

Appendix B –System Performance Analysis Technical Memorandum



NRTA Year-Round Bus Service Study

System Performance Analysis

Technical Memorandum

Prepared for

Nantucket Regional Transit Authority

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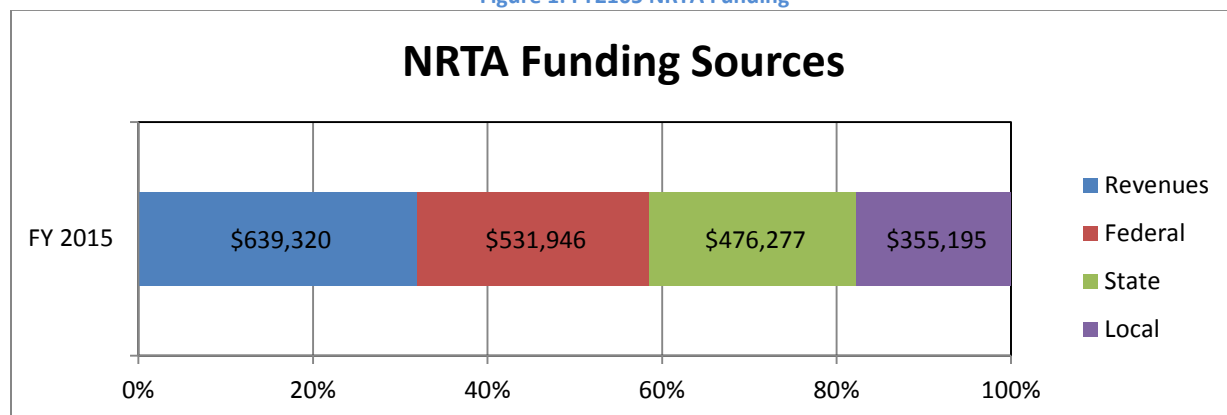
INTRODUCTION

The Nantucket Regional Transit Authority (NRTA) provides island-wide seasonal fixed route transit service, the WAVE, and year-round demand response van service, Your Island Ride. The NRTA was established to alleviate downtown traffic congestion and to create parking opportunities in the downtown core district. The NRTA began providing seasonal fixed route service in 1995 operating four buses on two mid-island area routes. It soon became apparent that the NRTA would become an island-wide transportation system. The NRTA has expanded its services to provide island-wide transportation operating ten routes with 15 buses. In 2014 the NRTA provided Ferry Connector service, a contract service mostly privately funded, between a park-and-ride lot and the ferries. In 2015 service hours were expanded to 12:00 a.m. on the Mid Island Loop, Miacomet Loop, and Sconset via Old South Road Route to better accommodate second shift workers.

The NRTA was created by Massachusetts General Laws Chapter 161B in 1993, although operations did not begin until 1995. The NRTA is a body politic and corporate and political subdivision of the Commonwealth of Massachusetts. According to the statute, regional transit authorities cannot operate service directly, but instead must contract with private operators for the provision of service. The NRTA contracts with Valley Transportation Services of Massachusetts, Inc. to provide operating and management services for the NRTA’s seasonal fixed route service and Your Island Ride van service.

Funding sources for NRTA include local, state and federal programs for operating assistance funds as well as capital funding available through the state and federal governments. Local funding is assessed to the Town of Nantucket, and increases are capped at 2.5% per year, unless new service is added. State funding is provided by the Commonwealth of Massachusetts Department of Transportation through state contract assistance. Federal money, through rural operating assistance Section 5311, is provided to the NRTA. Farebox revenue is collected from passengers and pass sales. Other revenue includes advertising revenue and local business financial support for the Ferry Connector. The NRTA’s operating budget covers three areas of expense: fixed route bus, demand response and administration.

Figure 1: FY2105 NRTA Funding



NRTA offers a wide range of fares and passes. Mid Island Loop, Miacomet Loop, and Jetties Beach Route have a \$1.00 fare, the Ferry Connector will have a base fare of \$2 starting with the 2016 season, and the remaining routes have a base fare of \$2.00. Half fares are offered to seniors 65 years of age and older, individuals with disabilities, veterans and active military personnel. Free fares are offered to children 6

years of age and younger when accompanied by an adult. The NRTA offers short-term passes: 1-day, 3-day, and 7-day, sold at the farebox. Short-term passes are valid for calendar days only, beginning at the time the pass is purchased. Seasonal and monthly passes are sold at the NRTA Administrative Office. Season passes are \$90, commuter passes, if purchased by a business for employees, are \$80, Nantucket student passes are \$50 and all other students are \$80. Discounted seasonal passes are available for seniors, disabled persons, veterans and active military for \$50. NRTA also offers a 30-day pass for \$50.

Basic statistics collected by route for the fixed route system performance evaluation included:

- Total passenger boardings by route and time of year
- Mileage by route
- Operating hours by route and time of year
- Fare revenue by route and time of year
- Operating cost (divided by revenue hours to calculate by line)
- Fleet information

This report presents an analysis and evaluation of NRTA fixed routes, identifying the strengths and weaknesses of each route, and how each route performs by time of year (summer vs. shoulder seasons). The report is divided into three parts – description of fixed route service, performance evaluation, and route ranking/issues and opportunities.

DESCRIPTION OF EXISTING ROUTES

The NRTA provides seasonal fixed route public transit service (The WAVE) in Nantucket. The WAVE operates from mid-May to early October on ten routes utilizing 15 vehicles. There are a total of 19 revenue vehicles in the fleet. The route configurations meet the needs of the islands’ diverse seasonal community of year-round residents, second home owners, seasonal employees, and both long-term and short-term visitors. Table 1 provides an overview of routes operated by NRTA including the type of service, where it operates, and when the route is in operation.

Table 1: NRTA Overview

Route	Service Type	Description
Mid Island Loop	Commuter/Community	Downtown to the mid-island area
Miacomet Loop	Commuter/Community	Downtown to the outer mid-island area
Sconset via Old South Road Route	Commuter/Community/ Tourist	Downtown to the village of Sconset through a residential and commercial area
Madaket Route	Commuter/Community/ Tourist	Downtown to the village of Madaket and points along the way
Sconset via Milestone Rd Route	Commuter/Community/ Tourist	Downtown to the village of Sconset and points along the way
Airport Route	Commuter/Community	Downtown to Nantucket Memorial Airport and points along the way
Surfside Beach	Tourist	Downtown to Surfside Beach
Jetties Beach	Tourist	Downtown to Jetties Beach
Sconset via Polpis Rd	Tourist/Community	Downtown to the village of Sconset and points along the way

The routes are classified into three different service types and can serve multiple functions. Commuter routes bring people downtown for work and provide connections to the ferries and airport. Community

routes focus on circulating passengers around the island to service civic and shopping destinations. Tourist routes connect to the beaches.

Span and Frequency

Fixed routes are operated from mid-May to Columbus Day. Table 2 through Table 4 list the operating statistics for each route including season of service, span of service¹ and frequency of service. The summer season runs from mid-June to Labor Day, with shoulder seasons on either side.

Table 2: Span of Service Days by Route

Route Name	Service Days
Airport Route	June 27 – September 7, 2015
Ferry Connector	May 21 – October 12, 2015
Jetties Beach	June 22 – September 7, 2015
Madaket Route	May 22 – September 13, 2015
Miacomet Loop	May 18 – October 12, 2015
Mid Island Loop	May 18 – October 12, 2015
Sconset via Milestone Road Route	June 22 – September 7, 2015
Sconset via Old South Road Route	May 18 – October 12, 2015
Sconset via Polpis Road Route	June 29 – September 7, 2015
Surfside Beach	June 22 – September 7, 2015

LOS	Hours of Service
A	19-24
B	17-18
C	14-16
D	12-13
E	4-11
F	0-3

NRTA routes start operating at 7:00 AM with the exception of the airport, beach, and additional Sconset service which have limited demand in the morning hours. Routes that run only during the summer season end by 7:15 PM, while the routes that operate during the summer and shoulder months run until midnight (the Ferry Connector ends at 10:00pm with the last boat). The *Transit Capacity and Quality of Service Manual*, produced by the Transit Cooperative Highway Research Program (TCRP) has a level of service (LOS) rating system based on the hours of service provided

(see box to the left). Routes with late night service have a LOS score of “B”, those that start early but end by 7 PM have a LOS score of “D”, and the ones that start at 10:00 AM are LOS “E”.

In 2013 state legislation required all Regional Transit Authorities to prepare Regional Transit Plans. These Regional Transit Plans examined ridership trends and conducted performance analysis of the existing system. A cross analysis of transit plans shows that NRTA is performing better than most of the other RTAs in MA, who’s highest LOS is a “C”.

¹ Morning start time to time of last run

Table 3: Span of Service Hours by Route

Route Name	Summer	Shoulder
Airport Route	10:00 AM to 6:00 PM	---
Ferry Connector	7:00 AM to 10:00 PM	9:40 AM to 9:00 PM
Jetties Beach	10:00 AM to 5:45 PM	---
Madaket Route	7:00 AM to 11:20 PM	7:00 AM to 11:20 PM
Miacomet Loop	7:00 AM to 12:00 AM	7:00 AM to 11:30 PM
Mid Island Loop	7:00 AM to 12:00 AM	7:00 AM to 11:30 PM
Sconset via Milestone Road Route	7:15 AM 7:15 PM	---
Sconset via Old South Road Route	7:15 AM 12:00 AM	7:15 AM to 11:15 PM
Sconset via Polpis Road Route	10:00 AM to 5:20 PM	---
Surfside Beach	10:00 AM to 5:40 PM	---

All but one of NRTA’s routes operate at a frequency of service of every 60 minutes or less. Some of the downtown circulator routes offer more frequent service and some of the longer routes offer less frequent service. The *Transit Capacity and Quality of Service Manual* provides a level of service (LOS) rating system based on the average headway as shown in the box to the right. Routes with a shorter headway would have a higher score. The highest score achieved by NRTA is LOS “C” on the Mid Island Loop and the lowest LOS is “F” on the Sconset via Polpis Rd Route.

LOS	Headway (Min)
A	<10
B	10-14
C	15-20
D	21-30
E	31-60
F	>60

Table 4: Frequency of Service by Route

Route Name	Summer	Shoulder
Airport Route	20 min	---
Ferry Connector	20 min	20 min
Jetties Beach	30 min	---
Madaket Route	30 min	60 min
Miacomet Loop	20 min	30 min
Mid Island Loop	15 min	30 min
Sconset via Milestone Road Route	60 min	---
Sconset via Old South Road Route	60 min	60 min
Sconset via Polpis Road Route	1 hr 20 min	---
Surfside Beach	40 min	---

Operating Speed

Calculating average operating speeds allows for the identification of routes that may be too long for the running time allotted, or may be running slowly and unreliably due to congestion. As such, average operating speeds are also indicators of safety, as routes that are too long require drivers to drive rapidly to keep on schedule; and reliability, since very slow routes may create problems with on-time performance and transfers. Slower routes are can also be an indicator of areas with higher vehicular traffic. Table 5 lists average operating speed by route and season and the roundtrip miles per trip and cycle time for each route. The trip length is consistent throughout the year but travel times may change with an influx of summer traffic. The NRTA system as a whole averages 11.2 MPH operating speed.

Table 5: Operating Speed

Route Name	Speed (MPH)		Miles	Cycle Time	
	Summer	Shoulder		Summer	Shoulder
Airport Route	6.6	--	6.6	60	0
Ferry Connector	see Airport	9.6	3.2	0	20
Jetties Beach	3.88	--	1.94	30	0
Madaket Route	12.5	12.5	12.5	60	60
Miacomet Loop	10.5	14	7	40	30
Mid Island Loop	8.2	8.2	4.1	30	30
Sconset via Milestone Road Route	15.8	--	15.8	60	0
Sconset via Old South Road Route	17.1	17.1	17.1	60	60
Sconset via Polpis Road Route	15.75	--	21	80	0
Surfside Beach	10.2	--	6.8	40	0

SERVICE OPERATIONS

Fleet Analysis

As of December 2015, the NRTA-owned fleet consisted of 19 fixed route vehicles consisting primarily of 25-29-foot diesel transit buses, all of which were manufactured in 2006 or later. In addition, all NRTA vehicles are wheelchair accessible in accordance with requirements of the Americans with Disabilities Act of 1990 (ADA). The oldest buses in the fleet, with the most miles, are the 29' Eldorado Escort RE, medium duty buses. All of the Escort REs are past their useful life of 7 years but not useful mileage of 200,000. The remaining fleet includes medium duty buses made by IC Bus. Due to roadway geometry and historic building placement and roadway width/alignment constraints, NRTA must operate vehicles below 30' in length and 96" in width.

Table 6: Revenue Fleet Inventory

Bus #	Year	Make	Model	Size	Mileage
1	2008	Eldorado	Escort RE	29	108,610
2	2007	Eldorado	Escort RE	29	100,442
3	2010	IC	HC CB	25	70,734
4	2016	IC	HCTC	29	12,675
5	2012	IC	HCCB	25	59,867
6	2013	IC	HC	25	40,560
7	2011	IC	HC CB	25	82,529
8	2013	IC	HC	25	41,191
9	2006	Eldorado	Escort RE	29	137,916
10	2006	Eldorado	Escort RE	29	127,257
11	2011	IC	HC CB	25	98,825
12	2011	IC	HC CB	25	72,867
13	2013	IC	HCTC	25	34,673
14	2011	IC	HC CB	25	63,884
15	2013	IC	HCTC	25	44,708
16	2013	IC	HCTC	25	32,963
17	2013	IC	HCTC	25	20,962
18	2011	IC	HC CB	25	45,727
24	2016	IC	HC	25	8,895

Labor Requirements

Labor requirements were calculated based on the number of daily revenue hours per route plus one hour of pre and post trip inspection per bus for each time period. Daily hours were then multiplied by the number of days a week that service runs and divided by 40 hours, the number of hours a full-time employee would work. During the peak summer season from July to Labor Day, NRTA needs 37 full time operators (Figure 2). For a complete breakdown of labor requirements by route and time of year see Table 7.

Figure 2: NRTA 2015 Labor Requirements

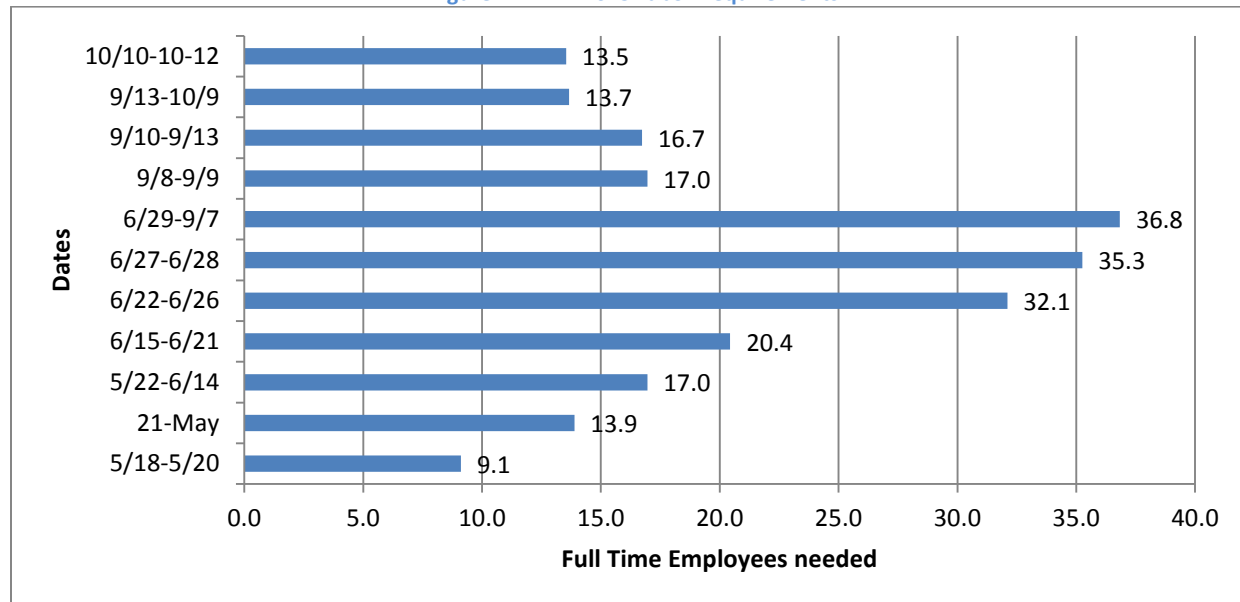


Table 7: Daily Labor Requirements by Route and Time of Year

2015	MAY	JUNE	JULY	AUGUST	SEPT.	OCT.
Mid Island	May 18-31 17.5 rev hrs/day 2.19 Employees/ day	June 1-14 17.5 rev. hrs/day 2.19 Employees/ day June 15-21 18 rev. hrs/day 2.25 Employees/ day June 22-30 36 rev. hrs/day 4.5 Employees/ day	July 1- 31 36 rev. hrs/day 4.5 Employees/ day	August 1 –31 35 rev. hrs/day 4.38 Employees/ day	Sept. 1-7 36 rev. hrs/day 4.5 Employees/ day Sept. 8-30 17.5 rev. hrs/day 2.19 Employees/ day	Oct. 1-12 17.5 rev. hrs/day 2.19 Employees/ day
Miacomet	May 18-31 17.5 rev hrs/day 2.19 Employees/ day	June 1-14 17.5 rev hrs/day 2.19 Employees/ day June 15-30 36 rev. hrs/day 4.5 Employees/ day	July 1 – 31 36 rev. hrs/day 4.5 Employees/ day	August 1-31 36 rev. hrs/day 4.5 Employees/ day	Sept. 1-7 36 rev. hrs/day 4.5 Employees/ day Sept. 8-30 17.5 rev hrs/day 2.19 Employees/ day	Oct. 1-12 17.5 rev hrs/day 2.19 Employees/ day
Madaket	May 22-31 17.5 rev hrs/day 2.19 Employees/ day	June 1-21 17.5 rev hrs/day 2.19 Employees/ day June 22-30 35 rev. hrs/day 4.38 Employees/ day	July 1 –31 35 rev. hrs/day 4.38 Employees/ day	August 1 –31 35 rev. hrs/day 4.38 Employees/ day	Sept. 1-7 35 rev. hrs/day 4.38 Employees/ day Sept. 8-13 17.5 rev hrs/day 2.19 Employees/ day	No Service
Polpis	No Service	June 29-30 9 rev hrs/day 1.13 Employees/ day	July 1 –31 9 rev hrs/day 1.13 Employees/ day	August 1 –31 9 rev hrs/day 1.13 Employees/ day	Sept.1-7 9 rev hrs/day 1.13 Employees/ day	No Service
Old South	May 18 – 31 17 hrs/day 2.13 Employees/ day	June 1-14 17 hrs/day 2.13 Employees/ day June 15-30 18 hrs/day 2.25 Employees/ day	July 1 –31 18 hrs/day 2.25 Employees/ day	August 1-31 18 hrs/day 2.25 Employees/ day	Sept 1 –7 18 hrs/day 2.25 Employees/ day Sept 8 –30 17 hrs/day 2.13 Employees/ day	Oct. 1-12 17 hrs/day 2.13 Employees/ day
Milestone	No Service	June 22-30 13 hrs/day 1.63 Employees/ day	July 1 –31 13 hrs/day 1.63 Employees/ day	August 1 –31 13 hrs/day 1.63 Employees/ day	Sept. 1- 7 13 hrs/day 1.63 Employees/ day	No Service
Surfside	No Service	June 22-30 9 rev hrs/day 1.13 Employees/ day	July 1 –31 9 rev hrs/day 1.13 Employees/ day	August 1-31 9 rev hrs/day 1.13 Employees/ day	Sept. 1- 7 9 rev hrs/day 1.13 Employees/ day	No Service
Jetties	No Service	June 22-30 9 rev hrs/day 1.13 Employees/ day	July 1-31 9 rev hrs/day 1.13 Employees/ day	August 1 –31 9 rev hrs/day 1.13 Employees/ day	Sept. 1- 7 9 rev hrs/day 1.13 Employees/ day	No Service
Airport	No Service	June 27- 30 18 rev hrs/day 2.25 Employees/ day	July 1-31 18 rev hrs/day 2.25 Employees/ day	August 1-31 18 rev hrs/day 2.25 Employees/ day	Sept. 1- 7 18 rev hrs/day 2.25 Employees/ day	No Service
Ferry Connector	May 21- 31 27.3 hrs/day 3.41 Employees/ day	June 1-30 27.3 hrs/day 3.41 Employees/ day	July 1-31 27.3 hrs/day 3.41 Employees/ day	August 1-31 27.3 hrs/day 3.41 Employees/ day	Sept 1 –10 27.3 hrs/day 3.41 Employees/ day Sept 11 –30 26 hrs/day 3.25 Employees/ day	Oct. 1-9 26 hrs/day 3.25 Employees/ day Oct. 10-12 25.3 hrs/day 3.16 Employees/ day

Service Capacity

Capacity is measured as the maximum number of passengers that can be carried daily during the peak season. The capacity of the system was determined by the number of one way trips or loops daily for each route multiplied by the vehicle's capacity. NRTA has an average seated vehicle capacity of 18 with a vehicle capacity of 23 (seated capacity plus 25% of the seated capacity for standees). During the peak summer months the daily capacity is almost 8,300 passengers (Table 8). The route with the highest capacity is the Mid Island Loop because it has the longest service span and shortest headway.

Table 8: Route Capacity

Route Name	Capacity	
	Summer	Shoulder
Airport Route	1,104	---
Ferry Connector	See Airport	1,564
Jetties Beach	713	---
Madaket Route	1,502	751
Miacomet Loop	1,173	759
Mid Island Loop	1,564	759
Sconset via Milestone Road Route	690	---
Sconset via Old South Road Route	771	736
Sconset via Polpis Road Route Route	253	---
Surfside Beach	529	---
Total Daily	8,298	4,569

ROUTE DIAGNOSTICS

Five important data sets were collected or calculated from NRTA 2015 records to create the route diagnostics: ridership statistics, revenue hours, revenue miles, operating cost, and farebox revenue. Route diagnostic statistics are described for each of the 10 fixed routes in Table 9.

Table 9: System-Wide Operating Statistics by Route

Route Name	Annual Revenue Miles	Annual Revenue Hours	Fare Revenue	Operating Cost (based on \$64/hr)	Annual Ridership
Airport Route	15,200	3,003	\$23,018	\$205,387	11,339
Ferry Connector	9,564	3,999	\$247,535	\$273,507	9,298
Jetties Beach	2,246	624	\$14,596	\$42,678	14,873
Madaket Route	40,295	3,185	\$76,819	\$217,834	43,209
Miacomet Loop	40,569	3,740	\$70,392	\$255,793	63,771
Mid Island Loop	27,860	3,584	\$63,919	\$245,124	56,466
Sconset via Milestone Road Route	13,198	936	\$31,096	\$64,017	17,371
Sconset via Old South Road Route	38,746	2,452	\$96,912	\$167,702	56,583
Sconset via Polpis Road	8,520	568	\$12,264	\$38,848	6,551
Surfside Beach	6,458	624	\$29,376	\$42,678	16,133
Fixed Route System Total	202,656	22,715	\$665,926²	\$1,553,566	295,594

² The difference in farebox recovery from Table 1 and Table 9 is due to the reporting periods. Table 1 is FY2015 (July 2014 – June 2015 and Table 9 is Calendar Year 2015.

In 2015, the fixed routes operated over 200,000 miles of service, 22,000 hours of service and provided nearly 300,000 rides. Fare revenue and revenue from the Ferry Connector contracts generated \$666,000, offsetting approximately 44% of the \$1.5 million in fixed route operating costs.

The diagnostic calculations for farebox recovery, passengers per mile, passengers per hour, cost per mile cost per passenger and subsidy per passenger are presented in Table 10, values in green indicate a better performance than the state average³. For each of the diagnostic indicators, each route will be ranked and compared to the other routes in the system and also compared to the system average. Routes are compared to 60% and 80% of the systems average for comparison/reference purposes to determine the health of the route⁴.

NRTA is a rural system performing like an urban

- Pax/Hr - Passengers per hour is a measure of productivity and service effectiveness
- Pax/Mile - Passengers per mile is a measure of productivity and service effectiveness
- Farebox Recovery - Measures the portion of operating costs covered by passenger fares/contracts
- \$/Mile - Cost per mile is a measure of financial efficiency based on the service provided
- \$/Pax - Cost per passenger is a measure of financial efficiency based on the number of riders
- Subsidy/Pax - Measures how much it costs to operate a route on a per-passenger basis

Table 10: System-Wide Route Diagnostics

Route Name	Farebox Recovery	Passengers per Mile	Passengers per Hour	Cost per Mile	Cost per Passenger	Subsidy/ passenger
Airport Route	11.2%	0.75	3.78	\$13.51	\$18.11	\$16.08
Jetties Beach	34.2%	6.62	23.83	\$19.00	\$2.87	\$1.89
Madaket Route	35.3%	1.07	13.57	\$5.41	\$5.04	\$3.26
Miacomet Loop	27.5%	1.57	17.05	\$6.31	\$4.01	\$2.91
Mid Island Loop	26.1%	2.03	15.76	\$8.80	\$4.34	\$3.21
Sconset via Milestone Rd	48.6%	1.32	18.56	\$4.85	\$3.69	\$1.90
Sconset via Old South Rd	57.8%	1.46	23.08	\$4.33	\$2.96	\$1.25
Sconset via Polpis Rd	31.6%	0.77	11.53	\$4.56	\$5.93	\$4.06
Surfside Beach	68.8%	2.50	25.85	\$6.61	\$2.65	\$0.82
Fixed Route System Total	32.6%*	1.54	15.90	\$8.05	\$5.22	\$3.81
Ferry Connector	90.5%**	0.97	2.33	\$28.60	\$29.42	\$2.79

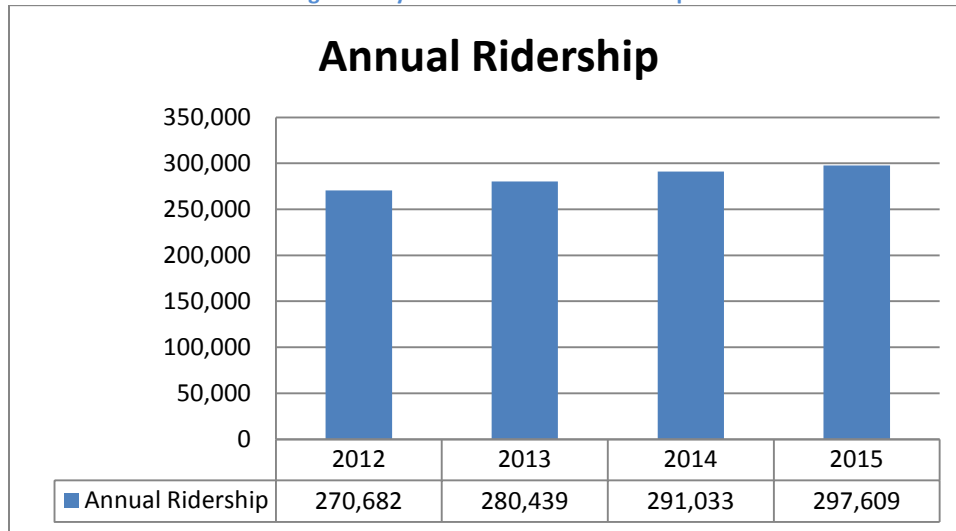
³The state average for all Regional Transit Authorities’ fixed route service in MA, this does not include the MBTA.

⁴ The use of 60% of the system average as the lower threshold for service performance analysis is based on service standards work completed for transit service operators around the country.

Ridership

The Wave carried nearly 300,000 passengers in 2015 and has experienced steady growth in ridership over the last four years. Ridership increased 9.9% from 2012 to 2015 (Figure 3) with the largest increases seen on the Jetties Beach Route and Sconset via Milestone Road Route. The Ferry Connector, initiated in 2014, saw the largest growth with 44.1%.

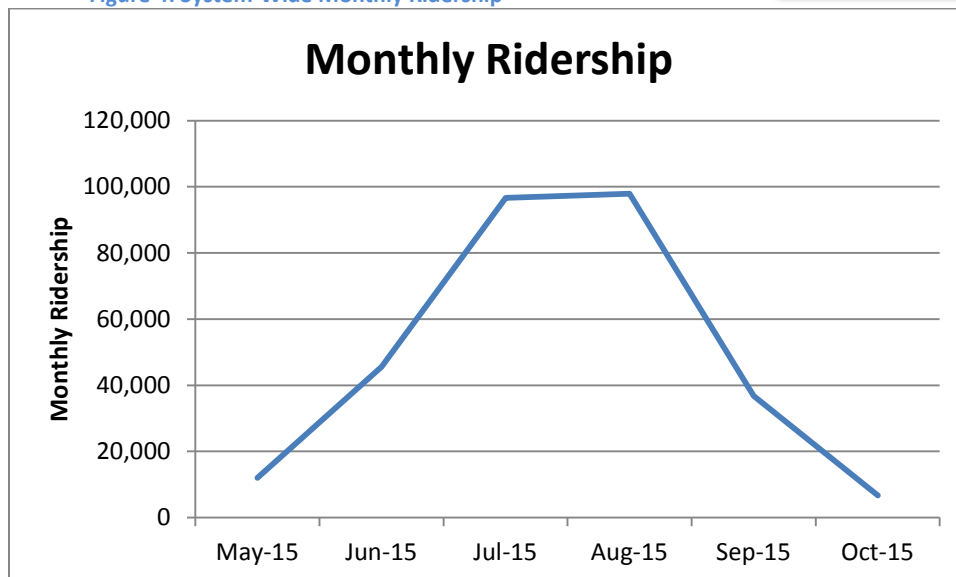
Figure 3: System Wide Annual Ridership



The Wave averages about 95,000 passengers each month during the peak summer operating season with about 65% of total boardings for the year, as seen in Figure 4. Ridership drops during the early summer and late summer months when there is a reduction in seasonal population, reduced service hours, and parking availability is less restricted in the downtown area. Even in the shoulder seasons NRTA carries more riders than other RTAs in the state with year-round service.

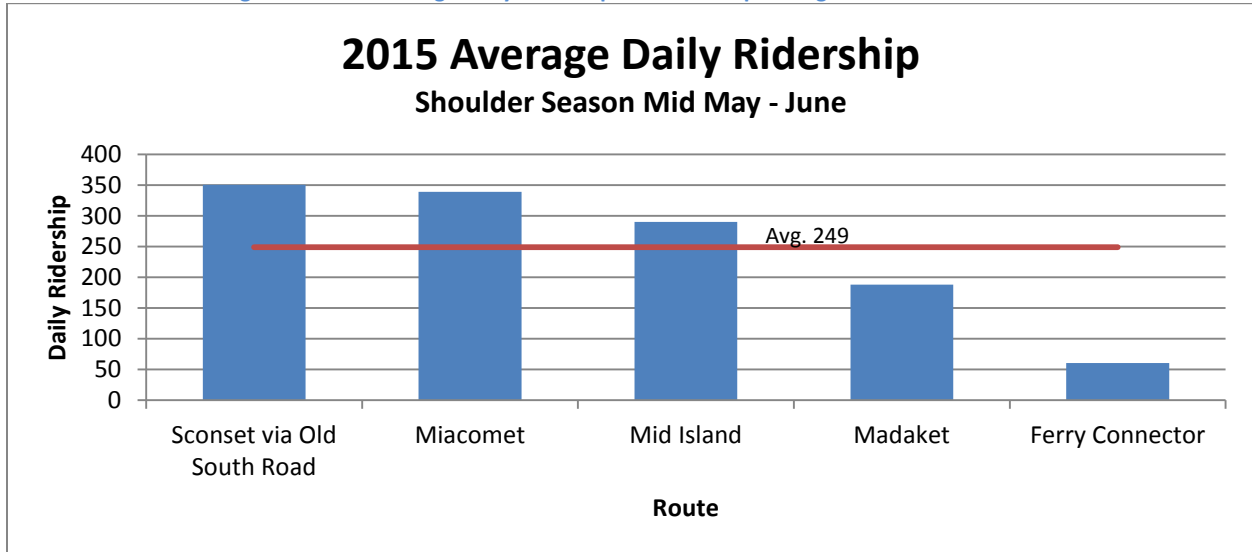
Average daily shoulder ridership is 2x higher than the system ridership of two other state RTAs which have year-round service

Figure 4: System-Wide Monthly Ridership



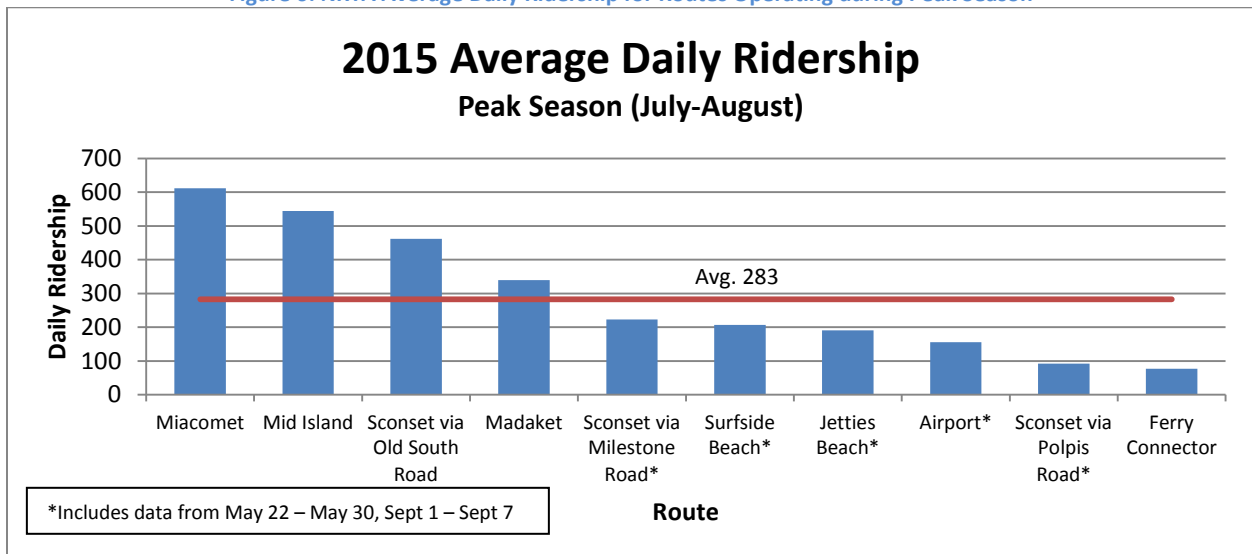
Average daily 2015 system ridership for the period prior to the peak service season was 1,228 passengers; this is a 9.6% increase from 2013. The Sconset via Old South Road Route has the highest ridership of the five routes that operate in the shoulder seasons with an average of 350 passengers per day. Ridership for routes operating prior to the peak season is shown in Figure 5.

Figure 5: NRTA Average Daily Ridership for Routes Operating Prior to Peak Season



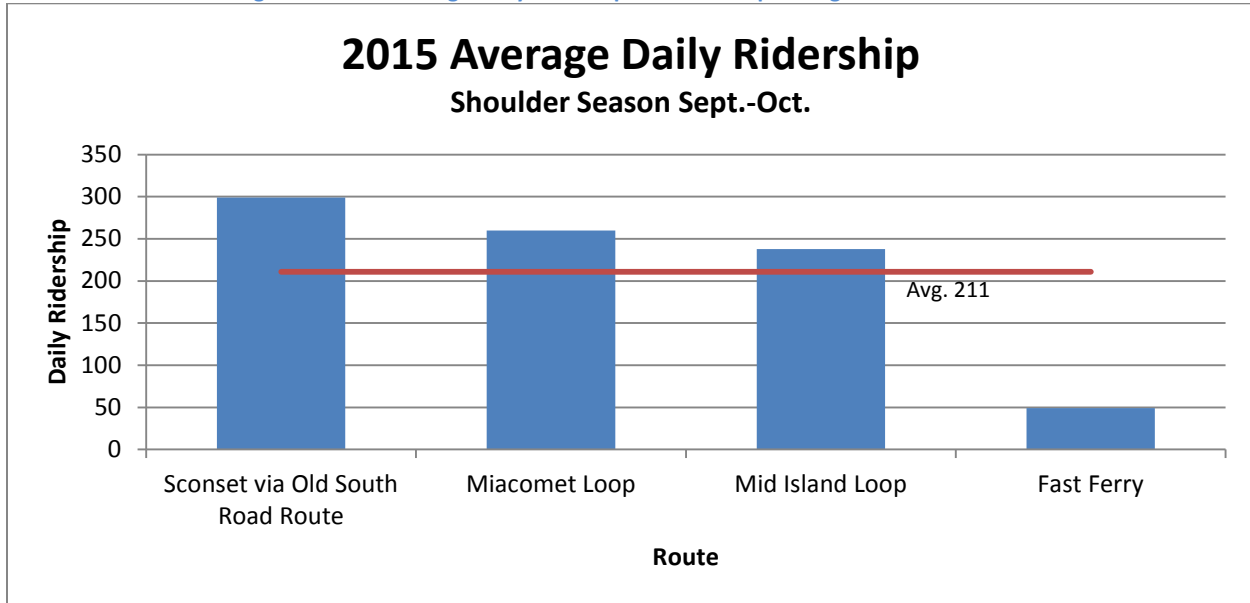
During the peak season, average system ridership is 2,902 passengers per day, with an average of 283 passengers per bus route. Note that this average includes select data from late May and early September for services that run purely during the peak season. The Miacomet Loop has the highest ridership out of all routes in the system. The top four routes all operate into the shoulders of the summer peak season, and account for 66% of system ridership during the peak. Ridership for routes operating during the peak season is shown in Figure 6.

Figure 6: NRTA Average Daily Ridership for Routes Operating during Peak Season



After the peak season, ridership drops considerably as does the level of service, with average daily ridership in the system down to 846 passengers per day. The Sconset via Old South Road Route has the strongest ridership at 299 passengers per day for this period. Service ends in the middle of October as seasonal population decreases. Ridership for routes operating after the peak season is shown in Figure 7.

Figure 7: NRTA Average Daily Ridership for Routes Operating after Peak Season



Service Effectiveness

Service effectiveness describes the amount of service utilized per unit of transit service provided. Service effectiveness is measured based on two indicators: passengers per mile and passengers per hour. While both passengers per mile and passengers per hour are presented, only passengers per mile is included in the route scoring and ranking presented at the end of the route diagnostics section to avoid duplication. Passengers per revenue mile and hour by route are presented in Table 11.

Table 11: Service Effectiveness by Route

Route Name	Passengers per Mile (PpM)	PpM Rank	Passengers per Hour (PpH)	PpH Rank
Airport Route	0.75	10	3.78	9
Ferry Connector	0.97	8	2.33	10
Jetties Beach	6.62	1	23.83	2
Madaket Route	1.07	7	13.57	7
Miacomet Loop	1.57	4	17.05	5
Mid Island Loop	2.03	3	15.76	6
Sconset via Milestone Road Route	1.32	6	18.56	4
Sconset via Old South Road Route	1.46	5	23.08	3
Sconset via Polpis Road	0.77	9	11.53	8
Surfside Beach	2.50	2	25.85	1

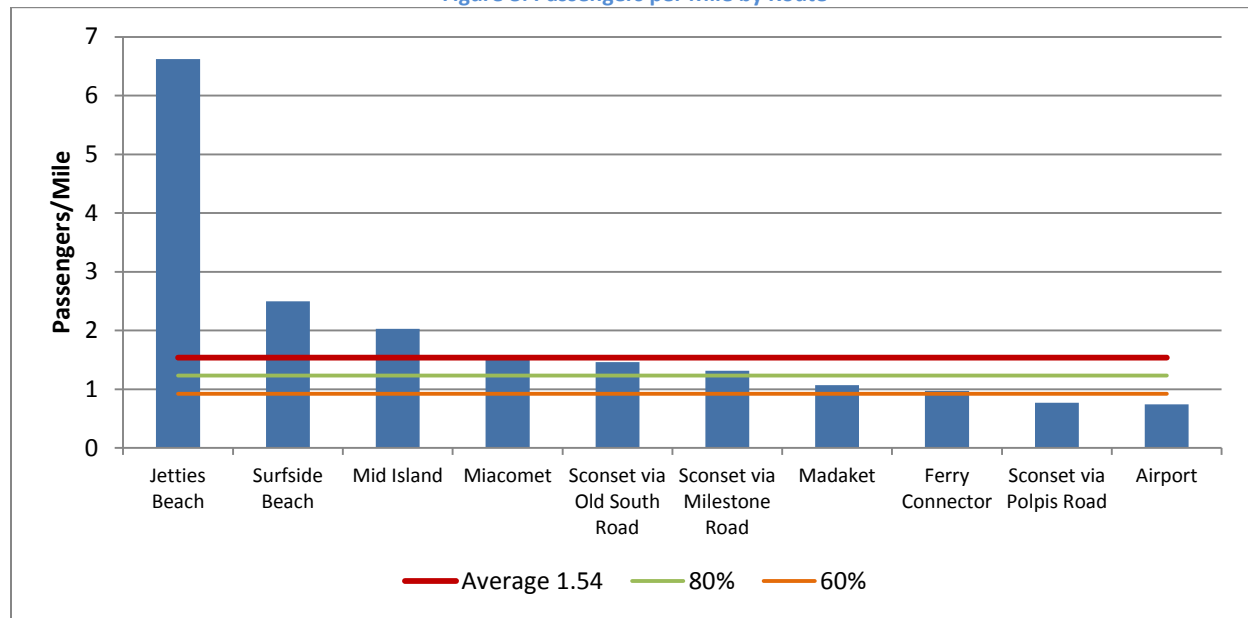
Passengers per Mile

NRTA averages 1.54 passengers per mile on the fixed routes. Sixty percent of the system average is 0.92 passengers per mile; 2 routes are below 60% of the system average. Eighty percent of system average is 1.23 passengers per mile; two routes fall between 60% and 80% of system average. Figure 8 charts passengers per mile by route along with the system average and 80% and 60% thresholds. In this chart, above the system average line is a higher rank. Jetties Beach Route⁵ had the highest passengers per revenue mile with 6.62.

The statewide average is 1.56 passengers per mile, this is skewed higher by the large Regional Transit Authorities (RTAs) in urban areas. NRTA is ranked 5th amongst all RTAs in the state and of the four predominantly rural RTAs⁶ in Massachusetts they are ranked first. According to the 2014 Rural Transit Fact Book the national average for passengers per mile for rural transit service providers⁷ is 0.59, NRTA is 164% above the average. In the Federal Transit Administration (FTA) Region 1 (New England), the average is 0.76 passengers per mile, Nantucket is more than twice this.

Passengers per Mile is more than 2X better than the average for all New England rural transit providers

Figure 8: Passengers per Mile by Route



⁵ Ridership per revenue mile is high on this route because each loop is only 1.8 miles long, while ridership per revenue hour is comparable to the rest of the system because it takes 30 minutes to complete one loop/trip in order to maintain a clock face schedule.

⁶ Franklin Regional Transit Authority, Berkshire Regional Transit Authority, Martha’s Vineyard Transit Authority, Nantucket Regional Transit Authority,

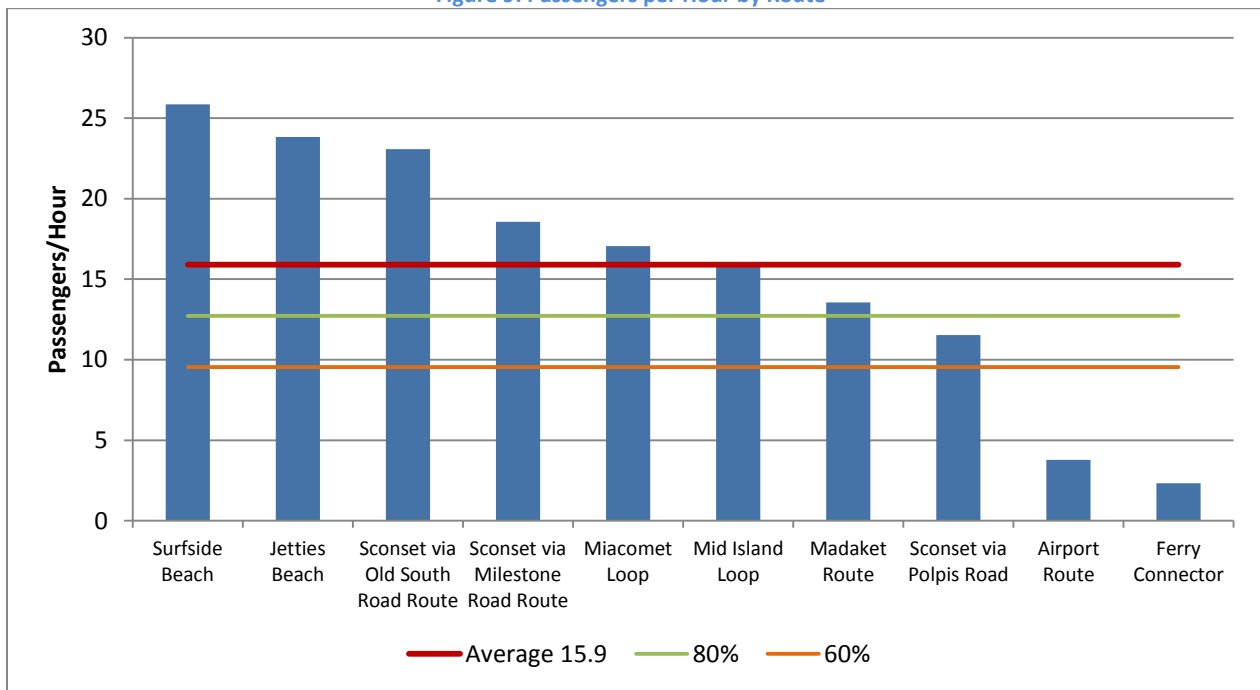
⁷ Urban areas are defined by the census as areas having more than 50,000 people with a core area density of 1,000 people per square mile or greater. The FTA Formula Grants For Other than Urbanized Areas is a rural program that is formula based and provides funding to states for the purpose of supporting public transportation in rural areas, with population of less than 50,000.

Passengers per Hour

NRTA fixed routes average 15.9 passengers per hour. Sixty percent of the system average is 9.54 passengers per hour; two routes are below 60% of the system average. Eighty percent of the system average is 12.72 passengers per hour; one route falls between 60% and 80% of system average. Figure 9 charts passengers per hour by route along with the system average. In this chart, above the line is a higher rank.

The statewide average is 21.5 passengers per hour, this is skewed higher by the large Regional Transit Authorities (RTAs) in urban areas. NRTA is ranked 8th amongst all RTAs in the state and of the four predominantly rural RTAs in Massachusetts NRTA is second. According to the *2014 Rural Transit Fact Book* the national average for passengers per hour for rural transit service providers is 10.8, NRTA is 20% above the average.

Figure 9: Passengers per Hour by Route



Financial Efficiency

Financial efficiency measures the cost of providing transit service per unit of service provided. During peak service NRTA operates up to 15 buses for 8 to 17 hours a day costing \$14,000 daily. Two indicators, cost per mile and cost per hour, can be used to determine financial efficiency. Since the daily operating cost was determined using an average cost per hour figure for the system as a whole and not for each individual route, only the cost per mile indicator varies from route to route in this analysis and therefore is presented for the review of financial efficiency.

Table 12: Financial Efficiency by Route

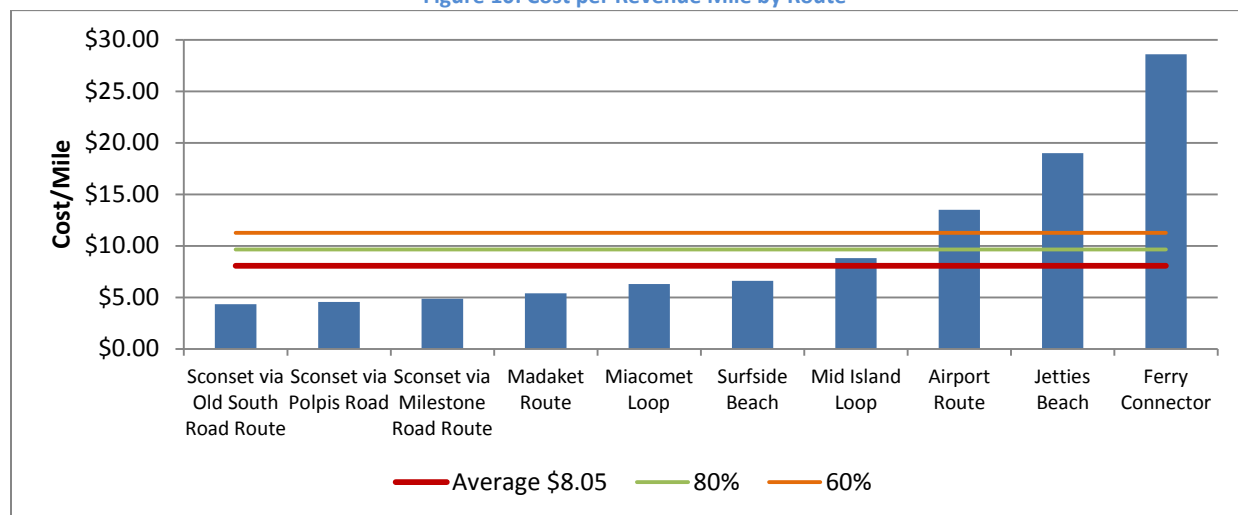
Route Name	Costs per Mile (CpM)	CpM Rank
Airport Route	\$13.51	8
Ferry Connector	\$28.60	10
Jetties Beach	\$19.00	9
Madaket Route	\$5.41	4
Miacomet Loop	\$6.31	5
Mid Island Loop	\$8.80	7
Sconset via Milestone Road Route	\$4.85	3
Sconset via Old South Road Route	\$4.33	1
Sconset via Polpis Road	\$4.56	2
Surfside Beach	\$6.61	6

Cost per Mile

The WAVE cost per mile averages \$8.05 for the fixed route network. Costs per mile more than \$11.27 are more than 60% of the system average; three routes fall into this category. Costs per mile between \$9.66 and \$11.27 are between 60% and 80% of system average; no route falls into this category. Figure 10 charts cost per mile by route along with the system average. In this chart, below the average line is a higher rank.

The statewide average cost per mile is \$6.57, this is skewed higher by the large Regional Transit Authorities (RTAs) in urban areas. According to the 2014 Rural Transit Fact Book the national average operating cost per mile for rural transit service providers \$3.04. This cost is because low because operating speeds tend to be higher in rural areas due to less traffic which allows of a greater number of miles for the same cost.

Figure 10: Cost per Revenue Mile by Route



Cost Effectiveness

Cost effectiveness measures the effectiveness of the system from a financial standpoint – how well the dollars put into the system are being used to produce trips. The cost effectiveness indicators are cost per passenger, farebox recovery and subsidy per passenger.

Table 13: Cost Effectiveness by Route

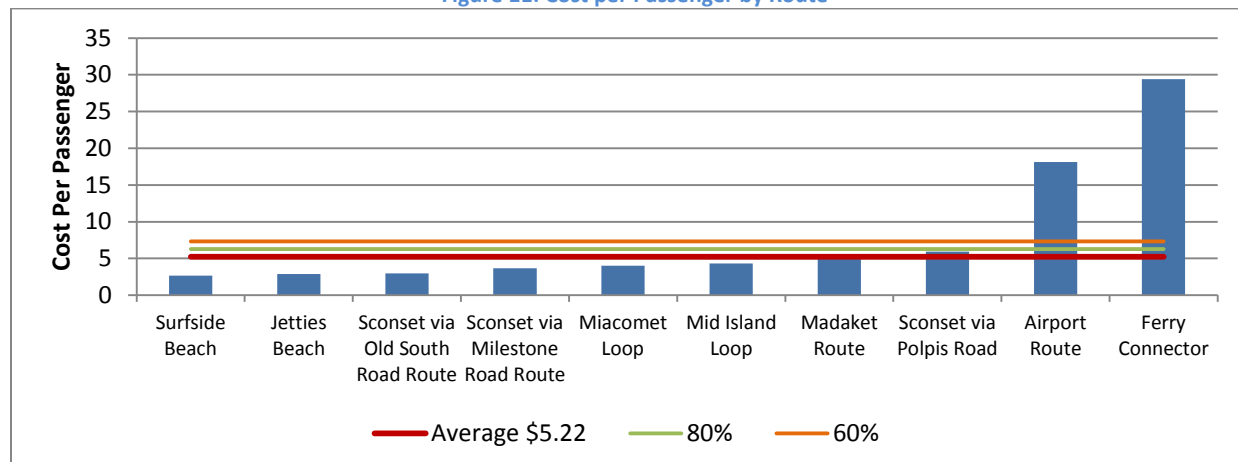
Route Name	Farebox Recovery (FR)	FR Rank	Cost per Passenger (CpP)	CpP Rank	Subsidy per Passenger	SpP Rank
Airport Route	11.2%	10	\$18.11	9	\$16.08	10
Ferry Connector	90.5%	1	\$29.42	10	\$2.79	5
Jetties Beach	34.2%	6	\$2.87	2	\$1.89	3
Madaket Route	35.3%	5	\$5.04	7	\$3.26	8
Miacomet Loop	27.5%	8	\$4.01	5	\$2.91	6
Mid Island Loop	26.1%	9	\$4.34	6	\$3.21	7
Sconset via Milestone Road Route	48.6%	4	\$3.69	4	\$1.90	4
Sconset via Old South Road Route	57.8%	3	\$2.96	3	\$1.25	2
Sconset via Polpis Road	31.6%	7	\$5.93	8	\$4.06	9
Surfside Beach	68.8%	2	\$2.65	1	\$0.82	1

Cost per Passenger

Cost per passenger is the overall cost to operate the route divided by the number of passengers, for NRTA it averages \$5.22 for NRTA fixed routes. Costs per passenger \$7.31 and above are 60% of the system average; two routes fall into this category. Costs per passenger between \$6.26 and \$7.31 are between 60% and 80% of the system average; no routes falls into this category. Figure 11 charts cost per passenger by route along with the system average. In this chart, below the line is a higher rank.

The statewide average cost per passenger is \$4.22, this is skewed higher by the large Regional Transit Authorities (RTAs) in urban areas. NRTA is ranked 5th amongst all RTAs in the state and of the four predominantly rural RTAs in Massachusetts they are ranked second. According to the 2014 Rural Transit Fact Book the national average for cost per passenger for rural transit service providers is 7.42, NRTA is 41.3% better than the average. In the Federal Transit Administration (FTA) Region 1 (New England), the average cost per passenger is \$11.46, Nantucket is 118% better than this.

Figure 11: Cost per Passenger by Route



Farebox Recovery

Farebox recovery measures the percent of operating cost covered by fares and is an outcome heavily influenced by the ridership productivity of a route against its total operating cost, as well as the fare policy of the system. It is calculated by dividing fare revenue by operating cost. For all NRTA fixed routes, the overall farebox recovery rate is 32.6%⁸.

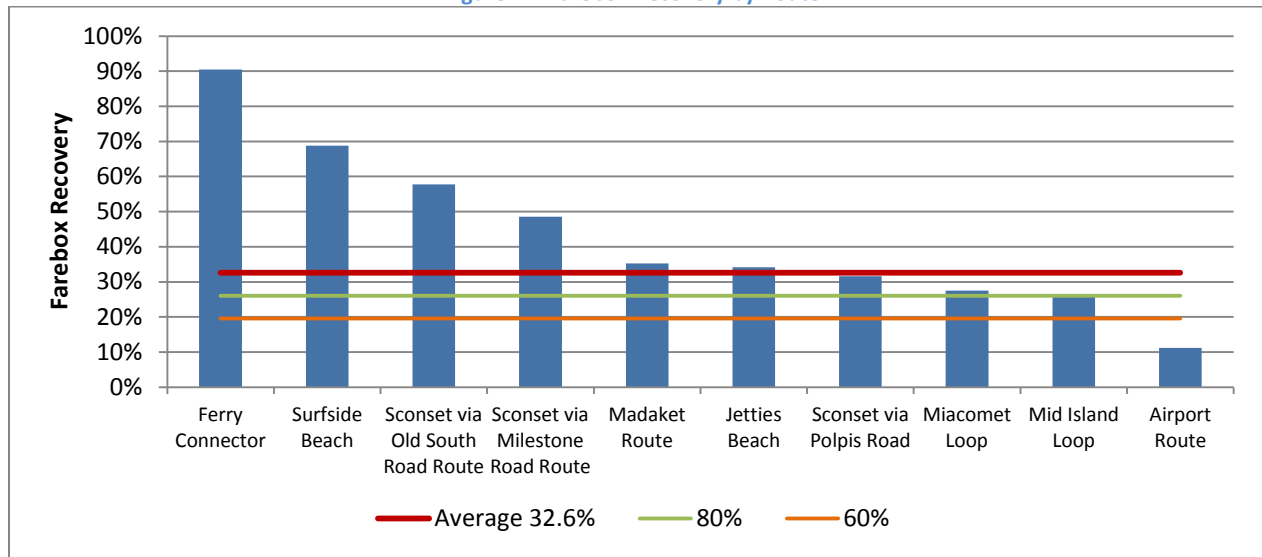
Farebox recovery of less than 19.6% is below 60% of the system average; one route falls within this category. Farebox recovery between 19.6% and 26.1% is between 60% and 80% of system average; one route fall within this category. Figure 12 charts farebox recovery by route along with the system average.

NRTA has the top farebox recovery in the state for bus service including the MBTA

In this chart, above the line is a higher rank. Nationwide transit systems strive for 20% farebox recovery, any route above this is considered to be operating well.

The statewide average farebox recovery is 19.4%, this includes the urban RTAs with higher ridership and funds received through contracts such as those with Universities. NRTA is ranked 1st amongst all RTAs in the state. According to the *2014 Rural Transit Fact Book* the national average farebox recovery for rural transit service providers is 8% , NRTA is five times better than the average. In the Federal Transit Administration (FTA) Region 1 (New England), the average farebox recovery is 6%, Nantucket far exceeds this value.

Figure 12: Farebox Recovery by Route



Subsidy per Passenger

Subsidy per passenger measures how much it costs to operate a route on a “per passenger” basis. It is calculated by subtracting passenger revenue from operating cost and dividing by the total number of passengers. Subsidy per passenger averages \$3.81

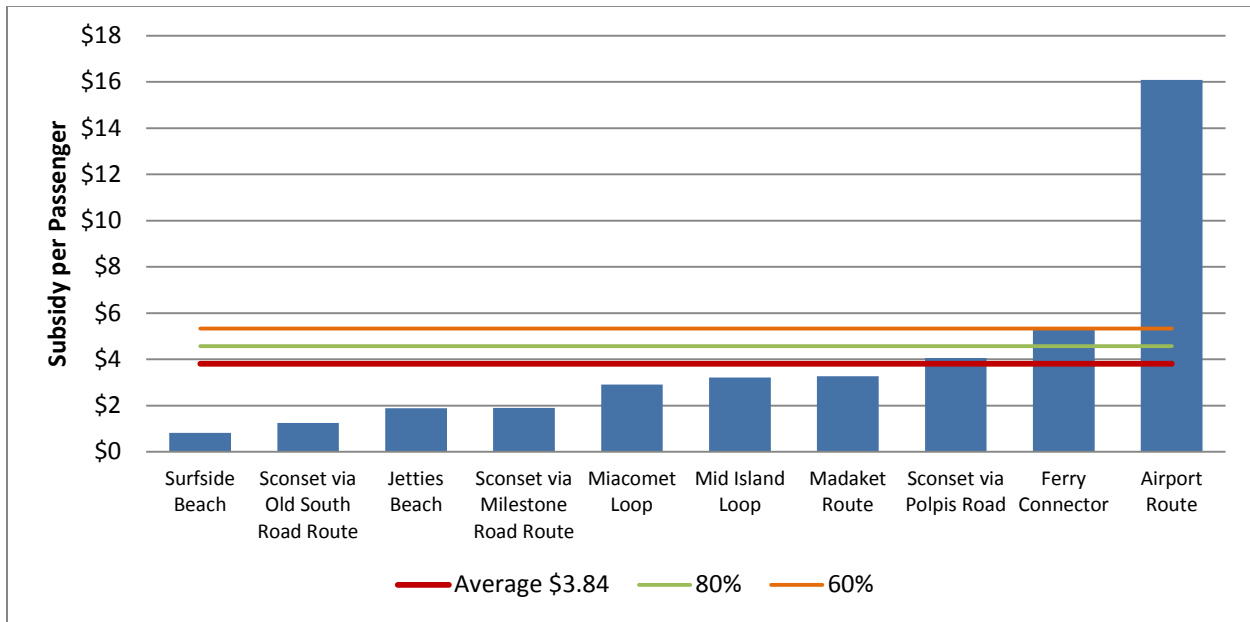
NRTAs low subsidy per passenger indicates a financially efficient system

⁸ Does not include dedicated revenue for the Ferry Connector

for NRTA fixed routes. Subsidy per passenger \$5.33 and above are 60% of the system average; one route fall into this category. Subsidy per passenger between \$4.57 and \$5.33 are between 60% and 80% of the system average; one route falls into this category. Figure 13 charts cost per passenger by route along with the system average. In this chart, below the line is a higher rank.

The statewide average subsidy per passenger is \$3.41, this includes the urban RTAs with higher ridership and funds received through contracts such as those with universities. NRTA is ranked 4th amongst all RTAs in the state and second amongst the rural ones.

Figure 13: Subsidy per Passenger by Route



Route Ranking

The rankings of each of the routes for two indicators can be used to calculate a cumulative rank score for each route. The two indicators include passengers per mile to rate service effectiveness and farebox recovery to rate cost effectiveness. Financial efficiency was not used in the cumulative rank score because the ratings of the routes in this category correlated directly to route length, which does not measure performance. Routes with a lower rank (i.e. a higher number) are indicative of poorer performing routes. Routes with a higher rank (i.e. a lower number) are generally better performing routes. A rank of 1 is indicative of the best performing route for a particular measure and a rank of 10 is indicative of the worst performing route for a particular measure. The ranking, in combination with route performance and shoulder season ridership can be used as indicators as to which route may perform well in the off-season.

Table 14 shows the cumulative ranking of routes, routes in bold operate during the shoulder season. Overall, the beach routes are the best performers in the system as they have short service spans and concentrated ridership. Of the routes that operate during the shoulder season, the Sconset via Old South Road Route has the highest rank.

Table 14: Route Ranking

Route Name	Passengers per Mile	PpM Rank	Farebox Recovery (FR)	FR Rank	Cumulative Rank Score	Overall Rank
Surfside Beach	2.50	2	69%	2	4	1
Jetties Beach	6.62	1	34%	6	7	2
Sconset via Old South Road Route	1.46	5	58%	3	8	3
Ferry Connector	0.97	8	91%	1	9	4
Sconset via Milestone Road Route	1.32	6	49%	4	10	5
Madaket Route	1.07	7	35%	5	12	6
Miacomet Loop	1.57	4	28%	8	12	6
Mid Island Loop	2.03	3	26%	9	12	6
Sconset via Polpis Road	0.77	9	32%	7	16	9
Airport Route	0.75	10	11%	10	20	10

Summary of Key Findings

The following are some key findings from the system performance analysis:

- NRTA is able to stretch the minimum useful life of their vehicles (as defined by the FTA) by not running in the winter
- The days operated for each route vary, which can be confusing to potential passengers
- Overall NRTA has a good span of service, with hours that meet the demand on the route
- Service does not vary between weekdays and weekends but rather among seasons
- There is a large gap (26) between the minimum and maximum number of employees needed to operate the service due to the varying service levels between seasons
- The system is operating below max capacity on all routes. While there is ample capacity to handle existing and future ridership system-wide, there are still times of day and certain locations when/where capacity on a single bus or on a route is an issue
- Of the shoulder season routes, Sconset via Old South Road is the most financially efficient. This is most likely due to the higher speed limits in this corridor. The shorter routes are less financially efficient because of the short trip distance, traffic in and around downtown and lower fare.
- The Ferry Connector is the most cost efficient route because it is contracted service; without the contract it would be one of the least efficient
- Most of the routes have a farebox recovery ratio of 20% or higher, indicating a financially healthy system
- The airport route has the highest subsidy per passenger; Sconset via Old South Road has the lowest

This analysis will be used in conjunction with the market analysis and demographic projections, as well as the results of the outreach effort to develop year-round transit service alternatives for NRTA.