TRANSPORTATION AND CIRCULATION

INTRODUCTION

A multi-modal transportation system is essential to a community's vitality by providing access to housing, employment centers, local services, retail establishments and recreational amenities. A transportation system must accommodate all users safely and efficiently, including motorists, pedestrians, bicyclists, and those needing or wanting transit services.

Dunstable's roadways, sidewalks, and trails exert a significant influence on the health, well-being, and quality of life of its residents. There are few sidewalks in Dunstable, so most roads double as pedestrian ways and travel ways for large and small vehicles, bicycles, and horses. Given the limited number of roads in town, local traffic and regional traffic mix to a greater degree than in many other communities. Much of Dunstable's road network consists of narrow, colonial-era byways that greatly affect the community's visual and rural character.

The Transportation and Circulation section provides an overview of Dunstable's existing transportation system, presents an assessment of safety and operational issues, and outlines recommendations for addressing needs and deficiencies. An assessment of existing conditions was prepared through background research, field reconnaissance and input provided by the Master Plan Committee and the public input process. Some of the information used in this analysis is derived from the *Regional Transportation Plan*[1] (RTP) and the *Transportation Improvement Program*[2] (TIP)

Transportation Goals

- Study the feasibility of establishing interconnected pathways and trails as an alternative to motorized transportation.
- Continue designating scenic roads as a means of protecting the town's rural character.
- Develop an asset management program for the town's transportation infrastructure.
- Work with NMCOG and MassDOT to study potential traffic calming measures along Route 113 within the Town Center and in neighborhoods.
- Incorporate bicycle and pedestrian accommodations in future transportation improvement projects, whenever possible.

[1] Northern Middlesex Regional Transportation Plan, 2016-2040, Northern Middlesex Council of Governments, July 2015
[2] FY 2017-2021Transportation Improvement Program, Northern Middlesex Council of Governments, August 2016

prepared by the Northern Middlesex Council of Governments (NMCOG).

EXISTING CONDITIONS

The Town of Dunstable is located in northern Massachusetts along the New Hampshire border, west of Tyngsborough, east of Pepperell, and north of Groton. The Town is served by State Route 113, which provides a direct connection to U.S. Route 3, as well as to points east and west. Dunstable's transportation network consists primarily of arterial and local roadways, and provides residents with access to essential services and employment opportunities.

Roadways are classified according to their function and purpose in a hierarchy based on mobility and access, as outlined in guidelines established by the Federal Highway Administration[3] (FHWA). Functional classification is the process by which streets and highways are grouped into classes according to the character of traffic service that they are intended to provide. There are three general highway functional classifications: arterial, collector, and local roads. In Massachusetts, arterials are further classified into interstates, principal arterials, and minor arterials, based on the mobility and access provided by the roadway. Table 1.1 below summarizes the number of centerline miles by main functional class for Dunstable's roadway network[4]. Map 1.1 on the following page graphically displays the town's roadway network by functional classification.

Table 1.1: Roadway Centerline Miles by Functional Classification

Functional Class	Interstate	Arterial	Collector	Local	Total
	0	10.29	0	31.15	41.44

Source: MassDOT

ARTERIALS

[3] Highway Functional Classification Concepts, Criteria and Procedures, Federal Highway Administration, U.S. Department of Transportation, 2013 Edition.
[4] MassDOT Road Inventory Year End Report 2015, Massachusetts Department of Transportation, Office of Transportation Planning, August 2016.

Arterials roadways provide the highest level of service, at the greatest speed, for the longest uninterrupted distance, with some degree of access control. Arterials are a major conduit for travel and commerce, and help link economic regions and urban centers. Dunstable contains one principal arterial: State Route 113 (Main Street/Pleasant Street) which extends in a general east/west direction for approximately 4.8 miles in Dunstable, according to MassDOT's database. This represents over 10% of the centerline roadway mileage owned by the Town.

PHOTO 1: MAIN STREET IN DUNSTABLE (PHOTO COURTESY OF GOOGLE MAPS)

Minor arterials serve shorter distance traffic movements, and are secondary to principal arterials. Minor arterials primarily link population centers within or between distinct geographic and economic regions. The characteristics of Dunstable's minor arterials are outlined below:

- **Groton Street** runs in a general north/south direction between Route 113 (Pleasant Street) and the Groton town line, where the roadway becomes Chicopee Row and eventually connects to Route 119. This two-lane roadway provides access to the Groton-Dunstable Regional High School and is key to linking Dunstable Town Center with Groton's downtown business district. Roadway width varies from 24 to 28 feet with narrow shoulders.
- **Westford Street** is a two-lane roadway extending from Route 113 to the Tyngsborough town line, where it becomes Scribner Road. Eventually, this roadway becomes Dunstable Road in Westford and connects with Route 40. The roadway is narrow (18 feet) and there are no shoulders present.
- **Lowell Street** is a north/south roadway running between Route 113 and the Tyngsborough town line, where the roadway becomes Dunstable Road. Eventually, this roadway connects with Routes 40 and 3A at Vinal Square in Chelmsford. The roadway is 24 feet wide with narrow shoulders.

Table 1.2 below summarizes the characteristics of the town's arterial roadways:

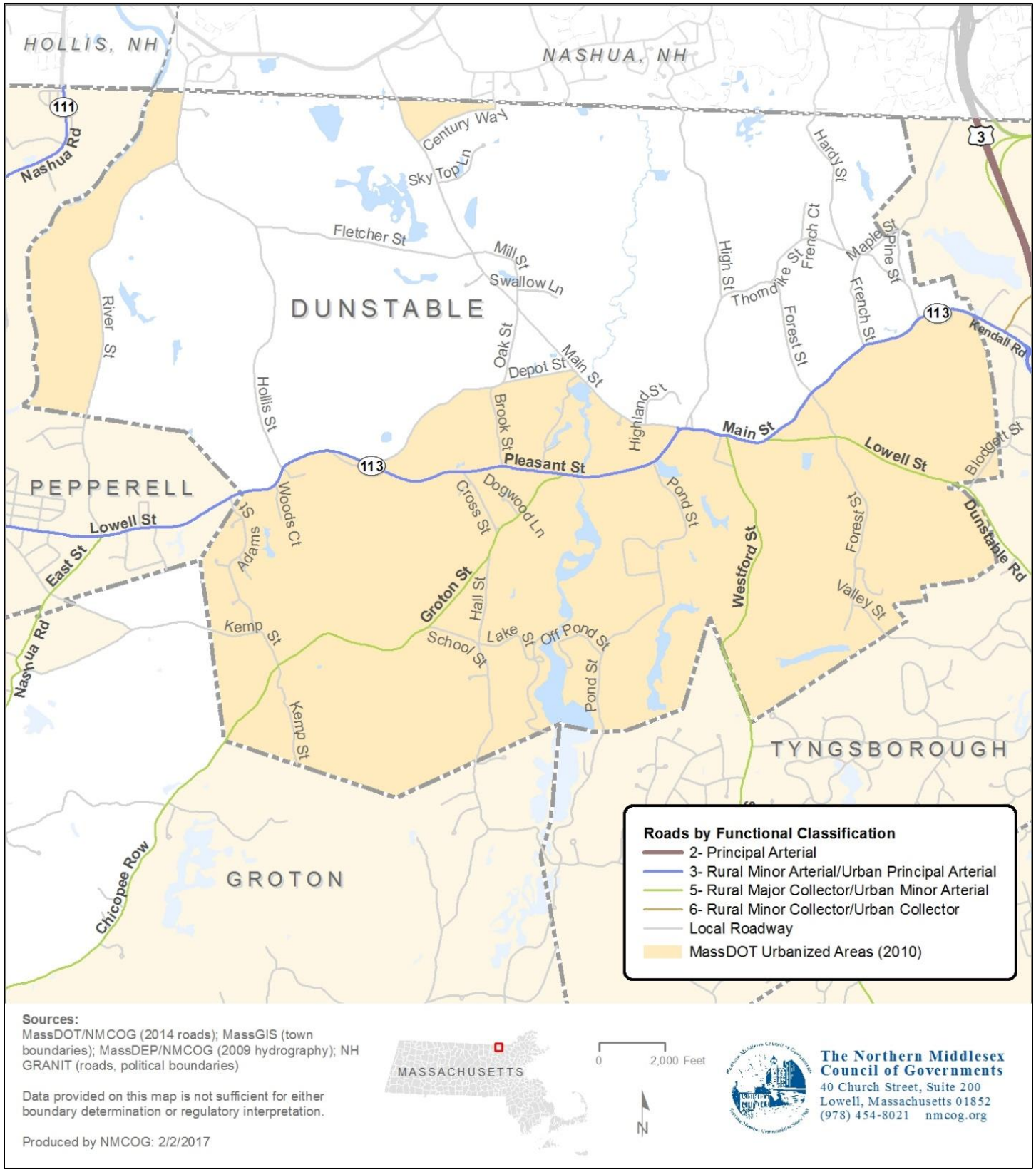
Table 1.2: Summary of Arterial Roadway Characteristics

Roadway	Class	Speed Limit (mph)	Roadway Width (ft)	Shoulder Width (ft)	Sidewalk	Bike Lane

Route 113 (Main/ Pleasant Street)	Principal Arterial	25-40	24-32	0-4	None	None
Groton Street	Minor Arterial	35-40	24-28	1-2	None	None
Lowell Street	Minor Arterial	40	24	1	None	None
Westford Street	Minor Arterial	30	18	0	None	None

Source: NMCOG Traffic Counting Inventory Database

MAP 1.1: DUNSTABLE ROADWAY FUNCTIONAL CLASSIFICATION



Sources:
MassDOT/NMCOG (2014 roads); MassGIS (town boundaries); MassDEP/NMCOG (2009 hydrography); NH GRANIT (roads, political boundaries)

Data provided on this map is not sufficient for either boundary determination or regulatory interpretation.

Produced by NMCOG: 2/2/2017

0 2,000 Feet

N

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LOCAL ROADWAYS

Local roads consist of all roads not defined as arterials or collectors, and serve to provide access to land with little or no through movement. There are approximately 31 miles of local roads in Dunstable, accounting for ninety (90) percent of the town's roadway mileage. Table 1.3 below summarizes the characteristics of several of the town's locally classified roadways.

Table 1.3: Local Roadway Characteristics

Roadway	Class	Speed Limit (mph)	Roadway Width (ft)	Shoulder Width (ft)	Sidewalk	Bike Lane
High Street	Local	25	20	0	No	No
Main Street	Local	25-40	24	1	No	No
Thorndike Street	Local	25	18	0	No	No
Depot Street	Local	30	16	0	No	No
Brook Street	Local	30	18	0	No	No
Oak Street	Local	30	16	0	No	No

Source: NMCOG Traffic Counting Inventory Database

UNACCEPTED ROADS

The Town has approximately 1.78 miles of unaccepted roadways, also known as private ways. Private ways are often unaccepted because they do not meet local standards for roadway construction. The Town does not receive funding through the Chapter 90 program to maintain these roads. According to MassDOT's database, the following roadways are unaccepted: Lake Circle, Lake Street, Lower Dam Way, Massapoag Way, Off Pond Street, and Sweets Pond Way.

SCENIC ROADS

Dunstable has been fortunate to retain the traditional character of its rural roadways. Many still reflect their original alignment, width and corridor characteristics, with extant stone walls, farm fences and roadside trees. On many of the secondary roads, traffic consists of local residents and speeds are low enough to accommodate farm vehicles. In order to protect their scenic and historic qualities, nearly all roads in Dunstable, except Route 113, are designated "scenic roads" under Chapter 40, Section 15C of the Massachusetts General Laws. Any repair, maintenance, reconstruction, tree removal, or altering of stone walls requires town approval.

JURISDICTION

Roadway ownership is key to identifying the responsible parties for maintaining and improving Dunstable's transportation network. The Town has full ownership of most of its roadway network. Of the 40.01 centerline miles of roadway in the Town, 88% are found on

accepted streets and are therefore eligible for Chapter 90 funding assistance from the State. Table 1.4 below summarizes the ownership of Dunstable's roadway network[5].

Table 1.4: Roadway Jurisdiction

Jurisdiction	Town-owned	Unaccepted	Total
	39.66	1.78	41.44

ROADWAY MAINTENANCE

Efficient utilization of limited transportation resources requires adequate maintenance and preservation of the existing transportation system. Timely and appropriate maintenance is vital given that construction costs rise annually and government agencies find themselves fiercely competing for funding. In addition, overused, poorly maintained, inadequately lit, and badly signed and striped roads pose a safety hazard. A sound and thoughtful maintenance program leads to the long-term sustainability of roadway infrastructure, and is comprised of the following activities:

- Winter maintenance
- Preservation (resurfacing and crack filling)
- Pavement markings, signs, safety barriers, etc.
- Pavement rehabilitation (restructuring without upgrading nominal load capacity)
- Pavement upgrading (increasing load capacity, environmental features, and low cost measures)
- Structural maintenance (bridges, tunnels, etc.)
- Peripheral maintenance (embankments, drainage, shoulders, etc.)

Dunstable's character is defined by large amounts of open land, a close-knit, small-town feel, and unobtrusive development. One significant disadvantage of being a small, rural community is that the Town has many miles of roads to maintain and few taxpayers to share the cost. The Town's Highway Department and Road Commissioners are responsible for the maintenance of all public roads, including snow and ice removal. The Town subcontracts roadwork on an as-needed basis and has no long-term roadway maintenance plan or asset management program.

Paved roadways represent one of the largest capital investments in the highway budget. Maintaining the paved surface of a public roadway system involves complex decision-

[5] MassDOT Road Inventory Year End Report 2015, Massachusetts Department of Transportation, Office of Transportation Planning, August 2016.

making on how and when to apply surface treatments to best keep the system performing and operating within the funding constraints facing the community.

NMCOG staff evaluated the 10.28 federal aid eligible centerline miles of roadway within Dunstable in 2016, as part of its regional pavement management program. The analysis showed that 8% of the federal-aid roadways monitored within Dunstable were in excellent condition, 46% were in good condition, 7% were in fair condition, and 39% were in poor condition, as shown on Map 1.2 on the following page.

Allocating adequate resources for preventive maintenance, such as crack sealing, can increase the life cycle for certain roadways, while deferring maintenance can lead to a need for full depth reconstruction, which is far more costly. The Town can initiate pavement preservation and rehabilitation type projects for federal aid eligible roadways by following the State's procedures for project initiation and approval. Under this funding scenario, the Town would be responsible for design, permitting and any needed right-of-way acquisition, while the Federal Highway Administration and MassDOT would assume the project construction costs.

State funding through the Chapter 90 program can be utilized for roadway improvement projects. The Chapter 90 Program is funded through the State Transportation Bond Bill and administered by MassDOT. The funds are apportioned by formula based on local roadway mileage, employment and population. The FY 2017 Chapter 90 allocation calculation for the Dunstable is detailed in Table 1.5 below.

Table 1.5: Dunstable Chapter 90 Apportionment, FY 2017

MassDOT District	Roadway miles	2015 Population	2015 Employment	FY 2017 Apportionment
3	39	3,343	236	$178,744

Chapter 90 funds must be used for roadway projects, such as resurfacing and related work, and other incidental work, such as preliminary engineering, State Aid/Consultant Design Agreements, right-of-way acquisition, shoulders, side road approaches, landscaping and tree planting, roadside drainage, structures (including bridges), sidewalks, traffic control, service facilities, and street lighting (excluding operating costs).

BRIDGES

MassDOT utilizes standards developed by the American Association of State Highway and Transportation Officials (AASHTO) to rate all bridges in Massachusetts based on their condition. Currently, MassDOT monitors one bridge in Dunstable. The Main Street Bridge over Salmon Brook was rebuilt in 2014, using Federal funding through the TIP process and is currently in good condition.

MAP 1.2: PAVEMENT CONDITIONS ON FEDERAL AID ROADWAYS

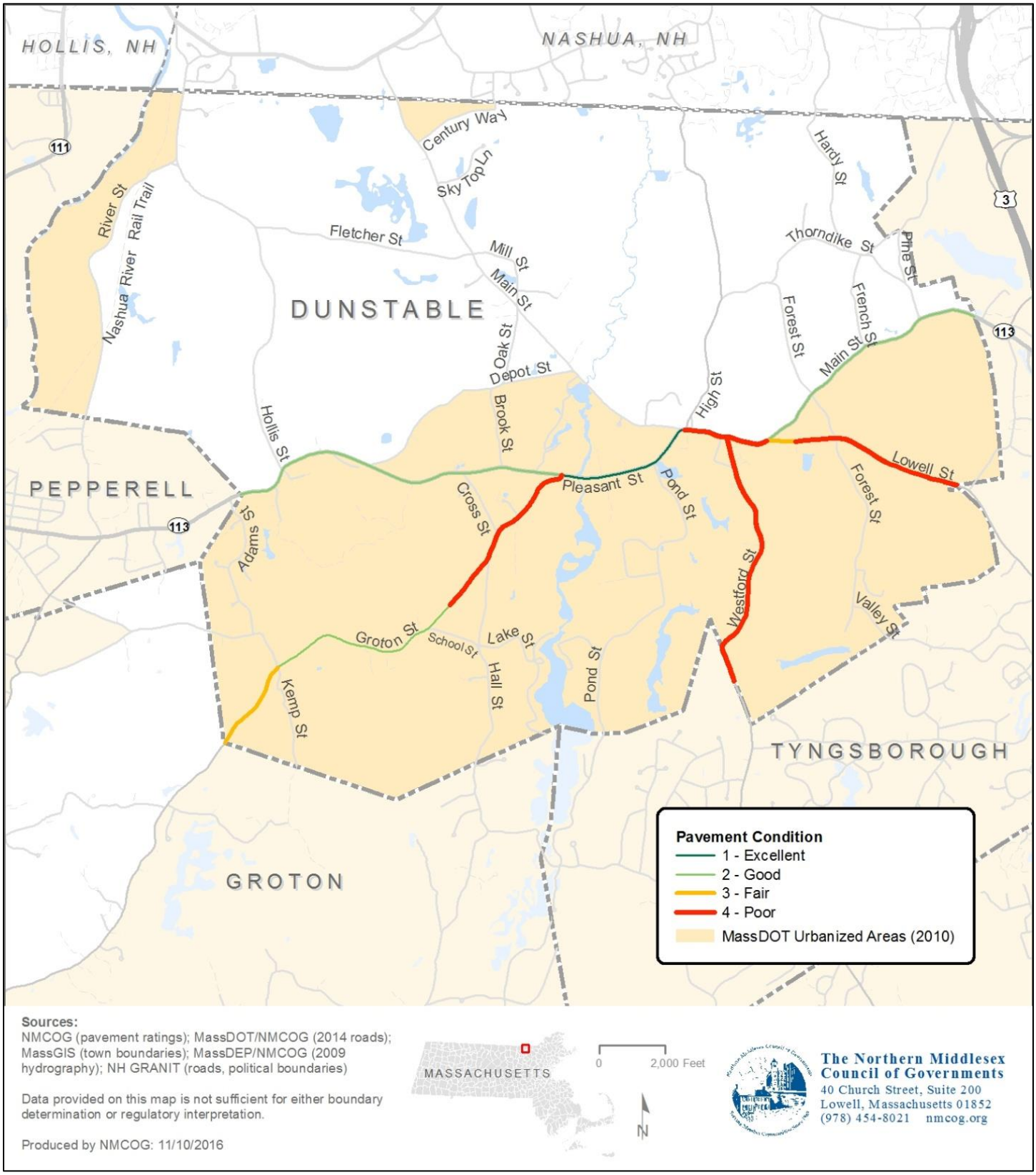


PHOTO 2: MAIN STREET BRIDGE OVER SALMON BROOK

TRAFFIC VOLUMES

Traffic volumes across the Northern Middlesex region are monitored through NMCOG's traffic counting program and gathered from traffic impact studies prepared for development projects. Generally, the NMCOG traffic counting monitoring program runs from April through October. Recorded traffic volumes taken between 2005 and 2016 show that the traffic has increased in Dunstable by approximately 0.21% annually. Map 1.3 shows locations of traffic counts and average daily traffic volumes on Town roadways. Table 6 provides a summary of traffic volumes, traffic growth rates and truck percentages at Dunstable count locations. The growth rates are calculated for locations with at least three years of volume data, and are shown in Table 1.6 on an annualized basis.

MAP 1.3: DUNSTABLE TRAFFIC VOLUME LOCATIONS

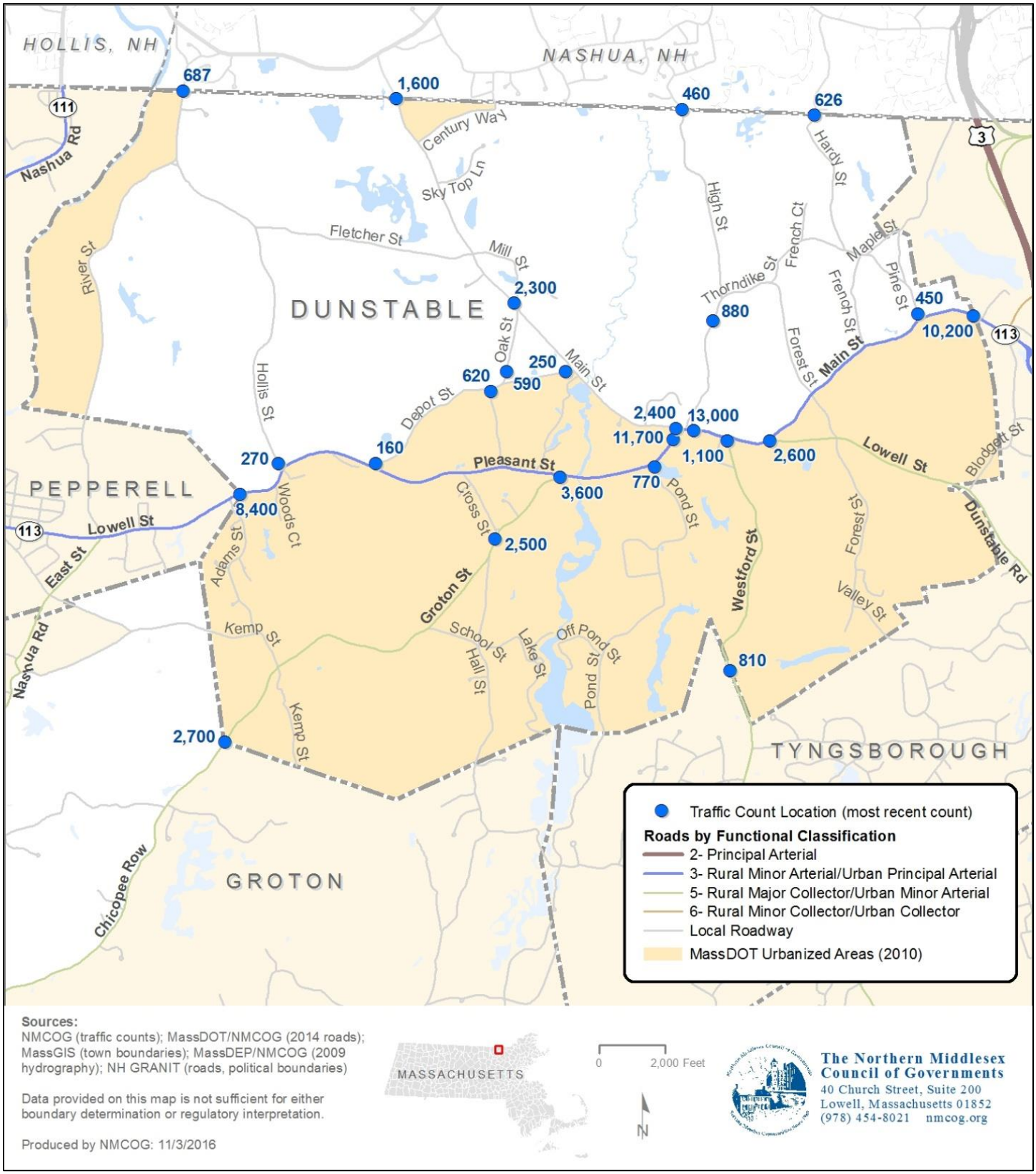


TABLE 1.6: TRAFFIC COUNT LOCATIONS IN DUNSTABLE

Location	Average Daily Traffic (ADT)												Growth Rate (%)	% Trucks
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016		
Groton St/Chicopee Row @ Groton Town Line			2,000	2,200		2,100			2,700				5.83	
Groton St S of Cross St				3,500			3,500				2,500		-4.08	1.6
Groton St S of Rte 113 (Pleasant St)		3,200			3,000			3,300				3,400	0.63	2.3
High St @ NH State Line				460										
Hollis St @ NH State Line		575			687									
Lowell St @ Rte 113 (Main St)	3,400			2,800				3,100				2,600	-2.14	2.5
Main St @ NH State Line			1,900	1,700		1,700			1,600				-2.63	
Pond St @ Rte 113 (Pleasant St)	770													
Rte 113 (Pleasant St) W of Main St			11,800			10,900						11,800	0.00	3.7
Rte 113 (Pleasant St) at Pepperell Town Line		7,900			7,500				8,700			8,400	0.63	2.6
Rte 113 (Main St) at Tyngsborough Town Line		10,200			10,300					10,200		11,600	1.37	4.2
Main St W of Rte 113 (Pleasant St)				2,200			2,400							
Thorndike St N of Rte 113 (Main St)					450									
Main St N of Oak St							2,100			2,300		2,200	0.95	1.6
Hardy St @ NH State Line		563			626									
Depot Street W of Main St (between Main and Oak St)										250				1.4
Depot Street E of Route 113 (Pleasant St)										160				6.6
Brook Street S of Depot St and Rte 113 (Main St)										620				4.3
Oak Street N of Depot Street										590				3.1
Westford Street South of Rte 113												1,100		3.0
Westford Street at Tyngsborough Town Line			890							810				1.3
Hollis St North of Rte 113												270		5.7
Rte 113 East of High St												12,900		4.1

PUBLIC TRANSPORTATION

Dunstable lies within the Lowell Regional Transit Authority (LRTA) service area. The LRTA is one of sixteen regional transit authorities across the Commonwealth of Massachusetts dedicated to operating transit services on a regional basis. In addition to Dunstable, the LRTA service area includes Acton, Billerica, Carlisle, Chelmsford, Dracut, Groton, Lowell, Maynard, Pepperell, Tewksbury, Townsend, Tyngsborough and Westford. Presently, there is no LRTA fixed route bus service within Dunstable.

The Dunstable Council on Aging provides senior demand-response transportation service via a private transportation provider and subsidizes fares. With advanced reservation, transportation is available seven days per week at a cost of $5.00 round-trip for surrounding communities and $10 per ride for longer distance destinations as far away as Boston.

PHOTO 2: MBTA COMMUTER RAIL TRAIN AT LOWELL STATION

MBTA regional commuter rail service to and from Boston via the Lowell line is available at the Gallagher Terminal in Lowell, at the commuter rail station in North Billerica, and in Ayer. The Lowell line service consists of twenty-two daily inbound trains operating between 5:35 A.M and 12:10 A.M. Headways are 30 minutes during the peak travel periods, and approximately hourly during other times of the day. In addition to Lowell and North Billerica, the train stops at Wilmington, Anderson, Mishawaum, Winchester, Wedgemere, and Medford and terminates at North Station in Boston. Weekend and holiday service consists of eight daily round trips between Lowell and Boston.

The Nashua River Rail Trail may be utilized to access the Ayer Commuter Rail station, thereby providing an automobile free commute between Dunstable and Boston. Private bus service (Boston Express) to Boston is available at the MassDOT park-and-ride lot located on Route 113 in Tyngsborough, just east of Route 3.

TRANSPORTATION SAFETY

The Dunstable Police Department provides crash records to the Registry of Motor Vehicles (RMV) on an ongoing basis. MassDOT and NMCOG maintain a database of all crash data reported to the RMV. Table 1.7 on the following page provides a summary of the crashes that occurred in Dunstable between 2012 and 2014, based on the most recent data available. Of the 151 crashes reported, 44 (29%) involved injuries, and none were reported as fatal.

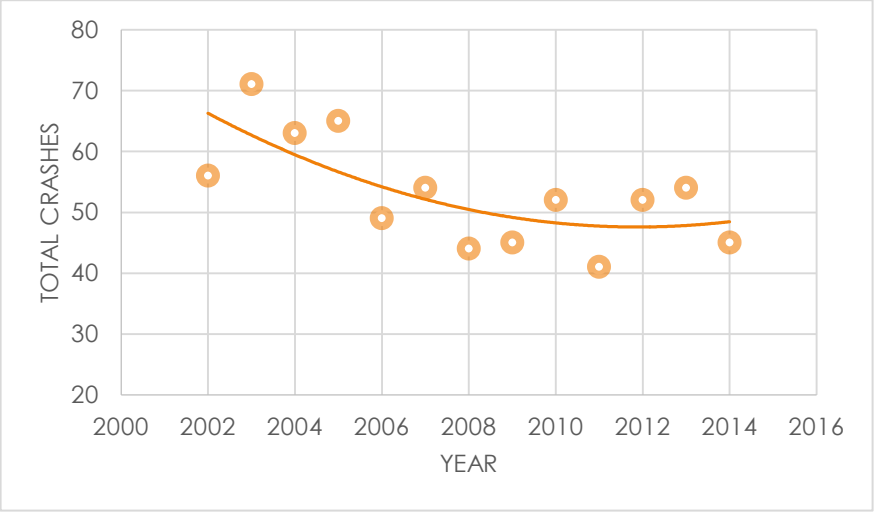
Table 1.7: Dunstable Crash Summary (2012-2014)

Year	Total Crashes	Property Damage Only Crashes	Injury Crashes (Total People Injured)	Fatal Crashes
2012	52	34	18 (23)	0
2013	53	37	16 (21)	0
2014	45	36	9 (17)	0

Source: MassDOT Crash Data Record System

Figure 1.1 shows reported Dunstable crash data trends between 2002[6] and 2014. This data shows a consistent decrease, from a high of 71 reported crashes in 2003 to a low of 41 in 2011. The latest data available shows a relatively constant total in the 40-60 range, well below reported crash data in the early 2000s.

FIGURE 1.1: REPORTED CRASHES IN DUNSTABLE 2002-2014



Source: Massachusetts RMV/MassDOT

NMCOG staff analyzes crash data for key intersections in Dunstable each year to identify locations with potential safety concerns. Three years of data are examined, in order to minimize annual variations that can be created by construction, road closures, or various factors at or near each location. Crash locations are analyzed using the equivalent property damage only (EPDO) method. Through this method, each reported crash is assigned a numeric value based on severity. Property damage only crashes are assigned one (1) point, injury crashes are assigned five (5) points, and fatal crashes are assigned ten (10) points. The points assigned to each crash are the added to determine the intersection's EPDO value. In accordance with accepted national transportation engineering best practices, NMCOG flags all locations with more than five accidents per year as warranting further study and investigation. Table 1.8 on the following page summarized the EPDO scores for Dunstable intersections for reporting years 2012-2014.

[6] 2002 was the first year Massachusetts began using the current crash data reporting system, requiring local police to send reports to the RMV. Prior to 2002, the RMV used an Accident Records System for reporting purposes.

Table 1.8: Crash Summary at Key Intersections in the Town of Dunstable (2012-2014)

Intersection	Intersection Control	Total Crashes	Property Damage Only Crashes	Injury Crashes	Fatal Crashes	EPDO
Rte. 113 (Pleasant St) at Hollis St	Stop	5	2	3	0	17
Rte. 113 (Main St) at Lowell St	Stop	7	5	2	0	15
Rte. 113 (Pleasant St) at Main St	Stop	3	1	2	0	11
Rte. 113 (Pleasant St) at Brook St	Stop	4	3	1	0	8
Rte. 113 (Pleasant St) at Groton St	Stop	4	3	1	0	8
Rte. 113 (Main St) at Westford St	Stop	3	2	1	0	7
Rte. 113 (Main St) at French St	Stop	2	1	1	0	6
Rte. 113 (Pleasant St) at Pond St	Stop	2	1	1	0	6
Rte. 113 (Main St) at Forest St	Stop	2	1	1	0	6
Rte. 113 (Pleasant St) at Depot St	Stop	1	1	0	0	1
Rte. 113 (Main St) at High St	Stop	1	1	0	0	1
Groton St at Cross St	Stop	2	0	2	0	1
Groton St at Hall St	Stop	1	1	0	0	1
Groton St at School St	Stop	2	2	0	0	2
Groton St at Kemp St	Stop	2	1	1	0	6
Lowell St at Forest St	Stop	2	2	0	0	2

Source: NMCOG Crash Database

While no intersections in Dunstable made the Top 100 High Crash Intersection List for the Northern Middlesex region, there are issues with run off the road incidents throughout the community, particularly along Route 113. Of the reported 43 injury related crashes between 2012 and 2014, 31 (72% of all injury crashes) occurred on Main Street/Pleasant Street, with 27 reported single vehicle incidents (62% of all injury crashes). The highest number of injury crashes at an intersection occurred at Pleasant Street and Hollis Street, where three of the five reported crashes involved non-fatal injuries. Two of the injury crashes reported were single vehicle incidents where the driver lost control and hit a fixed object along the side of the roadway. Weather may be partly to blame, as two of the three injury crashes occurred during snow events and the other occurred during a rainstorm.

While three years of data is used to analyze trends for vehicular crashes, more data is often needed to determine trends in pedestrian and bicycle crashes. A five-year review (2010-2014) of crashes involving vehicles and pedestrians/bicyclists has been examined in order to identify locations where bicycle and pedestrian safety may be an issue. Compiled records indicate no pedestrian or bicycle-related crashes occurred in Dunstable between 2010 and 2014.

KEY TRAFFIC ISSUES

The public input process has identified Route 113 as the most critical roadway in Dunstable from a traffic perspective. Extending from Tyngsborough to Townsend, the main thoroughfare through Town experiences traffic volumes that far exceed those of other roadways in town. The Town Center is the civic and cultural heart of the community and is bisected by Route 113/ Main Street. Main Street forms the basis of the Town Center and is characterized by a number of classic New England farm and village landscapes and structures. From a regional perspective, Main Street also provides a critical transportation link with neighboring towns and serves as the primary means of access to Route 3. Should Route 113 fail there are no viable alternative routes available for redirecting thousands of vehicles per day.

PHOTO 3: DUNSTABLE CENTER AREA, PHOTO COURTESY OF GOOGLE MAPS

In 2015, Town officials, working with NMCOG and MassDOT, initiated the Main Street Improvement Project to repair and reconstruct the roadway and intersections that lie between the Central Cemetery at Westford Street and the Main Street intersection with Route 113 near Town Hall. This work will include minor widening to allow for better bicycle and pedestrian accommodations, including the installation of a sidewalk along the south side of the road. The goals of the Main Street project are as follows:

- Improve vehicular travel and bicycle accommodations;
- Improve pedestrian safety and accessibility;
- Increase substandard sight distance issues at Westford Street by moving the intersection approach 7-9 further north;
- Improve substandard intersection geometry issues at High Street;
- Improve pedestrian crossing issues within the Town Center;
- Reconstruct 850 feet of dry-laid stone wall which is immediately adjacent to and supporting the roadway, and is currently failing;
- Replace an existing dry-laid stone box culvert which carries a perennial stream and is failing; and
- Respect and maintain the visual character of the Town Center and the historic integrity of the Central Cemetery.

The High Street approach to Main Street includes a landscaped island that controls two-way traffic on both sides. Many find the intersection confusing, in part due to inadequate signage and markings and the narrow 18-foot travel areas. As part of the improvement project, the Town is proposing to reconfigure this intersection as a conventional T-intersection.

In addition to this project, the Town is considering a plan to develop a new sidewalk/pathway segment on Main Street, west of the Town Center, extending from the intersection of High/Pleasant Street to the Library.

Overall, traffic congestion in Dunstable is minimal. Although the volume of traffic on Route 113 is considerable (nearly 13,000 vehicles per day), it does not exceed the capacity of the roadway. However, the steady flow of traffic during peak travel can make left turns at the intersecting roadways challenging. The lack of gaps in the Route 113 traffic flow during rush hour slows traffic moving through the Town Center. During the Visioning Session for the Master Plan, participants identified traffic on Route 113 as the second most significant weakness facing the town, and there was substantial interest in improving traffic control. However, the results of the written survey found that 75% of the nearly 300 respondents rated traffic flow in the Town Center as either good or fair, while only 12.5% found it to be poor.

While the majority of streets in Dunstable are very narrow, it is important to note that recent subdivision streets are significantly wider. This wider width is the result of the Town's subdivision regulations, which require a 55-foot right-of-way with two 10-foot travel lanes, an 8-foot parking lane, and sidewalks on each side (2-5 feet wide). The Town may want to revise these regulations to reflect the community's current desires and to be consistent with current practices and state and federal regulations. For example, the Americans with Disabilities Act (ADA) requires sidewalks that are wider than what is currently allowed within the existing subdivision regulations.

The Town should strive to consistently apply the requirements and standards set forth within the zoning and subdivision regulations. As written, the Town's subdivision regulations require that sidewalks be constructed of concrete. Observations made in existing subdivisions with sidewalks show that most are comprised on bituminous asphalt. It is assumed that the Planning Board has traditionally waived the requirement for concrete. If asphalt is preferred, the subdivision regulations should be revised to indicate this preference.

Pedestrian and Bicycle Facilities

Currently, Dunstable residents rely almost exclusively on their motor vehicles for transportation. The absence of sidewalks and bicycle accommodations discourages the use of alternative modes. In many communities, bicycling and walking have become key factors

for measuring a community's quality of life. Communities that promote walking and other forms of non-motorized transportation can reap significant social, environmental and health benefits. Safe, convenient and comfortable trails, sidewalks and walkways provide opportunities for exercise, help people meet and socialize, and provide mobility options for children and others who do not drive. With the option to walk or bike available to residents, visitors and workers, the number of motorized vehicles on the roadways can be reduced, which helps to decrease traffic congestion and air pollution.

While there are off-road trails in Dunstable, such as the Nashua River Trail and various other trails located on conservation lands, there are no continuous, connected pedestrian or bicycle facilities that can be used to access popular destinations, such as Town Hall, the Library, the elementary school, or the Larter recreation area. As a result, children and adults must share the limited roadway width with automobile and truck traffic. Dunstable has formed a six-member Safe Pathways Committee to address this concern. Currently, the Committee is focusing on creating a pedestrian pathway along Main Street to connect Town Hall and the Library, as mentioned previously.

In 2016, MassDOT launched a Complete Streets funding program for communities that adopt Complete Streets policies, and identify and prioritize projects that promote Complete Streets on local roads. Complete Streets is a design approach that requires streets to be planned, designed, operated and maintained so that travel is safe for walking and bicycling, in addition to driving. Over the past year, Dunstable adopted a Complete Streets Policy and prepared a draft Complete Streets Prioritization Plan. The recommendations of the Town's Complete Streets Prioritization Plan have been considered in the development of the Master Plan.

Non-Motorized Transportation and Healthy Aging

There are approximately five hundred (500) seniors residing in Dunstable, and like most communities, Dunstable's population is aging. Being able to get around using the means of transportation one desires is a fundamental aspect of healthy aging. Transportation for older adults is essential to their physical and emotional well-being. For the older adults who are not licensed to drive (12% of people 65-69 and 52% of those age 85 and over[7]), walking or public transportation may be the only transportation options available. National studies have shown that older drivers average six trips per week outside their

[7] Federal Highway Administration, Distribution of Licensed Drivers by Sex and Age, Table DL-20; http://www.fhwa.dot.gov/policyinformationstatistics

homes, while non-drivers average only two trips.[8] This reduction may have a significant impact on social connections and lead to depression and other mental health issues.

Walking and/or wheelchair use for daily activities is a valuable means for getting recommended daily exercise. Walking has numerous health benefits, such as:

- Improving blood pressure;
- Reducing the risk of heart disease;
- Alleviating depression; and
- Significantly reducing the risk of Alzheimer's.

However, walking is more dangerous for older adults than for younger residents. Older adults are more likely to be hit by automobiles, and are more likely to die as a result of such accidents. People age 70 and over comprise less than 10% of the nation's population but account for 18% of pedestrian deaths.[9] Overall, the elderly may be fifteen times more likely to be injured or killed as pedestrians than as drivers.[10] In addition, injuries from falls are a leading cause of death in older adults. Streets, curbs and sidewalks that have uneven surfaces, cracks, grade changes and tripping hazards can present a significant health risk for a community's senior population. These facts should be taken into consideration as Dunstable addresses maintenance and construction projects in the upcoming years.

Community Initiatives for Improving Non-Motorized Transportation

Enhancing transportation requires community design improvements to help everyone, including older adults, stay active and healthy in a safe manner. The following measures are typically utilized to address bicycle and pedestrian needs within a community:

- Evaluate local needs for pedestrian, bicycle and trail access and mobility;
- Create a plan for upgrading existing facilities, establishing future networks, and obtaining needed funding;
- Develop and maintain pedestrian and bicycle facilities using state and federal grant funds, and local Community Preservation funds;
- Enact local bylaws and subdivision regulations that encourage the provision of pedestrian and bicycle accommodations; and
- Consider pedestrian and bicycle needs within the site plan and subdivision review processes.

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[8] Livable Community Indicators for Sustainable Aging in Place, MetLife Mature Market Institute, 2013.
[9] Sandra Rosenbloom, *The Mobility Needs of Older Americans: Implications for Transportation Reauthorization*, The Brookings Institution.
[10] Deborah Howe, *Aging as the Foundation for Livable Communities*, Routledge, 2012.

Dunstable has taken action on some of these measures through the creation of its Complete Streets Policy and Plan. However, the Town's zoning bylaw and subdivision regulations need to be fine-tuned, in order to better address requirements related to bicycle and pedestrian accommodations.

Funding bicycle and pedestrian improvement projects can be challenging. Without a dedicated funding source, even the best-crafted plans cannot be implemented. While limited grants are available under the State's Complete Street program, the most likely funding source is local revenue that provides a predictable capital outlay. Given Dunstable's small budget and limited tax base, the Town should consider leveraging contributions from future development projects. Some communities, such as Chelmsford and Westford, have established sidewalks funds for accepting such contributions. These funds are expended on projects in each community that have been identified as high priority. Dunstable could utilize such monies for implementing portions of its Complete Street Prioritization Plan.

SIDEWALKS

Currently, Dunstable has a very limited sidewalk inventory, with designated sidewalks located in residential neighborhoods along Century Way, Skytop Lane, Swallow Lane, Parkhurst Street and Highland Street. The lack of sidewalks on main thoroughfares inhibits pedestrian travel throughout the Town. Pedestrians are forced to walk in the road to reach destinations, exposing themselves to the unnecessary risk of sharing space with vehicles. Over 77% of Dunstable residents responding to the Master Plan survey favor increasing available accommodations for non-motorized transportation, while 71% of the respondents favor adding sidewalks or pathways.

The Town has installed crosswalks in front of Town Hall and near the Town Library, demonstrating a noted desire for pedestrians to use Town Center amenities like the Town Common and fields, the Dunstable Evangelical Congregation Church, the Swallow Union Elementary School, and nearby conservation areas. These crosswalks are not ADA compliant, in that no sidewalk refuge is in place on either side for physically challenged individuals. The installation of adjacent sidewalks is necessary to bring these crosswalks into ADA compliance. When considering improvements to pedestrian facilities it is important to take into consideration all users, including those with physical impairments. Sidewalks should be wide enough to accommodate wheelchairs, and wheelchair ramps at crosswalks should meet ADA standards, which include tactile strips.

As mentioned earlier, the Town has initiated the Route 113 (Main Street) Improvement Project which will add a sidewalk between the Central Cemetery on Westford Street and the Town Center. In addition, the Town's Complete Streets Prioritization Plan identifies

several locations where sidewalks would benefit users of the local transportation network, as shown in Table 1.9 below.

Table 1.9: Sidewalk Project Locations Identified in Dunstable Complete Streets Prioritization Plan

1. Main Street between Pleasant Street and Highland Street (North Side)
2. Main Street between Highland Street and the Red Line Trail
3. Main Street between Common Street and Pleasant Street (North Side)
4. Main Street between Common Street and the east side of Westford Street
5. Westford Street between Main Street and existing Central Cemetery Roadway
6. Pleasant Street between Main Street and the Gas Station/Dunkin Donuts west of Groton Street (South Side)
7. Groton Street between Pleasant Street and Larter Field Driveway
8. Larter Field Driveway between Groton Street and existing pathway north of the parking area

Bicycle Facilities and Multi-use paths

Safe convenient and comfortable trails and walkways provide opportunities for exercising and help people meet and socialize. Accommodating bicyclists through on-road and off-road facilities, such as bike lanes, bike paths, and the use of wider roadway shoulders, encourages the use of bicycling as form of transportation and provides a safer bicycling experience. There are currently no on-road bicycle facilities in Dunstable. There are opportunities to designate on-road routes along Main Street and Route 113 west of the Town Center, providing improved access to the Town Center area. "Share the Road" signs along Route 113 would help increase awareness among motorists and bicyclists. Providing bike racks at strategic locations, as outlined in the town's Complete Streets Prioritization Plan, would also help encourage bicycling.

Map 1.4 on page 24 shows the current mapped trail system throughout the Town.

Nashua River Rail Trail (NRRT)

The Nashua River Rail Trail is a 12.5 mile paved, multi-use rail trail, which begins in Ayer, and follows the course of the Nashua River through Groton, Pepperell and Dunstable. It crosses over the state line extending into Nashua, NH, where it ends at Gilson Road. The trail is maintained and owned by the Massachusetts Department of Conservation and Recreation (DCR). Within Massachusetts, the NRRT is ten feet wide and sections of the trail include a

PHOTO 4: NASHUA RIVER RAIL TRAIL IN DUNSTABLE

separate, unpaved bridle path for equestrians.

The Ayer trailhead, located close to the Ayer commuter rail station, provides access to rail service between Boston and Fitchburg. The Ayer Center parking lot is the largest parking area along the trail with sixty (60) paved parking spaces. Parking for 10 to 15 vehicles can be found in Groton Center. Additional unpaved parking lots can be found at Sand Hill Road in Groton, Railroad Square in Pepperell and Hollis Street in Dunstable, at the trailhead at Yudicky Park near the New Hampshire State line.

PHOTO 6: NASHUA RIVER TRAIL IN DUNSTABLE

The NRRT is an important and popular transportation and recreation asset for the Town and the region, providing a safe off-road alternative to Routes 111 and 113. On Saturday, September 8, 2007, the first statewide trail usage count was held at multiple trails across Massachusetts. Volunteers completed counts at three points along the NRRT as part of this effort. The most recent NRRT counts were completed in May and July of 2014 by NMCOG staff at the Railroad Square trail crossing in Pepperell.

Table 1.10 compares the Saturday trail counts at Railroad Square between 2007 and 2014, with the highest increases occurring during the early afternoon. The "peak hour" for Saturday trail usage in both 2007 and 2014 occurred between 10:00 a.m. and 11:00 a.m. The largest share of users, 18% in 2007 and 17% in 2014, were counted during this time period. Overall trail usage increased nearly 48% during the seven-year study period.

Table 1.10: Trail Usage at NRRT Railroad Square Crossing in Pepperell, 2007 and 2014

Time	2007	%	2014	%	% Change
7:00 a.m. – 8:00 a.m.	39	6.3%	-	-	-
8:00 a.m. – 9:00 a.m.	84	13.6%	54	5.9%	-35.7%
9:00 a.m. – 10:00 a.m.	111	17.9%	78	8.5%	-29.7%
10:00 a.m. – 11:00 a.m.	112	18.1%	155	16.9%	+38.3%
11:00 a.m. – 12:00 p.m.	92	14.9%	134	14.6%	+45.6%

12:00 p.m. – 1:00 p.m.	92	14.9%	138	15.1%	+50.0%
1:00 p.m. – 2:00 p.m.	42	6.8%	106	11.6%	+152.3%
2:00 p.m. – 3:00 p.m.	45	7.3%	120	13.1%	+166.6%
3:00 p.m. – 4:00 p.m.	-	-	128	14.0%	-
Grand Total	**617**	**100%**	**913**	**100%**	**+47.9%**

Source: NMCOG Trail Counts (2014), Friends of Bruce Freeman Rail Trail website (2007)

As noted in Table 1.11, cyclists made up the largest share of users (78.6% in 2007 and 90% in 2014). The presence of joggers on the trail increased significantly, more than doubling between 2007 and 2014.

Table 1.11: Trail Users at NNRT Railroad Square Crossing, 2007 and 2014

Trail User	2007	%	2014	%	Percent Change
Baby Carriage	4	0.6%	2	0.2%	-50.0%
Bicycle	485	78.6%	822	90.0%	+69.4%
Jogger	17	2.7%	36	3.9%	+111.7%
Roller Blade (Skater)	17	2.7%	5	0.5%	-70.5%
Walker	83	13.4%	48	5.2%	-42.1%
Wheelchair	5	0.8%	0	0.0%	-100.0%
Other	6	0.9%	0	0.0%	-100.0%
Grand Total	**617**	**100%**	**913**	**100%**	**+47.9%**

Source: NMCOG Trail Counts (2014), Friends of Bruce Freeman Rail Trail website (2007)

In 2016, NMCOG and the Nashua Regional Planning Commission (NRPC) coordinated on the installation of a permanent trail count station on the NRRT in Nashua, NH, just north of the Dunstable/Nashua line. In May 2016, average weekend volumes (604 users) were found to by twice the weekday volume (300 users), indicating that most users are utilizing the trail for recreational purposes rather than for commuting. The peak Saturday count totaled 1,147 users on May 14th, while the highest weekday volume was 544 on Friday, May 20th. These user volumes are similar to those observed in Pepperell.

In addition to the Nashua River Rail Trail, Dunstable boasts a network of off-road trails running through wildlife refuges, conservation areas, and Town forests. Some of the key areas include the following:

- The Dunstable Rural Land Trust Wildlife Refuge on Main Street consists of approximately 800 acres of land with trail systems running throughout the property. The trails extend from the Nashua River Rail Trailhead on Hollis Street to the Dunstable Wildlife Preserve entrance on Main Street.
- Flat Rock Hill and Blanchard Hill Trail Systems lie just to the east of the Dunstable Rural Land Trust Wildlife Refuge, and consist of approximately 85 acres of land. Flat

Rock Hill Conservation Area and the adjacent Arched Bridge Conservation Area cover 425 acres with about 4.5 miles of woodland trails. A 1.5 mile rail trail runs through Arched Bridge Conservation Area to Main Street in Dunstable. The area is named after a beautiful granite bridge over Salmon Brook. Other trails connect to the adjacent Flat Rock Hill Conservation Area. Connecting to the Yudicky Farm Conservation Area in Nashua would provide even more opportunities for recreation and healthy transportation.

- The Pierce Town Forest, managed by the Town Forest Committee, is located off Groton Street and provides recreation activities through a system of trails that connect to the Unkety Brook Trail system.
- The Spaulding Proctor Reservation consists of four hiking trails that may be accessed from Larter Field on Groton Street.

MAP 1.4: DUNSTABLE TRAILS AND PATHWAYS

Dunstable Trails and Pathways

Hollis, NH
Nashua, NH
PEPPERELL
DUNSTABLE
TYNGSBOROUGH
GROTON
MASSACHUSETTS

Gregg Woods Red Trail
Gregg Woods Yellow Trail
Robbins Farm Trail
Shortcut Trail
Wildlife Preserve (DRLT)
Esker Trail
100 Acre Pasture Trail
Flat Rock Hill (DRLT)
Quarry Trail
Sky Top Ln
Tully Woods Trail
Main Street Trail
Blanchard Hill Trail
Flat Rock Trail
Salmon Brook Trail
Gage Town Forest
Nashua River Rail Trail
Fletcher Street Trail
Meadow Trail
Mid Trail
Kennedy Conservation Area
Proctor Conservation Area
Red Trail to Salmon Brook
Swallow Ln
Larter
Hauk Swamp Natural Heritage Area
Larter Property
Unkety Woods Trail
Town Forest Trail
Pierce Town Forest
Spaulding-Proctor Reservation
Woods Trail
Pond Trail
Pond Loop
Larter Trail
Keyes Meadow
Unkety
Unkety Brook Meadow (DRLT)
Horse Hill Quarry (DRLT)
Farnsworth Wildlife Refuge
English Wildlife Refuge
Dunstable Brook Wildlife Management Area
Massapoag Pond
Flint Pond

Nashua Rd
Hollis St
Nashua River
River St
Fletcher St
Mill St
Main St
Oak St
Depot St
Brook St
Sweets Pond Way
Salmon Brook
Highland St
High St
Pleasant St
Cross St
Lowell St
East St
Adams St
Kemp St
Groton St
School St
Lake St
Off Pond St
Hall St
Massapoag Way
Pond St
Parkhurst Rd
Scribner Rd
Chicopee Row
Westford St
Forest St
Trask Way
Valley St
Blodgett St
French Ct
Hardy St
Thorndike St
Maple St
Pine St
French St
Kendall
Dunstable Rd

111
113
3A

Dunstable Trails
- Nashua River Rail Trail
- Town Forest Trail
- Unkety Woods Trail

DRLT Wildlife Preserve:
- Esker Trail
- Fletcher Street Trail
- Gregg Woods Red Trail
- Gregg Woods Yellow Trail
- Main Street Trail
- Robbins Farm Trail
- Shortcut Trail
- Tully Woods Trail

Flat Rock Hill, Ferrari Farm, Kennedy, Proctor:
- 100 Acre Pasture Trail
- Blanchard Hill Trail
- Flat Rock Trail
- Meadow Trail
- Mid Trail
- Quarry Trail
- Red Trail to Salmon Brook
- Salmon Brook Trail

Spaulding-Proctor Reservation:
- Larter Trail
- Spaulding Proctor Pond Loop
- Spaulding Proctor Pond Trail
- Spaulding Proctor Woods Trail

Parcel Boundary
Town Boundary
Structure
Open Space Parcel

Sources:
The Town of Dunstable (2010/2011 GPS trail data, FY2017 (2016) parcels, 2012 Open Space); MassDOT/NMCOG (2014 roads); MassGIS (building footprints, town boundaries); MassDEP (2009 hydrology)

Data provided on this map is not sufficient for either boundary determination or regulatory interpretation.

Produced by NMCOG 2/21/2017

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N 0 1,000 Feet

PUBLIC INPUT

A Master Plan Visioning Session was held at Dunstable Town Hall on June 23, 2016. During the session, public input was generated through the use of a Strength, Weaknesses, Opportunities and Threats (SWOT) analysis exercise. During the session, the following input was received relative to transportation:

Strengths:

- Walking trails

Weaknesses:

- Traffic on Route 113
- Truck traffic on Route 113
- Condition of Main Roads
- Lack of sidewalks/streetlights
- Too many streetlights
- Trail designation
- Speed on Route 113/Main Street
- Throughway to other communities

Opportunities:

- Plan for traffic control
- Alternative modes of transportation
- Revisit town center plan
-

Threats:

- Lack of infrastructure funding
- Increased traffic
- Over use/improper use of trails
- Expansion of Route 113

The Master Plan written survey results relative to transportation are summarized as follows:

- 75% of respondents rate traffic flow in the Town Center as either good or fair; only 12.5% find it to be poor.
- Over 85% of respondents rate traffic flow in other areas of town as excellent or good.
- Over 85% of respondents rate speed enforcement as excellent or good.
- Over half (56%) of the respondents felt that pedestrian accommodations are poor, while only 22% felt that they are excellent or good.

- 77% favor increasing available accommodations for non-motorized transportation, while 71% of respondents favor adding sidewalks or pathways.
- Adding sidewalks was ranked third in responding to Question 7, where respondents identified where they would spend their $100 in town funds.
- 45% of the respondents rate bicycle facilities as poor, while 22% felt that they are excellent or good.

DISCUSSION QUESTIONS

1. What types of traffic calming measures should be deployed in the Town Center and along Route 113? Are there other locations where traffic calming is needed? (A description of traffic calming is attached)

2. Is there a need for additional parking for the Nashua Rail Trail? If so, where should it be located?

3. Should the town have a sidewalk snow removal bylaw in the future?

4. Are the parking requirements outlined in the town's Zoning Bylaw reasonable and effective or are modifications needed?

5. How can the town finance sidewalk or pathway improvements and other infrastructure needs, given the fiscal challenges confronting the community?

6. Should the town actively work to acquire right-of-way easements for additional off-road trails?

7. Should the Town post "share the road" signs on appropriate roadways?

8. Should the town's subdivision and zoning regulations be modified to reflect current practices and the desires of the community in terms of roadway width, historical roadside features (stone walls, shade trees, markers, etc.) and maintenance of rural character? Should Dunstable revise these regulations to provide greater emphasis on pedestrian and bicycle transportation?

9. Should developers be required to provide streetscape amenities, such as street trees, benches, and pedestrian scale lighting, as part of the project permitting process?

10. Does the Town maintain unaccepted streets? If so, is there an acceptance process in place so that the Town can receive additional Chapter 90 funds?

11. Run off the road accidents are a problem in Dunstable, particularly along Route 113. In your opinion, what can be done to reduce these types of incidents?

Menu of Traffic Calming Measures

- Narrowing: Narrowing traffic lanes makes slower speeds seem more natural to drivers and are less intrusive than other treatments that limit speed or restrict route choice. Narrowing measures include:
    - Lane narrowing can be created by adding/extending sidewalks, adding bollards or planters, or adding a bike lane or on-street parking.
    - Curb extensions (also called bulb outs) narrow the width of the roadway at pedestrian crossings
    - Chokers are curb extensions that narrow roadways to a single lane at certain points[9]
    - Road diets remove a lane from the street. For example, allowing parking on one or both sides of a street to reduce the number of driving lanes.
    - Pedestrian refuges or small islands in the middle of the street can help reduce lane widths.

- Construction of polymer cement overlay to change asphalt to brick texture and color to indicate high traffic crosswalk
- Vertical deflection: Raising a portion of a road surface can create discomfort for drivers travelling at high speeds. Both the height of the deflection and the steepness affect the severity of vehicle displacement:
    - Speed bumps, sometimes split or offset in the middle to avoid delaying emergency vehicles
    - Speed humps, parabolic devices that are less aggressive than speed bumps.
    - Speed cushions, two or three small speed humps sitting in a line across the road that slow cars down but allows wider emergency vehicles to straddle them so as not to slow emergency response time.
    - Speed tables, long flat-topped speed humps that slow cars more gradually than humps
    - Raised pedestrian crossings, which act as speed tables, often situated at intersections.
    - Changing the surface material or texture (for example, the selective use of brick or cobblestone). Changing in texture may also include changing color to highlight to drivers that they are in a pedestrian centric zone.
- Horizontal deflection, i.e. make the vehicle swerve slightly. These include:
    - Chicanes, which create a horizontal deflection that causes vehicles to slow as they would for a curve.
    - Pedestrian refuges again can provide horizontal deflection, as can curb extensions and chokers.
- Block or restrict access. Such traffic calming means include:
    - Median diverters to prevent left turns or through movements into a residential area.
    - Converting an intersection into a cul-de-sac or dead end.
    - Closing of streets to create pedestrian zones.

- Enforcement and education measures for traffic calming include:

  - Reducing speed limits near institutions such as schools
  - Vehicle activated sign, signs that react with a message if they detect a vehicle exceeding a pre-determined speed.
  - Speed limit enforcement techniques include: direct police action, automated systems such as speed cameras or vehicle activated signs