

Barnstable County Retirement System

**Actuarial Valuation and Review as of
January 1, 2016**





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June 22, 2016

*Retirement Board
Barnstable County Retirement System
750 Attucks Lane
Hyannis, MA 02601*

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of January 1, 2016. It summarizes the actuarial data used in the valuation, establishes the funding requirements for fiscal 2017 and later years and analyzes the preceding two years' experience.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement System. The census information and financial information on which our calculations were based was prepared by the staff of the Barnstable County Retirement System. That assistance is gratefully acknowledged.

The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

An actuarial valuation is a measurement at a specific date – it is not a prediction of a plan's future financial condition. We have not been retained to perform an analysis of the potential range of financial measurements, except where otherwise noted.

The actuarial calculations were directed under my supervision. I am a member of the American Academy of Actuaries and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of my knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in my opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the Plan.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By: 

Kathleen A. Riley, FSA, MAAA, EA
Senior Vice President and Actuary

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SECTION 1: Valuation Summary for the Barnstable County Retirement System

Purpose

This report has been prepared by Segal Consulting to present a valuation of the Barnstable County Retirement System as of January 1, 2016. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The contribution requirements presented in this report are based on:

- The benefit provisions of Massachusetts General Law Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of January 1, 2016;
- The assets of the System as of December 31, 2015;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc.

Certain disclosure information required by Governmental Accounting Standards Board Statements Numbers 67 and 68 as of December 31, 2015 for the Barnstable County Retirement System, a cost-sharing multiple-employer defined benefit pension plan, is provided in a separate report.

Significant Issues in Valuation Year

The following key findings were the result of this actuarial valuation:

1. The actuarial valuation report as of January 1, 2016 is based on financial information as of that date. Changes in the value of assets subsequent to that date are not reflected.
2. The actuarial value of assets as of December 31, 2015 was \$910.5 million, or 104.3% of the market value of assets of \$873.0 million (as reported in the Annual Statement). As of December 31, 2013, the actuarial value of assets was 97.9% of the market value. During the plan years ending December 31, 2014 and December 31, 2015, the market value rates of return were 7.60% and 0.63%, respectively. Because the actuarial value of assets gradually recognizes market value fluctuations, the actuarial rates of return for the plan years ending December 31, 2014 and December 31, 2015 were 8.19% and 6.65%, respectively.

SECTION 1: Valuation Summary for the Barnstable County Retirement System

3. As indicated in Section 2, Subsection B of this report, the total unrecognized investment loss as of December 31, 2015 was \$37.5 million. This investment loss will be recognized in the determination of the actuarial value of assets for funding purposes in the next few years, to the extent it is not offset by recognition of investment gains derived from future experience. This implies that earning the assumed rate of investment return on a market value basis will result in investment losses on the actuarial value of assets in the next few years. The funding schedule shown in Section 2, Chart 16 reflects the deferred investment losses in accordance with the asset valuation method adopted by the Board.
4. This valuation reflects the following changes in actuarial assumptions:
 - The investment return assumption was decreased from 7.75% to 7.625%.
 - The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally using Scale AA from 2010 to the RP-2000 Employee Mortality Table projected generationally using Scale BB2D from 2009.
 - The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale AA from 2010 to the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale BB2D from 2009.
 - The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward three years for males only projected generationally using Scale AA from 2010 to the RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale BB2D from 2015.
 - The administrative expense assumption was increased from \$1,150,000 to \$1,500,000 based on the fiscal 2017 expense budget.

The changes in assumptions increased the unfunded liability by \$46.8 million and increased the normal cost by \$1.7 million.

5. The following plan change is included in this valuation:
 - As permitted by Section 19 of Chapter 188 of the Acts of 2010, the Cost of Living Adjustment base was increased from \$15,000 to \$16,000 as of July 1, 2015, to \$17,000 as of July 1, 2016 and to \$18,000 as of July 1, 2017.

This plan change increased the unfunded liability by \$21.3 million and increased the normal cost by \$491,000.

SECTION 1: Valuation Summary for the Barnstable County Retirement System

6. The unfunded liability was expected to increase from \$576.8 million as of January 1, 2014 to \$582.8 million as of January 1, 2016. The actual unfunded liability as of January 1, 2016 was \$653.0 million. The greater than expected increase was due to the changes in actuarial assumptions, the change in the Cost of Living Adjustment base (reflected in prior funding schedule but not included in the January 1, 2014 unfunded liability) and the investment loss on an actuarial basis, partially offset by a net experience gain.
7. With the prior valuation, the Board approved a funding schedule that fully funds the System by June 30, 2036 based on an 8-year level amortization of the 2010 ERI and a 22-year increasing amortization (4.0% per year) of the remaining unfunded liability. The funding schedule shown in Chart 16 fully amortizes the unfunded actuarial accrued liability by June 30, 2036 with appropriations that increase 5.28% per year. The fiscal 2018 appropriation, including the amortization of the retired county sheriffs' liability, is \$60,326,984 or 5.28% more than the fiscal 2017 appropriation of \$57,301,467.
8. The liability of the retired county sheriffs was recalculated to reflect changes to assumptions and plan provisions. Since the fiscal 2017 payment has already been budgeted at \$1,359,250, this recalculation is first recognized in the fiscal 2018 appropriation. Chart 16 of Section 2 shows a fiscal 2018 payment of \$1,431,018.
9. On a market value basis, the funded ratio has decreased from 58.65% as of January 1, 2014 to 55.84% as of January 1, 2016. On an actuarial basis, the funded ratio has increased from 57.39% as of January 1, 2014 to 58.23% as of January 1, 2016.

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Summary of Key Valuation Results

	2016	2014
Contributions for fiscal year beginning July 1:		
Recommended for fiscal 2017 and 2015	\$57,301,467	\$52,473,575
Recommended for fiscal 2018 and 2016	60,326,984	54,576,015
Recommended for fiscal 2019 and 2017	63,512,249	57,301,467
Funding elements for plan year beginning January 1:		
Normal cost, including administrative expenses	\$40,367,439	\$36,478,892
Market value of assets (MVA)	873,002,091	793,984,292
Actuarial value of assets (AVA)	910,455,464	776,973,700
Actuarial accrued liability	1,563,442,019	1,353,810,101
Unfunded actuarial accrued liability	652,986,555	576,836,401
Funded ratio based on the MVA	55.84%	58.65%
Funded ratio based on the AVA	58.23%	57.39%
Demographic data for plan year beginning January 1:		
Number of retired participants and beneficiaries	2,937	2,729
Number of inactive participants entitled to a return of their employee contributions	476	513
Number of inactive participants with a vested right to a deferred or immediate benefit	146	138
Number of active participants	4,699	4,696
Total payroll	\$258,172,567	\$243,205,954
Average payroll	54,942	51,790

SECTION 1: Valuation Summary for the Barnstable County Retirement System

Important Information About Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal Consulting (“Segal”) relies on a number of input items. These include:

- **Plan of benefits** Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
- **Participant data** An actuarial valuation for a plan is based on data provided to the actuary by the Barnstable County Retirement System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
- **Assets** The valuation is based on the market value of assets as of the valuation date, as provided by the Barnstable County Retirement System and uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
- **Actuarial assumptions** In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

SECTION 1: Valuation Summary for the Barnstable County Retirement System

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The actuarial valuation is prepared at the request of the Barnstable County Retirement System. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- Sections of this report may include actuarial results that are not rounded, but that does not imply precision.
- If the Barnstable County Retirement System is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The Barnstable County Retirement System should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of the Plan, it is not a fiduciary in its capacity as actuaries and consultants with respect to the Plan.

SECTION 2: Valuation Results for the Barnstable County Retirement System

A. PARTICIPANT DATA

The Actuarial Valuation and Review considers the number and demographic characteristics of covered participants, including active participants, inactive participants, retired participants and beneficiaries.

This section presents a summary of significant statistical data on these participant groups.

More detailed information for this valuation year and the preceding valuation can be found in Section 3, Exhibits A and B.

A historical perspective of how the participant population has changed over the past ten valuations can be seen in this chart.

CHART 1
Participant Population: 1999 – 2015

Year Ended December 31	Active Participants	Inactive Participants	Retired Participants and Beneficiaries	Ratio of Non-Actives to Actives
1999	4,713	664	1,816	0.53
2001	4,970	899	1,952	0.57
2003	5,031	834	2,125	0.59
2005	5,269	765	2,201	0.56
2006	5,314	787	2,267	0.57
2008	5,290	748	2,368	0.59
2009	4,786*	772	2,422	0.67
2011	4,670	637	2,556	0.68
2013	4,696	651	2,729	0.72
2015	4,699	622	2,937	0.76

* Reflects transfer of county sheriffs to the State Retirement System.

SECTION 2: Valuation Results for the Barnstable County Retirement System

Active Participants

Plan costs are affected by the age, years of service and payroll of active participants. In this year's valuation, there were 4,699 active participants with an average age of 48.8, average years of service of 12.2 years and average payroll of \$54,942. The 4,696 active participants in the prior valuation had an average age of 48.9, average service of 12.2 years and average payroll of \$51,790.

Among the active participants, there were none with unknown age and/or service information.

Inactive Participants

In this year's valuation, there were 146 participants with a vested right to a deferred or immediate vested benefit and 476 participants entitled to a return of their employee contributions.

These graphs show a distribution of active participants by age and by years of service.

CHART 2
Distribution of Active Participants by Age as of December 31, 2015

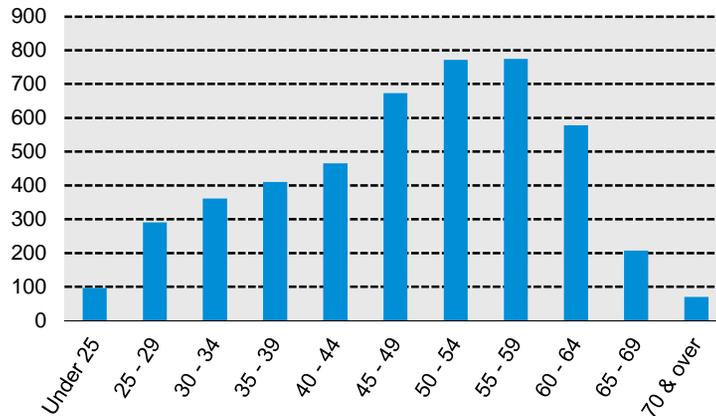
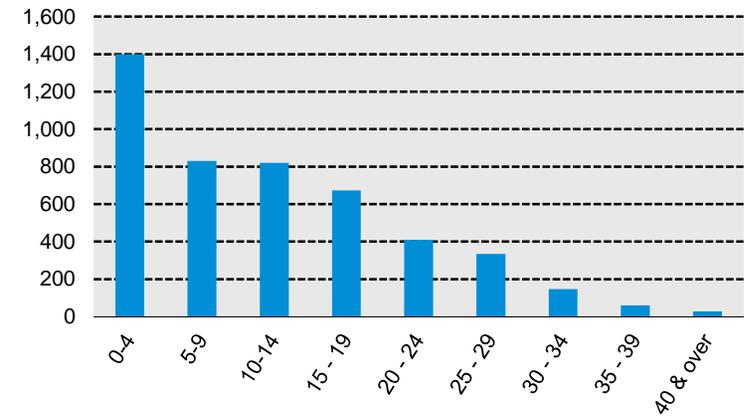


CHART 3
Distribution of Active Participants by Years of Service as of December 31, 2015



SECTION 2: Valuation Results for the Barnstable County Retirement System

Retired Participants and Beneficiaries

As of December 31, 2015, 2,633 retired participants and 299 beneficiaries were receiving total monthly benefits of \$6,130,942, excluding COLAs reimbursed by the Commonwealth. For comparison, in the previous valuation, there were 2,429 retired participants and 293 beneficiaries receiving monthly benefits of \$5,255,178, excluding COLAs reimbursed by the Commonwealth. There were five retired participants in suspended status this year and seven retired participants in the prior valuation.

These graphs show a distribution of the current retired participants and beneficiaries based on their monthly amount and age, by type of pension.

- Beneficiaries
- Accidental Disability
- Ordinary Disability
- Superannuation

CHART 4
Distribution of Retired Participants and Beneficiaries by Type and by Monthly Amount as of December 31, 2015

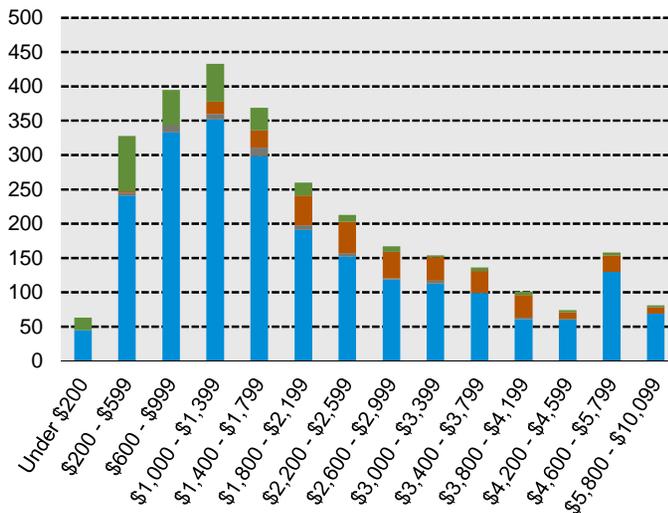
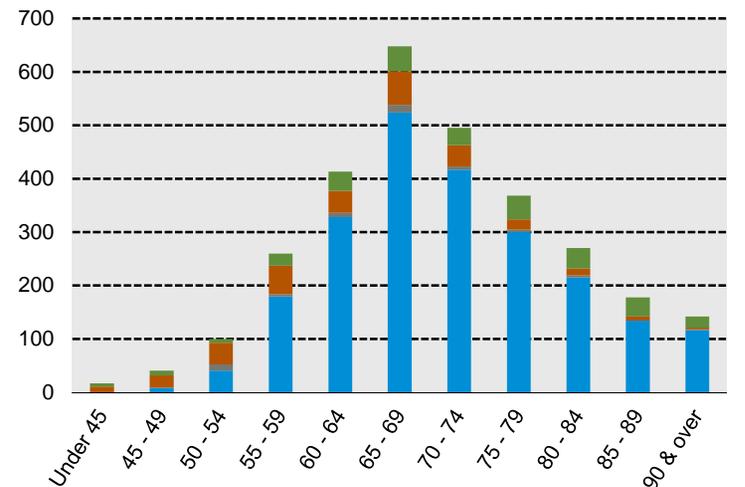


CHART 5
Distribution of Retired Participants and Beneficiaries by Type and by Age as of December 31, 2015



SECTION 2: Valuation Results for the Barnstable County Retirement System

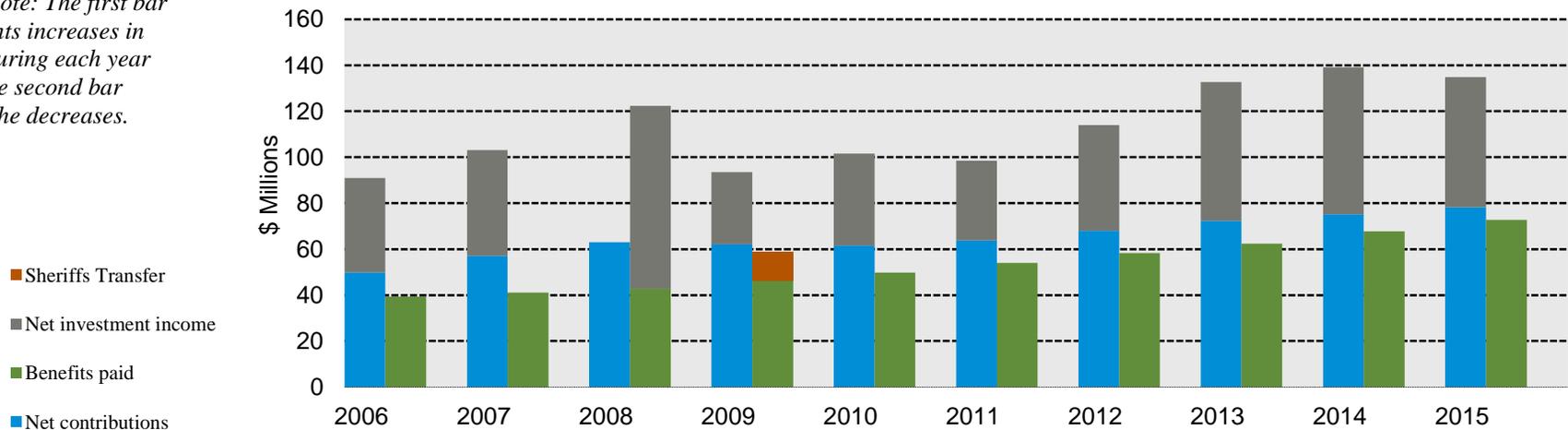
B. FINANCIAL INFORMATION

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and net investment earnings (less investment fees) will be needed to cover benefit payments.

Retirement plan assets change as a result of the net impact of these income and expense components. Additional financial information, including a summary of these transactions for the valuation year, is presented in Section 3, Exhibits C and D.

The chart depicts the components of changes in the actuarial value of assets over the last ten years. Note: The first bar represents increases in assets during each year while the second bar details the decreases.

CHART 6
Comparison of Increases and Decreases in the Actuarial Value of Assets for Years Ended December 31, 2006 – 2015



SECTION 2: Valuation Results for the Barnstable County Retirement System

It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable.

The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

The chart shows the determination of the actuarial value of assets as of the valuation date.

**CHART 7
Determination of Actuarial Value of Assets**

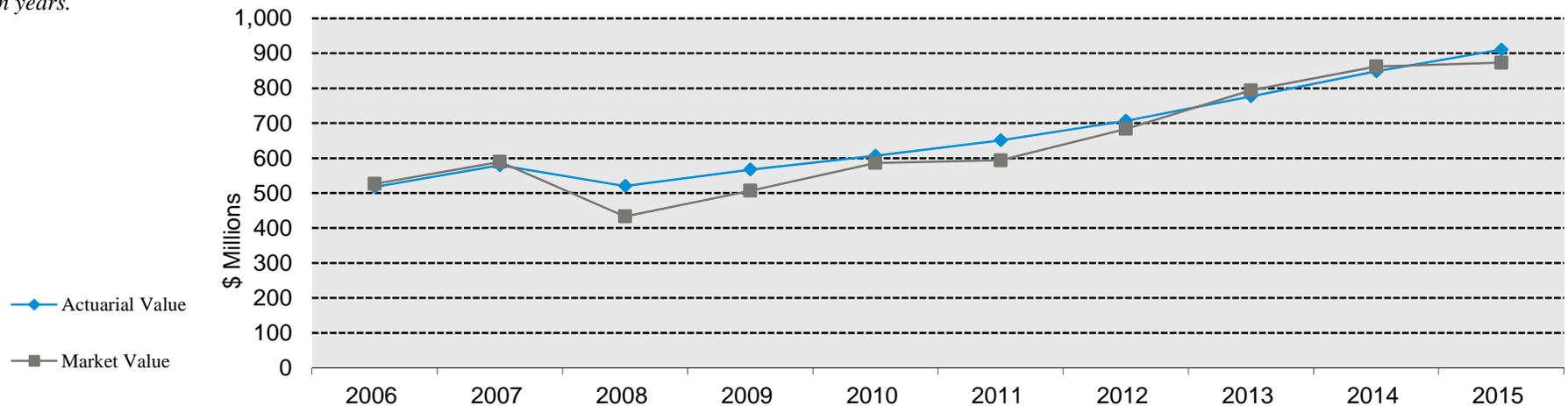
	Year Ended	
	December 31, 2015	December 31, 2014
1. Actuarial value of assets at the beginning of the year	\$848,394,344	\$776,973,700
2. Contributions, less benefit payments and expenses during the year	5,462,239	7,495,976
3. Average actuarial value: (1) + [50% of (2)]	851,125,465	780,721,688
4. Expected investment income: .0775 x (3)	65,962,224	60,505,931
5. Preliminary actuarial value of assets at the end of the year: (1) + (2) + (4)	919,818,807	844,975,607
6. Market value of assets at the end of the year	873,002,091	862,069,291
7. Adjustment toward market value: 20% of [(6) - (5)]	-9,363,343	3,418,737
8. Adjustment to be within 20% corridor	0	0
9. Final actuarial value of assets at the end of the year: (5) + (7) + (8)	<u>\$910,455,464</u>	<u>\$848,394,344</u>
10. Actuarial value as a percentage of market value: (9) ÷ (6)	104.29%	98.41%

SECTION 2: Valuation Results for the Barnstable County Retirement System

Both the actuarial value and market value of assets are representations of the Barnstable County Retirement System's financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the Barnstable County Retirement System's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

This chart shows the change in the actuarial value of assets versus the market value over the past ten years.

CHART 8
Actuarial Value of Assets vs. Market Value of Assets as of December 31, 2006 – 2015



SECTION 2: Valuation Results for the Barnstable County Retirement System

C. ACTUARIAL EXPERIENCE

To calculate the required contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), the contribution requirement will decrease from the previous year. On the other hand, the contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term

development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The net experience loss for the two-year period ending December 31, 2015 is \$2,069,023. A discussion of the major components of the actuarial experience is on the following pages.

This chart provides a summary of the actuarial experience over the past two years.

CHART 9

Actuarial Experience for Two-Year Period Ended December 31, 2015

1. Net loss from investments*	-\$5,944,606
2. Net loss from administrative expenses	-115,520
3. Net gain from other experience**	<u>3,991,103</u>
4. Net experience loss: (1) + (2) + (3)	-\$2,069,023

* Details in Chart 10

** Details in Chart 13

SECTION 2: Valuation Results for the Barnstable County Retirement System

Investment Rate of Return

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the Barnstable County Retirement System’s investment policy. For valuation purposes, the assumed rate of return on the actuarial value of assets is was 7.75% for 2015 and 2014. The actual rate of return on an actuarial basis for the 2015 and 2014 plan years were 6.65% and 8.19%, respectively.

Since the actual return for the two-year period was less than the assumed return, the Barnstable County Retirement System experienced an actuarial loss of \$5,944,606 during the two-year period ending December 31, 2015 with regard to its investments.

This chart shows the gain/(loss) due to investment experience.

**CHART 10
Actuarial Value Investment Experience**

	Year Ended	
	December 31, 2015	December 31, 2014
1. Actual return	\$56,598,881	\$63,924,668
2. Average value of assets	851,125,464	780,721,688
3. Actual rate of return: (1) ÷ (2)	6.65%	8.19%
4. Assumed rate of return	7.75%	7.75%
5. Expected return: (2) x (4)	\$65,962,224	\$60,505,931
6. Actuarial gain/(loss): (1) – (5)	<u>-\$9,363,343</u>	<u>\$3,418,737</u>

SECTION 2: Valuation Results for the Barnstable County Retirement System

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the market value investment return for the last ten years, including five-year and ten-year averages.

Based upon this experience and future expectations, we have decreased the assumed rate of return from 7.75% to 7.625%.

CHART 11

Investment Return – Actuarial Value vs. Market Value: 2006 - 2015

Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return	
	Amount	Percent	Amount	Percent
2006	\$41,126,626	8.73%	\$62,425,689	13.61%
2007	45,884,534	8.73	46,934,182	8.78
2008	-79,377,767	-13.47	-176,200,834	-29.39
2009	31,460,127	5.96	69,758,113	15.81
2010	39,828,569	7.10	68,065,161	13.28
2011	34,646,341	5.67	-2,301,715	-0.39
2012	45,883,414	7.00	79,901,995	13.34
2013	60,295,420	8.47	100,382,552	14.58
2014	63,924,668	8.19	60,589,023	7.60
2015	<u>56,598,881</u>	6.65	<u>5,470,561</u>	0.63
Total	\$340,270,813		\$315,024,727	
	Five-year average return	7.24%		6.89%
	Ten-year average return	5.41%		5.17%

Note: Each year's yield is weighted by the average asset value in that year.

SECTION 2: Valuation Results for the Barnstable County Retirement System

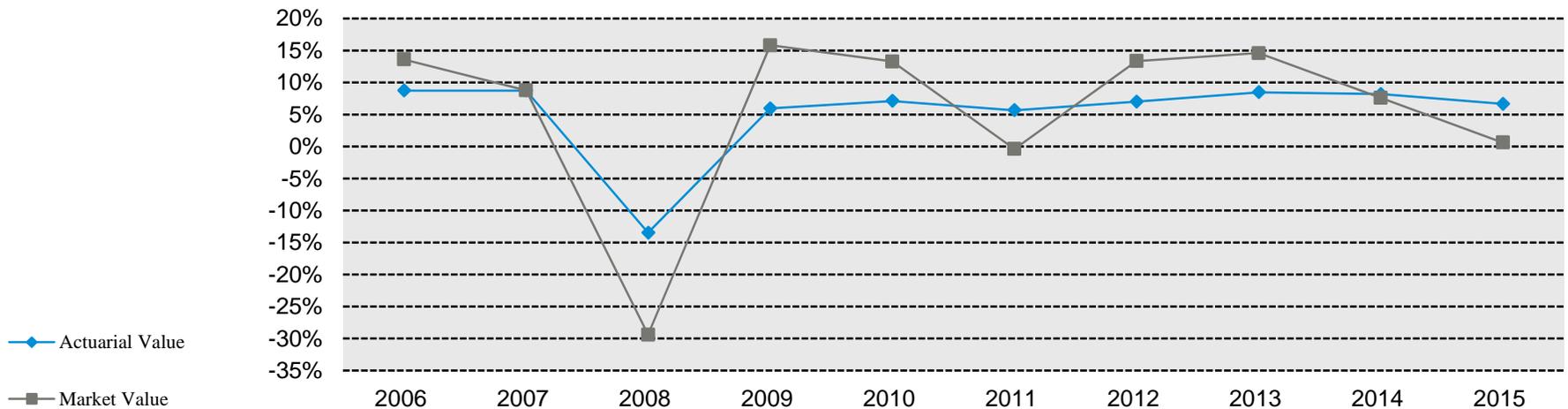
Subsection B described the actuarial asset valuation method that gradually takes into account fluctuations in the market value rate of return. The effect of this is to stabilize the actuarial rate of return, which contributes to leveling pension plan costs.

Administrative Expenses

Administrative expenses for the years ended December 31, 2014 and 2015 were \$1,210,998 and \$1,288,422, respectively, compared to the assumption of \$1,150,000 for 2014 and \$1,196,000 for 2015. This resulted in a loss of \$115,520 for the two-year period, including an adjustment for interest. Based on the fiscal 2017 expense budget, we have increased the assumption to \$1,500,000 for calendar year 2016.

This chart illustrates how this leveling effect has actually worked over the years 2006 - 2015.

CHART 12
Market and Actuarial Rates of Return for Years Ended December 31, 2006 - 2015



SECTION 2: Valuation Results for the Barnstable County Retirement System

Other Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among the participants,
- retirement experience (earlier or later than expected),
- mortality (more or fewer deaths than expected),
- the number of disability retirements, and
- salary increases different than assumed.

The net gain from this other experience for the two-year period ending December 31, 2015 amounted to \$3,991,103, which is 0.3% of the actuarial accrued liability.

A brief summary of the demographic gain/(loss) experience of the Barnstable County Retirement System for the two-year period ending December 31, 2015 is shown in the chart below.

This valuation reflects the following changes in actuarial assumptions:

- The investment return assumption was decreased from 7.75% to 7.625%.
- The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally using Scale AA from 2010 to the RP-2000 Employee Mortality Table projected generationally using Scale BB2D from 2009.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale AA from 2010 to the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale BB2D from 2009.
- The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward three years for males only projected generationally using Scale AA from 2010 to the RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale BB2D from 2015.

The chart shows elements of the experience gain/(loss) for the most recent years.

CHART 13

Experience Due to Changes in Demographics for Two-Year Period Ended December 31, 2015

1. More deaths than expected among retired members and beneficiaries	\$3,400,648
2. Salaries increasing less than expected for continuing actives	8,046,925
3. Loss from data changes and other miscellaneous experience, partially offset by fewer retirements than expected	<u>-7,456,470</u>
4. Total	\$3,991,103

SECTION 2: Valuation Results for the Barnstable County Retirement System

- The administrative expense assumption was increased from \$1,150,000 to \$1,500,000 based on the fiscal 2017 expense budget.

The changes in assumptions increased the unfunded liability by \$46.8 million and increased the normal cost by \$1.7 million.

The following plan change is included in this valuation:

- As permitted by Section 19 of Chapter 188 of the Acts of 2010, the Cost of Living Adjustment base was increased from \$15,000 to \$16,000 as of July 1, 2015, to \$17,000 as of July 1, 2016 and to \$18,000 as of July 1, 2017.

This plan change increased the unfunded liability by \$21.3 million and increased the normal cost by \$491,000.

The unfunded liability was expected to increase from \$576.8 million as of January 1, 2014 to \$582.8 million as of January 1, 2016. The actual unfunded liability as of January 1, 2016 of \$653.0 million is \$70.2 million higher than expected as detailed in Chart 14 below.

CHART 14 Recommended Contribution

	Year Ended	
	December 31, 2015	December 31, 2015
1. Unfunded actuarial accrued liability at beginning of year	\$580,498,466	\$576,836,401
2. Normal cost at beginning of year, including administrative expenses	37,938,048	36,478,892
3. Total contributions	-79,494,187	-76,409,860
4. Interest		
(a) For whole year on (1) + (2)	\$47,928,829	\$47,531,935
(b) For half year on (3)	<u>-4,097,858</u>	<u>-3,938,902</u>
(c) Total interest	<u>43,830,971</u>	<u>43,593,033</u>
5. Expected unfunded actuarial accrued liability	\$582,773,298	\$580,498,466
6. Changes due to:		
(a) Net experience loss	\$2,069,023	--
(b) Changes in actuarial assumptions	46,805,360	--
(c) Changes to plan provisions	<u>21,338,874</u>	--
(d) Total changes	<u>70,213,257</u>	--
7. Unfunded actuarial accrued liability at end of year	<u>\$652,986,555</u>	--

SECTION 2: Valuation Results for the Barnstable County Retirement System

D. RECOMMENDED CONTRIBUTION

The amount of annual contribution required to fund the Plan is comprised of an employer normal cost payment and a payment on the unfunded actuarial accrued liability.

Because the fiscal 2017 appropriation has already been budgeted at \$57,301,467, the results of this valuation will first be reflected in the fiscal 2018 appropriation. Appropriations for fiscal 2018 and later years are shown in Chart 16 on the following page. In projecting the unfunded actuarial accrued liability for future fiscal years, the deferred investment losses have been reflected in accordance with the asset valuation method approved by the Board.

With the prior valuation, the Board approved a funding schedule that fully funds the System by June 30, 2036 based on an 8-year level amortization of the 2010 ERI and a 22-year increasing amortization (4.0% per year) of the remaining unfunded liability. The funding schedule shown in Chart 16 fully amortizes the unfunded actuarial accrued liability by June 30, 2036 with appropriations that increase 5.28% per year. The fiscal 2018 appropriation, including the amortization of the retired county sheriffs' liability, is \$60,326,984 or 5.28% more than the fiscal 2017 appropriation of \$57,301,467.

The chart compares this valuation's recommended contribution with the prior valuation.

CHART 15
Recommended Contribution

	Year Beginning January 1			
	2016		2014	
	Amount	% of Payroll	Amount	% of Payroll
1. Total normal cost	\$38,867,439	14.41%	\$35,328,892	13.92%
2. Administrative expenses	1,500,000	0.56%	1,150,000	0.45%
3. Expected employee contributions	<u>-26,126,579</u>	<u>-9.69%</u>	<u>-24,272,605</u>	<u>-9.56%</u>
4. Employer normal cost: (1) + (2) + (3)	\$14,240,860	5.28%	\$12,206,287	4.81%
5. Actuarial accrued liability	1,563,442,019		1,353,810,101	
6. Actuarial value of assets	<u>910,455,464</u>		<u>776,973,700</u>	
7. Unfunded actuarial accrued liability: (5) - (6)	\$652,986,555		\$576,836,401	
8. Employer normal cost projected to July 1, 2016 and 2014, adjusted for timing	14,756,545	5.38%	12,682,491	4.90%
9. Projected unfunded actuarial accrued liability	677,424,379		598,771,744	
10. Payment on projected unfunded actuarial accrued liability, adjusted for timing	42,544,922	15.51%	39,791,084	15.36%
11. Total recommended contribution: (8) + (10)	<u>\$57,301,467</u>	<u>20.89%</u>	<u>\$52,473,575</u>	<u>20.26%</u>
12. Projected payroll as of July 1	\$274,351,495		\$258,948,715	

*Notes: Recommended contributions are assumed to be paid on July 1 and December 31.
Recommended contributions set equal to the budgeted amounts determined with the previous valuation.*

SECTION 2: Valuation Results for the Barnstable County Retirement System

CHART 16

Funding Schedule – Fully Funded by 2036 with uniform increases in the appropriation of 5.28% through 2035 and a smaller final payment

(1) Fiscal Year Ended June 30,	(2) Employer Normal Cost	(3) Amortization of ERI (2002) Liability	(4) Amortization of ERI (2003) Liability	(5) Amortization of ERI (2010) Liability	(6) Amortization of Remaining Liability	(7) Plan Cost Without Retired County Sheriff Liability: (2)+(3)+(4) +(5)+(6)	(8) Amortization of Retired County Sheriff Liability	(9) Total Appropriation: (7)+(8)	(10) Total UAL at Beginning of Fiscal Year	(11) Increase Over Prior Appropriation
2017	\$14,756,545	\$426,336	\$200,586	\$262,965	\$40,295,785	\$55,942,217	\$1,359,250	\$57,301,467	\$677,424,379	--
2018	15,335,551	443,389	208,610	262,965	42,645,451	58,895,966	1,431,018	60,326,984	692,774,127	5.28%
2019	15,937,107	461,125	216,954	262,965	45,127,522	62,005,673	1,506,576	63,512,249	705,746,451	5.28%
2020	16,562,087	479,570	225,632	262,965	47,749,319	65,279,573	1,586,123	66,865,696	716,157,762	5.28%
2021	17,211,398	498,752	234,658	262,965	50,518,561	68,726,334	1,669,871	70,396,205	723,783,325	5.28%
2022	17,885,979	518,702	244,044	262,966	53,443,393	72,355,084	1,758,040	74,113,124	728,355,634	5.28%
2023	18,586,810	539,451	253,806	--	56,795,366	76,175,433	1,850,864	78,026,297	729,563,344	5.28%
2024	19,314,903	561,029	263,958	--	60,057,606	80,197,496	1,948,590	82,146,086	727,049,896	5.28%
2025	20,071,316	583,470	274,516	--	63,502,621	84,431,923	2,051,476	86,483,399	720,410,872	5.28%
2026	20,857,141	606,808	285,497	--	67,146,321	88,895,767	2,153,956	91,049,723	709,191,347	5.28%
2027	21,673,515	631,081	296,917	--	71,015,521	93,617,034	2,240,114	95,857,148	692,883,087	5.28%
2028	22,521,621	656,324	308,793	--	75,101,948	98,588,686	2,329,719	100,918,405	642,677,399	5.28%
2029	23,402,682	682,577	321,145	--	79,417,586	103,823,990	2,422,907	106,246,897	608,842,879	5.28%
2030	24,317,973	709,880	333,991	--	83,975,065	109,336,909	2,519,824	111,856,733	567,729,059	5.28%
2031	25,268,815	738,275	347,351	--	88,787,712	115,142,153	2,620,616	117,762,769	518,519,777	5.28%
2032	26,256,582	767,806	361,245	--	93,869,569	121,255,202	2,725,441	123,980,643	460,322,337	5.28%
2033	27,282,698	798,519	375,694	--	99,235,451	127,692,362	2,834,459	130,526,821	392,160,903	5.28%
2034	28,348,645	830,459	390,722	--	104,900,974	134,470,800	2,947,837	137,418,637	312,969,335	5.28%
2035	29,455,959	863,678	406,351	--	110,882,603	141,608,591	3,065,750	144,674,341	221,583,453	5.28%
2036	30,606,236	898,228	422,604	--	114,387,712	146,314,780	3,188,380	149,503,160	116,732,645	3.34%
2037	31,801,135	--	--	--	--	31,801,135	--	31,801,135	--	-78.73%
2038	33,042,376	--	--	--	--	33,042,376	--	33,042,376	--	3.90%

Notes: Recommended contributions are assumed to be paid on July 1 and December 31.

Item (2) reflects 3.5% growth in payroll and 0.15% adjustment to total normal cost to reflect the effects of mortality improvement due to the generational mortality assumption.

Projected normal cost does not reflect the future impact of pension reform for future hires.

2002 and 2003 ERI amortization payments calculated to increase 4.0% per year and 2010 ERI amortizations are level.

Reflects deferred investment losses.

The Retiree Sheriff 2002 ERI payment is included in item (8).

July 1, 2016 unfunded accrued liability reflects the increase in the COLA base effective July 1, 2016 and July 1, 2017.

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT A

Table of Plan Coverage

Category	Year Ended December 31		Change From Prior Year
	2015	2013	
Active participants in valuation:			
Number	4,699	4,696	0.1%
Average age	48.8	48.9	N/A
Average service	12.2	12.2	N/A
Total payroll for prior year	\$258,172,567	\$243,205,954	6.2%
Average payroll for prior year	54,942	51,790	6.1%
Member contributions	239,399,454	223,293,103	7.2%
Number with unknown age information	0	1	-100.0%
Inactive participants entitled to a return of their employee contributions			
	476	513	-7.2%
Inactive participants with a vested right to a deferred or immediate benefit			
	146	138	5.8%
Retired participants:			
Number in pay status	2,264	2,072	9.3%
Average age	71.4	71.6	N/A
Average monthly benefit	\$2,084	\$1,920	8.5%
Number in suspended status	2	3	-33.3%
Disabled participants:			
Number in pay status	369	357	3.4%
Average age	63.4	62.8	N/A
Average monthly benefit	\$2,798	\$2,648	5.7%
Number in suspended status	3	4	-25.0%
Beneficiaries in pay status			
Number	299	293	2.0%
Average age	72	72.4	N/A
Average monthly benefit	\$1,271	\$1,135	12.0%

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT B

**Participants in Active Service as of December 31, 2015
By Age, Years of Service, and Average Payroll**

Age	Years of Service									
	Total	0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	96	95	1	--	--	--	--	--	--	--
	\$37,499	\$37,198	\$66,080	--	--	--	--	--	--	--
25 - 29	291	243	46	2	--	--	--	--	--	--
	\$47,966	\$46,167	\$56,841	\$62,483	--	--	--	--	--	--
30 - 34	361	177	131	51	2	--	--	--	--	--
	\$52,243	\$46,243	\$55,347	\$64,279	\$72,948	--	--	--	--	--
35 - 39	410	164	98	117	30	1	--	--	--	--
	\$57,175	\$44,140	\$58,673	\$70,390	\$72,122	\$53,521	--	--	--	--
40 - 44	466	155	81	89	104	37	--	--	--	--
	\$57,988	\$41,709	\$51,078	\$63,172	\$75,010	\$80,994	--	--	--	--
45 - 49	673	185	91	109	116	98	64	10	--	--
	\$59,123	\$39,382	\$43,921	\$58,145	\$70,666	\$80,470	\$78,970	\$103,206	--	--
50 - 54	772	145	142	140	116	77	108	41	3	--
	\$57,926	\$38,519	\$43,896	\$52,582	\$60,542	\$76,850	\$82,305	\$84,458	\$82,305	--
55 - 59	775	146	105	142	143	91	69	46	29	4
	\$55,434	\$41,131	\$47,087	\$51,047	\$53,596	\$60,036	\$70,675	\$83,594	\$89,395	\$80,340
60 - 64	578	64	99	95	121	64	65	34	23	13
	\$51,741	\$38,757	\$43,513	\$46,991	\$47,089	\$53,614	\$58,339	\$73,474	\$86,832	\$95,209
65 - 69	207	18	28	52	32	32	24	13	1	7
	\$52,379	\$40,972	\$48,891	\$43,952	\$55,396	\$55,952	\$55,305	\$67,736	\$24,988	\$93,515
70 & over	70	7	8	23	10	9	4	2	4	3
	\$43,891	\$25,226	\$32,820	\$46,438	\$36,988	\$53,488	\$60,621	\$67,219	\$38,638	\$60,809
Total	4,699	1,399	830	820	674	409	334	146	60	27
	\$54,942	\$42,110	\$49,316	\$56,130	\$60,586	\$68,509	\$72,399	\$81,187	\$83,601	\$88,745

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT C

Summary Statement of Income and Expenses on an Actuarial Value Basis

	Year Ended December 31, 2015	Year Ended December 31, 2014
Net assets at actuarial value at the beginning of the year	\$848,394,344	\$776,973,700
Contribution income:		
Employer contributions	\$53,512,418	\$51,438,214
Employee contributions	25,867,836	24,847,689
Federal grant reimbursement contributions	113,933	123,957
Less administrative expenses	<u>-1,288,422</u>	<u>-1,210,998</u>
Net contribution income	78,205,765	75,198,862
Investment income	<u>56,598,881</u>	<u>63,924,668</u>
Total income available for benefits	\$134,804,646	\$139,123,530
Less benefit payments:		
Pensions, annuities, refunds and net transfers	-\$73,594,625	-\$68,537,439
Net 3(8)(c) reimbursements	<u>851,099</u>	<u>834,553</u>
Net benefit payments	-\$72,743,526	-\$67,702,886
Change in reserve for future benefits	\$62,061,120	\$71,420,644
Net assets at actuarial value at the end of the year	\$910,455,464	\$848,394,344

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT D

Development of the Fund Through December 31, 2015

Year Ended December 31	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return*	Administrative Expenses	Benefit Payments	Preliminary Actuarial Value of Assets	Transfer to State Retirement System	Actuarial Value of Assets at End of Year
2006	\$31,044,132	\$19,753,749	\$122,894	\$41,126,626	\$1,032,312	\$39,256,986	\$517,396,087	--	\$517,396,087
2007	36,738,676	21,222,808	104,229	45,884,534	890,150	41,078,574	579,377,610	--	579,377,610
2008	41,826,233	22,037,322	109,158	-79,377,767	955,794	42,926,907	520,089,855	--	520,089,855
2009	39,820,453	23,266,441	116,859	31,460,128	1,105,896	46,373,532	567,274,308	\$12,397,754	554,876,554
2010	40,770,344	21,742,489**	166,011	39,828,569	987,783	49,810,805	606,585,379	--	606,585,379
2011	43,048,024	21,754,938	118,153	34,646,341	1,080,590	54,008,264	651,063,981	--	651,063,981
2012	45,725,078	23,220,718	107,650	45,883,414	1,065,300	58,305,330	706,630,211	--	706,630,211
2013	48,540,969	24,760,772	182,538	60,295,420	1,104,266	62,331,944	776,973,700	--	776,973,700
2014	51,438,214	24,847,689	123,957	63,924,668	1,210,998	67,702,886	848,394,344	--	848,394,344
2015	53,512,418	25,867,836	113,933	56,598,881	1,288,422	72,743,526	910,455,464	--	910,455,464

* *Net of investment expenses.*

** *Excludes Annuity Savings Fund transfer of \$12,397,754 to the State Retirement System for the county sheriffs, which was previously reflected in the December 31, 2009 actuarial value of assets.*

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT E

Table of Amortization Bases as of July 1, 2016

Type	Annual Payment	Years Remaining	Outstanding Balance
2002 ERI liability	\$426,336	20.00	\$6,164,355
2003 ERI liability	200,586	20.00	2,900,263
2010 ERI liability	262,965	6.00	1,299,280
Retired county sheriffs liability	1,359,250	20.00	21,191,369
Remaining unfunded liability	<u>40,295,785</u>	20.00	<u>645,869,112</u>
Total	\$42,544,922		\$677,424,379

Notes: Payments assumed to be made on July 1 and December 31.

Amortization payments calculated to increase 4.0% per year, except for 2010 ERI amortization payments, which are level.

Retired county sheriffs liability was recalculated to reflect assumption changes.

Payments on remaining unfunded liability and retired county sheriffs liability reflect adjustment to set fiscal 2017 appropriation to budgeted amount.

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT F

Unit Allocation of ERI Amortizations for Fiscal 2017

Unit	2002 ERI	2003 ERI	2010 ERI	Total
Barnstable County	\$88,741	\$28,018	\$0	\$116,759
Barnstable Fire	4,294	0	0	4,294
Barnstable Housing Authority	3,856	0	0	3,856
Bourne Recreation	16,972	0	0	16,972
Bourne Water	4,920	0	0	4,920
C.O.M.M. Fire	0	4,916	0	4,916
Cape Cod Mosquito	2,692	0	0	2,692
County Hospital	7,639	0	0	7,639
Dennis Housing	2,571	0	0	2,571
Hyannis Fire	1,698	0	0	1,698
Mashpee Water	0	4,279	0	4,279
Town of Barnstable	102,643	0	106,075	208,718
Town of Bourne	79,746	0	0	79,746
Town of Brewster	16,849	0	0	16,849
Town of Chatham	0	0	101,140	101,140
Town of Eastham	23,643	0	0	23,643
Town of Mashpee	37,739	0	0	37,739
Town of Nantucket	0	118,834	0	118,834
Town of Truro	13,777	0	0	13,777
Town of Wellfleet	14,430	0	0	14,430
Town of Yarmouth	0	40,400	55,750	96,150
Veterans District	4,126	0	0	4,126
Yarmouth Housing	<u>0</u>	<u>4,139</u>	<u>0</u>	<u>4,139</u>
Total	\$426,336	\$200,586	\$262,965	\$889,887

SECTION 3: Supplemental Information for the Barnstable County Retirement System

EXHIBIT G

Definitions of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Assumptions or actuarial assumptions:

The estimates on which the cost of the Plan is calculated including:

- (a) Investment return — the rate of investment yield that the Plan will earn over the long-term future;
- (b) Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates;
- (c) Retirement rates — the rate or probability of retirement at a given age;
- (d) Turnover rates — the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement.

Normal cost:

The amount of contributions required to fund the benefit allocated to the current year of service.

Actuarial accrued liability for actives:

The equivalent of the accumulated normal costs allocated to the years before the valuation date.

Actuarial accrued liability for pensioners:

The single sum value of lifetime benefits to existing pensioners. This sum takes account of life expectancies appropriate to the ages of the pensioners and the interest that the sum is expected to earn before it is entirely paid out in benefits.

Unfunded actuarial accrued liability:

The extent to which the actuarial accrued liability of the Plan exceeds the assets of the Plan. There are many approaches to paying off the unfunded actuarial accrued liability, from meeting the interest accrual only to amortizing it over a specific period of time.

SECTION 3: Supplemental Information for the Barnstable County Retirement System

Amortization of the unfunded actuarial accrued liability:

Payments made over a period of years equal in value to the Plan's unfunded actuarial accrued liability.

Investment return:

The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.

SECTION 4: Reporting Information for the Barnstable County Retirement System

EXHIBIT I

Summary of Actuarial Valuation Results

The valuation was made with respect to the following data supplied to us:

1. Retired participants as of the valuation date (including 299 beneficiaries in pay status and 5 retired participants in suspended status)	2,937
2. Participants active during the year ended December 31, 2015 with total accumulated contributions of \$239,399,454 and projected 2016 payroll as of January 1, 2016 of \$269,672,807	4,699
3. Inactive participants entitled to a return of their employee contributions as of December 31, 2015	476
4. Inactive participants with a vested right to a deferred or immediate benefit as of December 31, 2015	146

The actuarial factors as of the January 1, 2016 valuation date are as follows:

1. Normal cost	\$38,867,439
2. Administrative expenses	1,500,000
3. Expected employee contributions	<u>-26,126,579</u>
4. Employer normal cost: (1) + (2) + (3)	\$14,240,860
5. Actuarial accrued liability	1,563,442,019
Retired participants and beneficiaries	\$785,024,281
Active participants	758,211,712
Inactive participants	20,206,026
6. Actuarial value of assets (\$873,002,091 at market value as reported on the Annual Statement)	<u>910,455,464</u>
7. Unfunded actuarial accrued liability: (5) - (6)	\$652,986,555

The actuarial factors projected to July 1, 2016 are as follows:

1. Employer normal cost, adjusted for timing	\$14,756,545
2. Projected unfunded actuarial accrued liability	677,424,379
3. Payment on projected unfunded actuarial accrued liability, adjusted for timing	42,544,922
4. Recommended contribution: (1) + (3)	57,301,467
5. Projected payroll	274,351,495
6. Total budgeted appropriation as a percentage of projected payroll: (4) ÷ (5)	20.89%

Notes: Recommended contributions are assumed to be paid on July 1 and December 31.

Recommended contribution set equal to the budgeted amount determined with the previous valuation.

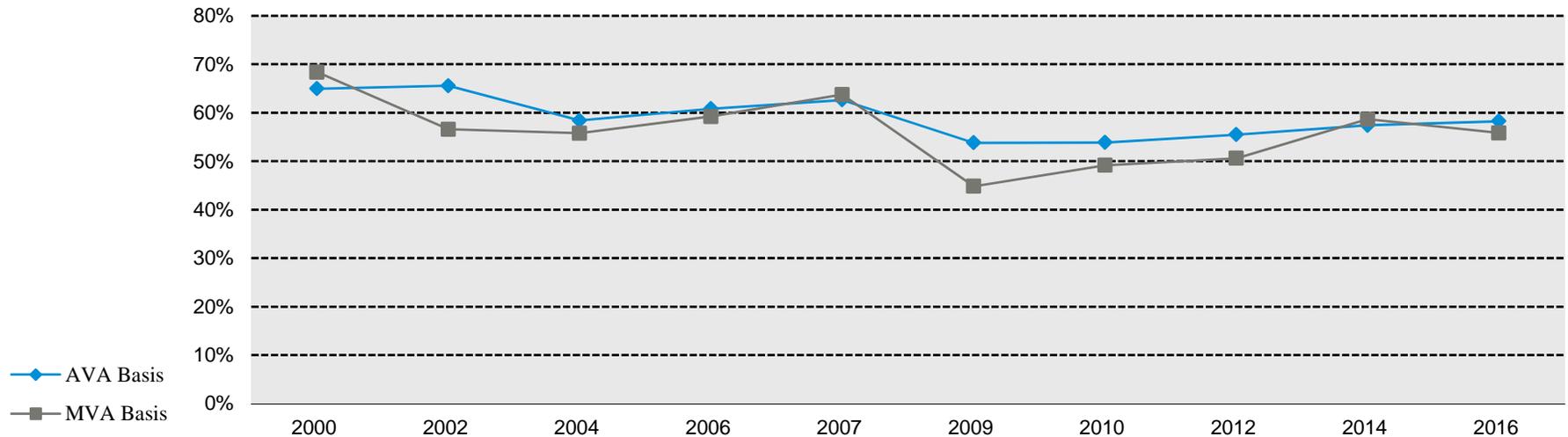
SECTION 4: Reporting Information for the Barnstable County Retirement System

**EXHIBIT II
Funded Ratio**

A critical piece of information regarding the System’s financial status is the funded ratio. This ratio compares the actuarial value of assets to the actuarial accrued liabilities of the System as calculated. High ratios indicate a well-funded plan with assets sufficient to cover the plan’s actuarial accrued liabilities. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors.

These measurements are not necessarily appropriate for assessing the sufficiency of System assets to cover the estimated cost of settling the System’s benefit obligation or the need for or the amount of future contributions.

The chart below depicts a history of the funded ratios for this plan. On a market value basis, the funded ratio has decreased from 58.65% as of January 1, 2014 to 55.84% as of January 1, 2016. On an actuarial value basis, the funded ratio has increased from 57.39% as of January 1, 2014 to 58.23% as of January 1, 2016.



SECTION 4: Reporting Information for the Barnstable County Retirement System

EXHIBIT III

Actuarial Assumptions and Actuarial Cost Method

Mortality Rates:

<i>Pre-Retirement:</i>	RP-2000 Employee Mortality Table projected generationally with Scale BB2D from 2009 (Previously, RP-2000 Employee Mortality Table projected generationally with Scale AA from 2010)
<i>Healthy Retiree:</i>	RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale BB2D from 2009 (Previously, RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale AA from 2010)
<i>Disabled Retiree:</i>	RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale BB2D from 2015 (Previously, RP-2000 Healthy Annuitant Mortality Table set forward three years for males only projected generationally with Scale AA from 2010)

The underlying tables with generational projection to the ages of participants as of the measurement date reasonably reflect the mortality experience of the plan as of the measurement date based on historical and current demographic data. As part of the analysis, a comparison was made between the actual number of retiree deaths and the projected number based on the prior years' assumption over the most recent six years. The mortality tables were then adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

SECTION 4: Reporting Information for the Barnstable County Retirement System

Termination Rates before Retirement:

Age	Groups 1 and 2 - Rate (%)		Disability
	Mortality		
	Male	Female	
20	0.03	0.02	0.01
25	0.04	0.02	0.02
30	0.04	0.03	0.03
35	0.08	0.05	0.06
40	0.11	0.07	0.10
45	0.15	0.11	0.15
50	0.21	0.17	0.19
55	0.30	0.25	0.24
60	0.49	0.39	0.28

*Notes: Mortality rates do not reflect generational projection.
 55% of the disability rates shown represent accidental disability.
 20% of the accidental disabilities will die from the same cause as the disability.
 55% of the death rates shown represent accidental death.*

Age	Group 4 - Rate (%)		Disability
	Mortality		
	Male	Female	
20	0.03	0.02	0.10
25	0.04	0.02	0.20
30	0.04	0.03	0.30
35	0.08	0.05	0.30
40	0.11	0.07	0.30
45	0.15	0.11	1.00
50	0.21	0.17	1.25
55	0.30	0.25	1.20
60	0.49	0.39	0.85

*Notes: Mortality rates do not reflect generational projection.
 90% of the disability rates shown represent accidental disability.
 60% of the accidental disabilities will die from the same cause as the disability.
 90% of the death rates shown represent accidental death.*

SECTION 4: Reporting Information for the Barnstable County Retirement System

Withdrawal Rates:

		Rate per year (%)	
Years of Service	Groups 1 and 2	Years of Service	Group 4
0	15.0	0 – 10	1.5
1	12.0	11+	0.0
2	10.0		
3	9.0		
4	8.0		
5	7.6		
6	7.5		
7	6.7		
8	6.3		
9	5.9		
10	5.4		
11	5.0		
12	4.6		
13	4.1		
14	3.7		
15	3.3		
16 – 20	2.0		
21 – 29	1.0		
30+	0.0		

The termination rates and disability rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of terminations and disability retirements and the projected number based on the prior years' assumption over the most recent six years.

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Retirement Rates:

Age	Rate per year (%)		Group 4
	Groups 1 and 2		
	Male	Female	
45 – 49	--	--	1.0
50 – 51	1.0	1.5	2.0
52	1.0	2.0	2.0
53	1.0	2.5	5.0
54	2.0	2.5	7.5
55	2.0	5.5	15.0
56 – 57	2.5	6.5	10.0
58	5.0	6.5	10.0
59	6.5	6.5	15.0
60	12.0	5.0	20.0
61	20.0	13.0	20.0
62	30.0	15.0	25.0
63	25.0	12.5	25.0
64	22.0	18.0	30.0
65	40.0	15.0	100.0
66 – 67	25.0	20.0	--
68	30.0	25.0	--
69	30.0	20.0	--
70	100.0	100.0	--

The retirement rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of retirements by age and the projected number based on the prior years' assumption over the most recent six years.

Retirement Age for Inactive Vested Participants:

55 for participants hired prior to April 2, 2012. For participants hired April 2, 2012 or later, 60 for Group 1, 55 for Group 2, and 50 for Group 4.

SECTION 4: Reporting Information for the Barnstable County Retirement System

The retirement age for inactive vested participants was based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment.

Unknown Data for Participants:	Same as those exhibited by participants with similar known characteristics.
Family Composition:	75% of participants are assumed to be married. None are assumed to have dependent children. Females are assumed to be three years younger than their spouses.
Benefit Election:	All participants are assumed to elect Option A. The benefit election reflects the fact that all benefit options are actuarially equivalent.

Net Investment Return:	7.625% (previously, 7.75%)
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The net investment return assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment. As part of the analysis, a building block approach was used that reflects inflation expectations and anticipated risk premiums for each of the portfolio’s asset classes, as well as the Plan’s target asset allocation.

Salary Increases:

Years of Service	Group 1	Group 2	Group 4
0	6.00%	6.00%	7.00%
1	5.50%	5.50%	6.50%
2	5.50%	5.50%	6.00%
3	5.25%	5.25%	5.75%
4	5.25%	5.25%	5.25%
5	4.75%	4.75%	5.25%
6	4.75%	4.75%	4.75%
7	4.50%	4.50%	4.75%
8	4.50%	4.50%	4.75%
9+	4.25%	4.50%	4.75%

SECTION 4: Reporting Information for the Barnstable County Retirement System

The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment.

Interest on Employee Contributions: 3.5%

Administrative Expenses: \$1,500,000 for calendar 2016, increasing 3.5% per year (previously, \$1,150,000 for calendar 2014, increasing 4.0% per year).

The administrative expense assumption is based on information on expenses provided by the Retirement System.

Total Service: Total creditable service reported in the data.

2015 Salary: 2015 salaries are equal to salaries provided in the data, annualized for new hires, except for participants missing salary, where salaries were calculated from annualized contributions divided by the contribution rates provided.

Net 3(8)(c) Liability: No liability is valued for benefits paid to or received from other municipal retirement systems.

Actuarial Value of Assets: A preliminary actuarial value is first determined by taking the actuarial value of assets at the beginning of the year and adding assumed investment earnings (at the assumed actuarial rate of return) and the net new money during the year (contributions less benefit payments and administrative expenses). Twenty percent of the difference between the market value of assets as reported in the System's Annual Statement and the preliminary actuarial value of assets is added to the preliminary actuarial value. In order that the actuarial value not differ too significantly from the market value of assets, the final actuarial value of assets must be within 20% of the market value of assets.

Actuarial Cost Method: Entry Age Normal Actuarial Cost Method. Entry Age is the attained age of the participant minus total creditable service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary. Normal Cost is determined using the plan of benefits applicable to each participant.

SECTION 4: Reporting Information for the Barnstable County Retirement System

Changes in Assumptions:

Based on past experience and future expectations, the following actuarial assumptions were changed:

The investment return assumption was decreased from 7.75% to 7.625%.

The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally using Scale AA from 2010 to the RP-2000 Employee Mortality Table projected generationally using Scale BB2D from 2009.

The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale AA from 2010 to the RP-2000 Healthy Annuitant Mortality Tables projected generationally using Scale BB2D from 2009.

The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward three years for males only projected generationally using Scale AA from 2010 to the RP-2000 Healthy Annuitant Mortality Table projected generationally with Scale BB2D from 2015.

The administrative expense assumption was increased from \$1,150,000 to \$1,500,000.

SECTION 4: Reporting Information for the Barnstable County Retirement System

EXHIBIT IV

Summary of Plan Provisions

This exhibit summarizes the major provisions of Chapter 32 of the Laws of Massachusetts.

Plan Year: January 1 through December 31

Retirement Benefits

Employees covered by the Contributory Retirement Law are classified into one of four groups depending on job classification. Group 1 comprises most positions in state and local government. It is the general category of public employees. Group 4 comprises mainly police and firefighters. Group 2 is for other specified hazardous occupations. (Officers and inspectors of the State Police are classified as Group 3.)

For employees hired prior to April 2, 2012, the annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following table based on the age of the member at retirement:

Age Last Birthday at Date of Retirement			
Percent	Group 1	Group 2	Group 4
2.5	65 or over	60 or over	55 or over
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	--	49
1.8	58	--	48
1.7	57	--	47
1.6	56	--	46
1.5	55	--	45

SECTION 4: Reporting Information for the Barnstable County Retirement System

A member’s final three-year average salary is defined as the greater of the highest consecutive three-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last three years of creditable service prior to retirement.

For employees hired on April 2, 2012 or later, the annual amount of the retirement allowance is based on the member’s final five-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following tables based on the age and years of creditable service of the member at retirement:

For members with less than 30 years of creditable service:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.50	67 or over	62 or over	57 or over
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

For members with 30 years of creditable service or greater:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.500	67 or over	62 or over	57 or over
2.375	66	61	56
2.250	65	60	55
2.125	64	59	54
2.000	63	58	53
1.875	62	57	52
1.750	61	56	51
1.625	60	55	50

SECTION 4: Reporting Information for the Barnstable County Retirement System

A member’s final five-year average salary is defined as the greater of the highest consecutive five-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last five years of creditable service prior to retirement.

For employees who became members after January 1, 2011, regular compensation is limited to 64% of the federal limit found in 26 U.S.C. 401(a)(17). In addition, regular compensation for members who retire after April 2, 2012 will be limited to prohibit “spiking” of a member’s salary to increase the retirement benefit.

For all employees, the maximum annual amount of the retirement allowance is 80 percent of the member’s final average salary. Any member who is a veteran also receives an additional yearly retirement allowance of \$15 per year of creditable service, not exceeding \$300. The veteran allowance is paid in addition to the 80 percent maximum.

Employee Contributions

<u>Date of Hire</u>	<u>Contribution Rate</u>
Prior to January 1, 1975	5%
January 1, 1975 – December 31, 1983	7%
January 1, 1984 – June 30, 1996	8%
July 1, 1996 onward	9%

In addition, employees hired after December 31, 1978 contribute an additional 2 percent of salary in excess of \$30,000.

Employees hired after 1983 who voluntarily withdraw their contributions with less than 10 ten years of credited service receive 3% interest on their contributions.

Employees in Group 1 hired on or after April 2, 2012 with 30 years of creditable service or greater will pay a base contribution rate of 6%.

Retirement Benefits (Superannuation)

Members of Group 1, 2 or 4 hired prior to April 2, 2012 may retire upon the attainment of age 55. For retirement at ages below 55, twenty years of creditable service is required.

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Members hired prior to April 2, 2012 who terminate before age 55 with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System).

Members of Group 1 hired April 2, 2012 or later may retire upon the attainment of age 60. Members of Group 2 or 4 hired April 2, 2012 or later may retire upon the attainment of age 55. Members of Group 4 may retire upon attainment of age 50 with ten years of creditable service.

Members hired April 2, 2012 or later who terminate before age 55 (60 for members of Group 1) with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (60 for members of Group 1) provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System.

Ordinary Disability Benefits

A member who is unable to perform his or her job due to a non-occupational disability will receive a retirement allowance if he or she has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55 (age 60 for Group 1 members hired on or after April 2, 2012), based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent year's pay plus an annuity based on his or her own contributions.

Accidental Disability Benefit

For a job-connected disability, the benefit is 72 percent of the member's most recent annual pay plus an annuity based on his or her own contributions, plus additional amounts for surviving children. Benefits are capped at 75 percent of annual rate of regular compensation for employees who become members after January 1, 1988.

Death Benefits

In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were

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eligible to retire on the date of death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. There is also a minimum widow's pension of \$500 per month, and there are additional amounts for surviving children.

If an employee's death is job-connected, the spouse will receive 72 percent of the member's most recent annual pay, in addition to a refund of the member's accumulated deductions, plus additional amounts for surviving children. However, in accordance with Section 100 of Chapter 32, the surviving spouse of a police officer, firefighter or corrections officer is killed in the line of duty will be eligible to receive an annual benefit equal to the maximum salary held by the member at the time of death.

Upon the death of a job-connected disability retiree who retired prior to November 7, 1996 and could not elect an Option C benefit, a surviving spouse will receive an allowance of \$12,000 per year if the member dies for a reason unrelated to cause of disability.

"Heart And Lung Law" And Cancer Presumption

Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman, permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.

Options

Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death any contributions not expended

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for annuity payments will be refunded to the beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree.

Post-Retirement Benefits

The Board has adopted the provisions of Section 51 of Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first \$16,000 (previously, \$15,000) of a retirement allowance. The Board has adopted an increase in the COLA base from \$16,000 to \$17,000 effective July 1, 2016 and to \$18,000 effective July 1, 2017. Cost-of-living increases granted prior to July 1, 1998 are reimbursed by the Commonwealth and not reflected in this report.

Changes in Plan Provisions

As permitted by Section 19 of Chapter 188 of the Acts of 2010, the Cost of Living Adjustment base was increased from \$15,000 to \$16,000 as of July 1, 2015, to \$17,000 as of July 1, 2016, and to \$18,000 as of July 1, 2017.