

Pavement Management 2019 Status Report

December 2019





Chapter 1: Table of Contents

1.	Introd	luction	. 1
	1.1 Pa	vement Management Systems - Background	. 1
		aluation Criteria for CCC Data Collection	
	1.3 Su	rvey of Cape Cod Communities' Pavement Management Activities.	. 3
	1.3.1	Barnstable Pavement Management Activities	
	1.3.2	Bourne Pavement Management Activities	
	1.3.1	Brewster Pavement Management Activities	
	1.3.2	Chatham Pavement Management Activities	
	1.3.3	Dennis Pavement Management Activities	
	1.3.4	Eastham Pavement Management Activities	
	1.3.5	Falmouth Pavement Management Activities	
	1.3.6	Harwich Pavement Management Activities	
	1.3.7	Mashpee Pavement Management Activities	. 7
	1.3.8	Orleans Pavement Management Activities	
	1.3.9	Provincetown Pavement Management Activities	
	1.3.10	Sandwich Pavement Management Activities	
	1.3.11	Truro Pavement Management Activities	
	1.3.12	Yarmouth Pavement Management Activities	
	1.3.13	Wellfleet Pavement Management Activities	
	1.4 Su	mmary of Town Pavement Management Efforts	
2.		nent Management Analyses	
	2.1.1	CCC evaluations of Pavement Conditions – "Windshield" Surveys	
	2.1.2	CCC evaluations of Pavement Conditions – ATR Sites	
3.	Recon	nmendations for Achieving Improved Pavement Condition	
4.		usion/Recommendations for PMS Enhancement	

Appendices:

- Cape Cod Commission Pavement Condition Comments
- Cape Cod Commission Automatic Traffic Recorder Location Data



List of Figures

Figure 1 - Pavement Deterioration Curve	2
Figure 2 - Municipal Roads Surveyed in 2019	
Figure 3 –Pavement Condition Surveys: Upper Cape	
Figure 4 –Pavement Condition Surveys: Mid-Cape	16
Figure 5 – Pavement Condition Surveys: Lower Cape	
Figure 6 –Pavement Condition Surveys: Outer Cape	
Figure 7 – Pavement Conditions at ATR Locations: Upper Cape	
Figure 8 – Pavement Conditions at ATR Locations: Mid-Cape	
Figure 9 – Pavement Conditions at ATR Locations: Lower Cape	
Figure 10 – Pavement Conditions at ATR Locations: Outer Cape	24
List of Tables	
Table 1 - CCC Evaluation Criteria	3
Table 2 – Municipal Pavement Management Activities Summary	
Table 3 – Surveys of Pavement Condition - miles	
Table 4 –Summary of Pavement Conditions at ATR Sites	
Table 5 - Treatment Band Descriptions	26



1. Introduction

As an essential task required by the Cape Cod Metropolitan Planning Organization (MPO) through its Unified Planning Work Program, this report provides the status of pavement condition assessment activities on Cape Cod. The objectives of this effort are to collect data and implement a regional pavement management system for Cape Cod to provide an objective rating of pavement conditions and needs.

The pavement management process is conducted with the intent to keep the roadway system in the best possible condition with the most efficient use of available funds. There are distinct advantages to managing pavement condition and significant cost savings that can take place with preventative or rehabilitation measures rather than waiting until a road needs reconstruction. Of course, due to the reality of limited financial resources, it is necessary to prioritize pavement repair based on affordability. Deciding which roads to improve and by what technique in a fiscally responsible manner is the essence of Pavement Management.

As stated in the MPO-approved Cape Cod 2020 Regional Transportation Plan, the goal of the pavement management process is to improve the overall pavement condition of all federal aid-eligible roads. Specifically, a four-year performance measure target has been set to have 30% of all non-interstate roads to be in "good" condition.

1.1 PAVEMENT MANAGEMENT SYSTEMS - BACKGROUND

Pavement Management is the practice of planning for pavement repairs and maintenance with the goal of maximizing the value and life of a pavement network.

To accomplish this, a community needs to have several repair techniques in its arsenal and the knowledge of when to apply them. This is where pavement management comes into play. With a comprehensive database of road conditions, the pavement management software can model when to perform which repairs on a road network. Of course, engineering judgment is required to finalize any list of street repairs, as no computer model can take every variable analyzed in making a repair decision into account. The computer system is a great springboard to help a community start its repair program for each year and is an excellent method of storing the repair data.

Below is a model of how a street's pavement deteriorates over time. Interpreting the curve, a street starts out in excellent condition when it is newly constructed. Midway through its life, a low-cost repair such as crack seal and full depth patch will cost approximately a dollar a square yard. It takes only a few years for the window of opportunity to perform this low-cost maintenance to pass after which the road would need an overlay costing \$13 - \$17 per square yard. By performing timely maintenance, road conditions can be improved today thereby extending the life of the road.



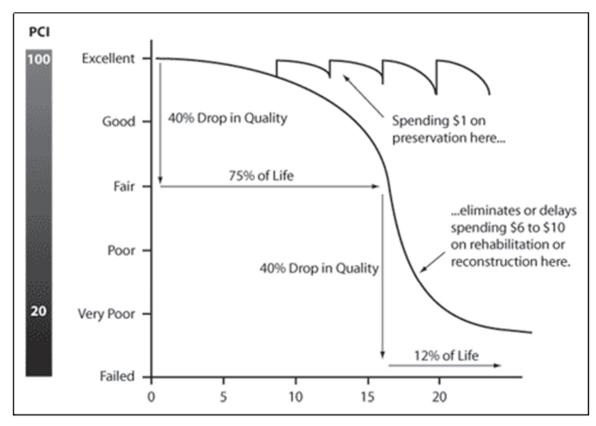


Figure 1 - Pavement Deterioration Curve

Source: Federal Highway Administration

1.2 EVALUATION CRITERIA FOR CCC DATA COLLECTION

The Cape Cod Commission has continued to collect pavement condition data since 2011 through two distinct efforts: a series of "Windshield Surveys" and spot observations at specific locations where the seasonal traffic technicians were installing Automatic Traffic Recorders (ATRs). In both cases observers were given photographs and descriptions of example pavement distresses. Observers used a 1-5 rating system and made notations of distresses observed in the field. Copies of the field observations for the most recent three-year period (2017-2019) are provided in the appendix of this report. The following table is a summary of the guidance given to observers:



Table 1 - CCC Evaluation Criteria

Condition	Description	Criteria
1	Very Good to Excellent	New pavement with no cracking, rutting, raveling/ signs of wear
2	Good to Very Good	No cracking, rutting, showing a little wear
3	Fair to Good	Showing evidence or more wear and possibly repairs that are in good condition
4	Poor to Fair	Evidence of cracking, rutting, serious wear
5	Poor	Severe cracking, rutting, potholes

1.3 SURVEY OF CAPE COD COMMUNITIES' PAVEMENT MANAGEMENT ACTIVITIES

In September 2019, an email was sent to each of the 15 towns' Department of Public Works directors to ask for an update on their current pavement management activities. The following pages summarize the current pavement management efforts underway among the towns.

1.3.1 BARNSTABLE PAVEMENT MANAGEMENT ACTIVITIES

The Town of Barnstable utilizes detailed survey and analysis performed by BETA Group as a Consultant. Their work is entered onto Barnstable's database and periodic reports are provided and discussed. The DPW participates in the data analysis, particularly in the cost analysis. DPW reviews project bids received by the Town and establishes base line costs for each pavement treatment band. These costs are discussed with the town's consultant - then utilized in the pavement conditions report. In addition to the BETA work, the DPW maintains a record of roadway repairs and relies upon experienced field personnel to assist in planning for individual maintenance tasks such as crack & chip seal. DPW also informally monitors the performance of all treatments. Key to the pavement management program is coordination with other utilities and proposed roadway rehabilitation information is passed to utility companies 6-12 months in advance of construction. A moratorium is in place for 5 years after application of a new surface. The Town of Barnstable does not maintain a public "5-year plan" - because of political considerations.



Submitted materials include:

• BETA-prepared "2018 Pavement Summary Report". The report contains a summary of the Town's Pavement Management Program, approach, description of the roadway surface survey process, summary of findings, capital planning and typical costs for various items involved in pavement repair and related road work. See section 1.4.1 for discussion of BETA Pavement Management Systems.

1.3.2 BOURNE PAVEMENT MANAGEMENT ACTIVITIES

The Town of Bourne retained BETA Group, Inc. (BETA) to develop a Pavement Management Program (PMP) for its Town maintained roadways in 2012. This comprehensive study was undertaken with the goal of establishing an extensive database of roadway surface conditions in order to produce a prioritized list of improvements. The PMP is a planning tool intended to provide the foundation to manage the town's roadway resources by combining professional engineering metrics with local institutional knowledge. These efforts will result in the creation of a dynamic Capital Improvement Plan for the Town's roadway network. BETA and Town Staff will work together to identify goals with regard to roadway network condition.

The roadway survey in Bourne, consisting of paved, town-accepted roadways, was most recently completed in the Fall of 2017. A total of 97.85 miles of roadway were inspected by BETA's field team. The collection effort focused on the primary categories of roadway data including roadway length, width, segment start/end points, surface type, and pavement condition. Additional roadway elements including curbing, sidewalks, striping, roadway width, and pavement material were also assessed as part of this inspection process and recorded in the database.

Upon completion of the survey, the overall Road Surface Rating (RSR) value for Bourne's public roadway network was 75.97. The overall RSR represents a benchmark for performance measuring of the Town's pavement management program moving forward. If the overall RSR were to drop in the years to come, this would be a sign that the program needs to be adjusted or funding for the program may need to be increased. Repair strategies and associated unit costs were defined to develop the Backlog Summary. The current backlog summary for the Town's roadway network is approximately \$10.8 Million. This budgetary dollar figure represents the funding necessary if the Town were to perform all required maintenance for the Town's road network within the next year.

The Town will continue to monitor its progress and roadway rating by performing periodic network inspections and is committed in maintaining and improving its roadway network.



1.3.1 BREWSTER PAVEMENT MANAGEMENT ACTIVITIES

In 2015, the Town of Brewster published its "Pavement Management Plan" (PMP). Prepared by the consultant CDM Smith, the plan included the following findings:

- The Town's overall Pavement Condition Index (PCI) was a 73.
- If no further money were spent on roadways for 10 years, that PCI would decline to 63.
- Performing all the work necessary on the roads as of the inventory date would cost in the order of magnitude of \$12 Million.
- Maintaining the existing PCI of 73 would cost approximately \$1.1 Million per year over the next 5 years.
- Continuing to spend at present levels (\$470K, if all went to roadway work) will result in a decline over the next 5 years to a PCI of 71. As it nears the critical PCI of 55, the overall condition will decline more rapidly.
- To reach a target PCI of 80 in 5 years, the Town would need to spend approximately \$2.3 Million per year.

The town has utilized the software "MicroPaver" to perform inventory management, calculate Pavement Condition Index ratings, and other pavement management functions. In 2015, the town passed a \$10 million road bond. Currently, the town is prioritizing a reconstruction and complete streets project on Millstone project. As of Fall 2019, the town is looking to solicit a new consultant to perform an update to their PMP.

1.3.2 CHATHAM PAVEMENT MANAGEMENT ACTIVITIES

The Town of Chatham has retained the firm of BETA Group, Inc. (BETA) to develop a Pavement Management Program (PMP). BETA's pavement services include performing a detailed visual inspection, calculation of a Roadway Surface Rating (RSR), and recommendation of required maintenance for each roadway segment. BETA compiles the pavement data into a web-based application to allow the town to actively manage their priorities.

1.3.3 DENNIS PAVEMENT MANAGEMENT ACTIVITIES

The Town of Dennis is currently evaluating various pavement management systems but has historically used VHB's Pavement Management for guidance. The term "guidance" is used because while VHB keeps Dennis' pavement quality records, does field verification on a 1/5th per year basis, grades the town's roads and makes recommendations for repairs, the town has to spend road funds based on several factors that the program is not designed to consider. These local parameters are: some work in each of Dennis' 5



villages each year, reconstruction of failed roads, resurfacing of dirt roads and lumping the type of repair to give off-cape vendors enough to give the town a reasonable rate.

The town has not had an assessment prepared of estimated costs for various repair strategies for several years. The town's road budget for pavement improvement has been consistently funded between \$400,000 to \$600,000 per year for "secondary roads" but can vary depending on other capital requests. Chapter 90 funds are primarily (not exclusively) used for primary roads.

1.3.4 EASTHAM PAVEMENT MANAGEMENT ACTIVITIES

Along with a consultant, the Town of Eastham embarked on a town-wide condition and assessment survey of all its private ways and town-maintained public roads, prompted mainly by the on-going construction of its town-wide water distribution network, with the purpose of assisting in the preparation of a Capital Improvements Plan (CIP).

A summary of the survey revealed the following information:

- Eastham has a total of 114 centerline miles broken down as follows:
 - 55 miles of which are town-maintained (non-State or Federal) public roads
 - o 59 miles of which are private ways
- Surface Information:
 - o 54 miles of the town-maintained public roads are paved
 - o 1 miles of the town-maintained public roads is unpaved
 - 25 miles of private ways are paved
 - o 34 miles of private ways are unpaved
- Pavement Condition Index (PCI):
 - The average PCI, prior to the construction of the water distribution network, was 88 for paved town-maintained public roads and 79 for paved public ways

Due to the disruption created by the water distribution construction project, the Town of Eastham is currently working on a Capital Improvements Plan to repair all townmaintained public ways, as well as on updating its current Temporary Repairs on Private Ways bylaw to provide a vehicle for residents of private ways to petition the Town for assistance with certain kinds of repairs. Once paving repairs begin in earnest in the Fall 2019 and Spring 2020, the Town plans to update both their current pavement



management software and data in order to maintain and update the system for years to come.

The Town of Eastham is also a Massachusetts Complete Streets Tier 3 community, and as such will be looking to include multimodal access options in all repairs related to its Roadway Capital Improvements Plan.

1.3.5 FALMOUTH PAVEMENT MANAGEMENT ACTIVITIES

Falmouth continues to use VUEWorks Asset Management Software to track their Public Works Assets. Their pavement rating system is based on the ASTM rating system. A complete survey of pavement within the town was performed over seven years ago with the help of an engineering consultant. Falmouth uses a couple of strategies to determine their repair schedule. The town has a 10-year roadway plan for major repairs. This is funded by the town operating budget and a Capital Plan. The town also has a service call/ work order system to take requests from the public for signs, potholes, sweeping and grading, etc. The town does some work in-house and contracts its crack sealing and large repairs out. These are covered by the town operating budget and Capital Plan.

1.3.6 HARWICH PAVEMENT MANAGEMENT ACTIVITIES

The Town of Harwich DPW currently works with StreetScan to maintain a road management database. StreetScan conducted a pavement survey for the Town in 2018. The DPW does not utilize the database to develop a PCI (Pavement Condition Index). The town rates roads in 1 of 4 structural conditions: good, fair, deficient, intolerable

The DPW does have a five-year road maintenance plan that is updated every few years and is available on the Harwich website. The town uses Chris Nickerson, Highway Road Manager who is a certified pavement inspector, to develop a plan based on his experience, training and knowledge of Harwich's 481 public roads (142 miles). The town attempts to balance maintenance with repair to avoid costly reconstruction utilizing many different processes and procedures.

The Town of Harwich typically spends \$1.5 million on their annual road maintenance program which is usually comprised from \$700,000 in Chapter 90 funds, \$700,000 in a local article and \$100,000 in budget. However, no road article was supported for FY 2020.

1.3.7 MASHPEE PAVEMENT MANAGEMENT ACTIVITIES

The Town of Mashpee hired Fay, Spofford and Thorndike (now Stantec) in 2014 to complete a town-wide pavement assessment. The Town is proposing an update to this report this year. The assessment excluded the Town's major collector roads as improvements on these are funded through Chapter 90 (regular maintenance is funded



through the operating budget). Improvements to the local/neighborhood roads are funded through the operating budget. The Town uses the assessment in the study to prioritize the projects to be completed on these local roads. The Town has a two-year capital plan which is updated annually based on funding.

One of the challenges is that the current level of funding in both Chapter 90 and the operating budget is not sufficient to maintain the roads to an acceptable PCI. This is due partly to inclusion of "Complete Street" improvements on the collector roads (sidewalks, shared use paths, etc.) and the need for isolated improvements (not part of larger road project) to drainage infrastructure in response to the increased frequency/intensity of storms as well as the funding amounts not keeping up with increased construction costs.

1.3.8 ORLEANS PAVEMENT MANAGEMENT ACTIVITIES

In Spring 2019, the Town of Orleans retained the firm of Vanasse Hangen Brustlin (VHB) to update the Town's pavement management system by performing pavement condition evaluations on all Town-maintained roadways and parking lots with the goal of prioritizing pavement maintenance and rehabilitation projects and analyzing budgetary needs. With this year's efforts, VHB conducted a street survey and compiled a report update. Historically, the Town performs a pavement management study update every five (5) years.

The current network PCI rating is 83, which is up from 79 in 2013. The Town appropriates about \$365,000 per year for pavement management above and beyond Chapter 90 funds. VHB estimates that a current budget of approximately \$660,000 per year is anticipated to maintain the average PCI over the five-year study period but will allow the backlog of work to increase due in part to inflation.

1.3.9 PROVINCETOWN PAVEMENT MANAGEMENT ACTIVITIES

Environmental Partners Group (EPG) was hired in 2016 to update the Town's pavement management program that has been used to assess existing roadway pavement conditions and establish a Capital Improvement Plan (CIP) for improvements. The planning tool continues to be utilized to establish an order-of-magnitude budget for roadway maintenance and reconstruction.

Recent roadway improvement activities include:

• Completed the reconstruction of 2,600 linear feet of Commercial Street in the Spring 2019. Work included reconstructing all drainage infrastructures, replacing



water service lines, new sidewalks and installation of a porous pavement roadway. Project cost \$3.1 Million.

- In the past year the Town has resurfaced several roadways with approximately 2,000 tons of asphalt.
- Received \$95,250 in grant funding from The Office of Coastal Zone Management to develop finalized drawings to reconstruct Commercial Street Phase 5.
- Redeveloped the Bradford / Standish Street Intersection to accommodate an increase in pedestrian and vehicular demands while providing green infrastructure to assist in stormwater management.

1.3.10 SANDWICH PAVEMENT MANAGEMENT ACTIVITIES

The Town of Sandwich works with the firm of Vanasse Hangen Brustlin (VHB) to perform pavement management services. The VHB study was undertaken to re-evaluate pavement conditions in Sandwich and to allow for the analysis of various funding scenarios. VHB performed a detailed inspection of the condition of the pavement on all town-maintained roads and updated a database of this information using VHB's "Smart Asset Management and Inventory System" (SAM) software. This year's efforts are focused on updating data with recent repairs and evaluating funding scenarios.

To determine road repair strategies, the town mainly uses PCI (Pavement Condition Index) and Benefit. For estimated costs for implementing various repair strategies, the town uses the County's bid process and incorporates these into their own spreadsheets. The town's 5-Year plan changes dramatically year-to-year but provides a guide to follow as funds become available.

1.3.11 TRURO PAVEMENT MANAGEMENT ACTIVITIES

Truro uses local knowledge to determine pavement repair priorities.

1.3.12 YARMOUTH PAVEMENT MANAGEMENT ACTIVITIES

The Town of Yarmouth works with the firm of Vanasse Hangen Brustlin (VHB) to perform pavement management services. VHB services consist of performing a comprehensive study to evaluate pavement conditions in Yarmouth and to allow for the analysis of various funding scenarios; perform a detailed inspection of the condition of the pavement on all town-maintained roads and update a database of this information using VHB's SAM software.



To determine repair strategies, the town reviews an initial list generated by the software and then decides whether to apply chip seal, double ship seal, or overlay. Main roads are treated with rubber chip seal or overlay. In the town's capital plan, annual spending ranges from \$1.3 million to \$1.5 million for roadway maintenance.

1.3.13 WELLFLEET PAVEMENT MANAGEMENT ACTIVITIES

The Town of Wellfleet retained the firm of BETA Group, Inc. (BETA) to develop a Pavement Management Program (PMP) in 2015. The Town is currently looking at updating the PMP.

In addition, the Town DPW actively keeps their own list and performs inspections on a regular basis. In Fall 2019, the following roads will be resurfaced: sections of Long Pond Road, sections of Gull Pond Rd, Schoolhouse Hill Rd, Coles Neck Road and sections of Brown's Neck Road.

1.4 SUMMARY OF TOWN PAVEMENT MANAGEMENT EFFORTS

Based on responses from the September 2019 email survey and subsequent follow-up, the following table summarizes the activities that responding towns use for pavement management.



Table 2 – Municipal Pavement Management Activities Summary

Town	Pavement Management Consultant	Software Program	Latest Survey Year
Barnstable	BETA Group Inc.	BETA - Microsoft Access	2018
Bourne	BETA Group Inc.	BETA - Microsoft Access	2017
Brewster	CDM Smith	MicroPaver	2015
Chatham	BETA Group Inc.	BETA - Microsoft Access	2018
Dennis	VHB	VHB - SAM	
Eastham	Environmental Partners Group	none	2016
Falmouth	TBA	VUEWorks Asset Management	2012
Harwich	StreetScan	Streetlogix	2018
Mashpee	Stantec	Cartegraph Systems	2015
Orleans	VHB	VHB - SAM	2019
Provincetown	Environmental Partners Group	none	2016
Sandwich	VHB	VHB - SAM	
Truro	none	none	
Yarmouth	VHB	VHB - SAM	
Wellfleet	BETA Group Inc.	BETA - Microsoft Access	2015

As seen in Table 2, the most prevalent technique used by local municipalities is using a Pavement Management System developed by an engineering consultant. BETA Group, Inc. (BETA) and Vanasse Hangen Brustlin (VHB) are the two most commonly used consultants who assist towns with their pavement inventory and management systems on Cape Cod. The use of a consultant allows a third party to perform the pavement inspections and compile the results. Both consultants compile results into a user-friendly GIS application, which allows the towns to easily access and track pavement activities. A



slight variation between the two consultants is that BETA classifies the pavement results using a Road Surface Rating (RSR) while VHB follows the PCI rating system. Both systems use a 0-100 scale to describe the general condition of the roadway.

2. Pavement Management Analyses

According to information prepared for the Cape Cod Regional Transportation Plan, the Cape Cod Region possesses 738.98 miles of roadway eligible for federal funding. Of those miles, 565.0 are under the jurisdiction of the Cape's local communities.

MassDOT evaluates roads under their own jurisdiction and a selection of municipally owned roadways. The following table lists the corresponding rating from Excellent to Poor, based on a "PSI" (Pavement Serviceability Index) rating – roughly analogous to the "Pavement Condition Index" (PCI) commonly used.

Pavement Condition	Excellent	Good	Fair	Poor	
"PSI" Range	PSI >=3.5	PSI 2.8-3.5	PSI 2.3-2.8	PSI < 2.3	

2.1.1 CCC EVALUATIONS OF PAVEMENT CONDITIONS — "WINDSHIELD" SURVEYS

Since 2011, Cape Cod Commission staff have performed "windshield" surveys throughout Barnstable County. In 2014, a new data collection strategy was deployed, based on Geographic Information Systems' needs and strengths. Data-collection regions of each town were identified which contained roughly one-third of the mileage of federal-aid eligible municipal roadways. The quality and accuracy of the data collection was greatly improved using GPS-capable tablet computers. The following figure shows the roadways that the CCC staff collected data on in 2019.



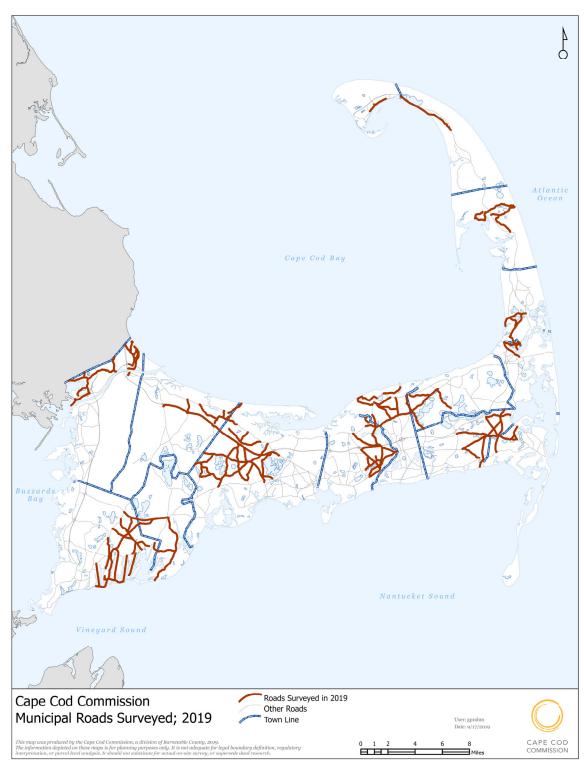


Figure 2 - Municipal Roads Surveyed in 2019



The following table provides a summary by town of the Cape Cod Commission's windshield survey data.

Table 3 – Surveys of Pavement Condition - miles

Town	Very Good to Excellent	Good to Very Good	Fair to Good	Poor to Fair	Poor	Totals
Barnstable	1.1	39.8	55.3	14.4	1.0	111.6
Bourne	1.3	2.8	26.7	10.6	0.4	41.7
Brewster	0.9	3.0	15.2	6.8	0.6	26.5
Chatham	0.0	1.0	7.4	4.4	0.0	12.8
Dennis	2.5	20.8	20.2	2.0	0.0	45.5
Eastham	1.5	4.1	1.9	9.3	0.0	16.9
Falmouth	1.8	14.8	44.3	23.8	0.4	85.2
Harwich	0.2	13.6	19.1	10.0	0.2	43.1
Mashpee	0.0	4.9	20.9	2.2	1.7	29.6
Orleans	1.6	8.3	6.1	0.4	0.6	16.9
Provincetown	0.8	0.6	11.9	0.0	0.0	13.3
Sandwich	0.1	7.3	21.7	5.7	3.2	37.9
Truro	0.0	0.0	8.4	4.0	0.0	12.4
Wellfleet	0.5	3.0	14.7	1.5	0.0	19.7
Yarmouth	1.6	18.1	30.1	2.2	0.0	52.1
Total:	13.8	141.9	303.8	97.5	8.1	565.0

Source: latest data available from 2017-2019, collected by Cape Cod Commission

As shown in the table above, approximately 565 miles of roadway have been surveyed at least once as recently as 2019. The most common rating "Fair to Good" yielded over 300 miles, which is an improvement over 2018 observations. This is followed by 141 miles of "Good to Very Good", 97.5 miles of "Poor to Fair," approximately 13 miles for "Very Good to Excellent" and approximately 8 miles of "Poor." The following figures provide a graphic of the CCC survey data in a series of four maps (Upper Cape, Mid-Cape, Lower Cape and Outer Cape). The CCC evaluations are shown as colored parallel lines ranging from Blue (Very Good to Excellent) to Red (Poor).



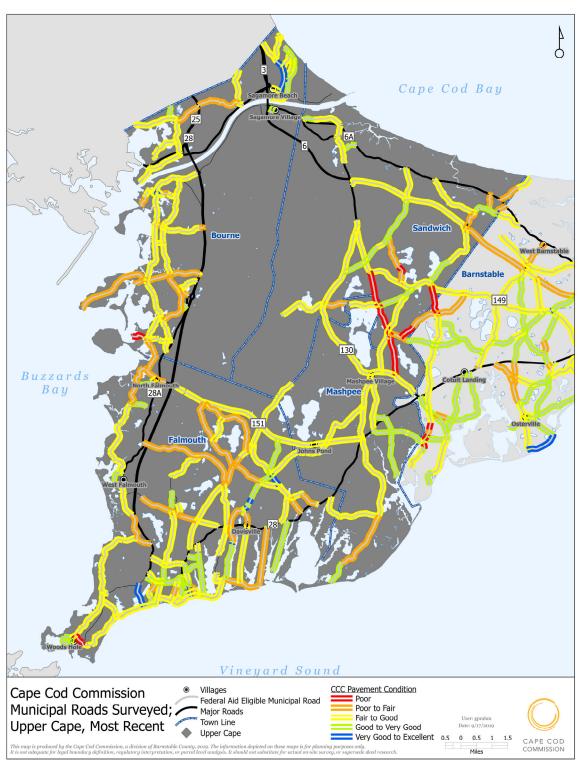


Figure 3 -Pavement Condition Surveys: Upper Cape



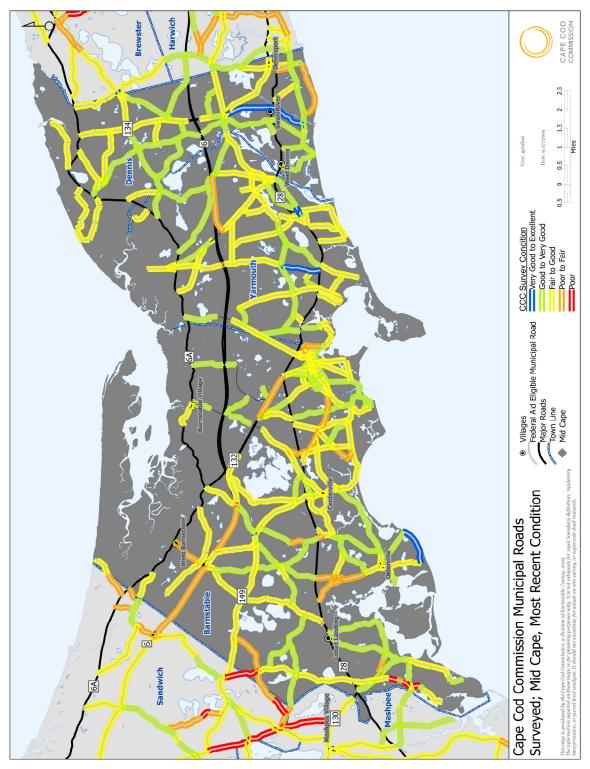


Figure 4 - Pavement Condition Surveys: Mid-Cape



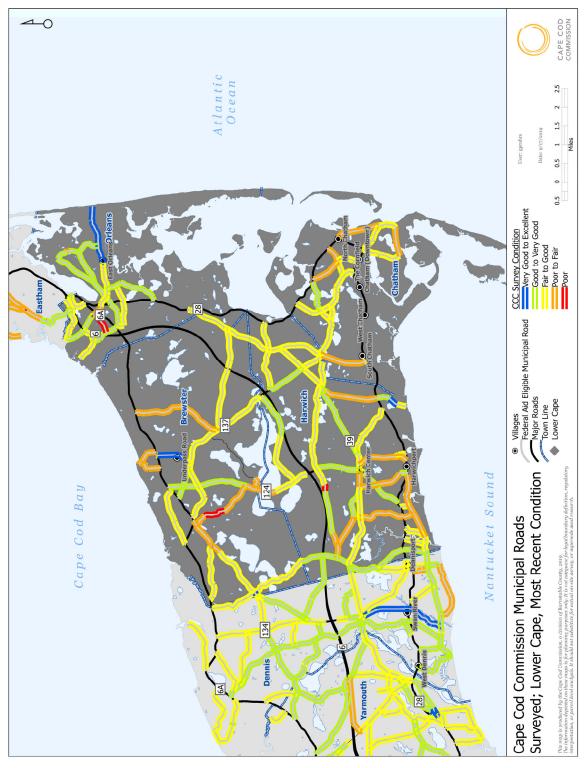


Figure 5 – Pavement Condition Surveys: Lower Cape



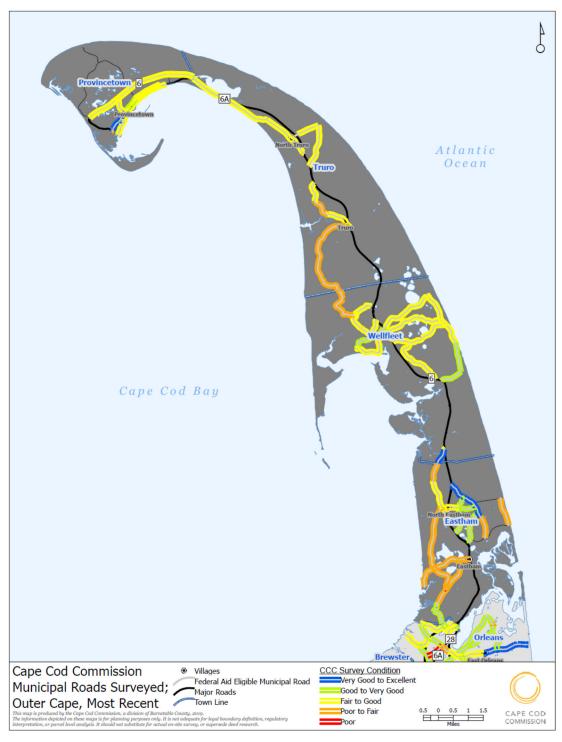


Figure 6 – Pavement Condition Surveys: Outer Cape



2.1.2 CCC EVALUATIONS OF PAVEMENT CONDITIONS – ATR SITES

Since 2011, CCC traffic technicians have been tasked with collecting pavement condition data as part of their work in setting up Automatic Traffic Recorders (ATRs). Including data collected in subsequent years, this yielded pavement condition data at 709 unique locations throughout the Cape's 15 towns. Some locations were surveyed more than once over a period of years – however, only the most recent data are used for the analysis described below.

Since a 48-hour traffic count was collected from each ATR, results include a "Weighted" pavement condition for each town. By multiplying the Annual Average Daily Traffic (ADT) at each location times that locations' observed pavement condition, we then totaled these results and divided by the sum of Annual Average Daily Traffic from that town's ATR's. Annual Average Daily Traffic is calculated by multiplying the appropriate MassDOT monthly adjustment factor times the observed average daily traffic over the 48-hour ATR data collection period. The following table presents town-wide averages of the pavement condition information collected at ATR sites.

Table 4 -Summary of Pavement Conditions at ATR Sites

TOWN	# of Sites	Avg. AADT	Avg. Condition	Weighted Condition
Barnstable	94	7,230	2.77	2.67
Bourne	53	4,945	2.81	2.76
Brewster	21	4,630	2.57	2.40
Chatham	41	5,155	3.12	3.14
Dennis	57	6,245	2.84	2.86
Eastham	22	2,490	3.32	2.85
Falmouth	68	6,815	2.90	2.88
Harwich	44	6,910	2.80	2.68
Mashpee	40	7,700	2.87	3.02
Orleans	35	5,660	2.69	2.56
Provincetown	31	4,140	2.86	2.88
Sandwich	65	5,510	2.98	2.89
Truro	40	2,380	3.15	2.93
Wellfleet	28	2,945	2.89	2.91
Yarmouth	70	7,370	2.72	2.72



See Table 1 for descriptions of pavement conditions (ranging from "Excellent" = 1 to "Poor" =5). Pavement conditions including comments and other ATR data for each of the 709 collection sites are presented in the appendix.

The following figures are a graphical display of the individual site data for sections of Barnstable County (Upper Cape, Mid-Cape, and Lower Cape). The pavement condition at each ATR site is shown as a colored circle ranging from Blue (Very Good to Excellent) to Red (Poor).



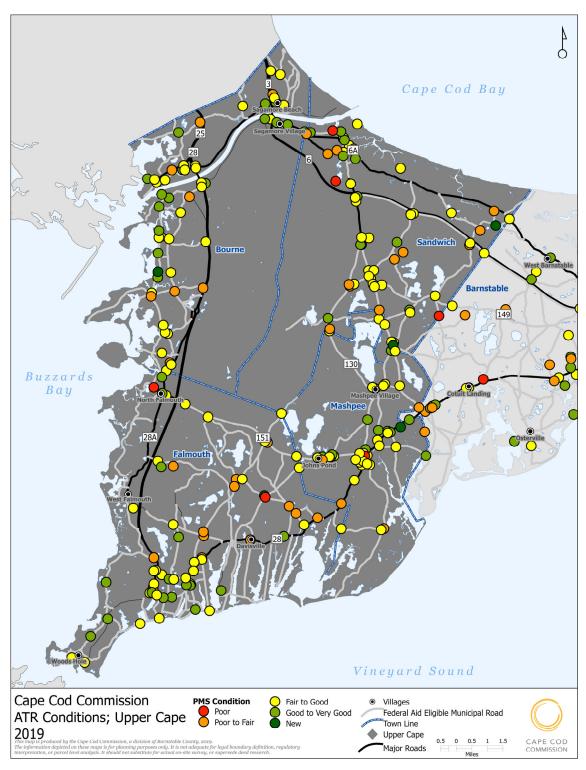


Figure 7 – Pavement Conditions at ATR Locations: Upper Cape Source: latest data available up to 2019 collected by Cape Cod Commission



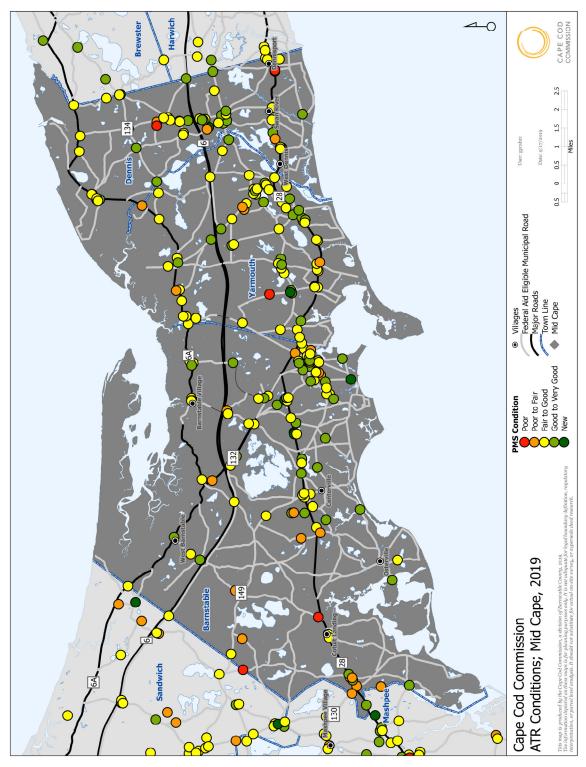


Figure 8 – Pavement Conditions at ATR Locations: Mid-Cape Source: latest data available up to 2019 collected by Cape Cod Commission



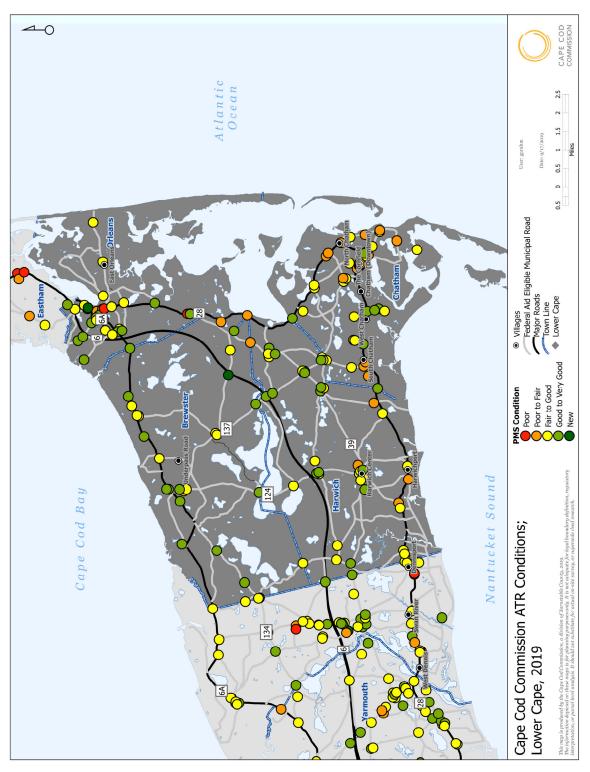


Figure 9 – Pavement Conditions at ATR Locations: Lower Cape Source: latest data available up to 2019 collected by Cape Cod Commission



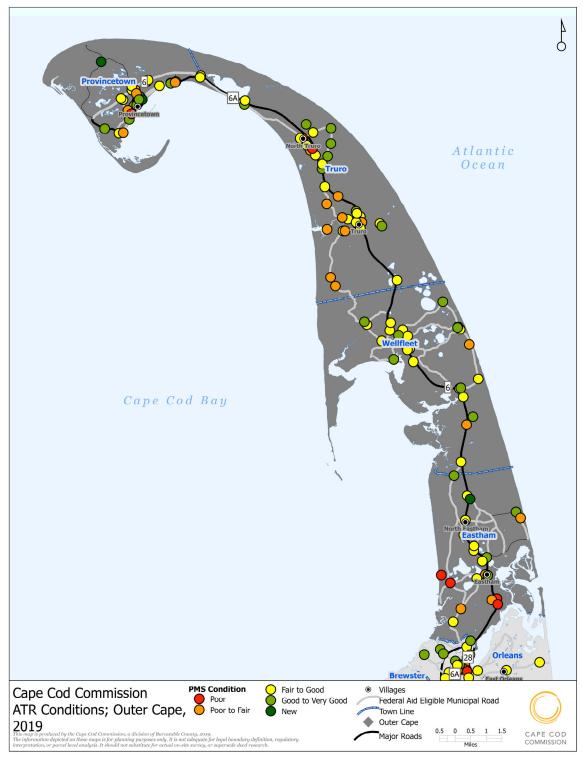


Figure 10 – Pavement Conditions at ATR Locations: Outer Cape

 $Source: \ latest\ data\ available\ up\ to\ 2019\ collected\ by\ Cape\ Cod\ Commission$



3. Recommendations for Achieving Improved Pavement Condition

After the pavement observations have been recorded and categorized, the next step is to calculate the pavement rating score, identify the proper treatment and appropriate timeline for maintenance.

Surface Distress Assessment

For each pavement management section, the severity and extent of nine major pavement distresses are recorded, and then entered into a weighted formula to arrive at a Pavement Condition Index (PCI). The distresses are categorized as base related or surface related distresses. Base related distresses indicate that the pavement structure is inadequate for the existing traffic load and soil conditions. Streets that show significant base related distresses may need to have the pavement structure strengthened with either thicker or stronger base or pavement materials. Surface related distresses are caused by age and weathering of the pavement. Streets that have predominantly surface related distresses are excellent candidates for maintenance sealing to inhibit further pavement oxidization (the main effect of aging). Streets with more of the base-related distresses will most likely need some full depth patching, structural overlays or reclamation/reconstruction.

The four base related distresses are:

- Potholing or non-utility patching
- Alligator cracking
- Distortion
- Rutting

The five surface related distresses are:

- Block cracking
- Transverse or longitudinal cracking
- Bleeding or polished aggregate
- Surface wear or raveling
- Shoving, slippage or corrugation

The Five Treatment Bands

The pavement management system uses broad ranges to group the individual repair types into five major treatment bands. Treatment bands are a useful tool to summarize data on a Town-wide basis. An individual road segment will fall into a category based on the strategy table's output of repair types and will vary due to functional classification. The goal is to gain a broad understanding of the existing conditions in simple yet meaningful terms.



Table 5 - Treatment Band Descriptions

TREATMENT BAND	PCI*	Description
DO-NOTHING	93-100	Excellent condition - in need of no maintenance.
ROUTINE MAINTENANCE	86-92	Good condition – may need crack sealing or minor localized repair.
PREVENTIVE MAINTENANCE	76-85	Fair condition – pavement surface may need surface sealing, full depth patch and/or crack sealing.
STRUCTURAL IMPROVEMENT	56-75	Deficient condition – pavement surface structure in need of added strength for existing traffic. Typical repairs are overlay with or without milling.
BASE REHABILITATION	0-55	Poor condition – in need of base improvement. Typical repairs are reclamation or full depth reconstruction.

^{*}Note: Treatment bands are defined below. These are only general PCI ranges for reference purposes and represent only one pavement type. There are several fields considered by the strategy table when assigning repair types to each individual street. Source: VHB

Do-Nothing

The Do-Nothing category exhibits roads which need no maintenance. These roads are in excellent condition and existing distresses generally do not need to be addressed.

Routine Maintenance

Routine maintenance activities are those which are taken to correct a specific pavement distress. Routine maintenance usually addresses localized pavement defects and includes activities such as:

- Full depth patching;
- Skin patching;
- Crack sealing.

Preventive Maintenance

Preventive maintenance activities are those which are performed at planned intervals to protect and seal the pavement. Seals are designed to provide one or more of the following benefits:

• Prevent the intrusion of air and moisture;



- Fill small cracks and voids;
- Rejuvenate an oxidized binder;
- Provide a new wearing surface.

Structural Improvement

Structural improvement includes the work necessary to restore the pavement to a condition that will allow it to perform satisfactorily for several years. Generally, a structural improvement will consist of a milling the existing pavement down and applying a new Hot Mix Asphalt Overlay allowing existing grades to be maintained. When the existing grade can be increased a new Hot Mix Asphalt course can simply be placed upon the existing surface. Structural improvements also include the work necessary to prepare the pavement for an overlay, either with or without milling. The major activities involved in the rehabilitation process are:

- Partial depth patching;
- Full depth patching;
- Joint and crack sealing;
- Grinding and milling;
- Hot Mix Asphalt Leveling Courses.

Base Rehabilitation

Base rehabilitation utilizes one of two methods:

- Reclamation;
- Reconstruction.

Reclamation is the process of rehabilitating existing deteriorated pavements. The existing pavement and base, subbase, and possibly subgrade are pulverized and blended to create a homogenous pavement base. This reclaimed pavement base is then paved with a new Hot Mix Asphalt surface. Reconstruction is the complete removal and replacement of a failed pavement, and might also involve widening, realignment, traffic control devices, safety hardware, and major base and drainage work.

The Cape Cod MPO is committed to exploring improved pavement management strategies and techniques to help optimize investment and achieve maximum improvement in overall PCIs.



4. Conclusion/Recommendations for Pavement Management Survey Enhancement

The data collected in the monitoring process will be continually analyzed to identify overall pavement conditions in the different Cape Cod towns to assist in programming maintenance and reconstruction activities. Cape Cod Commission staff will continue advance Pavement Management Survey activities throughout the fifteen towns of Barnstable County. Efforts will continue such as:

- Identify individual towns' methods for pavement condition evaluation and programming for improvements
- Develop a GIS web-based application to display the Annual Pavement Survey results to assist towns in their pavement management efforts. The GIS web application may be made available for public viewing as well.
- Identify "gaps" in pavement condition information on Municipally-owned Federal Aid eligible roadways and prioritize and implement CCC data collection activities on these roadways
- Improve CCC skills in performing pavement evaluations
- Analyze local communities' bid prices to develop Cape-specific improvement costs of various pavement conditions
- Generate listings of roadways with poor pavement conditions
- Explore strategies and techniques for a regional pavement management plan as part of a potential Regional Capital Plan.

APPENDIX -

Cape Cod Commission Pavement Condition - Comments

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
BARNSTABLE	ASA MEIGS ROAD	Major				Yes	Yes	No	Major		
	CEDAR STREET WEST								-		
BARNSTABLE	BARNSTABLE	Minor		Minor	Minor	Yes		Yes	Minor		
BARNSTABLE	CHURCH STREET	Minor		Minor	Minor			Yes	Minor		
BARNSTABLE	CROOKED CARTWAY	Major				Yes	Yes	No	Major		
BARNSTABLE	GREAT MARSH ROAD										
2,	HIGH STREET WEST										
BARNSTABLE	BARNSTABLE			Minor							
BARNSTABLE	HOWLAND ROAD	Major		Major	Minor			Yes	Minor	Minor	
BARNSTABLE	LOVELLS LANE					Yes					New sidewalk
BARNSTABLE	LUMBERTS MILL ROAD								Minor		
BARNSTABLE	LOWIBERTS WILL ROAD								IVIIIIOI		
BARNSTABLE	MEETING HOUSE WAY	Minor		Minor	Minor	Yes		Yes	Minor		
BARNSTABLE	NOTTINGHAM DRIVE										
BARNSTABLE	NYE ROAD	Minor		Major		Yes	Yes		Minor		
BARNSTABLE	OAK STREET	Minor	Major	Major	Major	Yes	Yes	Yes	Major	Major	
BARNSTABLE	OLD FALMOUTH ROAD	Major				Yes	Yes	Yes	Minor		
BARNSTABLE	OLD STAGE ROAD	Major		Major	Minor	Yes	Yes	Yes	Major		
DAMISTABLE	OSTERVILLE WEST	iviajoi		iviajoi	14111101	163	163	163	iviajoi		
BARNSTABLE	BARNSTABLE ROAD								Minor		
BARNSTABLE	PARKER ROAD	Minor		Minor	Minor			Yes	Minor		
BARNSTABLE	PROSPECT STREET	Minor		Minor		Yes		Yes	Minor		New sidewalk
BARNSTABLE	RACE LANE	Minor				Yes	Yes	No	Minor		
BARNSTABLE	RIVER ROAD										
BARNSTABLE	SANDY NECK ROAD	Minor		Minor	Minor			Yes	Minor		

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
BARNSTABLE	SANTUIT NEWTOWN ROAD	Minor		Minor		Yes		Yes			
DANIVSTABLE	NOAD	14111101		IVIIIIOI		163		163			
BARNSTABLE	SCHOOL STREET	Major				Yes	Yes	No	Major		
BARNSTABLE	SERVICE ROAD	Minor		Major	Minor	Yes	Yes	Yes	Minor		
BARROTABLE	SHOOT FLYING HILL	14111101		iviajoi	14111101	103	103	103	IVIIIIOI		
BARNSTABLE	ROAD	Minor			Minor	Yes		Yes	Minor		
BARNSTABLE	WAKEBY ROAD			Minor							
BOURNE	ACADEMY DRIVE	Major		Minor		Yes		Yes	Minor		
BOURNE	ADAMS STREET								Minor		
											Rather narrow at points. Better at the start
BOURNE	BOURNEDALE ROAD	Minor		Minor		Yes	Yes		Minor		and end of the road
BOURNE	CANAL STREET	Major						Yes	Minor		
BOURNE	CLARK ROAD	Major				Yes		Yes	Minor		
BOURNE	GIBBS ROAD	Major						Yes	Minor		
BOURNE	HEAD OF THE BAY ROAD	Minor		Major		Yes		Yes	Minor		
BOURNE	HERRING POND ROAD	Minor		Minor	Minor	Yes	Yes	Yes	Minor		Rather narrow at points. Better at the start and end of the road
BOURNE	HOMESTEAD AVENUE	Minor			Minor			Yes	Minor		
BOURNE	INDIAN TRAIL	Minor			Minor			Yes	Minor		
BOURNE	MAIN STREET	Major		Minor		Yes		Yes	Minor		
BOURNE	MEETINGHOUSE LANE	Minor				Yes					
BOURNE	NORRIS ROAD	Minor			Minor			Yes	Minor		
BOURNE	OLD PLYMOUTH ROAD	Major				Yes		Yes	Minor		
BOURNE	PEAKED CLIFF ROAD	Minor			Minor			Yes	Minor		
BOURNE	PLYMOUTH LANE								Minor		

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
BOURNE	PURITAN ROAD	Minor		Major		Yes		Yes	Minor		
3002	SAINT MARGARETS										
BOURNE	STREET	Minor		Major		Yes		Yes	Minor		
BOURNE	STANDISH ROAD	Major				Yes		Yes	Minor		
BOURNE	VICKERSON AVENUE	Minor			Minor			Yes	Minor		
BOURNE	WILLISTON ROAD								Minor		
BREWSTER	AIRLINE ROAD				Minor				Minor		
BREWSTER	GREAT FIELDS ROAD	Major	Minor	Major	Minor	Yes	Yes		Major		Literally not paved - No pavement
BREWSTER	SATUCKET ROAD				Minor	Yes		Yes	Minor		
BREWSTER	SLOUGH ROAD	Minor		Minor		Yes			Minor		Half road is patched
BREWSTER	STONY BROOK ROAD					Yes			Minor		Half patched road
СНАТНАМ	MEETING HOUSE ROAD	Minor		Minor	Minor			Yes	Minor		
СНАТНАМ	OLD COMERS ROAD	Minor				Yes			Minor		
СНАТНАМ	OLD QUEEN ANNE ROAD	Minor		Minor	Minor	Yes		Yes	Minor		
СНАТНАМ	TRAINING FIELD ROAD	Minor							Minor		
DENNIS	AIRLINE ROAD				Minor				Minor		
DENNIS	BAYVIEW ROAD				Minor	Yes		Yes			
DENNIS	BEACH STREET	Minor			Minor			Yes	Minor		
DENNIS	EAST WEST DENNIS ROAD			Minor	Minor			Yes			
DENNIS	ELM STREET					Yes			Minor		
DENNIS	HIGHBANK ROAD	Minor		Minor		Yes		Yes			
DENNIS	HOKUM ROCK ROAD	Major		Minor	Minor	Yes		Yes	Minor		

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
DENNIS	HORSEFOOT PATH	Minor			Minor			Yes	Minor		
DENNIS	NEW BOSTON ROAD	Minor			Minor			Yes	Minor		
DENNIS	NOBSCUSSETT ROAD	Minor				Yes		Yes			
DENNIS	OLD BASS RIVER ROAD	Major		Minor	Minor	Yes		Yes	Minor		
DENNIS	SCARGO HILL ROAD				Minor			Yes	Minor		
DENNIS	SESUIT NECK ROAD	Minor			Minor	Yes		Yes	Minor		
DENNIS	SETUCKET ROAD				Minor	Yes		Yes	Minor		
DENNIS	SHORE DRIVE				Minor	Yes		Yes			
DENNIS	SOUTH YARMOUTH ROAD	Minor			Major			Yes			
DENNIS	WHIG STREET					Yes			Minor		
EASTHAM	BRIDGE ROAD	Major		Minor	Major	Yes		Yes	Minor		Little connection road at herring and bridge is dirt and rutted
EASTHAM	CANAL ROAD	Minor			Major			Yes	Minor		
EASTHAM	HERRING BROOK ROAD	Major		Major	Major	Yes		Yes	Minor		Little connection road at herring and bridge is dirt and rutted
EASTHAM	ROUTE 6A										
EASTHAM	SAMOSET ROAD	Major		Major	Minor	Yes		Yes			
EASTHAM	SMITH LANE							Yes			
FALMOUTH	ACAPESKET ROAD	Minor	Minor	Minor	Minor	Yes			Minor		
FALMOUTH	BARROWS ROAD	Major		Minor	Minor	Yes	Yes	Yes	Major		
FALMOUTH	CARRIAGE SHOP ROAD	Major		Minor	Minor	Yes	Yes	Yes	Major		
FALMOUTH	CENTRAL AVENUE				Minor	Yes	No	Yes	Minor		
FALMOUTH	CROSS ROAD	Major		Minor	Minor	Yes	Yes	Yes	Major		

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
FALMOUTH	CURRIER ROAD	Major		Minor	Minor	Yes		Yes	Major		
FALMOUTH	DAVISVILLE ROAD				Minor	Yes	No	Yes	Minor		
FALMOUTH	EMERSON ROAD			Minor	Minor						
FALMOUTH	FRESH POND ROAD	Minor			Minor	Yes		Yes	Minor		
FALMOUTH	HAYWAY ROAD	Major		Minor	Minor	Yes		Yes	Major		
FALMOUTH	JOHN PARKER ROAD	Major		Minor	Minor	Yes	Yes	Yes	Minor		
FALMOUTH	MARAVISTA AVENUE	Major			Minor	Yes					
FALMOUTH	MARAVISTA AVENUE EXTENSION			Minor	Minor			Yes	Minor		
FALMOUTH	MEETING HOUSE ROAD			Major	Minor		Yes				
FALMOUTH	MENAUHANT ROAD	Major		Minor	Minor	Yes	No	Yes	Minor		
FALMOUTH	NATHAN ELLIS HIGHWAY	Minor				Yes		Yes			
FALMOUTH	OLD BARNSTABLE ROAD	Major		Minor	Minor	Yes	Yes	Yes	Major		Bridge at start has several sealed cracks
FALMOUTH	RED BROOK ROAD	Major				Yes		Yes	Minor		
FALMOUTH	SEACOAST SHORES BOULEVARD					Yes					
FALMOUTH	SHOREVIEW AVENUE			Minor	Minor						
FALMOUTH	SHOREWOOD DRIVE			Minor		Yes	Yes				
FALMOUTH	THATCHERS LANE			Minor	Minor	Yes	Yes		Minor		
HARWICH	CHATHAM ROAD	Major						Yes	Minor		
HARWICH	CHURCH STREET	Minor		Major		Yes		Yes	Minor		
HARWICH	DEPOT ROAD	Major		Minor	Minor	Yes		Yes	Minor		
HARWICH	DEPOT STREET	Minor		Minor		Yes			Minor		Half road is patched

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
HARWICH	ORLEANS ROAD	Major	Minor	Major	Minor	Yes		Yes	Major		Major patching
HARWICH	PLEASANT BAY ROAD	Major		Major	Minor	Yes		Yes	Major		
HARWICH	QUEEN ANNE ROAD	Minor	Minor	Minor	Minor	Yes		Yes	Minor		Half new patch
HARWICH	ROUTE 137	Minor		Minor	Minor	Yes		Yes	Minor		
HARWICH	UNCLE VENIES ROAD								Minor		
MASHPEE	GREAT NECK ROAD SOUTH	Major			Minor	Yes		Yes	Minor		
MASHPEE	GREAT OAK ROAD	Major		Minor	Minor	Yes		Yes	Minor		
MASHPEE	MONOMOSCOY ROAD	Major				Yes		Yes	Minor		
MASHPEE	NATHAN ELLIS HIGHWAY	Major		Minor	Minor	Yes		Yes	Major		
MASHPEE	OLD BARNSTABLE ROAD	Minor		Minor				Yes	Minor		
MASHPEE	RED BROOK ROAD	Major				Yes		Yes	Minor		
ORLEANS	BRIDGE ROAD	Major			Minor	Yes		Yes			
ORLEANS	CANAL ROAD	Minor			Major			Yes	Minor		
ORLEANS	MAIN STREET	Minor			Minor	Yes					
ORLEANS	ROCK HARBOR ROAD	Major			Minor	Yes		Yes			
PROVINCETOWN	BRADFORD STREET	Minor			Minor	Yes			Minor		
PROVINCETOWN	CONWELL STREET	Minor			Minor	Yes			Minor		
SANDWICH	CHASE ROAD	Minor		Major	Minor	Yes		Yes	Major		
SANDWICH	HOWLAND LANE	Major		Major	Minor			Yes	Minor	Minor	
SANDWICH	JONES LANE	Minor		Major	Minor			Yes	Minor		
SANDWICH	OLD COUNTY ROAD			Minor							

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
	QUAKER MEETING										
SANDWICH	HOUSE ROAD	Minor		Minor				Yes	Minor		
SANDWICH	SANDY NECK ROAD	Minor		Minor	Minor	Yes	Yes	Yes	Minor		
CANDWICH	CEDVICE BOAD	Minor		Major	Minor	Voc	Voc	Voc	Minor	Minor	
SANDWICH	SERVICE ROAD	Minor		Major	Minor	Yes	Yes	Yes	Minor	Minor	
TRURO	SHORE ROAD	Minor		Minor	Minor	Yes		Yes	Minor		
	CAHOONS HOLLOW										
WELLFLEET	ROAD	Minor			Minor	Yes		Yes			
	CHEQUESSETT NECK										
WELLFLEET	ROAD	Minor			Minor			Yes			
WELLFLEET	COMMERCIAL STREET	Minor			Minor			Yes			
	EAST COMMERCIAL										
WELLFLEET	STREET	Minor			Minor			Yes			
WELLFLEET	HOLBROOK AVENUE										
WELLFLEET	KENIDDICK AVENUE	Minor			Naiman			Vas			
WELLFLEET	KENDRICK AVENUE	Minor			Minor			Yes			
WELLFLEET	LONG POND ROAD	Minor			Minor		Yes	Yes			
WELLI ELLI	OLD COUNTY ROAD	Willion			14111101		103	103			
WELLFLEET	SOUTH	Minor			Minor	Yes		Yes	Minor		
WELLFLEET	WHITS LANE										
	BRAY FARM ROAD										
YARMOUTH	NORTH	Major		Minor	Minor	Yes		Yes	Minor		
	BRAY FARM ROAD										
YARMOUTH	SOUTH	Major		Minor	Minor	Yes		Yes	Minor		
YARMOUTH	CAPTAIN SMALL ROAD	Minor		Minor	Minor	Yes		Yes	Minor		
YARMOUTH	GREAT WESTERN ROAD	Minor		Minor	Minor	Yes		Yes			
TANIVIOUTH	OVENT MESTERIN KOND	IVIIIIVI	1	IVIIIIVI	IVIIIIUI	162		162			
YARMOUTH	HIGHBANK ROAD	Minor	1	Minor	Minor	Yes		Yes			
		14111101		14111107	14111101	103		103			
YARMOUTH	LONG POND DRIVE	Minor			Minor	Yes		Yes			
											We are driving at a slant (road not even).
YARMOUTH	NORTH DENNIS ROAD	Minor			Major	Yes		Yes	Minor		Huge swaths of patches
YARMOUTH	NORTH MAIN STREET	Minor			Major	Yes		Yes			

		Alligator	Block	Edge	Linear	Patched		Sealed			
TOWN	STREET NAME	Cracking	Cracking	Cracking	Cracking	Pavement	Potholes	Cracks	Weathering	Rutting	Comments
YARMOUTH	OLD MAIN STREET										
YARMOUTH	RAYMOND AVENUE	Minor			Minor	Yes		Yes	Minor		
YARMOUTH	REGIONAL AVENUE	Minor			Minor	Yes		Yes	Minor		
YARMOUTH	SETUCKET ROAD	Minor			Minor			Yes			
YARMOUTH	SHERIDAN ROAD	Minor			Minor	Yes		Yes			
YARMOUTH	STATION AVENUE	Minor		Minor	Minor	Yes		Yes	Minor		
YARMOUTH	WEIR ROAD				Minor			Yes			
YARMOUTH	WEST GREAT WESTERN ROAD				Minor	Yes		Yes			
YARMOUTH	WHITES PATH	Minor		Minor	Minor	Yes		Yes	Minor		We are driving at a slant (road not even). Huge swaths of patches
YARMOUTH	WITCHWOOD ROAD	Minor			Minor	Yes		Yes			
YARMOUTH	WOOD ROAD	Minor			Major	Yes		Yes			

APPENDIX -

Cape Cod Commission ATR Location Data

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions TOWN ROUTE & LOCATION** Begin Date: **AADT** 3 7/31/2019 Fair to Good **Bourne** 11,126 **Rt 28A Falmouth** 8,800 sealing. weathering @ Bour/Falm TL Site Code: 20123 Χ -70.6107 Υ 41.6577 Poor to Fair 8/21/2018 **Bourne** 10,060 **Rt 28A Falmouth** 8,000 Major weathering, eroding shoulder, cracks @ Bour/Falm TL Site Code: 20123 Χ -70.6107 Υ 41.6577 3 Fair to Good 8/9/2017 **Bourne** 11,925 **Rt 28A Falmouth** 9,500 weathered, rutting, patch @ Bour/Falm TL Site Code: 20123 -70.6107 Υ 41.6577 Χ 3 Fair to Good 7/31/2019 6,092 **Bourne Rt 28A** 4,800 major rutting. some sealing N of County Rd Site Code: 20124 -70.6077 Υ 41.6605 Χ 6/25/2019 3 Fair to Good 5,061 Bourne Rt 3A **Plymouth** 4,300 heavy cracking without seals S of Bour/Plym TL Site Code: 20125 -70.5439 Υ 41.7966 Χ 4 Poor to Fair 8/9/2017 6,470 **Bourne** Rt 3A 5,200 weathered, trans/long cracks, minor rutting N of Meetinghouse Rd/Rt 3 NB On-Ramp Site Code: 20126 -70.5428 Υ 41.7856 Х 2 Good to Very Good 5/28/2019 11,117 **Bourne** Sandwich Rt 6A 10,300 @ Bour/Sand TL Site Code: 20133 -70.5233 Χ 41.7682 Fair to Good 8/21/2018 13,598 **Bourne** Sandwich Rt 6A 10,900 General weathering, some cracking @ Bour/Sand TL Site Code: 20133 -70.5233 Υ 41.7682 Χ 8/9/2017 Good to Very Good 15,300 **Bourne** Rt 6A Sandwich 12,200 weathered @ Bour/Sand TL Site Code: 20133 -70.5233 41.7682 Χ Υ 6/13/2018 4 Poor to Fair 5,386 **Bourne Barlows Landing Rd** 4,500 heavy weathering, major cracking W of Rt 28 Site Code: 20102 Χ -70.5874 Υ 41.6959

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT** Pavement Conditions **ROUTE & LOCATION TOWN** Begin Date: **AADT** 2 5/23/2019 Good to Very Good 3,811 **Bourne** Ben Abbey Rd 3,500 S of Sandwich Rd Site Code: 20106 Χ -70.5338 41.7715 Υ 4 Poor to Fair 6/13/2018 **Bourne** 1,679 **Bournedale Rd** 1,400 cracking, weathering W of Rt 25 overpass Site Code: 20107 Υ Χ -70.5881 41.7730 3 7/31/2019 Fair to Good **Bourne** 5,061 Clay Pond Rd 4,000 sealing W of Rt 28 Site Code: 20108 -70.5854 Υ 41.7174 Χ 4 Poor to Fair 8/9/2017 **Bourne** 5,866 **County Rd** 4,700 weathered, rutted, crackseal, potholes N of Rt 28A Site Code: 20111 -70.6084 Υ 41.6614 Χ Poor to Fair 6/13/2018 4 3,890 **Bourne County Rd** 3,300 Heavy weathering, many cracks S of Barlows Landing Rd Site Code: 20109 Χ -70.6050 Υ 41.6945 3 Fair to Good 5/23/2019 4,638 **Bourne** Head of the Bay Rd 4,300 N of Belmont Circle Site Code: 20114 -70.5986 Υ 41.7530 Χ 3 Fair to Good 6/25/2019 6,750 **Bourne** Meetinghouse Ln 5,700 weathering and small cracks W of Old Plymouth Rd Site Code: 20115 -70.5360 41.7806 3 Fair to Good 6/25/2019 3,385 **Bourne** Old Plymouth Rd 2,800 some sealing S of Norris Rd Site Code: 7121 -70.5380 41.7948 3 8/21/2018 Fair to Good 19,453 **Bourne** Sandwich Rd 15,600 Mild weathering, cracks W of Sagamore Bridge Site Code: 7118 -70.5446 41.7742 Χ 3 Fair to Good 7/31/2019 5,701 **Bourne** Shore Rd 4,500 edge cracks N of Beach St Site Code: 7120 -70.6134 Χ 41.7200

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Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions ROUTE & LOCATION TOWN** Begin Date: **AADT** 07/31/2018 Poor to Fair Sandwich 4,132 Chase Rd 3,300 Big cracks and general weathering S of Service Rd Site Code: 20143 Χ -70.4217 Υ 41.7145 Fair to Good 3 7/26/2017 Sandwich 7,924 Cotuit Rd Mashpee 6,300 crackseal, weathering @ Sand/Mash TL (Middle) Site Code: 20147 Χ -70.4749 Υ 41.6780 4 Poor to Fair 6/7/2017 Sandwich 8,305 Cotuit Rd Mashpee 7,000 Crack seal, cracks, weathered, rutting @ Sand/Mash TL (N end) Site Code: 21284 -70.4782 Υ 41.6848 Χ 3 Fair to Good 6/4/2018 Sandwich 5,944 Farmersville Rd 5,000 Minor weathering E of Cotuit Rd Site Code: 20939 -70.4764 Υ 41.6963 Χ 7/31/2019 5 Poor 5,282 Sandwich Freezer Rd 4,200 potholes and cracking N of Tupper Rd Site Code: 20785 -70.5058 Υ 41.7685 Χ 3 Fair to Good 6/7/2017 4,243 Sandwich Harlow Rd 3,600 crack seal, weathering, paint fading E of Cotuit Rd Site Code: 7224 -70.4695 Υ 41.6695 Χ 3 Fair to Good 5/28/2019 Sandwich 1,920 Main St 1,800 Placed ATR on a new patch, overall however E of Rt 130 Site Code: road is fair to good 20720 -70.4991 41.7583 6/7/2017 1,835 Poor Sandwich **Newtown Rd Barnstable** 1,500 Weathering, depressions, potholes, crack seal @ Sand/Barn TL Site Code: 20938 -70.4412 Υ 41.6817 7/26/2017 New 783 Sandwich **Old County Ln** 620 new E of Jones Ln Site Code: 7117 -70.4053 41.7234 Χ 7/26/2017 Poor to Fair 7,540 Sandwich **Quaker Meetinghouse Rd** 6,000 crack seal, LNR, rutting, weathered E of Rt 130 Site Code: 20150 Χ -70.4963 Υ 41.6960

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Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions** TOWN **ROUTE & LOCATION** Begin Date: **AADT** 3 07/24/2018 Fair to Good Mashpee 7,035 South Sandwich Rd 5,600 General weathering, filled cracks N of Rt 130 Site Code: 20277 -70.4752 Χ Υ 41.6503 4 Poor to Fair 7/25/2017 **Barnstable** 9,234 Rt 132 7,300 rutting, weathered, transverse cracks N of CCCC N Exit Site Code: 20317 Χ -70.3423 Υ 41.6928 5 Poor 7/26/2017 **Barnstable** 10,170 Rt 149 8,000 weathering, rutting, crack seal, repaved N of Rt 28 Site Code: sections over gas main, patches 20325 Υ 41.6520 Χ -70.4142 3 Fair to Good **Barnstable** 6/17/2019 11,268 Yarmouth Rt 6A 9,500 rutting @ Barn/Yarm TL Site Code: 20338 -70.2603 Υ 41.7013 Χ 3 8/6/2018 Fair to Good 12,957 **Barnstable** Rt 6A Yarmouth 10,400 General weathering, minor cracking @ Barn/Yarm TL Site Code: 20338 -70.2603 Υ 41.7013 Χ 2 Good to Very Good 8/1/2017 14,038 **Barnstable** Rt 6A **Yarmouth** 11,200 weathered, rutting @ Barn/Yarm TL Site Code: 20338 -70.2603 Υ 41.7013 Χ 3 Fair to Good 7/30/2019 **Barnstable** 7,388 Rt 6A 5,900 E of Hyannis Rd Site Code: 7132 -70.2990 41.7004 Χ 3 Fair to Good 07/30/2018 7,738 **Barnstable** Rt 6A 6,200 General weathering, small wheel ruts E of Hyannis Rd Site Code: 7132 -70.2990 Υ 41.7004 Χ 6/5/2019 Fair to Good 2,173 **Barnstable** Airport Rd 1,800 N of Rt 132 Site Code: 20278 -70.2985 41.6705 Χ Υ 6/5/2018 Fair to Good 7,415 **Barnstable** Attucks Ln 6,200 Weathering, cracks and pebbles exposed W of Phinneys Ln Site Code: 21019 Χ -70.3128 Υ 41.6782

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions ROUTE & LOCATION** TOWN Begin Date: **AADT** 3 6/3/2019 Fair to Good 5,468 **Barnstable** Bassett Ln 4,600 N of North St Site Code: 7189 -70.2906 Χ Υ 41.6523 4 Poor to Fair 8/1/2017 **Barnstable** 6,237 Bassett Ln 5,000 weathered, rutting, crack seal, patch, 6ft deep N of North St Site Code: holes 7189 -70.2906 41.6523 Χ Υ 6/26/2019 1 New **Barnstable** 18,098 **Bearses Way** 15,200 N of Rt 28 Site Code: 20281 -70.3007 Υ 41.6640 Χ 3 Fair to Good 6/5/2018 **Barnstable** 13,809 **Bearses Way** 11,600 minor weathering, pebbles, becoming exposed S of Rt 28 Site Code: 21012 -70.2995 Υ 41.6626 Χ 2 6/5/2018 Good to Very Good 11,371 **Barnstable Bearses Way** 9,600 Minor weathering/relatively new N of Enterprise Rd Site Code: 7336 Χ -70.3033 Υ 41.6670 1 New 8/1/2017 12,626 **Barnstable Bearses Way** 10,100 N of Enterprise Rd Site Code: 7336 -70.3033 Υ 41.6670 8/12/2019 2 Good to Very Good **Barnstable** 3,193 **Bridge St** 2,600 E of Draw Bridge Site Code: 7201 -70.3954 Χ 41.6229 8/12/2019 1,747 Good to Very Good **Barnstable Bumps River Rd** 1,400 E of Lumbert Mill Rd Site Code: 7197 Χ -70.3636 41.6485 6/3/2019 Good to Very Good 13,151 **Barnstable Center St** 11,000 N of Main St Site Code: 20282 -70.2804 41.6546 Χ Υ 2 7/9/2019 Good to Very Good 4,357 **Barnstable Charles St** 3,400 Site Code: large patch W of Washington St Ext 21505 Χ -70.2853 41.6567

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions** TOWN **ROUTE & LOCATION** Begin Date: **AADT** 3 5/27/2019 Fair to Good 5,013 **Barnstable** Mary Dunn Rd 4,700 noticeable weathering S of Rt 6A Site Code: 20299 -70.2808 Χ Υ 41.6996 2 Good to Very Good 5/30/2017 **Barnstable** 6,052 Mary Dunn Rd 5,400 minor transverse crack N of Independence Park Site Code: 20298 Χ -70.2809 Υ 41.6840 8/6/2018 3 Fair to Good **Barnstable** 2,395 **Newtown Rd** 1,900 General weathering N of Rt 28 Site Code: 20300 -70.4458 Υ 41.6399 Χ 2 Good to Very Good 6/3/2019 **Barnstable** 8,368 **North St** 7,000 W of Barnstable Rd Site Code: 7134 -70.2833 Υ 41.6542 Poor to Fair 7/25/2017 4 1,761 **Barnstable** Nye Rd 1,400 alligator, major rutting, weathered N of Lumbert Mill Rd Site Code: 7203 -70.3729 Υ 41.6583 3 Fair to Good 5/27/2019 3,741 **Barnstable** Oak St 3,500 road is good, bridge is in poor condition @ Rt 6 Overpass Site Code: 20818 -70.3536 Υ 41.6843 Χ 3 Fair to Good 8/6/2018 **Barnstable** 4,067 Oak St 3,300 Weathering @ Rt 6 Overpass Site Code: 20818 -70.3536 41.6843 7/9/2019 New **Barnstable** 3,536 Ocean Av 2,800 new pavement. Bad for setups S of Sea St Site Code: 7135 -70.2905 41.6380 7/9/2019 Good to Very Good 3,616 **Barnstable** Ocean St 2,900 Site Code: N of Gosnold St 21507 -70.2796 41.6412 3 5/30/2017 Fair to Good 5,918 **Barnstable** Ocean St 5,200 crack seal, rutting S of South St &Old Colony Rd Site Code: 20303 Χ -70.2804 41.6507

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Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions ROUTE & LOCATION** TOWN Begin Date: **AADT** 2 Good to Very Good 6/20/2017 **Yarmouth** 6,784 **Union St** 5,700 crackseal, rutting S of Rt 6A Site Code: 20418 -70.2282 41.7050 Χ Υ 3 Fair to Good 6/18/2018 Yarmouth 7,296 West Yarmouth Rd 6,100 cracks N of Buck Island Rd Site Code: 20419 41.6657 Χ -70.2294 Υ 3 Fair to Good 6/18/2018 **Yarmouth** 7,814 Willow St 6,600 Minor weathering, some cracking S of R.R. tracks Site Code: 20426 -70.2574 Υ 41.6983 Χ 3 Fair to Good 6/26/2017 **Dennis** 7,978 Rt 134 6,700 weathered, rutting S of Rt 6A Site Code: 20450 -70.1614 Υ 41.7425 7/15/2019 3 Fair to Good 13,995 **Dennis** Rt 134 11,100 N of Airline Rd Site Code: 20904 -70.1538 Υ 41.7072 Χ 3 Fair to Good 8/20/2018 12,209 **Dennis** Rt 134 9,800 Smooth and even but soft, pebble-ridden type N of Airline Rd Site Code: pavement 20904 -70.1538 Υ 41.7072 2 Good to Very Good 7/15/2019 **Dennis** 25,063 Rt 134 19,800 N of Exit 9 Site Code: 20766 -70.1542 41.7002 Poor to Fair 8/20/2018 23,777 **Dennis** Rt 134 19,000 Major weathering, big cracks, a few holes N of Exit 9 Site Code: 20766 Χ -70.1542 Υ 41.7002 8/27/2018 Good to Very Good 21,069 **Dennis** Rt 134 16,900 general weathering but still very even and N of Upper County Rd Site Code: smooth 20453 -70.1518 Χ 41.6871 3 7/15/2019 Fair to Good 12,364 **Dennis** Rt 134 9,800 S of Upper County Rd Site Code: 20454 Χ -70.1512 41.6853

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT** Pavement Conditions **ROUTE & LOCATION** TOWN Begin Date: **AADT** 2 7/17/2018 Good to Very Good **Dennis** 12,944 Rt 134 10,200 S of Upper County Rd Site Code: 20454 Χ -70.1512 Υ 41.6853 2 Good to Very Good 6/26/2017 **Dennis** 12,251 Rt 134 10,300 Weathered, rutting S of Upper County Rd Site Code: 20454 Χ -70.1512 Υ 41.6853 3 Fair to Good 7/15/2019 **Dennis** 19,504 Rt 134 15,400 N of Bob Crowell Rd (Access Rd) Site Code: 20856 Υ 41.7036 Χ -70.1544 3 Fair to Good **Dennis** 07/17/2018 20,181 Rt 134 15,900 General weathering, some minor cracking N of Bob Crowell Rd (Access Rd) Site Code: 20856 -70.1544 Υ 41.7036 Χ 6/24/2019 3 Fair to Good 8,397 **Dennis** Rt 28 Harwich 7,100 patches and minor cracks @ Denn/Harw TL Site Code: 20455 -70.1220 Υ 41.6688 Χ 5 Poor 8/8/2017 12,165 **Dennis** Rt 28 Harwich 9,700 weathered, rutting, blocking, trans cracks, @ Denn/Harw TL Site Code: potholes 20455 Υ -70.1220 41.6688 Χ 3 Fair to Good 6/21/2017 **Dennis** 13,294 Rt 28 11,200 Site Code: Weathered, rutted, transverse cracks on one E of School St 21420 side, other side newer pavement -70.1687 41.6643 6/21/2017 15,431 Fair to Good **Dennis** Rt 28 Site Code: 13,000 Weathered, crack seal W of School St 21421 -70.1697 Υ 41.6642 6/24/2019 Poor to Fair 8,742 **Dennis** Rt 28 7,300 many patches W of Sea St Site Code: 41.6659 20456 -70.1291 Χ Υ 6/21/2017 Poor to Fair 7,058 **Dennis** Rt 28 5,900 transverse/longitudinal cracks, weathered E of Telegraph Rd Site Code: 20457 Χ -70.1235 Υ 41.6682

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions ROUTE & LOCATION** TOWN Begin Date: **AADT** 6/24/2019 4 Poor to Fair **Dennis** 12,309 Rt 28 10,300 big potholes and patches W of Woodbine Dr Site Code: 20458 Х -70.1645 Υ 41.6662 3 Fair to Good 8/20/2019 **Dennis** 8,546 Rt 6A **Brewster** 6,800 weathering @ Denn/Brew TL Site Code: 20460 Χ -70.1452 Υ 41.7448 4 Poor to Fair 8/27/2018 **Dennis** 6,790 Rt 6A **Brewster** 5,400 Yarm. side had cracks and major weathering, @ Denn/Brew TL Site Code: Denn. side was pretty new 20460 -70.1452 Υ 41.7448 Χ 3 8/20/2019 Fair to Good **Dennis** 10,934 Rt 6A 8,700 E of Old Bass River Rd Site Code: 20461 -70.1919 Υ Χ 41.7383 8/15/2017 3 Fair to Good 11,089 **Dennis** Rt 6A 8,900 weathered, rutting, long/trans cracks E of Old Bass River Rd Site Code: 20461 -70.1919 Υ 41.7383 Χ 3 Fair to Good 7/17/2018 7,232 **Dennis** Airline Rd 5,700 Weathering, generally soft E of Rt 134 Site Code: 20434 -70.1525 Υ 41.7081 Χ 2 Good to Very Good 8/20/2019 **Dennis** 5,076 Airline Rd **Brewster** 4,100 @ Denn/Brew TL (S end) Site Code: 7145 -70.1400 Υ 41.7265 Fair to Good 8/20/2018 5,682 **Dennis** Airline Rd **Brewster** 4,500 General weathering @ Denn/Brew TL (S end) Site Code: 7145 -70.1400 Υ 41.7265 Χ 6/13/2017 Fair to Good 5,116 **Dennis** Airline Rd **Brewster** 4,300 major weathering, crack seal, starting to rut @ Denn/Brew TL (S end) Site Code: 7145 -70.1400 41.7265 Χ 6/26/2017 3 Fair to Good 6,953 **Dennis Bob Crowell Rd (Access Rd)** 5,800 Weathered, a lot of rutting W of Rt 134 Site Code: 20857 Χ -70.1547 Υ 41.7034

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions ROUTE & LOCATION** TOWN Begin Date: **AADT** 3 6/20/2017 Fair to Good 912 **Dennis Division St** 770 Weathered, Long/Trans Cracks N of Rt 28 Site Code: 21092 Χ -70.1222 Υ 41.6695 4 Poor to Fair 6/20/2017 **Dennis** 1,756 **Division St** Harwich 1,500 Longitudinal and transverse cracks, a patch, S of Rt 28 Site Code: weathering 20435 Χ -70.1217 Υ 41.6682 7/15/2019 2 Good to Very Good **Dennis** 3,415 Main St 2,700 Site Code: N of Market PI 21510 -70.1540 Υ 41.6947 Χ 1 8/15/2017 New **Dennis** 8,155 Main St 6,500 S of Old Bass River Rd Site Code: 7146 -70.1578 Υ 41.6921 Χ 2 7/15/2019 Good to Very Good 3,459 **Dennis** Market PI 2,700 W of Main St Site Code: 21278 -70.1540 Υ 41.6944 Χ 2 Good to Very Good 6/24/2019 5,428 **Dennis** Old Bass River Rd 4,600 S of Rt 6A Site Code: 20446 41.7380 -70.1920 Υ Х 6/24/2019 4 Poor to Fair **Dennis** 1,667 **Old Chatham Rd** 1,400 major rutting and seals W of Rt 134 Site Code: 7209 -70.1547 41.7124 7/31/2017 3,053 Good to Very Good **Dennis** Old Chatham Rd Harwich 2,400 weathered @ Denn/Harw TL Site Code: 20783 -70.1322 Υ 41.7007 6/24/2019 Good to Very Good 3,274 **Dennis Old Main St** 2,800 N of Rt 28 Site Code: 7206 -70.1612 41.6671 Χ Υ 3 06/18/2018 Fair to Good 816 **Dennis** Scargo Hill Rd 690 Minor weather and wear and tear S of Rt 6A Site Code: 7205 Χ -70.1694 Υ 41.7429

Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions** TOWN **ROUTE & LOCATION** Begin Date: **AADT** 2 7/10/2019 Good to Very Good Harwich 6,073 Rt 124 **Brewster** 4,800 @ Harw/Brew TL Site Code: 20498 Χ -70.0849 Υ 41.7260 4 Poor to Fair 8/1/2018 Harwich 6,338 Rt 124 **Brewster** 5,100 Weathering, filled cracks, patchy uneven @ Harw/Brew TL Site Code: pavement 20498 Χ -70.0849 Υ 41.7260 4 Poor to Fair 6/13/2017 **Harwich** 5,456 Rt 124 **Brewster** 4,600 alligator, transverse cracks, weathering, minor @ Harw/Brew TL Site Code: rutting 20498 -70.0849 Υ 41.7260 Χ 2 Good to Very Good **Harwich** 7/10/2019 10,967 **Brewster** Rt 137 8,700 slight cracking on Harwich side @ Harw/Brew TL Site Code: 20500 -70.0387 Υ 41.7267 Χ 8/1/2018 3 Fair to Good 10,938 Harwich Rt 137 **Brewster** 8,800 Mild weathering @ Harw/Brew TL Site Code: 20500 -70.0387 Υ 41.7267 Χ 4 Poor to Fair 7/12/2017 11,266 **Harwich** Rt 137 **Brewster** 8,900 crack seal, alligator, potholes, weathering @ Harw/Brew TL Site Code: 20500 -70.0387 Υ 41.7267 Χ 2 Good to Very Good 7/12/2017 **Harwich** 13,503 Rt 137 10,700 weathered, slight rutting N of Queen Anne Rd Site Code: 20501 -70.0164 Χ 41.7009 3 Fair to Good 6/13/2017 10,931 Harwich Rt 28 9,200 one half repaved, other half has cracks, E of Belmont Rd Site Code: weathering, rutting 20505 -70.1164 Υ 41.6700 Χ 7/10/2019 Good to Very Good 9,922 Harwich Rt 28 Chatham 7,800 @ Harw/Chat TL (N end) Site Code: 20508 -69.9943 Χ Υ 41.7118 8/8/2017 Poor to Fair 11,944 Harwich Rt 28 Chatham 9,600 weathered, longitudinal cracks, rutting @ Harw/Chat TL (N end) Site Code: 20508 Χ -69.9943 Υ 41.7118

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Printed: 12/11/2019 Cape Cod Pavement Management System - ATR Locations **ADT Pavement Conditions ROUTE & LOCATION** TOWN Begin Date: **AADT** 2 8/14/2017 Good to Very Good 1,385 **Truro** South Highland Rd 1,100 weathered E of Rt 6 Site Code: 20744 -70.0721 42.0223 Χ Υ 5 Poor 8/14/2017 **Truro** 406 South Hollow Rd 320 Site Code: Alligator, LNR, potholes, huge transverse W of Rt 6 21413 cracks, weathered, rutting Χ -70.0781 Υ 42.0295 8/7/2018 4 Poor to Fair **Truro** 3,318 **Truro Center Rd** 2,700 Heavy weathering, minor cracking N of South Pamet Rd Site Code: 20801 -70.0499 41.9933 Χ Υ 3 Fair to Good 8/14/2017 Truro 1,362 **Truro Center Rd** Site Code: 1,100 weathered, linear cracks, transverse cracks S of Town Hall Rd 21345 -70.0511 Υ 41.9991 2 8/5/2019 Good to Very Good 10,796 **Provincetow Bradford St** Site Code: 8,600 some patching W of Center St 21514 -70.1857 Υ 42.0537 3 Fair to Good 8/5/2019 5,504 **Provincetow Bradford St** 4,400 Site Code: sealing Btwn Duncan Ln & Atkins Mayo Rd 21508 Υ -70.1729 42.0599 2 Good to Very Good 8/5/2019 7,083 **Provincetow Bradford St** 5,700 W of Shank Painter Rd Site Code: 20702 -70.1919 42.0480 Good to Very Good 8/5/2019 9,995 **Provincetow Bradford St** 8,000 minor patching E of Standish Ave Site Code: 20990 -70.1861 42.0533 8/5/2019 Good to Very Good 7,032 **Provincetow Bradford St** 5,600 **Btwn Winslow&Prince** Site Code: 20703 -70.1891 42.0506 Poor to Fair 8/7/2018 1,154 **Provincetow Commercial St** 920 Site Code: Heavy weathering, many cracks and patches E of Provincetown Inn 21438 areas Χ -70.1959 42.0383

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42.0532

Υ

N of Bradford Rd

-70.1868

Χ

Site Code: 20988

