Howard County Police and Fire Employees' Retirement Plan

Actuarial Valuation as of July 1, 2017 to Determine the County's Contribution for the Fiscal Year Ending June 30, 2019

BOLTON PARTNERS
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BOLTON PARTNERS

January 25, 2018

Retirement Plan Committee
Howard County Police and Fire
Employees' Retirement Plan
c/o Office of Human Resources
3430 Court House Drive
Ellicott City, MD 21043

Re: Howard County Police and Fire Employees' Retirement Plan

Dear Committee Members:

The following sets forth the actuarial valuation of the Howard County Police and Fire Employees' Retirement Plan as of July 1, 2017. Section 1 of the report provides a summary while Sections 2 through 6 contain the development of the County's contribution for the 2019 fiscal year along with a summary of the census and asset data, plan provisions, assumptions and actuarial methods. Section 7 provides a glossary of the terms used in this report. The appendices of the report provide additional information on the plan's funded status and a discussion on risk.

We are available to answer any questions on the material in this report or to provide explanations or further details as appropriate. The undersigned credentialed actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report. We are not aware of any direct or material indirect financial interest or relationship, including investments or other services that could create a conflict of interest, which would impair the objectivity of our work.

Respectfully submitted,

BOLTON PARTNERS, INC.

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Section I. Executive Summary

Background

Bolton Partners, Inc. has prepared the following report that sets forth the actuarial valuation of the Howard County Police and Fire Employees' Retirement Plan as of July 1, 2017.

Actuarially Determined Contributions

The actuarially determined contribution (ADC) amount increased this year. Investment gains and gains due to the retiree COLA which was less than the assumed annual COLA were offset by several losses including DROP losses and data changes. The ADC is the percentage of pay amount that will be applied to the actual covered payroll during the Fiscal Year.

	FY2017	FY2018	FY2019
ADC	23,517,289	25,940,154	27,974,552
Percent of Total Payroll	30.6%	32.5%	33.1%

Details of the determination of the County's contribution for FY2019 are shown in Section 2 of this report.

Funding Measures

Funding Measures	7/1/2016	7/1/2017	Percent Change
1. Actuarial Accrued Liability			
a. Active[1]	$ 330,593,245	$ 362,010,084	9.5%
b. Vested Terminated	1,226,769	1,282,327	4.5%
c. Disabled	16,778,542	16,940,650	1.0%
d. Retired and Beneficiaries	225,846,906	245,690,468	8.8%
e. Total	$ 574,445,462	$ 625,923,529	9.0%
2. Actuarial Value of Assets	$ 468,532,092	$ 516,832,773	10.3%
3. Plan Funded Ratio (2 / 1.e.)	81.6%	82.6%	
4. Market Value of Assets	$ 448,948,629	$ 516,255,787	15.0%
5. Funded Ratio if Market Value of Assets was used (4 / 1.e.)	78.2%	82.5%	

[1] Includes DROP participants

Section I. Executive Summary

(continued)

Risk Measures

The risks that a plan sponsor incurs from a defined benefit plan are primarily the risk of substantial increases in annual contributions. These increases occur most frequently due to variation in the investment returns. This valuation reflects the smoothing of asset returns, which reduces the risk of wide year-by-year contribution changes, but does not ultimately reduce the risk inherent in a defined benefit plan. The following table shows four commonly used measures of the relative riskiness of a pension plan, relative to the plan sponsor and the employee group covered by the plan. Additional information is shown in Appendix 2.

Risk Measure	7/1/2015	7/1/2016	7/1/2017	Conservative Measures
Retiree Liability as a Percent of Total Liability	42%	42%	42%	<50%
Market Value of Assets to Payroll	5.9	5.9	6.4	<5
Liabilities to Payroll	7.3	7.6	7.8	<5
Benefit Payments to Contributions	0.6	0.6	0.6	1-3

Experience Analysis

The following factors affected the County's contribution as a percentage of payroll:

- Investment returns during FY2017 were about $21.9 million higher than expected. A portion of this gain is reflected in this valuation, with the remaining portions to be reflected in future valuations. There is a total of $0.6 million in net deferred investment losses as of July 1, 2017 that will be reflected in future valuations.
- Retiree COLAs were less than expected, resulting in a gain of $1,620,000.
- Miscellaneous items including losses for participants retiring from DROP during FY2017 and data changes, resulting in a loss of $7,070,000.

Section I. Executive Summary

(continued)

Experience Analysis (cont.)

The above factors and other sources of gains and losses had the following effect on the County's unfunded liability since last year's valuation. Every $1,000,000 gain or loss is about 0.16% of the liability.

Source	Gain/(Loss)
1. Investment Gain/(Loss)	$ 1,420,000
2. Expenses	20,000
3. Pay Increases	640,000
4. Mortality	(690,000)
5. Turnover	(620,000)
6. Disability	240,000
7. Retirement	(130,000)
8. New Entrants	(510,000)
9. Gain/(Loss) from FY2018 Expected Funding[2]	(250,000)
10. COLA	1,620,000
11. DROP	(1,290,000)
12. All other Sources (including data changes)	(7,070,000)
13. Total Gain/(Loss) as of July 1, 2017 (sum of above)	$ (6,620,000)

[2] Due to one-year time lag between valuation date and fiscal year

Section I. Executive Summary

(continued)

Changes in Method, Assumptions, and Plan Amendments

There were no method changes, assumption changes, or plan amendments adopted that affect benefits since the prior valuation.

Sources of Information

The July 1, 2017 participant data and market value of assets were provided by or at the direction of Howard County. While we have reviewed this data for consistency and completeness, we have not audited this data.

Section I. Executive Summary

(continued)

Actuarial Certification

This actuarial valuation sets forth our calculation of an estimate of the liabilities of the Howard County Police and Fire Employees' Retirement Plan (the Plan), together with a comparison of these liabilities with the value of the plan assets, as submitted by Howard County Government (the County). This calculation and comparison with assets is applicable for the valuation date only. The future is uncertain, and the plan may become better funded or more poorly funded in the future. This valuation does not provide any guarantee that the plan will be able to provide the promised benefits in the future.

This is a deterministic valuation in that it is based on a single set of assumptions. This set of assumptions is one possible basis for our calculations. Other assumptions may be equally valid. The future is uncertain and the plan's actual experience will differ from those assumptions; these differences may be significant or material because these results are very sensitive to the assumptions made and, in some cases, to the interaction between the assumptions. We may consider that some factors are not material to the valuation of the plan and may not provide a specific assumption for those factors. We may have used other assumptions in the past. We will likely consider changes in assumptions at a future date.

Different assumptions or scenarios within the range of possibilities may also be reasonable and results based on those assumptions would be different. As a result of the uncertainty inherent in a forward looking projection over a very long period of time, no one projection is uniquely "correct" and many alternative projections of the future could also be regarded as reasonable. Two different actuaries could, quite reasonably, arrive at different results based on the same data and different views of the future. A "sensitivity analysis" shows the degree to which results would be different if you substitute alternative assumptions within the range of possibilities for those utilized in this report. We have not been engaged to perform such a sensitivity analysis and thus the results of such an analysis are not included in this report. At the County's request, Bolton Partners, Inc. is available to perform such a sensitivity analysis.

The County is responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in this report. The County is solely responsible for communicating to Bolton Partners, Inc. any changes required thereto.

The County could reasonably ask how the valuation would change if we used a different assumption set or if plan experience exhibited variations from our assumptions. This report does not contain such an analysis. This type of analysis would be a separate assignment.

Section I. Executive Summary

(continued)

Actuarial Certification (cont.)

In addition, decisions regarding benefit improvements, benefit changes, the trust's investment policy, and similar issues should not be based on this valuation. These are complex issues and other factors should be considered when making such decisions. These other factors might include the anticipated vitality of the local economy and future growth expectations, as well as other economic and financial factors.

The cost of this plan is determined by the benefits promised by the plan, the plan's participant population, the investment experience of the plan and many other factors. An actuarial valuation is a budgeting tool for the County. It does not affect the cost of the plan. Different funding methods provide for different timing of contributions to the plan. As the experience of the plan evolves, it is normal for the level of contributions to the plan to change. If a contribution is not made for a particular year, either by deliberate choice or because of an error in a calculation, that contribution can be made in later years. We will not be responsible for contributions that are made at a future time rather than an earlier time. The plan sponsor is responsible for funding the cost of the plan.

We make every effort to ensure that our calculations are accurately performed. These calculations are complex. Despite our best efforts, we may make a mistake. We reserve the right to correct any potential errors by amending the results of this report or by including the corrections in a future valuation report.

Because modeling all aspects of a situation is not possible or practical, we may use summary information, estimates, or simplifications of calculations to facilitate the modeling of future events in an efficient and cost-effective manner. We may also exclude factors or data that are immaterial in our judgment. Use of such simplifying techniques does not, in our judgment, affect the reasonableness of valuation results for the plan.

This report is based on plan provisions, census data, and asset data submitted by the County. We have relied on this information for purposes of preparing this report, but have not performed an audit. The accuracy of the results presented in this report is dependent upon the accuracy and completeness of the underlying information. The plan sponsor is solely responsible for the validity and completeness of this information.

The County is solely responsible for selecting the plan's investment policies, asset allocations and individual investments. Bolton Partners, Inc.'s actuaries have not provided any investment advice to the County.

Section I. Executive Summary

(continued)

Actuarial Certification (cont.)

The information in this report was prepared for the internal use of the County and its auditors in connection with our actuarial valuations of the pension plan. It is neither intended nor necessarily suitable for other purposes. Bolton Partners, Inc. is not responsible for the consequences of any other use or the reliance upon this report by any other party.

The only purpose of this report is to:

- Provide the recommended employer contribution for the 2019 fiscal year

This report may not be used for any other purpose; Bolton Partners, Inc. is not responsible for the consequences of any unauthorized use.

The calculation of actuarial liabilities for valuation purposes is based on a current estimate of future benefit payments. The calculation includes a computation of the "present value" of those estimated future benefit payments using an assumed discount rate; the higher the discount rate assumption, the lower the estimated liability will be. For purposes of estimating the liabilities (future and accrued) in this report, you selected an assumption based on the expected long-term rate of return on plan investments. Using a lower discount rate assumption, such as a rate based on long-term bond yields, could substantially increase the estimated present value of future and accrued liabilities.

Because valuations are a snapshot in time and are based on estimates and assumptions that are not precise and will differ from actual experience, contribution calculations are inherently imprecise. There is no uniquely "correct" level of contributions for the coming plan year.

This report provides certain financial calculations for use by the auditor. These values have been computed in accordance with our understanding of generally accepted actuarial principles and practices and fairly reflect the actuarial position of the Plan. The various actuarial assumptions and methods which have been used are, in our opinion, appropriate for the purposes of this report.

Section I. Executive Summary

(continued)

Actuarial Certification (cont.)

The report is conditioned on the assumption of an ongoing plan and is not meant to present the actuarial position of the Plan in the case of Plan termination. 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 or additional cost or contribution requirements based on the plan's funded status), and changes in plan provisions or applicable law.

The County should notify Bolton Partners, Inc. promptly after receipt of this report if the County disagrees with anything contained in the report or is aware of any information that would affect the results of the report that has not been communicated to Bolton Partners, Inc. or incorporated therein. The report will be deemed final and acceptable to the County unless the County promptly provides such notice to Bolton Partners, Inc.

The undersigned credentialed actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. We are currently compliant with the Continuing Professional Development Requirement of the Society of Actuaries. We are not aware of any direct or material indirect financial interest or relationship, including investments or other services, which could create a conflict of interest that would impair the objectivity of our work.

We are available to answer any questions on the material in this report to provide explanations or further details as appropriate.

Bolton Partners, Inc.

Thomas B. Lowman, FSA, EA, MAAA

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Section II. Determination of County Contributions

Liabilities and Actuarial Gain/(Loss)

Below is a summary of the actuarial accrued liability of the future benefits expected to be paid from the plan and the development of the actuarial gain/(loss).

Valuation Date	7/1/2016	7/1/2017
1. Actuarial Accrued Liability		
a. Active Participants[3]	$ 330,593,245	$ 362,010,084
b. Vested Terminated Participants	1,226,769	1,282,327
c. Disabled	16,778,542	16,940,650
d. Retired Participants and Beneficiaries	225,846,906	245,690,468
e. Total	$ 574,445,462	$ 625,923,529
2. Actuarial Asset Value	468,532,092	516,832,773
3. Unfunded Actuarial Liability (1.e.-2.)	$ 105,913,370	$ 109,090,756
4. Funded Ratio (2. ÷ 1.e.)	81.6%	82.6%
5. Projected Unfunded Liability as of July 1 following valuation date	$ 103,931,996	$ 105,479,131
6. Expected Unfunded Liability as of July 1 following valuation date	$ 91,218,261	$ 98,856,195
7. Plan Change	$ 0	$ 0
8. Assumption Change	$ 0	$ 0
9. Actuarial Gain/(Loss) (6. – 5. – 7. – 8.)	$ (12,713,735)	$ (6,622,936)

[3] Includes DROP participants

Section II. Determination of County Contributions

(continued)

Development of County Contributions

The County's contribution is based on (1) the Normal Cost plus (2) an amortization payment less (3) expected employee contributions. All amortization amounts are based on a "level percentage of pay" method which assumed payments (and covered payroll) increase by 2.75% each year.

The valuation determines the County contribution for the next fiscal year.

Actuarially Determined Contribution		FYE 6/30/2019	Percentage of Payroll[4]
1. Total Normal Cost	$	22,513,486	26.6%
2. Amortization Amount	$	13,371,293	15.8%
3. Total Contribution (1. + 2.)	$	35,884,779	42.4%
4. Expected Participant Contributions	$	7,910,227	9.3%
5. Howard County's Contribution (3. – 4.)	$	27,974,552	33.1%
6. Active payroll, including DROP (Rate as of 7/1/2017)	$	80,071,119	

Actuarially Determined Contribution		FYE 6/30/2018	Percentage of Payroll[5]
1. Total Normal Cost	$	20,998,025	26.3%
2. Amortization Amount	$	12,413,606	15.5%
3. Total Contribution (1. + 2.)	$	33,411,631	41.8%
4. Expected Participant Contributions	$	7,471,477	9.3%
5. Howard County's Contribution (3. – 4.)	$	25,940,154	32.5%
6. Active payroll including DROP (Rate as of 7/1/2016)	$	75,678,677	

[4] Based on payroll shown as of 7/1/2017 increased by 2.75% per year for two years.
[5] Based on payroll shown as of 7/1/2016 increased by 2.75% per year for two years.

Section II. Determination of County Contributions

(continued)

Projected and Expected Unfunded Liability

Below is a summary of the projected and expected unfunded liability for the following plan year.

Projected Unfunded Liability		7/1/2018
1. Unfunded Actuarial Liability at July 1, 2017	$	109,090,756
2. Expected County Contributions	$	26,380,931
3. Expected Employee Contributions	$	7,698,518
4. Expected Administrative Expenses	$	350,000
5. Normal Cost Before Expenses	$	21,560,935
6. Projected Unfunded Liability at July 1, 2018 (1. – 2. – 3. + 4. + 5., including interest adjustment for each line)	$	105,479,131

Expected Unfunded Liability		7/1/2018
1. Projected Unfunded Actuarial Liability at July 1, 2017	$	103,931,996
2. Expected County Contributions	$	25,940,154
3. Expected Employee Contributions	$	7,471,477
4. Normal Cost Including Expenses	$	20,998,025
5. Expected Unfunded Liability at July 1, 2018 (1. – 2. – 3. + 4., including interest adjustment for each line)	$	98,856,195

Expected Unfunded Liability is calculated by rolling forward assets and liabilities one year. The roll-forward of assets is based on the actuarial value of assets as of the valuation date without regard to any recognition of additional gains or losses under the smoothing method.

Section II. Determination of County Contributions

(continued)

Schedule of Amortization Bases

Below is a schedule of the amortization bases as of July 1, 2018.

Description	Remaining Years		Amount to be Amortized as of 7/1/2018		Payment / (Credit)
Original Unfunded Liability	5	$	12,830,660	$	2,906,363
Fire Plan Improvements	9.5	$	2,531,368	$	332,401
Police Plan Improvements	9.75	$	4,200,834	$	540,235
2002 Fire Plan Improvements	13	$	3,852,360	$	397,243
2002 Police Plan improvements	13	$	13,004,971	$	1,341,032
2004 Plan Change	16	$	541,351	$	48,181
2008 Plan Change	16	$	(4,435,220)	$	(394,744)
2013 Assumption Change	11	$	13,848,782	$	1,619,685
2013 Cumulative Gains/Losses	11	$	47,754,004	$	5,585,073
2014 Assumption Change	12	$	9,486,585	$	1,038,263
2014 (Gain)/Loss	12	$	(14,850,652)	$	(1,625,336)
2015 DROP Change	13	$	(1,559,839)	$	(160,846)
2015 (Gain)/Loss	13	$	(2,048,638)	$	(211,249)
2016 (Gain)/Loss	14	$	13,699,629	$	1,338,676
2017 (Gain)/Loss	15	$	6,622,936	$	616,316
Totals		**$**	**105,479,131**	**$**	**13,371,293**

The July 1, 2018 amortization payment of $13,371,293 is sufficient to cover the interest on the plan's unfunded liability.

Bases are amortized as an equal percent of payroll each year. Total payroll is assumed to increase 2.75% annually. Payments are assumed to be made mid-year.

Section III. Valuation of Assets

Reconciliation of Assets

Below is a reconciliation of assets for FY2016 and FY2017 from the trust asset statements provided by the County.

	FY2016	FY2017
1. Beginning of Year Assets	$ 432,029,024	$ 448,948,629
2. Additions		
a. Contributions		
i. Employer	$ 21,636,281	$ 24,729,051
ii. Employee	7,040,881	7,387,461
b. Total Contributions	$ 28,677,162	$ 32,116,512
c. Investment Income		
i. Net Appreciation in Fair Value of Investments	$ (3,073,955)	$ 46,251,000
ii. Interest	2,515,056	2,430,318
iii. Dividends	8,304,546	8,503,292
iv. Other, Net	51,441	269,689
v. Total Investment Income	$ 7,797,088	$ 57,454,299
vi. Less Investment Expenses	1,338,181	1,497,885
d. Net Investment Income	$ 6,458,907	$ 55,956,414
e. Total Additions (2.b. + 2.d.)	$ 35,136,069	$ 88,072,926
3. Deductions		
a. Benefit Payments		
i. Annuities	$ 17,741,674	$ 20,131,994
ii. Death	0	0
iii. Refund of Contributions	147,957	289,152
b. Total Benefits	$ 17,889,631	$ 20,421,146
c. Administrative Expenses	326,833	344,622
d. Total Deductions (3.b. + 3.c.)	$ 18,216,464	$ 20,765,768
4. Net Change (2.e. – 3.d.)	$ 16,919,605	$ 67,307,158
5. End of Year Assets (1. + 4.)	$ 448,948,629	$ 516,255,787

Section III. Valuation of Assets

(continued)

Statement of Assets

Below is a statement of assets as of June 30, 2016 and June 30, 2017 from the trust asset statetments provided by the County.

	6/30/2016	6/30/2017
1. Receivables		
a. Employer Contributions	$ 1,103,819	$ 1,358,257
b. Employee Contributions	357,493	394,451
c. Interest and Dividends	570,535	612,712
d. Due from Sale of Investments	253,635	19,794
e. Other	7,022	188,664
f. Total Receivables	$ 2,292,504	$ 2,573,878
2. Investments at Fair Value		
a. Equities	$ 187,843,351	$ 219,274,138
b. Alternative Investments	98,781,475	118,920,503
c. Money Market Mutual Funds	7,314,477	8,540,880
d. Fixed Income	132,985,222	148,628,783
e. Real Estate	21,724,979	19,100,948
f. Other	0	0
g. Total Investments	$ 448,649,504	$ 514,465,252
3. Prepaid Insurance	24,124	24,124
4. Total Assets (1.f. + 2.g. + 3.)	$ 450,966,132	$ 517,063,254
5. Liabilities		
a. Investments Purchased	$ 1,705,257	$ 470,375
b. Accounts Payable	312,246	337,092
c. Other	0	0
d. Total Liabilities	$ 2,017,503	$ 807,467
6. End of Year Assets (4. – 5.d.)	$ 448,948,629	$ 516,255,787

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Section III. Valuation of Assets

(continued)

Calculation of Actuarial Asset Value

The actuarial asset value is determined by spreading the asset gain or loss for each year over a five-year period. The asset gain or loss is the amount by which the actual asset return differs from the expected asset return.

							7/1/2017
1.	Market Value of Assets					$	516,255,787
2.	Net Investment Income					$	55,956,414
3.	Estimated Net Rate of Return						12.31%
4.	Valuation Interest Rate						7.50%
5.	(Gain)/Loss					$	(21,864,366)
6.	Spreading of Investment (Gain)/Loss						
	BOY	EOY		(Gain)/Loss	% Deferred		Amount Deferred
	2016	2017	$	(21,864,366)	80%	$	(17,491,493)
	2015	2016		26,272,041	60%		15,763,225
	2014	2015		19,577,604	40%		7,831,042
	2013	2014		(27,628,939)	20%		(5,525,788)
	Total Deferred						576,986
7.	Actuarial Value of Assets (1. + 6.)					$	516,832,773
8.	Rate of Return on Actuarial Value of Assets						7.8%

							7/1/2016
1.	Market Value of Assets					$	448,948,629
2.	Net Investment Income					$	6,458,907
3.	Estimated Net Rate of Return						1.48%
4.	Valuation Interest Rate						7.50%
5.	(Gain)/Loss					$	26,272,041
6.	Spreading of Investment (Gain)/Loss						
	BOY	EOY		(Gain)/Loss	% Deferred		Amount Deferred
	2015	2016	$	26,272,041	80%	$	21,071,633
	2014	2015		19,577,604	60%		11,746,562
	2013	2014		(27,628,939)	40%		(11,051,576)
	2012	2013		(10,645,780)	20%		(2,129,156)
	Total Deferred						19,583,463
7.	Actuarial Value of Assets (1. + 6.)					$	468,532,092
8.	Rate of Return on Actuarial Value of Assets						5.9%

Section IV. Participant Information

Participant Summary

The following table summarizes the counts, ages and benefit information for plan participants used in this valuation.

	7/1/2016	7/1/2017
1. Actives including DROP		
a. Number	872	904
b. Average Age	39.41	39.37
c. Average Service	13.08	13.02
d. Average Salary	$ 86,787	$ 88,574
2. Service Retirements and Beneficiaries		
a. Number	320	341
b. Average Age	61.43	61.94
c. Total Annual Benefits	$ 16,772,000	$ 18,344,036
3. Vested Terminations[6]		
a. Number	19	18
b. Average Age	47.47	49.26
c. Total Annual Benefits	$ 216,830	$ 205,431
4. Disabled		
a. Number	33	33
b. Average Age	50.76	51.98
c. Total Annual Benefits	$ 1,124,346	$ 1,155,003

[6] In addition, in 2016 there are 17 participants who are terminated nonvested and due a refund of employee contributions. The refund amount as of 7/1/2016 is $105,908. In 2017 there are 15 participants who are terminated nonvested and due a refund of employee contributions. The refund amount as of 7/1/2017 is $93,220.

Section IV. Participant Information

(continued)

Active Age/Service Distribution Including Compensation

Shown below is the distribution of active participants based on age and service. The compensation shown is the average rate of pay as of July 1, 2017. The chart includes 74 active participants currently in DROP.

	Years of Service as of 07/01/2017								
Age	**Under 1**	**1-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30 & Up**	**Total**
Under 25	15	15	0	0	0	0	0	0	30
	$53,674	$60,660	0	0	0	0	0	0	$57,167
25 - 29	26	55	46	2	0	0	0	0	129
	$53,796	$61,752	$70,041	$74,531	0	0	0	0	$63,302
30 - 34	11	37	72	51	1	0	0	0	172
	$53,017	$63,515	$74,691	$83,341	$83,965	0	0	0	$73,519
35 - 39	2	12	38	91	33	0	0	0	176
	$52,840	$62,992	$76,875	$85,893	$101,388	0	0	0	$84,914
40 - 44	1	1	16	31	65	18	0	0	132
	$52,840	$61,755	$75,600	$84,033	$108,134	$119,697	0	0	$99,337
45 - 49	1	4	11	12	42	41	26	1	138
	$52,840	$64,756	$78,607	$83,602	$105,133	$117,491	$128,735	$124,862	$107,858
50 - 54	0	0	2	5	10	21	38	15	91
	0	0	$75,215	$83,341	$101,837	$117,707	$123,081	$132,292	$117,788
55 - 59	0	0	2	2	3	9	8	6	30
	0	0	$81,191	$92,256	$90,071	$106,658	$115,232	$126,113	$108,519
60 - 64	0	0	0	0	0	1	3	1	5
	0	0	0	0	0	$99,318	$105,165	$108,703	$104,703
65 & Up	0	0	0	0	0	1	0	0	1
	0	0	0	0	0	$105,165	0	0	105,165
Totals	56	124	187	194	154	91	75	23	904
	$53,542	$62,363	$74,374	$84,666	$104,952	$116,571	$123,487	$129,331	$88,574

Averages	
Age	39.37
Service	13.02

BOLTON PARTNERS

Section IV. Participant Information

(continued)

Participant Reconciliation

Shown below is the reconciliation of participants between the prior and current valuation date.

			Inactive Participants			
	Active Participants	DROP	Terminated Vested[7]	Retirees & Beneficiaries	Disabled	Total
Participants in Last Valuation	799	73	19	320	33	1,244
Retired	(7)	(12)	0	19	0	0
Vested Termination	(1)	0	1	0	0	0
Nonvested Termination/ Paid Lump Sum	(3)	0	(2)	0	0	(5)
Disabled	(1)	0	0	0	1	0
Deceased/ Payments Expired	0	0	0	0	(1)	(1)
New Beneficiary	0	0	0	0	0	0
Rehire	0	0	0	0	0	0
New QDRO	0	0	0	2	0	2
Transfers	0	0	0	0	0	0
New Hires	56	0	0	0	0	56
DROP	(13)	13	0	0	0	0
Data Adjustment	0	0	0	0	0	0
Participants in This Valuation	830	74[8]	18	341	33	1,296

[7] In addition, in 2016 there are 17 participants who are terminated nonvested and due a refund of employee contributions. In 2017 there are 15 participants who are terminated nonvested and due a refund of employee contributions.

[8] 1 member participates in DROP I and 73 members participate in DROP II.

Section V. Summary of Plan Provisions

Effective Date

July 1, 1989.

Plan Year

July 1 – June 30.

Eligibility Requirements

All full-time career Firefighters and Police Officers in the covered classifications. Participation starts on the first day that an hour of service is performed. Those hired before July 1, 1990 may elect to remain in the state plans and not be covered by this plan.

Normal Form

Life Annuity.

Normal Retirement Date

First of the month coincident with or immediately following the earlier of:

(a) Attainment of age 62 and completion of 5 years of Eligibility Service.
(b) The completion of 20 years of Eligibility Service (for participants who become covered employees after June 30, 1990, 10 of these years of Eligibility Service must be as a covered employee).

Section V. Summary of Plan Provisions

(continued)

Normal Retirement Benefit

Effective January 1, 2002, the benefits are based on the percentage of average compensation shown in the table below:

Years of Creditable Service	Police	Fire
20	50%	50%
21	53%	53%
22	57%	56%
23	62%	59%
24	68%	62%
25	75%	65%
26	76%	66%
27	77%	67%
28	78%	68%
29	79%	69%
30	80%	70%

The police benefit for accumulated sick leave is 2.5% of Average Compensation for each year of Creditable Service attributable to accumulated sick leave. For fire, accumulated sick leave is added to total Creditable Service and applied to the table above. If total service including accumulated sick leave exceeds 30 years, the benefit for sick leave is 1% of Average Compensation times sick leave in excess of 30 years.

Section V. Summary of Plan Provisions

(continued)

Average Compensation

Average compensation for the 36 consecutive full months which produce the highest average.

Compensation is base salary including longevity payments, but excluding overtime, bonuses, etc. Effective July 1, 1996, compensation includes day shift premiums, ALS premiums and H.V.O. premiums.

Early Retirement Date

Effective January 1, 2002 this provision is no longer applicable.

Early Retirement Benefit

Effective January 1, 2002 this provision is no longer applicable.

Deferred Retirement

A participant who defers retirement until after Normal Retirement Date will receive a benefit determined on the basis of Average Compensation and Creditable Service as of his actual retirement date (limited to 30 years plus unused sick leave).

Disability Retirement

A participant who becomes totally and permanently disabled may retire prior to Normal Retirement and receive a benefit. The amount of the benefit depends upon the cause of disability. If a participant is eligible for normal retirement at the time of disability, he/she may elect to receive a retirement benefit in lieu of a disability benefit.

Section V. Summary of Plan Provisions

(continued)

Disability Retirement (cont.)

Ordinary Disability

The greater of:
(a) 20% of Average Compensation if the participant has at least 5 years of Creditable Service as a covered employee;
(b) The accrued benefit if the participant has at least 5 years of Creditable Service.

Line of Duty Disability

Effective 1/1/1998 for Firefighters and 4/1/1998 for Police Officers, Line of Duty Disability benefits may be either Catastrophic or Non-Catastrophic.

Catastrophic
66 2/3% of compensation.

Non-Catastrophic
50% of compensation.

The County, and not the plan, will pay for individual health insurance for a participant disabled in the Line of Duty.

To be eligible for Line of Duty Disability, the disability must be ruled compensable under Worker's Compensation.

Pre-Retirement Death Benefit

Ordinary

Either of (a) or (b) below:
(a) A return of employee contributions with interest plus, if the participant had at least one year of Creditable Service and died while a covered employee, a lump sum equal to the participant's Compensation;
(b) A monthly survivor annuity for the spouse equal to the actuarial equivalent of the benefit the spouse would have received if the participant had retired with a 100% Joint and Survivor annuity.

Section V. Summary of Plan Provisions

(continued)

Pre-Retirement Death Benefit (cont.)

The benefit in (b) is only payable if:

- The participant is married at death
- The death occurs before benefit commencement
- The spouse is the participant's only primary beneficiary
- The participant was eligible for normal retirement
- The death was not in the line of duty, and
- The spouse does not elect the benefit in (a).

Line of Duty

One of (a), (b), or (c) below:
(a) A return of employee contributions with interest plus, if the participant died while a covered employee, a lump sum equal to the participant's Compensation;
(b) A monthly survivor annuity for the spouse equal to 66 2/3% of the participant's compensation. If the spouse dies, 50% of the participant's compensation will be paid to surviving children (50% in total, not to each child) who are named as contingent beneficiaries until the earlier of:

- The child's death, or
- The later of:
  i. The child's 18th birthday, or
  ii. The child's 23rd birthday if he/she remains a full time student.

The benefit in paragraph (b) is payable only if:

- The participant is married at death
- The death occurs before benefit commencement
- The spouse is the participant's only primary beneficiary
- The death was in the line of duty and
- The spouse does not elect the benefit in (a).

(c) A monthly annuity totaling 50% of the participant's compensation will be paid to the child(ren) until the earlier of:

- The child's death, or
- The later of:
  i. The child's 18th birthday, or
  ii. The child's 23rd birthday if he/she remains a full time student.

The benefit in paragraph (c) is payable only if:

- The death occurs before benefit commencement
- The child(ren) is (are) the only primary beneficiaries and
- The death is in the line of duty.

Section V. Summary of Plan Provisions

(continued)

Termination Benefits

Participants who have completed at least 5 years of Eligibility Service are entitled to a benefit beginning at Normal Retirement Date which is equal to the accrued benefit at termination. (2.5% of Average Compensation times Creditable Service).

Employee Contibutions

Participants contribute to the plan:
(a) 2% of Compensation (post-tax) from July 1, 1989 to June 30, 1990.
(b) 7.7% of Compensation (pre-tax pick-up) effective July 1, 1990. Effective July 1, 2001 for police, 11.6% of compensation (pre-tax pick up).
(c) Contributions stop once an employee has 30 years of service.

Upon leaving employment for any reason, accumulated contributions are returned if not eligible for plan benefits. Furthermore, plan benefits must be at least equal to the actuarial equivalent of accumulated contributions. Accumulated contributions are credited with interest of 5% per annum. Contributions during a plan year are credited with 2.5% interest for the year of contribution. Transferred contributions are credited with 0.42% interest per month for the remainder of the year of transfer.

Cost of Living Adjustments

Effective each July 1, the level of retirement benefits paid to retirees who retired at least 12 months earlier is increased according to the CPI-U for the Washington-Baltimore area, but in no event more than 2%, compounded annually.

DROP I (closed to new entrants as of January 1, 2015)

Eligibility

Police officer. Election after 25, 26 or 27 years of Creditable Service.

Period

Three or four-year election made at DROP entry (penalty on DROP account with 3-year DROP period).

Section V. Summary of Plan Provisions

(continued)

DROP I (cont.)

3-Year DROP Penalty

89% of DROP account if enter with 25 years.
87% of DROP account if enter with more than 25 years.

Deposits to Account

Monthly benefit at DROP entry adjusted with COLA. No interest is earned on DROP account.

Employee Contributions

Continue to plan while in DROP as long as Creditable Service is less than 30 years and DROP participant does not work beyond elected DROP period.

Benefit Upon Disability

Regular plan benefit (continuation of pay and service) and no DROP account.

Or

DROP account plus reduced plan benefit (total value equals actuarial equivalent of regular plan benefit).

Benefits Upon Death

Regular plan benefit (continuation of pay and service) plus DROP account.

Benefits If Terminate Prior to Elected DROP Period

Participant is treated as if never entered DROP – Regular plan benefit (continuation of pay and service).

Section V. Summary of Plan Provisions

(continued)

DROP II (effective January 1, 2015)

Eligibility

All plan members are eligible upon completing at least 25 years of Creditable Service.

Participation Period

Determined by DROP II participant. The minimum participation period is two years and the maximum participation period is five years. A member must provide at least 18 months' written notice of the intended termination date. However, termination of participation is automatic upon the earlier of the fifth anniversary of DROP II participation or upon accruing 35 years of Creditable Service.

Deposits to Account

(a) Monthly benefit at DROP entry with no adjustment for cost of living
(b) An amount equal to employee contributions.
(c) Interest compounded monthly is applied to the balance of the DROP II account as of the last day of each month. No interest is applied to additions made during the current month. The effective annual interest rate is equal to the assumed rate of return minus 4.0%, but not less than 1.5%. The current rate is 3.5%.

Employee Contributions

Continue to plan while in DROP as long as Creditable Service is less than 30 years.

Benefit Upon Disability

Regular plan benefit (continuation of pay and service) and no DROP account.

Or

DROP account plus regular plan benefit based on actual year of creditable service and average compensation earned through the day before DROP II entry.

Section V. Summary of Plan Provisions

(continued)

Benefits Upon Death

Regular plan benefit (continuation of pay and service) plus DROP account.

Actuarial Equivalence

Mortality: UP-1984
Interest: 8%
Cost of Living Adjustment: 2% compounded annually.

Creditable Service

Period from employment or reemployment to termination (in whole calendar months) excluding any period while not a covered employee. One month credit is given for each 22 days of unused sick leave. An additional month is credited if unused sick leave remaining after full months have been credited is at least 12 days.

Eligibility Service

Similar to Creditable Service; however, Eligibility Service excludes unused sick leave and includes transferred service.

Optional Forms

50% or 100% Joint & Survivor
50% or 100% Pop-Up (similar to joint and survivor except that the participant's benefit returns to the unreduced amount if the spouse dies first or if the participant and spouse divorce)
Life only
Lump sum (for return of employee contributions only).

Changes Since Last Valuation

None.

Section VI. Actuarial Methods and Assumptions

Funding Method

Projected Unit Credit Actuarial Cost Method. The contribution equals the sum of the normal cost and the amount necessary to amortize the frozen unfunded actuarial liabilities and any actuarial gains or losses over a period of years. Amortization payments increase 2.75% annually. The contribution rate as a percentage of payroll developed in this report is applied to the actual payroll in the fiscal year the contribution is paid.

Asset Method

Asset smoothing method. Spreading the market value investment gains or losses in excess of the assumed return over a 5-year period. Actuarial value of assets can be no less than 50% of market value of assets and no more than 150% of market value of assets.

Interest

7.50% compounded annually, net of investment expenses.

Post Retirement COLA Increases

Benefits are assumed to increase by 2.0% of the current benefit each year.

Salary Increases

The following graded schedule is used:

Years of Service	Rate
0 – 4	7.55%/yr
5 – 9	6.55%/yr
10 – 14	5.85%/yr
15 – 19	5.80%/yr
20 - 24	4.55%/yr
25+	4.25%/yr

These rates include an inflation component of 2.75% compounded annually.

Section VI. Actuarial Methods and Assumptions

(continued)

Mortality

Pre-Retirement Healthy

Generational RP-2000 Combined Mortality Table for males and females set back two years, projected using scale AA. 20% of active participant mortality is assumed to be service connected and 80% is assumed to be non-service connected. Projections to the valuation date represent current mortality and projections using scale AA beyond the valuation date represent future mortality improvement.

Post Retirement Healthy

Generational RP-2000 Combined Mortality Table for males and females projected using scale AA. Projections to the valuation date represent current mortality and projections using scale AA beyond the valuation date represent future mortality improvement.

Termination of Employment

Termination rates are based on service only. Rates are as follows:

Years of Service	Police	Fire
0	7.00%	4.00%
1	4.00%	4.00%
2 – 4	2.00%	2.00%
5 – 9	1.50%	1.00%
10 – 14	1.00%	0.50%
15+	0.00%	0.00%

Section VI. Actuarial Methods and Assumptions

(continued)

Retirement Rates

Retirement rates are based on service.

Eligibility Service	Police	Fire
20	15%	10%
21 – 23	3%	5%
24	20%	7.5%
25 – 28	8%	3%
29	8%	5%
30	100%	10%
31 – 34	N/A	5%
35	N/A	100%

The retirement rate for Fire employees is 100% once an employee reaches age 62 (regardless of service).

Disability Rates

Sampled Annual Percentage of Disablement rates are as follows:

Age	Police	Fire
25	0.1222%	0.0750%
35	0.1577%	0.0968%
45	0.2700%	0.1658%
55	0.8700%	0.5340%

85% of the disabilities are assumed to occur in the line of duty. 25% of the line of duty disabilities are catastrophic and 75% of the line of duty disabilities are noncatastrophic.

Section VI. Actuarial Methods and Assumptions

(continued)

DROP

100% of members eligible for DROP are assumed to elect DROP and are assumed to remain in DROP for four years. To reflect the additional value of the DROP benefits, liability loads were added. Sample loads appear in the following tables:

DROP Loads for Fire			
	Years of Service at DROP Exit Date		
Age at DROP Exit Date	29	31	33
50	1.048	1.069	1.101
54	1.062	1.083	1.116
58	1.081	1.102	1.135

DROP Loads for Police		
	Years of Service at DROP Exit Date	
Age at DROP Exit Date	29	30
50	1.065	1.069
54	1.080	1.084
58	1.100	1.103

Marital Status

70% are assumed to be married with wife 3 years younger than husband.

Sick Leave

The service credit for unused sick leave is assumed to be 2.4% of creditable service from all other sources for Police participants and 2.2% of creditable service from all other sources for Fire participants.

Non-Investment Expenses

Average of prior two years non-investment expenses increased with assumed inflation and rounded to the nearest $1,000. This equals $350,000 (= average of $344,622 x 1.0275 and $326,833 x 1.0275 x 1.0275).

Section VI. Actuarial Methods and Assumptions

(continued)

Liability for Terminated Non-Vested Participants

Beginning in the 2016 valuation, the Vested Terminated liability includes a liability for terminated non-vested participants who are due a refund of their contributions. The liability is equal to the refund amount as of the valuation date.

Rationale for assumptions

The key assumptions were based on the most recent Experience Study dated June 26, 2014.

Changes Since Prior Valuation

None.

Section VII. Glossary

Actuarial Accrued Liability (AAL)	The difference between the Actuarial Present Value of Future Benefits and the Actuarial Present Value of Future Normal Costs or the portion of the present value of future benefits allocated to service before the valuation date in accordance with the actuarial cost method. Represents the present value of benefits expected to be paid from the plan in the future allocated to service prior to the date of the measurement.
Actuarial Asset Valuation Method	The method of determining the value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially determined contribution (ADC).
Actuarial Cost Method	A procedure for allocating the Actuarial Present Value of Future Benefits and the actuarial Present Value of Future Normal costs and the Actuarial Accrued Liability. Also known as the "funding method". Examples of actuarial cost methods include Aggregate, Entry Age Normal, Projected Unit Credit, and Pay-as-you-go.

Section VII. Glossary

(continued)

Actuarial Present Value of Future Benefits (APVFB)	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, nonretired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Annual Determined Contributions of the Employer(s) (ADC)	The employer's periodic determined contributions to a pension plan, calculated in accordance with the assumptions and methods used by the plan actuary. The ADC replaced the actuarially required contribution (ARC), with the replacement of GASB 27 with GASB 68.
Cost-of-Living Adjustment (COLA)	An annual increase in the amount of a retired participant's benefit intended to adjust the benefit for inflation.
Covered Group	Plan members included in actuarial valuation.
Deferred Retirement Option Program (DROP)	A program allowing a participant eligible to retire to continue working for a fixed period of time, while accumulating the benefit payments he would have received if he had retired on his entry to DROP.

Section VII. Glossary

(continued)

Demographic Assumption

Assumptions regarding the future population of pension participants, including retirement, termination, disability and mortality assumptions.

Economic Assumption

Assumptions regarding future economic factors, including COLA, salary improvement, change in average wages, changes in Social Security benefits and investment returns.

Employer's Contributions

Contributions made in relation to the actuarially determined contributions of the employer (ADC). An employer has made a contribution in relation to the ADC if the employer has (a) made payments of benefits directly to or on behalf of a retiree or beneficiary, (b) made premium payments to an insurer, or (c) irrevocably transferred assets to a trust, or an equivalent arrangement, in which plan assets are dedicated to providing benefits to retirees and their beneficiaries in accordance with the terms of the plan and are legally protected from creditors of the employer(s) or plan administrator.

Expenses

Plan expenses paid by the plan are divided into administrative and investment related expenses.

Funded Ratio

The actuarial value of assets expressed as a percentage of the plan's actuarial accrued liability.

Section VII. Glossary

(continued)

GASB	Government Accounting Standards Board.
GASB No. 25 and GASB No. 27	These are the government accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting rules for the employers that sponsor or contribute to public retirement systems while Statement No. 25 sets the rules for the systems themselves.
GASB No. 67 and GASB No. 68	These are the government standards that replace GASB 25 and 27 They are effective for plan years beginning after June 14, 2013 and employer fiscal years beginning after June 14, 2014.
Investment Return Assumption or Investment Rate of Return (Discount Rate)	The rate used to adjust a series of future payments to reflect the time value of money.
Level Percentage of Projected Payroll Amortization Method	Amortization payments are calculated so that they are a constant percentage of the projected payroll of active plan members over a given number of years. The dollar amount of the payments generally will increase over time as payroll increases due to inflation; in dollars adjusted for inflation, the payments can be expected to remain level.
Normal Cost or Normal Actuarial Cost	That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

Section VII. Glossary

(continued)

Pay-as-you-go (PAYG)	A method of financing a benefits plan under which the contributions to the plan are generally made at about the same time and in about the same amount as benefit payments and expenses becoming due.
Payroll Growth Rate	An actuarial assumption with respect to future increases in total covered payroll attributable to inflation; used in applying the level percentage of projected payroll amortization method.
Plan Liabilities	Obligations payable by the plan at the reporting date, including, primarily, benefits and refunds due and payable to plan members and beneficiaries, and accrued investment and administrative expenses. Plan liabilities do not include actuarial accrued liabilities for benefits that are not due and payable at the reporting date.
Plan Members	The individuals covered by the terms of a Pension or OPEB plan. The plan membership generally includes employees in active service, terminated employees who have accumulated benefits but are not yet receiving them, and retired employees and beneficiaries currently receiving benefits.
Post-Employment	The period between termination of employment and retirement as well as the period after retirement.
Salary Improvement	An actuarial assumption regarding the increase in employees' salaries, reflecting cost-of-living, merit and longevity increases.

Section VII. Glossary

(continued)

Select and Ultimate Rates

Actuarial assumptions that contemplate different rates for successive years. Instead of a single assumed rate with respect to, for example, the investment return assumption, the actuary may apply different rates for the early years of a projection and a single rate for all subsequent years. For example, if an actuary applies an assumed investment return of 8 percent for year 2000, 7.5 percent for 2001, and 7 percent for 2002 and thereafter, then 8 percent and 7.5 percent are select rates, and 7 percent is the ultimate rate.

Unfunded Actuarial Accrued Liabilities

The excess of the present value of prospective pension benefits, as of the date of a pension plan valuation, over the sum of (1) the actuarial value of the assets of the plan and (2) the present value of future normal costs determined by any of several actuarial cost methods. For plans that define an accrued liability, this amount equals the excess of the accrued liability over plan assets.

Vested Plan Benefits

All benefits to which current participants have a vested right based on pay and service through the valuation date. A participant has a vested right to a benefit if he/she would still be eligible to receive that benefit if employment terminated on the valuation date.

Appendix 1

Summary of Funding Progress

Valuation Date	(1) Actuarial Value of Assets	(2) Actuarial Accrued Liability	(3) Percentage Funded (1) / (2)	(4) Unfunded Actuarial Accrued Liability (2) - (1)	(5) Annual Covered Payroll[9]	(6) Unfunded Actuarial Accrued Liability as a Percentage of Covered Payroll (4) / (5)
7/1/2007	210,784,674	270,497,729	77.9%	59,713,055	43,604,715	136.9%
7/1/2008	238,417,336	300,686,389	79.3%	62,269,053	46,863,025	132.9%
7/1/2009	253,566,998	322,469,583	78.6%	68,902,585	52,145,928	132.1%
7/1/2010	266,984,658	348,701,993	76.6%	81,717,335	53,308,475	153.3%
7/1/2011	288,375,566	378,296,941	76.2%	89,921,375	55,656,754	161.6%
7/1/2012	308,764,110	403,741,233	76.5%	94,977,123	57,602,620	164.9%
7/1/2013	337,533,634	449,036,313	75.2%	111,502,679	59,687,553	186.8%
7/1/2014	386,612,386	491,602,868	78.6%	104,990,482	63,421,673	165.5%
7/1/2015	432,178,934	528,450,952	81.8%	96,272,018	62,709,059	153.5%
7/1/2016	468,532,092	574,445,462	81.6%	105,913,370	63,703,392	166.3%
7/1/2017	516,832,773	625,923,529	82.6%	109,090,756	68,184,464	160.0%

Analysis of the dollar amounts of net assets available for benefits, actuarial accrued liability, and unfunded actuarial accrued liability in isolation can be misleading. Expressing the net assets available for benefits as a percentage of the actuarial accrued liability provides one indication of funding status on a going-concern basis. Analysis of this percentage over time indicates whether the plan is becoming financially stronger or weaker. Generally, the greater this percentage, the stronger the plan. Trends in unfunded actuarial accrued liability and annual covered payroll are both affected by inflation. Expressing the unfunded actuarial accrued liability as a percentage of annual covered payroll approximately adjusts for the effects of inflation and aids analysis of Howard County's progress made in accumulating sufficient assets to pay benefits when due. Generally, the smaller this percentage, the stronger the plan.

[9] Excludes members participating in DROP.

Appendix 2

Risk Metrics

The County contributions will vary over time based on the experience of the plan's investments and participants. As the value of the plan's assets and liabilities increase relative to the participant payroll, there is a greater risk of large changes to the County's contribution expressed as a percentage of participant payroll.

The Asset Volatility Ratio (AVR) is equal to the market value of assets (MVA) divided by payroll. A higher AVR implies that the plan is exposed to greater contribution volatility. The current AVR of 6.4 indicates that a 1% asset gain/loss can be related to about 6.4% of the annual payroll. The plan currently amortizes asset gains/losses over a period of 15 years. This would result in a change in the County's contribution of about 0.6% of payroll for each 1.0% change in market assets.

The Liability Volatility Ratio (LVR) is equal to the Actuarial Accrued Liability (AAL) divided by payroll. A higher LVR implies that the plan is exposed to greater contribution volatility due to changes in liability measurements. The current LVR of 7.8 indicates that a 1% liability gain/loss can be related to about 7.8% of the annual payroll. The plan currently amortizes liability gains/losses over a period of 15 years. This would result in a change in the County's contribution of about 0.7% of payroll for each 1.0% change in AAL. As the plan approaches a 100% funded level, the AVR will converge to the LVR.

	2013	2014	2015	2016	2017
AVR	5.3	5.9	5.9	5.9	6.4
LVR	6.9	7.1	7.3	7.6	7.8