Anne Arundel County Detention Officers' and Deputy Sheriffs' Retirement Plan

Actuarial Valuation as of January 1, 2018 to Determine the County's Contribution for the Fiscal Year Ending June 30, 2019

Bolton

Submitted by:

Thomas Lowman, FSA, EA
Chief Actuary
(443) 573-3909
tlowman@boltonusa.com

Kristopher Seets, FSA, EA
Senior Consulting Actuary
(443) 573-3911
kseets@boltonusa.com

Table of Contents

Bolton

May 15, 2018

PERSONAL & CONFIDENTIAL
Andrea Rhodes
Personnel Officer
Anne Arundel County Government
P.O. Box 6675
Annapolis, MD 21401

Re: Detention Officers' and Deputy Sheriffs' Retirement Plan Valuation

Dear Andrea:

The following sets forth the actuarial valuation of the Anne Arundel County Detention Officers' and Deputy Sheriffs' Retirement Plan as of January 1, 2018. 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 many of the terms used in this report. The appendices of the report provide information for financial reporting as well as a ten-year projection of benefit payments.

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

Thomas Lowman, FSA, EA

Kristopher Seets, FSA, EA

Section I. Executive Summary

Background

Bolton Partners, Inc. has prepared the following report that sets forth the actuarial valuation of the Anne Arundel County Detention Officers' and Deputy Sheriffs' Retirement Plan as of January 1, 2018.

Actuarially Determined Contributions (ADC)

The actuarially determined contribution (ADC) amount increased as a dollar amount and as a percentage of payroll this year.

	FY2017	FY2018	FY2019
ADC	$6,850,930	$7,148,832	$7,415,524
Percent of Total Payroll	34.3%	34.0%	34.9%

The above amounts assume the County contribution will be made monthly throughout the fiscal year.

Changes in Contribution Rate

The following table shows the sources of changes in the County's contribution rate.

Description	Contribution Rate
January 1, 2017 Valuation	34.0%
Investment Performance	0.3%
Pay Increases	0.9%
New Entrants/Change in Normal Cost	(0.4%)
COLA	(0.1%)
Change in Expenses	0.0%
Demographics and Other Changes	0.2%
January 1, 2018 Valuation	34.9%

Section I. Executive Summary (cont.)

Funding Measures

Funding Measures	1/1/2017	1/1/2018	Percent Change
1. Actuarial Accrued Liability			
a. Active	$ 86,920,620	$ 92,333,444	6.2%
b. Retirees and Beneficiaries	83,963,844	91,181,964	8.6%
c. Term Vested	808,044	844,578	4.5%
d. Total	$ 171,692,508	$ 184,359,986	7.4%
2. Actuarial Value of Assets	$ 127,553,081	$ 137,791,833	8.0%
3. Plan Funded Ratio (2. / 1.d.)	74.3%	74.7%	
4. Market Value of Assets	$ 120,339,035	$ 141,368,993	17.5%
5. Funded Ratio based on Market Value of Assets (4. / 1.d.)	70.1%	76.7%	

Risk Measures

The risk that a plan sponsor incurs from a defined benefit plan is 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 three 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 3.

Risk Measure	CY2015	CY2016	CY2017	Conservative Measures
Retiree Liability as a Percent of Total Liability	50%	49%	49%	<50%
Assets to Payroll	5.5	5.7	6.6	<5
Liabilities to Payroll	8.2	8.2	8.7	<5
Benefit Payments to Contributions	0.8	0.7	0.8	1 - 3

Section I. Executive Summary (cont.)

Experience Analysis

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

- Retiree COLAs effective July 1, 2017 were less than the assumed annual increases.
- Investment returns during CY2017 were about $10.5 million higher than expected. A portion of this gain is reflected in this valuation, with the remaining portions to be reflected in future valuations. This was offset by the continued recognition of prior investment losses. There is a total of $3.6 million in net deferred investment gains as of January 1, 2018 that will be reflected in future valuations.
- Pay for returning employees increased approximately 6.2% over the prior year; higher than what was expected.
- Total participant payroll increased by 1.3% over the prior year; less than the assumption of 3.0% growth per year.

Changes in Method, Assumptions, and Plan Amendments

There were no method or assumption changes since the prior valuation.

There were no plan amendments adopted that affect benefits since the prior valuation.

Projection of Expected Benefit Payments

The projection of expected benefit payments for current participants is shown in Appendix 2.

Sources of Information

The January 1, 2018 participant data and market value of assets were provided by or at the direction of Anne Arundel County. While we have reviewed this data for consistency and completeness, we have not audited this data.

Section I. Executive Summary (cont.)

Actuarial Certification

This actuarial valuation sets forth our calculation of an estimate of the liabilities of the Anne Arundel County Detention Officers' and Deputy Sheriffs' Retirement Plan (the Plan), together with a comparison of these liabilities with the value of the plan assets, as submitted by Anne Arundel 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.

Section I. Executive Summary

Actuarial Certification (cont.)

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.

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 County is solely responsible for the validity and completeness of this information.

Section I. Executive Summary (cont.)

Actuarial Certification (cont.)

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.

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, the County 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 (cont.)

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 Lowman, FSA, EA

Kristopher Seets, FSA, EA

Section II. Determination of County Contributions

Derivation of Liabilities

Below is a summary of the actuarial accrued liability of the future benefits expected to be paid from the plan.

Unfunded Liability		1/1/2017		1/1/2018
1. Participants				
a. Active (excluding DROP)		343		327
b. Active DROP		15		18
c. Retirees and Beneficiaries		250		266
d. Inactive with Deferred Benefits		7		6
e. Total		615		617
2. Active Payroll	$	21,000,562	$	21,268,895
3. Actuarial Accrued Liability				
a. Active Participants	$	86,920,620	$	92,333,444
b. Retirees and Beneficiaries		83,963,844		91,181,964
c. Inactive with Deferred Benefits		808,044		844,578
d. Total	$	171,692,508	$	184,359,986
4. Actuarial Asset Value	$	127,553,081	$	137,791,833
5. Unfunded Actuarial Liability (3.d.- 4.)	$	44,139,427	$	46,568,153
6. Funded Ratio (4. ÷ 3.d.)		74.3%		74.7%

Section II. Determination of County Contributions (cont.)

Development of County Contributions

The breakdown of the Actuarially Determined Contribution into normal cost, amortization payment, and expected administrative expenses is illustrated below.

Actuarially Determined Contribution			FY2019
1.	County Normal Cost	$	3,362,237
2.	Amortization Amount	$	3,431,925
3.	Expected Expenses	$	104,000
4.	County's Contribution (1. + 2. + 3.)	$	6,898,162
5.	County's Contribution at Adjusted for Timing of Payment (4. x 1.075)	$	7,415,524
6.	County's Contribution as a Percentage of Participant Payroll		34.9%

Section II. Determination of County Contributions (cont.)

Schedule of Amortization Bases

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

Description	Date Established	Remaining Years		Amount to be Amortized		Payment / (Credit)
Unfunded Accrued Liability	1/1/2003	15	$	8,869,449	$	784,183
Actuarial (Gain)/Loss	1/1/2004	16	$	(1,323,193)	$	(111,785)
Actuarial (Gain)/Loss	1/1/2005	17	$	855,728	$	69,338
Actuarial (Gain)/Loss	1/1/2006	18	$	1,949,927	$	152,043
Plan & Assumption Change	1/1/2006	18	$	818,923	$	63,854
Actuarial (Gain)/Loss	1/1/2007	19	$	(1,279,217)	$	(96,269)
Actuarial (Gain)/Loss	1/1/2008	20	$	3,542,572	$	257,984
Assumption Change	1/1/2008	20	$	1,515,931	$	110,396
Actuarial (Gain)/Loss	1/1/2009	21	$	8,023,468	$	566,752
Actuarial (Gain)/Loss	1/1/2010	22	$	4,923,031	$	338,020
Actuarial (Gain)/Loss	1/1/2011	23	$	(378,230)	$	(25,292)
Asset Method Change	1/1/2011	23	$	5,465,477	$	365,470
Actuarial (Gain)/Loss	1/1/2012	24	$	3,624,458	$	236,450
Plan & Assumption Change	1/1/2013	25	$	1,329,921	$	84,779
Actuarial (Gain)/Loss	1/1/2013	25	$	3,941,825	$	251,280
Assumption Change	1/1/2014	16	$	2,937,455	$	248,159
Actuarial (Gain)/Loss	1/1/2014	16	$	(2,906,394)	$	(245,535)
Actuarial (Gain)/Loss	1/1/2015	17	$	1,181,354	$	95,722
Plan Change	1/1/2016	5	$	202,484	$	44,032
Actuarial (Gain)/Loss	1/1/2016	18	$	780,096	$	60,827
Actuarial (Gain)/Loss	1/1/2017	19	$	(16,316)	$	(1,228)
Actuarial (Gain)/Loss	1/1/2018	20	$	2,509,404	$	182,745
Totals			**$**	**46,568,153**	**$**	**3,431,925**

Bases are amortized as an equal percent of payroll each year with total payroll expected to increase 3.0% annually. The January 1, 2018 amortization payment of $3,431,925 is sufficient to cover the interest on the plan's unfunded liability.

Section III. Valuation of Assets

Reconciliation of Assets

Below is a reconciliation of assets (unaudited) from January 1, 2016 through December 31, 2017.

		CY2016		CY2017
1. Beginning of Year Assets	$	110,110,665	$	119,665,701
2. Receipts				
a. Employer Contributions	$	6,661,617	$	6,975,057
b. Employee Contributions		1,319,018		1,354,593
c. Investment Income & Dividends		2,184,773		2,549,804
d. Realized and Unrealized Gain/(Loss)		6,285,402		17,002,831
e. Stock Loan Income		10,627		16,611
f. Other		440,237		858,235
g. Total Receipts	$	16,901,673	$	28,757,131
3. Deductions				
a. Benefit Payments	$	6,485,372	$	6,821,395
b. Administrative Expenses		99,535		109,213
c. Investment Expenses		761,730		820,724
d. Total Disbursements	$	7,346,637	$	7,751,332
4. Net Increase (2.g. – 3.d.)	$	9,555,036	$	21,005,799
5. Preliminary Ending Value (1. + 4.)	$	119,665,701	$	140,671,500
6. Contribution Receivable	$	673,334	$	697,493
7. End of Year Assets	$	120,339,035	$	141,368,993
8. Rate of Return Net of Investment Fees (2I / [A + B – I] Method)		7.34%		16.24%

Please note that some numbers may not add due to rounding.

Section III. Valuation of Assets (cont.)

Calculation of Actuarial Asset Value

The actuarial asset value as of January 1, 2018 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.

							1/1/2018
1.	Market Value of Assets					$	141,368,993
2.	Spreading of Investment (Gain)/Loss						
		Calendar Year		(Gain)/Loss	% Deferred		Amount Deferred
		2017	$	(10,527,958)	80%	$	(8,422,366)
		2016		200,931	60%		120,559
		2015		10,320,607	40%		4,128,243
		2014		2,982,020	20%		596,404
	a. Total Deferred						(3,577,160)
3.	Actuarial Value of Assets (1. + 2.a.)					$	137,791,833
4.	Rate of Return Net of Investment Fees (2I / [A + B – I] Method)						6.9%

Section IV. Participant Information

Participant Summary

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

	1/1/2017	1/1/2018
1. Actives		
a. Number	358	345
b. Average Age	44.3	44.6
c. Average Service	11.7	12.2
d. Average Salary	$ 58,661	$ 61,649
2. Service Retirements and Beneficiaries		
a. Number	250	266
b. Average Age	61.6	62.3
c. Total Annual Benefits	$ 6,479,145	$ 7,155,547
3. Vested Terminations		
a. Number	7	6
b. Average Age	43.5	46.7
c. Total Annual Benefits	$ 74,687	$ 68,534

Section IV. Participant Information (cont.)

Active Age/Service Distribution Including Compensation

Shown below is the distribution of active participants, excluding those currently enrolled in DROP, based on age and service. The compensation shown is the average rate of pay as of January 1, 2018.

	Years of Service as of 01/01/2018										
Age	**Under 1**	**1-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40 & Up**	**Total**
Under 25	3	10	0	0	0	0	0	0	0	0	13
	42,842	44,063	0	0	0	0	0	0	0	0	43,781
25 - 29	6	26	6	0	0	0	0	0	0	0	38
	43,059	44,783	48,525	0	0	0	0	0	0	0	45,102
30 - 34	3	16	11	7	0	0	0	0	0	0	37
	43,754	45,441	49,215	54,807	0	0	0	0	0	0	48,198
35 - 39	0	7	10	8	3	0	0	0	0	0	28
	0	46,278	54,310	58,613	63,981	0	0	0	0	0	54,568
40 - 44	2	3	5	12	17	5	0	0	0	0	44
	44,734	47,222	49,553	60,698	70,085	80,387	0	0	0	0	63,651
45 - 49	2	7	5	8	21	19	2	0	0	0	64
	41,796	47,343	53,304	57,420	68,971	79,409	97,794	0	0	0	67,088
50 - 54	0	8	4	9	4	11	3	0	0	0	39
	0	49,130	51,965	60,452	78,804	77,209	92,774	0	0	0	66,354
55 - 59	1	6	5	7	5	11	5	0	2	0	42
	47,672	48,619	54,202	57,426	65,776	82,441	97,034	0	91,626	0	69,441
60 - 64	0	3	2	3	4	2	0	0	0	0	14
	0	47,534	52,686	60,133	72,259	73,398	0	0	0	0	61,729
65 - 69	0	0	2	1	0	4	0	0	0	0	7
	0	0	52,686	63,332	0	120,698	0	0	0	0	93,071
70 & Up	0	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	0	81,108	0	0	0	0	81,108
Totals	17	86	50	55	54	53	10	0	2	0	327
	43,463	46,005	51,590	58,729	69,721	82,595	95,908	0	91,626	0	60,519

Averages	
Age	44.0
Service	11.4

Section IV. Participant Information (cont.)

Participant Reconciliation

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

	Active Participants	DROP	Inactive Participants With Deferred Benefits	Inactive Participants Receiving Benefits	Total
Participants in Last Valuation	343	15	7	250	615
Retired	(16)	(1)	0	17	0
Vested Termination	0	0	0	0	0
Nonvested Termination	(12)	0	0	0	(12)
Disabled	0	0	0	0	0
Deceased/Payment Expired	0	0	0	(1)	(1)
Return of Employee Contributions	0	0	(1)	0	(1)
New QDRO	0	0	0	0	0
Transfer In From:					
Fire Plan	0	0	0	0	0
Police Plan	0	0	0	0	0
Employee Plan	1	0	0	0	1
Transfer Out To:					
Fire Plan	0	0	0	0	0
Police Plan	(1)	0	0	0	(1)
Employee Plan	(2)	0	0	0	(2)
New Participants	18	0	0	0	18
Entered DROP	(4)	4	0	0	0
Beneficiary	0	0	0	0	0
Adjustments	0	0	0	0	0
Participants in This Valuation	327	18	6	266	617

Section V. Summary of Plan Provisions

Plan Year

January 1 – December 31.

Normal Retirement Age

Category I Participants: 20 years of service, or age 50 with 5 years.

Category II Participants: Age 50 with 10 years of service, or age 50 with 5 years of service for members hired before July 1, 2015.

Normal Form of Benefit

Monthly life annuity with payments guaranteed for 5 years.

Post Retirement Cost of Living Increases

Simple for Benefits Accrued as of 1/31/97

Retiree benefits are adjusted each year. The revised benefit amount is the lesser of:

a. Prior year benefit plus base benefit multiplied by increase in current CPI from CPI for prior year, or
b. Benefit increased by 4% of original benefit.

Compound for Benefits Accrued after 1/31/97

Retiree benefits are adjusted each year. The revised benefit amount is the lesser of:

a. Prior year benefit multiplied by 60% of the increase in the current March CPI from March CPI for prior year, or
b. Benefit increased by 2.5%.

Employee Contributions

6.75% of compensation for all plan members.

Compensation

Regular annual rate of pay, exclusive of extra compensation of any kind such as overtime pay, bonuses, and commissions. Some members received a special FY10 increase for pension purposes.

Section V. Summary of Plan Provisions (cont.)

Final Earnings

The average of the highest 3 years of annual basic pay.

Benefit Formula

2 ½% of final earnings for each year of service up to 20 years plus 2% of final earnings for each year of service after 20 years (maximum 70% plus 2% times unused disability credit and pre-employment military service credit).

Early Retirement

Reduced benefits are available the first of any month coincident with or next following the completion of 20 years of continuous service.

Termination Prior to Retirement

Less Than 5 Years of Service

Return of employee contributions with 4.25% interest.

5 Years of Service or More

For Category II employees hired before July 1, 2015 and all Category I employees, at the discretion of the employee, either a return of contributions with interest or the accrued normal retirement benefit taking into account final earnings and service at date of termination, payable at normal retirement date. For Category II employees hired on or after July 1, 2015, return of employee contributions with 4.25% interest.

10 Years of Service or More

For Category II employees hired on or after July 1, 2015, at the discretion of the employee, either a return of contributions with interest or the accrued normal retirement benefit taking into account final earnings and service at date of termination, payable at normal retirement date.

Section V. Summary of Plan Provisions (cont.)

DROP

Allows accumulation of pension after 20 years of County service. DROP period must be between three and five years. Members may remain in DROP for a sixth year, but no interest shall be credited to the DROP account in the sixth year.

Disability Benefit

Must be totally and permanently disabled (except as the result of activities specified in the County code) regardless of length of service.

Line of Duty Disability

The greater of the accrued benefit or 66 2/3% of final earnings, payable immediately, unreduced.

Non-Line of Duty Disability

The greater of the accrued benefit or 20% of final earnings, payable immediately, unreduced.

Pre-Retirement Spouse's Benefit

Line of Duty Death Benefit

Greater of accrued benefit or 66 2/3% of final earnings.

Non-Line of Duty Death Benefit

If participant is vested, surviving spouse's choice of an annuity equal to the participant's accrued benefit, or a lump sum equal to return of employee contributions with 4.25% interest plus 50% of annual pay. If participant is not vested, return of employee contributions with 4.25% interest, and a lump sum equal to 50% of annual pay.

Section V. Summary of Plan Provisions (cont.)

Other Pre-Retirement Death Benefits

Return of employee contributions with 4.25% interest, and a lump sum equal to 50% of annual pay.

Changes Since Prior Valuation

None.

Section VI. Actuarial Methods and Assumptions

Funding Method

Projected Unit Credit Cost Method. This method divides the cost of funding benefits into two parts: normal cost and actuarial accrued liability. The normal cost is the estimated cost of the benefits that are considered to be accrued in that plan year. The actuarial accrued liability is the estimated cost of all benefits that are considered to have been accrued to the valuation date. The unfunded actuarial accrued liability is the actuarial accrued liability minus plan assets. An actuarial gain or loss is calculated each year based on the change in the unfunded actuarial accrued liability. The total contribution is the normal cost plus (minus) a payment to amortize actuarial losses (gains) that occur. The benefit that is considered to be accrued in a year is the participant's projected benefit divided by his total projected years of service.

Asset Method

Asset smoothing method which spreads the investment gains or losses in excess of the assumed return over a five-year period. Actuarial Value of Assets recognizes adjustments resulting from an audit.

Interest

7.5% compounded annually, net of investment expenses.

Post Retirement COLA Increases

Benefits accrued before Bill 88-96 are assumed to increase by 3.0% of the original benefit each year from retirement.

Benefits accrued after Bill 88-96 are assumed to increase by 1.8% of the current benefit each year from retirement.

Section VI. Actuarial Methods and Assumptions (cont.)

Salary Increases

The following graded schedule is used:

Attained Age	Rate
20	6.00%
25	6.00%
30	5.50%
35	5.25%
40	4.75%
45	4.25%
50	4.25%

Mortality

Healthy

RP-2000 Blue Collar Mortality Table for males and females projected generationally using scale AA. Pre-Termination mortality uses 60% of these rates. Projections to the valuation date represent current mortality and projections using scale AA beyond the valuation date represent future mortality improvement.

Disabled

RP-2000 Blue Collar Mortality Table for males and females set forward five years and then projected generationally using scale AA. Projections to the valuation date represent current mortality and projections using scale AA beyond the valuation date represent future mortality improvement.

100% of pre-retirement deaths are assumed to be non-duty related.

Section VI. Actuarial Methods and Assumptions (cont.)

Disability

Sample rates are:

Age	Rate
30	0.245%
35	0.362%
40	0.747%
45	1.250%
50	1.839%
55	0.00%

75% of disablements are assumed to be duty-related.

Turnover

Less Than 10 Years of Service

Sample rates are:

Age	Male	Female
20	12.38%	18.75%
25	8.98%	14.06%
30	6.81%	11.25%
35	4.95%	8.44%
40	3.41%	6.19%
45	1.86%	3.94%
50	0.00%	0.00%

Section VI. Actuarial Methods and Assumptions (cont.)

Turnover (cont.)

10 or More Years of Service

Sample rates are:

Age	Male	Female
20	8.67%	13.13%
25	6.29%	9.84%
30	4.77%	7.88%
35	3.47%	5.91%
40	2.39%	4.33%
45	1.30%	2.76%
50	0.00%	0.00%

Retirement

Category I

Retirement rates are as follows:

Less Than 20 Years of Service	
Age	**Rate**
50	10%
51 – 54	5%
55 – 59	20%
60	100%

Section VI. Actuarial Methods and Assumptions (cont.)

Retirement (cont.)

	20 or More Years of Service	
Age	**20 Years but Less Than 30 Years**	**30 or More Years**
40 – 49	12%	
50 – 59	30%	100%
60	100%	100%

Category II

Retirement rates are as follows:

Age	< 20 Years of Service	20 Years of Service	21 – 29 Years of Service	≥ 30 Years of Service
< 50	N/A	5%	2%	100%
50	10%	30%	30%	100%
51 – 59	10%	15%	15%	100%
60 – 64	10%	20%	20%	100%
65+	100%	100%	100%	100%

DROP Load

To reflect the cost of the more valuable benefits provided from the Deferred Retirement Option Program, the following loads were applied:

	Service			
Age	**23**	**27**	**30**	**35**
44	0.40%	1.20%	2.10%	13.70%
50	2.70%	4.40%	5.30%	17.20%
55	4.10%	6.20%	7.10%	19.20%
60	5.90%	8.50%	9.40%	21.90%

Section VI. Actuarial Methods and Assumptions (cont.)

Disability Leave

Service credit for benefit formula purposes is increased by 1.75% to account for disability leave which is converted to service credit at retirement.

Military Service

Active liabilities (which depend on credited service) are loaded by 3.25% to account for future crediting of military service.

In addition, it is assumed that participants with 30 or more years of service will have credit for one year of combined disability leave and military service.

Marriage

It is assumed that 80% of employees are married. Husbands are assumed to be 4 years older than wives.

Other Methods and Assumptions

A load for estimated administrative expenses is included in the Actuarially Determined Contribution. The load is equal to the average of actual expenses for the two years preceding the valuation date, rounded to the nearest thousand.

It is assumed that vested terminations prior to age 40 will choose to take a lump sum while those 40 and older will choose a deferred benefit.

The rationale for the demographic assumptions is based on the results of the December 2012 Experience Study. The economic assumptions are based on future expectations with an underlying 3.0% inflation assumption.

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 resent 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 (cont.)

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.
Aggregate Cost Method	An actuarial cost method that spreads the cost of all future benefits in excess of plan assets as a level percentage of future salary or service. The actuarial accrued liability is set to the value of assets in this method.
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.

Section VII. Glossary (cont.)

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.
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.

Section VII. Glossary (cont.)

Entry Age Normal (EAN) Cost Method	An actuarial cost method that spreads the cost for each individual's expected benefits over their career, either as a level percentage of pay or service. The actuarial accrued liability is the accumulated value of all past normal cost, and the unfunded accrued liability (surplus) is the excess of the AAL over the value of assets.
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.
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.

Section VII. Glossary (cont.)

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.
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.

Section VII. Glossary (cont.)

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.

Projected Unit Credit (PUC) Funding Method

An actuarial cost method that spreads the employee's benefit over their career, as a level percentage of service. The normal cost is the present value of the portion of the benefit assigned to the current year. The actuarial accrued liability is the accumulated value of all past normal cost, and the unfunded accrued liability (surplus) is the excess of the AAL over the value of assets.

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.

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.

Section VII. Glossary (cont.)

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	(6) Unfunded Actuarial Accrued Liability as a Percentage of Covered Payroll (4) / (5)
1/1/2009	$76,525,847	$98,485,152	77.7%	$21,959,305	$19,785,653	111.0%
1/1/2010	$84,490,610	$111,277,697	75.9%	$26,787,087	$20,203,895	132.6%
1/1/2011	$87,911,133	$119,767,203	73.4%	$31,856,070	$19,310,216	165.0%
1/1/2012	$90,334,022	$125,987,284	71.7%	$35,653,262	$18,760,664	190.0%
1/1/2013	$92,617,788	$133,678,085	69.3%	$41,060,297	$17,896,574	229.4%
1/1/2014	$102,136,092	$143,696,346	71.1%	$41,560,254	$18,132,868	229.2%
1/1/2015	$112,017,103	$154,984,268	72.3%	$42,967,165	$19,775,644	217.3%
1/1/2016	$119,275,911	$163,414,894	73.0%	$44,138,983	$19,974,632	221.0%
1/1/2017	$127,553,081	$171,692,508	74.3%	$44,139,427	$21,000,562	210.2%
1/1/2018	$137,791,833	$184,359,986	74.7%	$46,568,153	$21,268,895	218.9%

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 Anne Arundel County's progress made in accumulating sufficient assets to pay benefits when due. Generally, the smaller this percentage, the weaker the plan.

Appendix 1: Summary of Contributions

Year Ended December 31	Actuarially Determined Contribution	Percentage Contributed
2014	$6,110,988	100.0%
2015	$6,370,760	100.0%
2016	$6,688,662	100.0%
2017	$6,999,882	100.0%

The information presented in the required supplementary schedules was determined as part of the actuarial valuations at the dates indicated. Additional information as of the latest actuarial valuation follows.

Actuarial cost method	Projected unit credit
Amortization Method	Level percentage of payroll (closed)
Remaining amortization period	Remaining amortization periods range from 5 to 25 years with an average effective period of 20 years. Starting with new bases in 2014, Assumption changes and gains and losses are amortized over 20 years and plan changes are amortized over the average future service of the active population at time of the change.
Asset valuation method	Five-year smoothed method
Actuarial assumptions:	
Investment rate of return	7.50%
Projected salary increase	Varies by age
Post-retirement cost-of-living adjustments	3.0% for pre 2-97 accruals 1.8% for post 2/97 accruals

Appendix 2: Benefit Payment Projection

The following table shows the estimated benefit payments from January 1, 2018 through December 31, 2027 based on existing members of the plan.

Calendar Year	Benefits
2018	$8,889,000
2019	11,668,000
2020	12,357,000
2021	13,652,000
2022	13,373,000
2023	14,177,000
2024	14,882,000
2025	15,568,000
2026	16,268,000
2027	16,871,000

Appendix 3: Risk Metrics

The County's 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 6.6 indicates that a 1% asset gain/loss can be related to about 6.6% of the annual payroll. The plan currently amortizes asset gains/losses over a period of 20 years. This would result in a change in the County's contribution of about 0.5% 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 8.7 indicates that a 1% liability gain/loss can be related to about 8.7% of the annual payroll. The plan currently amortizes liability gains/losses over a period of 20 years. This would result in a change in the County's contribution of about 0.6% of payroll for each 1.0% change in AAL. As the plan approaches a 100% funded level, the AVR will converge to the LVR.

	2014	2015	2016	2017	2018
AVR	5.8	5.6	5.5	5.7	6.6
LVR	7.8	7.8	8.2	8.2	8.7

Appendix 4: Summary of Major Legislative Changes

County Council Bill No. 34-92	Effective 6/1/92 through 8/31/92. Participants over age 50 or with at least 20 years of service could elect to retire with an additional pension equal to 1/12 of 2.5% of final earnings for the first 20 years of service, plus 1/12 of 2% of final earnings for each additional year of service. The additional amount could be taken as a pension increase, a lump sum, or as a temporary supplement to age 62. Appropriate actuarial adjustments apply.
State House Bill No. 687	Effective 7/1/90. County employees were given the opportunity to apply for credit under the County's plan for previous service with the State of Maryland (or a political subdivision of the State).
County Council Bill 90-93	Effective 12/22/93. Plan participants are required to pay the full actuarial value for service purchases. Purchases can only be made at retirement. To be eligible, an employee must have 60 months of County service. Existing plan participants must be notified of their right to purchase service under existing law.
County Council Bill No. 94-93	Effective 11/19/93. All current and future employees shall be 100% vested after 5 years of Credited Service.

Appendix 4: Summary of Major Legislative Changes (cont.)

County Council Bill 88-96	Effective 12/4/96. The previous method of calculating cost of living increases will only apply to benefits accrued as of 1/31/97. The cost of living increase for future benefits is a compound increase equal to 60% of the annual change in the CPI, not to exceed 2.5%. Employees hired, or rehired, on or after 12/4/96 will be Tier Two employees and will have different benefits than current employees.
County Council Bill No. 41-99	Effective 6/15/99. Employees paid under the deputy sheriff employees pay schedule become Tier Two members of the Detention Center Plan effective as of January 1, 1999. Service credited under the Employees' Plan will count as credited service in the Detention Center Plan and no future benefit will be paid from the Employees' Plan. Assets are transferred from the Employees' Plan to the Detention Center Plan in an amount equal to the projected unit credit accrued liability in the Employees' Plan.
Recodification	Effective 2/25/2002. Allows a benefit based on disability leave service and pre-plan military service to be paid over the 70% cap. Elimination of Tier 2 benefits. Changed early retirement factors. Added a death benefit.

Appendix 4: Summary of Major Legislative Changes (cont.)

County Council Bill No. 32-04	Effective 7/1/2004. Allows retirement after 20 years of service for "Category I" participants. Changes vesting for new hires from 5 years to 20 years. Provides for employees contributions to be made on a pre-tax ("pick up") basis.
County Council Bill 74-09	Effective 12/11/2009. For non-represented members, FY2010 annual pay shall be determined by increasing FY2009 annual pay by an assumed 3% for determining the final average basic pay. For D3 and S2 members, FY2010 annual pay shall be determined by increasing FY2009 annual pay by an assumed 4% for determining the final average basic pay.
County Council Bill No. 78-09	Effective 11/16/2009. For D1 and D2 members, FY2010 annual pay shall be determined by increasing FY2009 annual pay by an assumed 4% for determining the final average basic pay.
County Council Bill 6-10	Effective 4/18/2010. Provides for a disability benefit for those participants who are totally and permanently disabled as a result of qualified military service.

Appendix 4: Summary of Major Legislative Changes (cont.)

County Council Bill 41-10	Effective 7/1/2010. Increased the contribution rate for Detention Officers, Detention Corporals and Detention Sergeants to 6.75%. Added a "pop-up" option.
County Council Bill No. 98-12	Effective 5/13/2013. Changed the definition of "final average basic pay" from highest 3 out of the last 5 years basic pays to highest 3 of all basic pays.
County Council Bill No. 30-12	Effective 2/1/2013 A participant in the classification of Detention Officer, Detention Corporal, or Detention Sergeant shall contribute 6.75% of his or her annual basic pay in each calendar year or portion of a calendar year while an active participant in the plan.
County Council Bill No. 97-13	Effective 4/14/2014. Category II members of the Detention and Deputy Sheriffs' Plan hired on or after July 1, 2015 will be subject to 10 year vesting and 10 year normal retirement provisions. The 10 year requirement also affects the ability to purchase service or get credit for pre-plan military service.