

NW Corridor Transit
Planning Project
Part 3 – Downtown
Hartford Transit
Circulation Study,
Final Report

Capital Region Council of
Governments

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1.0 EXECUTIVE SUMMARY

This study of downtown Hartford transit circulation was conducted as one of three parts of the Northwest Corridor Study. The Project Steering Committee adopted the following goals for this part of the study:

1. Develop an understanding of current and future transit ridership to, through, and within the downtown.
2. Develop a comprehensive downtown circulation plan that accommodates all transit services in downtown Hartford.
3. Increase transit ridership by developing a downtown circulation plan that meets the needs of current and future riders traveling into, through, and within downtown.
4. Identify the need for and the appropriate location(s) for one or more downtown transit centers.
5. Improve downtown transit service in a cost-effective manner.

To accomplish these goals the project assembled data on existing and planned downtown transit services and collected data on transfer patterns between bus routes in the downtown. The study's finding of a high rate of transfers in the downtown led to an effort to identify a downtown circulation pattern that included a new off-street downtown transit center that would better serve transferring riders while maintaining service to Main Street for riders with downtown destinations.

The Study Area

The study area for the downtown circulation portion of the Northwest Corridor Study, as shown in Figure 1-1, consists of downtown Hartford plus the commercial portion of the Asylum Hill neighborhood. It is bounded by the Connecticut River on the east, I-84 and Walnut Street to the north, Garden and Collins Streets in the northwest, Sigourney Street on the west, and Capitol Avenue on the south. This includes all of the traditional downtown area, plus the insurance companies on the eastern side of the Asylum Hill neighborhood, and the State Capitol and state office buildings along Capitol Avenue. This area encompasses 0.94 square miles.

Figure 1-1: Downtown Circulation Study Area



Hartford's traditional downtown is small and compact and is easily walkable from end to end. The downtown has been kept small by several natural and man-made barriers. The Connecticut River defines the eastern edge of downtown, while I-84 and the Whitehead Highway provide northern, western and southern limits. Bushnell Park fills the gap between the two highways at the southwestern corner of downtown.

Over the past decade there have been a number of development initiatives in the study area. These have primarily been near the southern end of downtown, close to the river. Recently, there have been a series of initiatives that shift some of the focus toward the west and the Union Station neighborhood. The Union Station area is an entertainment area with many of the city's nightspots, restaurants and the existing XL Center, and it is near many of the City's cultural attractions. The availability of transit and proximity of Union Station (as well as access to I-84) make it one of the most accessible areas of the city.

Current and future employment data highlights a concentration of dense employment along either side of Main Street. Non-retail employment makes up most of the employment within the downtown study area. Future employment projections assume that the downtown area will maintain a constant share of regional employment and grow only slightly. Many of the larger downtown employers fall into two categories: financial services and governmental/social service agencies. The largest of the financial services establishments are clustered near Main Street and in Asylum Hill. Larger government agencies are located near the State Capitol and along Capitol Avenue.

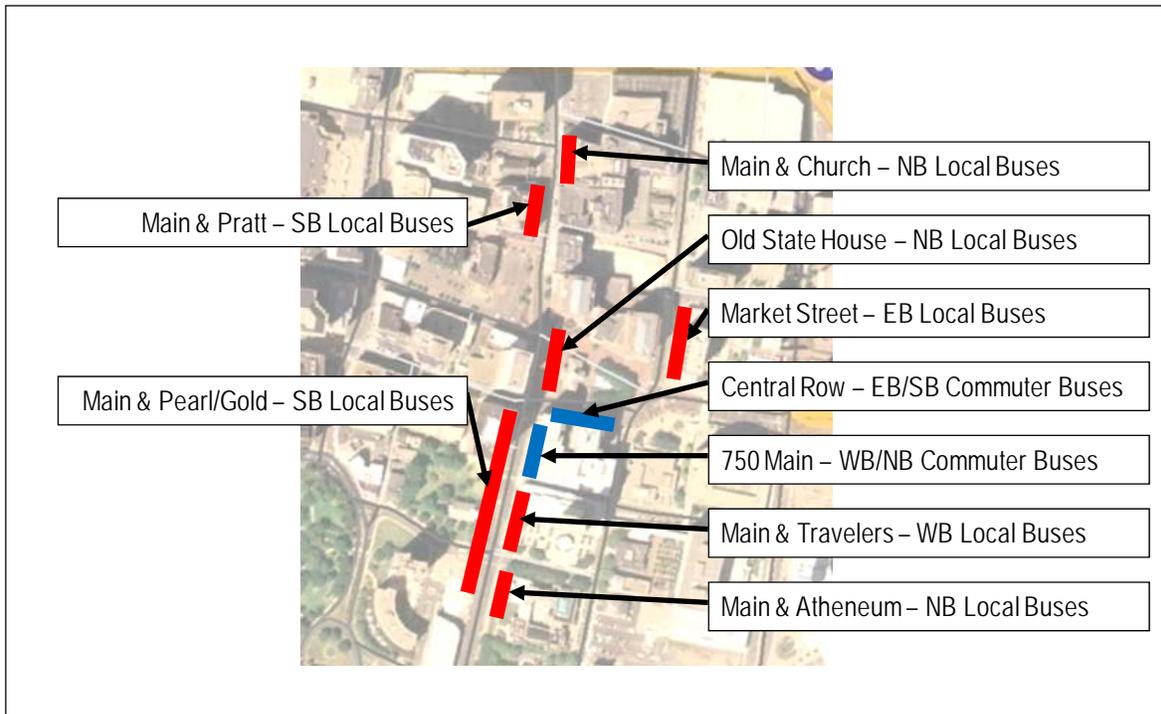
Existing Transit Services

CTTransit provides most of the transit service into downtown Hartford. CTTRANSIT operates both local and commuter bus services. Several of the local routes are through-routed in the downtown area; that is, each route continues through downtown and serves another corridor on the other side of downtown. Most through routes traverse downtown in a north-south direction on Main Street. There are no routes that travel through downtown to or from the east. The routes that do not continue through downtown turn around and return to the same corridor from which they came. They enter along Main Street either from the north or from the south and turn around, or they enter from the west and turn around using a loop along Jewel, Main and Asylum. The largest group of routes that turn around downtown consists of all of the routes from east of the river. These enter downtown on the Founders Bridge, turn north on Market Street and return to the east side of the river via I-84. All routes essentially intersect in a small area along Main and Market Streets that is the center of demand for riders traveling to the downtown and also where the vast majority of transfers occur.

CTTransit also provides service on twelve commuter express routes serving downtown Hartford. Commuter routes enter and exit downtown from one of four basic directions. Some commuter service from each direction also serves the Capitol area and Asylum Hill along portions of either a clockwise or a counter-clockwise loop. Schedules are structured such that one commuter bus serves the Asylum Hill Loop every five minutes and one commuter bus serves the Capitol Avenue Loop every ten minutes. Passengers may transfer to and from the scheduled loop bus at no cost at Central Row. There are also nine additional commuter bus routes sponsored by the Connecticut Department of Transportation (CTDOT) that are provided through contracts with four private carriers. These routes generally serve destinations that are a greater distance from Hartford than the CTTRANSIT commuter routes.

All of the major bus stops and transfer points in the downtown are on the east side of the study area on or near Main Street (see Figure 1-2). The main stop for local routes that head out to the west is along Main Street in the northbound direction in front of the Travelers Tower. The stop for commuter bus routes that travel to the west and to the north is on the northern end of that same block, just before Central Row. Further north on Main Street, across Central Row, is the Old State House stop which serves all local routes continuing north. In the southbound direction, most boarding activity occurs along a stretch of Main Street between Pearl Street and a point just south of Gold Street. There are two major downtown stops off Main Street. The stop along the south side of Central Row is primarily for commuter buses traveling to the east and south. The stop on Market Street, north of State Street, serves all local routes heading to the east. Transfers occur at all of these major downtown stops. Because these

Figure 1-2: Current Major Downtown Bus Stops



bus stop locations are all spread out along Main Street, Central Row and Market Street, riders who must transfer sometimes have to walk as much as 2-3 blocks to change buses. They also often have to cross Main Street, Central Row, and/or Market Street.

Two major transit expansion initiatives are likely to have a major impact on downtown bus operations in Hartford. The New Britain Busway is currently being designed as a bi-directional grade-separated busway from New Britain to Hartford. In Hartford, the busway will terminate adjacent to the I-84 ramps at the south side of Asylum Avenue opposite Spruce Street at Union Station. All busway services will circulate in downtown Hartford, however, the path to be followed by the buses once they leave the busway was left to be determined by this study. While CTDOT has not yet developed a final service plan for the busway, a preliminary service plan developed in 2007 indicated that busway service would consist of twelve different routes. These routes were divided into three categories: a *busway "shuttle"* providing regular frequent service only to busway stations and to the two downtowns; *local bus routes* providing local service in New Britain and Hartford and continuing to downtown Hartford along the busway; and *express services* beginning at more distant locations and operating non-stop on the busway to Hartford. The busway is expected to carry 29 buses in the peak direction in the peak hour and 18 in off-peak hours.

The New Haven-Hartford-Springfield Commuter Rail was the subject of an implementation study completed in 2005. The study proposed re-routing most local bus lines to Union Station to serve the commuter rail station. A follow on study is currently underway. That study is projecting weekday ridership at Union Station of 699 in the year 2015 and 1,144 in 2030.

Current Transit Ridership

Downtown transit ridership data was assembled from existing CTTRANSIT on-off counts, transfer data collected from the fareboxes, and a new downtown rider survey. CTTRANSIT on-off counts for each route were used to obtain estimates of typical weekday boardings at each downtown study area stop. The vast majority of downtown local bus

boardings occur on Main Street and on Market Street. The three major Main Street local bus stops and the Market Street stop each serve over 2,000 daily boardings. The Main Street southbound stop between Pearl and Gold serves over 4,000. Study area stops west of Main Street serve far fewer riders. All of the stops in the study area combined serve approximately 17,000 daily local bus and 1,800 daily commuter bus boardings.

Data on the total number of transfers and on route-to-route transfer patterns was tabulated from raw farebox data. A route-to-route transfer matrix representing all transfers made in downtown Hartford was developed in order to gain an understanding of the overall level of transferring in the downtown, the existing route-to-route transfer patterns and the potential for new through routing combinations. The transfer matrix indicates that an estimated daily total of approximately 11,500 transfers are made between local buses in the downtown, representing 67% of all downtown local bus boardings. Only about 7% of commuter bus boardings are transfers.

Each downtown local bus transfer was assigned to a downtown stop based on assumptions as to the most logical location for transfers between each pair of routes. The number of transfers at each stop was deducted from downtown boarding counts in order to obtain estimates of originating riders. Table 1-1 shows the estimated transferring and originating boardings at each of the downtown stops with more than 100 weekday boardings. Transferring passengers represent a very significant share of bus passengers in the downtown area. Overall, transfers make up about two-thirds of study area local bus boardings and about three-fourths of boardings at the three highest ridership stops on Main Street. That share has most likely increased considerably over the years as ridership patterns on the bus network changed from being primarily downtown-oriented to being oriented to a more dispersed set of destinations.

There are several routes that operate as through-routes in downtown Hartford. The number of riders passing through downtown on these routes was estimated to be approximately 1,000 riders per day, far fewer than the number transferring. However, examination of the transfer matrix seems to indicate that the through-routing patterns make sense. The data did not indicate that there are any realignment possibilities that would reduce the number of transfers on the through routes. On the routes that terminate downtown, there are opportunities for pairs of routes to be connected in new through-routing combinations to reduce the number of transfers without disrupting existing ridership patterns.

Excluding transfer boardings, the number of originating local bus boardings on Main Street is considerably less, but still substantial. The Main Street and Market Street stops where so many transfers occur still represent the top five downtown stops in terms of originating riders, with between 400 and 1,100 originating daily local bus boardings at each stop. Based on a limited survey of downtown riders conducted for this study, most originating downtown riders are walking only a short distance to Main Street.

With downtown still an important destination, improvements to downtown circulation will need to consider both transferring riders and those traveling downtown. Transferring riders have trip origins and destinations that are outside of the downtown area making the location of their downtown boarding less important than the convenience of the transfer and the time spent traveling to and from the transfer point. These riders don't necessarily have to be boarding on Main Street. The convenience of these riders must, however, be weighed against the needs of riders who require a bus stop close to their downtown destination.

Key Nodes and Connections

Based on the existing conditions and future services, the study identified the key elements that need to be considered in the development of downtown transit circulation options for Hartford. The key points, or nodes, in the downtown transit network include:

- **Main Street Area** – The area on either side of Main Street between I-84 and Gold Street, and between Columbus Boulevard and Ann Street, is the center of employment in downtown Hartford.

Table 1-1: Boardings at Major Downtown Stops

	Total		Transfers		Origins	
	Local	Commuter	Local	Commuter	Local	Commuter
MAIN ST & PEARL/GOLD	4,194	-	3,106	-	1,088	-
MAIN ST & OLD STATE HOUSE	3,052	-	2,244	-	808	-
MAIN & TRAVELER'S	2,869	-	2,274	-	595	-
MARKET ST & CONSTITUTION	2,580	4	1,727	-	853	4
MAIN ST & ATHENEUM	903	-	462	-	441	-
CENTRAL ROW SOUTH	491	308	192	60	299	248
MAIN ST & CHURCH ST	685	66	321	-	364	66
MAIN ST & 750 MAIN	-	694	-	84	-	610
ASYLUM ST & TRUMBULL	280	31	-	-	280	31
MAIN ST & PRATT ST	279	-	-	-	279	-
STATE ST & THE PHOENIX	-	234	-	-	-	234
PEARL ST & ANN ST	-	144	-	-	-	144
PEARL ST & TRUMBULL	-	134	-	-	-	134
ASYLUM ST & ANN ST	104	21	-	-	104	21
MAIN ST & WELLS ST	123	-	120	-	3	-
FARMINGTON AVE & SIGOURNEY	111	-	-	-	111	-

- **Asylum Hill** – The eastern non-residential portion of the Asylum Hill neighborhood is home to Aetna and The Hartford, the two largest employers in the study area.
- **Capitol Avenue** – There are numerous government offices along a ¾ mile stretch of Capitol Avenue and Elm Street between Sigourney Street and Main Street.
- **Residential Nodes** – As of 2000, there are two existing pockets of residents in the study area, between Ann Street and Union Station, and the area along Main Street south of Gold Street. The Hartford 21 project recently added over 200 residents on Trumbull Street.
- **Entertainment District** – The area between the XL Center and Union Station is growing as an entertainment destination.
- **Main Street/Central Row** – Main Street between Pearl Street/Central Row and a point just south of Gold Street is the center of the current transit system. Most local bus routes, all commuter bus routes, and the Star Shuttle pass through this node.
- **Union Station** – Union Station currently serves Amtrak rail service and private intercity bus carriers and is included as a stop on the planned New Haven-Hartford-Springfield commuter rail line. Union Station will also be adjacent to the terminus for the New Britain Busway facility.

The key downtown transit connections that must be made or maintained by the transit network include:

- **Local Bus Services to Downtown** – Service from all local bus corridors will need to be maintained to the heart of the downtown employment area on Main Street.
- **Main Street North/South** – Seven bus routes traverse Main Street in a north south direction and many riders pass through without leaving the bus and many more transfer between a north side route and a south side route.

- **North/West and South/West Connections** – There are also many transfers between the north and west and between the south and west corridors.
- **Connections to/from East of the River** – East of the river routes all terminate on Market Street, away from Main Street but many riders transfer to or from other routes.
- **Commuter Services to Downtown** – Service from all commuter bus corridors will need to be maintained to the heart of the downtown employment area on Main Street.
- **Star Shuttle Route** – The Star Shuttle primarily serves a market niche consisting of visitors and bar and restaurant patrons that will need to be maintained and/or strengthened.
- **Union Station to Downtown** – The future downtown circulation pattern will need to accommodate the additional demand from commuter rail passengers who need to travel to the employment center of downtown.
- **Union Station to Asylum Hill** – Commuter rail riders may also need to travel to the employers on Asylum Hill.
- **Busway Circulation** – The New Britain busway buses will need to travel the ½ mile from the busway terminus to the employment concentration around Main Street.

Transit Center Sites

The prevalence of transfers in downtown Hartford emphasizes the need to make the service work for the majority of downtown local bus riders who are in the downtown for the purpose of transferring to another local bus route. It became apparent during the course of this study that a downtown transit center could provide a better environment for the large number of transferring passengers. A transit center would be:

- safe - with little or no need to cross the street
- dry - with more shelters and/or a waiting room
- convenient - with public rest rooms and concessions, and
- informative - with schedule and bus arrival information posted.

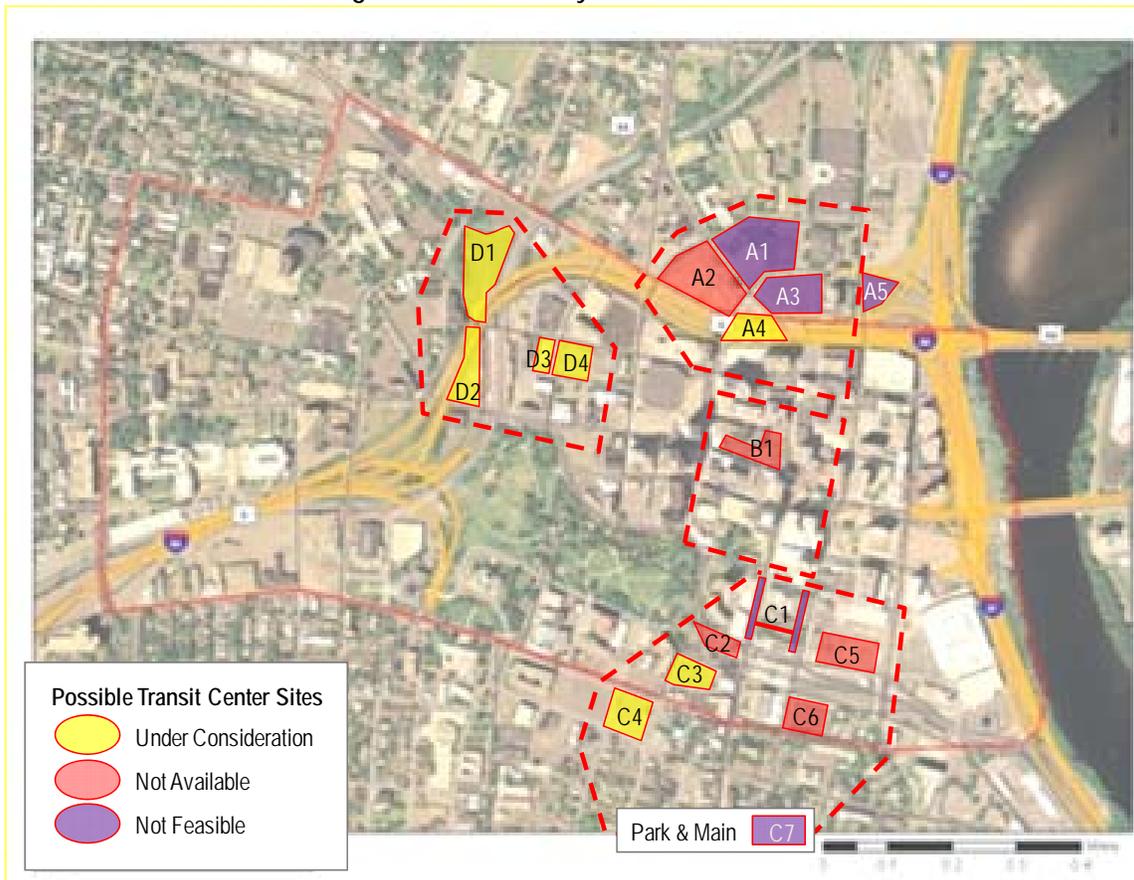
A transit center could also provide benefits to downtown businesses. The presence of many bus riders in an area provides customers for downtown businesses while a transit center moves transferring passengers away from downtown doorways where they can obstruct businesses. A clean, attractive facility could improve the perception of downtown, as will the reduction in the crowds of waiting riders sometimes blocking the sidewalk. While buses will still travel along downtown streets and pick up passengers at downtown bus stops, the buses will keep moving while on the street since they will complete their scheduled layovers inside the transit center facility. The removal of most bus layovers from the street can mean that less on-street curb space is needed to accommodate buses. A transit center with adequate layover facilities for buses can contribute to a better overall quality of service, including better on-time performance. Finally, transit centers can promote Transit Oriented Development (TOD) in an under-developed area. Federal funds used for development of a transit center can leverage private investment to revitalize areas on the edge of a downtown.

To achieve these benefits an appropriate transit center site would need to be identified. The site would need to have the following characteristics:

- **Parcel Size and Shape:** A transit center site must be large enough to accommodate all of the current downtown Hartford local bus routes, plus the local routes from the New Britain busway. Rectangular parcels would allow the most efficient layout.
- **Site Topography:** A site needs to be level. The entry and exit points, and the streets they connect to, will also have to be at the same elevation for the transit center to be on level ground.
- **Proximity to Bus Routes:** While the exact location of a transit center may not be important to transferring riders, locating a facility away from bus routes can add substantial costs for the bus operator.
- **Access to/from the Street Network:** The access for buses into and out of some sites can be problematic. Ideally, access should be at multiple points. Routes in and out should be as direct as possible. Difficulties can be caused by one-way and narrow streets; tight turns; congested roadways; restrictions on entry and exit points due to nearby intersections; elevation differences; restricted access caused by barriers such as highways, ramps, rail lines, water and other developments; and sensitive nearby land uses.
- **Site Availability:** Most downtowns have few available sites meeting the other criteria. Publicly owned sites are often the most readily available. Otherwise, privately owned parking lots can be acquired for use as a transit center. Care needs to be taken to avoid selecting a site in an available, but poor location.

An initial list of possible transit center sites was developed. Figure 1-3 shows the sites identified. The sites identified fit into four general locations shown in the figure:

Figure 1-3: Preliminary Transit Center Sites



The sites were screened first considering feasibility as a transit center site and then availability of the parcel. A preliminary search for possible transit center sites led to a conclusion that a feasible available site of adequate size does not exist adjacent to the existing transfer point at the main downtown bus stops on Main Street. A new transit center would have to be located several blocks from the current transfer point. Several sites were found to be not feasible and were excluded from further consideration. The remaining sites were investigated for site availability and several were determined to be either not for sale, have active development plans or have essential public uses. (However, during the final site selection process, the availability of these and other sites should be re-assessed, as these sites may have become available.) This left the seven sites shown in yellow in Figure 1-3. Each of these sites is compatible with one or more of the circulation alternatives; however, not all sites are compatible with all alternatives.

Development of Downtown Circulation Alternatives

Based on the analysis of downtown ridership, the high rate of transfers identified, and the key nodes and connections, it was determined that all downtown circulation alternatives considered had to meet two basic criteria: 1) all had to provide improved facilities to better accommodate downtown transfers, and 2) all had to retain stops on all routes at or near the center of downtown at Main Street and Central Row to serve riders with downtown destinations.

In addition, all of the alternatives considered sought to accomplish the following:

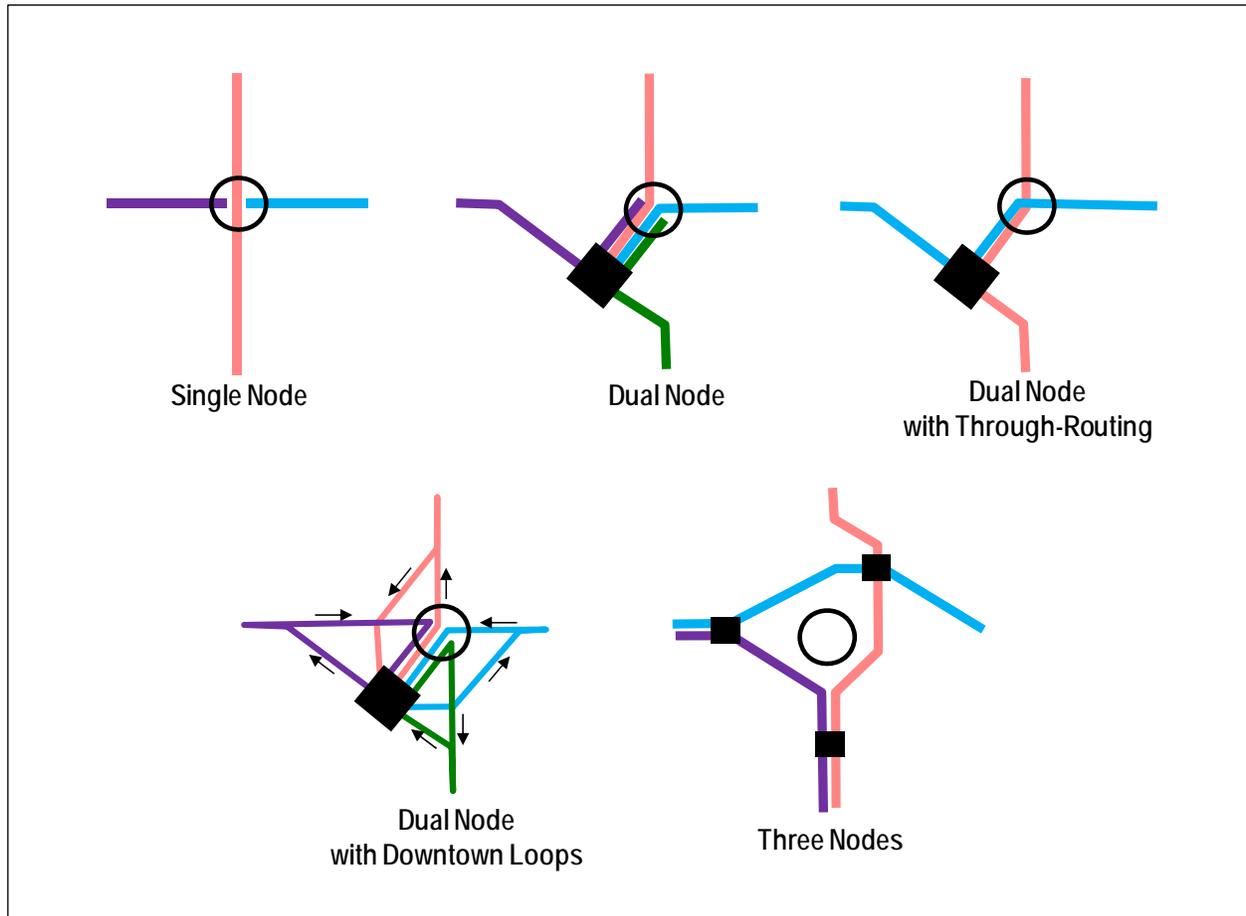
- improve service by improving transfer connections and amenities for transferring riders
- minimize the number of transfers occurring at unimproved transfer facilities
- reduce the overall number of transfers through the expanded use of through-routing
- improve service to parts of downtown away from Main Street (such as the west side of downtown near Union Station, the east side along Columbus Boulevard, and the area along Capitol Avenue)

Currently downtown local bus service forms a simple cross, with transfers and most downtown destinations at the center. This is a very simple, yet efficient, design. Ideally, the desired improvements in transfer connections would be made without sacrificing the efficiency of the existing downtown bus network. However, such improvements often require more space than is available on downtown streets and at downtown bus stops. The study examined alternatives that simply relocated on-street facilities as well as alternatives that included new off-street transfer facilities. Alternatives that would provide more convenient transfers but allow transfers to continue to be made at on-street bus stops near the center of downtown were found to result in unacceptably high bus and passenger volumes on lower capacity streets and sidewalks. On the other hand, an off-street transit center facility can be expected to result in a significant shift of transfer activity into the transit center, albeit with some diversion of bus routes and slightly increased travel time for some downtown riders.

Several circulation alternatives, each with numerous variations, were proposed and screened during the course of the study. These were grouped into the following five conceptual alternatives shown in Figure 1-4, based on the manner in which routes would intersect in the downtown and on how a transit center would be included in the pattern of downtown bus circulation.

- **Single Node** – All routes either end or cross at essentially a single point at the center of downtown. An initial investigation of possible sites near the current focal point at Main and Central Row resulted in no available off-street sites. Therefore, several alternatives that made use of relocated on-street transfer facilities were considered. One alternative of this type was retained (Alternative #4), with all transfers occurring “on-street” away from the current Main Street stops.
- **Dual Node** – A downtown transit center is included at a location separate from the center of downtown and all routes would serve both the center of downtown and the transit center. Few, if any, routes would be

Figure 1-4: Conceptual Circulation Alternatives



- through-routed. Several alternatives of this type were proposed, but concerns about increased bus traffic and bus operating costs led to a desire to avoid these alternatives in favor of the following alternative.
- **Dual Node with Through-Routing** – A downtown transit center is included at a location separate from the center of downtown and all routes would serve both the center of downtown and the transit center. Nearly all routes would be through-routed. Routes could be arranged so that the west and south routes join together and the north and east routes join together (as shown in the figure) – or west and north routes join together and the south and east routes join together.
- **Dual Node with Downtown Loops** – A downtown transit center is included at a location separate from the center of downtown. Routes would operate on a loop through downtown, serving both the transit center and the center of downtown only once each, in either order. Consideration of rider benefits and operating costs resulted in a determination that these alternatives were inferior to the “dual node with through-routing” alternatives
- **Three Nodes** – Buses are spread out using three smaller transit centers surrounding downtown. Each route would serve two transit centers and would pass near, but not necessary through, the center of downtown demand.

Considering these five conceptual alternatives, four specific alternatives were developed for evaluation. Alternatives #1 and #2 follow the Dual Node Through-Routed concept. Alternative #3 follows the Triple Node concept. Alternative #4 follows the Single Node concept.

With a transit center located away from the center of downtown, an efficient pattern of through-routing becomes a critical element. A well-designed set of through-routes can reduce the number of transfers, reduce bus volumes and reduce operating costs. It can also help make a transit center that is located away from the center of downtown work more efficiently. Several possible new through-route combinations were identified that could improve the effectiveness of one or more of the alternatives. While new through-routing could conceivably encourage new through ridership and alter travel patterns over time, the most significant impact of increased through-routing may be in the ability to locate a downtown transit center away from the center of downtown without as large an increase in bus operating costs as might otherwise be required.

As a way to enhance through-routing opportunities, improve service to the east and west sides of downtown and provide a more direct routing to potential transit center sites away from the center of downtown, some of the alternatives include changing the direction from which some routes enter downtown. This includes shifting some north and south routes to Columbus Boulevard so that they cross downtown from east to west. It also includes shifting some Main Street routes approaching from the northwest or southwest to enter downtown from the west near Union Station.

Circulation Alternatives Considered

Several circulation alternatives, each with numerous variations, were proposed during the course of the study. Variations were screened considering possible transit center locations, traffic circulation, transfer impacts and locations, complexity of operations, and possible operating cost impacts. This resulted in four alternatives remaining for detailed evaluation. The four alternatives reflect three of the five conceptual alternatives. The four alternatives evaluated in detail were:

- **Alternative 1** – Through-route most services and develop a transit center on the southwest side of downtown. East and North routes serve stops near Main Street before continuing to the transit center where they would be through-routed to the West and South routes. (consistent with the *Dual- Node with Through-Routing* concept)
- **Alternative 2** – Through-route most services and develop a transit center on the northwest side of downtown. East and South routes serve stops near Main Street before continuing to the transit center where they would be through-routed to the West and North routes. (consistent with the *Dual- Node with Through-Routing* concept)
- **Alternative 3** – Through-route most services and develop three smaller transit centers on the north, south and west sides of downtown. Each route serves two centers so that all transfer connections can be made at transit centers. Routes also make intermediate stops close to Main and Central Row. (consistent with the *Three Node* concept)
- **Alternative 4** – Minimize added travel time and mileage by maintaining a centrally located transfer point and developing an on-street transfer point east of Main Street. Through-route most services. (consistent with the *Single Node* concept)

All of the alternatives include an increase in the use of through-routing operations. Through-routing provides a more effective way to serve both the center of downtown and a transit center located away from the center of the demand in the city. All of the alternatives maximize through-routing opportunities for that particular configuration. Some of

the alternatives re-route some north and south routes to an east-west orientation to better improve east-west service and enable more through-routing.

Evaluation of the Alternatives

While there are significant differences between the four alternatives, there are some impacts common to all of the alternatives included in the final evaluation. First and foremost, all four alternatives include improved facilities for downtown transfers. In all cases, a sizeable majority of downtown transfers would take place in one of more downtown transit centers. All routes serve one or more transit centers in each alternative and serve at least one stop at or close to Main Street and Central Row so that those riders who do not transfer maintain access to the center of downtown. Bus routings and transfer stop locations were identified to make transfers as convenient as possible and to minimize the number of transferring riders who would have to cross downtown streets. Because the operating cost of the alternatives with a transit center away from the center of downtown can be minimized by through-routing much of the service, each alternative included the maximum amount of through-routing that was feasible.

As the study progressed, the original extensive set of evaluation criteria was reduced to a set of nine criteria focusing on the key elements of the impacts that differentiated the alternatives being considered. Each alternative was given a rating (very high, high, medium, low, or very low) in each category as an aid to the Steering Committee in selecting a preferred alternative. The nine criteria were as follows:

- *Effective Use of Transit Centers*
 - **Utilization of Transit Centers** – The number of daily transfers expected to occur at off-street transit centers
 - **Capital Cost of Transit Centers** – An assessment of the relative capital cost of the transfer facilities needed for each alternative
 - **Capacity/Quality of Transit Centers** – An assessment of the number and size of available options for transit center sites and the possibility of creating high quality amenities at the site(s)
- *Efficiency and Effectiveness of Service*
 - **Through and Transferring Riders** – A qualitative assessment of the change in total travel time for transferring riders resulting from relocation of the points at which transfers would be made; also the change in total travel time for passengers riding through downtown as well as the number of passengers having to transfer versus having a through trip
 - **Riders into Downtown** – An assessment of the extent to which alternatives preserve the current direct route into downtown for most passengers
 - **Riders within Downtown** – an assessment of the extent to which an alternative establishes an east-west connection across downtown and/or has more frequent service to the Union Station area and/or the area east of Main Street
 - **Bus Operating Costs** – an estimate of the relative impact of each alternative on bus operating costs

- *Traffic Impacts*
 - **Bus Volumes on Downtown Streets** – the number of buses per hour in peak hours on the key downtown streets such as Main Street, Trumbull Street, Church Street, Pearl Street, Asylum Street, Market Street and Columbus Boulevard
 - **Traffic Issues and Circulation Changes** – an assessment of the extent to which the alternative can be accommodated without changes to the downtown traffic circulation pattern

The ratings for the four alternatives are summarized in Table 1-2. The evaluation determined that Alternative 2, with a transit center located north and west of the center of downtown, would maximize the number of riders who would choose to transfer at a single new transit center, minimize the travel time for transferring riders, and minimize delays to non-transferring riders destined for Main Street. A transit center in this location would also allow easy connections between the future New Britain Busway and other routes and would allow new east-west through-routes to create an enhanced east-west bus service across the downtown. It was found that the transit center located south and west of the center of downtown, as in Alternative 1, would not attract as many transfer riders. It would also require extensive rerouting of service around Bushnell Park creating a longer trip for many riders. The three transit centers in Alternative 3 would result in the most transfers at transit centers but would create more negative impacts on downtown originating riders than the other alternatives. Alternative 4 would not divert downtown riders as much as the other alternatives but could not provide as efficient and convenient transit center as those alternatives utilizing other feasible and available sites.

This evaluation was discussed with the Project Steering Committee and the committee agreed that Alternative 2 is the preferred alternative. Alternative 4 was not considered acceptable, due to the committee's desire to establish a full-featured off-street transit center and concerns over the impact of a Market/Columbus transit center on traffic and development in the surrounding area. Alternative 3 was rejected primarily due to the difficulty and expense of establishing the three necessary transit centers, as well as the poor connections provided to some riders. Alternative 1 was considered inferior to Alternative 2 due to its impacts on transferring and downtown riders and the lower number of transfers that would occur in the transit center.

Recommended Configuration

The study concludes that Alternative 2 would be the best alternative. Alternative 2 would provide a feasible quality transit center serving the vast majority of transfers at an acceptable cost. Alternative 2 would provide improved service for the majority of local bus riders who transfer while creating relatively minor delays for riders destined for downtown. It would improve service to the Union Station area and provide better east-west bus connections in downtown. Operating costs would increase but not as much as in some other options. Significant bus volumes would result on Church Street and improvements to the Church Street corridor may be needed. Southbound Main Street bus volumes would increase, largely due to busway vehicles. However, only the block between Pearl and Gold would have very high bus volumes.

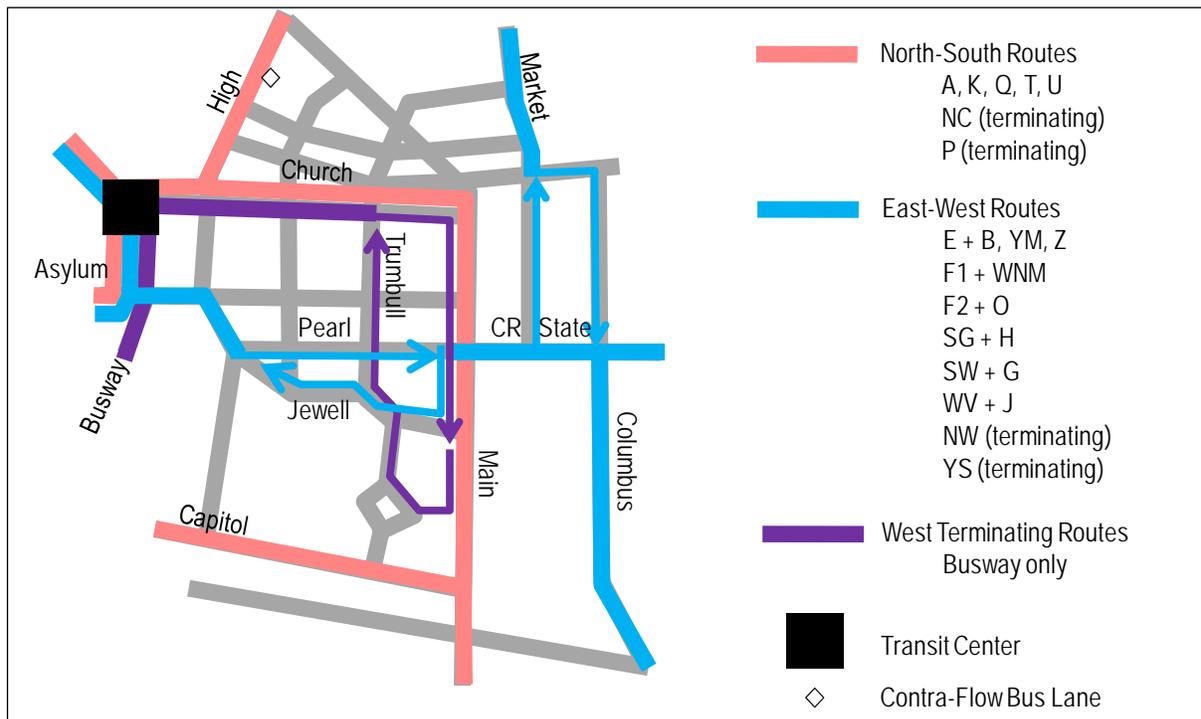
The recommended downtown local bus circulation pattern is shown in Figure 1-5. It would through-route most services and would develop a transit center on the northwest side of downtown. East and south routes would serve stops near Main Street before continuing to the transit center where they would be through-routed with west and north routes, respectively. There would be five north-south through-routes and six new combined east-west through-routes. Four routes would terminate at the transit center. Over 11,000 daily transfers would take place at the transit center, relocating 70% of the current Main Street/Market Street area bus transfers into a new off-street transit center facility and reducing total bus boardings in the Main Street/Market Street area by 55%. Most transfers would move to the transit center. Only transfers between east and south routes would continue to take place on Main Street.

Table 1-2: Ratings of All Alternatives

	Alternative			
	1	2	3	4
Utilization of Transit Centers	0	+	++	++
Capital Cost of Transit Centers	0	0	-	+
Capacity and Quality of Transit Centers	++	++	0	--
Through and Transferring Riders	-	++	0	0
Riders into Downtown	--	0	--	+
Riders within Downtown	-	+	-	+
Operating Cost	--	-	--	-
Bus Volumes on Downtown Streets	0	--	-	--
Traffic Circulation Changes	+	-	--	+

++ Very high + High 0 Moderate - Low -- Very low

Figure 1-5: Recommended Downtown Local Bus Circulation



The final determination of the site of the transit center will occur at a later date. However, for the purpose of detailing the recommended circulation alternative, one of the four feasible and available sites northwest of downtown had to be assumed. While each of the sites has advantages and disadvantages, the Hartford parking lot site off Myrtle Street was selected to illustrate the recommended alternative. As a further site selection process is undertaken, other possible sites that were not considered may also be identified and sites previously considered unavailable may become available as conditions change. The recommended circulation alternative can then be adapted to conform to the final selected site.

It is estimated that up to 16 bays will be needed for local buses, exclusive of those needed for busway vehicles. Busway vehicles would need up to four additional bays. While local bus services would have short scheduled layovers in the transit center, busway services would terminate and layover downtown and would therefore continue on to Main Street and not layover in the transit center. Therefore, a single bay for unloading inbound busway passengers and up to three bays for loading passengers would be sufficient, for a total requirement of 20 transit center bus bays. A transit center at the Myrtle Street location would most likely have a single entrance/exit at the Myrtle/Church/Spruce intersection opposite Spruce Street.

From the south, routes would approach downtown northbound on Main Street before turning west on Church Street. Main Street stops would be at the near side of Arch Street and the near side of Central Row. (Riders could transfer to eastbound buses at the Central Row stop without having to cross any streets.) Most of the remaining transfers would take place in the transit center. Upon leaving the transit center, most routes would follow Myrtle Street and Edwards Street to the north to Albany Avenue. Southbound stops on Main Street would be at Pratt Street, between Pearl and Gold, and at Wells Street. (At the Pearl/Gold stop, riders could transfer to these routes from the east of the river routes without having to cross the street).

In creating the six east-west through-routes some routes that now approach from the north or south would be modified to approach from the east or west. East of the river routes would enter downtown from the Founders Bridge and would be joined at Columbus Boulevard by other routes. These routes would turn south onto Main Street to serve a major stop between Pearl and Gold where riders could transfer (without crossing the street) to routes heading south. These routes would then turn right onto Gold Street and continue along Jewell, Ford and Asylum before turning onto Spruce Street and continuing to the transit center. The remaining transfers would take place in the transit center. Upon leaving the transit center, these routes would disperse to the northwest, west and southwest either via Spruce Street to Asylum Avenue, or via Myrtle Street to either Garden Street or onto Cogswell and Broad streets.

In the eastbound direction from the transit center, these routes would follow Spruce, Asylum and Ford to Pearl Street. They would then continue east along Pearl, Central Row and State Street. Riders transferring from the south would board on Central Row at Main Street (without having to cross the street). Some routes would turn onto Market Street or Columbus Boulevard while the remaining routes would continue east across the Founders Bridge.

Busway routes that originate in New Britain or Hartford would exit the busway and continue along Spruce Street to the transit center where all transfers would take place. They would then follow Church Street to Main Street with a stop on Main Street at Pratt Street and a downtown layover point at a far side stop on Main Street at Gold Street. Outbound they would turn onto Wells Street to Trumbull Street and Church Street, picking up transferring passengers at the transit center before returning to the busway via Spruce Street. If busway services were extended east of the river in the future, their downtown routing could be modified to resemble that of the east-west routes, or could follow a different alignment through downtown, without impacting their ability to serve the transit center and Main Street area stops.

Recommended commuter bus routings in the downtown were designed to complement the local bus circulation pattern, avoiding areas of high local bus volume and using stops that are still well-located for commuter bus riders while avoiding stops used by local buses. Most inbound commuter bus routes would make their first stop on the

north side of Central Row adjacent to the Old State House and would continue onto Pearl Street with a few trips serving the Asylum Hill and Capitol Avenue loops. Central Row would serve as the transfer point to access service on the two loops in the morning. Evening transfers from the two loops would occur at the Travelers stop on Main Street.

The bus circulation pattern and bus stops described above would accommodate nearly all transfers without requiring riders to cross Main Street, Central Row or Market Street, as they must do today. However, bus stops on Main Street would be reassigned to different routes. This reassignment is shown in Figure 1-6, which can be compared to the current situation shown in Figure 1-2. Passenger volumes at each stop are shown in Table 1-3, which can be compared to those in Table 1-1. Boardings on both sides on Main Street would decrease while those on Central Row would increase and the stop on Market Street would be eliminated.

Next Steps

This study identified the need for a downtown transit center in Hartford. Further study will be needed in order to identify an appropriate site and to quantify the costs and benefits of such a center. There are also several key factors and assumptions that led to the selection of the recommended alternative that may need to be explored further or re-confirmed by such a study. These key factors include the study findings on the downtown transfer rate, the assumed service design and ridership patterns on the future New Britain Busway, the operational feasibility of through-routing most local bus services, and the ability to locate a feasible available transit center site.

While the recommended configuration described above assumed a specific location, additional study is needed to select a final site. CRCOG, CTDOT and the City of Hartford should collaborate on a Transit Center Location Study to review all possible sites, assess their suitability for a transit center, and assess their compatibility with existing and expected future bus and rail services. The study should consider all sites north and west of downtown that were initially identified for this study. It should also include a thorough examination to identify any additional sites that may be suitable. Each site should then be evaluated considering the physical and operational requirements of a transit center, displacement of existing uses, the likelihood of alternative uses for the site, and the potential for joint development of the site and surrounding areas, including transit oriented development opportunities.

Conceptual layouts and operating plans should be developed for the most promising sites so that construction and operating costs can be estimated. The layouts and operating plans should be used to more accurately assess the impacts on bus operations and bus operating costs. The location study should also assess new information from other ongoing transportation planning efforts, especially the New Britain Busway, since Busway operating plans and projected ridership patterns may suggest changes in the way busway services would interact with the transit center.

This Downtown Circulation part of the Northwest Corridor Study has provided Hartford with a direction to follow to improve the performance of the region's bus network while maintaining bus access to the downtown and improving the pedestrian and business environment on Main Street. However, the identification of the need for a new facility means that the process of bringing about these improvements is just beginning. Determination of a preferred transit center site is the next step, which must then be followed by identification of funding sources, environmental analysis, and design before the many benefits can be realized.

Figure 1-6: Major Downtown Bus Stops in the Recommended Alternative

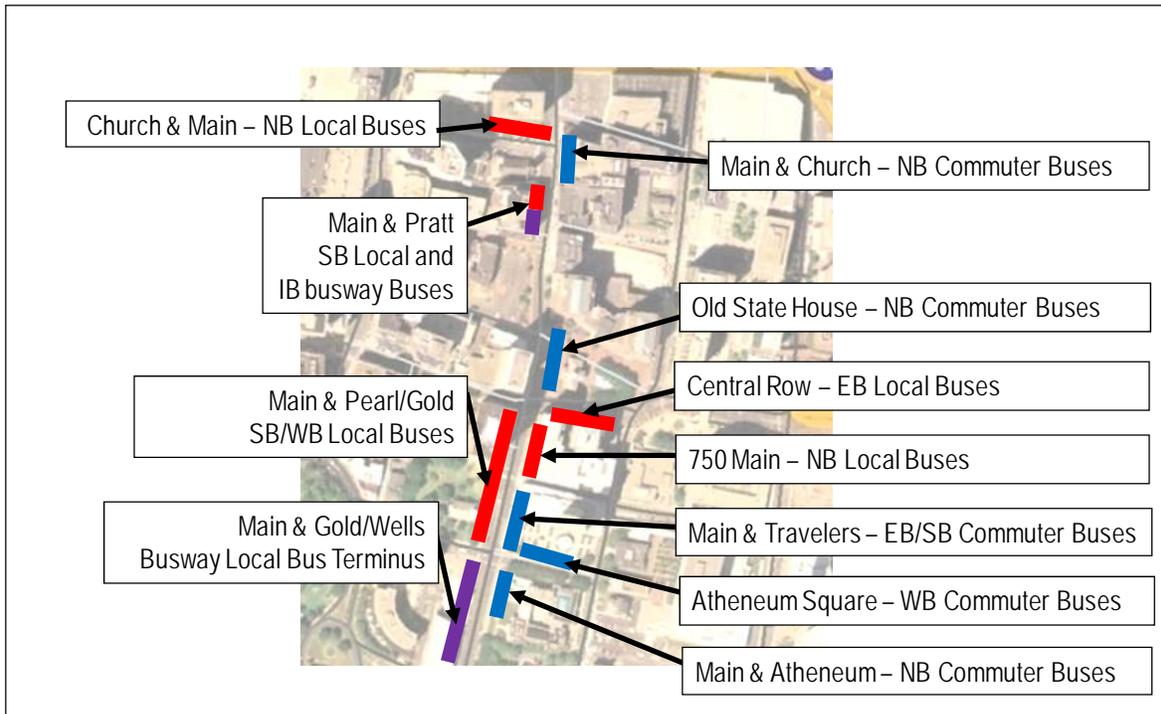


Table 1-3: Boardings at Main Street Stops in the Recommended Alternative

	Transfers		Origins		Total			Current Boardings
	Local	Commuter	Local	Commuter	Local	Commuter	Total	
MAIN ST & OLD STATE HOUSE								3,052
MAIN & TRAVELER'S	-	144	-	858	-	1,002	1,002	2,869
MAIN ST & ATHENEUM								903
MAIN ST & 750 MAIN		-	1,249	-	1,249	-	1,249	694
CENTRAL ROW SOUTH	837	-	853	-	1,690	-	1,690	799
MAIN ST & PEARL/GOLD	814	-	1,982	-	2,796	-	2,796	4,194
MARKET ST & CONSTITUTION	-	-	-	-	-	-	-	2,583
TOTAL	1,651	144	4,084	858	5,735	1,002	6,737	15,095

2.0 STUDY GOALS AND OBJECTIVES

Goals and Objectives for this part of the Northwest Corridor study were adopted at the first Steering Committee Meeting for this part of the project held on July 5, 2007. At that meeting, the committee adopted the following goals and objectives.

2.1 *Study Goals*

1. Develop an understanding of current and future transit ridership to, through, and within the downtown.
2. Develop a comprehensive downtown circulation plan that accommodates all transit services in downtown Hartford.
3. Increase transit ridership by developing a downtown circulation plan that meets the needs of current and future riders traveling into, through, and within downtown.
4. Identify the need for and the appropriate location(s) for one or more downtown transit centers.
5. Improve downtown transit service in a cost-effective manner.

2.2 *Study Objectives*

Goal 1: Develop an understanding of current and future transit ridership to, through, and within the downtown.

- 1.1. Document current downtown through ridership and transfer patterns
- 1.2. Document current downtown transit usage by stop
- 1.3. Understand current downtown rider trip purposes, destinations and access to bus stops
- 1.4. Understand the extent to which transit is used for trips within downtown
- 1.5. Understand the extent to which transit meets the needs of downtown stakeholders and how improved transit could benefit each one
- 1.6. Identify planned developments and development trends affecting downtown transit needs

Goal 2: Develop a comprehensive downtown circulation plan that accommodates all transit services in downtown Hartford.

- 2.1. Develop coordinated circulation patterns for local bus routes, express routes, busway services, private carriers, and the STAR Shuttle
- 2.2. Provide downtown circulation capacity for future expansion, including busway services
- 2.3. Provide coordinated downtown distribution service for commuter rail and intercity bus riders
- 2.4. Use transit priority strategies to provide travel time advantages over the automobile
- 2.5. Develop traffic circulation changes that will facilitate transit improvements
- 2.6. Minimize negative impacts on downtown vehicular traffic circulation

Goal 3: Increase transit ridership by developing a downtown circulation plan that meets the needs of current and future riders traveling...

into downtown

- 3.1. Maximize current and future downtown destinations within walking distance of transit
- 3.2. Enhance pedestrian access to bus services
- 3.3. Improve the waiting experience of riders boarding in the downtown
- 3.4. Provide a downtown transit system that can accommodate future development
- 3.5. Provide downtown distribution patterns that are easy for riders to understand

through downtown

- 3.6. Minimize the number of transfers required for through riders
- 3.7. Minimize the time required and the inconvenience of transfers made in the downtown
- 3.8. Improve the waiting experience of riders transferring in the downtown
- 3.9. Provide transfer connections that are easy for riders to understand

within downtown

- 3.10. Provide service for the local travel needs of the increasing number of downtown residents
- 3.11. Provide service for current and future trips within downtown by visitors
- 3.12. Provide a downtown transit system that is convenient and easy to understand

Goal 4: Identify the need for and the appropriate location(s) for one or more downtown transit centers.

- 4.1. Provide downtown transit center(s) to facilitate both intermodal and local bus-to-bus transfers
- 4.2. Provide downtown transit center(s) at locations with high local demand
- 4.3. Provide downtown transit center(s) that can be integrated with Transit Oriented Development
- 4.4. Identify the necessary features for each downtown transit center
- 4.5. Identify necessary layover locations in the downtown area

Goal 5: Improve downtown transit service in a cost-effective manner.

- 5.1. Provide cost-effective improvements in CTTRANSIT operations
- 5.2. Provide cost-effective capital improvements
- 5.3. Avoid costly impacts on private carrier operations

2.3 Report Contents

This report continues with a discussion of the existing conditions affecting downtown Hartford bus circulation in Section 3. Anticipated future services are discussed in Section 4. A summary of input received from stakeholders in the project is contained in Section 5. Study findings concerning key downtown nodes and connections to be served are summarized in Section 6. Sections 7 and 8 discuss the evolution of the evaluation criteria used in the study and the process of developing categorizing alternatives. Sections 9 and 10 discuss alternative transit center sites and downtown circulation alternatives. Section 11 is the evaluation of the alternatives and Section 12 describes the recommended alternative.

3.0 EXISTING CONDITIONS AFFECTING DOWNTOWN HARTFORD BUS CIRCULATION

As part of the Downtown Circulation task of the Northwest Corridor Study, the existing conditions in the downtown were assembled and summarized as of the middle of 2008. This section presents the definition of the downtown study area, including current downtown land use, employment, and population. This is followed by descriptions of current bus services, current ridership and traffic conditions.

3.1 Downtown Study Area

The study area for the downtown circulation portion of the Northwest Corridor Study, as shown in Figure 3-1, consists of downtown Hartford plus the commercial portion of the Asylum Hill neighborhood. It is bounded by the Connecticut River on the east, I-84 and Walnut Street to the north, Garden and Collins Streets in the northwest, Sigourney Street on the west, and Capitol Avenue on the south. This includes all of the traditional downtown area, plus the insurance companies on the eastern side of the Asylum Hill neighborhood, and the State Capitol and state office buildings along Capitol Avenue. This area encompasses 0.94 square miles.

Hartford's traditional downtown is small and compact and is easily walkable from end to end. The downtown has been kept small by several natural and man-made barriers. The Connecticut River defines the eastern edge of downtown, while I-84 and the Whitehead Highway provide northern, western and southern limits. Bushnell Park fills the gap between the two highways at the southwestern corner of downtown.

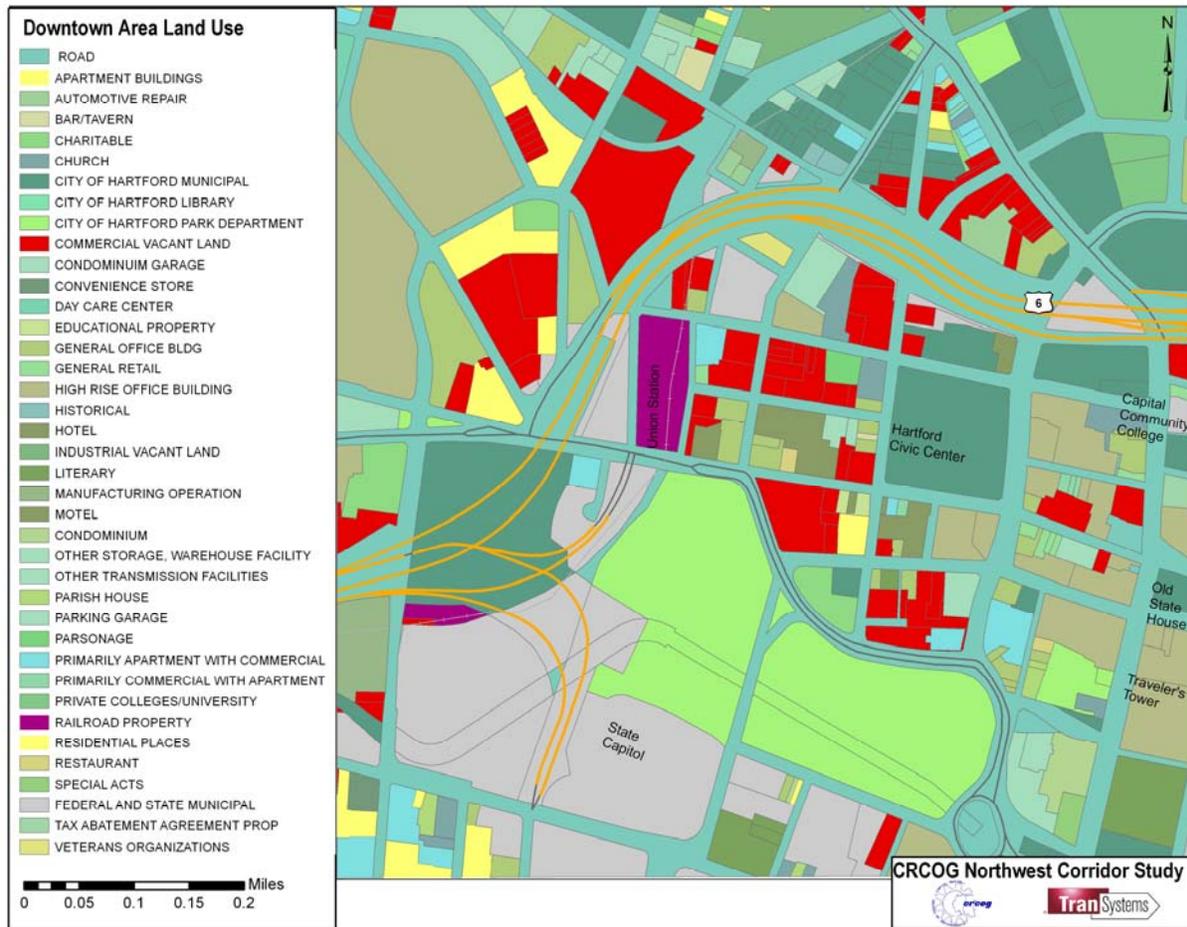
3.1.1. Land Use

Land use data for the part of the downtown area around Union Station was provided by the City of Hartford reflecting the city assessor's data as of July 2007. Data for the area east of Main Street and Asylum Hill was not included. The available data is shown in Figure 3-2. One key category, vacant commercial land, is shown in red. The figure shows that there are many vacant parcels in this part of the study area.

Figure 3-1: Downtown Circulation Study Area



Figure 3-2: Union Station Area Land Use (July 2007)



Over the past decade there have been a number of development initiatives. These have primarily been near the southern end of downtown, close to the river, at Adriaen's Landing and in City Center, most notably: The Connecticut Convention Center, the Marriott Hotel, the Connecticut Science Center, Mortensen Riverfront Plaza and the new downtown housing projects, including the new tower at The XL Center (Hartford 21).

Recently, there have been a series of initiatives that shift some of the focus toward the west and the Union Station neighborhood¹. These studies have identified key development sites, "target sites" and proposed public improvements for the Asylum/Farmington and Downtown West sections and recommended mixed use development on vacant and underutilized parcels. The area between The XL Center and Union Station is targeted for an expansion and reinforcement of the existing entertainment uses.

The Union Station area is on the edge of Bushnell Park; it is an entertainment area with many of the city's nightspots, restaurants and the existing XL Center, and it is near many of the City's cultural attractions; it has an inviting historic character; there are many available parcels for development; and, the availability of transit and proximity of Union Station (as well as access to I-84) make it one of the most accessible areas of the city.

¹ *Hartford 2010* (2007), *The Urban Land Institute Advisory Services Report* (2007) and *Redevelopment Plan for The Downtown West Section 1 Project* (2006)

In the immediate Union Station Area, there are three parcels of interest to the City's Development Services Department: the Union Station parking lot on Spruce Street, the North Parking Lot (owned by Mass Mutual and leased to The Hartford), and the Capitol West Building adjacent to the North Parking Lot. The City considers these important development sites (especially The Capitol West site), and any plans for Union Station should take them into consideration. The former Mass Mutual headquarters building on Garden Street also presents an important redevelopment opportunity.

3.1.2. Employment

Current and future employment was analyzed using Traffic Analysis Zone (TAZ) data from the CRCOG Regional Travel Demand Model and commercially available data purchased from InfoUSA.

Employment Assumptions Used in the Regional Travel Demand Model

Employees per square mile, as of the year 2000, were mapped using TAZ data from the CRCOG Regional Travel Demand Model, and are shown in Figure 3-3. The downtown study area's TAZs ranged between approximately 250 and 11,500 total employees each, in the year 2000. There was a concentration of dense employment along either side of Main Street. The XL Center, Capital Community College, the Old State House, and Travelers Towers are all located in this area. The area surrounding Travelers Towers and the Old State had the most total employees: 11,303, followed closely by the adjacent TAZ, with 10,603 employees. The TAZ in the northwest corner of Asylum Hill, where only the southern half is within the study area, had the fewest number of employees: 275.

Figure 3-4 demonstrates the share of retail and non-retail employment in the downtown study area for the year 2000. Non-retail employment makes up most of the industry within the downtown study area. In eight of 15 TAZs, retail employment made up less than one percent of total employment in 2000. This includes the areas around the Convention Center, Pulaski Circle, the State Capitol, and Farmington Avenue. In addition, another six TAZs, those within the vicinity of the XL Center, Capital Community College, and the southern corners of the downtown study area showed no more than six percent of all employment as retail.

Future employment projections used in the CRCOG Regional Travel Demand Model assume that the downtown area will maintain a constant share of regional employment. Projections for non-retail and retail growth are shown in Figures 3-5 and 3-6, respectively. These projections indicate that no significant growth in employment is projected by 2010. The non-retail sector is projected to experience growth after 2010. Between 2010 and 2030, non-retail employment is projected to rise by a minimum of four percent in the southwest corner of the study area, to a maximum of 55 percent in the northwest corner of the study area, below I-84. Other areas of high non-retail employment growth, those expected to gain by more than 25 percent, lie within the center of the study area, in those TAZs surrounding Union Station, the XL Center, and close to the Travelers Tower.

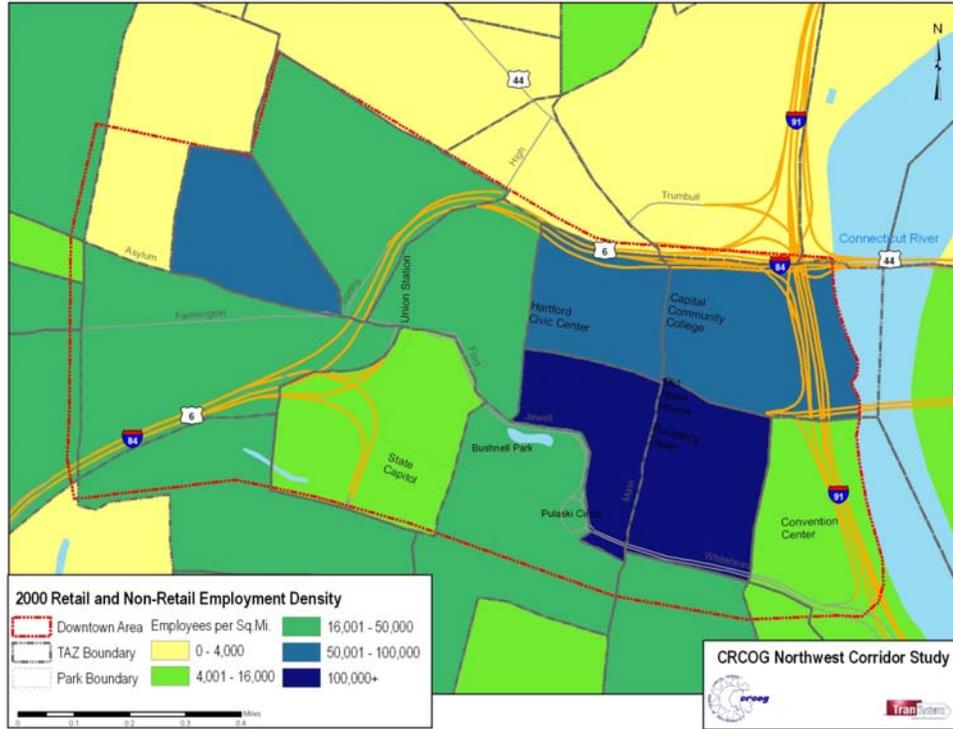
Major Downtown Employers

Regional employment data for the Hartford area was purchased from InfoUSA and plotted. Data obtained from InfoUSA included employer name, address, primary and secondary SIC² codes, census geographic identifiers, latitude-longitude coordinates, and number of employees, as well as limited financial data.

Figure 3-7 illustrates employer data, by size of employer at each address in the downtown study area. (Employers at the same address were grouped together, to prevent overlapping map symbols.) As shown in the figure, companies in the area on Farmington Avenue, near and including Aetna, employ over 10,000 employees, and Hartford Financial Services Group, near the intersection of Asylum and Farmington avenues, employs around 5,000 employees. Other

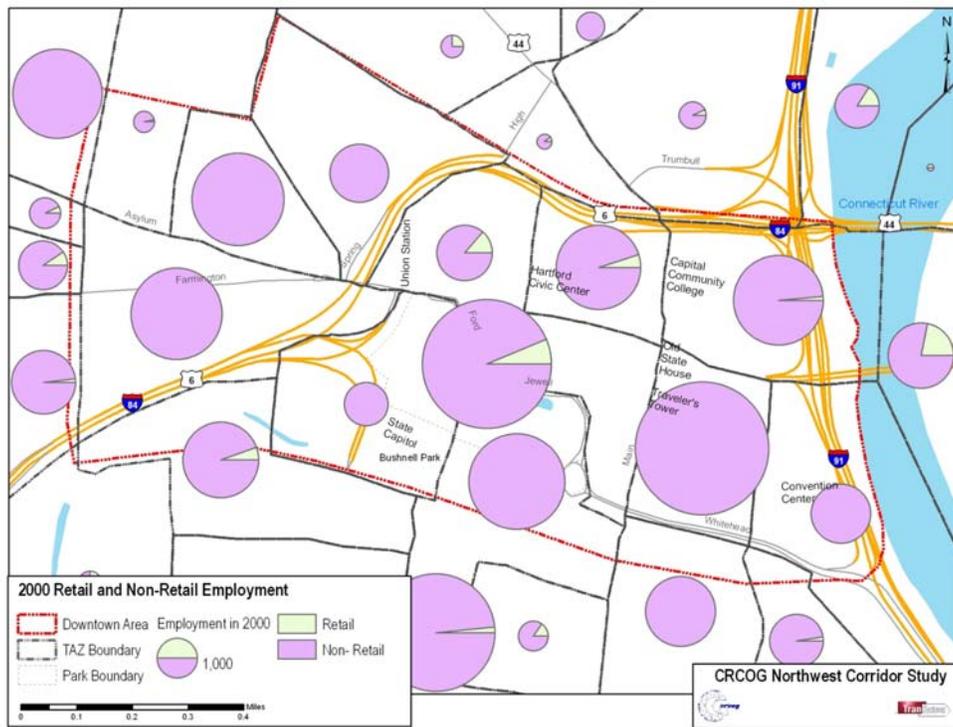
² United States government Standard Industry Codes

Figure 3-3: Downtown Employment Density



Source: CRCOG Travel Demand Model

Figure 3-4: Downtown Employment Makeup



Source: CRCOG Travel Demand Model

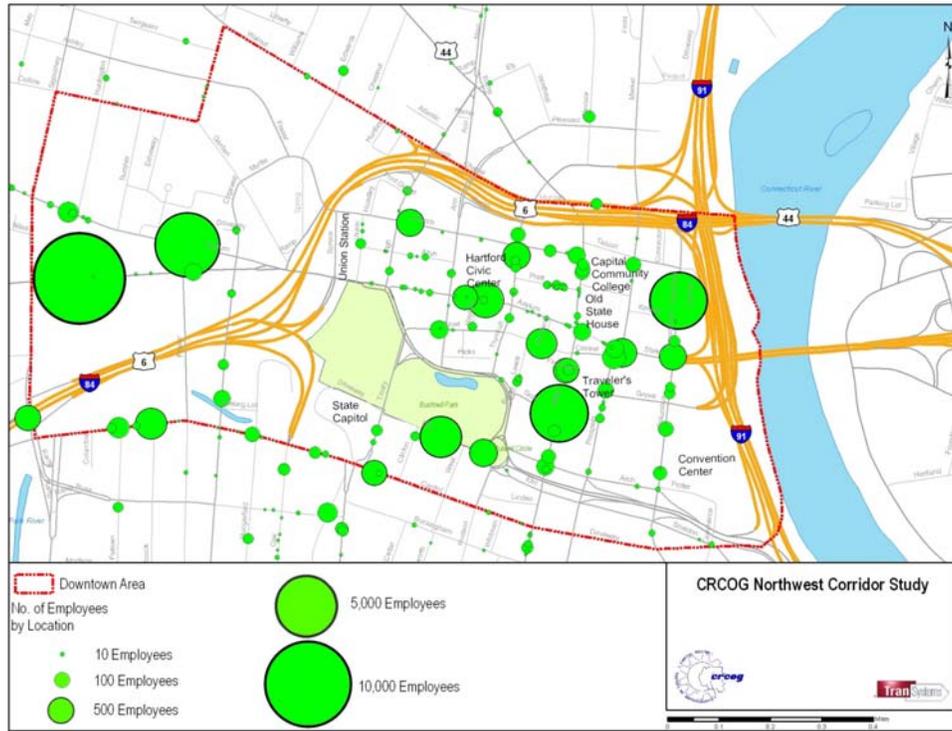
Figure 3-5: Downtown Non-Retail Employment



Figure 3-6: Downtown Retail Employment

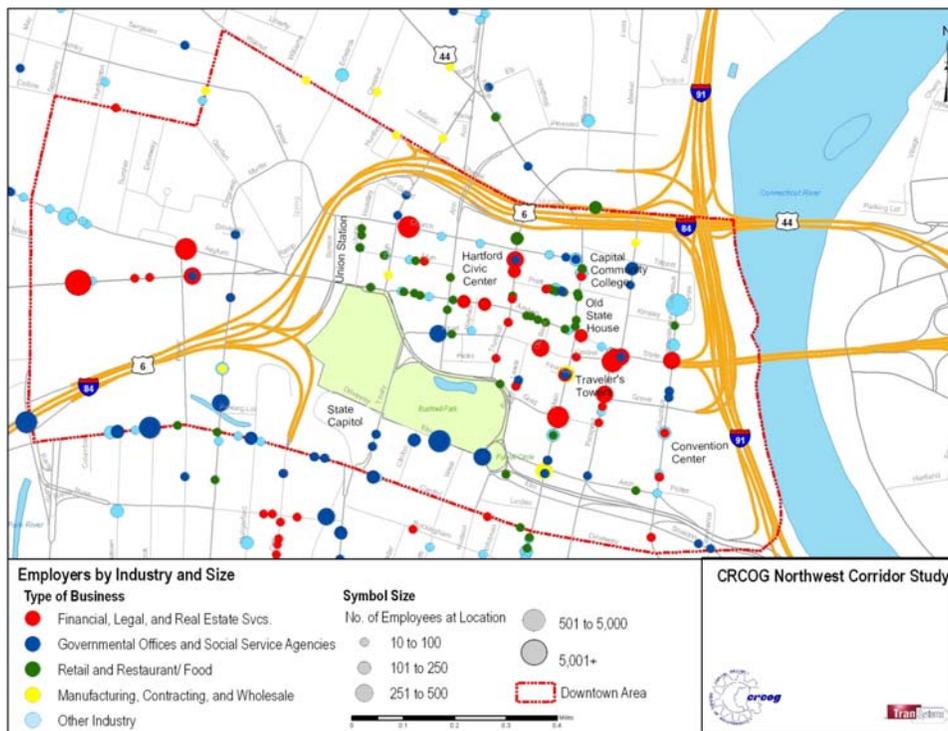


Figure 3-7: Downtown Employers



Source: Info USA

Figure 3-8: Downtown Employers by Industry



Source: Info USA

large clusters of employment can be seen on Columbus Avenue, near the northern corner of the study area, on Main Street near Travelers Towers, and along the southern border of Bushnell Park.

Figure 3-8 provides expanded analysis on employer data for the downtown study area, illustrating both employer size and industry. For this analysis, employer industry was divided into five categories, based on the Primary SIC codes provided in the InfoUSA data set: Financial, Legal, and Real Estate Services (including insurance companies); Governmental Office and Social Service Agencies; Retail and Restaurant or Food; Manufacturing, Contracting, and Wholesale; and Other Industries. As shown below, many of the larger downtown employers fall into the first two categories: Financial, Legal, and Real Estate Services and Governmental Office and Social Service Agencies. In this case, employers were not aggregated by address; the symbol size was reduced to appropriately display individual employment locations.

The largest of the Financial, Legal, and Real Estate Services establishments are clustered between I-84 and I-91, especially along Prospect Street, and in Asylum Hill. In the first area, The Travelers employs 4,000 people; the combined Phoenix companies employ about 1,000 people; and Pricewaterhouse Coopers employs 500 people. There are also large employers in this sector on Asylum and Farmington avenues, west of Interstate 84, including Hartford Financial Services Group with 5,000 employees and Aetna with 10,000 employees. Smaller employers in Financial, Legal, and Real Estate Services are clustered throughout the study area, usually located in close proximity to larger employers in the same industry.

Larger Governmental Office and Social Service Agencies are located near or on the southern boundary of the downtown study area, south of Bushnell Park near the State Capitol, along and just below Capitol Avenue. The largest of these are in the Connecticut Department of Environmental Protection Building on Elm Street, with just over 2,000 state employees working from that location. Smaller groups are located throughout the eastern half of the study area. Similarly, Retail and Restaurant or Food establishments, which make up a small portion of overall employment, are mostly located in the northwest part of downtown, particularly along Asylum Street.

Manufacturing, Contracting, and Wholesale and Other Industries are scattered throughout the downtown area, and include small employers in Asylum Hill, along Columbus Avenue, and close to the XL Center.

3.1.3. Population

Both current and projected future downtown population data were examined to understand the location and potential needs of downtown residents.

Current Downtown Population

Figure 3-9 illustrates the population density of the downtown area and the boundary of the downtown study area. Demographic data for the year 2000 (most recent available) at the census block level was obtained from the U.S. Census and residential population density was calculated. There are 118 census blocks within the downtown study area, including two large blocks that border the west side of the Connecticut River, from the intersection of Van Dyke Avenue and Sequassen Street in the south, to the interchange of I-91 and I-84 in the north. In 2000, the 118 downtown study area census blocks had a population of 2,673 in a 0.94 square mile area, for an average density of 2,844 persons per square mile.

Overall, the downtown area has a very low population, especially as compared to the surrounding area. Many downtown blocks have no residents, including the entire eastern portion of the downtown study area and areas surrounding the Convention Center, Old State House, Travelers Towers, and the State Capitol.

The residential areas in the northwest corner of the study area, west of Interstate 84 made up almost 75 percent of the total downtown study area population. Along Asylum Avenue and Huntington and Summer streets, along Fraser

Figure 3-9: Downtown Population Density



Source: US Census 2000

Street, and adjacent to the western side of I-84 were pockets of population, surrounding the major employers. The population of the study area west of I-84 was 2,026, leaving only 647 east of I-84. East of I-84, there are pockets of population just east of Union Station, across Main Street from Capital Community College, and between Main Street and Pulaski Circle. In 2000, there were 212 residents between Ann Street and Union Station, just 37 off Main Street between Church and Asylum Streets, and 393 residents between Pulaski Circle and Main Street, between Gold Street and the study area boundary at Capitol Avenue.

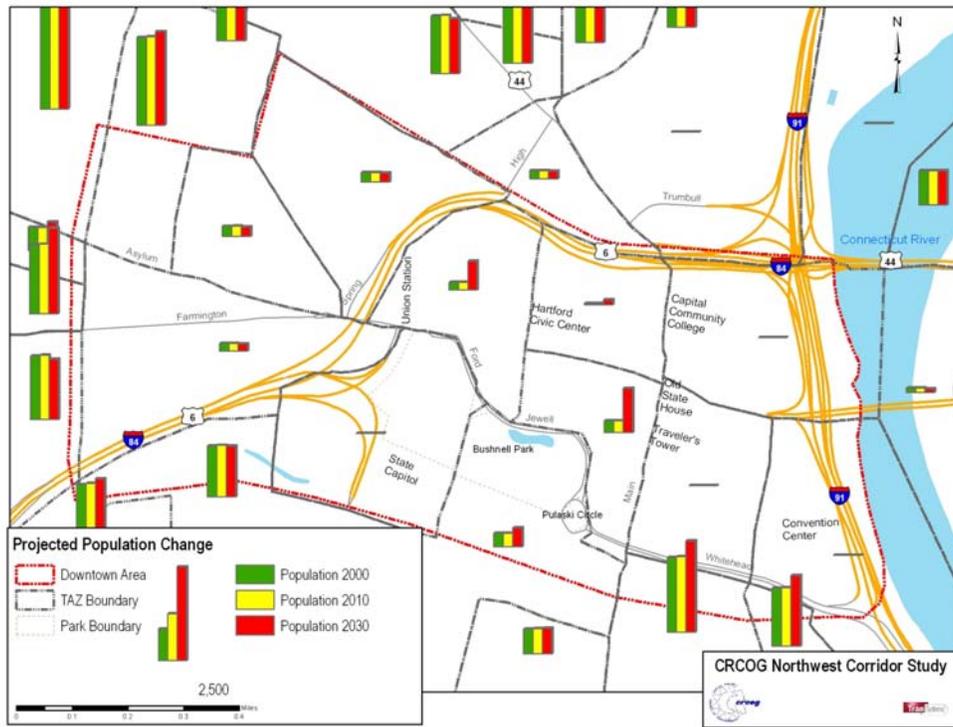
Population Projections

Population projections used as inputs to the CRCOG Regional Travel Demand Model were also examined. CRCOG assembles data at the Traffic Analysis Zone or “TAZ” level, which can be significantly larger, geographically, than a census block. Four of the 15 TAZs in the study area, including those containing the State Capitol, Capital Community College, the Convention Center, and Travelers Tower and the Old State House have no residents.

Figure 3-10 depicts the population projections geographically. In the year 2000, total population for the eleven populated TAZs all or partially within the downtown study area ranged from 37 people in the TAZ surrounding the XL Center, to 2,322 individuals residing in the TAZ in the far northwestern corner of the study area, along Asylum Hill. Projections are that by the year 2010 the population of each of the eleven downtown study area TAZs will grow by less than one percent.

CRCOG projections, which are based on information on planned residential developments within the study area, show a varied growth rate among the TAZs from 2010 to 2030. It should be noted that these reflect planned developments at the time the projections were made. The planned projects may or may not be completed in this time frame and additional projects not included in the projections have since been proposed and some have even been completed (notably Hartford 21 with approximately 250 residents at the time of this writing). According to the projections, some of the TAZs are expected to more than triple their population, while others are expected to grow

Figure 3-10: Downtown Population Projections



Source: CRCOG Travel Demand Model

only by about 7 percent. The three TAZs where population is expected to grow most between 2010 and 2030 are clustered together around Union Station and the XL Center, bordered by I-84 on the north and west, Main Street in the east, and parts of Ford, Jewell, and Elm streets in the south. For these new downtown residents, transit could potentially be their primary mode of transportation.

Four additional TAZs are expected to see an increase in population, though the growth is projected to be significantly less than those areas discussed above. The population in three TAZs along the southern edge of the downtown study area is projected to grow by between 20 and 45 percent and the current most populated TAZ, in the northwest corner of the study area, is expected to grow by about six percent between 2010 and 2030.

The remaining four TAZs, those projected by model data to lose population between 2010 and 2030, are grouped together in the Asylum Hill portion of the study area, around I-84 and the intersection of Asylum and Farmington Avenues. None of those TAZs are expected to lose more than seven percent of their population, although overall population will remain low, with no single TAZ having more than 1,350 inhabitants.

3.2 Downtown Bus Services

Downtown Hartford is served by numerous existing local and commuter bus services, described below.

3.2.1. Downtown Routes

CTTransit provides most of the transit service into downtown Hartford. CTTRANSIT operates both local and commuter bus services. There are also several commuter bus services sponsored by the Connecticut Department of Transportation (CTDOT) and provided by other private operators.

3.2.1.1. CTTransit Local Bus Routes

CTTransit operates numerous local bus routes in Hartford. The paths followed by these local bus routes through downtown Hartford are shown in Figure 3-11. (Note that CTTANSIT recently changed the naming/numbering convention of its routes. The figure reflects the convention used at the beginning of this study in 2007.) Several of these local routes are through-routed in the downtown area; that is, each route continues through downtown and serves another corridor on the other side of downtown. These through routes follow one of three general patterns through downtown, shown in red in the schematic in Figure 3-12. Most through routes traverse downtown in a north-south direction on Main Street, while two routes use a combination of Asylum, Pearl, and Jewel to/from the west and continue either north or south on Main Street. There are no routes that travel through downtown to or from the east.

A number of routes do not continue through downtown, but rather turn around and return to the same corridor from which they came. The four basic patterns followed by these routes are shown in grey in Figure 3-12. They enter along Main Street either from the north or from the south and turn around downtown. A third group enters from the west and uses a loop along Jewel Main and Asylum to turn around. The fourth, and largest, group includes all routes from east of the river. These routes enter downtown on the Founders Bridge, turn north on Market Street and return to the east side of the river via I-84.

Although CTTANSIT is currently in the process of renaming and renumbering its Hartford routes, CTTANSIT local bus routes in the Hartford area have traditionally been identified using a single letter. The different destinations or route variations that a route could serve were denoted by a number added to the letter (e.g. "T7"). Through-routed services had the same letter identifier on both sides of downtown, but used a different set of numbers on each side. Furthermore, service on each side of downtown had a different route name. For example, T1, T2, T3 and T9 formed the south side of the T route and were known as the "T Franklin Avenue". T4, T5, T6, T7, T8 and T10 form the north side of the T route and were known as the "T Blue Hills Avenue".

Even prior to the current renumbering, there were actually several different ways to count the number of local bus "routes" in downtown Hartford. This is because there were several different route naming or numbering systems. Traditionally routes were defined simply by their single letter. Using this systems there were 18 different lettered routes. When route variations, defined by a letter-number combination, were considered there were 79 routes. As noted in the example above for Route T, several of these variations were typically combined into each named route. There were 28 such named routes³. Prior to renumbering CTTANSIT used three different ways to name these 28 routes. There was the route name, "T Franklin Avenue" in the above example; a one-, two- or three-letter code (TF for Franklin Avenue and TBH for Blue Hills Avenue); and a three-digit number corresponding to each letter code. The route name was used on maps and public timetables. The letter code and number were only used internally. The 28 local routes, and their various names, are listed in Table 3-1.

As noted above, CTTANSIT recently replaced the letter-number codes with a system using only numbers. There are 44 numbered local bus routes operating downtown, each with a unique name. There will also be several variations on some routes, indicated by a letter suffix attached to the route number. *For consistency of the analyses conducted throughout this study, this report uses the "old" letter codes that were in place on the schedules that were in effect in late 2007.* When only one side of a through-route is referenced, the two- or three-letter code is used.

Each of the 18 lettered routes follows one of the three through-routed or four terminating patterns previously shown in Figure 3-12. Routes K, N, Q, T, U and W pass through downtown on Main Street. Route A travels through from the west to the south. Route S travels through downtown from the west to the north (but only in peak periods). Routes G, P, and F2 enter on Main St. from the south and turn around between Central Row and Atheneum Square. Route

³ Of the 18 lettered routes, seven are through-routes which are each broken into two named routes. Three others are broken into two named routes that for the most part operate independently.

Figure 3-11: Local Bus Routes through Downtown

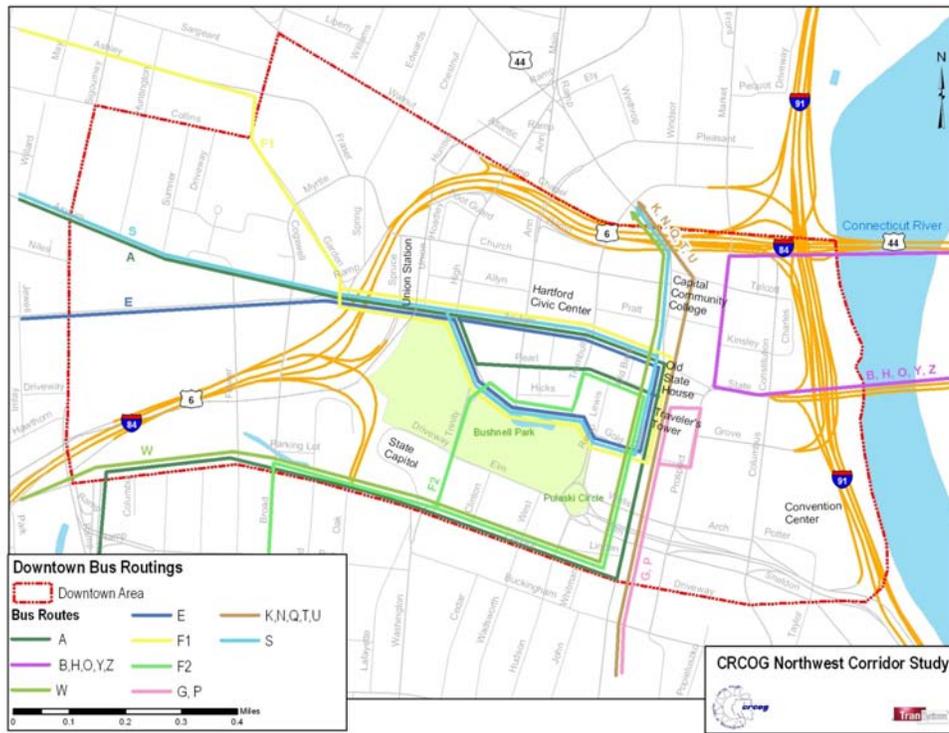


Figure 3-12: Local bus Route Patterns

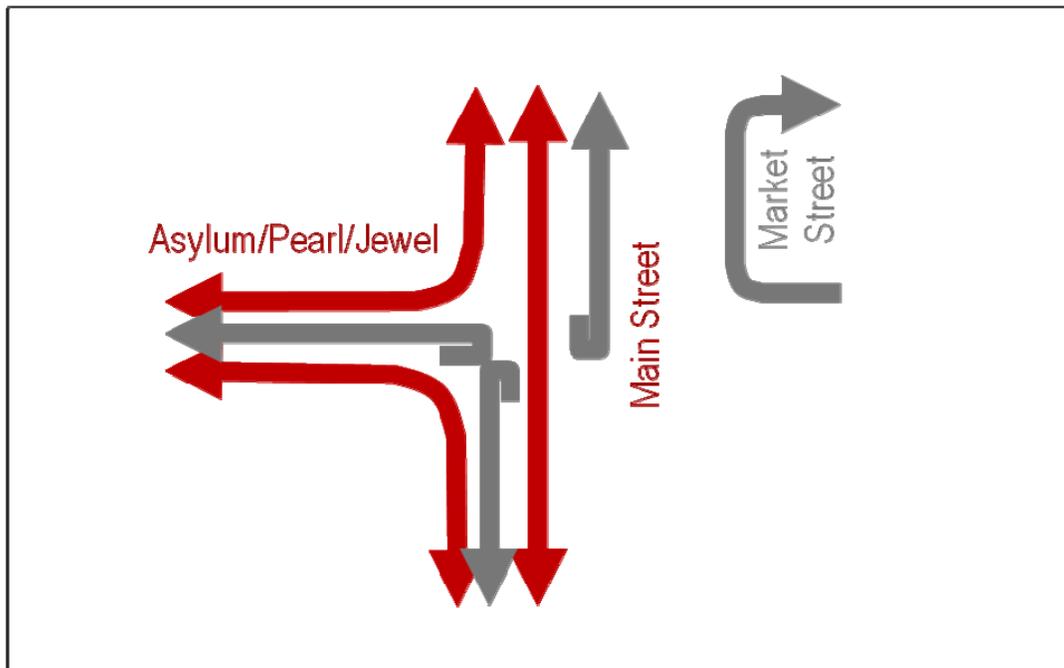


Table 3-1: CTTRANSIT Downtown Hartford Routes

Route Letter	Route Code	Route Number	Route Name	Variations
A	AA	601	Asylum Avenue	A1, A2
A	AH	602	Hillside Avenue	A3
B	B	603	Silver Lane	B1, B2, B3, B4, Bx
E	E	604	Farmington Avenue	E1, E2, E3, E5, E6, E7, E8
F	F1	605	Ashley Street	F1
F	F2	606	Broad Street	F2, F3, F4
G	G	607	Locust Street	G1
H	H	608	South Windsor/ Park Avenue	H1, H2
J	J	609	Brewer Street	J, J1, J2
K	KN	610	North Main	K1, K2
K	KS	611	Park Street	K3, K4, K5
N	NC	613	Campfield	N1
N	NW	614	Windsor	N2, N3, N4, N5, N6, N7, N7x
O	O	615	Glastonbury	O1, O2, O3
P	P	616	New Britain	P1, P1x
Q	QNB	617	New Britain Avenue	Q2, Q3, Q4
Q	QV	618	Vine Street	Q1
S	SG	619	Garden Street	S2
S	SW	620	Granby Street	S1
T	TBH	622	Blue Hills Avenue	T4, T5, T6, T7, T8, T10, T10x
T	TF	621	Franklin Avenue	T1, T2, T3, T9
U	UA	623	Albany Avenue	U3, U4, U5, U6
U	UW	624	Weathersfield/ Middleton	U1, U2, U7, U7x
W	WNM	626	Weston Street	W3, W4
W	WV	625	Capitol Avenue	W1, W2
Y	YM	627	Manchester	YM1, YM2
Y	YS	628	Sunset Hills	T3, Y4
Z	Z	629	Tolland Turnpike	Z1, Z2, Z3

S Garden Street (off-peak periods only) enters on Main St. from the north and turns around between Wells and Gold Streets. Routes E, F1, and S Granby Street (off-peak periods) enter from the west and turn around using Jewel, Main and Asylum. From the east, Routes B, H, J, O, Y, YM, and Z turn around using Market Street.

3.2.1.2. CTTransit Flyer Routes

CTTransit also provides service on four Flyer routes serving downtown Hartford. These are primarily express services running to and from suburban job locations. Two flyer routes, the Westfarms and Buckland Flyers, offer weekend-only service to suburban retail centers. The Berlin Turnpike Flyer offers early morning and evening weekday service, as well as weekend service, to a suburban retail center. The Bradley Flyer offers hourly service seven days a week to Bradley International Airport and the surrounding commercial area. Three of these routes pick-up along Main Street, while the Buckland Flyer that travels east of the river uses Market Street.

3.2.1.3. CTTransit Commuter Routes

CTTransit also provides service on 12 commuter express routes serving downtown Hartford. Each is designated with a number between one and fifteen. They were traditionally denoted with the letter "C" before the number (the "C" was dropped in the new numbering system). Commuter routes enter and exit downtown from one of three basic directions.

Some commuter service from each pattern also serves the Capitol area and Asylum Hill along portions of either a clockwise or a counter-clockwise loop formed by Main Street, Capitol Avenue, Sigourney Street and Asylum Avenue.

PM peak period outbound routing patterns are shown in Figure 3-13. Red patterns in the figure begin on Capitol Avenue and serve Asylum Hill clockwise before picking up downtown (this is referred to as the Asylum Hill Loop). Blue patterns begin on Asylum Hill and serve Capitol Avenue counter-clockwise before picking up downtown (this is referred to as the Capitol Avenue Loop). The two loops are reversed in the AM Peak. Grey patterns begin downtown with no service to the Capitol Avenue or Asylum Hill loops. At the time this study began, a large percentage of commuter bus trips served one of the two loops. Beginning in November 2008, the number of trips serving the loops was reduced; however, schedules were structured such that one commuter bus serves the Asylum Hill Loop every five minutes and one commuter bus serves the Capitol Avenue Loop every ten minutes. Passengers may transfer between their own commuter bus and the scheduled loop bus at no cost at the Central Row bus stop.

Commuter routes serving areas east (C3, C4 and C14) and south (C6, C7 and C10) of downtown enter and leave downtown via the Founders Bridge or I-91 and travel east/west on State Street and Central Row. In the AM Peak, some continue on to Pearl Street and Asylum Avenue to Asylum Hill and follow the Asylum Hill loop clockwise onto Sigourney Street and Capitol Avenue ending just east of the State Capitol. A few trips turn onto Main Street instead of Pearl and follow the Capitol Avenue Loop in the clockwise direction to Asylum Hill. Outbound in the PM, some service originates in Asylum Hill and follows the counter-clockwise Capitol Avenue Loop to Main Street, some originates on Capitol Avenue and follows the clockwise Asylum Hill Loop to Main Street, and some service originates on Pearl Street and does not serve either loop. Regardless of origin, all outbound service serves Pearl Street and Central Row.

Commuter routes C5 and C15 from areas north of downtown enter downtown from Columbus Boulevard and also travel east/west on State Street and Central Row. Like the eastern routes, some serve Pearl Street and the Asylum Hill Loop, and one AM trip serves the Capitol Avenue Loop. Outbound service is also split between the two loops. All service on these routes exits downtown traveling northbound on Main Street.

Commuter routes C1, C2, C9 and C11 from areas west of downtown enter downtown from I-84 or Asylum Avenue from the west side and use Pearl Street to reach Central Row. These routes do not continue on either of the loops in the morning. Most outbound trips originate on Main Street (northbound side) and exit downtown on Asylum Street. Only two evening outbound trips originate in Asylum Hill and follow the Capitol Avenue Loop before serving Main Street.

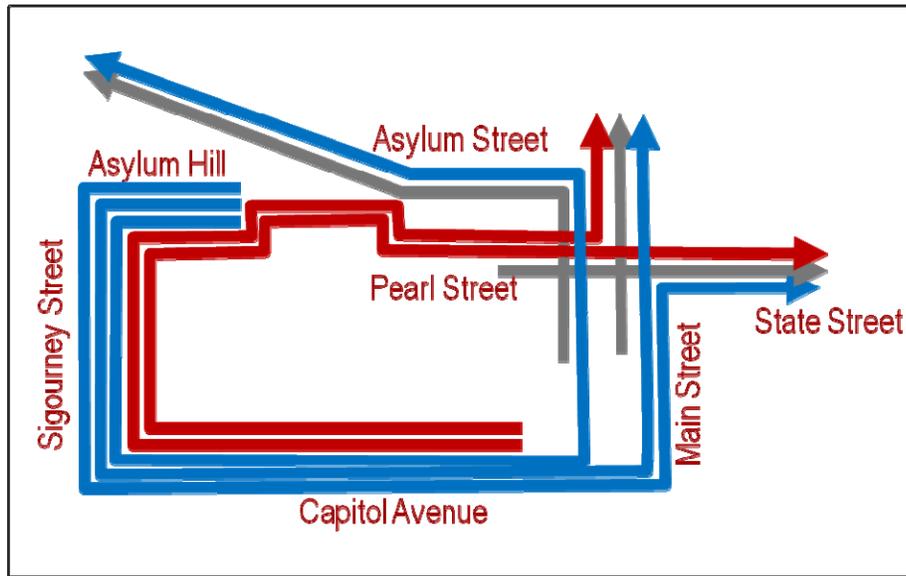
3.2.1.1. Contracted Commuter Routes

CTDOT contracts with four private carriers to provide additional commuter express service on nine routes. These routes generally serve destinations that are a greater distance from Hartford than the CTTANSIT commuter routes. These routes generally pick-up along an east-west corridor along State Street, Central Row, Pearl Street, and Asylum Avenue, and exit downtown either to the east or to the west. The route followed downtown can differ from trip to trip within a route, depending on the stops served by that trip. Therefore only the most typical downtown routing for each routes is described here.

Contracted commuter routes 17 and 18 serving areas east of downtown enter and leave downtown via the Founders Bridge and travel west on State Street, Central Row and Pearl Street. In the AM Peak, Routes 17 and 18 continue onto Pearl Street and Asylum Avenue to Asylum Hill and follow the commuter bus loop clockwise onto Sigourney Street and Capitol Avenue ending just east of the State Capitol. Outbound in the PM, Route 18 originates in Asylum Hill and travels eastbound through downtown without serving the Capitol while Route 17 has a limited number of trips from both the Capitol and Asylum Hill.

Contracted commuter routes 26 and 27 from areas west of downtown enter downtown on Asylum Avenue from the northwest and use Pearl Street to reach Central Row. They continue along Main Street clockwise to Capitol Avenue. In the PM period, this routing is followed in the opposite direction, beginning at Capitol Avenue and exiting via Asylum Avenue.

Figure 3-13: CTRANSIT Commuter Bus PM Route Patterns



Contracted commuter Routes 23, and 24 from areas southwest of downtown enter downtown from I-84 from the west, exit onto Capitol Avenue rather than Asylum Street and stop near the Capitol before turning north to serve Asylum Hill. These routes then continue into downtown via Asylum Avenue and Pearl Street to Central Row. They then turn north onto Market Street before returning to I-84 in the westbound direction. The routing is the same in both the AM and PM periods.

Contracted commuter routes 19 and 21 serving areas south of downtown enter and leave downtown via I-91 and travel west on State Street, Central Row and Pearl Street. In the AM Peak, these routes then use Trinity Street to serve the Capitol but only Route 19 continues to Asylum Hill. Outbound in the PM, Route 19 reverses the inbound pattern originating in Asylum Hill and serving the Capitol and using Trinity Street to reach eastbound stops on Pearl Street. Similarly Route 21 originates at the Capitol and follows Trinity Street to Pearl Street.

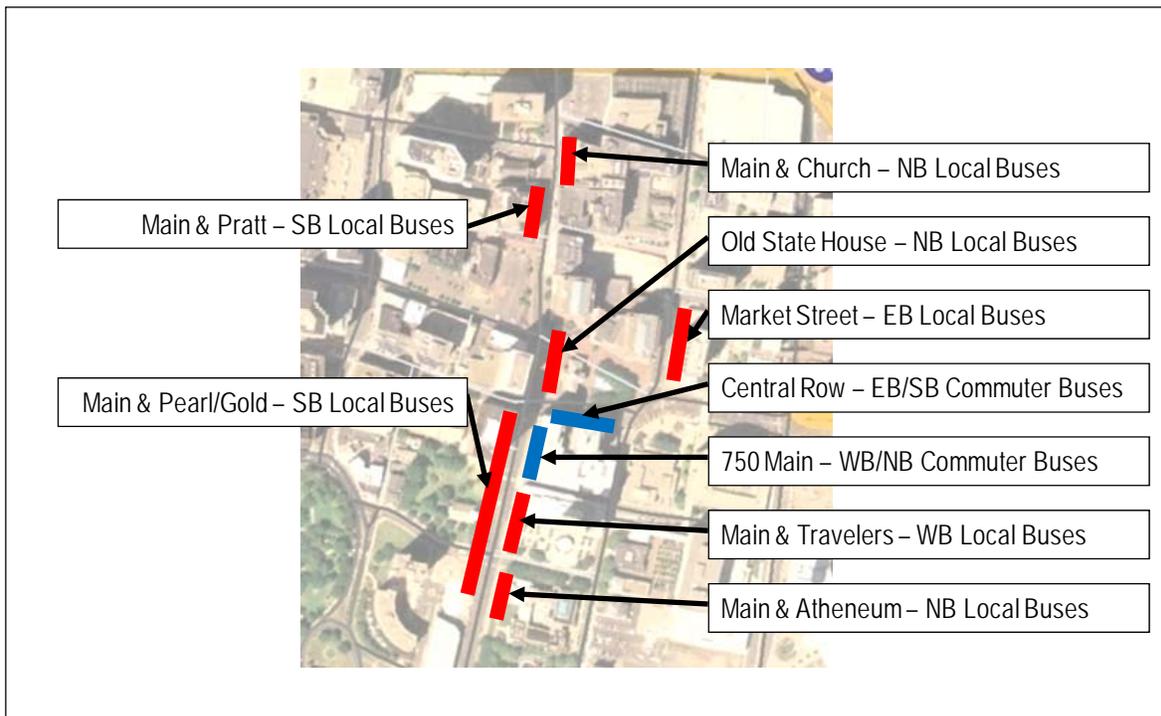
Contracted commuter Route 20 from the south enters downtown from I-84 from the west side and uses Pearl Street to reach Central Row before returning south on I-91. There is no service to Asylum Hill or the Capitol.

3.2.2. Major Downtown Bus Stops and Transfer Points

All of the major bus stops and transfer points in the downtown are on the east side. Most are on Main Street. Figure 3-14 shows the location of the major downtown stops.

Along Main Street in the northbound direction, the first major stop in the downtown is in front of the Wadsworth Atheneum, just south of Atheneum Square. There are no shelters. All of the Main Street local bus routes traveling through to the north (K, N, Q, T, U and W) stop here. Routes G and P drop riders off here before turning back south. The Bradley Flyer picks up at this stop for service to the north. The next stop, just north of Atheneum Square in front of the Travelers Tower, is the stop for local routes that will turn west onto Asylum Street (A, E, F1 and SW). Two shelters are provided. On the northern end of that same block, just before Central Row, is a stop (with no shelters) for commuter bus routes that travel to the west via Asylum Street and to the north via Main Street. Continuing up Main Street, across Central Row is the Old State House stop. This stop serves all routes continuing north on Main Street (K, N, Q, SG, T, U, W and the Bradley Flyer) and has three shelters. These routes have one more major

Figure 3-14: Current Major Downtown Bus Stops



downtown stop opposite Church Street at Capital Community College. There is no shelter at that location but the building overhang provides adequate cover.

Along Main Street in the southbound direction, the stop just before Pratt Street is served by all of the Main Street bus routes from the north (K, N, Q, SG, T, U and W). Most boarding and transfer activity, however, occurs along a stretch of southbound Main Street between Pearl Street and a point south of Gold Street where a continuous series of bus stops has been laid out. There are six distinct stops laid end to end, each designated for either one or two local bus routes. Routes K, T, A, F2, U, Q, N, and W all stop there. There are four shelters placed unevenly between Pearl Street and Gold Street, plus two shelters south of Gold Street.

Transfers occur at all of these Main Street stops. CTTRANSIT also reports that transfers occur just south of downtown at Main and Park Street (the South Green), and north of downtown at Main and Albany Avenue.

Major downtown stops off Main Street are on Central Row and on Market Street. The stop along the south side of Central Row is primarily for commuter buses traveling to the east and south. There are three shelters in the middle of the block. Routes G and P also stop there as they turn around to head back south. The Market Street stop serves all local routes from east of the river (B, H, J, O, Y, YM and Z). There are two distinct areas, each designated for three or four routes. Several shelters are provided.

Because all operations are on-street and bus stop locations are spread out along Main Street, Central Row and Market Street, riders who must transfer sometimes have to walk as much as 2-3 blocks to change buses. They also often have to cross Main Street, Central Row, and/or Market Street. While riders transferring between Main Street routes and continuing in the same direction, in most cases, would not have to cross the street, riders reversing direction have to cross Main Street. Riders transferring to or from routes from east of the river must cross Market

Street to access other routes. If they are connecting to routes going south, or coming from routes from the north, they also have to cross Central Row and Main Street.

An important amenity worth noting is the CTTRANSIT information booth. It is located in the plaza northwest of the corner of Market Street and Central Row. No buses stop on this side of the street. The location is somewhat convenient for the rider making the long transfer walk between the Market Street and Main Street stops; however, it is out of the way for almost all other riders.

3.2.3. Level of Service

The number of scheduled weekday bus trips leaving downtown on each route is shown by time of day in Table 3-2. The number of scheduled weekday bus trips leaving downtown on each of the seven local service patterns and eight CTTRANSIT commuter service patterns are shown in Tables 3-3 and 3-4. (Table 3-4 shows the commuter bus volumes both prior to November 2008 and currently.) Figures 3-15 and 3-16 graphically illustrate the PM peak period (3:30 – 6:00 p.m.) local and CTTRANSIT commuter bus volumes (as of 2007), respectively. Exact routings for contracted commuter services were not assembled since downtown routing sometimes vary from trip to trip. However, contracted commuter services account for approximately 40 PM peak period outbound trips.

Throughout the day, downtown bus departures are staggered so that there is a roughly constant flow of buses. The number of bus departures scheduled during a five minute interval never exceeds ten between 8:15 a.m. and 3:00 p.m. In peak periods, the number of local bus departures exceeds fourteen only once. In the evening, however, local buses pulse, meaning that most routes depart at the same time, creating concentrations of bus departures at several specific times (at 7:15, 8:20, 9:25, 10:40, 11:40 and 12:40). The largest of these, at 7:15 p.m., results in 17 simultaneous bus departures. The 8:20 pulse results in 16 bus departures. At 9:25, 14 buses pulse. No more than eight buses pulse at each of the later times.

CTTRANSIT local bus services in Hartford vary in peak frequency between every 6 minutes on E Farmington Avenue to only every 30 minutes or more on a few routes. The frequency of service on each local route, by time of day, is shown in Table 3-5.

3.2.4. Downtown Bus Operations

All downtown bus activity occurs on the street so space for downtown layovers is limited. Through routes typically have between zero and two minutes scheduled layover time on Main Street. Terminating routes generally have 2-5 minutes scheduled layover time. When possible, these layovers are scheduled to occur off Main Street, on Market Street or on Central Row. If extended layovers are needed because of an early arrival, buses are often moved off Main Street to Central Row, or behind the Travelers Building.

In the evening and all day on Sundays, east of the river routes layover on the northbound side of Main Street at the Travelers Building. After 7:00 p.m. most routes pulse in the downtown at 7:15, 8:20, 9:25, 10:40, 11:40 and 12:40. The first three of these pulse times are when the maximum number of local buses are scheduled to depart from downtown at the same time.

CTTransit stations a supervisor on site at Main and Central Row throughout the peak periods (6:45-8:00 a.m. and 3:30-6:00 p.m.). Duties primarily consist of customer assistance and general oversight of the operation. CTTRANSIT also stations one or two spare buses with operators downtown during peak periods to be able to respond quickly to service disruptions.

CTTransit reports that the current through-routing works well operationally. Supervisors are able to fix problems that arise. They did note that the on-street operation is vulnerable to disruptions caused by street closures for special events or emergencies. CTTRANSIT staff report that the problem with downtown is not with bus operations, but

Table 3-2: Scheduled Weekday Downtown Bus Departures

Route	Period					Total
	Early	AM Peak	Mid-day	PM Peak	Evening	
AA	2	9	14	10	1	36
AH	1	7	13	10	1	32
B	3	7	13	7	3	33
E	7	16	41	18	10	92
F1	5	9	21	9	7	51
F2	3	7	14	7	4	35
G	1	6	7	3	1	18
H	4	6	8	7		25
J	4	5	6	5		20
KN	8	16	40	14	11	89
KS	6	15	39	13	7	80
NC		8	12	8	1	29
NW	4	10	14	9	5	42
O	4	7	13	7	2	33
P	2	4	7	3	2	18
QNB	3	12	21	14	6	56
QV	6	14	21	12	5	58
SG		5	10	5		20
SW	4	5	10	5		24
TBH	9	17	39	18	8	91
TF	4	15	39	16	8	82
UA	3	10	13	10	3	39
UW	3	11	15	11	2	42
WNM	2	6	18	5	3	34
WV	1	4	7	4	1	17
YM	6	8	13	10	3	40
YS	2	4	4	5	1	16
Z	7	6	14	7	5	39
BDL	3	3	7	2	6	21
BTF	1	3			4	8
C1	1	3	1	5		10
C2		3		6		9
C3		7	1	13	1	22
C4	2	2	1	5		10
C5	3	8	3	17	1	32
C6	2	5	2	6		15
C7				4		4
C9	1	1		2		4
C10		2		2		4
C11	1	1	2	7	1	12
C14	2	2	2	7	1	14
C15E				3		3
Total	120	289	505	331	114	1359

Table 3-3: Local Bus Departures by Routing Pattern

	Period					Total
	Early	AM Peak	Mid-day	PM Peak	Evening	
Market Street	30	43	71	48	14	206
SB Main Street through	17	65	133	66	25	306
SB Main Street through from Pearl	1	7	13	10	1	32
SB Main Street originating	6	17	28	13	7	71
NB Main Street through	36	79	152	70	45	382
NB Main Street through from Gold		5		5		10
NB Main Street originating			10			10
Asylum through from SB Main		5		5		10
Asylum through from NB Main	2	9	14	10	1	36
Asylum originating	16	25	72	27	17	157
Commuter	12	34	12	77	4	139
Total	120	289	505	331	114	1,359

Figure 3-15: PM Peak Period Local Bus Volumes

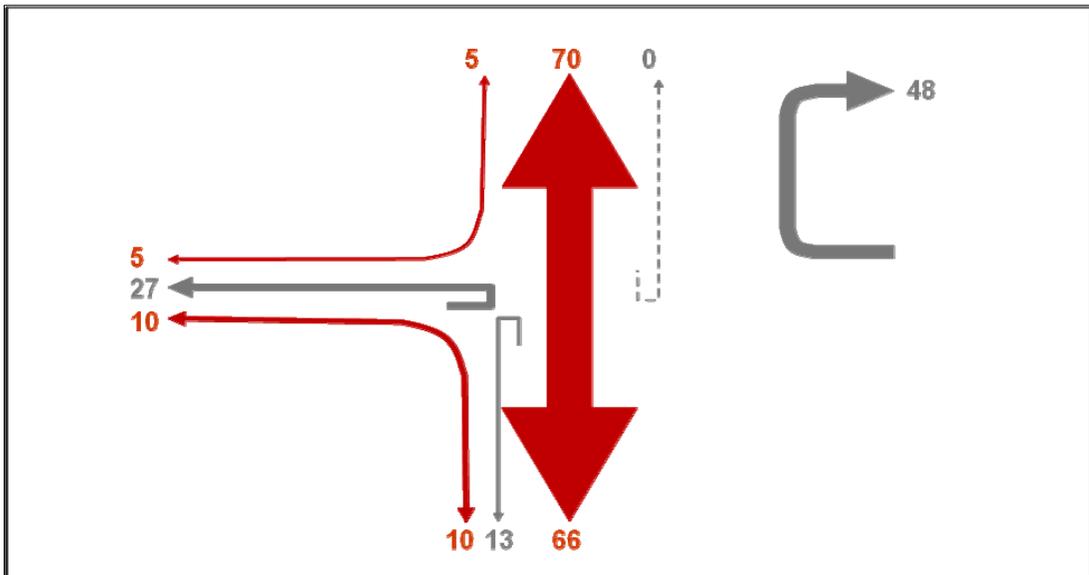


Table 3-4: PM Peak CTRANSIT Commuter Bus Departures by Routing Pattern

	PM Peak	
	2007	Current
Capitol - Asylum Hill - Downtown to east/south	19	12
Asylum Hill - Capitol - Downtown to east/south	9	6
Downtown only to east/south	10	20
Capitol - Asylum Hill - Downtown to north	9	6
Asylum Hill - Capitol - Downtown to north	3	3
Downtown only to north	9	12
Asylum Hill - Capitol - Downtown to west	5	2
Downtown only to west	16	19
Total	80	80

Figure 3-16: PM Peak Period Outbound CTRANSIT 2007 Commuter Bus Volumes

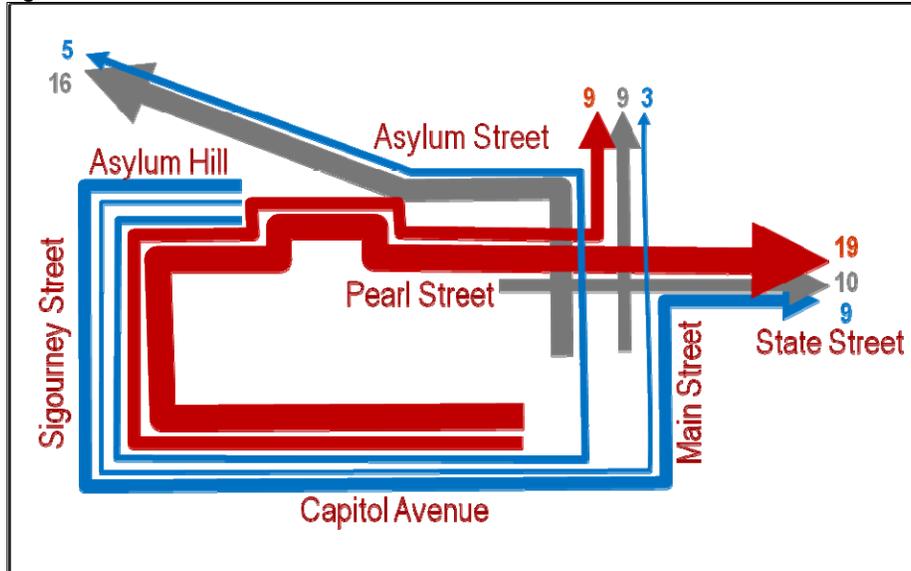


Table 3-5: Local Bus Headways

Route	Mid-day	PM Peak	Evening
AA	0:30	0:16	
AH	0:30	0:13	
B	0:30	0:21	1:05
E	0:10	0:06	1:05
F1	0:20	0:16	1:05
F2	0:30	0:20	1:05
G	1:00	0:30	
H	1:00	0:35	
J	1:00	0:30	
KN	0:10	0:10	0:32
KS	0:10	0:10	1:05
NC	0:30	0:20	
NW	0:30	0:15	1:05
O	0:30	0:17	
P	0:30	1:05	
QNB	0:20	0:10	1:05
QV	0:20	0:12	1:05
SG	0:40	0:32	
SW	0:40	0:32	
TBH	0:10	0:07	1:05
TF	0:10	0:08	1:05
UA	0:30	0:12	
UW	0:30	0:12	
WNM	0:20	0:22	
WV	1:00	0:45	
YM	0:30	0:17	1:05
YS		0:27	
Z	0:30	0:20	1:05
BDL	1:00	1:00	1:05

rather with the customer experience. The area for transfers is not compact; walk distances for transfers are too long. Transferring between routes from east of the River to west of the river involves walking 1-3 blocks. The evening and weekend pulse creates a pedestrian crunch roughly every hour. Pedestrians dart across Main Street mid-block between buses creating conflicts with vehicles. Despite this, CTTRANSIT reports that riders tend to feel safe at downtown bus stops, even at the evening pulse time, due to the large number of other riders.

CTTransit also noted that there are not enough shelters. Shelters placement is haphazard and passenger amenities are not distributed in an ideal way. They also noted that while the wide sidewalks on Main Street southbound allow plenty of room for waiting passengers and pedestrians, the sidewalk on the northbound side is narrower and businesses have complained about loitering and vandalism, allegedly by bus riders.

CTTransit noted several traffic enforcement problems that are encountered on Main Street. First, the “bus-only” diamond lane on Main Street northbound in front of the Travelers Building is routinely ignored. Second, there is a general lack of enforcement of no parking rules in the bus stops. CTTRANSIT supervisors are only able to provide enforcement during peak periods.

Off Main Street, CTTRANSIT reports that the layover operation for east of the river routes on Market Street works well. Stops on Central Row have excess capacity that could accommodate additional routes. On the west side of downtown, Asylum Avenue is very congested with parked cars. Pearl Street regularly backs up and problems on Asylum Street and Pearl Street need to be resolved if any additional east-west service is added. CTTRANSIT

suggested that low cost traffic improvements be investigated that could speed bus travel. A queue jumper on Pearl Street at Main Street was suggested. This would benefit existing commuter bus service as well as any future enhanced east-west service.

3.2.5. Star Shuttle and Commuter Bus Circulation

The Star Shuttle resulted from the 2002 Downtown Circulation Study⁴. The purpose of that study was to develop a transit service to connect major employers with downtown attractions. The study proposed two bi-directional downtown circulator bus loops, one from Main Street to Asylum Hill and the Capitol area, and the other between Columbus Boulevard and the Capitol. The connection point between the two loops, as well as the connection to regular local bus routes would be at Main Street and Pearl Street. The study proposed 25 circulator stops, each on both sides of the street. Service would operate from 6 a.m. to 10 p.m. with 7-8 minute peak and lunch time headways and 8-12 minute off-peak headways. Annual operating and administrative costs were estimated at \$1.1 million (in 2002). The study proposed dedicated bus lanes to replace parking on some streets, a transit center near either Main Street or Columbus Boulevard and expanded parking at Union Station. It also recommended rider and pedestrian amenities throughout area.

The Star Shuttle, as it was finally implemented, is a scaled down version of the study recommendations. Figure 3-17 shows a comparison of the Circulation Study recommendations (in red and green) and the Star Shuttle (in blue). The Star Shuttle is a single one-directional loop between Columbus Boulevard and Union Station. It does not serve Asylum Hill or the Capitol area. The connection point to regular local bus routes occurs at the Travelers Building and at Main and Church Streets. There are currently 13 Star Shuttle stops. Each has a number but is identified by only a simple sign. Service operates every 12 minutes from 7 a.m. to 11 p.m. weekdays and from 3 p.m. to 11 p.m. Saturdays. No new dedicated bus lanes or transit centers were created when the shuttle was implemented.

The Circulation Study and decision to implement a scaled down circulator led to the decision in 2004 to extend commuter bus services along the Asylum Hill-Capitol Avenue loop described above. Prior to that time, outbound commuter services began on Pearl Street (services to the north, south and east) or on Main Street (services to the west).

3.3 *Downtown Transit Usage*

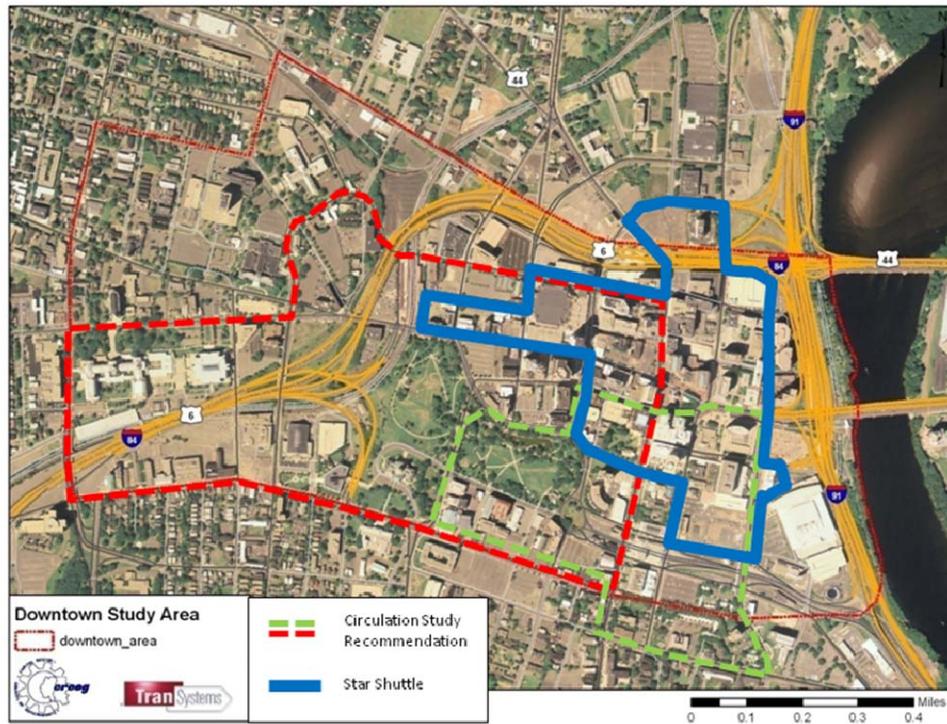
Downtown transit ridership data was assembled from existing CTTRANSIT on-off counts, data on transfers, and a new downtown rider survey. Data on downtown boardings was obtained from the CTTRANSIT database of on-off counts. Through ridership on through routes was also inferred from these counts. Data on the total number of transfers, as well as transfer patterns among the 28 routes, was tabulated from detailed farebox data. Estimated downtown transfers were deducted from downtown boarding counts to obtain estimates of originating riders. The distribution of the origins of originating trips was estimated from the rider survey. The rider survey also shed some light on travel behavior for short trips within the downtown. (No data was available on ridership on contracted commuter bus services.)

3.3.1. Downtown Transfers

A transfer matrix representing all transfers made in downtown Hartford was developed in order to gain an understanding of existing route-to-route transfer patterns and potential for new through routing combinations. For this study, data was collected both for transfers made by riders paying cash and using a paper transfer and those

⁴ Parsons Brinkerhoff Quade and Douglas, Inc., *Downtown Hartford Circulation Project, Interim Report*, February 2002.

Figure 3-17: Star Shuttle and Circulation Study Recommendations



made by riders who use unlimited ride passes and do not have to obtain a paper transfer slip. This analysis was documented in a separate technical memorandum⁵ and is summarized here.

Transferring cash riders are issued a transfer on which the issuing route, direction, date, and time are printed on the paper slip and encoded on a magnetic strip. The farebox records the time and route on which the transfer was issued. When the transfer is used this data is recorded alongside data on the route and direction on which the transfer is received. Farebox data was obtained for the week of November 26-30, 2007. Data on 52,788 cash transfers were obtained for that five-weekday period, or 10,558 on an average weekday.

Pass users are allowed unlimited boardings on CTTRANSIT buses and do not receive paper transfer slips as cash riders do. CTTRANSIT fareboxes record the ID number of each pass used, the route boarded and the date and time of each boarding. As a result, pass users who directly transfer between routes were detected by noting the times of consecutive boardings using the same pass ID. A complete set of raw data from CTTRANSIT fareboxes was obtained for all weekday pass boardings for the week of November 26-30, 2007 (the same week for which the cash transfer information was obtained). Cases of consecutive boardings of different routes by the same user within 90 minutes were considered transfers. In total, 18,670 pass transfers were identified from the over 71,000 pass boardings over the five-weekday period, or 3,734 daily.

The intersection points of each possible route pair were identified in order to exclude transfers that most likely occurred outside downtown. Once those transfers were removed a route-to-route downtown transfer matrix of

⁵ Task 3.3.1./3.3.2 Technical Memorandum, Data Collection Plan and Results

12,247 daily transfers was produced. When the 756 transfers involving commuter buses are excluded, the number of weekday downtown transfers between local buses is an estimated 11,491.

Each possible downtown local bus transfer combination was assigned to a downtown stop. The assumptions were based on a combination of what seemed to be the most logical location for a given transfer to occur and actual boardings at the downtown stops. The estimated transfers are illustrated graphically in Figure 3-18. The figure illustrates estimated transfer pedestrian movements and transfer boardings in the Main Street, Central Row and Market Street area. (It should be noted that this figure is based on farebox data and assumed transfer locations and not on any actual pedestrian or bus boarding counts.) The figure illustrates the large number of riders who transfer downtown, as well as how difficult some of these transfers are considering the number of streets that must be crossed.

3.3.2. Downtown Boardings

CTTransit on-off counts for each route were used to obtain estimates of typical weekday boardings at each downtown study area stop⁶. The downtown stops with more than 100 weekday boardings are ranked in Table 3-6. Figure 3-19 geographically shows the local bus route typical weekday boardings, while Figure 3-20 shows CTTANSIT commuter bus boardings. Note that these figures include all boardings, regardless of whether they are an originating trip, or a transfer. The figures show that the vast majority of downtown local bus boardings occur on Main Street and on Market Street. Three Main Street stops and the Market Street stop each serve over 2,000 daily boardings. The Main Street stop between Pearl and Gold serves over 4,000. The stops west of Main Street serve far fewer riders. Some riders board on Asylum Street/Avenue and on Farmington Avenue, while only a few board on Capitol Avenue. Commuter bus boardings occur on Main Street and along the Pearl/Central Row/State Street corridor. A small number of commuter bus boardings occur in Asylum Hill and few occur along Capitol Avenue.

As noted above, the total number of transfer boardings downtown was estimated and allocated to specific stops based on downtown routing patterns. The analysis identified that there are approximately 11,491 weekday transfers between local buses. The local bus transfers are assumed to occur primarily at twelve different stops (three of these, Main & Albany, Main & Park, and Broad & Capitol are slightly outside the study area boundary). Table 3-6 shows the estimated transferring and originating boardings at each of these stops. (The local bus numbers in the table differ slightly from Figure 3-18 because they include transfers from commuter buses as well.)

Figures 3-21 and 3-22 show only estimated originating downtown boardings by stop for local and commuter services, respectively. For local buses, eliminating the transfer boardings reduces the number of boardings on Main Street considerably. However, the Main Street and Market Street stops still represent the top five downtown stops in terms of originating riders, with between 400 and 1,100 originating boardings. Asylum Street and Trumbull Street, ranked sixth with 280 boardings, is the highest ranking of the stops west of Main Street. Because few transfers are received on commuter buses, the boardings shown in Figure 3-22 differ little from those including transfers in Figure 3-20.

The above tables and figures showed that transfer boardings outnumber originating boardings at downtown stops by almost two to one. Transferring riders at the 16 study area stops listed make up 67% of local bus boardings. At the seven largest stops on Main, Market and Central Row, transferring riders make up 70% of local bus boardings. (While so many boardings are transfers, it should be recognized that transfer riders making a daily round trip will board a bus in the downtown twice daily, while those with downtown destinations will only board once. Therefore, the number of individual *people* who transfer is roughly equal to the number of *people* with a downtown destination.) Transferring passengers represent a very significant share of bus passengers in the downtown area. That share has

⁶ Recorded boardings at each downtown stop on each route were factored up to account for the number of trips that were not surveyed. Boardings estimates were then summed over all routes using the stop.

Figure 3-18: Main Street Area Estimated Current Local Bus Transfer Movements

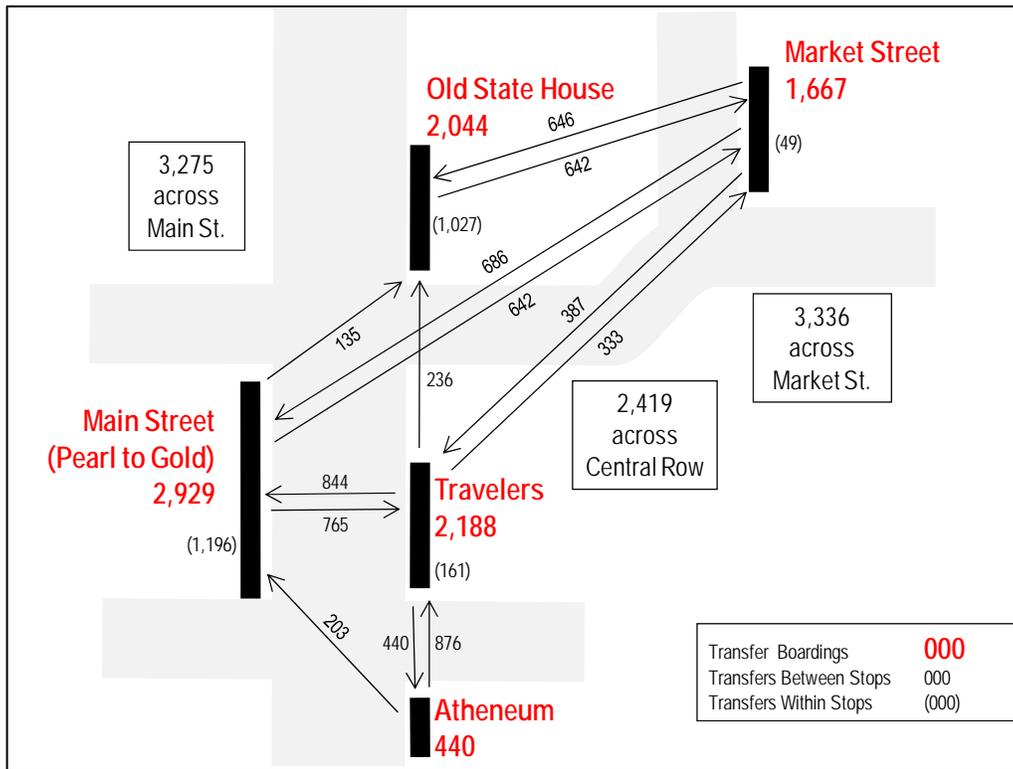


Table 3-6: Boardings at Major Downtown Stops

	Total		Transfers		Origins	
	Local	Commuter	Local	Commuter	Local	Commuter
MAIN ST & PEARL/GOLD	4,194	-	3,106	-	1,088	-
MAIN ST & OLD STATE HOUSE	3,052	-	2,244	-	808	-
MAIN & TRAVELER'S	2,869	-	2,274	-	595	-
MARKET ST & CONSTITUTION	2,580	4	1,727	-	853	4
MAIN ST & ATHENEUM	903	-	462	-	441	-
CENTRAL ROW SOUTH	491	308	192	60	299	248
MAIN ST & CHURCH ST	685	66	321	-	364	66
MAIN ST & 750 MAIN	-	694	-	84	-	610
ASYLUM ST & TRUMBULL	280	31	-	-	280	31
MAIN ST & PRATT ST	279	-	-	-	279	-
STATE ST & THE PHOENIX	-	234	-	-	-	234
PEARL ST & ANN ST	-	144	-	-	-	144
PEARL ST & TRUMBULL	-	134	-	-	-	134
ASYLUM ST & ANN ST	104	21	-	-	104	21
MAIN ST & WELLS ST	123	-	120	-	3	-
FARMINGTON AVE & SIGOURNEY	111	-	-	-	111	-

Figure 3-19: Local Bus Boardings at Downtown Stops

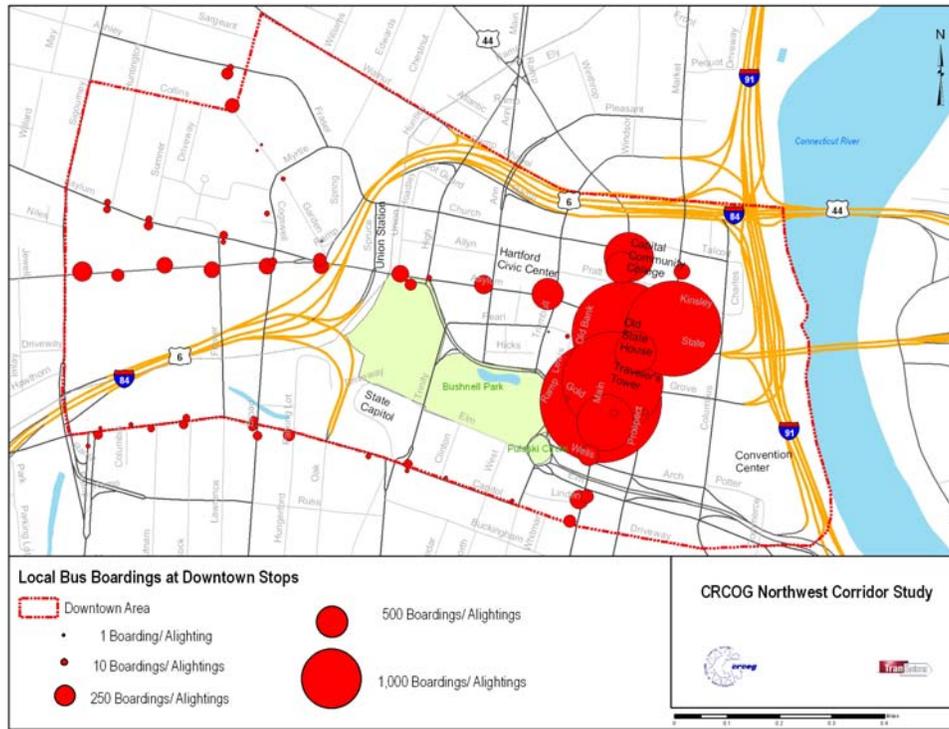


Figure 3-20: Commuter Bus Boardings at Downtown Stops

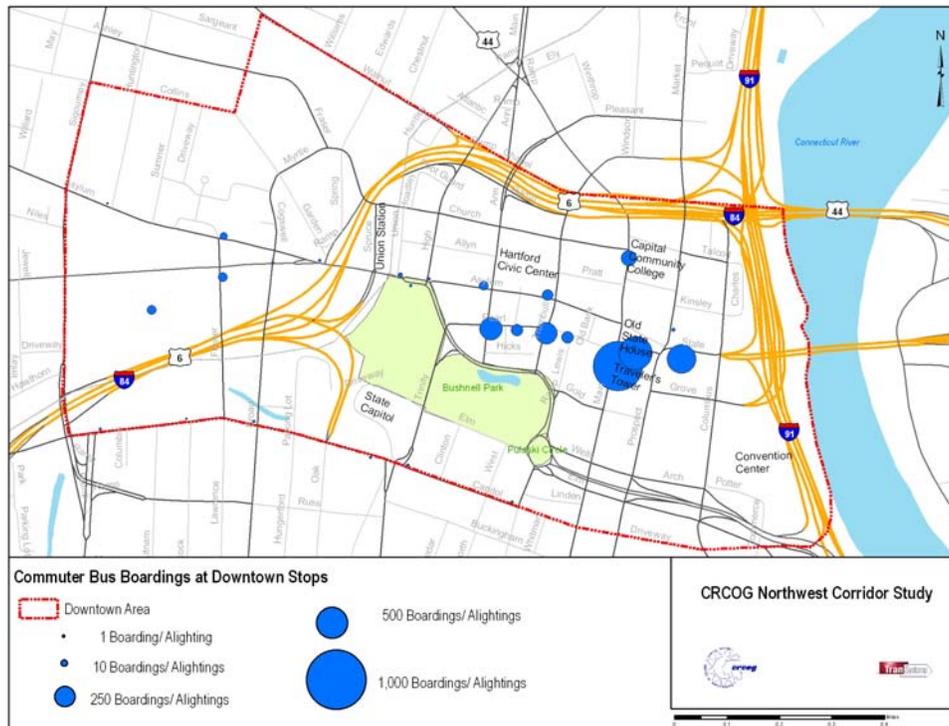


Figure 3-21: Local Bus Originating Boardings at Downtown Stops

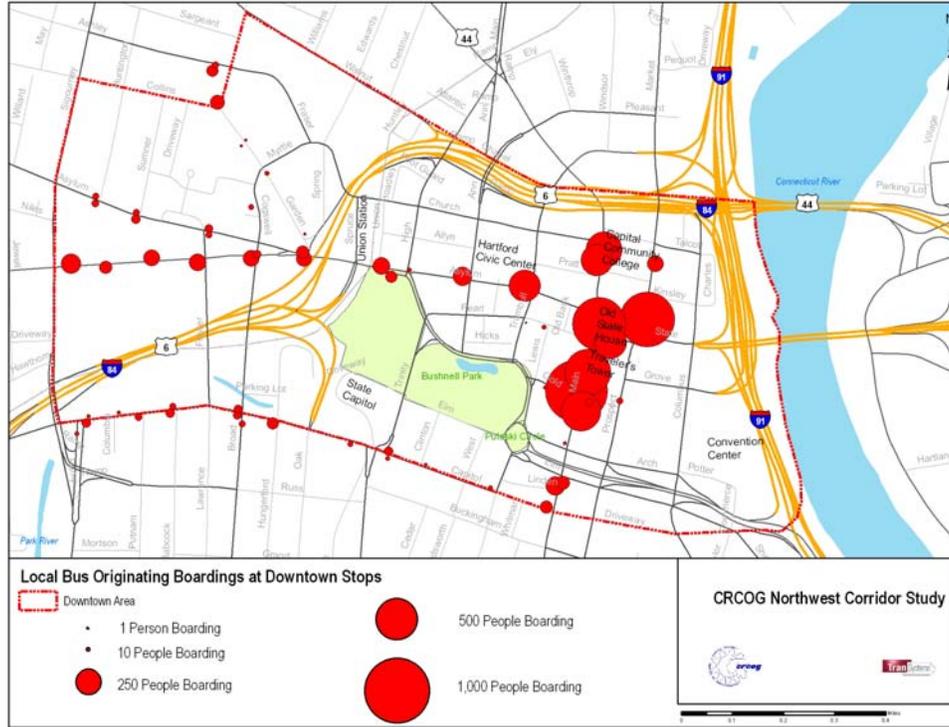
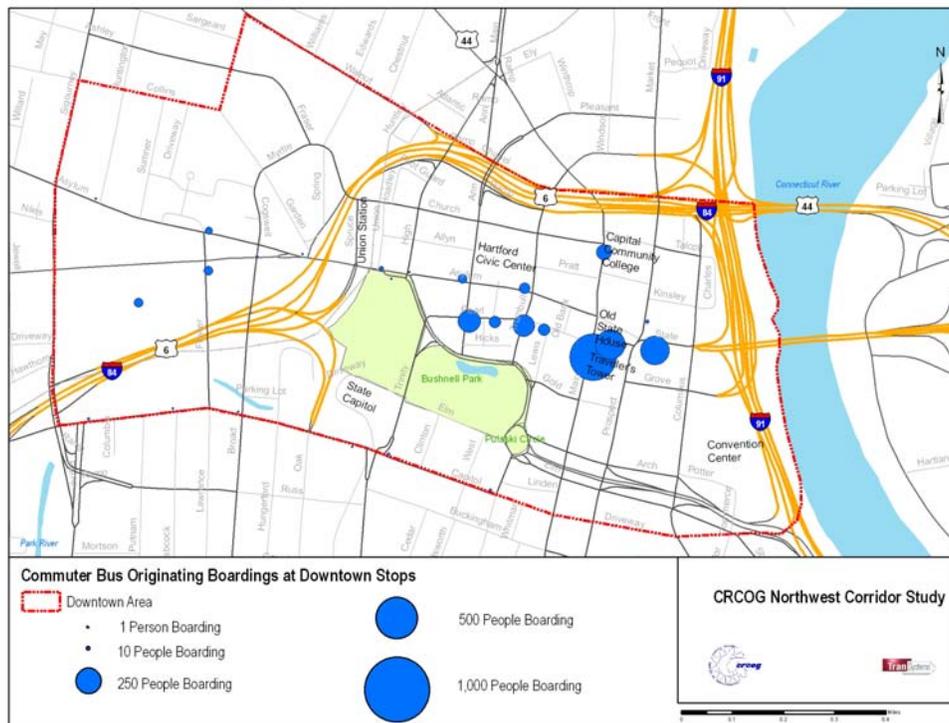


Figure 3-22: Commuter Bus Originating Boardings at Downtown Stops



most likely increased considerably over the years as ridership patterns on the bus network changed from being primarily downtown-oriented to being oriented to a more dispersed set of destinations. But with downtown still an important destination, improvements to downtown circulation will need to consider both transferring riders and those traveling downtown.

3.3.3. Originating Downtown Trips

A survey of riders boarding buses in the downtown was conducted for this study. The survey methodology and results are documented separately⁷. The survey was only conducted at stops east of I-84 and did not include Asylum Hill and Capitol Avenue riders. The survey asked whether riders were transferring downtown. Those who were not transferring were asked where in the downtown they were coming from. Only 190 good responses were obtained. However, these responses were factored up based on the total estimated originating ridership at the stop at which they were surveyed. The result was that each survey response had to represent, in most cases, between 8 and 104 daily originating riders. Each valid response was assigned to the nearest intersection. These results should be considered approximate given the small sample size, but they do give some indication of where riders are coming from within the downtown. Figure 3-23 shows the distribution of originating downtown riders based on the expanded survey data. The figure shows that, based on the limited survey data, most downtown riders originate within a short distance of Main Street and Asylum Street.

3.3.4. Downtown Through Ridership and Transfers on Through Routes

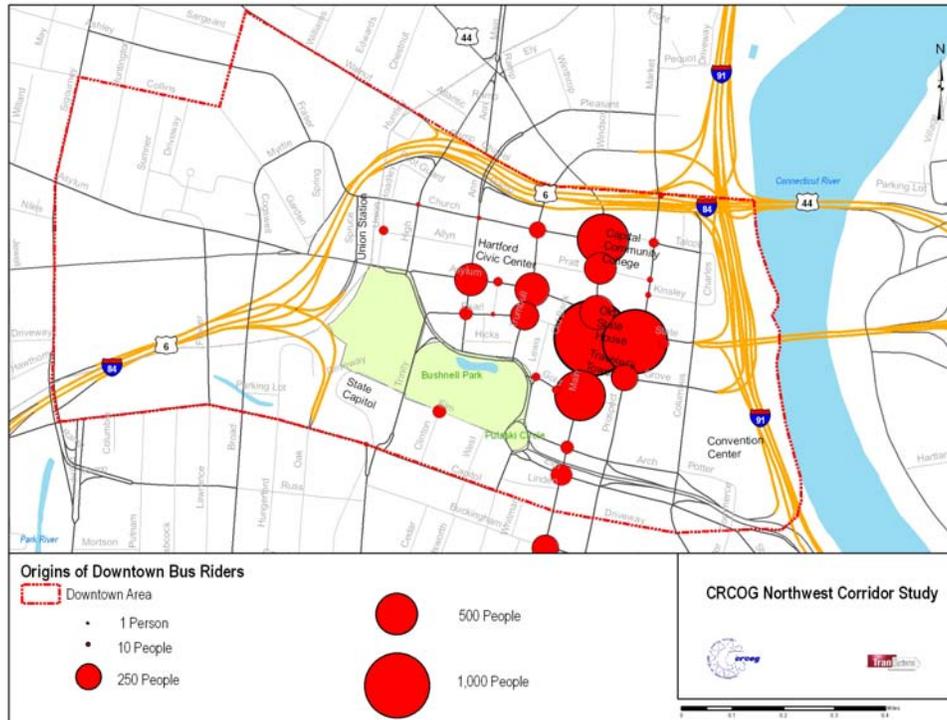
There are seven through-routes in downtown Hartford. Riders passing through downtown on the seven routes were estimated from the CTRANSIT database of on-off counts by route. Downtown was defined as the area between the Main Street and Trumbull Street intersection on the north and the Main Street and Capitol Avenue intersection on the south. Any rider on board prior to either of those stops and remaining on board when passing the other stop can be considered a through rider. While the origin and destination of individual riders cannot be determined from on-off count data, with a simplifying assumption that no riders make trips entirely within such a short zone, the number of riders boarding in the zone was subtracted from the number leaving the zone to produce an estimate of the number traveling through the downtown zone on each route. The result was an estimated total of 1,027 daily through riders.

On the seven through-routes, the ridership transferring downtown substantially exceeds the ridership passing through downtown. Closer examination of the transfer matrix developed for this study allows a comparison of the through ridership on each of these routes to the number of riders transferring to each of the other through and terminating routes. If the number of riders transferring to another specific route exceeds the through ridership, it may be appropriate to change the through-routed pairings. In cases where transferring ridership to a single route is comparable to through ridership, it may still be an indication that a change might have some potential benefit. Through routes with little through ridership indicate potential for splitting those routes or changing the through-routing pattern.

The downtown transfer matrix for local routes is shown in Table 3-7. In the table, the through route pairs are shown in adjacent columns and rows. Examination of the transfer matrix seems to indicate that the through-routing patterns on the four through routes with the highest through ridership (K, T, Q, and A) seem to make sense. (These routes are shown first in Table 7 and are shown with dark shading.) Routes K and T exchange almost 850 daily riders with each other while 880 travel through (520 on K and 360 on T); however, riders from each of the four legs are transferring to both legs of the other route since these routes serve four very distinct corridors. No one combination of transfers among the four corridors exceeds the through ridership. Switching the pairing on these two routes would reduce the number of through riders from 880 to about 380.

⁷ Task 3.3.1./3.3.2 Technical Memorandum, Data Collection Plan and Results

Figure 3-23: Origins of Downtown Bus Riders



Route Q carries about 240 through riders while exchanging 400 riders with Route K and 310 with Route T, but again no one transfer combination exceeds the through ridership. Route A carries about 100 through riders while exchanging 160 riders with Route T, but with no one transfer combination exceeding the through ridership. Routes K and T each also have in excess of 500 riders transferring to or from Route E Farmington Avenue, a route which terminates downtown. Route Q has nearly 400 riders transferring to or from Route E. Although there is a substantial amount of transferring among these major routes, the data does not indicate that there are any realignment possibilities that would reduce the number of transfers. Possible realignment of through routes with Route E Farmington Avenue could be explored for some currently through-routed corridors, but other options for connections with Route E, discussed below, may offer benefits without disruption of existing through ridership.

The other three through routes, Routes U, N and W, have fewer through riders. (These routes are shown with lighter shading in Table 7.) Both sides of Routes U and N have more transfers with parts of Routes K, T, and Q, than they do through riders; however, the potential disruption of through ridership on those three high ridership routes could not justify a realignment with either of these routes. Both sides of Routes U and N also have more transfers to/from Route E than they do through riders; however, other options for Route E are likely to be more beneficial. There also does not appear to be any specific benefit to switching the through-routing of these two routes, although the negative impact of breaking the through-routing of either of these routes would not be very significant, so the through-routing could be changed if it were justified for other reasons. Route W has few through riders and few transfers, with the most transfers being with the major routes E, K and T.

Overall, the on-offs counts indicate just over 1,000 through riders on the seven through routes, with many more riders transferring downtown. Nevertheless, the through-routing operation is beneficial to a substantial number of riders,

Table 3-7: Local Bus Estimated Weekday Transfer Matrix

	KN	KS	TBH	TF	QNB	QV	AA	AH	UA	UW	NC	NW	WNM	WV	E	F1	SW	F2	P	G	SG	Z	B	YM	O	H	YS	J	TOTAL
KN	-	283	110	132	64	33	-	22	76	34	51	17	-	19	123	53	15	-	19	13	11	42	41	36	28	20	9	6	1,259
KS	241	-	54	119	47	66	17	35	41	39	-	13	8	16	130	42	16	39	8	15	10	37	29	28	15	12	5	8	1,087
TBH	137	69	-	195	22	-	14	30	-	18	21	9	4	12	121	41	19	20	10	6	-	35	29	24	18	13	8	6	881
TF	122	103	162	-	52	76	18	20	56	55	43	15	13	18	139	30	34	27	18	19	8	59	51	35	22	14	6	10	1,227
QNB	67	33	27	60	-	106	10	16	32	24	-	6	6	12	105	17	7	26	-	9	6	25	29	19	15	9	3	3	675
QV	35	59	-	69	137	-	-	20	-	23	24	10	-	10	84	37	15	-	9	8	-	31	24	19	11	11	9	8	654
AA	-	15	15	21	11	-	-	29	19	14	8	5	5	5	26	6	-	5	-	5	2	5	10	17	2	2	1	1	228
AH	22	37	22	22	27	27	69	-	19	-	12	9	1	-	13	8	5	12	4	4	1	8	6	10	4	3	1	1	347
UA	49	31	-	36	22	-	11	14	-	31	13	5	7	8	56	25	11	10	9	4	-	16	9	16	8	5	2	2	403
UW	37	23	15	52	21	32	5	-	24	-	13	6	1	4	25	-	-	10	4	4	4	12	13	8	6	5	5	6	336
NC	48	-	23	40	-	27	6	13	17	13	-	10	2	9	58	15	4	10	-	8	6	8	17	12	6	3	3	3	358
NW	24	13	9	13	7	10	3	7	12	4	22	-	-	5	30	10	7	5	2	2	1	5	5	4	5	1	1	2	208
WNM	-	8	6	11	4	-	2	1	7	5	5	-	-	12	9	0	-	4	0	5	0	3	4	3	3	2	1	0	98
WV	20	15	7	11	10	11	2	-	10	5	7	4	1	-	13	3	2	3	3	0	1	5	3	10	3	1	2	0	152
E	130	130	119	137	91	112	22	13	70	39	62	28	7	22	-	50	20	42	14	22	13	61	45	34	28	18	10	15	1,355
F1	54	42	25	43	13	49	9	7	30	-	19	8	4	3	44	-	5	13	8	8	5	19	21	18	10	11	2	2	472
SW	23	21	15	57	9	13	-	7	14	-	6	5	2	3	21	4	-	6	4	4	2	8	11	5	4	5	3	3	255
F2	-	36	12	20	26	-	5	9	12	6	12	3	3	6	31	12	5	-	2	2	1	14	11	8	3	3	3	3	246
P	25	13	14	25	-	16	-	12	19	7	-	1	1	5	33	11	5	2	-	3	2	8	11	15	7	4	2	2	244
G	11	13	6	16	6	7	1	1	4	2	5	3	1	0	17	7	2	2	3	-	1	9	7	4	3	2	3	1	138
SG	16	11	-	12	5	-	2	3	-	5	4	1	0	2	23	5	2	1	1	3	-	5	4	5	1	5	-	-	116
Z	42	40	30	42	24	22	5	11	15	14	15	4	4	9	53	21	5	16	5	11	7	-	24	-	-	-	-	6	426
B	43	29	33	51	19	25	5	9	16	12	17	4	3	3	51	27	6	13	4	7	4	26	-	11	-	-	-	3	423
YM	47	34	30	45	22	20	6	9	23	13	16	4	3	7	33	13	5	11	6	4	5	-	18	-	-	-	-	1	376
O	28	19	18	25	11	15	5	7	11	7	9	3	3	7	28	9	5	4	2	5	0	-	-	-	-	-	-	1	221
H	20	11	14	12	8	12	3	5	6	7	5	4	1	3	17	10	3	7	5	3	2	-	-	-	-	-	-	1	159
YS	13	7	6	7	4	9	2	2	3	3	4	2	2	3	10	2	0	3	2	1	0	-	-	-	-	-	-	0	87
J	7	5	4	10	3	4	2	1	3	5	4	1	0	0	10	3	1	1	2	0	1	6	4	3	1	2	0	-	85
TOTAL	1,264	1,100	776	1,286	665	692	222	304	536	388	397	179	83	203	1,304	461	199	291	143	176	93	449	427	344	205	152	80	96	12,515

particularly on Routes K, T, and Q. Through-routing is also a benefit to CTTRANSIT operationally as the through-routing allows routes to just continue in the same direction without turning around on side streets. It also minimizes downtown bus traffic in that overlap between routes is reduced.

3.3.5. Downtown Transfers on Terminating Routes

Unlike the seven through routes, the fourteen terminating routes could be connected with other terminating routes without disruption to existing ridership patterns. There are seven routes from east of the river that terminate downtown. There are also seven entirely on the west side of the river. Three of these approach from the west, three from the south and one from the north.

The three terminating routes from the west (E, F1, and SW) have the most transfers with the major north-south through Routes T, K, and Q. Route E Farmington Avenue is by far the largest of these routes. While a realignment with one of the through routes could be considered, connection to one or more of the other terminating routes may be more beneficial and less disruptive to existing through ridership patterns. Considering only the other terminating routes, Route E has the most transfers with Route Z (115 transfers) and Route B (96 transfers), both from east of the river. These are followed by Route F1 (94), F2 (73), YM (66) and O (57). These routes, especially those from east of the river, could be considered for a possible new east-west through routing in the downtown. The other two terminating routes from the west, F1 Albany Avenue and S Granby both have the most transfers with Route B, and so could possibly be through-routed.

Of the three terminating routes from the south, P New Britain has the most transfers with through routes T and K, followed by Route E. Route G Locust Street and F2 Broad Street have almost as many transfers with terminating Route E than with the major through routes. Route S Garden Street, from the north has low ridership and few transfers.

Of the seven routes from east of the river, all of which terminate downtown, five have significant ridership and a significant number of transfers. These routes, B Silver Lane, H South Windsor/Park Avenue, O Glastonbury, YM Burnside Avenue and Z Tolland Turnpike each exchange the most riders with Routes T and K. However, Routes B and Z exchange more riders with Route E than with any one side of Route T or K. The numbers of transfers involved, however, are less than the through ridership on those through routes and less than the number of transfers those routes have with several other major routes. Looking just at other terminating routes, these five routes have by far the most transfers with Route E Farmington Avenue, with Route F1 Ashley Street a clear second. All five of these routes could be examined for possible through-routing with Route E or possibly F1. The two lower ridership routes from the east, Y Burnside Ave. and J Brewer St. have few transfers with any routes.

3.3.6. Within Downtown Travel

The rider survey asked downtown riders (both originating and transferring) about modes they typically used for short trips (defined simply as "less than 10 minutes") within downtown. They were given a list of modes: CTTRANSIT bus, Star Shuttle, taxi, car, walk, and other. They were also given the option "I don't make short trips within downtown." Respondents were allowed to check as many answers as they wished. Their responses were compared among different age and income groups, as well as by frequency of transit use.

As shown in Table 3- 8, only 14% of all respondents indicated that they did not make short trips downtown. When making trips short trips within the downtown area, more people (50%) walk than use any other mode. Many use the

Table 3-8: Modes Used for Trips within Downtown

	All Groups	What is your age?			What is your annual household income?			How often do you ride CTTransit buses?	
		under 35	35-64	65 or older	less than \$20,000	\$20,000 to \$59,000	\$60,000 or more	at least one day a month	less than once a month
CTTRANSIT bus	34%	39%	30%	32%	50%	37%	15%	35%	21%
Star Shuttle	5%	3%	6%	11%	4%	5%	6%	5%	14%
Taxi	2%	2%	2%	0%	3%	2%	2%	2%	7%
Car	9%	12%	7%	0%	6%	9%	10%	8%	50%
Walk	50%	44%	54%	42%	46%	51%	57%	52%	14%
Other	3%	3%	3%	0%	3%	2%	3%	3%	14%
no short trips	14%	14%	14%	32%	12%	12%	20%	15%	7%

Table 3-9: Reasons for Not Using the Bus within Downtown

	All Groups	What is your age?			What is your annual household income?			How often do you ride CTTransit buses?	
		under 18	25-34	75 or older	less than \$40,000	\$40,000 to \$59,000	\$60,000 or more	at least one day a month	less than once a month
Bus doesn't go where I'm going	14%	37%	17%	13%	14%	13%	15%	14%	7%
I don't know which bus to take	9%	10%	10%	8%	5%	14%	11%	9%	14%
I don't like to wait	16%	31%	14%	12%	20%	9%	17%	16%	14%
I don't know the schedule	10%	12%	11%	9%	7%	12%	13%	9%	14%
Bus costs too much	7%	8%	8%	6%	11%	7%	4%	8%	0%
Bus is too slow	15%	35%	10%	12%	16%	15%	9%	15%	0%
I like to walk	28%	8%	19%	37%	23%	31%	44%	28%	7%
Other	12%	8%	13%	13%	12%	15%	11%	11%	21%

bus (34%) while only 9% drive⁸. The Star Shuttle, taxis and other modes were used by few riders. Walking is the most common mode among nearly all age, income and ridership groups, except the lowest income group (who use the bus more often) and the least frequent transit users (a small group who use cars more often.) Buses tend to be used more by lower income people and frequent transit users, while cars are more likely to be used by young people and infrequent transit users.

Respondents were asked to select the reasons for their choice of downtown mode from a list of possible reasons. They were allowed to check as many answers as they wished. Their responses are shown in Table 3-9 compared among different age, income, and frequency of use groups⁹. The most common selection was "I like to walk", chosen by 28% of respondents. "I don't like to wait", "the bus is too slow", and "the bus doesn't go where I'm going" were each chosen by 14-16% of respondents. Fewer chose "I don't know the schedule", "I don't know which bus to take", and "the bus costs too much". Interestingly, higher income and people over 35 are more likely to like to walk, while lower income and people under 25 don't like to wait and think the bus is too slow. Infrequent riders, while a small group, are only slightly more likely to lack information on schedules and which bus to take.

⁸ Percentages add to more than 100% due to multiple answers given.

⁹ Note that several age and income categories were combined for purposes of developing these tables and that the combinations differ between the two tables. Detailed survey results for all categories are documented separately.

3.3.7. Implications for Downtown Bus Circulation

The most striking finding of this review of downtown transit usage is the high number of transferring riders boarding local buses in the downtown. The data assembled indicated that 67% of local bus riders boarding downtown are transferring from another bus. As noted above, this means that the number of individual people passing through downtown approximately equals the number with downtown destinations. This has important implications for downtown bus service. Transferring riders have trip origins and destinations that are outside of the downtown area making the location of their downtown boarding less important than the convenience of the transfer and the time spent traveling to and from the transfer point. These riders don't necessarily have to be boarding on Main Street. The convenience of these riders must, however, be weighed against the needs of riders who require a bus stop close to their downtown destination. All this must be considered in the context of constraints on available resources and the cost of providing transit service.

3.4 *Downtown Traffic Conditions*

The existing transportation network in downtown Hartford is typical for an urban environment with many one-way streets, on-street parking, sidewalks, adjacent buildings, and limited right-of-way for widening or adding turn lanes. There is a considerable amount of pedestrian activity within the study area. Crosswalks and pedestrian signals are provided at many of the intersections. Transit service provided by CTRANSIT requires bus stops and shelters along main routes. There are no bicycle facilities within the study area.

The transportation network in Hartford consists of roadways that have different operational systems based on the function they are intended to fulfill. The various road types are freeways, arterials (major non-freeway roadways), and local and collector roadways. Freeways serve longer distance trips and are grade-separated facilities that provide regional access. Major arterials are roads that provide connections to the regional roadway network including interstates and highways. They primarily carry through travel from one community to another while minor collectors are roads intended to "collect" traffic from the local roads. Local roads provide access to private property or low volume public facilities.

Within the study area, regional access is provided by I-84, which traverses in the east-west direction and I-91, which traverses in the north-south direction in Hartford. The streets within the study area categorized as major arterials include Asylum Avenue, Main Street, Farmington Avenue, Ford Street, Jewell Street, Trumbull Street, and Pulaski Circle. Major arterials support the regional demand and usually represent the greatest challenge in balancing the needs of all users. Main Street traverses in the north-south direction and is the primary thoroughfare on the east side of Hartford for both regular traffic and transit buses. Asylum Street/Avenue is one of the City's major east-west principal arterials and it interconnects with I-84. It is a major thoroughfare that merges with another principal arterial, Farmington Avenue, just west of the I-84 interchange, such that inbound traffic from both arterials is combined by the time Asylum Avenue reaches Union Station.

Existing traffic conditions were characterized by field observations and consultation with the City of Hartford. In general, the traffic flow in downtown Hartford is good. The one-way patterns help reduce traffic conflicts and the coordinated signal system benefits the progression of traffic. There is capacity in the network to accommodate economic growth. Generally speaking, traffic flow is good, with the few exceptions noted below:

Farmington Avenue & Asylum Avenue (west of the I-84 Interchange): Farmington Avenue and Asylum Avenue are two major thoroughfares that carry high traffic volumes. During peak travel times, congestion and delay occur as a result of peak traffic flows merging onto Asylum Street near Union Station and Broad Street due to the large volume of cars accessing and exiting I-84. This intersection is of particular concern due to its proximity to Union Station and its impact of the four routes approaching downtown from the west.



Morgan Street & Market Street: The Morgan Street garage is located at the corner of Morgan Street and Market Street. It holds a capacity of 2,290 parking spaces. During the evening peak hours, traffic exiting the Morgan Street Garage causes congestion as a result of a surge of high traffic volumes within a short-time frame. This impacts the existing downtown terminus of east of the river routes on Market Street.

Columbus Boulevard: Columbus Boulevard is a connector road and it provides access to the Founder's Bridge, which connects Hartford to East Hartford across the Connecticut River. During peak hours, congestion occurs as a result of travel demand desiring to cross the river. There is currently no bus service on Columbus Boulevard, but all east of the river routes cross Columbus Boulevard after crossing the Founders Bridge.



4.0 FUTURE TRANSIT SERVICES INTO DOWNTOWN HARTFORD

Two major transit expansion initiatives are likely to have a major impact on downtown bus operations in Hartford. They are the New Britain Busway and the New Haven-Hartford-Springfield Commuter Rail.

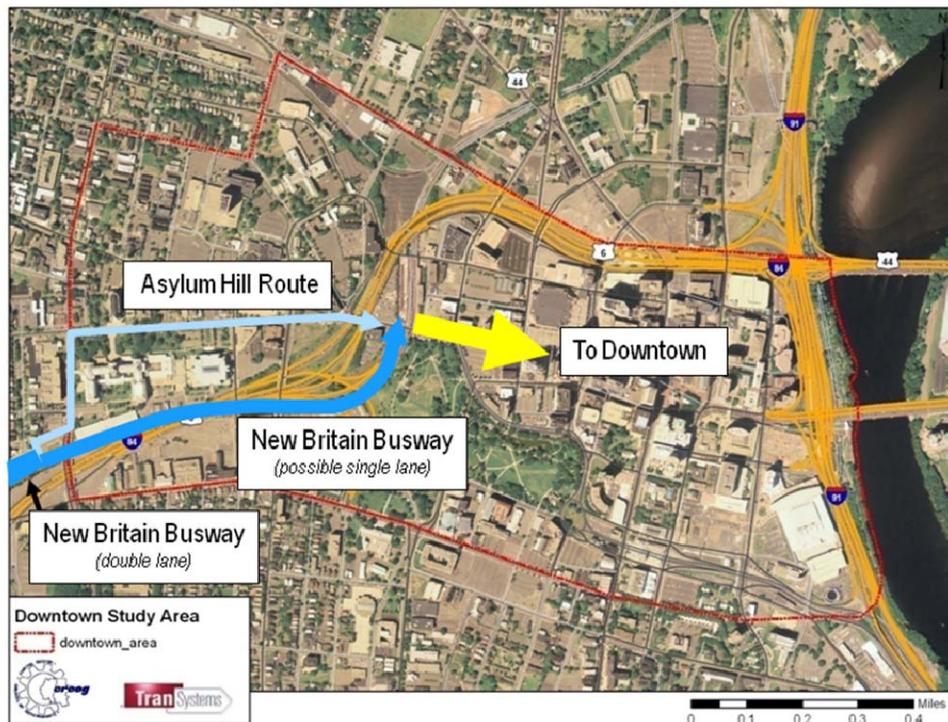
4.1 *New Britain Busway*

The New Britain Busway is currently being designed as a bi-directional grade-separated busway from New Britain to Hartford. There will be ten on-line stations with at least three mid-line entry points. Most stations are located in areas where park-and-ride will be an important mode of access. In Hartford, the busway will terminate adjacent to the I-84 ramps at the south side of Asylum Avenue opposite Spruce Street at Union Station. The path to be followed by the buses once they leave the busway is to be determined by this study. In addition to the Asylum Avenue terminus, a station and busway exit is planned at Sigourney Street in the Asylum Hill neighborhood.

All busway services will circulate in downtown Hartford. CTDOT expects that some percentage of them would exit at Sigourney and use Sigourney and Farmington Avenue to reach Union Station where they would re-join buses that remain on the busway until the Asylum Avenue terminus. This is shown in Figure 4-1. The busway is expected to carry 29 buses in the peak direction in the peak hour and 18 in off-peak hours. CTDOT has not yet determined the number of buses that will use the Sigourney routing versus continuing to the terminus at Asylum Avenue.

CTDOT has not yet developed a final service plan for the busway. However, a preliminary service plan developed in 2007 indicated that busway service would consist of twelve different routes. These routes can be divided into three categories:

Figure 4-1: New Britain Busway Terminus



- **Busway "Shuttle"** – One route would provide regular frequent service only to busway stations and the two downtowns. This would most likely be CTTRANSIT operated route.
- **Local Bus Routes** – Four routes would provide local service in New Britain and continue to Hartford along the busway making all busway station stops. Three additional routes would provide local service and enter the busway way at one of the intermediate entry points before continuing to Hartford along the busway making all busway station stops. Six of these seven routes would originate in New Britain. The seventh would originate along the outer end of Route Q in West Hartford. These routes would most likely be operated by a combination of the CTTRANSIT Hartford and New Britain Divisions.
- **Express Service** – Four routes would begin at more distant locations, enter the busway in New Britain, and operate non-stop on the busway to Sigourney Street. Three of the four routes would be existing contracted commuter routes (Routes 19, 23, and 24) that would be operated using the busway with enhanced frequency.

The four express routes (from Bristol, Cheshire, Meriden and Waterbury) are proposed to provide ten peak hour and five off-peak hour trips per hour. The existing versions of these routes provide five peak hour trips and little to no off-peak service. On the remaining eight routes, six shuttle trips and thirteen local trips are proposed per hour in peak periods. This would be reduced to four shuttle trips and nine local trips in off-peak hours.

Development of a final service plan is ongoing for this initial phase of busway implementation in the Hartford area. Additional busways have also been proposed as well as expansion of busway-like services into other corridors. The development of a downtown circulation pattern for New Britain busway services will need to consider the possibility of future busway service through-routed to points east of the river, or possibly even north of downtown.

For use in this study, busway ridership projections for the design year (2030) done in 2006 were scaled back to reflect ridership in the shorter term assuming that near term ridership is 80% of design year projections (this is consistent with the 25% growth in employment projected for downtown). These estimates were used in conjunction with data on current transfer patterns to assess how many additional transfers would be added by the busway and to which routes riders might transfer.

The four express routes can be expected to carry long distance commuters to downtown Hartford. These routes are expected to carry an estimated 1,800 riders in the near term in both directions to and from downtown. It is assumed that riders of these services would have travel characteristics similar to riders of current commuter services. Current commuter route riders tend to have destinations in the downtown area and are unlikely to transfer. Therefore it was assumed that only 5% of riders on these routes would transfer downtown. In developing the downtown circulation alternatives, these routes were treated as commuter routes and were assumed to be the services that would use the Sigourney entrance/exit of the busway.

The shuttle and seven local routes are expected to carry approximately 7,300 daily riders in the near term in both directions into downtown Hartford through the point at which the busway ends at Union Station. Riders on these routes can be assumed to transfer at rates more comparable to local bus riders in downtown Hartford (of whom approximately 70% transfer). An estimated 81% of these riders are expected to access the busway at the intermediate stations between New Britain and Hartford, most of these at the stations rather than on local routes entering the busway. The remaining 19% are expected to board or alight at the New Britain terminus. In New Britain riders can access the service by local bus (either through-routed to the busway or by a transfer), by walking or by parking at the station. The 2006 ridership estimates indicated that about 32% of New Britain riders might park (versus only 5% for other stations) and 42% might transfer (versus 28% for other stations). Because people who park and ride and people who already transfer once tend to transfer less often than other riders, a lower transfer rate was assumed for riders from New Britain Station. Therefore, it was assumed that only about 25% of New Britain riders would transfer in downtown Hartford, while 60% of riders accessing the service using one of the other stations or on local routes would transfer downtown. The result is an estimate of 3,981 transfers (1,990 in each direction in

the near term) for busway riders in downtown Hartford. With this large number of transfers to and from these routes, these routes will need to make convenient transfer connections in the downtown much like what is needed for the local bus routes.

Riders using the busway and transferring downtown will largely be originating in a corridor extending southwest from downtown Hartford. This area is now served by routes W Capitol Avenue, K Park Street, Q New Britain Avenue, and P Hartford/New Britain. Thus it can be assumed that the transferring busway riders would transfer to other routes in the region following a pattern similar to that exhibited by transferring riders from those four existing routes. The combined transfer patterns for these four routes were therefore used to allocate the 1,990 busway transfers in each direction to other routes in the region. These transfers were added to the system-wide transfer matrix for the purpose of evaluating future circulation alternatives.

4.2 *New Haven - Hartford - Springfield Commuter Rail Project*

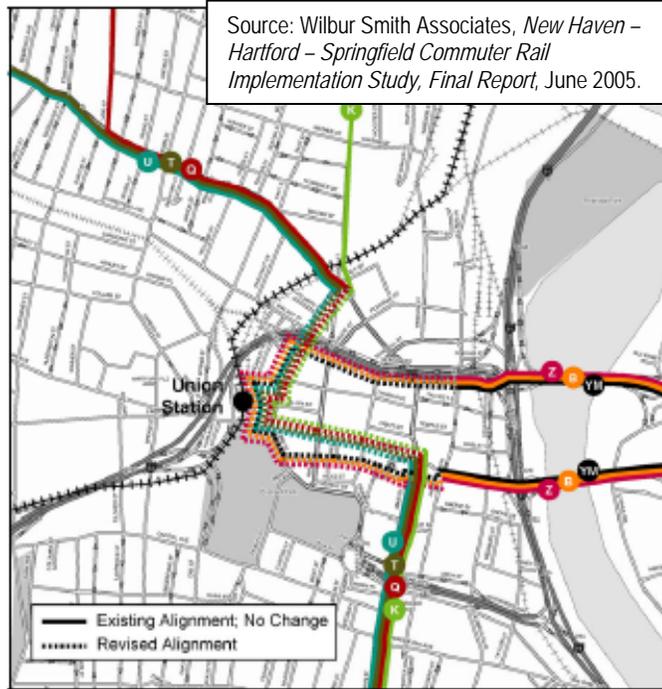
The Implementation Study for the New Haven-Hartford-Springfield Commuter Rail was completed in June 2005¹⁰. The study assessed alternative scenarios, ridership, capital and operating costs, environmental resources, financing needs and next steps. It recommended a start-up service with bi-directional service (oriented toward both New Haven and Springfield) with weekday peak period service every 30 minutes. The study also recommended supplementing existing Amtrak service with eight new round trips. A total of twelve start-up stations were proposed, including Hartford Union Station. This initial study projected system-wide ridership of 2,428 new weekday boardings in 2025, including 515 weekday boardings in Hartford. The Connecticut Department of Transportation is currently conducting an environmental assessment of the project which has not yet been published. Updated weekday ridership projections from the new study indicate that system-wide ridership is now projected to reach 3,844 by 2015 and 5,426 by 2030. Hartford Union Station ridership is projected at 699 in 2015 and 1,144 in 2030¹¹.

The 2005 Implementation study proposed re-routing most local bus lines to Union Station to serve commuter rail (see Figure 4-2). It was proposed that north-south routes be rerouted from the intersection of Main Street and Albany Avenue down High Street to Union Station and would then use Asylum/Pearl to return to Main Street near Central Row. East of the river routes were proposed to be relocated from their Market Street terminus to Union Station via an extension westward along Pearl Street to Union Station before entering I-84 near Ann Street to return to the east.

¹⁰ Wilbur Smith Associates, *New Haven – Hartford – Springfield Commuter Rail Implementation Study, Final Report*, June 2005.

¹¹ *Presentation to New Haven Hartford, Springfield Commuter Rail Environmental Assessment Steering Committee*, April 16, 2009

Figure 4-2: Commuter Rail Study Proposed Bus Routings



5.0 STAKEHOLDER INPUT

CRCOG representatives had a series of meetings with stakeholders to provide information on the Northwest Corridor Study as it impacts downtown circulation and to receive input for the study. Extensive comments were received from the public during a Connecticut Coalition for Environmental Justice workshop. CRCOG staff also met with several other groups. This section summarizes overall findings from those meetings.

5.1 *Connecticut Coalition for Environmental Justice (CCEJ) Workshop*

CRCOG staff met with representatives of the CCEJ and attended a CCEJ workshop to discuss how the project will impact environmental justice target groups and how best to insure that the EJ community remains engaged throughout the project. The workshop was designed to work as a two-way conversation and each participant was allowed the opportunity to speak. Participants made numerous comments. Those regarding bus travel and transfers in the downtown area were as follows:

Comments on riding the bus

- Participants noted that they use the bus to go to numerous locations including shopping in Buckland Hills and West Farms Mall, Wethersfield shops along the Silas Deane Highway, and to avoid driving into downtown to run errands or go shopping.
- It was also noted that a cross town bus would be useful.
- If you need to use transit, this defines where you can work.

Comments on using the bus downtown

- It is not clear which bus route uses which bus stop, the route labels on the bus stop signs are too small.
- Current schedule information, including maps, should be available at all stops and shelters. The mounted schedules, when maintained, are useful.
- There is a need for seating at bus stops in downtown Hartford, especially for senior citizens. Particularly, there is not much seating available in bus shelters or bus stops in front of the Wadsworth, and Central Row.
- It was noted that the downtown pedestrian environment makes bus use a challenge. Current walk signals at intersections downtown are too short, and drivers are making right turns in conflict with pedestrians. It was noted that the use of audible signals would be great.
- None of the participants had used the Star Shuttle, though they were all aware that it existed. One individual (a regular transit user) did not know how to use the service or that it was free.

Comments on transfers

- Drivers are usually helpful, with regard to transfers.
- For buses that are currently through-routed, the schedule information does not indicate the continuing routes are, so a passenger may think they need to transfer when in fact, they do not have to.
- Problems with transfers: sometimes riders forget to request the transfer (a sign on the farebox to serve as a reminder may be helpful), transferring requires accurate timing.
- It was noted by all participants that it is pretty easy to transfer when needed, however, concerns were expressed regarding two issues:
 - personal security, especially at night
 - safety when crossing the street to access another bus stop. Especially for transfers on Main Street – even though a stop an individual needs to get to for a transfer is very nearby, the road is wide and feels threatening, especially to senior citizens and those with limited mobility.
- Attendees liked the idea of a downtown transfer center. (In fact, whenever this topic is brought up with people who have used the bus for a number of years, they invariably say – the Isle of Safety should never have been taken away. This was a location very close to the current CTTRANSIT kiosk, on the State House

Square plaza, where all bus routes converged. At the time, it was a public thoroughfare.) What people liked about this facility, was the security, of all bus users congregating in one location, and the convenience.

5.2 *Meetings with Other Groups*

CRCOG staff also met with:

- Director of Transportation and Parking at the Travelers
- South Downtown Neighborhood residents
- Business for Downtown Hartford
- Metro Hartford Alliance
- Asylum Hill Neighborhood Revitalization Zone (NRZ)
- Hartford 2000
- Hospitality Task Force

In each of the meetings CRCOG staff presented the objectives of the study and indicated the desire of the study to receive any comments or suggestions that the participants had to offer. Following is a description of the feedback that was obtained.

The Director of Transportation and Parking at Travelers said that Travelers does not provide free parking to its employees—there is a charge for parking. Travelers does not have enough parking for all of its employees. Employees are charged on a sliding scale for parking, based upon the location and salary (the more you make, the more you pay for parking). Travelers provides a monthly transit subsidy. Transit passes are sold in the Travelers building and they sell about 1,500 passes per month. She has not heard any complaints about CTTRANSIT routes—all Travelers facilities are very accessible via CTTRANSIT buses. She was not aware of many employees using the Star Shuttle.

Residents of the South Downtown Neighborhood discussed downtown circulation. They are so accessible to everything in downtown that they do not use the star shuttle, but walk to any destinations downtown. Early on they did use the Star Shuttle, to show public support for it. They would like to have their options broadened with more transit to Park Street (for the hardware), to Franklin Avenue (for eating places). Currently, the E bus will get you to West Hartford Center, but with stops virtually every block, it is way too slow. They expect that as they grow older (and as the downtown population ages) access to shopping and the hospitals will become more important. Right now, just about anyone who lives downtown has a car and uses it for a variety of trip purposes. The downtown residents use the Bradley Flyer to get to the airports. This service was considered very efficient and one of the best services for downtown. They were concerned by the number of buses that congregate on Main St.

Members of Business for Downtown Hartford were concerned about whether the Star Shuttle would be affected by the recommendations made in the study.

The Metro Hartford Alliance is interested in the relationship between the pedestrian environment and where buses congregate and layover in the downtown area. They would like to see pedestrian improvements on Main Street. It was noted that links to Asylum Hill from the Union Station area are important. The walk from Union Station to the Hartford/Farmington area needs to be more pleasant and likewise, the walk from Sigourney needed to be improved. There are few places to go to lunch without going past Union station, but the underpass is very unpleasant, deterring people from making the walk.

6.0 KEY NODES AND CONNECTIONS

Based on the existing conditions and future services presented in Sections 3 and 4, this section summarizes the key elements which need to be considered in the development of downtown transit circulation options for Hartford. This section summarizes the current and future key nodes in the downtown transit network, followed by a summary of the key current and future downtown transit connections which must be made by the transit network.

6.1 *Key Transit Nodes in Downtown Hartford*

Main Street Area – The area on either side of Main Street between I-84 and Gold Street, and between Columbus Boulevard and Ann Street, is the center of employment in downtown Hartford. This area is roughly 0.4 miles square. Many large, medium and small employers are located in this area. According to data from InfoUSA, there are approximately 22,800 employees at 267 businesses in this area. (CRCOG estimates place the number of employees at almost 32,000.) Most of the largest employers are in the financial services industry. There are many small employers in the retail and food service industry. There are also a few government and social service offices. The geographic center of this area is near Main and Asylum Streets, one block north of Central Row.

Asylum Hill – The eastern non-residential portion of the Asylum Hill neighborhood is home to Aetna and The Hartford, the two largest employers in the study area. Aetna and The Hartford employ 10,000 and 5,000 people, respectively at these locations. Both of these employers are located between $\frac{1}{4}$ and $\frac{1}{2}$ mile west of Union Station. There are few other employers nearby.

Capitol Avenue – There are numerous government offices along a $\frac{3}{4}$ mile east-west stretch of Capitol Avenue and Elm Street between Sigourney Street and Main Street, plus some just south of Capitol on Washington Street. The eastern end of this area is within $\frac{1}{4}$ mile of Main Street and Central Row. These offices employ about 8,200 people.

Residential Nodes – While there are few residents in the study area east of I-84, there were two existing pockets of over 200 residents each according to the 2000 census. The area between Ann Street and Union Station had just over 200 residents. The area along Main Street south of Gold Street had almost 400 residents. Based on development plans CRCOG projects the population of these pockets to more than triple by 2030. The Hartford 21 project recently added over 200 residents on Trumbull Street.

Entertainment District – The area between the XL Center and Union Station is growing as an entertainment destination. The number of restaurants and nightspots is growing and the area is adjacent to the XL Center, cultural attractions, and transportation facilities. The area between the XL Center and Main Street also has numerous restaurants.

Main Street/Central Row – Main Street between Pearl Street/Central Row and a point just south of Gold Street is the center of the current transit system. With the exception of the east side bus routes, which stop nearby on Market Street, all local bus routes, all commuter bus routes, and the Star Shuttle pass through this node. It is believed that the vast majority of transfers in the downtown (over 8,400 daily) occur here. There are also an estimated 4,300 daily originating bus boardings on Main Street and on Central Row in this area. Another 850 originate on Market Street.

Union Station – Union Station lies $\frac{1}{2}$ mile due west of Main Street and currently serves Amtrak rail service (75,000 annual boardings, or roughly 250 per weekday) and private intercity bus carriers, including Greyhound and Peter Pan. Union Station is included as a stop on the planned New Haven-Hartford-Springfield commuter rail line. At least 515 additional weekday rail boardings are projected. (It is anticipated that this figure will be higher in future studies.) Union Station will also be adjacent to the terminus for the New Britain Busway facility, with 29 buses per peak hour expected to be exiting the busway.

6.2 Key Connections for Downtown Transit

Local Bus Services to Downtown – All local bus routes serve either Main Street between Pearl and Gold or Market Street at the heart of the downtown employment area. Service from all corridors to this area will need to be maintained.

Main Street North/South – Seven bus routes and 30 buses in each direction in the peak hour traverse Main Street in a north south direction through downtown. While many riders board and alight from these buses, an estimated 1,000 riders per day pass through the downtown without leaving the bus. Another 2,400 riders transfer between a north side route and a south side route.

North/West and South/West Connections – While each of these connections are made by only one route, there are 1,500 daily transfers between the north and west and over 1,900 between the south and west corridors.

Connections to/from East of the River – East of the river routes all terminate on Market Street, one block east of Main Street. Almost 1,500 daily riders transfer to or from the south; 1,100 transfer to or from the north; and 700 transfer to or from the west. While most of these transfers are to/from the major through routes, one terminating route from the west (E Farmington) receives the second most transfers from some east of the river routes.

Commuter Services to Downtown – Currently all commuter bus services serve downtown at the intersection of Main Street and Central Row, very close to the center of the downtown employment area. All commuter routes also have some trips serving the Asylum Hill and Capitol Avenue employment areas. However, commuter bus ridership to these areas is low.

Star Shuttle Route – The Star Shuttle operates on a 2.6 mile one-way loop through downtown, connecting hotels, restaurants and the Convention Center. It spans the 0.8 mile distance from the Convention Center to Union Station. It connects with local buses on Main Street at Atheneum Square and at Church Street. It primarily serves a market niche consisting of visitors and bar and restaurant patrons. The connections provided by this service will need to be maintained and/or strengthened.

Union Station to Downtown – With commuter rail service added to Amtrak and intercity bus services, more people will arrive at Union Station with a need to travel the approximately $\frac{1}{4}$ to $\frac{3}{4}$ mile distance to the employment center of downtown. The future downtown circulation pattern will need to accommodate this demand.

Union Station to Asylum Hill – Commuter rail riders may also need to travel the $\frac{1}{4}$ to $\frac{1}{2}$ mile to the employers on Asylum Hill. Although this is a short distance a transit connection may be needed.

Busway Circulation – The New Britain busway is expected to discharge 29 buses per peak hour and 18 buses per off-peak hour at a combination of Sigourney Street and Union Station. These buses will need to travel the $\frac{1}{2}$ mile from the busway terminus to the employment concentration around Main Street. Buses exiting at Sigourney Street will follow a 0.9 mile route through Asylum Hill before passing Union Station.

7.0 EVALUATION CRITERIA

This section outlines evaluation criteria used in assessing alternative configurations for bus circulation in downtown Hartford. Both the initially identified evaluation criteria and the more focused revised criteria are presented.

7.1 *Initial Evaluation Criteria*

The criteria that were initially adopted were based on the Goals and Objectives for this part of the study, as adopted at the first Steering Committee Meeting and discussed in Section 2. Goal #1 dealt with the assembly of relevant data for the project, rather than the development of a circulation plan. Therefore, Goal #1 did not need to be addressed in developing evaluation criteria for the circulation alternatives. As a result, this section presents the initial evaluation criteria based only on Goals 2 through 5.

Table 7-1 presents the proposed evaluation criteria related to each objective. Criteria are listed as being either qualitative or quantitative. Evaluations for the qualitative criteria were intended to be based on a qualitative assessment of the relative impacts of the alternatives being evaluated. Evaluations for quantitative criteria were to be based on the measures and calculations listed in the table.

Table 7-1 also groups the objectives and their associated measures into nine categories. Once the values and qualitative assessments have been developed for each measure, an overall assessment could be made for each category. The various measures in each category were to be considered as a whole and a rating of High, Medium, or Low would be assigned to each alternative for each category. This was intended to reduce the 40 different measures down to a more manageable number of rating categories so that the relative merits of the alternatives could be assessed more easily.

7.2 *Reduced Set of Evaluation Criteria*

As the study progressed, issues were identified and the alternatives were developed it became apparent that a few criteria would be the key distinguishing factors among the alternatives. These focused on the impact on transferring riders, impacts on riders with destinations in the downtown, traffic circulation changes needed, and the cost. A reduced set of nine criteria was developed focusing on the key elements of these impacts. Each alternative would be given a rating (very high, high, medium, low, or very low) in each category as an aid to the Steering Committee in selecting a preferred alternative. The nine criteria were as follows:

- **Utilization of Transit Centers** – A key pair of issues that surfaced during the study were 1) conditions are poor for transferring passengers, such as having to cross Main Street and the lack of sufficient shelter, and 2) transferring passengers congregating on Main Street were seen as a negative factor in the downtown. Therefore, alternatives were rated highly if they reduced the number of transfers on Main Street and the number of passengers having to cross Main Street to transfer and located those transfers in a comfortable safe off-street facility.
- **Service to Through and Transferring Riders** – Currently transfers are made at a central point in downtown. Moving transfers away from that point could make the trip longer or shorter for transferring riders. Alternatives were rated highly if they reduced the travel time for transferring riders and poorly if they increased the travel time for transferring riders. The travel time for passengers riding through downtown was also considered as was the number of passengers having to transfer versus having a through trip.
- **Service to Riders into Downtown** – Current routes into downtown generally follow the most direct route. Bus route changes in the downtown could increase the length of the trip for riders with downtown destinations. Alternatives were rated highly if they preserved the direct route for most passengers and poorly if they increased the travel time for riders into downtown.

Table 7-1: Initial Evaluation Criteria

Objective Category	Objective	Measure	Qualitative*	Quantitative**	Notes/Calculations
Coordinated Transit	2.1	Number of different local bus circulation patterns		✓	count of unique routing patterns within study area
		Number of circulation patterns used by busway vehicles		✓	count of unique routing patterns within study area
		Consolidation of commuter bus stops (CTTransit and contracted)		✓	average number of commuter routes per commuter stop
		Local and commuter routes with transfers to STAR shuttle		✓	count of routes with transfers to STAR shuttle (same stop, same block, cross street, >1 block)
	2.2	Capacity for additional local and commuter bus service	✓		ability to accommodate a 50% increase in bus service
		Capacity of stops to support busway services	✓		ability to accommodate proposed busway service
Capacity of stops to support future busway services		✓		ability to accommodate service from additional busways	
2.3	Employees within 0.1 mile of downtown route patterns connecting to Union Station		✓	based on employer data	
	Peak period wait time on downtown route patterns connecting to Union Station		✓	wait time on each pattern weighted by employees closest to each pattern	
Travel Time Savings	2.4	Vehicle-hour savings resulting from transit priority strategies		✓	time saved x weekday vehicle-trips
		Passenger time savings resulting from transit priority strategies		✓	time saved x weekday passenger-trips
	2.5	Time savings resulting from traffic circulation changes		✓	time saved x weekday vehicle-trips
		Passenger travel time savings resulting from traffic circulation changes		✓	time saved x weekday passenger-trips
Traffic Impact	2.6	Change in traffic LOS resulting from transit improvements	✓		for key intersections where no data is available
		Change in traffic LOS resulting from transit improvements		✓	for key intersections where data is available
Riders to Downtown	3.1	Employees within 0.1 mile of each downtown route pattern (weighted by pattern ridership)		✓	number of employees x share of system ridership using each pattern
		Employees within ¼ mile of each downtown route pattern (weighted by pattern ridership)		✓	number of employees x share of system ridership using each pattern
	3.2	Ease of access to bus stops	✓		street crossings and other impediments to pedestrian access
		Riders with sheltered waiting area		✓	downtown boardings at sheltered stops
	3.3	Riders with other amenities		✓	downtown boardings at stops with enhanced amenities
		Service to development areas		✓	percent of systemwide riders with direct access to specified new developments
3.4	Percent of study area within 0.1 mile of each pattern (weighted by pattern ridership)		✓	square miles x share of system ridership using each pattern	
	Consolidation of bus stops		✓	for selected points, number of stops needed to access all routes	
Through Riders	3.6	Downtown through ridership		✓	percent of current through and transfer riders with a through-routed trip
		Total wait time for transfers		✓	number of transfers categorized as pulsed/matched-headways/other, times estimated wait time
	3.7	Transfers at non-contiguous stops		✓	count of transfers at: same stop, same block, across the street, and more than one block
		Transfers made at sheltered stops		✓	downtown transfer boardings at sheltered stops
3.8	Simplicity of transfers	✓		simplicity of transfer connections	
Riders Within Downtown	3.10	Service between residential developments and identified downtown destinations	✓		service to identified needs of downtown residents
	3.11	Service between hotels and identified downtown destinations	✓		service to between hotels and convention center and other visitor destinations
	3.12	Simplicity of trip making in downtown	✓		number of different route patterns needed to make all possible trips within downtown
Transit Centers	4.1	Transfers made at transit centers		✓	downtown transfer boardings at transit centers
	4.2	Non-transfer trips using transit centers		✓	non-transfer boardings at transit centers
	4.3	Integration with Transit Oriented Development	✓		potential for transit oriented development at transit center
	4.5	Expansion of layover capacity	✓		ability to accommodate additional layover facilities
Cost	5.1	Change in annual CTT operating cost		✓	based on hourly operating cost and estimated change in annual vehicle hours
		Change in annual CTDOT contracted service cost		✓	based on operator contracts and estimated change in service
5.2	Capital costs of bus, transit center, stop, traffic, transit priority improvements		✓	using estimated unit costs	
Private Carriers	5.3	Operational burdens on contracted commuter carriers	✓		impacts on contracted operators
		Impacts on intercity carrier operations and ridership	✓		impacts on intercity carriers

* Qualitative assessment of the relative impacts of the alternatives

** Quantitative estimate

- **Service to Riders Traveling within Downtown** – Currently few people travel within the downtown area by bus. Downtown Hartford is fairly small and many trips within downtown can be made on foot. North-south bus service is frequent; however, there is less service to the Union Station area on the west side and the Capitol Avenue area in the south. There is also no service connecting the area east of Main Street to the west side of downtown. Therefore, alternatives were rated highly if they established an east-west connection across downtown and/or had more frequent service to the Union Station and/or Capitol Avenue area.
- **Bus Volumes on Downtown Streets** – High volumes of buses on downtown streets were generally seen as a negative factor, both aesthetically and in terms of increased traffic impact congestion. Alternatives that focused a high number of buses in one or more locations were rated poorly, while alternatives that kept bus volumes at more reasonable levels on downtown streets were rated highly.
- **Traffic Circulation Changes Needed** – While modifying traffic circulation in the downtown was not part of this study, some alternatives would require modifications to the one-way street pattern to at least allow bus service in the opposite direction on some current one-way streets. This could possibly disrupt existing traffic patterns, create new bottlenecks, and require expensive modifications to streets and traffic signal systems. To the extent that alternatives required such modifications, they were rated poorly.
- **Bus Operating Costs** – Lengthening bus routes increases operating costs while shortening routes and through-routing to reduce overlap among routes reduces operating costs. Alternatives were given high or low ratings depending on the likely impact on operating costs given the changes in route structure.
- **Capital Cost** – Capital costs include creation of one or more downtown transit centers and the cost of any physical changes to the street network. Alternatives were given high or low ratings depending on the likely extent of capital improvements needed.
- **Capacity and Quality of Transit Centers** – Where alternatives included a new transfer facility, the ability to locate a facility of adequate size with improved passenger amenities resulted in high ratings. Alternatives requiring new facilities where the number and size of candidate sites is limited, or alternatives that would rely on on-street facilities with fewer amenities, were rated poorly.

This reduced set of criteria was used to develop ratings for each of the circulation alternatives described in Section 10. The Steering Committee then considered these ratings in selecting a preferred alternative.



8.0 DEVELOPMENT OF DOWNTOWN CIRCULATION ALTERNATIVES

Based on the analysis of downtown ridership, the high rate of transfers identified, and the key nodes and connections described in Section 6, it was determined that all downtown circulation alternatives considered had to meet two basic criteria: 1) all had to provide improved facilities to better accommodate downtown transfers, and 2) all had to retain stops on all routes at or near the center of downtown at Main Street and Central Row to serve riders with downtown destinations.

In addition, all of the alternatives considered sought to accomplish the following:

- improve service by improving transfer connections and amenities for transferring riders
- minimize the number of transfers occurring at unimproved transfer facilities
- reduce the overall number of transfers through the expanded use of through-routing
- improve service to parts of downtown away from Main Street (such as the west side of downtown near Union Station, the east side along Columbus Boulevard, and area along Capitol Avenue)

Several circulation alternatives, each with numerous variations, were proposed during the course of the study. Variations were screened considering possible transit center locations, traffic circulation, transfer impacts and locations, complexity of operations, and possible operating cost impacts. Rather than enumerate every alternative considered, in this section the possible alternatives are discussed on a more conceptual basis. First, general methods of improving downtown transfer connections are discussed. Five conceptual alternatives are then identified based on where and how routes would intersect in the downtown. Next, possible options for through-routing service are discussed, followed by a discussion of possible reorientation of some routes to different corridors to improve downtown service and connections. Finally, options for commuter routes (including new busway commuter services) are discussed. Several of the most promising specific alternatives, based on the conceptual alternatives, were selected for evaluation. These specific alternatives are presented in Section 10 and are evaluated in Section 11.

8.1 *Improving Downtown Transfer Connections*

Most Hartford local bus routes approach downtown from one of the four cardinal directions. From the north side of the city, all routes enter the study area by crossing I-84 along Main Street. From the west side, routes enter through Asylum Hill along several streets before converging and crossing I-84 on Asylum Avenue. From the south, many converge along Main Street in the vicinity of the South Green, with a few others approaching from Capitol Avenue. From east of the river, all routes enter downtown over the Founders Bridge and exit on I-84. Routes from the north and south are generally through-routed, while east and west routes all terminate in the downtown with buses exiting downtown in the direction from which they came.

Currently, as noted in Section 3, all routes essentially intersect in a small area along Main and Market Streets between Gold Street and just north of Central Row. This is both the location where the vast majority of transfers occur and the center of demand for riders traveling to the downtown business district. Conceptually, downtown local bus service can be seen as a simple four-armed cross, with transfers and the majority of downtown destinations at the center. This is a very simple, yet efficient, design.

With the increasing extent of transfers in the system, and downtown a significant, but no longer overwhelmingly predominant, destination, improved conditions for non-downtown-oriented trips are desired. New crosstown services could be implemented to improve service in these markets, but such services can be costly and often serve few riders given the dispersed nature of transit trips. Unless there is high demand in very specific markets, the most cost-effective solution is most often improving the transfer connections that can be made downtown. This can be done by coordinating schedules, providing improved (possibly real-time) connection information, and by providing a safe, comfortable and convenient environment for transfers in the downtown.

Ideally, the desired improvements in transfer connections would be made without sacrificing the efficiency of the existing downtown bus network. However, such improvements often require more space than is available on downtown streets and at downtown bus stops. Creating pedestrian paths for transferring riders that are relatively free from conflicts with vehicles is often not possible on downtown streets. Cities have attempted to address these issues in several different ways, including developing enhanced on-street transfer facilities, developing transit malls, and developing off-street transit centers.

Hartford is no different in its need to accommodate many downtown transfers. Given the rate of transfer activity in downtown Hartford, this study focused on how to modify the pattern of downtown bus circulation in order to improve transfer connections while continuing to serve downtown destinations. The alternatives examined included relocated on-street facilities that reduce the need for transferring riders to cross the street while addressing concerns about the number of buses and bus passengers on Main Street, and also alternatives that included new off-street transfer facilities.

An effort was made to identify a reconfiguration of bus operations that would allow transfers to continue to be made at on-street bus stops near the center of downtown but in such a way that the distance walked and number of passengers having to cross the street would be significantly reduced. Several alternatives were identified during the course of the study. Nearly all involved moving buses off Main Street in one or both directions so that passengers would not have to cross such wide, heavily traveled streets. This generally resulted in unacceptably high bus volumes on lower capacity adjacent streets and a need for bus stops that would have to accommodate high volumes of waiting passengers on sidewalks that were just too small or in areas where waiting passengers would likely conflict with other uses.

Efforts were also made to identify alternatives that incorporated an off-street transit center facility. Since it is unlikely that a sufficiently large parcel would be available in the center of downtown, these generally involved identifying where, in relation to the center of downtown, such a facility should be located and how bus routes should be modified to serve the needs of both transferring and downtown riders. Several alternative general locations were considered, each with several bus routing variations. The most promising of these alternatives can be expected to result in a significant shift of transfer activity into a transit center as well as a significant reduction in passenger activity along Main Street and crossing Main Street, albeit with some diversion of bus routes and slightly increased travel time for some downtown riders.

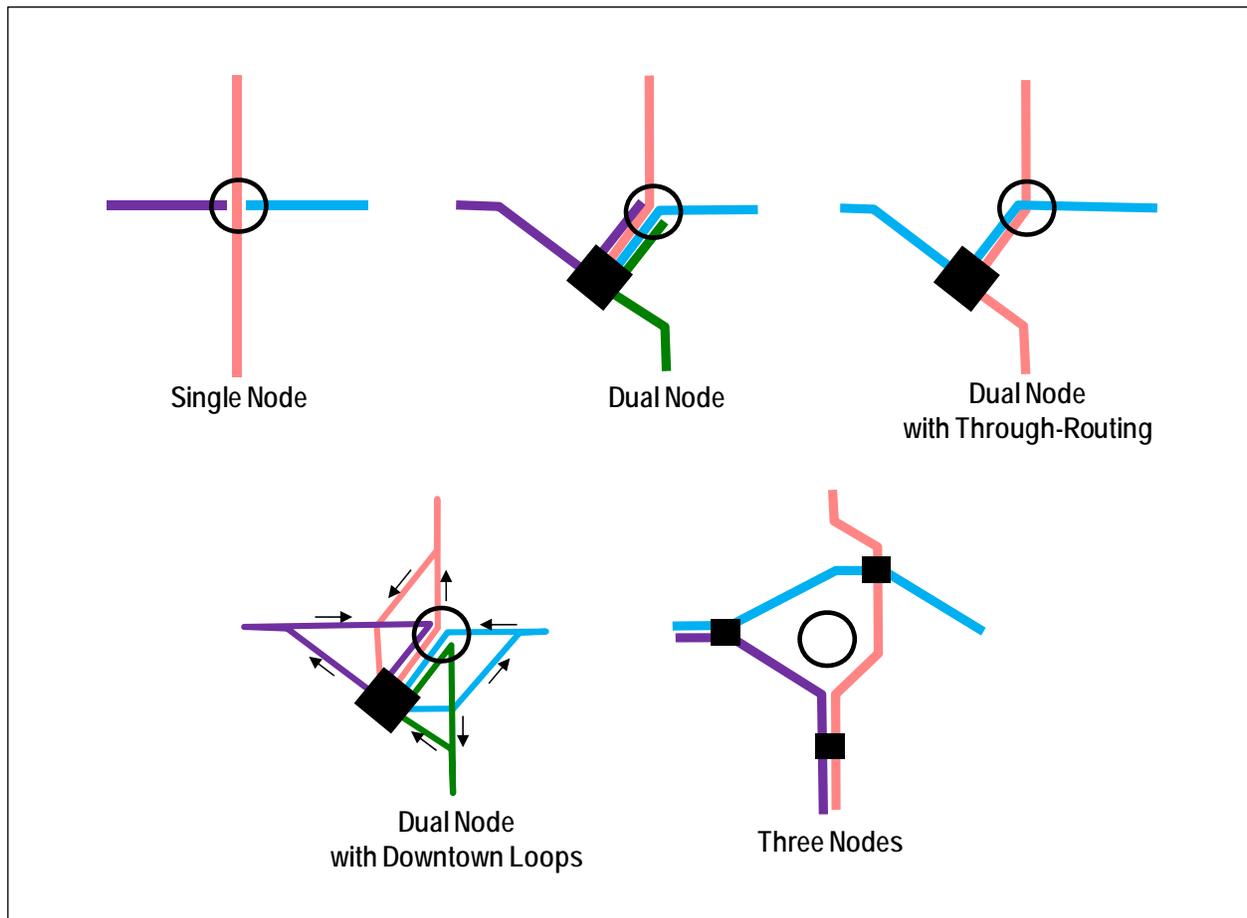
8.2 Conceptual Alternatives

The following five conceptual alternatives, also shown in Figure 8-1, encompass all of the possible alternatives considered during the course of this study.

Single Node – This is the alternative that most closely resembles current service. All routes either end or cross at essentially a single point at the center of downtown. Routes can be through-routed or terminate downtown without significantly changing operating costs. All transfers occur at the center of demand for downtown riders (shown as an open circle in the figure). While all buses converge at this point, they quickly disperse in multiple directions upon leaving the focal point. Because the only point served by all routes is at the center of downtown development, the amount of space available for an enhanced transfer facility is severely restricted. An initial investigation of possible sites near the current focal point at Main and Central Row resulted in no available off-street sites. Therefore, several alternatives that made use of relocated on-street transfer facilities were considered. These mostly resulted in less efficient bus circulation patterns, high bus volumes on some streets, and a relocation of Main Street bus passengers to other streets less able to accommodate the high transferring passenger volume. In the end, one alternative of this type was retained (Alternative #4), with all transfers occurring “on-street” away from the current Main Street stops.

Dual Node – In alternatives based on this concept, a downtown transit center is included at a location separate from the center of downtown (shown as a black square). All routes would serve both the center of downtown and the

Figure 8-1: Conceptual Circulation Alternatives



transit center. Few, if any, routes would be through-routed. Depending on the order in which the two sites are served on each route, some riders will transfer at the transit center, but others many may choose to continue to transfer in the center of downtown. These alternatives result in virtually every bus traveling along the segment connecting the two sites, possibly resulting in unacceptably high bus traffic volumes in that area. (This could be alleviated if multiple paths exist between the two points.) Several alternatives of this type were proposed, but concerns about increased bus traffic and bus operating costs led to a desire to avoid these alternatives in favor of the following alternative.

Dual Node with Through-Routing – The alternatives employing this concept resemble those following the previous concept, except that nearly all routes are through-routed. These alternatives require a balance of service between routes serving the transit center first and routes serving the downtown first. North-south routes would remain through-routed and new through-routing of east and west routes would occur. As with the previous concept, some riders will transfer at the transit center, but others may choose to continue to transfer in the center of downtown, depending on where their routes first intersect. These alternatives result in virtually every bus traveling along the segment connecting the two sites, possibly resulting in unacceptably high bus traffic volumes. (Again, this could be alleviated if multiple paths exist between the two points.) Volumes on the connecting segment are less than in the previous alternative since through-routing reduces the overlap between routes. In Hartford, routes could be arranged so that the west and south routes join together and the north and east routes join together (as in the figure) – this

became Alternative #1. Conversely, routes could be arranged so that the west and north routes join together and the south and east routes join together (not shown in the figure) – this became Alternative #2.

Dual Node with Downtown Loops – The alternatives based on this concept also include a downtown transit center separate from the center of downtown. Routes would operate on a loop through downtown, serving both the transit center and the center of downtown only once each, in either order, before returning in the direction from which they came. This sort of downtown routing is not consistent with through-routed service. Bus volumes on the connector would be comparable to the through-routed alternatives. These alternatives would not provide any of the rider benefits of through-routing and could be somewhat confusing to riders since buses would not travel in both directions on the same downtown streets. Also, operating costs are expected to be greater than under the dual node through-routed alternatives but less than under the dual node alternatives with all routes terminating. For these reasons, these alternatives appear to be inferior to the “dual node with through-routing” alternatives.

Three Nodes – These alternatives attempt to spread out buses by developing three smaller transit centers surrounding downtown. Each route would serve two transit centers and would pass near, but not necessary through, the center of downtown demand. If most routes are through-routed, each of the three connecting segments would have lower bus volumes than in the other alternatives. Several different through-routing combinations are possible. Alternative #3 was developed to examine this concept.

Considering these conceptual alternatives, four specific alternatives were developed. Alternatives #1 and #2 follow the Dual Node Through-Routed concept. Alternative #3 follows the Triple Node concept. Alternative #4 follows the Single Node concept. These alternatives and are described more fully in Section 10.

8.3 Through-Routing Options and Impacts

The ability to continue or expand through-routing was critical in evaluating the alternatives and their variations. Through-routing affects the number and location of transfers, as well as bus operating costs. While a well-designed set of through-routes can reduce the number of transfers, reduce bus volumes and reduce operating costs, it can also help make a transit center that is located away from the center of downtown work more efficiently. Several possible new through-route combinations were identified that could improve the effectiveness of one or more of the alternatives.

The existing through-route pairings and the existing through ridership were documented in Section 3.3.4. It was noted that some through-routes have a much greater through ridership than others. There are currently seven through-route pairings. Three of these, routes K, Q and T, were found to have significant through ridership – enough so that breaking these pairings would likely produce an unacceptably high number of new transfers. One other through-route, Route A, exhibited a more moderate, but not insignificant, number of through riders. The remaining three, routes N, U, and W, exhibited so few through-riders that these pairings could be considered candidates for separation and possible combination with other routes if that supported a desirable new circulation path through downtown. These separate halves of these routes are referred to below by the CTRANSIT route code used for each half (NW, UA and WNM for the north halves and NC, UW and WV for the south halves).

While most of the major routes in Hartford are through-routed in the downtown, there are still fifteen routes that terminate downtown. Section 3.3.5 included a review of transfer patterns to and from these routes and noted some possible new through-route pairings. Through-routing of these routes would ideally be based on a higher than average number of transfers between them. It could also be based on a need to provide service to multiple parts of downtown that can be done more effectively with a single through route rather than two overlapping routes. However, to through-route two currently independent routes cost-effectively requires that they offer the same frequency of service at most times of day and days of the week. Otherwise, service levels would have to be changed on one or both routes, increasing costs or reducing the quality of service and possibly causing overcrowding.

The analysis of transfers on terminating (non-through) routes indicated a high volume of transfers to and from Route E. While the largest numbers of transfers to Route E were from the major through-routes, a reconfiguration of those routes to be through-routed with Route E would increase the number of transfers rather than reduce transfers. A more appropriate through-routing of Route E appears to be with the services from east of the river that terminate downtown. Route E is far more frequent than any one of those routes; however, it appears possible that a combination of three of those routes provide a comparable level of service to that of Route E. Route E could be through-routed with routes B, YM and Z. These three routes provide the bulk of service in a corridor extending east through East Hartford, Manchester and Vernon. The combined service on these three routes roughly matches the service on the three branches of Route E throughout the weekday schedule, although service on Route E slightly exceeds that on the other three routes at night and at some times on weekends.

Several pairings of other terminating routes also appear possible (based on matching existing service levels) and desirable (based on the need to maintain service to Main Street on all routes while also serving a transit center possibly located away from the center of downtown). Considering pairs of routes with comparable service levels and from different corridors, possible combinations include:

- **Route F1 (west) with WNM (north)** - these operate every 20 minutes in the mid-day; Route F1 operates every 15 minutes in peak periods while WNM operates only every 20 minutes (WNM also has no evening service)
- **Route F2 (south) with O (east)** - these operate every 30 minutes in the mid-day and every 20 minutes in peak periods (O has no evening service; F2 and O have no Sunday service). F2 could also be through-routed with B, Z, or YM (from the east) if these are not through-routed with E. Similarly, NC (south) or either half of Route A (AA from the west or AH from the south) could be used instead of F2.
- **Route H or J (east) with Route G or WV (south)** – these operate hourly in the mid-day and every 30 minutes in peak periods
- **Routes SW (west) and SG (north)** – these could be through-routed at all times (instead of the current peak periods only). These operate every 40 minutes in the mid-day and every 30 minutes in peak periods

There are additional pairings possible involving routes SW or SG; however, their unique 40 minute mid-day headways do not permit through-routing with other routes without changes to headways on at least one of the routes. If headway changes are made, these could be through-routed with H, J, G, or WV if SW or SG become less frequent or the other route becomes more frequent in the mid-day.

The possible combinations noted above were considered in developing the details of each of the four alternatives described in Section 10.

A review of the transfer matrix and the transfers that could be eliminated by these new through-routing combinations indicates that the aggregate impact of all of the above combinations would be only on the order of about 300 transfers eliminated, or less than 3% of the over 11,000 current downtown transfers. While new through-routing could conceivably encourage new through ridership and alter travel patterns over time, the most significant impact of increased through-routing may be in the ability to locate a downtown transit center away from the center of downtown without as large an increase in bus operating costs as might otherwise be required.

8.4 Corridor Re-Orientation Options

In considering the two alternatives based on the “dual node with through-routing” concept, the above through-routing combinations are possible only if the two routes come from corridors that enter the connecting segment (between the transit center and downtown) from opposite ends. This section discusses how some north and south routes could be

modified to approach downtown from the east and west corridors improving service to the east and west sides of downtown while making more through-routing combinations possible.

To move routes to the west side, three routes from the north and south could use a modified approach into downtown. Route SG (from the north) could be rerouted via Garden and Myrtle while routes F2 and WV (from the south) could be re-routed via Broad, Cogswell and Myrtle. The routes would then follow a west corridor routing instead of north or south corridor routings. This would facilitate through-routing of these routes with east corridor routes (O, H and J) and also Route G (which, as noted below, could be re-oriented to be from the east). This would also shift these routes onto a more direct route to Union Station as well as strengthen east-west service across downtown.

To move routes to the east side, three routes from the north and south could use a modified approach into downtown. These routes could be modified to become east corridor routes providing better service to the Columbus Boulevard area. This could be particularly beneficial in any alternatives where east corridor routes use I-84 instead of the Founders Bridge. To serve Columbus Boulevard south of the bridge, Route G could be re-routed via Charter Oak, Columbus, State, and Central Row where it would then operate like an east corridor route. To serve the area between the Founders Bridge and I-84, Routes WNM and NW could follow Market, Morgan, Columbus, State, and Central Row (Central Row and Market northbound) where they would then operate like east corridor routes. This will facilitate through-routing of these routes with west corridor routes (such as SG, SW and F1). This would also strengthen east-west service across downtown.

8.5 Commuter Route Options

As illustrated in Section 3.3.2, CTTRANSIT commuter bus riders generally do not transfer and have downtown destinations concentrated near the center of downtown with very few riders destined for Asylum Hill or Capitol Avenue. With very few riders transferring, it will be important to maintain service to the center of downtown near Main Street, Pearl Street and Central Row as the primary market for commuter services. Commuter bus service to a downtown transit center is unlikely to benefit many riders and may inconvenience the majority of commuter bus riders. Therefore, it may be most appropriate to maintain the existing commuter bus circulation patterns. Changes could be considered for two reasons: 1) changes in local bus routes and stops could concentrate too many local and commuter buses on some streets or concentrate too many local and commuter riders at some stops, or 2) the addition of commuter service from the New Britain Busway could require changes in the commuter bus circulation pattern.

Changes in downtown circulation for local buses may involve shifting some local buses to streets and bus stops currently used by commuter services. To resolve this conflict, it may be necessary to prioritize local bus service needs over commuter routes since over 75% of downtown origins are on local buses. Some of the alternatives would increase the number of local buses on Pearl Street and on Central Row, streets currently used by commuter bus services. Some alternatives also have local buses using stops now used by commuter buses. The commuter buses in some alternatives can be moved to nearby streets and stops in order to avoid overloading some downtown streets and bus stops while still maintaining good service to the center of downtown.

The express routes on the New Britain Busway will add more contracted commuter bus trips into the downtown from the west. These trips could exit either at Sigourney Street (serving Asylum Hill) or at Union Station and follow the same downtown circulation pattern as other west corridor commuter routes (rather than follow a local bus circulation pattern via the transit center as would busway services more characteristic of local bus routes). Alternatively, these commuter trips could use the Sigourney Street exit and serve a loop through Asylum Hill, downtown and Capitol Avenue, returning to the busway at Sigourney Street. This option for commuter trips from the west would replace the existing Capitol Avenue Loop service at a lower cost.

9.0 TRANSIT CENTER SITES

Most of the circulation alternatives depend on the identification of at least one suitable site for a transit center. This section explains how a transit center can be beneficial and what the requirements are for a suitable transit center site. It discusses how possible transit center sites were identified in downtown Hartford and how the possible sites were screened for feasibility and availability. Each of the seven resulting sites is compatible one or more of the four circulation alternatives. Selection of a final site depends on the recommended alternative and will require further evaluation subsequent to this study.

9.1 *Benefits of a Transit Center*

The prevalence of transfers in downtown Hartford emphasizes the need to make the service work for the majority of downtown local bus riders who are in the downtown for the purpose of transferring to another local bus route. The current on-street stops along Main Street provide minimal shelter for transferring riders. Many transferring riders must cross one or more wide downtown streets. The information booth is far away from the bus stops and there are few other amenities provided. It became apparent during the course of this study that a downtown transit center could provide a better environment for the large number of transferring passengers. A transit center would be:

- safe - with little or no need to cross the street
- dry - with more shelters and/or a waiting room
- convenient - with public rest rooms and concessions, and
- informative - with schedule and bus arrival information posted.

A transit center could also provide benefits to downtown businesses. The presence of many bus riders in an area provides customers for downtown businesses while moving transferring passengers away from downtown doorways where they can obstruct businesses. A clean, attractive facility could improve the perception of downtown, as will the reduction in the crowds of waiting riders sometimes blocking the sidewalk. While buses will still travel along downtown streets and pick up passengers at downtown bus stops, the buses will keep moving while on the street since they will complete their scheduled layovers inside the transit center facility. The removal of most bus layovers from the street would mean that less on-street curb space is needed to accommodate buses. A transit center with adequate layover facilities for buses can contribute to a better overall quality of service, including better on-time performance. Finally, transit centers can promote Transit Oriented Development (TOD) in an under-developed area. Federal funds used for development of a transit center can leverage private investment to revitalize areas on the edge of a downtown.

9.2 *Requirements of a Transit Center Site*

To achieve the above benefits an appropriate transit center site would need to be identified. The site would need to be of adequate size and shape, be relatively level, be in a location near most bus routes, have acceptable access to street network, and most importantly, be available for acquisition and development.

Parcel Size and Shape

A transit center large enough to accommodate all of the current downtown Hartford local bus routes, plus the local routes from the New Britain busway, is expected to require space for up to 20 buses. Depending on the configuration of the site, this could mean a space requirement of at least 1.5 acres. The space requirement could be less if some on-street spaces surrounding the facility are used. Rectangular parcels would work best. Irregular shapes may be difficult to use efficiently while square sites are less efficient than rectangular sites since they require more rows of fewer buses each.

Site Topography

A site needs to be level. Accessible bus stops require level boarding areas. The need for transferring riders to easily move between bus stops requires level pathways. Also, buses will typically access a transit center from multiple entry and exit points. These, and the streets they connect to, will have to be at the same elevation for the transit center to be on level ground.

Proximity to Bus Routes

While the exact location of a transit center may not be important to transferring riders, locating a facility away from bus routes can add substantial costs for the bus operator. Diverting far off an existing route can also add significant travel time to riders on the bus who are riding through the transit center and are not getting on or off. If bus routes terminate in the downtown ending at a transit center, the impacts on through riders can be eliminated but the increase in operating costs is likely to be high if the transit center is far from the downtown center. With most service through-routed, costs can be lower. A location near existing bus routes can further reduce costs as well as minimize travel time for through riders.

Access to/from the Street Network

In addition to the proximity to most bus routes, the access for buses into and out of some sites can be problematic. Difficulties can be caused by one-way and narrow streets; tight turns; congested roadways; restrictions on entry and exit points due to nearby intersections; elevation differences; restricted access caused by barriers such as highways, ramps, rail lines, water and other developments; and sensitive nearby land uses. Ideally, access should be at multiple points allowing buses to enter and exit from multiple directions dispersing bus volumes quickly without overloading any one street. Routes in and out should be as direct as possible with as few turns as possible. In some cases it may be best to have some routes, especially through routes, use on-street stops adjacent to the transit center rather than enter the transit center itself.

Site Availability

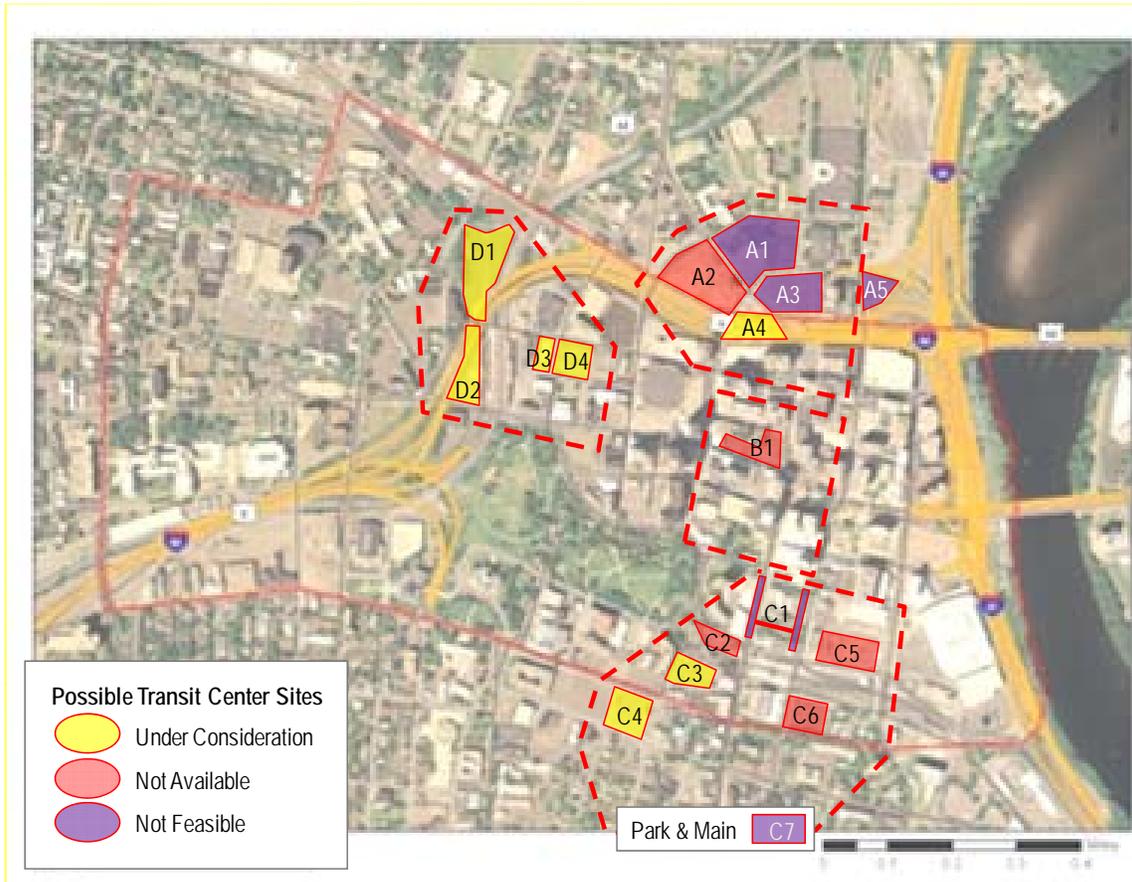
Most downtowns have few available sites meeting the other criteria. Publicly owned sites are often the most readily available. Otherwise, privately owned parking lots can be acquired for use as a transit center. City development plans often play a major role in determining which sites are considered appropriate for a significant transit facility. However, plans often change and sites can become available or unavailable during the course of the site selection process. While the availability of a site is often the most important deciding factor, it should not be the only factor. Care needs to be taken to avoid selecting a site in an available, but poor location. The cost, in terms of increased operating cost, passenger inconvenience and lost ridership potential can be significant if a poor site is chosen just because it is available. The potential for Transit Oriented Development (TOD) can also be a significant factor in locating a facility. Inclusion of TOD can sometimes overcome objections to the use of a particular site, and can promote transit use and boost ridership when implemented.

9.3 Preliminary List of Possible Transit Center Sites

An initial list of possible transit center sites was developed. The list was first developed through use of aerial photos of downtown. All undeveloped parcels of significant size in or near downtown were identified. Suggestions were also solicited from the Steering Committee. Most of the potential sites are currently surface parking lots. Figure 9-1 shows the sites identified. The sites identified fit into four general locations:

- A. On the north end of Main Street between Church and Pleasant
- B. On Main Street between Church and Gold
- C. On or near the south end of Main Street between Gold and Park
- D. In the Union Station area

Figure 9-1: Preliminary Transit Center Sites



Area A sites on the north end of Main Street between Church and Pleasant could be used by an alternative that uses a dual-node concept (either Alternative #1 that combines north and east services, or Alternative #2 that combines north and west services). One could also be part of a tree node alternative (such as Alternative #3). Area B sites centrally located on Main Street between Church and Gold would be most conducive to a single node alternative (such as Alternative #4). Area C sites on or near the south end of Main Street between Gold and Park could be used by an alternative that uses a dual-node concept that combines south and west services (such as Alternative #1). One could also be part of a Three Node alternative. Area D sites near Union Station would work best with a dual-node alternative that combines north and west services (such as Alternative #2) or as part of a three node alternative.

9.4 Screening of Sites

The sites were screened first considering feasibility as a transit center site and then availability of the parcel. Feasibility screening criteria included:

- Parcel size and shape
- Site topography
- Proximity to bus routes
- Access to/from the street network

Field observations were made at each site and a preliminary bus circulation pattern was considered for each site taking into account existing bus routes, site topography, and the adjacent street network.

Site A5 nearest I-91 was deemed not feasible due to size and the lack of access to the street network from more than one side. Site A3 on the north side of I-84 at Main Street was deemed not feasible due to the steep grade and lack of access points due to the steep congested one-way street and major intersection on the south side. Site A1 further north along the east side of Main Street also has problems with steep grades both on the site and on adjacent streets. Site A4, the I-84 deck between Main and Trumbull, is small and access would be difficult. It was initially eliminated but was later kept on the list as the best remaining site on the north side of downtown. Site C1, the site using Main and Prospect Streets connected by plaza next to City Hall, was deemed not feasible due to grades and lack of space on the Prospect Street side as well as limited overall capacity. Site C7 at Park and Main was eliminated due to its distance from many bus routes, especially those serving the east and west corridors.

The remaining sites were investigated for site availability. This was done primarily through conversations with the City of Hartford Department of Development Services, Planning Division. Site B1 at Main and Asylum is a privately owned site with active development plans. Plans are also moving forward with Site C5 at Arch and Columbus. Site C2 off Wells at Pulaski Circle is a city-owned parking and is not available for development. The City has plans for Site C6 at Sheldon and Prospect. The three large sites on Main Street north of I-84, including Site A2, are being held for a future major development. For the purpose of this study, these sites were all dropped due to their lack of availability. However, during a future site selection process, the availability of these sites should be re-assessed, as these sites may become available in the future. Also additional available sites not considered in this study may be identified and should be considered.

This left seven available sites which are listed by general area in Table 9-1. Each of these sites is compatible with one or more of the four circulation alternatives; however, not all sites are compatible with all alternatives. Thus, the selection of a recommended alternative will further narrow the list. Selection of a final site will then require further evaluation subsequent to this study.

Table 9-1: Feasible Available Transit Center Sites

Area	Site
A) On Main Street between Church and Pleasant	A4 - I-84 deck between Main and Trumbull
B) On Main Street between Church and Gold	<i>(no sites available)</i>
C) On or near Main Street between Gold and Park	C3 - Hudson Street east side between Linden and Elm
	C4 - Hudson Street west side between Capitol and Buckingham
D) In the Union Station area	D4 - High Street east side between Church and Allyn
	D3 - High Street west side between Church and Allyn
	D2 - Spruce Street parking lot at Union Station
	D1 - Hartford parking lot north of I-84 near Union Station

10.0 DESCRIPTION OF THE CIRCULATION ALTERNATIVES

As noted In Section 8, several circulation alternatives, each with numerous variations, were proposed during the course of the study. Variations were screened considering possible transit center locations, traffic circulation, transfer impacts and locations, complexity of operations, and possible operating cost impacts. This resulted in four alternatives remaining for detailed evaluation. The four alternatives reflect three of the five conceptual alternatives. Each alternative also incorporates some degree of the additional through-routing, reorientation of routes and commuter bus route adjustments presented in Section 7. This section presents the four alternatives and then discusses common elements before describing each of the four circulation alternatives in more detail.

10.1 *Downtown Circulation Alternatives*

The four alternatives were to be evaluated in detail are:

- **Alternative 1** – Through-route most services and develop a transit center on the southwest side of downtown. East and North routes serve stops near Main Street before continuing to the transit center where they would be through-routed to the West and South routes. (consistent with the *Dual- Node with Through-Routing* concept)
- **Alternative 2** – Through-route most services and develop a transit center on the northwest side of downtown. East and South routes serve stops near Main Street before continuing to the transit center where they would be through-routed to the West and North routes. (consistent with the *Dual- Node with Through-Routing* concept)
- **Alternative 3** – Through-route most services and develop three smaller transit centers on the north, south and west sides of downtown. Each route serves two centers so that all transfer connections can be made. Routes also make intermediate stops close to Main and Central Row. (consistent with the *Three Node* concept)
- **Alternative 4** – Minimize added travel time and mileage by maintaining a centrally located transfer point and developing an on-street transit center east of Main Street. Through-route most services. (consistent with the *Single Node* concept)

The four alternatives are shown in Figure 10-1 through 10-4. The elements common to all of the alternatives are described first below, followed by detailed descriptions of each alternative.

10.2 *Elements Common to All Alternatives*

All of the alternatives include increase the use of through-routing operations. Through-routing provides a more effective way to serve both the center of downtown and a transit center located away from the center of the demand in the city. Without through-routing, operating costs would be higher since buses from opposite sides of the city would both have to travel the segment between the transit center and the center of downtown demand along Main Street at Central Row. The increase in cost would be directly related to the distance between the transit center and the center of downtown. Given the distance from the center of most of the available transit center sites, increased through-routing appears to be necessary if a transit center is to be developed.

All of the alternatives maximize through-routing opportunities for that particular configuration. The combinations of routes that are through-routed differ for each one. Routes K, Q, T, and U remain through-routed in all alternatives. Routes A and N are treated differently depending on the alternative. Route W is separated in all alternatives with the northern section (WNM) through-routed with Route F1 and the southern end through-routed with Route J. Most east of the river routes are through-routed with other services in all alternatives. Route P is not through-routed in any alternative. The remaining routes are treated differently in each alternative.

Figure 10-1: Downtown Circulation Alternative #1

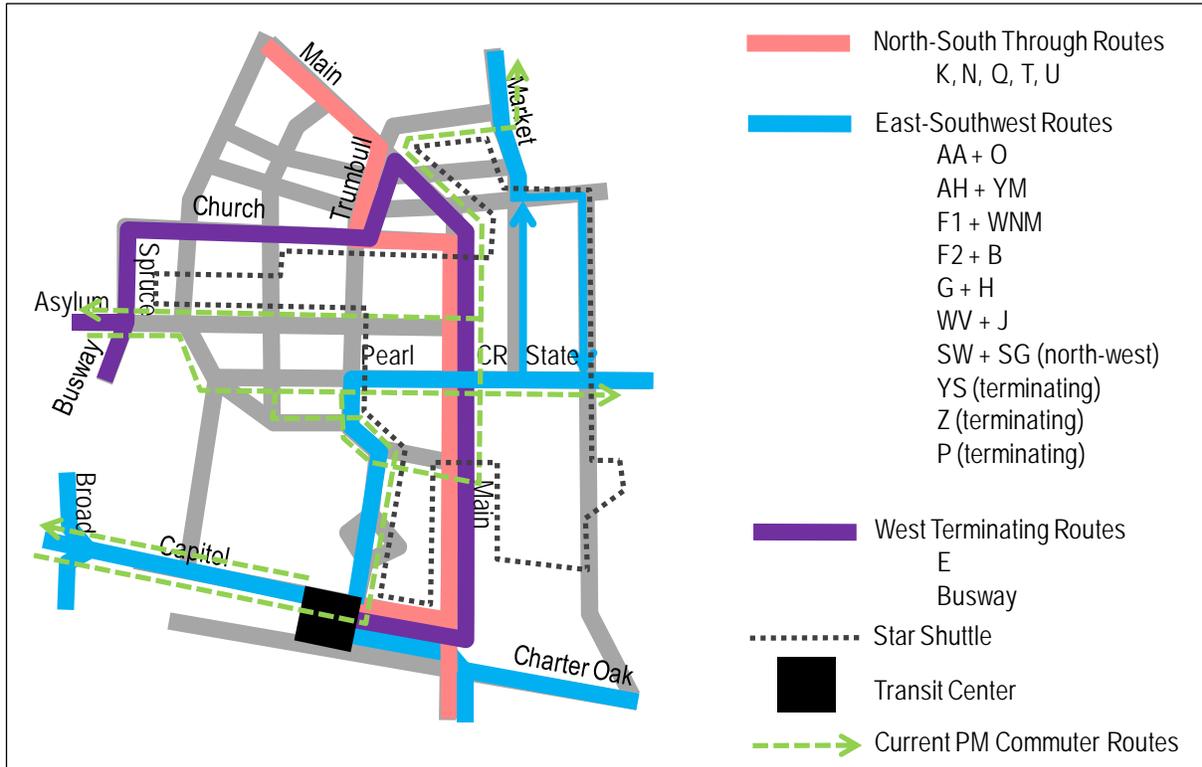


Figure 10-2: Downtown Circulation Alternative #2

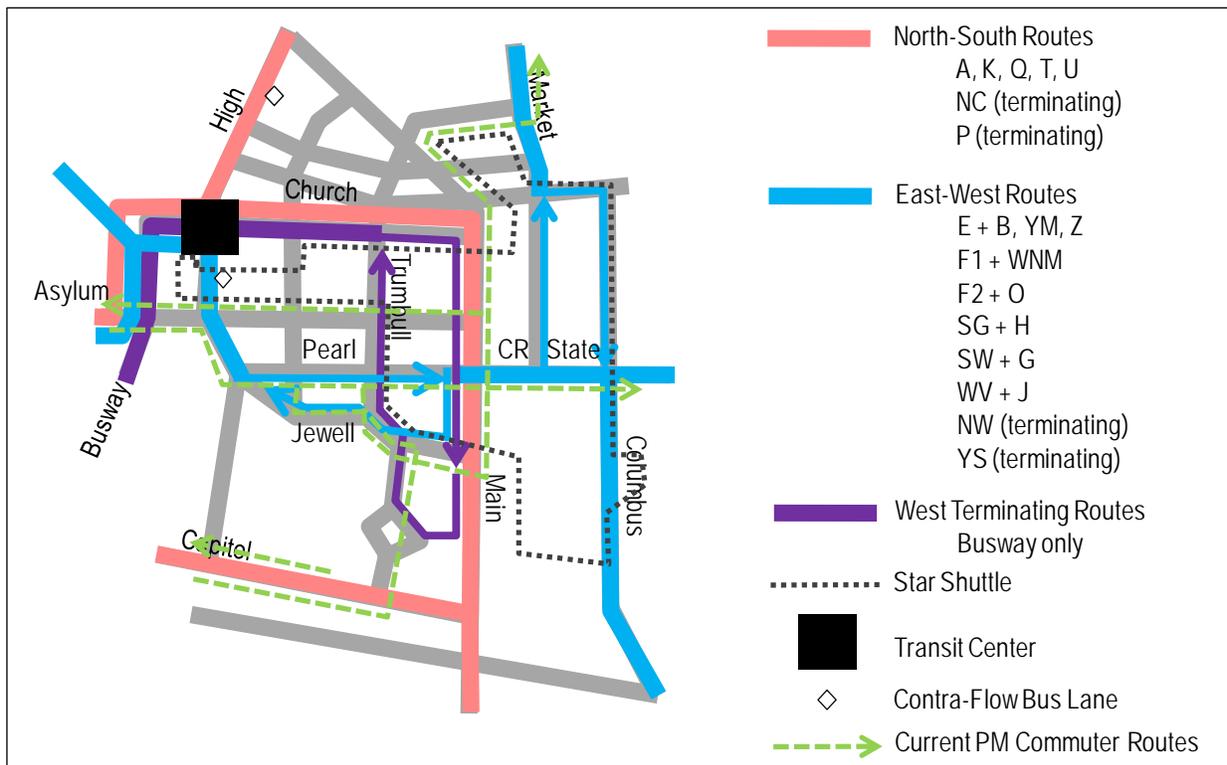


Figure 10-3: Downtown Circulation Alternative #3

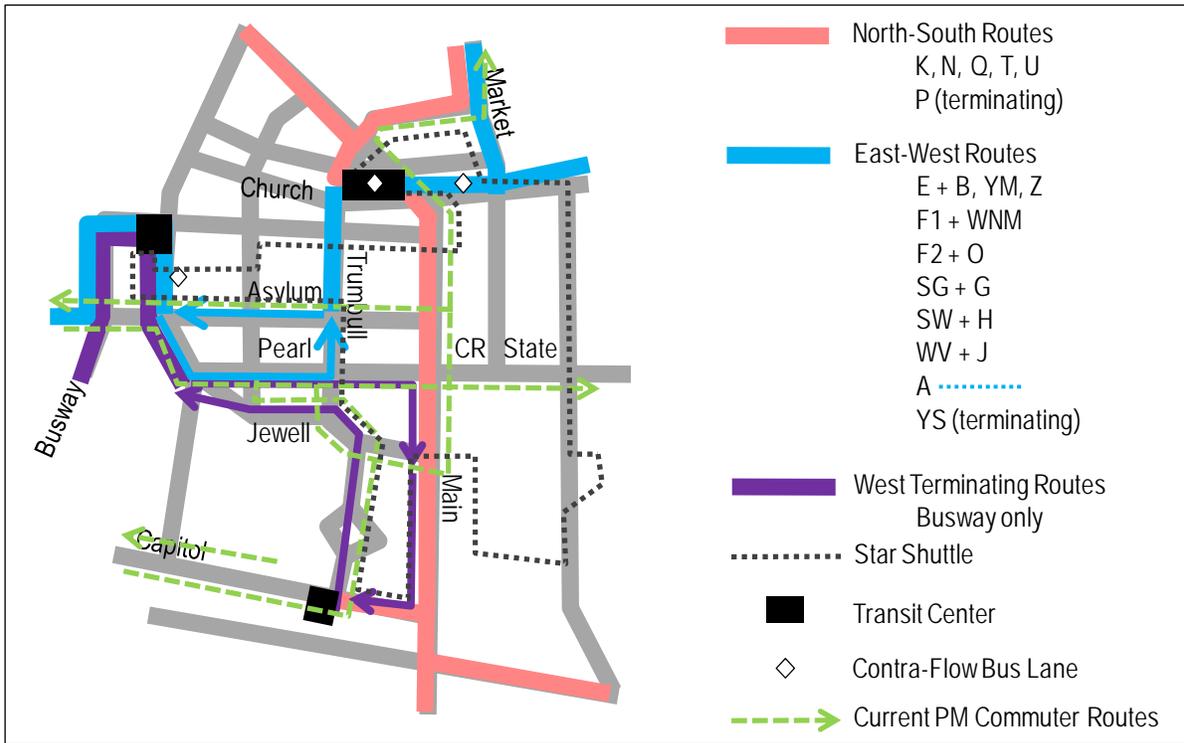
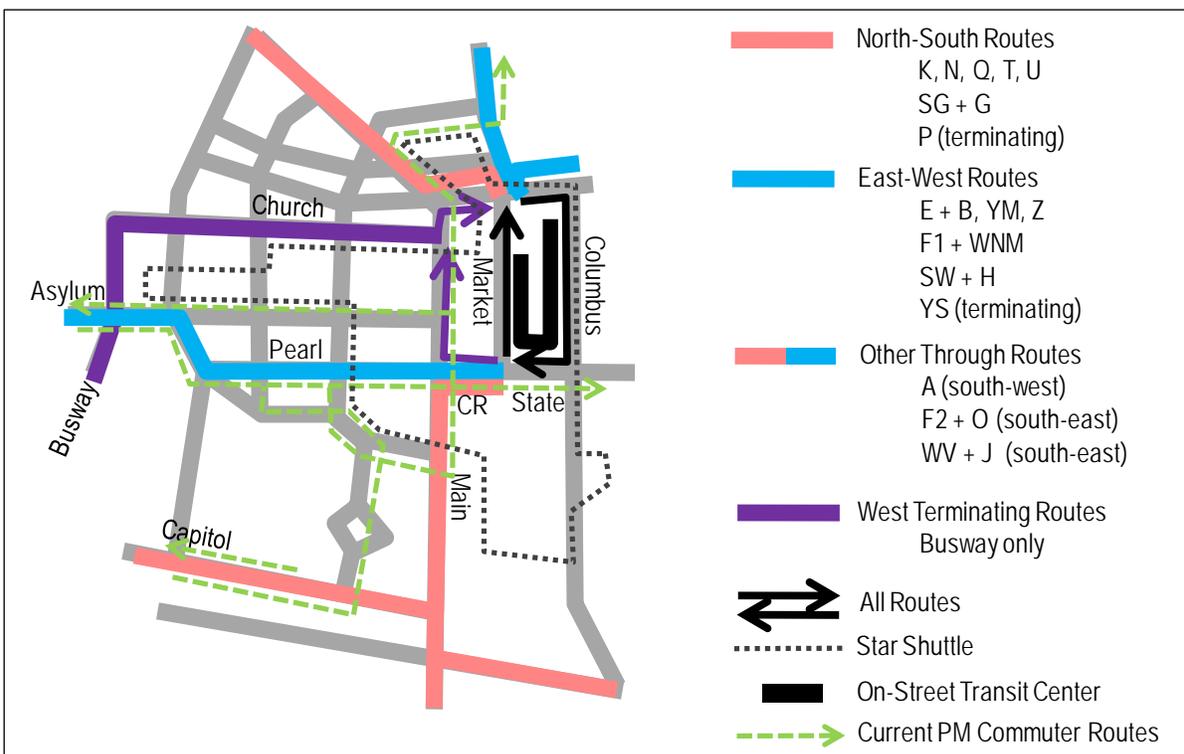


Figure 10-4: Downtown Circulation Alternative #4



For the purpose of evaluating and comparing the four alternatives, existing commuter routes were assumed to continue to operate as they do today. Nevertheless, it was recognized that, in some alternatives, it may be necessary to move some commuter routes off of streets proposed for heavy local bus traffic and away from stops that could be reprogrammed to become major local bus stops.

In all alternatives, local busway services would terminate downtown but the routing and terminal point would vary by alternative. Busway commuter services would operate the same as existing commuter services from the west and could be subject to the same route adjustments as other commuter services, depending on the alternative.

The unique elements of each alternative are discussed below. The basic concept of each alternative is presented first, followed by a description of the downtown routings and a discussion of transit centers sites that would be consistent with that alternative.

10.3 Alternative #1

10.3.1. Concept

This alternative, shown in Figure 10-1, is consistent with the "Dual-Node with Through-Routing" concept. Most services would be through-routed with west and south routes meeting at a transit center on the southwest side of downtown before continuing through downtown and on to the east and north. Because the availability of transit center sites in the southwest quadrant is limited by Bushnell Park and the State Capitol, the only possible sites are close to Main Street and the south corridor routes. Most routes from the west would need to be re-routed a substantial distance to Capitol Avenue and then be through-routed to the east or north.

10.3.2. Routes

Routes K, N, Q, T, and U would continue to be through-routed. Routes A and W would be split. The western segment of Route A (AA), as well as Routes SW and F1, would be re-routed from Asylum Avenue south on Broad Street and east on Capitol Avenue to reach the transit center. Route AA would then be through-routed with Route O. Route SW would be through-routed with Route SG, and Route F1 would be through-routed with Route WNM. These routes are shown in blue in the figure.

Routes WV, AH, and F2, which currently already approach downtown on Capitol Avenue, would also be through-routed to the east. Route WV would be through-routed with Route J. Route AH would be through-routed with Route YM and Route F2 would be through-routed with Route B. These routes are also shown in blue.

Route G, which approaches downtown from the southeast via Charter Oak Avenue would be through-routed with Route H. This is also blue in the figure. The only routes from east of the river that would not be through-routed would be Routes Z and YS which would terminate at the transit center.

The blue routes from the west and south that are through-routed to the east would travel from the transit center north on Hudson, Wells, and Trumbull before turning east on Pearl which becomes Central Row and then State Street before crossing the Founders Bridge. In the opposite direction these routes would follow the same streets. In order to balance the volume of buses on the north-south and the east-west routings through downtown, Routes N and F1/WNM would also follow this routing as far as Market Street where they would turn north instead of crossing the bridge. Inbound, they would use Columbus Boulevard to join the route at State Street.

In order to continue to provide direct service between Asylum Hill and downtown, Route E would not be re-routed to Capitol Avenue. Route E would continue to follow Asylum Avenue across I-84. It would then turn north along Spruce Street. There it would be joined by the busway local routes and turn east on Church Street before turning north on Trumbull Street and then south on Main Street through downtown to terminate at the transit center. In order for these

routes to terminate at the transit Center, Route E would not be through-routed nor could busway local routes be easily through-routed to other future corridors. These routes are shown in purple in the figure.

The five north-south through routes, shown in orange, would make two diversions off Main Street. In addition to serving the transit center south of downtown, approaching downtown from the north they would turn south on Trumbull and east on Church to return to Main Street. The same route would be reversed in the northbound direction. A secondary transfer point on Trumbull Street at the I-84 deck would serve passengers transferring between the north side routes and the busway local routes and Route E.

In this alternative, commuter routes to the east and south traveling along Pearl Street, Central Row and State Street could benefit from being relocated off of Pearl Street due to increased local bus volumes and local bus boarding activity on Pearl Street. Service could be relocated to Gold Street. The relocation of some routes off of Main Street would partially offset the additional Main Street volume resulting from busway vehicles. However, it may be desirable to relocate north and west commuter service to Market Street or Trumbull Street.

In this alternative, a significant modification to the Star Shuttle route would be needed to serve the transit center southwest of downtown. While all of the current stops would most likely be maintained, the route would have to be diverted to the transit center between Stop 2 (along Atheneum Square North) and Stop 3 (at Jewell and Trumbull). This diversion could follow Wells Street through Pulaski Circle to Hudson Street and back via the same route. Alternatively, the route could use Main Street on the way to the transit center. Returning from the transit center it could use Trinity to Jewell with Stop #3 relocated around the corner onto Trumbull.

10.3.3. Possible Transit Centers

This alternative could make use of either of the two remaining sites in the "on or near Main Street between Gold and Park" area (as well as any future sites identified that are west of Main Street and south of Bushnell Park). The two sites are Site C3, of the east side of Hudson Street between Linden and Elm, and Site C4 on the west side of Hudson Street between Capitol and Buckingham. For Site C3, buses to/from the north and south would need to access the site from Main Street using the Linden and Elm Street one-way pair. For Site C4, these buses south would need to access the site from Main Street using either Capitol Avenue or Buckingham. Buses to/from the west would approach both sites from Capitol Avenue, turning onto Hudson Street to reach the Hudson/Linden/Elm site. Buses to/from the east would use Hudson Street to Pulaski Circle.

The transit center would serve up to 135 buses in the peak hour. This would require between up to 16 bus bays for the current local bus routes. An additional three bays would be needed for busway service.

Under this alternative, a substantial number of transfers would occur at two other locations. First, as noted above, transfers between the busway services/Route E and north side routes would occur on Trumbull Street in the vicinity of the I-84 deck. North-to-west transfers would occur on the southbound side of the street while west-to-north transfers would occur on the northbound side of the street. Second, a substantial number of transfers between east routes and routes going north and to the busway would occur at the intersection of Main Street with Pearl Street and Central Row. Riders from the east headed north, to Route E or to the busway would alight on the north side of Central Row and board on Main Street at the Old State House. Riders from those routes going east would alight on Main Street just south of Pearl and board eastbound buses on Pearl Street.

10.4 *Alternative #2*

10.4.1. Concept

This alternative, shown in Figure 10-2, is also consistent with the "Dual- Node with Through-Routing" concept. Most services would be through-routed with west and north routes meeting at a transit center on the northwest side of

downtown before continuing through downtown and on to the east and south. (This differs from Alternative #1 in that the west routes join with the north routes at the transit center before traveling downtown, rather than join with the south routes.) Although this alternative could work with any transit center site in the northwest quadrant between Asylum Street and Main Street, the available transit center sites are all near Union Station and are closer to the west routes. Routes from the north would need to be re-routed off Main Street via High Street or Edwards Street to the transit center and then use Church Street to return to Main Street. West routes would use Spruce Street to reach the transit center but would then be through-routed to the east.

10.4.2. Routes

Routes A, K, Q, T and U would continue to be through-routed. Routes N and W would be split. The four north-south through routes (K, Q, T and U), when arriving from the north, would divert off Main Street to the transit center and return to Main Street via Church Street. These routes are shown in orange in the figure. For the transit center sites near High Street, as represented in the figure, these routes would use High Street between Main and the transit center (High Street would either need to be made two-way or a northbound bus lane would be needed.) For the sites closest to Union Station, Routes Q, T, and U could divert off Main Street at Edwards and use Edwards and Myrtle to reach a Union Station area transit center, while Route K would need to use High and Church streets and backtrack to the transit center. For any of the locations, Route A would be re-routed from Asylum Avenue along Spruce Street to Church Street and the transit center before joining the other through routes continuing south. The same routes would be reversed in the northbound direction. A secondary transfer point at the current transfer point on Main Street would serve passengers transferring between the south side of these routes and the east of the river routes. For any of these sites, the need to serve a transit center near Union Station would leave a gap in service along Main Street between High and Church Streets. While this area is underdeveloped now, future development in this area would not have a nearby bus stop.

The three routes (E, F1 and SW) from the west that currently terminate downtown would be through-routed to the east and would be re-routed via Spruce or Myrtle to Church Street to serve the transit center first before continuing through downtown via High (or Spruce and Asylum), Ford, Pearl, Central Row and State Street to the Founders Bridge. These routes are shown in blue in the figure. (High Street may need to be made two-way or a northbound bus lane would be needed.) These routes would receive transferring passenger from south side routes on Central Row. Returning from the east they would turn south onto Main Street to drop off riders making transfer connections to south side routes before turning west onto Gold to Jewell and Ford. Route E would be through-routed with a combination of Routes B, YM and Z. Route SW would be through-routed with Route G, and Route F1 would be through-routed with Route WNM.

Two of the routes (WV and F2) that currently approach downtown on Capitol Avenue from the south would be through-routed to the east and re-routed via Broad, Cogswell and Myrtle to approach the transit center from the west before continuing through downtown to the east. Similarly, Route SG from the north would be re-routed down Garden and Myrtle to serve the transit center from the west and continue east. Route WV would be through-routed with Route J. Route F2 would be through-routed with Route O. Route SG would be through-routed with Route H. These routes are also shown in blue.

As they leave the transit center, Routes SW/G, F1/WNM and NW would follow the east-west routing to Central Row. Routes F1/WNM and NW would turn north onto Market Street. Inbound, they would use Columbus Boulevard to join the route at State Street. Route SW/G would turn onto Columbus Boulevard before it reached the bridge.

In this alternative, Routes YS and NW would follow the east (blue) route to the transit center and terminate there. Routes P and NC would follow the south (orange) route to the transit center and terminate there.

Busway local bus services, shown in purple, would terminate downtown. In this alternative, their layover point would not be in the transit center, but would rather be on Main Street, probably between Gold and Wells where there is

currently available curb and sidewalk space. Busway local routes would exit the busway and follow Spruce, Church and Main to the terminal point. They would return via Wells and Trumbull to Church Street. The purpose of the Main Street layover is to allow busway vehicles to serve both transit center and Main Street riders without delays to passengers resulting from buses waiting at the layover point. In the future, these busway routes could easily be extended to other corridors.

In this alternative, commuter routes to the east and south traveling along Pearl Street, Central Row and State Street would not encounter increased local bus volumes on Pearl Street. Instead, their stop on Central Row would become a major local bus boarding stop for eastbound riders, including transfers from south side routes. Commuter stops would need to be relocated. Possibly locations include Pearl Street, Gold Street, State Street or Market Street. Similarly, the Main Street stop for north and west commuter service would become a local bus stop for riders from the south transferring to east side routes. The commuter stop may need to be relocated up or down Main Street, or service could be relocated to Market or Trumbull Street.

In this alternative, a minor modification to the Star Shuttle route would be needed to serve the transit center in the vicinity of Union Station. The extent of the modification will depend on the selected site for the transit center. Stop #8 currently serves Union Station on Union Place while Stop #9 is on Allyn Street at Ann Street. A transit center on the Spruce Street side of Union Station would suggest moving Stop #8 to Spruce Street. A High Street transit center could involve moving Stop #9 closer to High Street.

10.4.3. Possible Transit Centers

This alternative could make use of any of the four remaining sites in the Union Station area (as well as any future sites identified that are west of Main Street and north of Asylum Street). The four sites include the two sites on either side of High Street at Church Street (D3 and D4), the Spruce Street parking lot at Union Station (D2), and the Hartford parking lot across I-84 from Union Station (D1). For the High Street sites, buses to/from the north would use High Street (which would need to be converted to two-way or a northbound bus-only lane added). For the two Union Station sites, most buses to/from the north would use Edwards and Myrtle Street from Main Street. Buses to/from the west, including busway buses, would use Spruce Street to access the Union Station sites and would continue on Church Street to access the High Street sites. Buses to/from the east would use High Street (which would need to be converted to two-way or a northbound bus-only lane added) to reach the High Street sites and continue on Church Street to access the Union Station sites. Buses to/from the south, as well as busway buses to/from Main Street, would use Church Street.

The transit center would serve up to 154 buses in the peak hour. This is higher than the transit center in Alternative #1 because each busway bus will serve the transit center twice on each round trip (once inbound to drop off riders and once outbound to pick up riders). This transit center would require between up to 16 bus bays for the current local bus routes. An additional four bays (one inbound and three outbound) would be needed for busway service.

Under this alternative, a substantial number of transfers would occur at the intersection of Main Street with Pearl Street and Central Row. Riders from the east transferring to south side routes would transfer on Main Street just south of Pearl. Riders from south side routes going east would alight on the east side of Main Street before Central Row and board on the south side of Central Row.

10.5 *Alternative #3*

10.5.1. Concept

This alternative, shown in Figure 10-3, is consistent with the "Three Node" concept. Three smaller transit centers would be developed on the north, south and west sides of downtown. Not all routes would serve each transit center, but each route would serve two centers so that all possible transfer connections can be made. Most services would

be through-routed. North-south routes would continue to be through-routed. East and west routes would be through routed and would intersect north-south routes at the north side transit center. Busway services would terminate downtown. They would intersect east-west routes at a west side transit center (near Union Station) and would continue on to terminate at a south side transit center where connections would be made with north-south routes. All routes would also serve stops on or near Main Street to serve riders with downtown destinations.

10.5.2. Routes

Routes A, K, N, Q, T and U would continue to be through-routed. Only Route W would be split. Routes SG and G would be through-routed to form a new north-south through route. The five current north-south through routes (K, N, Q, T and U) and Route SG/G would divert off Main Street only as far as is needed to serve the north and south transit centers. These routes are shown in orange in the figure. Connections to east-west routes would be made at the north transit center. Connections to the busway would be made at the south transit center. Riders with downtown destinations would continue to use Main Street stops.

As in Alternative #2, the three routes (E, F1 and SW) from the west that currently terminate downtown would be re-routed via Spruce or Myrtle to approach the west transit center from the west. Also as in Alternative #2, routes F2 and WV would follow Broad, Cogswell and Myrtle to approach the west transit center. Connections to busway services from these routes would be made at the west transit center. These five routes are shown in blue in the figure. Also shown in blue, Route E would be through-routed with a combination of Routes B, YM and Z. Route SW would be through-routed with Route H, and Route F1 would be through-routed with Route WNM. Route F2 would be through-routed with Route O and Route WV would be through-routed with Route J. All of these routes would be through-routed to the east and would continue through downtown via High, Ford, Pearl (Asylum going westbound), and Trumbull to the north transit center where connections would be made to north-south routes. (High Street would either need to be made two-way or a northbound bus lane would be needed, or with some transit center sites, Spruce could be used instead.) Riders with downtown destinations would need to use new bus stops on Trumbull Street as these routes would not serve stops on Main Street. From the north transit center these routes would continue to the east via Morgan Street and the I-84 Bridge.

Busway local services would terminate at the south transit center. They would exit the busway and use Spruce and Church streets to the west transit center where connections would be made to east-west routes. They would proceed along High, Ford, Pearl, Main, and Capitol to the south transit center where connections would be made to north-south routes. They would return via Hudson and Jewell before returning to the inbound route at Ford Street. Riders with downtown destinations would use a stop along Main Street. Riders transferring to north-south routes may also prefer this stop instead of using the south transit center. Extension of busway services to other corridors would require some modification to this routing.

Route A, shown as a dotted blue line, would follow a unique routing almost identical to its current route. It would use Spruce and Church streets to reach the west transit center where connections would be made to east-west routes. It would follow the east-west routes as far as Trumbull Street but would then follow its existing routing along Main Street to Capitol Avenue. At the south transit center, connections would be made to north-south routes.

In this alternative, Route YS would follow the east-west route and terminate at the west transit center. Route P would terminate at the north transit center.

In this alternative, commuter routes to the east and south traveling along Pearl Street, Central Row and State Street could continue to use the commuter stop on Central Row. These routes would encounter some increased local bus volumes on Pearl Street, especially west of Trumbull Street, so some adjustments to commuter routes may be needed in that area. Main Street would actually experience a reduction in bus volumes and the commuter bus stop for north and west commuter service would not be affected by local bus changes.

Several changes in the Star Shuttle would be needed to serve the three transit centers. Both of the changes described under Alternatives 1 and 2 would be needed, as well as some modifications between Stops #11 and #13 to serve the north transit center. The exact changes needed would depend on the transit center sites chosen.

10.5.3. Possible Transit Centers

For the south transit center this alternative could make use of either of the two remaining sites on the south side (C3 or C4). Buses to/from the north and south would need to access the sites from Main Street via Elm/Linden, Capitol, or Buckingham as described under Alternative #1. Busway buses would access the site from Main Street but would exit onto Hudson Street to Pulaski Circle. Only Route A would approach from Capitol Avenue. The south transit center would serve an estimated 91 buses in the peak hour. This would require between up to 12 bus bays for the current local bus routes. An additional three bays would be needed for busway service.

For the west transit center this alternative could make use of either any of the four sites in the Union Station area. Buses to/from the east and west would need to access the sites as described under Alternative #2 using Spruce, Church and High. Busway buses would access the sites from the west, as in Alternative #2, but would access the sites from Main Street via High Street just like the routes from the east. The west transit center would serve an estimated 90 buses in the peak hour. This would require between up to 10 bus bays for the current local bus routes. An additional three bays would be needed for busway service.

For the north transit center, the only site listed as available is the deck over I-84 (Site A5). This site could be too small to be considered for a full transit center, but was believed to be large enough to be one of three. North-south buses would need to follow Main, Trumbull and Morgan before turning back on to Main Street. The Morgan Street one-way pair would need to be made two-way or have contra-flow bus lanes added. Buses would have to access the deck on-street or a feasible off-street design using the deck would have to be identified. Because this transit center would serve both the heavy north-south corridor and the east-west corridor, the north transit center would serve an estimated 110 buses in the peak hour. This would require between up to 15 bus bays, which may not be possible given the constraints at this site.

10.6 *Alternative #4*

10.6.1. Concept

This alternative, shown in Figure 10-4, is consistent with the "Single Node" concept. A centrally-located on-street transit center would be located on three sides of the block bounded by Columbus Boulevard, State Street, and Market Street. The facility would consist of a large number of on-street bus stops with no off-street facility. Most services would be through-routed in order to reduce bus volumes at the transit center but through-routing is otherwise not an essential part of this alternative.

10.6.2. Routes

While through-routing is not essential to make this alternative work, through-routing as many routes as possible will reduce the number of buses circling the block formed by Columbus, State, Market and Morgan. A counter-clockwise circulation pattern, shown in black in the figure, would be established around this block so that riders could walk between all stops without crossing a major street.

As in other alternatives, north-south routes, shown in orange, would generally remain through-routed, while east and west routes, shown in blue, would be joined into new through-routed combinations. North-south routes traveling southbound would follow Main Street, Morgan, Columbus, State and Central Row before returning to Main Street. Northbound they would follow Main Street, Central Row, Market and Morgan to Main Street. Southbound stops would be on Columbus or State. Northbound stops would be on Market. East-west through routes going eastbound

would follow Asylum, Ford, Pearl, Central Row, Market and Morgan to the I-84 Bridge. Westbound they would follow I-84 to Morgan (westbound), Market, Morgan (eastbound), Columbus, State, Central Row, Pearl and Ford to Asylum. Westbound stops would be on Columbus or State. Eastbound stops would be on Market.

Busway local services, shown in purple in the figure, would terminate at stops on Columbus Boulevard. They would exit the busway onto Spruce and proceed to Church Street. They would turn around using a loop following Main Street (northbound), Morgan, Columbus, State, Central Row, and Main Street (northbound) to Church. Future extension to other corridors could be easily accommodated.

All existing through-routes would remain, except for Route W. Routes K, Q, T and U would follow the standard north-south routing. Route N would arrive on Market Street from the north, rather than Main Street, but would otherwise follow the north-south routing. Route A would continue to be a west-south route, making a complete circuit of the transit center block in each direction.

Routes SG and G would be through-routed to form a new north-south through route. East-west through-route combinations would be similar to those in Alternative #3. Route E would be through-routed with a combination of Routes B, YM and Z. Route SW would be through-routed with Route H, and Route F1 would be through-routed with Route WNM. There would also be two south-east through-route combinations since the central location of the transfer facility allows more possible combinations. Route F2 would be through-routed with Route O and Route WV would be through-routed with Route J.

Routes YS and P would terminate at the transit center making a full circuit around the block. As noted above, most routes do not have to be through-routed for this alternative to work. Any of the through-routed combinations could be operated as two separate routes with buses making a full circuit around the block to return in the direction from which they came. The only impact would be an increase in bus traffic on that block and the impacts on through ridership. If east-west routes are split, then the remaining east side route could use the Founders Bridge in one or both directions, eliminating the need for the east side route to circle the block.

In this alternative, commuter routes to the east and south traveling along Pearl Street, Central Row and State Street would encounter significantly increased local bus volumes on Pearl Street and Central Row. Pearl Street stops would be shared with east-west local routes and may need to be relocated. These routes could, however, continue to use the Central Row commuter stop since local buses would turn onto Market Street rather than use this stop. Main Street, south of Central Row, would actually experience a slight reduction in bus volumes and the commuter bus stop for north and west commuter service would not be affected by local bus changes.

Unlike in any of the other alternatives, no changes would be needed to the Star Shuttle route. Stop #14 and Stop #15 may need to be relocated or combined to accommodate the large number of routes that would stop on Columbus Boulevard.

10.6.3. Possible Transit Centers

This alternative would not make use of an off-street transit center site. Instead, on-street stops on Market, State and Columbus would be used. The transit center would serve up to 135 buses in the peak hour. This would require between up to 16 bus bays for the current local bus routes split evenly between Market and Columbus/State. An additional three bays would be needed for busway service on Columbus Boulevard.

11.0 EVALUATION OF ALTERNATIVES

The four alternatives described in Section 10 are evaluated in detail in this section. The evaluation begins with a discussion of the common elements of the alternatives before detailing the evaluation methodology and comparing the alternatives with respect to the revised evaluation criteria described in Section 7. The ratings and advantages and disadvantages of each alternative are then summarized and a final comparison is made.

11.1 *Impacts and Elements Common to All Alternatives*

While there are significant differences between the four alternatives, there are some impacts common to all of the alternatives included in the final evaluation. First and foremost, all four alternatives include improved facilities for downtown transfers. In all cases, a sizeable majority of downtown transfers would take place in one of more downtown transit centers. All routes serve one or more transit centers in each alternative such that each route intersects with every other route thus continuing the current situation limiting all trips to no more than one transfer. All routes also serve at least one stop at or close to Main Street and Central Row so that those riders who do not transfer maintain access to the center of downtown.

While the goal was to create a circulation pattern where as many transfers as possible could take place in a transit center in all alternatives, there are some transfer movements that would still take place elsewhere. In developing the details of each alternative, an effort was made to minimize the number of riders who would have to cross downtown streets to transfer. Bus routings and transfer stop locations were identified to make transfers as convenient as possible given the circulation concept represented by the alternative and the feasible transit center sites available for each alternative.

Finally, with a goal of minimizing additional operating costs, as well as limiting the volume of buses on downtown streets, each alternative includes the maximum amount of through-routing that was feasible. While through-routing creates longer routes that can be more challenging to manage, the operating cost of alternatives with a transit center away from the center of downtown can be minimized by through-routing much of the service.

11.2 *Evaluation Methodology*

The application of the revised evaluation criteria described in Section 7 required the development of measures for each of the criteria. The measures fall into three categories: 1) effective use of transit centers, 2) efficiency and effectiveness of service, and 3) traffic impacts. It was possible to use quantitative measures for a few of the criteria, but it was more appropriate to rely on qualitative assessments in cases (such as travel time) where the relative impacts could be determined without exact measurements. The measures used were as follows:

Effective Use of Transit Centers

- **Utilization of Transit Centers** – The number of daily transfers expected to occur at off-street transit centers
- **Capital Cost of Transit Centers** – An assessment of the relative capital cost of the transfer facilities needed for each alternative
- **Capacity/Quality of Transit Centers** – An assessment of the number and size of available options for transit center sites and the possibility of creating high quality amenities at the site(s)

Efficiency and Effectiveness of Service

- **Through and Transferring Riders** – A qualitative assessment of the change in total travel time for transferring riders resulting from relocation of the points at which transfers would be made; also the change

in total travel time for passengers riding through downtown as well as the number of passengers having to transfer versus having a through trip

- **Riders into Downtown** – An assessment of the extent to which alternatives preserve the current direct route into downtown for most passengers
- **Riders within Downtown** – an assessment of the extent to which an alternative establishes an east-west connection across downtown and/or has more frequent service to the Union Station area and/or the area east of Main Street
- **Bus Operating Costs** – an estimate of the relative impact of each alternative on bus operating costs

Traffic Impacts

- **Bus Volumes on Downtown Streets** – the number of buses per hour in peak hours on the key downtown streets such as Main Street, Trumbull Street, Church Street, Pearl Street, Asylum Street, Market Street and Columbus Boulevard
- **Traffic Issues and Circulation Changes** – an assessment of the extent to which the alternative can be accommodated without changes to the downtown traffic circulation pattern

The following three sections discuss the evaluation in each of the three categories. These are followed in Section 11.6 by a summary of the evaluation for each alternative, including an enumeration of the advantages and disadvantages of each alternative. Section 11.7 presents a summary comparison of the four alternatives.

11.3 Analysis of Use of Transit Centers

Utilization of Transit Centers

As noted in Section 3.3.1, the current number of daily transfers between local buses in the downtown area is estimated to be about 11,491. These transfers primarily occur at on-street bus stops in the area of Main Street, Central Row and Market Street. Only about 2,400 of these transfer movements can be made without changing bus stops, which means that just over 9,000 of these transfers involve crossing the street to change buses. The streets most crossed are Market Street, Main Street and Central Row, with some transfers requiring passengers to cross all three.

It is noted in Section 4.1 that an estimated 3,981 additional downtown transfers will result from riders on the New Britain Busway, for a daily total of 15,472 local bus transfers. The likely locations of these transfers were determined for each of the four alternatives and are shown in Figures 11-1 through 11-4. The transfers are categorized below in Table 11-1.

Table 11-1: Summary of Estimated Transfer Locations

	Alternative			
	1	2	3	4
Inside the Transit Center	8,244	11,578	13,267	12,637
Main/Pearl/Central/Market	2,596	1,753	0	0
Trumbull Street	2,263	0	0	0
Crossing one or more streets	2,100	1,629	1,657	2,287
New through riders	269	512	548	548
Rating for Utilization of Transit Centers	moderate	high	very high	very high

Figure 11-1: Daily Transfer Volumes - Alternative 1

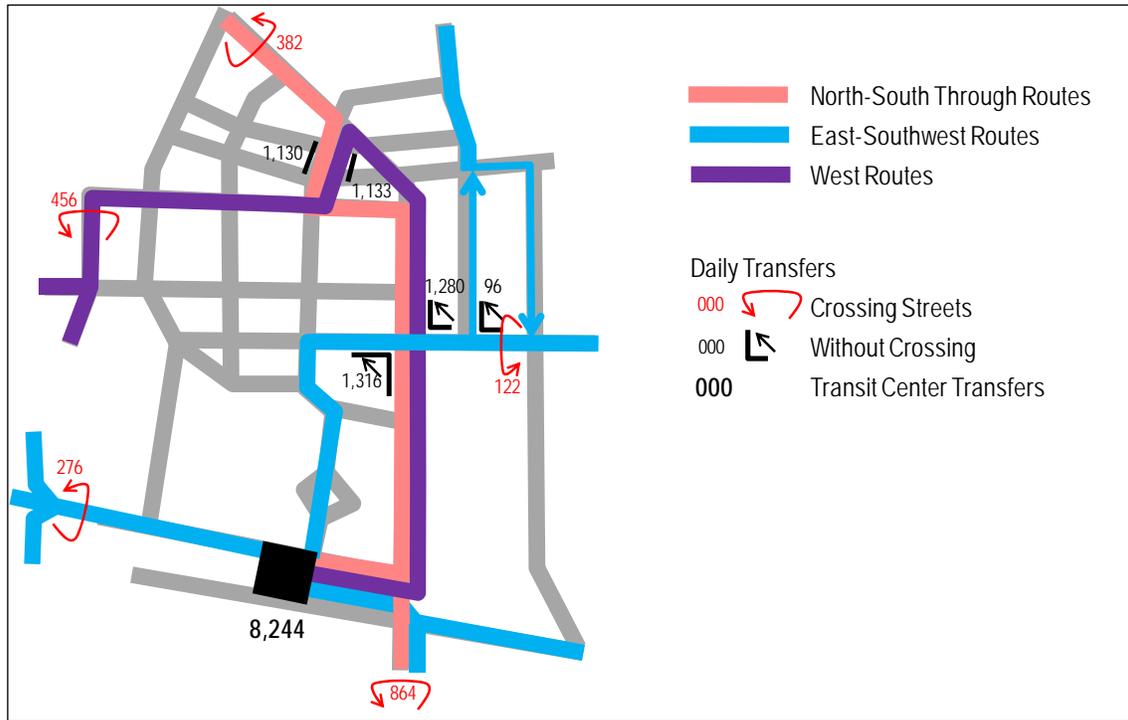


Figure 11-2: Daily Transfer Volumes - Alternative 2

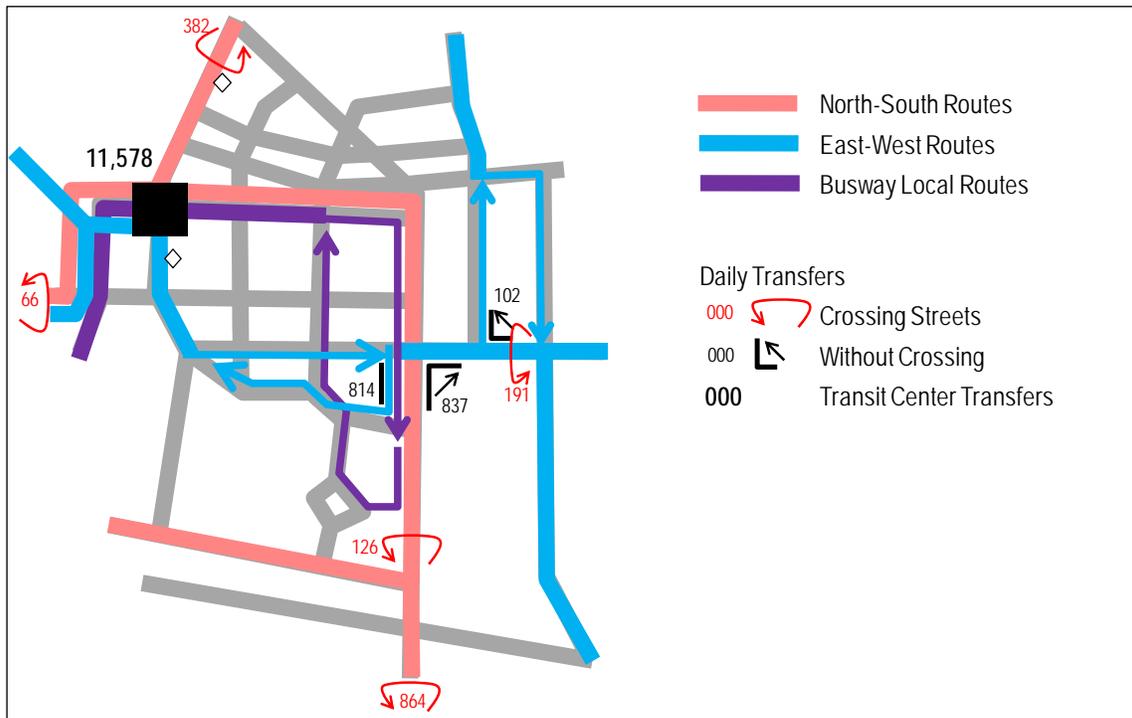


Figure 11-3: Daily Transfer Volumes - Alternative 3

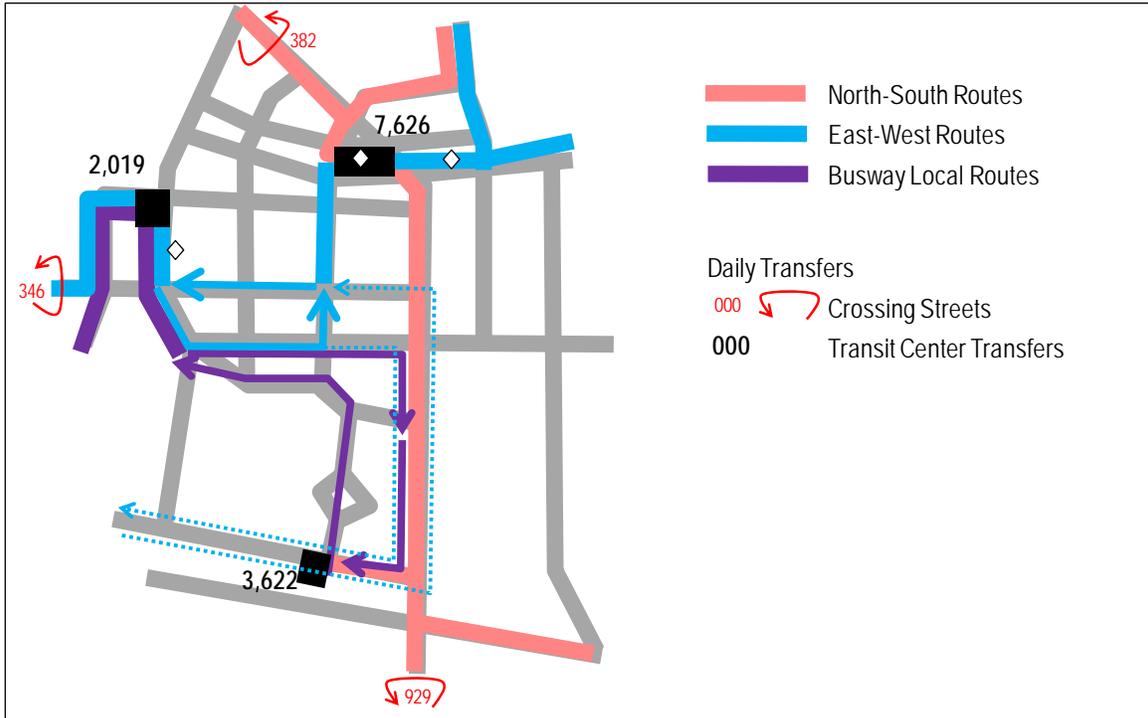
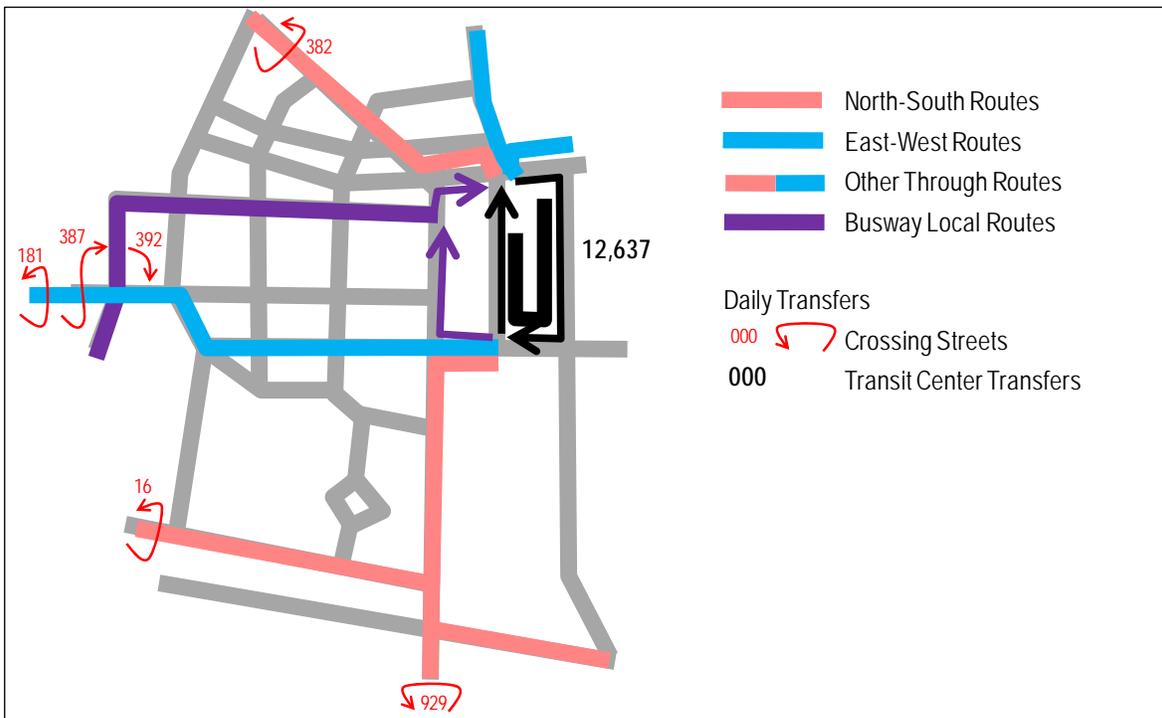


Figure 11-4: Daily Transfer Volumes - Alternative 4



The table and Figure 11-1 show that Alternative 1 would result in 8,244 transfers occurring in the transit center. A significant number of transfers between east of the river routes and the west and north side routes would occur at the Main, Pearl and Central Row intersection. All of these transfers could be accommodated without having to cross the street (provided that far side stops are provided on Main Street and near side stops are provided on Pearl and Central Row). In this alternative, a significant number of transfers would also occur at a transfer location on Trumbull Street at the I-84 deck. While these are also outside the main transit center, they could also be accommodated without having to cross the street, giving the routings shown for north-south routes and for west and busway routes. There would also be about 2,100 transfers crossing the street, mostly between routes within the same corridor at the points at which two routes intersect as they approach downtown. The relatively high number of transfers outside the transit center (despite few transfers crossing the street) resulted in only a moderate rating for utilization of transit centers for Alternative 1.

In Alternative 2, the number transferring in the transit center is higher. All of the Main Street and Trumbull Street transfers from Alternative 1 would occur at the transit center while transfers between east and south routes would occur at Main and Central Row instead of in the transit center. The net effect is over 3,300 additional transfers in the transit center. There are also almost 500 fewer transfers crossing the street primarily because transfers between busway and west corridor routes could occur inside the transit center instead of across Spruce Street. Therefore, Alternative 2 was given a high rating for utilization of transit centers.

In Alternative 3, all transfers, with the exception of transfers between routes in the same corridor, are likely to occur within one of the three transit centers. In Alternative 4, nearly all transfers would occur in the on-street transit center on Market, State and Constitution. With virtually all transfers in transit centers, Alternatives 3 and 4 were each given very high ratings for utilization of transit centers.

Capital Cost of Transit Centers

The alternatives would differ in terms of the capital cost for the transit center facilities. Alternatives 1 and 2 require a transit center handling 135 and 154 buses per hour, respectively. Alternative 3, with its three transit centers, would require three centers each handling 90-110 buses per hour. With each of the three roughly two-thirds the size of the Alternative 1 and 2 centers, the total capital cost of the three facilities is likely to be at least twice as much for Alternative 3. Therefore Alternative 3 was given a low rating for capital cost, while Alternatives 1 and 2 were given moderate ratings. The capital cost for Alternative 4 is likely to be less than the other alternatives, since the transit center would use existing streets and sidewalks and would involve only improvements in shelters and passenger amenities. Therefore, Alternative 4 was given a high rating for its lower capital cost.

Capacity and Quality of Transit Centers

The alternatives would also differ in terms of the number and adequacy of potential transit center sites, as well as the level of amenities that could be provided. The screening of transit center sites in Section 9 identified multiple feasible and available sites of adequate size for both Alternatives 1 and 2, so these were given very high ratings for transit center capacity and quality. The two sites could also serve as two of the three required transit centers for Alternative 3; however, a sufficiently large north side transit center site does not appear to be available, so Alternative 3 was given a moderate rating. The Alternative 4 site appears to have adequate capacity, but the level of amenities that could be provided and the necessarily more spread out layout of the on-street facility resulted in a very low rating.

Summary – Use of Transit Centers

Ratings for the Use of Transit Centers are summarized in Table 11-2.

Table 11-2: Ratings for the Use of Transit Centers

	Alternative			
	1	2	3	4
Rating for Utilization	moderate	high	very high	very high
Rating for Capital Cost	moderate	moderate	low	high
Rating for Capacity and Quality	very high	very high	moderate	very low

11.4 Analysis of Efficiency and Effectiveness of Service

Through and Transferring Riders

The location of a transit center and other transfer points within the downtown will have a significant impact on the travel time for transferring riders. Section 8.1 described conceptual alternatives where corridors of routes intersected before reaching the center of downtown. Alternatives 1 through 3 employ different ways of connecting routes for transfers outside the center of downtown. This impacts how quickly passengers are able to make connections once they arrive in the downtown area.

The connections between each possible pair of the four corridors of regular routes (north, south, east, west) was evaluated, with the busway treated as a fifth corridor. The comparison, shown in Table 11-3, was a qualitative assessment comparing the distance traveled within the downtown to make each possible connection. If the total distance traveled to make the transfer would be slightly or significantly less than under the current situation, a high (or very high) rating was given. If the total distance would be slightly or significantly greater, a low (or very low) rating was given.

Table 11-3: Travel Time Impacts on Transferring Riders

	Alternative			
	1	2	3	4
West - North	very low	very high	moderate	moderate
West - South	very high	moderate	low	low
East - North	high	moderate	very high	high
East - South	high	high	moderate	high
West - East	low	moderate	moderate	moderate
North - South	low	low	low	low
Busway - North	high	very high	very low	low
Busway - South	low	moderate	moderate	low
Busway - East	moderate	moderate	high	high
Busway - West	very low	very high	very high	high
Rating for Transferring Riders	low	very high	moderate	moderate

For Alternatives 3 and 4, the number of low ratings almost exactly offset the number of high ratings so a moderate overall rating was given for this measure. Alternative 1 has slightly more low ratings so it received a low overall rating, while Alternative 2 received a very high rating due to the number of high and very high ratings for individual transfer movements.

Current through riders (nearly all the north-south direction) would be delayed similarly under all alternatives. North-south through riders in Alternative 2 would be impacted by a single large diversion to the transit center, while the same riders under Alternative 1 or 3 would experience two smaller diversions. Only under Alternative 4 would the total diversion be less significant.

Riders into Downtown

Riders traveling to downtown destinations (and who do not transfer) would also be impacted by changes in bus routing to serve the transit center(s). Table 11-4 shows the impacts on riders from each of the four corridors traveling to the center of downtown (defined as Main Street and Central Row). Riders from the north would be most impacted by the re-routing to serve the transit center in Alternative 2 and would also be slightly negatively impacted by route changes in the other alternatives. Riders from the south would be slightly impacted only in Alternatives 1 and 3. Riders from the east would be negatively impacted only in Alternative 3 where re-routing via the North Transit Center to Trumbull Street would inhibit access to the center of downtown, while in all other alternatives through-routing would provide better access to the center of downtown from the east. Riders from the west would be diverted far to the south in Alternative 1 and would, as would be the case with riders from the east, be relocated away from Main Street to Trumbull in Alternative 3. These riders would also be impacted by a diversion through the transit center near Union Station before reaching downtown in Alternative 2.

Table 11-4: Travel Time Impacts on Riders with Downtown Destinations

	Alternative			
	1	2	3	4
from North	low	very low	low	low
from South	low	moderate	low	moderate
from East	high	high	very low	high
from West	very low	low	very low	moderate
to Union Station	very low	very high	high	high
to East of Main	high	high	very low	very high
Rating for Downtown Riders	very low	moderate	very low	high

The table also shows how access to the east side and west (Union Station) side of downtown would be affected. Access to the Union Station area would be improved in all but Alternative 1. Increased east-west through-routing would improve access in Alternatives 3 and 4 while a transit center near Union Station serving all routes would greatly enhance access in Alternative 2. Only Alternative 1 would take service away from Union Station to serve a transit center on the south side of downtown.

The proposed increase in the number of routes using Columbus Boulevard, as well as increased east-west through-routing, would improve access to the east side of downtown in Alternatives 1 and 2 while the transit center on Columbus and Market in Alternative 4 would greatly enhance access by bringing all routes to the east side. Only Alternative 3 would reduce access to the east side of downtown.

Overall, Alternatives 1 and 3 provide the most negative impacts on riders destined for the center of downtown. So, despite improving access to some parts of downtown, both alternatives were given overall very low ratings for service to riders into downtown. Alternative 2 provide somewhat less impact on riders to the center of downtown and provides new access to both the east and west side of downtown, and so was given a moderate overall rating.

Alternative 4 provides little impact on riders to the center of downtown and also improves access to both the east and west side of downtown, and so was given a high overall rating.

Riders within Downtown

While few people travel within downtown by bus, the alternatives were assessed based on their ability to provide better service between the area east of Main Street and the area around Union Station, between Union Station and Asylum Hill, and between Main Street and Capitol Avenue. An assessment of the alternatives with respect to service to these markets is shown in Table 11-5. Alternatives 2 and 4, with through east-west service operating between Columbus Boulevard and Union Station, would provide the most potential for increase ridership between east of Main Street and Union Station, and were rated highly. Alternatives 1 and 3 lack this connection and received a low rating. Alternatives 2 and 3 increase service between Union Station and Asylum Hill by diverting service from Capitol Avenue, while Alternative 1 diverts service to Capitol Avenue from the Union Station Asylum Hill connection. In developing overall ratings, more weight was given to the East Side to Union Station connection so Alternatives 2 and 4 received the highest rating.

Table 11-5: Potential for Increased Ridership within Downtown

	Alternative			
	1	2	3	4
East Side - Union Station	low	high	low	high
Union Station - Asylum Hill	low	high	high	moderate
Main Street - Capitol Avenue	high	low	low	moderate
Rating for Operating Cost	low	high	low	high

Operating Costs

Potential impacts on operating costs were also assessed qualitatively based on the increase in route length. This assessment is shown in Table 11-6. As noted above concerning rider impacts, north-south through-routes would be lengthened in all alternatives with little apparent variation between alternatives. East and west routes are shown as a single row in the table since most would be through-routed in each alternative. Operating costs on east-west routes would increase in each alternative in order to make the connection between routes. East-west costs would increase most in Alternative 1 which would require the largest diversion of west routes to serve the South Transit Center. Busway routes would be slightly longer in Alternatives 1 and 3 than in Alternatives 2 and 4.

Table 11-6: Assessment of Possible Operating Cost Impacts

	Alternative			
	1	2	3	4
North-South	low	low	low	low
East-West	very low	low	low	low
Busway	low	moderate	low	moderate
Rating for Operating Cost	very low	low	very low	low

Summary – Efficiency and Effectiveness of Service

Ratings for the Use of Transit Centers are summarized in Table 11-7.

Table 11-7: Ratings for Efficiency and Effectiveness of Service

	Alternative			
	1	2	3	4
Rating for Through and Transferring Riders	low	very high	moderate	moderate
Rating for Riders into Downtown	very low	moderate	very low	high
Rating for Riders within Downtown	low	high	low	high
Rating for Operating Cost	very low	low	very low	low

11.5 Analysis of Traffic Impacts

Bus Volumes on Downtown Streets

While each of the alternatives assumes the same level of service on all routes, each would result in very different peak hour bus volumes on specific streets. The current peak hour local bus volume on downtown streets is shown in Figure 11-5. Current peak hour bus volumes, including both local and commuter buses, are shown in Figure 11-6. Figures 11-7 through 11-10 show peak hour local bus volumes for each of the alternatives. While commuter bus routings were not developed for each one of the alternatives, Figures 11-11 through 11-14 show peak hour volumes assuming the *current* peak hour commuter bus volumes and proposed local bus volumes. (Revised commuter bus routings were developed only for the preferred alternative as outlined in Section 12.)

A comparison of local bus volumes in the peak direction for several key segments is shown in Table 11-8. The number of buses per hour varies significantly between alternatives on some streets. Some wide streets, such as Main Street and parts of Trumbull Street, are capable of accommodating a large number of buses, while others, particularly the east-west streets, have less capacity. This study did not include traffic analyses of these streets to determine their capacity to accommodate increased bus volumes, however, it was assumed that volumes under 30 buses per hour would not pose a problem on most streets, while volumes of around 60 buses per hour would not be a problem on Main Street.

Table 11-8: Peak Hour Local Bus Volumes on Key Street Segments

	Current	Alternative			
		1	2	3	4
Main Street (Pearl to Gold)	58	57	82	55	41
Trumbull Street (Main to Church)	0	57	0	35	0
Trumbull Street (Church to Asylum)	0	0	19	23	0
Church Street (High to Trumbull)	0	29	53	0	19
Pearl/Asylum (Ann to Trumbull)	20	20	29	46	20
Market (NB State to Morgan)	20	7	7	0	61
Columbus (SB Morgan to State)	0	7	7	0	80
Rating for Bus Volumes		moderate	very low	low	very low

Figure 11-5: Current Peak Hour Local Bus Volumes

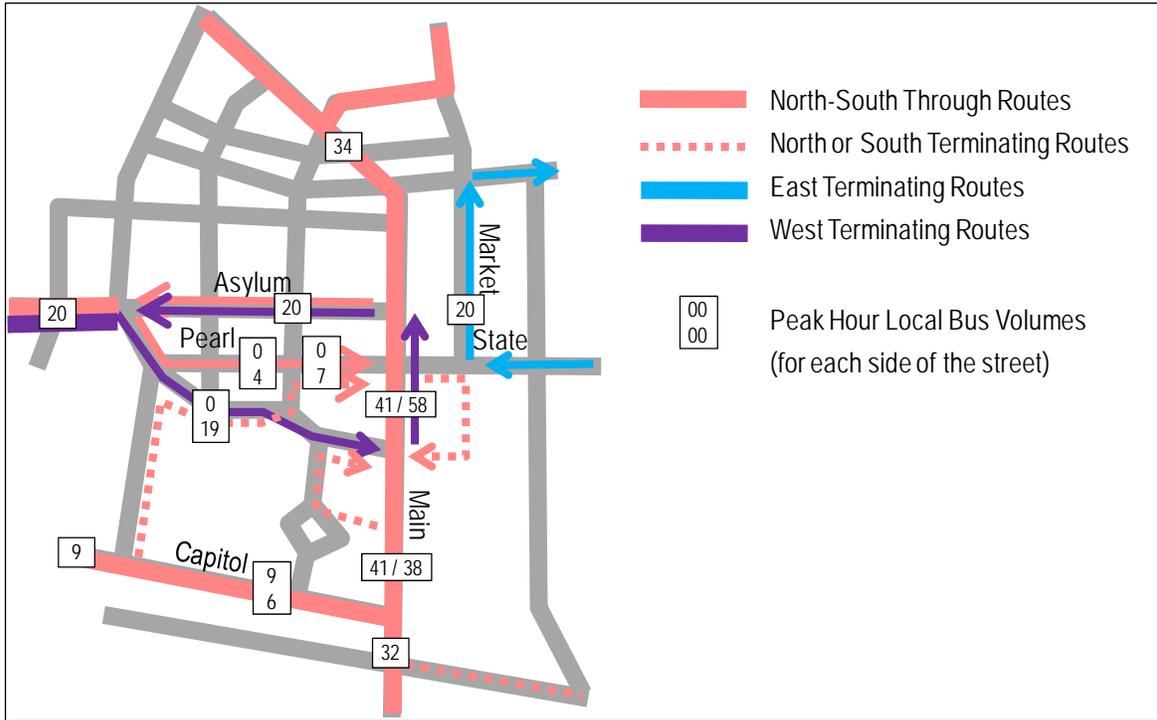


Figure 11-6: Current Peak Hour Local and Commuter Bus Volumes

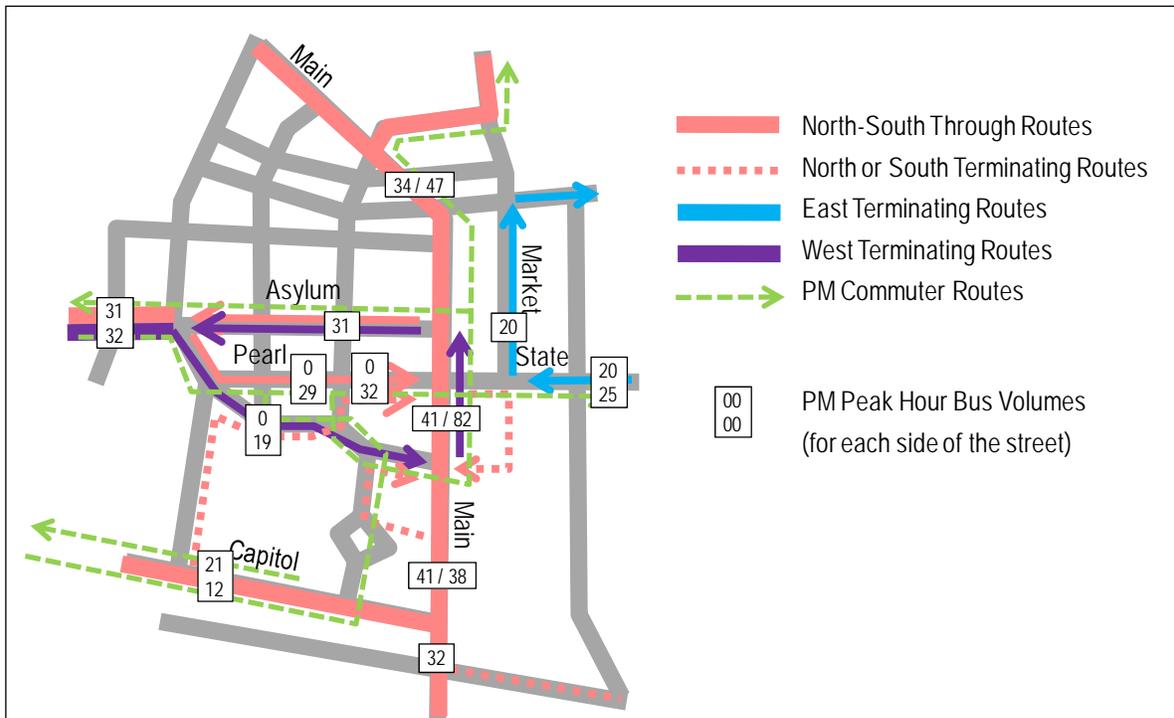


Figure 11-7: Peak Hour Local Bus Volumes - Alternative 1

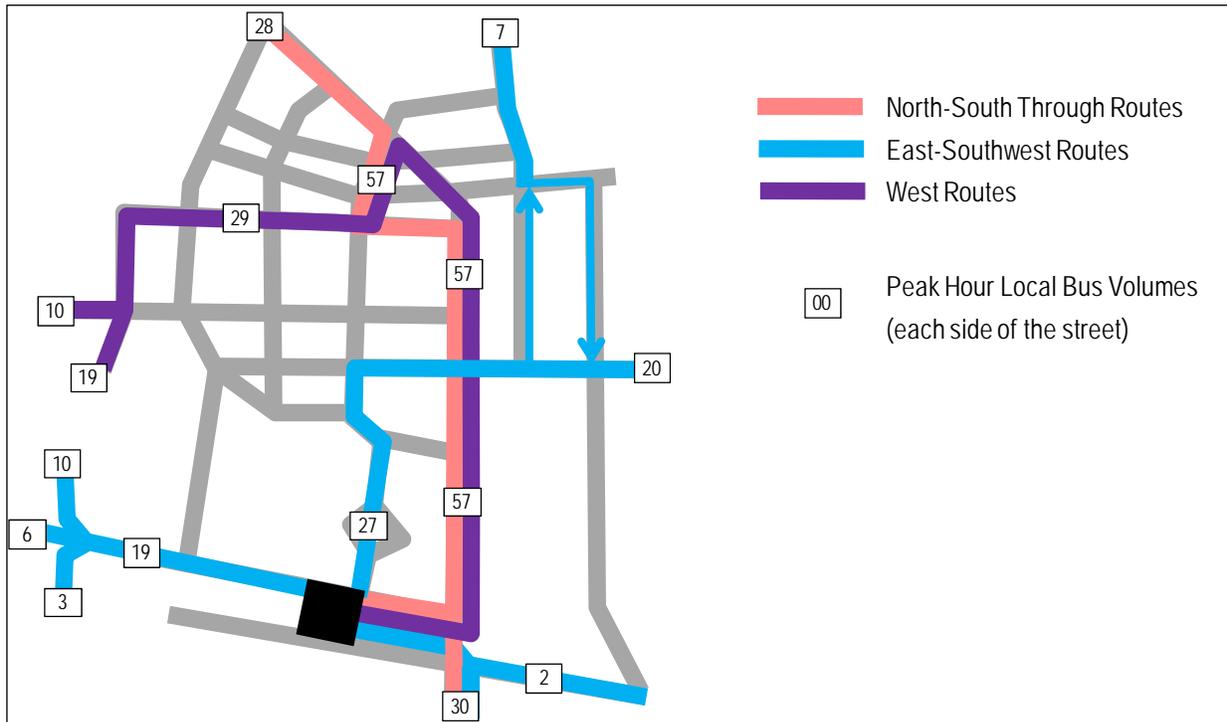


Figure 11-8: Peak Hour Local Bus Volumes - Alternative 2

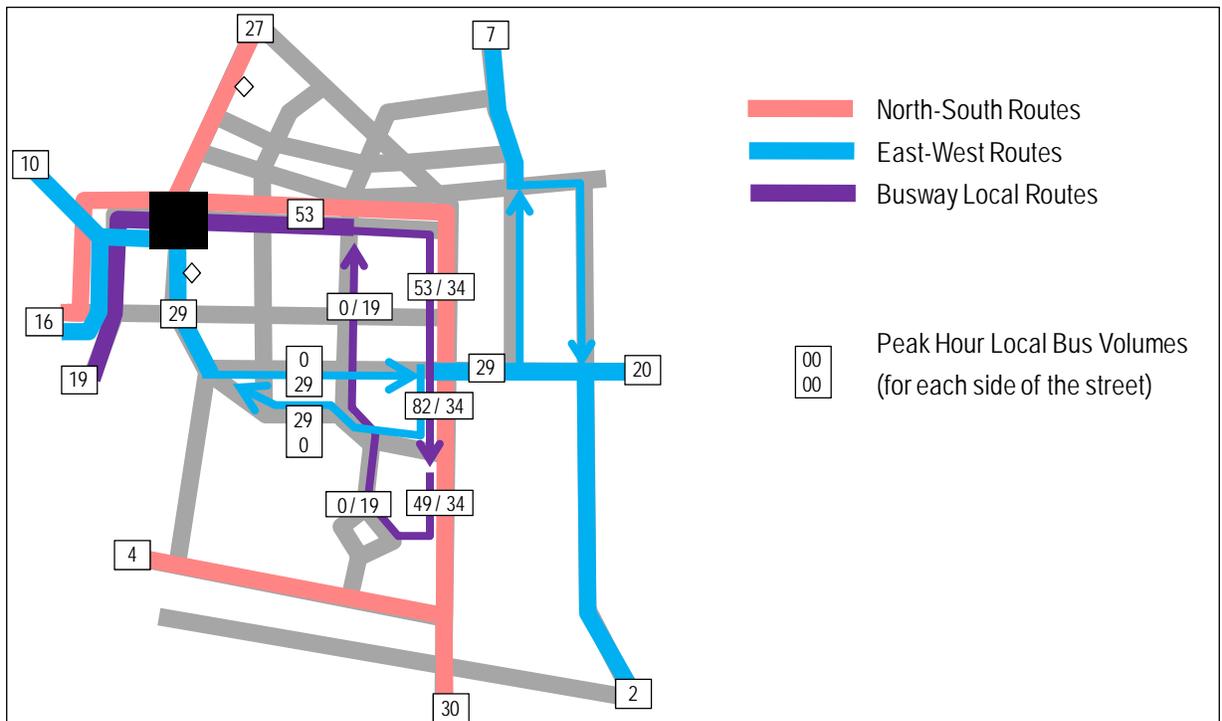


Figure 11-9: Peak Hour Local Bus Volumes - Alternative 3

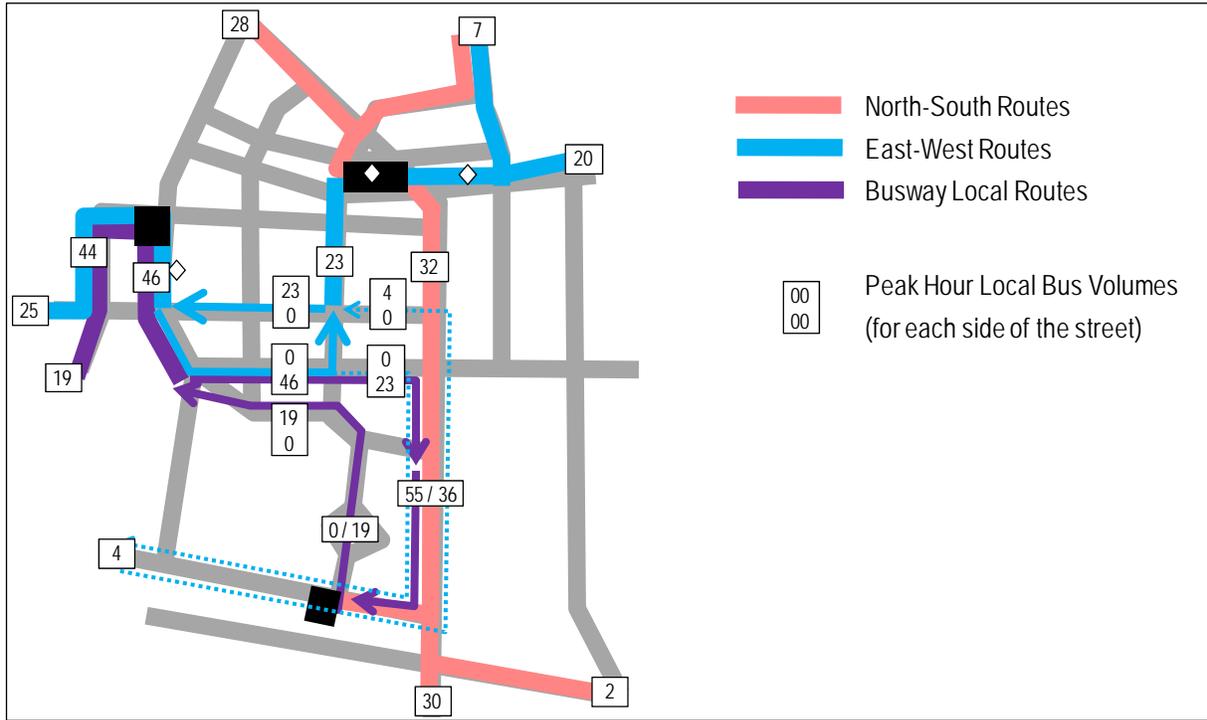


Figure 11-10: Peak Hour Local Bus Volumes - Alternative 4

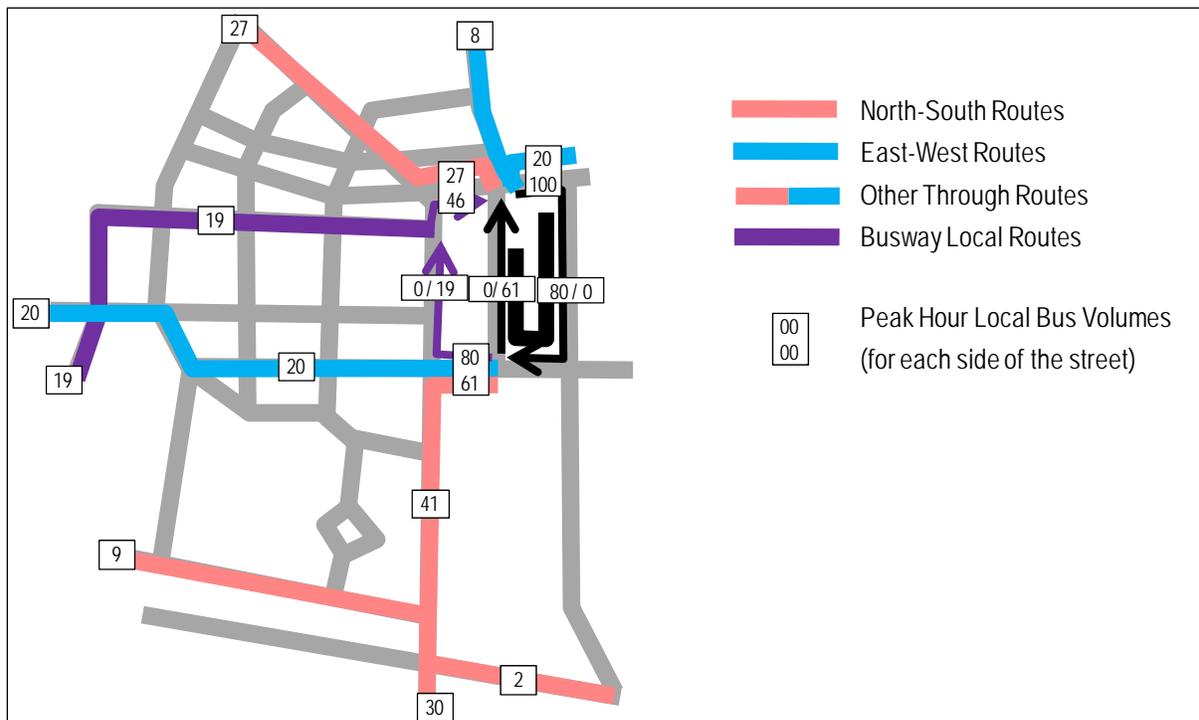


Figure 11-11: Peak Hour Local and Commuter Bus Volumes - Alternative 1

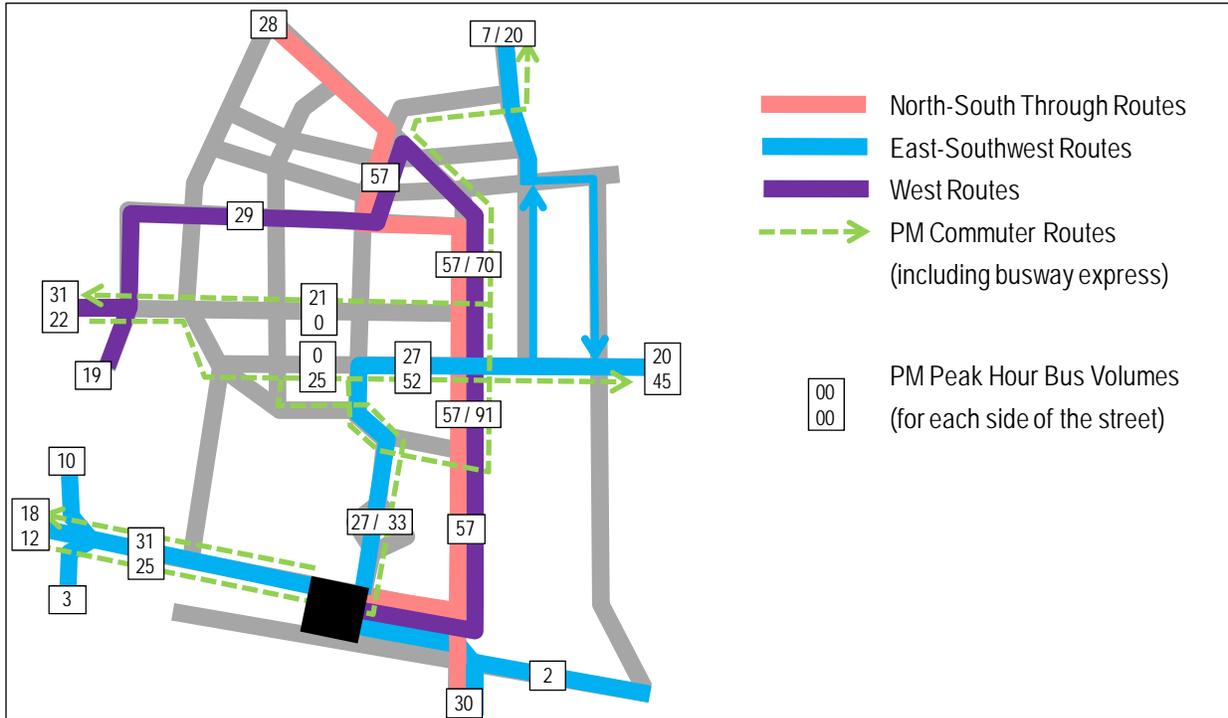


Figure 11-12: Peak Hour Local and Commuter Bus Volumes - Alternative 2

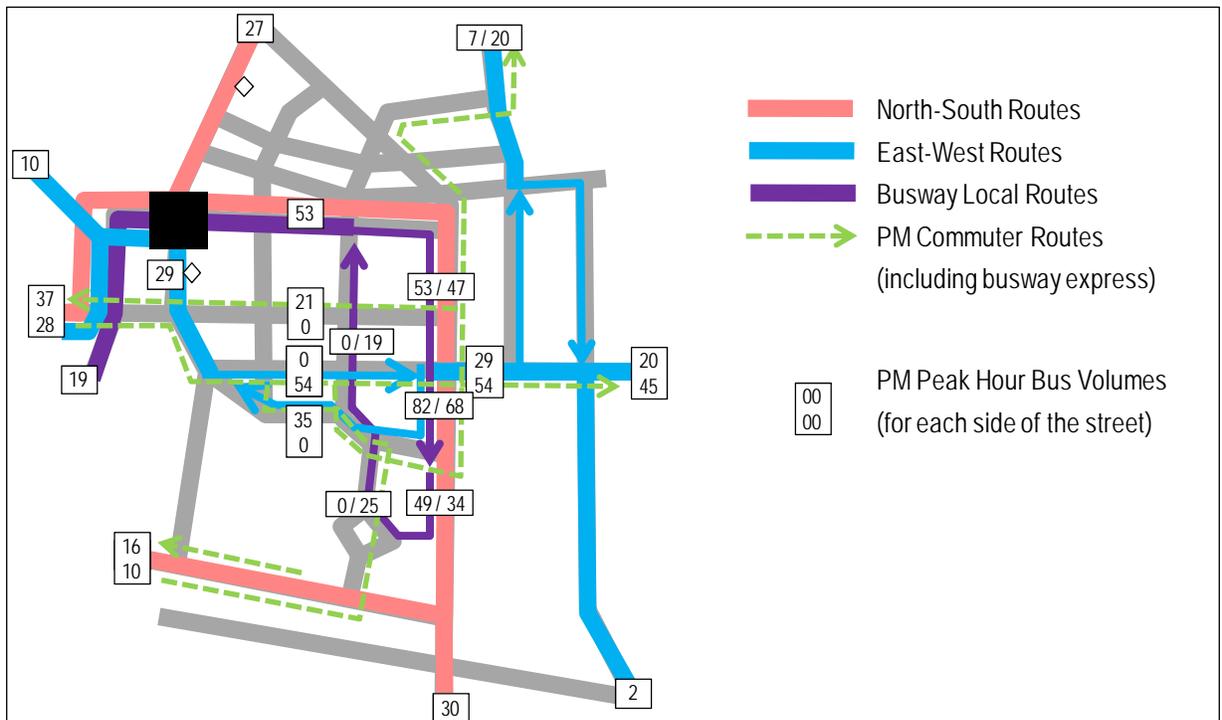


Figure 11-13: Peak Hour Local and Commuter Bus Volumes - Alternative 3

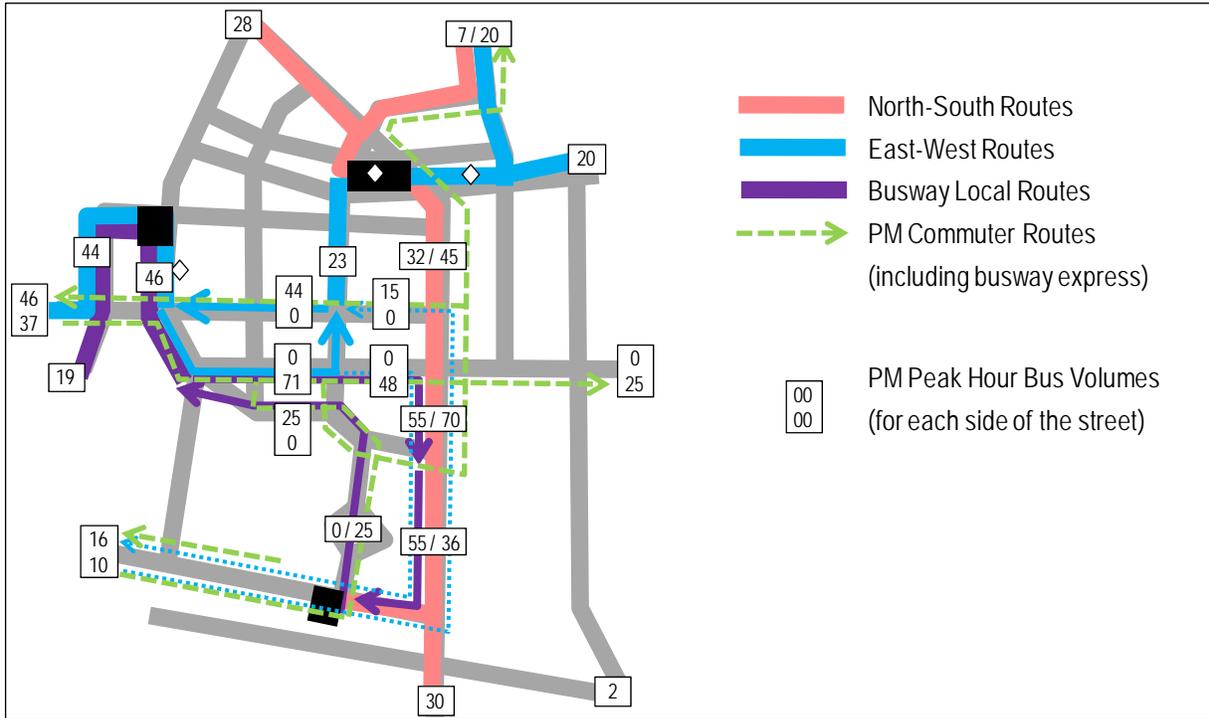
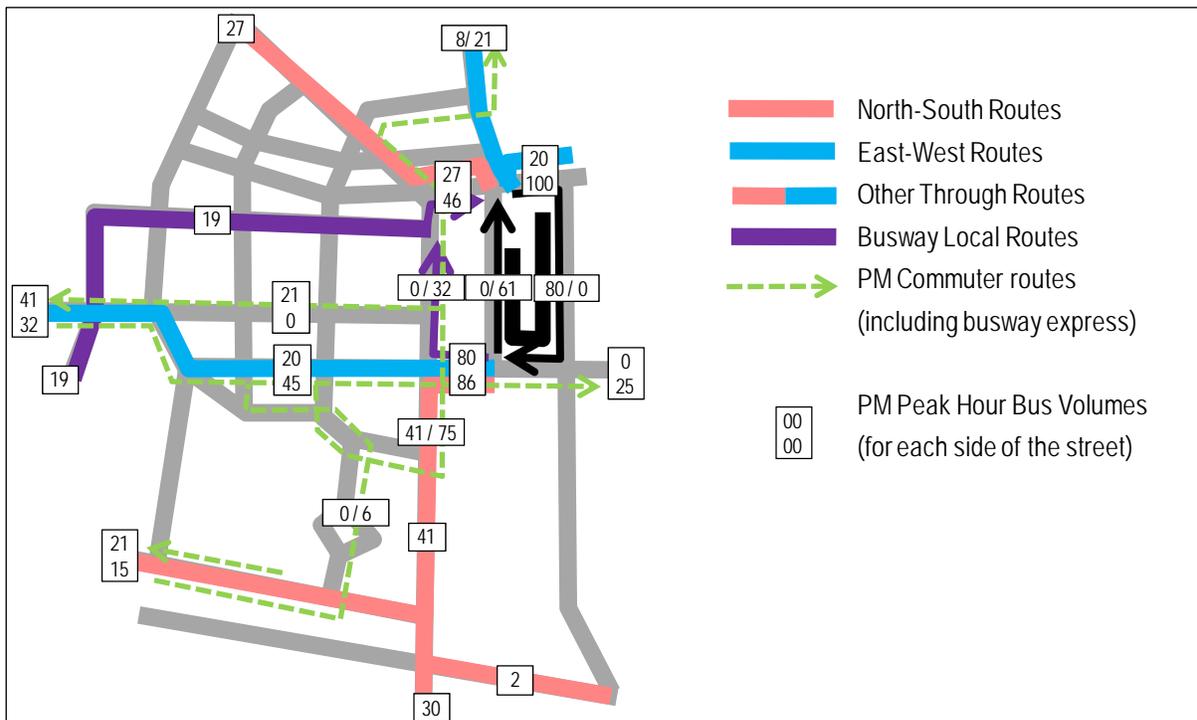


Figure 11-14: Peak Hour Local and Commuter Bus Volumes - Alternative 4



Main Street currently carries the largest volume of buses with 34-41 local buses per hour throughout most of the downtown and as many as 58 per hour northbound between Gold/Atheneum and Asylum where west corridor bus routes use Main Street for a short segment. When commuter buses are included, the number of current northbound buses on that segment is 82 per hour. Adding the projected number of future busway vehicles to the west corridor routes would increase the number of northbound peak hour buses on Main Street to 111. Therefore, each of the alternatives sought to provide more of a balance between the number of northbound and southbound buses on Main Street and in some cases to shift more buses to the southbound side where there is capacity to handle a larger number of waiting passengers.

While busway local services would increase the number of buses on most of Main Street in Alternatives 1 through 3 (in comparison to current volumes), a reasonable balance is achieved. The through-routing of the west corridor buses with east of the river routes in all alternatives would remove the west corridor buses from Main Street (except for one block in the southbound direction in Alternative 2). Therefore, the highest single block local bus volume on Main Street would be 82 buses per hour southbound between Pearl and Gold in Alternative 2, while Alternative 1 would have the highest volume (57 local buses in each direction) over an extended portion of the street. Alternative 4 would have the fewest buses on Main Street, a maximum of 41 local buses per hour, as busway routes and north-south routes would not overlap.

Trumbull Street currently has virtually no bus service but would carry moderate bus volumes in Alternatives 1 through 3. In Alternative 1, the segment between Church and Main streets would serve as a transfer point between north routes and busway routes and would carry 57 buses per hour in each direction. In Alternative 2, 19 busway buses per hour would use the northbound side between Jewell and Church streets. In Alternative 3, 23 east-west buses would use Trumbull Street in each direction between Pearl/Asylum and the transit center over I-84.

Church Street also currently has no bus service. Alternative 3 does not use Church Street, while Alternative 4 uses it only for 19 local busway vehicles per hour. Alternative 1 adds Route E buses to the busway vehicles for a total of 29 per hour. Alternative 2 has by far the most buses on Church with 53 north-south and busway vehicles in each direction between Main Street and the transit center.

Pearl Street currently carries only a few buses, and those only in the eastbound direction, while Asylum Street (which is one-way westbound) carries 20 local buses per hour. Asylum Street is not used in the alternatives, except for Alternative 3 which has 23 east-west buses per hour traveling westbound. Pearl Street is used only eastbound in Alternative 3 and carries 23 east-west and 19 busway local buses for a total of 46 buses per hour. Pearl Street is also used only eastbound in Alternative 2 (with Jewell Street used westbound) for 29 east-west buses per hour. Pearl Street is used by 20 buses in each direction in Alternatives 1 and 4, although Alternative 1 uses only the section between Main and Trumbull.

Market Street between State and Morgan is one-way northbound and serves as the terminus for all of the east of the river routes. A total of 20 buses per hour currently use the street. Columbus Boulevard between State and Morgan currently has no bus service. The two streets would function as a one-way pair carrying just 7 buses per hour in Alternatives 1 and 2 and none in Alternative 3. Alternative 4, however, would use these streets as the main transit center. Market Street would carry 61 buses per hour and Columbus Boulevard would carry 80 buses per hour. Given that Market Street, Morgan Street and Columbus Boulevard were identified as a traffic bottlenecks in Section 3.4, these streets may not be able to accommodate the volume of buses without significant delays in peak periods.

All of the alternatives would have to accommodate the additional service from the New Britain busway, so increases in the number of buses traveling into downtown are inevitable. The alternatives need to spread those buses around to avoid taxing the capacity of downtown streets, or accommodate additional vehicles through targeted street improvements. Alternative 1 would extend the highest bus volumes to a longer portion of Main Street in both directions and a short segment of Trumbull Street. It would also add a moderate amount of bus service to Church Street. Neither of these should create significant problems, so Alternative 1 was given a moderate rating. Alternative

2 requires one very high volume block along Main Street to accommodate east-to-south transfers. It also has high volumes on Church Street that may need mitigating actions. Therefore, Alternative 2 was given a very low rating. Alternatives 3 and 4 maintain lower bus volumes on Main Street but substantially increase volumes on Pearl Street in Alternative 3 giving it a low rating and on Market and Columbus in Alternative 4 giving it a low rating.

Traffic Circulation Changes

A final important factor to consider is whether any traffic circulation changes would be needed for any of the alternatives. The exact changes that might be needed are highly dependent on the exact location of any new transit center. Changes would most likely consist of changing one-way streets to two-way streets or of adding a contra-flow bus lane to a one-way street.

It appears that Alternatives 1 and 4 would not require any traffic circulation changes and so were given high ratings. Alternative 2 could require two-way operations or contra-flow bus lanes on one-way portions of High Street between Asylum and Main Street, especially if a transit center site near High Street is chosen. A transit center site near Spruce Street would be less likely to require changes on High Street, although the most efficient re-routing for some service from the north (Route K) would require changes on High Street north of I-84. Because of these needs, Alternative 2 was given a low rating.

Alternative 3 could require changes to High Street between Asylum and Church if a High Street site were chosen. More significantly, changes would be required to access the North Transit Center site at I-84 between Main and Trumbull. The frontage road (Chapel Street) in this area would need to accommodate contra-flow lanes, and a scheme would need to be developed for transitioning buses to normal flow lanes along Morgan Street to and from the I-84 bridge over the Connecticut River. Because the traffic issues around this location appear significant, Alternative 3 was given a very low rating.

Summary – Traffic Impacts

Ratings for traffic impacts are summarized in Table 11-9.

Table 11-9: Ratings for Traffic Impacts

	Alternative			
	1	2	3	4
Rating for Bus Volumes	moderate	very low	low	very low
Rating for Traffic Circulation Changes	high	low	very low	high

11.6 Evaluation of Each Alternative

The results of the evaluation discussed in the previous section are used here to summarize the ratings for each alternative and discuss the advantages and disadvantages of each alternative.

Ratings for Alternative 1 are summarized in Table 11-10 with the advantages and disadvantages shown in Table 11-11. Alternative 1 has one or two easily accessed available transit center sites and can be implemented without changing downtown traffic circulation. However, this alternative results in the lowest number of transfers occurring within a transit center and the highest number crossing downtown streets. Changes to west side routes to serve the transit center would negatively impact bus operating costs as well as service to riders from the west and access to Union Station. It would result in the highest bus volumes throughout the extent of Main Street in the downtown.

Ratings for Alternative 2 are summarized in Table 11-12 with the advantages and disadvantages shown in Table 11-13. Alternative 2 has available transit center sites although access is more difficult and traffic changes are likely to be needed on High Street. It results in more transfers within the transit center than Alternative 1 and the fewest crossing the street. Connections are good between the busway, west and north routes but poor between the north and east. The alternative provides good access to Union Station and good east-west service across downtown. Operating costs would be somewhat less than for Alternative 1. There would be high bus volumes on Church Street where there is currently no bus service and Main Street southbound between Pearl and Gold would see significantly increased volumes.

Ratings for Alternative 3 are summarized in Table 11-14 with the advantages and disadvantages shown in Table 11-15. Alternative 3 would result in the highest number of transfers within transit centers. However, three transit center facilities would be needed, each about two-thirds the size of the single facilities in Alternatives 1 and 2, resulting in high capital costs. There may not be a feasible site for the North Transit Center and establishing traffic circulation in and out of the site could be problematic. Some transfer connections would be conveniently served while others would not. Access to Union Station would be improved while access to the east side would not. East-west routes would not stop on Main Street but would serve Trumbull Street. Bus volumes on Pearl Street would be increased.

Ratings for Alternative 4 are summarized in Table 11-16 with the advantages and disadvantages shown in Table 11-17. Alternative 4 would also result in a very high number of transfers at the transit center. However, the transit center itself would be a lower quality facility, relying on on-street improvements rather than a new off-street facility. The transit center would be spread out around a large city block and bus volumes on Market Street and Columbus Boulevard would be very high. The transit center would also be near several very congested intersections. Transfer connections for west and busway routes would not be as quick as in other alternatives. Access to the center of downtown and the east side of downtown would be very good and east-west service across downtown would serve Union Station. Bus volumes and traffic circulation impacts would not be significant, except for bus volumes in the immediate vicinity of the transit center. While maintaining more of the benefits of the current configuration, this alternative does little to improve the current situation for riders and simply moves the bus volume and bus passenger issues to another location.

11.7 Evaluation Summary and Recommendation

All of the ratings are summarized in Table 11-18. The evaluation indicates that Alternative 2 would be the best alternative. Alternative 2 would provide a feasible quality transit center serving the vast majority of transfers at an acceptable cost. Alternative 2 would provide improved service for the majority of local bus riders who transfer while creating relatively minor delays for riders destined for downtown. It would improve service to the Union Station area and provide better east-west bus connections in downtown. Operating costs would increase but not as much as in some other options. Significant bus volumes would result on Church Street and improvements to the Church Street corridor may be needed. Traffic circulation changes (two-way flow or contra-flow bus lanes) would be needed on parts of High Street. Southbound Main Street bus volumes would increase, largely due to busway vehicles. Only the block between Pearl and Gold would have very high volumes.

This evaluation was discussed with the Project Steering Committee and the committee agreed that Alternative 2 is the preferred alternative. Alternative 4 was not considered acceptable, due to the committee's desire to establish a full-featured off-street transit center and concerns over the impact of a Market/Columbus transit center on traffic and development in the surrounding area. Alternative 3 was rejected primarily due to the difficulty and expense of establishing the three necessary transit centers, as well as the poor connections provided to some riders. Alternative 1 was considered inferior to Alternative 2 due to its impacts on transferring and downtown riders and the lower number of transfers that would occur in the transit center.

Section 12 presents a more detailed description of the preferred alternative including recommendations for corresponding changes in commuter bus circulation.

Table 11-10: Ratings of Alternative 1

	Rating	Explanation
Utilization of Transit Centers	moderate	Majority of transfers in transit center but many still on-street
Capital Cost	moderate	One large off-street transit center facility
Capacity/Quality of Transit Centers	very high	Multiple feasible sites available
Through & Transferring Riders	low	Several worse connections to/from the west and some poor busway connections
Riders into Downtown	very low	Delays to riders from the north, south, and especially west; poor Union Station area access; good east side access
Riders within Downtown	low	No east side to Union Station connection
Operating Costs	very low	Increased costs on north-south routes to serve the transit center; increased east-west costs for through routing and service to south side transit center; slightly higher busway costs to serve south side transit center
Bus Volumes	moderate	Increased volumes on Main Street in both directions; new bus service on Church Street
Traffic Issues and Circulation Changes	high	No circulation changes required

Table 11-11: Advantages and Disadvantages – Alternative 1

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Large available transit center site ▪ Easy bus access to/from transit center sites ▪ Increased access to the east side ▪ Increased access to the Capitol area 	<ul style="list-style-type: none"> ▪ Lowest number of Transit Center transfers ▪ Highest number of transfers crossing streets ▪ High bus volumes on Main Street – especially northbound ▪ Largest increase in local bus operating costs ▪ Highest busway operating cost ▪ Poor connection between some west routes and both north and busway routes (via Capitol Avenue) ▪ Reduced access to Union Station ▪ Significant changes needed for the Star Shuttle to serve the transit center ▪ Increased local bus service on Central Row could affect commuter bus operations

Table 11-12: Ratings of Alternative 2

	Rating	Explanation
Utilization of Transit Centers	high	Most transfers in transit center with some on-street
Capital Cost	moderate	One large off-street transit center facility
Capacity/Quality of Transit Centers	very high	Multiple feasible sites available
Through & Transferring Riders	very high	Good connections for busway riders and better west-north connections
Riders into Downtown	moderate	Delays to riders from the north and west; good Union Station area access; good east side access
Riders within Downtown	high	Several through routes make east side to Union Station connection
Operating Costs	low	Increased costs on north-south routes to serve the transit center; increased east-west costs for through routing; moderate busway costs
Bus Volumes	very low	Increased volumes on Main Street southbound only, especially between Pearl and Gold; new bus service on Church Street with significant bus volumes
Traffic Issues and Circulation Changes	low	Could require two-way operation or bus lanes on two sections of High Street

Table 11-13: Advantages and Disadvantages – Alternative 2

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ High number of transfers in Transit Center ▪ Few transfers crossing streets ▪ Relatively low increase in operating costs ▪ Good connection between busway and both north and west routes ▪ Good connection between west and north routes ▪ Increased access to the east side ▪ Increased access to Union Station from all corridors 	<ul style="list-style-type: none"> ▪ High bus volumes on Church Street ▪ Poor connection between east and north routes (via Union Station) ▪ Increased local bus service on Central Row could affect commuter bus operations ▪ Moderately difficult transit center sites ▪ Transit center sites may lack capacity and may need to be combined ▪ Traffic modifications (contra-flow lanes) needed on High Street

Table 11-14: Ratings of Alternative 3

	Rating	Explanation
Utilization of Transit Centers	very high	Nearly all transfers in transit centers
Capital Cost	low	Relatively high cost for three medium/large centers
Capacity/Quality of Transit Centers	moderate	Three sites needed; multiple feasible sites available at two locations; possibly no feasible site available for north transit center
Through & Transferring Riders	moderate	Some better and some worse connections
Riders into Downtown	very low	Delays to riders from all directions; good Union Station area access; poor east side access
Riders within Downtown	low	No east side to Union Station connection
Operating Costs	very low	Increased costs on north-south routes to serve the two transit centers; increased east-west costs for through routing; slightly higher busway costs to serve south side transit center
Bus Volumes	low	Increased southbound volumes on Main Street, especially Pearl to Capitol; new bus service on Trumbull; increased volumes on Pearl Street
Traffic Issues and Circulation Changes	very low	Possibly complex traffic changes needed to access a north side transit center; could require two-way operation/bus lanes on part of High Street

Table 11-15: Advantages and Disadvantages – Alternative 3

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ Highest number of transfers in Transit Centers ▪ Few transfers crossing streets ▪ Good connections between busway and both south and west routes ▪ Increased access to Union Station from the east ▪ Smaller transit centers may be easier to fit into the available sites 	<ul style="list-style-type: none"> ▪ High local bus volumes on Pearl Street could affect commuter bus operations ▪ High busway operating cost ▪ Poor connection between busway and north routes ▪ Indirect connection between west and north/south routes ▪ East and west routes serve Trumbull rather than Main Street ▪ Reduced access to east side ▪ Significant changes needed for Star Shuttle ▪ Three transit center facilities are required ▪ I-84 deck site requires traffic modifications, is congested and may not be large enough ▪ Traffic modifications (contra-flow lanes) needed on High and Morgan Streets

Table 11-16: Ratings of Alternative 4

	Rating	Explanation
Utilization of Transit Centers	very high	Nearly all transfers in transit center
Capital Cost	high	Low cost on-street facility
Capacity/Quality of Transit Centers	very low	Capacity is available but only site is on-street, is spread out, and would accommodate only limited amenities
Through & Transferring Riders	moderate	Some better and some worse connections
Riders into Downtown	high	Delays to riders from the north; good Union Station area access; good east side access
Riders within Downtown	high	Several through routes make east side to Union Station connection
Operating Costs	low	Slightly increased costs on north-south routes to serve the transit center; increased east-west costs for through routing; moderate busway costs
Bus Volumes	very low	Moderate volumes on Main Street; new service on Church Street; very high bus volumes around Market Street, Columbus Boulevard, State and Morgan
Traffic Issues and Circulation Changes	high	No circulation changes required

Table 11-17: Advantages and Disadvantages – Alternative 4

Advantages	Disadvantages
<ul style="list-style-type: none"> ▪ High number of transfers in Transit Center ▪ Nearly all transfers in a single location ▪ Relatively low bus volumes on Main Street ▪ Relatively low increase in operating costs ▪ Lowest busway operating cost ▪ Increased access to Union Station from the east ▪ Increased access to the east side from all corridors ▪ No changes needed to Star Shuttle ▪ Is not at all dependent on through-routing to minimize bus volumes 	<ul style="list-style-type: none"> ▪ Longest distance between busway and north/south routes ▪ High local bus volumes on Central Row could affect commuter bus operations ▪ An on-street transit center may lack the convenience, amenities and operational benefits of an off-street site ▪ Traffic congestion around Market, Morgan, Columbus and State may make a transit center very difficult

Table 11-18: Ratings of All Alternatives

	Alternative			
	1	2	3	4
Utilization of Transit Centers	0	+	++	++
Capital Cost of Transit Centers	0	0	-	+
Capacity and Quality of Transit Centers	++	++	0	--
Through and Transferring Riders	-	++	0	0
Riders into Downtown	--	0	--	+
Riders within Downtown	-	+	-	+
Operating Cost	--	-	--	-
Bus Volumes on Downtown Streets	0	--	-	--
Traffic Circulation Changes	+	-	--	+

++ Very high + High 0 Moderate - Low -- Very low

12.0 RECOMMENDED CONFIGURATION

This study has identified Alternative 2 as the preferred alternative. Alternative 2 is consistent with the *Dual-Node with Through-Routing* concept described in Section 8. Alternative 2 would through-route most services and develop a transit center on the northwest side of downtown. East and south routes would serve stops near Main Street before continuing to the transit center where they would be through-routed with west and north routes, respectively. Transfers would take place at the transit center, with the exception of those between east and south routes, which would take place on Main Street.

This section includes a description of the preferred alternative, consisting of the through-routing combinations, transit center capacity and circulation needs, downtown local bus routings, downtown commuter bus routings, Main Street bus stop locations, traffic issues and circulation changes, and downtown bus volumes. After this description, next steps are identified, including the need for further study as well as review of some of the key factors and assumptions that led to the recommendations of this study since future changes in these key factors could lead to a need to revisit the recommendation.

12.1 Description of the Recommended Alternative

12.1.1. Through-Route Combinations

There would be five north-south through-routes (A, K, Q, T, and U) and six new combined east-west through-routes. The six east-west through-route combinations are shown in Table 12-1.

Table 12-1: Through-Routing Combinations for the Recommended Configuration

West Route	East Route	Peak Headway (min.)	Midday Headway (min.)
E	B, YM & Z	6	10
F1	WNM	15	20
F2	O	20	30
SW	G	30	40
SG	H	30	40
WV	J	30	60

In addition, two routes from the south (NC and P) would terminate at the transit center. Route YS from the east would also terminate at the transit center. Route NW from the northeast would follow an east route through downtown to the transit center before terminating. Local services using the New Britain busway would serve the transit center before terminating on Main Street.

12.1.2. Transit Center Capacity and Circulation

The final determination of the site of the transit center will occur at a later date. However, for the purpose of detailing the recommended circulation alternative, one of the four proposed sites in Union Station area that were shown in Figure 9-1 had to be assumed. The four possible sites were considered by the Project Steering Committee. While each of the sites has advantages and disadvantages, Site D1, the Hartford parking lot site off Myrtle Street, was identified by the Committee as the preferred site, having adequate capacity, likely lower construction cost, potentially fewer traffic circulation issues and the least displacement of existing uses and opportunities. Its disadvantages, however, include being more isolated and being far from Main Street and the center of downtown, thus requiring more extensive and more costly re-routing of major north-south bus routes. As a further site selection process is

undertaken, other possible sites that were not considered may also be identified and sites previously considered unavailable may become available as conditions change. The recommended circulation alternative can then be adapted to conform to the final selected site.

The assumed location on the north side of Myrtle Street is a large site currently occupied by surface parking. The site is expected to become available and replacement of the current surface parking is not necessary. Therefore, the entire site is available for use as a transit center. The number of bays that are needed will depend on how long buses are typically expected to layover, or hold, in the transit center for the purpose of maintaining schedule adherence. It is estimated that up to 16 bays will be needed for local buses, exclusive of those needed for busway vehicles. A possible 16 bay configuration is outlined below in Table 12-2. Higher frequency routes would have a dedicated bay while lower frequency routes would be grouped together such that most bays would accommodate 6-8 buses per hour in the peak hour, with a few as high as 10. The groupings shown in the table were made so that routes with overlapping service areas are grouped together (for passenger convenience) and routes with similar or complementary headways are grouped together (to allow scheduled departures to be staggered). A smaller 11-bay configuration (not shown here) is possible, but this would have bays accommodating 9-12 peak hour buses each. A smaller configuration would also not be able to accommodate the current evening pulse schedule inside the transit center, since the three largest evening pulses involve 17, 16 and 14 buses. On-street space outside the transit center would be needed for the overflow.

Busway vehicles would need up to four additional bays. While busway services would terminate downtown, busway vehicles would be continuing on to Main Street and would not be laying over in the transit center. Therefore, a single bay for unloading inbound passengers would be sufficient. With many different busway routes sharing the facility, outbound busway service could require up to three bays for loading passengers due to the need to sort the heavy passenger volumes by route before boarding. Busway bays could be in the transit center (to facilitate transfers between routes), for a total requirement of 20 transit center bus bays, or outside on the street (to speed operations and provide quick access to Main Street).

A transit center at the Myrtle Street location would most likely have a single entrance/exit at the Myrtle/Church /Spruce intersection opposite Spruce Street. Buses would enter and exit from all three directions. In the circulation pattern described in the following section 116 local buses would enter and then exit the transit center in the peak hour. Of these, 45 would use Spruce Street, 40 Church Street, and 31 Myrtle Street. In addition, 19 busway vehicles in each direction would use both Spruce and Church Streets, increasing the totals to 64 on Spruce Street and 59 on Church Street.

12.1.3. Downtown Local Bus Routes and Stops

Details of the downtown circulation pattern are discussed below for north-south, east-west and busway local services. Main Street stops are noted for each set of routes. The circulation pattern for local routes is shown in Figure 12-1.

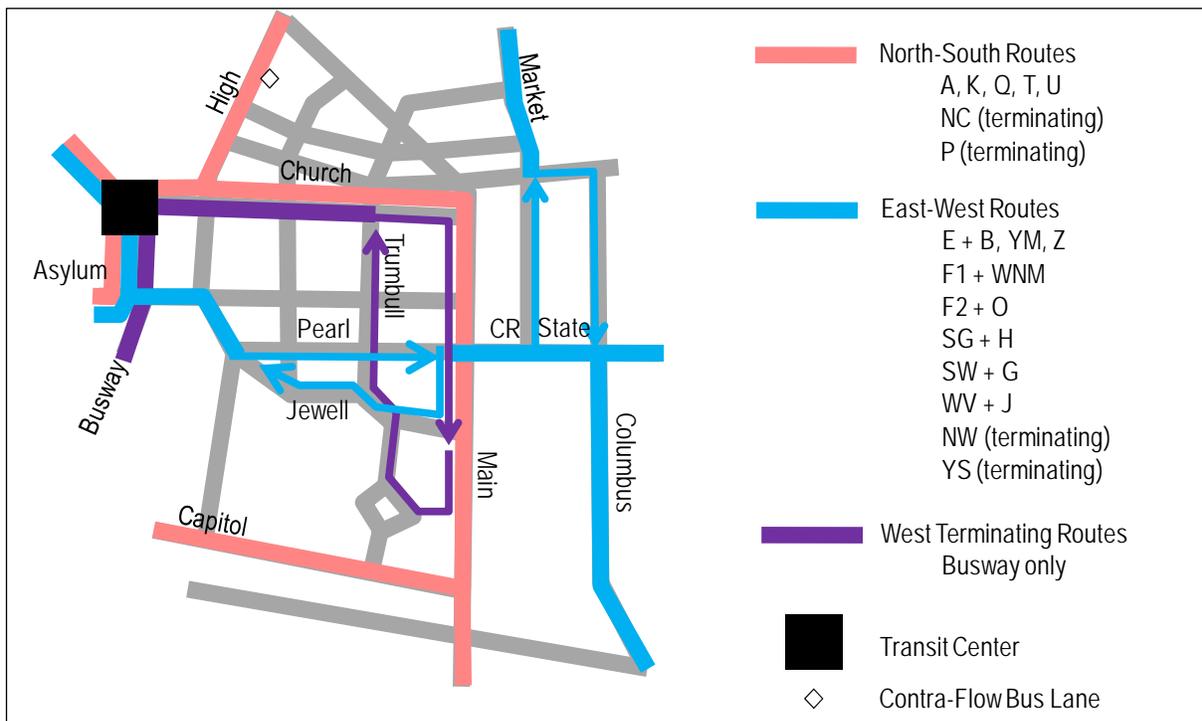
North-South Routes

The five north-south through-routes (A, K, Q, T, U) and two terminating routes from the south (NC, P) would approach downtown northbound on Main Street before turning west on Church Street. Main Street stops would be at the near side of Arch Street and the near side of Central Row. (Riders could transfer to eastbound buses at the Central Row stop without having to cross any streets.) These buses would no longer stop at the Atheneum or at the Old State House. The stop at Church Street would have to be relocated either further south along Main Street or around the corner on the north side of Church Street. Buses would enter the transit center at the intersection of Church, Myrtle and Spruce streets. Most of the remaining transfers would take place in the transit center.

Table 12-2: Possible Transit Center Bus Bay Assignment

Bay	Peak Hour Buses	Routes
1	6	KN
2	8	BDL, NW, WNM
3	10	B, YM, Z
4	8	H, J, O
5	6	YS, G, P
6	5	UW
7	8	TF
8	6	NC, F2
9	6	QNB
10	6	KS
11	6	AH, WV
12	10	E
13	10	AA, F1, SW
14	5	UA
15	8	TBH
16	8	QV, SG

Figure 12-1: Recommended Downtown Local Bus Circulation



Routes NC and P would terminate at the transit center while the five through-routes would continue. Upon leaving the transit center, Route A would follow Spruce Street to Asylum Avenue and Route K would return via Church Street to High Street and then north to Main Street (a contra-flow bus lane or two-way flow on High Street would be needed). Routes Q, T, and U would follow Myrtle Street and Edwards Street to Albany Avenue.

The north-south routes would follow the same streets in the southbound direction. Stops on Main Street would be at Pratt Street, between Pearl and Gold, and at Wells Street. (At the Pearl/Gold stop, riders could transfer to these routes from the east of the river routes without having to cross the street).

East-West Routes

In creating the six east-west through-routes some routes that now approach from the north or south would be modified to approach from the east or west.

East of the river routes would enter downtown from the Founders Bridge. They would be joined at Columbus Boulevard by Route G from the south and Routes NW and WNM from the north. These routes would have a stop on State Street between Columbus and Market to serve local destinations. They would then turn south onto Main Street to serve a major stop between Pearl and Gold where riders could transfer (without crossing the street) to routes heading south. These routes would then turn right onto Gold Street and continue along Jewell, Ford and Asylum before turning right onto Spruce Street and continuing across Church Street to the transit center. The remaining transfers would take place in the transit center.

Routes NW and YS would terminate at the transit center while the through routes would continue. Upon leaving the transit center, Routes E and SW would follow Spruce Street to Asylum Avenue. The other routes would turn west onto Myrtle Street. Routes SG and F1 would turn onto Garden Street while Routes F2 and WV would continue onto Cogswell and Broad streets.

In the eastbound direction these routes would approach the transit center along the same streets. From the transit center, they would follow Spruce, Asylum and Ford to Pearl Street. They would then continue east along Pearl, Central Row and State Street. Riders transferring from the south would board on Central Row at Main Street (without having to cross the street). Routes NW and WNM would turn north onto Market Street while Route G would turn south on Columbus Boulevard and the remaining routes would continue across the Founders Bridge.

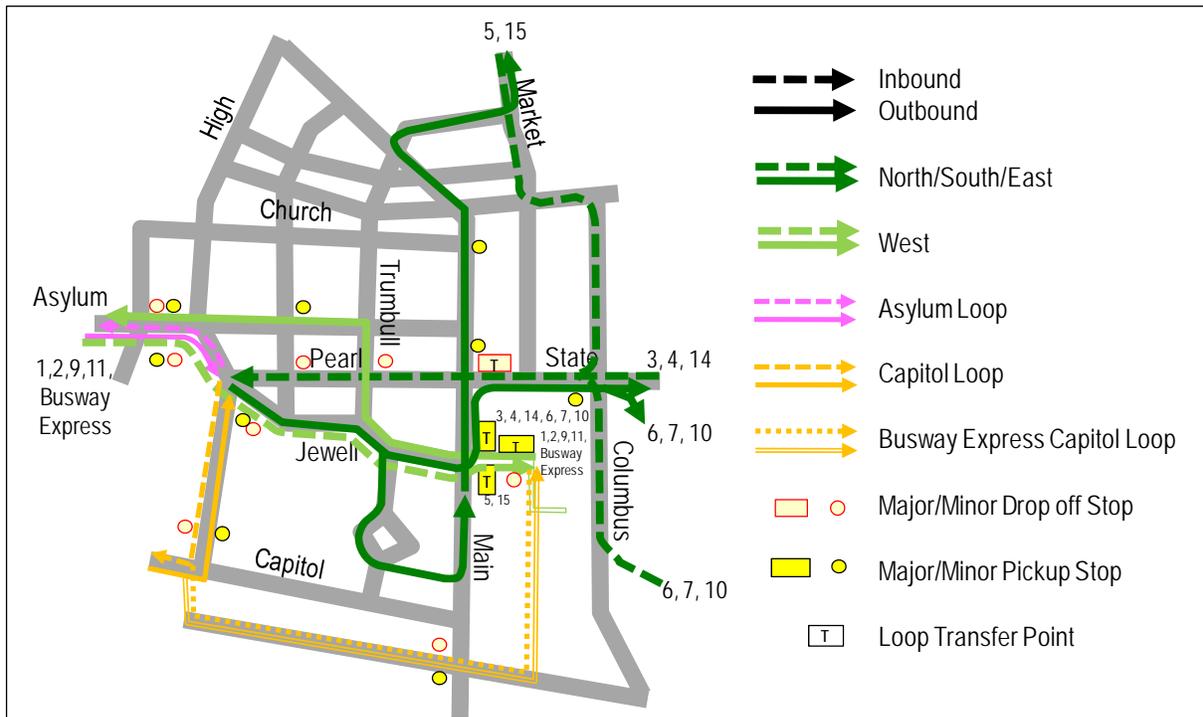
Busway Local Routes

Busway routes that originate in New Britain or Hartford were assumed to carry riders with transfer rates similar to those on local bus routes and would need to make transfer connections in downtown Hartford with other local bus routes. These local busway routes would exit the busway and continue along Spruce Street to the transit center where all transfers would take place. They would then follow Church Street to Main Street with a stop on Main Street at Pratt Street and a downtown layover point at a far side stop on Main Street at Gold Street. Outbound they would turn onto Wells Street to Trumbull Street and Church Street, picking up transferring passengers at the transit center before returning to the busway via Spruce Street. (If busway services were extended in the future, their downtown routing could be modified to resemble that of the east-west routes, or could follow a different alignment through downtown, without impacting their ability to serve the transit center and Main Street area stops.)

12.1.4. Downtown Commuter Bus Routes and Stops

A revised circulation pattern for commuter routes was developed specifically for this alternative. Revised commuter bus routings in the downtown were designed to complement the local bus circulation pattern, avoiding areas of high local bus volume and using stops that are still well-located for commuter bus riders while avoiding stops that would be used by local buses. The commuter bus circulation pattern is shown in Figure 12-2.

Figure 12-2: Recommended Downtown Commuter Bus Circulation



The eight CTRANSIT commuter bus routes from the north, east and south would continue to arrive downtown at State Street from the Founders Bridge and Columbus Boulevard. They would make their first stop on the north side of Central Row adjacent to the Old State House. (Local bus routes would also be on Central Row, but they would be turning left onto Main Street and would not use the commuter bus stop.) Buses would continue onto Pearl Street discharging passengers at Trumbull Street and Ann Street. A few trips would continue to Asylum Avenue to serve the Asylum Hill Loop while a few would continue on Trinity Street to the Capitol Avenue Loop. Buses making outbound trips would turn east on Jewell Street to begin outbound service. Central Row would serve as the transfer point to access service on the two loops.

Most evening outbound trips would begin on Pearl Street at Trumbull Street heading westbound before turning eastbound on Jewell Street. They would be joined by a few trips from Asylum Avenue on the Asylum Hill Loop and a few from Trinity Street from the Capitol Avenue Loop. There would be a stop on Jewell Street between Trinity and Ann streets. Buses going to the east and south would bear left onto Gold Street and turn left onto Main Street to serve the primary pickup location at the Main Street stop at the Travelers Building (the stop currently used by Routes A, E, F and S). They would then turn east onto Central Row and make a stop on State Street before leaving downtown. Buses going north from Jewell would use Wells, Pulaski Circle and Elm Street to reach Main Street and would make stops at the Atheneum, Old State House and Church Street (the stops currently used by northbound local buses). Transfers from the two loops would occur at the Travelers and Atheneum stops.

Commuter routes from the west, including long distance commuter services using the busway, would enter downtown on Asylum Avenue. They would follow Asylum, Ford, Jewell, and Gold to Atheneum Square terminating on the south side of Atheneum Square. Busway services would continue on Prospect to Charter Oak and Buckingham to serve the Capitol area and return to the busway at Sigourney Street. Other commuter services in the corridor would terminate at Atheneum Square. In the evening, busway vehicles would reverse this route and they and all westbound commuter buses would load on the north side of Atheneum Square in front of the Travelers Building and

follow Gold and Trumbull to Asylum. Creation of commuter bus stops on Atheneum Square would require removal of on-street parking.

12.1.5. Star Shuttle Changes

In this alternative, a minor modification to the Star Shuttle route would be needed to serve the transit center in the Hartford parking lot. Stop #8 currently serves Union Station on Union Place but also serves businesses on Union Place and Allyn Street. Stop #8 could be moved to Spruce Street with the Star Shuttle route modified between Stops #7 and #9 to follow Asylum Street, Spruce Street, Church Street and High Street to Allyn Street. Stop #8 would serve Union Station and the transit center, but would be located further from businesses on Union Place and the first block of Allyn Street. Alternatively, the use of the Hartford lot location could allow Stop #8 to remain on Union Place to serve the local businesses. Instead of turning right from Union Place onto Allyn Street, the Star Shuttle could continue on Union Place to Church Street, turn left on Church and enter the transit center. From the transit center, it could follow Church Street, turn right onto High Street and then left onto Allyn Street to serve Stop #9. The second version would require space in the transit center and would be slightly longer, but would provide better local bus connections and maintain service to Union Place.

12.1.6. Traffic Circulation Changes

The description of Alternative 2 in Section 10.4.3 noted that the transit center sites on High Street could require changes in the traffic pattern on High Street, changing traffic flow to two-way or adding contra-flow bus-only lanes. These could be needed both between Asylum and Church and between Chapel and Main. With the Myrtle Street site, buses would use Spruce Street instead of the segment of High Street between Asylum and Church. Furthermore, the segment between Chapel and Main Street would probably be used only by Route K, as other routes would be able to use Myrtle and Edwards to reach Albany Avenue. Several options will need to be explored. These include:

- Make High Street two-way between Chapel and Main
- Add a northbound bus lane on High Street between Chapel and Main
- Have northbound Route K use Ann/Pleasant Street between Church and Main
- Have Route K northbound use Myrtle, Edwards and Albany to North Main Street

Adding a northbound lane, either for buses or for mixed traffic, would reduce the number of southbound lanes crossing I-84 and would require further study. Northbound traffic on High Street would also further complicate the complex Main/North Main/Albany/High/Ann intersection. This could be avoided by funneling northbound traffic to Ann Street using the existing short connecting roadway before the intersection. The latter two options would not require traffic circulation changes but would lengthen the route and inconvenience a significant number of riders. Selection of one of the possible transit center sites closer to High Street would require the changes to traffic circulation on the full length of High Street.

12.1.7. Downtown Bus Volumes

The expected PM peak hour volume of buses on downtown streets is shown in Figure 12-3. For comparison, current peak hour volumes from the previous section are repeated as Figure 12-4. The figures include local buses and commuter buses. Figure 12-3 differs from Figure 11-12 in that the bus routings are consistent with a transit center on Myrtle Street, commuter bus routings are revised in accordance with the revised commuter bus routings noted above, and arriving commuter bus volumes are included as well as departing volumes. This last modification is to reflect the fact that commuter buses must arrive downtown in the PM peak (whether in service or empty) as well as depart.

Figure 12-3: Downtown Bus Volumes in the Recommended Alternative

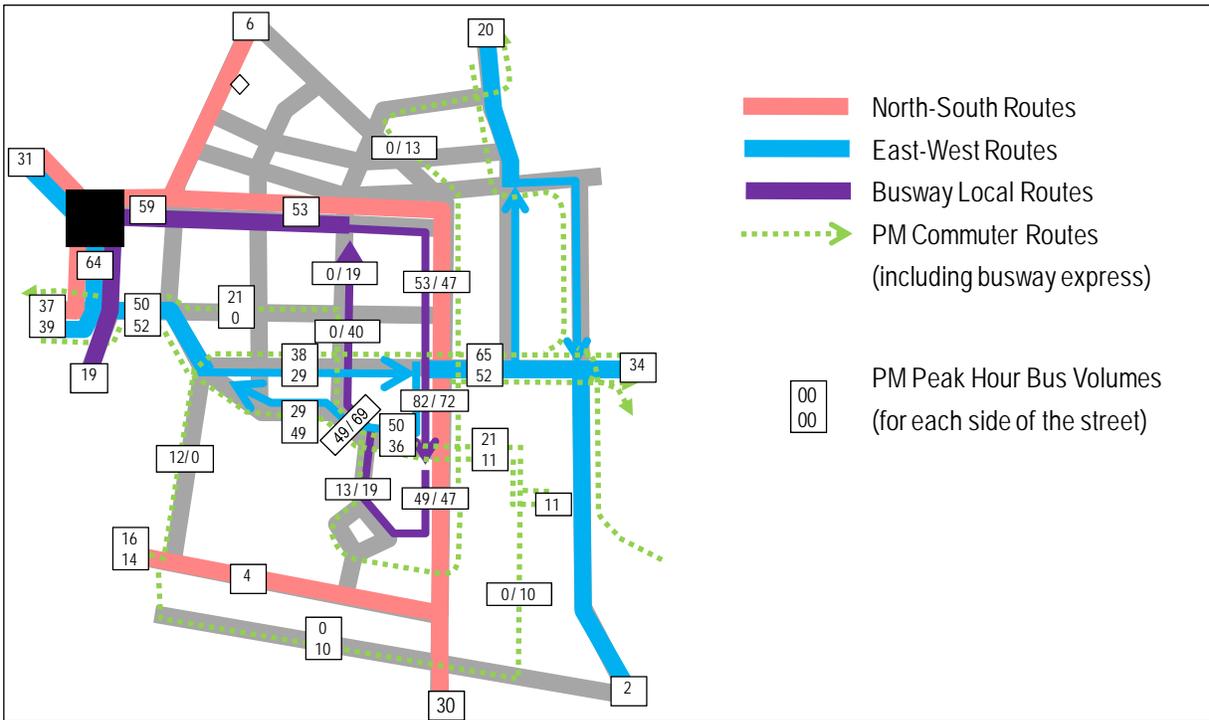
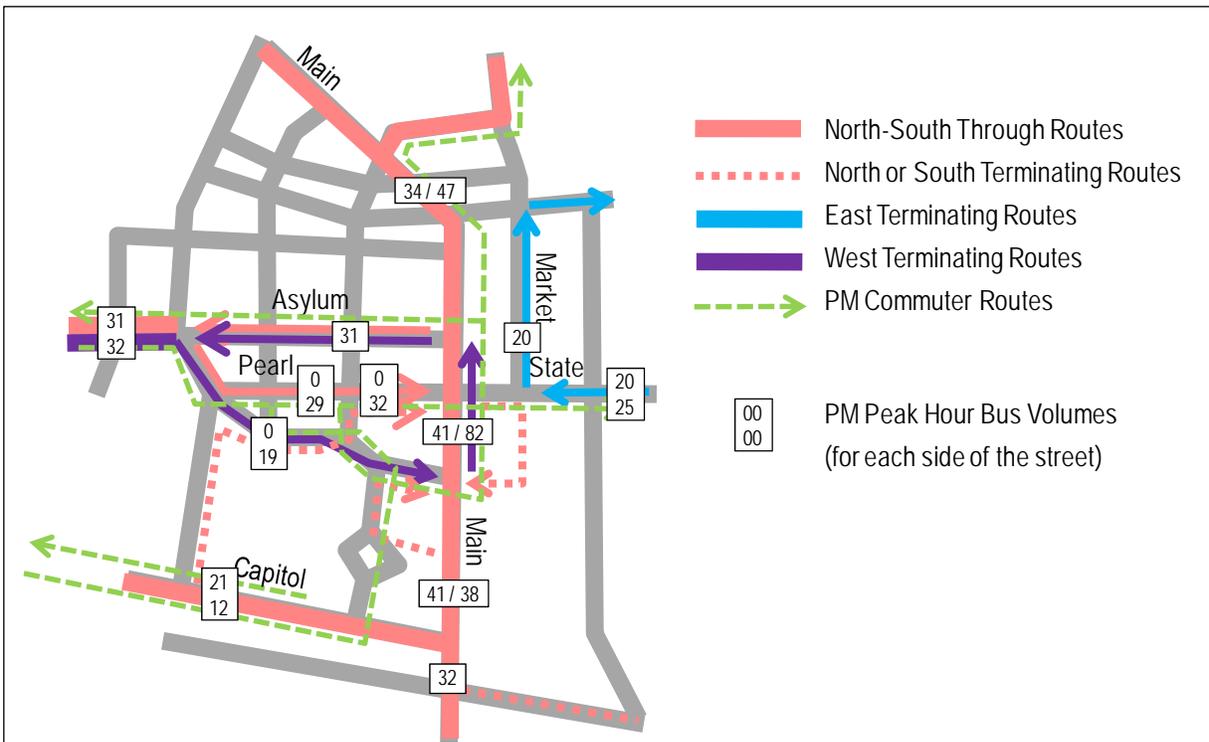


Figure 12-4: Current Peak Hour Local and Commuter Bus Volumes



North-South Streets

In Section 11.5 it was noted that, in the preferred alternative (Alternative 2), the through-routing of the west corridor buses with east of the river routes would remove the west corridor local buses from Main Street, thus reducing northbound Main Street local bus volumes. The recommended pattern would, with the addition of westbound buses, increase the number of southbound local buses for one block of Main Street between Pearl and Gold. Busway local services would also increase the number of local buses traveling southbound on Main Street so that the highest single block bus volume on Main Street would be 82 buses per hour southbound between Pearl and Gold. Commuter buses would continue to operate only northbound on Main Street; however, the revised commuter bus circulation would add commuter bus service to Main Street northbound between Atheneum Square and Central Row, partially offsetting the reduction in the number of local buses. The net total peak hour bus volume of 72 buses at this point would still be less than the current northbound total of 82.

Trumbull Street, which currently has virtually no current bus service, would carry 19 busway buses per hour northbound-only between Jewell and Church streets, plus commuter buses between Jewell and Asylum Street, increasing the total to 40 peak hour buses on that segment.

Section 11.5 noted that there would be 29 buses per hour on High Street, south of Church Street. Locating the transit center off Myrtle Street would likely shift those buses to Spruce Street, increasing the number on Spruce Street from 35 to 64. There is currently no CTRANSPORT bus service at all on Spruce Street. It was also noted that there would be 27 buses per hour on High Street, north of Church Street. Locating the transit center off Myrtle Street would shift most of those buses to Myrtle and Edwards streets, reducing High Street to 6 buses per hour and increasing the number on Myrtle Street from 10 to 31 per hour. This represents a significant level of bus service on Myrtle Street, where there is currently no bus service and only lower levels of bus service were included for other transit center locations. The higher level would be a direct result of locating a transit center at the Hartford lot site.

East-West Streets

On east-west streets, it was noted in Section 11.5 that Church Street, which currently has no bus service, would carry 53 north-south and busway vehicles in each direction between Main Street and the transit center. With a transit center off Myrtle Street, the number on Church Street between the transit center and High Street would increase to 59.

Asylum Street (which is one-way westbound) currently carries 20 local and 11 commuter buses per hour. Under the recommended plan Asylum Street would no longer be used by local buses but would continue to be used by commuter buses, including new commuter services using the busway. The block of Asylum Street between Main Street and Trumbull (the narrowest portion of the street) would no longer be used by buses as westbound commuter buses would use Gold and Trumbull to reach Asylum Street from Atheneum Square.

Pearl Street currently carries mostly commuter buses. Jewell Street carries the eastbound local bus traffic that currently travels westbound on Asylum. In the recommended configuration, Pearl Street would be used in the eastbound direction by 29 east-west buses per hour, with Jewell Street used in the westbound direction. The proposed commuter bus circulation pattern would have commuter buses using these streets in the opposite direction, with commuter buses traveling westbound on Pearl Street and eastbound on Jewell Street, resulting in total peak hour bus volumes ranging between 29 and 49 in any one direction on these two streets.

12.1.8. Main Street Bus Stops

The recommended alternative moves over 70% of the current Main Street/Market Street area transfers into the transit center and reduces total boardings in the area by 55%. Most of the transfers that would not move to the transit center are made by riders transferring between east and south routes, for whom traveling to the transit center and back would be time-consuming and inconvenient. The bus circulation pattern and bus stops described above would

accommodate these transfers without requiring that riders cross Main Street, Central Row or Market Street, as they must do today. To accomplish this efficiently, bus stops on Main Street would have to be reassigned to different routes as noted above. This reassignment is shown in Figure 12-5, which can be compared to the current situation repeated in Figure 12-6. Passenger volumes at each stop are shown in Table 12-3, which can be compared to those previously shown in Table 3-6.

On Main Street in the northbound direction, most of the stops would switch roles from local to commuter or vice versa. Commuter buses would use the northbound stops on either side of Atheneum Square at the Atheneum (northbound) and at Travelers (eastbound and southbound). There would also be a new stop on Atheneum Square for westbound commuter routes. These two Main Street stops now serve about 3,800 northbound and westbound local bus boardings and would instead serve fewer than 1,000 (mostly p.m. peak) commuter bus boardings that now occur about one block to the north. Sidewalks are relatively narrow on this side of the street and there are only two shelters so reducing the number of boardings and restricting use to peak commute hours will lessen the impact of bus riders on the surrounding area. Some of the 1,000 commuter bus riders traveling north may use the stop in front of the Old State House. This stop now accommodates over 3,000 daily local bus riders in a very constricted space, but in the recommended plan would serve just a few commuters.

Northbound local buses would use the stop at 750 Main Street just before Central Row that is now used by commuter buses. This would enable riders to alight here and transfer to eastbound buses around the corner on Central Row. The stop now serves about 700 commuters but would serve about 1,200 northbound downtown originating local bus riders under the recommended plan. While this represents an increase, the increase is more than offset by the reductions at the adjacent Travelers stop. Central Row, which now serves about 800 local and commuter riders, would serve about 1,700 eastbound local riders, about half of whom would be transferring from northbound buses and half would be downtown riders who currently board on Market Street. This stop currently has excess capacity that could accommodate the increase.

In the southbound direction, local buses would continue to have a major stop on the block between Pearl and Gold, although many transfer riders (all except those transferring from westbound east of the river routes) would choose to board at the transit center instead of on Main Street. The current brief downtown bus layovers would also be relocated to the transit center. This would reduce the capacity needed for north-south routes at this major stop and allow westbound routes to stop there as well. There is substantial sidewalk capacity and several existing bus shelters on this side of Main Street, so increasing the number of buses should be feasible. While many current transfer riders would no longer use the stop, this stop would become the transfer point for east to south transfers and become the boarding point for downtown riders heading west in addition to downtown riders heading south. The wide sidewalks should be able to accommodate these riders. The number of total boardings is expected to decrease from 4,100 to about 2,800. Busway buses would have a separate downtown layover point and boarding location for downtown riders on Main Street south of Gold Street.

12.2 Next Steps

This study identified the need for a downtown transit center in Hartford. Further study will be needed in order to identify an appropriate site and to quantify the costs and benefits of such a center. There are also several key factors and assumptions that led to the selection of the recommended alternative that may need to be explored further or re-confirmed. These key factors and assumptions are highlighted below followed by a discussion of the recommended next step in the process, a Transit Center Location Study.

12.2.1. Key Factors and Assumptions

There are several key factors and assumptions that led to the selection of the recommended alternative. Should any of these change in the future, the recommendations should be re-examined and adjusted if necessary.

Figure 12-5: Major Downtown Bus Stops in the Recommended Alternative

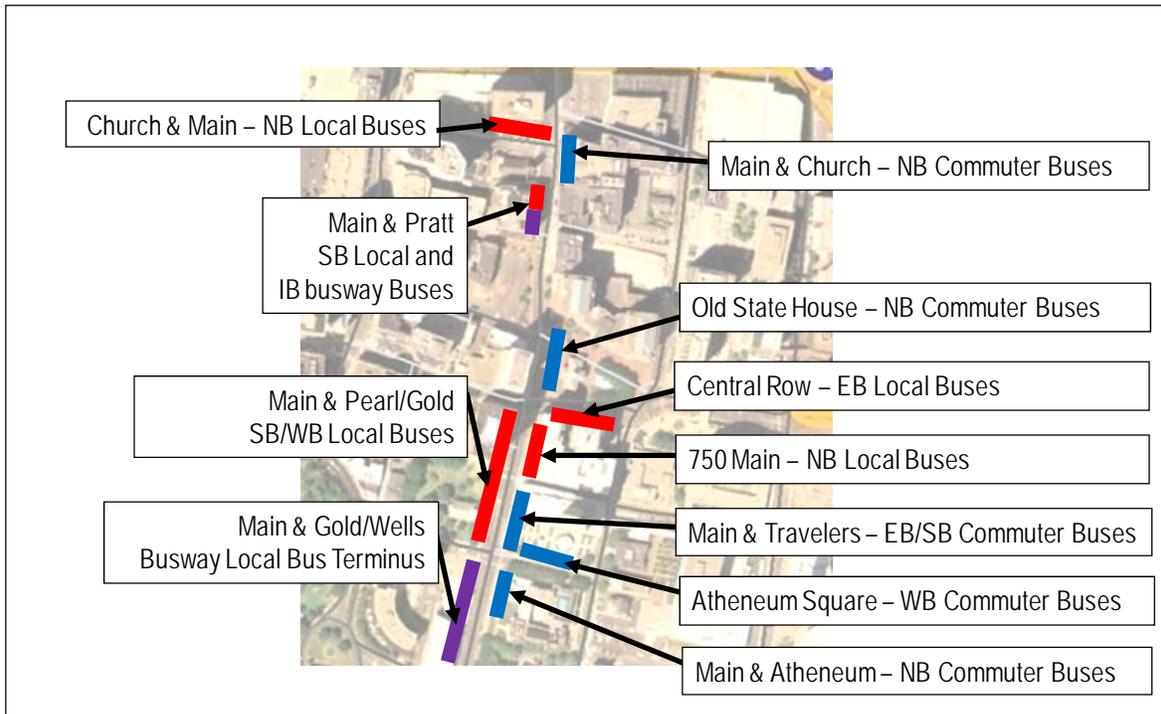


Figure 12-6: Current Major Downtown Bus Stops

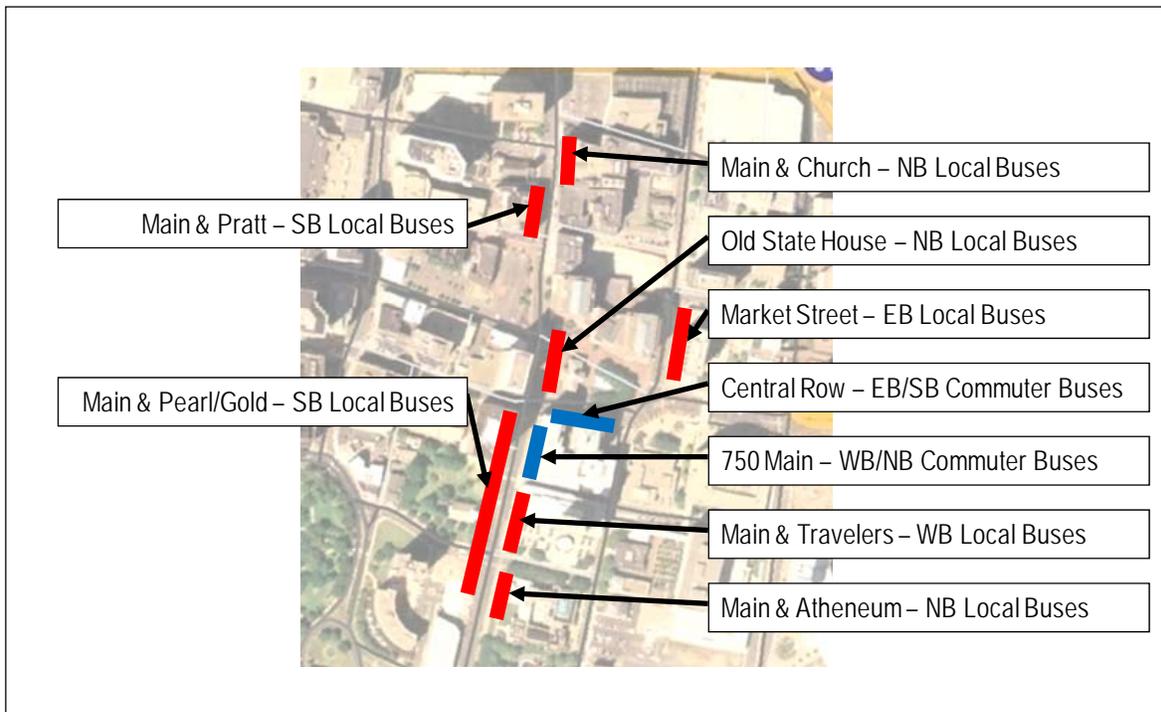


Table 12-3: Boardings at Main Street Stops in the Recommended Alternative

	Transfers		Origins		Total			Current Boardings
	Local	Commuter	Local	Commuter	Local	Commuter	Total	
MAIN ST & OLD STATE HOUSE								3,052
MAIN & TRAVELER'S	-	144	-	858	-	1,002	1,002	2,869
MAIN ST & ATHENEUM								903
MAIN ST & 750 MAIN		-	1,249	-	1,249	-	1,249	694
CENTRAL ROW SOUTH	837	-	853	-	1,690	-	1,690	799
MAIN ST & PEARL/GOLD	814	-	1,982	-	2,796	-	2,796	4,194
MARKET ST & CONSTITUTION	-	-	-	-	-	-	-	2,583
TOTAL	1,651	144	4,084	858	5,735	1,002	6,737	15,095

Local Bus Transfer Rate

A key finding of the study is that a significant share of riders boarding in downtown Hartford are transferring between routes. Both their trip origins and their trip destinations are outside of the downtown area making the location of their downtown boarding less important than the convenience of the transfer and the time spent traveling to and from the transfer point. While it was estimated that 69% of downtown boardings are transfers (twice as many as those who do not transfer), it should be recognized that transfer riders making a daily round trip will board a bus in the downtown twice daily, while those with downtown destinations will only board once. Therefore, the number of *people* who transfer is roughly equal to the number of *people* with a downtown destination. Nevertheless, the number of people who transfer is still significant and this was the key factor in the recommendation of a circulation alternative making use of a new passenger-friendly transit center.

Busway Transfer Patterns

Detailed estimates of busway ridership patterns were not part of this study. It was assumed that busway riders from inner portions of the line would behave much like local bus riders from those same areas and would tend to transfer at similar rates. Those from New Britain and beyond were assumed to behave more like commuter bus riders and have a very low transfer rate. Data from prior studies projecting ridership by station were used to estimate the numbers of riders in the two groups. Those behaving like local riders were assumed to have a significant transfer rate and would transfer to other routes in a pattern similar to that of the local routes serving the busway corridor (K, P, Q and W).

The result was a significant estimated number of transfers from busway services to other local routes, particularly to those serving the north side of the city. Thus, a transit center conveniently located for busway riders became an important consideration. As noted below, this reinforced the notion that a transit center should be located west (near the busway terminus) and north of downtown (to facilitate transfers to the north), but this was not the only factor.

As busway studies progress and new ridership estimates become available, the importance of a connection for busway services should continue to be evaluated.

General Transit Center Location

Given the decision to include a transit center, the key factors in determining its general location were the detailed transfer matrix and the physical layout of the corridors of existing bus service. The transfer matrix showed a high number of north-south through riders and transfers between north-south routes. Outside the north-south corridor, there were somewhat more transfers between west routes and north-south routes than between east routes and north-south routes. When the estimated busway transfers were included, the estimated number transferring between the west (including busway routes) and north-south routes became more than twice the number transferring between the east and north-south routes. Thus, with or without the busway transfers, there was a stronger tendency to transfer between north-south and west routes than between north-south and east routes. This helped lead to a

recommended circulation pattern with a transit center west of Main Street rather than east of Main Street so that more riders would benefit from a shorter trip and the use of the transit center.

The decision to locate a transit center to the northwest, rather than southwest, was based more on the physical layout of the city and the existing routes than on transfer numbers. The matrix of existing transfers actually showed more transfers between the west and south than between the west and north. When estimated busway transfers were included, the two movements had equal numbers of transfers. The decision was more dependent on the closer proximity of the north routes to the west routes and the lack of street connections in the southwest corner of downtown caused by the presence of Bushnell Park and the I-84 ramps. Most north routes actually approach downtown from Albany Avenue from the northwest, making the diversion required to bring north (Albany Avenue) and west routes (Asylum and Farmington avenues) together much less than that required to bring west and south (Main Street) routes together.

Within the northwest sector identified as the recommended location for the transit center, several possible sites were noted. Further investigation may identify new sites or find that others that had been dropped may ultimately be feasible and available. From a bus operations perspective, a site that requires a relatively equal diversion of north routes from Main Street and west routes from Asylum Avenue would be optimal. A site too close to Asylum Avenue could require a large diversion for north-south routes, while a site along Main Street could require a large diversion for west routes and busway routes.

Use of Through-Routing

Implementation of the recommended alternative at a reasonable operating cost with improved service to transferring riders and maintenance of service to downtown riders is highly dependent on the expansion of through-routed services. The inability to locate a suitable transit center site adjacent to the existing downtown transfer point meant that a transit center would have to be located some distance from the center of downtown. Having all routes serve both a downtown stop and a transit center, without increased through-routing, would require extending many routes which would increase operating costs and increase the volume of buses on some downtown streets, particularly those connecting the transit center with the Main Street bus stops. Having some routes serve only the transit center or only the downtown stops would result in diminished customer service to downtown and/or low utilization of the transit center. Through-routing those routes that are now not through-routed would result in lower costs and lower bus volumes than implementing a transit center and not doing so.

The proposed through-routing will need to be carefully considered before a final decision is made to implement the recommended alternative. Issues to be considered would include the overall length of the new through-routes, the balancing of passenger loads and headways on the two sides of each through-routed pair, off-peak and weekend service levels and service span, and the impacts of eliminating any existing cost-saving interlining patterns. Development of a transit center away from the center of downtown without the operational efficiency of increased through-routing could substantially increase operating costs and/or result in poorer service to riders.

It should be noted that transfers between east and west routes were found to be not nearly as numerous as transfers between these routes and the already through-routed north-south routes. Thus, the recommendation for east-west through-routing was based primarily on operational considerations, not on transfer rates.

Busway Services

As noted in Section 4.1, prior busway studies assumed three different busway service types: "shuttle", local and express. The shuttle and local services would mostly carry riders from inner parts of the service area, that is those riders who were assumed for this study to have a high rate of transfer to local bus routes in the downtown. These routes, which the prior study determined would account for 19 of the 29 peak hour busway trips, were assumed to follow the local busway service routing presented above and make a stop at the transit center before continuing to the terminus on Main Street. They would stop again at the transit center in the outbound direction. The ten express

trips were assumed to follow a commuter bus routing, in the morning exiting at Sigourney Street to serve Asylum Hill, then following the commuter bus route noted above, and finally serving Capitol Avenue before returning to the busway at Sigourney. (The route would be reversed in the evening.)

The conclusion that shuttle and local busway services should serve the transit center is based on the above assumptions concerning busway ridership and transfer rates. Should additional ridership studies and busway service planning studies result in different conclusions, modifications to the downtown busway circulation patterns and use of the transit center should be re-evaluated.

Transit Center Site, Operations and Traffic Issues

Success of the recommended alternative depends on finding a workable transit center site. As additional site evaluations are conducted, careful attention must be paid to on-site bus circulation, access/egress points, and local area circulation. A site must be able to efficiently accommodate all bus operations activities and should have sufficient access and egress points serving all corridors of service. Direct access/egress routes must be available using the adjacent streets which must be able to accommodate the necessary high bus volumes. Traffic circulation changes and possibly bus priority treatments may be necessary to make a particular site work. Failure to consider these operational aspects could result in an inefficient and ineffective transit center and bus circulation pattern.

12.2.2. Transit Center Location Study

A downtown transit center in Hartford would serve the significant share of current bus passengers who transfer downtown in order to travel between outlying portions of the metropolitan area. It could also provide connections to the regional bus network for New Britain Busway services. While transfer patterns indicate a high level of transfer between all corridors, the street network, the existing bus route network and the expected addition of busway services indicate a preference for a location north and west of the center of the center of downtown. The recommended configuration described above assumed a specific location; however, additional study is needed to select a final site.

CRCOG, CTDOT and the City of Hartford should collaborate on a Transit Center Location Study to review all possible sites, assess their suitability for a transit center, and assess their compatibility with existing and expected future bus and rail services. The study should consider all sites north and west of downtown that were initially identified for this study. It should also include a thorough examination to identify any additional sites that may be suitable. Each site should then be evaluated considering the physical and operational requirements of a transit center, displacement of existing uses, the likelihood of alternative uses for the site, and the potential for joint development of the site and surrounding areas, including transit oriented development opportunities.

Conceptual layouts and operating plans should be developed for the most promising sites so that construction and other costs can be estimated. The layouts and operating plans should be used to more accurately assess the impacts on bus operations and bus operating costs. The layout of entrances and exits and the operating plans may suggest adjustments to the recommended downtown bus circulation patterns and may suggest traffic improvements and bus priority strategies to improve downtown bus flow.

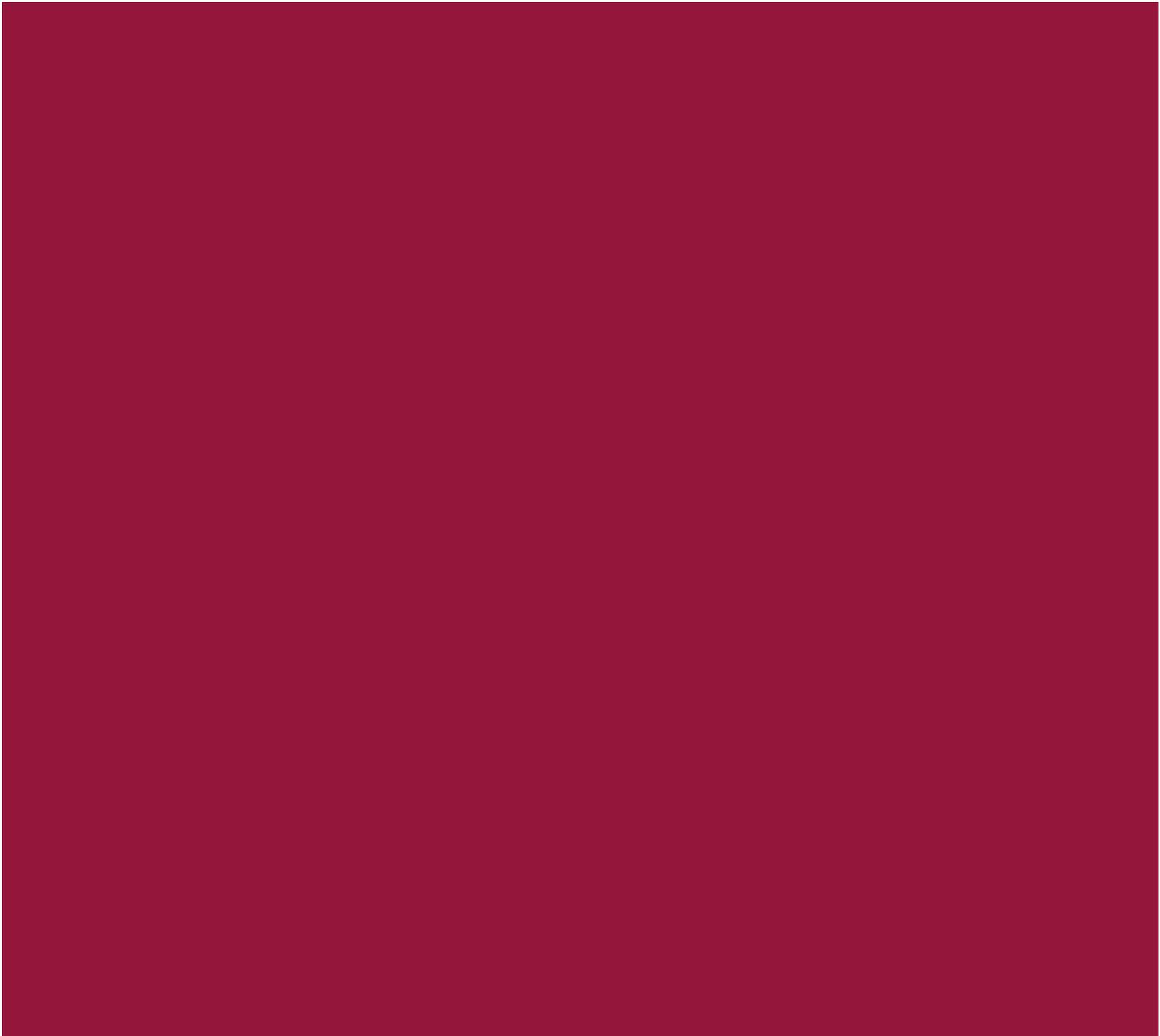
The location study should also assess new information from other ongoing transportation planning efforts, in particular the development of operating plans and updated ridership projections for the New Britain Busway and the latest projections of New Haven - Hartford - Springfield rail ridership. Busway operating plans and the trip patterns of the projected riders, in particular, may suggest changes in the way busway services would interact with the transit center.

The recommendations of the Transit Center Location Study should include a recommended site along with a conceptual layout and operating plan. Costs and benefits should be assessed, including construction costs, the cost



of transit center operations, and the impact of bus routing changes on bus operating costs. The benefits identified through this study should be further refined based on the selected location. Rider benefits would include travel time savings, better transfer amenities and safer connections. Benefits to the city would include reductions in on-street bus layovers, reductions in sidewalk crowding, reduction in pedestrian-vehicle conflicts, possible redevelopment of an under-utilized site, and transit-oriented development opportunities.

This Downtown Circulation part of the Northwest Corridor Study has provided Hartford with a direction to follow to improve the performance of the region's bus network while maintaining bus access to the downtown and improving the pedestrian and business environment on Main Street. However, the identification of the need for a new facility means that the process of bringing about these improvements is just beginning. Determination of a preferred transit center site is the next step, which must then be followed by identification of funding sources, environmental analysis, and design before the many benefits can be realized.



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