Anne Arundel County Police Service Retirement Plan

Actuarial Valuation as of January 1, 2019 to Determine the County's Contribution for the Fiscal Year Ending June 30, 2020

Bolton

Submitted by:

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Bolton
Employee Benefits, Actuarial & Investment Consulting

May 1, 2019

PERSONAL & CONFIDENTIAL

Anne Budowski
Acting Personnel Officer
Anne Arundel County Government
P.O. Box 6675
Annapolis, MD 21401

Re: Police Service Retirement Plan Valuation

Dear Anne:

The following sets forth the actuarial valuation of the Anne Arundel County Police Service Retirement Plan as of January 1, 2019. Section I of the report provides a summary while Sections II through VI contain the development of the County's contribution for the 2020 fiscal year along with a summary of the census and asset data, plan provisions, assumptions and actuarial methods. Section VII provides a glossary of many of the terms used in this report. The appendices of the report provide information on plan funding as well as a ten-year projection of benefit payments 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,

Thomas Lowman, FSA, EA

Ann M. Sturner, FSA, EA

Michael Spadaro, ASA

Section I. Executive Summary

Background

Bolton Partners, Inc. has prepared the following report that sets forth the actuarial valuation of the Anne Arundel County Police Service Retirement Plan as of January 1, 2019.

Actuarially Determined Contributions (ADC)

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

	FY2018	FY2019	FY2020
ADC	$21,354,858	$22,513,026	$23,674,767
Percent of Total Payroll	42.2%	43.5%	43.0%

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, 2018 Valuation	43.5%
Investment Performance	2.2%
Pay Increases	0.0%
New Entrants/Change in Normal Cost	0.3%
COLA	(0.4%)
Change in Expenses	0.0%
Assumption and Method Changes	(1.4%)
Demographics and Other Changes	(1.2%)
January 1, 2019 Valuation	43.0%

Section I. Executive Summary

Funding Measures

Funding Measures	1/1/2018	1/1/2019	Percent Change
1. Actuarial Accrued Liability			
a. Active	$ 253,849,382	$ 260,275,778	2.5%
b. Retirees and Beneficiaries	430,537,535	448,094,223	4.1%
c. Total	**$ 684,386,917**	**$ 708,370,001**	**3.5%**
2. Actuarial Value of Assets	$ 540,292,183	$ 553,866,523	2.5%
3. Plan Funded Ratio (2. / 1.c.)	78.9%	78.2%	
4. Market Value of Assets	$ 553,461,320	$ 516,505,185	(6.7%)
5. Funded Ratio based on Market Value of Assets (4. / 1.c.)	80.9%	72.9%	

Risk Measures

A new Actuarial Standard of Practice concerning pension plan risk is now in effect. Appendix 3 contains important information about various risks common to most public pension plans. Because the information is too lengthy to include in this summary, we strongly recommend reviewing the Appendix and considering whether further risk assessments are necessary.

Generally, 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 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 3.

Risk Measure	1/1/2017	1/1/2018	1/1/2019	Conservative Measures
Retiree Liability as a Percent of Total Liability	63%	63%	63%	<50%
Assets to Payroll	9.6	10.7	9.4	<5
Liabilities to Payroll	12.9	13.2	12.9	<5
Benefit Payments to Contributions[1]	1.4	1.4	1.4	1 - 3

[1] For the year ending on the date shown.

Section I. Executive Summary

Experience Analysis

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

- Retiree COLAs effective July 1, 2018 were less than the assumed annual increases.
- Investment returns during CY2018 were about $67.0 million lower than expected. A portion of this loss 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 gains and losses. There is a total of $37.4 million in net deferred investment losses as of January 1, 2019 that will be reflected in future valuations.
- Pay for returning employees increased approximately 8.1% over the prior year; higher than what was expected.
- Total participant payroll increased by 6.5% over the prior year; higher than the assumption of 3.0% growth per year.
- Several actuarial assumptions were changed, based on our recent experience study. The net effect of the changes was to lower the contribution by approximately $782,000 or 1.4% of payroll.

Changes in Method, Assumptions, and Plan Amendments

There were changes to several methods and assumptions, based on the results of our recent experience study. These changes are described in detail in Section VI.

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, 2019 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

Actuarial Certification

This actuarial valuation sets forth our calculation of an estimate of the liabilities of the Anne Arundel County Police Service 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.

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.

Section I. Executive Summary

Actuarial Certification

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.

The County is solely responsible for selecting the plan's investment policies, asset allocations and individual investments. Bolton Partners, Inc. has 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 2020 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.

Section I. Executive Summary

Actuarial Certification

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.

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.

Thomas Lowman, FSA, EA

Ann M. Sturner, FSA, EA

Michael Spadaro, ASA

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		1/1/2018		1/1/2019
1.	Participants			
a.	Active (excluding DROP)	634		638
b.	Active DROP	54		61
c.	Retirees and Beneficiaries	730		739
d.	**Total**	**1,418**		**1,438**
2.	Active Payroll	$ 51,758,654	$	55,101,812
3.	Actuarial Accrued Liability			
a.	Active Participants	$ 253,849,382	$	260,275,778
b.	Retirees and Beneficiaries	430,537,535		448,094,223
c.	**Total**	**$ 684,386,917**	**$**	**708,370,001**
4.	Actuarial Asset Value	$ 540,292,183	$	553,866,523
5.	Unfunded Actuarial Liability (3.c.- 4.)	$ 144,094,734	$	154,503,578
6.	Funded Ratio (4. ÷ 3.c.)	78.9%		78.2%

Section II. Determination of County Contributions

Projection of Unfunded Liability

The projection of the unfunded actuarial liability from January 1, 2019 to July 1, 2019, the beginning of the fiscal year, is shown below.

1.	Unfunded Liability as of January 1, 2019	$	154,503,478
2.	Expected County Contributions 1/1/2019 – 6/30/2019	$	11,256,513
3.	Expected Employee Contributions 1/1/2019 – 6/30/2019	$	1,751,689
4.	Expected Expenses 1/1/2019 – 6/30/2019	$	227,500
5.	Total Normal Cost 1/1/2019 – 6/30/2019	$	7,429,169
6.	Interest at 7.45%	$	5,691,980
7.	Projected Unfunded Liability as of July 1, 2019 (1. – 2. – 3. + 4. + 5. + 6.)	$	154,843,925

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			FY2020
1.	County Normal Cost as of July 1	$	11,524,025
2.	Amortization Amount as of July 1	$	10,853,485
3.	Expected Expenses as of July 1	$	461,775
4.	County's Contribution Beginning of Year (1. + 2. + 3.)	$	22,839,285
5.	County's Contribution Adjusted for Timing of Payment (4. x 1.0745 ^ 0.5)	$	23,674,767
6.	County's Contribution as a Percentage of Participant Payroll		43.0%

Section II. Determination of County Contributions

Schedule of Amortization Bases

Below is a schedule of the amortization bases as of July 1, 2019.

Description	Date Established	Remaining Years	Amount to be Amortized	Payment / (Credit)
Unfunded Accrued Liability	1/1/2004	15	$ 15,184,550	$ 1,338,652
Actuarial (Gain)/Loss	1/1/2005	16	$ (5,838,006)	$ (491,688)
Actuarial (Gain)/Loss	1/1/2006	17	$ 7,751,838	$ 626,074
Actuarial (Gain)/Loss	1/1/2007	18	$ (5,182,074)	$ (402,683)
Actuarial (Gain)/Loss	1/1/2008	19	$ 4,378,743	$ 328,342
Assumption Change	1/1/2008	19	$ 453,689	$ 34,020
Actuarial (Gain)/Loss	1/1/2009	20	$ 42,481,186	$ 3,082,006
Actuarial (Gain)/Loss	1/1/2010	21	$ (989,063)	$ (69,590)
Asset Method Change	1/1/2011	22	$ 25,400,447	$ 1,736,883
Actuarial (Gain)/Loss	1/1/2011	22	$ (14,675,194)	$ (1,003,490)
Actuarial (Gain)/Loss	1/1/2012	23	$ 30,942,978	$ 2,060,324
Assumption Change	1/1/2013	24	$ 5,111,356	$ 331,981
Actuarial (Gain)/Loss	1/1/2013	24	$ 34,774,933	$ 2,258,623
Assumption Change	1/1/2014	15	$ 6,388,468	$ 563,200
Actuarial (Gain)/Loss	1/1/2014	15	$ (18,046,588)	$ (1,590,966)
Actuarial (Gain)/Loss	1/1/2015	16	$ 6,346,438	$ 534,509
Actuarial (Gain)/Loss	1/1/2016	17	$ 3,533,212	$ 285,359
Actuarial (Gain)/Loss	1/1/2017	18	$ (1,558,684)	$ (121,120)
Actuarial (Gain)/Loss	1/1/2018	19	$ 7,870,136	$ 590,146
Actuarial (Gain)/Loss	1/1/2019	20	$ 8,836,964	$ 641,121
Assumption Change	1/1/2019	20	$ 1,338,149	$ 97,083
Method Change	7/1/2019	20	$ 340,447	$ 24,699
Totals			**$ 154,843,925**	**$ 10,853,485**

Bases are amortized as an equal percent of payroll each year with total payroll expected to increase 3.0% annually. Since the July 1, 2019 amortization payment of $10,853,485 is not sufficient to cover the interest on the plan's unfunded liability, the unfunded liability is scheduled to increase for an initial period.

Bases established prior to July 1, 2019 were reported as of the date of the valuation, resulting in a difference between the date established and the remaining years. This difference does not have a material effect on the funding of the plan.

Section III. Valuation of Assets

Reconciliation of Assets

Below is a reconciliation of assets (unaudited) from January 1, 2017 through December 31, 2018.

		CY2017		CY2018
1. Beginning of Year Assets	$	484,559,649	$	551,428,972
2. Receipts				
a. Employer Contributions	$	20,860,447	$	21,837,429
b. Employee Contributions		3,248,831		3,357,225
c. Investment Income & Dividends		10,338,640		11,473,368
d. Realized and Unrealized Gain/(Loss)		67,696,277		(36,999,706)
e. Stock Loan Income		66,062		78,296
f. Other		3,400,347		2,910,989
g. Total Receipts	**$**	**105,610,604**	**$**	**2,657,600**
3. Deductions				
a. Benefit Payments	$	34,950,315	$	35,937,699
b. Administrative Expenses		445,097		464,176
c. Investment Expenses		3,345,869		3,322,938
d. Total Disbursements	**$**	**38,741,281**	**$**	**39,724,813**
4. Net Increase (2.g. – 3.d.)	$	66,869,323	$	(37,067,212)
5. Preliminary Ending Value (1. + 4.)	$	551,428,972	$	514,361,760
6. Contribution Receivable	$	2,032,348	$	2,143,425
7. End of Year Assets	$	553,461,320	$	516,505,185
8. Rate of Return Net of Investment Fees (2I / [A + B – I] Method)		16.28%		(4.73%)

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

Section III. Valuation of Assets

Calculation of Actuarial Asset Value

The actuarial asset value as of January 1, 2019 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.

					1/1/2019
1.	Market Value of Assets			$	516,505,185
2.	Spreading of Investment (Gain)/Loss				
	Calendar Year	(Gain)/Loss	% Deferred		Amount Deferred
	2018	$ 66,953,485	80%	$	53,562,788
	2017	(42,086,981)	60%		(25,252,189)
	2016	859,450	40%		343,780
	2015	43,534,794	20%		8,706,959
	a. Total Deferred				37,361,338
3.	**Actuarial Value of Assets (1. + 2.a.)**			**$**	**553,866,523**
4.	Rate of Return Net of Investment Fees (2I / [A + B – I] Method)				4.6%

Section IV. Participant Information

Participant Summary

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

		1/1/2018		1/1/2019
1. Actives				
a. Number		688		699
b. Average Age		38.5		38.6
c. Average Service		12.2		12.1
d. Average Salary	**$**	**75,231**	**$**	**78,829**
2. Service Retirements and Beneficiaries				
a. Number		730		739
b. Average Age		62.5		62.8
c. Total Annual Benefits	**$**	**32,279,545**	**$**	**33,500,276**

Section IV. Participant Information

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, 2019.

	Years of Service as of 01/01/2019										
Age	**Under 1**	**1-4**	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40 & Up**	**Total**
Under 25	15	21	0	0	0	0	0	0	0	0	36
	51,501	54,049	0	0	0	0	0	0	0	0	52,987
25 - 29	21	82	27	1	0	0	0	0	0	0	131
	52,417	56,951	62,721	67,848	0	0	0	0	0	0	57,497
30 - 34	5	26	64	41	0	0	0	0	0	0	136
	54,781	59,000	65,188	74,480	0	0	0	0	0	0	66,424
35 - 39	3	10	18	56	12	0	0	0	0	0	99
	53,092	58,513	69,422	80,417	86,158	0	0	0	0	0	76,073
40 - 44	4	2	4	21	41	16	0	0	0	0	88
	53,551	62,416	65,780	84,243	89,926	101,522	0	0	0	0	87,302
45 - 49	2	3	2	11	18	43	5	0	0	0	84
	59,702	59,419	79,792	80,988	91,299	109,666	113,387	0	0	0	98,501
50 - 54	2	0	3	3	9	20	12	1	0	0	50
	55,602	0	73,262	88,705	89,438	103,323	117,533	124,072	0	0	100,060
55 - 59	0	0	2	3	4	2	0	2	0	0	13
	0	0	77,199	86,633	92,856	101,131	0	107,002	0	0	92,461
60 - 64	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
65 - 69	0	0	0	0	0	0	0	0	0	1	1
	0	0	0	0	0	0	0	0	0	156,389	156,389
70 & Up	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
Totals	**52**	**144**	**120**	**136**	**84**	**81**	**17**	**3**	**0**	**1**	**638**
	52,909	**57,134**	**65,933**	**79,492**	**89,769**	**106,280**	**116,314**	**112,692**	**0**	**156,389**	**75,741**

Averages	
Age	37.2
Service	10.8

Section IV. Participant Information

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	634	54	0	730	1,418
Retired	(12)	(13)	0	25	0
Nonvested Termination	(16)	0	0	0	(16)
Disabled	0	0	0	0	0
Deceased	0	0	0	(22)	(22)
Beneficiary	0	0	0	5	5
Rehires	0	0	0	0	0
QDRO Put in Pay	0	0	0	1	1
Transfers Out	(3)	0	0	0	(3)
Transfers In	1	0	0	0	1
New Hires	54	0	0	0	54
Entered DROP	(22)	22	0	0	0
Data Adjustment	2	(2)	0	0	0
Participants in This Valuation	638	61	0	739	1,438

Section V. Summary of Plan Provisions

Plan Year
January 1 – December 31.

Normal Retirement Date or Unreduced Early Retirement Date
For those hired prior to February 25, 2002: 20 years of service or age 50. For those hired on or after February 25, 2002: 20 years of service, or age 50 with 5 years of service.

Normal Form of Benefit
For single participants, monthly life annuity with payments guaranteed for 5 years.

For married participants, unreduced 100% Joint & Survivor Annuity with payments guaranteed for 5 years.

Post Retirement Cost of Living Increases
For Benefits Accrued as of 1/31/1997
Retiree benefits are adjusted each year. The revised benefit amount is the lesser of:

a. Base benefit multiplied by ratio of current 12 month average CPI to 12 month average CPI at retirement.
b. Prior year benefit increased by 4%.

For Benefits Accrued After 1/31/1997
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. Prior year benefit increased by 2.5%.

Employee Contributions
7.25% of compensation for all employees.

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.

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).

Termination Prior to Retirement
At less than 20 years of service, return of employee contributions with 3% interest.

Section V. Summary of Plan Provisions

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 Disability

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

Non-Line of Duty Disability

Accrued benefit.

Other Pre-Retirement Death Benefits

Return of employee contributions with 3% interest.

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.

Changes Since Prior 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 unfunded actuarial liabilities and any actuarial gains or losses over a period of years. Amortization payments increase 3.0% per year.

Amortization Policy

The unfunded actuarial accrued liability (UAAL) is amortized as a level percentage of payroll as follows:

- Gains and losses over 20 years
- Assumption changes over 20 years
- Post-2018 plan improvements over the average expected future working period
- Early retirement incentives over 5 years or less
- Surplus, when reached, over 30 years

Asset Method

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

Interest

7.45% 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.

Mortality

Healthy

RP-2014 Blue Collar Mortality Table projected generationally using scale MP-2018. Projections to the valuation date represent current mortality and projections using scale MP-2018 beyond the valuation date represent future mortality improvement.

Disabled

RP-2014 Blue Collar Mortality Table set forward five years and then projected generationally using scale MP-2018. Projections to the valuation date represent current mortality and projections using scale MP-2018 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

Salary Increases

The following graded schedule is used:

Age	Rate
20	6.0%
25	6.0%
30	5.5%
35	5.0%
40	4.5%
45	4.0%
50	4.0%

Disability

Sample rates are:

Age	Rate
30	0.3060%
35	0.4526%
40	0.9340%
45	1.5619%
50	2.2983%
55	0.0000%

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

Turnover

Sample rates are:

Age	Rate
20	7.97%
25	5.31%
30	3.51%
35	2.56%
40	1.28%
45	0.64%
50	0.00%

Rates are based on the results of the most recent experience study.

Section VI. Actuarial Methods and Assumptions

Retirement

Retirement rates are as follows:

	Years of Service					
Age Group	<20	20	21 – 23	24	25 – 31	32+
38 – 44	0%	26.40%	5%	9%	5%	10%
45 – 49	0%	18.34%	5%	9%	5%	10%
50	30%	36.66%	25%	29%	25%	100%
51 – 52	10%	14.66%	10%	14%	10%	100%
53	10%	22%	10%	14%	10%	100%
54	10%	22%	10%	18%	10%	100%
55	30%	30%	30%	30%	30%	100%
56 – 59	30%	30%	30%	30%	30%	100%
60	100%	100%	100%	100%	100%	100%

Rates are based on the results of the most recent experience study.

DROP Load

To reflect the cost of the more valuable benefits provided from the deferred retirement option program the following loads were applied:

	Years of Service			
Age	23	27	30	35
44	0.35%	1.06%	1.77%	11.41%
50	2.00%	3.33%	4.05%	13.97%
55	2.69%	4.28%	5.01%	15.03%
60	3.59%	5.44%	6.16%	16.31%

Disability Leave

Active liabilities (which depend on credited service) are loaded by 1.75% to account for future crediting of disability service.

Military Service

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

Transferred Service

Transferred service is included in the calculation of a participant's benefit starting at the time the service is originally transferred to the County.

Section VI. Actuarial Methods and Assumptions

Marriage

80% of employees and 70% of current retired and disabled members are assumed married. Males are assumed to be four years older than their spouses.

CIGNA Benefit

Our calculations reflect that some benefits have already been purchased.

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.

The rationale for the demographic Assumptions is based on the results of the December 2018 Experience Study. The economic Assumptions are based on future expectations with an underlying 3.0% inflation assumption.

Changes Since Prior Valuation

Based on the results of the recent experience study, the following assumptions were changed: interest rate, mortality, retirement rates, DROP loads, and turnover rates. In addition, a corridor was added to the asset method, and the amortization policy was expanded and documented. Finally, transferred service is now recognized at the time the service is transferred to the County rather than at the time a member leaves County employment.

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.

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

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.

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.

Section VII. Glossary

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.

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.

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.

Section VII. Glossary

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.

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	$408,261,502	$463,681,196	88.0%	$55,419,694	$41,508,547	133.5%
1/1/2010	$432,176,036	$487,575,178	88.6%	$55,393,143	$42,499,380	130.4%
1/1/2011	$435,891,125	$502,001,669	86.8%	$66,110,544	$42,449,204	155.7%
1/1/2012	$430,342,941	$526,154,978	81.8%	$95,812,037	$41,334,580	231.8%
1/1/2013	$420,675,703	$555,292,097	75.8%	$134,616,394	$40,521,944	332.2%
1/1/2014	$452,075,806	$576,387,838	78.4%	$124,312,032	$41,714,302	298.0%
1/1/2015	$481,633,710	$613,617,013	78.5%	$131,983,303	$48,261,635	273.5%
1/1/2016	$498,491,072	$635,017,447	78.5%	$136,526,375	$48,116,765	283.7%
1/1/2017	$517,010,262	$652,697,719	79.2%	$135,687,457	$50,560,385	268.4%
1/1/2018	$540,292,183	$684,386,917	78.9%	$144,094,734	$51,758,654	278.4%
1/1/2019	$553,866,523	$708,370,001	78.2%	$154,503,478	$55,101,812	280.4%

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 stronger the plan.

Appendix 1

Summary of Employer Contributions

Year Ended December 31	Actuarially Determined Contribution	Percentage Contributed
2014	$18,869,731	100.0%
2015	$19,559,952	100.0%
2016	$20,410,901	100.0%
2017	$20,931,078	100.0%
2018	$21,933,942	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 15 to 24 years with an average effective period of 21.4 years.

Asset valuation method
Five-year smoothed method.

Actuarial assumptions:

Investment rate of return	7.45%
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, 2019 through December 31, 2028 based on existing members of the plan.

Calendar Year	Benefits
2019	$38,525,000
2020	42,251,000
2021	42,932,000
2022	50,389,000
2023	47,011,000
2024	48,830,000
2025	50,986,000
2026	52,989,000
2027	55,225,000
2028	57,463,000

Appendix 3

ASOP 51 Disclosure

Actuarial Standard of Practice No. 51 *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions* is effective for actuarial valuations after November 2018. The standard requires actuaries to provide information so that users of the report can better understand the potential for future results to vary from the results presented in this report and identify risks on the plan's future financial condition. This standard does not require the assessment to be based on numerical calculations.

Examples of risk common to most public plans include the following (generally listed from greatest to least risk):

- Investment risk: The potential that investment returns will be different than expected. The Trustees are well aware of this risk.
- Contribution risk: Most commonly this is associated with the potential that actual future contributions are not made in accordance with the plan's actuarially based funding policy. When this occurs, it can create negative long-term problems.
- Longevity and other demographic risks: The potential that mortality or other demographic experience will be different than expected.
- Asset/liability mismatch risk: The potential that changes in asset values are not matched by changes in the value of liabilities.
- Cash flow risks: The potential that contributions coming into the plan will not cover benefit payments. While common in well-funded plans, this still requires the use of interest, dividends or principal to cover benefit payments. When assets need to be sold (or more cash held) it can be an issue. Poorly funded plans with DROP lump sum payments can be a particular issue.

One item left off this list is "interest rate risk" (i.e., the potential that interest rates will be different than expected). This risk is common in corporate ERISA plans where funding is based on bond rates. Interest rates on bonds are still an important consideration when setting an expected return assumption and can change over time.

There are some plan maturity measures that are significant to understanding the risks associated with the 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.

Appendix 3

ASOP 51 Disclosure

Risk Measure	1/1/2017	1/1/2018	1/1/2019	Conservative Measures
Retiree Liability as a Percent of Total Liability	63%	63%	63%	<50%
Assets to Payroll (Asset Volatility Ratio)	9.6	10.7	9.4	<5
Liabilities to Payroll (Liability Volatility Ratio)	12.9	13.2	12.9	<5
Benefit Payments to Contributions[2]	1.4	1.4	1.4	1 - 3

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 9.4 indicates that a 1% asset gain/loss can be related to about 9.4% 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 0.7% 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 12.9 indicates that a 1% liability gain/loss can be related to about 12.9% 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 0.9% of payroll for each 1.0% change in AAL. As the plan approaches a 100% funded level, the AVR will converge to the LVR.

The use of payroll in these risk measures is an easily available substitute for the employer's revenue and often reflects the employer's ability to afford the plan. As shown in the table above, the Plan is not considered "low risk". Each of these measures are a measure of plan maturity. The ratios are generally outside of the "conservative" range because the plan is becoming more mature. Mature plans present more risk to plan sponsors because changes to the liability or assets will result in large changes in the unfunded liability as compared to the overall size of the employer as measured by payroll.

[2] For the year ending on the date shown.

Appendix 3

ASOP 51 Disclosure

If the plan or employer were interested in doing more quantitative assessment of risks, the following are example of tests that could be performed:

Scenario Test—A process for assessing the impact of one possible event, or several simultaneously or sequentially occurring possible events, on a plan's financial condition.

Sensitivity Test—A process for assessing the impact of a change in an actuarial assumption on an actuarial measurement.

Stochastic Modeling—A process for generating numerous potential outcomes by allowing for random variations in one or more inputs over time for the purpose of assessing the distribution of those outcomes.

Stress Test—A process for assessing the impact of adverse changes in one or relatively few factors affecting a plan's financial condition.

Appendix 4

Summary of Major Legislative Changes

County Council Bill No. 48-89
Effective 9/13/89.

The previously combined Police and Fire plan was separated into distinct plans for each group. The reduction for retirement prior to age 50 was changed to 0.2% per month from 0.3% per month.

County Council Bill No. 34-92
Effective 6/1/92 through 8/31/92.

Participants 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.

County Council Bill No. 66-92
Effective 7/2/92.

The plan was amended to allow normal, unreduced retirement after 20 years of service. Employee contributions were increased to 6% from 5%. Participants under age 50 were not allowed to retire and receive retirement incentives (under Bill No. 34-92) in addition to unreduced retirement. They could either retire early with the incentives, or normally without the incentives.

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 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. 80-00/ 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. Normal Retirement was changed to the earlier of 20 years of service or age 50 with 5 years of service. Elimination of Tier 2 benefits implemented a Deferred Retirement Option Program (DROP), a voluntary program that provides an alternative way to earn and receive retirement benefits.

Appendix 4

Summary of Major Legislative Changes

County Council Bill 66-05
Effective 10/10/2005.

Reduced the contribution percentage for Category II participants from 6% to 5%.

County Council Bill 58-07
Effective 10/11/2007.

Reduced the contribution percentage for Category I participants from 6% to 5%.

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 average basic pay. Clarified the limits on those entering DROP. The effective annual interest rate for the DROP account changed from 8% to 4.25% for those entering DROP on or after July 1, 2009.

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.

County Council Bill 41-10
Effective 7/1/2010.

Increased the contribution rate for Police Officers, Police Officer First Class, Police Corporals, and Police Sergeants to 7.25%.

County Council Bill No. 30-12
Effective 2/1/2013

All participants except for those in the Police Lieutenant classification shall contribute 7.25% of his or her annual basic pay in each calendar year or portion of a calendar year while an active participant is in the plan.

County Council Bill No. 67-12
Effective 2/1/2013

Participants in the Police Lieutenant classification shall contribute 7.25% of his or her annual basic pay in each calendar year or portion of a calendar year while an active participant in the plan.