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CAPE COD  
COMMISSION

# Barnstable County Freight Study

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## Executive Summary

This 2015 Cape Cod Freight Study is the first attempt by the Cape Cod Metropolitan Planning Organization to bring a comprehensive assessment of issues facing freight haulers to, from and within Barnstable County.

The information in this study will help to identify the methods used to transport freight and provide recommendations to improve freight flexibility, speed-efficiency, fuel-efficiency, and safety. The study provides details regarding existing infrastructure, for each movement type (trucking, rail, and waterborne).

Truck freight issues are focused on on-time reliability and routing options. The Cape's arterial road and bridge network forms the backbone of freight routing – with significant constraints at the Cape Cod Canal area. Rail infrastructure is far more limited – with its own unique constraints at the rail bridge over the Cape Cod Canal. Waterborne freight is currently very limited, but the many ports and harbors of the Cape provide opportunities unique to the area.

The study features data from a survey presented to local freight businesses. Respondents indicated their particular freight use and needs and support for investments to improve freight infrastructure.

In order continue to make progress in improving freight safety and reliability, the following strategies are offered:

- Identify “Critical” Freight Commodities
- Encourage Specific Types of Freight Transportation
- Make Infrastructure Improvements for Freight Industry
- Update Truck Routes for MassDOT Road Inventory
- To reduce impact to freight traffic, restructure Bourne and Sagamore bridge repair contracts (night work or 24-hour shift)



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# Introduction

## BACKGROUND – STUDY OBJECTIVES

Freight transportation is the movement of goods in large quantity. The movements are generally split up in to four major categories, truck, rail, and water and air freight, each with their own types of contracts. All freight movement types are evaluated in this study for infrastructure accommodations and routing. Freight travel mostly reaches its end point for goods to be bought by consumers; movements are internal to the region, or goods are exported. Cape Cod has several exports including solid waste, parcel post and seafood products which are explored in the study.

The purpose of the study is to provide recommendations to improve freight flexibility, speed-efficiency, fuel-efficiency, and safety by transport method. The study will detail the existing infrastructure, zoning and routing for each movement type. The study will feature data from a survey presented to local freight businesses. The third part of the study will detail problem areas for freight transportation. Finally the study will provide recommendations for the improvement of freight operations and infrastructure on Cape Cod.

Local economies typically depend on freight transportation to export and import goods. The freight industry on Cape Cod is different from most areas because of the seasonal tourist industry, abundance of waterways, and historic culture. The tourist industry creates more demand on goods in the summer months; the waterways create opportunities for sea freight, but also require crossings for truck freight. The historic character of Cape Cod limits the ability to create large-scale freight infrastructure. The following report establishes the details of the current industry and suggests improvements.



## Truck Freight

Vehicle transportation is the primary method of freight distribution in the region. This section will address issues relating to Cape Cod roads, focusing on the freight routes. The purpose will be to highlight factors that affect freight. It is important to note that all vehicle traffic on Cape Cod experiences two different seasons, extreme congestion in the summer or peak season, and normal congestion in the remaining seasons or off season.

### Cape Cod Canal Bridges

The largest bottlenecks on Cape Cod occur at the canal bridges during the summer season. Cape Cod's bridges serve many important functions, one of which is to permit travel over waterways. The Bourne Bridge and Sagamore Bridge permit vehicular travel over the Cape Cod Canal. If not for the canal bridges, vehicles would have to use a ferry to reach Cape Cod. Summer time delays at the canal bridges can sometimes be measured in hours. Because of the unreliable travel time associated with crossing the canal bridges many freight companies will not locate on Cape Cod.

The Bourne Bridge and Sagamore Bridge are both under the jurisdiction of the Army Corp of Engineers (ACOE). One or the other of the two highway bridges may have restrictions on lanes and heavy vehicles during several weeks of the year to accommodate painting and structural maintenance activities. While avoiding the heavy summer traffic season, these lane closures have been observed to result in traffic backups of several hours.

The Bourne and Sagamore bridges provide the only crossings of the Cape Cod Canal for motorists, pedestrians and cyclists. Maintained by the U.S. Army Corps of Engineers, the geometric design of each bridge includes a roadway width of 40 feet (four 10 foot wide lanes) flanked by a 6-foot wide sidewalk on one side and a 2-foot wide safety curb on the other. The roadways are separated from the sidewalks and safety curbs by 16-inch high vertical granite curbing.

The bridges first opened to traffic in 1935. Historic records indicate a general upward trend in the annual bridge crossings and this traffic is currently approaching 100,000 vehicles per average day. Over the decades, the bridges have been exposed to deicing salts, the effects of which include progressive deterioration of the concrete deck and some steel members of the bridges. These effects are compounded by the fact that the bridges are located near salt water. An additional maintenance activity is the periodic painting of the exposed steel portions of the bridges.

For certain maintenance activities, including repairs to the concrete deck, the worksite requires the closures of two lanes. For a bridge undergoing maintenance, the four lanes are reduced to two. Depending on the duration of the closure and the seasonal demand, significant delays and backups may occur. The ACOE is committed to minimizing these



conditions by avoiding daytime lane reductions during the summer months and limiting work to one bridge at a time.

Impacts to traffic will be most severe in the autumn during maintenance on the Sagamore Bridge. Encouraging the use of the alternate (Bourne) bridge would be an important element of any mitigation strategy. Impacts to the areas on bypass routes, (e.g., diversion from Route 6 westbound at Exit 2 through Sandwich), will be significant and some planning to minimize these impacts must also be done.

### **Strategies related to Bridge Maintenance**

Several strategies are suggested for addressing the impacts of maintenance-related lane closures. In all cases, adequate public notification is recommended. The Army Corps of Engineers established a website and email notification system for major maintenance efforts on the bridges. By providing timely warnings of impending closures, travelers may adjust travel mode, choice of bridge crossing and approach routes, or timing. The bridges do need to be maintained in order to continue to provide safe passage to and from the region. Foul weather may interfere sometimes in the maintenance efforts, and as a result the schedule prolonged. The ACOE seems to now include this aspect in consideration of the estimated maintenance schedule, and that has provided for improved public expectations.

- *Scheduling Maintenance Activities for Off-Peak Periods:* minimizes disruptions to traffic during heavy travel periods. The Army Corps is already making efforts to achieve this - and should continue to do so. To the greatest extent possible, lane closures should avoid summer months and daytime periods during the spring and fall.
- *Intelligent Transportation Systems (ITS)* is collection and dissemination of real-time information through means such as cameras and/or cell phone data collection. The information is available on the state traffic information website and 511 telephone system. This allows for travelers to check online or via cell phones on current traffic conditions at the bridges. Radio stations also look up and provide updates on bridge traffic. The Cape Cod Commission website provides links to transportation providers ([www.capecodcommission.org](http://www.capecodcommission.org)) including a link to the ACOE website to provide travelers with the latest information on lane closures.
- *Improve Transportation Alternatives to Offset Automobile Crossings by increasing express bus service, and improving marketing of bus and other alternatives.* The marketing should inform travelers of the advantages of using alternatives and the disadvantages of driving during the lane closures. An additional strategy to enhance the attractiveness of buses and high-occupancy vehicles would be to allow travel on the shoulders (currently nonexistent on Route 6) of Routes 3, 6, 25, and 28 to bypass the queues (under police supervision). This concept would include construction of shoulders/breakdown lanes that could be used as a bus lane during peak times.

This would encourage a shift from single-occupant vehicles and would likely result in an overall reduction of vehicles traveling through the lane closures.



- **Traffic Management:** reduces traffic conflicts. During periods of traffic congestion at the Canal crossings, motorists seek alternate routes - regardless of whether or not such routes actually save travel time. In addition, such routings have effect on the capacity of the bridges, and may actually create bottlenecks in other locations such as the Exit One on-ramp at the approach of the Mid-Cape Highway westbound at the Sagamore Bridge. Techniques to be considered should include police officer traffic control, signage, and turn restrictions.



FIGURE 1 – BOTTLENECK AT THE BOURNE BRIDGE



## MASSDOT DESIGNATED TRUCK ROUTES

There are over 200 miles of designated truck routes under state authority (shown in the following figure). These routes are only located on state highways (e.g., Routes 6, 28, 6A and 28A). There are several obvious gaps in connectivity, due to changes in jurisdiction (e.g., Route 6A in Barnstable Village, Route 28 in downtown Falmouth). Other gaps in connectivity occur between the truck route network and intermodal facilities such as the ferry ports in Hyannis and Provincetown.

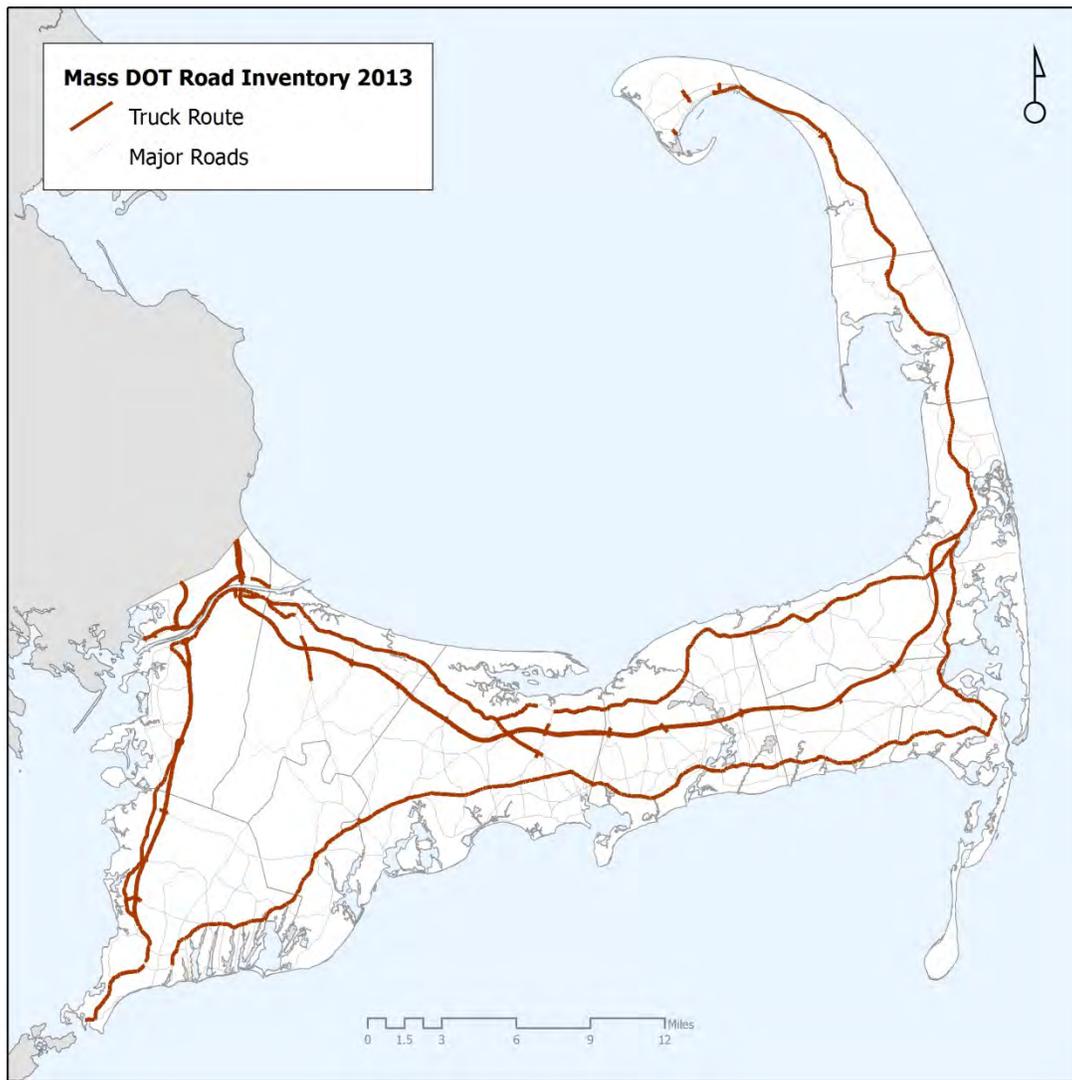


FIGURE 2 - DESIGNATED TRUCK ROUTES UNDER STATE AUTHORITY

*Source: Massachusetts Roadway Inventory File 2013*

## ROADWAY FUNCTIONAL CLASSIFICATION

Cape Cod's three major routes, Route 6, Route 28, and Route 6A, comprise only less than 6% of Cape Cod's roads by mileage. These roads make up the majority of the truck routes. The majority (80%) of Cape Cod roads are designated as Functional Class "0/null," or local roads. 6% of roads are classified as minor or major "Collector" roadways. This means that just over two-tenths of Cape Cod's roadways are used as primary routes, while the remaining nearly eight-tenths are used to access residential and other private areas. There are no interstate highways on Cape Cod. Cape Cod's roadway functional classes are presented in the following figure.

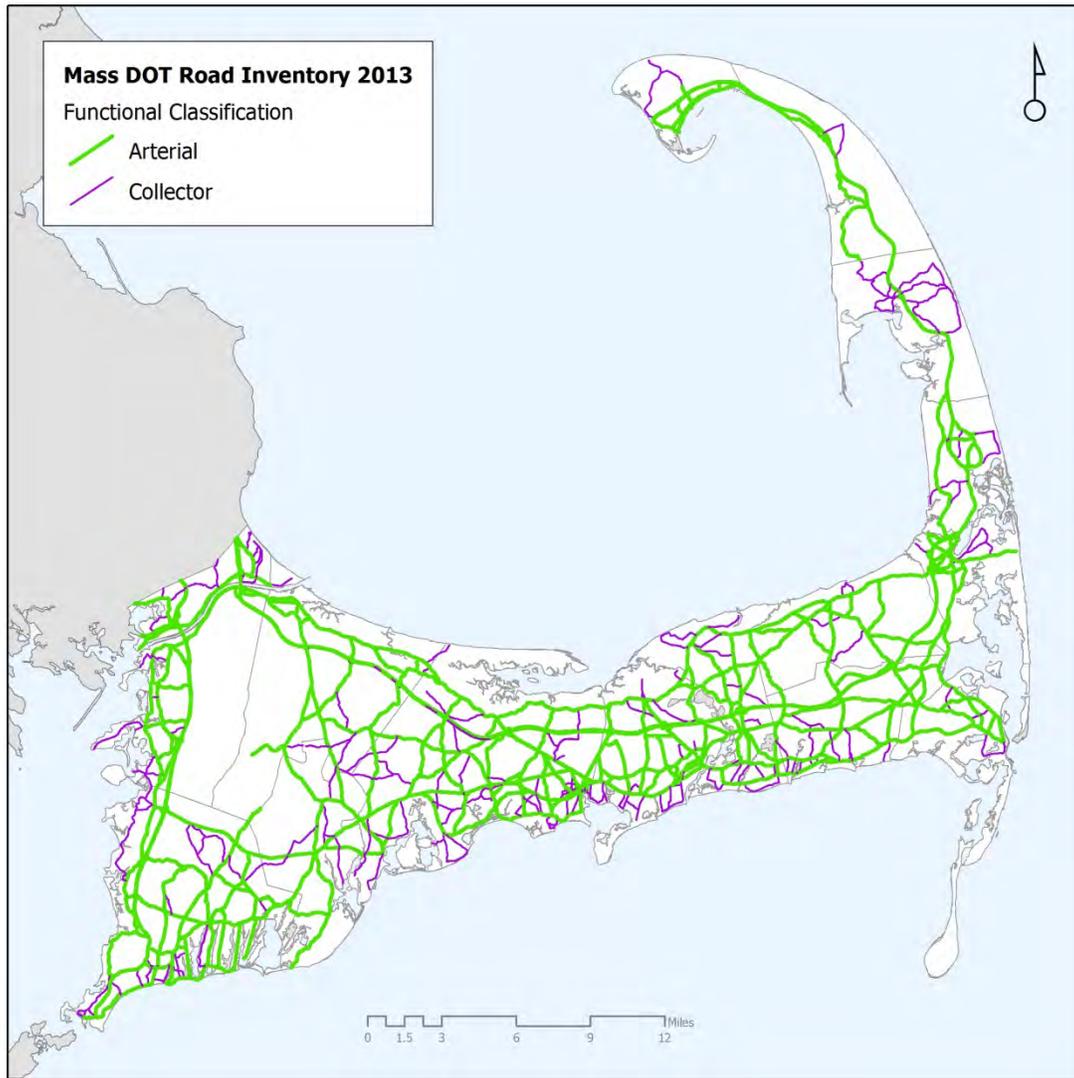


FIGURE 3 - FUNCTIONAL CLASSIFICATION

*Source: Massachusetts Roadway Inventory File 2013*

TABLE 1 - ROAD MILEAGE BY FUNCTIONAL CLASS

Interstate		Local		Arterial		Collector		Total
0	0%	3,076	80%	574	15%	213	6%	3,863

*Source: Massachusetts Roadway Inventory File 2014*

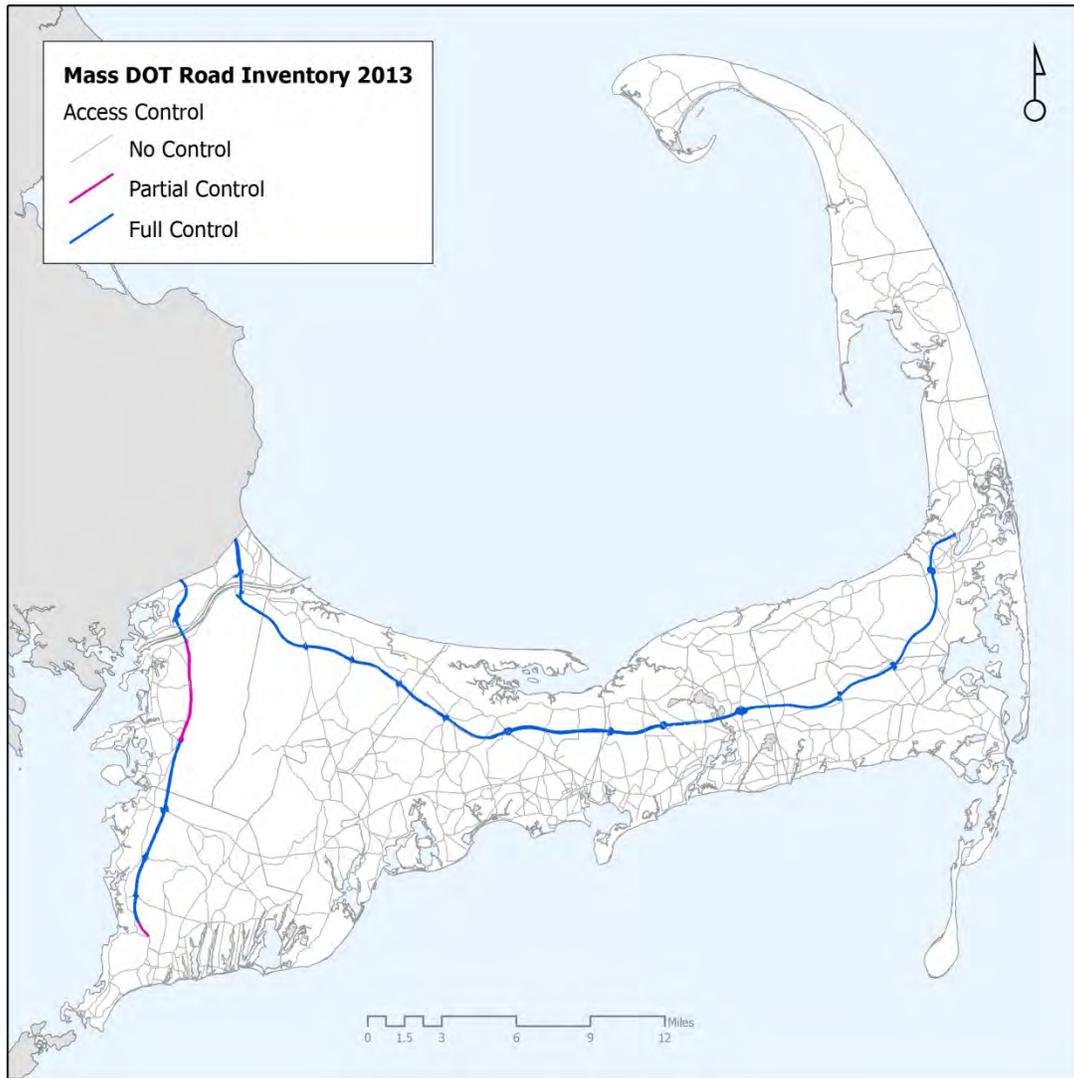


FIGURE 4 - ROADWAY INFRASTRUCTURE

*Source: Massachusetts Roadway Inventory File 2013*

Limited-access highways south/east of the Cape Cod Canal bridges are portions of either Route 6 or Route 28 and are shown in the figure above. The only limited-access portions of Route 28 are located in Bourne and Falmouth. Most of Route 28 (MacArthur Boulevard) in Bourne is partial-access control with sporadic opportunities to change direction in U-turn lanes. The majority of Cape Cod's roads do not have access control. The lack of availability of limited access routes, especially on the Outer Cape area can create delays for freight traffic.

There are thousands of roadway intersections across Cape Cod. Of these intersections, 129 are signalized and 25 are circular. Circular intersections refer to rotaries and



roundabouts. Rotaries tend to be larger in diameter, and their interior travel speed is often faster than a modern roundabout. Roundabouts are identified by smaller diameters and approaches that enter at a greater angle than rotaries – encouraging slower speeds. Barnstable has five circular intersections, the most of any Cape Cod town. Maintaining properly designed intersection controls is important for the freight industry to ensure safety, and minimize delays. At signalized intersections this may mean optimizing signal timing and phases and providing turning lanes. At roundabouts this may mean the provision of truck aprons adjacent to the center island and on exit/entrance shoulders.

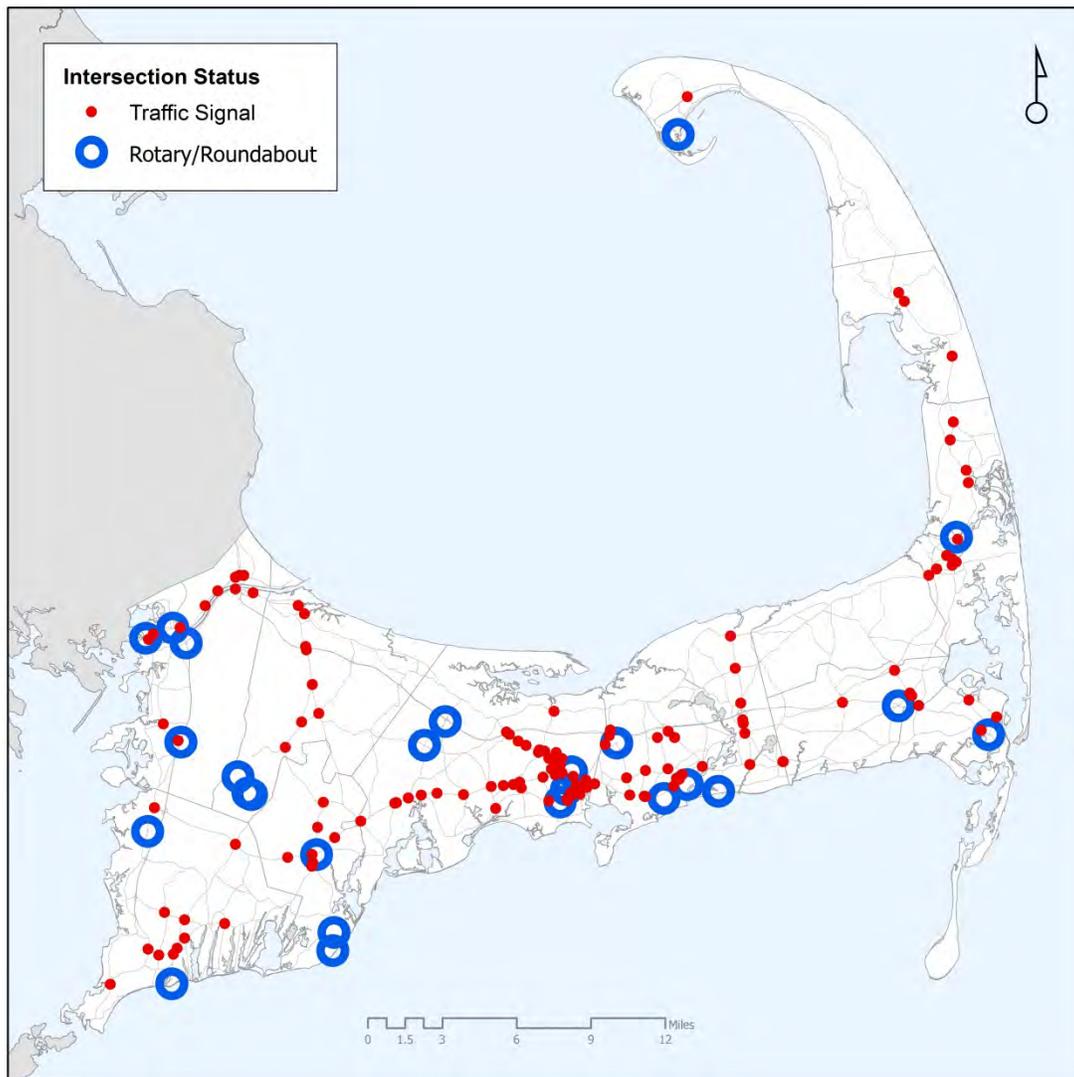


FIGURE 5 - ROADWAY INTERSECTIONS - TRAFFIC CONTROL

*Source: Cape Cod Commission*



## SAFETY AND SPEED LIMITS

According to data reported by MassDOT from the Federal Motor Carrier Safety Administration, there were 309 reported crashes involving commercial vehicles during the years 2010-2012. Two-hundred ninety-four of these crashes were geo-located as shown in the figure below. There were 157 injury crashes and three fatality crashes reported.

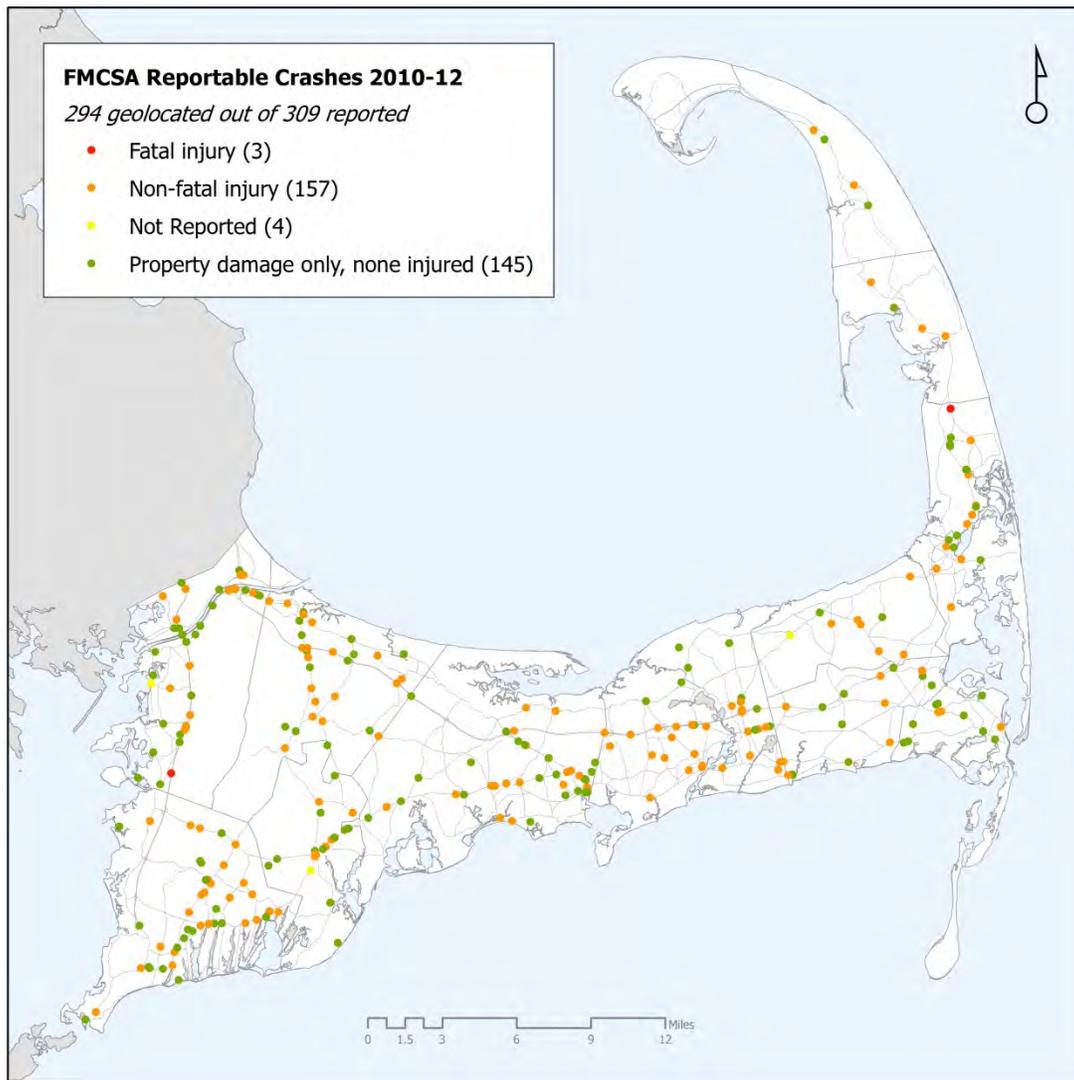


FIGURE 6 - COMMERCIAL VEHICLE CRASHES

*Source: 2010-2012 MassDOT Crash Records*

The maximum legal speed limit on most Cape Cod highways is 55 mph. Exceptions include Route 3 (60 mph) and Route 25 (65 mph) in Bourne. The speed limits on the road affect the movement of freight traffic by governing travel time. In order to encourage truck freight to remain on the limited-access portions of freeways such as the Mid Cape Highway, an evaluation of safety and free-flow travel speeds should be performed – possibly leading to an increase in some speed limits (perhaps limited to daytime hours).

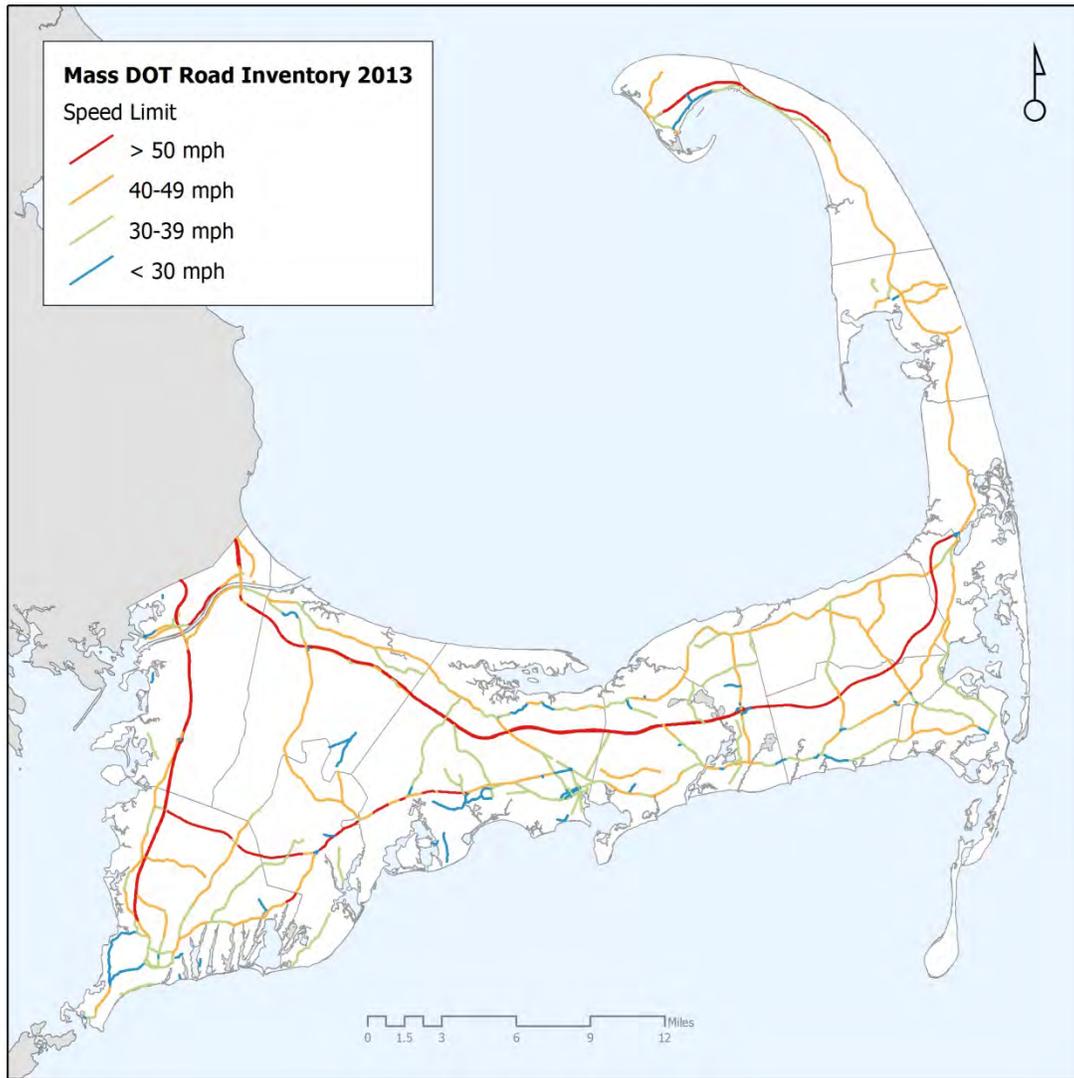


FIGURE 7 - SPEED LIMITS ON CAPE COD ROADWAYS

*Source: Massachusetts Roadway Inventory File 2013*

## ROADWAY VOLUMES

The Massachusetts Department of Transportation (MassDOT) maintains six permanent counter locations on or near Cape Cod on some of the more heavily trafficked roads. The



following table displays those six locations with their ten-year growth, ten-year average annual growth, and one-year growth rate (2013-2014).

TABLE 2 - GROWTH RATES - PERMANENT COUNTING STATIONS AND BRIDGE CROSSINGS

Permanent Traffic Counting Station	10 Year Total Growth	10 Year Average Annual Growth Rate	One Year Growth Rate 2013-2014
#15: Rt 6 E of Rt 149 (Ex. 5)	-6.76%	-0.70%	n/a
#20: Rt 3 N of Bourne TL	16.0%	1.49%	0.30%
#707: Bourne Bridge	-0.97	-0.10%	1.90%
#708: Sagamore Bridge	1.8%	0.17%	-2.32%
#709: Rt 28 E of Higgins Crowell	-11.2%	-1.19	-0.95
#7351: Rt 28 W of Old Post Rd	-7.03%	-0.73%	-1.67

*Source: MassDOT*

It is important to note that growth is based on summer traffic volumes, not off-season values.

TABLE 3 - CAPE COD SUMMER TRAFFIC GROWTH (2004-2014)

Region	Number of Comparisons	10 Year Total Growth	10 Year Average Annual Growth Rate
<b>Upper Cape</b>	115	1.23%	0.12%
<b>Mid-Cape</b>	113	-7.37%	-0.77%
<b>Lower Cape</b>	74	-5.66%	-0.59%
<b>Outer Cape</b>	68	-5.77%	-0.60%
<b>All Roads</b>	<b>370</b>	<b>-3.20%</b>	<b>-0.33%</b>

“Upper” = Bourne, Sandwich, Falmouth, Mashpee

“Mid” = Barnstable, Yarmouth, Dennis

“Lower” = Harwich, Chatham, Brewster, Orleans

“Outer” = Eastham, Wellfleet, Truro, Provincetown

*Source: Cape Cod Traffic Counting Report*

The following figure depicts the average annual change in traffic for each sub-region.

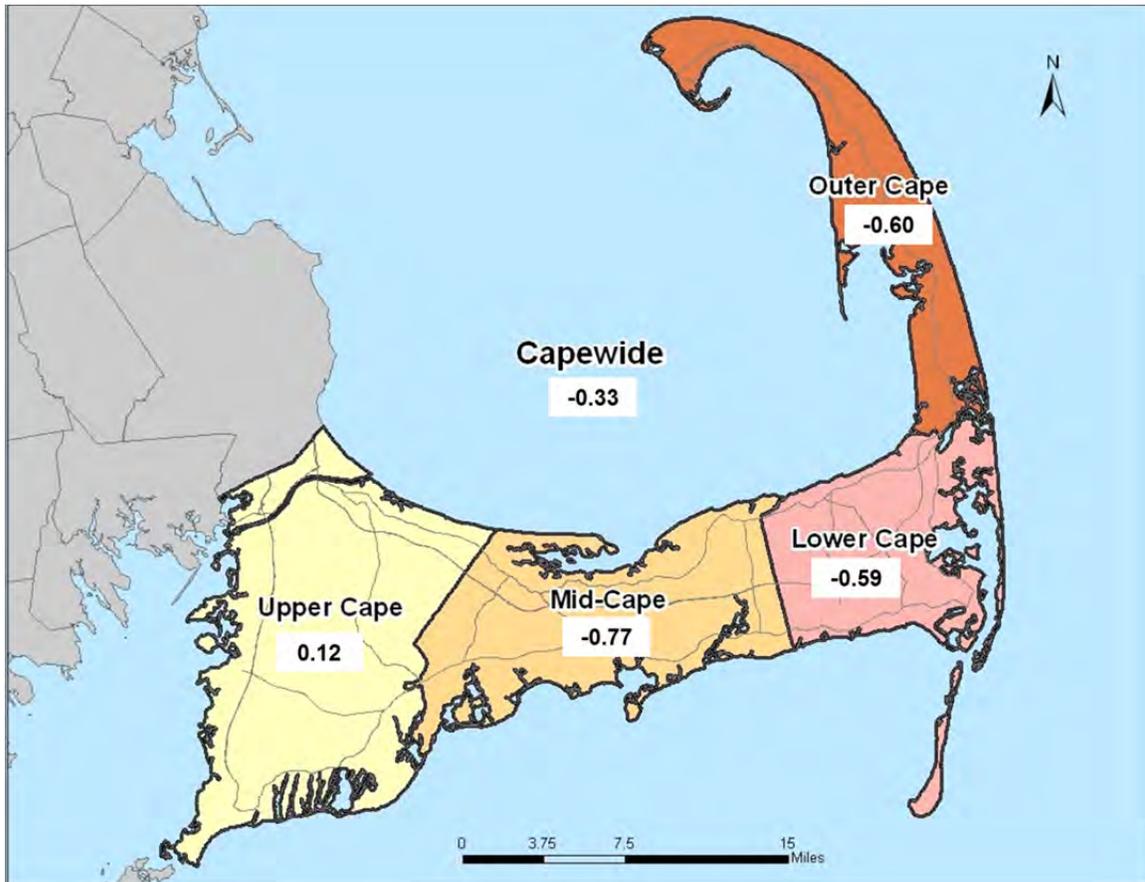


FIGURE 8 - AVERAGE ANNUAL TRAFFIC VOLUME GROWTH RATE % (2004-2014)  
*Source: Cape Cod Traffic Counting Report*

The following figure shows year-round average daily traffic volumes on major Cape Cod roads. Heaviest travel occurs on the Cape Cod Canal road and canal bridges and the Mid-Cape Highway. High volumes of traffic are found on the roads leading to and within the Hyannis area (an area that receives/sends goods to/from many businesses, institutions such as Cape Cod Hospital and multimodal facilities such as the ferry ports). In comparison, downtown Falmouth also experiences high levels of congestion.

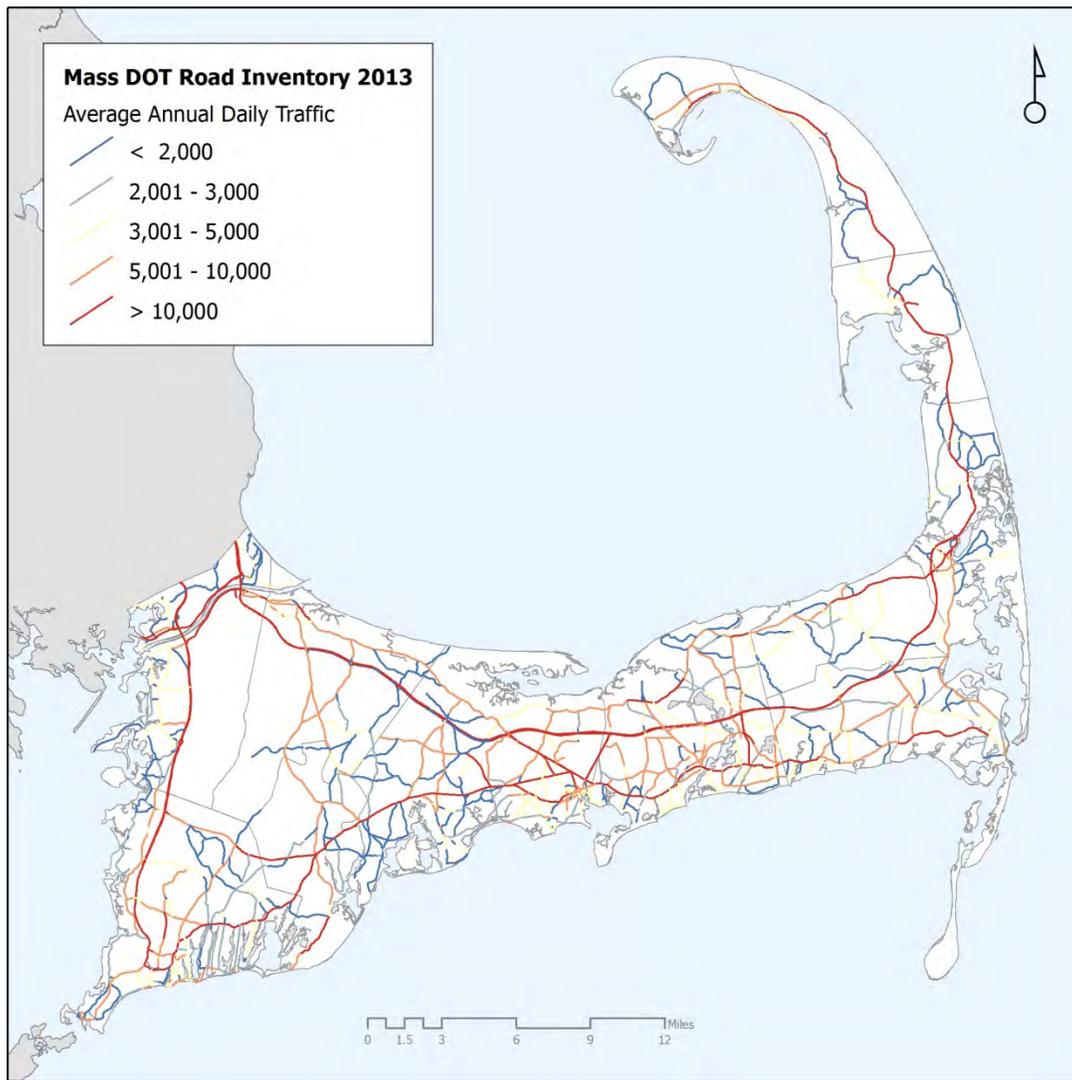


FIGURE 9 –YEAR-ROUND AVERAGE DAILY ROADWAY VOLUMES  
*Source: MassHighway Road Inventory 2013*

## PAVEMENT CONDITIONS

Freight traffic has the most significant effect on pavement conditions because of the stress that truck weight causes on the pavement. Freight is also affected by pavement conditions because potholes and other pavement issues can create safety hazards for truck drivers and cargo. Pavement condition data are collected with the intent to keep the roadway system in the best possible condition with the most efficient use of available



funds. There are distinct cost savings that can take place with preventative or rehabilitation measures rather than waiting until a road is in need of reconstruction. The goal of the pavement management process is for all federal aid-eligible roads to be maintained in “excellent” condition. The majority of truck routes are federal aid-eligible.

The following table includes a summary of pavement conditions, by town.

TABLE 4 - PAVEMENT CONDITION BY TOWN (MILES)

Town	Very Good to Excellent	Good to Very Good	Fair to Good	Poor to Fair	Poor	Totals
Barnstable	2.45	9.05	41.59	31.82	0.22	85.12
Bourne	3.59	2.16	23.18	10.95	0.99	40.87
Brewster	-	0.90	7.05	10.06	-	18.01
Chatham	0.75	0.39	5.22	1.61	-	7.97
Dennis	0.11	10.56	27.23	3.91	0.04	41.84
Eastham	-	1.35	13.17	2.80	-	17.32
Falmouth	1.12	1.06	19.23	14.26	0.27	35.93
Harwich	-	9.74	13.17	3.72	-	26.63
Mashpee	-	7.02	17.28	0.38	0.02	24.70
Orleans	-	2.65	6.21	6.39	-	15.24
Provincetown	0.68	0.36	0.36	1.60	-	3.00
Sandwich	5.69	9.80	18.95	12.57	0.98	47.99
Truro	-	-	1.84	3.20	-	5.04
Wellfleet	-	2.00	7.38	1.47	-	10.86
Yarmouth	0.24	7.05	25.42	10.02	0.62	43.35
Totals	14.62	64.09	227.29	114.73	3.13	423.87

*Source: Cape Cod Commission – 2013 Pavement Management Status Report*

As shown in the table above, over 400 miles of survey data were collected throughout the 15 towns of Barnstable County from 2011-2013. The most common rating “Fair to Good” yielded over 227 miles. This is followed by almost 115 miles of “Poor to Fair,” over 64 miles of “Good to Very Good” and almost fifteen miles for both “Very Good to Excellent” and slightly over three miles of “Poor.”

## VEHICLE CLASSIFICATION DATA

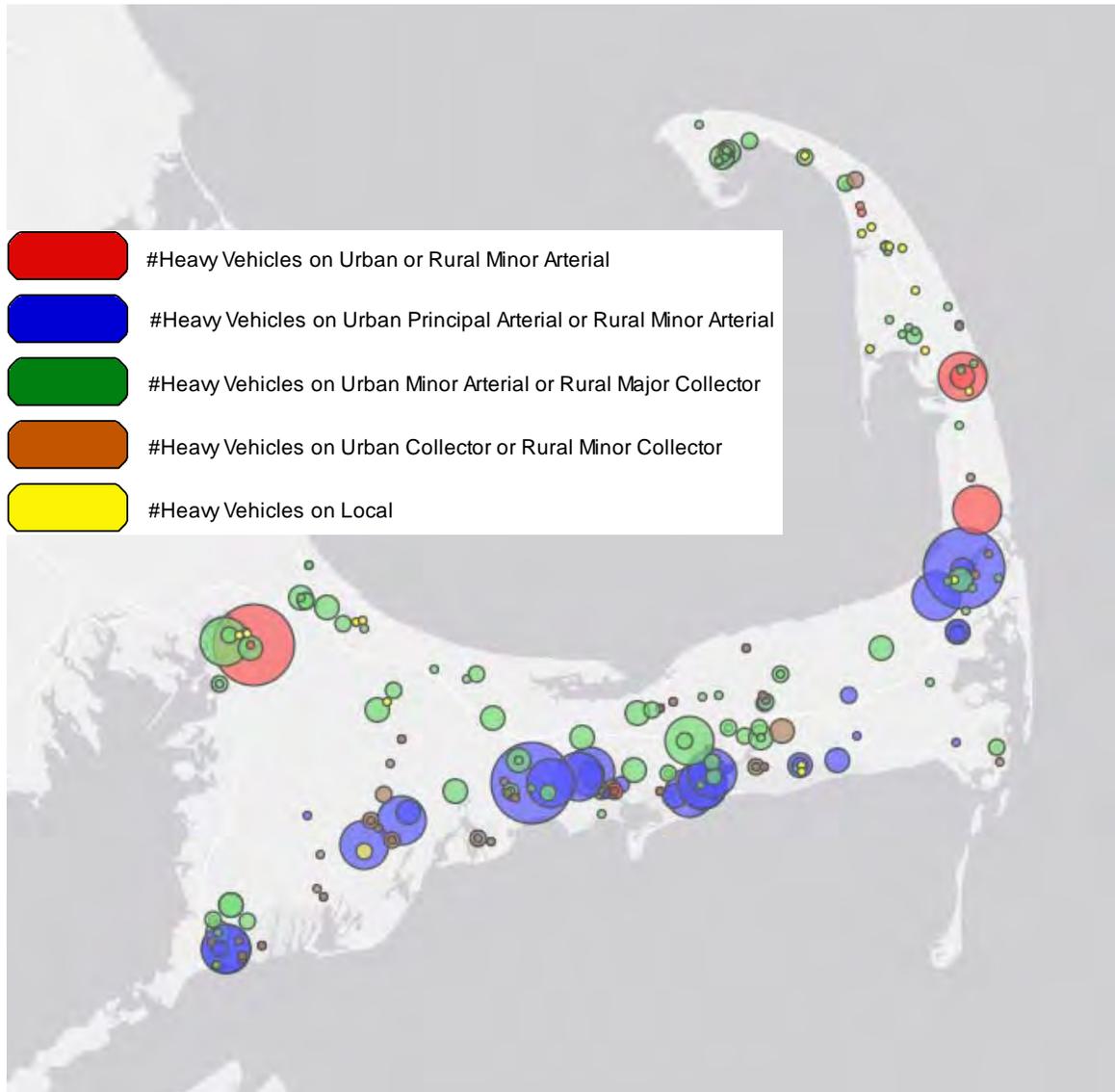


FIGURE 10 - OBSERVED HEAVY VEHICLE TRAFFIC VOLUMES BY FUNCTIONAL CLASS

*Source: Cape Cod Commission Traffic Counting Program*

The Cape Cod Commission data collection program deploys a number of automated traffic recorders that detect the classification of vehicles traveling at that location, including several types of heavy vehicles. Data collection is limited to non-access controlled roads due to the safety concerns of setting up equipment on limited-access highways such as the Mid-Cape Highway. Nodes on the map above show the relative truck traffic volumes for each location that data were collected. The sizes of the circles



represent the relative volume of truck traffic (larger circles are more heavily traveled). The colors of the circles represent the functional classification of the roadway as follows:

- Red: Urban or Rural Principal Arterials (higher level)
- Blue: Urban Principal Arterial or Rural Minor Arterial (lower level)
- Green: Urban Minor Arterial or Rural Major Collector
- Brown: Urban Collector or Rural Minor Collector
- Yellow: Local

Most of the high volume truck traffic was measured on more important (collectors and arterials) functionally classified roads, showing that trucks are generally not driving on local roads. Data availability is limited – Cape Cod Commission technicians generally install automated traffic recorders at 200 locations during the summer – a subset of which are deployed as classification counts.

## TRUCKING INFRASTRUCTURE

Truck facilities on Cape Cod have several distinct features including bridges and a combination of limited-access and non-limited-access roads. There are several locations that have been determined as preferable for drivers and also locations that are difficult or frequently experience bottlenecks.

### U.S. Route 6

U.S. Route 6 runs from Provincetown, Massachusetts all the way to Bishop, California, and is the longest continuous route in the United States. On Cape Cod, Route 6 is the major transportation corridor, particularly for those traveling long distances. From where it enters Barnstable County in Buzzards Bay until its end in Provincetown, it provides a primarily limited-access high-speed means of traveling along the spine of the Cape for commercial traffic. The Route 6 corridor in the Outer Cape does not have limited access. This portion of Route 6 also contains segments of the Claire Saltonstall Bikeway, or State Bicycle Route 1. During peak travel periods in the summer it is not unusual for westbound traffic to be stopped for several miles east of the Sagamore Bridge or in Wellfleet or in Dennis.

#### Buzzards Bay to Sagamore Bridge

From where it enters the county in Buzzards Bay to where it crosses the Cape Cod Canal at the Sagamore Bridge Route 6 is a two- to four-lane road with curb cuts on both sides. The Sagamore Rotary, located north of the Sagamore Bridge, was eliminated by 2006. This new grade separated intersection provides for a direct connection between Route 3 and the Sagamore Bridge.



FIGURE 11 - SCENIC HIGHWAY (ROUTE 6), WEST OF BOURNE DALE ROAD

### Sagamore Bridge to Exit 9, Dennis

From the Sagamore Bridge to just after Exit 9 in Dennis, Route 6 is a four-lane limited-access highway with a grass shoulder and rest areas. These characteristics make this portion of the corridor the most accommodating to freight truck traffic. Between Exits 1 and 13 there are a limited number of rest areas (the only rest area with facilities is located on eastbound Route 6 between exits 6 and 7). There are two weigh stations for freight traffic (on Route 6 eastbound and westbound between exits 4 and 5).



FIGURE 12 - ROUTE 6 AT EXIT 4 IN SANDWICH

### **Exit 9, Dennis to Orleans Rotary**

From Dennis to the Orleans/Eastham rotary the road narrows to two lanes but remains limited-access, with a raised median and yellow reflective post delineators to reduce crossovers from one direction of traffic to the other. Truck freight reliability can be affected on this section of Route 6 by traffic delays and accidents – there may be several miles before an exit is available during incidents. There are three rest stops for eastbound travel and two for westbound.



FIGURE 13 - ROUTE 6 BETWEEN EXITS 9 AND 10 (LOWER CAPE)



### **Orleans Rotary to Provincetown**

Route 6 in the Outer Cape area is generally a consolidation of existing roadways over time since the 1930s. Short sections of the original Route 6 have been retained for local access for road straightening projects. In northern Truro and Provincetown, the original Route 6 became Route 6A – several sections of which have been realigned.

Finally, from the Orleans Rotary until the road’s end in Provincetown the road is once again a two- to four- lane road with curb cuts on both sides, although a grassed median limits crossovers on sections of Route 6 in Provincetown. There are not any rest areas located on this short corridor.



FIGURE 14 - ROUTE 6 NORTH OF GOVERNOR PRENCE ROAD, EASTHAM (OUTER CAPE)

## State Route 28

State Route 28 begins at the New Hampshire border and joins Route 6 as it enters Barnstable County at Cohasset Narrows on the border of Bourne/Wareham. Route 28 runs for almost sixty-five miles after crossing the Cape Cod Canal and passing through villages adjacent to Buzzards Bay/Nantucket Sound/the Atlantic Ocean from Bourne to Orleans Center. Route 28 is a regional roadway but it does not provide very direct inter-regional travel options in most cases. Some alternative routes to 28 include Route 151, Buck Island Road, Great Western Road, Upper and Lower County Roads, Route 39 and, for longer trips, Route 6. The cross section of Route 28 varies greatly throughout the Cape. However, there are three primary sections to Route 28, which are identifiable by their roadway characteristics. There are no rest areas located on the Route 28 corridor.



Traffic flow along the corridor is generally heavy during the summer, with gridlock occurring in many locations. However, the level of traffic varies greatly along the corridor. Much of the Route 28 corridor is congested during summer peak hours. Some sections, such as in Hyannis and Falmouth, can experience congestion year-round.

### **Buzzards Bay to Bourne Rotary**

Route 28 consists of four lanes from the county line across the Bourne Bridge to the Bourne Rotary.

### **Bourne Rotary to Palmer Avenue, Falmouth**

Route 28 consists of four lanes, divided by a grassy median, from the Bourne Rotary to Saconesset Hills in Falmouth. The western side of Route 28 in Bourne from the Bourne Rotary to the Otis Rotary (MacArthur Boulevard) allows property access. Vehicles can reverse direction via a number of U-turn areas in the median.



FIGURE 15 - ROUTE 28 NORTH, SOUTH OF THE OTIS ROTARY IN BOURNE

### **Palmer Avenue, Falmouth to Orleans Rotary**

From Palmer Avenue in Falmouth, Route 28 is predominately two lanes to the intersection of Old Stage Road in Barnstable. Route 28 then transitions to four Lanes from Old Stage Road to Phinneys Lane in Barnstable and then predominately is two lanes from Phinneys Lane to the Orleans/Eastham Rotary. Portions of this route are more developed than others. The most developed and subject to congestion area is Hyannis. Congestion in this area is experienced year-round.



FIGURE 16 - ROUTE 28 IN SOUTH YARMOUTH (MID-CAPE)

## Route 6A

Route 6A on Cape Cod is one of the oldest travel corridors in the country. Originally a path used by Native Americans, it was later adopted by colonists for travel from Plymouth out to Eastham. Later it served as state Route 6 until the construction of the current Route 6 in the 1950s. Today it serves much of the Old Kings Highway Historic District and is designated as a state Scenic Byway.

Route 6A is a narrow and windy two lane road with little or no shoulder. One exception to this is the four-lane cross section in Orleans (which is not included in the Old Kings Highway Historic District). Because of the narrow shoulders, passing zones are limited and biking can be difficult. There are not any rest areas located on this corridor. Traffic congestion along the corridor is generally heavy during the summer however; the level of traffic varies greatly along the corridor.

Much of the Route 6A corridor is congested during summer peak hours. Recommendations from the Route 6A Corridor Management Plan (Cape Cod Commission, 2010) include the reduction of speed limits to 35 MPH and accommodation of alternate mode users such as pedestrians, bicyclists and public transportation users. Although Route 6A may appear to be the shortest route for some trips, the roadway is less suitable for large-scale truck freight operations.



FIGURE 17 - ROUTE 6A WEST OF WILLOW STREET (MID-CAPE)



## Rail Freight

Freight service is the major user of Cape Cod's rail network in addition to scenic excursions and weekend passenger service. After many years of suspended rail service, CONRAIL formed in 1976 to provide freight service. CONRAIL owned the rail tracks on the Cape Cod Line as far as Sandwich and worked under contract with the Commonwealth of Massachusetts for tracks beyond that point. After CONRAIL announced plans to suspend Cape Cod freight service in 1981, the Commonwealth of Massachusetts purchased the affected lines. It then contracted Bay Colony Railroad to take over freight service in 1982. The Commonwealth of Massachusetts, through MassDOT, still owns most railroad tracks on Cape Cod today, with Massachusetts Coastal Railroad (a company of Cape Rail, Inc.) operating under contract to provide freight service.

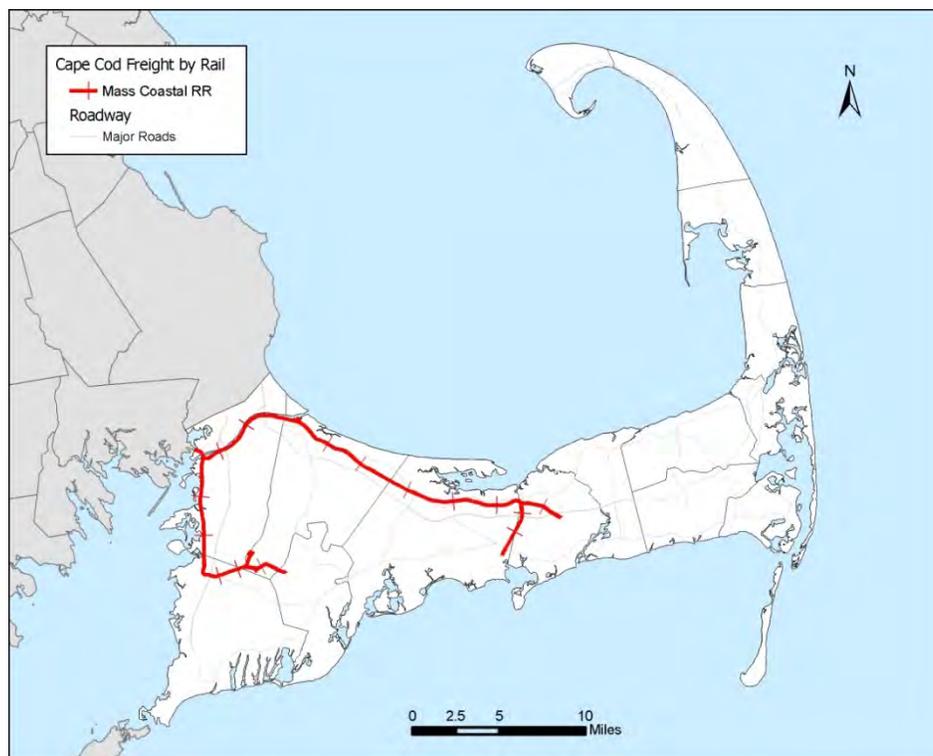


FIGURE 18 - MASS COASTAL RAILROAD CAPE COD SERVICE

Currently, the primary use of Cape Cod's rails is for transporting solid waste by Mass Coastal Railroad. Mass Coastal is a short line freight railroad serving Cape Cod and southeastern Massachusetts between Middleboro, Otis Air Force Base, Hyannis, and South Yarmouth. The majority of Cape Cod's solid waste is transported to the SEMASS trash-to-energy plant in Rochester, MA via Mass Coastal's Energy Train. Other freight



Mass Coastal carries includes food, construction materials, chemicals, heavy equipment amongst many other things.

## RAIL INFRASTRUCTURE

Rail tracks from Provincetown to Route 134 in Dennis were dismantled and a portion of the rail right-of-way was converted into the Cape Cod Rail Trail by the Massachusetts Department of Conservation and Recreation. The Cape Cod Rail Trail currently occupies the rail right-of-way from LeCount Hollow Road in southern Wellfleet to Route 134 in Dennis. An extension of the Rail Trail is planned to connect into Barnstable, using rail right-of-way from Route 134 in Dennis to an area to the east of Higgins Crowell Road in Yarmouth.

According to the history provided by the Falmouth Bikeways Committee, tracks from Palmer Avenue in Falmouth to the ferry terminal in Woods Hole were converted into the Shining Sea Bikepath in 1976. Further segments are considered for conversion to bikepaths to eventually connect Falmouth to the Cape Cod Canal bikepaths in Bourne. Most of the remaining track in Falmouth is out of service (e.g., the portion that formerly provided service to Falmouth Depot). The branch from North Falmouth to Joint Base Cape Cod is currently used by Mass Coastal Railroad for export of solid waste; these operations are scheduled to end this year and future usage is uncertain.

Cape Cod has a single rail line, the Cape Cod Line, with three branches. Together, they form a network of rail infrastructure which serves the freight and recreational needs of Cape Cod residents and visitors.

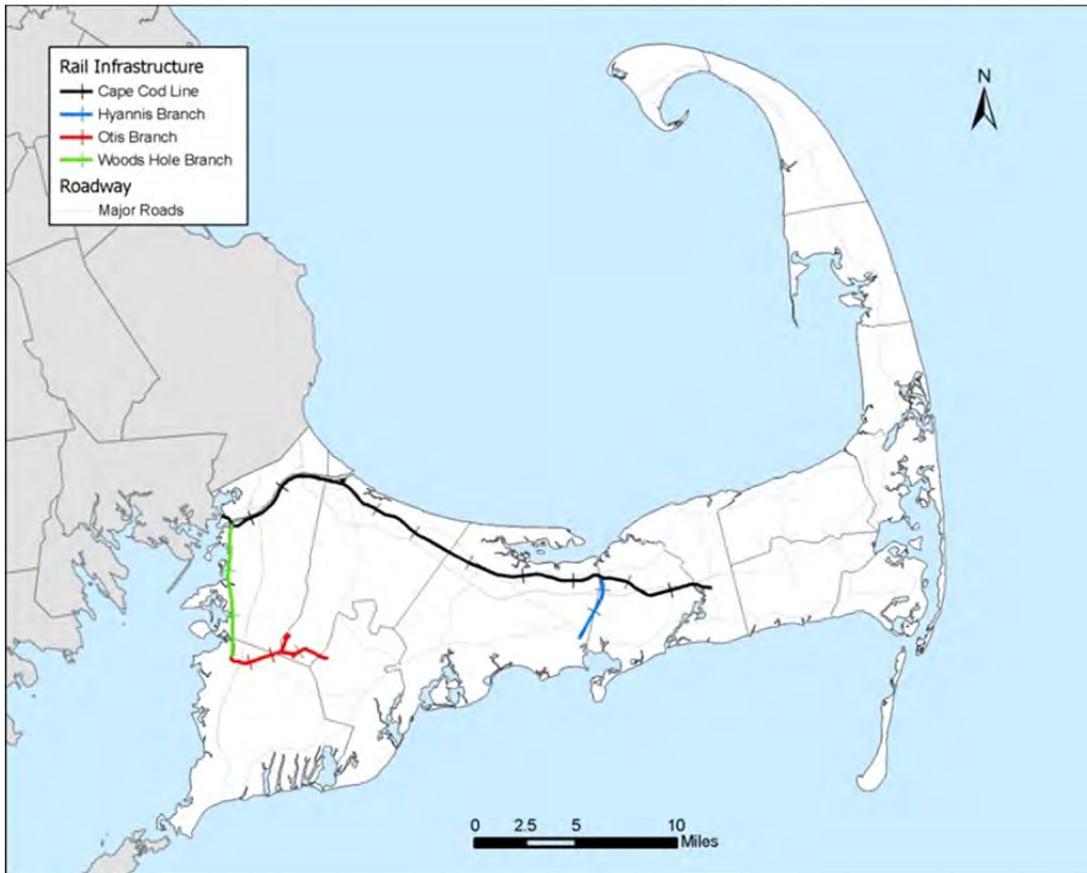


FIGURE 19 - CAPE COD RAIL LINE AND BRANCHES



TABLE 5 - RAIL TRACKS ON CAPE COD

		Total Mi.	Percent of Total
	Cape Cod Total	53.8	
By Rail Line	Cape Cod Line	32.0	59.5%
	Hyannis Branch	4.4	8.2%
	Otis Branch	10.4	19.3%
	Woods Hole Branch	7.0	13.0%
By Owner	Federally Owned	9.8	18.2%
	Army Corps of Engineers	0.2	0.3%
	MassDOT	43.8	81.4%
By Town	Barnstable	11.2	20.8%
	Bourne	14.4	26.8%
	Dennis	1.2	2.2%
	Falmouth	4.0	7.4%
	Mashpee	0.4	0.8%
	Sandwich	14.8	27.5%
	Yarmouth	7.8	14.5%

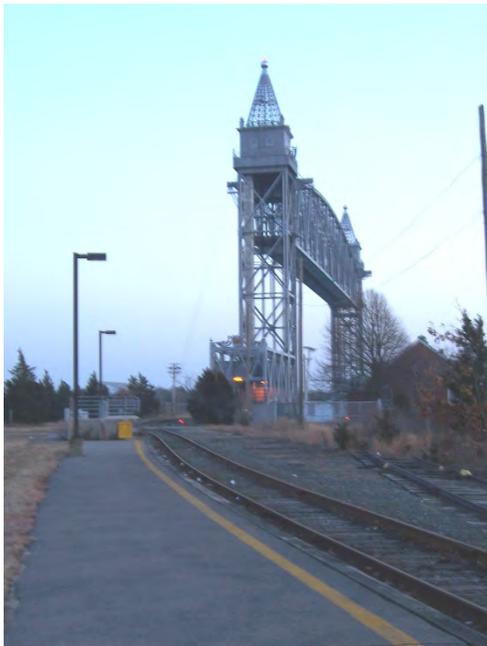


FIGURE 20 - RAIL TRACKS LEADING SOUTH TO THE CAPE COD CANAL BRIDGE



FIGURE 21 - RAIL TRACKS LEADING NORTH TO THE COHASSET NARROWS



FIGURE 22 - OLD DEPOT STATION, CURRENTLY CAPE COD CANAL REGION CHAMBER OF COMMERCE

The Cape Cod Line begins in Buzzards Bay, Bourne and continues over the Cape Cod Canal Railroad Bridge to the Canal Junction where the Woods Hole Branch splits off to the south. Here the second segment of the Cape Cod Line continues, following the Cape Cod Canal and then running alongside Route 6A through Sandwich and Barnstable. Out of service side tracks and former stations can be seen in West Barnstable. An out-of-service platform remains at Sandwich Station, located off of Jarves Street. West Barnstable Station, located on Route 149 in Barnstable, has been preserved even though it is no longer in use. The Cape Cod Line continues to the Yarmouth “wye” (triangular junction) at Willow Street in Yarmouth. Here, the Hyannis Branch turns south, while the Cape Cod Line continues to the east. An out of service and disconnected segment of track sits to the north of the main line and stretches several hundred feet on either side of Willow Street. A study by the Cape Cod Transit Task Force rated this segment for 30 MPH travel. In total, the segment contains 23.31 miles of track, one bridge over Mill Creek in Sandwich, four grade-separated roadway crossings, and 40 total roadway crossings.

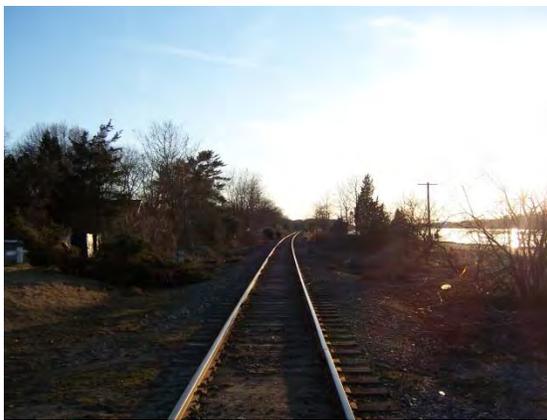


FIGURE 23 - RAIL TRACKS WEST OF THE SAGAMORE BRIDGE



FIGURE 24 - RAIL TRACKS EAST OF MARY DUNN RD. IN BARNSTABLE



FIGURE 25 - RAIL TRACKS AND SWITCH WEST OF WILLOW STREET IN YARMOUTH



FIGURE 26 - RAIL CROSSING AT WILLOW STREET IN YARMOUTH, FACING EAST

East of Willow Street, the Cape Cod Line continues towards Dennis on its third segment. This is the easternmost section of railroad still in use on Cape Cod. It extends from Willow Street in Yarmouth to the Yarmouth Waste Management Facility just west of Station Avenue. The connection to the Waste Management Facility can be made from the mainline in either direction. Mass Coastal Railroad operates its “Energy Train” from this facility, usually one or two trips a day exporting solid waste to a waste-to-energy facility in Rochester, Mass. In total, the segment contains 3.38 miles of track, the grade separated crossing of Route 6, and 23 total roadway crossings.



FIGURE 27 - AN OUT OF SERVICE TRACK RUNS SEVERAL HUNDRED FEET ON EITHER SIDE OF WILLOW STREET IN YARMOUTH



FIGURE 28 - RAIL TRACKS EAST OF WILLOW STREET IN YARMOUTH



FIGURE 29 - RAIL TRACKS IN YARMOUTH,  
FACING WEST.  
THE SHINY METAL SURFACE OF THE RAIL  
TRACKS INDICATES THEIR CONTINUED USE.



FIGURE 30 - RAIL TRACKS IN YARMOUTH  
WEST OF STATION AVENUE.  
ALONG WITH THE STOP SIGN, STOPPERS ON  
THE TRACKS PREVENT TRAINS FROM GOING  
TOO FAR.

The last segment of the Cape Cod line, starts at the Yarmouth Waste Management Facility east of Station Avenue and crosses the Bass River via a bridge. The Cape Cod Line used to continue all the way to Provincetown, with the Chatham Branch starting west of Route 124 in Harwich. However, the tracks were dismantled and a portion of the right-of-way was converted into the Cape Cod Rail Trail, which serves bicycle users and recreational purposes. Currently, however, the Cape Cod Line extends as far as Route 134 in Dennis. This final segment of track is out of service, abandoned, and not usable by train. Vegetation has encroached upon the rail tracks, crossing signals have been left in disrepair, and road crossings have been paved over. Plans for the westerly extension of the Rail Trail through Yarmouth to Willow Street are currently under design.



FIGURE 31 - RAIL TRACKS EAST OF STATION  
AVENUE IN YARMOUTH



FIGURE 32 - RAIL TRACKS EAST OF GREAT  
WESTERN ROAD, YARMOUTH.  
THE RAIL TRACKS HAVE BEEN PAVED OVER,  
WHILE VEGETATION AND A BOULDER BLOCK  
THE WAY.



In sum, the Cape Cod Line is the backbone of rail service on Cape Cod. It stretches 31.09 miles, and includes 3 bridges over waterways, 8 grade separated roadway crossings, and 51 total roadway crossings. The Cape Cod Line forms the majority of regional rail infrastructure. It serves as the only access to Cape Cod by rail, and is used by both Mass Coastal freight services and Cape Cod Central Railroad for scenic excursion trains and the Cape Flyer for weekend passenger service.

## Hyannis Branch

The Hyannis Branch begins at the Yarmouth “wye” (triangular junction) at Willow Street in Yarmouth and travels south. The historic Hyannis Roundhouse, located between Route 28 and Main Street in Barnstable, has been converted into a nightclub and warehouses. The rail yard is now used for the Hyannis Transportation Center and as a rail yard for Cape Cod Central Railroad. A restaurant and a furniture store now occupy part of the site. The terminus of the Hyannis Branch is a station for the Cape Cod Central. Originally, the Hyannis Branch continued from the rail yard south to a port facility in the Outer Harbor of Hyannis Harbor. The port and rail connection were dismantled however, and the right of way converted into Old Colony Road. This segment has also been rated for 30 MPH travel. In total, the Hyannis Branch contains 4.39 miles of track, 2 grade separated crossings under Route 6, and 6 total roadway crossings. Currently the Hyannis Branch only serves passengers and does not carry freight.



FIGURE 33 - RAIL TRACKS WEST OF WILLOW STREET, FACING NORTH



FIGURE 34 - THE HYANNIS RAIL YARD, WITH CCCRR CARS PARKED ON THE SIDE TRACKS



FIGURE 35 - THE TERMINUS OF THE HYANNIS BRANCH AT THE CCCRR STATION

## Woods Hole Branch

The Woods Hole Branch begins at the Canal Junction, splitting off from the Cape Cod Line and traveling south through Bourne and Falmouth. Three depot stations along the route, in Monument Beach, Pocasset, and Cataumet, have been converted to other uses. The tracks continue south to the Otis Junction just south of Old County Road in Falmouth. The track from Otis Junction to Joint Base Cape Cod is currently used by Mass Coastal Railroad to export solid waste; this service is due to expire later this year. An out of service side track runs from Old Main Road to the Otis Junction. This portion of the Woods Hole Branch has been rated for 30 MPH travel. In total, the segment contains 8.43 miles of track, 2 bridges over waterways, 5 grade separated roadway crossings, and 17 total road crossings.



FIGURE 36 - RAIL TRACKS AT THE OTIS JUNCTION.

THE LEFT TRACK RUNS EAST TO THE OTIS AIR FORCE BASE. THE RIGHT TRACK RUNS SOUTH TO PALMER AVENUE AND THE END OF THE SHINING SEA BIKE PATH.



FIGURE 37 - RAIL TRACKS NORTH OF OLD COUNTY ROAD IN FALMOUTH

The final segment of the Woods Hole Branch runs from the Otis Junction to the overpass at the southern crossing of Palmer Avenue. Vegetation encroached upon the rail tracks and crossing signals have been left in disrepair, and road crossings have been paved. This section has been converted to an extension of the Shining Sea Bike Path. In total, the segment contains 5.82 miles of track, a bog sluiceway north of Fox Lane, 4 grade separated roadway crossings, and 14 road crossings.

Originally, the Woods Hole Line continued south with stations at Depot Street and the current Steamship Authority port at Woods Hole. Originally built in 1872, this section of the Woods Hole line has been dismantled. The station at Depot Street now serves as a bus terminal, while the right-of-way has been converted into the Shining Sea Bike path.



FIGURE 38 - A BUSH GROWS IN THE MIDDLE OF THE WOODS HOLE LINE



FIGURE 39 - A CROSSING SIGNAL AT OLD DOCK ROAD OVERGROWN WITH VEGETATION



FIGURE 40 - THE WOODS HOLE LINE HAS BEEN PAVED OVER AT OLD DOCK ROAD



FIGURE 41 - OTIS BRANCH RAIL TRACKS, EAST OF ROUTE 28A

## Otis Branch

From the Otis Junction, the Otis Branch runs east into Joint Base Cape Cod. Inside the base, the track splits into several terminals, with one track running as far east as Mashpee. The track from Otis Junction to Joint Base Cape Cod is currently used by Mass Coastal Railroad to export solid waste; this service is due to expire later this year. In total, the segment contains 10.51 miles of track, 3 grade separated roadway crossings, and 15 total roadway crossings.

## Cape Cod Canal Railroad Bridge

In order to enter Cape Cod, trains must cross the Cape Cod Railroad Bridge (Figure 42). In 1910, the Buzzards Bay Railroad Bridge was completed over the first Cape Cod Canal, which was under construction at the time. When the canal was reconstructed in 1933, a new railroad bridge had to be built over the widened waterway. Since the railroad grade could not be easily raised, the Army Corps of Engineers constructed a vertical lift railroad bridge. The new bridge was completed in December of 1935 and was the longest bridge of its kind at the time. Recently, the Cape Cod Railroad Bridge underwent a major rehabilitation effort, in large part through \$25 million in Federal funds. Normally the bridge remains in the “up” position, allowing marine traffic access through the canal, and is lowered for rail service as needed. Marine traffic has statutory right-of-way over rail traffic but can be managed to accommodate scheduled train service such as the Cape Flyer. A panel in the bridge’s control room allows the controller to raise and lower the bridge. The mechanisms to control the interlocking rail, however, are located within the Buzzards Bay Tower in Buzzards Bay, Bourne. The bridge is 806 feet long, 297 feet high and has a high water clearance of 136 feet. Rail improvement is scheduled for 2015 to decrease waiting time for crossing the bridge.



CAPE COD  
COMMISSION

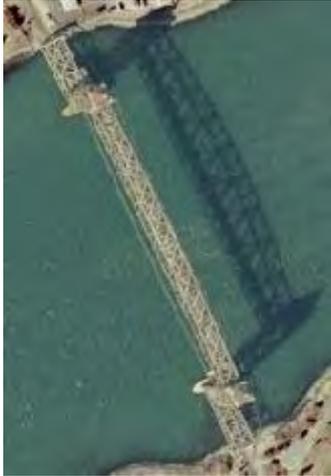


FIGURE 42 - AERIAL VIEW OF THE CAPE COD RAILROAD BRIDGE



FIGURE 43 - BUZZARDS BAY TOWER HOUSING RAIL CONTROL MECHANISMS



FIGURE 44 - CAPE COD RAILROAD BRIDGE FROM BRIDGE PARK, IN THE "UP" POSITION



## Signals and Crossings

Exclusive rights-of-way can limit the interaction of rail and other modes, making rail transportation safer and faster. However, crossing at roadways can pose problems if the intersection is not properly signed and designed. Currently on Cape Cod, there are 66 at-grade roadway intersections along active rail lines. Some, such as the railroad crossing at Route 28 in Barnstable, can actually interfere with roadway traffic and cause congestion and delays. Of those, 21 are not gated, signalized or signed. Although most of these are minor roadways, they do represent a potential for mishap. Moreover, there are 18 grade separated roadway crossings, as well as 5 bridges over waterways along active rail lines. These bridges and overpasses must be maintained in order to ensure continued use. If rail service on Cape Cod is to be increased, further study of railroad crossings may be necessary to ensure safety and prevent interruptions to roadway traffic.



TABLE 6 - RAIL INFRASTRUCTURE THROUGHOUT CAPE COD  
Source: [www.masscoastal.com/train-energy.php](http://www.masscoastal.com/train-energy.php)

	Railroad Crossings at Cape Cod Roads					
	Total	Grade Separated	Gated	Signalized	Signed	Other/ None
Cape Cod Total	102	22	4	26	19	31
Cape Cod Line	62	10	3	20	11	18
Hyannis Branch	6	2	1	-	1	2
Otis Branch	15	3	-	-	2	10
Woods Hole Branch	19	7	-	6	5	1
Locally Owned	13	4	-	5	3	1
Federally Owned	15	3	-	2	-	10
MassDOT	73	15	4	27	13	14
Barnstable	18	1	3	8	4	2
Bourne	27	11	-	6	5	5
Dennis	3	-	-	-	-	3
Falmouth	6	4	-	1	-	1
Sandwich	33	2	1	11	3	16
Yarmouth	15	4	-	1	6	4

## Rail Connectivity

Rail service has a long and rich history on Cape Cod. The region’s early growth was in part brought about by the railroad. Many miles of usable track still exist on Cape Cod, intersecting the roads and waterways. MassDOT owns the majority of rail tracks on Cape Cod, but some tracks are owned by federal agencies. Currently though, only the Mass Coastal freight service, the Cape Cod Central Railroad scenic train service, and the Cape Flyer summer weekend passenger service operate on Cape Cod. Proposals currently exist to connect Buzzards Bay to Middleboro, which would give Cape passengers improved access to Boston. If freight rail service were to be expanded, upgrades would be necessary to the tracks, stations, and signals. Moreover, issues of accessibility, mobility and connectivity would need to be addressed. Funding for these improvements would need to be identified and secured. As many tracks are converted in bicycle paths, the future of rail on Cape Cod is still uncertain. A major advantage of rail freight is the movement of goods across the Cape Cod Canal without adding vehicle crossings to the congested highway bridges.



## Water Freight

Waterborne freight to and from Cape Cod uses a variety of vessel types and seaports. This section of the report includes discussion of the shipping issues and an inventory of Cape Cod's many ports and harbors.

The primary form of public water transportation on Cape Cod is ferry service, carrying passengers between the mainland and the islands of Martha's Vineyard and Nantucket. A significant amount of freight is carried by water transportation as well. As a result, the region's seaports and channels are vital in addressing the economic and transportation needs of Cape Cod.

### CAPE COD SEAPORTS

Cape Cod has 586 miles of tidal coastline, with many inlets and bays that provide marine access to the land. Seaports have been constructed along several of these bays and inlets to facilitate the transfer of people and goods from water to land transportation. Significant Cape Cod seaports are recognized in reports by the Army Corps of Engineers, the agency that maintains many of them. These and other seaports are discussed in this section.

#### Woods Hole Harbor

Woods Hole Harbor, located in Falmouth, is a primary seaport for Cape Cod. It is split into two harbors by Juniper Point: Great Harbor and Little Harbor (see following figures). Little Harbor is located in the 550,000 square feet of water between Juniper and Nobska Points. In 1906, the Army Corps of Engineers completed a 1,600 foot-long channel from the Little Harbor to Vineyard Sound, as well as a turning basin. The Coast Guard widened and deepened both projects in the 1960s to a depth of 17 feet and a width of 200 and 400 feet respectively. Located on the western side of Little Harbor is a Coast Guard station, which is also used for recreational purposes. Great Harbor is located between Penzance Point and Juniper Point. A bascule drawbridge separates Great Harbor from Eel Pond to the north. Woods Hole Channel, which leads west to Buzzards Bay, connects at the southern end of Great Harbor. Many piers are located throughout the harbor, each with their own anchorages. Of the more significant ones are the 15-foot deep anchorage for the Steamship Authority ferries and the 22-foot deep anchorage for the Woods Hole Oceanographic Institute. Great Harbor is home to ferry passenger service, charter and sport fishing services, research vessels, and recreational boats. Charts of various ports shown in the following figures were produced by the National Oceanic and Atmospheric Administration's *Coast and Geodetic Survey*.

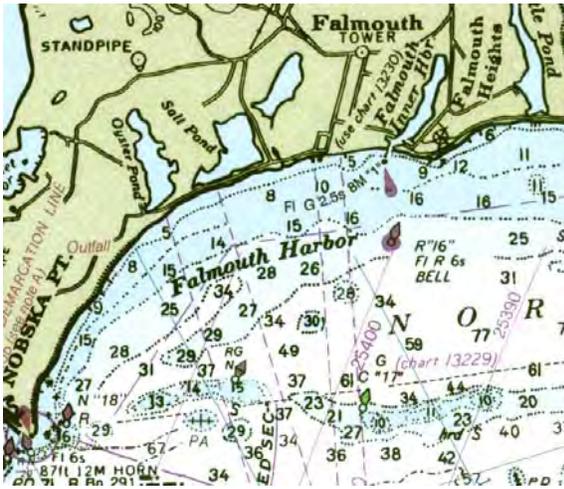


FIGURE 45 - FALMOUTH HARBOR



FIGURE 46 - A SECTION OF GREAT HARBOR,  
WOODS HOLE IN FALMOUTH

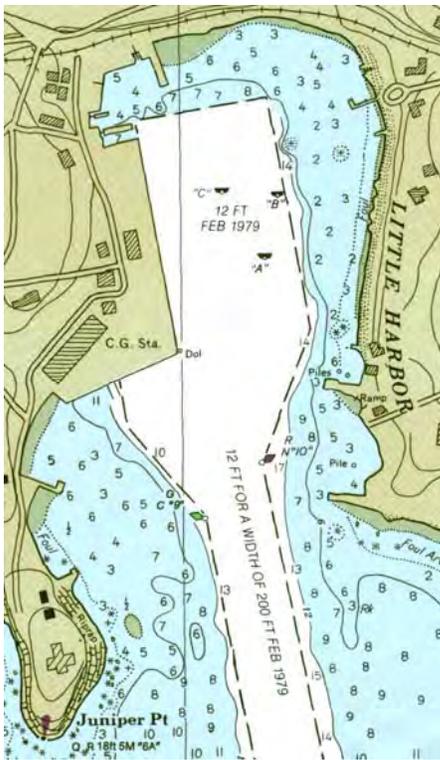


FIGURE 47 - LITTLE HARBOR, WOODS HOLE  
IN FALMOUTH

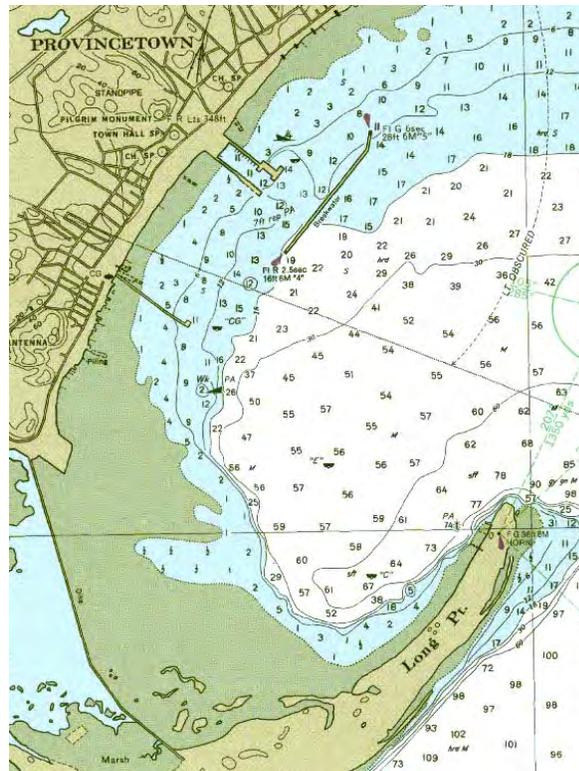


FIGURE 48 - PROVINCETOWN HARBOR



## Hyannis Harbor

Hyannis Harbor in Barnstable is another primary seaport on Cape Cod. It consists of an outer harbor, a middle harbor (known as Lewis Bay), and an inner harbor (see following figure). Dunbar Point, a 1,000-foot stone jetty, and the Kalmus Park Beach separate the Outer Harbor and Lewis Bay. Major boat terminals and piers are located within the Inner Harbor. The Army Corps of Engineers began construction projects in the harbor in 1882. Currently, Hyannis Harbor includes a 12-foot deep anchorage at the eastern end of the Inner Harbor. In Lewis Bay, there is a 15.5-foot deep anchorage of about 55 acres behind a 1,170-foot long breakwater at Dunbar Point. A 6,000-foot long channel, 12 feet deep and 100 feet wide, extends from the Inner Harbor into the deep water in Lewis Bay. From there, a 7,200-foot long channel extends to the Outer Harbor. Hyannis Harbor is used as a terminal for ferry service, freight service, charter, and sport fishing services, as well as for recreational purposes.

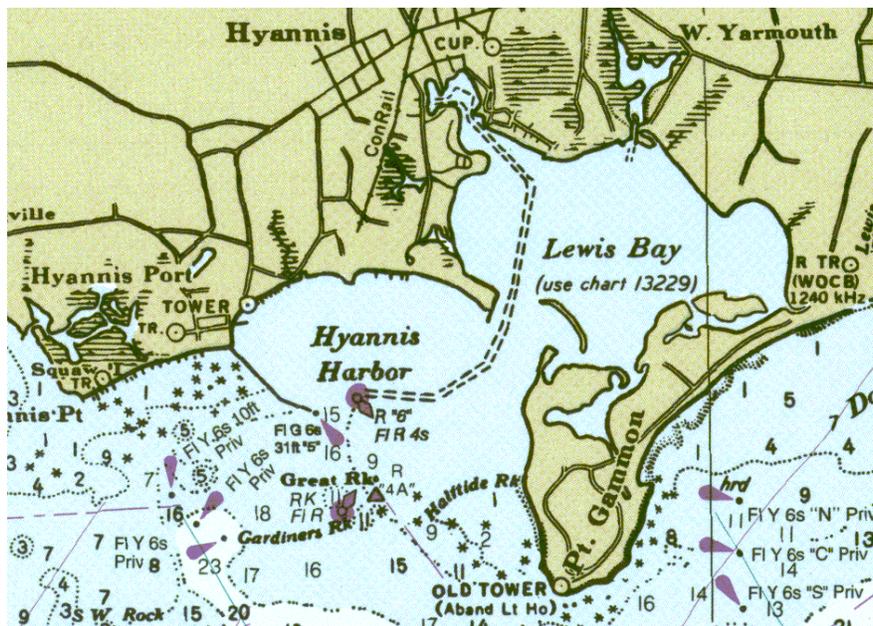


FIGURE 49 - HYANNIS HARBOR

## Provincetown Harbor

Provincetown Harbor was initially constructed during the nineteenth century. In 1914, the Army Corps of Engineers completed improvements to the harbor, including a 6,150-foot dike from Stevens Point across the House Point Island Flats to the sandy spit at Wood End. A stone breakwater, built in 1972, runs parallel to the shore about 835 feet from the end of MacMillan Wharf. The breakwater is 15.5 feet high and 2,500 feet long. Currently, the harbor is used as a terminal for ferries, whale watching tours, and as a base of operations for fishing boats (see following figure). Local and state officials have



discussed and rejected the expansion of the harbor to include a freight pier. According to a MassDOT report (“Identification of Massachusetts Freight Issues and Priorities,” 1999), the narrow streets in Provincetown’s historic district and the traffic congestion during peak hours make such a proposal unfeasible.

## Falmouth Harbor

Falmouth Harbor is located three miles east of Woods Hole, on the waterway between Falmouth Heights Road and Scranton Avenue. The Army Corps of Engineers began construction work in the harbor in 1957. Falmouth Harbor is 17 acres in area and 10 feet deep, with a 100-foot wide entrance channel. It is currently used as a terminal for ferries and charter tours, as well as for fishing and recreation.

## Saquatucket Harbor (Harwichport)

Saquatucket Harbor in Harwich serves the Lower Cape (see following figure). The harbor has a 12-foot deep, 200-foot long channel leading to a 12-foot deep anchorage. The Coast Guard maintains a station at this facility. Accessible from Route 28 in Harwichport, the harbor is a terminal for ferry service, tour boats, commercial fishing and recreational use. A private passenger ferry operates from this harbor to provide seasonal service to Nantucket.

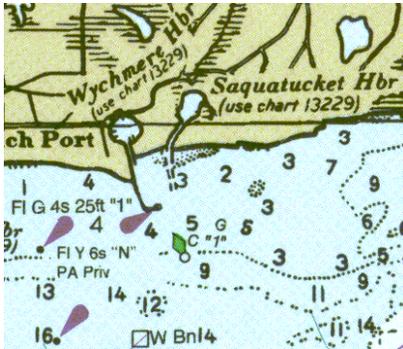


FIGURE 50 - SAQUATUCKET HARBOR

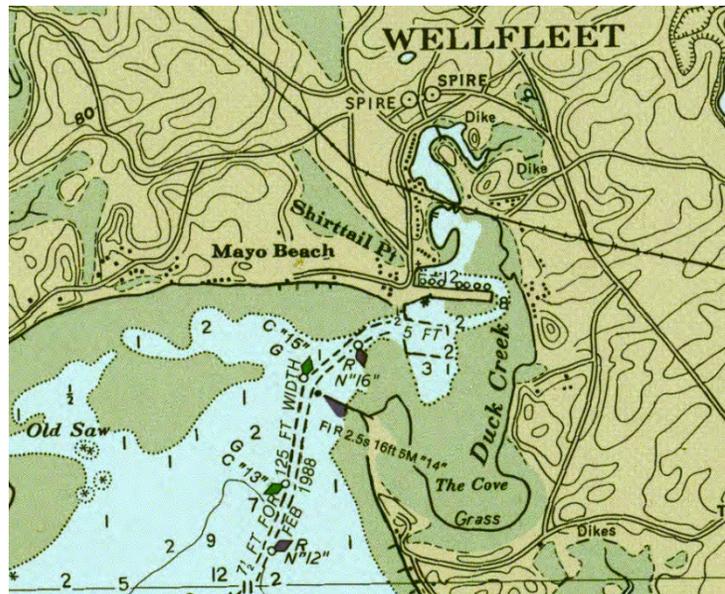


FIGURE 51 - WELFLEET HARBOR



## Wellfleet Harbor

Wellfleet Harbor is located at the mouth of Duck Creek, just south of Wellfleet Center (see figure above). Work on the harbor dates back to 1899 when a 4-foot deep channel was constructed between deep water and the town wharves at Duck Creek. The state dredged the channel in 1916 and deepened it by two feet. The Army Corps of Engineers later improved the harbor by creating a 10-foot deep, 125 foot-wide, 0.8-mile long channel from the middle of Wellfleet Harbor to the town landing, as well as a 10-foot deep, 500-foot long, 800-foot wide anchorage area. Currently, Wellfleet Harbor serves recreational boating, boat tours, commercial fishing, and sport fishing charter boats.

## Stage Harbor (Chatham)

Stage Harbor, located in Chatham, is one of the major seaports in the Lower Cape (see following figure). The harbor is divided into two parts: the Upper Harbor and Stage Harbor. The Upper Harbor extends from Bridge Street to Morris Island, and Stage Harbor extends from Morris Island to the Harding Beach bars. Original work in Chatham Harbor, including the construction of a channel through the Harding Beach bars, was completed in 1901. In the late-1950s, the Army Corps of Engineers constructed a new 2.1-mile channel from Chatham Roads through Harding Beach and into the Upper Harbor. Other harbor features include a 500-foot long stone jetty at the southwestern corner of the channel, a 2,500-foot long sand dike from Harbor Beach to Morris Island, and an adjacent 1,500-foot long timber jetty that has been partially removed. Additionally, a boathouse facility and dock in the Upper Harbor are maintained by the Chatham Coast Guard Station. Stage Harbor is used as a base for boat tours, recreational boats and a small local fishing fleet.

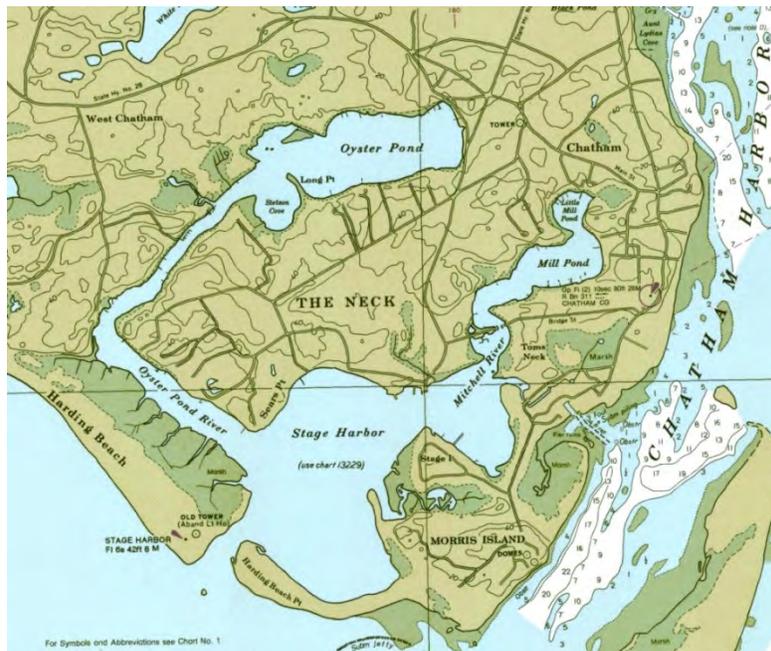


FIGURE 52 - STAGE HARBOR



## Barnstable Harbor

Barnstable Harbor lies between Sandy Neck and the mainland of Cape Cod (see figure above). The marina and landing in Barnstable Village serves as the primary seaport for Barnstable Harbor. A small channel, 7 feet deep, provides access to the marina from the entrance of the Harbor at Beach Point. Barnstable Harbor is the terminal for recreational and whale watching tours, as well as fishing vessels.

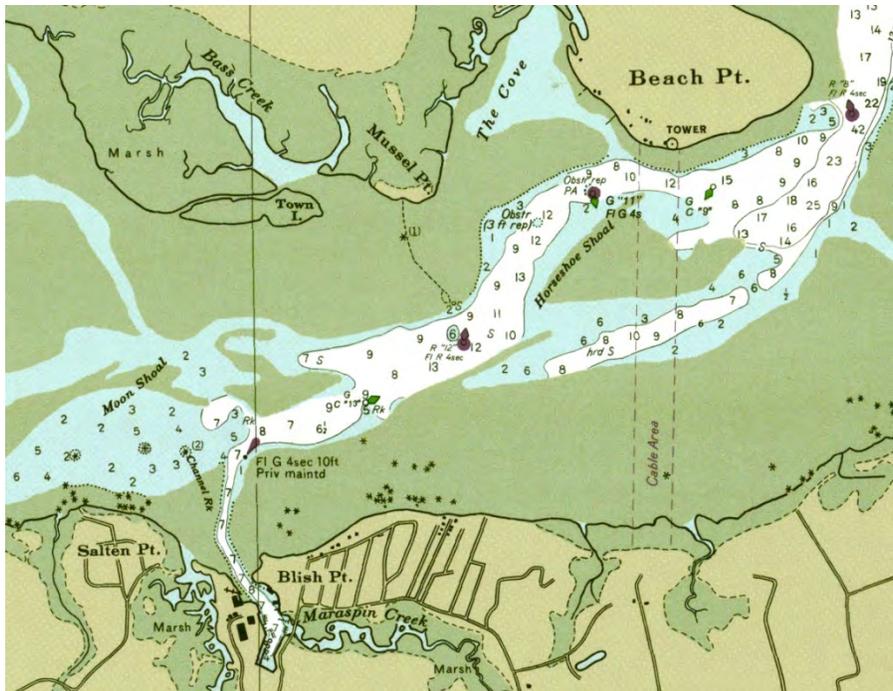


FIGURE 53 - BARNSTABLE HARBOR AND MARINA

## Sandwich Marina

Sandwich Marina is located on the eastern end of Cape Cod Canal in Sandwich. The marina has an anchorage of 8 feet, serving as a home to many fishing and recreational vessels. The marina primarily serves recreational and fishing vessels. With its proximity to road, rail tracks, and canal access, Sandwich Marina has the potential to be a ferry terminal for service from Boston and Plymouth (see following figure).

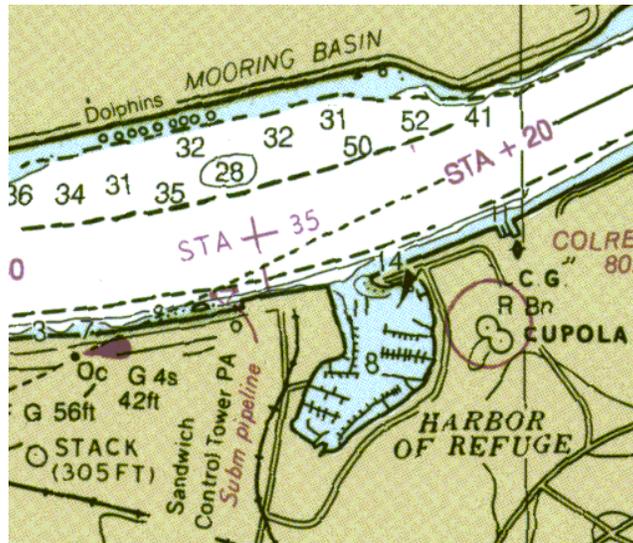


FIGURE 54 - SANDWICH MARINA

## Red Brook Harbor

Red Brook Harbor in Bourne is one of Cape Cod's seaports on Buzzards Bay. The harbor is located behind Bassetts Island between Handy and Long Points (see figure above). The boat docks are separated into two sections. The first, exposed to the harbor, provides an anchorage of 8 feet. The second is 7.5 feet deep and is connected to the harbor by a short channel. Red Brook Harbor serves as a base for fishing and recreational boats.

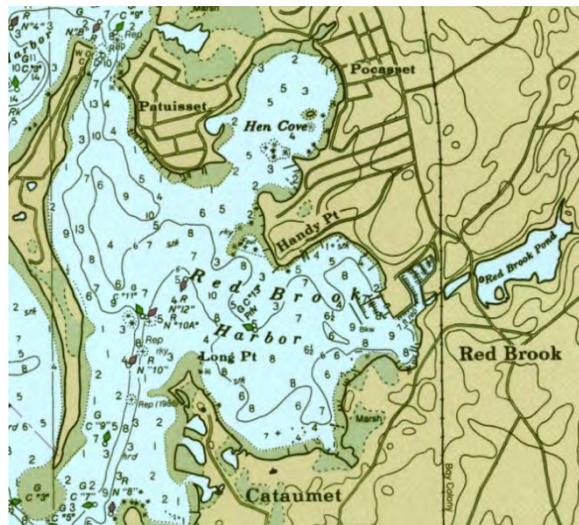


FIGURE 55 - RED BROOK HARBOR



## Sesuit Harbor

Sesuit Harbor is located in the Town of Dennis. It is accessible by Sesuit Neck Road and Harbor Road on the west, and Cold Storage Road and Salt Works Road on the east. The channel entering the harbor is 100 feet wide, narrowing to 80-90 feet, and approaching an anchorage of 6-7 feet (see following figure). With a yacht club located on the western side of the harbor, and a boat ramp on the eastern side, Sesuit Harbor is used for fishing and recreational use.

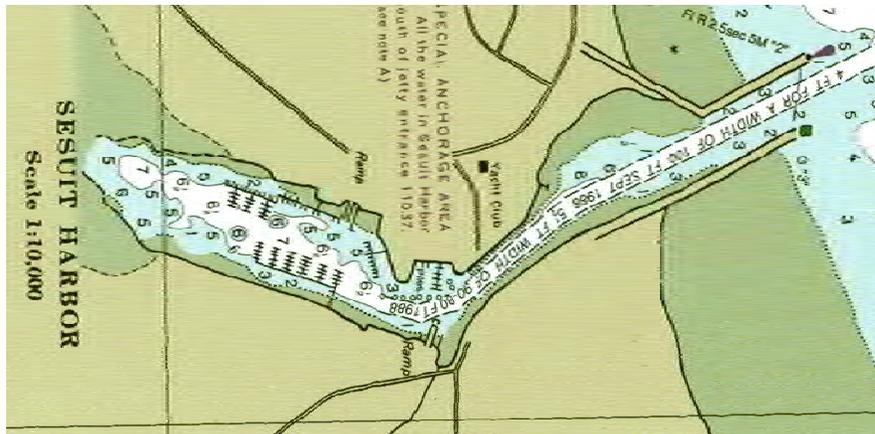


FIGURE 56 - SESUIT HARBOR, DENNIS

## FREIGHT BY FERRY

The Steamship Authority records movements of trucks between Cape Cod and the Islands. Generally, these trucks are transporting goods from the mainland to the Islands. In 2013, truck movements exceeded 153,000 vehicles. The total number of trucks carried includes pick-up trucks, vans, and other commercial vehicles under 20' in overall length. In 2004, the Steamship Authority started classifying certain vehicles under 20' as trucks rather than automobiles. Some pick-up trucks and vans that were previously classified as automobiles are now being classified more consistently as trucks based on the make and model of the vehicle. SUVs, however, are still classified and counted as automobiles. This resulted in more trucks and fewer automobiles being carried starting in 2004. Also, the number of trucks in this category of under 20' represented 53% of the total trucks carried on the Woods Hole – Martha's Vineyard route and 36% of the total trucks carried on the Hyannis – Nantucket route during 2005. The numbers of trucks, automobiles, or passengers are reported as one-way segments or movements. A truck carried round trip is reported as two trucks carried. Roughly two-thirds of these shipments are made between Woods Hole and Martha's Vineyard. The remainder is made between Hyannis and Nantucket. This makes Hyannis Harbor and Woods Hole important freight handling facilities.



TABLE 7 - TRUCKS CARRIED BY STEAMSHIP AUTHORITY VESSELS  
*Source: Steamship Authority*

Year	To and From Martha's Vineyard	To and From Nantucket
2013	118,922	34,329
2012	112,958	39,657
2011	114,782	44,025
2010	116,461	49,547
2009	115,600	48,187
2008	98,393	44,537
2007	98,257	41,011
2006	103,939	40,175
2005	97,595	39,598
2004	87,166	40,799
2003	70,546	43,226

## CAPE COD CHANNELS

Waterborne freight originating or destined for the Cape’s seaports often encounters shipping from and to off-Cape ports. These interactions occur most frequently in the various shipping channels, most notably the Cape Cod Canal and Woods Hole Channel.

### Cape Cod Canal

The Cape Cod Canal connects Buzzards Bay to Cape Cod Bay through the towns of Bourne and Sandwich. The channel itself stretches 17.4 miles in length, extending from the outer end of the northerly breakwater in Cape Cod Bay to a point in Buzzards Bay near Cleveland Ledge about 5 miles southwest of the Wings Neck Light. It provides a shorter route for vessels traveling along the Atlantic Coast, reducing trip length by 65-150 miles depending on origin and destination. Additionally, the route is a safer path, allowing vessels to avoid the shoals and shipwrecks scattered along the Outer Cape route.

A canal was envisioned as early as 1623 by Myles Standish of the Plymouth Colony. Studies and surveys were produced over the next 250 years recommending the construction of a canal, until a charter was finally granted to the Cape Cod Canal Company in 1880. Unfortunately, work lapsed and so did the charter. Several more charters were granted and more attempts at digging were made over the next 25 years, without success. Although Cape Cod and the region stood to benefit from the canal, none were willing to risk investing in such a venture.

Finally, in 1907, August Belmont purchased the charter to build the canal. Belmont was a New York investment banker who had built the City’s first subway. Unlike previous builders, he was able to secure the financial backing necessary to complete the Cape Cod Canal. Work began in June of 1909, and was completed in 1914. The new toll seaway opened with great celebration.



Unfortunately, the original canal had many problems. First, it was relatively small: 100 feet wide and 25 feet deep. These dimensions permitted only one-way travel, resulting in delays for vessels. Additionally, strong tidal currents caused several accidents and lent the canal a poor reputation. Toll revenues fell as a result, making the canal a commercial disaster.

In 1918, the U.S. Government assumed control of the canal after a German U-boat attacked five vessels just three miles off Cape Cod. Control was returned to Belmont's company after World War I in 1920. However, the company was not interested and the waterway was closed. Massachusetts Governor Calvin Coolidge urged Belmont's company to reopen the canal, which it did for three days. After much negotiating, the Cape Cod Canal was sold to the federal government for \$11.5 million in 1921. However, the government did not acquire the title until March 30, 1928.

Goods are transported by water via ferries, barges, and tankers. The busiest Cape Cod water facility in terms of freight transportation is the Cape Cod Canal. Although more vessels may pass through the Woods Hole Channel per year, more tons of freight pass through the Cape Cod Canal. Petroleum and petroleum products constitute the majority of freight traveling through the Canal (including off-loading at the canal's power generation facility in Sandwich). Other products include coal, chemicals, crude materials (i.e. wood, gravel, ore), food and manufactured goods, and equipment.

According to the U.S. Army Corps of Engineers, the Cape Cod Canal is a sea-level waterway offering vessels a minimum channel width of 480 feet wide and an authorized depth of 32 feet at mean low water. The swift running Canal current changes direction every six hours and can reach a maximum velocity of 5.2 miles per hour, during the ebb (westerly) tide. The three bridges that span the Canal were designed to allow for 135 feet of vertical clearance above mean high tide.

Use of Cape Cod Canal saves mariners an average of 135 miles of coastwise travel while circumnavigating Cape Cod. Support for the navigation mission at the Canal includes a state of the art Marine Traffic Control System, Marine Traffic Patrol by Corps vessels, and maintenance and improvement of the Canal channel and mooring basins.



FIGURE 58 - FIRST CAPE COD CANAL, 1914-1935



FIGURE 57 - THE ORIGINAL BOURNE BRIDGE COMPLETED IN 1911



FIGURE 59 - THE ORIGINAL RAILROAD BRIDGE OVER THE CAPE COD CANAL, 1914-1935

*Source: U.S. Army Corps of Engineers*

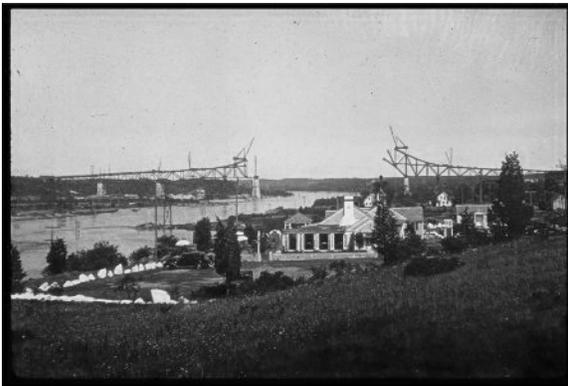


FIGURE 60 - CONSTRUCTION OF THE BOURNE BRIDGE



FIGURE 61 - CONSTRUCTION OF THE BOURNE BRIDGE

*Source: U.S. Army Corps of Engineers*

Responsibility for the Cape Cod Canal was passed to the Army Corps of Engineers, who subsequently set out to improve it. The Corps began construction on an expanded canal in 1935 and completed the work by 1940. The existing canal is the result of this work.



The current Cape Cod Canal has a width of 480 feet and a 32-foot deep channel, allowing two-way travel. At that size, the Cape Cod Canal is the world's widest sea-level canal. The old canal drawbridges were replaced in 1935 by the Bourne, Sagamore, and Railroad bridges. The architect Ralph Adams Cram designed the Sagamore and Bourne bridges. Built simultaneously with Work Progress Administration funds, construction provided about 700 jobs. The existing bridges have larger spans of 616 feet each and provide an overhead clearance of 135 feet. A 32-foot deep approach channel was also constructed to facilitate movement of ships from Buzzards Bay into the canal. The channel is 700 feet wide from Cleveland Ledge to Wings Neck and 500 feet from Wings Neck to the canal entrance. Other improvements to the canal include two mooring basins, two basins for small boats, an improved lighting system, a 600-foot and a 3,000-foot stone jetty at the entrance to canal from Cape Cod Bay, and a dike between Hog Island and Rocky Point in Bourne.

The Army Corps of Engineers continues to operate and maintain the Canal and its bridges today. The highway bridges now carry over 34 million vehicles to and from the isthmus of Cape Cod annually. Over six thousand ships, tug and barge combinations and other large commercial vessels pass through the canal annually. In 2009 they carried over 8 million tons of cargo to ports along the east coast including 1.9 billion gallons of petroleum products and 380 million gallons of bio fuels. Marine traffic is monitored and regulated 24 hours a day, 365 days a year. Moreover, Corps patrol boats stand by to assist vessels in distress. As a result, the Cape Cod Canal is a safe shortcut for marine traffic from Cape Cod Bay to Buzzards Bay. Recreational boaters take advantage of this fact as well with over seven thousand small boat canal transits each year.



FIGURE 62 - A SMALL BOAT TRAVELS THROUGH THE CAPE COD CANAL



FIGURE 63 - CAPE COD CANAL AND RAILROAD BRIDGE IN THE DISTANCE, FACING WEST



## Woods Hole Channel

The Woods Hole Channel is the most heavily traveled Cape Cod waterway. It is located between Penzance Point on the mainland and the northernmost of the Elizabeth Islands. The channel connects Buzzards Bay with Great Harbor in Woods Hole.

The Army Corps of Engineers has performed work on the Woods Hole Channel since 1870. Major works include the dredging of the channel and the removal of dangerous shoals and boulders from the main channel. By 1913, the Corps completed the current dimensions of the channel.

The Woods Hole Channel is comprised of a main channel and two branches (see following figure). The main channel, referred to as “The Strait,” is 2,500 feet long, 13 feet deep and 300 feet wide. It connects an inlet of Buzzards Bay to Woods Hole between Grassy Island and Red Ledge. The larger branch, called “Broadway,” separates from the Strait at Middle Ledge and travels south of Red Ledge to Vineyard Sound. Broadway is 1,300 feet long, 13 feet deep and 300 feet wide. The final branch simply provides a route into Buzzards Bay that is aimed towards the north. The smaller branch is also 13 feet deep and 300 feet wide.

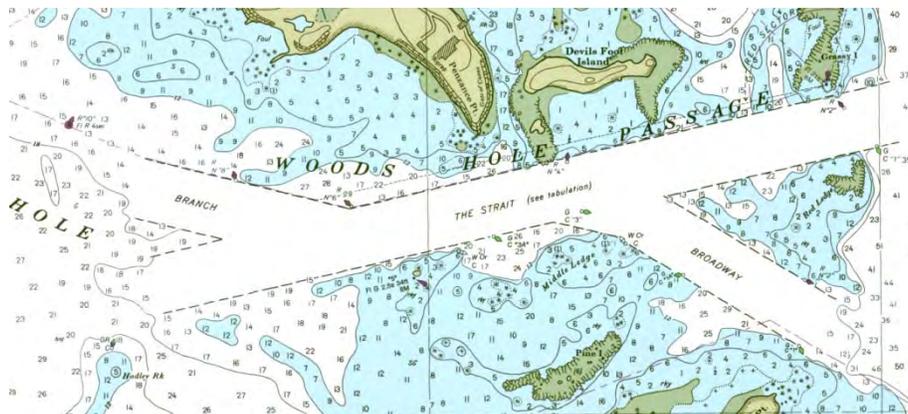


FIGURE 64 - WOODS HOLE CHANNEL

Woods Hole Channel connects ports and ferry terminals in Woods Hole Harbor to seaports in Buzzards Bay and Vineyard Sound. Freight vessels traveling to Boston and points north can also use the channel on their way to the Cape Cod Canal. The channel is used by seasonal passenger ferries from New Bedford to Martha’s Vineyard. As a result, the channel is heavily traveled.

## Nantucket Sound Channels

Nantucket Sound also contains several channels that serve Cape Cod’s water traffic. The Cross Rip Shoals mark the point, about 14 miles south of Hyannis Harbor, where several of these channels meet. From this point, vessels can travel to Buzzards Bay, Martha’s Vineyard, Nantucket, Cape Cod, and the Atlantic Ocean. The channel at the Cross Rip Shoals was created by the Army Corps of Engineers and is 30 feet deep, 4,000 feet wide,



and 1.7 miles long (see following table). The Pollack Rip Shoals are located about three miles to the east of Monomoy Island. The Army Corps of Engineers constructed a channel extending six miles through the Pollack Rip Shoals in 1925. The Pollack Rip Channel is 30 feet deep and 2,000 feet wide. It serves as the entrance to Nantucket Sound from the Atlantic Ocean. Taken together, the Wood Hole Channel, Cross Rip Channel, the Pollack Rip Channel, and the Main Channel create a thoroughfare for water traffic within Nantucket Sound (see following figure).

TABLE 8 - ESTIMATED DISTANCES THROUGH NANTUCKET SOUND CHANNELS

Woods Hole Channel to Martha's Vineyard Branch	7 miles
Martha's Vineyard Branch to Cross Rip Channel	13.5 miles
Cross Rip Channel	1.7 miles
Cross Rip Channel to Pollack Rip Channel	15 miles
Pollack Rip Channel	6 miles
Cross Rip Channel to Nantucket Harbor	12 miles

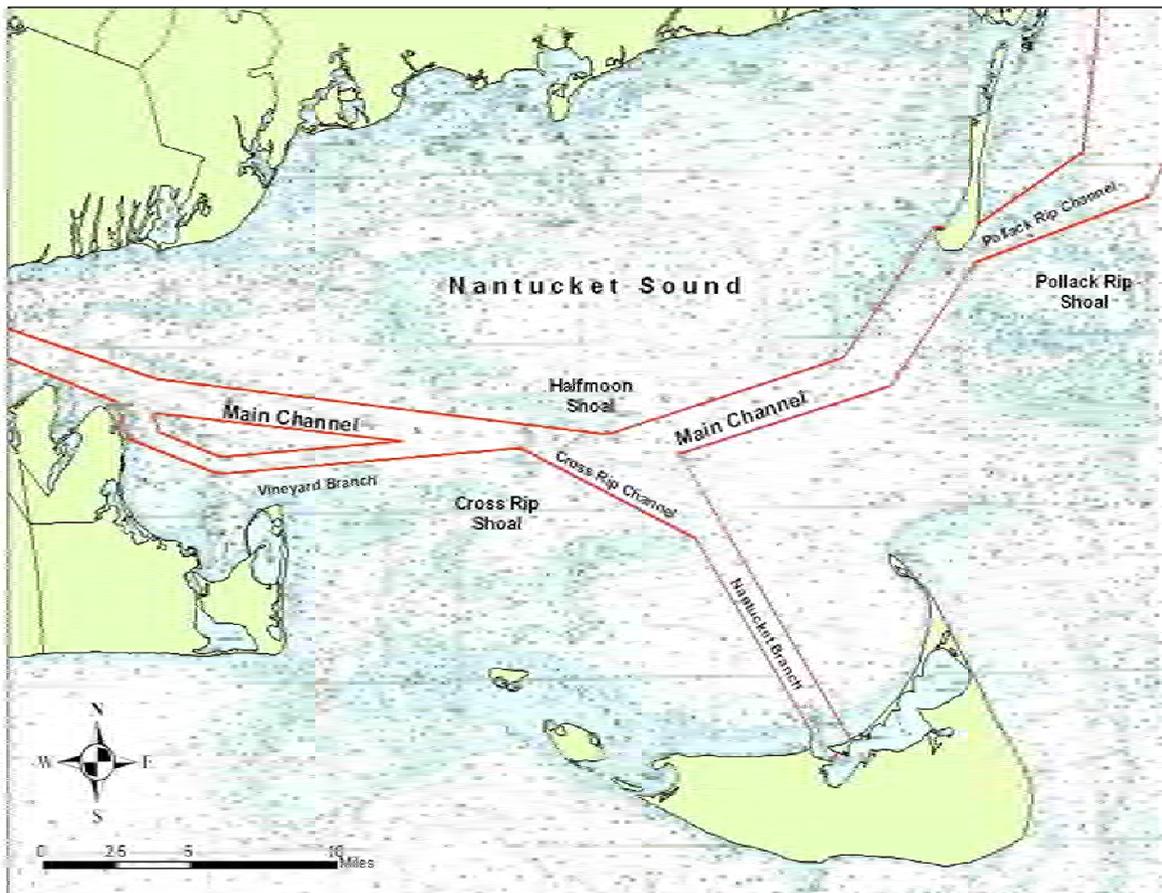


FIGURE 65 - NANTUCKET SOUND CHANNELS



## WATER TRANSPORTATION INFRASTRUCTURE

A lighthouse is a structure, such as a tower, that gives a continuous or intermittent light signal to navigators. Cape Cod is famous for its many lighthouses and their unique towers. However, in addition to being aesthetically pleasing, these lights serve a vital purpose. Along with other navigational lights and aids, they form the infrastructure that keeps water traffic on course and out of danger. There are ten active lighthouses on Cape Cod (Table 9). Most are located in the Outer Cape region. Additionally, there are six inactive lighthouse structures still in their original locations. Navigational lights and fog signals (bells, whistles, gongs, and horns) are generally located along the perimeter of channels and at dangerous areas. Due to its shoals and other hazards, the majority of Cape Cod's navigational aids are located in Nantucket Sound. Cape Cod has 43 fog signals and 72 navigational lights in total.

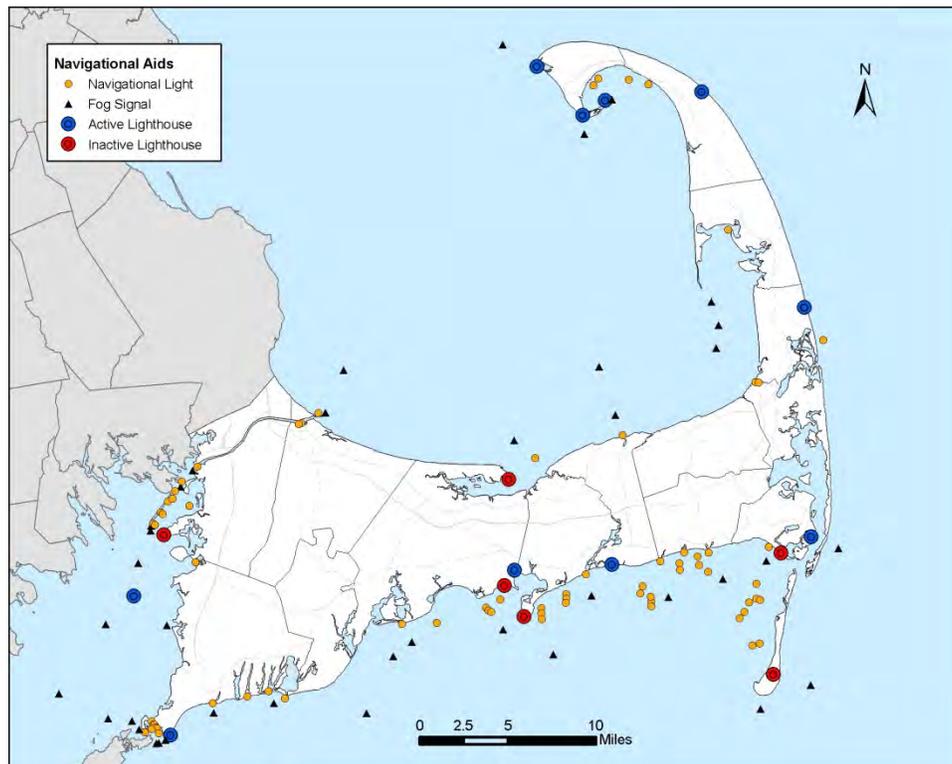


FIGURE 66 - NAVIGATIONAL AIDS WITHIN THREE MILES OF CAPE COD



TABLE 9 - ACTIVE CAPE COD LIGHTHOUSES

<b>Lighthouse Name</b>	<b>Town</b>
Nobska Light	Falmouth
Cleveland Ledge Light	In Buzzards Bay
Lewis Bay Light	Barnstable
West Dennis Light	Dennis
Chatham Lighthouse	Chatham
Nauset Light	Eastham
Highland Light	Truro
Race Point Light	Provincetown
Wood End Light	Provincetown
Long Point Light	Provincetown

TABLE 10 - NAVIGATIONAL LIGHTS AND FOG SIGNALS BY LOCATION

	<b>Navigational Lights</b>	<b>Fog Signals</b>
Atlantic Ocean	1	4
Buzzards Bay	13	13
Cape Cod Bay	12	11
Nantucket Sound	46	15
Total	72	43

## Discussion

Cape Cod has several seaports and channels that provide a network for water transportation. Many of these are the result of Army Corps of Engineers projects. Navigational aids such as lighthouses and fog signals mark the edges of safe channels and the location of dangerous waters. Woods Hole Harbor and the Woods Hole Channel are the busiest passenger facilities. Water transportation is primarily offered from Cape Cod to the Islands, but also Boston and Plymouth. In 2013, the Steamship Authority was Cape Cod's largest ferry service provider with over 2.8 million passengers. In terms of freight service, the Cape Cod Canal handles almost all freight traffic, much of which is petroleum and petroleum products. Ferry service is accessible by many modes, with great mobility between the mainland and the Islands. However, coordination with bus schedules, coordination with air service, better connections, and more routes would increase accessibility and mobility.



## Interviews & Questionnaire Responses

### RAIL

Cape Cod Commission staff met with a representative of Cape Cod's major rail operation: Mass Coastal Railroad. Mass Coastal operates the "Energy Train" transporting solid waste from the Yarmouth Transfer Station (and from the soon-to-close Otis transfer station at Joint Base Cape Cod) to the Southeastern Massachusetts Resource Recovery Facility – "SEMASS"), and an excursion/tourist train identified as "Cape Cod Central Railroad." Freight issues/concerns affecting rail service included:

- Energy Train service is affected by Cape Cod Canal rail bridge delays, and hours of operation at SEMASS and the Yarmouth transfer station
- Commercial marine shipping may have priority (especially eastbound in the canal – can restrict access to the rail bridge for over 1 ½ hours).
- The Otis transfer station will close in December 2014 resulting in:
  - More Energy Train cars available for Yarmouth transfer station – resulting in fewer daily trips to SEMASS
  - Opportunity to modify the Otis facility for trans-loading operations (e.g., propane, construction materials, etc.)
- Potential future rail shipments could include deliveries of construction materials to Hyannis.
- National (and global) freight trends are for containerization (freight is consolidated in large containers that can be stacked on ships or trains and then transported over the road by tractor trailers).
- Rail services between North Falmouth and Hyannis are restricted due to the absence of a "Y" rail connector in the vicinity of the rail bridge (currently, the rail bridge must be lowered and a train would have to partially cross the canal and then reverse)

### ONLINE QUESTIONNAIRE

The Cape Cod Commission sought input from users and providers of freight services on Cape Cod through an online questionnaire. The questionnaire included multiple-response and open-ended questions. The availability of the questionnaire was announced on the Cape Cod Commission and Cape Cod Chamber of Commerce websites and via a direct email announcement sent by the Cape Cod Chamber to its membership. Only seven responses were received as of the fall of 2014 and are summarized below

#### **Question 1: Which Cape Cod town(s) is your company based in?**

Three respondents indicated Barnstable, two each for Bourne and Mashpee, and one each for Yarmouth and Provincetown.



### **Question 2: What type of business do you operate?**

There was one response in each of the following categories:

- Freight Shipper
- Entertainment/Recreation
- Manufacturing
- Professional Services
- Restaurant
- Other Retail

Comments included the statement “Cape Cargo we pickup and deliver freight on the Cape.”

### **Question 3: How does your company use freight?**

Five responses indicated that their company imports/receives goods. There was one response each for “transport goods (I operate a shipping company)” and “other.” There was one comment: “ship and receive goods”

### **Question 4: How frequently do you use freight?**

Responses were organized into three categories as follows:

#### Importing

- One response for greater than three times per day
- One response for one-two times per day
- Two responses for three-five times per week
- One response for one-two times per week
- One response for less than once per week

#### Exporting

- One response for less than once per week

#### Transporting

- One response for greater than three times per day
- One response for one-two times per day

### **Question 5: Where does your freight come from or where does it go?**

Responses were organized into three categories as follows:

#### Importing

- Five responses for “Off Cape” (mainland side of Cape Cod Canal)
- Two responses for “On Cape” (south/east of Cape Cod Canal)

#### Exporting

- No responses



### Transporting

- One response for “Off Cape” (mainland side of Cape Cod Canal)
- Two responses for “On Cape” (south/east of Cape Cod Canal)
- One response for Islands (Nantucket or Martha’s Vineyard)
- One response for International
- One response for Other

### **Question 6: What are some of the major commodities that your company imports/exports/transport (or relies upon)?**

This was an open-ended question that received seven responses as follows:

- Lighting products
- Parts for repair of our video games. Prizes for our customers. Paper products plates, cups, napkins, paper towels, etc....
- Hardware, paint & sundries, power tools, hand tools, locks, plumbing supplies, electrical supplies, fasteners, housewares, lawn and garden supplies, fertilizers, automotive supplies, propane, cleaning supplies.
- Green Coffee - Import Ship off Cape Roasted Coffee USPS and UPS Daily, also self deliver in our own truck to on Cape customers
- Cabinets flooring retail goods
- We transport all types of freight except perishables and food. General freight, household goods, furniture, items for internet purchases, freight to from the Islands
- Food, kitchen equipment, restaurant supplies

### **Question 7: What types of shipping does your company use on Cape Cod?**

All seven responses indicated that they use road (trucking) for their shipping needs. One response also indicated the use of waterborne freight.

### **Question 8: Please identify your primary shipping company (if applicable):**

There was one response each for the following shipping companies

- Cape Cod Express
- FedEx
- UPS

There were two responses that indicated “Other.”



**Question 9: What issues regarding freight do you have (e.g., roadway safety, speed/fuel efficiency, flexibility, reliability)? How may these issues be addressed?**

Responses included the following statements:

- Prices are so much higher for just 20 units
- Many carriers do not want to deliver to Cape Cod so they deliver to Cape Cod Express in Wareham who then delivers the freight locally. This adds time and the potential for damage.

**Question 10: What types of policy changes or investments would you support or not support?**

Responses were organized into a set of categories as follows:

**Increase vehicular capacity across the Cape Cod Canal**

- Two responses were “Strongly Support”
- Two responses were “Neutral”

**Rail investments**

- Three responses were “Support”
- One response was “Neutral”
- One response was “Oppose”

**Ferry ports (expansion or construction of new ports)**

- Two responses were “Strongly Support”
- Three responses were “Support”
- One response was “Neutral”

**Air freight (expansion of facilities)**

- Five responses were “Support”
- One response was “Neutral”

**Improved intermodal facilities (e.g., ferry to rail, air freight to truck, etc.)**

- Five responses were “Support”
- One response was “Neutral”

**Identification of appropriate trucking routes/trucking restrictions**

- Two responses were “Strongly Support”
- Two responses were “Support”
- Two responses were “Neutral”

There was one comment: “convert South St Hyannis to 2 way traffic to allow for safer egress from WHMVNSSA terminal.”



**Question 11: Do you have any other comments, questions, or concerns?**

This question had one response: “It is troublesome to hear that any wide load requires two state police escorts on the bridges. Trucking companies pay a four hour minimum to the state police for this service when the drive over the bridge takes 15 minutes!”



## Recommendations

This 2015 Cape Cod Freight Study is the first attempt by the Cape Cod Metropolitan Planning Organization to bring a comprehensive assessment of issues facing freight haulers to, from and within Barnstable County. In order continue to make progress in improving freight safety and reliability, the following strategies are offered:

### Identify “Critical” Freight Commodities

Work with planners to identify commodities critical in all stages of emergency preparedness and response. These stages include advanced planning and resiliency preparations, emergency management during events, and follow-up/rehabilitation.

### Encourage Specific Types of Freight Transportation

Freight modes that minimize travel over Cape Cod’s narrow and congested roadways are to be encourages. Such modes include rail and waterborne. Trucking deliveries during off-peak times are also encouraged.

### Make Infrastructure Improvements for Freight Industry

Maintain and rehabilitate bridges and roads – focusing on higher functional class facilities. During roadway and intersection rehabilitation on truck routes, include properly-engineered pavement, turning radii, and avoid height obstructions.

### Update Truck Routes

Work with town and state officials to refine preferred truck routes. Currently, truck routes are based on a limited number of state roads and may be discontinuous based on jurisdiction. Refined truck routes would be included in the MassDOT’s Roadway Inventory.

### Bridge Maintenance Scheduling

To reduce impact to freight traffic, restructure Bourne and Sagamore bridge repair contracts (night work or 24-hour shift).



## CAPE COD COMMISSION

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