TOWN OF ESSEX

TOWN TRANSPORTATION STUDY

Volume I - Existing Conditions

Final Report • April 2011

NELSON
NYGAARD

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Table of Contents

Table of Figures

Chapter 1. Demographics

Mobility in the Town of Essex is intimately related to its land use, demographics, and travel patterns. As this context evolves – for example, as more development occurs along select corridors and travel patterns change – the mobility needs of Essex will change as well. The Town Transportation Study will develop recommendations to address Essex's current and future transportation needs, so solutions today will prepare Essex to meet the needs of the future.

This chapter summarizes Essex's current demographics and travel patterns that are relevant to the transportation study. It highlights the implications of demographic changes for mobility in Essex.

Population

The Town of Essex's population in the year 2000 was 6,505, a 10% increase from the 1990 count of 5,904. The population of Middlesex County grew at a similar rate of 8%. Current forecasts project that in 2030, Essex will have a population of 7,637, a 17% increase from the 2000 level. By contrast, the population of Middlesex County is expected to grow by 19% in this period. Essex grew steadily after World War II, stayed steady in the 1970s, and has seen more growth since the early 1980s. Local, regional, and state sustainable growth planning and polices are aiming to alleviate the negative impacts brought on by this growth and if successful, would result in different population levels in the town than currently projected.

Figure 1-1 Population Trends and Projections for the Town of Essex

	1920	1950	1960	1970	1980	1990	2000	2010	2020	2030
Population	2,815	3,491	4,057	4,911	5,078	5,904	6,505	7,013	7,354	7,637
10-Year Change (%)		24%	16%	21%	3%	16%	10%	8%	5%	4%

Source: Connecticut State Data Center, 2007

The growth of surrounding towns has an impact on mobility in the region. The impact on Essex is especially apparent with those towns that have a significant portion of their labor force working in Essex. Looking forward to 2030, Essex is growing at annual rates that are about average compared to its neighbors. Killingworth is forecasted to increase at the highest rates, whereas Old Saybrook's population is expected to slightly decline.

Figure 1-2 shows the rates of annual population growth in surrounding communities.

Figure 1-2 Projected Yearly Population Growth Rate in Select Connecticut River Estuary Town

	2010	2015	2020	2025	2030
Chester	0.32%	0.43%	0.42%	0.52%	0.47%
Clinton	0.59%	0.47%	0.53%	0.46%	0.42%
Deep River	-0.11%	-0.03%	-0.02%	0.03%	0.01%
Essex	0.65%	0.49%	0.49%	0.43%	0.30%
Killingworth	0.91%	0.93%	0.90%	0.81%	0.79%
Lyme	0.19%	0.25%	-0.10%	0.10%	-0.03%
Old Saybrook	0.13%	0.04%	-0.05%	-0.07%	0.12%
Westbrook	0.11%	0.16%	0.19%	0.30%	0.26%

Source: Connecticut State Data Center, 2007

Figure 1-3 presents selected demographic data for the Town of Essex and Middlesex County as defined by the U.S. Census. The county is included as a comparison of Essex to its surrounding region. The town and the county have many similar characteristics, though the town has a slightly higher density and more housing that is owned rather than rented.

The typical demographic ingredients for a successful multi-modal system include higher densities and high shares of traditionally transit-using populations – youth, elderly, households owning fewer vehicles and households with lower incomes. The data show that Essex has potential to support such a multi-modal transportation system.

Figure 1-3 Selected Demographic Data, Town of Essex and Middlesex County

	Town of Essex	Middlesex County
Population	6,505	155,071
Land Area (square miles)	10.4	369
Density (persons / sq mile)	625	420
Income		
Median Household Income, 1999	$66,746	$59,175
Percent of Population in Poverty	3%	5%
Age *(percent of population)*		
Under 18	22%	23%
Aged 65 and over	20%	14%
Housing Tenure *(percent of households)*		
Own	80%	72%
Rent	20%	28%
Vehicle Availability *(percent of households)*		
Zero	7%	6%
One	30%	31%
Two or more	63%	63%
Race / Ethnicity *(percent of population)*		
White alone	97%	91%
Black or African American alone	<1%	4%
Hispanic or Latino	1%	3%

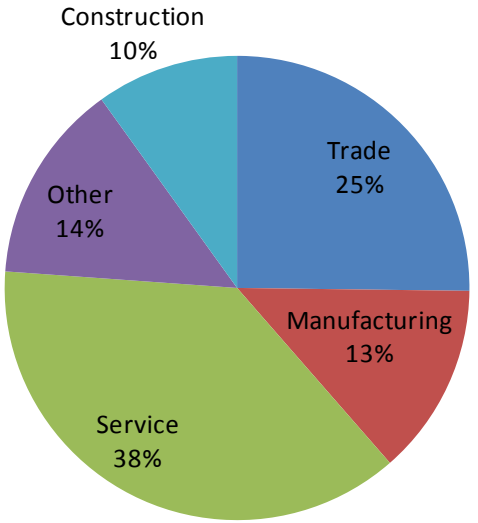
Source: US Census, 2000

Employment

In 2008, 3,653 of 3,813 Essex workers were employed. The unemployment rate was at 4.2%, compared to the state's unemployment rate of 5.7%. The Connecticut River Estuary Regional Planning Agency reports that Essex is the third largest employment center in the Estuary region. Only Old Saybrook and Clinton have larger centers of employment. There are 388 places of work in Essex, with nearly 4,000 employees. Within the Connecticut River Estuary region, the Town of Essex employs 19% of the regional workforce, although Essex's population only comprises 11% of the total regional population.

Employment opportunities in Essex are varied (Figure 1-4). Most of the jobs in Essex are in the service and trade industries. Manufacturing is a growing industry in Essex, as the number of firms doubled from 1990 to 2000. According to the Connecticut Economic Resource Center, the top five major employers (2006) in Essex are Tower Laboratories, The Lee Company, Essex Meadows Inc, Essex Credit Corporation, and Essex Elementary School. In terms of regional industries, Essex supplies 21% of both service and construction jobs, 19% of trade jobs, and 16% of manufacturing jobs.

Figure 1-4 Employment Opportunities in Essex (2005)



Travel Patterns

Most work trips by Essex residents are made by single-occupant automobile.

Among all Essex residents, 85% drive alone to work, 5% carpool, 1% use public transit, and about 3% walk to work. Compared to the mode split of the United States as a whole, the mode choice of Essex residents is very similar. Essex residents carpool and take public transit slightly less than the average for the country, and drive to work in single-occupant vehicles slightly more, but overall, the breakdown is similar to the US average. Mode split; the proportion of trips made by each mode of transportation, car, public transit, bicycle, etc.; are summarized in Figure 1-5.

Residents of Essex have varied travel times to work (Figure 1-6). Twenty-percent of Essex residents that commute to work travel less than 10 minutes. Most (55%) travel between 10 and 40 minutes, and 25% travel more than 40 minutes.

Figure 1-5 Mode to Work

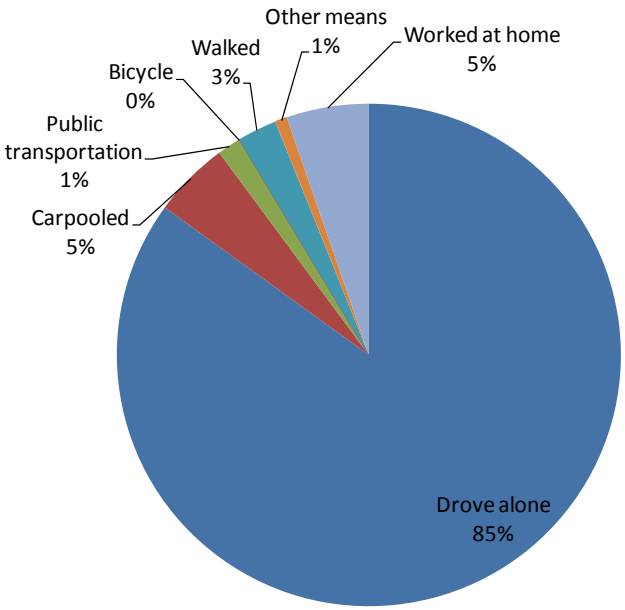
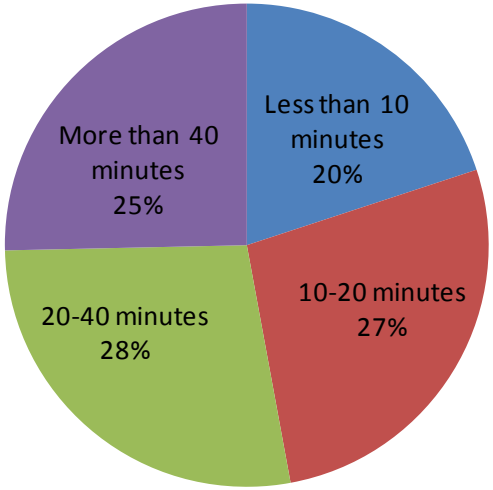


Figure 1-6 Travel Time to Work



Origins and Destinations

The origins and destinations analysis only includes towns in the Estuary region, so the total population for this analysis is confined to the region's nine towns. Out of this sample, half of Essex residents are employed in Essex, but the majority of people who work in Essex are commuting from surrounding communities. Other popular places of employment in the region for Essex residents are Old Saybrook, Clinton, Chester, and Westbrook. Workers that travel to Essex to work are most likely coming from Old Saybrook, Deep River, and Westbrook. Specific origins and destinations of residents and non-residents are summarized in Figure 1-7 and Figure 1-8.

Figure 1-7 Essex Residents Employment Destinations

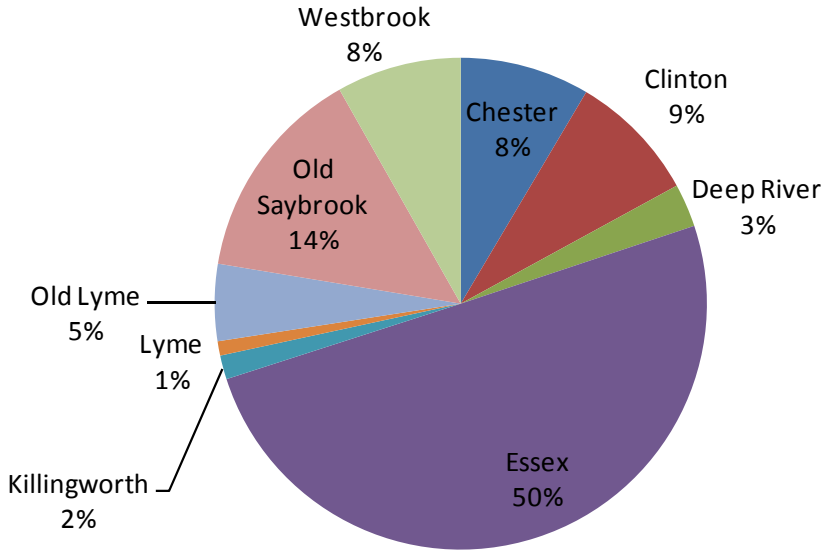
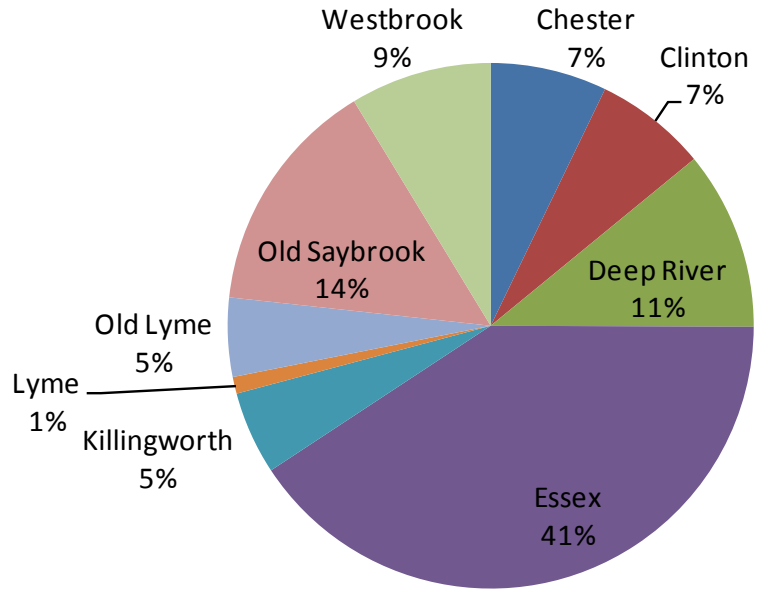


Figure 1-8 Origin of Essex Workers



Chapter 2. Land Use and Zoning

Full reviews of land use patterns and zoning, including past, present, and future, is an essential element to the town transportation study. Analysis of the zoning code is particularly important, as it has fundamental impacts on all modes of transportation and their relationship to land uses. The amount, type, and location of parking, safe pedestrian and bicycle facilities, access to public transit, and the street network are all direct or indirect products of the zoning code.

The Town of Essex's historic growth patterns, current land uses, zoning code, and other related documents are analyzed in Chapter 2. This information is particularly useful when making recommendations for Essex's future mobility as addressing the source of transportation demand is a critical component in a comprehensive transportation plan.

Historic Growth[1]

By the early 18th century, the population in present-day Essex became large enough to support a church. The Second Ecclesiastical Society was established in Center Say Brooke, later renamed Centerbrook, which is today's middle village of three in Essex. Centerbrook became the home of this church because it was located in the "center" of the activity in the settled area of that time.

To the east of Centerbrook, Essex Village began to develop shortly thereafter. Main Street on the "point" of the Connecticut River was laid out in 1748. Essex Village began to gain population and economic activity during the Revolution War, which established Essex Village as a center of shipbuilding activities. Between the Revolutionary and Civil Wars, over 600 vessels of various types were produced in Essex Village.

Ivoryton, once known as West Centerbrook, was developed as a manufacturing center for ivory and piano parts in the late 19th century. It became one of the most important social and economic hubs in the lower river valley, and was an area where manufacturing employees and the local village were intertwined. By 1900 and until World War I, the businesses and residents of Ivoryton were paying more than half of the property taxes collected in Essex.

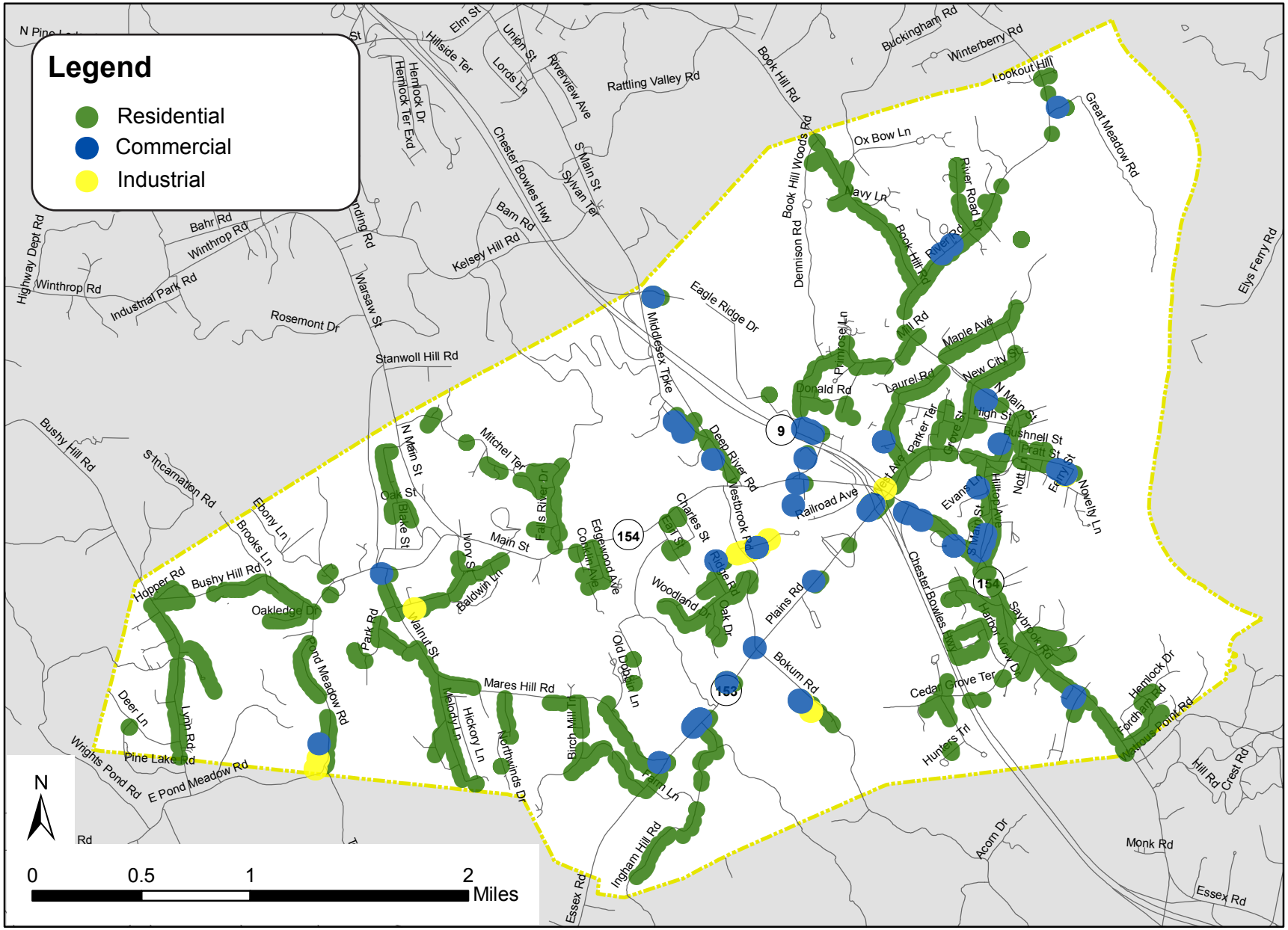
With other prominent factories in Essex and the surrounding area, the Connecticut Valley Railroad ran its line through Centerbrook in 1870. Although many of these factories eventually closed, travel conditions in the area improved as a result of this rail line. Essex Village remained a marine focal point, and Route 153 and Route 9 began as important thoroughfares through the area. With the decline of the manufacturing sector over the last century, 80% of the town's property taxes now originate from residential properties. Recently the industrial sector has focused on smaller manufacturers, primarily in the Centerbrook Industrial Park. Today's retail and service sector growth is focused around Bokum Corner, where Route 153 and Bokum Road intersect. Essex's history and modern growth represent a dynamic mix of three villages in one town with strong residential and commercial heritage.

Existing Land Use

Land use information for the Town of Essex is limited. Most of the properties in the Town of Essex are residential with some commercial and industrial clusters (Figure 2-1). The primary commercial clusters are along Route 153 and Route 154, and near the intersection of Route 9 and Route 153.

1 Historic Growth adapted from Town Historian Don Malcarne's A Brief History of Essex.

Figure 2-1 Land Use Clusters



Zoning Analysis

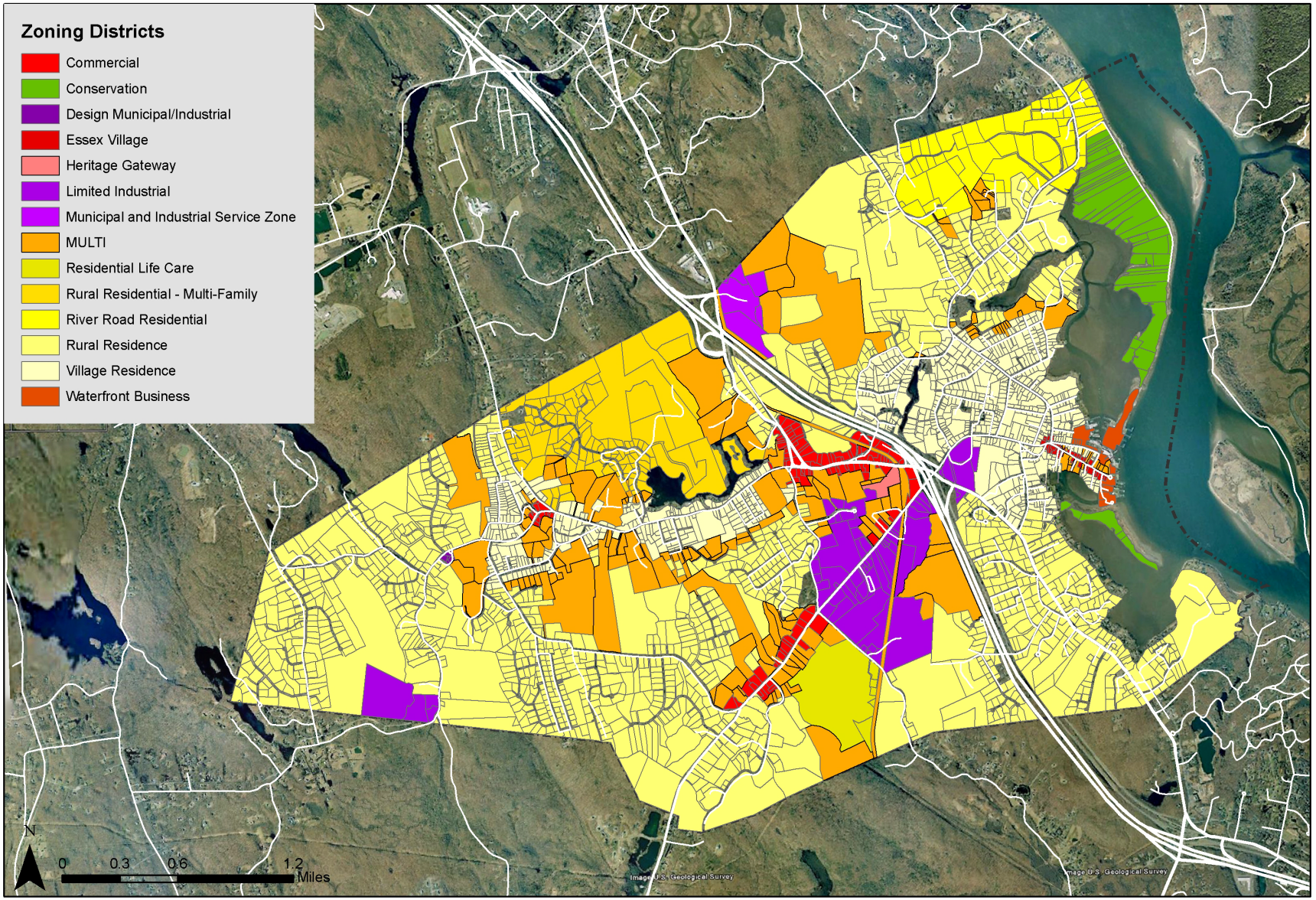
The Town Transportation Study focuses on the entirety of the Town of Essex. The study area includes five distinct residential zoning districts: *Village Residence*, *Rural Residence, Rural Residence - Multi-Family, Residential Life Care with an associated Active Adult Community,* and *River Road Residential* Districts. These districts compose the largest percentage of land in the town. Essex also has three commercial district designations, *Essex Village, Waterfront Business,* and *Commercial* Districts. The *Heritage Gateway* District is a mixed-use area, which according to the Zoning Regulations, provides

> *"a flexible framework for the development of properties that have unique or unusual characteristics and do not fit into the conventional zoning pattern, such as village centers, heritage industrial areas and open spaces that would otherwise require unusual environmentally and aesthetically sensitive development" (81A).*

The Town also has three industrial districts, including the *Limited Industrial* and *Design Municipal/Industrial District*, as well as the *Municipal and Industrial Service Zone*. Finally, the Town has five districts dedicated to preserving and protecting various natural resources through the *Conservation, Gateway Conservation, Coastal Management, Flood Plain,* and *Water Resource* Districts.

An additional zone, labeled *Multi,* is a zoning designation for those parcels that cross between two zoning districts. A majority of *Multi* zones are *Rural Residence* Districts that have small sections of *Limited Industrial, Municipal* and *Industrial,* or *Commercial* Districts.

Figure 2-2 Town of Essex Zoning Districts



Residential and Commercial Zoning

Based upon the minimum lot requirements for development within residential, commercial, mixed use, and industrial districts, the current Zoning Code encourages development to occur in a low-density, spread out fashion. Even for buildings within the Essex Village District, the current minimum lot area requirement of 15,000 square feet means that there will only be 2.90 units per acre of development in that zoning district.

Figure 2-3 Lots per Acre based on Zoning Regulations

Use Type	Minimum Lot Area/ (Family DU) (sq ft.)	Lots/Acre (43,560)
Village Residence	60,000	0.73
Rural Residence	80,000	0.54
Residential Life Care	40,000	1.09
Active Adult Community	80,000	0.54
River Road Residential	130,000	0.34
Essex Village	15,000	2.90
Waterfront Business	30,000	1.45
Commercial	30,000	1.45
Limited Industrial	80,000	0.54
Municipal & Industrial Service	80,000	0.54

Translation to Density

With a maximum of 2.90 lots per acre in Essex, density is relatively low. This type of low-density development is unlikely to have a significant impact on the number of people driving alone. According to Holtzclaw (2002), household density is a good indicator of mode choice. Transit use rises from 0.2 - 0.3 daily transit trips per household at 6 or 7 households per acre to 1.3 daily transit trips per household at 30 – 50 households per acre. Walking trips have very similar characteristics, and as density increases, journey by foot becomes more and more convenient. Transit trips increase with density until trip distances become short enough to take by walking or bicycle.

Dimensional Requirements

Requiring buildings to provide a minimum setback encourages greater dispersal of development and decreases the likelihood that one will walk between various uses. Allowing or requiring parking between the building and the street increases the incentive for drivers to use their vehicle to travel between nearby destinations.

The zoning regulations have eliminated minimum front setback requirements for the Essex Village District, which allows residential uses and home occupations and, by special exception, business, service, restaurant, and place of worship uses. The side and rear setbacks for buildings in this District are both five feet.

The Heritage Gateway District similarly requires no setback for lots located within the District; however, buildings at the edge of the District must have a setback of 30 feet from the District line. The other Zoning Districts in Essex require setbacks ranging from 25 to 75 feet, depending upon land use type.

There is also guidance as to the location of parking in the Commercial District, in which no more than 25% of the parking is to be provided between the building and the street. The rest of the parking may be provided behind the building or screened from view by landscaping near the street. Industrial Districts also have a similar limitation on the amount of parking that can be provided in the front of the building.

Figure 2-4 Dimensional Requirements under Essex's Zoning Regulations

Existing Regulation	Best Practices
Most zones have minimum front yard setbacks.	No front yard parking in downtown area. Reduced or eliminated minimum setback requirements in downtown area.
Exceptions	
"DISTRICT: EV Front Setback: 0 ft. Side Setbacks Each: 5 ft. Rear Setbacks: 5 ft." (70B) "The setback from the district boundary for new buildings constructed after adoption of the HG-1 Concept Plan within the HG-1 District shall be 30 feet, as shown on the Concept Plan. There shall be no minimum lot line setback for lots within the district to allow for subdivision of property at the footprint of buildings and establishment of common areas for parking, access and site amenities." (HG.1.D.1.) **Commercial District:** "Not more than 25 percent of all parking provided shall be located between the principal building and the street. The balance of parking provided shall be located in an area either behind the building or screened from the view of the street, except at entrances to and exits from the parking area." (80B) **Limited Industrial District:** "There shall be no parking in the 50 foot front setback from the street with the possible exception of two handicapped parking spaces if this is needed for ease of access to the building." **Municipal and Industrial Service Zone:** "Not more than 60 percent of the area of the required setback from the street shall be used for driveways or for parking, and the balance shall be put in law or suitably landscaped and planted and shall at all times, during use of such building or enlargement, be maintained in good appearance. Parking in the required setback from the street shall be for passenger vehicles only, and no portion of the required setback shall be used for storage or for any purpose except as herein provided." (91C.1.a)	

Driveway Curb Cuts

Driveway curb cuts are a major source of vehicle-pedestrian-bicycle conflicts. Busy thoroughfares with more curb cuts experience more congestion on due to left turns in and out of the driveway. When alternatives are available and feasible, limiting or prohibiting driveway curb cuts along key vehicle, pedestrian and bicycle routes reduces or eliminates these conflicts, providing safer, more efficient, and less congested public rights-of-way.

The zoning regulations provide general guidance on curb cuts and access points, by ensuring that they do not create hazardous conditions for driving or encourage congestion. In the Commercial District, within the landscaping section, driveways may only cross a landscaped strip of land up to two times, unless the street frontage is particularly long. In the Limited Industrial District, for properties with less than a 300 foot frontage, one driveway may cross the landscaped strip, while properties with more than a 300-foot frontage may have two drives.

The curb cuts, along with other detailed information, must be included in the plot plan for a zoning permit. The guidance is not specific about placement of curb cuts relative to intersections or side streets or the impact of curb cuts on pedestrians or bicyclists.

Figure 2-3 Curb Cut Guidance under Essex's Zoning Regulations

Existing Regulation	Best Practices
Commercial District: "All lots used in a Commercial District shall provide a strip of land not less than 15 feet wide, adjacent to and extending for the length of the street line, which strip shall be kept in lawn or otherwise suitably landscaped. Such strip may be transverse by not more than two driveways, and one additional driveway for each 200 feet of frontage of the lot in excess of 300 feet." (80B) **Limited Industrial District:** "The landscaping strip may be traversed by one driveway for a property with less than 300 feet of street frontage. The landscaping strip may be traversed by two driveways for properties with over 300 feet of frontage. Each driveway is not to exceed 24' wide and a minimum of 100 feet apart. Additional driveways/ access lanes may be allowed if the property is very large or if warranted by safety considerations because of conditions specific to that property." (90C.1.B) **Municipal and Industrial Service Zone:** "All lots used in a Municipal and Industrial Service Zone shall provide a strip of land not less than ten feet wide, adjacent to and extending for the length of the street line, which strip shall be put in lawn or otherwise suitably landscaped and planted. Such strip may be transversed by not more than two driveways, and one additional driveway for each 200 feet of frontage of the lot in excess of 300 feet." (91C.1.a) **General Parking Regulations:** "The access areas shall be so connected to a street as to avoid unsafe driving conditions and traffic congestion." (110C) "Each plot plan submitted with application for a zoning permit shall clearly show all required parking facilities, and for every use except residential uses shall show truck loading spaces, curbs and curb cuts, lighting, landscaping, surface material, drainage, grades and elevations. The Zoning Commission may require that such plot plan be designed and prepared by a registered professional engineer licensed to practice in Connecticut." (110G.3)	In transit-oriented zoning districts, reviews emphasize a prohibition of curb cuts and driveway openings along key transit, bicycle, and/or pedestrian routes whenever possible. Where curb cuts are present, standards expect a level crossing for pedestrians (raised driveway) and clear sightlines for exiting motorists to see pedestrians

Other Relevant Documents

2005 Plan of Conservation and Development - 2009 Update

The 2005 Plan of Conservation and Development (Plan) became effective July 1, 2005 and was updated in 2009 to include two new chapters addressing energy sustainability and the revitalization of Ivoryton Center. The Plan provides guidance for the Town's growth and development as well as maintaining its character and heritage. It also provides information on Town goals to inform long-range planning. A Plan of Development was first adopted in 1971 and the first Plan of Conservation and Development was completed in 1991. It is anticipated that there will continue to be intermediate updates and additions to the plan, like the 2009 Update, in between the recurring 10-year cycles of plan creation mandated by the Legislature.

The Plan contains a description of Essex as it has been and is, and includes targets for the way Essex should develop in the future. It also includes demographic and land use information. Among the goals outlined in the Plan, emphasis is placed on concentrating economic development within the Village Centers, in a mixed-use manner that supports infill, reuse, and historic growth patterns. Cluster Zoning is another goal within the Plan, with all commercial, industrial, and residential growth accommodating higher density, causing less intrusion into open space and the natural environment. Encouraging the use of a variety of modes of transportation within the Town is also encouraged, while goals for preserving natural resources, open space, and the Town's architectural heritage are also established, as well as for housing and infrastructure.

The Plan views the Village Centers, historically as Essex Village, Centerbrook, and Ivoryton, and more recently to include the Heritage Gateway and Bokum Center, as the focal points for mixed-use development and sites of increased intensity of use, with development scaling down in accordance with distance from these centers. To institute these goals, revising the zoning regulations was necessary to reinforce the role of the village districts as the centers of development, encourage mixed-use development through appropriate regulatory language, and connect the zoning updates to the 2000 Open Space Plan and the open space and cluster growth components of the Plan.

Residential Zoning Districts

Within each Zoning District, the Plan also offers implementation steps to make the zoning regulations more reflective of the goals detailed within the Plan. For residential districts, the emphasis is on structuring development so that it avoids encroaching upon important natural resources and open space, and encouraging the development of affordable housing, particularly within mixed-use areas. Based upon the amendment dates of the residential district sections of the Essex Zoning Regulations, it appears that these goals have not been formalized into regulatory language.

Commercial Zoning Districts

Recommendations for the Commercial Districts again include the focus on village centers for commercial activity, with first floor retail, avoiding the potential for development along Route 153 from the intersection of Ingham Hill Road to the Westbrook Town line. Additionally, implementing rear parking standards, shared parking, and building at or close to the lot line , along with other pedestrian-friendly features. Other transportation-oriented recommendations include implementing requirements that developments within Bokum Center and the Heritage Gateway provide more detailed information about their traffic plans, and minimize curb cuts to improve access and limit traffic congestion. The parking and transportation-oriented recommendations have been incorporated into the Essex Zoning Regulations, while those addressing first floor retail have not been put in place.

Industrial Zoning Districts

For Industrial Districts, the Essex Zoning Regulations have incorporated the recommendations that the Limited Industrial District include professional offices, in addition to light manufacturing, and while development in each District must mitigate its impact, the requirements to limit impact are not as stringent nor addressed as

comprehensively as the recommendations for protecting natural resources, particularly in flood zones, aquifer areas, and wetlands.

Economic Development

The Town of Essex has worked hard to maintain its village development pattern and avoid strip and big box retail developments. The goals for economic development in Essex focus on enhancing the Town's unique position as both a venue for local and tourist retail, rather than developing itself as a regional retail center. The goals strongly emphasize the mechanism of redevelopment within the commercial and mixed-use zones to keep the pattern of development that has characterized the Town.

The Plan envisions the implementation of these goals by fostering commercial activity in the Route 153 area, redevelopment that is accessible by pedestrians, side and rear parking to serve developments, adaptive reuse, an emphasis on the unique tourist attractions of the Town, and first floor retail with housing above in commercial districts. Additionally, pursuing the type of development already present in each village center would help ensure diversity in retail options. According to the plan, Essex Village should pursue upscale specialty shops and restaurants, while Centerbrook continues to focus on general retail and services, and Ivoryton encourages more antique and arts and crafts retail to match its role as a hub for tourism. Additionally, the Plan suggests evaluating the tax advantages of promoting redevelopment, including zoning alterations to change requirements for Floor Area Ratio, Parking Standards, and Site Plan Layouts.

While industrial development continues to be encouraged, the plan suggests rigorous review of plans should be required to limit externalities that could affect natural resources and people living and working nearby. "Clean" industry and high tech companies are strongly encouraged. Another recommendation is for the Town to conduct an Economic Development Study to create a long-term plan for Essex's future economic growth.

Transportation

While analyzing transportation issues for Essex, the Plan highlights both the recent growth of the region that is resulting in significantly higher traffic volume as well as the Town's location in the center of the region. The Town is bisected by U.S. Route 9 but it is State Routes 153 and 154, which have experienced dramatic increases in average daily traffic in recent years and are unlikely to weather further increases well if development is pursued in a spread out and low-density fashion. The Town has been opposed to the widening of Route 153, and the Plan emphasizes the need for Essex to work with surrounding towns to prevent major growth. It suggests that one potential avenue for control is obtaining official designation as "scenic roads", and while parts of Route 154 outside of Essex have received that approval, Routes 153 and 154 in the town do not have that status.[2]

Based on the findings from the 2000 Census, Essex was included in the Connecticut River Estuary Regional Planning Agency Metropolitan Planning District. The roads that had been classified as rural are now within an urban border, but the Plan encourages pursuing road design that is suited to the rural character of the area, as well as limiting dead-end creation, and preventing lots smaller than 5 acres from being subdivided for roads.

Mass Transit

The Plan outlines the various forms of mass transit in the Town, including the Shoreline Shuttle, with service along the Route 1 corridor that has a variety of stops in the region, and the Estuary Transit District's On-Demand Bus, serving older adults and persons with disabilities. The region also has a variety of rail services, including the Shoreline East, which is Connecticut Department of Transportation-sponsored commuter rail; Amtrak, with stops in New London, Old Saybrook, and New Haven that connect to Shoreline East; and the Essex Valley Railroad, a historic railroad that functions as a tourist attraction. The Plan suggests that improvement efforts for these modes should include expanding Shuttle Service and marketing the Shuttle and Bus as means of tourist mobility, connecting bike and

2 http://www.ct.gov/dot/lib/dot/documents/dscenicroads/List_of_Scenic_Roads_Nov_1_2008.pdf

pedestrian routes to mass transit, exploring federal funds for bus shelters, and expanding the Shoreline East rail service to mitigate congestion on Interstate 95.

Bicycles/Bikeways and Pedestrians

Since the adoption of the Plan, Connecticut has passed a Complete Streets Law, with requirements for amenities to promote safe walking and use of bicycles, and has created a Statewide Transportation Plan for bicycles and pedestrians (see below). The Plan focuses on the promotion of safe scenic and commuter biking, suggesting that the towns pursue inclusion of bike lanes when road improvements are made and work with other towns for regional bike trails. For pedestrians, the Plan recommends sidewalk and trail connectors throughout the villages, as well as requiring new development to include sidewalks, and building greenway corridors as a component of open space acquisition.

Parking

In discussing parking, the Plan names parking standards as one component determining the number of spaces a business provides, but also cites the success of the business as the main determinant of parking demand. The Plan suggests shared parking regulations and dense development as tools in combating the vast parking lots the requirements can create. The implementation steps for improving parking in the town include:

- A study of parking as part of a comprehensive transportation plan,
- Promoting remote parking with shuttles to the three villages,
- Analyzing shared parking overlay districts to count spaces within a walkable area, rather than a lot basis,
- Promoting a mixture of business to ensure lots are used throughout the day,
- Utilizing landscaping to break up expanses of asphalt,
- Enforcing the two-hour parking regulation, and
- Requiring employees in the villages to park in lots, rather than on-street.

2009 Update

Energy Sustainability

In 2008 the Town joined the International Council of Local Environmental Initiatives and its program "Local Governments for Sustainability," which encourages the reduction of greenhouse gas emissions and lessening dependence on fossil fuels. The following year, the Planning Commission created the "Energy Sustainability Subcommittee" to make recommendations for inclusion in the Plan. The implementation priorities include

- Meeting the ICLEI goals of reducing greenhouse gas emissions to 10% below 1990 levels by 2020 and to 80% below 2001 levels by 2050,
- Ensuring the Zoning Regulations foster dense development that supports alternatives to automobile transportation,
- Expanding public transportation,
- Incorporating energy efficiency and sustainability into the Zoning Regulations,
- Considering changing the municipal fleet to alternative fuel vehicles,
- Pursuing funds for clean energy sources and energy efficiency improvements to homes and businesses, and
- Requiring municipal building construction meet guidelines of LEED certification.

Ivoryton Center Revitalization

In 2008, the Planning Commission created an ad-hoc committee to study the Ivoryton area and make recommendations for encouraging economic vitality. Their July 2009 report focused on economic revitalization to further enhance the current mix of uses in the area; sewage disposal, as the neighborhood lacks sewer lines or an ideal site for a large-scale community wastewater disposal facility, and parking availability, as the area developed prior to the automobile and there is a shortage of spaces currently, which will only become more serious as the area redevelops.

The implementation plans include:

- Adopting Ivoryton Center Zone regulations to foster mixed-use redevelopment with relaxed setback and parking requirements,
- Construction of a municipal parking area to encourage a "park once" environment,
- Exploring shared parking,
- Creating a "Complete Street" on Main Street,
- Pursuing public-private partnerships to redevelop vacant space,
- Determining a community wastewater plan that will take advantage of existing funding sources, and
- Promoting the village as a tourist attraction.

Chapter 3. Pedestrian and Bicycle

This chapter summarizes existing conditions for pedestrians and bicyclists in the Town of Essex. While downtown Essex Village has a generally pleasant pedestrian environment, there is a lack of cycling facilities in all villages. In many areas of town, there are blocks and even entire street segments with very basic and at times inadequate pedestrian infrastructure. Furthermore, attempts to leverage the current walking/cycling potential of downtown Essex's transportation infrastructure and physical environment could be eroded by decisions that prioritize cars and parking over pedestrians and cyclists on downtown streets.

Existing Pedestrian Facilities

Essex Village has sidewalks and some crosswalks along Main Street, but other major streets in the village have incomplete pedestrian infrastructure (Figure 3-1). Pratt Street, North Main Street, West Avenue, Methodist Hill, and Prospect Streets were all identified in the field work observations as corridors with inadequate pedestrian infrastructure. For example, on Pratt Street, the north side of the street only has sidewalks between North Main Street and Cross Street, while from Cross Street east, there are no sidewalks. The south side of the street is also inconsistent, as there are some sections without sidewalks. Just west of the village center, sidewalks and crosswalks are either incomplete or non-existent, which provides an unsafe environment for pedestrians coming to and from Essex Village.

In Centerbrook (Figure 3-2), there are sidewalks on a majority of streets and crosswalks at most major intersections. However, there are several sections with poor sidewalk conditions, including width, grade, and general physical condition. Crosswalks are also not up to best practice safety standards. The crosswalk on Main Street is difficult to see and another lacks a pedestrian signal. There are numerous curb cuts on almost every street, and particularly at the Main Street/Westbrook Road/Route 154 intersection. Too many curb cuts and high traffic volumes, particularly at intersections, are major hazards and are more likely to result in pedestrian/vehicle collisions. Despite Centerbook having the foundations for pedestrian infrastructure available, there is maintenance and adjustments needed to bring current conditions to safe standards for pedestrians and other users. It should also be noted that Essex Elementary School is located in Centerbrook and that as part of its recent Safe Routes to School Plan, developed by the Town, pedestrian safety upgrades in Centerbrook were recommended and funding has been awarded to construct additional sidewalks serving the school.

Ivoryton has a combination of the issues in Essex Village and Centerbrook (Figure 3-3). There are sidewalks that begin and end mid-block, and the north and south sides of the street are inconsistent. There are some crosswalks at major intersections west of Ivory Street, but at the intersection around Ivory Street, there is a lack of crosswalks. In addition, where there are crosswalks, the ramps are inadequate for meeting Americans with Disabilities Act (ADA) design standards. There are also a variety of issues with road shoulders: Main Street lacks shoulders in some places, while there is a good example of a road shoulder on Route 602/North Main Street. The combination of incomplete sidewalk infrastructure, no or inadequate crosswalks for pedestrians, and inconsistent shoulders for pedestrians when there are no sidewalks are all issues that create hazardous conditions for pedestrians and do not invite residents and visitors to walk comfortably.

Figure 3-1 Identified Pedestrian and Bicycle Features in Essex Village

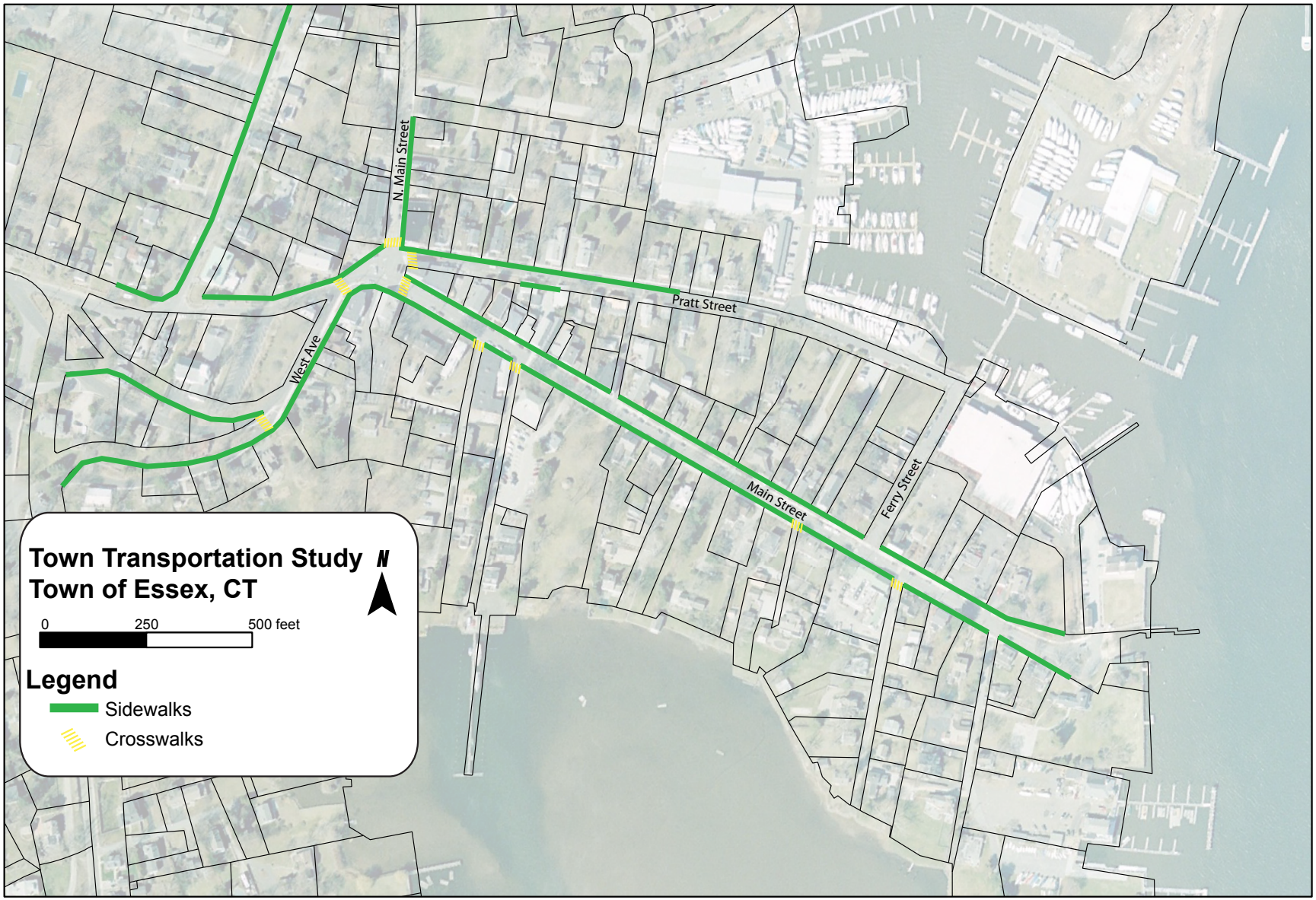


Figure 3-2 Identified Pedestrian and Bicycle Features in Centerbrook

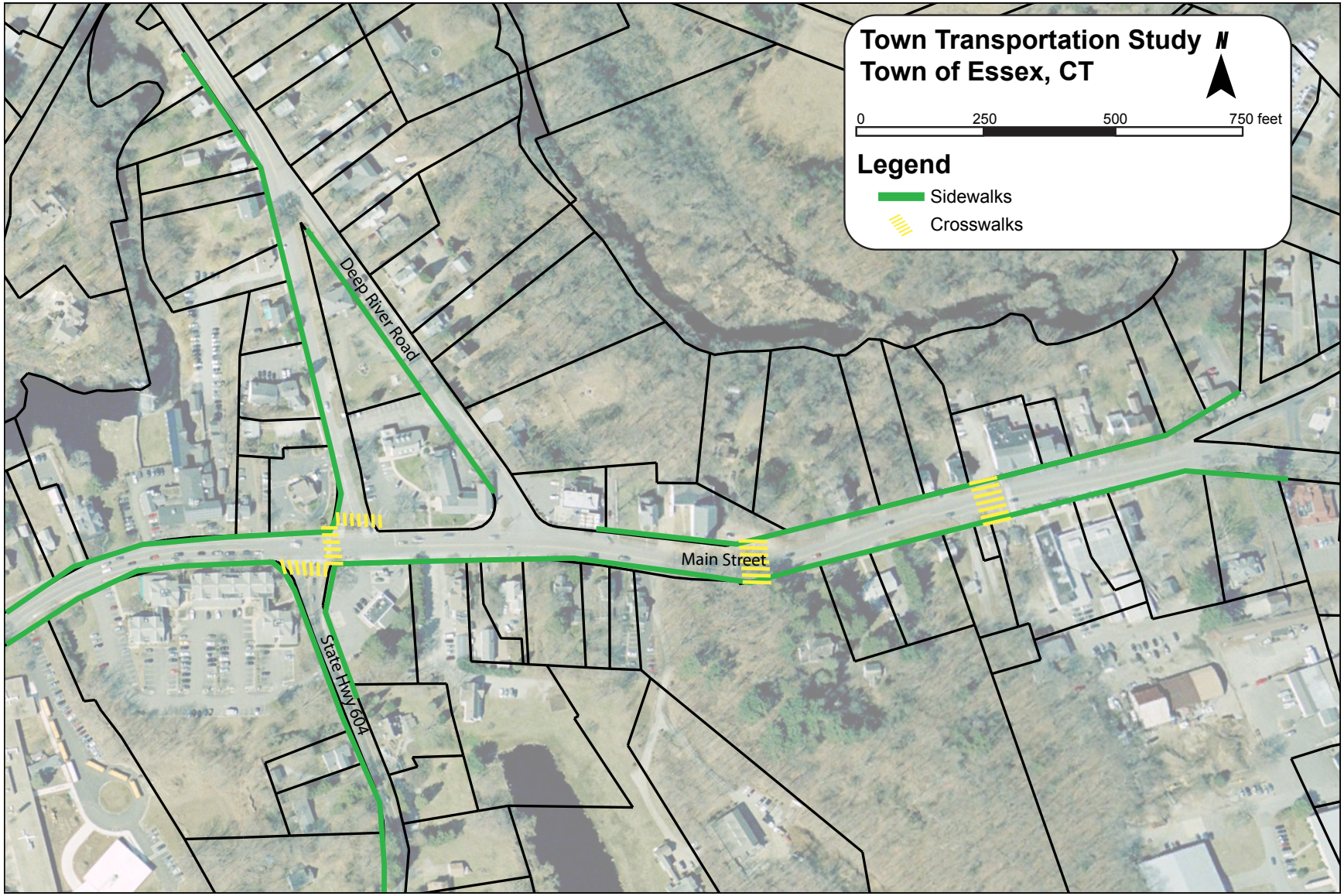
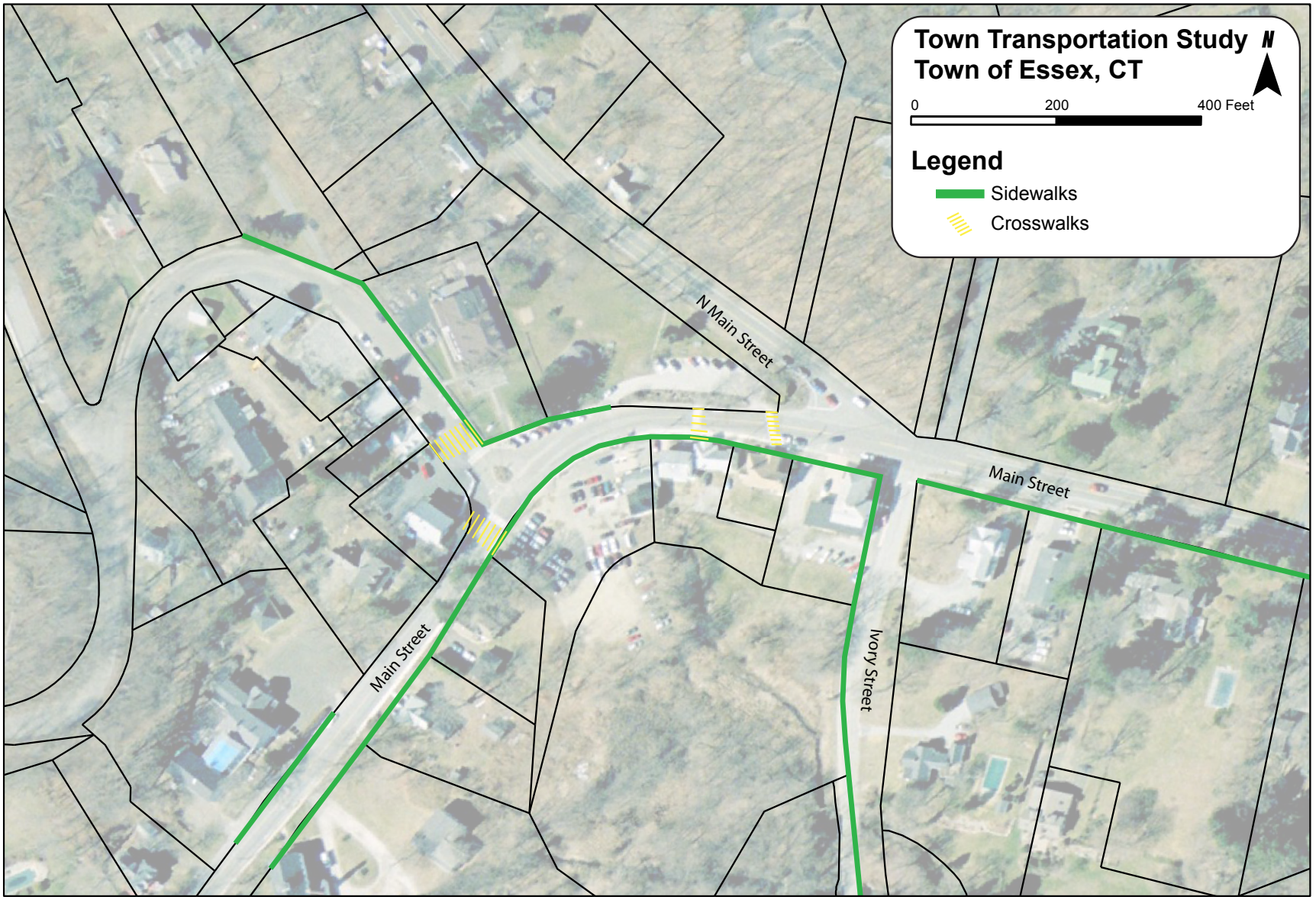


Figure 3-3 Identified Pedestrian and Bicycle Features in Ivoryton



Existing Bicycle Facilities

The Town of Essex has minimal to no bicycle facilities. There are no bike lanes, paths, or trails identified, and there is minimal bike parking. Although the town does not routinely accommodate bicycles, there is significant amount of bicycle demand by commuters, recreational cyclists, and children. There are also local and state policies that support a stronger bicycle infrastructure.

Regulations

Bicycle Parking

Bicycle parking is an essential part of encouraging bicycling and typically serves two important markets. Long-term parking is needed for bicycle storage for residents and employees. This parking is located in secure, weather-protected, restricted access facilities. Short-term parking serves shoppers, recreational users and other. As well as security, convenient locations are a priority – otherwise, bicyclists will tend to lock their bicycles to poles or fences close to their final destination. Bicycle improvements increase mobility, reduce auto dependency, congestion and air pollution and can be a very important mode of transportation for lower-income families and teens that are too young to drive.

The Heritage Gateway District section of the Zoning Regulations does address the need for developers to include proposed bike paths into their concept plans. However, the Zoning Regulations do not address bicycle parking requirements.

Figure 3-4 Bicycle Parking Regulation under Essex's Zoning Regulations

Existing Regulation	Best Practices
None. The following elements should be included in the concept plan: "The shape, size and location of proposed public or private streets, walkways, parking areas, rail lines, easements, planted and treed areas, buffers, signage, lighting and lighting patterns, drainage patterns, open space areas, access locations from connecting roads and driveways within the site to the existing public road system, and amenities, such as parks, meeting space, **bike paths**, pedestrian trails, and public restrooms." (81C.2.C)	Minimum bike parking facilities are provided in relation to the scale of development, and minimum design standards for such parking facilities are specified.

Relevant Plans and Other Documents

2009 Connecticut Statewide Bicycle and Pedestrian Transportation Plan and Recent Policy Changes

The 2009 Connecticut Statewide Bicycle and Pedestrian Transportation Plan (Bike/Ped Plan) provides an analysis of the current status of these activities in Connecticut, guidance for the future development of bicycle and pedestrian accommodations and amenities in the state, as well policy changes and funding opportunities to ensure the implementation of these plans. The Bike/Ped Plan provides information about similar efforts in other states and details the variety of benefits from walking and bicycling. A chapter on the laws, agency policies, and other initiatives includes a three-foot passing law that was passed in 2008 and the Safe Routes to School program, as well as recommendations to inform people of bicycle and walking resources and to encourage businesses to provide bicycle parking facilities.

There is a chapter dedicated to safety information including details on the Connecticut Department of Transportation's awareness campaign, with a "sharetheroadct" website, signs on buses, and radio announcements, and includes additional recommendations to improve safety. According to the report, there was one crash involving a pedestrian in Essex in 2005 and 2006, but none in 2007. In 2005, there were three crashes that involved bicycles, and one each in 2006 and 2007.

Existing, planned, and needed bicycle and pedestrian facilities are also discussed in the report, and maps of existing and planned routes. When asked to name the region's most critical needs, CRERPA cited a north-south bike route to connect the region to Hartford (Figure 18), enhanced bicycle and pedestrian routes between towns that include access to transit, and expanded and improved crosswalks throughout the region. Information about the potential for state roads to accommodate cyclists is also included, including establishing a bicycle suitability metric, based on Average Daily Traffic and shoulder width on state roadways. The Plan further identifies a planned on-road bicycle/multi-use trail running parallel to Route 9 in Essex, starting just north of Old Saybrook and terminating south of East and West Haddam.

Complete Streets Initiative

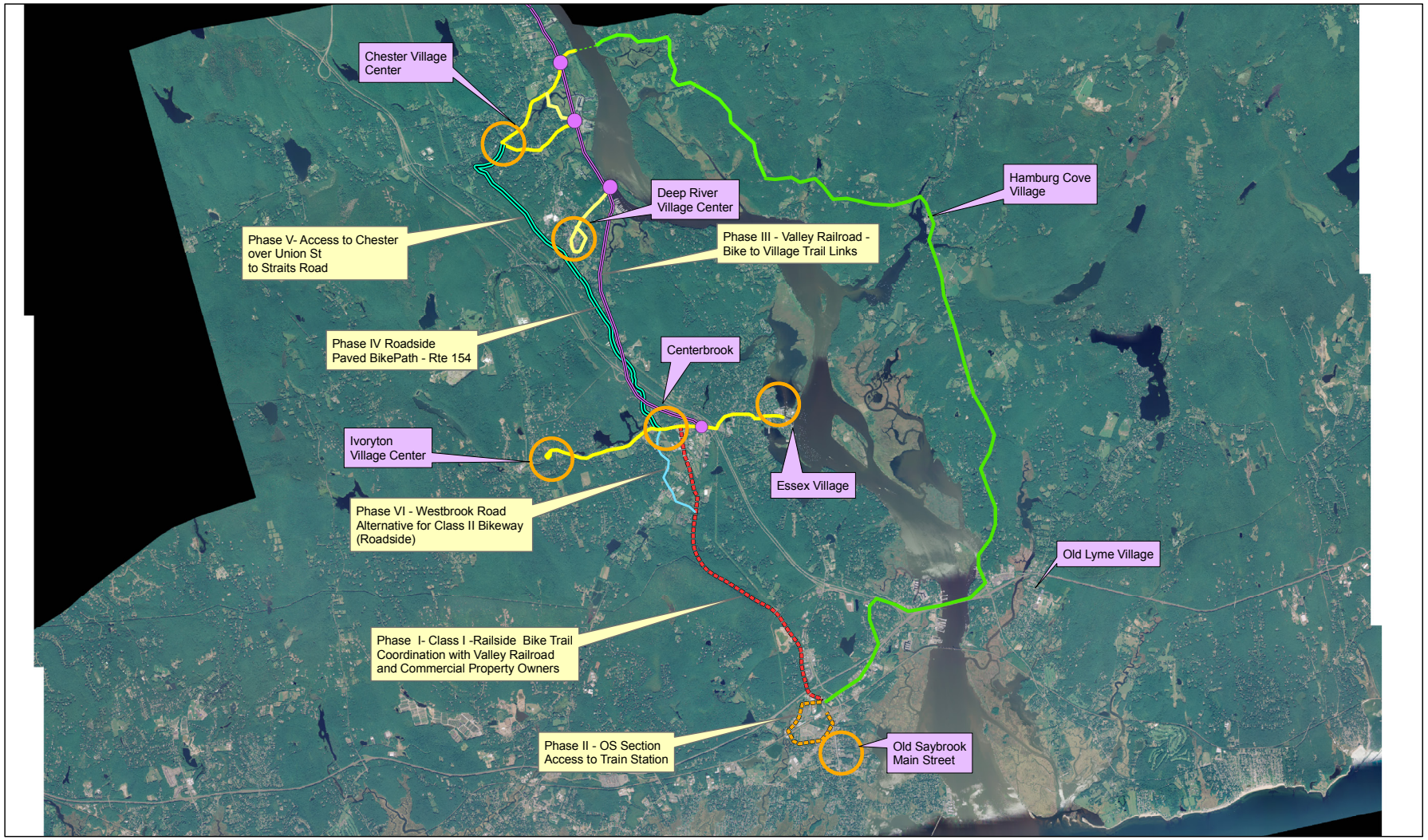
Connecticut enacted PA 09-154 An Act Improving Bicycle and Pedestrian Access, also known as the Complete Streets Law, on July 1, 2009. The law requires that each year, beginning on October 1, 2010, 1% of the funds received by the Connecticut Department of Transportation (CT DOT) or Connecticut municipalities must go to infrastructure that supports all users, including bicyclists, pedestrians, and those who utilize mobility assistance. The law also established an 11-member panel, called the Connecticut Bicycle and Pedestrian Advisory Board, with membership appointed by the Governor and leaders of the state House and Senate. The Board is charged with keeping complete streets a priority and promoting programs that aid in making the roads safe and accessible for all users. Finally, an annual report must be completed by the CT DOT that details the state and federal money spent on complete streets projects.

As a part of their effort to improve conditions for cyclists and pedestrians, the Connecticut Bicycle and Pedestrian Advisory Board and the Connecticut Department of Transportation recently announced a new policy for lane widths on state roads, reducing the width from twelve to eleven feet wherever possible. The restriping of roads will take place as they are repaved. The initiative refers to the Bike/Ped plan to determine those areas in greatest need of this lane width reduction.

CRERPA Reports: Integrated Regional Access Plan 2009: Coordinated Access for Non-Motorized Intermodal Transportation

This plan (CRERPA Plan) provides information on the policies and means of implementation that can improve transportation those who walk, cycle, ride horses, and travel in human-powered boats in the region. The introduction describes how transportation-related concerns generally have focused on the safety and efficiency of automobile travel without considering the impact of that form of travel on other modes. Some important statistics from the region include

Figure 3-5 CRERPA's North-South Bicycle Route



Estuary North South Bikeway/ Multiuse Path :Phases I- VI

Goal Objectives: Commuter/Recreation/Tourism

CRERPA MAP - For Planning Purposes Only
November 08- Updated to 7/09- LJD

0 0.5 1 2 Miles

Attachment for Question 5A of Application

- Railside Multi-use Trail
- Existing Scenic Roadside Bike Route
- Bike on Railcar Links to Villages
- Bike-Walking Trails to Villages
- Route 154 to Union St Improvements
- Link to OS Rail Station
- Westbrook Roadside Improvements
- Railside Multi-use Trail

N

that the regional population of 60,000 doubles with the seasonal population in coastal municipalities and from tourism. Additionally, aside from land dedicated to residential development, infrastructure for transportation is the second greatest land use.

One characteristic of the plan is its emphasis on the regional nature of projects and improvements and highlights the following:

- Road improvements for safety of all modes of travel (Complete Streets Program)
- Coordinated transit routing and bus stop improvements
- Bikeway corridor construction
- Mapping of trail systems (recreational, marine, and heritage)
- Construction of roadside pathways
- Regional rail coordination and access
- Boating and ferry access
- Sidewalk construction and critical crosswalk connections

In the section on Bicycle Transportation, the Plan notes several features of the region that make it suitable for cycling, including the land's relative flatness, the short distance between towns, to location of large employers close to population centers, and the fact that two thirds of those living in the region also work in the region. This section also discusses the classification of infrastructure accommodating bikes and of trip purpose. A North South Class I Bikeway connecting Essex to Old Saybrook is recommended, which would serve bicycles but also be a multi-use path (see map in Connecticut Statewide Bicycle and Pedestrian Transportation Plan section). Mentioned in this section of the report is the fact that Essex received a $450,000 Safe Routes to School grant from the Federal Highway Administration, with construction anticipated to start in the spring of 2011. The Plan also suggests transferring between modes, including allowing bikes on Valley Railroad and utilizing transit oriented development to promote bike use.

In the portion dedicated to Pedestrian uses, the CRERPA Plan notes that there are few sidewalks and pedestrian amenities outside of the village centers. This section of the plan acknowledges environmental justice components of the plan, including "providing access to all forms of available motorized transportation options within the region; access to recreational transportation options for disabled persons; dependable and viable access to services: medical, social, household; and affordable transportation alternatives for those populations with limited options for automobile ownership." CRERPA is working with individual towns to incorporate features that promote both pedestrian activity and the use of public transit, such as bus shelters.

Multi-Use trails, which are present throughout the region, marine access, and open space links are also topics addressed. The CRERPA Plan also describes the concentration of historical sites within the region and the idea of promoting the area as a Heritage Corridor, which would help reinforce public and non-motorized transportation options. Making sure the various modes of transportation are integrated will help support tourism in the region. The Plan also promotes transit-oriented development as a mechanism for managing growth.

In a final summary, the potential regional access projects for Essex include a "shared roadway initiative for Routes 1, 154, 166, and River Road; sidewalk plan in place – coordination with bus stops and rail station; and water access signage, parking, and sidewalk."

Chapter 4. Public Transit

Description of Available Services

The Town of Essex is served by bus transit services provided by several different transit operators, including 9 Town Transit / Estuary Transit District (9TT), and DATTCO/CT Transit. 9TT provides local bus service, while DATTCO, operating on behalf of CT Transit, provides commuter services to New Haven and Hartford. During the summer, a trolley service provides circulator service within the Essex area; however, the trolley will not run as a fixed route service during 2010 and will instead serve trips on demand with advance notice.

Rail service is available at the nearby Old Saybrook rail station. Shoreline East provides direct rail service from Old Saybrook to New Haven seven days a week with additional service to New London on weekdays. Amtrak provides rail service to New Haven on the Northeast Regional line connecting Boston with Washington, D.C./Virginia, as well as its premium complementary service, Acela, offering high-speed connections between Boston and Washington, D.C. Acela makes stops at New Haven and Stamford, CT, and some Northeast Regional trips also stop in New London and Old Saybrook, CT.

All of 9TT's services, as well as the Shoreline East train service, some Amtrak services, and DATTCO/CTTransit services, connect at Old Saybrook Train Station.

9 Town Transit/Estuary Transit District

9 Town Transit (9TT), also known as Estuary Transit District, operates four bus routes in total, of which two serve Essex: the *Riverside Shuttle* which connects Chester to Old Saybrook and the *Mid-Shore Shuttle* which connects Middletown to Old Saybrook. These routes operate as flex-route services and will deviate up to ¾-mile off the route's course. While there are some established bus stops within the system, all 9TT shuttle services may be flagged down by customers at any point along the route where it is safe for the bus to stop. In addition to fixed route service, 9TT operates a demand-response service ("Transit on Call/Dial-a-Ride") that is open to the general public. Dial-a-Ride service provides door-to-door transportation with reservations required one day in advance.

In addition to routes serving Essex directly, 9TT also operates services to New London and Madison. All 9TT vehicles are accessible to persons with disabilities, and all vehicles are equipped with bicycle racks. According to its most recent survey, 30% of 9TT riders are seniors and 70% are non-seniors; of all trips made in the system, 50% are work-related trips.

Fares

Cash fares on 9TT services are as follows:

- Regular adult fare: $1.25
- Off-route fare (where permitted): $2.50
- Transit-on-Call / Dial-a-Ride: $2.50
- Children age 4 and under: Free
- Seniors: Free

In addition to cash fares, 9TT offers a monthly pass for $45.00, and a multi-trip ticket book that provides 10 regular adult fares or 5 off-route fares for $11.50. Fare media can be purchased from Stop and Shop locations in Madison, Clinton, and Old Saybrook, as well as the 9TT business office in Centerbrook. Fares are provided free for seniors through a Title III grant from the Senior Resources Agency on Aging. To receive this fare, seniors must be pre-approved for the discount and use special tickets.

Additionally, riders with a Shore Line East Monthly Pass may use 9TT services for free, as may those holding a transfer from DATTCO's "S"

Route, Middletown Area Transit, CT Transit Hartford, and South East Area Transit, which connect with the Mid-Shore Express route.

Transit information is available in paper format (brochures), by phone, and on 9TT's website. Brochures are one of the most popular methods by which riders get information about service, and there are brochure holders at locations in the 9TT service area including at government buildings and businesses, such as banks and hotels. At Old Saybrook, where 9TT's services converge, information is posted at the 9TT bus stop but not within the Old Saybrook Rail Station itself. Amtrak representatives regularly hand out 9TT brochures and regularly call to request additional brochures as they run out.

Riverside Shuttle

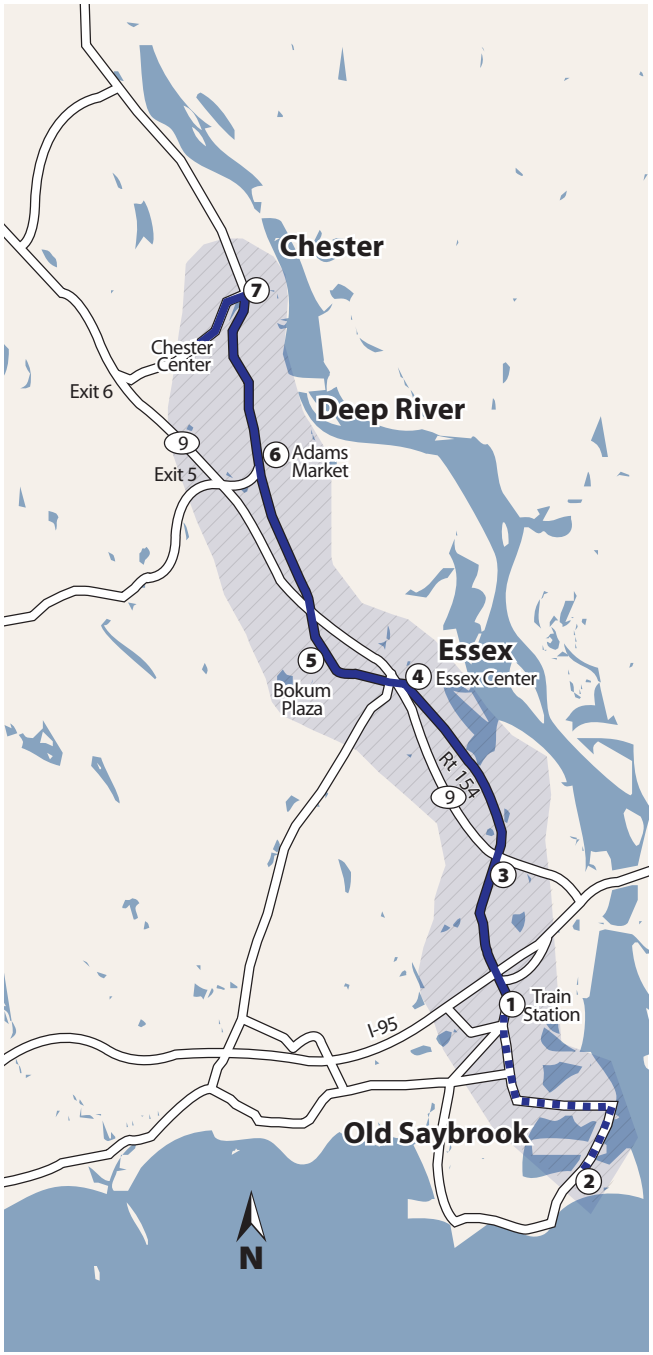
The Riverside Shuttle route operates from Chester to Old Saybrook, with service to Deep River (Adams Market), Bokum Plaza, Essex Center, and Old Saybrook Train Station (see Figure 19). The route also serves Old Saybrook Shopping Center in the northbound direction. Between June 1 and October 31, the route also serves Old Saybrook Point on Connecticut's coast. The route will also deviate up to ¾-mile to drop off or pick up customers. To be picked up, customers must call in advance to schedule a deviation from the route, and doing so incurs a higher fare of $2.50.

Schedule

The Riverside Shuttle operates 13 one-way trips (seven northbound and six southbound) on weekdays that serve Essex, roughly every hour and a half, and four trips per day in each direction on Saturdays, roughly every two and a half hours. Trips before 10AM on weekdays are request-only stops in Essex. Travel times on the route from downtown Essex are as follows:

- 23 minutes to Chester Center;
- 12 minutes to Bokum Plaza;
- 11 minutes to Old Saybrook Railroad Station; and
- 32 minutes Old Saybrook to Essex (return trip).

Figure 4-1 Riverside Shuttle Route



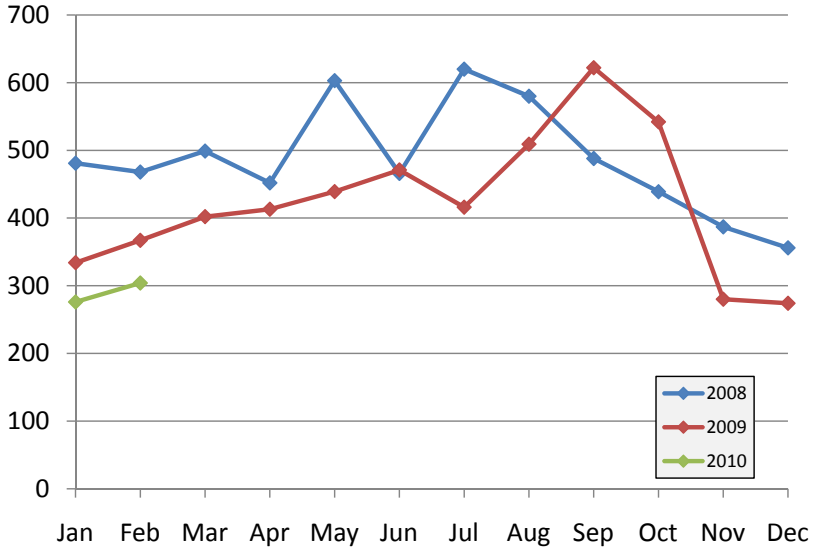
Service Connections

The Riverside Shuttle connects with all four other 9TT routes at Old Saybrook Train Station, including the Shoreline Shuttle (which offers service to Scranton Gazebo – Madison) and the Niantic Shuttle. It also connects with Shoreline East and Amtrak rail services at Old Saybrook Train Station. However, services are not timed to meet.

Ridership

Ridership on the Riverside Shuttle route is typically between 400 and 600 riders per month, with higher ridership during summer months (see Figure 4-2). Annual total ridership for 2008 was 5,839 and for 2009 it was 5,069.

Figure 4-2 Riverside Shuttle Monthly Ridership



Mid-Shore Express Route

The Mid-Shore Express Route connects Middletown (including Middlesex Community College), Chester, Deep River, Essex, and Old Saybrook (see Figure 4-3).

Schedule

The Mid-Shore Express operates five trips per day in each direction on weekdays, concentrated during AM and PM peak travel times with a break at midday. The midday trip between 10:50 and 11:10AM serves Essex Park and Ride by request only. Travel times on the route from Essex Park and Ride are as follows:

- 35 minutes to Middletown bus terminal; and
- 10 minutes to Old Saybrook Rail Station.

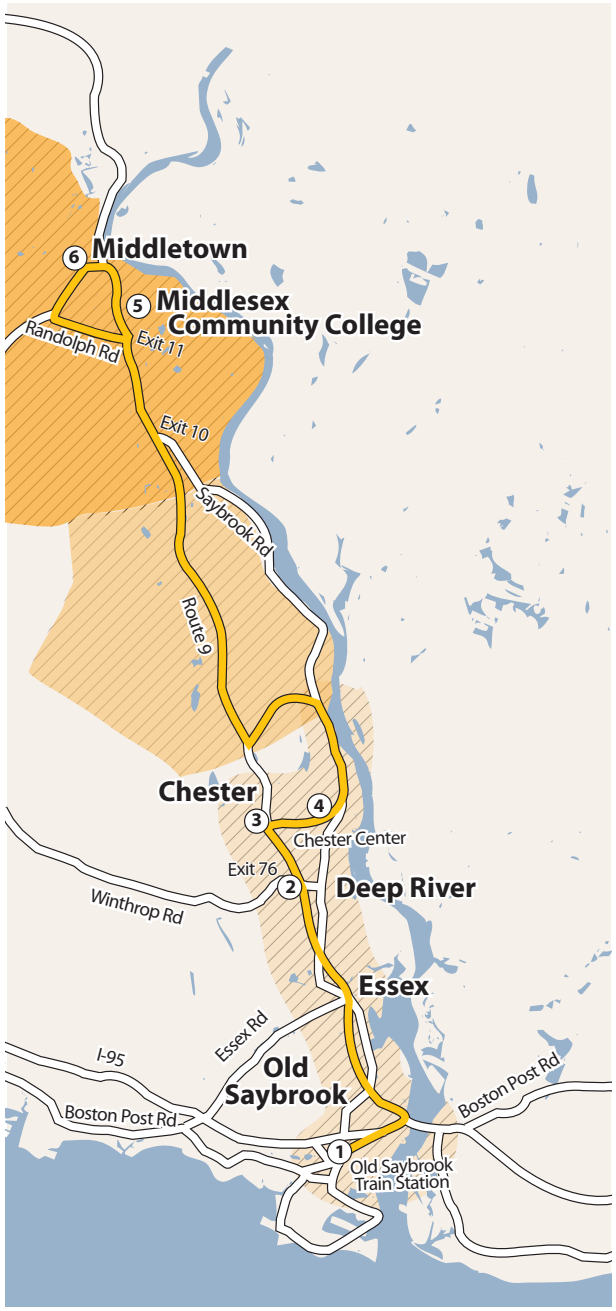
Service Connections

The Mid-Shore Express connects with the DATTCO "S" route (described below) at Old Saybrook Train Station at 5:45PM for service along the shoreline from Madison to New Haven. Free transfers can be made to CT Transit's Route 55, which connects Hartford and Middletown, at the Middletown Bus Terminal. The route also connects to services provided by Middletown Area Transit (MAT), which offers service to Meriden and Middletown. Free transfers can be made to any MAT bus at the Middletown Bus Terminal.

Ridership

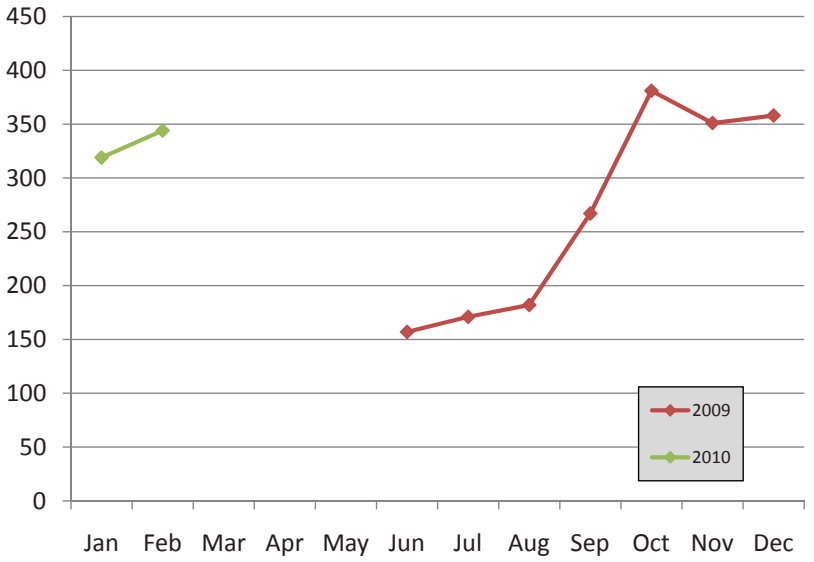
Service on the Mid-Shore Express commenced in June 2009. Since that time, ridership on the Mid-Shore Express has increased significantly, rising to between 300 and 400 riders per month.

Figure 4-3 Mid-Shore Express Route



Source: 9TownTransit

Figure 4-4 Mid-Shore Express Route Monthly Ridership



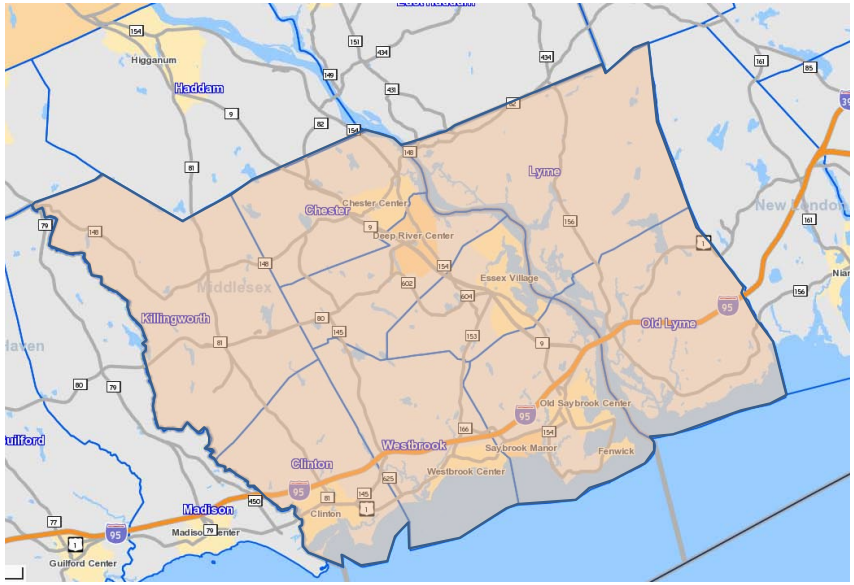
Source: 9TownTransit

Transit-on-Call / Dial-a-Ride

In addition to its fixed route and deviated fixed route services, 9TT also offers a demand-response service called Transit-On-Call/Dial-A-Ride (TOC). TOC service provides door to door shared ride transit service to and from anywhere in the estuary region. The service operates Monday through Friday and reservations must be made by phone at least 24 hours in advance. The service area includes all areas within the city limits of the towns of Chester, Clinton, Deep River, Essex, Killingworth, Lyme, Old Lyme, Old Saybrook, and Westbrook (See Figure 4-5).

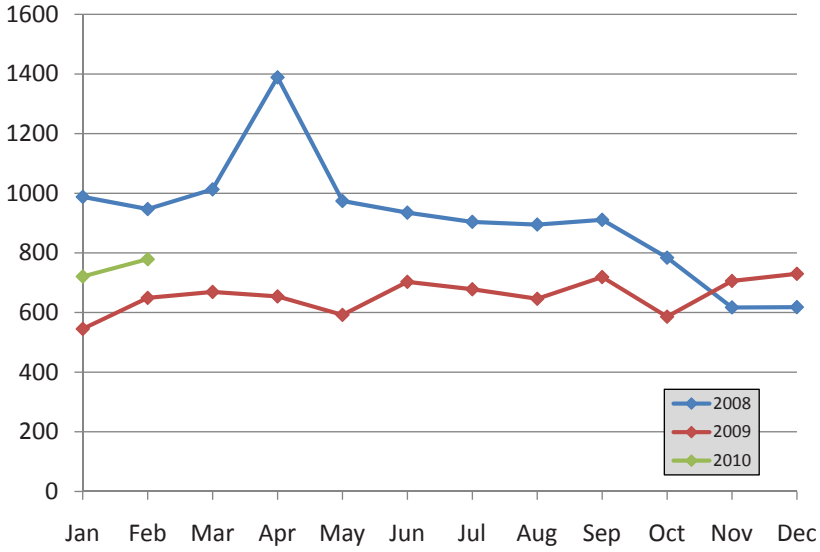
Figure 4-6 indicates monthly ridership on the Dial-a-Ride service, and shows that ridership has declined over time, from 10,975 annual riders in 2008 to 7,877 riders in 2009, though demand has been increasing since November 2009.

Figure 4-5 Dial-a-Ride Service Area



Source: 9TownTransit

Figure 4-6 Dial-a-Ride Service Monthly Ridership



Source: 9TownTransit

Recent Developments

While 9TT services are "flag" services – the driver will stop to pick up and drop off customers anywhere along the route where it is safe to do so – 9TT has secured funding for several bus shelters. These shelters will help to alert customers to the presence of services and provide comfortable waiting areas. However, flag-stop service will remain in effect.

The shelters are planned for placement as follows:

- Essex – one shelter at Route 154 at the driveway to Essex Court housing complex in Centerbrook;
- Deep River – one shelter at Route 154 in front of Adam's Market (already constructed);
- Chester – one shelter at main municipal parking lot in town center;
- Old Saybrook – one at recently constructed Ferry Road affordable housing development, and one at the bowling alley on Route 1;

- Clinton – two shelters at the Community Health Center on Route 1; and
- Westbook – Route 1 in town center.

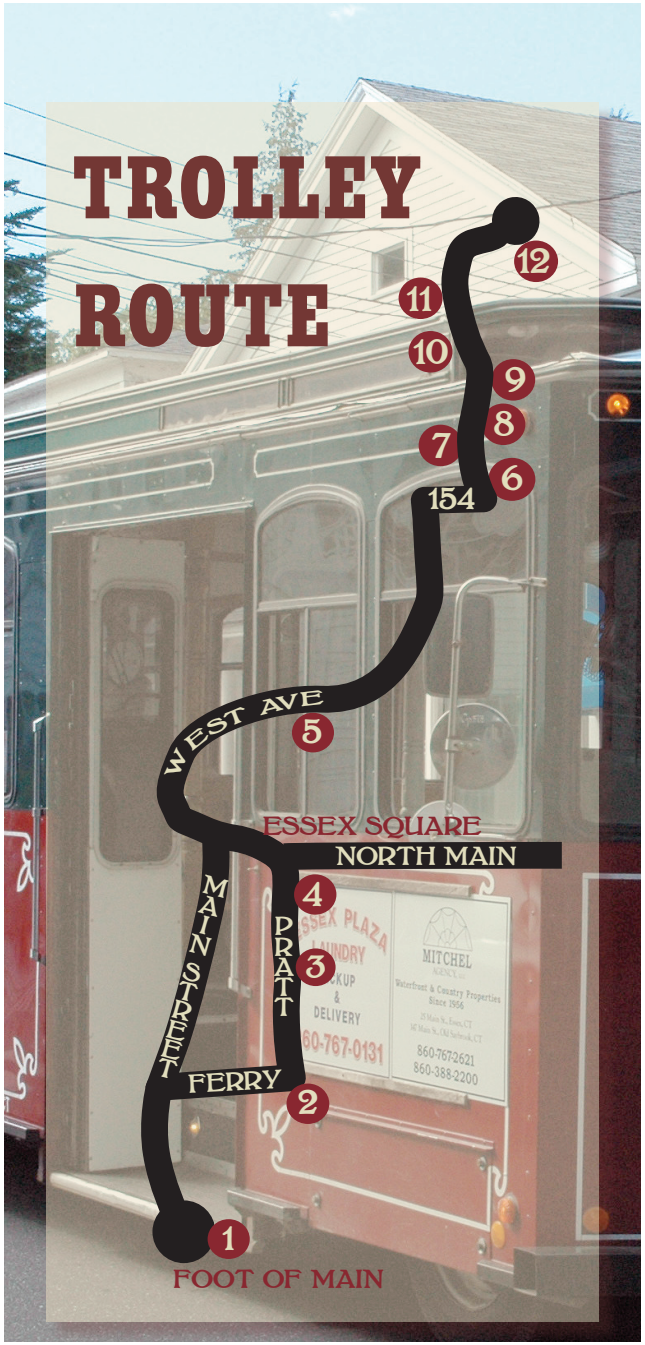
Additionally, 9TT has also secured additional funding from the Connecticut Clean Fuel Program to purchase a hybrid gasoline-electric Ford Escape and two hybrid gasoline-electric 12-passenger buses. The hybrid buses will be the first light-duty hybrid buses in operation in Connecticut. Currently, 9TT's fleet consists of eleven 14-passenger vehicles and two 20-passenger vehicles, all of which operate on gasoline; the new hybrid vehicles will replace 14-passenger buses, and the Ford Escape will be the first supervisor vehicle for 9TT.

9TT is working to add more functionality to its online information resources. For example, 9TT has recently added the ability to book Dial-a-Ride service and route deviation service for fixed routes online (service is now available). They will also soon add Google Transit integration and text message notifications of scheduled bus pickups for Dial-a-Ride and route deviation customers. All buses are equipped with mobile data terminals to assist drivers in serving Dial-a-Ride and route deviation customers effectively, and scheduling is done at 9TT using a program called *Ecolane*, which integrates scheduling with mapping functionality to enhance efficiency for these trips.

Essex Trolley

In past years, during the summer season, Essex has had a local fixed route transit service called the Essex Trolley. However, in 2010 it appears unlikely that the Trolley will operate as a fixed route service due to funding concerns; instead, it will operate as an on-demand service at the request of large groups. The Essex Trolley is primarily targeted toward tourists and only operates during the summer. Its fixed route did operate primarily along West Avenue and Main Street and served local attractions and businesses including the Connecticut River Museum, Essex Square, the Essex Steam Train, marinas, and the Ivoryton Playhouse. During summer of 2009, service operated every half hour between 10AM and 9PM, seven days a week, with a $2.00 requested donation, and the Trolley could be flagged anywhere that it was safe to do so. The Trolley service is coordinated by a local business owner.

Figure 4-7 Essex Trolley Fixed Route Service Map



Destinations on Trolley During Fixed Route Service

1. Connecticut River Museum
2. Essex Island Marina
3. Brewer Dauntless Marina
4. Essex Square
5. Town Hall / Public Library
6. Essex Laundromat
7. Essex Stream Train
8. Bennie's Market
9. Pizza Pub
10. Gabrielle's
11. Copper Beech Inn
12. Ivoryton Playhouse

DATTCO Transit Services / CTTransit

DATTCO operates two scheduled service routes in or near Essex on behalf of CTTransit. These include the "S" route commuter connection between Old Saybrook and New Haven, and the Middletown/ Old Saybrook Express (CTTransit Route 21).

New Haven/Madison "S" Route

DATTCO provides a scheduled bus service that operates between Madison Gazebo and New Haven. One trip per day in each direction also services Old Saybrook Train Station, arriving at Old Saybrook at 6:55AM and departing Old Saybrook at 5:45PM. The service operates on weekdays only, and trips terminate in New Haven at Church and Crown Streets, with midday trips also serving Union Station. Connections to the S route at Madison are also possible throughout the day by using 9TT's Shoreline Shuttle route, and transfers are free and timed to meet. Service throughout the day on the S route is operated roughly every 40 to 60 minutes. The adult cash fare for the S route is $1.25.

Middletown/Old Saybrook Express (Route 21)

DATTCO's Middletown/Old Saybrook Express route operates between Hartford and Old Saybrook Rail Station with service to the Essex Park and Ride. The service operates nine trips per day (four northbound and five southbound) on weekdays only in the peak direction only (to Hartford AM, to Old Saybrook PM). Travel times from Essex are as follows:

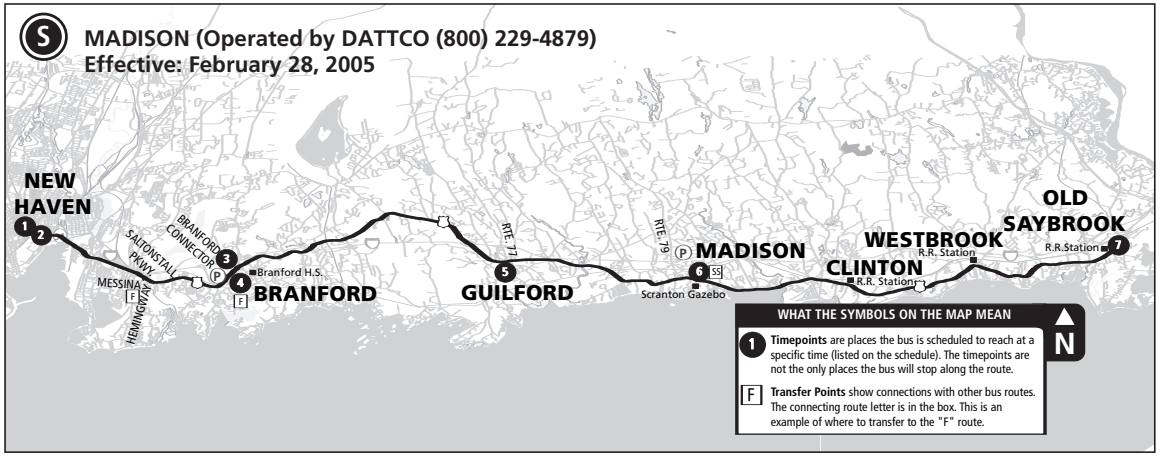
- 23 minutes to Old Saybrook Rail Station; and
- 60 minutes to Hartford.

The fare for the service is $1.25.

FISH Human Service Transportation

FISH (Friends in Service Here) is a non-profit, volunteer-staffed human service transportation provider that provides rides to and from medical and dental appointments for those who do not have another means of transportation. The service is available to residents of Essex, Centerbrook, Ivoryton, Deep River and Chester, and appointments must be at an office, clinic or hospital within the area roughly bounded by Guilford, Middletown and New London. Transportation is available between 8AM and 5PM on weekdays; reservations must be made one business day in advance.

Figure 4-8 DATTCO "S" Route



Chapter 5. Parking and Transportation Demand Management

The continuing success, preservation, and future development of Essex's three villages brings with it several parking and transportation challenges. As discussed in Chapter 1, parking demand is primarily influenced by the following unique downtown characteristics:

- Essex's tourist draw (year round, summer, and special events)
- Essex's position as an employment center
- Regional retail draws (such as Bokum Corner) and other village centers
- Community focal points such as schools, Town Hall, libraries, and parks

As discussed in the "Travel Patterns" section of Chapter 1, large numbers of workers and visitors come to Essex everyday both to pursue their livelihood and to enjoy the town's specialty retail, unique restaurants, and small village character. The majority of these visitors arrive by car and seek a parking space in the village centers. In addition, residents of village centers and adjacent-to centers need to be able to find reasonably convenient street parking.

The ongoing development of Essex, along with pending and proposed new development, has created the need to revisit the town's parking policies. The need for better parking management in Essex Village will therefore be one of the most pressing issues facing the town. The consultant team will be developing a Parking and Transportation Demand Management Plan with specific strategies intended to:

- Respond to the existing parking conditions in Essex and identified above to ensure adequate parking for downtown workers, residents, and visitors
- Put forward-looking parking management policies in place that respond to the projected increase in downtown residents and visitors
- Create parking standards for new development that are based on best practices and the actual transportation profile of existing and new residents, so that new development is of the quality and type that furthers the goals for the village centers and leverages its existing assets

Existing Conditions

To estimate the efficiency of parking supply and demand, consultants conducted a simplified parking utilization study. As part of a one-day collection effort, consultants conducted an in-field inventory to identify the locations and capacity of on- and off-street parking facilities. The baseline parking inventory is displayed in Figure 5-1, Figure 5-2, and Figure 5-3.

Figure 5-1 Essex Village Parking Inventory

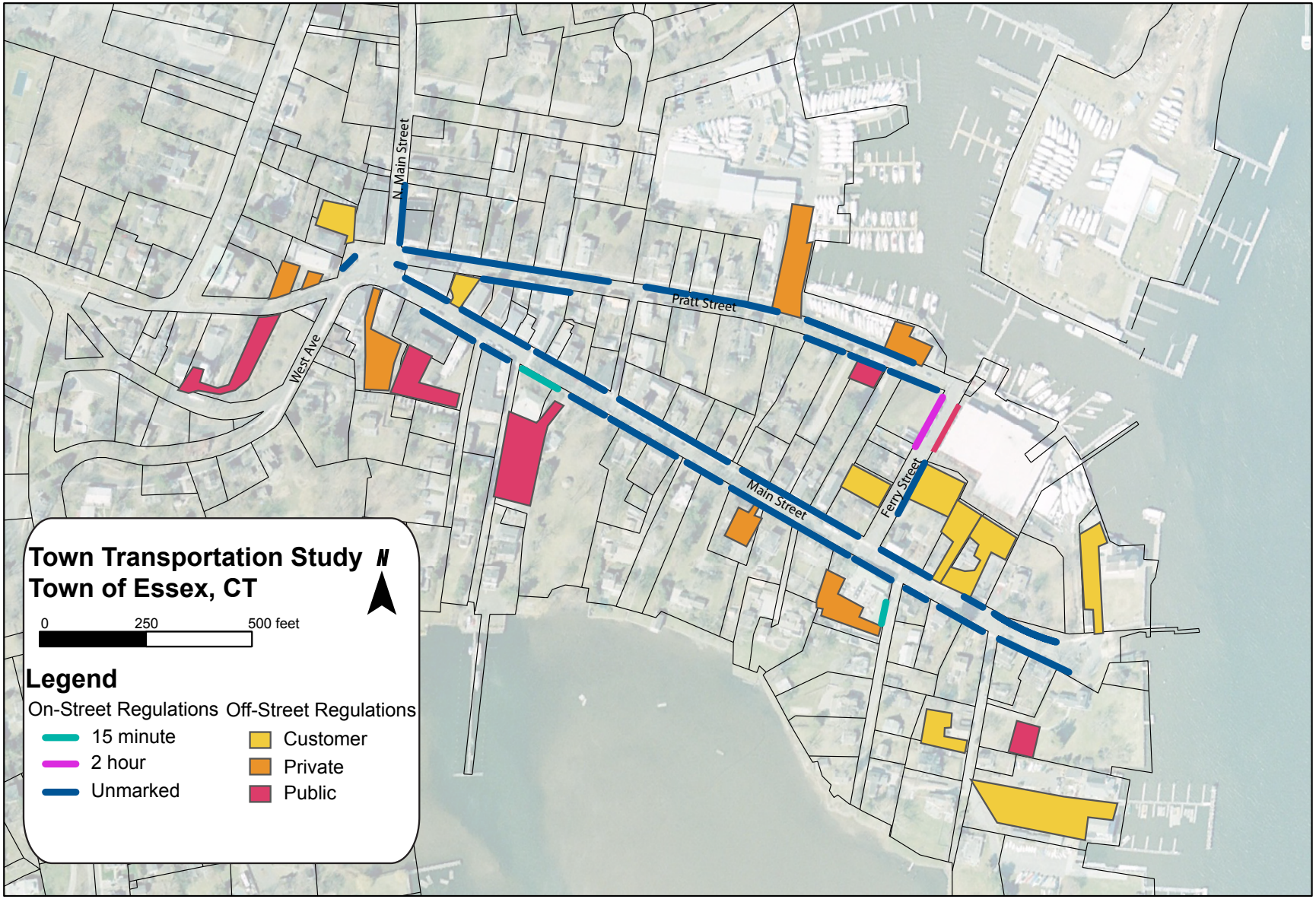


Figure 5-2 Centerbrook Parking Inventory

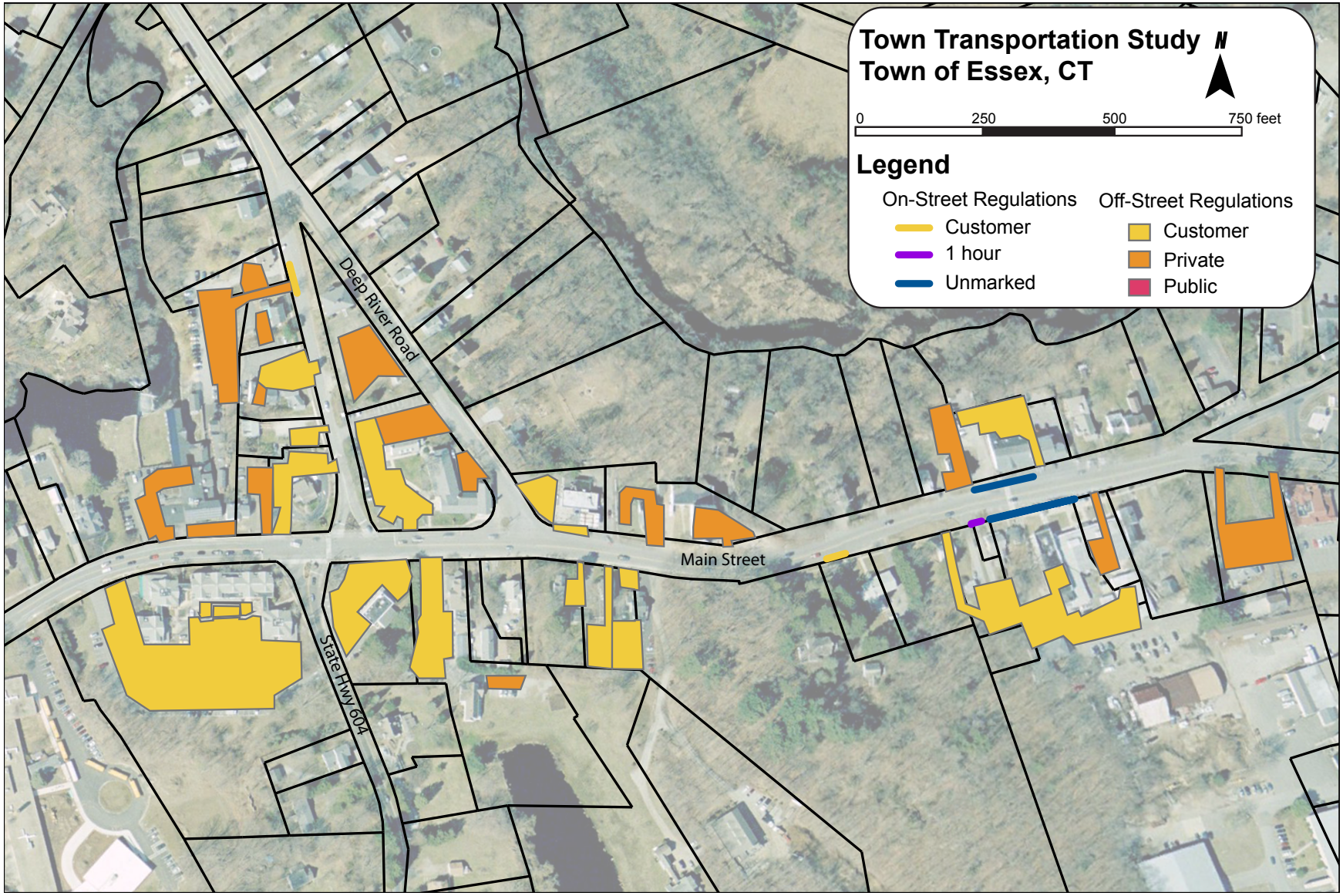
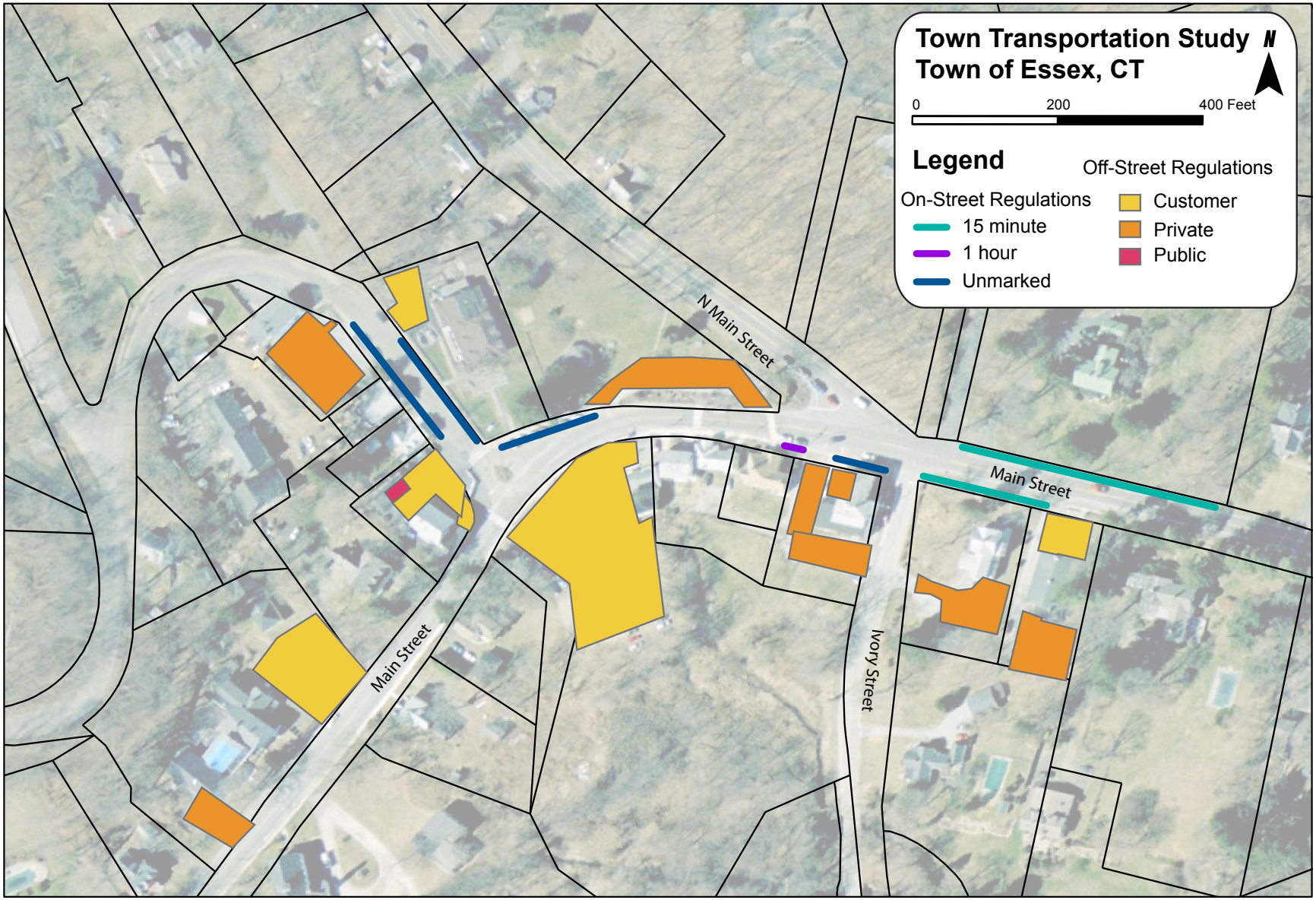


Figure 5-3 Ivoryton Parking Inventory



Within the three major villages, the Town of Essex has 1,617 parking spaces available for public and private parking. A majority, or about 80%, is off-street spaces in lots. Most of the off-street spaces are in Centerbrook, followed by Essex Village and then Ivoryton (Figure 5-4). Centerbrook has over 30 off-street lots, averaging about 20 spaces each; Essex Village has just over 20 lots, also averaging 20 spaces each; and Ivoryton has 17 identified lots, which are significantly smaller, averaging 12 spaces each.

As for on-street spaces, there are nearly 300 among the three villages. Essex Village has the most on-street parking, particularly along Main Street. Centerbrook and Ivoryton both have significantly less on-street parking: on-street parking in Centerbrook is primarily limited to a small section on Main Street, east of Deep River Road, and Ivoryton's on-street inventory is mostly on Summitt Street.

Figure 5-4 Parking Inventory in Essex: On-Street and Off-Street

	On-Street	Off-Street	Total
Centerbrook	40	657	697
Essex Village	211	448	659
Ivoryton	46	215	261
Total	297	1,320	1,617

Parking Policies and Regulations

General Parking Requirements

In our review of the most up-to-date Zoning Regulations (August 28, 2008), it appears that in most cases Essex's general parking requirements are higher than the peak parking demand rates found in ***Parking Generation 3rd Edition*** (Institute of Transportation Engineers, 2004), as illustrated in (Figure 5-5). The peak parking demand rates found in the ITE guide are primarily derived from studies conducted in pure auto-dependent suburban sprawl settings. These rates are generally considered to be very conservative and when applied as minimum requirements in a more mixed-use setting, such as the village centers, these are likely to produce a similar auto-dependent suburban sprawl setting that is not reflective of Essex's historical development. The current parking requirements exceed the ITE rates for almost every described land use.

Figure 5-5 General Parking Requirements under Essex's Zoning Regulation

Principal Use	Existing Regulation	ITE Peak Parking Demand Rates	Essex vs. ITE
Single-family	2 spaces per dwelling unit	1.83 spaces per dwelling unit	Above
Two-family	2 spaces per dwelling unit	N/A	N/A*
Multiple Dwellings	1.5 spaces per dwelling unit	1.73 spaces per dwelling unit	Below
Hospital	1 space per doctor, staff member or employee on duty, plus 1 space per inpatient bed	0.39 spaces per bed	N/A[1]
Convalescent , Rest, or Nursing Homes, or Extended Care Facilities	1 space per employee or staff member plus 1 space per 4 patient beds	0.39 spaces per bed	N/A[1]
Retail Sales	2 spaces plus 1 per 400 square feet of gross floor area, plus one space per each 1,000 feet of gross floor area or fraction thereof (plus 1 truck loading space for each 20,000 square feet of gross floor area or fraction thereof)	2 to 4 spaces per 1000 square feet (depending on type)	Above
Business and Professional Office, Bank	2 spaces plus 1 space per 400 square feet of gross floor area plus 1 space per each 1,000 square foot of gross floor area or fraction thereof	2.84 spaces per 1000 square feet	Above
Medical and Dental Professional Office	5 spaces per doctor on duty plus 1 space per employee	3.9 spaces per 1000 square feet	N/A[1]
Restaurant	1 space per 3 customer seats, other than counter or bar service seating, plus one car per 1.5 counter or bar seats or fraction thereof, plus 1 space per employee	0.5 spaces per seat for sit-down restaurants	In-line

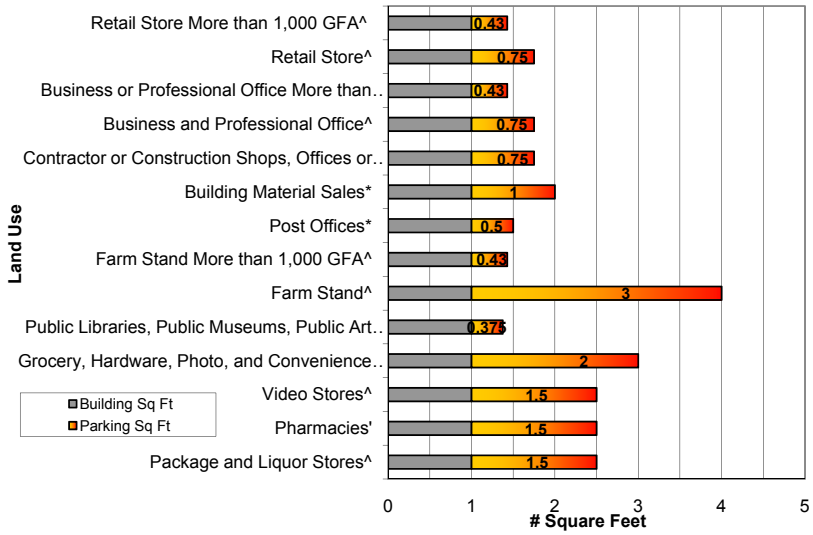
* Not comparable as the rates are based on unrelated factors

Parking Requirements for Certain Districts

Every residential zoning district restricts the parking of vehicles used commercially on residential property as well as on other special principal uses allowed in those districts. For residential property, there is a limit of one commercial vehicle, which must usually be parked indoors. For other principal uses, there is a limit of five commercial vehicles, all of which must be parked no less than 100 feet from the street line and 50 feet from the property line. The Active Adult Community District requires that two spaces be provided for each dwelling unit and one of those spaces must be covered.

In Figure 5-6, the minimum parking requirements for Essex are normalized to illustrate the amount of parking that must be built for one square foot of building area. Retail, business and professional offices require low additional square footage for parking, while video stores, pharmacies, package and liquor stories, grocery, hardware, and convenience stores all have parking requirements that exceed the size of the building. The parking requirements for a farm stand far exceed the size of the stand.

Figure 5-6 Essex Zoning Parking Requirements Normalized for Building Size



**One space per employee plus relevant ratio*
^Two spaces plus relevant ratio
'Three spaces plus relevant ratio
"Eight spaces plus relevant ratio

Smart Parking Regulatory Instruments

Parking Minimums and Maximums

Most minimum parking requirements take into account only two variables, land use and the size of development. As with Figure 33, they are typically expressed in terms of number of spaces required per a certain square footage of a particular land use, per residential unit or (for restaurants and stadiums) number of seats. In reality, however, parking demand is affected by many more variables, such as the geographic context, adjacent land uses, demographic characteristics of the community, availability of transit or other alternatives to the car, traffic demand management programs, vehicle ownership rates, housing unit size, share of affordable housing units, etc.

As currently configured, the Essex Zoning Regulations establish minimum parking requirements for a variety of land uses but do not provide a cap or limit on the maximum number of spaces. In fact, the regulations allow the Commission to increase the amount of parking required, depending upon the needs of a particular use,

> *"The Commission may require additional parking spaces where the nature of development, its location, or other unique features require such additional parking" (110F).*

The regulations then go further, emphasizing that the minimum parking requirements provided do not serve as a limit on the amount of parking a land owner could offer, should a building owner or developer want to provide more than the minimum.

The Town of Essex also allows for the phased introduction of parking, by determining that some parking spaces associated with a particular use may not be needed immediately, and therefore can be held in reserve for future use as parking, upon notification by the Commission. The parking for an associated use must be in place before the residence can be inhabited or the business can operate.

In contrast to minimum parking requirements, parking maximums restrict the total number of spaces that can be constructed. Reasons for setting maximum requirements may include a desire to restrict traffic from new development, promote alternatives to the private automobile, or limit the amount of land that is devoted to parking. Parking maximums can be introduced anywhere there are or could be measures in place to restrict parking supply. While the policy is likely to be most appropriate in the transit corridors, village centers, and corridors with high levels of traffic congestion, it can be useful in any area that wants to limit traffic or the amount of land devoted to parking.

Figure 5-7 Parking Minimum and Maximum Requirements under Essex's Zoning Regulation

Existing Regulation	Best Practices
Parking Minimums "No use of any land or improvement thereon shall be commenced until the required off-street parking and truck loading facilities have been provided and completed in accordance with Section 110 (Off-Street Parking and Truck Loading Space)." (40M) "Nothing in this Section shall be construed to prohibit the providing of more than the minimum amount of parking for each such proposed use or proposed uses." (110E) "The Commission may require additional parking spaces where the nature of development, its location, or other unique features require such additional parking" (110F). "The Zoning Commission may determine that the total number of parking spaces required by this section will not be immediately required by a particular use and may therefore further determine that up to 50 percent of the required parking area may be kept in reserve. It must then be planted and maintained rather than surfaced for parking until such time as the Zoning Commission may determine that the additional parking area is required. At such time as the Zoning Commission shall inform the applicant in writing by certified mail that additional parking area is to be completed, as authorized in the approved application, the area shall be completed within 60 days of dispatch of such notification. No above ground improvement shall be constructed or placed upon such reserve parking area." (110H)	**Reduced Parking Minimums:** In a number of municipalities parking minimum requirements can be reduced when certain conditions are met, such as central business districts, or with a specific percentage of affordable housing. **Removed Parking Minimums:** Some places have done away with minimum parking requirements for the entire municipality while others have targeted specific zoning districts. **Parking Maximums:** In a growing number of municipalities, parking minimums have been replaced with parking maximums. In some cases, the amount required as a minimum is directly converted to a maximum. In others, the current standards are rejected altogether and a new analysis is carried out based on local auto ownership rates and commuting patterns.

Shared Parking

Mixed-use developments offer the opportunity to share parking spaces between various uses, thereby reducing the total number of spaces required compared to the same uses in stand-alone developments and reducing the number of trips required for separate activities. This is a major benefit in mixed-use development contexts. Shared parking operations offer many localized benefits to the surrounding community including a more efficient use of land resources and reduced traffic congestion.

Generally, the Town requires that off-street parking facilities be provided on the same lot as the associated use. Through a special exception, the Commission can approve off-site parking, particularly within the Heritage Gateway District.

Essex does allow for several establishments to use the same parking structure, but the number of spaces provided within the lot or structure must be the sum of those required for each use.

Figure 5-8 Shared Parking under Essex's Zoning Regulations

Existing Regulation	Best Practices
Heritage Gateway District: "PUBLIC ACCESS RIGHTS AND COVENANTS. The owner, to the extent available and consent is provided, may enter into a reciprocal cross license agreement with abutting property owners to permit the public visitors to use parking on the owner's property in the designated areas, and to have the abutting owner(s) permit the owner's public visitors to use parking which the abutting owner(s) make available to its public visitors from time to time. Such off-site parking shall only be permitted upon the grant of a special exception by the Commission." (HG-1.J) **General Parking Regulations:** "Such parking or loading facilities shall be located on the same premises as the use which they serve, except that the Commission may, by grant of a special exception, approve their location elsewhere. On any premises, parking facilities, including access thereto, shall be not less than six feet from the front lot line or less than five feet from any side or rear lot line." (110B) "A single parking facility may serve more than one use provided that the aggregate number of spaces shall be the sum of those required for each use. Whether or not Section 40B.2. or Section 40B.3. may apply, if more than one permitted individual principal use is proposed to occupy any portion of the gross floor area of any existing or proposed building, an accurate account of the gross floor area to be occupied by each proposed use or proposed uses within such space shall be provided. In addition, the location and calculations of all parking spaces prescribed for each such proposed use shall be provided. Nothing in this Section shall be construed to prohibit the providing of more than the minimum amount of parking for each such proposed use or proposed uses." (110E) "Where two or more different principal or accessory uses are located on the same premises the parking requirements for the different uses shall be computed separately and cumulatively." (110F)	Shared parking can be provided as of right at least a 5 minute walk from the associated use (roughly 1,000 feet). Required parking spaces for all uses in all districts need not be limited to use by residents, employees, occupants, guests, visitors, or customers of such uses and may be used for general public parking. This enhances the inherent "park-once" efficiency of a downtown area.

Change of Use Exemptions

Situations arise where the minimum parking requirements interfere with the ability of the owner/occupant to change the use of their property. As discussed above, often the minimum parking requirements set out in the zoning code require more off-street parking than is feasible within the constraints of the property. In the village centers, where lots are small and available space is limited, this can become a serious obstruction to sensible redevelopment.

Figure 5-9 Change of Use Exemptions under Essex's Zoning Regulations

Existing Regulation	Best Practices
"EXISTING BUSINESSES. Any Village Business Use occupying a portion of a building within the Essex Village District, which use was actually in existence on January 1, 1981, may, without the authorization of a special exception required in Section 70A.2, be expanded to occupy other portions of said building provided that: 1. VILLAGE BUSINESS USE. The other portions to be so occupied existed and were actually in use on the date referred to above for any Village Business Use and have not since said date been used for a use described in Section 70A.1; and 2. OTHER REQUIREMENTS. Such use as so expanded conforms with all other requirements of these Regulations including any additional provision for Off-Street Parking and Truck Loading Space required for such use as so expanded." (70D) "Such parking or loading facilities shall remain in existence so long as the use which they serve exists and shall at all times be exclusively reserved for, and available to, the persons occupying or visiting the land or improvement, the use of whom such facilities are provided to serve." (110D)	When buildings and parcels are converted to new uses, exemptions from parking requirements may be granted when providing the required amount of parking on-site is infeasible.

Transportation Demand Management

Transportation Demand Management (TDM) refers to strategies that encourage residents and employees to drive less, particularly during peak commuting hours, in favor of transit, carpooling, walking, and bicycling. TDM often encompasses financial incentives such as parking charges, parking cash-out, or subsidized transit passes; Guaranteed Ride Home programs to give employees confidence they will not be stranded if they carpool or ride transit; compressed work schedules; and information and marketing efforts. TDM programs have been shown to reduce peak hour commuting by single-occupant vehicle by up to 40%, particularly when financial incentives are provided.

The Essex Zoning Regulations do not address TDM.

Figure 5-10 Transportation Demand Management Measures under Essex's Zoning Regulations

Existing Regulation	Best Practices
None.	Pre-Tax transit benefits – Employees are provided with access to "transit checks", vouchers, or debit card systems that allow the use of pre-tax income for purchase of transit fares. Preferential parking for carpooling, for instance 10% of all parking spaces are set aside for carpool vehicles prior to 9:00 AM on weekdays, or provide carpool parking in prime locations. Provide ride-sharing services, such as a carpool and vanpool incentives, customized ride-matching services, a transportation information package for new employees and residents, a Guaranteed Ride Home program (offering a limited number of emergency taxi rides home per employee), and an active marketing program to advertise the services to employees and residents.

Car Sharing

Car-sharing provides individuals with access to a fleet of shared vehicles, allowing them to avoid owning a car, or a second or third car. Car-sharing can also be a tool for businesses and government organizations, which can use it to replace their fleet vehicles. At the same time, car-sharing at the workplace allows employees to take transit, walk or cycle to work, since a car will be available for business meetings or errands during the day.

The Essex Zoning Regulations do not address car sharing.

Figure 5-11 Car Sharing Regulations under Essex's Zoning Regulations

Existing Regulation	Best Practices
None.	A minimum number of car share spaces are required to be provided free of charge to car share services (such as Zipcar), in relation to the amount of parking provided.

Unbundling Parking Costs

Unbundling parking costs changes parking from a required purchase to an optional amenity, so that households and employers can freely choose how many spaces they wish to purchase or lease. Especially among households with below average vehicle ownership rates (e.g., low income people, singles and single parents, seniors on fixed incomes, and college students), allowing this choice can provide a substantial financial benefit. Unbundling parking costs means that these households no longer have to pay for parking spaces that they may not be able to use or afford.

Charging separately for parking is the single most effective strategy to encourage households to own fewer cars, and rely more on walking, cycling and transit. According to a study by Todd Litman,[1] unbundling residential parking can significantly reduce household vehicle ownership and parking demand.

The unbundling of parking costs is not addressed in Essex's Zoning Regulations.

Figure 5-12 Unbundling of Parking Cost Regulations under Essex's Zoning Regulations

Existing Regulation	Best Practices
None.	Any parking spaces offered to tenants of a new development must be offered as a fee-based option distinct from charges established for renting, leasing, or purchasing primary-use space within the development. These fees shall reflect market realities (i.e., the actual value of parking).

1 Todd Litman, *Parking Management Best Practices* (Planners Press, 2006)

Parking In-Lieu Fees

In some communities, new developments can waive their minimum parking requirements by making an annual payment (in-lieu of providing parking) to the municipality. The fee is usually utilized for transportation improvements, particularly shared public parking facilities. This allows the redevelopment of constrained sites and provides a revenue stream to support the construction/maintenance of shared public parking facilities such as a central lot or garage.

The Essex Zoning Regulations do not provide for parking in-lieu fees.

Figure 5-13 Parking In-Lieu Fee Regulation under Essex's Zoning Regulations

Existing Regulation	Best Practices
None.	Where zoning requirements for minimum numbers of parking spaces exist, a parking in-lieu fee or payment has found great success in the U.S. at reducing parking supply for dense mixed-use areas that have lower parking demand or high potential for sharing. Fees vary widely.

Chapter 6. Current Street Network & Traffic Conditions

Roadway Functions and Characteristics

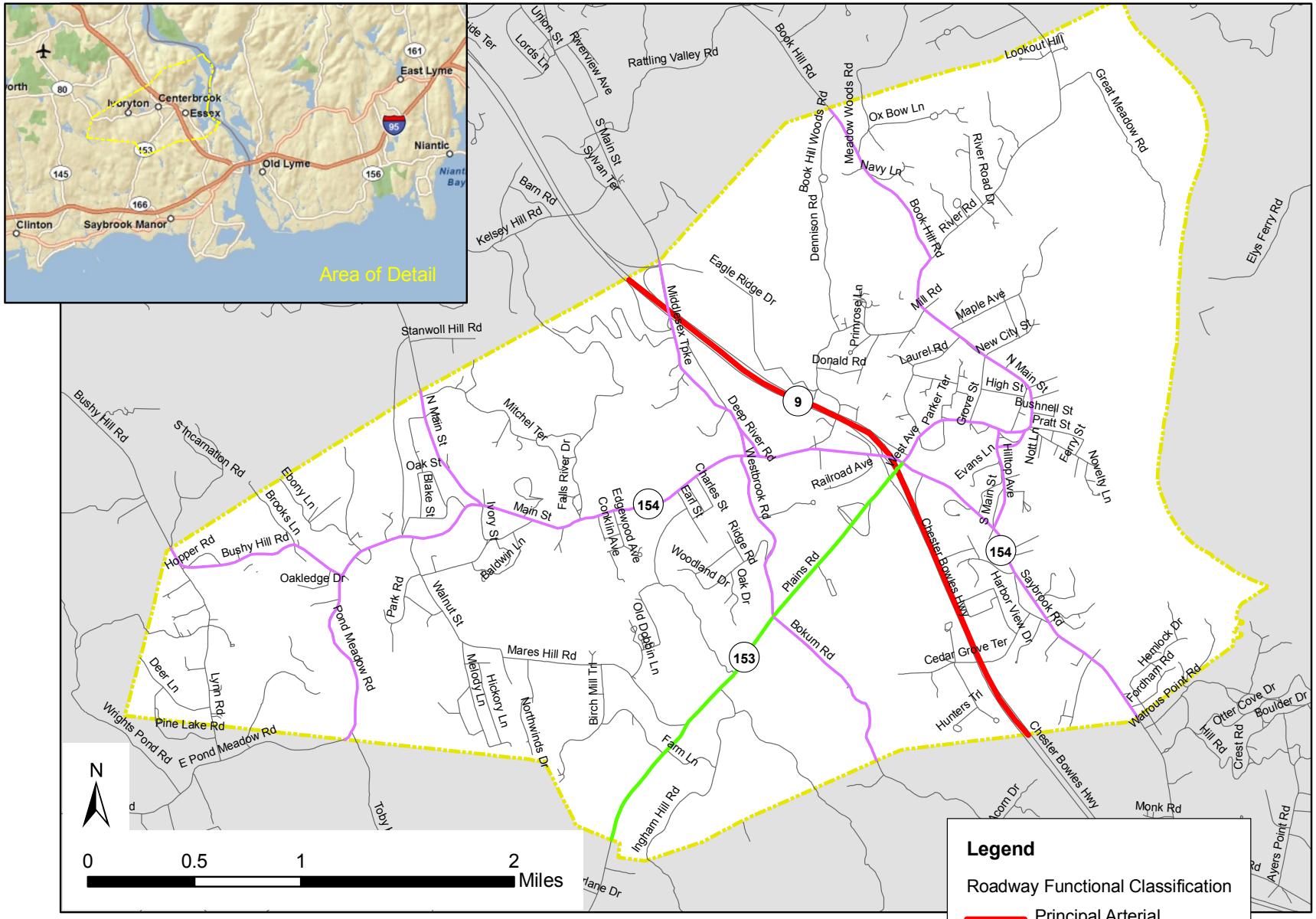
The Town of Essex is centrally located in the Connecticut River Estuary Regional Planning Agency (CREPA) region. The town has a wide variety of roadway and intersection characteristics and function. The majority of roads are local, low density, and residential in nature with low traffic volume. However, there are also a number of collector roads and arterials that carry higher traffic volume and experience higher travel speeds.

Routes 153 and 154 bisect the town and provide access to Essex from other towns in the lower valley including Deep River, Chester, Old Saybrook, and Westbrook. Additionally, these routes provide access to Route 9 which connects to Interstate 95 to the south and provides regional access to central Connecticut including Interstate 91 and Hartford. Route 153 (Plains Road) is characterized as a minor arterial that traverses in the north-south direction from Westbrook town line to its intersection with Route 154 near the Route 9 (Exit 3) interchange. Route 154 is characterized as a collector road that traverses east-west from the Deep River town line, through the villages of Ivoryton and Centerbook to the Old Saybrook town line and passes just west of the Essex village. These routes are primarily two-lane roadways (one-lane in each direction) with shoulders ranging from two to six feet and have additional travel lanes and turning lanes at some intersections and near the Route 9 interchange. Route 154 and Route 153 intersect at a signalized intersection near the Route 9 (Exit 3) interchange. Exit 3 is an unconventional "split interchange" and a frontage road along the west side of Route 9 connects Route 154 and Route 153 for a short distance. Route 154, Route 153, and the frontage road form a triangle (with all 3 roads providing two-way travel) in the interchange area. This triangle essentially provides connections between the various Route 9 ramps of the split interchange as well as the roads to Essex Village (West Avenue), Centerbrook and Ivoryton (Main Street), and Bokum Center (Plains Road). Posted speeds range from 30 to 35 miles per hour.

Intersection of Route 153 and Route 154 (Looking west)
Source: Nelson\Nygaard

There are other collector roads in town including: West Avenue, North Main Street, Book Hill Road, Bokum Road, Westbrook Road, and Deep River Road. Figure 6-1 shows the study area along with the functional classification of the roadways.

Figure 6-1 Functional Classification of Essex Roadways



Essex Transportation Study Area and Roadway Classification

Traffic Volumes

Traffic volume counts were collected in June 2010 to understand and assess traffic demands and operations along specific segments within the town and at key intersections. These counts included automatic traffic recorder (ATR) counts that measure daily traffic volume on a section of road and peak hour turning movement counts (TMC) that provide information about specific turn movements at an intersection.

Automatic traffic recorder (ATR) counts were collected bi-directionally over a 48-hour period at seven locations in the study area. The ATR counts indicate a relatively even directional split (the ratio of volume of traffic traveling in each direction) over the course of the day. A summary of the daily traffic volumes is provided in Figure 6-2 and shown in Figure 6-5.

Figure 6-2 Daily Traffic Volumes (2010)

Roadway/Segment	Annual Daily Traffic (vehicles per day)
Main Street (Rt. 154) - between Centerbrook and Route 9 ramps	8, 500
Old Saybrook Road (Rt. 154) – east of Route 153	4,200
Deep River Road (Rt. 154) north of Rt. 9 (Exit 4) Northbound Ramps	6,600
Deep River Road (Rt. 154) south of Rt. 9 (Exit 4) Southbound Ramps	6,600
Westbrook Road (Rt. 153) - north of Mares Hill Road	10,800
Plain Road (Rt. 153) - north of Bokum Road	9, 200
Main Street - west of Centerbrook near Essex Elementary School	8,500

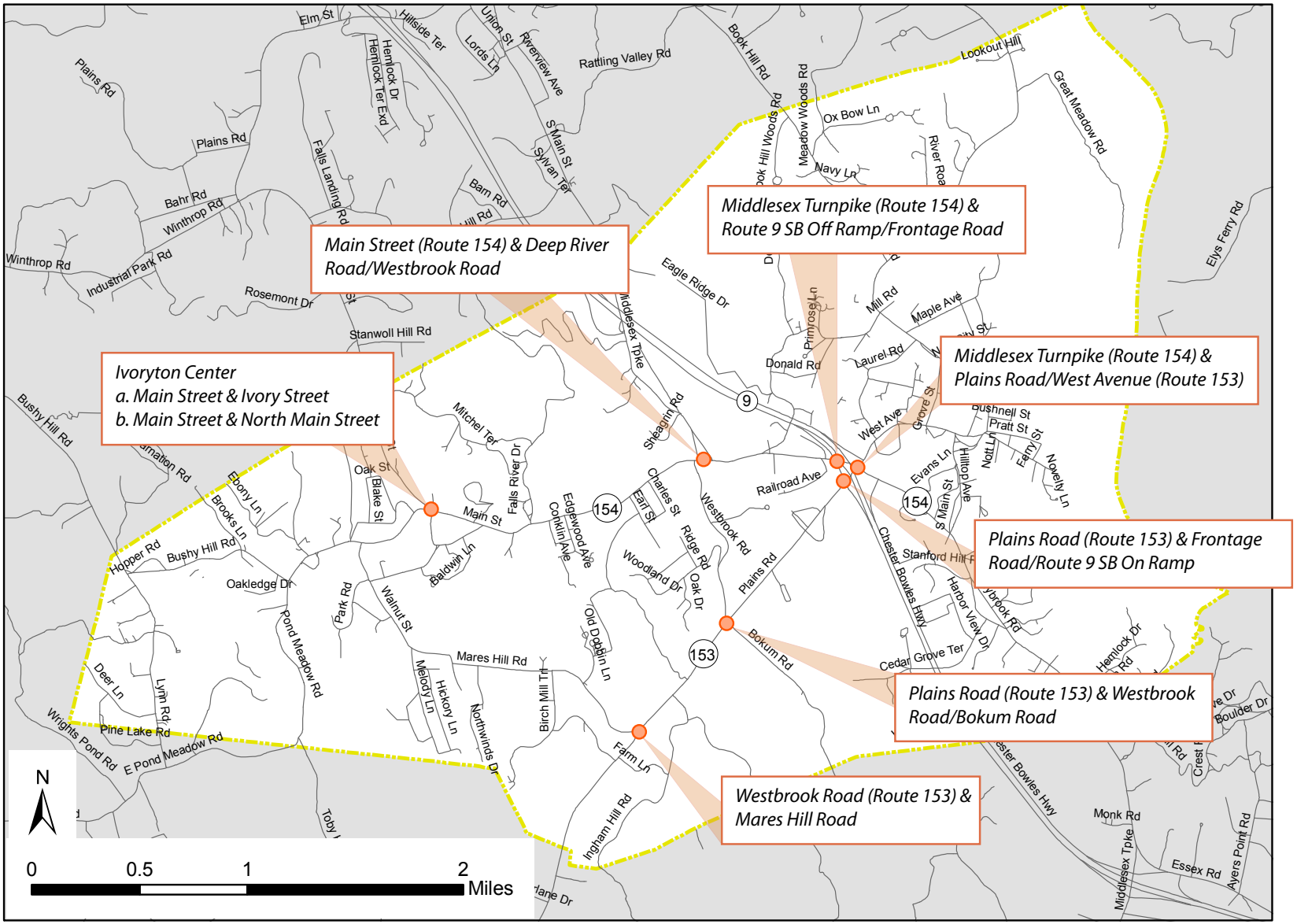
Source: Fitzgerald & Halliday, Inc., July 2010

Turning movement counts were collected during the morning peak period (7 AM – 9 AM) and afternoon peak period (4PM - 6PM) at eight intersections. The key intersections for this evaluation are listed below and shown in Figure 6-3. Figure 6-4 shows a summary of the peak hour turning movement volume and daily traffic volume.

Figure 6-3 Key Intersections

Exit 3 Route 9 Interchange with Routes 153 and Route 154		
1	Middlesex Turnpike (Route 154) & Plains Road/ West Avenue (Route 153)	Signalized
2	Plains Road (Route 153) & Frontage Road/Route 9 Southbound On Ramp	Flasher
3	Middlesex Turnpike (Route 154) & Route 9 Southbound Off Ramp/Frontage Road	Unsignalized
Centerbrook		
4	Main Street (Route 154) & Deep River Road/Westbrook Road	Signalized
Ivoryton Center		
5	Main Street at Ivory Street	Unsignalized
6	Main Street at North Main Street	Unsignalized
South Central Area of Essex		
7	Plains Road (Route 153) at Westbrook Road/Bokum Road (Bokum Center)	Signalized
8	Plains Road (Route 153) at Mares Hill Road	Unsignalized

Figure 6-4 Location of Key Intersections

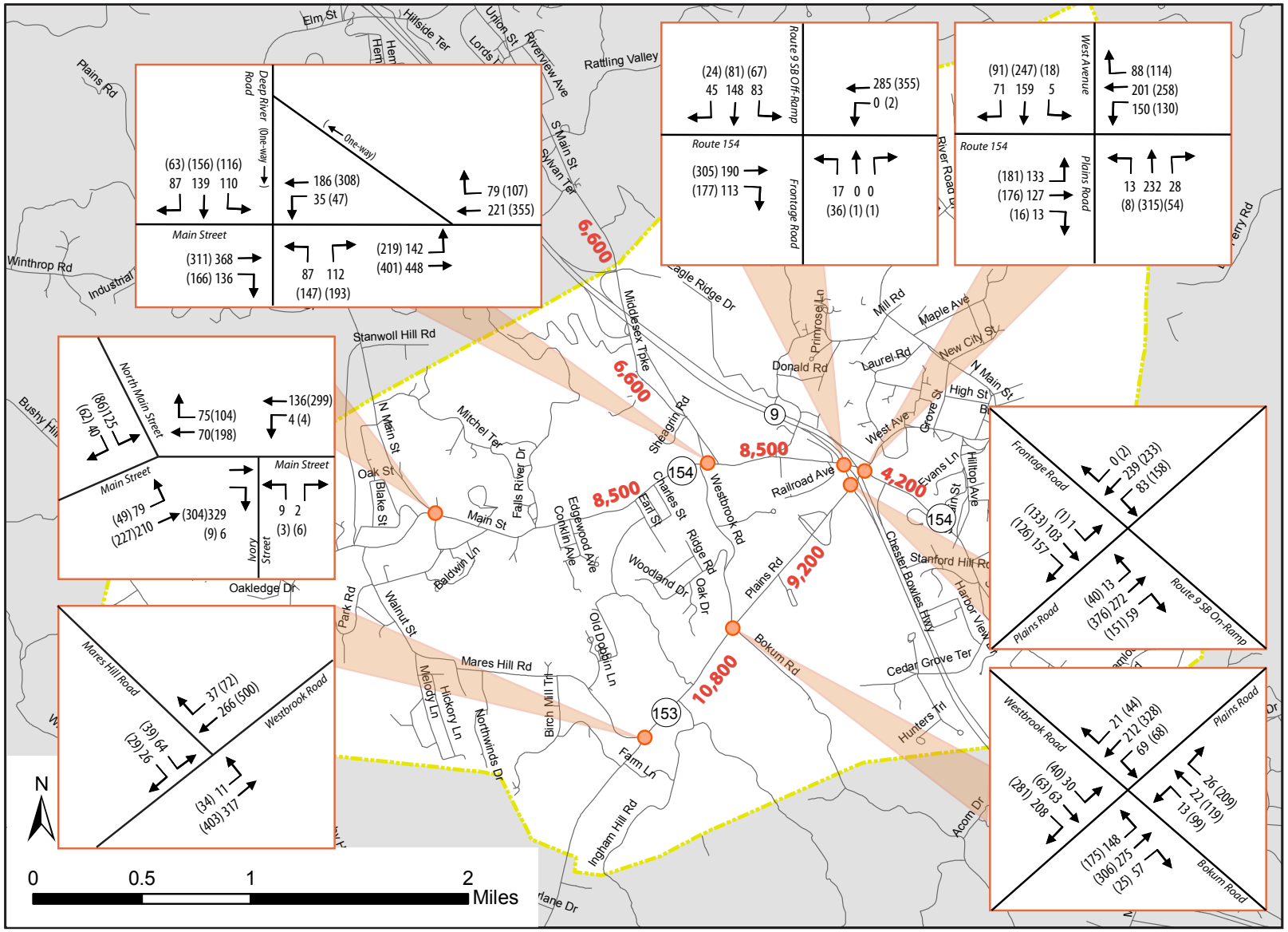


Study Area Intersections

Legend

- Essex Town Boundary
- Study Area Intersections

Figure 6-5 Turning Movement Counts at Key Intersections & Segment Volumes for Major Thoroughfares



Legend

XX	Morning Peak Hour Volume
(XX)	Afternoon Peak Hour Volume
XX	Two-way Daily Traffic Volume

Existing Traffic Volume (2010)

Traffic Operations Analysis

A level-of-service (LOS) analysis was conducted at the eight study area intersections to assess traffic operations. The LOS analyses were conducted using procedures presented in the *Highway Capacity Manual 2000, Transportation Research Board.* Synchro 7.0, a computer-based intersection operations model, which implements these procedures, was used to perform the analyses. The analysis results describe the operational effectiveness of the study area intersections.

Level-of-service is a term used to denote different operating conditions which occur at a given intersection under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including intersection geometrics, speed, travel delay, freedom to maneuver, and safety. Level-of-Service provides an index to the operational qualities of an intersection. Six levels-of-service are defined by letter designations ranging from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. Generally, LOS D is considered acceptable at peak hours.

Level-of-Service designation is reported differently for signalized and unsignalized intersections. For signalized intersections, LOS is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. Specifically, LOS criteria are stated in terms of average stopped delay per vehicle for the peak 15-minute period of the peak hour for the entire intersection and by approach.

For unsignalized intersections, the analysis assumes that the traffic on the mainline is not affected by traffic on the side street. The LOS for each movement is calculated by determining the number of gaps that are available in the conflicting traffic stream. Based upon the number of gaps, the capacity of the movement is calculated. The demand of the movement is then compared to the capacity to determine the average delay for the movement. For unsignalized intersections, an overall intersection LOS is not determined.

The delay ranges differ slightly between unsignalized and signalized intersections due to driver expectations and behavior for each LOS. Figure 6-6 summarizes the Level-of-Service criteria for both signalized and unsignalized intersections.

Figure 6-6 Level-of-Service Criteria

Level-of-Service (LOS)	Signalized Intersection Control Delay (sec/veh)	Unsignalized Intersection Control Delay (sec/veh)
A	0-10	0-10
B	>10-20	> 10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

Source: 2000 Highway Capacity Manual (Special Report 209) and Fitzgerald & Halliday, Inc., July 2010

Intersection Operational Issues

Results from the LOS analysis are shown in Figure 48 and Figure 49 and indicate operational issues at the Exit 3 Route 9 Interchange with Routes 153 and 154 and in Centerbrook as described below.

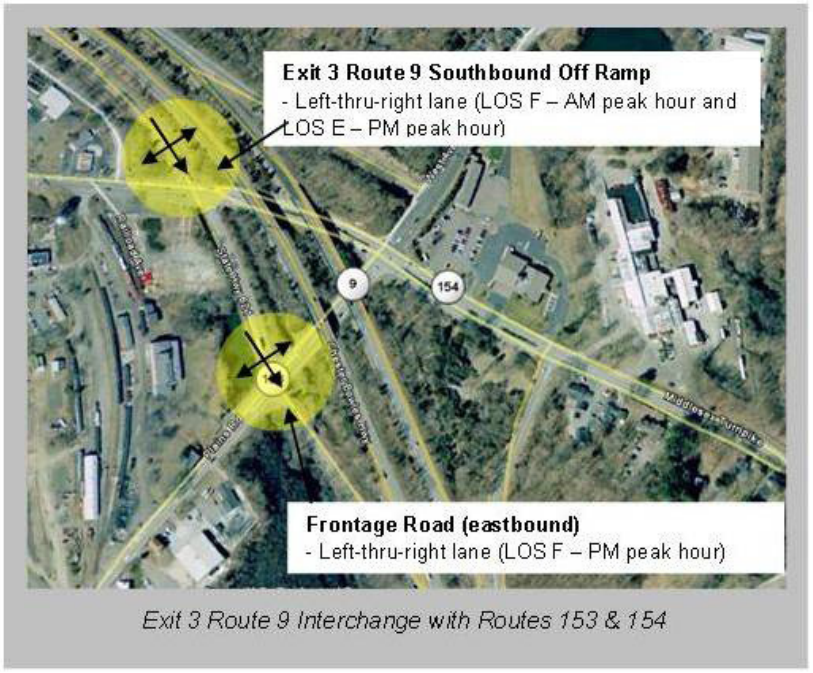
Exit 3 Route 9 Interchange with Routes 153 and Route 154

Travelers from the Route 9 southbound off ramp at Exit 3 accessing the Essex area experience delay and congestion during the morning and afternoon peak hours. The Route 9 southbound off ramp currently operates at low LOS levels (LOS F during the morning peak hour and LOS E during the afternoon peak hour). The Route 9 southbound off ramp and Frontage Road approaches are stop-controlled at its intersection with Middlesex Turnpike (Route 154). Thus, long delays during the peak hours are anticipated as a result of the demand of vehicles trying to find acceptable gaps to access Route 154.

Vehicles traveling to Route 9 southbound from Main Street/Route 154 will experience some congestion (delay and queuing) on Frontage Road during the morning and afternoon peak hours. The Frontage Road approach at its intersection with Route 153 and the Route 9 southbound on ramp currently operates at a low level (LOS F) during the afternoon peak hour. The intersection is controlled by a flashing beacon requiring vehicles on Frontage Road to find acceptable gaps on a major state highway (Route 153) to pass through the intersection to access the Route 9 southbound on ramp.

Due to the delay and lack of frequent opportunity to enter these intersections safely from the off ramp and the frontage road, vehicles often get impatient and take greater chances to proceed through the intersection. Vehicles have been observed making quick and risky maneuvers in both of these locations. As a result, the "actual" delay experienced might be lower than the model produces, but safety is compromised. Both intersections are large with a significant amount of pavement and shoulder and vehicles on the major roads are often travelling fast.

Figure 6-7 Operational Issues at Exit 3 Route 9 Interchange with Routes 153 & 154



Exit 3 Route 9 Interchange with Routes 153 & 154

Centerbrook

The Centerbrook area is a mix of uses, including residential, retail, school, and office with a concentration of activity in the village core including two gas stations, a bank, a restaurant, an architect's office, Essex Elementary School, and other small businesses located within the triangle formed by the two one-way legs of Deep River Road and Main Street. Directly in the core of Centerbrook is the intersection of Main Street (Route 154) with Deep River Road and Westbrook Road. The southbound approach of Deep River Road is controlled by a signal at Main Street (Route 154) and is slightly offset from Westbrook Road. This results in longer delays for travelers on Deep River Road and Westbrook Road, as the signal system needs to isolate these movements through the intersection to ensure safety. Currently, Deep River (southbound approach) operates at LOS E for left-turning vehicles and LOS F for right-turning vehicles during the afternoon peak hour.

Figure 6-8 Operational Issues at Main Street (Route 154) & Deep River Road/Westbrook Road

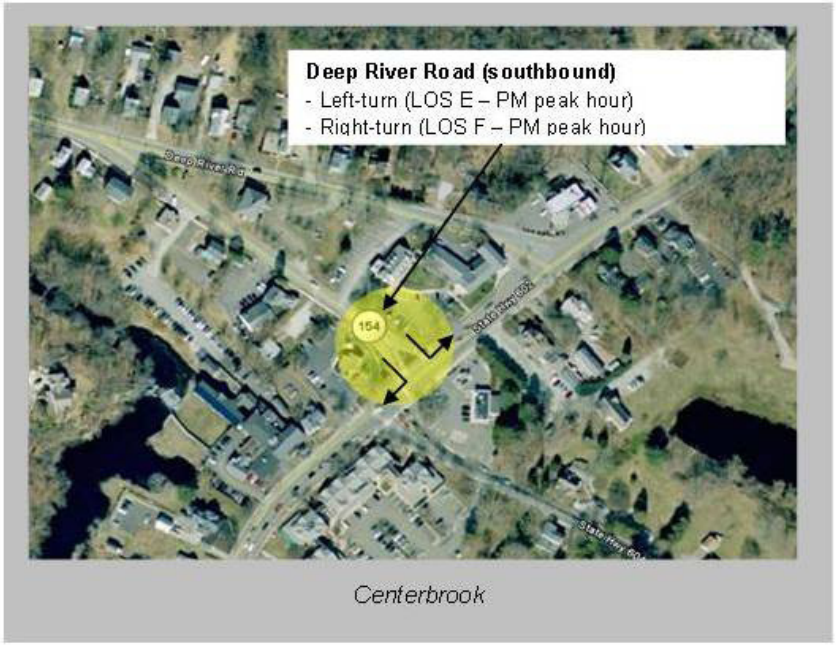


Figure 6-9 Level-Of-Service Summary Existing Condition (2010)

		Existing Condition (2010)			
		AM Peak Hour		PM Peak Hour	
Approach	Movement	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Middlesex Turnpike (Route 154) & Plains Road /West Avenue (Route 153) (signalized)					
Middlesex Turnpike (eastbound)	Left	6.0	A	8.7	A
Middlesex Turnpike (eastbound)	Thru-right	13.3	B	15.2	B
Middlesex Turnpike (westbound)	Left	5.7	A	7.4	A
Middlesex Turnpike (westbound)	Left-thru	17.1	B	22.6	C
West Avenue (northbound	Left-thru-right	18.3	B	20.9	C
West Avenue (southbound)	Thru-left	21.6	C	28.7	C
West Avenue (southbound)	Right	6.4	A	5.8	A
Intersection		14.2	B	18.5	B
Plains Road (Route 153) & Frontage Road/Route 9 SB On Ramp (flashing beacon)					
Frontage Road	Left-thru-right	29.0	D	> 50.0	F
Plains Road (northbound)	Left	7.8	A	7.9	A
Plains Road (southbound)	Left	8.5	A	9.7	A
Middlesex Turnpike (Route 154) & Route 9 SB Off Ramp/Frontage Road (unsignalized)					
Frontage Road (northbound)	Left-right	33.7	D	26.5	D
Route 9 SB Off Ramp (southbound)	Left-thru-right	> 50.0	F	44.1	E
Main Street (Route 154) & Deep River Road/Westbrook Road (signalized)					
Main Street/Route 154 (eastbound)	Thru-right	45.1	D	31.7	C
Main Street/Route 154 (westbound)	Left-thru	52.0	D	38.5	D
Westbrook Road (northbound)	Left-right	46.6	D	39.8	D
Deep River Road (southbound)	Left	31.1	C	60.1	E
Deep River Road (southbound)	Right	51.3	D	> 80.0	F
Intersection		46.5	D	67.6	E

		Existing Condition (2010)			
		AM Peak Hour		PM Peak Hour	
Approach	Movement	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Ivorytown Center (unsignalized)					
Ivory Street (northbound)	Left-right	12.3	B	12.6	B
North Main Street (southeastbound)	Left-right	16.3	C	18.4	C
Plains Road (Route 153) & Westbrook Road/Bokum Road (signalized)					
Westbrook Road (eastbound)	Left-thru	21.5	C	28.8	C
Westbrook Road (eastbound)	Right	7.7	A	5.5	A
Bokum Road (westbound)	Left	16.8	B	21.4	C
Bokum Road (westbound)	Thru-right	11.6	B	25.0	C
Plains Road (northbound)	Left	4.6	A	10.5	B
Plains Road (northbound)	Thru-right	10.8	B	15.2	B
Plains Road (southbound)	Left	4.5	A	7.7	A
Plains Road (southbound)	Thru-right	11.4	B	21.0	C
Intersection		10.3	B	17.3	B
Westbrook Road (Route 153) & Mares Hill Road (unsignalized)					
Mares Hill Road (eastbound)	Left-right	16.7	C	24.2	C

Source: Fitzgerald & Halliday, Inc., July 2010

Accident Summary

Crash data were obtained from the Connecticut Department of Transportation (CTDOT) for state routes in the study area for the most recent three-year period available (Jan. 1, 2006 – Dec. 31, 2008). A total of ninety-two (92) accidents occurred on these roadways and are summarized in Figure 50 below. Twenty-eight (28) of the accidents resulted in injuries. There were no fatal accidents or pedestrian or bicyclist collisions. Summaries of the accident experience by roadway are as follows:

- **Route 153:** Along the 1.5-mile length of Route 153 in the study area, thirty-nine (39) accidents occurred in the three-year timeframe, ten (10) of which resulted in injuries
- **Route 154:** Thirty-five (35) accidents took place along the 0.7-mile segment of Route 154 in the study area, with ten (10) of them resulting in injuries
- **Main Street (State Route 602):** Eighteen (18) accidents occurred on the 1.4-mile length of Main Street in the study area, eight (8) of which led to injuries

The most prevalent type of accident overall was the rear-end collision, representing 37 percent of all accidents, typically caused by vehicles following too closely. Eighteen percent of the accidents were turning collisions involving vehicles on head-on paths. The typical contributing factor for turning collisions was failure to grant right-of-way. Fourteen percent of all reported accidents were fixed-object collisions. Common contributing factors to fixed-object collisions included driving too fast for conditions or losing control.

Locations exhibiting a higher proportion or pattern of accidents in the study area are described below. Intersections with a notable accident history include:

1. **Middlesex Turnpike (Route 154) at Plains Road (Route 153):** A total of 18 accidents occurred at this location during the three-year period analyzed, five resulting in injuries. The most prevalent accident type was head-on turn collision (10), typically resulting from drivers failing to grant right-of-way to vehicles turning left from the proper lane. There were also four rear-end collisions at this intersection, resulting from vehicles following too closely.

2. **Plains Road (Route 153) at Exit 3 Route 9 Southbound on Ramp/Frontage Road (SR 621):** A total of seven accidents occurred at this location, with one of the accidents resulting in injury. The most prevalent accident type was angle collision (5). Most of these accidents involved southbound vehicles on Frontage Road (SR 621) proceeding straight across Route 153 and being struck by a westbound vehicle. Visibility of southbound vehicles by motorists traveling westbound may be limited, resulting in this pattern of accidents.

3. **Westbrook Road (Route 153) at Mares Hill Road:** A total of five accidents occurred at this location, with two of the accidents resulting in injuries. The most prevalent accident type was rear-end collision (4). Most of these accidents involved northbound vehicles on Route 153 (Plains Road) striking a vehicle which was either stopped for traffic or stopped to turn left onto Mares Hill Road. Visibility of northbound vehicles by approaching northbound motorists is limited due to the curve in on Westbrook Road approaching the intersection, resulting in this pattern of accidents.

Roadway segment with notable accident history include:

1. **Westbrook Road (Route 153) from Mares Hill Road to Bokum Road:** A total of ten accidents occurred along this 0.6-mile segment during the three-year period analyzed. Three of the accidents resulted in injuries. The most prevalent accident type was rear-end collision (8), typically resulting from drivers following too closely. This area features a number of closely-spaced commercial driveways. Rear-end collisions along this type of roadway typically occur when a vehicle is traveling too fast or is following too closely behind a vehicle which stops to make a left turn into a driveway.

Figure 6-11 Crash Summary (CTDOT 2006-2008)

Roadway	Intersection/Segment			Collision Type												
		Total Accidents	Total Accidents with Injuries	Rear-End	Head-On Turn	Fixed Object	Angle	Sideswipe-Same Dir.	Turning-Same Dir.	Turning-Intersecting	Sideswipe-Opposite Dir.	Backing	Head-On	Moving Object	Overturn	Parking
Westbrook Road (Route 153)	Mares Hill Road	5	2	4					1							
Westbrook Road (Route 153)	Mares Hill Road to Bokum Road	10	3	8	1	1										
Plains Road (Route 153)	Bokum Road	7	0	2	1	2		1		1						
Plains Road (Route 153)	Bokum Road to Railroad Crossing	7	3	5	1			1								
Plains Road (Route 153)	Railroad Crossing	3	1	1		1						1				
Plains Road (Route 153)	Route 9 SB Exit 3 On-Ramp/SR 621	7	1	1			5		1							
Middlesex Turnpike (Rt. 154)	Route 153 (Plains Road)	18	5	4	10		2				2					
Middlesex Turnpike (Rt. 154)	Route 9 SB Exit 3 Off-Ramp/ SR 621	2	1	1		1										
Middlesex Turnpike (Rt. 154)	Railroad Crossing	2	0			2										
Middlesex Turnpike (Rt. 154)	Railroad Crossing to Main Street	9	4	2	2	2		2		1						
Middlesex Turnpike (Rt. 154)	Main Street (SR 602)	4	0	1				2						1		
Main Street (SR 602)	Route 154 (Middlesex Turnpike) to Westbrook Road (SR 604)	1	1	1												
Main Street (SR 602)	Westbrook Road (SR 604)	4	0	3					1							
Main Street (SR 602)	Westbrook Road (SR 604) to Edgewood Ave	2	2		1								1			
Main Street (SR 602)	Edgewood Ave	3	1			2			1							
Main Street (SR 602)	Edgewood Ave to Main Street #2	7	4	1	1	2		1							1	1
Main Street (SR 602)	Main Street #2	1	0							1						
	Total	92	28	34	17	13	7	7	4	3	2	1	1	1	1	1

Source: CTDOT 2006- 2008