of the law, people cannot move a vehicle from one space on Central Avenue to another space on Central Avenue at the end of two hours. However, it would be legal to move a vehicle from a space on Central Avenue to a space around the corner on Washington Street.

It is also difficult from a practical standpoint to enforce the parking regulations in the case of shuffling. DPD officers typically put a chalk mark on a vehicle's tire when they patrol. If the mark is still there when they patrol a few hours later, they know to ticket the vehicle. However, if the vehicle is moved to a new parking space, the tire is rarely in the same position as it was in the previous parking space, making it difficult for officers to issue a parking ticket if he cannot see his earlier mark. The chalk can also be easily removed, so one drive around the block could wear the mark off of the tire.

Winter Parking Ban. All on-street parking throughout Dover is subject to the winter parking ban, which prohibits any on-street parking from 1:00 AM to 6:00 AM from December 1 to April 1. This parking ban is designed to ensure that the Dover Public Works and Utilities Division is able to effectively plow any and all streets in the event of a snowstorm. The DPD routinely enforces this regulation, issuing 2,018 winter parking ban citations from December 1, 2003 through March 31, 2004; these citations account for 31% of the total citations issued over the same time period. Only rarely are cars towed for violating the winter parking ban, and they are only towed when Public Works requests that the DPD remove a car. This is typically only done in the downtown area, where plowing is most critical. Only 22 cars were towed in the winter of 2003 / 2004, or about 1% of the cars issued citations for violating the ban. Downtown residents can avoid winter parking ban citations by obtaining a free overnight parking pass for municipally-owned parking lots.

Off-Street Parking

There is off-street parking throughout the downtown study area. Almost all of this off-street parking is provided in surface lots, with the exception of a very small proportion of mostly residential garage parking spaces, such as the ground floor parking spaces in the Bell Center.

This off-street parking is divided into several types of use. These usage types have been grouped into the following categories:

Other off-street parking lots in the downtown study area are privately owned and enforced. Most of these privately-owned lots provide customer parking for adjacent businesses. Some parking lots also provide resident parking. There are also several large private parking lots for downtown employees, particularly

employees at the two mill buildings. These private employee parking lots include lots on the property adjacent to the mill buildings, as well as the large parking area on Chestnut Street near the Dover Transportation Center, which is owned by the Cocheco Falls Mill. The One Washington Center mill has a long-term lease with the City of Dover for exclusive use of the parking on the Riverfront parcel across the Washington Street footbridge.

- **Municipal Permit.** Within the downtown study area, the City of Dover owns municipal parking lots on Orchard Street, Locust Street, School Street, First Street, Portland Avenue, Third Street, and adjacent to the Dover Public Library. These parking lots are regulated by the Dover Police Department (DPD), which issues monthly parking permits for employee use or for resident use. The Police Department issues two kinds of parking permits for these lots: resident parking permits (which are available to residents living within 500 feet of a lot for $5 per month) and employee parking spaces (which cost $20 - $40 per month, depending upon the location). Parking permits are issued and renewed on a monthly basis, at the City of Dover's discretion. Parking permit requirements are currently not enforced at the Third Street municipal lot and the Portland Avenue municipal lot due to low demand.

- **Public Metered.** Public metered parking spaces are also owned by the City of Dover and regulated by the DPD. The metered parking has a two-hour limit, and is principally intended to provide parking for retail customers to supplement the on-street parking supply. Most of the public metered parking supply is in a section of the Orchard Street municipal lot (adjacent to the Central Avenue retail core). There are also some public metered parking spaces in a lot off of Locust Street, near City Hall and other Central Avenue businesses south of Washington Street.

- **Private Customer.** These are generally privately owned parking lots associated with retail businesses. Parking at these lots is only for customers of the adjacent business.

- **Private Employee.** These parking lots are dedicated for use by employees of specific downtown employment centers. These include privately owned parking lots (such as the parking lot adjacent to the Dover Transportation Center that is owned by the Cocheco Falls Mill). These also include City-owned parking lots that have long-term leases for employee parking (such as the parking spaces on the Riverfront parcel that are leased by the One Washington Center mill).

- **Private Resident.** These are parking lots that are owned by downtown residential buildings, and are only for residential parking.

- **Unrestricted.** These are off-street parking lots where there are no parking regulations, or where the parking regulations are consistently unenforced. These unrestricted lots include the City-owned Third Street lot and Portland Avenue lot, where demand for parking is so low that permit requirements are not enforced.

The distribution of on-street parking is shown in Figure 2-14.

Weekday off-street parking and levels of utilization was surveyed through field investigations on Tuesday, September 23, 2003. Parking utilization was survey for the morning parking peak demand period from 9:00 to 11:00 AM, and for the afternoon peak demand period from 2:00 to 4:00 PM. The results of these field surveys are summarized in Table 2-9.

Table 2-10 Off-Street Parking Supply and Demand

	Municipal Permit	Public Metered	Private Customer	Private Employee	Private Resident	Unrestricted	Total	Total Utilization	
								AM	PM
Zone 1	0	0	113	114	21	0	248	51%	58%
Zone 2	196	18	292	37	20	83	646	61%	55%
Zone 3	94	60	147	26	77	0	404	69%	54%
Zone 4	79	0	252	263	39	0	633	46%	43%
Zone 5	0	0	46	0	0	124	170	48%	48%
Zone 6	0	0	251	0	12	0	263	45%	38%
Zone 7	66	0	81	19	0	43	209	49%	51%
Zone 8	21	0	92	247	34	0	394	60%	64%
Zone 9	0	0	0	186	0	0	186	68%	69%
Total	**456**	**78**	**1,274**	**892**	**203**	**250**	**3,153**	**56%**	**53%**

The following are the principal findings of current parking supply and demand field surveys.

- Downtown study area parking includes a total of 3,985 spaces
  - 832 on-street parking spaces (two-hour parking or unrestricted)
    - Mid-morning occupancy: 53%
    - Mid-afternoon occupancy: 45%
  - 3,153 off-street parking spaces (municipal permit, private employee, private customer, resident, metered)
    - Mid-morning occupancy: 56%
    - Mid-afternoon occupancy: 53%
- There is significant parking capacity available. However, much of this parking is not broadly available. Of the 3,153 off-street spaces, 2,369 (75%) are private: mostly customer or employee, as well as some resident. These private spaces have limited usage.
- The Cocheco Falls Mill is currently about half full. There is the potential for another 500 – 600 employees in the center of downtown.

2.5 Public Transportation

Downtown Dover is served by a variety of public transportation services. These include regional bus service, inter-city bus service, and inter-city train service. Most of these serve the downtown center and/or the Dover Transportation Center.

Dover Transportation Center. The Dover Transportation Center is located at 33 Chestnut Street, between Second Street and Third Street adjacent to the railroad tracks. The Dover Transportation Center is at the site of the former Dover railroad station, which was restored in conjunction with the initiation of Amtrak's Downeaster rail service between Boston and Portland, Maine. The Dover Transportation Center

serves as the hub for Dover's public transit services, and has helped to enhance public transit in Dover. By creating a central hub, the Dover Transportation Center makes transfers between modes and services more convenient, and contributes to a "critical mass" of transit services. This has already had the benefit of attracting C&J Trailways service back to Dover.

The following are transit services that operate in Dover.

Coast Bus Service. The Cooperative Alliance for Seacoast Transportation (COAST) is a regional transit carrier that provides bus service within Dover, and connects Dover to neighboring cities and towns. COAST Bus Route 1 connects downtown Dover with Somersworth and Berwick, ME; Route 2 provides connections between downtown Dover, Portsmouth, Newington, Somersworth, and Rochester. These routes operate on roughly 1 – 1 ½ hour headways on weekdays; Route 2 operates on about 2 hour headways on Saturdays. COAST also operates three "Community Routes" in different areas of Dover. Each of these routes provides a once-a-day connection to and from Dover High School and the Dover Transportation Center. COAST routes 1 and 2 operate year-round, while the community routes operate only during the school year. Adult one-way bus fare is $1.00; seniors (65 and older) ride for half fare, and children five and under ride free.

Wildcat Transit. Wildcat Transit is operated by the University of New Hampshire (UNH) in Durham. Wildcat Transit operates several routes within Durham, as well as three inter-city routes, providing connections between the UNH campus and Dover (Route 3), Portsmouth (Route 4), and Newmarket (Route 5). Wildcat Transit provides shuttle service that is geared primarily to the needs of UNH students, faculty and staff, who ride free, while the general public may ride for $1.00. Wildcat Transit operates with a full schedule when UNH is in session, with a reduced weekday schedule during breaks and summer term, and with no service on holidays.

C&J Trailways. C&J Trailways provides inter-city bus services between the Dover Transportation Center and Boston's South Station Transportation Center, with connections in Portsmouth, NH and Newburyport, MA. These services run with high frequency, especially during weekday commuter peak periods. C&J Trailways had discontinued service to Dover in January 2000, with service terminating at the Pease Intermodal Facility. However, with the restoration of the Dover Transportation Center and the initiation of Amtrak Downeaster service, C&J Trailways restored bus service to Dover.

Hampton Shuttle. The Hampton Shuttle operates shuttle bus service from the Dover Transportation Center to Manchester Airport and to Logan Airport.

Amtrak Downeaster. The Amtrak Downeaster is an inter-city passenger rail service between Boston's North Station and Portland, Maine. It serves intermediate stations in Woburn, MA; Haverhill, MA; Exeter, NH; Durham, NH; Dover; Wells, ME; Saco / Biddeford, ME; and Old Orchard Beach, ME. The Downeaster operates four trains per day in each direction.

Cocheco Falls Mill Shuttle. The Cocheco Falls Mill operates a shuttle between the mill and its off-site parking lot, located on Chestnut Street adjacent to the Dover Transportation Center. This shuttle operates continuously during morning and evening peak periods, with service frequency of approximately 10 minutes.

The routes for these transit services within the downtown study area are shown in Figure 2-15, and their service characteristics are summarized in Table 2-11.

Downtown Dover Transit Service. The City of Dover has secured a federal Congestion Mitigation and Air Quality (CMAQ) grant to establish a downtown shuttle bus transit service. This service is

designed to provide improved transit access to Dover's most active and popular destinations, with a particular focus on providing service for Dover's transit-dependent populations, including the elderly, children, the economically disadvantaged, and the disabled. This service is still being planned, and various options for service characteristics are being investigated. The downtown transit service will be discussed in more detail in the alternatives evaluation section.

Table 2-11 Downtown Dover Public Transportation Services

Service – Route	Connections	Trips per Weekday / Saturday / Sunday (each direction)	Weekday Headway	Service Time	Adult Fare
COAST					
Route 1	Central Avenue / High Street to - Somersworth - Berwick	9 / 0 / 0	1 – 1.5 hours	6 am – 6:30 pm	$ 1.00
Route 2	Central Avenue / Dover Point Road to - Portsmouth - Newington - Somersworth - Rochester	12 / 7 / 0	1 – 2 hours	6 am – 11 pm	$ 1.00
Community Routes - North - South - West	Dover High School to / from - Sixth Street - Dover Point Road - Tolend Rd/Route 9	- 1 / 0 / 0 - 1 / 0 / 0 - 1 / 0 / 0	--	6:45 am 2:30 pm	$ 1.00
Wildcat Transit					
Route 3A	UNH Durham to Dover (Shaw's) via Rt 108, return via Rt 155	9 / 3 / 3	1 – 3 hours	7 am – 11 pm	$ 1.00
Route 3B	UNH Durham to Dover (Shaw's) via Rt 155, return via Rt 108	9 / 4 / 4	1 – 2.5 hours	7 am – 10 pm	$ 1.00
C&J Trailways	- Portsmouth - Newburyport, MA - Boston, MA	12 / 6 / 6	20 minutes – 2 hours	4:45 am – 1:30 am	$15.00 (1-way to Boston)
Hampton Shuttle					
	Logan Airport	9 / 9 / 9	1 – 2 hours	4:20 am – 11 pm	$49.00
	Manchester Airport	8 / 8 / 8	1.5 – 2 hours	5 am – 11 pm	$46.00
Amtrak Downeaster	- Portland, ME - Boston, MA	4 / 4 / 4	2.5 – 5 hours	7 am – 1 am	- $10.00 - $15.00
Cocheco Falls Mill Shuttle	- Mill parking lot (near Dover Trans. Ctr.) - Cocheco Falls Mill		10 minutes		Mill employees only

2.6 Pedestrian Access

Downtown Dover retains much of its historic form, and it remains a dense, compact downtown district. Sidewalks and crosswalks are provided throughout downtown. As a result, downtown Dover remains walkable, and it has vibrant street activity, with pedestrians walking between residential, employment, retail, and civic destinations.

The Riverwalk provides off-street connections for pedestrians along the Cochecho River. It runs through Henry Law Park on the eastern side of Central Avenue, and along the southern side of the river to the west of Central Avenue. It crosses Central Avenue and Chestnut at mid-block locations that can be challenging for pedestrians.

Figure 2-16 shows the total pedestrian volumes at key intersections in throughout the downtown study area during the AM and PM peak hours. There are some intersections further from the downtown center that are in the study area, but are not shown in Figure 2-16; no pedestrians were observed at these intersections during the peak periods.

Figure 2-17 shows detailed pedestrian volumes and pedestrian flows in the downtown center, in the major commercial corridor between Lower Square and Upper Square.

Lower Square and Upper Square experience the heaviest pedestrian traffic in the downtown area. Pedestrian demand is high in both the morning and afternoon peak periods. Upper Square is especially busy in the morning, with people walking to work or coffee shops from their homes or parking spaces. From Upper Square, the majority of the pedestrians were walking to the south, toward Lower Square or the businesses in between Upper and Lower Squares. Lower Square was also busy, with many pedestrians walking through, although the majority of pedestrians at Lower Square were walking in the east-west direction instead of north-south. Most of the pedestrians out in between 7:00 and 8:00 AM were observed exercising, either walking or jogging, in athletic clothing. After 8:00 AM, most pedestrians were in business attire, heading to work for the day.

During the midday peak period, there is also a lot of pedestrian traffic at Upper and Lower Squares. Most of this traffic appeared to be downtown employees out for a walk on their lunch breaks. The lunch hour time period was the most heavily traveled time. The highest pedestrian volume for any hour during the day was from 12:00-1:00 PM, with approximately 410 pedestrians out in the Upper and Lower Square areas.

The afternoon peak period was also a high pedestrian activity period. There were a lot of people walking through Upper and Lower Squares, and shopping at businesses in between. There were also many people who were leaving work for the day, walking back to their homes or parking spaces. Due to the concentration of employment and shopping in the corridor between Upper Square and Lower Square, there is a lot of pedestrian traffic in this section of the city.

Most people crossing in the Lower Square crosswalks used the southern crosswalks (Henry Law Avenue and Central Avenue) instead of the crosswalk across Central Avenue north of Washington Street. Most pedestrians also cross Washington Street on the western side of Central Avenue. This crossing pattern could be the result of the conflicts that occur between pedestrians and vehicles at the eastern and northern crosswalks at Lower Square. Cars coming from Henry Law Avenue and left turns from Central Avenue southbound are not under signal control, so pedestrians may feel safer walking on the western side, where all traffic is under signal control and should stop when the pedestrians have the WALK sign.

2.7 Bicycle Facilities

Downtown Dover currently has fairly limited designated bicycle facilities. The Riverwalk, which runs along the Cochecho River through downtown, is an off-street path that is available for bicycle use. The Riverwalk also provides connections to existing and future planned bicycle facilities.

There are several roadways in downtown Dover that are designated as bicycle routes, although they do not have any bicycle signs or pavement markings. The most comprehensive network of designated on-street bicycle routes in Dover is the NHDOT bicycle route network, which includes "Statewide Bike Routes," which are the primary bicycle connections, and "Regional Bike Routes," which are lesser connections.

- Statewide Bike Route. The statewide bike route through downtown Dover runs from Rochester in the north via Pickering Road to Sixth Street. It enters downtown Dover via Sixth Street, turns onto Chestnut Street, then Washington Street to Lower Square. From there, it follows Henry Law Avenue to Back Road and Middle Road (the Henry Law Avenue – Back Road – Middle Road connection is concurrent with a bike route designated by the City of Dover). From Middle Road, it connects to Dover Point Road and crosses the Spaulding Turnpike, then runs along Cushing Road to the south, where is connects to the Great Bay Loop.

- Regional Bike Routes. Most of the other major radial streets leading into and out of downtown Dover are designated by NHDOT as regional bike routes. These include:

    - Central Avenue / Route 108 south of Lower Square. This includes the section of Route 108 (Durham Road) between Back River Road and the Madbury town line that has been widened to accommodate safe bicycle travel. Route 108 to the north of downtown is not designated as a bicycle route.

    - Silver Street

    - Court Street

    - Portland Avenue

    - Broadway to Goodwin Road, connecting to Somersworth.

    - Fourth Street to Tolend Road

    The downtown one-way loop is not designated as a bike route, due to high traffic volumes and circuitous connections through downtown.

Newington Branch Rail Trail. The City of Dover has an ongoing project to create a new off-street multi-use path in the abandoned Newington Branch railroad corridor. The first phase of this project, which is funded through the federal Transportation Enhancement (TE) program, runs from the Dover Transportation Center south across the Cochecho River via the railroad bridge, between Belknap Street and Cushing Street, to Central Avenue, a total of 2.1 miles. This project is scheduled for design in the spring of 2005, and construction in the fall of 2005. A proposed second phase of this path would extend along Central Avenue, cross the Bellamy River on a new bicycle bridge beneath the existing roadway bridge, and run along the southern shore of the Bellamy River to Bellamy Park. This second phase is not yet funded.

The existing and planned bicycle facilities in downtown Dover are shown in Figure 2-18.

2.8 Land Use and Development

Dover Demographics

Dover is one of the major cities in New Hampshire's Seacoast Region, and it is the Strafford County seat. The following are some of Dover's key demographic characteristics, based on the 2000 U.S. Census:

- Population: 26,884 (a 7.4% increase over the 1990 population)
- Housing Units: 11,924 (an average of 2.3 residents per household)
- Median Income: $ 23,459 per capita

  $ 43,873 per household
- Employment: 14,816 (a 7.3% increase over 1990 employment)

Downtown Dover

Dover has a vibrant and successful downtown, with many land use and development advantages. It has a historic, dense downtown with a concentration of housing, retail, and employment, both private and public sector. Downtown Dover also has natural resources in the Cochecho River and riverfront park spaces. Finally, Dover has the potential for significant expansion of its downtown on the Riverfront parcel.

The mix of land uses in downtown is critical to Dover's success. Downtown Dover has a dense concentration of residential, retail, and employment that creates a "virtuous cycle." Residents and downtown employees patronize downtown businesses. This interaction creates foot traffic and an active downtown business district. The mix of residents and employees produces activity for a full 16-hour day.

This enables businesses to be successful, and facilitates a vibrant downtown. This reinforces Dover's success, and makes it more attractive to residents, employers, and retail businesses. These factors contribute to Dover's healthy tax base, which enables the City to provide excellent services, further enhancing the virtuous cycle.

Downtown Dover is currently experiencing a high level of success, particularly in the retail sector. Retail occupancy in the downtown business district is so high, at approximately 93%, that new businesses often have difficulty finding space.

Dover also has a large public sector anchoring its downtown employee base. The City of Dover is the second largest employer in Dover, with over 1,100 employees, many of them based in City Hall and the City Hall Annex on Locust Street. In addition, Dover is the Strafford County seat, which adds many county employees. In total, the public sector accounts for about 13% of Dover's approximately 15,000 jobs, and many of the public sector jobs are based in the downtown.

Dover's downtown private (non-retail) employment is currently not as robust. In 2000, the largest employers in Dover were (in order) Liberty Mutual, the City of Dover, Wentworth-Douglass Hospital, Heidelberg Harris, Foster's Daily Democrat, Cambridge Tool North, EAD Motors, and DT Magnetics. Of these, only the City of Dover and Foster's Daily Democrat are based in the downtown study area. Several of the others, including the Wentworth-Douglass Hospital, are near the downtown study area, but not near

enough for an easy walk to the retail core. Liberty Mutual, Dover's largest employer, used to be based in downtown Dover, but in 2000 it moved out of the downtown.

The major non-retail private employment centers in the downtown study area are the two large mills, the Cocheco Falls Mill and the One Washington Center mill. The Cocheco Falls Mill contains approximately 380,000 gross square feet, and provides prime office space as well as a small amount of accessory retail. It is currently 52% occupied, with 110,000 square feet of leasable office space available. The mill currently houses about 500 – 600 employees, but it can accommodate up to 1,100 – 1,200.

The Cocheco Falls Mill was 95% occupied by Liberty Mutual until 2000. At that point, Liberty Mutual moved out of the mill to its current location in northern Dover on Sixth Street at Indian Brook Drive, adjacent to Spaulding Turnpike Exit 9. Liberty Mutual remains Dover's largest employer, with almost 1,200 employees, but those employees are no longer situated in downtown.

The One Washington Center mill contains 280,000 gross square feet, with a mix of industrial office, warehouse, and light manufacturing space, as well as a small amount of accessory retail. One Washington Center is currently fully occupied.

Table 2-12 summarizes the land uses in the downtown study area. The information on the commercial land uses and square footage was obtained from Dover Main Street, information about downtown residential units was obtained from the Dover Planning Department.

The land uses in the study area total approximately 2.5 million square feet, assuming that each residential unit averages 1,500 square feet. The principal components of downtown land use are residences, office space, retail stores, and restaurants. Table 2-12 also shows the estimated trip generation and parking demand that would be expected to result from these land uses, based on industry standard trip generation rates and parking generation rates from the Institute of Transportation Engineers (ITE). However, it is likely that these trip rates and parking demand rates would be reduced by the sharing of trips that would occur between the various land uses in downtown Dover. For example, downtown employees would park and visit the coffee shop by foot on their way to the office, thereby generating only one automobile trip, rather than two (one office trip and one coffee shop trip).

Table 2-12 Existing Downtown Land Uses and Trip Generation

	Size		Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips			Parking Demand
				Entering	Exiting	Total	Entering	Exiting	Total	
Office	626,500	sq ft	7,863	890	129	1,018	233	1,072	1,305	1,748
Retail & Restaurant	500,300	sq ft	31,681	964	822	1,786	1,489	1,255	2,744	1,986
Residential	678	units	5,522	98	329	427	352	200	553	820
Education	192,900	sq ft	2,953	481	396	877	144	139	284	193
Culture & Recreation	70,800	sq ft	1,142	39	33	72	36	44	80	247
Light Industrial	86,400	sq ft	429	32	7	39	10	30	41	241
Total	**2,493,900**	**sq ft**	**49,590**	**2,504**	**1,716**	**4,219**	**2,265**	**2,741**	**5,006**	**5,236**

ITE Land Use Codes:
Office: # 710 – General Office
Retail: # 820 – Shopping Center
Restaurant – # 932: High-Turnover (Sit-Down) Restaurant
Residential: 50% Units: #210 – Single-Family Home
50% Units: # 220 – Apartment
Education: #522 – Middle School and #565 – Day Care Center
Culture & Recreation: # 495 – Recreational Community Center, #560 – Church, #420 – Marina
Light Industrial: #150 – Storage / Warehouse

Based on the ITE trip generation estimates, the land uses in the downtown study area are expected to generate approximately 50,000 vehicle trips per weekday, including 4,200 during the morning peak hour and 5,000 during the afternoon peak hour. Comparing these volumes to the total peak hour traffic volumes (as shown in the origin – destination matrix in Table 2-4), the total afternoon peak hour traffic volume in downtown Dover is approximately 10,200 (5,000 vehicles entering and 5,200 vehicles exiting). This suggests that approximately 50% of the traffic in downtown Dover is generated by the land uses contained therein, while 50% is traffic that is merely passing through downtown Dover with no destination.

Riverfront Development

The Riverfront development parcel is an important component of the downtown's future. The Riverfront development site is a 30-acre city-owned parcel across the Cochecho River from the eastern end of Washington Street. Much of the site is occupied by granite ledge outcroppings, but there are several sections that can support development, including a large level area adjacent to the Cochecho River. The Riverfront parcel, and the developable sections of the parcel, are shown in Figure 2-19.

The Riverfront parcel previously housed a sewage treatment plant and a recycling facility, but these have been demolished. The only uses that remain on the Riverfront parcel are a pump station, a storage building, and parking. The pump station is directly across the Cochecho River from the eastern end of Washington Street, and it blocks the logical extension of Washington Street, but it must remain in place, although the storage building can be removed. The parking spaces lie along River Street, and are owned by the City of Dover, though the One Washington Center Mill has a long-term lease for the exclusive use of the spaces. Although the City is not required to provide parking for the One Washington Center Mill, this parking must be provided somewhere in a convenient location.

The Riverfront development offers Dover many exciting opportunities, including:

1. **Economic Benefits.** The potential economic benefits to the City of Dover are significant. Since the City owns the land, it would realize revenues from the sale or lease of the property. The City would also benefit from ongoing tax revenues.
2. **Physical Expansion of Downtown.** A concentrated mixed-use development like the one proposed would be economically and physically related to Dover's existing downtown. The new development in the southeast quadrant of downtown would attract pedestrians and activity along Washington Street to the river.
3. **Enhanced Relationship between Downtown and the Cochecho River.** The Cochecho River runs through the middle of downtown Dover, but the significant riverfront open spaces are at the edges of downtown, on the west side near First Street and in the southeast adjacent to Henry Law Avenue. The Riverfront development could create more useable open space along the Cochecho River. If the Riverfront development is also able to attract more development along Washington Street, this could strengthen the connection between downtown and the open spaces adjacent to Henry Law Avenue.

However, the Riverfront development faces some challenges, many of which are transportation-related:

1. **Limited Roadway Access.** The vehicular bridge that once connected the eastern end of Washington Street to the riverfront development parcel was removed in the late 1970s. It was replaced with the existing pedestrian bridge in the mid-1990s. With the elimination of the roadway connection to Washington Street, the roadway access to the Riverfront development

parcel is limited to only one major access road, Henry Law Avenue. Henry Law Avenue can be accessed from the east via Back Road, or by local residential streets that connect to Route 108, but these routes are circuitous. Principal access to Henry Law Avenue is via the congested Lower Square intersection. As a result, there may be significant access benefits to restoring a roadway bridge connecting the eastern end of Washington Street to the Riverfront development parcel.

2. **Downtown Circulation Pattern.** Downtown Dover's one-way loop could pose access challenges for the Riverfront development. The Riverfront parcel is located near the corner of the one-way loop at Washington Street / Main Street. Even if the Washington Street bridge were restored as a vehicular connection to the riverfront parcel, the two major vehicular connections, Washington Street and Henry Law Avenue, would still require circulation around the one-way loop to enter and exit the site.

3. **Displacement of Existing Parking.** The Riverfront development parcel currently accommodates a significant amount of parking for downtown employees. When the Riverfront parcel is developed, this parking supply must be replaced in some form, at the same time that the new parking demand from the Riverfront development must be satisfied.

The Riverfront development site has been the focus of on-going planning efforts. The following is a brief summary of the recent (since 1990) Riverfront land use planning to date.

1990 The Cochecho Waterfront Task Force. The Dover City Council appointed the Waterfront Task Force to recommend a plan for the Riverfront parcel. The Task Force's recommendations, which were released in 1991, included the following principal elements:

- Riverfront park space
- Active recreational uses (boating, playing fields, ice rink, basketball)
- Residential development
- Historical and cultural uses
- Parking (both surface parking and a parking garage)
- Washington Street vehicular bridge

Many of these recommendations have been retained in later planning efforts.

1994 The Cochecho Riverwalk. As a short-term step in improving the Cochecho Riverfront waterfront, the City of Dover and the Greater Dover Chamber of Commerce planned and developed the Riverwalk and the Henry Law Park improvements. These improvements include a paved walk along the river, benches, improved landscaping, a fence between the path and the river, and rebuilt parking areas. These improvements were completed between 1994 and 1998.

1996 The Cochecho Riverfront Partnership / Design Charrette. In 1996, the Cochecho Riverfront Partnership participated in a design "charrette" to further develop the Riverfront plan. The charrette developed two planning concepts, Low Density and Moderate Density. These included the following elements:

Concept 1 – Low Density
- Riverfront park space
- Boating
- Residential development
- Historical and cultural uses
- Mixed-use development on the western side of the Cochecho River
- No vehicular bridge

Concept 2 – Moderate Density
- Riverfront park space
- Boating
- Residential development
- Community-oriented uses
- Hotel and conference center
- Parking
- Washington Street vehicular bridge

2002 Chamber of Commerce Planning Study. In 2002, the Greater Dover Chamber of Commerce hired AG Architects to do more detailed planning and economic analysis of the Riverfront development. The recommended plan included the following elements:

- Riverfront park space
- Recreational and boating
- Mixed-use development (totaling 270,000 – 360,000 square feet) with the following elements
  - Residential
  - Office
  - Retail
- Parking
- Washington Street vehicular bridge

The economic analysis of this development scenario indicated that the public realm improvements required to facilitate the Riverfront development (including building the vehicular bridge, moving the pedestrian bridge, the boat launch, parking, roads and utilities) would cost roughly $4.5 million (in 2002 dollars). Assuming an assessed value of $100 per square foot of building area and a tax rate of $24 / $1000 of assessed value, the Riverfront development would generate roughly $648,000 to $864,000 in new taxes annually. This would result in a simple payback period of 5.2 to 7 years for the public improvements.

2004 Cochecho Waterfront Development Advisory Committee. In 2004, the Dover City Council appointed a new Cochecho Waterfront Development Advisory Committee (CWDAC). The CWDAC is charged with review and updating previous planning efforts for the Riverfront. In the fall of 2004, the CWDAC issued an updated "Cochecho Waterfront Design Charrette" that described the committee's vision for the development. The CWDAC preferred concept for the Riverfront development is based principally on the 1996 Design Charrette, and combines characteristics of the two proposed concepts (i.e. the "Low Density" and the "Moderate Density" concepts). The preferred concept recommends the following elements:

- *Creation* of public gathering places along the river's edge for community functions and meeting space.
- *Construction of a vehicular* bridge with pedestrian access linking Washington Street to the City property.
- *Study the possible* discontinuation (or conversion to one way) of River Street at Henry Law Avenue.
- *Continuation* of the Riverwalk from Henry Law Park to Maglaras Park and adjacent public properties.
- *Provide the opportunity for* public/private boating facilities and points of interest.
- *Development of mixed-use* (shops, offices, apartments) structures set back from the river and facing the Riverwalk and including detailed landscaping.
- *Incorporate the former* County Administration building into any overall site design plan.

- *Construction* of an inn consistent with the scale and overall vision of the project.
- *Development of* housing clusters, where appropriate, consistent with the scale and overall vision of the project.
- *Relocation of* the pedestrian bridge to accommodate pedestrian access the area.
- *Redevelopment* of properties along Portland, Main, Water, Washington and Cochecho Streets that incorporates mixed uses and is consistent with waterfront/downtown architecture with an emphasis on the historic waterfront area.
- *Encourage* the creation of a walkway on the westerly shore of the river linking the One Washington Center building with the pedestrian bridge and properties fronting on the river from Washington Street to the existing marina.
- *Provide* increased parking facilities as appropriate on the west side of the river, and minimize the visual impact of parking areas on the east side.
- *Development* of a number of walking paths throughout the property, providing a linkage between riverfront uses and cultural/historical and recreational uses in the areas further away from the river.

The Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan's analysis of the Riverfront development's needs and impacts builds upon these plans and proposals. It incorporates the principles for access and downtown planning from all of these previous efforts. The technical analyses for the Riverfront development parcel are based most closely on the 2002 Greater Dover Chamber of Commerce Planning Study. This study includes the most specific land use recommendations (which helps to facilitate the technical analysis), it was the most recently available planning effort when the Downtown / Riverfront Plan began the technical analysis, and the development assumptions in this plan are more extensive than the subsequent CWDAC vision, which ensures a conservative analysis.

2.9 Downtown Travel Survey

The Downtown / Riverfront study also entailed a detailed stated-preference survey of travel behavior by a varied sample of downtown Dover residents, employees, shoppers, business owners, and others. Surveys were distributed via email and the on-line by the Dover Planning Department; in addition, paper surveys were distributed through City Hall departments, the Greater Dover Chamber of Commerce, and Dover Main Streets. The survey was conducted between December 2003 and April 2004, and a total of 362 people completed and returned surveys. The survey form and detailed results of the surveys are included in Appendix H. The results of these surveys were compiled and they are summarized in Table 2-13.

Table 2-13 Downtown Travel Survey Summary

Trip Purpose/Visitor Type		
Resident	37%	• Evenly split: residents/shoppers/others (mostly employees)
Shopper	34%	• Some responses suggest residents may be area residents in town to shop
Office Employee	13%	
Business Employee	5%	
Business Owner	4%	
Other	7%	
Time of Arrival		
Before 10:00 AM	38%	• 79% of business owners, employees, office employees arrive before 10:00
10:00 AM-12:00 PM	21%	• 67% of shoppers arrive after noon
12:00 PM-4:00 PM	26%	• 44% of residents arrive before 10:00
After 4:00 PM	15%	
Length of Stay		
0-1 hour	49%	• 63% of residents stay less than 1 hour
1-2 hours	22%	• 54% of shoppers stay less than 1 hour
2-4 hours	5%	• 52% of business owners and employees and office employees stay 8 hours or more
4-8 hours	9%	
8 hours +	16%	
Number of Destinations		
1	34%	• User groups fairly similar
2	37%	• 68% of business owners and employees and office employees have 1 or 2 destinations
3	21%	• 72% of shoppers have 1 or 2 destinations
4	3%	
5+	5%	
Mode of Travel		
Drive	97%	• Almost all people drive into the downtown area (survey conducted December through April)
Walk	2%	
Bike	1%	
Route of Entry		
Central Ave. NB	27%	• Fairly even split between roadways for employees and business owners
Central Ave. SB	16%	• Most shoppers (56%) use Central Avenue northbound or southbound
Dover Point Road	14%	• Most residents (60%) use Central Avenue and Dover Point Road to access the downtown area
Silver Street	12%	
Washington Street	9%	
Sixth Street	9%	
Portland Avenue	7%	
Broadway	5%	
Fourth Street	2%	
Trip Length		
0-5 miles	63%	• The majority of people are driving from short distances away.
5-10 miles	16%	• 82% of residents travel 0-5 miles
10-15 miles	9%	• 49% of shoppers travel 0-5 miles
15-20 miles	6%	• 45% of business owners and employees and office employees travel 0-5 miles
20 miles+	6%	• Employees in the area tend to travel from farther away (32% travel from 10+ miles away)

Type of Parking Permit		
None	85%	• Most shoppers (97%) and residents (90%) have no parking permits
Employee	9%	• 49% of employees and business owners have parking permits
Municipal	4%	
Resident	2%	
Number of Times Circulating One-Way Loop		
0	54%	• Most people do not go around the one-way loop more than once
1	30%	• Only 7% of employees or business owners go around more than one time
2	10%	• 16% of residents go around more than once
3	2%	• 23% of shoppers go around more than once
4	1%	
5+	0%	
Unknown	4%	
Type of Parking Space		
On-Street (non-metered)	53%	• 85% of shoppers park on-street
On-Street (metered)	17%	• 78% of residents park on-street
Off-Street (Public)	18%	• 72% of employees and business owners park in lots off-street, either private or public
Off-Street (Private)	12%	
Aware of Parking Validation Program		
No	64%	• Most people (64% residents and 74% shoppers) are not aware of the validation program
Yes	35%	• 57% of employees are aware of the program
Yes-Used it this trip	1%	
Time to Find Parking		
0-5 minutes	82%	• Most people are able to find parking quickly
5-10 minutes	12%	• All employees and business owners were able to find parking in less than 10 minutes
10-15 minutes	4%	• 93% of shoppers and residents were able to find parking in less than 10 minutes
15-20 minutes	1%	
20 minutes+	0%	
Difficulty of Finding Parking		
1-Easy	57%	• Most people find it fairly easy to find parking
2	16%	• For employees and business owners, the average difficulty level is 1.6
3	15%	• For shoppers, the average difficulty level is 2.0
4	7%	• For residents, the average difficult level is 1.9
5-Difficult	5%	
Length of Walk to Destination from Parking Space		
0-1 minutes	61%	• 94% of all employees and business owners can walk to their destination within 4 minutes
2-4 minutes	32%	• 90% of residents and shoppers can walk to their destination within 4 minutes
5-9 minutes	6%	
10-14 minutes	1%	
15 minutes +	0%	
Number of Times Visited Downtown Dover		
1	6%	• Most have visited Dover many times before
2	1%	• 86% of employees visited many times
5	4%	• Only 2% of shoppers have been to Dover many times before
10	1%	
More	88%	
Visit Again?		
Yes	99%	• Almost all people will visit Dover again
No	1%	

Of the respondents, 37% were residents of Dover, 34% were shoppers, and 22% were employees or store owners in the area. The majority of the people surveyed (38%) arrived downtown before 10:00 AM. Most people (49% of those surveyed) were planning on staying downtown for one hour or less, while only 16% were staying for longer than eight hours. Many people (71%) were only visiting one or two destinations in the area.

Driving into the city was the mode of choice, as 97% of people surveyed drove in to the city. People entered the city via a variety of routes, but Central Avenue northbound (27%), Central Avenue southbound (16%), and Dover Point Road (14%) were the most popular routes. Most people were not traveling from long distances, as 63% of people surveyed were five miles or less from their origin.

The majority of people surveyed (82%) found parking fairly easily, within five minutes or less. Only one percent of those surveyed took from 15 to 20 minutes to find a space. On a scale of one (least difficult) to five (most difficult), most people (57%) rated the difficulty of finding a parking space a one. Many of the people surveyed found a parking space within a one minute walk of their destination.

Of the various user groups, shoppers had the most difficulty finding parking, rating the difficulty of finding a space an average of 2.0. Twenty-three percent of shoppers circled the downtown loop more than once, compared to 7% of employees and business owners. This is to be expected, since shoppers are more likely to be only occasional visitors to downtown, they do not have reserved parking, and they are highly likely to park on the street (85% of shoppers responding to the survey parked on the street).

Most people (85%) entering the downtown area did not have a parking permit. The remaining 15% had either a resident, municipal, or employee parking permit. Most people (53%) were parked in on-street, non-metered spaces; another 17% in on-street, metered spaces; 18% in off-street, public lots; and the remaining 12% in off-street, private lots. Many of the people traveling to the area (64%) were unaware of the parking validation program. Only one percent of those surveyed actually used the validation program in their trip.

3.0 Alternatives Analysis

The Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan process included an extensive analysis of improvement alternatives. Based on the plan's goals and objectives, as well as input from agencies and the community, the key issues and problems were identified for the various elements and transportation modes in the downtown study area. Based on these issues, a series of design alternatives were proposed and evaluated, taking into account physical feasibility, benefits and impacts for the various transportation modes (motor vehicle traffic, parking, transit access, and pedestrian and bicycle accommodation), and development benefits.

This section describes the future no-build conditions; identifies the evaluation criteria that are used to assess the benefits and impacts of the proposed alternatives; and the alternatives evaluation process for the downtown Dover transportation system. The alternatives analysis process addresses each of the modes and dimensions of the downtown Dover transportation system: motor vehicle traffic, truck traffic, parking, public transportation, pedestrian access, bicycle accommodation, and development impacts. For each of these, the key issues that the alternatives must address are identified, a series of improvement alternatives are proposed, and the alternatives are evaluated.

3.1 No-Build Conditions

In order to evaluate the benefits and impacts of the various alternatives, they must be compared to each other, as well as to an appropriate baseline condition. This baseline condition, known as the no-build condition, reflects the status of Dover's downtown study area if there were no changes associated with this study.

The no-build condition is typically assumed to be in an appropriate future year. By analyzing the no-build conditions and the potential improvement alternatives in a future year, the study identifies the future impacts of the "do-nothing" alternative, and the study recommendations are forward-looking. These recommendations accommodate natural growth in travel demand, and take into account any major changes in land use or changes to the transportation system. For Dover's Downtown and Riverfront Plan, which analyzes significant changes to downtown circulation and to land use in the downtown study area, a ten-year planning horizon to 2014 was assumed. This planning horizon is consistent with that of the 2003 *Central Avenue Traffic Signal Coordination Evaluation.*

The future no-build condition includes general "background" traffic growth related to new development and new trip-making in and around the study area. As shown in Section 2.2.1, traffic in the downtown study area has been growing at an average rate of 1% per year for the last ten years. This was also the growth rate that was assumed in the 2003 *Central Avenue Traffic Signal Coordination Evaluation*. Therefore, the downtown study includes a 1% annual traffic growth rate from the 2004 base year to the 2014 horizon year.

The future no-build condition also includes any changes to the transportation system in the area that are expected to happen irrespective of the Arborway Master Plan. The following are the major changes to Dover area transportation system that are expected to be in place by the 2014 horizon year:

- **Central Avenue Traffic Signal Coordination.** The 2003 *Central Avenue Traffic Signal Coordination Evaluation* recommends changes to traffic signal timing and signal coordination along the Central Avenue corridor through downtown Dover. These changes are currently being

implemented, and they are reflected in both the 2004 existing condition and in the 2014 no-build condition.

- **Washington Street Bridge.** The City of Dover, working with NHDOT, will restore a vehicular bridge over the Cochecho River at the eastern end of Washington Street. This bridge will connect Washington Street and downtown Dover with River Street and the Riverfront development parcel. This project is one of Dover's top priorities, and is critical to providing access to and from the Riverfront parcel, as shown in Section 3.3 below. NHDOT has approved the project and the funding, and the City of Dover has allocated the local match. It is expected that bridge design will begin in 2005, and that bridge construction will be complete by 2007.

The 2014 no-build condition does not assume that major new developments or land use are in place in the study area. The 1% background traffic growth reflects relatively minor land development and increased building occupancy within the study area, along with land development outside the study area and general increases in travel and traffic. However, major developments and land use changes in the downtown study area, such as the Riverfront development, full occupancy of the Cocheco Falls Mill, and significant increases in downtown development, are evaluated separately and in detail in Section 3.3.

3.2 Transportation Improvement Alternatives

This section summarizes the key transportation issues and problems in downtown Dover, the improvement alternatives that have been proposed to address these issues, and the benefits and impacts of these alternatives. The key issues are based on surveys of field conditions, quantitative analysis (including traffic volume counts, pedestrian counts, and parking counts), and input from study participants. The alternatives were proposed by various study stakeholders, including City of Dover staff, Transportation Advisory Commission (TAC) members, participants from the general public, and members of the consultant team.

3.2.1 Motor Vehicle Traffic

The following are the key issues related to motor vehicle traffic, and the improvement alternatives that have been proposed and evaluated in order to address these issues.

Downtown One-Way Loop

The downtown one-way loop is the central focal point of Dover's radial street system. Due to the central location, heavy traffic volumes, and critical circulation characteristics of the downtown one-way loop, many of downtown Dover's traffic and circulation issues relate to the downtown one-way loop and its intersections. Figure 3-1 shows the downtown one-way loop existing circulation pattern.

Like other one-way circulation systems, Dover's downtown one-way loop has advantages and disadvantages.

One-Way Loop Advantages

- **Efficient Traffic Operations.** One-way circulation tends to reduce the number of traffic movements and conflicts at intersections, resulting in more efficient traffic operations. This enables motorists to drive to the downtown one-way area more quickly and easily.

- **Higher Traffic Speeds.** With more efficient traffic operations, traffic experiences less delay, vehicles can travel at higher speeds, and the roadway system can accommodate higher traffic volumes.

- **More On-Street Parking.** There is typically less width required for vehicular travel lanes. The reduction in conflicting traffic movements at intersections enables the traffic signal cycles to be simpler and more efficient. This reduces the need for turning lanes and queuing distance. This leaves more room for on-street parking.

One-Way Loop Disadvantages

- **Indirect Traffic Circulation.** Traffic circulation is less direct, and can be confusing, especially to drivers unfamiliar with the area.

- **Concentrated Traffic Volumes.** Because vehicles must travel further through a one-way circulation system, vehicular flows overlap on segments of the loop. This results in higher traffic volumes on some segments of the loop.

- **High Traffic Speeds.** Travel speeds tend to be higher with one-way circulation than with two-way circulation.

- **Attraction of Through-Traffic.** By reducing traffic conflicts and increasing traffic speeds, one-way circulation patterns can attract through-traffic that would otherwise use an alternate route that may be more appropriate for through-traffic.

- **Negative Impacts on Businesses Due to Reduced Pass-By Traffic.** The one-way circulation pattern only passes a given segment of the loop in one direction. As a result, drivers only pass a given business while traveling in one direction, which reduces the opportunities that storefront retail businesses have to capture "pass-by" customers. Coupled with faster speeds, this reduction in pass-by traffic can have negative impacts on retail businesses.

In order to further understand the issues related to one-way versus two-way street systems, a literature review was conducted. The principal documents reviewed included the *Traffic Study and Business Vitality Analysis for Dover's Downtown One-Way Loop* (C & C Consulting Engineers, 2003) and the *Survey of Communities Converting Downtown Streets from 1-Way to 2-Way Circulation* (Hyannis Main Street Business Improvement District study, December 1999).

The *Traffic Study and Business Vitality Analysis for Dover's Downtown One-Way Loop* reviewed the traffic circulation in the downtown one-way loop and evaluated the traffic impacts of converting the one-way circulation pattern to a two-way circulation pattern. Based on the study's analysis, the existing one-way circulation pattern (with signal timing improvements) performed better than a circulation pattern in which all legs of the downtown loop were converted to two-way. It therefore recommended that the existing one-way circulation pattern be retained. This is a reasonable conclusion as far as the analysis went; however, there were some issues with the alternatives and the assumptions underlying the study's analysis.

- The study considered a limited range of alternatives. These included the existing one-way circulation pattern, a circulation pattern that converts all the legs of the downtown loop to two-way, and minor adjustments to these two alternatives.

- The study did not consider alternatives that changed only some legs of the downtown loop to two-way circulation; access restrictions; or turn restrictions.

- While the study did evaluate the impact of restoring the Washington Street Bridge and introducing traffic from the Riverfront development, it did not consider the qualitative accessibility issues related to Riverfront parcel access via the existing one-way circulation pattern.

The *Survey of Communities Converting Downtown Streets from 1-Way to 2-Way Circulation* was prepared by the Hyannis Main Street Business Improvement District (HMSBID) in December 1999 in order to provide supplementary information on whether to convert Hyannis downtown streets from one-way circulation to two-way. This survey solicited input from 22 cities and towns from around the United States, and was intended to provide economic and "quality of life" information to supplement analysis of the traffic impacts of such a change.

The HMSBID survey yielded responses that were almost universally positive about one-way to two-way conversions. The major benefits that were cited by most surveyed communities were:

- Improved business climate and reduced vacancy rates

- Increased downtown investment

- Better distribution of traffic

- Better pedestrian access

- Reports of improved "livability" and "sense of community"

The following is a summary of the cities and towns surveyed, and some of the key findings of the survey.

Table 3-1 Downtown One-Way Versus Two-Way Circulation Survey Summary

Municipality	Population	Year Changed	Street Width	Vacancy Before	Vacancy After	Notes
Anniston, AL	26,400	1997	59 / 38	6 %	1%	Merchants very positive about change
Buffalo, NY	328,000	1996				First conversion (Chippewa St) so successful others planned
Charleston, SC	95,000	1996				Increased retail activity, but also increased congestion
Dubuque, IA	60,000	1998	40			Merchants advocated change to attract business
Gardner, MA	22,000	1993	40		10%	Merchants advocated change, has been successful
Green Bay, WI	97,000	1997	31-36			Change has dispersed traffic, improved retail access & exposure
Hickory, NC	36,000	1999	30			Downtown more "user-friendly," new businesses, no congestion issues
Lafayette, IN	50,000	1994	44			Retail improved, through-traffic reduced so that some signals removed
Lubbock, TX	191,000	1995				Retail increase after years of decline; other conversions planned
Mansfield, OH	51,000	1996				Business increased, easier for visitors
Milwaukee, WI	650,000	1997				Very successful, more user friendly, calmed traffic, improved flow
New Haven, CT	126,000	1997				Visitors more comfortable, public wants more 2-ways
North Little Rock, AR	61,000	Construction	46	75%	60%	Announcing 2-way attracted investment, new businesses
Sheridan, WY	14,000	1994	50	25%	< 5%	Very successful, increased investment, tourist friendly
Toledo, OH	323,000	1998				Excellent results, vacancy down, increased investment
Wailuku, HI	14,000	1997	52			Positive response from businesses and public
Walla Walla, WA	29,000	1991				1-way circulation unpopular, more investment since 2-way conversion
Washington, MO	11,500	1990	33-36	30%	2%	Well-received by merchants and residents, major vacancy reduction
West Palm Beach, FL	85,000	1993	39	80%	< 5%	$10 million in public investment, $300 m private
Woonsocket, RI	44,000	1997		50%	20%	Merchants initially concerned about parking, congestion, but now favor plan
York, PA	43,000	1998	52			Merchants advocated plan – reduced speeds, improved access, reduced through-traffic

Although the communities surveyed reported significant benefits in converting from one-way to two-way circulation, several issues should be kept in mind:

- These were fairly qualitative surveys, without thorough quantitative analysis.
- The circulation changes were frequently coupled with streetscape improvements and other revitalization measures that could enhance the likelihood of success.
- The respondents were generally municipal representatives, who may have an interest in the success of the one-way to two-way conversion.

The following are some of the key issues at the intersections in the one-way loop.

Lower Square (Central Avenue / Washington Street). Lower Square is the most critical intersection in the downtown Dover study area. Lower Square is located in the center of downtown, adjacent to the mills, the retail district on Central Avenue, the civic building district, and Henry Law Park. Dover's major radial roadways all lead into the downtown one-way loop. Central Avenue (Route 108), the principal roadway through Dover and the main commercial corridor, runs through the one-way loop. The following are the principal issues at Lower Square.

- **High Traffic Volumes and Congestion.** Dover's radial traffic pattern concentrates high volumes of traffic on downtown one-way loop, and particularly at Lower Square. Figure 3-2 shows how most of Dover's major radial roadways lead into Lower Square. This results in a total of 3,300 vehicles passing through Lower Square during the PM peak hour.

- **Poor Lane Assignment.** The heaviest traffic flows at Lower Square are the Central Avenue northbound and southbound movements. These two flows, the Central Avenue northbound right turn (required to continue northbound through the one-way loop) and the Central Avenue southbound through-movement, are each assigned a single travel lane at Lower Square. The lane assignment and proportional traffic volumes during the PM peak hour are shown in Figure 3-3.

- **Uncontrolled Traffic Movements.** Lower Square is a signalized intersection, but it has two significant traffic movements that are not controlled by the traffic signal. The Henry Law Avenue traffic must turn right onto Washington Street; the Henry Law Avenue approach is STOP-controlled, and therefore it is in conflict with Central Avenue northbound and Washington Street eastbound traffic that may have a green light. The Central Avenue southbound left turn to Washington Street is YIELD-controlled, and also in conflict with Central Avenue northbound and Washington Street eastbound traffic that may have a green light.

- **Difficult Pedestrian Access.** Since it is located at the center of downtown, adjacent to employment centers, retail and restaurant businesses, and residential neighborhoods, Lower Square is a crossroads for pedestrians as well as vehicles. Pedestrian volumes are high, but pedestrian crossings can be difficult, especially the Washington Street crossing on the east side of the intersection, which provides access to Henry Law Park. This crossing is very wide and there are very heavy volumes of opposing traffic (approximately 1,750 vehicles during the PM peak hour). In addition, many of these opposing vehicles are not controlled by the traffic signal, and therefore try to use the same gaps in the traffic that are intended for the pedestrians.

Upper Square. Upper Square is located at the northern corner of the downtown one-way loop, where the northbound and southbound traffic split. Upper Square, shown in Figure 3-4, is bounded by three intersections: Central Avenue / Broadway / Third Street, Main Street / Chapel Street, and Central Avenue / Second Street. The following are the principal issues at Upper Square:

- **Confusing Traffic Movements.** Upper Square is crossed by several traffic movements: Main Street to Central Avenue, Central Avenue to Chapel Street, Central Avenue southbound to Central Avenue northbound U-turn, and Central Avenue northbound left turn to Third Street. These movements cross Upper Square very close to one another, and can be confusing to unfamiliar drivers. The confusion is exacerbated by the presence of angle parking on both sides of Upper Square. In addition, the angle parking on the west side of the square is on the inside of a curve, which limits sight distance.

- **Closely-Spaced Intersections.** There are several closely-spaced intersections in Upper Square, including Main Street / Chapel Street, Central Avenue / Second Street, Central Avenue / Third Street, and Central Avenue / Broadway. This creates conflicts and adds to the confusion in

Upper Square. The intersections of Central Avenue / Broadway and Central Avenue / Third Street are particularly problematic because the two cross streets intersect Central Avenue at nearly the same point, but only Broadway is signalized. Third Street traffic is stop-controlled, and must turn right, which adds to the U-turn demand in Upper Square.

- **Lack of Useable Space.** The northbound – southbound roadway split leaves a large space in the middle of Upper Square. This space could be centrally located plaza, but Upper Square must accommodate several traffic movements that divide the plaza and make it unusable.

- **Difficult Pedestrian Access.** There are high traffic volumes, and many conflicting traffic movements that make pedestrian access through Upper Square difficult.

Washington Street / Main Street. The third intersection that forms the downtown one-way loop, Washington Street/Main Street, does not have a familiar name, like Upper Square and Lower Square. This lack of a name reflects this location's sense of being the "back end" of downtown Dover. The intersections of Washington Street / Main Street and Main Street / Portland Avenue are shown in Figure 3-5.

- **High Traffic Volumes.** Like at Lower Square, two of downtown Dover's major traffic flows overlap at Washington Street / Main Street: the Central Avenue northbound through-traffic flow and the Silver Street / Washington Street-to-Portland Avenue traffic flow.

- **Concentration of Northbound Traffic at Washington Street to Main Street Left Turn.** Because Central Avenue is one-way southbound between Upper Square and Lower Square, all of the downtown loop's northbound traffic must travel through this intersection. This concentrates the traffic bound for Portland Avenue, Broadway, Central Avenue, and Sixth Street at a single left turn.

- **Drivers Traveling Out of Their Way.** Many of the automobiles passing through this intersection are passing through Dover on Central Avenue, or have come to visit downtown and traveling to or from the Central Avenue commercial corridor on the other side of the loop. As a result, the intersection of Washington Street / Main Street is out of their way.

- **High Traffic Speeds.** Because they are traveling out of their way, and because there is very little opposing traffic at this intersection, drivers travel very quickly through the Washington Street / Main Street intersection.

- **Difficult Pedestrian Access.** The combination of high traffic volumes, high traffic speeds, and poor sight distance around the roadway curve makes the intersection difficult to cross and uncomfortable for pedestrians. This in turn contributes to the sense that the intersection of Washington Street / Main Street is the "back end" of downtown.

Main Street / Portland Avenue. All of the downtown one-way loop's northbound traffic turns left from Washington Street eastbound to Main Street northbound; at the Portland Avenue intersection this traffic splits. About 60% of the traffic continues northbound on Main Street toward Central Avenue northbound, while the remaining 40% turns right on Portland Avenue toward South Berwick, Maine.

- **Congestion and Delay for Portland Avenue Southbound Traffic.** Portland Avenue is a major route connecting Dover to Maine, and it carries significant traffic volumes. Most of the southbound Portland Avenue traffic enters Dover at the stop-controlled approach to Main Street.

Because the Main Street through-traffic volumes are high, this results in congestion, delay and queuing for Portland Avenue southbound traffic.

- **Difficult Pedestrian Access.** The northbound Main Street approach to this intersection has high traffic volumes with high speeds. This traffic splits between Main Street northbound and Portland Avenue northbound. These two traffic flows create conflict with pedestrians crossing Main Street and pedestrians crossing Portland Avenue.

Transportation Issues Related to the Riverfront Development

The Riverfront Development is a central element of the downtown study, and its transportation issues are a principal consideration in developing and evaluating alternatives for downtown transportation improvements. The two key dimensions of transportation planning for the Riverfront Development are capacity to accommodate the Riverfront Development's transportation demands, and accessibility to ensure that the transportation connections to and from the Riverfront Development are reasonable and convenient for all transportation modes.

Capacity

- **Traffic Capacity.** There are currently significant traffic volumes and traffic congestion in downtown Dover, especially along the Central Avenue corridor and at Lower Square. The Riverfront Development will add new land uses and new traffic that must be accommodated.

- **Parking Capacity.** New land uses will also create new parking demand. The Riverfront parcel currently accommodates parking demand from the One Washington Center Mill. This parking demand will need to be accommodated, along with added demand from the new uses associated with the Riverfront Development.

Accessibility

- **Traffic Access.** The Riverfront parcel is located immediately adjacent to downtown. However, the existing roadway system provides poor access to and from the Riverfront parcel. The following are the key disadvantages of the current roadway system in providing motor vehicle access to the Riverfront parcel.

    - **Lack of a Washington Street Vehicle Bridge.** The lack of a vehicular bridge at the eastern end of Washington Street prevents direct vehicle connections from downtown and from Dover's major roadways.

    - **Poor Access on Existing Roadway System.** Without a Washington Street bridge, motor vehicles traveling to and from the Riverfront Development would have to rely on River Street, Henry Law Avenue, and Hanson Street. All of these are minor streets with relatively low capacity. The River Street approach to Henry Law Avenue is unsignalized, and has poor vertical sight distance to the south. Henry Law Avenue is residential, and its approach to Lower Square is unsignalized. Hanson Street is residential, has a steep slope, and its approach to Central Avenue has a low capacity due to the high traffic volumes on Central Avenue.

    - **One-Way Loop Circulation is an Obstacle.** The one-way loop circulation creates challenges for access to and from the Riverfront parcel, even if it is assumed that a new Washington Street vehicle bridge is in place.

The following are the different options for access to and from the Riverfront parcel, assuming that the downtown loop remains one-way (or principally one-way, but with two-way circulation on Washington Street).

- **Existing Roadway Network, No Washington Street Bridge.** With the existing roadway network, northbound exiting traffic (heading toward Central Avenue, Broadway, Sixth Street, Portland Avenue, or even Washington Street) must enter via Henry Law Avenue and circulate through the one-way loop. This is a very indirect route, especially for traffic bound for Central Avenue, Sixth Street, or Washington Street. This circulation pattern is shown in Figure 3-6.

- **Washington Street Bridge, One-Way Loop.** Assuming that a new Washington Street vehicular bridge is in place, the current one-way loop circulation still creates difficulties for Riverfront Development access, as shown in Figure 3-7. Access to the one-way loop would be much more direct across the Washington Street Bridge than via Henry Law Avenue; however, circulation around the one-way loop would still be indirect for many connections. In addition, the left turn from Washington Street to Main Street is very heavy because it accommodates all northbound traffic passing through Lower Square: the traffic heading for Portland Avenue, Broadway, Central Avenue, and Sixth Street. As a result, there is little additional capacity at the intersection of Washington Street / Main Street to accommodate Riverfront Development traffic.

- **Washington Street Bridge, Two-Way Washington Street.** In order to address the one-way loop's indirect connections to the Riverfront Development, Washington Street only could be made two-way, as shown in Figure 3-8. The remainder of the current one-way loop circulation pattern could be retained. However, this would also retain the heavy left turn volume from Washington Street to Main Street (1,750 vehicles in the PM peak hour). The intersection of Washington Street / Main Street cannot accommodate this heavy left turn movement as well as two-way traffic on Washington Street, as discussed below.

- **Washington Street Bridge Alignment.** Washington Street has a straight east – west alignment between Lower Square and its eastern terminus near the Cochecho River. The previously existing bridge continued this alignment across the Cochecho River, and its abutments remain. The new pedestrian bridge is in the same alignment, and rests on the old vehicular bridge abutments. However, the sewer pump station is at the end of this alignment on the eastern side of the Cochecho River, adjacent to the Riverfront parcel. The general placement of the bridge (at the eastern end of Washington Street, connecting Washington Street to the Riverfront parcel) is fixed, but there are two principal alternatives for the specific alignment of the bridge.

  - **Direct Connection.** This alternative would extend the new Washington Street Bridge in the same east – west alignment as Washington Street and the original bridge. This would have the advantages of having the shortest crossing (and therefore the shortest bridge span), and may enable the new bridge to use the old bridge abutments. It would have the disadvantages of requiring that the pedestrian bridge be relocated, and aligning directly with the sewer pump station, which would be the "gateway" to the Riverfront parcel.

  - **Angled Alignment.** The new Washington Street Bridge could be angled to the north as it crosses the Cochecho River, so that it lines up with the existing roadway extending toward Maglaras Park. This would have the advantages of providing a more attractive entry to the Riverfront parcel, and may enable the existing pedestrian bridge to be retained. It has the disadvantages of requiring a longer span and construction of new bridge abutments.

- **Pedestrian Access.** The Riverfront parcel is a short walk from downtown Dover: it is only ¼ mile from Lower Square at the center of downtown. However, this ¼ mile stretch of Washington Street is uninviting for the following reasons:

    - **Lack of Active Uses.** Washington Street between Lower Square and the Cochecho River does not currently have an active, downtown feel. The Cocheco Falls Mill does not have active uses along Washington Street. Henry Law Park and the Butterfield Gym could be more oriented toward the street. The only public uses that are oriented toward Washington Street are at the eastern end of the block, at the One Washington Mill.

    - **High Traffic Volumes and Speeds.** All of the one-way loop's northbound traffic is concentrated on this block of Washington Street. This traffic passes through the intersection at Main Street with no traffic controls and at high speeds. Although there is a pedestrian crossing of Washington Street at Main Street, cars typically do not yield to pedestrians, and crossing to the Riverfront parcel is difficult.

Improvement Alternatives – Central Downtown Loop

Based on the existing conditions analysis and the motor vehicle traffic issues that have been identified in the downtown loop, a range of roadway improvement alternatives has been proposed. These improvement alternatives specifically address motor vehicle traffic issues: circulation, traffic patterns, congestion, roadway and intersection design, and traffic controls (including traffic signals and stop or yield control at unsignalized intersections).

In addition to the issues that are related directly to traffic, there are certain other issues that are unavoidably connected to traffic circulation and intersection design. These issues include vehicular access to the Riverfront development and pedestrian accommodation at intersections.

Because the loop is central to downtown Dover's major traffic flows, and because the various elements of the downtown loop are interrelated, the downtown loop is evaluated as a unit. That is, each potential alternative for the downtown loop addresses all elements of the loop, and is independent of the other alternatives.

The evaluation below includes a total of seven different potential alternatives for the downtown loop. This does not include several other alternatives that were investigated and either rejected or combined with other alternatives to form one of the alternatives shown below. This wide variety of alternatives for the downtown loop is necessary in order to fully explore potential solutions for a complex system with many interconnected elements. It also demonstrates that the evaluation of the downtown loop circulation is comprehensive and thorough.

The following are the key priorities for traffic improvement alternatives in the downtown central loop:

- **Overall**

    - Improve access to the main commercial corridor along Central Avenue between Lower Square and Upper Square

    - Preserve on-street parking, especially along the main Central Avenue commercial corridor, and increase the on-street parking where possible

    - Improve access to the Riverfront parcel

- **Lower Square**
    - Reduce congestion, delay, and queuing
    - Improve lane assignment
    - Address approaches and movements (Henry Law Avenue, Central Avenue southbound left turn) that are not controlled by the signal, but are in conflict with signal-controlled movements
    - Improve pedestrian access
- **Upper Square**
    - Simplify traffic circulation, address confusing traffic movements
    - Address issues of queuing and conflict at the closely-spaced intersections
    - Improve pedestrian access
    - Create useable plaza space
- **Washington Street / Main Street**
    - Reduce the heavy volume of left turning traffic to enable access to and from the Riverfront parcel
    - Reduce high traffic speeds
    - Improve poor pedestrian access
- **Main Street / Portland Avenue**
    - Reduce congestion, delay and queuing on Portland Avenue southbound
    - Improve pedestrian access

The following is a brief description of the motor vehicle traffic alternatives. The no-build condition is shown in Figure 3-9, while the improvement alternatives are shown in Figures 3-10 to 3-16. Each alternative's circulation pattern, its characteristics, the way in which it addresses the downtown loops key issues, and its advantages and disadvantages are described in detail in the accompanying Tables 3-2 to 3-8.

Alternative 1 – Near-Term, Low-Cost Improvements – Lower Square and Upper Square Local Improvements. Alternative 1 includes a series of changes that can be implemented in the short-term, with relatively low cost. Alternative 1 focuses on improvements to lane assignment and relief of congestion at Lower Square. It does not include major infrastructure or circulation changes. Alternative 1 preserves the existing one-way circulation pattern in the downtown loop, which essentially precludes convenient vehicular access to the Washington Street Bridge and the Riverfront parcel. Therefore, it is best considered as a short-term improvement, prior to opening the Washington Street Bridge and the Riverfront development.

Alternative 1A – Minimum Long-Term Improvements – Two-Way Washington Street. Alternative 1A is intended to be the minimum changes to the downtown loop that would accommodate access to and from the Riverfront parcel. Alternative 1A includes the improvements from Alternative 1 that reduce congestion at Lower Square and simplify Upper Square. In order to provide reasonable vehicular access to and from the Riverfront parcel, Alternative 1A converts Washington Street to two-way circulation between Lower Square and Main Street. This circulation pattern continues to send all of the northbound traffic (from Lower Square to Portland Avenue, Broadway, Central Avenue, Sixth Street) via the left turn from Washington Street to Main Street. This results in LOS F and heavy congestion at both Lower Square and the intersection of Washington Street / Main Street.

Alternative 2 – Downtown Loop Two-Way Circulation. Alternative 2 converts all three legs of the downtown one-way loop from one-way circulation to two-way circulation. In addition, Portland Avenue connects directly to Main Street as the main through-connection, and the segment of Main Street north of Portland Avenue becomes the stop-controlled minor street. As a result, the major traffic flows (the north-south through connection on Central Avenue and the Washington Street – Main Street – Portland Avenue connection) take the most direct route through the downtown loop. In addition, the major northbound traffic flows through the downtown loop are split at Lower Square between Central Avenue and Washington Street – Main Street – Portland Avenue. This reduces the Washington Street to Main Street left turn by about 60%, enabling traffic to and from the Riverfront parcel. Because Main Street does not serve any major regional traffic flows, traffic volumes in Alternative 2 drop drastically. Circulation at Upper Square remains somewhat confusing in Alternative 2.

Alternative 3 – Two-Way Circulation on Major Traffic Routes. Alternative 3 is a hybrid scheme that provides two-way circulation on the routes that satisfy major traffic flows through the downtown loop: Central Avenue and Washington Street – Main Street – Portland Avenue. Traffic connections along these routes are direct, and the main traffic volumes are split between these two routes instead of concentrated together. Main Street between Portland Avenue and Upper Square no longer satisfies an important regional traffic connection, and it becomes one-way southbound to satisfy local access. The Main Street – Portland Avenue connection becomes the through-connection, and the Main Street southbound approach is stop-controlled. A variation on this alternative was also analyzed, in which Lower Square was replaced with a roundabout; this roundabout experienced LOS F in the PM peak hour, with high levels of congestion and queuing, especially on the Central Avenue approaches.

Alternative 4 – One-Way Downtown Loop with Two-Way Washington Street – Main Street – Portland Avenue Connection. Alternative 4 retains the current traffic circulation in the downtown loop, with the exception of the Washington Street – Main Street – Portland Avenue connection. This connection becomes two-way, and Main Street – Portland Avenue becomes the through-connection at this point. Central Avenue between Upper Square and Lower Square remains one-way southbound, which preserves the angle parking along the main commercial corridor. Given this circulation pattern, the downtown one-way loop cannot accommodate the heavy northbound traffic flow from Lower Square to Broadway, Central Avenue, and Sixth Street. Therefore, it is assumed that this traffic flow is diverted to the Chestnut Street – Locust Street corridor, resulting in significant congestion along this corridor.

Alternative 5 – Reversed (Clockwise) One-Way Downtown Loop with Two-Way Washington Street – Main Street – Portland Avenue Connection. Alternative 5 creates a two-way connection along the Washington Street – Main Street – Portland Avenue corridor, and reverses the one-way circulation on both Central Avenue (which becomes one-way northbound from Lower Square to Upper Square) and Main Street (which becomes one-way southbound from Upper Square to Portland Avenue). This circulation pattern is designed to split the northbound traffic: approximately 60% continues directly north on Central Avenue, and 40% heads north from Lower Square to Washington Street – Main

Street – Portland Avenue. This provides northbound traffic with direct connections, enables access to and from the Riverfront parcel, and relieves congestion in the downtown loop. However, Alternative 5 forces southbound traffic to travel via the Chestnut Street – Locust Street corridor, at least between Second Street and Washington Street. This results in increased congestion on Chestnut Street, especially at the intersection of Washington Street / Chestnut Street, which experiences LOS F during the PM peak hour.

Alternative 6 – One-Way Pair: Central Avenue Northbound / Chestnut Street Southbound. The Alternative 6 downtown loop circulation is similar to Alternative 5: it creates a two-way connection along the Washington Street – Main Street – Portland Avenue corridor, and reverses the one-way circulation on both Central Avenue (which becomes one-way northbound from Lower Square to Upper Square) and Main Street (which becomes one-way southbound from Upper Square to Portland Avenue). In addition, Alternative 6 continues the one-way northbound circulation on Central Avenue from Upper Square all the way to Chestnut Street, while Chestnut Street becomes one-way southbound from Central Avenue to Washington Street. This creates a major one-way pair in downtown Dover. This simplifies traffic operations at many intersections, but makes travel circuitous and confusing, especially for drivers with destinations in downtown Dover. At the same time, it also increases traffic on the cross streets between Central Avenue and Chestnut Street. Finally, Alternative 6 worsens traffic operations at Lower Square by adding significant traffic volumes to the eastbound Washington Street approach.

Motor Vehicle Traffic – Improvement Alternatives Outside the Central Loop

There are other locations in the downtown Dover study area, besides the central one-way loop, that have motor vehicle traffic issues. The following is a summary of the issues and potential alternatives for addressing these issues.

Chestnut Street – Locust Street Corridor

The Chestnut Street – Locust Street corridor runs parallel to the Central Avenue corridor. As traffic volumes and congestion have increased on the Central Avenue corridor, drivers have increasingly avoided Central Avenue by traveling via the Chestnut –Locust corridor. As a result, traffic increases on the Chestnut –Locust corridor have averaged approximately 5% per year over the past ten years, while traffic in the whole of the study area has increased by only 1% per year during the same period. The Chestnut – Locust corridor continues to offer a bypass for Central Avenue that is generally faster and has lower traffic congestion, but there are constrained locations along the corridor that will serve as bottlenecks as traffic volumes continue to increase. These existing or potential bottlenecks include the intersections formed by Chestnut Street, Central Avenue, and Sixth Street; the intersection of Chestnut Street / Washington Street; and the intersection of Locust Street / Silver Street.

The most critical sections of the Chestnut –Locust corridor are located at the northern end of the corridor (at Central Avenue and Sixth Street), in the middle of the corridor (at Washington Street), and at the southern end of the study area (at Silver Street). Different sections of the corridor have different issues, with different potential improvement alternatives.

Some of the alternatives for the central downtown loop entail changes to the Chestnut – Locust corridor (e.g. Alternatives 5 and 6, which divert large volumes of Central Avenue southbound traffic to the corridor). The principal impacts of those alternatives on the Chestnut – Locust corridor were discussed in the section above regarding the downtown loop. The following alternatives are other alternatives for the Chestnut – Locust corridor that are independent of changes to the downtown loop.

Chestnut Street – Central Avenue – Sixth Street

Key Issues

These three major roadways form a triangle, with three closely-spaced, unsignalized conflict points. Chestnut Street and Sixth Street each has a stop-controlled approach at Central Avenue, while Chestnut Street and Sixth Street intersect at an all-way stop-controlled intersection. There is a privately-owned triangular parcel in the center of these three streets.

Chestnut Street / Central Avenue. This unsignalized intersection is located at the northern end of the downtown study area, where the Central Avenue corridor and the Chestnut – Locust corridor.

- **Congestion and Queuing for Chestnut Street Northbound Traffic.** This is the major problem at the northern end of the Chestnut Street corridor. Northbound traffic that has used Chestnut Street as a bypass of the downtown loop re-joins Central Avenue northbound traffic at this point. Central Avenue is the major street, while northbound Chestnut Street traffic is STOP-controlled. Most of the northbound Chestnut Street traffic turns left to continue northbound on Central Avenue; this traffic must wait for gaps in both the northbound and southbound Central Avenue traffic. During peak traffic periods, Central Avenue traffic is heavy, and gaps for Chestnut Street left turns can be rare. This can cause long delays for Chestnut Street left turns, resulting in queues of several hundred feet, back beyond the intersection of Chestnut Street / Sixth Street.

- **Difficult Grades and Sight Lines.** Chestnut Street climbs a fairly steep grade as it approaches Central Avenue. This makes acceleration more difficult for Chestnut Street traffic, and provides limited sight lines such that only the first driver in the Chestnut Street queue can see approaching Central Avenue traffic.

Chestnut Street / Sixth Street. This unsignalized intersection has all-way STOP control.

- **Efficient Operations.** Because the traffic volumes at this intersection are relatively low and divided fairly evenly among the four intersection approaches, all-way STOP control functions fairly well most of the time. Drivers take turns, and traffic flows slowly but efficiently through the intersection. This is aided by the fact that most drivers appear to be familiar with the intersection, especially during commuter peak periods.

- **Chestnut Street Northbound Congestion.** The Chestnut Street northbound approach to Sixth Street has the highest traffic demand of the four approaches, and as a result it has the highest delay and congestion. This effect is exacerbated by the congestion from the Chestnut Street northbound approach to Central Avenue, which can spill back through the Chestnut Street / Sixth Street intersection, and sometimes creates gridlock in that intersection.

Central Avenue / Sixth Street. This intersection completes the triangle formed by Central Avenue, Chestnut Street, and Sixth Street. The vast majority of Sixth Street traffic at this intersection turns right and travels south on Central Avenue; most Sixth Street traffic headed north on Central Avenue turns left onto Chestnut, then left again onto Central Avenue.

Improvement Alternatives

The following are two improvement alternatives for these three intersections: Chestnut Street / Central Avenue, Chestnut Street / Sixth Street, and Central Avenue / Sixth Street. The major issue at this location is the delay and queuing on the Chestnut Street northbound approach to Central Avenue. These two alternatives are designed to address this issue. These alternatives are shown in Figures 3-18 and 3-19.

Alternative 1 – Existing Roadway Design with Traffic Signal at Chestnut Street / Central Avenue. This alternative would replace the existing unsignalized intersection with a signalized intersection, which would provide Chestnut Street northbound traffic with a dedicated interval for turning onto Central Avenue.

Alternative 2 – Consolidated Chestnut Street / Sixth Street Approach with Traffic Signal at Central Avenue. This alternative would replace the separate Chestnut Street and Sixth Street approaches to Central Avenue with a single consolidated approach that is signalized at Central Avenue. This approach would be aligned with New York Street, which would require an eminent domain taking of at least a segment of the triangular parcel in the center of these streets.

Chestnut Street Between Sixth Street and First Street.

This segment of Chestnut Street generally has one through lane in each direction, with a central lane that is allocated for left turns at the closely-spaced intersections. On-street parking is provided between Third Street and Sixth Street. The side streets (Fifth Street, Fourth Street, Third Street, Second Street, and First Street) are approximately 250 feet apart, and they provide access to the Central Avenue corridor and to local land uses. The train tracks cross Chestnut Street at-grade at Third Street.

Through-traffic on Chestnut Street is heavy, and the STOP-controlled traffic on these side streets can experience high levels of delay during commuter peak periods. Although the delay for each side street vehicle may be relatively high, most of the side streets have fairly low volumes. As a result, the long delays for these relatively few vehicles do not have a significant impact on overall traffic operations.

The intersections at Second Street and First Street, however, have higher volumes than the other side streets along Chestnut Street. Chestnut Street / First Street is a signalized intersection, and provides access to and from the First Street municipal parking lot and the parking lot for the shopping center on the opposite side of Chestnut Street. The traffic volumes on First Street and at the shopping center approach to the intersection are relatively low, and the pedestrian demand at the intersection is also low. This intersection may not meet traffic signal warrants, and may not require its existing traffic signal.

Chestnut Street / Second Street is an unsignalized intersection that has connections from Upper Square to the Chestnut Street corridor via Second Street. Changes to circulation in the downtown loop could cause significant increases in Second Street traffic from Upper Square to Chestnut Street. This could result in the intersection of Chestnut Street / Second Street meeting traffic signal warrants. This intersection also provides access to and from the Dover Transportation Center and the large Cocheco Falls Mill employee parking lot, which generate pedestrian trips to and from the center of downtown. However, there are currently no crosswalks across Chestnut Street at or near Second Street; the closest crosswalks are at the First Street traffic signal, and north of Third Street. Pedestrian crossing improvements could address the pedestrian demand between the downtown center and the Dover Transportation Center / Cocheco Falls Mill employee parking lot.

Washington Street / Chestnut Street

Key Issues

The Chestnut Street / Washington Street intersection is a key location for traffic circulation in downtown Dover. Washington Street and the Chestnut – Locust corridor are both major traffic routes in downtown. This intersection has high traffic volumes and heavy turning movements.

Chestnut Street between First Street and Washington Street. This segment of Chestnut Street has two lanes in each direction, with no on-street parking. Chestnut Street crosses the Cochecho River in this section. There is a mid-block pedestrian crossing located approximately 150 feet south of the river, between the Bell Center and Waldron Towers. This pedestrian crossing is just south of a rise in the roadway, which can create sight distance issues for southbound drivers, especially when they are traveling quickly.

Chestnut Street / Washington Street. Two of downtown Dover's major roadways intersect at this signalized intersection. It is located about 500 feet west of Lower Square, and is a critical intersection for downtown circulation.

- **Physical Constraints.** Walnut Street, on the south side of the intersection, has two narrow lanes and tightly constrained on both sides by buildings.

- **Poor Roadway Alignment.** Narrow, two-way Walnut Street is directly aligned with Chestnut Street's two southbound lanes. As a result, the southbound Chestnut Street through lane is aligned with Walnut Street northbound, requiring both northbound and southbound through-traffic to make a significant lateral movement in the middle of the intersection.

Locust Street / Washington Street. This unsignalized T-intersection is located midway between Chestnut Street / Washington Street / Walnut Street and Lower Square.

- **Gridlock.** Traffic from the adjacent congested intersections (especially Lower Square) can block Locust Street traffic from exiting onto Washington Street, and create gridlock. This can also create an uncomfortable situation for pedestrians crossing between Locust Street and the Orchard Street municipal parking lot.

Alternatives

The following are three improvement alternatives for the intersection of Chestnut Street / Washington Street, and the surrounding streets and intersections affected by the proposed changes. These are independent improvement alternatives, and do not include changes that are directly related to downtown loop alternatives (e.g. the three lane southbound approach in Alternative 5, or the one-way southbound Chestnut Street approach in Alternative 6). These alternatives are shown in Figures 3-21, 3-22 and 3-23, and the benefits and impacts are described in Table 3-9.

Alternative 1 – Reduce Lanes on Chestnut Street Between Washington Street and First Street. The four-lane cross-section between First Street and Washington Street is reduced in some segments to provide added on-street parking, to provide width for bicycles (either in bicycle lanes or a wide outside lane), and to have a "traffic calming" effect on traffic, which tends to speed in this section of Chestnut Street. Chestnut Street only needs one northbound receiving lane at Washington Street, and requires only a short two-lane approach at First Street. Chestnut Street southbound could potentially be reduced from two lanes to one lane from First Street to the pedestrian

crossing near Waldron Towers. This alternative is designed to provide enough two-lane queuing at Washington Street and at First Street so that traffic operations are not significantly affected.

Alternative 2 – Change Chestnut Street to One-Way Southbound (South of Washington Street). This alternative is designed to address the constrained width of Walnut Street and the poor alignment of Walnut Street with Chestnut Street. The northbound Walnut Street traffic is diverted to Locust Street, which is stop-controlled at Washington Street. The traffic capacity indicates that the Locust Street approach to Washington Street deteriorates from LOS C to LOS F due to the diverted northbound traffic. The actual traffic operations may be even worse due to congestion and queuing from adjacent intersections at Washington Street / Locust Street. Therefore, this alternative is problematic and should not be pursued.

Alternative 3 – Widen Chestnut Street Southbound Approach to Three Lanes, Provide Pedestrian Refuge at Orchard Street. The Chestnut Street southbound approach currently has two lanes: a right-turn lane and a through-left lane. It is necessary to provide a dedicated right-turn lane in order to provide a southbound right-turn phase during the eastbound lead left phase. However, southbound left turning vehicles must wait for gaps in northbound traffic, and this can cause delay for southbound through-traffic. Some vehicles avoid this delay by going straight in the right turn lane, which creates a safety problem. Adding a third southbound lane provides a dedicated left turn lane, which reduces congestion, adds capacity, and eliminates the safety problem of through-traffic in the dedicated right-turn lane. Only one northbound lane is necessary, although providing three southbound lanes and one northbound lane in the existing four lane cross-section exacerbates an already problematic lane alignment problem; signage and pavement markings should be added to guide drivers to the northbound lane. This lane re-assignment provides another opportunity: the dedicated left turn lane only needs to be 100 feet long at the most; as a result, only three lanes (two southbound and one northbound) are required on Chestnut Street at Orchard Street; this would enable the addition of a pedestrian refuge island in the center of the mid-block crossing at Orchard Street. This would improve the visibility and safety of the crossing, which is used by many seniors.

Table 3-9 Comparison of Chestnut Street Improvement Alternatives

	No-Build			Alternative 1			Alternative 2			Alternative 3		
Proposed Improvements				▪ Reduce Chestnut St from 4 lanes to 2 lanes north of Washington St ▪ Add parallel parking on both sides ▪ Chestnut St SB at Washington St remains 2 lanes: LT-TH / RT			▪ Chestnut St / Locust St one-way pair south of Washington St: Chestnut St SB / Locust St NB ▪ All NB through-traffic must turn left from Locust St onto Washington St			▪ Widen Chestnut St southbound approach to Washington St to 3 lanes: LT / TH / RT ▪ Add pedestrian refuge island at Orchard St crosswalk		
Traffic Operations	PM Peak LOS	Delay (sec)	V/C Ratio	PM Peak LOS	Delay (sec)	V/C Ratio	PM Peak LOS	Delay (sec)	V/C Ratio	PM Peak LOS	Delay (sec)	V/C Ratio
Washington St / Chestnut St	**D**	**35.0**	**0.84**	**D**	**35.0**	**0.84**	**C**	**20.8**	**0.72**	**C**	**25.7**	**0.73**
Locust St NB LT at Washington St	C	16.7	0.13	C	16.7	0.13	F	58.3	0.96	C	17.9	0.14
Advantages				▪ Reduces amount of unused pavement ▪ Narrows pedestrian crossings at Washington St, Orchard St ▪ Provides additional on-street parking			▪ Improves traffic operations, reduces congestion at Chestnut St / Washington St			▪ Increases capacity, relieves congestion, improves safety at Chestnut St / Washington St ▪ Improves pedestrian safety, visibility at Orchard St		
Disadvantages	▪ Poor lane alignment ▪ Narrow right-of-way south of Washington St ▪ Safety problem: SB LT traffic blocks through-traffic, which "sneaks around" in RT lane ▪ Poor sight lines at Orchard St crosswalk			▪ Does not address capacity issues and safety issues at Chestnut St / Washington St			▪ Significantly worsens traffic operations, congestion for Locust St approach to Washington St			▪ Pedestrian crossing of Chestnut St on north side of Washington St remains very wide		

Locust Street / Silver Street

This signalized intersection generally has acceptable traffic operations. However, it has narrow approaches: each approach has a single wide lane with room enough for a vehicle to pass another vehicle waiting to turn left (except for the southbound Locust Street approach, which has a single lane but is not wide enough for a vehicle to pass another vehicle waiting to turn left). This intersection is physically constrained by adjacent structures (including historic homes), and cannot be widened easily. No changes are recommended at this location.

Silver Street / Central Avenue

This signalized intersection is principally a T-type intersection, with Silver Street terminating at Central Avenue (although the gas station driveway on the west side of the intersection is also signalized for safety purposes). The intersection is located at a curve in Central Avenue. The majority of Silver Street traffic turns left toward the center of downtown. The northbound Central Avenue approach has a dedicated left turn bay, although northbound left turns to Silver Street are fairly light. The southbound Central Avenue approach has a lead green interval before northbound Central Avenue traffic in order to provide gaps for left turning traffic to exit from nearby Hanson Street.

Improvement Alternative: A lagging green interval for the southbound Central Avenue approach may provide better gaps for Hanson Street left turns, since the lagging interval would enable any southbound queue to dissipate.

Hanson Street / Central Avenue

Hanson Street is a minor residential street that provides a connection from Henry Law Avenue to Central Avenue. Hanson Street is STOP-controlled at Central Avenue, with the vast majority of its traffic turning left to head south on Central Avenue; traffic headed to the north tends to use Henry Law Avenue to Lower Square. Even though Hanson Street traffic is relatively low (approximately 70 – 100 vehicles during each commuter peak hour), the heavy traffic volumes on Central Avenue can cause significant delays for left turning Hanson Street traffic.

Improvement Alternative: Several of the downtown loop alternatives entail prohibiting access from Henry Law Avenue to Lower Square in order to remove the uncontrolled traffic movement and improve safety. This requires diverting the Henry Law Avenue traffic to another location. It is recommended that this traffic be diverted to Hanson Street. This requires diverting a total of 111 vehicles during the AM peak hour and 152 vehicles during the PM peak hour in existing conditions. Since this traffic currently turns right at Lower Square, it is assumed that all of these vehicles would turn right from Hanson Street onto Central Avenue toward Lower Square. Hanson Street has a dedicated right turn lane at Central Avenue, and the traffic signal at Silver Street would provide ample gaps for this additional right turning traffic.

Broadway / St. John Street

Broadway makes sharp turn where Saint John Street enters, creating a large open triangle of unnecessary pavement with a small central island. This results in confusing circulation for vehicles and difficult crossings for pedestrians. Trucks sometimes need this space for maneuvering when they become trapped by the height limit on Broadway northbound beneath the railroad overpass.

Improvement Alternative. Much of this pavement could be eliminated, and the intersection could be consolidated to a single conflict point. This would enable the creation of a plaza space and several additional on-street parking spaces, and would not have a significant impact on traffic operations. The intersection should be designed to accommodate truck movements, including reversing direction on Broadway to avoid the railroad height restriction. The existing condition is shown in Figure 3-24, and the proposed improvement is shown in Figure 3-25.

Portland Avenue / Chapel Street

The intersection of Chapel Street at Portland Avenue is located at the eastern end of Chapel Street. This is an unsignalized intersection, and Chapel Street is stop-controlled. Chapel Street splits at the eastern end, so that right turns onto Portland Avenue are made via a steep downgrade, with poor sight lines to the northeast due to the upgrade on Portland Avenue.

The Chapel Street split could be eliminated, and the intersection could be consolidated to a single conflict point. This would connect the monument to the side of the road, instead of placing it in a traffic island, making it more accessible. In addition, all of the Chapel Street turns would be made near the top of the hill, which would improve sight lines and safety. The existing condition is shown in Figure 3-26, and the proposed improvement is shown in Figure 3-27.

Dover Point Tolls

Spaulding Turnpike Exit 6, which provides access to and from Dover Point Road, is located immediately south of the Dover Toll Plaza. Dover Point Road provides access directly to downtown Dover, and generally has minimal congestion and delay. As a result, many drivers avoid the Dover toll by taking Dover Point Road. This diversion is demonstrated by the fact that traffic on the Spaulding Turnpike at the Dover Toll Plaza dropped dramatically after the toll policy change: in 1989, the discount for tokens was reduced from 50% to 40%, and Annual Average Daily Traffic (AADT) on the Spaulding Turnpike dropped from 28,000 vehicles in 1989 to 22,500 vehicles in 1990, a 20% drop. The 50% discount for tokens was reinstated in July 1990.

The State of New Hampshire is currently implementing the EZ Pass Consortium toll system, and expects it to be operational by March 2005. At this time, the current 50% toll discount for tokens will be reduced to 20%, and the toll discount for EZ Pass holders will only be 40%. Dover residents are concerned that this change will further increase the number of drivers who avoid the Dover Toll Plaza and cut-through via Dover Point Road.

Alternatives

- **Toll Relocation.** One remedy to the situation would be to relocate the Dover Toll Plaza to the south of the Exit 6 ramps. The City of Dover has investigated this option in the past, and it is infeasible.

- **Delay the Reduction in the Toll Discount.** Retain the 50% toll discount for both tokens and EZ Pass transponders for 6 months to a year after the inception of the new system to enable drivers to adjust to the new system.

- **Encourage Use of EZ Pass Transponders.** Offer incentives for drivers to sign up for the EZ Pass system. Once drivers are invested in the EZ Pass system, the convenience of the system combined with the 40% discount may make it attractive enough so that drivers will remain on the Spaulding Turnpike. Measures to encourage use of the EZ Pass system could include waiving deposits for the transponders for an introductory period (e.g. six months) and distributing information promoting use of EZ Pass.

3.2.2 Truck Traffic Improvement Alternatives

Key Issues

The following are some of the key issues related to truck traffic in downtown Dover.

- Several state numbered highways (Route 108, Route 9, Route 4) run through the center of downtown Dover. State numbered routes must remain open to truck traffic unless the prohibition is approved by the New Hampshire Department of Transportation, and such prohibitions are difficult to obtain. In addition, these routes provide important connections between the Spaulding Turnpike and other points to the south, the Berwicks, and other Maine destinations.

- Based on observations of truck circulation and cargo type, it has been proposed that many trucks travel through downtown Dover when they could use the Spaulding Turnpike. These trucks may travel through downtown Dover and Dover Point Road to and from Exit 6 in order to avoid the Dover Toll (which has a maximum commercial vehicle toll of $3.00).

- Significant truck traffic on major downtown streets, especially
    - Central Avenue (Route 108 / 9): connections to Durham, Rochester
    - Silver Street (Route 9): connections to Barrington and Spaulding Turnpike in south, Somersworth and Berwick, Maine in the north
    - Portland Avenue (Route 4): connections to Maine to the north
- Overlap of major regional routes in downtown, using downtown streets as alternate to Spaulding Turnpike
- Central Avenue has better geometry than Chestnut Street (bottleneck at Washington Street / Walnut Street)

Improvement Alternatives

- Guide signs at Weeks Crossing, Spaulding Turnpike Exit 9, Sixth Street / Indian Brook Road
- Bridge improvements on Oak Street to remove the 6-ton weight limit. This would enable trucks to bypass downtown Dover and make the connection between Portland Avenue and Central Avenue.
- Outreach to regional businesses that generate significant truck traffic to identify businesses' issues with truck access and to disseminate information about recommended truck routes and truck prohibitions.

The proposed truck traffic improvements are shown in Figure 3-28.

3.2.3 Parking Improvement Alternatives

Downtown Dover's density and mix of land uses generates significant demand for parking. Residents, employees, and visitors to downtown Dover naturally want to park as close as possible to their destinations. However, in the downtown core, land is at a premium. This tends to reduce the amount of space devoted to parking, especially surface parking. This creates tension in terms of parking supply, demand, and location.

The more land devoted to parking in the downtown center, the lower the density of uses generating parking demand, and the less vibrant the downtown district can be. This makes it easier for people to drive to their destinations and harder to walk between destinations. This can facilitate sprawl.

Conversely, the higher the density of uses generating parking demand, the less land that can be devoted to parking in the downtown center. This density of uses can make the downtown more vibrant, and encourage walking, but can create challenges for driving and parking: the density of land uses concentrates traffic on the roadway system and increases the demand for parking within a limited area at the same time that it makes land more valuable for development than as parking. A dense and vibrant downtown, however, is more able to support structured parking (parking decks or garages).

Downtown Dover lies in between the extremes of land use density and parking convenience. The downtown has a significant supply of parking, both on-street and off-street, as well as robust demand for this parking. The parking utilization and turnover surveys indicate that there are parking spaces available

in downtown during typical weekdays, both in on-street parking spaces and in off-street parking lots. Some areas have higher levels of utilization, while others have very low utilization levels.

In order to improve parking conditions in Dover, the downtown study must address issues of physical parking supply and utilization, as well as issues of parking management and administration. The following are some of the key issues with parking in downtown Dover.

Downtown Parking Key Issues

Parking Supply and Demand

- Parking demand and utilization tend to be higher the closer to the center of downtown (generally the section of Central Avenue between Lower Square and Upper Square).

- Other factors besides location influence parking demand and utilization. These factors include accessibility, permitted use, and duration of permitted parking. The on-street parking with the highest utilization is unrestricted parking that is located a few blocks from the center of downtown. This unrestricted parking provides free parking for an unlimited duration, which makes it very attractive for downtown employees and residents who do not wish to purchase a parking permit. Table 3-10 shows the parking utilization as surveyed on Wednesday, September 17, 2003 for blocks where on-street parking had an average utilization (morning and afternoon) of 75% or more. Out of the 189 parking spaces with the highest on-street utilization, 142 spaces (or 75%) were unrestricted.

Table 3-10 On-Street Parking with the Highest Utilization Levels

Street (Side: N,S,E,W)	Block Location	Regulation	Supply	AM Demand	AM Utilization	PM Demand	PM Utilization	Average Utilization
Fayette Street (E)	Washington St to Green St	Unrestricted	8	8	100%	7	88%	94%
Young Street (S)	Main St to River St	Unrestricted	6	6	100%	5	83%	92%
Washington Street (N)	Central St to Main St	2 Hour	12	10	83%	12	100%	92%
St. Thomas Street (N & S)	Atkinson St to Chestnut St	Unrestricted	5	5	100%	4	80%	90%
St. Thomas Street (N & S)	Belknap St to Atkinson St	Unrestricted	18	17	94%	15	83%	89%
Henry Law Avenue (W)	Washington St to Williams St	Unrestricted	12	11	92%	10	83%	88%
Church Street (N & S)	Locust St to Central St	Unrestricted	20	17	85%	17	85%	85%
Central Avenue (W)	Chestnut St to Sixth St	Unrestricted	3	3	100%	2	67%	83%
Central Avenue (E)	First St to Second St	2 Hour	8	8	100%	5	63%	81%
Atkinson Street (E)	Washington St to St. Thomas St	Unrestricted	10	9	90%	7	70%	80%
Central Avenue (E)	Orchard Street to First St	Unrestricted	12	10	83%	9	75%	79%
Henry Law Avenue (E)	Washington St to Pool Entrance	Unrestricted	19	18	95%	12	63%	79%
Central Avenue (W)	Church St to Kirkland St	Unrestricted	16	12	75%	13	81%	78%
Locust Street (E)	Church St to Kirkland St	Unrestricted	11	9	82%	8	73%	77%
Central Avenue (W)	Second St to Third St	2 Hour	15	13	87%	10	67%	77%
Hale Street (N & S)	Central St to Locust St	2 Hour	12	8	67%	10	83%	75%
Locust Street (E)	Washington St to St. Thomas St	Unrestricted	2	1	50%	2	100%	75%

- The on-street parking closer to the center of downtown tends to have a two-hour time limit. This parking generally has lower utilization than the unrestricted parking slightly farther from the center, due to this time limit.

- Business owners in the center of downtown are concerned about maintaining the supply of on-street parking on Central Avenue. The Central Avenue on-street parking in and near the center all has a two-hour time limit, and has had available parking at all times that parking utilization was surveyed. As shown in Table 3-11, parking utilization on Central Avenue in the center of downtown averaged between 60% and 75% during parking surveys; this left between 30 and 50 parking spaces available on Central Avenue between Upper Square and City Hall.

Table 3-11 Central Avenue On-Street Parking Utilization

Central Avenue Block Face	Parking Supply	Parking Utilization Wed, September 17, 2003		Parking Utilization Thursday, June 24, 2004			
		10:00 AM	2:00 PM	9:00 AM	10:00 AM	2:00 PM	3:00 PM
Washington St to Hale St – West	13	88%	50%	62%	69%	69%	38%
Washington St to Williams St – East	9	45%	36%	78%	33%	44%	44%
Washington St to 1st St – West	41	48%	48%	59%	59%	76%	66%
Washington St to 1st St – East	11	83%	75%	64%	82%	73%	91%
1st St to 2nd St – West	15	50%	88%	80%	67%	87%	87%
1st St to 2nd St – East	8	100%	63%	100%	88%	50%	100%
2nd St to 3rd St – West	14	87%	67%	100%	79%	79%	100%
Chapel St to Broadway – East	15	31%	81%	47%	47%	93%	67%
Central Avenue Total	**126**	**61%**	**61%**	**69%**	**64%**	**75%**	**72%**
Available Parking		**50**	**49**	**39**	**46**	**32**	**35**

- The most heavily used off-street parking lots were ranked, and they are shown in Table 3-12. These parking lots tend to be near the center (at least within a block or two of the downtown one-way loop). The majority of these parking lots are private: most are for employees or customers (some of the parking lots designated as "Private – Employee" lots are actually owned by the City of Dover, but are fully leased and reserved for certain private businesses. Some of the more remote parking lots are less well-utilized, including those that provide dedicated parking for certain users. One example of this is the large parking lot west of Chestnut Street adjacent to the Dover Transportation Center that is owned by the Cocheco Falls Mill. This parking lot, with parking for approximately 240 vehicles, was only about 47% occupied during the morning and afternoon demand peaks.

Table 3-12 Off-Street Parking with the Highest Utilization Levels

Parking Lot	User Type	Supply	AM Utilization	PM Utilization	Average Utilization
Second St Northeast	Private-Resident	22	132%	136%	134%
Washington St USPS Lot	Private-Customer	20	160%	65%	113%
Main St / School St Lot	Private-Employee	19	100%	100%	100%
Chestnut St / Washington St SW Corner	Private-Customer	30	100%	87%	93%
Main St / School St NE Corner	Private-Customer	16	100%	81%	91%
Young St S Lot	Private-Employee	21	86%	95%	90%
One Washington Center (East of River)	Private-Employee	66	89%	89%	89%
One Washington Center (West of River)	Private-Employee	89	89%	89%	89%
Orchard Street Lot	Public-Metered	60	98%	73%	86%
St. Thomas St North Side, W of Atkinson	Private-Customer	29	83%	83%	83%
Angle Street	Private-Employee	31	81%	81%	81%
Lower Square - NW Corner	Private-Customer	22	68%	91%	80%
Chestnut St-Transportation Center	Private-Customer	27	59%	89%	74%
Walnut St Lot West Side, S of Washington	Unrestricted	55	73%	75%	74%
Third St Municipal Lot	Unrestricted	81	77%	68%	72%
Williams St-Daily Democrat Lot	Private-Employee	32	72%	72%	72%
Orchard Street Lot	Public-Municipal	72	76%	67%	72%
Henry Law Ave West Side, S of Williams St	Private-Resident	34	71%	71%	71%
Chapel St Lots	Private-Customer	17	76%	65%	71%
Kirkland St South Lot	Private-Customer	18	67%	67%	67%
St. Thomas St South Side, W of Atkinson	Unrestricted	20	105%	25%	65%
Orchard Street Lot -- Deeded Spaces	Private-Employee	31	61%	68%	65%
Mechanic/School St NW Lot	Public-Municipal	66	67%	62%	64%
Cocheco Falls Mill Visitor Parking	Private-Customer	21	38%	86%	62%
City Hall Offices - Behind Library	Public-Municipal	149	64%	56%	60%
Fayette St West Lot	Private-Customer	40	90%	30%	60%

- The publicly-owned municipal lots are generally not as well-utilized as the most desirable private lots, as shown in Table 3-13. The Orchard Street lot, which is located very close to the center of downtown, is fairly well-utilized. Some of the other well-utilized public lots are those where the municipal permit requirements are not enforced, such as the Third Street municipally-owned lots. The publicly-owned parking lots have an overall average utilization of 55% (somewhat higher in the morning), which is consistent with overall parking utilization in downtown Dover among all different parking types and facilities.

Table 3-13 Parking Utilization at Publicly-Owned Off-Street Lots

Parking Lot	User Type	Supply	AM Utilization	PM Utilization	Average Utilization
Orchard Street Lot	Public-Metered	60	98%	73%	86%
Walnut St Lot West Side, S of Washington	Unrestricted	55	73%	75%	74%
Third St Municipal Lot	Unrestricted	81	77%	68%	72%
Orchard Street Lot	Municipal Permit	72	76%	67%	72%
St. Thomas St South Side, W of Atkinson	Unrestricted	20	105%	25%	65%
City Hall Offices	Municipal Permit	149	64%	56%	60%
First St South Lot	Municipal Permit	79	62%	43%	53%
Locust/St Thomas St NE Corner Lot	Public-Metered	18	61%	39%	50%
St. Thomas Street (North & South)	Municipal Permit	4	50%	50%	50%
Locust/Walnut N Corner Lot	Municipal Permit	28	50%	46%	48%
City Hall Offices – Behind Library	Municipal Permit	20	50%	45%	48%
Locust St / St. Thomas St NE Corner Lot	Municipal Permit	15	27%	27%	27%
Young St N Lot	Municipal Permit	35	23%	23%	23%
Chestnut/Third St NE Corner Lot	Unrestricted	43	14%	12%	13%
Portland Ave/Chapel St	Unrestricted	43	0%	0%	0%
Total		**722**	**60%**	**50%**	**55%**

- The Orchard Street parking lot is owned by the City of Dover, and it has a highly advantageous location. It is located in the center of downtown Dover, immediately adjacent to the Central Avenue commercial corridor and within a two or three minute walk of the Cocheco Falls Mill and City Hall. It has an overall average utilization of 73%, which includes the following different user types:

    - The private deeded parking was granted to business owners as part of the urban renewal takings for the original clearing and construction of the parking lot.

    - The metered parking spaces are located closest to Central Avenue, and the municipal permit parking spaces are located farther from Central Avenue. Ideally this is an appropriate configuration: the metered spaces are for short-term (two hour) convenience parking, and should be located as close as possible to the storefront businesses on Central Avenue that require the parking. The permit parking spaces are typically for long-term use, but permit holders are also allowed to park in metered parking spaces without payment or time limit. This arrangement is designed to ensure that permit holders are able to find parking if all permit spaces are taken. However, some permit holders reportedly park in metered spaces even when there are permit spaces available because the metered spaces are more convenient to their destination. This results in less efficient parking utilization, since non-permit holders cannot park in the permit parking spaces if the metered spaces are full.

Table 3-14 Parking Utilization at the Orchard Street Parking Lot

User Type	Supply	AM Utilization	PM Utilization	Average Utilization
Public-Metered	60	98%	73%	86%
Municipal Permit	72	76%	67%	72%
Private-Deeded (urban renewal)	31	61%	68%	65%
Private-Resident (Bell Center)	18	67%	44%	56%
Total	**181**	**80%**	**57%**	**73%**

- Based on existing parking supply and utilization, potential utilization of vacant space, potential land development, and parking issues reported by study stakeholders, the following user groups are expected to have the most critical future downtown parking needs:

  - Customers of small retail businesses in and around the Central Avenue commercial corridor. Away from the main Central Avenue commercial corridor, most retail businesses have parking lots, and on-street parking is more generally available. However, the Central Avenue storefront businesses typically do not have private parking lots and rely upon public parking. The ideal parking for these businesses would be on-street parking located immediately adjacent to the store. The downtown travel survey indicates that shoppers favor on-street parking and are generally able to find parking, with 85% of shoppers parking in on-street spaces. There is a significant supply of such parking, especially with the angle parking on Central Avenue. Table 3-11 indicates that there is generally parking available on Central Avenue, but there is still a good deal of competition for these centrally-located spaces. Some of this competition comes from other retail customers, but the "shuffling" behavior that was observed indicates that much of the competition also comes from downtown employees, both from the mills and from the storefront businesses themselves.

  - Employees. There is a large concentration of employment in downtown Dover. This includes office space in the mills and other downtown buildings, downtown retail businesses, and public employees. The most critical employee parking needs are the following:

    - Cocheco Falls Mill. The Cocheco Falls Mill is currently only about 60% occupied, and has the potential to accommodate approximately 500 – 600 additional employees. There is additional parking available in the Mill's parking lot adjacent to the Dover Transportation Center (about 125 additional parking spaces). However, this is not adequate to satisfy the maximum potential demand.

    - One Washington Center Mill. This mill is currently fully occupied, with warehouse, light industrial, and industrial office uses. If the future demand warrants, some of this space could be converted to office space, which generally has a higher density of employees than the existing uses, and therefore higher parking demand. In addition, most of the mill's existing parking is located across the Cochecho River on the Riverfront parcel. When this parcel is developed with new land uses, the One Washington Center Mill parking must be accommodated at some convenient location.

- Public Employees. There is a concentration of public employees in the area encompassing City Hall, the Dover Public Library, and district courthouse. In addition, there is demand for parking in this area by visitors to City Hall and the Public Library. The principal parking area for City Hall, located behind the Public Library, currently has an average utilization of only 56%, so there is some additional parking capacity. However, there is the potential for increased future parking demand if the McConnell Center (the former Dover Middle School) is redeveloped as education, office and recreational space.

The parking supply and availability for these key constituencies was surveyed and analyzed. These surveys consisted of identifying the destinations for which parking is required, determining the appropriate distance that people would be willing to walk to reach their destination, and surveying the supply and availability of parking within that radius.

The key destinations for which additional parking supply should be identified are:

- Cocheco Falls Mill
- One Washington Center Mill
- Central Avenue Commercial Corridor
- City Hall / Public Library / McConnell Center (especially if the McConnell Center is rehabilitated)

For the employee parking, the survey reviewed the existing parking supply and availability for two different criteria:

- Long-term parking available for additional employee parking within an eighth-mile radius (2-3 minute walk): On-street unrestricted, municipal permit parking, employee parking, and off-street unrestricted parking.
- All parking within a quarter-mile radius (4-6 minute walk).

For retail customer parking, the survey reviewed only short-term parking within an eighth-mile of the center of the Central Avenue commercial corridor. It was recognized that most customers of storefront businesses would be reluctant to walk much further than this, and reluctant to search a large area for parking.

Figure 3-29 shows the coverage areas for the various destinations, and Table 3-15 shows the results of the parking survey.

Table 3-15 Parking Availability for Major Downtown Destinations

	Cocheco Falls Mill	One Washington Center Mill	City Hall Area	Central Avenue Commercial
1/8th Mile Radius (2-3 min walk)	**Long-Term**	**Long-Term**	**Long-Term**	**Short-Term**
On-Street				
Supply	23	11	98	318
Available - Morning	21	8	67	158
Available - Afternoon	15	6	51	147
Off-Street				
Supply	401	416	323	78
Available - Morning	244	279	207	8
Available - Afternoon	238	283	195	27
Total				
Supply	424	427	421	396
Available - Morning	265	287	274	166
Available - Afternoon	253	289	246	174
1/4th Mile Radius (4-6 min walk)	**All Parking**	**All Parking**	**All Parking**	
On-Street				
Supply	472	302	377	
Available - Morning	224	123	123	
Available - Afternoon	255	147	163	
Off-Street				
Supply	1,692	1,230	1,381	
Available - Morning	671	448	509	
Available - Afternoon	724	438	582	
Total				
Supply	2,164	1,532	1,758	
Available - Morning	895	571	632	
Available - Afternoon	979	585	745	

Table 3-15 shows that there is significant parking available for any of the given destinations. However, there are a number of issues that diminish the parking availability indicated in Table 3-15.

- There is some overlap among the parking supply and available parking for the different destinations. Therefore, the cumulative parking available is less than the total for each destination.

- For the employee parking, the review of all parking sources includes parking types that are not appropriate for employee use. On-street two-hour parking is not appropriate for employee use (although many employees use these parking spaces). The largest supply of off-street parking, accounting for 40% of the off-street parking in the downtown study area, is private customer parking for businesses. This parking is not available for employee use, although there is significant parking availability in these lots, especially during the day.

- The parking supply in downtown Dover is mostly in relatively small parking lots. As a result, the parking supply is decentralized, and available parking can be difficult to find. This is a significant issue for retail customers, who are generally unwilling to hunt for parking for a

short retail visit. It is also problematic for employee parking because it negates the efficiency and flexibility of larger parking facilities.

Alternatives

The analysis of Dover's parking supply and utilization indicates that there is generally significant parking available in downtown Dover. This parking should be adequate for Dover's near-term parking needs, but downtown residents, employees, and other visitors would be well-served by improvements in parking management and utilization. In addition, longer-term conditions, such as development of the Riverfront parcel and full occupancy of the Cocheco Falls Mill, will likely require an increased parking supply. Finally, the review of these potential changes to Dover's parking supply and operations should be accompanied by an evaluation of Dover's parking administration and management.

Improved Utilization and Management of Existing Parking Supply

There is generally parking available throughout downtown, and the downtown travel survey indicates that most downtown visitors are able to find parking quickly and easily. However, parking utilization and convenience could be increased by improving the management of downtown parking. The following are potential enhancements that could be implemented in the short term in order to improve parking utilization and convenience.

- **Flexible Parking.** The parking utilization surveys indicate that parking is generally available, but it may not be available to the type of user that needs it. For example, a shopper may not be able to use an available City-owned parking space because it is reserved for municipal permit holders, or an employee at one of the mills may not be able to use a customer parking that is empty during the entire work day. The following are some potential methods of increasing utilization by making parking use more flexible.

    - **Over-Subscription of Permit Parking Lots.** Typically, not all potential users of a parking facility use it at the same time. If parking privileges are granted to a number of potential users equal to the parking supply, this will result in under-utilized parking. It is not practical to expect 100% parking utilization. However, Dover could increase utilization at some of its permit parking lots by granting more permits than spaces. The Orchard Street parking lot currently has more permits than permit spaces (89 employee permits plus 25 resident permits versus 62 permit spaces). However, permit holders may park in the metered parking spaces, so there is generally adequate capacity for all permit holders.

    - **Leasing of Unused Customer Spaces.** Private customer parking makes up a large share of the downtown Dover parking supply. Much of this parking remains empty during working hours, and some of this parking could potentially be leased by downtown employers. In particular, the large parking lot at the NH State Liquor Store / Goodwill shopping center has had over 100 spaces available during working hours. Other customer parking lots closer to the downtown center also have available parking, but most of these lots are smaller, and do not offer as large a potential supply.

    - **Shared Parking.** Shared parking increases parking utilization by sharing parking supply among different user types, and taking advantage of staggered parking demand among the different users. In this way, parking is treated as a shared resource that can be used by office employees during the day, retail customers in the evening, and residents at night. Shared parking arrangements must be designed with enough capacity to accommodate "shoulder" periods when demand from different user groups may overlap. Applications to this approach

in Dover may include allowing short-term commercial customer parking in municipal permit lots during the evening, or a fully-developed shared parking scheme for the Riverfront development.

- **Pedestrian Connections.** Improved pedestrian connections could make remote parking locations more attractive.

    - **Chestnut Street / Second Street.** The Cocheco Falls Mill owns most of the parking lot at the Dover Transportation Center, and it is available for use by their employees. However, the lot is under-utilized, and was observed to be less than half full. The most direct pedestrian access between the mill and the parking lot is via Second Street, but the Chestnut Street / Second Street is unsignalized, and has no crosswalks. Pedestrian access at this location could be improved by installing a traffic signal at this location, providing striped crosswalks, and improving pedestrian connections from the parking lot to Chestnut Street. This could increase utilization of this parking lot, potentially adding over 100 parking spaces to the Cocheco Falls Mill's effective parking supply.

    - **Portland Avenue.** The City-owned Portland Avenue parking lot near Cochecho Street currently has minimal utilization, even though it is less than ¼-mile from the Cocheco Falls Mill. This is largely due to the fact that the sidewalk along Portland Avenue is in very poor condition. Improving this connection would make it easier for downtown employees to use it. The improved sidewalk would also provide better access to the path that connects the eastern end of School Street to Portland Avenue. This path is steep, which is especially problematic in the winter, but it is a more direct connection to the mill entrance opposite School Street.

- **Remote Parking.** In addition to the parking located in the downtown study area, there are other parking lots located within a five or ten minute drive of downtown Dover. Downtown employees at the mills and at retail businesses could use these parking lots if there were fast convenient shuttle bus service to downtown, and if there were adequate incentives for using these lots. Potential locations for remote parking include:

    - **The Dover Arena.** 196 parking spaces located 0.9 miles (2-3 minutes by shuttle bus) from the downtown loop at the intersection of Portland Avenue / Oak Street. Minimal parking demand during weekdays.

    - **Miracle Mile.** The Miracle Mile retail district is located approximately 2.0 miles (5-10 minutes by shuttle bus, depending on traffic) north of the downtown loop on Central Avenue. There are several large parking lots (including Hannaford Brothers Supermarket, Shaw's Supermarket, and Dover Bowl) that are typically not full during weekdays, and could be used for remote downtown parking.

- **Adjust Parking Regulations.** The current regulations for public parking (both on-street and municipal off-street lots) may not facilitate optimal parking utilization. The following are some changes to parking regulations that could improve utilization:

    - **Revise On-Street Regulations.** A review of the on-street parking occupancy and regulations shows that some of the most highly utilized on-street parking is unrestricted (with no time limit), while some of the two-hour limit parking has low utilization. Some of the more centrally-located and heavily-used unrestricted parking could be converted to two-hour limit parking to provide more short-term retail customer parking. At the same time, some of

the under-utilized two-hour parking that is more remote from the commercial core could be converted to unrestricted parking to compensate for the loss of unrestricted spaces.

- **Adjust Orchard Street Lot Parking Regulations.** Most of the municipally-owned parking lots have an appropriate parking allocation. Several, such as the School Street lot and the Riverfront parcel parking, are leased in full or large part to private employers, whose employees use them. Other lots, including the First Street lot and the parking lot behind the Dover Public Library, have excess capacity and no demand for additional parking. The Orchard Street lot, however, has high utilization and high demand due to its central location; outstanding parking permits exceed permit parking spaces. The following regulation improvements could help to better manage the parking supply:

  - Convert all Orchard Street lot permit parking to metered parking. Currently, Orchard Street municipal parking permit holders may park in metered parking spaces; this is intended to ensure a parking space if all the permit spaces are taken. However, many permit-holders park in the conveniently-located metered parking spaces even if there are permit spaces available. If the metered parking spaces fill up with permit holders, and there are permit parking spaces remaining, potential retail customers would be unable to park. This proposal could be facilitated most cheaply by providing "master meters," i.e. parking control and payment stations that control parking and compliance for many parking spaces.

  - Coordinate Orchard Street lot regulations with First Street lot regulations: Orchard Street Lot ALL PERMIT, First Street Lot ALL METERED. The Orchard Street parking lot and the First Street parking lot are close to each other and to the Central Avenue commercial corridor. Parking operations could be simplified by converting the Orchard Street permit parking and metered parking to all permit parking, and making the First Street lot all metered (for short-term parking and for permit overflow from the Orchard Street lot). There are a total of 124 permit and metered spaces in the Orchard Street parking lot, and there are 146 monthly employee permits that are currently issued for the two parking lots. This would allow for 85% utilization of the monthly parking permits in the Orchard Street lot, which should generally be adequate for demand. In the event of a shortfall, permit holders could parking in the First Street lot. Short-term parking could be directed to the First Street lot at all times.

- **Revise Dover Code to Minimize "Shuffling."** A major challenge to preserving short-term parking for short-term use by shoppers and other legitimate users is the practice of "shuffling," which results in long-term parkers taking up short-term parking spaces (especially two-hour on-street spaces) due to their convenient location, and displacing short-term parkers. The practice of shuffling is common in downtown Dover, as demonstrated by the parking turnover survey and supported by anecdotal reports of mill employees taking "parking breaks" at two-hour intervals. The Dover Code currently states that it is unlawful to park a motor vehicle in excess of the time limit on a specified segment of roadway; however, this does not preclude moving that motor vehicle to around the corner to another street, for another two hours. One potential remedy for this issue is to change Dover's parking regulations to prohibit parking for more than two consecutive hours in *any* two-hour or metered parking throughout a specified area (e.g. the downtown study area). This would present challenges in terms of regulation and enforcement, but it would help to preserve the intent of two-hour limit and metered parking.

- **Outreach and Education.** Another approach to "shuffling" would address the problem through education and outreach to downtown employers and employees, both in the mills and in the small storefront businesses. This could be a cooperative effort of the City of Dover, Greater Dover Chamber of Commerce, and Dover Main Streets. It could emphasize the importance Dover's downtown storefront businesses, the need to preserve short-term parking for shoppers at these businesses, and the true time requirements of moving one's car three or four times a day versus parking a five-minute walk away. This initiative should also be used to identify key parking issues for these downtown stakeholders. This approach could be used in addition to or instead of a regulatory change to address shuffling.

- **Signage**. Parking utilization and convenience could be improved by better guide signage, especially for off-street parking, and better on-street parking regulation signs. Dover currently has a few parking signs (white "P" on a blue field), but these signs tend to get lost in the general downtown "sign pollution" and they do not reflect parking regulations that change from daytime (municipal permit) to evening (short-term parking). Dover could install a few distinctive various message signs (VMS) indicating when a few key parking lots (e.g. the Orchard Street Lot and the First Street Lot) are available for short-term parking use. Many of Dover's on-street parking regulation signs are general (e.g. "Two-Hour Parking") and do not provide detailed information on hours and days that the regulations are in effect. As parking regulation signs come due for replacement, they could be replaced by clear and specific regulatory signs.

Increase Parking Supply

In addition to improving the utilization of downtown Dover's existing parking supply, the parking situation would also be helped by increasing the overall parking supply.

- **Maximize On-Street Parking Supply.** In the short-term, modest increases in the parking supply can be realized through such measures as re-striping parking lots that are laid out inefficiently and maximizing the supply of on-street parking. In addition, the proposed roadway design and circulation alternatives also maximize on-street parking.

- **Structured Parking.** Anticipated long-term changes in downtown Dover, especially the Riverfront development and full occupancy of the Cocheco Falls Mill, are expected to require significant new parking supply, which will likely entail structured parking. Table 3-16 summarizes potential locations for structured parking, the users and market that each structure would be expected to serve, the added parking supply, the cost, and the advantages and disadvantages of each proposal. The locations, structure footprints, and basic configurations for the various parking structure proposals are shown in Figure 3-30. The following are some of the assumptions used in evaluating the potential parking structure alternatives.

    - Parking structures will be modular pre-cast concrete structures.

    - Costs for structured (i.e. above grade) parking structures are assumed to be $18,000 per space, for both single level decks and multi-level garages. This represents a fairly conservative, all-inclusive cost estimate.

    - The structured parking alternatives below entail building a parking deck or garage on the site of an existing surface parking lot. Building parking structures would entail work that would cause disruption and damage to the existing parking lot. In addition, in order to maximize the parking supply, it is assumed that a portion the existing parking lot is excavated below the

parking ramp. This results in costs to restore the existing surface parking spaces, costs that are estimated at $3,000 per ground level space.

- Some of the potential parking structures are proposed for private property. These include the Bank of New Hampshire parking lot, the Cocheco Falls Mill heating plant parking areas, the Water Street parking lot, and the strip mall on Main Street near the corner of Washington Street. In order for parking structures to be built in these locations, the owner of the property would have to build the parking structure, or the City of Dover would have to obtain the property by purchase or by eminent domain.

- Extraordinary costs have not been included in the cost estimates. These costs include property acquisition costs and major site preparation costs, such as significant environmental remediation or removal of the smoke stack at the Cocheco Falls Mill heating plant.

Table 3-16 Parking Availability for Major Downtown Destinations

	Orchard Street Parking Lot	First Street Parking Lot	Public Library Parking Lot	Bank of New Hampshire Parking Lot	Heating Plant Parking	Water Street Parking Lot	Main St Shopping Center
Owner	City of Dover	City of Dover	City of Dover	Bank of NH	Cocheco Falls Mill		
Current Use	Surface Parking ▪ Municipal permit ▪ Public metered ▪ Private deeded	Surface Parking ▪ Municipal permit	Surface Parking ▪ Municipal permit ▪ Library, City Hall visitors	Surface Parking ▪ Bank customers	Surface Parking (two levels, with separate at-grade entry) ▪ Mill employees	Surface Parking Existing Building	Small Retail Mall
Current Parking Supply	181 Total (107 in decked area)	77	210	92	122	111	26
Potential Parking Structure	Parking Deck	Parking Deck	Parking Deck	Parking Garage	Parking Deck	Parking Garage	Parking Garage
Expected Parking Structure Uses	▪ Retail customers ▪ Employees ▪ Residents (night)	▪ Retail customers ▪ Employees ▪ Residents (night)	▪ Employees, visitors at McConnell Ctr	▪ Retail customers ▪ Employees ▪ Residents (night)	▪ Mill employees ▪ Riverfront development	▪ Mill employees ▪ Riverfront development	▪ Mill employees ▪ Riverfront development
Proposed Structure							
Surface Spaces	107	74	151	82	105	121	121
Structured Spaces	97	89	138	95	194	378	378
Total Parking Supply	204	163	289	177	299	499	499
Net New Spaces	97	86	79	85	177	388	473
Cost	$2,067,000	$1,824,000	$2,937,000	$1,956,000	$3,807,000	$7,167,000	$7,167,000
Cost per new space	$21,309	$21,209	$37,177	$23,012	$21,508	$18,472	$15,152
Advantages	▪ Central location ▪ Efficient layout ▪ Replaces on-street parking lost to 2-way Central Ave.	▪ Good location ▪ Replaces on-street parking lost to 2-way Central Ave.	▪ Accommodates demand from McConnell Center	▪ Central location ▪ Could add ground floor retail	▪ Owned by Cocheco Falls Mill ▪ Fulfills demand from increased mill occupancy ▪ Grades reduce need for ramping	▪ Site is close to mills and Riverfront parcel ▪ Potential for ground floor retail	▪ Site is close to mills and Riverfront parcel ▪ Potential for ground floor retail
Disadvantages	▪ Not visible from Central Avenue (signage) ▪ Truck access (requires added headroom)	▪ Not as central as Orchard St ▪ Not visible from Central Avenue (signage) ▪ Inefficient layout (wedge-shaped)	▪ Layout of existing parking lot maximizes supply ▪ Requires ~140 space deck to net ~80 spaces ▪ McConnell Ctr rehab not certain	▪ Not publicly-owned ▪ Would block views, light for Cocheco Falls Mill	▪ Difficult site conditions: grades, river, smokestack ▪ Driveways too close to Washington / Main intersection	▪ Requires eminent domain taking	▪ Requires eminent domain taking
Assessment	Highly advantageous	Not advantageous	Not advantageous	Advantageous	Advantageous	Highly advantageous	Highly advantageous

Parking Administration and Management

The Parking and Traffic Bureau of the Dover Police Department (DPD) has responsibility for Dover's parking and traffic management. This includes traffic regulations and enforcement, as well as administration and enforcement for the City of Dover's parking supply (both on-street parking and municipally-owned off-street lots).

The Parking and Traffic Bureau is headed by a sworn police officer, and overseen by a police captain who represents the DPD on Dover's Transportation Advisory Commission (TAC). The officer in charge of the Parking and Traffic Bureau supervises the bureau's staff, which comprises one part-time (4 days per week) civilian parking clerk who executes administrative tasks, and four civilian parking enforcement officers (PEOs), including one full-time PEO and three part-time PEOs. One part-time PEO position is currently unfilled due to the current low level of parking violations, although this activity is expected to increase in the future and require that the vacant position be filled.

The Parking and Traffic Bureau's principal responsibilities include the following:

- Parking facilities. The Parking and Traffic Bureau is in charge of managing on-street and off-street parking facilities and regulations.

- Parking permit program. Sale of parking permits and administration of the parking permit program. The civilian parking clerk sells parking permits, collects fees, and tracks permit status.

- Parking enforcement. The four PEOs enforce parking regulations and work mostly in the downtown area. The PEOs work from 7 AM to 5 PM, and enforce permit violations, over-time violations, and meter violations. Sworn police officers also enforce parking regulations, but they typically do so in response to complaints or for public safety reasons.

- Parking fine resolution. The parking clerk tracks parking citations, takes in parking fines, and reviews disputed parking violations.

- Parking and traffic regulations. The Parking and Traffic Bureau Review reviews traffic and parking issues, and makes recommendations for changes to and regulations. Traffic and parking issues and complaints are generally first referred to the DPD Parking and Traffic Bureau, which reviews the issue and makes a recommendation to the Transportation Advisory Commission (TAC). Where necessary (e.g. if an ordinance change is required), the TAC will refer the issue to the City Council. For certain issues, the Chief of Police is empowered to establish parking regulations directly: taxicab stands, bus stops, and loading / unloading zones (per Chapter 166-16 of the Dover Code).

When parking and/or traffic issues arise, they are brought to the attention of the Parking and Traffic Bureau. The officer in charge of the bureau then investigates these issues. Depending on the nature of the issue, the officer in charge of the Parking and Traffic Bureau makes a recommendation, reports the issue directly to the Transportation Advisory Commission (TAC), or consults with other City of Dover departments to make a recommendation. These consultations are typically undertaken on an ad hoc, informal basis, and include the following departments:

- Department of Planning and Community Development (regarding land use and transportation planning issues)

- Facilities, Grounds and Cemetery Division, Community Services Department (regarding traffic signs and signals)

- Public Works and Utilities Division, Community Services Department (regarding roadway and sidewalk maintenance and repair, snow plowing)

The officer in charge of the Parking and Traffic Bureau then reports the issue or the recommendation to the TAC. The TAC may refer the issue back to the Parking and Traffic Bureau for further review, or else the TAC votes on the recommendation. Where necessary, parking recommendations approved by the TAC are then submitted to the City Council for a vote.

For the sake of comparison to Dover's current practices, the parking administration, regulation, and enforcement practices in other New Hampshire cities were reviewed. The manager of parking administration was contacted and questioned about parking policies and practices. This review indicates a range of approaches to parking and traffic administration, as shown in Table 3-17. These approaches suggest different approaches to parking management and administration that Dover could consider.

Table 3-17 Comparison of Parking Administration for New Hampshire Cities

	Dover	Concord	Manchester	Keene	Nashua	Portsmouth
Population (2000)	26,884	40,687	107,006	22,563	86,605	20,784
Employment (2002)	15,077	40,321	65,345	18,878	50,241	27,353
On-Street Parking						
Meters	NA	1,2, 4, 10 hour	2, 10 hours	2-hour limit	1, 2 hours	15-minute, 2, 4 hours
Unmetered	2-hour limit	2, 3 hour limit	Permits	2-hour limit Resident permit	Permits	30-minute, 1, 2 hours
Municipal Surface Lots	10 lots	4 lots	9 lots	9 lots	15 lots	8 lots
# Spaces	950 spaces		1,500 spaces	1,130 spaces		675 spaces
Regulations	Permit only Permit + meters	Permit only Meters only	Permit only Permit + meters	Free 10-hour meters Permit only	Permit only Permit + meters (1, 2, 10 hours)	Fee (attended) Free
Municipal Garages	NA	2 garages (1 more planned)	3 garages	2 parking decks	2 garages	1 garage (2 more planned)
# Spaces			1,600 spaces	350 spaces	800 spaces	900 spaces
Regulations		Permit + meters	Permit, attended fee parking	Permit + meters	Permit + meters	Permit + meters
Permits	Yes – monthly ▪ Employee $20-40 ▪ Resident $5-10	Yes – quarterly ▪ Garage: $209-248 ▪ Surface: $179	Yes – monthly ▪ Garage: $45-60 ▪ On-Street: $35	Yes – monthly ▪ Deck: $40 ▪ Surface: $30	Yes – monthly ▪ Garage: $30-45 ▪ Surface: $50	Yes – monthly ▪ Garage: $50-100
Administration						
Regulations	Parking and Traffic Bureau (Police Department)	Parking Control Unit (Police Department.)	Traffic Department	Parking Division (Police Department)	Downtown Parking Committee	Parking & Transportation Division (Public Works Dept.)
Permits / Fees	Parking and Traffic Bureau (PD)	Parking Control Division (PD)	Traffic Department	Parking Division (PD)	Public Works Division / Collections	Parking & Transportation Division (PWD)
Enforcement	Parking and Traffic Bureau (PD)	Parking Enforcement Division (PD)	Traffic Division, Police Department	Parking Division (PD)	Police Department	Parking & Transportation Division (PWD)
Violations, Fees	Parking and Traffic Bureau (PD)	Parking Enforcement Division (PD)	Ordinance Violations Bureau, Police Department	Parking Division (PD)	Police Department / Traffic Violations Bureau	Parking & Transportation Division (PWD)
Surface Lot Management	Parking and Traffic Bureau (PD)	Parking Control Division (PD.)	Traffic Department	Parking Division (PD)	Public Works Division	Parking & Transportation Division (PWD)
Garage Management	NA	Parking Control Division (PD.)	Private Contractor	Parking Division (PD)	Public Works Division	Parking & Transportation Division (PWD)
Parking Manager	Police Officer Police Department	Civilian Parking Control Unit, PD	Civilian Traffic Department	Civilian Parking Division PD	Civilian Public Works Division	Civilian Parking & Traffic Division, PWD

The following are some of the key parking administration issues, including similarities and differences among the different cities.

- Most cities reviewed have parking administration and enforcement functions consolidated in a single department. Like Dover, Concord and Keene have their parking functions within the city police department. Portsmouth has all parking functions within the Parking and Transportation Division of the Public Works Department. Portsmouth's Parking and Transportation Division was created four years ago for the purpose of consolidating these functions from disparate departments; the division director reports that this has been a successful approach.

- Manchester and Nashua have parking-related functions distributed in different city departments. In Manchester, the Traffic Department is responsible for policy and administrative tasks (regulations, permits and fees) while the Police Department is responsible for enforcement (through its Traffic Division) and citations (through its Ordinance Violations Bureau); Manchester's garages are managed by a private contractor. Nashua's parking functions are very decentralized among its Public Works Division, Collections Department, Police Department, and the Downtown Parking Committee, made up of representatives of different city departments, business owners, and residents.

- Labor costs, maintenance and security diminish the financial benefits of parking facilities with booths and attendants. Manchester does not realize a financial benefit from their parking garages (managed by private companies). Nashua recently assumed management of their parking garages from a private management company, and replaced attended booths with meters and permits.

- All of the other cities reviewed have a dedicated parking manager, with a specialization and focus on the parking function. In contrast, Dover's Parking and Traffic Bureau is headed by a sworn police officer with responsibility for parking regulations as well as traffic regulations, enforcement, safety and accident functions.

- All of the other cities reviewed have parking structures. If Dover pursues implementing parking structures (decks and/or garages), consideration should be given to the added requirements for managing the financing, construction, and administration of parking structures.

Alternatives

Dover's principal challenge in parking management and administration is competition for the time and resources of the Parking and Traffic Bureau, and of the officer in charge in particular. Parking supervision and traffic supervision (including traffic regulations, traffic safety, moving violations, and crash investigation) could both be full-time positions. Combining them into a single position threatens to divert resources from both. In addition, Dover's likely need for structured parking in the future will further increase the time and specialization required for the parking management position.

Therefore, Dover should investigate dividing the PARKING management position from the TRAFFIC management position. The traffic management position has a clear law enforcement orientation (e.g. traffic safety, moving violations, and crash investigation), and it should therefore remain within the DPD.

The parking management function, however, does not necessarily need to remain within the DPD. The experience of other New Hampshire cities indicates that parking coordination and management are most efficient when the parking function is as integrated as possible. Therefore, if the parking management function is to be moved out of the DPD and to a different department, it should be moved in its entirety. The following are two potential approaches for administering the parking management position:

- **Retain Parking Management in DPD.** All parking management and administration functions would remain in the DPD, where they currently reside. The existing Parking and Traffic Bureau would be divided into separate bureaus or divisions, each with a dedicated director. The parking division director should have experience in implementing new parking structures, and managing all aspects of a city's parking program, including parking structures. The added position could be funded in part through increased parking revenues from structured parking. The existing chain of command could be retained, with both directors reporting to the police captain who sits on the TAC. This approach would maintain the existing overall institutional structure, including the siting and

disposition of the Parking Enterprise Fund. Implementing this approach would raise budgetary issues for DPD related to the salary of the parking director, and any other additional costs.

- **Establish a Parking Division / Department Outside the DPD.** As in the first alternative, the parking and traffic functions would be split into two positions. The traffic function would remain in the DPD, while the parking management function would be moved to another department (most likely either Planning and Community Development, Community Services, or a new parking department). DPD officers should still be empowered to issue parking tickets, as they do now, but civilian parking enforcement officers would remain under the parking director, outside the DPD. This approach would require changing the Administrative Code to establish a new institutional structure. DPD-issued citations would likely be adjudicated in the District Court (as they are now), but the new parking management institution would need to resolve its own tickets. This approach would also require moving the Parking Enterprise Fund to a different department, and possibly dividing up the Parking Enterprise Fund's allocation between different departments.

3.2.4 Public Transportation Improvement Alternatives

Dover has a variety of public transit services, and most of them provide service that is focused on the downtown Dover study area. The public transit hub for downtown Dover is the Dover Transportation Center, located at the train station on the Guilford rail line.

Public Transportation – Key Issues

- Public transportation serves important roles in Dover's overall transportation system.
    - Public transportation serves transit-dependent populations in Dover, such as the elderly, children too young to drive, the economically disadvantaged who cannot afford automobiles, and the disabled who cannot drive.
    - Transit also has the potential to gaps and shortcomings in the existing transportation system. One such gap is the lack of available parking near Dover's downtown center, with its concentration of employment and retail businesses that are reliant on parking. Transit and shuttle services could connect these downtown destinations to remote parking. The Cocheco Falls Mill parking shuttle already provides such a service; this concept could be expanded to address more of Dover's parking needs.
    - Several trends suggest that transit ridership in Dover could increase in the future. These include an aging population, growing traffic congestion, and increasing fuel prices. Together, these factors could significantly increase potential ridership for improved transit services in Dover.
- COAST provides excellent regional inter-city transit service. For the relatively long-haul trips between cities in the COAST service region, riders plan their trip-making in accordance with the COAST schedule. However, COAST's 1 – 1 ½ hour headways are not well-suited to short-haul, intra-city service.
- It is likely that Dover could support greater public transportation ridership, especially to and from downtown. Dover has a compact downtown, with concentrated employment, shopping, and civic uses. Major radial arterial streets provide access to and from downtown Dover. Most of Dover's

residential and commercial development is located on or near these major streets, which include Central Avenue, Locust Street, Silver Street, Washington Street, Sixth Street, Broadway, Portland Avenue, Henry Law Avenue, and Dover Point Road. Therefore, transit services along these roads would be able to capture trips to and from downtown Dover. In order to attract significant ridership, however, improved service frequency would likely be required.

Alternatives

Dover has the potential for enhanced local public transit service. The City of Dover has obtained a federal grant through the Federal Highway Administration's Congestion Mitigation and Air Quality (CMAQ) program. This grant is for enhanced local transit service to supplement COAST's inter-city bus services.

The CMAQ grant has a budget of $900,000 and a term of three years. This budget must cover capital costs (including vehicle procurement) and operating costs for a period of three years. After three years, the operating costs for the service are to be funded by the $4.50 auto registration surcharge that the City of Dover collects, along with matching funds from the Federal Transit Administration (FTA). The auto registration surcharge raises an estimated $100,000, which can leverage $100 – 150,000 from the FTA. This is expected to cover the $250,000 annual operating costs of the service, with no reliance on the city's property tax revenues.

The City of Dover is currently working with COAST to plan and implement this service so that the new service will be coordinated with COAST's existing local and regional transit services. Transit Research Center (TRC), a consulting firm that specializes in transit planning and operations, has been hired to evaluate Dover's transit needs, and to recommend a supplemental transit service for Dover.

The Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan has coordinated with TRC in order to stay updated on the status of the supplemental transit service, and to ensure that the downtown plan's recommendations are consistent with the recommendations for a supplemental transit service.

Based on a survey distributed to representatives from Dover and from COAST, TRC has identified the following key requirements for enhanced transit service.

- Critical Service Locations – these include many destinations within the downtown study area, including the downtown loop, the Dover Transportation Center, City Hall, the Public Library, the McConnell Center, the Dover District Court, the US Post Office, senior housing, Wentworth-Douglass Hospital, the Miracle Mile, and a number of other locations.

- Service during weekday working hours (6:30 AM – 5:30 PM)

- Maximum 30-minute headways

There are a few basic approaches to providing a transit shuttle system such as the one proposed for Dover. These include fixed route systems, demand responsive systems, and hybrid systems that combine elements of fixed route and demand responsive systems. Table 3-18 summarizes the basic characteristics of the different system types, along with their respective advantages and disadvantages, both for riders and for the transit service provider.

Table 3-18 Comparison of Supplemental Transit Service Types

	Fixed Route – Line Haul	Fixed Route – Loop System	Demand Responsive	Hybrid: Fixed Route / Demand Responsive
Service Specifications	▪ Pick-up / drop-off only at designated stops ▪ Stops located along a 2-way linear route, with service in both directions and termini	▪ Pick-up / drop-off only at designated stops ▪ Stops located along a 1-way loop route, with circulating service in 1 direction	▪ Pick-up / drop-off only in response to rider requests ▪ Service to accessible line haul transit service or directly to destination	▪ Pick-up / drop-off at designated stops AND in response to rider requests ▪ Several flexible routes / coverage areas can be combined, with a central transfer hub
Rider Advantages	▪ Predictability ▪ Enables the greatest frequency of service for the least operating cost ▪ Direct service to destinations along route	▪ Predictability ▪ Enables relatively frequent service	▪ Convenience ▪ Quick, direct service	▪ Predictability (for service to designated stops) ▪ Convenience (for demand responsive service)
Provider Advantages	▪ Efficient method of serving high-demand destinations	▪ Increases geographic coverage of transit service ▪ 1-way service on a loop is less expensive than 2-way service to the same destinations	▪ Enables service to transit-dependent riders who may have mobility problems ▪ Reduced fleet costs by using standard passenger vehicles (e.g. sedan, van)	▪ Flexibility to provide more frequent service (at designated stops) and direct service (in response to demand) ▪ Fleet efficiency from using same vehicles and same trips to serve both needs ▪ Reduced fleet costs by using standard passenger vehicles (e.g. sedan, van)
Rider Disadvantages	▪ Limited geographic coverage may result in need to travel farther to reach stops	▪ 1-way loop configuration may result in indirect service (e.g. two-thirds of the way around the loop) and excessive trip length	▪ Potential for long wait to be picked up	▪ Hybrid nature of service diverts both rider types from desired route ▪ Zone / transfer hub-based service requires transfer
Provider Disadvantages	▪ Limited geographic coverage may limit ridership or require additional service	▪ Indirect service may discourage ridership	▪ High labor costs, especially if service standards require low wait times for riders	▪ Higher labor costs than fixed route service ▪ Longer waiting times than fixed route service

3.2.5 Pedestrian Improvement Alternatives

Downtown Dover is compact, with a scale that is suited to walking. However, some pedestrian connections are difficult, especially those with motor vehicle conflicts and/or poor visibility. The following are some of the key issues for pedestrian access in the downtown Dover study area.

Pedestrian Accommodation – Key Issues

- **Downtown One-Way Loop.** The downtown one-way loop is the center of Dover's commercial and employment district. As a result, downtown pedestrian volumes are at their highest in the one-way loop. Traffic volumes and conflicts are also very high.

  - Lower Square has a large paved area, with wide pedestrian crossings. In addition, the Central Avenue southbound left turn and the Henry Law Avenue northbound approach are not controlled by the traffic signal, which puts these traffic movements into conflict with the pedestrian crossing on the eastern leg of the intersection.

  - Upper Square has numerous traffic movements, which may be confusing for pedestrians attempting to cross. The crossing from one side of Upper Square to the other is very wide, and the plaza in the center of Upper Square is essentially unusable because it is divided into several small pieces by vehicular turns and surrounded by high volumes of traffic on all sides. There are painted crosswalks only at the corners of Upper Square:

    - Central Avenue / Second Street, which is not signal-protected, and has sight distance issues due to the slope and curve on Central Avenue

    - Main Street / Chapel Street

    - Central Avenue / Broadway / Third Street, which is 300 feet north of the other two intersections.

    As a result, crossing Upper Square can be circuitous and discouraging for pedestrians.

  - The Washington Street / Main Street intersection has very high volumes of traffic circulating northbound through the downtown one-way loop. This location is essentially the back corner of the downtown one-way loop, and it has high traffic volumes with minimal conflicts due to the lack of a vehicular connection at the eastern end of Washington Street. As a result, traffic speeds are very high, and pedestrian crossings are difficult.

  - Mid-Block Crossings in the Downtown Loop. There are three crosswalks on Central Avenue between Upper Square (at Second Street) and Lower Square. These are not strictly mid-block crossings, since they are located at the corners of First Street, Waldron Court, and Orchard Street. However, these are low-volume streets used mostly for local access, so they do not create obvious pedestrian crossing points. Pedestrian crossing can be somewhat challenging due to the downward slope of Central Avenue, sight distance obstructions from parked cars, and long vehicle queues approaching Lower Square. These locations are marked with "Yield to Pedestrians" signs; in addition, traffic calming treatment has been proposed for these locations to make them more prominent. There are also two crossings on Main Street between Portland Avenue and Upper Square, though pedestrian volumes are lower.

- **Other Critical Pedestrian Crossings**

    - Central Avenue between Lower Square and Silver Street. Central Avenue between Lower Square and Silver Street has significant pedestrian traffic, and many pedestrian origins and destinations, including storefront retail, City Hall, several churches, and Central Towers. Crosswalks are provided at Saint Thomas Street (in front of City Hall), at Williams Street (in front of Central Towers), and at Hanson Street. However, there are a number of obstacles to pedestrian crossing: there are no major intersections between Lower Square and Silver Street, Central Avenue is wide and curving, the roadway is on a significant grade, traffic volumes are high, and there are frequently vehicle queues that extend through the crosswalks.

    - Washington Street at Locust Street. This crosswalk is frequently blocked by vehicle queues from Lower Square.

    - Washington Street at Green Street. Residents at Waldron Towers have indicated a desire for a crosswalk across Washington Street at the end of Green Street. However, the southern side of this crosswalk would be located in between the closely-spaced and very busy driveways of the Fleet Bank. There is an existing crosswalk across Washington Street at Fayette Street and Atkinson Street, about 200 feet east of Green Street; this crosswalk should be upgraded to improve visibility. It is also recommended that a new crosswalk be built across Washington Street at Belknap Street; this crosswalk would be only 100 feet west of Green Street.

Alternatives

Optimal pedestrian access is very important, and should be a central consideration in roadway and intersection design. Pedestrian access is a key element in all of the traffic and circulation alternatives. These alternatives all incorporate pedestrian improvements, and the alternative objectives, advantages, and disadvantages are heavily influenced by pedestrian access considerations. The following are the key elements of pedestrian-sensitive design that were incorporated into the traffic and circulation alternatives:

- Minimize pedestrian crossing widths and improve pedestrian sight lines and visibility by designing intersections with appropriate vehicle lanes and by providing neckdowns where appropriate.

- Maximize pedestrian crossing opportunities by installing crosswalks at all legs of intersections, where possible.

- Incorporate pedestrian crossing phases into traffic signal timing. In downtown Dover, push-button activated exclusive pedestrian crossing phases are recommended due to the high volumes of turning movements at most signalized intersections.

Pedestrian crosswalks are another important element of the downtown Dover transportation system. Crosswalks should be clearly marked, and visible enough to provide adequate notice for conflicting vehicles, and adequate protection for pedestrians in the crosswalks.

All of the crosswalks in the downtown Dover study area have been catalogued, and divided into three categories. The following are the categories, along with issues associated with each category and proposals for pedestrian improvements.

- **Crosswalks at Signalized Intersections.** These crosswalks are generally well-marked with paint or thermoplastic pavement markings, and provided with a signal-protected crossing phase. In

addition, vehicles at signalized intersections are generally aware of potential conflicts. Crosswalks at signalized intersections should be clearly painted, provided with pedestrian signal heads, and given protected crossing phases that are appropriate to the intersection design.

- **Crosswalks at Unsignalized Intersections Parallel to Major Traffic Flows.** These crosswalks are not protected by traffic signals, but they generally do not have heavy volumes of conflicting traffic. Traffic from the minor street is generally controlled by a stop sign, which requires that vehicles come to a full stop before the crosswalk. Traffic from the major street must slow to turn onto the minor street, and drivers who are turning are generally more aware of potential conflicts. Crosswalks at unsignalized intersections parallel to major traffic flows should be clearly painted, preferably with durable and highly visible thermoplastic pavement markings.

- **Crosswalks Across Major Traffic Flows.** There crosswalks may be midblock crossings (e.g. the crossing of Main Street north of Portland Avenue) or crossings of the uncontrolled major street traffic at an unsignalized intersection (e.g. the crossing of Central Avenue at Williams Street). There are heavy flows of fast-moving traffic at these locations; these vehicles are required to stop for pedestrians attempting to cross the street, but drivers are generally not as attentive to pedestrians at these locations. Therefore, it is important to enhance the visibility of these crosswalks using the following measures:

    - Crossings of major traffic flows should be reconstructed with stamped asphalt, a material that is highly visible, durable, and easy to maintain.

    - These crossings should be equipped with highly visible signage notifying drivers of the presence of the crosswalk and the requirement that they stop for pedestrians.

    - These crossings must have adequate street lighting, directed downward at the crossing to ensure that the crosswalk, signage, and pedestrians are adequately lit.

  The crosswalks on Central Avenue at Orchard Street, Waldron Court, First Street, and Second Street, and the crosswalk on Chestnut Street at Orchard Street, have all been reconstructed with stamped asphalt; this has enhanced their visibility.

Figure 3-31 shows all of the crosswalks in the downtown study area, by crosswalk type. Figure 3-31 also indicates the crosswalks where stamped asphalt treatment is recommended.

3.3 Development Needs and Impacts

Planning for Dover's future development is a central element of the Downtown / Riverfront Development Traffic Circulation and Parking Plan. The transportation and parking recommendations must accommodate the transportation access and capacity needs of future development in the downtown study area, and ensure that the transportation and environmental impacts of the recommendations are acceptable.

The most critical new development in the downtown study area is the Riverfront development. The Riverfront development will entail significant new trip generation, which will require traffic capacity; it will also require a comprehensive review of the downtown traffic circulation and access pattern. The traffic operations and environmental impacts of the new development traffic must also be considered.

Downtown Dover is expected to have other transportation requirements associated with new development. The Cocheco Falls Mill has significant office space available; this office space will generate new travel demand when it is occupied. In addition, downtown Dover's retail space has very low vacancy, which indicates demand for additional retail development.

Key Issues

The following are the key issues that will determine downtown Dover's future development, and the development's anticipated transportation needs.

- **Riverfront Parcel.** The City of Dover owns the 30-acre Riverfront parcel, and plans to facilitate mixed-use development on this site. The key elements that must be considered include:
    - **Development.** The ongoing Riverfront development planning process has produced a number of different proposals. All of the various planning scenarios call for some mix of residential, office, retail, and recreational development. Some include other elements, such as a hotel / conference center.
    - **Motor Vehicle Access.** Access for the Riverfront is critical to its success. A Riverfront development of any size or density requires the construction of a vehicular bridge connecting the eastern end of Washington Street to the Riverfront parcel.
    - **Parking.** The Riverfront parcel currently houses approximately 180 parking spaces for One Washington Center. About 60 of these spaces are used on a daily basis, while another 120 or so are located in a rear parking lot that is generally used seasonally. The future development must ensure that its own parking needs are accommodated, and that the existing parking users on the site are taken into consideration.
    - **Pedestrian and Bicycle Access.** The Riverfront development planning includes park space along river and an extension of the Riverwalk. Pedestrian and bicycle access should also be provided via the new Washington Street Bridge, since Washington Street provides direct access to the center of downtown Dover, and Washington Street should be made as accessible and pedestrian-friendly as possible to facilitate the connection between the existing downtown and the Riverfront development.

- **Environmental Impacts.** The Riverfront development will bring new traffic and new uses to the edge of the Cochecho River. The site's current environmental conditions and the potential environmental benefits and impacts of development must also be considered.

- **Downtown Mill Development.** The downtown mills are also expected to generate future traffic and parking demand.

  - **Cocheco Falls Mill.** This mill includes 380,000 gross square feet of Class A office space. The Cocheco Falls Mill is currently approximately 60% occupied; this is up from about 52% at the beginning of the study process (when the traffic counts were conducted). Relative to the baseline condition (when traffic was counted), 110,000 square feet of leasable office space is available. This would result in an expansion of employment at the mill from the current 500 – 600 employees to a potential total of 1,100 – 1,200 employees.

  - **One Washington Center Mill.** This mill encompasses 280,000 gross square feet. It is currently fully occupied as industrial office, warehouse, light industrial space, with a total of 300 employees. The mill expects to develop approximately 20 – 25 condominiums in a minor expansion. In addition, the mill may convert some of the existing light industrial / warehouse space to more intensive uses in future, such as office, as demand warrants.

- **Downtown Retail.** There is currently a very high rate of downtown retail occupancy, estimated at about 93%. This indicates a very healthy downtown retail market, but is too low to accommodate the likely demand. This has resulted in conversion and rehabilitation of other types of space, as well as marginal space. In the future, it is expected that additional retail space will be developed in the downtown study area.

Future Land Use Scenario

Based on these issues, a variety of development scenarios were investigated. These scenarios were designed to adhere to the general land use and size guidelines that were included in the previous Riverfront development planning efforts. The scenarios that were investigated included some that relocated some elements of the Riverfront development program away from the Riverfront parcel. For example, one scenario reviewed the possibility of relocating some of the proposed Riverfront retail space to Central Avenue at the Bank of New Hampshire parking lot; this parcel was developed with a parking garage and storefront retail. This proposal was investigated, and it is feasible.

However, the final development scenario that was evaluated in detail does not assume any further development on the Bank of New Hampshire parking lot. Ultimately, the development scenario that was evaluated preserves all of the new Riverfront development program elements on or near the Riverfront parcel, and it assumes that all new vehicle trips related to the Riverfront development would pass through the intersection of Washington Street / Main Street, and would cross the new Washington Street Bridge.

The development scenario assumed for the Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan transportation analysis (the "analysis scenario") is designed to be conservative and to allow for the maximum likely development. It assumes that the Riverfront development program is maximized at 355,000 square feet, plus a 100-slip marina. This square footage is divided roughly equally among residential, office, retail / restaurant, and hotel land uses. The hotel proposal is not included in the latest Riverfront proposals, but it was in earlier proposals. It was added to the recommended development scenario in order to provide a more conservative development program, with the highest traffic demand that would be likely to result from the Riverfront development. By planning for the highest level of traffic

demand that might be expected from the Riverfront development, the Downtown / Riverfront Redevelopment Traffic Circulation and Parking Plan is assured of accommodating the Riverfront traffic demand.

In addition to the Riverfront development, the recommended development scenario includes other downtown development. It is assumed that the Cocheco Falls Mill is 100% occupied, with an additional 182,400 square feet of leased office space. Coupled with the 90,000 square feet of office development in the Riverfront development, this represents an aggressive target for office market absorption: based on data on downtown land use obtained from Dover Main Streets, this additional 272,400 square feet of office space would increase the downtown Dover occupied office space by about 70%.

The recommended land use scenario also includes an additional 30,000 square feet of retail in the existing downtown commercial core. Along with the additional 90,000 square feet of retail and restaurant space included in the Riverfront development, this represents an increase of about 25% over the existing 500,000 square feet of retail and restaurant space in the downtown study area.

Table 3-19 Future Development Scenario

	Size	Daily Trips	AM Peak Hour		PM Peak Hour		Parking
			Entering	Exiting	Entering	Exiting	
Cocheco Falls Office	182,400 sq ft	2,106	265	36	48	236	509
Downtown Retail	30,000 sq ft	1,330	46	30	36	46	119
1 Washington Condos	25 units	147	2	9	9	4	30
Downtown Total	**249,900**	**3,582**	**313**	**75**	**93**	**285**	**658**
Riverfront							
Apartments	90 units	605	9	37	36	20	109
Office	90,000 sq ft	1,224	151	21	31	150	251
Hotel	100 rooms	823	34	22	32	29	103
Restaurant	10,000 sq ft	1,101	26	24	58	34	125
Retail	80,000 sq ft	3,546	84	53	95	121	318
Marina	100 berths	296	3	5	10	9	26
Cultural	10,000 sq ft	229	9	4	6	12	40
Riverfront Total	**355,000**	**7,824**	**315**	**167**	**268**	**374**	**971**

These trips were added to the future traffic networks, and tested for the no-build condition as well as the various future alternatives. The added traffic from the analysis scenario had some effects, especially on intersections in the downtown central loop and along Washington Street. In the no-build condition and Alternatives 1 and 1A, the additional traffic from the analysis scenario resulted in some intersections experiencing LOS F traffic operations. However, in the Preferred Alternative (discussed in Section 4), the key downtown intersections operate at LOS D or better with the exception of Lower Square, which operates at LOS E. In addition, the actual traffic from the Riverfront development is likely to be lower than that assumed in the analysis scenario, as discussed below.

Cochecho Waterfront Development Advisory Committee

The Cochecho Waterfront Development Advisory Committee (CWDAC) recently issued "Cochecho Waterfront Design Charrette – 2004 Version" suggests that the Riverfront development will entail a less-intensive, less dense land use program than what is shown in Table 3-19.

The transportation access and traffic capacity needs for the Riverfront development that have been described in this report will still be valid for the new Riverfront proposal, for the following reasons.

- **Transportation Access.** Even with a reduced program, there will still be a significant concentration of mixed-use development on the Riverfront parcel. The Washington Street Bridge and change to downtown circulation are still necessary in order to make access to and from the Riverfront parcel convenient and attractive.

- **Traffic Capacity.** Planning for a larger development, and showing that the downtown street network can accommodate the increase in traffic, ensures that the downtown street network can accommodate the traffic from a smaller development.

Riverfront Environmental Issues

There are significant environmental issues related to the Riverfront development. The Cochecho River is an important natural resource for Dover and its residents. Dover has already made a significant investment in improving the riverfront at Henry Law Park, and in clearing the Riverfront parcel of most of pre-existing industrial uses.

However, the Riverfront parcel is still a blighted and underutilized parcel that previously supported a broad spectrum of environmentally undesirable uses. Historic uses of the site have included manufacturing, quarrying, solid waste disposal, and incineration. The site has also been used for dumping of sludge, tannery waste, and dredge material. Recent uses on the site include the storage of vehicles and materials (including road salt and jersey barriers) by the City's Community Services Department; school bus storage and maintenance; a recycling center; and a waste water treatment plant. The parcel currently houses a sewer pump station and parking lots.

The environmental impact of these activities and materials is exacerbated by the drainage system for the site, which consists of drains leading to underground culverts that dump directly into the Cochecho River. As a result, the Cochecho River bore direct impacts from materials draining from the culverts, as well as continuing indirect impacts from soil contamination and seepage into the river. Approximately four wetlands have been identified on the site all of which are in a degraded state.

From an environmental standpoint, any responsible redevelopment of the parcel would result in improvements to the existing site. Environmental remediation for decades of neglect and creation of public access along the waterfront will be essential components of any redevelopment plan for the area. The development of the parcel would require remediation and/or capping of any contaminated soil or groundwater, and mitigation of any problematic drainage structures.

There is a tremendous potential to improve the environmental character of the site through careful building and site design. The following are the key environmental issues and guidelines for developing the Riverfront parcel.

Buffer Zones and Setbacks

Buffer zones and setbacks around natural resource areas are necessary in order to preserve their integrity. Buffer zones around sensitive resource areas, such as the Cochecho River, play an important role in preservation of the physical, chemical and biological characteristics of the resource area. Extensive work adjacent to the Cochecho River, particularly clearing of natural vegetation and soil disturbance, could change the soil composition, topography, hydrology, temperature, and the amount of light received. The Cochecho River's soil and water chemistry may be adversely affected by work in the buffer zone.

The Riverfront parcel currently has no specific buffer zone or setback requirements. The property is located within the Cochecho Waterfront District (CWD), a mixed-use district. The CWD does not identify any setback requirements within the zoning bylaw, Table of Dimensional requirements ((170-17). Setbacks from Riverine systems should be based on environmental considerations, such as FEMA floodplain regulations (i.e. 100 year flood zone and the floodway boundaries) and compliance with the Wetland Protection overlay District (170-27.1 of the Dover Zoning Bylaw). The New Hampshire Department of Environmental Services (DES) has established setback guidelines whereby primary structures should have a 50-foot setback from the reference line, i.e. the ordinary high water line (RSA 483-B:9, II(B)).

Municipalities may supersede this guideline and establish a different setback limit. However, the setback area from the Cochecho River should be adequate to provide for public access in the form of walking and biking trails, boat launch, marina, and vehicular parking, if appropriate, to support the public uses along the river. Therefore, the City should preserve a minimum setback of 50 feet from the Cochecho River and floodplains to allow for a reasonable open space corridor. If residential/commercial uses are planned, the City should consider at least a 100 foot setback from the edge of the river. The 50 to 100 foot setback should apply to both structures and new roadways.

Dover zoning requires a site plan review for all non-residential or redevelopment projects, and this would apply to the anticipated mixed-use development envisioned for the Riverfront development. This would entail an inventory of all natural resources and preparation of a site master plan that will identify proposed land uses and access. In preparing the site plan for the Riverfront development, the developer should work with the City of Dover to establish the appropriate setbacks for the site.

Buffer Zone Design and Landscaping

The Riverfront development should include restoration of the bank and enhancement of any wetlands resource areas located on the parcel. Along the bank of the Cochecho River, this is likely to include bank stabilization and bioengineering. On the upland area of the buffer zone, the previous industrial uses of the site and the environmentally marginal nature of the land will likely require that the buffer zone be capped with several inches of clean soil to facilitate landscaping.

Vegetation enhancements to the riverfront zone should be selected as part of an overall bioengineered plan for river bank stabilization. Bioengineering approaches to bank stabilization will emphasize vegetative techniques but may also include "hard" elements such as rip-rap/river rock and wood (e.g. embedded logs/root wads or constructed cribbing).

Riverfront restoration may require bank reconstruction to reduce slope gradient and may include placement of soil terraces or lifts. Vegetation will typically be placed in between each soil lift in a "sandwich style." Surface areas will also be re-vegetated, typically with native grass and wildflower

seed. Surface erosion on reconstructed banks will typically be immediately controlled with biodegradable matting through which seed will grow.

All vegetation used for river bank and upslope restoration in the riverfront zone should be native to New England. Vegetation should include trees, shrubs, groundcovers, grasses and wildflowers. Species selected should be typical of those found growing wild along river banks and in riparian zones in the surrounding region. Trees may be planted as seedlings or saplings or seeded in to keep costs down. Shrubs may be planted from small size containers or as live brush/live stakes (branch cuttings), tubelings (similar to grass plugs or bare root material) or seed.

New plantings / seedings of shrubs and trees should be particularly heavy at the toe of river banks where undercutting potential is the greatest. This would have the additional benefit of creating dense shade for aquatic species. Native grasses and wildflowers should be selected for aesthetics and for aggressive growth characteristics to rapidly cover eroded banks and/or exposed ground quickly. A diversity of species should be used to ensure good coverage and to maximize wildlife habitat values. Eel grass beds must be identified and preserved. They are protected under federal law, and all bank stabilization and landscaping efforts must respect the presence of eel grass.

As much of the area as possible should be covered with low maintenance native species that do not require mowing. Maintained lawn areas should be minimized. For proposed lawn areas, organic turf installation and management strategies should be considered to create optimum turf growing soil conditions requiring minimal irrigation and fertilization. A wide vegetated buffer should be maintained along all undeveloped sections of the riverfront to preserve water quality in the river and maintain good wildlife habitat. Maintained turf areas shall be kept well away from the water's edge under all circumstances.

Recreation and Open Space

Site redevelopment would also offer an opportunity to create areas for both passive and active recreational uses along the river including walking, bicycling, and other activities. Use of the Cochecho River for recreational activities, such a boating, should also be explored. Provisions for public access should also be included in buildings within the proposed development, as appropriate.

The buffer zone along the Cochecho River should principally be a green open space, and it should be designed in a manner that is inviting and clearly public. It should include a primary shared-use (pedestrian and bicycle) path. This path should serve as a clear and continuous connection from the existing Henry Law Park around the edge of the Riverfront parcel to Maglaras Park. The path should also have clear and well-defined links to downtown Dover via the new Washington Street Bridge, and to the Riverfront development, particularly the public accommodation facilities to be included in the development, such as restaurants, shops, and bathrooms.

The Riverfront development is expected to include boating facilities, such as a marina and/or a public boat launch. The U.S. Army Corps of Engineers is currently dredging the section of the Cochecho River near the Riverfront parcel, and this should enable larger boats to use this portion of the river. As a result, the marina and/or boat launch at this location must be designed to accommodate appropriately-sized boats. In addition, the access roads leading to and from the marina and/or boat launch must be designed to accommodate landside access for the boats. This is especially important if a public boat launch is built, since landside access to a public boat launch would be much more frequent than for a marina.

Roadway and Parking Design

Beyond the buffer zone, the site planning and design of the Riverfront development's buildings, roadways, and parking must also be environmentally sensitive. The landscaping and pervious cover should be maximized in the Riverfront development as a whole. This will help to control run-off and improve the aesthetics of the development.

New roadways should re-use existing roadways to the degree possible. This will reduce environmental impacts and facilitate re-use of paving materials. New roadways should be integrated with the overall street pattern, and should provide access for pedestrians and bicycles.

The siting and design of parking facilities for the Riverfront development will entail certain trade-offs. For the most part, parking facilities should be sited away from the Cochecho River and away from the buffer zone, for aesthetic reasons and to minimize the potential for run-off into the river. The best potential sites for parking facilities are likely to be the site of the existing "rear" parking lot, located at the former quarry site in the southeast corner of the Riverfront parcel, and the eastern edge of the parcel.

Construction of a parking deck or a multi-level parking garage would be desirable from an environmental perspective, since it would conserve land and reduce the amount of impervious cover on the site. However, such structured parking entails a significant cost to the developer. If land availability for parking is at a premium or if the development's parking requirements cannot be met with surface parking, then structured parking should be considered. The structured parking could be built on the Riverfront parcel itself, or some of the Riverfront development's parking requirements could be accommodated in a parking garage immediately across the river in a garage on or near Washington Street.

The environmental impacts of the additional Riverfront development traffic are expected to be minor. The additional traffic will contribute to airborne emissions, but this is true of new traffic from background growth and any other development in the downtown Dover study area. In addition, many of the study recommendations will reduce congestion and automobile idling, which will tend to reduce automotive airborne emissions.

Drainage

Development of the parcel would result in removing poorly designed and obsolete industrial land uses that produce poor quality stormwater runoff, and replacing them with clean land uses that have state of the art stormwater and drainage controls. The existing culverts and drainage system will be removed, thereby eliminating contaminated stormwater and groundwater discharges to the Cochecho River, further improving the water quality of the river. Surface runoff from the site to the river will also be improved by remediation and/or capping of contaminated soil and the inclusion of vegetative buffers between the river and adjacent land uses.

The new traffic is not expected to have any negative impacts on the Cochecho River or on discharges to the river. On balance, the Riverfront development should improve the Cochecho River water quality, even when only vehicle-related discharge is considered. Currently, any stormwater or discharge related to vehicles accessing and parking on the Riverfront parcel is able to seep into the unpaved parking area, and discharge to the Cochecho River. The Riverfront development will entail reconstruction of roadways and construction of parking lots and garages to include drainage systems that incorporate best management practices (BMPs) such as oil separation. These drainage systems will minimize run-off to the Cochecho River and protect its water quality.

Environmentally-Sensitive Design and Construction

The design and construction of the buildings themselves can also help to enhance the Riverfront development's environmental sensitivity. So-called "Green Buildings" are designed and built with comprehensive strategies to minimize resource consumption and environmental impacts.

Green buildings integrate traditional energy-conservation measures that have been used for decades. These include passive solar design; tight construction that minimizes air infiltration; natural lighting and ventilation; high performance insulation, windows and doors; and energy-efficient heating systems, cooling systems, appliances and light fixtures. These approaches have been successful in reducing energy consumption at a relatively low cost.

Recently, a more comprehensive view of the environmental impact of buildings has led to a broader range of environmentally sensitive measures. Green buildings also encompass the promotion of waste minimization, water conservation, indoor environmental quality, low-impact use of land, and the greater use of natural and recycled materials.

Green buildings also expand the definition of energy efficiency to include renewable energy technologies, especially active solar systems such as photovoltaic power generation. These approaches minimize the impact of buildings elements on human health and the environment.

The City of Dover should encourage developers on the Riverfront parcel to incorporate green building strategies that are appropriate to the scale and nature of the development. Measures especially critical for the Riverfront development may include extensive landscaping, stormwater retention systems, and water recycling. These measures could help to minimize run-off and protect the water quality of the Cochecho River.

4.0 Recommendations

This chapter summarizes the study recommendations. These recommendations build upon the previous elements of the study and the final report: they are based on the goals and objectives identified in Chapter 1, the existing conditions analysis in Chapter 2, and the quantitative and qualitative evaluation of alternatives described in Chapter 3.

The study recommendations:

- Address downtown Dover's existing transportation needs and issues.
- Plan for future transportation access and demand. This includes the future needs of existing businesses and residents, as well as the needs of new development in downtown Dover and on the Riverfront parcel.
- Complement each other, and work together as a cohesive whole. They represent the combination of options that best satisfies the downtown plan's goals and objectives.

The recommendations included in this chapter address traffic, parking, public transportation, pedestrian, and bicycle improvements for downtown Dover and the Riverfront Development. These recommendations also respond to issues and comments raised by the Transportation Advisory Commission (TAC), City of Dover staff, the Riverfront Committee, and the general public through the public meeting process and the extensive downtown survey process.

The recommended improvements are divided up into three categories based on priority and phasing:

- Immediate Recommendations (6 months – 1 year)
- Short-Term Recommendations (1– 5 years)
- Long-Term Recommendations (5 – 10 years)

These recommendations include both capital improvements and policy recommendations. The recommendations are summarized below. The capital improvements are also assigned preliminary order-of-magnitude cost estimates. These cost estimates are intended for long-term budgeting and planning purposes, and are based on a preliminary design and a general understanding of site conditions. In addition, the cost estimates for each item, and for the total costs, are rounded off to the nearest thousand dollars (the itemized cost estimates and the totals may be inconsistent due to rounding errors).

4.1 Immediate Recommendations

A few transportation improvements are recommended for immediate implementation, i.e. within 6 months to one year. These are improvements that address pressing congestion and safety problems, and that can be implemented fairly quickly and cheaply. These recommendations are summarized in Table 4-1.

Table 4-1 Immediate Recommendations – Capital Improvements

Location	Improvement	Benefit	Timing	Cost
Motor Vehicle				
1. Lower Square	NB Approach: Change LT lane to shared LT - RT	Congestion relief	2005	$600
2. Chestnut St / Washington St	SB Approach: Widen to 3 lanes: LT - TH - RT WB Approach: Eliminate parking space in RT lane	Congestion relief, safety Congestion relief, safety	2005	$8,000
3. Locust St / Washington St	Pavement striping to define lanes, intersection	Congestion relief, safety	2005	$1,000
Pedestrian				
4. Chestnut St at Orchard St	Pedestrian refuge island at mid-block crossing	Safety, pedestrian access	2005	$17,000
Total				**$27,000**

Capital Improvements

Motor Vehicle Traffic

- **Lower Square.** Northbound left turns account for a low volume of traffic (less than 10% of volume), but this movement must be retained in order to accommodate bus access. Therefore, the existing left turn lane is converted to a shared left turn – right turn lane. Most of the time, the northbound approach can be used as a dual right turn lane to satisfy the major traffic movement around the one-way loop.

- **Chestnut Street / Washington Street.** Widening the southbound approach to three lanes (left turn / through / right turn) reduces congestion, increases Chestnut Street capacity, and addresses the safety issue of through-movements using the right turn lane to "sneak by" the queue. Eliminating the parking space on the north side of Washington Street between the hardware store driveway and Chestnut Street improves traffic flow, especially for westbound right turns, and reduces congestion.

- **Locust Street / Washington Street.** Washington Street is very congested in this section of roadway, especially due to eastbound queuing from nearby Lower Square. Re-striping Washington Street at this intersection provides three narrow travel lanes on Washington Street, including two eastbound lanes. This provides more queuing capacity for the eastbound Lower Square approach. The re-striping also defines the lanes more clearly and discourages the Lower Square eastbound queue from blocking Locust Street traffic.

Pedestrian

- **Chestnut Street Pedestrian Crossing at Orchard Street.** Creating a pedestrian refuge at this location enhances the safety and visibility of this crossing and provides better pedestrian access by enabling pedestrians to cross the street in two stages.

Policy Recommendations

Motor Vehicle Traffic

- **Dover Tolls.** The State of New Hampshire plans to implement the EZ Pass electronic toll payment system in March 2005. At the same time, it will reduce the toll discount that is currently available to drivers who purchase toll tokens from 50% to 40% for EZ Pass users and 20% for token users. This could have a significant impact on traffic that uses Dover Point Road and downtown Dover to avoid the Dover Toll Plaza. The State of New Hampshire should promote the use of the EZ Pass system, offer incentives for its use, and delay the reduction of the toll discount for a period after the electronic toll system has been in place, in order to reduce the impact of the transition. The City Council should pass a resolution requesting that the State of New Hampshire delay reducing the token discount for six months after the implementation of the EZ Pass system, and send the resolution to the Governor and Executive Council.

Truck Traffic

- **Improved Signage.** Improved signage to direct trucks to use appropriate regional roadways. Signs should be posted at all the Dover exits on the Spaulding Turnpike exits. These signs should indicate that trucks coming from the south should use Exit 9 for access to Miracle Mile / Weeks Crossing businesses and for access to Route 9 and Berwick, Maine.

- **Oak Street Bridge Improvements.** The City of Dover should advocate with NHDOT for the reconstruction of the Oak Street Bridge over the Guilford Railroad tracks. This would remove the weight limit and allow trucks to bypass downtown when traveling between Weeks Crossing in northern Dover and Maine via Route 4.

4.2 Short-Term Recommendations

The following are improvements that are recommended for implementation in the short term, between about one year and five years. These recommendations are generally changes that address existing congestion, safety, and access issues. For the most part, they can be implemented independently of one another, and can therefore be phased as funding and capacity for the projects becomes available.

Table 4-2 summarizes the proposed capital improvements. Figure 4-1 shows the immediate and short-term capital improvement recommendations.

In addition to the improvements in Table 4-2, there are also proposals for changes to parking administration and management, and a discussion of Dover's potential supplemental public transit service.

Table 4-2 Short-Term Recommendations – Capital Improvements

Location	Improvement	Benefit	Timing	Cost
Motor Vehicle				
1. Lower Square	SB Approach: 3 lanes: LT - TH - TR	Congestion relief	2006	$52,000
	2 SB receiving lanes, rebuild SW corner of intersection	Congestion relief	2006	
Upper Square				
5. Main St / Chapel St	Reverse Chapel St (WB), consolidate central plaza	Pedestrian access, simplify circulation	2007	$128,000
6. Central Ave / 3rd St / Broadway	Signalize 3rd St approach	Simplify circulation	2007	$22,000
7. Washington St at Cochecho River	Build Washington Street Bridge	Economic development: access to Riverfront	2007	$1,500,000
8. Chestnut St / 2nd St	Install pedestrian refuge island and stamped asphalt	Pedestrian access, parking lot access	2008	$16,000
9. Chestnut St / 1st St	Move crosswalk, modify pavement markings	Pedestrian access	2008	$2,800
10. Chestnut St / Central Ave	Install traffic signal	Relieve Chestnut St NB congestion	2008	$274,000
11. Broadway / St. John St	Rebuild intersection	Simplify circulation, create plaza	2009	$127,000
12. Portland Ave / Chapel St	Rebuild intersection	Simplify circulation, improve sight distance	2009	$62,000
Parking				
13. Main Street	Additional parallel parking on west side of street	Increased on street parking supply	2006	$1,700
Pedestrian				
14. Portland Ave	Sidewalk construction from parking lot to Main St	Pedestrian access, parking utilization	2005	$60,000
15. Crosswalk Location Unsignalized, major traffic flow	Upgrade to stamped asphalt, improved signs	Safety, pedestrian access		
Central Ave at Hanson St			2005	$4,300
Central Ave at Williams St			2005	$3,200
Central Ave at St. Thomas St			2005	$3,600
Washington St at Locust St			2005	$4,300
Washington St at Main St			2005	$3,200
Main St at Portland Ave			2005	$2,500
Portland Ave at Main St			2005	$1,800
Young St at Main St			2005	$3,200
Main St at School St			2005	$2,900
Central Ave at 5th St			2005	$4,000
Chestnut St at 3rd St			2005	$3,600
3rd St at Chestnut St			2005	$2,900
Washington St at Fayette & Atkinson St			2005	$3,200
Washington St at Belknap St			2005	$3,200
Locust St at Hale St			2005	$5,000
Henry Law Ave at Central Towers			2005	$2,900
Total				**$2,299,000**

Capital Improvements

Motor Vehicle

- **Lower Square.** Minor geometric and signal changes provide two southbound through lanes. As a result of this change and the immediate recommendation to convert the northbound left turn lane to a shared left turn – right turn lane, there will be two lanes for the each of Lower Square's heaviest movements (northbound right turn, southbound through, eastbound through), significantly reducing congestion.

- **Upper Square.** Reversing Chapel Street circulation provides better access for Portland Avenue traffic into downtown Dover and to Chestnut Street via Second Street. Closing the turn lanes through the central plaza simplifies traffic circulation and improves pedestrian access; it also requires that the Third Street approach be signalized.

- **Washington Street at the Cochecho River.** Construction of the Washington Street Bridge provides access to the Riverfront parcel. State and local funding for the bridge has been allocated, and the bridge design contract is expected to be advertised in Fall 2004.

- **Chestnut Street / Second Street.** Consolidating the Dover Transportation Center vehicular entry and exit would provide a direct westbound connection through downtown via Portland Avenue – Chapel Street – Second Street. It would also enable a Chestnut Street northbound dedicated left turn lane to terminate at this location, and facilitate the creation of a crosswalk with a center refuge island on the northern side of this intersection. These changes would provide improved vehicular access into and out of the Dover Transportation Center parking lot, and provide improved safety and comfort for pedestrians crossing between the downtown center and the Dover Transportation Center / Cocheco Falls Mill parking lot. Traffic at this intersection should be monitored to determine whether it increases to a level where it meets warrants for installing a traffic signal.

- **Chestnut Street / Central Avenue.** Installing a traffic signal at this location reduces the congestion and queuing on northbound Chestnut Street, which enhances Chestnut Street's ability to provide an alternate north – south route through downtown. The proposed signal also reduces the safety issues associated with the sight lines and upgrade from the Chestnut Street northbound approach.

- **Broadway / St. John Street.** Consolidating this intersection simplifies circulation, reduces driver and pedestrian confusion, and creates the potential for useful plaza space. The new design must take into account driveway access for the fire house and the houses adjacent to the proposed plaza.

- **Portland Avenue / Chapel Street.** Consolidating this intersection simplifies circulation and provides better sight distance for Chapel Street right turns.

Parking

- **Main Street.** Adding parallel parking on the west side of Main Street increases the supply of public parking. This parking is located immediately adjacent to the Cocheco Falls Mill, and could be regulated as short-term (two-hour) shopper / visitor parking.

Pedestrian

- **Pedestrian Connections to Parking.** Improving pedestrian connections to under-used parking lots would increase the effective parking supply.

    - **Portland Avenue Sidewalk.** Building a new sidewalk along Portland Avenue would enable Cocheco Falls Mill employees to use the city-owned parking lot on Portland Avenue near Cochecho Street, which has been virtually unused. This sidewalk, from Main Street to the parking lot, would enable a less than 5-minute walk between the mill and the parking lot. This connection would be even shorter via the steep paved path between the end of School Street and Portland Avenue.

    - **Chestnut Street / Second Street.** The proposed refuge island at this location would make it easier for pedestrians to cross Chestnut Street at this location. This would enable easier pedestrian access between the Cocheco Falls Mill and the parking lot that it owns adjacent to the Dover Transportation Center.

- **Enhanced Crosswalks.** The crosswalks with the highest priority for enhanced visibility are those that cross major traffic flows and are unsignalized. It is recommended that these crosswalks be enhanced with stamped asphalt and highly visible warning signs notifying drivers that they are required to stop for pedestrians in crosswalks. The locations where such enhancement is recommended are listed in Table 4-2, and shown in Figure 4-1.

Policy Recommendations

Parking

Management and Utilization

- **Orchard Street Parking Lot.** Convert all public parking spaces in the Orchard Street parking lot to metered parking spaces that can also be used by permit holders. This would enable greater flexibility, higher parking utilization, and issuance of more parking permits. Master meters are recommended to reduce costs of metered the remainder of the lot. If this change is successful, and if demand warrants, this policy could also be implemented in the First Street parking lot.

- **Revise Dover Code to Discourage Shuffling.** Limit parking in two-hour spaces to a total of four hours, two hours in any given block, throughout the downtown area. Undertake an educational campaign through the mill employers, the Greater Dover Chamber of Commerce, and Dover Main Streets to emphasize the importance of preserving two-hour parking for short-term visitors.

- **Remote Parking.** Work with Cocheco Falls Mill employers to identify potential remote parking opportunities, such as the Dover Arena or Miracle Mile. Incorporate the potential for shuttle service to this remote parking location in the planning for the downtown transit shuttle. Identify incentives that the City of Dover can offer to the Cocheco Falls Mill to encourage remote parking (e.g. potential for construction of a municipal garage that could be used by mill employees). Encourage the mill employers to develop incentives for employees to use the remote parking.

- **Leasing of Daytime Parking.** Work with the Cocheco Falls Mill and the owner of the Goodwill / NH State Liquor Store shopping center to explore daytime leasing arrangements for

excess parking capacity in the shopping center parking lot. Identify any other potential opportunities for daytime employee parking in the downtown center.

- **Improved Parking Signs.** Parking in downtown Dover would be made more convenient and attractive with improved parking signs. Highly visible parking guide signs should be installed to direct visitors to available parking. On-street parking regulation signs should be replaced with signs that provide clear and comprehensive information.

Administration

- Divide the parking management and traffic management functions, with a full-time director for each function.

- Retain parking management, administration, and enforcement as an integrated unit. The parking management unit should either remain centralized within the Dover Police Department (DPD) or be moved in its entirety to a new department.

- Ensure that the parking director has adequate time and experience to pursue financing, construction, and management of structured parking.

- Develop a "parking and traffic working group," which should include the parking director, traffic director, and representatives from relevant city departments: Planning and Economic Development; Facilities, Grounds, and Cemetery; and Public Works. This would formalize the current practice of consulting these departments on an ad hoc basis; broaden the base of knowledge to inform and support parking and traffic rulings; and streamline the decision-making process by ensuring that all factors are taken into account.

Public Transportation

Dover should use the CMAQ grant that it has won to implement a supplemental local transit service, focused on providing frequent service to and from downtown Dover, with its concentration of destinations and activities.

Transit Resource Center (TRC), in cooperation with COAST and the City of Dover, is developing a proposal for supplemental transit service for Dover. This service, known as the "Check-Point" service, is a hybrid fixed-route / demand responsive serve. It has the following basic characteristics:

- **Hub-and-Spoke Service.** Dover will be divided into radial zones, with a central hub to be located at the Dover Transportation Center. Trips will begin or end at the Dover Transportation Center, or else passengers will transfer from one zone to the other there. One vehicle will be allocated to each zone.

- **Dedicated Stops.** The Check-Point vehicles will pick up and drop off at dedicated stops in each zone, and at relatively regular interval intervals. In this way, the Check-Point service is similar to a fixed route transit service.

- **Demand Responsive Service.** In addition to the dedicated stops, the Check-Point service will also provide demand-responsive service to and from locations that riders request by calling in to a central dispatcher.

The City of Dover should work with TRC and COAST to ensure that the Check-Point service provides the optimal local transit service to supplement COAST's inter-city transit services. The Check-Point service should therefore have the following characteristics:

- **Good Service Within Downtown.** In addition to providing good connections between downtown and Dover's neighborhoods, the Check-Point service should also serve as a good shuttle service between downtown destinations. This could result in some overlap among the routes for the different zones, but this could be advantageous in that it would provide high frequencies for the downtown. This downtown shuttle service may enable COAST to simplify some of its inter-city bus routes through Dover.

- **Connections Between Downtown and Park-and-Ride Lots.** The Check-Point service should include outlying parking lots that could be used for park-and-ride to downtown. These lots should include the Dover Arena, the Spaulding Turnpike Exit 9 park-and-ride lot, and parking lots in the Miracle Mile retail district.

This combination of characteristics would be advantageous for potential transit riders in Dover. Dover should implement this hybrid service as long as it proves financially viable. Dover should ensure that the proposed service and ridership can be accommodated with a fleet of small vehicles, such as minivans. This would reduce capital vehicle procurement costs and long-term maintenance costs. Dover should also ensure that the service can be supported permanently without reliance on city property taxes.

4.3 Long-Term Recommendations

The long-term transportation recommendations are expected to be implemented in approximately six to ten years. The long-term recommendations include the following transportation improvements:

- Significant circulation changes the downtown loop, and associated roadway and traffic signal improvements.

- Parking structures that will significantly increase the downtown parking supply.

These changes are recommended for long-term implementation because they will require more extensive planning, design, and funding efforts than the short-term recommendations. In addition, the long-term recommendations address issues that are generally not as pressing as the short-term recommendations.

However, the long-term recommendations represent improvements that would be beneficial in the short term, if they could be implemented. The circulation changes to the downtown loop address existing issues: changing Central Avenue and Washington Street from one-way to two-way circulation would have short term benefits for traffic access, pedestrian safety, economic development, urban design, and quality of life. In addition, implementing the downtown loop circulation changes in the short-term could supersede proposed short-term improvements at Lower Square and Upper Square, and enable Dover to save money.

Table 4-3 summarizes the proposed long-term improvements. These include the capital improvements that are recommended for implementation by the City of Dover. In addition to these improvements, the Riverfront development will be an important part of Dover's downtown and its transportation system in the long term. No cost estimates are made for the Riverfront development, due to the uncertainty about

the specific development program, and its transportation requirements. Figure 4-2 shows the long-term recommendations.

Table 4-3 Long-Term Recommendations – Capital Improvements

Location	Improvement	Benefit	Timing	Cost
Riverfront Parcel	Construction of Riverfront Development	Economic development, downtown vitality	2010 - 2015	
Motor Vehicle				
Changes to Downtown Loop			2011-2012	
1. Central Avenue	Two-way circulation with parallel parking	NB and SB access along commercial core		$111,000
2. Washington Street	Two-way circulation with parallel parking	Riverfront access, potential for retail		$77,000
3. Main Street	One-way southbound circulation with angle parking	Reduced traffic, increased parking supply		$60,000
4. Lower Square	Four-way signalized intersection	Congestion relief, shorter pedestrian crossings		$229,000
5. Upper Square	Central Ave through-connection, Main St T-intersection	Simplified circulation, plaza created		$221,000
6. Washington Street / Main Street	Signalized intersection	Improved Riverfront, pedestrian access		$274,000
7. Main Street / Portland Avenue	Through-connection: Main St (south) to Portland Ave	Satisfied major traffic flow, reduces congestion – Main St stop-controlled		$52,000
Downtown Loop Subtotal				**$1,024,000**
Parking				
8. Orchard Street Parking Lot	New parking deck	Parking for downtown businesses	2010	$2,000,000
9. Washington Street / Water Street	New parking garage	Parking for mill employees, Riverfront	2012	$7,000,000
Total				**$10,024,000**

Motor Vehicle Traffic

The long-term motor vehicle traffic recommendations are all elements of the circulation change for the downtown loop. The long-term recommendations change the downtown loop from a one-way loop to a street network with two-way circulation on the major roadways. The following are the principal reasons for changing from the one-way circulation pattern to a two-way circulation pattern in the downtown loop:

- Direct and intuitive access for traffic driving to, from, and through downtown Dover.
- Improved access and pass-by traffic for the Central Avenue retail corridor.
- Reduced traffic speeds and improved pedestrian access throughout the downtown loop, and especially along Washington Street between Central Avenue and Main Street.
- Convenient and attractive traffic access to and from the Riverfront development.

The alternatives evaluation in Section 3 indicates that Alternative 3, Two-Way Loop B for the downtown has the best combination of traffic operations, downtown access, pedestrian access, and safety

improvements. As a result, the long-term recommendations for the downtown loop are based on Alternative 3. The long-term recommendations retain the same circulation pattern as Alternative 3, and the same general recommendations for traffic controls, traffic movements, and parking. However, the long-term recommendation does include two changes to Alternative 3 that respond to concerns that have been raised.

- **Northbound Left Turn Lane at Lower Square.** A representative of COAST raised concerns with the proposed northbound left turn prohibition for Central Avenue traffic at Lower Square. COAST buses make this turn for access to Waldron Towers and the Dover Transportation Center. With the proposed two-way circulation on Central Avenue, COAST buses could continue northbound on Central Avenue and turn left onto First Street for access to the Dover Transportation Center. However, this does not address access to Waldron Towers. As a result, it is recommended that a 60-foot left turn bay be added to the Central Avenue northbound approach, and that the five parking spaces on the east side of Central Avenue nearest Lower Square be eliminated to provide better traffic flow. [If Dover's Check-Point supplemental transit service enabled COAST's inter-city bus routes to be simplified, the COAST routes may not need to serve Waldron Towers, and the northbound left turn could be eliminated.]

- **Angle Parking on Central Avenue.** Central Avenue merchants have raised concerns about loss of curbside parking if the angle parking is converted to parallel parking. Central Avenue's width and the dimensional requirements for parking and travel lanes have been reviewed. Although parallel parking on both sides of Central Avenue (as proposed in Alternative 3) would provide better traffic operations, it is feasible to retain angle parking on the west side of Central Avenue. This is discussed in more detail below, in the parking section.

The following are the major changes proposed for the downtown loop.

Roadway Circulation

- **Central Avenue.** Two-way circulation on Central Avenue. This makes Central Avenue the main arterial through Dover, both northbound and southbound. This simplifies access and improves the utilization of the capacity on Central Avenue.

- **Washington Street.** Washington Street becomes two-way. This provides direct access to and from the Washington Street Bridge and the Riverfront development. Two-way circulation also makes Washington Street more urban and pedestrian-friendly, and may help to facilitate the development of storefront businesses. Storefront development on Washington Street is important for integrating Dover's downtown with the Riverfront development.

- **Main Street.**

    - **Main Street – Portland Avenue.** There is a major traffic flow between Lower Square and Portland Avenue. Making a through-connection from Portland Avenue to the southern segment of Main Street satisfies this heavy traffic demand.

    - **Main Street North of Portland Avenue.** Two-way circulation on Central Avenue and on the Main Street – Portland Avenue connection satisfies the two principal traffic flows through the downtown loop. This significantly reduces traffic on Main Street north of Portland Avenue, and allows it to be principally for local access and for access

from the north to the Riverfront development. Therefore, Main Street becomes one-way southbound, and is stop-controlled at Portland Avenue.

- **Chapel Street.** The Portland Avenue – Main Street connection reduces traffic demand on Chapel Street, which becomes mostly for traffic access to and from the Upper Square area. It is recommended that Chapel Street become two-way.

Intersection Improvements

- **Lower Square.** Lower Square is redesigned as a four-way signalized intersection. Henry Law Avenue becomes one-way southbound, away from Lower Square. All movements are allowed, except for southbound left turns. Drivers traveling to Main Street, Washington Street or the Riverfront development can turn left at Upper Square and travel via Main Street.

- **Upper Square.** Upper Square is consolidated from three intersections to two signalized intersections at Central Avenue / Broadway / Third Street and at Central Avenue / Second Street. This enables the creation of a useable plaza space attached to the eastern side of the block.

- **Washington Street / Main Street.** This intersection is signalized in order to provide access to and from the Riverfront parcel, and in order to improve pedestrian access.

- **Main Street / Portland Avenue.** Portland Avenue – Main Street (to the south) becomes the major through-connection. Main Street to the north becomes the stop-controlled minor street.

Parking

On-Street Parking

Maximize the supply of on-street parking, while accommodating the new traffic circulation patterns. The new traffic patterns may require reduction of on-street parking in some areas, but significant increases in on-street parking should be possible in other areas. The following is a discussion of the impact of the proposed changes to the downtown loop to on-street parking.

- **Central Avenue.** Central Avenue is downtown Dover's principal street, and the main commercial corridor. Central Avenue merchants are concerned about the loss of convenient curbside parking that would be entailed if the Central Avenue angle parking were converted to parallel parking.

  Between Upper Square and Lower Square, Central Avenue has a prevailing curb-to-curb width of approximately 53-54 feet. Figure 4-3 shows the existing cross-section of Central Avenue.

Parallel Parking on Central Avenue

In converting Central Avenue to two-way circulation, the preferable roadway configuration would be one wide travel lane (13 feet) in each direction, a bicycle lane (5 feet) in each direction, and a parallel parking lane (8 feet) on each side of the street. This configuration is shown in Figure 4-4.

Advantages of Parallel Parking

- Adequate width for traffic to pass cars that are stopped for parking maneuvers (as shown in Figure 4-4).

- Better access and visibility for pedestrians.

- Better visibility for storefront businesses (angle parking blocks the view of storefronts from passing vehicles more than parallel parking).

Disadvantages of Parallel Parking

- Reduced on-street parking supply. Converting the angle parking on the west side of Central Avenue to parallel parking would reduce the parking supply from 58 spaces to 35 spaces (on the west side of Central Avenue between Third Street and Lower Square), a loss of 23 parking spaces.

Angle Parking on Central Avenue

Given the width of Central Avenue, it would be feasible to retain angle parking on the west side of the street. This would result in a roadway configuration with one wide travel lane (14 feet) in each direction, an angle parking lane (16 feet) on the west side of the street, and a parallel parking lane (8 feet) on the east side of the street. This roadway cross-section is shown in Figure 4-5.

Advantages of Angle Parking

- The existing parking supply on the west side of Central Avenue would be retained, except on the west side of Upper Square (between Third Street and Second Street). This parking should be replaced with parallel parking in order to improve roadway alignment and sight distance. As a result, only six parking spaces out of 58 on the west side of Central Avenue would be eliminated.

Disadvantages of Angle Parking

- Traffic safety and operations impacts of parking maneuvers. Vehicles can pull directly into angle parking spaces, but backing out of angle parking spaces is considerably more difficult. Drivers have worse sight lines and must back up blindly at first. In addition, the vehicle is at an oblique angle to traffic flow, and blocks traffic flow more than a vehicle pulling into a parallel parking space. Finally, angle parking leaves less roadway width for parking maneuvers. All of these factors contribute to worsened traffic operations. The dimensional effects are shown in Figure 4-5.

- Diminished pedestrian access and sight distance.

- Worse visibility for storefront businesses than parallel parking.

- **Central Avenue between Lower Square and Hale Street.** On-street parking is eliminated on both sides of Central Avenue in order to improve traffic operations and reduce congestion at Lower Square. Eight spaces are eliminated on the west side in order to provide two southbound receiving lanes, and five spaces are eliminated on the east side to provide a longer northbound right-turn lane. These spaces can be compensated for through several adjustments to parking supply and utilization in the immediate area: New angle parking spaces are proposed along

Henry Law Avenue between Lower Square and Williams Street; this would significantly increase the on-street parking supply immediately adjacent to Foster's Daily Democrat. The parking supply in the city-owned lot adjacent to the Masonic Temple building could also be increased by approximately three spaces by consolidating the dumpsters located adjacent to Locust Street. In addition, the privately-owned parking lot behind the pizza restaurant and paint store (betweeen Locust Street and Central Avenue, north of St. Thomas Street) typically has many available parking spaces; these parking spaces could be used by customers of these businesses who are displaced from the parking spaces on the west side of Central Avenue, and could also be used in a shared-parking arrangement by visitors to Foster's Daily Democrat (who might be displaced from the spaces on the east side of Central Avenue).

- **Washington Street.** Two-way circulation on Washington Street will slow traffic and enable the implementation of parallel parking on the south side of Washington Street, adjacent to Henry Law Park.

- **Main Street.** Traffic on Main Street will be significantly reduced, and will enable the implementation of angle parking on the west side of Main Street between Portland Avenue and Upper Square.

- **Henry Law Avenue.** Henry Law Avenue will be changed from two-way to one-way southbound in the block between Lower Square and Williams Street. This would allow the implementation of angle parking on one side of the street, which would increase the parking supply by approximately 10-12 spaces.

Off-Street Parking

Build new parking structures to increase the downtown parking supply without increasing the valuable downtown space dedicated to parking. The following parking structures are recommended:

- **Orchard Street Parking Deck.** A one-level parking deck is recommended for the eastern section of the Orchard Street parking lot. This parking deck can increase the parking supply for short-term visitors (such as downtown shoppers), employees, and residents (overnight parking).

- **Parking Garage on Washington Street at Water Street or Main Street.** A four level parking garage is recommended for Washington Street east of Main Street. This garage could be located either on the site of the existing Water Street parking lot, or on the site of the strip mall on Main Street. Either location would provide additional parking supply for the Cocheco Falls Mill, the One Washington Center Mill, and the Riverfront Development, as well as good access via Washington Street. Both would also require property takings to enable the City of Dover to build a municipal garage. The Water Street site is lower, and probably offers easier access, but building the garage on that site would also block access along Water Street to potential development parcels along the western bank of the Cochecho River.

Riverfront Development

The long-term recommendations will be implemented in the context of the Riverfront development, which will also entail additional transportation improvements. Because the Cochecho Waterfront Development Advisory Committee is reviewing the plan for the Riverfront development, it is not possible

to make highly specific recommendations. However, the following are general transportation recommendations that will improve access, safety, and traffic operations for the Riverfront development.

- **Washington Street Bridge.** Construction of the Washington Street Bridge (included as a short-term recommendation).

- **Roadway Connection from Washington Street Bridge to Maglaras Park ("Washington Street Extension").** The existing pedestrian bridge is an extension of Washington Street, and is directly aligned with the sewer pumping station. Using this alignment for the new vehicular bridge would provide the shortest bridge crossing, and would enable the re-use of the existing bridge abutments. However, it would require Washington Street Extension to take a sharp S-turn to pass around the sewer pumping station. If this alignment is necessary from a cost standpoint, the roadway should be designed to provide safe movement around the pumping station. In order to accommodate truck turns, it would probably be necessary to provide painted shoulders and a painted median. The new Washington Street Bridge design should take into account the need to make the connection around the pumping station.

- **Retention of the Pedestrian Bridge.** The existing pedestrian bridge across the Cochecho River is directly aligned with the eastern end of Washington Street. As a result, it may need to be removed from its current location in order to accommodate the new vehicular bridge. However, the pedestrian bridge should be retained at some location on the river in order to provide an addition pedestrian crossing.

- **Water Street Extension.** Extending Water Street parallel to the Cochecho River would provide access to property along the west side of the river, and open these parcels up for potential development. This could bring more activity to the Cochecho River, and enhance economic development and recreation opportunities.

- **River Street Circulation.** The construction of the Washington Street Bridge and the changes to the downtown loop's circulation will provide direct access between the Riverfront development and Dover's principal roadways. As a result, access to the Riverfront parcel via River Street will be less important, and traffic volumes will be lower than on Washington Street. Therefore, the River Street approach to Washington Street Extension should be stop-controlled, and Washington Street Extension traffic should have the right of way. In addition, there are vertical sight distance limitations at the River Street southbound approach to Henry Law Avenue. The crash records at this location are not conclusive: there were four vehicle crashes during 2001 and 2002 at Henry Law Avenue / River Street / George Street. This is not a high number of crashes, but it is a relatively high rate of crashes given the low traffic volumes. In order to address the sight distance issue, River Street could be converted to one-way northbound.

- **Niles Street Extension to the Top of the Bluff.** The top of the bluff overlooking the Riverfront parcel can be build on, and it has lesser environmental issues relative to the remainder of the Riverfront parcel. As a result, it may be a good site for housing. However, access to the site is difficult. The best option for access to this parcel is most likely via an extension of Niles Street.