Howard County Police and Fire Employees' Retirement Plan

Experience Study Report
July 1, 2017 to July 1, 2021 Experience

Bolton

Submitted by:

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September 15, 2022

Retirement Plan Committee
Howard County Police and Fire Employees' Retirement Plan
3430 Court House Drive
Ellicott City, MD 21043

Re: Howard County Police and Fire Employees' Retirement Plan Experience Study

Dear Committee Members,

This report presents the results of our experience study of the Howard County Police and Fire Employees' Retirement Plan and includes our recommended changes to plan assumptions. These recommendations are based on:

- Our findings from the study of the demographic and economic experience of the plan for the period July 1, 2017, through June 30, 2021, and
- Our expectations, based on professional judgement, estimates inherent in market data, emerging trends, and expert opinions, of future experience

We summarize our recommendations in the *Summary of Recommendations* section and analyze our findings in the *Demographic Assumptions* and *Economic Assumptions* sections. Finally, we present in the *Impact of Changes* section the effect of the proposed changes on plan liabilities, funding levels, and annual contribution for the July 1, 2021 actuarial valuation.

Respectfully submitted,

Ann M. Sturner, FSA, EA, FCA, MAAA

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Table of Contents

Section I. Introduction

This report reviews the actuarial experience of the Howard County Police and Fire Employees' Retirement Plan (the "Plan") during the four-year period from July 1, 2017, to June 30, 2021, in order to consider changes in actuarial assumptions. It is our understanding that the Retirement Plan Committee is responsible for recommending "the mortality and other tables and interest rates to be used" for the Plan. Based on the review of plan experience and considerations regarding future expectations, several changes in actuarial assumptions are recommended for approval by the Committee.

The County, with recommendations from the Committee, is entrusted with setting the assumptions for the actuarial valuations. To keep the actuary's liability and contribution calculations in concert with reality, the assumptions used must be reasonably related to the circumstances surrounding the plan as currently written. Generally, the best way to maintain reasonable assumptions is to periodically compare past plan experience to the assumptions incorporated by the actuary and, as a result of that comparison and the consideration of future expectations, recommend improvements, where necessary, for use in the valuation process.

Section VI of the report shows the impact of proposed changes to the liabilities, funding levels, and annual contributions for the July 1, 2021, valuation, which develops the contributions for FY2023. Actual changes will first impact the July 1, 2022 valuation and FY2024 contribution.

The actual long-term cost of the plan is not dependent on assumptions but rather will be based on actual plan experience, including changes in plan demographics and fluctuations in the general economy (such as variations in inflation or interest rate levels), which translate into tangible costs for the plan through:

(1) the plan benefits paid (including cost-of-living adjustments (COLAs) on post-retirement benefits as applicable),
(2) the investment return on plan assets, and
(3) the payment of other plan-related expenses.

Despite the lack of influence that assumptions have on long-term plan costs, a current value of expected future plan benefits needs to be calculated regularly (generally, annually) to orderly determine an appropriate amount of money to set aside for prefunding benefits. Such a determination requires the use of assumptions about future events. As actual experience differs from the assumptions, the expected cost of the plan and, consequently, the contributions to fund the plan generally will gradually change. Ideally, the assumptions will closely track actual experience. However, for some assumptions (e.g., investment return), actual experience will commonly and materially vary from the assumption from year to year. As such, reasonable assumptions should not only be appropriate for the purpose of the measurement, but they should also be unbiased in nature such that they balance expected upward and downward deviations in experience.

While the cost of the plan will "self-adjust" to reflect actual experience, it is important to review and reset the assumptions from time to time to:

(1) minimize experience gains and losses,
(2) reduce contribution volatility, and
(3) achieve a better level of intergenerational taxpayer equity.

For some assumptions (e.g., mortality), the experience of the plan alone is insufficient to be statistically significant, and as such, industry tables and experience should be considered when setting those assumptions. Also, certain economic assumptions (i.e., inflation) are not based solely on recent plan experience and require longer periods of experience to be considered in conjunction with future expectations. The long-term inflation assumption generally is used as the principle building block for the following key economic assumptions:

(1) Investment returns
(2) Cost of living adjustments
(3) Pay increases

In conducting this experience study, we emphasized the importance of developing assumptions that reflect a best estimate of *future* plan experience. Rather than change every assumption to exactly match actual recent experience, we have analyzed the *trends* inherent in that experience and have developed assumptions that reflect expectations of future experience.

Bolton has prepared this report exclusively for the Committee and the County. The purpose of this report is to provide recommended assumption changes and the impact of those recommendations on plan liabilities and annual contributions. This report may not be used or relied upon by any other party or for any other purpose; Bolton is not responsible for the consequences of any unauthorized use.

This report is based on data provided by or at the direction of the County (see Section VII for further details). The County is solely responsible for the validity, accuracy, and comprehensiveness of this information. If the data or plan provisions supplied are not accurate and complete, the experience study results may differ significantly from the results that would be obtained with accurate and complete information; such a scenario could require a later revision of this report.

Professional Qualifications

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 that would impair the objectivity of our work.

Ann M. Sturner, FSA, EA, FCA, MAAA

Jordan McClane, FSA, EA, FCA, MAAA

Section II. Summary of Recommendations

The period since 2007 has been an unusual period of time. By early 2020, the economic markets had largely recovered from the implosion of the real estate, debt, and equity markets in 2008 and the first quarter of 2009. The recovery had been slow, with both short- and long-term effects on government finances. Then COVID-19 hit. We have tried to consider all of these environments in our review of the four years of demographic and economic pension plan experience from July 1, 2017, through June 30, 2021, and in our recommendations for changes to the assumptions used to determine the pension contributions and funding levels.

The following tables summarize the current economic assumptions, demographic assumptions, and actuarial methods and provide the recommendations that are detailed in this report.

Economic Assumptions

Assumption	Current	Recommendation
Inflation / COLA for post-retirement benefits	2.50%	No change
Investment Return / Discount Rate	7.25%	No change; review annually
Pay Increases	Separate service-based rates for Police and Fire	**Police**: Decrease rates for all years of service **Fire**: Increase rates for the first two years of service and decrease rates for all years thereafter
Payroll Growth	2.75%	No change
Administrative Expenses	Average of prior two years increased with assumed payroll growth and rounded to the nearest $1,000	No change

Demographic Assumptions

Assumption	Current	Recommendation
Mortality and Longevity	Society of Actuaries **RP-2014 Total Dataset** Mortality Tables projected from the 2006 base year with Improvement Scale **MP-2017**	Society of Actuaries **Pub-2010 Safety Amount-Weighted** Mortality Tables projected from the 2010 base year with Improvement Scale **MP-2021** (update all tables to most recent MP scale as of each valuation date)
	Healthy Actives, Terminated Vested Participants, and Retirees RP-2014 Employee and Healthy Retiree with MP-2017	**Healthy Actives, Terminated Vested Participants, and Retirees** Pub-2010 Safety Employee and Healthy Retiree with MP-2021
	Disabled Retirees RP-2014 Healthy Retiree with MP-2017	**Disabled Retirees** Pub-2010 Safety Disabled Retirees with MP-2021
	Contingent/Beneficiaries RP-2014 Healthy Retiree with MP-2017	**Contingent/Beneficiaries** Pub-2010 Contingent Survivor with MP-2021
Retirement	Rates based on age and service	**Police**: Extend the years of service threshold at which a 100% rate is first assumed from 30 to 32 years of service **Fire**: Increase rates at 20, 25, 26, 29 - 34 years of service, decrease rates at 21, 22, and 24 years of service
Termination of Employment	Rates based on service	**Police:** Increase rates at 0 and 10 – 14 years of service **Fire:** No changes
Disability Incidence	Rates based on age	No changes
Unused sick leave	**Police:** Service credit is 2.4% of creditable service **Fire:** Service credit is 2.2% of creditable service	No change to either
Beneficiary demographics (for preretirement death benefit)	70% with beneficiary Female beneficiary 3 years younger than male participant and male beneficiary 3 years older than female participant	65% with beneficiary Female beneficiary 2 years younger than male participant and male beneficiary 2 years older than female participant

Actuarial Methods

Method	Current	Recommendation
Cost Method	Projected unit credit	No change, but consider studying entry age normal cost method
Asset Smoothing	Five-year smoothing of investment gains and losses with a 50%-150% corridor around the market value of assets	No change
Amortization of Unfunded Liabilities / (Surplus)	UAAL amortization period based on source and amount developed as a level percentage of payroll: - Gains/ losses: 15 years - Assumption/Method Changes: 15 years - Active plan amendments: Average future service - Inactive plan amendments: Not defined - Early retirement incentives: <= 5 years - Surplus: 30 years	Modify plan amendment amortizations - Active plan amendments: lesser of average future service and 15 years - Inactive plan amendments: lesser of average life expectancy and 10 years

We discuss the actual experience and the reasons for these recommended assumption changes in Sections III (*Demographic Assumptions*) and IV (*Economic Assumptions*) and show the effect of these changes on the pension funding levels and required contributions in Section VI.

Section III. Demographic Assumptions

This section addresses our review and recommendations regarding all demographic assumptions. The order in which we address these assumptions is generally the order of significance of the assumption in determining plan liabilities.

Recommended changes to assumptions do not imply that prior assumption sets were not appropriate for prior valuations. Rather, when changes to the assumptions are recommended, they are generally to keep up with emerging trends and changes in the sponsoring organization.

Mortality

Pension plans pay benefits for life, so estimates of longevity are an important element in assessing the funded status and funding needs of the program. Studies over the last two decades have shown a marked improvement in life expectancy. In addition, more studies have been conducted and subsequently published, which has allowed us to analyze differences between various professions and how other factors beyond gender factor into future longevity. While overall life expectancy has improved, the projected rates of future improvements have slowed with the most current improvement scales showing lower rates of improvement than scales developed a few years ago.

The COVID-19 pandemic had a significant impact on short-term mortality. Pension plan mortality is based on a future outlook of mortality, not on what has happened in the immediate past. As of the date of this report, there are two leading schools of thought regarding the impact of the pandemic on future mortality. The first opinion is that, because deaths related to COVID-19 were much more prevalent in older and sicker populations than in younger, healthier populations, mortality may actually improve over the short-term given that the current plan members generally are the healthier individuals who remain. The second opinion is that there could be more variants and the vaccines are either not widely taken or not as effective as originally thought and mortality could increase in the future. At this time, we do not recommend adjusting the mortality assumption for the pandemic. Instead, we recommend that the long-term impact of the pandemic be reviewed in the next experience study.

For the plan experience to be considered statistically credible, over 1,000 deaths are needed by gender. During the 4-year study period, there were a total of 18 post-retirement deaths and 4 pre-retirement deaths. Since membership in the plan is not large enough to allow us to create a custom set of tables, we recommend using the best available mortality tables that reflect the plan's demographics.

Current Assumptions – tables based on multiple types of pension plans

The current mortality assumption uses the RP-2014 mortality table. That table is based upon mortality experience in private, public, and federal sector plans between 2004 and 2008, and was developed to be a benchmark for U.S. private pension plan mortality experience.

Proposed Assumptions – tables based on public sector pension plans

In January 2019, the Society of Actuaries (SOA) released new mortality tables based exclusively on the experience of participants in public sector retirement plans. These tables (Pub-2010 mortality tables) featured versions that were specific to teachers, public safety, and general employees. The Pub-2010 tables were also developed based on head-count weighting (looking at the number of people who died) and benefit amount weighting (including the benefit amount in the death statistics). Mortality rates vary by income in that members with larger pensions are generally shown to live longer, on average, than members with lower pensions.

We recommend utilizing the amount-weighted public safety version of the tables for both Police and Fire. Below we show the current assumption and recommended Pub-2010 tables based on the type of participant.

Healthy Actives, Terminated Vested Participants, and Retirees

Current: RP-2014 Mortality Table

Recommended: Amount-Weighted Pub-2010 Safety Employee and Healthy Retiree Mortality Tables

Disabled Retirees

Current: RP-2014 Mortality Table

Recommended: Amount-Weighted Pub-2010 Safety Disabled Retiree Mortality Table

Contingent/Beneficiaries

Current: RP-2014 Mortality Table

Recommended: Amount-Weighted Pub-2010 Contingent Survivor Mortality Table

Furthermore, we recommend continuing the use of fully generational mortality improvement projection but recommend updating the improvement scale from MP-2017 to MP-2021 as of July 1, 2022 (for all groups) in order to capture more recent national experience. Additionally, we recommend the use of the mortality improvement scale most recently published as of each valuation date.

Future Considerations – tables based on current plan population

In February 2022, the Society of Actuaries (SOA) published a report titled *Mortality by Socioeconomic Category in the United States*. As stated in the Executive Summary:

> *Since around 1980, geographic and socioeconomic disparities in survival have been growing in the United States. An enhanced understanding of the differences in mortality patterns across subgroups of the population is essential for addressing the needs of the American public. While geographic and racial/ethnic variations in mortality are well documented, studies of socioeconomic differences have been lagging in the United States, in part because of data limitations.*

In this report, the authors "construct a series of mortality indicators for groupings of U.S. counties based on their socioeconomic characteristics as measured by county-wide variables on education, occupation, employment, income and housing price and quality." Advancements in data collection and analysis are leading actuaries to consider factor-based longevity models tailored to a plan's population. We recommend that the Committee consider a study to determine how this type of model could reduce volatility due to changing mortality.

Retirement

Retirement patterns may change over the years and, for some plans, that shift can have a major impact on the plan costs. Later retirements can mean fewer years of payments but higher benefit amounts due to additional service credits or a higher pay level.

We analyzed the 2019-2021 data to determine whether the pandemic had a temporary impact on retirement behavior. The ratio of the number of retirements and terminations to exposures was not vastly different than the ratios during the 2017-2019 period. Thus, we have not made any adjustments to the data or our proposed assumption to isolate the impact of the pandemic.

Retirement experience is dependent on the plan provisions. The following are the key provisions:

> Normal retirement with unreduced benefits can occur at the earlier of (1) the attainment of age 62 with 5 years of eligibility service, or (2) the completion of 20 years of eligibility service.
>
> Benefit accrual rates after 20 years of service are different for Police Officers and Firefighters.
>
> Prior to January 1, 2015, Police Officers could elect to enter the Deferred Retirement Option Plan I (DROP I) at 25, 26 or 27 years of service. Effective January 1, 2015, both Police Officers and Firefighters can elect to enter DROP II at 25 or more years of service.

The current assumptions (probability of retiring) are tied to years of service. DROP participants are considered “retired” when they exit DROP. The current retirement rates reflect expected experience under DROP II.

Members who elect to enter DROP II must remain in DROP II at least 18 months but not more than 5 years to receive DROP II benefits.

Police

The following tables summarize the retirement experience for Police Officers over the years ending June 30, 2018 through 2021. Based on that experience, the proposed assumption extends the service threshold at which a 100% retirement rate is first applied from 30 to 32 years of service.

Police Officers who have elected to enter DROP are assumed to remain in DROP for four years. Police Officers who have not entered DROP and have more than 25 years of service on the valuation date are assumed to never enter DROP. For members with less than 25 years of service on the valuation date, all assumed retirement rates after 25 years of service and before 29 years of service are assumed to be regular retirements while all retirements rates at 29 years of service and beyond are assumed to be DROP exits.

GASB-specific retirement rates which are based on assumed DROP entry rather than DROP exit will be developed and documented in the future GASB report in which the July 1, 2022 liabilities are used.

Police Retirement Rates			
Service	Current	Proposed	Actual
20	5%	5%	5%
21	3%	3%	3%
22	3%	3%	0%
23	3%	3%	3%
24	25%	25%	26%
25	8%	8%	0%
26	8%	8%	10%
27	8%	8%	13%
28	8%	8%	12%
29	8%	35%	41%
30	100%	35%	35%
31	100%	35%	36%
32	100%	100%	25%
33	100%	100%	0%
34	100%	100%	0%
35+	100%	100%	0%

Police Retirements						
Service	Exposures	Expected	Actual	Actual / Expected	Proposed Expected	Actual / Proposed Expected
20	42	2.1	2	95%	2.1	95%
21	36	1.1	1	93%	1.1	93%
22	47	1.4	0	0%	1.4	0%
23	36	1.1	1	93%	1.1	93%
24	42	10.5	11	105%	10.5	105%
25	26	2.1	0	0%	2.1	0%
26	20	1.6	2	125%	1.6	125%
27	23	1.8	3	163%	1.8	163%
28	25	2.0	3	150%	2.0	150%
29	27	2.2	11	509%	9.5	116%
30	17	17.0	6	35%	6.0	101%
31	11	11.0	4	36%	3.9	104%
32	4	4.0	1	25%	4.0	25%
33	2	2.0	0	0%	2.0	0%
34	0	0.0	0	0%	0.0	0%
35+	2	2.0	0	0%	2.0	0%
Total	360	61.9	45	73%	50.9	88%

Fire

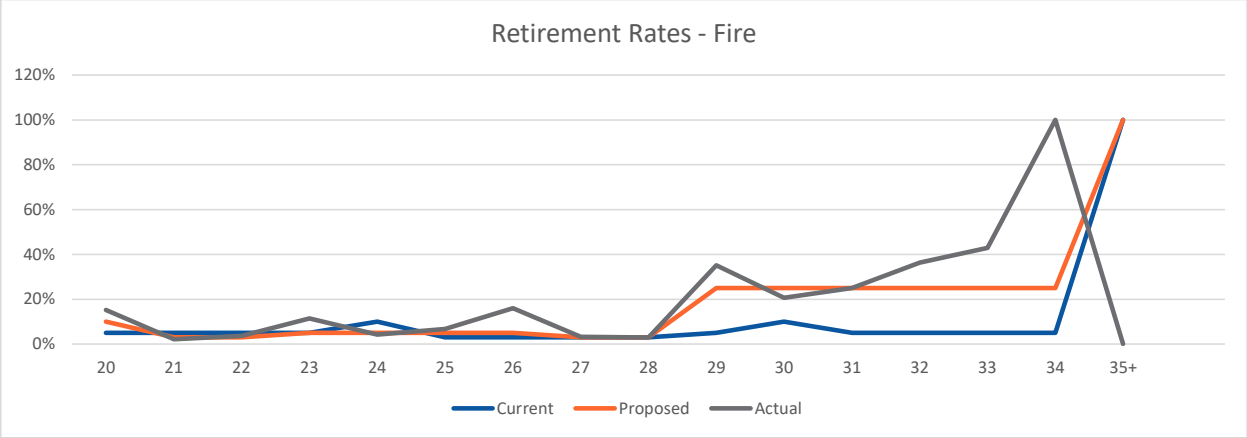
The following table summarize the retirement experience for Firefighters over the years ending June 30, 2018 through 2021. The proposed rates are generally higher than the current rates and to reflect that there were more retirements than expected, particularly from 29 to 34 years of service. This, in turn, will better align the assumption with emerging DROP exits.

Similar to Police Officers, Firefighters who have elected to enter DROP are assumed to remain in DROP for four years. Firefighters who have not entered DROP and have more than 25 years of service on the valuation date are assumed to never enter DROP. For members with less than 25 years of service on the valuation date, all assumed retirement rates after 25 years of service and before 29 years of service are assumed to be regular retirements while all retirements rates at 29 years of service and beyond are assumed to be DROP exits.

GASB-specific retirement rates which are based on assumed DROP entry rather than DROP exit will be developed and documented in the future GASB report in which the July 1, 2022 liabilities are used.

Fire Retirement Rates			
Service	Current	Proposed	Actual
20	5%	10%	15%
21	5%	3%	2%
22	5%	3%	4%
23	5%	5%	11%
24	10%	5%	4%
25	3%	5%	7%
26	3%	5%	16%
27	3%	3%	3%
28	3%	3%	3%
29	5%	25%	35%
30	10%	25%	21%
31	5%	25%	25%
32	5%	25%	36%
33	5%	25%	43%
34	5%	25%	100%
35+	100%	100%	0%

Fire Retirements						
Service	Exposures	Expected	Actual	Actual / Expected	Proposed Expected	Actual / Proposed Expected
20	59	2.9	9	316%	5.7	158%
21	48	2.4	1	42%	1.4	69%
22	27	1.4	1	74%	0.8	123%
23	35	1.8	4	229%	1.8	229%
24	24	2.4	1	42%	1.2	83%
25	15	0.5	1	222%	0.8	133%
26	25	0.8	4	533%	1.3	320%
27	31	0.9	1	108%	0.9	108%
28	35	1.1	1	95%	1.1	95%
29	37	1.9	13	703%	9.3	141%
30	29	2.9	6	207%	7.3	83%
31	16	0.8	4	500%	4.0	100%
32	11	0.6	4	727%	2.8	145%
33	7	0.4	3	857%	1.8	171%
34	3	0.2	3	2000%	0.8	400%
35+	8	8.0	0	0%	8.0	0%
Total	410	28.5	56	196%	48.6	115%



Termination of Employment

Termination assumptions are designed to capture the rate and pattern at which active members leave employment with the sponsor for reasons other than retirement, disability, or death. Higher turnover for low-service employees results in fewer members reaching eligibility for monthly pension benefits and higher turnover for long-service employees results in smaller pensions than had they worked until reaching full benefit accrual. A good turnover assumption helps to keep costs stable in the long run.

Similar to retirement rates, the pandemic did not appear to skew terminations heavily in either direction for Fire. For Police, there were over twice as many (18 vs 8) terminations from 2019-2021 as there were from 2017-2019. As these terminations may have been COVID-related, we propose only modest increases to the Police termination rates.

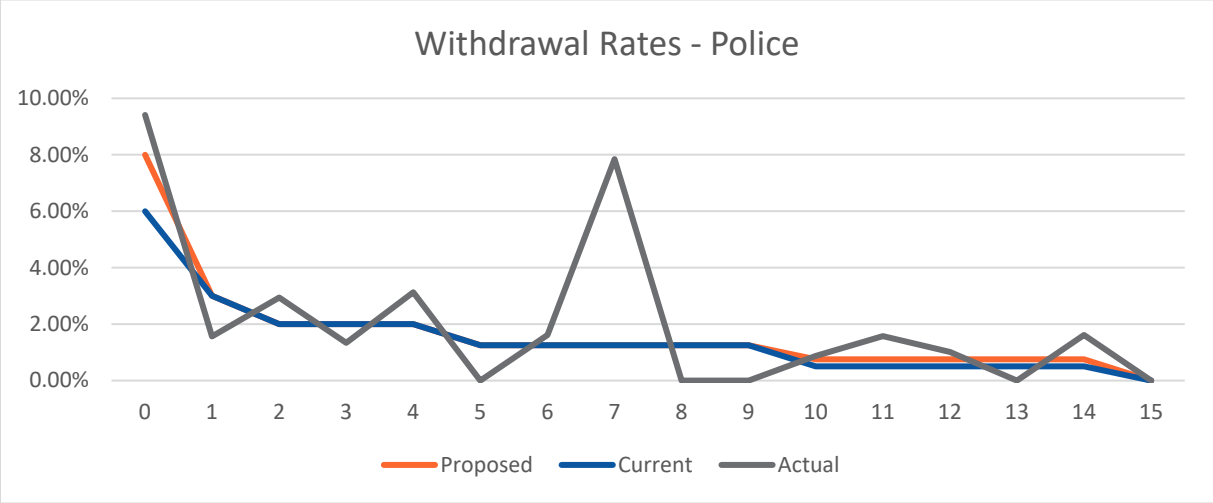
Police

Current termination assumptions vary based on service. Over the four years, the plan expected 16.9 withdrawals under the current assumptions and experienced 26. The following table shows the current rates and proposed rates. We propose increased rates for new hires and those with 10-14 years of service.

Service	Current Rate	Proposed Rate
0	6.00%	8.00%
1	3.00%	3.00%
2-4	2.00%	2.00%
5-9	1.25%	1.25%
10-14	0.50%	0.75%
>=15	0.00%	0.00%

The following table shows the number of withdrawal exposures, the expected number of withdrawals using the current and proposed rates, the actual number of withdrawals, and the actual-to-expected ratios using the current and proposed rates.

		Withdrawals				
Service	Exposures	Expected	Actual	Actual / Expected	Proposed Expected	Actual / Proposed Expected
0	85	5.0	8	161%	6.6	121%
1	64	1.7	1	60%	1.7	60%
2-4	207	3.8	5	132%	3.8	132%
5-9	369	4.3	5	115%	4.4	113%
10-14	483	2.2	5	230%	3.3	153%
>=15	537	0.0	2	<1%	0.0	N/A
Total	1,745	16.9	26	153%	19.7	132%



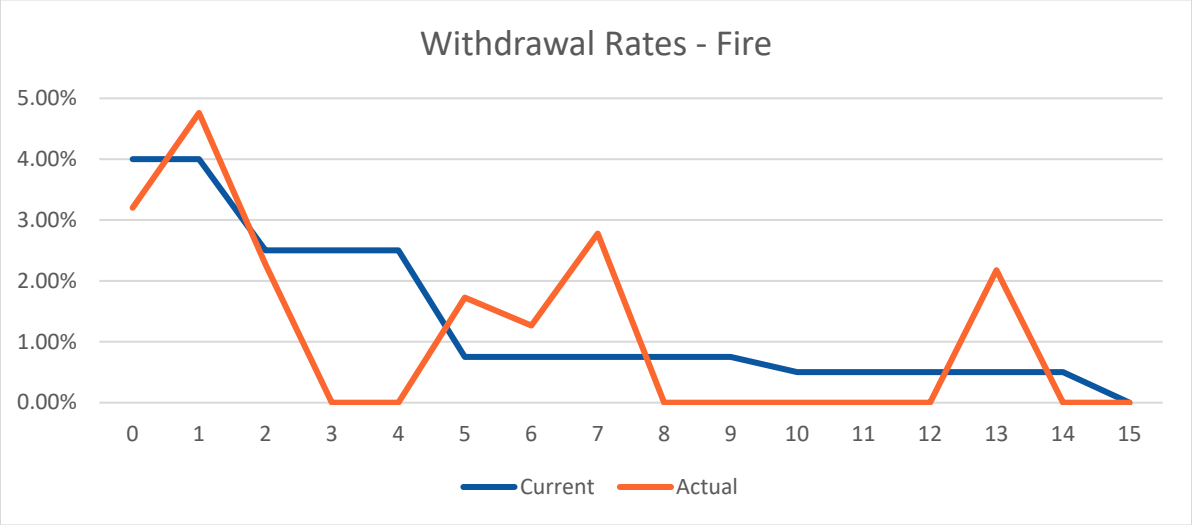
Fire

Current termination assumptions vary based on service. Over the four years, the plan expected 16.7 withdrawals under the current assumptions and experienced 15. The following table shows the current rates and proposed rates. We do not recommend any changes.

Service	Current Rate	Proposed Rate
0	4.00%	4.00%
1	4.00%	4.00%
2-4	2.50%	2.50%
5-9	0.75%	0.75%
10-14	0.50%	0.50%
>=15	0.00%	0.00%

The following table shows the number of withdrawal exposures, the expected number of withdrawals using the current and proposed rates, the actual number of withdrawals, and the actual-to-expected ratios using the current and proposed rates.

		Withdrawals				
Service	Exposures	Expected	Actual	Actual / Expected	Proposed Expected	Actual / Proposed Expected
0	125	5.0	4	80%	5.0	80%
1	84	3.4	4	119%	3.4	119%
2-4	155	3.9	1	26%	3.9	26%
5-9	315	2.4	4	169%	2.4	169%
10-14	427	2.1	2	94%	2.1	94%
>=15	520	0.0	0	0%	0.0	0%
Total	1,626	16.7	15	90%	16.7	90%


Withdrawal Rates - Fire
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Current
Actual

Disability Incidence

The plan provides separate benefits for incidences of disability. Therefore, it is appropriate to value these benefits although the incidence of disability retirements is relatively rare.

Police

Sample current disability assumptions, which vary based on age, are displayed below. The plan expected 3.98 new disabilities and experienced 3. When we include the experience for the four years in the prior study, the plan expected 8.30 disabilities and experienced 7. We recommend no changes to the current rates.

Age	Current Rate
25	0.1222%
30	0.1369%
35	0.1577%
40	0.2004%
45	0.2700%
50	0.4241%
55	0.8700%

Fire

Sample current disability assumptions, which vary based on age, are displayed below. The plan expected 3.11 new disabilities and experienced 1. When we include the experience for the four years in the prior study, the plan expected 6.48 disabilities and experienced 7. We recommend no changes to the current rates.

Age	Current Rate
25	0.0938%
30	0.1050%
35	0.1210%
40	0.1538%
45	0.2073%
50	0.3254%
55	0.6675%

Beneficiary Demographics

The plan provides survivor benefits to a designated beneficiary. Assumptions are set to properly value these survivor benefits. The current assumptions are 70% of the active population are assumed to have a beneficiary eligible for survivor benefits when valuing the death benefit, with a female beneficiary 3 years younger than a male participant and a male beneficiary 3 years older than a female participant.

We recommend updating the beneficiary percent assumption for all benefits to 65% based on the MetLife 2022 “US Employee Benefit Trends Study.” This study shows that 66% (55% married, 11% single living with partner) of employees surveyed were either married or had domestic partners.

Based on our review of active beneficiary data which is collected for benefit statements, we recommend reducing the difference in average age between participants and their beneficiary from 3 years to 2 years.

Unused Sick Leave

We currently assume the additional service that employees receive credit for at retirement in lieu of unused sick leave adds 2.4% to employees’ creditable service for Police Officers and 2.2% to employees’ creditable service for Firefighters. We did not have enough data to study this assumption, but based on discussions with the plan sponsor, we will be gathering data to better assess this assumption in future experience studies.

Section IV. Economic Assumptions

Inflation

The inflation assumption is at the heart of the economic assumptions, as it is used as a starting point for all other economic assumptions, including the Cost-of-Living Adjustment (COLA), pay improvement and investment return assumptions. Thus, our economic experience analysis starts with the inflation assumption. The current inflation assumption is 2.50%.

Unlike demographic assumptions where recent past experience is often a good predictor of future experience, economic assumptions, and particularly the investment return and inflation assumptions, typically reflect future expectations more than past experience. In order to review the current assumption, we analyzed inflation from two perspectives:

- Past experience – based on the Consumer Price Index for all Urban Consumers (CPI-U) Baltimore-Columbia-Towson, MD, all items, over the last 10, 20, 30 and 40 years.
- Current expectations of future experience – based on investment experts' analysis, the Social Security Administration reports, and the Federal Reserve forecasts of future expected inflation.

Past Experience

We reviewed the recent experience in developing our recommendation for the inflation assumption. Presented below are the average annual increases in the CPI-U, Baltimore-Columbia-Towson, MD, over multiple time periods ending with the February 2021 index to follow the same method that is used by the Howard County retirement plans to determine the annual cost of living adjustment.

	Averaging Period			
	10 years	20 years	30 years	40 years
CPI-U Annual Average	2.17%	2.66%	2.45%	2.81%

Experts' Inflation Expectations

The Howard County retirement plans have retained NEPC as their investment advisor. NEPC updates their 10 and 30-year expected inflation and return assumptions quarterly. As of June 30, 2022, NEPC's expected 10 and 30-year inflation assumptions are 2.4% and 2.5%, respectively.

We also reviewed an annual survey of investment advisors which includes the inflation assumption built into investment return assumptions. The 2022 edition of the *Horizon Survey of Capital Market Assumptions* (Horizon Survey), which encompasses capital market assumptions from 40 investment advisors, shows an average 10-year future expected inflation rate of 2.46% and a 20-year rate of 2.44%[1].

The December 2021 inflation forecast of the Federal Reserve Bank was 2.10%. The June 2022 report from the Social Security Trustees indicated a forecast of 2.40%

[1] When considering all 40 survey respondents. The rates are 2.51% and 2.44%, respectively, when considering only the 24 survey respondents who provided both a 10-year and 20-year inflation expectation.

Recommended Inflation Assumption

The past experience, the average of the expectations of the 40 investment managers represented in the Horizon Survey, and recent Social Security Administration and Federal Reserve expectations are all close to the current inflation assumption. Although recent experience in 2021 and 2022 has seen inflation well over 5.0% (getting to over 8% recently), inflation over the long term has remained relatively steady, supporting a mean reversion hypothesis. Given the long-term nature of the assumption and the unpredictability of short-term inflation, we believe that the 2.50% assumption is supported for the valuations.

We recommend keeping the inflation assumption at 2.50%.

Cost of Living Adjustments

The plan benefit adjusted for COLA is equal to the lesser of (1) the annuity amount increased by the full percentage change in CPI or (2) the initial benefit amount increased by 2% each year since retirement. Hence it is possible for a retiree to receive in one year a COLA of more than 2% as long as the cumulative adjustments from retirement date to present are 2% per year or less. The current COLA assumption is 2.00% and is aligned with the current inflation assumption adjusted for the plan's 2% limit.

We recommend keeping the COLA assumption at 2.00%.

Investment Return / Discount Rate

The single assumption that has the largest effect on the determination of plan liabilities, funding levels and actuarially determined contributions (ADCs) is the investment return / discount rate assumption. This is not only an assumption about future expected returns on plan assets but also generally is the basis for setting the discount rate used to measure pension plan liabilities. The County sets this assumption, and it is the actuary's duty to provide information to the County to help set all assumptions. Actuaries are also required to comply with Actuarial Standards of Practice No. 27 *Selection of Economic Assumptions for Measuring Pension Obligations* (ASOP 27) when setting the investment return / discount rate assumption that they recommend and use for the actuarial reports. The County currently uses a 7.25% long term assumed rate of return.

Investment advisor expectations

The most common way to set this assumption is to look at the investment mix and expected future returns. We have used information provided by the Plan's investment advisor, NEPC, as well as the Horizon Survey.

NEPC provided us with their expected 10 and 30-year returns using their June 30, 2022 capital market assumptions. The returns include inflation rates for the 10-year and 30-year returns of 2.4% and 2.5%, respectively. As shown on the exhibit below, NEPC's range is a 10-year expected geometric return of 7.1% and a 30-year expected geometric return of 7.7%. NEPC noted the expected returns as of June 30, 2022 are higher than those presented to the Committees at the January 27, 2022 meeting which used their December 31, 2021 capital market assumptions (the 10-year and 30-year rates were 5.7% and 6.9%, respectively). The current 7.25% assumption is within the June 30, 2022 range.

HOWARD COUNTY POLICY REVIEW

JUNE 30, 2022 CAPITAL MARKET ASSUMPTIONS

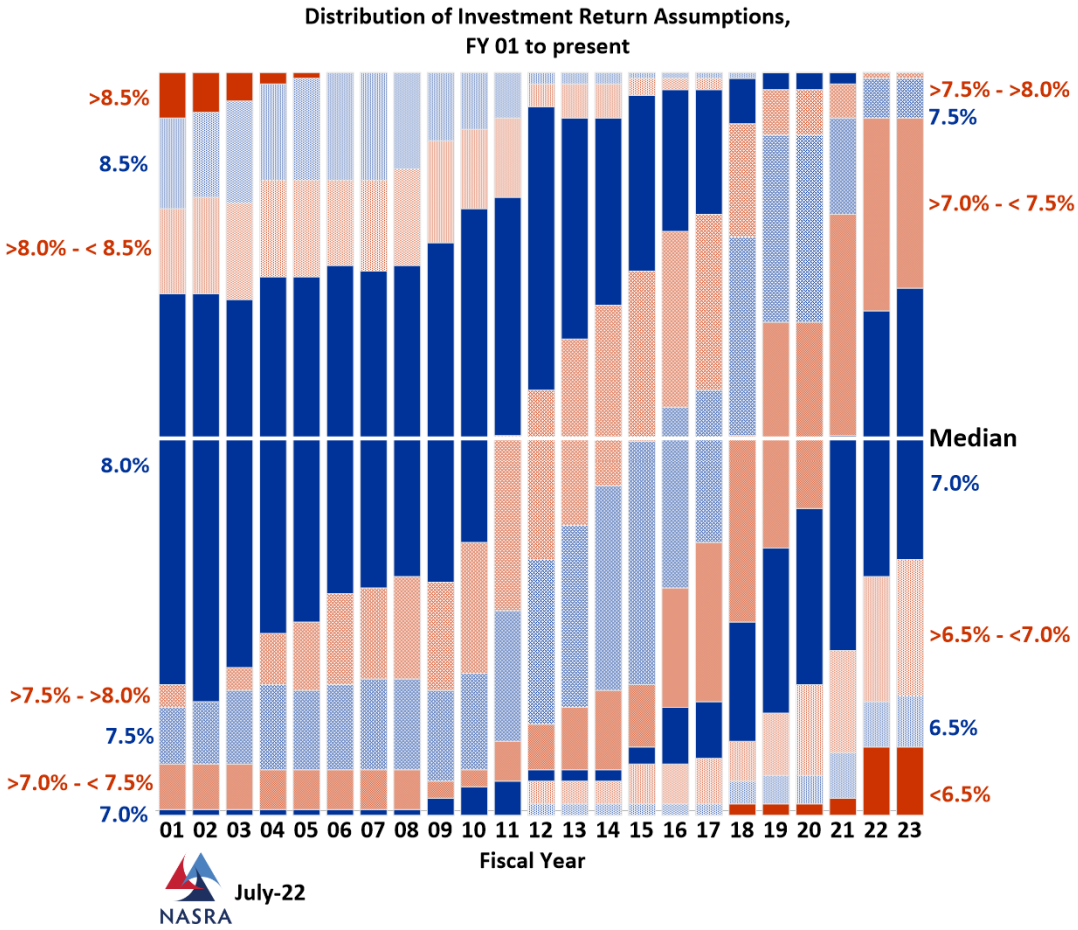
Asset Classes	Policy Index
US Large-Cap Equity	22%
US Small/Mid-Cap Equity	5.5%
Non-US Developed Equity	11%
Emerging Market Equity	6.5%
Private Equity	13%
Total Equity	**58%**
US TIPS	2%
US Aggregate Bond	4.5%
10 Year US Treasury Bond	4.5%
US High Yield Corporate/Leveraged Loan	4%
Emerging Market Local Currency Debt	4%
Absolute Return Fixed Income	4%
Private Debt	5%
Total Fixed Income	**28%**
Real Estate - Core	2%
Real Estate - Non-Core	2%
Private Real Assets (Natural Resources/Infrastructure)	2%
Total Real Assets	**6%**
Hedge Fund	8%
Total Multi Asset	**8%**
Expected Return 10 yrs	**7.1%**
Expected Return 30 yrs	**7.7%**
Standard Dev	**13.6%**

NEPC's Capital Market Assumptions as of June 30, 2022

We also reviewed the investment policy and analyzed expected returns of the current aggregate investment mix of the plan using the August 2022 Horizon Survey capital market assumptions. Based on this analysis, a reasonable discount rate might fall in the range of 5.88% to 7.98%. The expected geometric return is 6.93%. The Horizon Survey notes that "While interest rates have risen in recent months, these increases are not fully reflected in this survey given most of the effective dates of the assumptions were on or around January 1, 2022." See the Appendix for additional details on the development of the range and the return.

NASRA

As a comparator, we present the NASRA survey (published in July 2022) of discount rates shown below. There is a clear trend to lower nominal investment return assumptions across the NASRA universe over the last 10 years. While we would not suggest setting investment return assumptions solely based on this survey, we believe it is useful to know what other plans are doing and review the investment assumption trends.



Recommended Investment/Discount Rate Assumption

The current 7.25% assumption is supported by the forward-looking expected returns of the plan's target investment categories and investment allocation outlined in the plan's investment policy.

We recommend the Retirement Committee and the County continue to review this assumption annually.

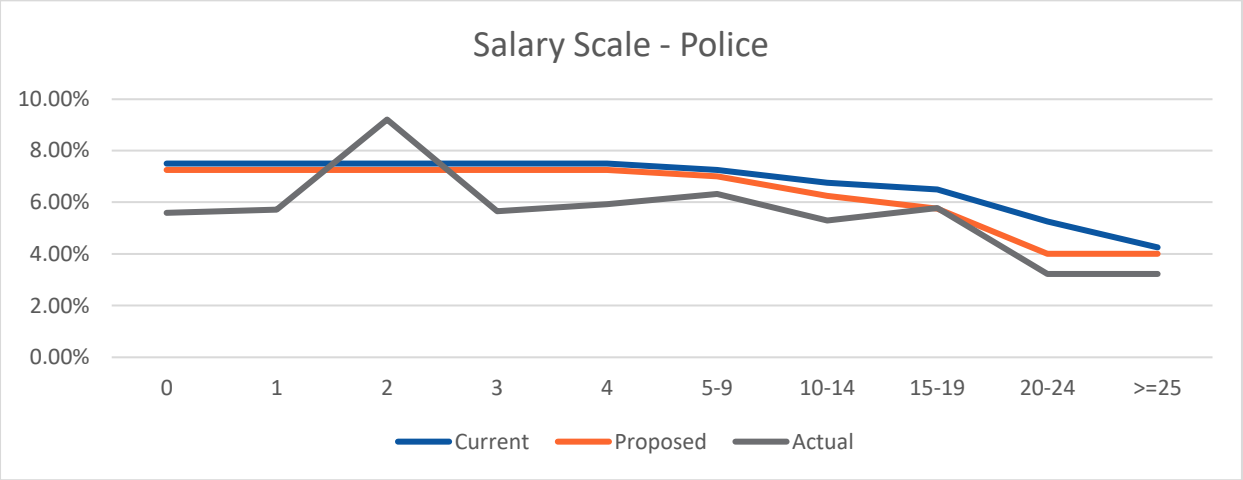
Pay Increases

All plan benefits are based in part on the wages received by the plan members. This makes the level of future pay an important consideration in valuing plan liabilities. The current pay increase assumption is based on service. Generally, larger annual percentage increases in pay occur early in a career, followed by smaller percentage increases in later years.

Police

The analysis below summarizes the pay increases for Police Officers over the years ending June 30, 2018 through 2021. Police Officer positions received across the board (not including merit, or step, increases) salary adjustments of 2% in each of FY2018 to FY2021. The proposed rates reflect a slight reduction from the current rates to capture that pay increases have been less than expected. The graph following the table illustrates the actual average pay increases and expected pay increases.

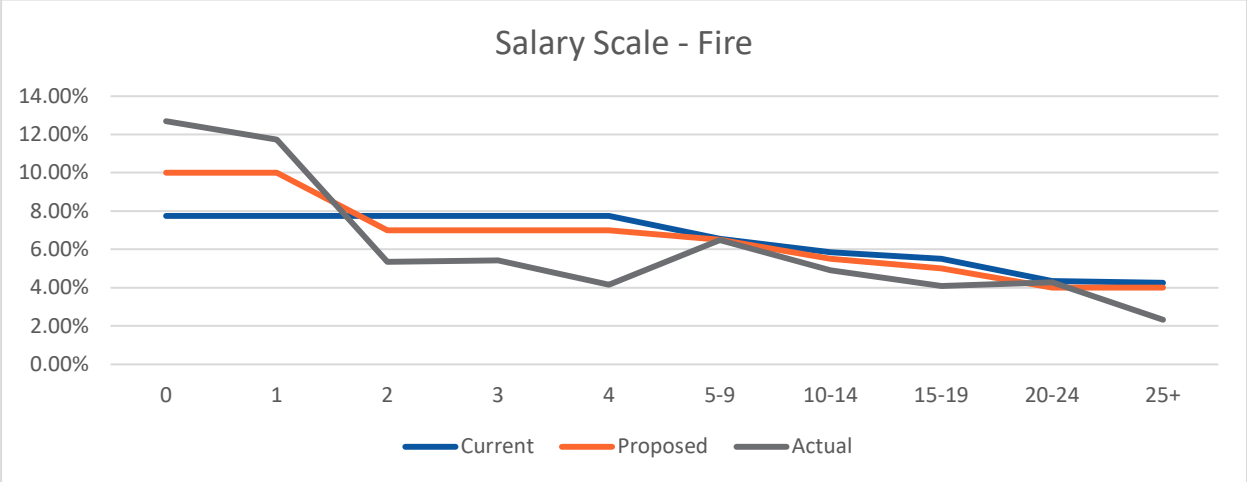
Pay Increases					
Service	Expected from Current	Actual	Actual / Expected	Expected from Proposed	Actual / Expected (Proposed Rates)
0-4	7.50%	6.39%	85%	7.25%	88%
5-9	7.25%	6.32%	87%	7.00%	90%
10-14	6.75%	5.29%	78%	6.25%	85%
15-19	6.50%	5.77%	89%	5.75%	100%
20-24	5.25%	3.22%	61%	4.00%	81%
>=25	4.25%	3.22%	76%	4.00%	80%
Weighted Average	6.81%	5.62%	82%	6.30%	89%



Fire

The analysis below summarizes the pay increases for Firefighters over the years ending June 30, 2018 through 2021. Firefighter positions received across the board (not including merit, or step, increases) salary adjustments of 2% in each of FY2018 to FY2021. We recommend increasing the rates during the first two years of employment and reducing the rates thereafter. The graph following the table illustrates the actual and expected average pay increases.

Pay Increases					
Service	Expected from Current	Actual	Actual / Expected	Expected from Proposed	Actual / Expected (Proposed Rates)
0-1	7.75%	12.31%	159%	10.00%	123%
2-4	7.75%	4.94%	64%	7.00%	71%
5-9	6.55%	6.48%	99%	6.50%	100%
10-14	5.85%	4.91%	84%	5.50%	89%
15-19	5.50%	4.08%	74%	5.00%	82%
20-24	4.35%	4.28%	98%	4.00%	107%
>=25	4.25%	2.33%	55%	4.00%	58%
Weighted Average	6.16%	5.91%	96%	6.15%	96%



Overall Payroll Growth Assumption

The current assumption is that total payroll will grow by 2.75% per year. The payroll growth assumption is used to (1) amortize unfunded liability bases such that the payment of each base remains as a consistent percentage of expected payroll over the amortization period, and (2) project the payroll to determine the County contribution as a percentage of future expected payroll. Generally, the lower the payroll growth assumption, the more conservative the assumption (i.e., lower assumed payroll growth results in higher amortization amounts in dollars and a higher County contribution as a percentage of expected payroll). If actual future payroll increases exceed 2.75%, the higher County contribution percentage will be applied to the higher actual payroll, and thus, larger contributions will be deposited into the trust to better fund the plan.

Recent experience is that payroll for Police and Fire Employees has increased about 3.4% annually over the last four years; however, over that time period, headcount has also changed. Per participant payroll has increased by 1.7% annually over the last four years. We recommend retaining the current assumption that payroll will grow at 2.75% annually but will monitor the increases annually.

Police/Fire Employees	7/1/2017	7/1/2018	7/1/2019	7/1/2020	7/1/2021	4-year average
Total Payroll	80,071,119	81,864,069	85,180,155	87,691,543	91,591,651	
Increase in total payroll		2.2%	4.1%	2.9%	4.4%	3.4%
Number of active participants	904	900	929	947	968	
Payroll per participant	88,574	90,960	91,690	92,599	94,619	
Increase in per participant payroll pay rates as of July 1		2.7%	0.8%	1.0%	2.2%	1.7%

Non-Investment Expenses

Total non-investment expenses for the fiscal year are assumed to be the average of the non-investment expenses for the prior two years increased with the assumed payroll growth and rounded to the nearest $1,000. We do not recommend any change to this assumption.

Section V. Actuarial Methods and Assumptions

Valuation Cost Method / Cost Allocation Procedure

The Plan's valuations are completed using the projected unit credit (PUC) cost method. This method is considered an acceptable practice in the Conference of Consulting Actuaries (CCA) White Paper on Actuarial Funding Policies and Practices for Public Pension Plans[2]. The method produces a reasonably level cost with respect to payroll when the plan population's average age and service remain similar from year to year. This method has fit well with the County's budgeting process for many years, and we currently recommend no change. In the next experience study, or even in the interim, we recommend a study to consider changing to the entry age normal (EAN) cost method. The EAN cost method is more common for public sector plans, is required for GASB, and is designed to produce contributions which are a level percentage of payroll over a members working career.

Asset Smoothing Method

The intention of an asset smoothing methodology is to dampen the initial impact of investment market fluctuations on plan costs by spreading them over a number of years. The plan uses a five-year smoothing period for recognizing returns on the market value of assets that are over or under the assumed return. The actuarial value of assets are constrained to be within 50% to 150% of the market value of plan assets. This is deemed model practice in the CCA White Paper. We recommend no changes.

Amortization of Unfunded Actuarial Accrued Liability

Currently, the unfunded actuarial accrued liability (UAAL) is amortized as a level percentage of payroll over the following closed periods

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- 15 years for experience gain/loss
- 15 years for assumption and method changes
- Average expected future service for active plan amendments
- No explicit period defined for inactive plan amendments
- 5 or fewer years for early retirement incentives
- Surplus, when reached, over 30 years

The layered amortization approach used by the Plan is the CCA White Paper model practice for amortizing any unfunded liabilities. Additionally, the amortization periods also generally conform to model practice, except for plan amendments. We recommend that plan amendments that impact active members be amortized over the *lesser of 15 years and* the average expected future service. Also, we recommend adding that plan amendments that impact inactive members be amortized over the *lesser of the average life expectancy and 10 years*.

Actuarial Equivalent Definition

This study is about assumptions used to fund the plan and not about benefit levels. However, actuarial assumptions are also used to determine benefits as described in the *Actuarial Equivalent* definition of the plan. The most common use is to reduce benefits when a retiring member elects to provide additional survivor benefits. These reductions factor in the ages of the member and beneficiary and must use certain assumptions about mortality, investment returns and cost of living adjustment.

[2] The CCA White Paper is available at https://www.ccactuaries.org/docs/default-source/papers/cca-ppc_actuarial-funding-policies-and-practices-for-public-pension-plans.pdf?sfvrsn=6397cc76_6,

In recent years, participants in a number of ERISA plans have filed lawsuits against plans claiming that their benefit were determined using outdated mortality tables and hence their benefit should be increased based on more recent mortality tables. ERISA has a variety of rules that do not apply to governmental plans. However, Maryland law imposes ERISA fiduciary standards on local government pension plans. Litigation risk with public plans in this area is much less. However, updates should be considered from time-to-time.

An analysis of the plan's *Actuarial Equivalent* assumptions are not part of the scope of work for this study, however, the Retirement Committee and/or the County may ask Bolton to prepare a separate study to review the *Actuarial Equivalent* assumptions.

Section VI. Impact of Changes

The results below reflect the impact of the proposed changes on the July 1, 2021 valuation results used for the Actuarially Determined Contribution (ADC) for FY2023. Note, however, that if changes to the assumptions are adopted, they would first be reflected in the July 1, 2022 valuation which will develop the ADC for FY2024.

	Current Assumptions	Proposed Assumptions	Change	Change (% of Current)
Actuarial Accrued Liability	$821,136,660	$822,297,116	$1,160,456	0.1%
Actuarial Value of Assets	$739,199,104	$739,199,104	$0	0.0%
Unfunded Liability	$81,937,556	$83,098,012	$1,160,456	1.4%
AVA Funded Ratio	90.0%	89.9%	-0.1%	0.0%
ADC	$33,060,808	$32,752,559	$(308,249)	-0.9%
ADC as Percent of Payroll	34.2%	33.9%	-0.3%	-0.9%

Section VII. Data, Methods and Assumptions Applied in the Experience Study

We used participant data initially prepared for the actuarial valuations for the years beginning:

- July 1, 2017
- July 1, 2018
- July 1, 2019
- July 1, 2020
- July 1, 2021

The data files were provided by or at the direction of Howard County. We have relied on this information for purposes of preparing this report. We have not audited the census data provided, however based on our review the data appears to be reasonable and consistent. Unless otherwise noted in our report, we believe the information provided is sufficiently complete and reliable for purposes of the analysis presented in this report.

We determined, for each year, the actual incidence of each demographic assumption, based on the participant's rounded integer age and years of service as of the beginning of the year and compared that to the expected incidence, determined using the same factors.

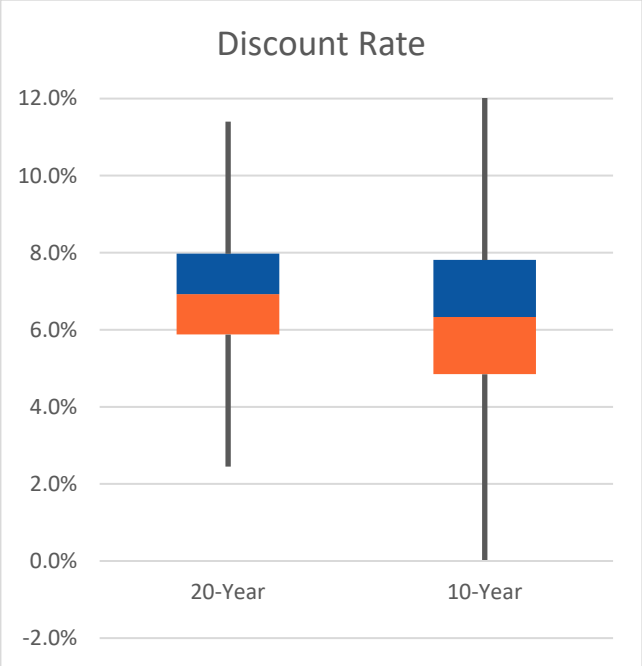
Appendix

As an independent review of this assumption, we used the Capital Market Assumptions (CMAs) provided in Horizon Actuarial Services' *Survey of Capital Market Assumptions – 2022 Edition* to develop an expected portfolio geometric return based on the June 30, 2022 asset allocation.

The table below summarizes Horizon's CMAs and our derivation of the portfolio return for the Howard County Retirement Plan. In our calculations, to convert between the portfolio arithmetic (A) and geometric (G) return, we used the formula G ≈ A – V/2, where V is the portfolio variance.

		Arithmetic Return		
Horizon Asset Class	**6/30/2022 Allocation**	**10-Year Real Return (net of inflation)**	**20-Year Real Return (net of inflation)**	**St. Dev**
US Equity - Large Cap	22.0%	4.70%	5.37%	16.33%
US Equity - Small/Mid Cap	5.5%	6.04%	6.53%	20.34%
Non-US Equity - Developed	11.0%	5.61%	6.22%	18.09%
Non-US Equity - Emerging	6.5%	7.52%	8.22%	23.92%
US Corp Bonds - Core	4.5%	0.31%	1.20%	5.36%
US Corp Bonds - High Yield	4.0%	2.00%	2.98%	9.90%
Non-US Debt – Developed	4.0%	-0.39%	0.32%	7.51%
Non-US Debt – Emerging	4.0%	2.77%	3.43%	10.92%
TIPS	6.5%	-0.30%	0.39%	5.79%
Real Estate	4.0%	4.33%	4.87%	17.00%
Hedge Funds	8.0%	2.67%	3.39%	7.99%
Commodities	2.0%	2.84%	3.41%	17.78%
Private Equity	13.0%	9.13%	10.05%	22.13%
Private Debt	5.0%	5.09%	5.38%	11.49%
Total	***100.00%***			
Portfolio Arithmetic Return (net of inflation)		**4.53%**	**5.22%**	
Inflation		2.47%	2.45%	
Portfolio Arithmetic Return (including inflation)		**7.00%**	**7.67%**	
Portfolio Variance				1.48%
Portfolio Standard Deviation				12.2%
Portfolio Geometric Return (net of investment expenses)		**6.26%**	**6.93%**	

Using the calculated portfolio standard deviation of 12.2%, we estimated the 5th, 35th, 50th, 65th, and 95th percentiles for the portfolio geometric return for both the 10-year and 20-year investment horizons. The graph below illustrates the ranges of returns.



	20-Year	10-Year
95th	11.40%	12.59%
65th	7.98%	7.74%
50th	6.93%	6.26%
35th	5.88%	4.77%
5th	2.45%	-0.07%

Some plan sponsors prefer a more conservative assumption for their funding valuations since contribution requirements increase following years in which investment returns do not meet the assumption. As such, they set the discount rate assumption lower than the expected investment return to increase the probability that the fund's return will meet or exceed the discount rate. From a fiduciary standpoint, the number one goal of a pension system is to adequately and systematically fund the plan to ensure that promised benefits can be paid in full. Achieving this goal often entails the consideration of supporting, and sometimes competing, objectives, such as mitigating undo pressure on the sponsor, participants, or other stakeholders and balancing contribution development and volatility with intergenerational equity.